DELTA ELECTRONICS CO., LTD.

PCI-DMC-A01
PCI-DMC-B01

High-Speed PCI 12-Axis Motion Control Card

Programming Manual

Version: 1.11.1

About this Manual

User Information

Please keep this manual in a safe place.
This manual is subject to change without notice due to the release of new products, improvements and changes in technologies, and/or modifications to data and forms.

Trademarks

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Chapter 1 Introduction to the API Function Library

PCI-DMC-A01 provides a function library and dynamic-link library (DLL) which can be called upon to perform functions as you require. The following sections will detail how you can incorporate these function libraries into your development environment.

1.1 Using the Function Libraries

Once you have installed the program you will find two libraries under the “lib” folder. These libraries are intended for use in Visual Studio C or Borland development environments.

Table 1.1

PCI_DMC_01.lib	Visual Studio C function library
BCBPCI_DMC_01.lib	Borland C function library

1.2 Edit New Project

1.2.1 Using VC

1. Add the following command to your project:
   # include “..\inc\VC\PCI_DMC_01.h”
   # include “..\inc\VC\PCI_DMC_01_Err.h”
2. Under the Visual C development environment, select Project / Setting / Link Under Object / Library modules, input “..\lib\PCI_DMC_01.lib”
3. Once set, you can begin using the API to control PCI-DMC-A01.

1.2.2 Using Borland C

1. Add the following command to your project:
   # include “..\inc\BCB \PCI_DMC_01.h”
   # include “..\inc\BCB\PCI_DMC_01_Err.h”

2. Under the Borland C++ Build development environment, select View/ Project Manager
   Add the function library "..\lib\BCBPCI_DMC_01.lib" to your new project.
3. Once set, you can begin using the API to control PCI-DMC-A01.

1.2.3 Using VB

Under the installation directory "..\ \PCI-DMC-A01\inc\VB" you will find "PCI_DMC_01.bas" and "PCI_DMC_01_Err.bas". Add these two files to your new project to use the API to control PCI-DMC-A01.

1.2.4 Using Delphi

Under the installation directory "..\ \PCI-DMC-A01\inc\Delphi" you will find "PCI_DMC_01.pas". Add this file to your new project to use the API to control PCI-DMC-A01.

1.2.5 Using VB.Net

Under the installation directory "..\ \PCI-DMC-A01\inc\VB.Net" you will find "PCI_DMC_01.vb" and "PCI_DMC_01_ERR.vb". Add these two files to your new project to use the API to control PCI-DMC-A01.

1.2.6 Using C#

In the installation directory "..\ \PCI-DMC-A01\inc\C#" you will find "PCI_DMC_01.css" and "PCI_DMC_01_ERR.cs". Add these two files to your new project to use the API to control PCI-DMC-A01.

Chapter 2 Command Return Values and Messages

2.1 Error Codes

When you use API for PCI-DMC-A01, the function library will generally return one of the error codes listed in Table 2.1.

If the API function's return value is 0, then the API function was executed successfully. If the API function returns some other error code, then an error may have occurred during operation or in the hardware connection. You can troubleshoot the problem by referring to the error code description.

Table 2.1

Error Return Code (Decimal)	Error Code	Error Description
0	ERR_NoError	API executed successfully
3	ERR_CardNoError	Card number error. Please check the number set by the DIP Switch on the card.
5	ERR_bootmodeErr	Unable to boot DSP procedure
6	ERR_downloadcode	DSP memory program read/write error
7	ERR_downloadinit	DSP memory data read/write error
8	ERR_PCI_boot_first	"_DMC_01_pci_initial" AP function must be launched first
11	ERR_AxisNoError	Axis number error (too large)
12	ERR_IPO_First	Must be in IPO mode
13	ERR_Target_reach	Target must be in position for Mode 1 operation
14	ERR_Servo_on_first	Must be set to Servo on
15	ERR_MPG_Mode	Unable to clear position in Manual Pulse Generator (MPG) mode
16	ERR_PDO_TG	Unable to return acknowledgement when sending command to module in PDO mode
17	ERR_ConfigFileOpenError	Error opening configuration file
18	ERR_Ctrl_value	Command code error
19	ERR_Security_Fifo	Write error using Security Fpga
20	ERR_Security_Fifo_busy	Security Fpga is busy

Error Return Code (Decimal)	Error Code	Error Description
21	ERR_SpeedLimitError	Defined velocity exceeds maximum velocity
22	ERR_Security_Page	Security page must be smaller than 16
23	ERR_Slave_Security_op	Security slave_operate command failed
24	ERR_channel_no	channel no error
25	ERR_start_ring_first	"_DMC_01_pci_initial" AP function must be launched first
26	ERR_NodeIDError	NodeID does not exist
27	ERR_MailBoxErr	DSP busy, unable to send command
28	ERR_SdoData	SDO data sent, but no response received
29	ERR_IOCTL	Operating system unable to process this IRP
30	ERR_SdoSvonFirst	Servo On required to use SDO axis control
31	ERR_SlotIDError	No such Slot ID for Slave module (GA or RM)
32	ERR_PDO_First	PDO protocol mode required to use PDO protocol
33	ERR_Protocal_build	Protocol, not built
34	ERR_Maching_TimeOut	Module matching time-out
35	ERR_Maching_NG	Module matching failed
40	ERR_Master_Security_Wr	Security Master Write command failed
41	ERR_Master_Security_Rd	Security Master Read command failed
42	ERR_Master_Security_Pw	Correct password required
50	ERR_NonSupport_CardVer	Master Card version error. Please contact distributor to purchase the correct Master Card
51	ERR_Compare_Source	Ver Type: B Compare Source selection error
52	ERR_Compare_Direction	Compare direction error; dir must be set to 1 or 0 (1:ccw, 0:cw)
112	ERR_RangeError	Axis number error
114	ERR_MotionBusy	Motion command overlap
116	ERR_SpeedError	Maximum velocity set to 0
117	ERR_AccTimeError	Acceleration/deceleration time greater than 1000 sec
124	ERR_PitchZero	Screw displacement parameter "pitch" set to 0
127	ERR_BufferFull	Motion command buffer is full
128	ERR_PathError	Motion command error
130	ERR_NoSupportMode	Velocity change not supported
132	ERR_FeedHold_support	Feedhold Stop enabled. Unable to receive new commands

Error Return Code (Decimal)	Error Code	Error Description
133	ERR_SDStop_On	Currently executing deceleration/stop command, Unable to receive new commands
134	ERR_VelChange_supper	Unable to execute velocity change function (Feedhold, Synch, and Deceleration)
135	ERR_Command_set	Unable to repeat FeedHold command
136	ERR_sdo_message_choke	Sdo command return error. Please check network connection
137	ERR_VelChange_buff_feedhold	Feedhold function must be enabled first. Unable to change velocity
138	ERR_VelChange_sync_move	Waiting for sync command, unable to change velocity
139	ERR_VelChange_SD_On	Waiting for decelerate command, unable to change velocity
140	ERR_P_Change_Mode	Single axis point to point mode. Acceleration segment's velocity is 0. Non-single axis point to point mode
141	ERR_BufferLength	When mode is _Path_p_change,_Path_velocity_change_onfly, _Path_Start_Move_2seg then Buffer Length must be 0
142	ERR_2segMove_Dist	Distance must be in same direction
143	ERR_CenterMatch	Center must match
144	ERR_EndMatch	Center must match
145	ERR_AngleCalcu	Angle calculation error
146	ERR_RedCalcu	Radius calculation error
147	ERR_GearSetting	Gear numerator or denominator is 0
148	ERR_CamTable	Table Setting First Array Point Error, Table setting cannot be negative; table[-1] does not exist
149	ERR_AxesNum	Number of axes must be set to at least 2 for multiple axes settings
150	ERR_SpiralPos	Final position will be the center of the spiral

2.2 Error Code Example

The following example is a return function. You can use it as a reference to create new functions that meet your control requirements.

■ Example

```
Void error (unsigned short rc)      // Function that returns error code; rc is the parsed return value
{
    Switch(rc)
    {
      Case 3:
            printf("Card No. Error, Please check Card No. again.");
            break;
      default:
            break;
    }
```

Chapter 3 Operating Principles

3.1 Card Initialization

3.1.1 Function List

Table 3.1

Function Name
_DMC_01_open
_DMC_01_get_CardNo_seq
_DMC_01_check_card_running
_DMC_01_reset_card
_DMC_01_close
_DMC_01_pci_initial
_DMC_01_initial_bus
_DMC_01_start_ring
_DMC_01_get_device_table
_DMC_01_get_node_table

3.1.2 Sample Application

Program Appearance

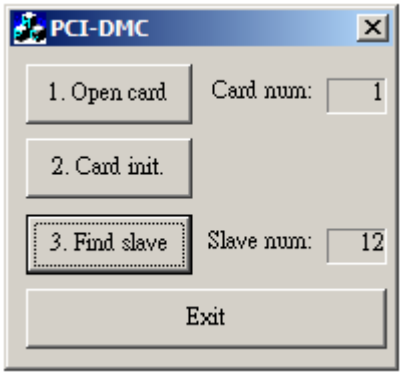


Figure 3.1

1) Open card

Figure 3.2

Click on the “Open card” button to execute the following procedure:

```
/* gDMCExistCards variable is set as the number of PCI-DMC-A01 on the PC*/
rt = _DMC_01_open(&gDMCExistCards);
```

2) Card initialization

Figure 3.3

Click on the “Card init” button to execute the following procedure:

```
for(i=0; i<gDMCExistCards; i++)
{
/* Get the card number of the i-th card on the PC. Card number is the value set by
the DIP Switch*/
  rt = _DMC_01_get_CardNo_seq(i, &CardNo);
  gpDMCCardNoList[i] = CardNo;

/*Check to see if the card has been initialized. If the value is 0, then the card has not
been initialized .*/
  rt = _DMC_01_check_card_running(gpDMCCardNoList[i], &running);
  if(running == 0) {
      rt = _DMC_01_pci_initial(gpDMCCardNoList[i]);    // Initialize card
      if(rt != 0) AfxMessageBox(“Can't boot PCI_DMC_01 Master Card!”);
  }
  rt = _DMC_01_initial_bus(gpDMCCardNoList[i]); // Initialization communications
  protocol
  gbpDSPBoot[gpDMCCardNoList[i]] = true;
}
```

3) Establish communications

Figure 3.4

Click on the “Find slave” button to execute the following procedure:

```
rt = _DMC_01_start_ring(gDMCCardNo, 0); // Begin communications
rt = _DMC_01_get_device_table(gDMCCardNo, &gpDeviceInfo[gDMCCardNo]);
rt = _DMC_01_get_node_table(gDMCCardNo, &gpSlaveTable[0][gDMCCardNo]);
```

Once the above procedure has been executed, the detected Slave device is displayed in the “Slave num” field.

NOTE

_DMC_01_get_device_table → Get the Slot ID using the PDO protocol
Example: gpDeviceInfo[gDMCCardNo] is a "WORD" type variable. If its value is 7, the binary form is expressed as "0000 0000 0000 0111", so Slave devices with Slot IDs "1", "2" and "3" exist.
_DMC_01_get_node_table → Get Node ID using SDO protocol.
Example: gpSlaveTable[0][gDMCCardNo] is a "DWORD" type variable. If its value is 7, the binary form is expressed as "0000 0000 0000 0000 0000 0000 0000 0111", so Slave devices with Node ID "1", "2", and "3" exist.

※You can use the following algorithm to find the Node ID for SDO.

```
lMask = 0x1;
for(i=0; i<32; i++)
{
/* Condition is met when the i-th bit is 1. */
if((gpSlaveTable[0][gDMCCardNo]>>i) & lMask) {
/* The derived i-th value +1 is the Node ID and corresponds to servo parameter
"P3-00" */
    gpNodeID[gNodeNum] = (unsigned short)(i+1);
    gNodeNum++;
  }
}
```

4) Exit procedure

Figure 3.5

Click on the "Exit" button to execute the following procedure:

```
for(i=0; i<gDMCExistCards; i++) {
        rt = _DMC_01_reset_card(gpDMCCardNoList[i]);     // Reset card
}
_DMC_01_close();    // Shut down PCI-DMC-A01
```

3.2 Read/Write Driver Parameters

3.2.1 Function List

Table 3.2

Function Name
_DMC_01_set_pdo_mode
_DMC_01_read_servo_parameter
_DMC_01_write_servo_parameter

3.2.2 Sample Application

Program Appearance

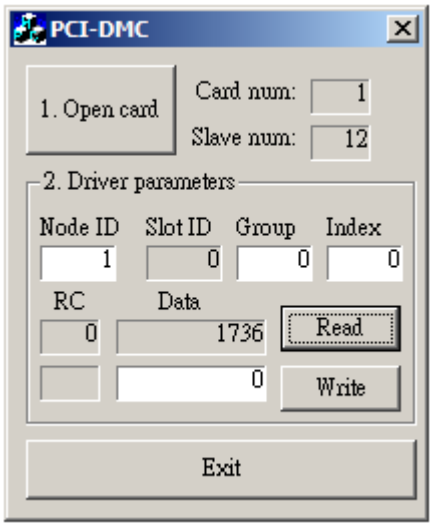


Figure 3.6

1) Card Initialization and Mode Switching

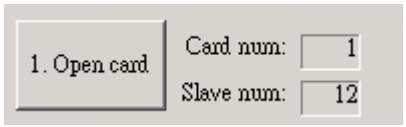


Figure 3.7

Click on “Open card” to execute card initialization and set SDO mode.
For detailed instructions on card initialization, please refer to the functions described in Section 3.1 between “Open card” and “Establish communications”.
Setting the SDO mode will use the following API function:

```
/* Set Slave communications to SDO mode */
rt = _DMC_01_set_pdo_mode(gDMCCardNo, gpNodeID[i], SlotID, 0);
```

The last argument [Enable] is used to set whether PDO mode is used for Slave communications or not. Please refer to the section on this function for a more detailed description of this argument.
In the above example, the value of the argument is 0. This means PDO mode is disabled during Slave communication.
If you set PDO mode to disabled, then Slave communications will use the SDO protocol. If you need to use the SDO protocol to control the slave, you **must** set the value of this argument to **zero**.

2) Input the servo to change (Including Node ID, Group No. and Index value)

Figure 3.8

For example, you can enter the values shown below in Fig. 3.8.
1st field - "**Node ID**": If the value is 1, then it will operate the servo with Node ID 1.
2nd field - "**Slot ID**": This field cannot be changed. It shows the current Slave device (Servo's Slot ID is 0).
3rd Field - "**Group**": Refers to the group number. of the device (usually a servo). For a more detailed description of group number, please refer to the "ASDA-A2 User Manual". If Group is set to 0 as shown in Fig. 3.8, this means this will set the servo parameter for "P0-xx" (the value of xx is explained below under Index).
4th field - "**Index**": As noted above, this value depends on the value for Group. In Fig. 3.8, index has a value of 0 so in this case, read/write will be carried on the "P0-00" parameter of Servo with Node ID of 1.

3) Read servo parameter

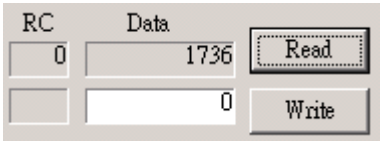


Figure 3.9

Click on the "Read" button to execute the following procedure:
rt = _DMC_01_read_servo_parameter(gDMCCardNo, NodeID, SlotID, group, idx, &data);
// A data value will be returned. The value will be current value set for this servo parameter.
// The value of rt will be displayed in the "RC" field while the value of data will be displayed in the "Data" field.

4) Write servo parameter

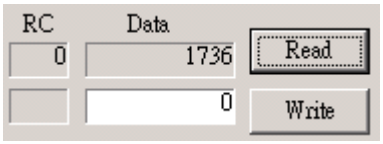


Figure 3.10

As shown in Fig. 3.10, if you wish to write a parameter value to servo then you must input the desired value in the edit box and then click on the “Write” button to execute the following procedure:

```
rt = _DMC_01_write_servo_parameter(gDMCCardNo, NodeID, SlotID, group, idx, data);
//The value will be written to the servo group parameter you set. Please refer to the previous section for a detailed description.
```

5) Exit procedure

Click on the “Exit” button to quit and exit the procedure.

“_DMC_01_reset_card” and “_DMC_01_close” must be executed to exit this function. Please refer to Section 3.12 “Exit procedure” for the function operations.

3.3 CANopen Protocol

3.3.1 Function List

Table 3.3

Function Name
_DMC_01_set_pdo_mode
_DMC_01_send_message
_DMC_01_read_message
_DMC_01_get_message

3.3.2 Sample Application

Program Appearance

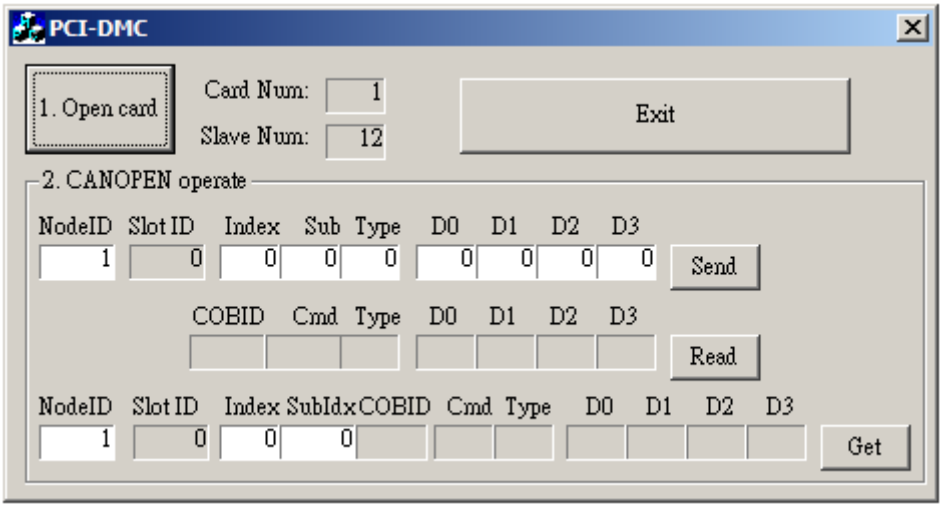


Figure 3.11

1) Initialize card and set Slave communications to SDO mode.
   Click on the “Open card” button shown in Fig. 3.11 to initialize card and set SDO mode.
   A description of this button is provided in Section 3.2.2 “Card Initialization and Mode Switching”.

2) Send SDO protocol command

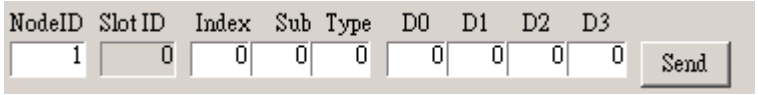


Figure 3.12

You input the value of the “NodeID”. The value will reflect the Slave ID you wish to set up.

Please refer to th CANopen manual (DS 402) for setting the “Index”, “Sub” and “Type” values.

The values “D0” to “D3” are used to input the SDO command data you wish to set (Valid data: Byte).

Once you enter the above data, click on the “Send” button to execute the following API function:

rt = _DMC_01_send_message(gDMCCardNo, NodeID, SlotID, Index, SubIdx, DataType, Value0, Value1, Value2, Value3);

3) Command for reading SDO protocol

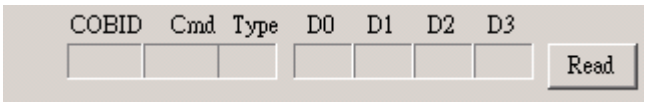


Figure 3.13

Click on the “Read” button to execute the following procedure:

/* Get the returned data for the last SDO command you sent*/

rt = _DMC_01_read_message(gDMCCardNo, &Cmd, & COBID, &DataType, &Value0, &Value1, &Value2, &Value3);

You can create some variables to store the data returned by SDO commands. For detailed description of the returned data, please see Section 8.8.

4) Command for getting SDO protocol

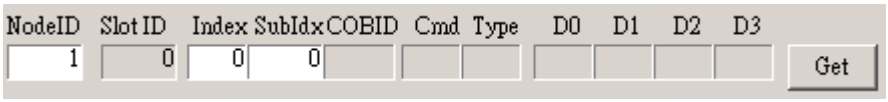


Figure 3.14

You must enter the corresponding Node ID, Object Dictionary (OD) index and sub-index to get the information you want to know from the CANopen interface protocol. Once you enter the data, click on the “Get” button to execute:

rt = _DMC_01_get_message(gDMCCardNo, NodeID, SlotID, Index, SubIndex, &COBID, &Cmd , &DataType, &Value0, &Value1, &Value2, &Value3);

You can create some variables to store the data returned by SDO commands. For detailed description of the returned data, please see Section 8.9.

5) Exit procedure

Click on the “Exit” button to quit and exit the procedure.

3.4 Homing Motion Control

3.4.1 Overview

Most application programs use an incremental encoder to retrieve position feedback. A homing operation is essential to performing accurate motion control. After the power is switched on, the status of the machine bench's position can be in one of three states. First, position is stopped at the homing position awaiting the next command; second, position is stopped at the ORG sensor; third, position is stopped somewhere between ORG and Limit Switch (PEL and MEL). Please refer to the block diagram in Fig. 3.15 below.

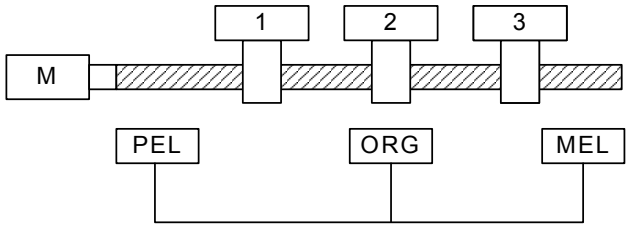


Figure 3.15

PCI-DMC-A01 provides different functions for each of the above conditions. For homing mode in a normal position, PCI-DMC-A01 offers up to 35 different reset to home functions (including the reserved part). The user can simply use software settings to have the hardware perform the user-selected homing operation. Once the homing motion is complete, the corresponding command and feedback position will be cleared to 0. The target position will however not be cleared to 0. The following graph shows the conditions for executing homing:

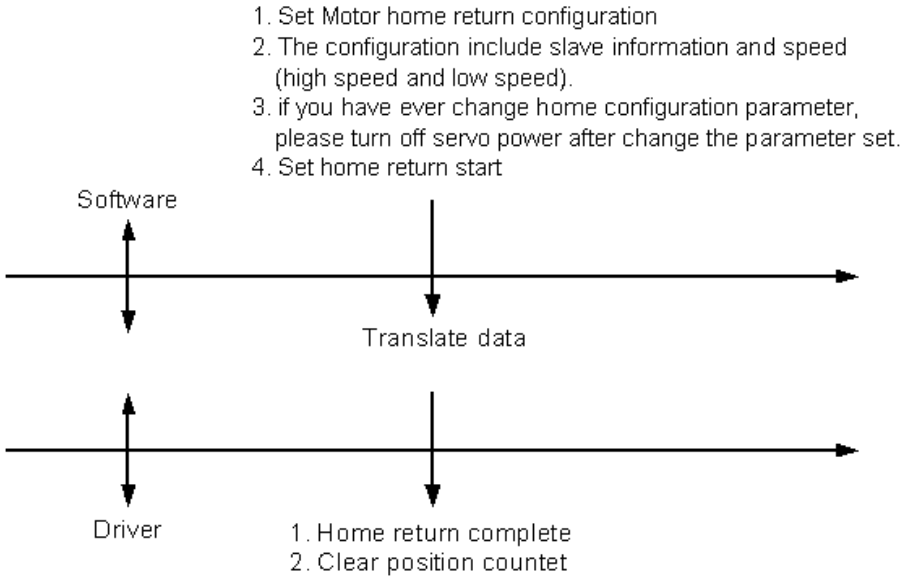


Figure 3.16

3.4.2 Function List

Table 3.4

Function Name
_DMC_01_set_home_config
_DMC_01_set_home_move
_DMC_01_escape_home_move

3.4.3 Sample Application

Program Appearance

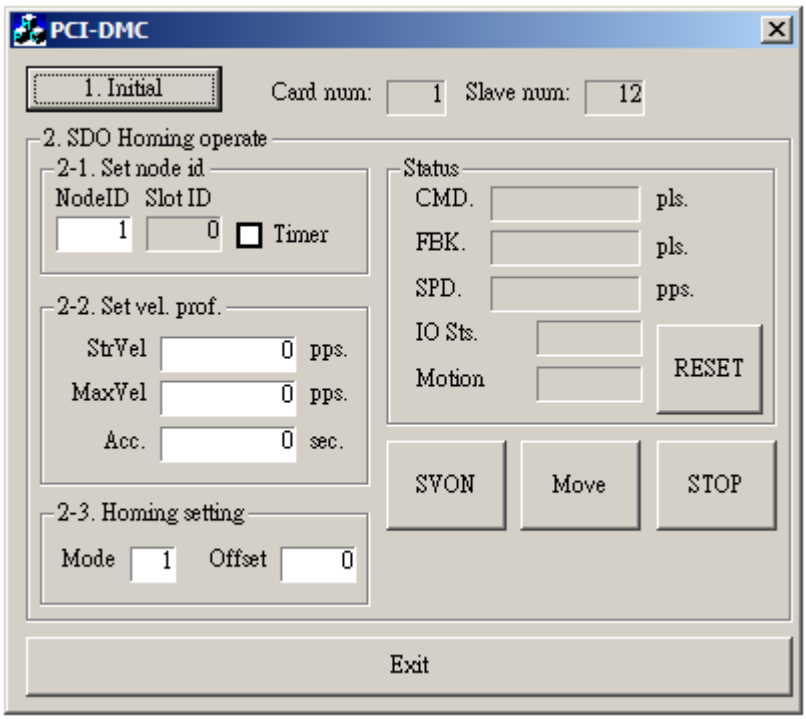


Figure 3.17

1) Open card and initialization
   Click on the “Initial” button to open and initialize the card.
   For a detailed description of card initialization, please refer to “Open card” and “Card initialization” in Section 3.1.2.

2) Enter the values of the arguments for motion control

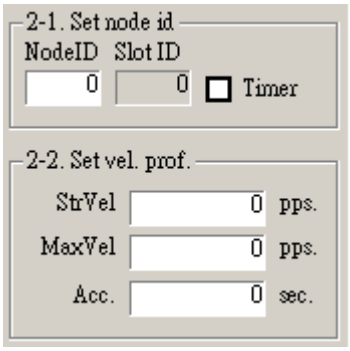


Figure 3.18

NodeID item: API function's argument variable “NodeID”.
Timer Checkbox: Check to display the motion status. Uncheck to disable display.
Vel. item: Number of pulses per second. API function's argument variable “MaxVel”.
Acc. item: Time required to reach maximum velocity. API function's argument variable “acc”.

3) Set homing parameter (Homing mode and offset)

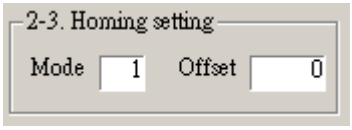


Figure 3.19

Mode item: Homing modes 1 to 35. API function's argument variable “home_mode”.
Offset item: Homing offsetAPI function's argument variable “home_offset”.

4) Set Servo Motor Power ON/OFF(servo on/servo off)

Figure 3.20

Click on the “SVON” button to execute the following procedure:

```
rt =    _DMC_01_ipo_set_svon(gDMCCardNo, NodeID, SlotID , ON_OFF);
// ON_OFF: 0 – Servo Power OFF; 1 – Servo Power ON
```

5) Homing operation

See Fig. 3.20. Click on “Move” to begin executing the following procedure;

```
/* Set homing mode: 1~35, offset and velocity parameters */
rt = _DMC_01_set_home_config(gDMCCardNo, NodeID, SlotID, home_mode,
home_offset, StrVel, MaxVel, acc);
/* Start homing motion */
rt = _DMC_01_set_home_move(gDMCCardNo, NodeID, SlotID);
```

6) Stop homing motion

If you wish to stop the homing motion operation, you must hit the “STOP” button to execute the following procedure:

```
/* Interrupt homing motion */
rt = _DMC_01_escape_home_move(gDMCCardNo, NodeID, SlotID);
```

7) Exit procedure

Click on the “Exit” button to quit and exit the procedure.

“_DMC_01_reset_card” and “_DMC_01_close” must be executed to exit this function. Please refer to Section 3.12 “Exit procedure” for the function operations.

3.5 Torque Motion Control

3.5.1 Function List

Table 3.5

Function Name
_DMC_01_set_torque_mode
_DMC_01_set_torque
_DMC_01_set_torque_stop
_DMC_01_get_torque

3.5.2 Sample Application

Program Appearance

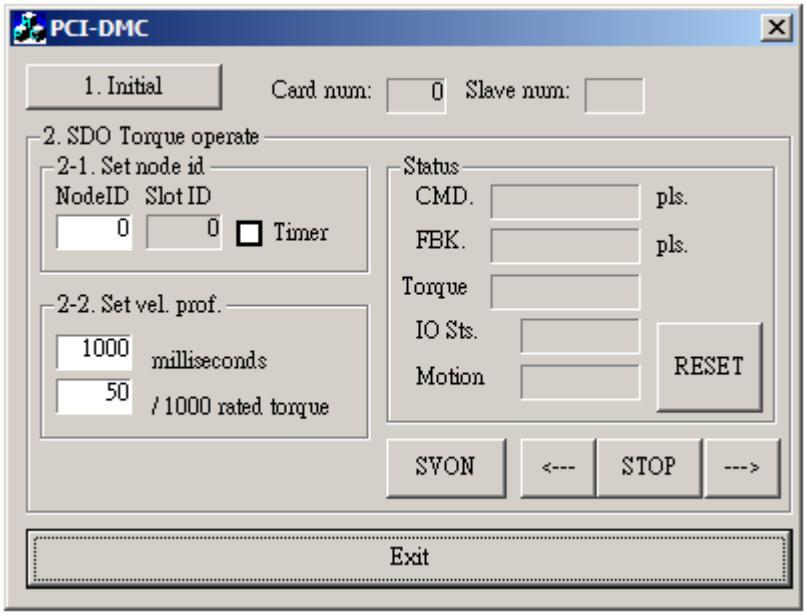


Figure 3.21

1) Card initialization
   Click on the “Initial” button to open and initialize the card.
   For a detailed description of card initialization, please refer to “Open card” and “Card initialization” in Section 3.1.2.

2) Set Servo Node ID and enable motion status display

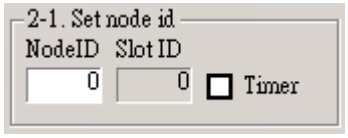


Figure 3.22

Input Node ID and check the “Timer” checkbox to enable motion status display

NodeID item: API function argument variable “NodeID”.

Timer Checkbox: Check to display the motion status. Uncheck to disable display.

3) Enter values for slope and ratio

Figure 3.23

Slope item: Time required to go from 0 to 100% rate torque. (Unit: ms)

Ratio item: Thousandths of rated torque. For example, a value of 100 represents 10% of rated torque.

4) Set Servo Motor Power ON/OFF(servo on/servo off)

Figure 3.24

Click on the “SVON” button to execute the following procedure:

```
rt =   _DMC_01_ipo_set_svon (gDMCCardNo, NodeID, SlotID , ON_OFF);
// ON_OFF: 0 – Servo Power OFF; 1 – Servo Power ON
```

5) Torque Motion Control

Click on the “→” or “←” button to execute the following procedure:

```
/* Set torque parameter (slope value) */
rt = _DMC_01_set_torque_mode(gDMCCardNo, NodeID, SlotID, slope);
/* Start torque motion */
rt = _DMC_01_set_torque(gDMCCardNo, NodeID, SlotID, ratio);
// If ratio is greater than 0, the motor rotates clockwise. If ratio is less than 0, the
motor rotates counterclockwise.
```

Press the “STOP” button to execute torque stop or not

```
/* Whether the motor's torque motion has stopped or not depends on the Stop value.
If Stop value is 1 then torque motion has stopped.    */
rt = _DMC_01_set_torque_stop(gDMCCardNo, NodeID, SlotID, stop);
```

6) Display current torque value

```
rt = _DMC_01_get_torque(gDMCCardNo, NodeID, SlotID, &torque);
// torque variable will return current torque value
```

7) Exit procedure

Click on the “Exit” button to quit and exit the procedure.

“_DMC_01_reset_card” and “_DMC_01_close” must be executed to exit this function. Please refer to Section 3.12 “Exit procedure” for the function operations.

3.6 Velocity Motion Control (1)

3.6.1 Function List

Table 3.6

Function Name
_DMC_01_set_velocity_mode
_DMC_01_set_velocity
_DMC_01_set_velocity_stop
_DMC_01_get_rpm

3.6.2 Sample Application

Program Appearance

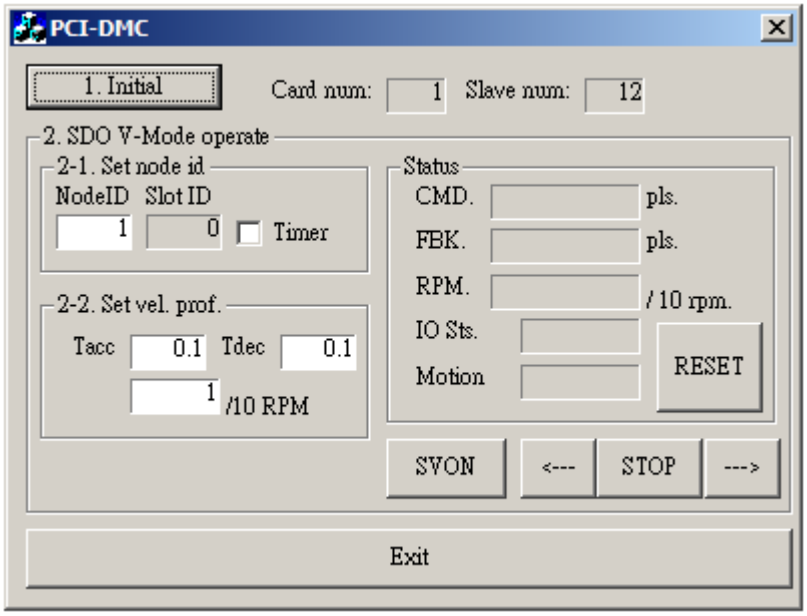


Figure 3.25

1) Card initialization
   Click on the “Initial” button to open and initialize the card.
   For a detailed description of card initialization, please refer to “Open card” and “Card initialization” in Section 3.1.2.

2) Set Servo Node ID and enable motion status display

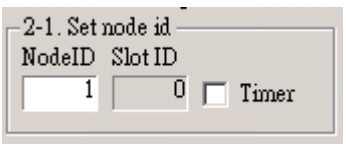


Figure 3.26

Input Node ID and check the “Timer” checkbox to enable motion status display

NodeID item: API function's argument variable “NodeID”.

Timer Checkbox: Check to display the motion status. Uncheck to disable display.

3) Enter the values for acceleration/deceleration time and rotations per minute (RPM)

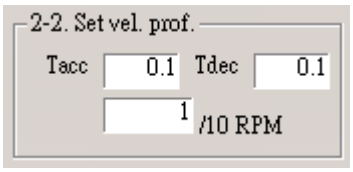


Figure 3.27

Tacc item API function's argument variable “Tacc”.

Tdec item: API function's argument variable “Tdec”.

RPM item: API function's argument variable “rpm”.

※Actual RPM is 10% of rpm variable.

4) Set Servo Motor Power ON/OFF(servo on/servo off)

Figure 3.28

Click on the “SVON” button to execute the following procedure:

```
rt = _DMC_01_ipo_set_svon(gDMCCardNo, NodeID, SlotID , ON_OFF);
// ON_OFF: 0 – Servo Power OFF; 1 – Servo Power ON
```

5) Velocity Motion Control

Click on the “→” or “←” button to execute the following procedure:

```
/* Set velocity mode parameter (value for acceleration and deceleration time)) */
rt = _DMC_01_set_velocity_mode(gDMCCardNo, NodeID, SlotID, Tacc, Tdec);
/* Start velocity mode motion */
rt = _DMC_01_set_velocity(gDMCCardNo, NodeID, SlotID, rpm);
// If value of RPM is greater than 0 then drive motor rotates clockwise. if value is less than 0 then rotates counterclockwise.
```

Press the “STOP” button to execute velocity stop or not.

```
/* Set whether to stop velocity motion control. If stop value is 1 then velocity motion stops. */
rt = _DMC_01_set_velocity_stop(gDMCCardNo, NodeID, SlotID, stop);
```

6) Display current RPM value

```
rt = _DMC_01_get_rpm (gDMCCardNo, NodeID, SlotID, & rpm);
// Value returned by RPM variableActual motion RPM is 10% of RPM variable value
```

7) Exit procedure

Click on the “Exit” button to quit and exit the procedure.
“_DMC_01_reset_card” and “_DMC_01_close” must be executed to exit this function. Please refer to Section 3.12 “Exit procedure” for the function operations.

3.7 Velocity Motion Control (2)

3.7.1 Function List

Table 3.7

Function Name
_DMC_01_tv_move
_DMC_01_sv_move
_DMC_01_emg_stop

3.7.2 Sample Application

Program Appearance

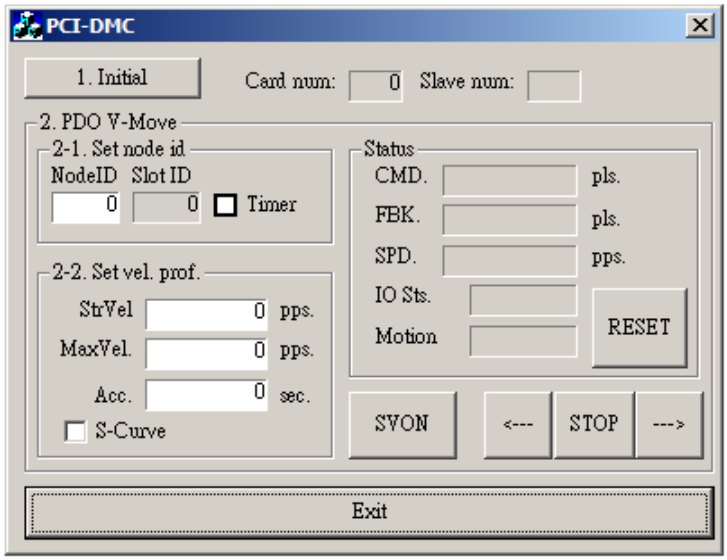


Figure 3.29

1) Card initialization
   Click on the “Initial” button to open and initialize the card.
   For a detailed description of card initialization, please refer to “Open card” and “Card initialization” in Section 3.1.2.

2) Set Servo Node ID and enable motion status display

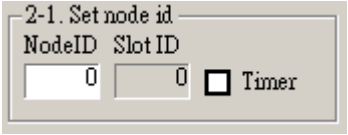


Figure 3.30

Input Node ID and check the “Timer” checkbox to enable motion status display
NodeID item: API function's argument variable “NodeID”.
Timer Checkbox: Check to display the motion status. Uncheck to disable display.

3) Enter the values of the arguments for motion control

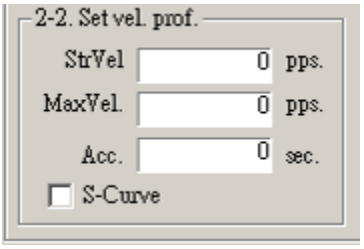


Figure 3.31

StrVel item: Starting velocity. API function's argument variable “StrVel”.
MaxVel item: Maximum velocity. API function's argument variable “MaxVel”.
Acc. item: Time required to reach maximum velocity. API function's argument variable “acc”.
S-Curve checkbox: You must check this box if you wish to use the S-curve velocity curve.

4) Set Servo Motor Power ON/OFF(servo on/servo off)
Click on the “SVON” button to execute the following procedure:

```
rt = _DMC_01_ipo_set_svon(gDMCCardNo, NodeID, SlotID , ON_OFF);
// ON_OFF: 0 – Servo Power OFF; 1 – Servo Power ON
```

5) Start velocity motion control
Click on the “→” or “←“ button to execute the following procedure:

```
/* S-curve velocity curve */
rt = _DMC_01_sv_move(gDMCCardNo, NodeID, SlotID, StrVel, MaxVel, acc, 0);
/* T-curve velocity curve */
rt = _DMC_01_tv_move(gDMCCardNo, NodeID, SlotID, StrVel, MaxVel, acc, 0);
```

6) Stop motion
Hit the “STOP” button to execute an emergency stop:

```
rt = _DMC_01_emg_stop (gDMCCardNo, NodeID, SlotID);
```

In this example, emergency stop is used to stop motion. This method quickly stops motion by setting deceleration time to 0. For more information about the Stop Motion function, refer to the later section on “Stop Motion Control API”.

7) Exit procedure
Click on the “Exit” button to quit and exit the procedure.
“_DMC_01_reset_card” and “_DMC_01_close” must be executed to exit this function. Please refer to Section 3.12 “Exit procedure” for the function operations.

3.8 Point to Point Motion Control

3.8.1 Overview

Point to point motion control can be used with single and multi-axes.

For single- or multi-axes point to point motion control, PCI-DMC-A01 absolute or relative coordinate motion modes with a S-Curve or T-curve velocity cross-section.

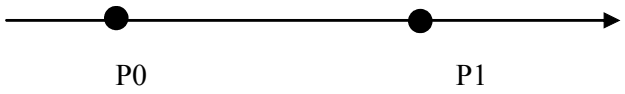


Figure 3.32

Fig. 3.32 for example shows motion displacement from P0 to P1 along a single axis. You can choose to use T-curve or S-curve motion modes based on relative or absolute coordinates for motion displacement.

3.8.2 Function List

Table 3.8

Function Name
_DMC_01_ipo_set_svon
_DMC_01_start_tr_move
_DMC_01_start_sr_move
_DMC_01_start_ta_move
_DMC_01_start_sa_move
_DMC_01_sd_stop
_DMC_01_set_command
_DMC_01_set_position
_DMC_01_get_command
_DMC_01_get_position
_DMC_01_get_current_speed
_DMC_01_motion_status
DMC_01_motion_done

3.8.3 Sample Application

Program Appearance

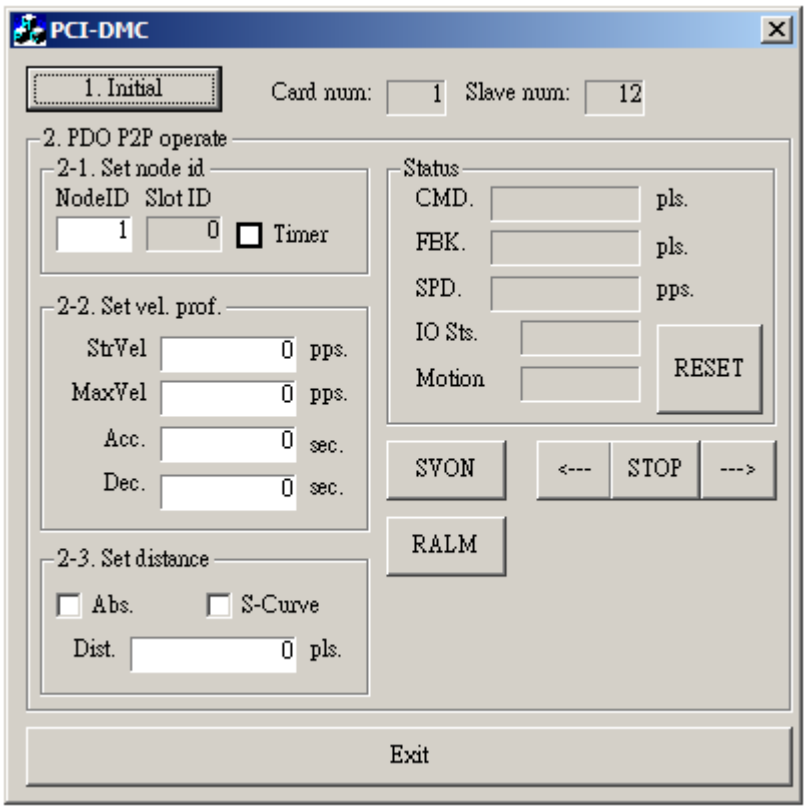


Figure 3.33

1) Card initialization

   Click on the “Initial” button to open and initialize the card.

   For a detailed description of card initialization, please refer to “Open card” and “Card initialization” in Section 3.1.2.

2) Set Servo Node ID and enable motion status display

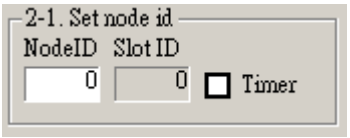


Figure 3.34

Input Node ID and check the “Timer” checkbox to enable motion status display

NodeID item: API function's argument variable “NodeID”.

Timer Checkbox: Check to display the motion status. Uncheck to disable display.

3) Enter the values of the arguments for motion control

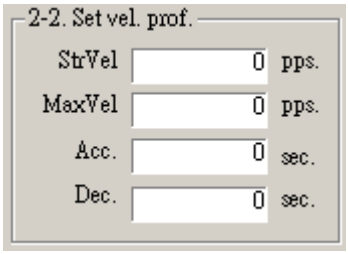


Figure 3.35

StrVel item: Starting velocity. API function's argument variable “StrVel”.
MaxVel item: Maximum velocity. API function's argument variable “MaxVel”.
Acc. item: Time required to reach maximum velocity. API function's argument variable “acc”.
Dec item: Time required to go from maximum velocity to 0. API function's argument variable “dec”.

4) Select motion mode and set motion distance.

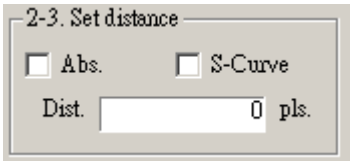


Figure 3.36

Abs. Checkbox: You must check this if you want motion displacement to use absolute coordinates.
S-Curve checkbox: You must check this box if you wish to use the S-curve velocity curve.
Dist. item: Motion distance. API function's argument variable “Distance”.

5) Set Servo Motor Power ON/OFF(servo on/servo off)

Figure 3.37

Click on the “SVON” button to execute the following procedure:

```
rt = _DMC_01_ipo_set_svon(gDMCCardNo, NodeID, SlotID , ON_OFF);
// ON_OFF: 0 – Servo Power OFF; 1 – Servo Power ON
```

6) Start point to point motion control

Click on the "→" or "←" button to execute the following procedure:

```
rt = _DMC_01_start_sa_move(gDMCCardNo, NodeID, SlotID, Distance, StrVel,
MaxVel, acc, dec);
// Motion displacement using absolute coordinates with S-curve velocity
cross-section
rt = _DMC_01_start_ta_move(gDMCCardNo, NodeID, SlotID, Distance, StrVel,
MaxVel, acc, dec);
// Motion displacement using absolute coordinates with T-curve velocity
  cross-section
rt = _DMC_01_start_sr_move(gDMCCardNo, NodeID, SlotID, Distance, StrVel,
MaxVel, acc, dec);
// Motion displacement using relative coordinates with S-curve velocity cross-section
rt = _DMC_01_start_tr_move(gDMCCardNo, NodeID, SlotID, Distance, StrVel,
MaxVel, acc, dec);
// Motion displacement using relative coordinates with T-curve velocity cross-section
```

7) Reset motion displacement counter (Command and Feedback)

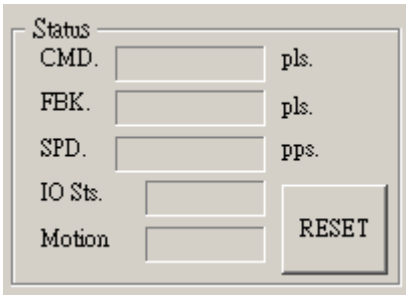


Figure 3.38

Click on the "RESET" button to execute reset command:

```
/* If you wish to reset the command and feedback counters, you must first set drive
motor to "servo off" */
if(gbIsSVON)
  rt = _DMC_01_ipo_set_svon(gDMCCardNo, NodeID, SlotID , 0);
/* The motion counters can only be cleared when the motor is confirmed to be
"servo off" */
rt = _DMC_01_set_command(gDMCCardNo, NodeID, SlotID, 0); // Clear command
rt = _DMC_01_set_position(gDMCCardNo, NodeID, SlotID, 0); // Clear feedback
/* Once the command and feedback counters are cleared, set drive motors to "servo
on" again */
if(gbIsSVON)
rt = _DMC_01_ipo_set_svon(gDMCCardNo, NodeID, SlotID , 1);
```

Motion counter value:

```
rt = _DMC_01_get_command(gDMCCardNo, NodeID, SlotID, &cmd);
// Get value of command counter
rt = _DMC_01_get_position(gDMCCardNo, NodeID, SlotID, &pos);
// Get value of feedback counter
```

Motion status:

```
rt = _DMC_01_get_current_speed(gDMCCardNo, NodeID, SlotID, &speed);
// Get velocity of current motion
rt = _DMC_01_motion_status(gDMCCardNo, NodeID, SlotID, &MC_status);
// Get current status
rt = _DMC_01_motion_done(gDMCCardNo, NodeID, SlotID, &MC_done);
// Get current motor status
```

8) Stop motion

Figure 3.39

Hit the “STOP” button to execute an emergency stop:

```
rt = _DMC_01_emg_stop (gDMCCardNo, NodeID, SlotID);
```

In this example, emergency stop is used to stop motion. This method quickly stops motion by setting deceleration time to 0. For more information about the Stop Motion function, refer to the later section on “Stop Motion Control API”.

9) Exit procedure

Click on the “Exit” button to quit and exit the procedure.

“_DMC_01_reset_card” and “_DMC_01_close” must be executed to exit this function. Please refer to Section 3.12 “Exit procedure” for the function operations.

3.9 Linear Interpolation Motion Control

3.9.1 Overview

If you wish to use CANopen PDO protocol for motion control you must operate in the CANopen IP mode.

PCI-DMC-A01 supports 2~3 axis linear interpolation in absolute or relative coordinate motion modes under the S-curve or T-curve velocity cross-section.

2-axis linear interpolation is as shown in Fig. 3.30.

This is a straight line that starts and P0 and ends at P1 in 2 dimensions.

Velocity is the vector speeds (dX:dY) along the X and Y axes as shown in Fig. 3.37:

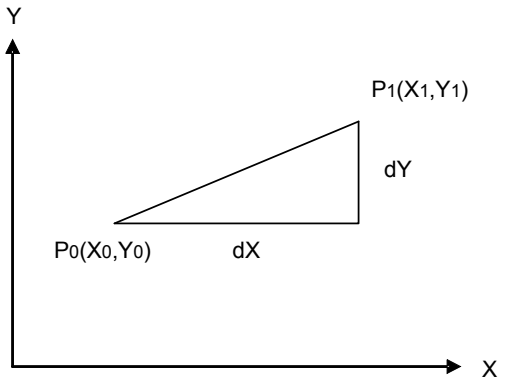


Figure 3.40

3.9.2 Function List

Table 3.9

Function Name
_DMC_01_start_tr_move_xy
_DMC_01_start_sr_move_xy
_DMC_01_start_ta_move_xy
_DMC_01_start_sa_move_xy
_DMC_01_start_tr_move_xyz
_DMC_01_start_sr_move_xyz
_DMC_01_start_ta_move_xyz
_DMC_01_start_sa_move_xyz
_DMC_01_sd_stop

3.9.3 Sample Application

Program Appearance

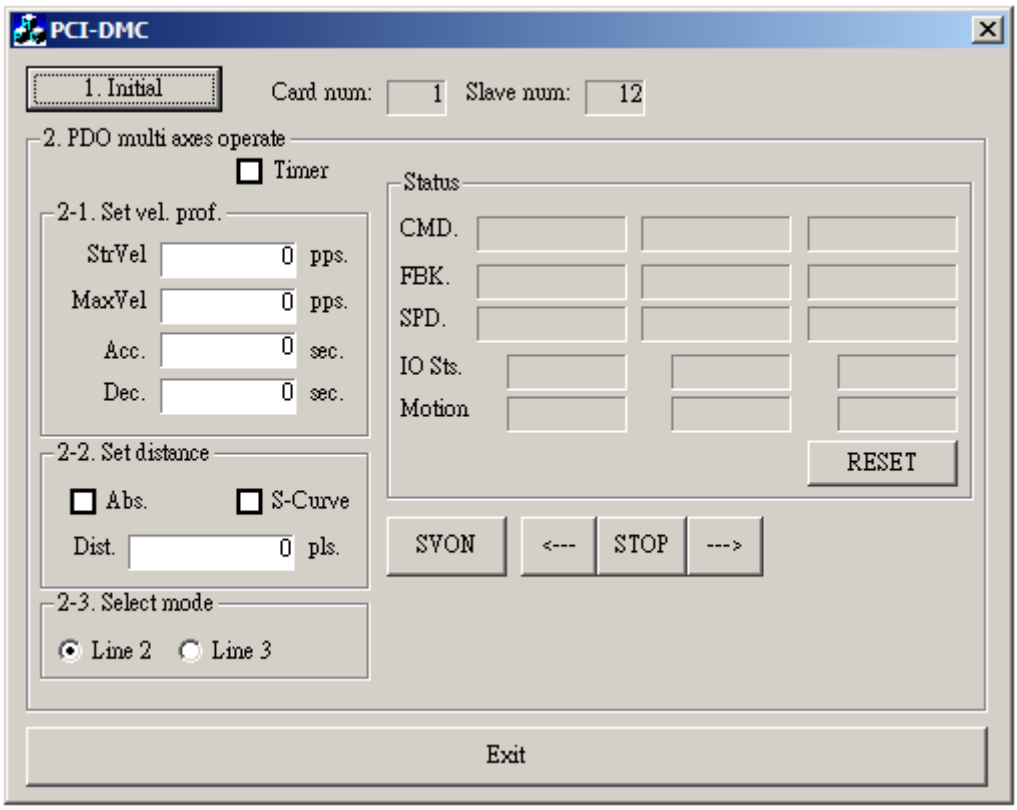


Figure 3.41

1) Card initialization

Click on the “Initial” button to start card initialization.

For a detailed description of card initialization, please refer to Section 3.1.2 - 1) Open card.

2) Get Slot ID and enable motion status display

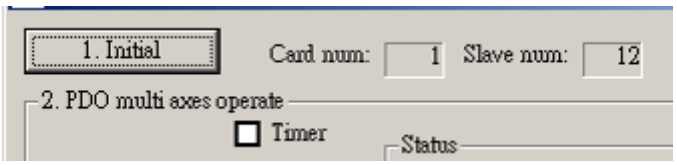


Figure 3.42

Check the “Timer” checkbox to enable motion status display

Timer Checkbox: Check to display the motion status. Uncheck to disable display.

3) Enter the values of the arguments for motion control

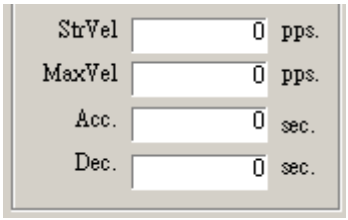


Figure 3.43

StrVel item: Starting velocity. API function's argument variable “StrVel”.
MaxVel item: Maximum velocity. API function's argument variable “MaxVel”.
Acc. item: Time required to reach maximum velocity. API function's argument variable “acc”.
Dec item: Time required to go from maximum velocity to 0. API function's argument variable “dec”.

4) Select motion mode and set motion distance.

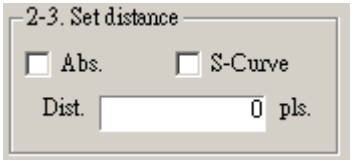


Figure 3.44

Abs. Checkbox: You must check this if you want motion displacement to use absolute coordinates.
S-Curve checkbox: You must check this box if you wish to use the S-curve velocity curve.
Dist. item: Motion distance. API function's argument variable “Distance”.

5) Set Servo Motor Power ON/OFF(servo on/servo off)

Figure 3.45

Click on the “SVON” button to execute the following procedure:

```
rt = _DMC_01_ipo_set_svon(gDMCCardNo, NodeID, SlotID , ON_OFF);
// ON_OFF: 0 – Servo Power OFF; 1 – Servo Power ON
```

6) Start motion control with linear interpolation in 2 or 3 axes
Click on the "→" or "←" button to execute the following procedure:

2-axis linear interpolation:

```
rt = _DMC_01_start_sa_move_xy(gDMCCardNo, gLine2, gSlot2, Distance,
Distance, StrVel, MaxVel, acc, dec);
//// Linear interpolation motion using absolute coordinates with S-curve velocity
cross-section
rt = _DMC_01_start_ta_move_xy(gDMCCardNo, gLine2, gSlot2, Distance,
Distance, StrVel, MaxVel, acc, dec); //// Linear interpolation motion using absolute
coordinates with T-curve velocity cross-section
rt = _DMC_01_start_sr_move_xy(gDMCCardNo, gLine2, gSlot2, Distance,
Distance, StrVel, MaxVel, acc, dec);
//// Linear interpolation motion using relative coordinates with S-curve velocity
cross-section
rt = _DMC_01_start_tr_move_xy(gDMCCardNo, gLine2, gSlot2, Distance, Distance,
StrVel, MaxVel, acc, dec); //// Linear interpolation motion using relative coordinates
with T-curve velocity cross-section
```

3-axis linear interpolation:

```
rt = _DMC_01_start_sa_move_xyz(gDMCCardNo, gLine3, gSlot3, Distance,
Distance, Distance, StrVel, MaxVel, acc, dec);
//// Linear interpolation motion using absolute coordinates with S-curve velocity
cross-section
rt = _DMC_01_start_ta_move_xyz(gDMCCardNo, gLine3, gSlot3, Distance,
Distance, Distance, StrVel, MaxVel, acc, dec);
//// Linear interpolation motion using absolute coordinates with T-curve velocity
cross-section
rt = _DMC_01_start_sr_move_xyz(gDMCCardNo, gLine3, gSlot3, Distance,
Distance, Distance, StrVel, MaxVel, acc, dec);
//// Linear interpolation motion using relative coordinates with S-curve velocity
cross-section
rt = _DMC_01_start_tr_move_xyz(gDMCCardNo, gLine3, gSlot3, Distance,
Distance, Distance, StrVel, MaxVel, acc, dec);
//// Linear interpolation motion using relative coordinates with T-curve velocity
cross-section
```

7) Stop motion

Figure 3.46

Hit the “STOP” button to execute an emergency stop:
rt = _DMC_01_emg_stop (gDMCCardNo, NodeID, SlotID);
In this example, emergency stop is used to stop motion. This method quickly stops motion by setting deceleration time to 0. For more information about the Stop Motion function, refer to the later section on “Stop Motion Control API”.

8) Exit procedure
Click on the “Exit” button to quit and exit the procedure.
“_DMC_01_reset_card” and “_DMC_01_close” must be executed to exit this function. Please refer to Section 3.12 “Exit procedure” for the function operations.

3.10 Arc Interpolation Motion Control

3.10.1 Overview

PCI-DMC-A01 supports 2-axis arc interpolation in absolute or relative coordinate motion modes under the S-curve or T-curve velocity cross-section. Fig. 3.44 illustrates arc interpolation on any 2 axes.

The start point is P0 (X0, Y0) and end point is P1(X1, Y1). The path from P0 to P1 forms an arc. The maximum velocity is the tangential velocity.

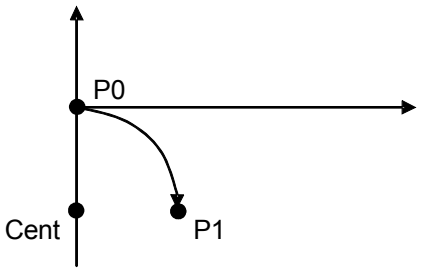


Figure 3.47

3.10.2 Function List

Table 3.10

Function Name
_DMC_01_start_tr_arc_xy
_DMC_01_start_sr_arc_xy
_DMC_01_start_ta_arc_xy
_DMC_01_start_sa_arc_xy
_DMC_01_start_tr_arc2_xy
_DMC_01_start_sr_arc2_xy
_DMC_01_start_ta_arc2_xy
_DMC_01_start_sa_arc2_xy
_DMC_01_start_tr_arc3_xy
_DMC_01_start_sr_arc3_xy
_DMC_01_start_ta_arc3_xy
_DMC_01_start_sa_arc3_xy

3.10.3 Sample Application

Program Appearance

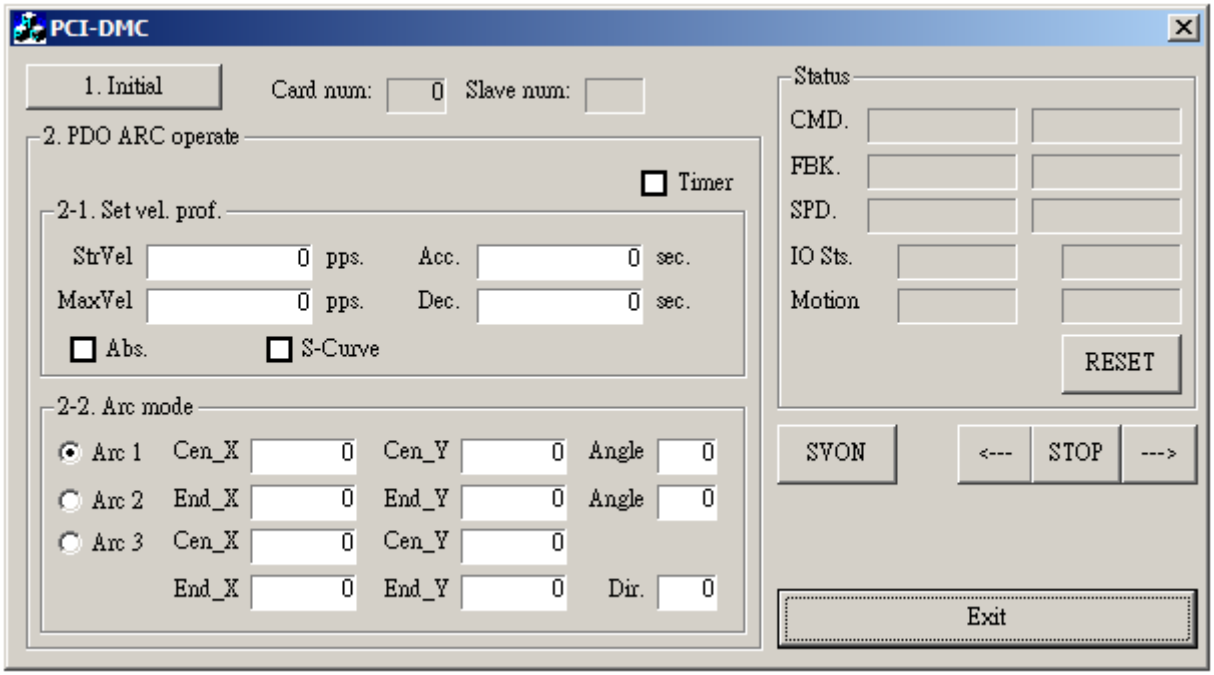


Figure 3.48

1) Card initialization
   Click on the “Initial” button to open and initialize the card.
   For a detailed description of card initialization, please refer to “Open card” and “Card initialization” in Section 3.1.2.

2) Get Slot ID and enable motion status display

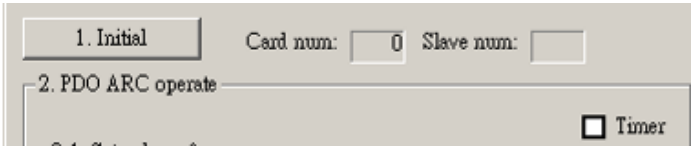


Figure 3.49

   Check the “Timer” checkbox to enable motion status display
   Timer Checkbox: Check to display the motion status. Uncheck to disable display.

3) Enter the values of the arguments for motion control

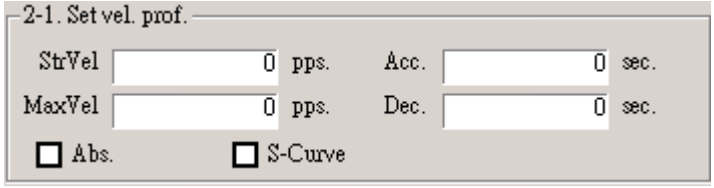


Figure 3.50

StrVel item: Starting velocity. API function's argument variable “StrVel”.

MaxVel item: Maximum velocity. API function's argument variable “MaxVel”.

Acc. item: Time required to reach maximum velocity. API function's argument variable “acc”.

Dec item: Time required to go from maximum velocity to 0. API function's argument variable “dec”.

Abs. Checkbox: You must check this if you want motion displacement to use absolute coordinates.

S-Curve checkbox: You must check this box if you wish to use the S-curve velocity curve.

4) Select the type of 2-axis arc interpolation and enter the corresponding values

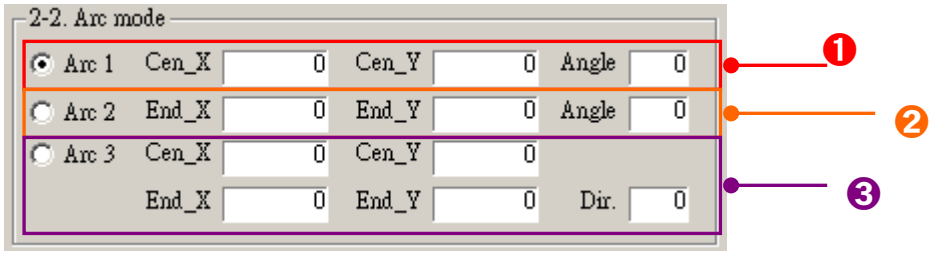


Figure 3.51

Arc 1: Interpolation method 1. Must provide the center coordinates (X, Y) and angle (0^o to 359^o)

❶ **Cen_X item:** Center's x-coordinate. API function's argument variable “arc1_cen_x”.

Cen_Y item: Center's y-coordinate. API function's argument variable “arc1_cen_y”.

Angle item: Angle. API function's argument variable “arc1_angle”.

Arc 2: Interpolation method 2. Must enter the endpoint coordinates (X, Y) and angle (0^o to 359^o)

❷ **End_X item:** Endpoint's x-coordinate. API function's argument variable “arc2_end_x”.

End_Y item: Endpoint's Y-coordinate. API function's argument variable “arc2_end_y”.

Angle item: Angle. API function's argument variable “arc2_angle”.

Arc 3: Interpolation method 3. Must provide the center coordinates (X, Y), endpoint coordinates (X, Y) and direction.

❸ **Cen_X item:** Center's x-coordinate. API function's argument variable "arc3_cen_x".

Cen_Y item: Center's y-coordinate. API function's argument variable "arc3_cen_y".

End_X item: Endpoint's x-coordinate. API function's argument variable "arc3_end_x".

End_Y item: Endpoint's Y-coordinate. API function's argument variable "arc3_end_y".

Dir item: Direction. API function's argument variable "arc3_dir".
When this value is 0, the servo motor will rotate clockwise (CW).
When this value is 1, the servo motor will counterclockwise (CCW).

5) Set Servo Motor Power ON/OFF(servo on/servo off)

Figure 3.52

Click on the "SVON" button to execute the following procedure:

```
rt = _DMC_01_ipo_set_svon(gDMCCardNo, NodeID, SlotID , ON_OFF);
// ON_OFF: 0 – Servo Power OFF; 1 – Servo Power ON
```

6) Start 2-axis arc interpolation motion control

Click on the "→" or "←" button to execute the following procedure:

2-axis arc interpolation using interpolation method 1 (Arc1):

```
rt = _DMC_01_start_sa_arc_xy(gDMCCardNo, gArcNode, gSlot2, arc1_cen_x,
arc1_cen_y, arc1_angle, StrVel, MaxVel, acc, dec);
// Arc interpolation motion using absolute coordinates under the S-curve velocity
cross-section
rt = _DMC_01_start_ta_arc_xy(gDMCCardNo, gArcNode, gSlot2, arc1_cen_x,
arc1_cen_y, arc1_angle, StrVel, MaxVel, acc, dec);
// Arc interpolation motion using absolute coordinates under the T-curve velocity
cross-section
rt = _DMC_01_start_sr_arc_xy(gDMCCardNo, gArcNode, gSlot2, arc1_cen_x,
arc1_cen_y, arc1_angle, StrVel, MaxVel, acc, dec);
// Arc interpolation motion using relative coordinates under the S-curve velocity
cross-section
rt = _DMC_01_start_tr_arc_xy(gDMCCardNo, gArcNode, gSlot2, arc1_cen_x,
arc1_cen_y, arc1_angle, StrVel, MaxVel, acc, dec);
// Arc interpolation motion using relative coordinates under the T-curve velocity
cross-section
```

2-axis arc interpolation using interpolation method 2 (Arc2).

```
rt = _DMC_01_start_sa_arc2_xy(gDMCCardNo, gArcNode, gSlot2, arc2_end_x, arc2_end_y, arc2_angle, StrVel, MaxVel, acc, dec);
// Arc interpolation motion using absolute coordinates under the S-curve velocity cross-section
rt = _DMC_01_start_ta_arc2_xy(gDMCCardNo, gArcNode, gSlot2, arc2_end_x, arc2_end_y, arc2_angle, StrVel, MaxVel, acc, dec);
// Arc interpolation motion using absolute coordinates under the T-curve velocity cross-section
rt = _DMC_01_start_sr_arc2_xy(gDMCCardNo, gArcNode, gSlot2, arc2_end_x, arc2_end_y, arc2_angle, StrVel, MaxVel, acc, dec);
// Arc interpolation motion using relative coordinates under the S-curve velocity cross-section
rt = _DMC_01_start_tr_arc2_xy(gDMCCardNo, gArcNode, gSlot2, arc2_end_x, arc2_end_y, arc2_angle, StrVel, MaxVel, acc, dec);
// Arc interpolation motion using relative coordinates under the T-curve velocity cross-section
```

2-axis arc interpolation using interpolation method 3 (Arc3):

```
rt = _DMC_01_start_sa_arc3_xy(gDMCCardNo, gArcNode, gSlot2, arc3_cen_x, arc3_cen_y, arc3_end_x, arc3_end_y, arc3_dir, StrVel, MaxVel, acc, dec);
// Arc interpolation motion using absolute coordinates under the S-curve velocity cross-section
rt = _DMC_01_start_ta_arc3_xy(gDMCCardNo, gArcNode, gSlot2, arc3_cen_x, arc3_cen_y, arc3_end_x, arc3_end_y, arc3_dir, StrVel, MaxVel, acc, dec);
// Arc interpolation motion using absolute coordinates under the T-curve velocity cross-section
rt = _DMC_01_start_sr_arc3_xy(gDMCCardNo, gArcNode, gSlot2, arc3_cen_x, arc3_cen_y, arc3_end_x, arc3_end_y, arc3_dir, StrVel, MaxVel, acc, dec);
// Arc interpolation motion using relative coordinates under the S-curve velocity cross-section
rt = _DMC_01_start_tr_arc3_xy(gDMCCardNo, gArcNode, gSlot2, arc3_cen_x, arc3_cen_y, arc3_end_x, arc3_end_y, arc3_dir, StrVel, MaxVel, acc, dec);
// Arc interpolation motion using relative coordinates under the T-curve velocity cross-section
```

7) Stop motion

Figure 3.53

Hit the “STOP” button to execute an emergency stop:

rt = _DMC_01_emg_stop (gDMCCardNo, NodeID, SlotID);

In this example, emergency stop is used to stop motion. This method quickly stops motion by setting deceleration time to 0. For more information about the Stop Motion function, refer to the later section on “Stop Motion Control API”.

8) Exit procedure

Click on the “Exit” button to quit and exit the procedure.

“_DMC_01_reset_card” and “_DMC_01_close” must be executed to exit this function. Please refer to Section 3.12 “Exit procedure” for the function operations.

3.11 Spiral Interpolation Motion Control -Helix

3.11.1 Function List

Table 3.11

Function Name
_DMC_01_start_tr_heli_xy
_DMC_01_start_sr_heli_xy
_DMC_01_start_ta_heli_xy
_DMC_01_start_sa_heli_xy

3.11.2 Sample Application

Program Appearance

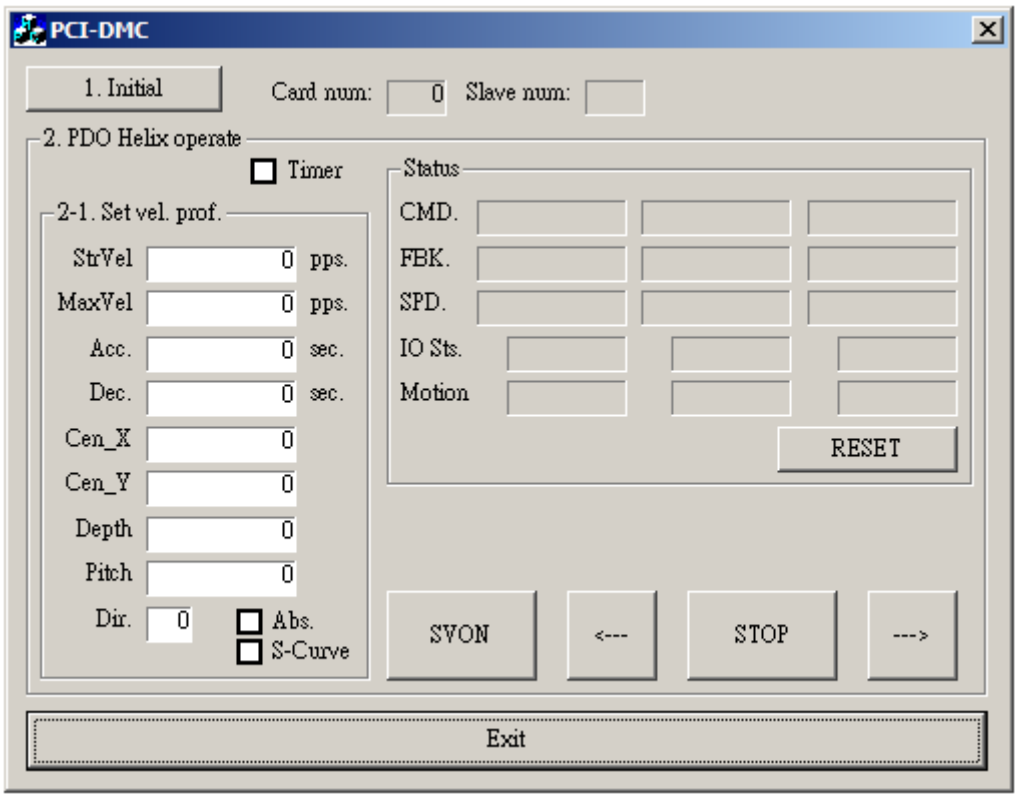


Figure 3.54

1) Card initialization

Click on the “Initial” button to open and initialize the card.

For a detailed description of card initialization, please refer to “Open card” and “Card initialization” in Section 3.1.2.

2) Get Slot ID and enable motion status display

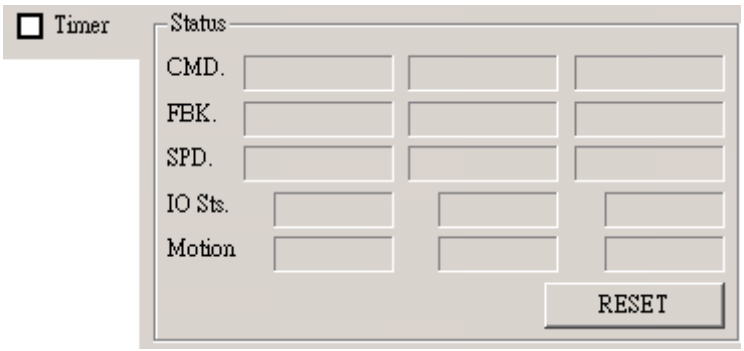


Figure 3.55

Check the “Timer” checkbox to enable motion status display

Timer Checkbox: Check to display the motion status. Uncheck to disable display.

Below motion status is the “RESET” button. Click on the “RESET” button to execute the reset command.

```
/* If you wish to reset the command and feedback counters, you must first set drive motor to "servo off" */
if(gbIsSVON)
rt = _DMC_01_ipo_set_svon(gDMCCardNo, NodeID, SlotID , 0);
/* The motion counters can only be cleared when the motor is confirmed to be "servo off" */
rt = _DMC_01_set_command(gDMCCardNo, NodeID, SlotID, 0); // Clear command
rt = _DMC_01_set_position(gDMCCardNo, NodeID, SlotID, 0); // Clear feedback
/* Once the command and feedback counters are cleared, set drive motors to "servo on" again */
if(gbIsSVON)
rt = _DMC_01_ipo_set_svon(gDMCCardNo, NodeID, SlotID , 1);
```

Motion counter value:

```
rt = _DMC_01_get_command(gDMCCardNo, NodeID, SlotID, &cmd);
// Get value of command counter
rt = _DMC_01_get_position(gDMCCardNo, NodeID, SlotID, &pos);
// Get value of feedback counter
```

Motion status:

```
rt = _DMC_01_get_current_speed(gDMCCardNo, NodeID, SlotID, &speed);
// Get velocity of current motion
```

```
rt = _DMC_01_motion_status(gDMCCardNo, NodeID, SlotID, &MC_status);
// Get current status
rt = _DMC_01_motion_done(gDMCCardNo, NodeID, SlotID, &MC_done);
// Get current motor status
```

3) Enter the argument values and chosen velocity cross-section for motion control

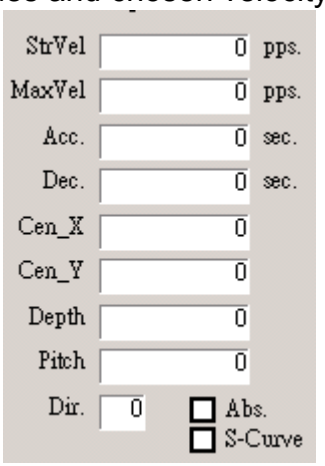


Figure 3.56

StrVel item: Starting velocity. API function's argument variable “StrVel”.
MaxVel item: Maximum velocity. API function's argument variable “MaxVel”.
Acc. item: Time required to reach maximum velocity. API function's argument variable “acc”.
Dec item: Time required to go from maximum velocity to 0. API function's argument variable “dec”.
Cen_X item: Center's x-coordinate. API function's argument variable “helix_cen_x”.
Cen_Y item: Center's y-coordinate. API function's argument variable “helix_cen_y”.
Depth item: Total distance of 3rd axis. (See Fig. 3.55).
Pitch item: Distance in the 3rd axis when one revolution is completed in axis-1 and axis-2.
Dir item: The direction of the arc path in axis-1 and axis-2 (0: Clockwise; 1: Counterclockwise).
Abs. Checkbox: You must check this if you want motion displacement to use absolute coordinates.
S-Curve checkbox: You must check this box if you wish to use the S-curve velocity curve.

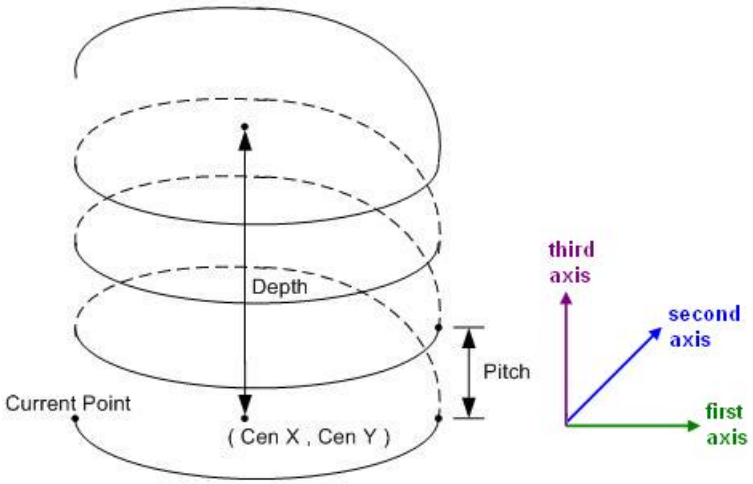


Figure 3.57

4) Set Servo Motor Power ON/OFF(servo on/servo off)

Figure 3.58

Click on the “SVON” button to execute the following procedure:

```
rt = _DMC_01_ipo_set_svon(gDMCCardNo, NodeID, SlotID , ON_OFF);
// ON_OFF: 0 – Servo Power OFF; 1 – Servo Power ON
```

5) Start spiral interpolation motion control

Click on the “→” or “←“ button to execute the following procedure:

```
rt = _DMC_01_start_sa_heli_xy(gDMCCardNo, gHelix, gSlot3, helix_cen_x,
helix_cen_y, helix_depth, helix_pitch, helix_dir, StrVel, MaxVel, acc, dec);
//// Spiral interpolation motion using absolute coordinates with S-curve velocity
cross-section
rt = _DMC_01_start_ta_heli_xy(gDMCCardNo, gHelix, gSlot3, helix_cen_x,
helix_cen_y, helix_depth, helix_pitch, helix_dir, StrVel, MaxVel, acc, dec);
//// Spiral interpolation motion using absolute coordinates with T-curve velocity
cross-section
rt = _DMC_01_start_sr_heli_xy(gDMCCardNo, gHelix, gSlot3, helix_cen_x,
helix_cen_y, helix_depth, helix_pitch, helix_dir, StrVel, MaxVel, acc, dec);
//// Spiral interpolation motion using relative coordinates with S-curve velocity
cross-section
rt = _DMC_01_start_tr_heli_xy(gDMCCardNo, gHelix, gSlot3, helix_cen_x,
helix_cen_y, helix_depth, helix_pitch, helix_dir, StrVel, MaxVel, acc, dec);
//// Spiral interpolation motion using relative coordinates with T-curve velocity
cross-section
```

6) Stop motion

Hit the “STOP” button to execute an emergency stop:

rt = _DMC_01_emg_stop (gDMCCardNo, NodeID, SlotID);

In this example, emergency stop is used to stop motion. This method quickly stops motion by setting deceleration time to 0. For more information about the Stop Motion function, refer to the later section on “Stop Motion Control API”.

7) Exit procedure

Click on the “Exit” button to quit and exit the procedure.

“_DMC_01_reset_card” and “_DMC_01_close” must be executed to exit this function. Please refer to Section 3.12 “Exit procedure” for the function operations.

3.12 Continuous Interpolation Motion Control

3.12.1 Overview

A series of motion commands can be used to describe a square path with rounded corners.

PCI-DMC-A01 supports using the 20-unit software FIFO in Motion ASIC for motion control during continuous interpolation. Please refer to the following diagram:

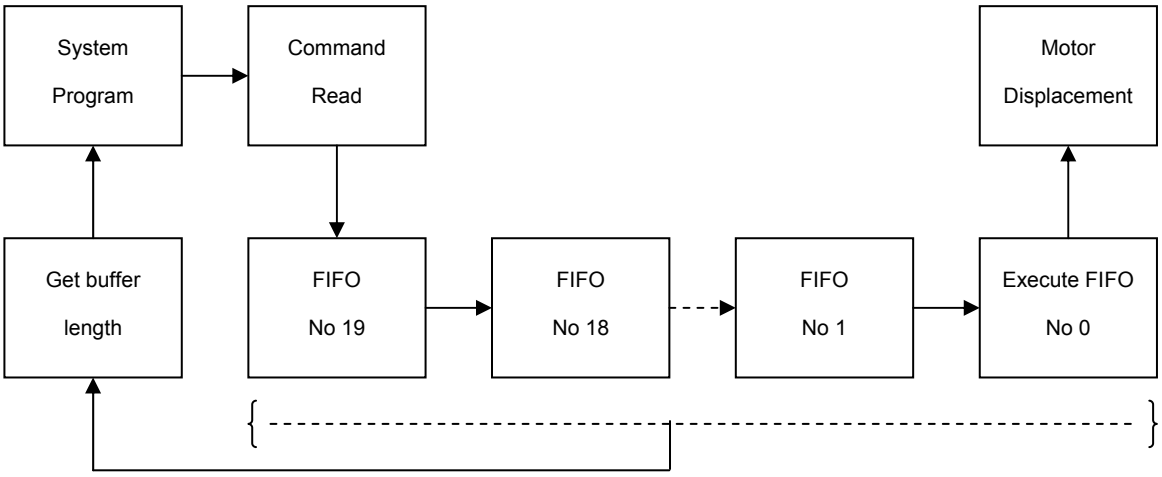


Figure 3.59

3.12.2 Function List

Table 3.12

Function Name
_DMC_01_start_ta_move_xy
_DMC_01_start_ta_arc_xy

3.12.3 Sample Application

If you wish to perform the continuous interpolation motion illustrated below, you must execute the following procedure and carry out the commands from ① ~ ⑧:

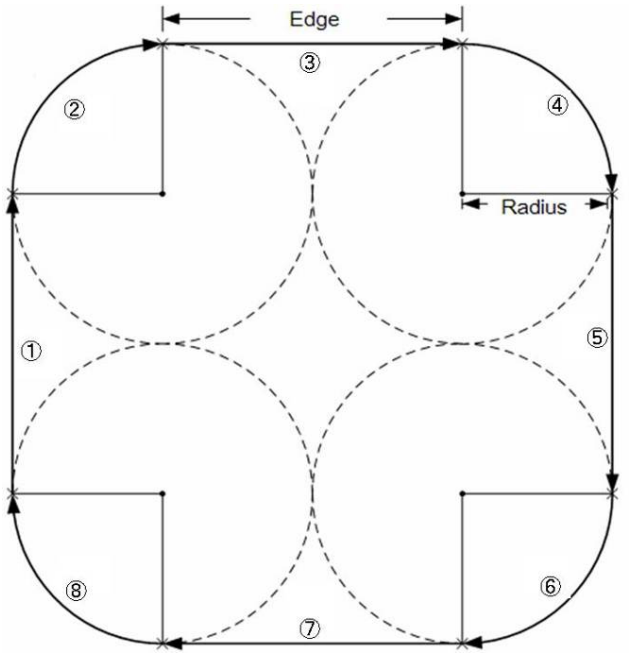


Figure 3.60

Program Appearance

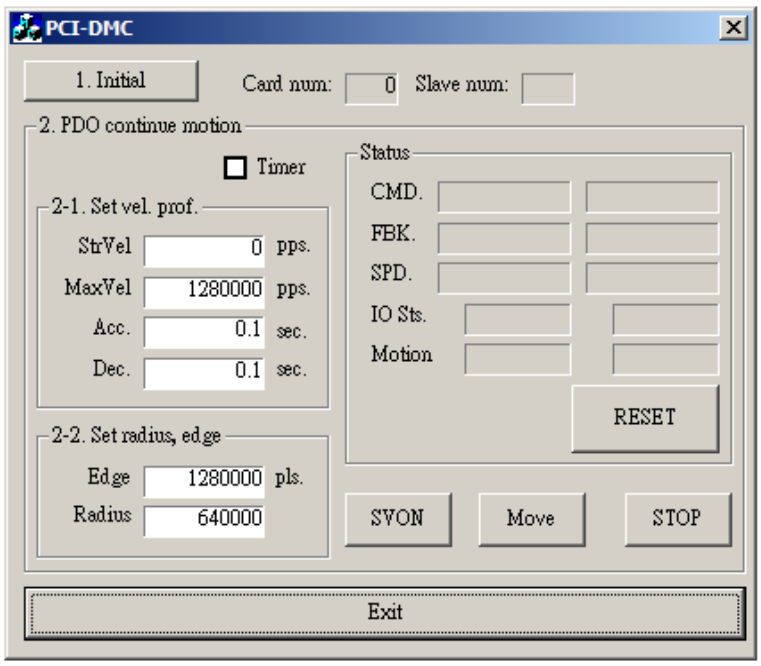


Figure 3.61

1) Card initialization
   Click on the “Initial” button to open and initialize the card.
   For a detailed description of card initialization, please refer to “Open card” and “Card initialization” in Section 3.1.2.

2) Get Slot ID and enable motion status display

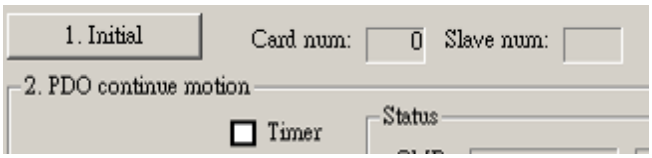


Figure 3.62

   Check the “Timer” checkbox to enable motion status display
   Timer Checkbox: Check to display the motion status. Uncheck to disable display.

3) Enter the values of the arguments for motion control

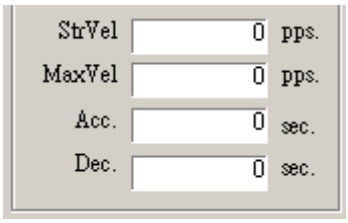


Figure 3.63

   StrVel item: Starting velocity. API function's argument variable “StrVel”.
   MaxVel item: Maximum velocity. API function's argument variable “MaxVel”.
   Acc. item: Time required to reach maximum velocity. API function's argument variable “acc”.
   Dec item: Time required to go from maximum velocity to 0. API function's argument variable “dec”.

4) Enter edge length and corner radius

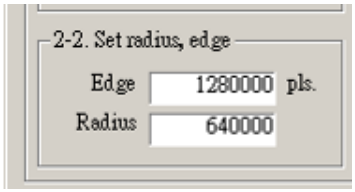


Figure 3.64

   Edge item: Edge length (Unit: Pulses), API function's argument variable “edge”.
   Radius item: Corner radius (Unit: Pulses), API function's argument variable “radius”.

5) Set Servo Motor Power ON/OFF(servo on/servo off)

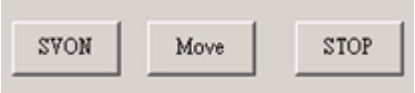


Figure 3.65

Click on the “SVON” button to execute the following procedure:

```
rt = _DMC_01_ipo_set_svon(gDMCCardNo, NodeID, SlotID , ON_OFF);
// ON_OFF: 0 – Servo Power OFF; 1 – Servo Power ON
```

6) Click on the “Move” button to start executing continuous interpolation motion
The following procedures ①~⑧ will realize the continuous interpolation motion shown in Fig. 3.60. t

```
① rt = _DMC_01_start_ta_move_xy(gDMCCardNo, gLine2, gSlot2, 0, edge, 0, radius, 0.1, 0); // Deceleration set to 0
② rt = _DMC_01_start_ta_arc_xy(gDMCCardNo, gLine2, gSlot2, radius, edge, 90, 0, radius, 0, 0); // Acceleration and deceleration set to 0
③ rt = _DMC_01_start_ta_move_xy(gDMCCardNo, gLine2, gSlot2, edge + radius, edge + radius, 0, radius, 0, 0); // Acceleration and deceleration set to 0
④ rt = _DMC_01_start_ta_arc_xy(gDMCCardNo, gLine2, gSlot2, edge + radius, edge, 90, 0, radius, 0, 0); // Acceleration and deceleration set to 0
⑤ rt = _DMC_01_start_ta_move_xy(gDMCCardNo, gLine2, gSlot2, edge + radius*2, 0, 0, radius, 0, 0); // Acceleration and deceleration set to 0
⑥ rt = _DMC_01_start_ta_arc_xy(gDMCCardNo, gLine2, gSlot2, edge + radius, 0, 90, 0, radius, 0, 0); // Acceleration and deceleration set to 0.
⑦ rt = _DMC_01_start_ta_move_xy(gDMCCardNo, gLine2, gSlot2, radius, 0 - radius, 0, radius, 0, 0); // Acceleration and deceleration set to 0
⑧ rt = _DMC_01_start_ta_arc_xy(gDMCCardNo, gLine2, gSlot2, radius, 0, 90, 0, radius, 0, 0.1); // Acceleration set to 0
```

V-T diagram of actual X-axis motion:

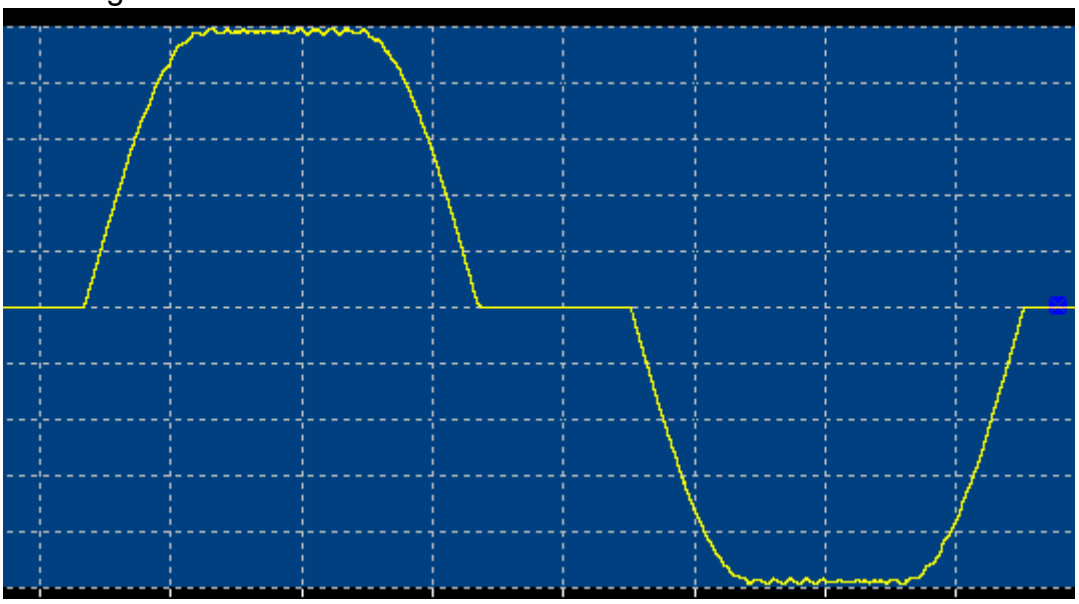


Figure 3.66

7) Stop motion

Hit the “STOP” button to execute an emergency stop:

rt = _DMC_01_emg_stop (gDMCCardNo, NodeID, SlotID);

In this example, emergency stop is used to stop motion. This method quickly stops motion by setting deceleration time to 0. For more information about the Stop Motion function, refer to the later section on “Stop Motion Control API”.

8) Exit procedure

Click on the “Exit” button to quit and exit the procedure.

“_DMC_01_reset_card” and “_DMC_01_close” must be executed to exit this function. Please refer to Section 3.12 “Exit procedure” for the function operations.

3.13 Software Limit Control

3.13.1 Function List

Table 3.13

Function Name
_DMC_01_start_sr_move
_DMC_01_start_tr_move
_DMC_01_start_sa_move
_DMC_01_start_ta_move
_DMC_01_set_soft_limit
_DMC_01_enable_soft_limit
_DMC_01_disable_soft_limit
_DMC_01_get_soft_limit_status

3.13.2 Sample Application

Program Appearance

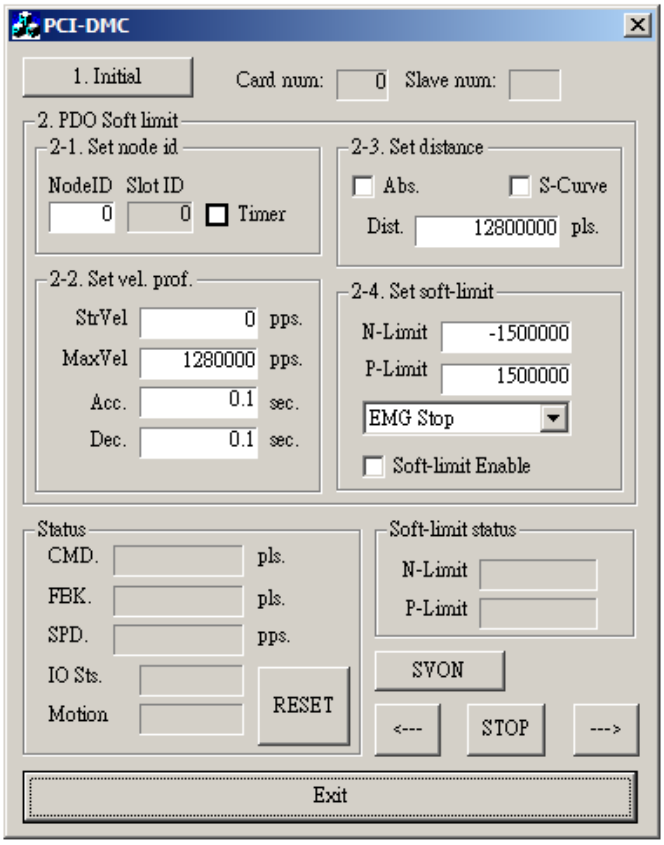


Figure 3.67

1) Card initialization
   Click on the “Initial” button to start card initialization.
   For a detailed description of card initialization, please refer to Section 3.1.2 - 1) Open card.

2) Set Servo Node ID and enable motion status display

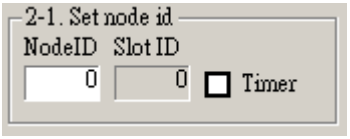


Figure 3.68

Input Node ID and check “Timer” checkbox to enable motion status display
NodeID item: API function's argument variable “NodeID”.
Timer Checkbox: Check to display the motion status. Uncheck to disable display.

3) Enter the values of the arguments for motion control

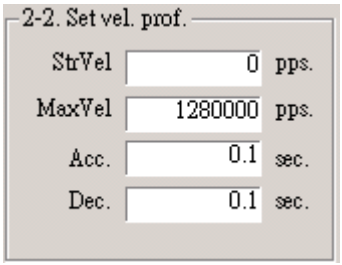


Figure 3.69

StrVel item: Starting velocity. API function's argument variable “StrVel”.
MaxVel item: Maximum velocity. API function's argument variable “MaxVel”.
Acc. item: Time required to reach maximum velocity. API function's argument variable “acc”.
Dec item: Time required to go from maximum velocity to 0. API function's argument variable “dec”.

4) Select motion mode and set motion distance.

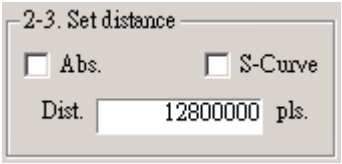


Figure 3.70

Abs. Checkbox: You must check this if you want motion displacement to use absolute coordinates.
S-Curve checkbox: You must check this box if you wish to use the S-curve velocity curve.
Dist. item: Motion distance. API function's argument variable “Distance”.

5) Set positive/negative value limit, stop motion mode, and whether software limit is enabled

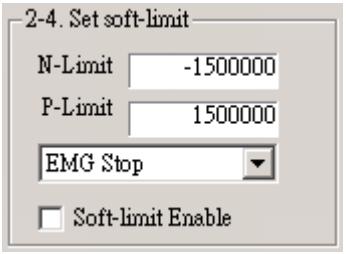


Figure 3.71

N-Limit item: Value of negative limit. API function's argument variable “NLimit”.
P-Limit item: Value of positive limit. API function's argument variable “PLimit”.
Stop mode pull-down menu: Stop mode. API function's argument variable “action”.
Soft-limit Checkbox: Enables/disables software limit.

6) If software limit is enabled, you must check the “Soft-limit Enable” checkbox and execute the following procedure:

```
/* Start software limit configuration */
rt = _DMC_01_enable_soft_limit(gDMCCardNo, NodeID, SlotID, action);
// action argument specifies the stop mode to use when limit is reached. A value of 1
   means an emergency stop; A value of 2 means a slow down stop.
/* Set the values for positive and negatives */
rt = _DMC_01_set_soft_limit(gDMCCardNo, NodeID, SlotID, PLimit, NLimit);
// PLimit argument is the set value for positive limit; NLimit is the set value for
negative limit
```

7) To disable software limit, you must use the following procedure:

```
rt = _DMC_01_disable_soft_limit(gDMCCardNo, NodeID, SlotID);
```

8) Set Servo Motor Power ON/OFF(servo on/servo off)

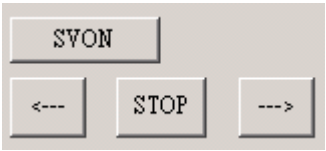


Figure 3.72

Click on the “SVON” button to execute the following procedure:

```
rt = _DMC_01_ipo_set_svon(gDMCCardNo, NodeID, SlotID , ON_OFF);
// ON_OFF: 0 – Servo Power OFF; 1 – Servo Power ON
```

9) Start motion control (Using point to point motion control as an example)
Click on the "→" or "←" button to execute the following procedure:
rt = _DMC_01_start_sa_move(gDMCCardNo, NodeID, SlotID, Distance, StrVel, MaxVel, acc, dec); // Motion displacement using absolute coordinates with S-curve velocity cross-section
rt = _DMC_01_start_ta_move(gDMCCardNo, NodeID, SlotID, Distance, StrVel, MaxVel, acc, dec); // Motion displacement using absolute coordinates with T-curve velocity cross-section
rt = _DMC_01_start_sr_move(gDMCCardNo, NodeID, SlotID, Distance, StrVel, MaxVel, acc, dec); // Motion displacement using relative coordinates with S-curve velocity cross-section
rt = _DMC_01_start_tr_move(gDMCCardNo, NodeID, SlotID, Distance, StrVel, MaxVel, acc, dec); // Motion displacement using relative coordinates with T-curve velocity cross-section

10) If you wish to observe the contact with positive/negative limits during point to point motion control, you can execute the following procedure:
/* Observe feedback status from contact with positive/negative limits*/
rt = _DMC_01_get_soft_limit_status(gDMCCardNo, NodeID, SlotID, &PLimit_sts, &NLimit_sts);

In the figure below, the left side indicates no contact with positive/negative limits during motion; the center indicates contact with positive limit during motion; the right side indicates contact with negative limit during motion.

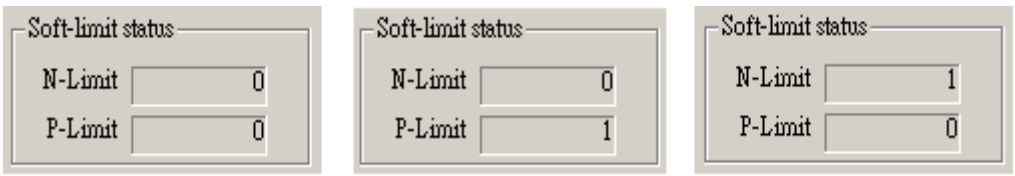


Figure 3.73

11) Stop motion
Hit the "STOP" button to execute an emergency stop:
rt = _DMC_01_emg_stop (gDMCCardNo, NodeID, SlotID);
In this example, emergency stop is used to stop motion. This method quickly stops motion by setting deceleration time to 0. For more information about the Stop Motion function, refer to the later section on "Stop Motion Control API".

12) Exit procedure
Click on the "Exit" button to quit and exit the procedure.
"_DMC_01_reset_card" and "_DMC_01_close" must be executed to exit this function. Please refer to Section 3.12 "Exit procedure" for the function operations.

3.14 Synchronization Motion Control

3.14.1 Function List

Table 3.14

Function Name
_DMC_01_sync_move
_DMC_01_sync_move_config

3.14.2 Sample Application

Program Appearance

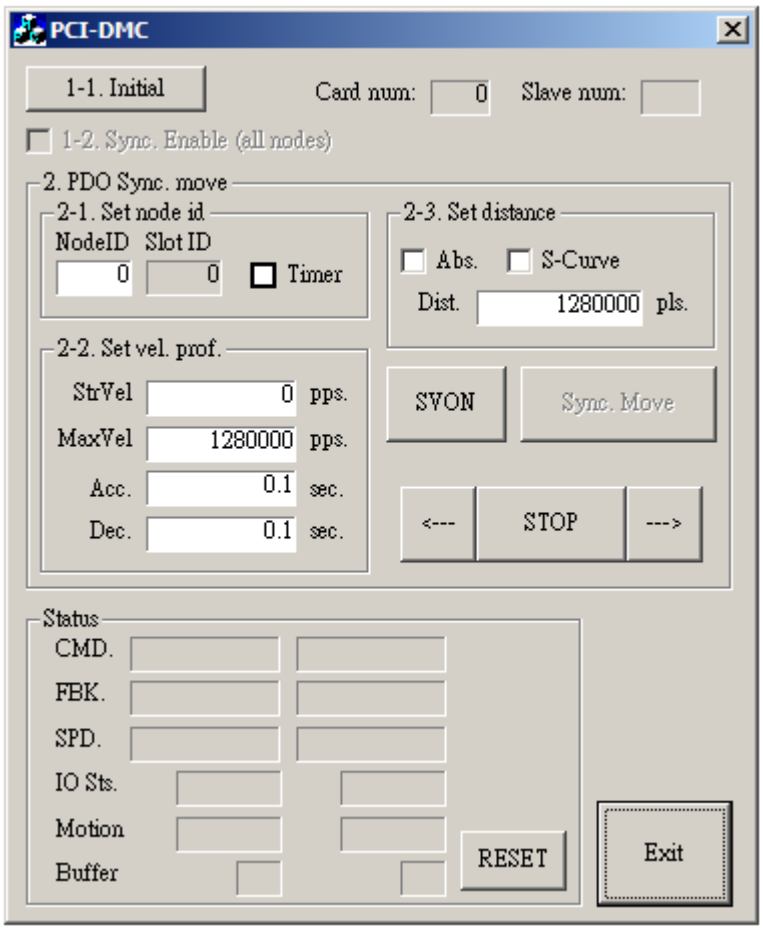


Figure 3.74

1) Card initialization

Click on the “Initial” button to open and initialize the card.

For a detailed description of card initialization, please refer to “Open card” and “Card initialization” in Section 3.1.2.

2) Choose whether to enable synchronization motion control

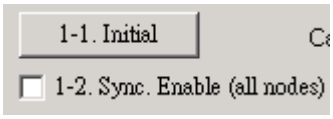


Figure 3.75

Sync. Enable checkbox: Enable motor sync or not.
You can execute the following procedure to enable sync motion:
rt = _DMC_01_sync_move_config(gDMCCardNo, gpNodeID[i], SlotID, enable);
// If enable argument is 1, then synchronized motion control is enabled.

3) Set Servo Node ID and enable motion status display

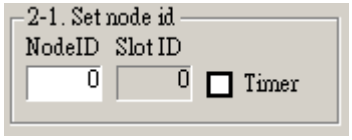


Figure 3.76

Input Node ID and check “Timer” checkbox to enable motion status display
NodeID item: API function's argument variable “NodeID”.
Timer Checkbox: Check to display the motion status. Uncheck to disable display.

4) Enter the values of the arguments for motion control

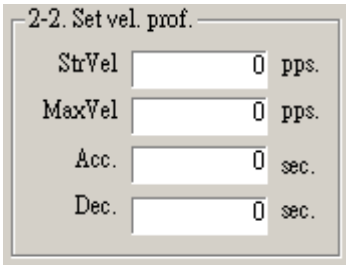


Figure 3.77

StrVel item: Starting velocity. API function's argument variable “StrVel”.
MaxVel item: Maximum velocity. API function's argument variable “MaxVel”.
Acc. item: Time required to reach maximum velocity. API function's argument variable “acc”.
Dec item: Time required to go from maximum velocity to 0. API function's argument variable “dec”.

5) Select motion mode and set motion distance.

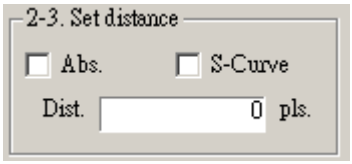


Figure 3.78

Abs. Checkbox: You must check this if you want motion displacement to use absolute coordinates.
S-Curve checkbox: You must check this box if you wish to use the S-curve velocity curve.
Dist. item: Motion distance. API function's argument variable “Distance”.

6) Set Servo Motor Power ON/OFF(servo on/servo off)
Click on the “SVON” button to execute the following procedure:
rt = _DMC_01_ipo_set_svon(gDMCCardNo, NodeID, SlotID , ON_OFF);
// ON_OFF: 0 – Servo Power OFF; 1 – Servo Power ON.

7) Click on the “→” or “←“ button to execute point to point single-axis motion command. As you have only set up motion in one axis, this motion will not be executed right away. You must go back to 3) Set Servo Node ID to set the motion commands for other axes first. Once the setting have been completed, click on the “Syn. Move” button to execute synchronized motion control command.

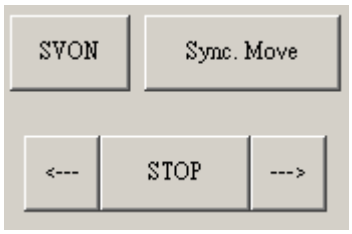


Figure 3.79

The synchronized motion control command is executed as shown in the following function:
rt = _DMC_01_sync_move(gDMCCardNo);
// After synchronized motion control is complete, the synchronized motion control setting will be disabled. If you wish to use the synchronized motion control command again, you must re-enable synchronized motion control.

8) Stop motion

Hit the “STOP” button to execute an emergency stop:

rt = _DMC_01_emg_stop (gDMCCardNo, NodeID, SlotID);

In this example, emergency stop is used to stop motion. This method quickly stops motion by setting deceleration time to 0. For more information about the Stop Motion function, refer to the later section on “Stop Motion Control API”.

9) Exit procedure

Click on the “Exit” button to quit and exit the procedure.

“_DMC_01_reset_card” and “_DMC_01_close” must be executed to exit this function. Please refer to Section 3.12 “Exit procedure” for the function operations.

3.15 Dwell Command

3.15.1 Function List

Table 3.15

Function Name
_DMC_01_start_ta_move
_DMC_01_buf_dwell

3.15.2 Sample Application

Program Appearance

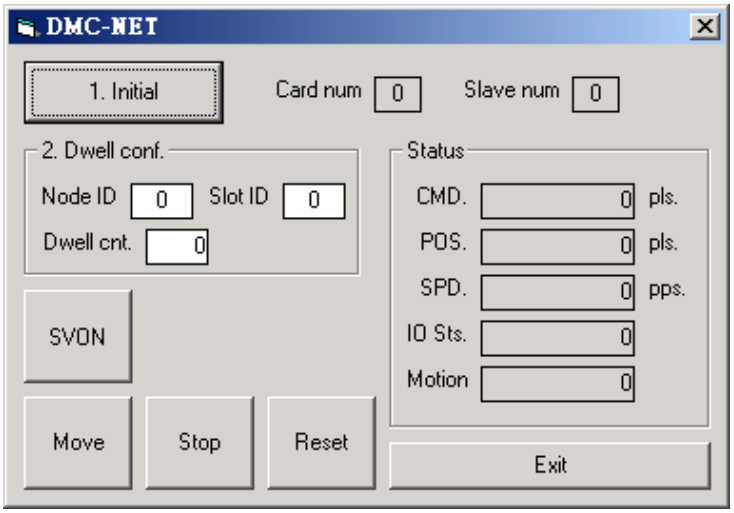


Figure 3.80

1) Card initialization
   Click on the “Initial” button to open and initialize the card.
   For a detailed description of card initialization, please refer to “Open card” and “Card initialization” in Section 3.1.2.

2) Set Servo Node ID and enable motion status display

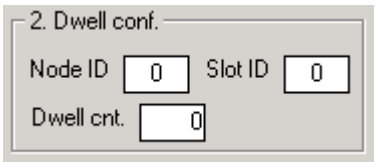


Figure 3.81

NodeID item: API function's argument variable “NodeID”.
SlotID item: API function's argument variable “slotID”.
Dwell cnt. item: Enter the delay time (Mini Sec) between the execution of two API functions.

3) In the following example, adding the dwell command between continuous motion commands will ensure the execution of continuous motion:
rt = _DMC_01_start_ta_move(gDMCCardNo, NodeID, SlotID, Distance, StrVel, MaxVel, acc, dec); // Motion displacement using absolute coordinates with T-curve velocity cross-section
rt = _DMC_01_buf_dwell(CardNo, NodeID, SlotID, dwell_cnt);
//Set the dwell buffer interval. If dwell_cnt is 0 the delay is 4ms; In this example, the value is 3
so delay is 2*3+2=8ms
rt = _DMC_01_start_ta_move(gDMCCardNo, NodeID, SlotID, Distance, StrVel, MaxVel, acc, dec); // Motion displacement using absolute coordinates with T-curve velocity cross-section

4) Set Servo Motor Power ON/OFF(servo on/servo off)

Figure 3.82

Click on the “SVON” button to execute the following procedure:
rt = _DMC_01_ipo_set_svon(gDMCCardNo, NodeID, SlotID , ON_OFF);
// ON_OFF: 0 – Servo Power OFF; 1 – Servo Power ON

5) Start motion control (Using point to point motion control as an example)
Click on the “Move” button to execute the following procedure:
rt = _DMC_01_start_ta_move(gDMCCardNo, NodeID, SlotID, Distance, StrVel, MaxVel, acc, dec); // Motion displacement using absolute coordinates with T-curve velocity cross-section

6) Stop motion
Hit the “STOP” button to execute an emergency stop:
rt = _DMC_01_emg_stop (gDMCCardNo, NodeID, SlotID);
In this example, emergency stop is used to stop motion. This method quickly stops motion by setting deceleration time to 0. For more information about the Stop Motion function, refer to the later section on “Stop Motion Control API”.

7) Exit procedure
Click on the “Exit” button to quit and exit the procedure.
“_DMC_01_reset_card” and “_DMC_01_close” must be executed to exit this function. Please refer to Section 3.12 “Exit procedure” for the function operations.

3.16 Change Position

3.16.1 Function List

Table 3.16

Function Name
_DMC_01_start_ta_move
_DMC_01_p_change

3.16.2 Sample Application

Program Appearance

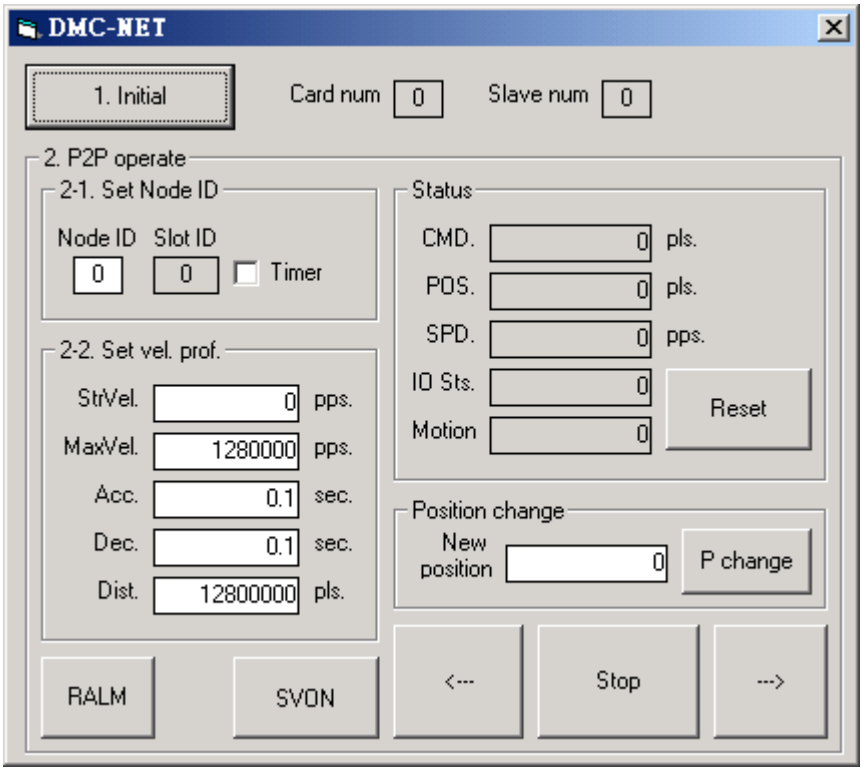


Figure 3.83

1) Card initialization
   Click on the “Initial” button to open and initialize the card.
   For a detailed description of card initialization, please refer to “Open card” and “Card initialization” in Section 3.1.2.

2) Set Servo Node ID and enable motion status display

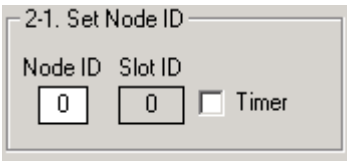


Figure 3.84

Input Node ID and check “Timer” checkbox to enable motion status display
NodeID item: API function's argument variable “NodeID”.
Timer Checkbox: Check to display the motion status. Uncheck to disable display.

3) Enter the values of the arguments for motion control

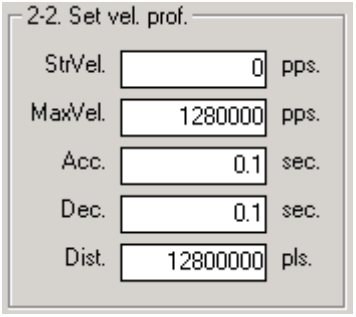


Figure 3.85

StrVel item: Starting velocity. API function's argument variable “StrVel”.
MaxVel item: Maximum velocity. API function's argument variable “MaxVel”.
Acc. item: Time required to reach maximum velocity. API function's argument variable “acc”.
Dec item: Time required to go from maximum velocity to 0. API function's argument variable “dec”.
Dist. item: Set motion distance. API function's argument variable “Distance”.

4) Enter value of new position.

Figure 3.86

New Position item: Enter value of new position. API function's argument variable “NewPos”.

5) Set Servo Motor Power ON/OFF(servo on/servo off)
Click on the “SVON” button to execute the following procedure:
rt = _DMC_01_ipo_set_svon(gDMCCardNo, NodeID, SlotID , ON_OFF);
// ON_OFF: 0 – Servo Power OFF; 1 – Servo Power ON

6) Start motion control (Using point to point motion control as an example)
Click on the “→” or “←” button to execute the following procedure:
rt = _DMC_01_start_ta_move(gDMCCardNo, NodeID, SlotID, Distance, StrVel, MaxVel, acc, dec); // Motion displacement using absolute coordinates with T-curve velocity cross-section

7) If you want to change position of current motion to a new position, you must click on "P change" to execute the following procedure:
   rt = _DMC_01_p_change (CardNo, NodeID, SlotID, NewPos);
   // Replaces the current position with a new position value

8) Stop motion
   Hit the "STOP" button to execute an emergency stop:
   rt = _DMC_01_emg_stop (gDMCCardNo, NodeID, SlotID);
   In this example, emergency stop is used to stop motion. This method quickly stops motion by setting deceleration time to 0. For more information about the Stop Motion function, refer to the later section on "Stop Motion Control API".

9) Exit procedure
   Click on the "Exit" button to quit and exit the procedure.
   "_DMC_01_reset_card" and "_DMC_01_close" must be executed to exit this function. Please refer to Section 3.12 "Exit procedure" for the function operations.

3.17 Change Position

3.17.1 Function List

Table 3.17

Function Name
_DMC_01_start_ta_move
_DMC_01_v_change

3.17.2 Sample Application

Program Appearance

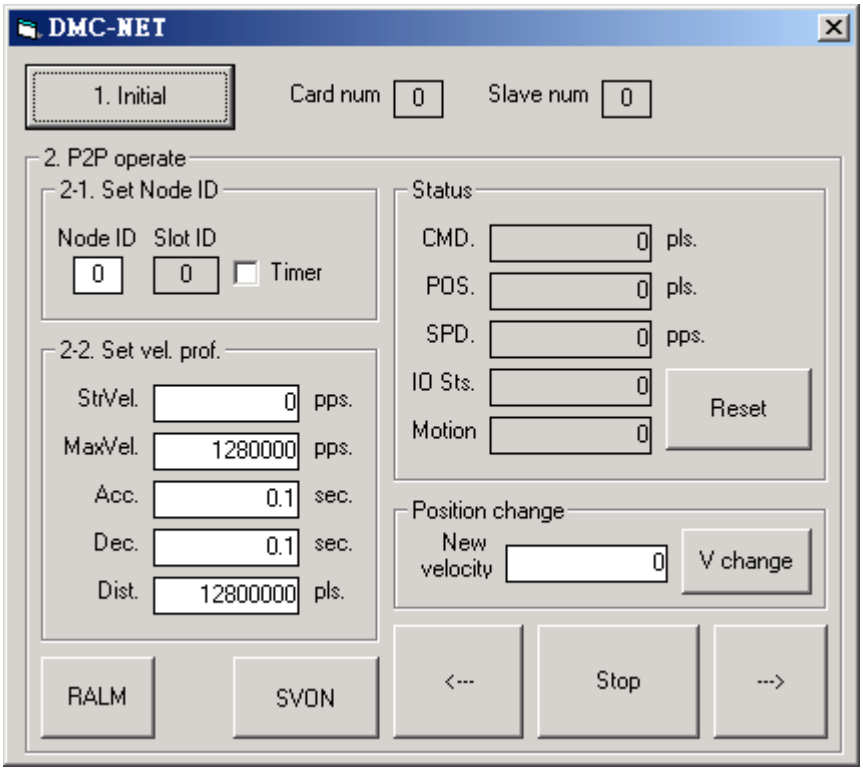


Figure 3.87

1) Card initialization

Click on the “Initial” button to open and initialize the card.

For a detailed description of card initialization, please refer to “Open card” and “Card initialization” in Section 3.1.2.

2) Set Servo Node ID and enable motion status display

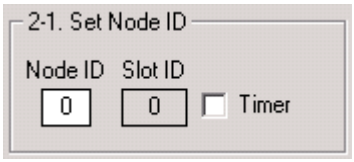


Figure 3.88

Input Node ID and check “Timer” checkbox to enable motion status display
NodeID item: API function's argument variable “NodeID”.
Timer Checkbox: Check to display the motion status. Uncheck to disable display.

3) Enter the values of the arguments for motion control

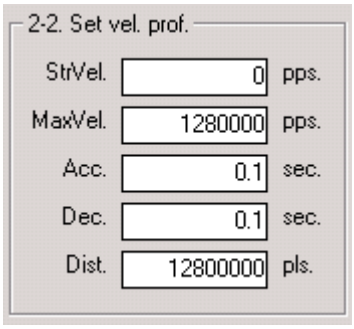


Figure 3.89

StrVel item: Starting velocity. API function's argument variable “StrVel”.
MaxVel item: Maximum velocity. API function's argument variable “MaxVel”.
Acc. item: Time required to reach maximum velocity. API function's argument variable “acc”.
Dec item: Time required to go from maximum velocity to 0. API function's argument variable “dec”.
Dist. item: Set motion distance. API function's argument variable “Distance”.

2) Enter value of new velocity

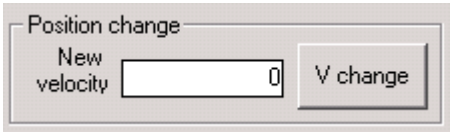


Figure 3.90

New Velocity item: Enter value of new velocity. API function's argument variable “NewSpeed”.

5) Set Servo Motor Power ON/OFF(servo on/servo off)
   Click on the “SVON” button to execute the following procedure:
   rt = _DMC_01_ipo_set_svon(gDMCCardNo, NodeID, SlotID , ON_OFF);
   // ON_OFF: 0 – Servo Power OFF; 1 – Servo Power ON

6) Start motion control (Using point to point motion control as an example)
   Click on the “→” or “←” button to execute the following procedure:
   rt = _DMC_01_start_ta_move(gDMCCardNo, NodeID, SlotID, Distance, StrVel, MaxVel, acc, dec); // Motion displacement using absolute coordinates with T-curve velocity cross-section

7) If you want to change velocity of current motion to a new velocity, you must click on “V change” to execute the following procedure:
   rt = _DMC_01_v_change (CardNo, NodeID, SlotID, NewSpeed, sec);
   // Replace current velocity with new velocity

8) Stop motion
   Hit the “STOP” button to execute an emergency stop:
   rt = _DMC_01_emg_stop (gDMCCardNo, NodeID, SlotID);
   In this example, emergency stop is used to stop motion. This method quickly stops motion by setting deceleration time to 0. For more information about the Stop Motion function, refer to the later section on “Stop Motion Control API”.

9) Exit procedure
   Click on the “Exit” button to quit and exit the procedure.
   “_DMC_01_reset_card” and “_DMC_01_close” must be executed to exit this function. Please refer to Section 3.12 “Exit procedure” for the function operations.

3.18 Change Velocity

3.18.1 Function List

Table 3.18

Function Name
_DMC_01_start_sa_move_2seg
_DMC_01_start_ta_move_2seg
_DMC_01_start_sr_move_2seg
_DMC_01_start_tr_move_2seg

3.18.2 Sample Application

Program Appearance

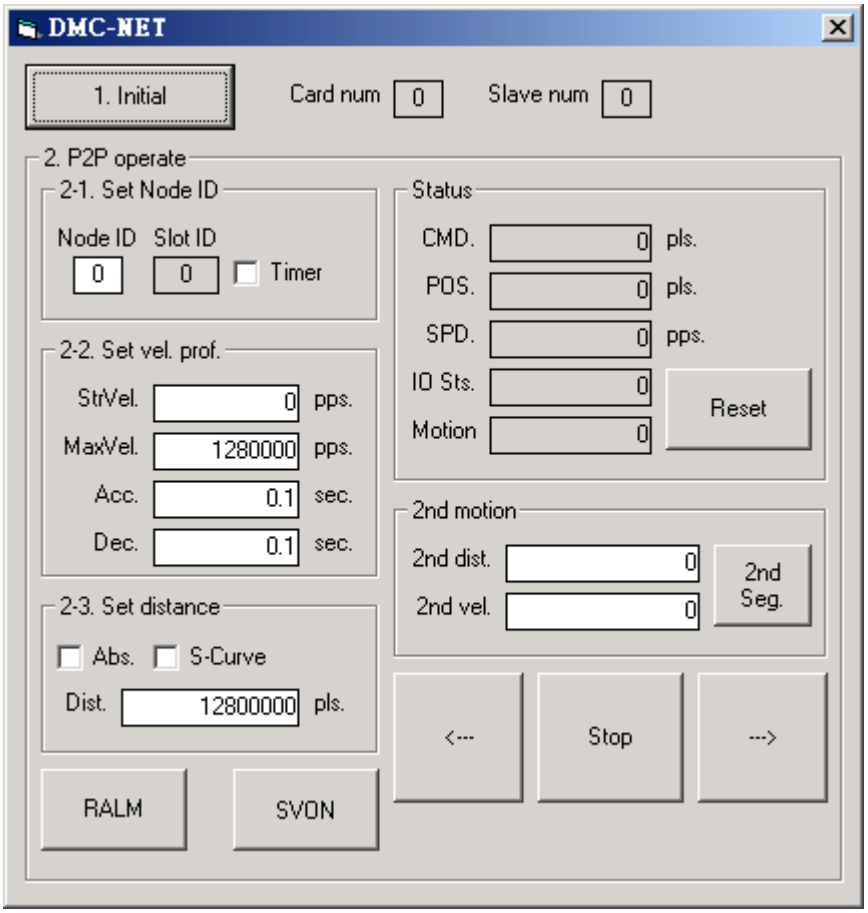


Figure 3.91

1) Card initialization

Click on the “Initial” button to open and initialize the card.

For a detailed description of card initialization, please refer to “Open card” and “Card initialization” in Section 3.1.2.

2) Set Servo Node ID and enable motion status display

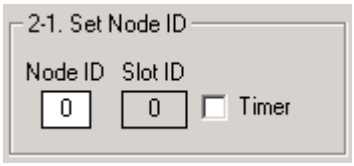


Figure 3.92

Input Node ID and check “Timer” checkbox to enable motion status display
NodeID item: API function's argument variable “NodeID”.
Timer Checkbox: Check to display the motion status. Uncheck to disable display.

3) Enter the values of the arguments for motion control

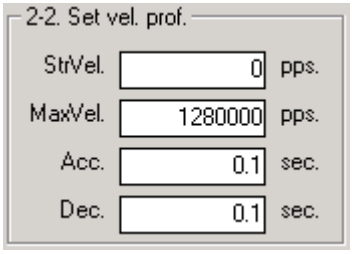


Figure 3.93

StrVel item: Starting velocity. API function's argument variable “StrVel”.
MaxVel item: Maximum velocity. API function's argument variable “MaxVel”.
Acc. item: Time required to reach maximum velocity. API function's argument variable “acc”.
Dec item: Time required to go from maximum velocity to 0. API function's argument variable “dec”.

4) Select motion mode and set motion distance.

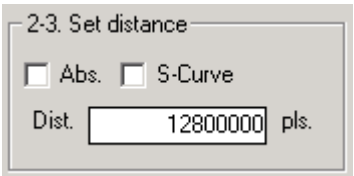


Figure 3.94

Abs. Checkbox: You must check this if you want motion displacement to use absolute coordinates.
S-Curve checkbox: You must check this box if you wish to use the S-curve velocity curve.
Dist. item: Motion distance. API function's argument variable “Distance”.

5) Set distance and velocity for 2nd motion

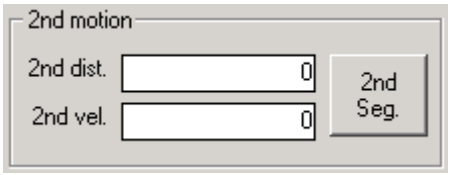


Figure 3.95

2 nd dist item: Value of distance for 2nd motion. API function's argument variable "Dist2".
2 nd vel item: Value of velocity for 2nd motion. API function's argument variable "MaxVel2".

6) Set Servo Motor Power ON/OFF(servo on/servo off)
Click on the "SVON" button to execute the following procedure:
rt = _DMC_01_ipo_set_svon(gDMCCardNo, NodeID, SlotID , ON_OFF);
// ON_OFF: 0 – Servo Power OFF; 1 – Servo Power ON

7) Start motion control (Using point to point motion control as an example)
Click on the "→" or "←" button to execute the following procedure:
rt = _DMC_01_start_sa_move(gDMCCardNo, NodeID, SlotID, Distance, StrVel, MaxVel, acc, dec); // Motion displacement using absolute coordinates with S-curve velocity cross-section

8) If you wish to change the current motion velocity to a new velocity, please click on the "2 nd seg." button to execute the following procedure:
rt = _DMC_01_start_sa_move_2seg (CardNo, NodeID, SlotID, Dist, Dist2, StrVel, MaxVel, MaxVel2, Tacc, Tsec, Tdec);
// 2nd motion displacement using absolute coordinates with S-curve velocity cross-section
rt = _DMC_01_start_ta_move_2seg (CardNo, NodeID, SlotID, Dist, Dist2, StrVel, MaxVel, MaxVel2, Tacc, Tsec, Tdec);
// 2nd motion displacement using absolute coordinates with T-curve velocity cross-section
rt = _DMC_01_start_sr_move_2seg (CardNo, NodeID, SlotID, Dist, Dist2, StrVel, MaxVel, MaxVel2, Tacc, Tsec, Tdec);
// 2nd motion displacement using relative coordinates with S-curve velocity cross-section
rt = _DMC_01_start_tr_move_2seg (CardNo, NodeID, SlotID, Dist, Dist2, StrVel, MaxVel, MaxVel2, Tacc, Tsec, Tdec);
// 2nd motion displacement using relative coordinates with T-curve velocity cross-section

9) Stop motion

Hit the “STOP” button to execute an emergency stop:

rt = _DMC_01_emg_stop (gDMCCardNo, NodeID, SlotID);

In this example, emergency stop is used to stop motion. This method quickly stops motion by setting deceleration time to 0. For more information about the Stop Motion function, refer to the later section on “Stop Motion Control API”.

10) Exit procedure

Click on the “Exit” button to quit and exit the procedure.

“_DMC_01_reset_card” and “_DMC_01_close” must be executed to exit this function. Please refer to Section 3.12 “Exit procedure” for the function operations.

3.19 Remote I/O Module-I/O Port

3.19.1 Function List

Table 3.19

Function Name
_DMC_01_set_rm_input_filter
_DMC_01_set_rm_input_filter_enable
_DMC_01_set_rm_output_value_error_handle
_DMC_01_get_slave_version
_DMC_01_get_devicetype
_DMC_01_set_rm_output_value
_DMC_01_get_rm_input_value

3.19.2 Sample Application

Program Appearance

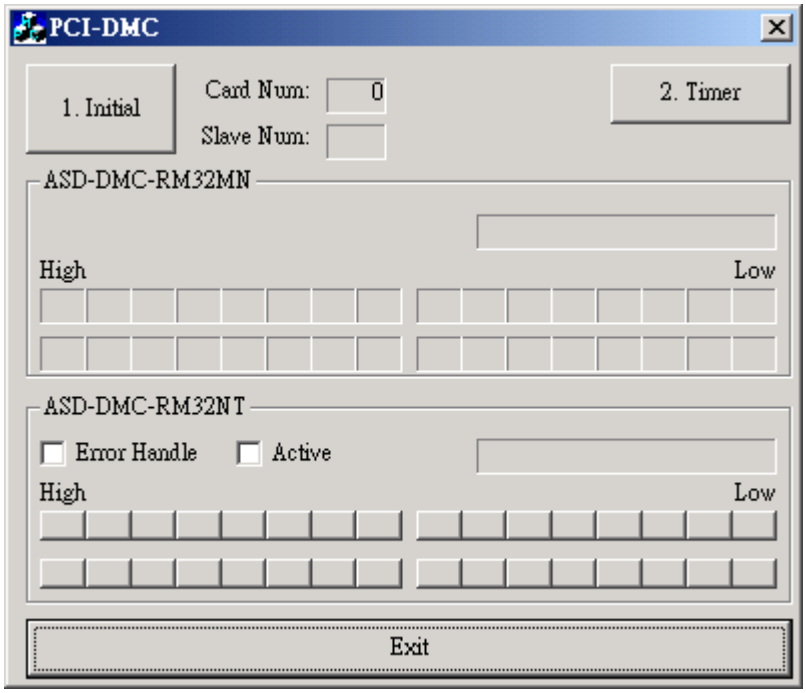


Figure 3.96

1) Card initialization
   Click on the “Initial” button to open and initialize the card.
   For a detailed description of card initialization, please refer to “Open card” and “Card initialization” in Section 3.1.2.

2) When setting the ASD-DMC-RM32MN module initialization parameters, you must execute the following procedure:

```
rt = _DMC_01_set_rm_input_filter(gDMCCardNo, gpNodeID[gNodeNum], 0, port, filter);
// The port variable can be set to the 2 ports on the remote module. A value of 0 corresponds to Port 0 on the module. A value of 1 corresponds to Port 1. The filter variable sets the level of the software filter. A value of 0 means software filter time is 1 ms; a value of 1 means filter time becomes 2 ms, and so on.

rt = _DMC_01_set_rm_input_filter_enable(gDMCCardNo, gpNodeID[gNodeNum], 0, port, filter_enable);
// The filter_enable variable has range of 0~0xFFFF. It is used to control the software filter mask for bit 0 to bit 15 on the Port.
```

3) To set the ASD-DMC-RM32NT module initialization parameters, you can execute the following procedure:

```
rt = _DMC_01_get_rm_output_value(gDMCCardNo, gpNTNode[gNTNodeNum], 0, port, &value);
// The value variable shows the number of signals that the RM32NT module is outputting on that port.
```

4) Get slave device type

To get the type of this slave device, you must execute the following procedure:

```
rt = _DMC_01_get_devicetype(gDMCCardNo, NodeID, SlotID, &DeviceType, &IdentityObject);
```

For a detailed description of this function, please refer to the section on “Slave Information API”.

5) Digital Input (DI) and Digital Output (DO) operation

When you wish to perform DO operations, you must use the ASD-DMC-RM32NT module and execute the following procedure:

```
/* Set the value of DO Port 0 */
rt = _DMC_01_set_rm_output_value(gDMCCardNo, NodeID, SlotID, 0, output_value[0]);
// The Output_value[0] variable will store the value to be output for bit 0 to bit 15 of Port 0
/* Set the value of DO Port 1 */
rt = _DMC_01_set_rm_output_value(gDMCCardNo, NodeID, SlotID, 1, output_value[1]);
```

```
// The Output_value[1] variable will store the value to be output for bit 0 to bit 15 of
Port 1

/* Enable output */
rt = _DMC_01_set_rm_output_active(gDMCCardNo, NodeID, SlotID, Enable);
//This function must be enabled before the output value set above can be outputted
from the output port.
```

If you wish to get the data you sent through the DO module on the DI side, you must use the ASD-DMC-RM32MN module and execute the following procedure:

```
/* Get value of DI Port 0 */
rt = _DMC_01_get_rm_input_value(gDMCCardNo, NodeID, SlotID, 0,
&input_value[0]);
// The Input_value[0] value will return the data from bit 0 to bit 15 of Port 0.

/* Get value of DI Port 1 */
rt = _DMC_01_get_rm_input_value(gDMCCardNo, NodeID, SlotID, 1,
&input_value[1]);
// The Input_value[1] value will return the data from bit 0 to bit 15 of Port 1.
```

Data cannot be retrieved from Port 0 of ASD-DMC-RM32MN module, as shown in the following figure. In Port 1 bit 0 is ON and the remaining bits are OFF.

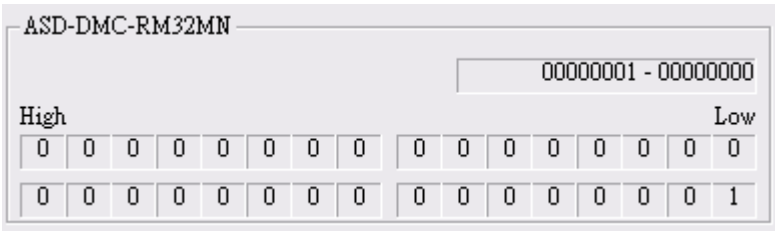


Figure 3.97

6) Maintain output port's output status (value)

To maintain the current output until power to the module is turned off, use the following procedure:

```
rt = _DMC_01_set_rm_output_value_error_handle(gDMCCardNo,
gpNodeID[gNodeNum], 0, port, gErrorHandle);
// The port variable can be set to the 2 ports on the remote module. A value of 0
corresponds to Port 0 on the module. A value of 1 corresponds to Port 1. The value
of the gErrorHandle variable determines whether the system should retain the
incorrect output value in the event of an error. If the value is 1, system will retain the
output value until module is powered off or removed; if value is 0, then the incorrect
output will be reset to 0.
```

3.20 Remote I/O Module- Manual Pulse Generator (1)

3.20.1 Function List

Table 3.20

Function Name
DMC_01_get_rm_input_value
_DMC_01_set_rm_mpg_axes_enable
_DMC_01_set_rm_mpg_axes_enable2

3.20.2 Sample Application

Program Appearance

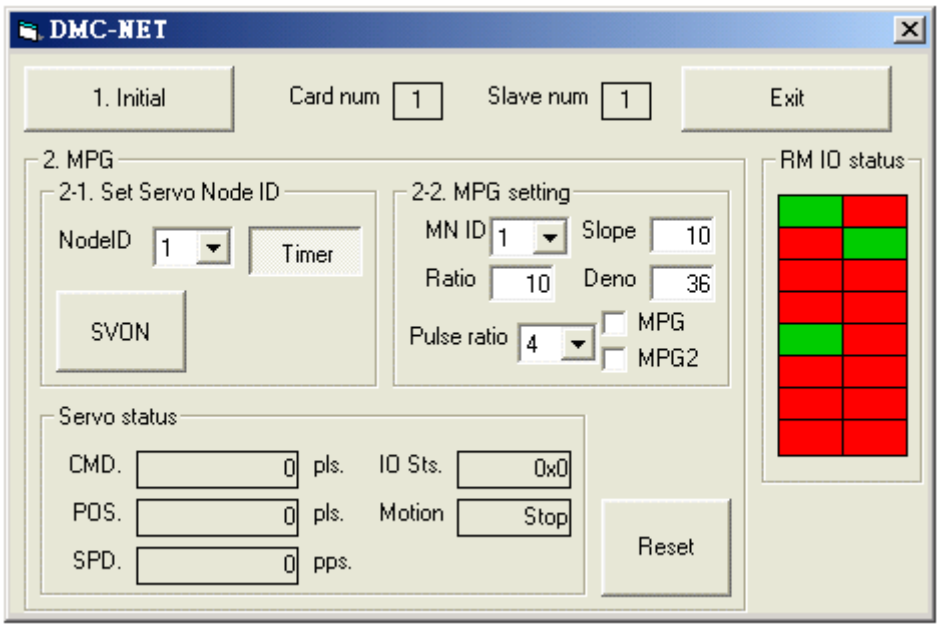


Figure 3.98

1) Card initialization
   Click on the “Initial” button to open and initialize the card.
   For a detailed description of card initialization, please refer to “Open card” and “Card initialization” in Section 3.1.2.

2) Set Servo Node ID and enable motion status display

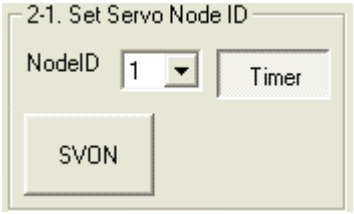


Figure 3.99

Input Node ID and check “Timer” checkbox to enable motion status display

NodeID item: API function's argument variable “NodeID”.

Timer Checkbox: Check to display the motion status. Uncheck to disable display.

3) Enter parameter value of manual pulse control.

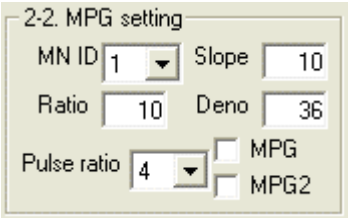


Figure 3.100

MN ID item: API function's argument variable “MNNodeID”.

Ratio item: Ratio between each MPG rotation and motor rotation. API function's argument variable “ratio”.

Slope item: MPG speed slope. API function's argument variable “slope“.

Deno item: Denominator for motor rotations per MPG revolution. API function's argument variable denominator”.

Pulse ratio item: Ratio of pulses per MPG revolution. API function's argument variable “pulse_ratio”.

4) Set Servo Motor Power ON/OFF(servo on/servo off)

Click on the “SVON” button to execute the following procedure:

```
rt = _DMC_01_ipo_set_svon(gDMCCardNo, NodeID, SlotID , ON_OFF);
// ON_OFF: 0 – Servo Power OFF; 1 – Servo Power ON
```

5) If you wish to execute “Manual Motion Control 1”, you must check the “MPG” checkbox and execute the following procedure:

```
rt = _DMC_01_get_rm_input_value(CardNo, NodeID, SlotID, Port, &Value);
// Retrieve the value for bit 0 to bit 15 of the remote I/O module's input port
rt = _DMC_01_set_rm_mpg_axes_enable(CardNo, MasterNodeID, MasterSlotID,
NodeID, SlotID, enable, pulser_ratio, ratio, slope);    // Manual motion control 1
```

If you wish to execute “Manual Motion Control 2”, you must check the “MPG2” checkbox and execute the following procedure:

```
rt = _DMC_01_set_rm_mpg_axes_enable2(CardNo, MasterNodeID, MasterSlotID,
NodeID, SlotID, enable, pulser_ratio, ratio, slope, denominator);
// Manual motion control 2. ratio is the numerator for motor rotations per revolution;
   denominator is the denominator for motor rotations per revolution; These two
   parameters can be used to customize the MPG outputs.
```

6) Stop manual position control
   If you wish to stop using the MPG, simply uncheck the “MPG” or “MPG2” checkboxes.

7) Reset SERVON status
   If you wish to reset the SERVON status, you must uncheck the “MPG” or “MPG2” checkboxes then click on the “RESET” button to execute the following procedure:

```
rt = _DMC_01_set_command(gDMCCardNo, NodeID, SlotID, 0);
// Reset Command to 0
rt = _DMC_01_set_position(gDMCCardNo, NodeID, SlotID, 0);
// Reset Position to 0
```

8) Exit procedure
   Click on the “Exit” button to quit and exit the procedure.
   “_DMC_01_reset_card” and “_DMC_01_close” must be executed to exit this function. Please refer to Section 3.12 “Exit procedure” for the function operations.

3.21 Remote I/O Module- Manual Pulse Generator (2)

3.21.1 Function List

Table 3.21

Function Name
_DMC_01_get_rm_input_value
_DMC_01_set_rm_mpg_axes_enable
_DMC_01_set_rm_jog_axes_enable

3.21.2 Sample Application

Program Appearance

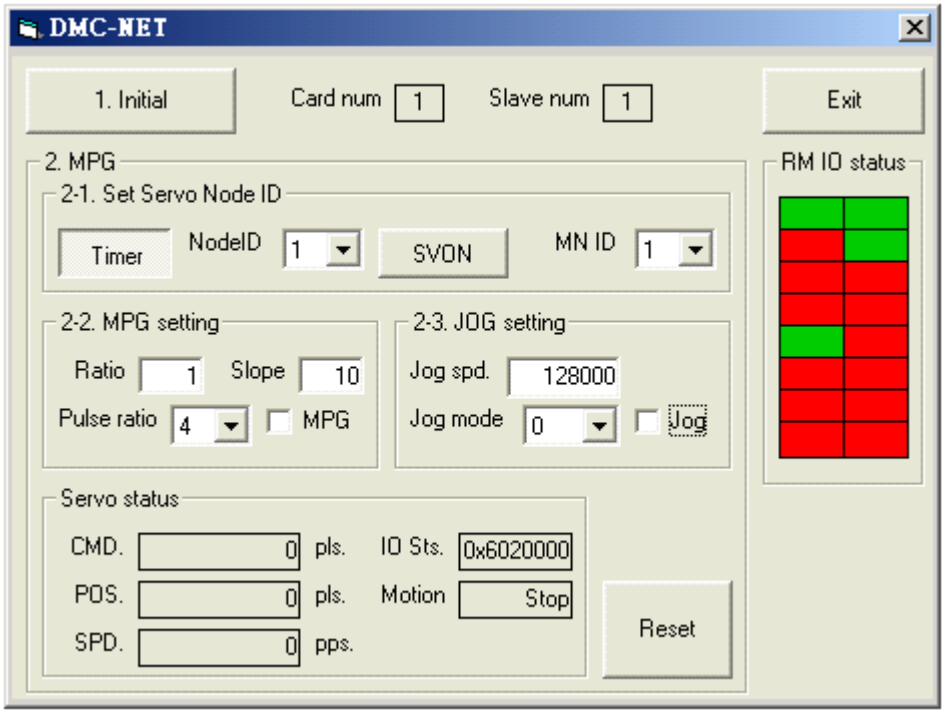


Figure 3.101

1) Card initialization

Click on the “Initial” button to open and initialize the card.

For a detailed description of card initialization, please refer to “Open card” and “Card initialization” in Section 3.1.2.

2) Set Servo Node ID and enable motion status display

Figure 3.101

Enter Node ID and check “Timer” checkbox to enable motion status display
NodeID item: API function's argument variable “NodeID”.
NNID item: API function's argument variable “slotID”.
Timer command checkbox: Click to display motion status. Click again to turn off display.

3) Enter parameter value of manual pulse control.

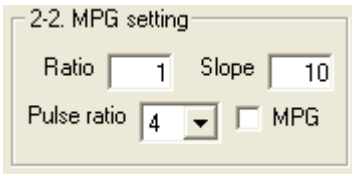


Figure 3.102

MN ID item: API function's argument variable “MNNodeID”.
Ratio item: Ratio between each MPG rotation and motor rotation. API function's argument variable “ratio”.
Slope item: MPG speed slope. API function's argument variable “slope”.
Pulse ratio item: Ratio of pulses per MPG revolution. API function's argument variable “pulse_ratio”.

4) Enter the argument values for Jog control

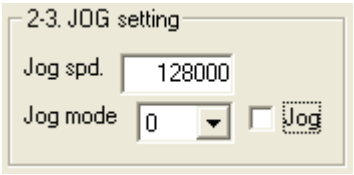


Figure 3.103

Jog spd item: Set the Jog speed. API function's argument variable “jog_speed”.
Jog mode item: Choose JOG axis. API function's argument variable “jog_mode”.

5) Set Servo Motor Power ON/OFF (servo on/servo off)
Click on the “SVON” button to execute the following procedure:

```
rt = _DMC_01_ipo_set_svon(gDMCCardNo, NodeID, SlotID , ON_OFF);
// ON_OFF: 0 – Servo Power OFF; 1 – Servo Power ON
```

6) If you wish to use the MPG function, you must check the “MPG” checkbox and execute the following procedure:

```
rt = _DMC_01_get_rm_input_value(CardNo, NodeID, SlotID, Port, &Value);
// Retrieve the value for bit 0 to bit 15 of the remote I/O module's input port
rt = _DMC_01_set_rm_mpg_axes_enable(CardNo, MasterNodeID, MasterSlotID,
NodeID, SlotID, enable, pulse_ratio, ratio, slope);
```

7) If you wish to use the JOG function, you must check the “Jog” checkbox and execute the following procedure:

```
rt = _DMC_01_set_rm_jog_axes_enable (CardNo, MasterNodeID, MasterSlotID,
NodeID, SlotID, enable, jog_mode, jog_speed, sec);    // Execute JOG motion
control
```

8) Stop MPG and JOG motion control

If you wish to stop MPG or JOG motion control, please uncheck the “MPG” or “JOG” checkboxes to stop their motion control.

9) Reset SERVON status

If you wish to reset the SERVON status, you must uncheck the “MPG” or “JOG” checkboxes then click on the “RESET” button to execute the following procedure:

```
rt = _DMC_01_set_command(gDMCCardNo, NodeID, SlotID, 0);
// Reset Command to 0
rt = _DMC_01_set_position(gDMCCardNo, NodeID, SlotID, 0);
// Reset Position to 0
```

10) Exit procedure

Click on the “Exit” button to quit and exit the procedure.

“_DMC_01_reset_card” and “_DMC_01_close” must be executed to exit this function. Please refer to Section 3.12 “Exit procedure” for the function operations.

3.22 Remote Pulse Interface Module -Mode 1

3.22.1 Function List

Table 3.22

Function Name
_DMC_01_get_buffer_length
_DMC_01_get_servo_DI
_DMC_01_get_servo_DO
_DMC_01_rm_04pi_md1_get_soft_limit_status
_DMC_01_set_rm_04pi_ipulse_mode
_DMC_01_set_rm_04pi_opulse_mode
_DMC_01_rm_04pi_md1_set_soft_limit
_DMC_01_set_rm_04pi_svon_polarity
_DMC_01_rm_04pi_md1_v_move
_DMC_01_rm_04pi_md1_start_move
_DMC_01_set_rm_04pi_DO2
_DMC_01_rm_04pi_md1_p_change
_DMC_01_rm_04pi_md1_v_change

3.22.2 Sample Application

Program Appearance

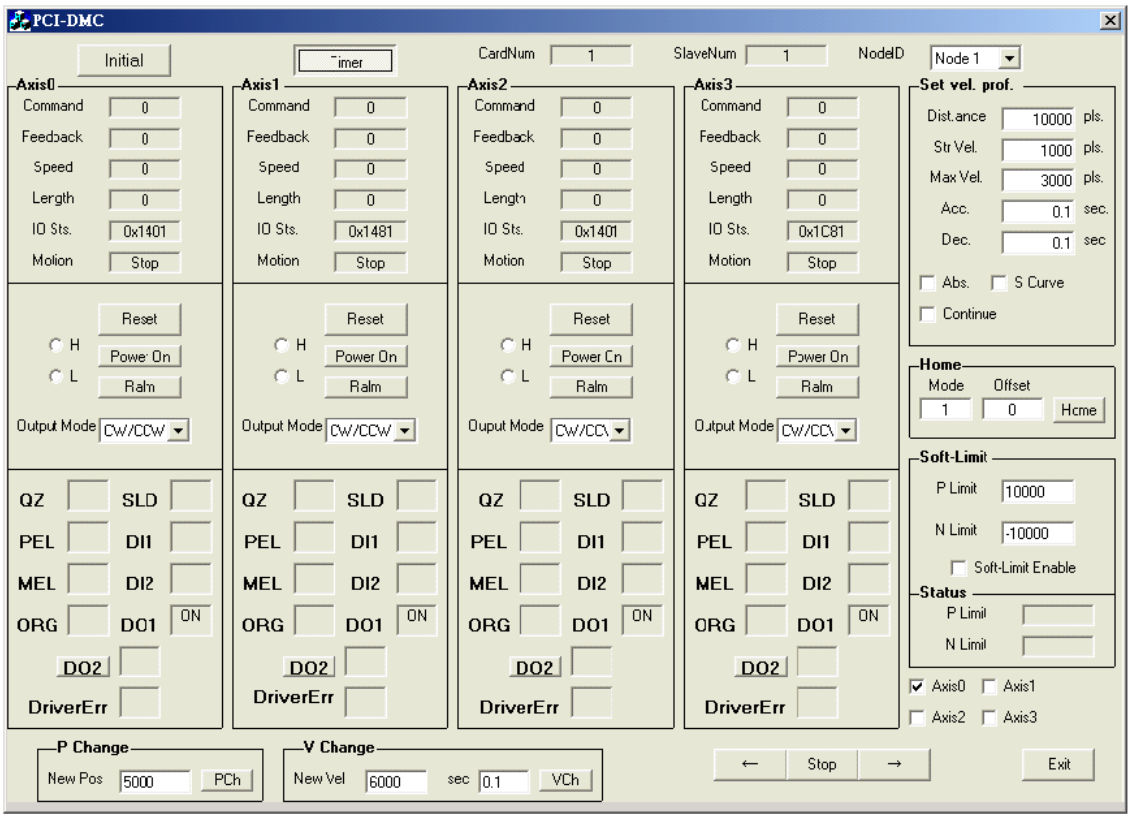


Figure 3.104

1) Card initialization

Click on the “Initial” button to open and initialize the card.

For a detailed description of card initialization, please refer to “Open card” and “Card initialization” in Section 3.1.2.

2) Set Servo Node ID and enable motion status display

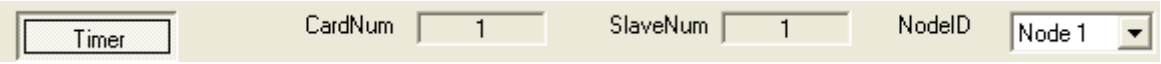


Figure 3.105

Enter Node ID and check “Timer” checkbox to enable motion status display

NodeID item: API function's argument variable “NodeID”.

Timer Checkbox: Check to display the motion status. Uncheck to disable display.

3) Enter the values of the arguments for motion control

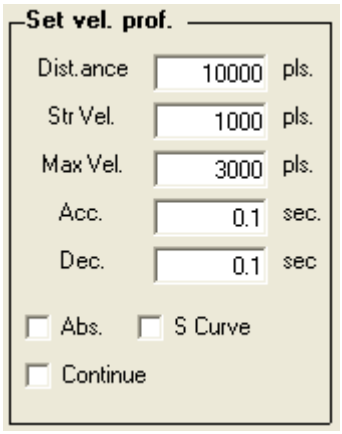


Figure 3.106

Dist. item: Set motion distance. API function's argument variable “Distance”.
StrVel item: Starting velocity. API function's argument variable “StrVel”.
MaxVel item: Maximum velocity. API function's argument variable “MaxVel”.
Acc. item: Time required to reach maximum velocity. API function's argument variable “acc”.
Dec item: Time required to go from maximum velocity to 0. API function's argument variable “dec”.
Abs. Checkbox: You must check this if you want motion displacement to use absolute coordinates.
S-Curve checkbox: You must check this box if you wish to use the S-curve velocity curve.
Continue checkbox: Check if you wish to use the Continue motion mode.

4) Select motion mode and set motion distance.

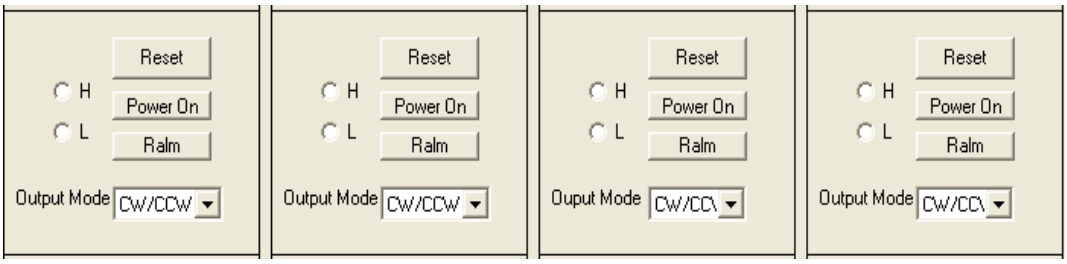


Figure 3.107

Power On checkbox: Click Power On to turn on power to that axis.
H/L Checkbox: Select active voltage level.
Output Mode item: Output phase is either ABphase or CW/CCW.
Ralm item: Resets alarm error codes produced during operation.
Reset item: Reset Command and feedback data.

5) Set Home motion mode and offset:

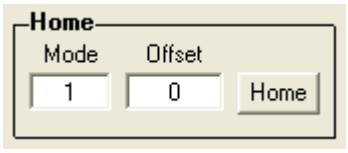


Figure 3.108

Mode item: Select Home motion mode. API function's argument variable “home_mode”.
Offset item: Set Home motion offset. API function's argument variable “home_offset”.

6) Set positive/negative value limit; enable/disable software limit, and whether to touch software limit or not;

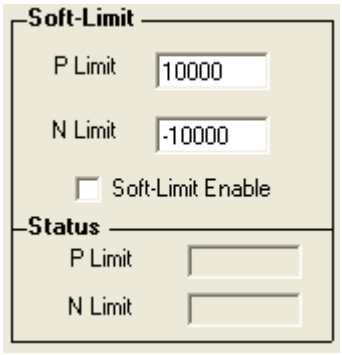


Figure 3.109

P-Limit item: Value of positive limit. API function's argument variable “PLimit”.
N-Limit item: Value of negative limit. API function's argument variable “NLimit”.
Soft-limit Checkbox: Enables/disables software limit.
P Limit limit: Display contact with positive software limit is “ON”.
N Limit item: Display contact with negative software limit is “ON”.

7) Set new position value and execute change of position:

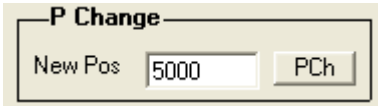


Figure 3.110

New Pos item: Value of new position. API function's argument variable “NewPos”.
PCh item: Enable position change.

8) Set the new velocity, deceleration time and enable position change for new position.

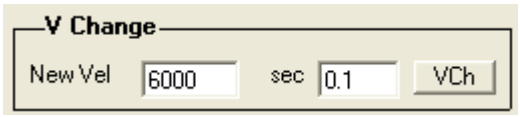


Figure 3.110

New Vel item: Set new velocity. API function's argument variable “NewSpeed”.
sec item: Set acceleration/deceleration time. API function's argument variable “sec”.
PCh item: Enable position change.

9) Set Servo Motor Power ON/OFF(servo on/servo off)

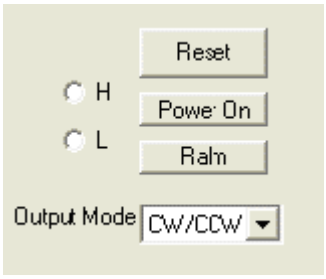


Figure 3.111

Click on the “POWERON” button to execute the following procedure:
rt = _DMC_01_ipo_set_svon(gDMCCardNo, NodeID, SlotID , ON_OFF);
// ON_OFF: 0 – Servo Power OFF; 1 – Servo Power ON

10) Start motion control (using point to point motion control as an example)

Figure 3.112

Click on the “→” or “←” button to execute the following procedure:
rt = _DMC_01_rm_04pi_md1_start_move (CardNo, NodeID, SlotID, Dist, StrVel, MaxVel, Tacc, Tdec, m_curve, m_r_a); // Carry out motion displacement

11)Enable software limit

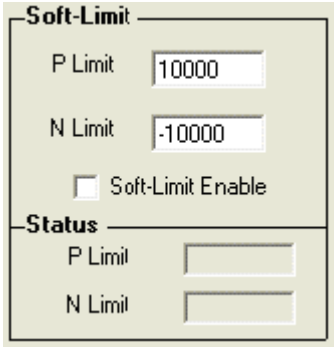


Figure 3.113

If you wish to use the software limit function, you must first set the “P Limit” and “N Limit” values then check the “Soft-limit Enable” checkbox to execute the following procedure:

```
/* Start software limit configuration */
rt = _DMC_01_rm_04pi_md1_set_soft_limit(CardNo, NodeID, SlotID, PLimit, NLimit, Enable);    // PLimit argument is the set value for positive limit; NLimit is the set value for negative limit
```

※For a detailed description of software limit examples, please refer to section “3.13 Software Limit”.

12)Countine motion control

If you wish to carry out Countine motion, you must check the “Countine” checkbox then click on the “→” or “←” button to execute the following procedure:

```
/* Countine motion */
rt = _DMC_01_rm_04pi_md1_v_move(CardNo, NodeID, SlotID, StrVel, MaxVel, Tacc, Tdec, dir, m_curve);
```

13)Homing motion control

If you wish to carry out the Homing action, please click on the “Home” button to execute the following procedure:

```
/* Set homing mode: 1~35, offset and velocity parameters */
rt = _DMC_01_set_home_config(gDMCCardNo, NodeID, SlotID, home_mode, home_offset, StrVel, MaxVel, acc);
/* Start homing motion */
rt = _DMC_01_set_home_move(gDMCCardNo, NodeID, SlotID);
```

14)Change position

Under mode 1, RM04PI will replace the current position with the new position value. You must click on the “Pch” button to execute the following procedure:

```
/* P Change */
```

```
rt = _DMC_01_rm_04pi_md1_p_change(CardNo, NodeID, SlotID, NewPos);
```

15) Change velocity

Under mode 1, RM04PI will replace the current velocity with the new velocity. You must click on the “Vch” button to execute the following procedure:

```
/* P Change */
rt = _DMC_01_rm_04pi_md1_v_change(CardNo, NodeID, SlotID, NewsPeed,sec);
```

16) Stop motion

Hit the “STOP” button to execute an emergency stop:

```
rt = _DMC_01_emg_stop (gDMCCardNo, NodeID, SlotID);
```

In this example, emergency stop is used to stop motion. This method quickly stops motion by setting deceleration time to 0. For more information about the Stop Motion function, refer to the later section on “Stop Motion Control API”.

17) Exit procedure

Click on the “Exit” button to quit and exit the procedure.

“_DMC_01_reset_card” and “_DMC_01_close” must be executed to exit this function. Please refer to Section 3.12 “Exit procedure” for the function operations.

3.23 Remote Pulse Interface Module -Mode 2

3.23.1 Function List

Table 3.23

Function Name
_DMC_01_start_sa_move
_DMC_01_start_ta_mov
_DMC_01_start_sr_move
_DMC_01_start_tr_move
_DMC_01_set_rm_04pi_ipulse_mode
_DMC_01_set_rm_04pi_opulse_mode
_DMC_01_set_rm_04pi_svon_polarity
_DMC_01_set_monitor
_DMC_01_get_monitor
_DMC_01_send_message

3.23.2 Sample Application

Program Appearance

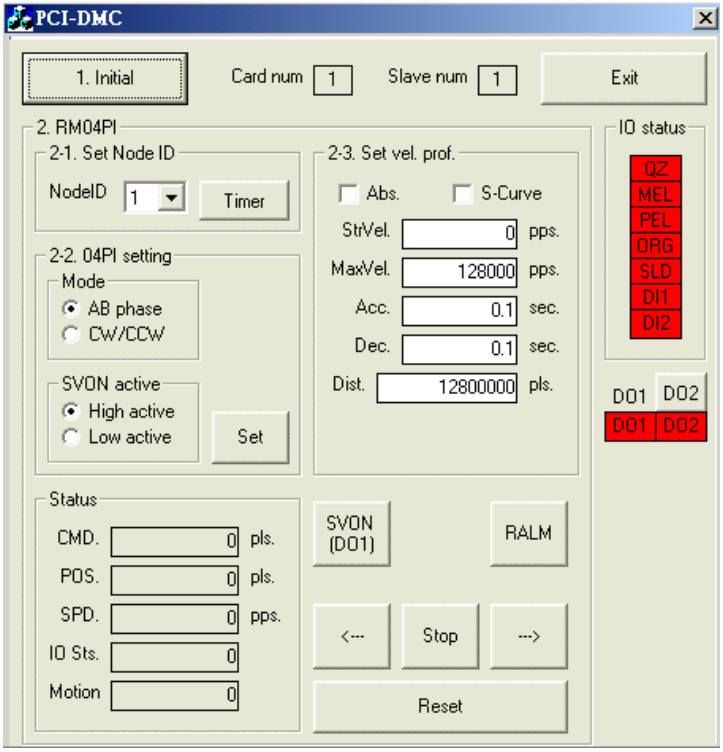


Figure 3.114

1) Card initialization
   Click on the “Initial” button to open and initialize the card.
   For a detailed description of card initialization, please refer to “Open card” and “Card initialization” in Section 3.1.2.

2) Set Servo Node ID and enable motion status display

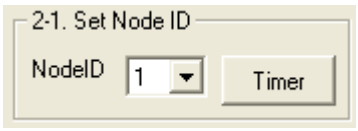


Figure 3.115

Enter Node ID and check “Timer” checkbox to enable motion status display
NodeID item: API function's argument variable “NodeID”.
Timer Checkbox: Check to display the motion status. Uncheck to disable display.

3) Select the control argument value

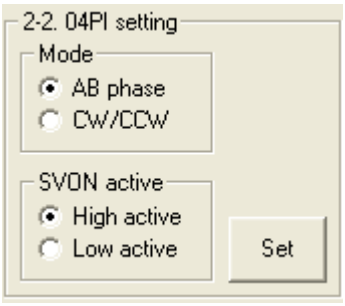


Figure 3.116

AB phase item: Input/Output mode set to AB phase.
CW/CCW item: Input/Output mode set to CW/CCW.
High active item: Trigger when level is high.
Low active item: Trigger when level is low.

4) Enter the values of the arguments for motion control

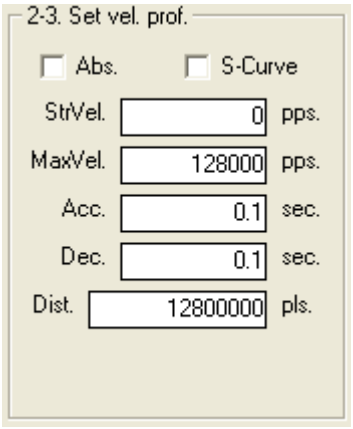


Figure 3.117

Abs. Checkbox: You must check this if you want motion displacement to use absolute coordinates.
S-Curve checkbox: You must check this box if you wish to use the S-curve velocity curve.
StrVel item: Starting velocity. API function's argument variable “StrVel”.
MaxVel item: Maximum velocity. API function's argument variable “MaxVel”.
Acc. item: Time required to reach maximum velocity. API function's argument variable “acc”.
Dec item: Time required to go from maximum velocity to 0. API function's argument variable “dec”.
Dist. item: Set motion distance. API function's argument variable “Distance”.

5) Set Servo Motor Power ON/OFF (servo on/servo off)
Click on the “SVON” button to execute the following procedure:

```
rt = _DMC_01_ipo_set_svon(gDMCCardNo, NodeID, SlotID , ON_OFF);
// ON_OFF: 0 – Servo Power OFF; 1 – Servo Power ON
```

6) Once AB Phase, CW/CCW, as well as High active and Low active have been set, click on the “Set” button to execute the following procedure:

```
rt =_DMC_01_set_rm_04pi_ipulse_mode(CardNo, NodeID, SlotID, mode);
//Set input phase mode for pulse interface module
rt = _DMC_01_set_rm_04pi_opulse_mode(CardNo, NodeID, SlotID, mode);
//Set output phase mode for pulse interface module
rt = _DMC_01_set_rm_04pi_svon_polarity(CardNo, NodeID, SlotID, polarity);
//Set POWER ON (SVON) level
```

7) Start motion control (Using point to point motion control as an example)
   Click on the "→" or "←" button to execute the following procedure:
   rt = _DMC_01_start_sa_move(gDMCCardNo, NodeID, SlotID, Distance, StrVel, MaxVel, acc, dec); // Motion displacement using absolute coordinates with S-curve velocity cross-section
   rt = _DMC_01_start_ta_move(gDMCCardNo, NodeID, SlotID, Distance, StrVel, MaxVel, acc, dec); // Motion displacement using absolute coordinates with T-curve velocity cross-section
   rt = _DMC_01_start_sr_move(gDMCCardNo, NodeID, SlotID, Distance, StrVel, MaxVel, acc, dec); // Motion displacement using relative coordinates with S-curve velocity cross-section
   rt = _DMC_01_start_tr_move(gDMCCardNo, NodeID, SlotID, Distance, StrVel, MaxVel, acc, dec); // Motion displacement using relative coordinates with T-curve velocity cross-section

8) Stop motion
   Hit the "STOP" button to execute an emergency stop:
   rt = _DMC_01_emg_stop (gDMCCardNo, NodeID, SlotID);
   In this example, emergency stop is used to stop motion. This method quickly stops motion by setting deceleration time to 0. For more information about the Stop Motion function, refer to the later section on "Stop Motion Control API".

9) Exit procedure
   Click on the "Exit" button to quit and exit the procedure.
   "_DMC_01_reset_card" and "_DMC_01_close" must be executed to exit this function. Please refer to Section 3.12 "Exit procedure" for the function operations.

3.24 Get (Calculate) Arc Information

3.24.1 Function List

Table 3.24

Function Name
_misc_app_get_circle_endpoint
_misc_app_get_circle_center_point

3.24.2 Sample Application

Program Appearance

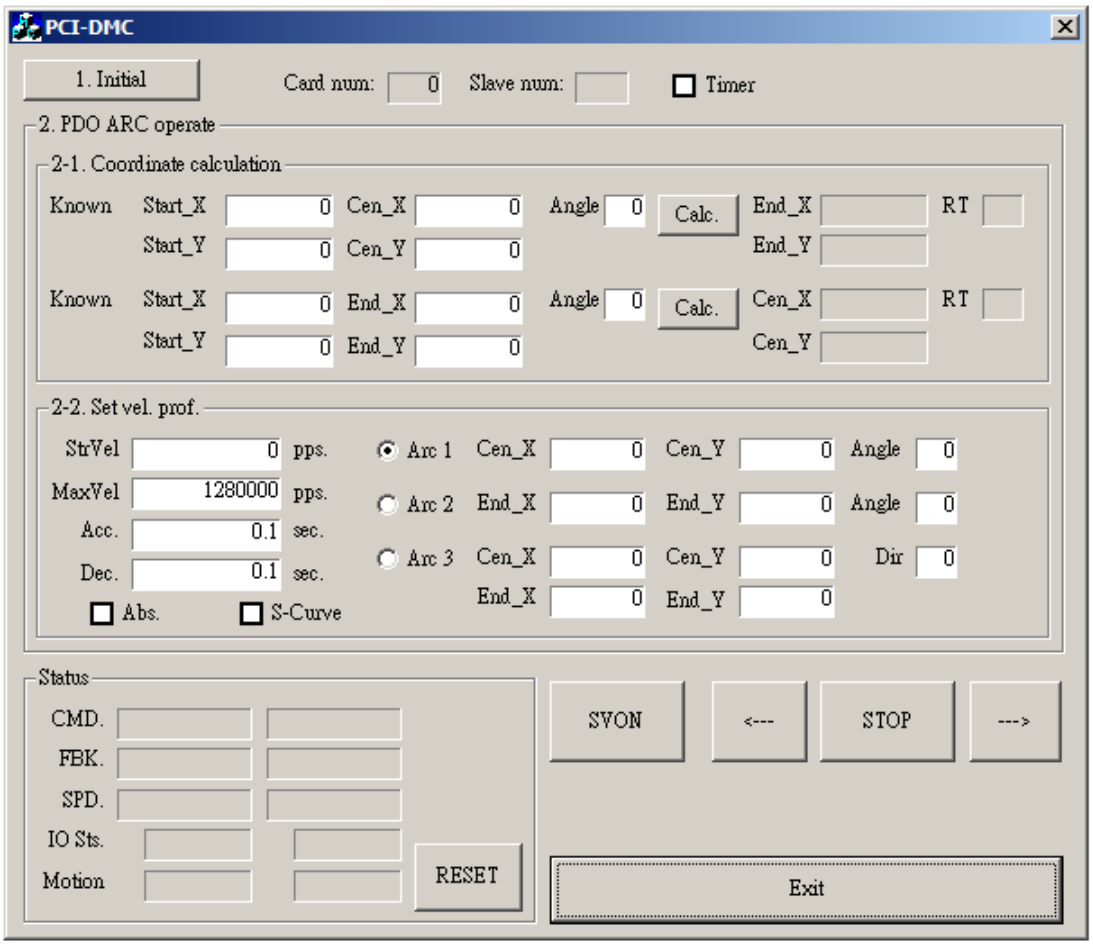


Figure 3.118

1) Card initialization

Click on the “Initial” button to open and initialize the card.

For a detailed description of card initialization, please refer to “Open card” and “Card initialization” in Section 3.1.2.

2) Get Slot ID and enable motion status display

Figure 3.119

Check the “Timer” checkbox to enable motion status display

Timer Checkbox: Check to display the motion status. Uncheck to disable display.

3) Enter Known conditions and select the method of calculation to use

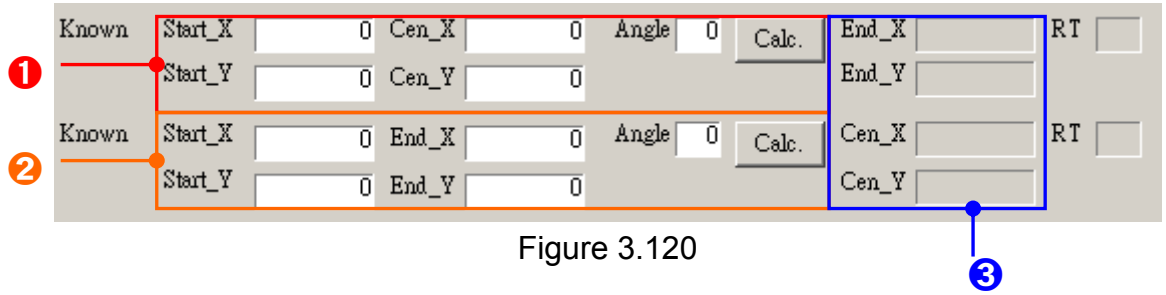


Figure 3.120

❶ If you know the starting point's XY coordinates, the center point's XY coordinates and the corresponding angle, you can use these to calculate the XY coordinates of the endpoint. Clicking on “Calc.” then executes the following procedure:

```
/* Get the X and Y values for the endpoint coordinates */
rt = _misc_app_get_circle_endpoint(Start_X, Start_Y , Center_X, Center_Y,
Angle, &End_X, &End_Y);
```

❷ If you know the starting point's XY coordinates, the endpoint's XY coordinates and the corresponding angle, you can use these to calculate the XY coordinates of the center point. Clicking on “Calc.” then executes the following procedure:

```
/* Get the X and Y values for the center point coordinates */
rt = _misc_app_get_circle_center_point(Start_X, Start_Y , End_X, End_Y, Angle,
&Center_X, &Center_Y);
```

❸ The results calculated by executing procedure ❶ or procedure ❷ is displayed in block ❸.

4) When you complete the arc calculation and get the data you require for arc interpolation motion, you can begin motion control for arc interpolation. Enter the data required for arc interpolation as shown in Fig. 390, select the arc interpolation motion you wish to use. For a detailed description of arc interpolation, please refer to “2-axis Arc Interpolation Motion Control API”.

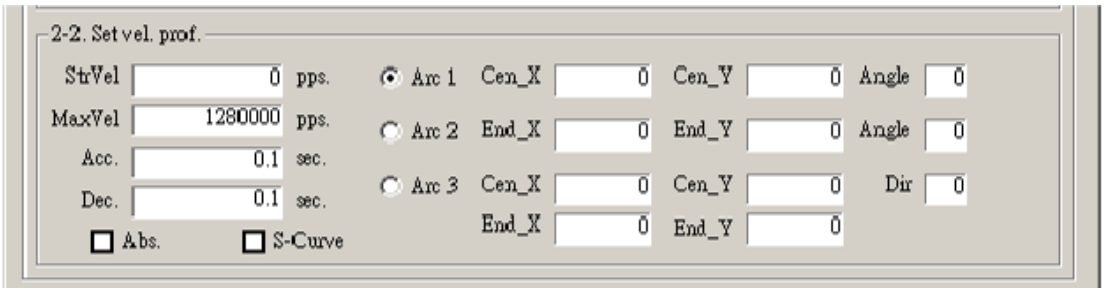


Figure 3.121

3.25 Control Interrupt

3.25.1 Function List

Table 3.26

Function Name
_DMC_01_int_enable
_DMC_01_int_disable
_DMC_01_set_int_factor
_DMC_01_get_int_count

3.25.2 Sample Application

Program Appearance

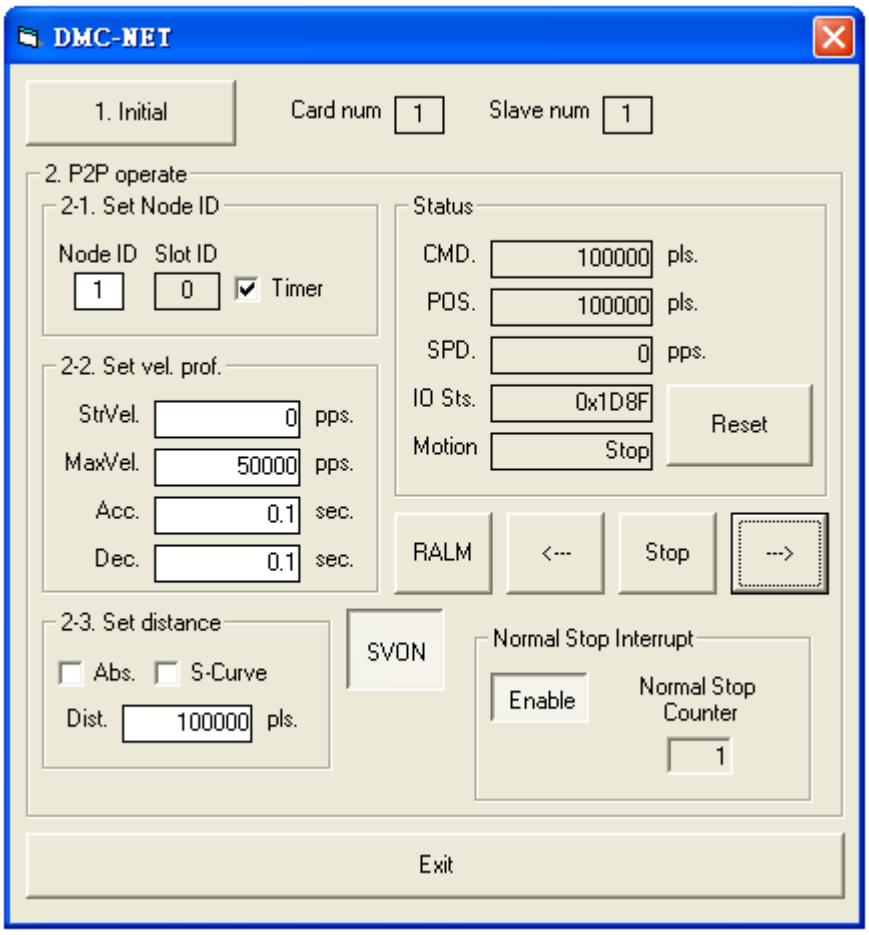


Figure 3.124

1) Card initialization:
   Click on the “Initial” button to start card initialization.
   For a detailed description of card initialization, please refer to Section 3.1.2 - 1) Open card.

2) Set Servo Node ID and enable motion status display

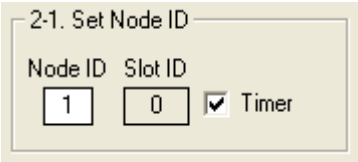


Figure 3.125

Input Node ID and check “Timer” checkbox to enable motion status display
NodeID item: API function's argument variable “NodeID”.
Timer Checkbox: Check to display the motion status. Uncheck to disable display.

2) Enter the values of the arguments for motion control

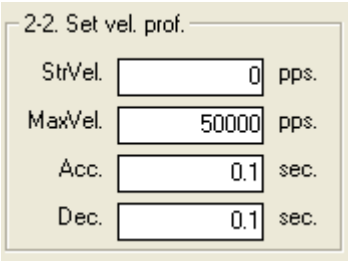


Figure 3.126

StrVel item: Starting velocity. API function's argument variable “StrVel”.
MaxVel item: Maximum velocity. API function's argument variable “MaxVel”.
Acc. item: Time required to reach maximum velocity. API function's argument variable “acc”.
Dec item: Time required to go from maximum velocity to 0. API function's argument variable “dec”.

3) Select motion mode and set motion distance.

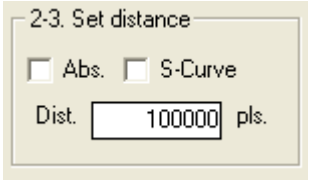


Figure 3.127

Abs. checkbox: You must check this if you want motion displacement to use absolute coordinates.

S-Curve checkbox: You must check this box if you wish to use the S-curve velocity curve.

Dist. item: Motion distance. API function's argument variable “Distance”.

5) Enable or disable Normal Stop Interrupt

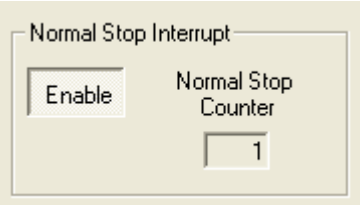


Figure 3.128

Enable item: Enables/disables Normal Stop Interrupt.

Normal Stop Counter item: Counts number of normal stops after Normal Stop Interrupt is enabled.

6) If you wish to use Normal Stop Interrupt, you must click on the “Enable” button and execute the following procedure:

```
/* Enable Interrupt*/
rt = _DMC_01_int_enable(gDMCCardNo, NodeID);
/* Disable Interrupt*/
rt = _DMC_01_int_disable(gDMCCardNo, NodeID);
/* Set Interrupt function to Normal Stop Interrupt*/
rt = _DMC_01_set_int_factor(gDMCCardNo, NodeID,1);
/* 1: Normal Stop: Triggers after any kind of motion is completed (Mode2) */
/* 2: Next Buffer: Triggers when executing Buffer action (Mode2) */
/* 3: Acceleration End: Triggers when acceleration ends (Mode2) */
/* 4: Deceleration Start: Triggers when deceleration starts (Mode2) */
/* 5: Sdo Finish: (Function not available) */
/* 6: DMC Cycle Start: Triggers when DMC Cycle starts */
/* 7: RM04PI-FIFO: Triggers when 04PI FIFO starts(Mode1) */
/* 8: User define: (Function not available) */
```

7) Set Servo Motor Power ON/OFF(servo on/servo off)

Click on the “SVON” button to execute the following procedure:

```
rt = _DMC_01_ipo_set_svon(gDMCCardNo, NodeID, SlotID , ON_OFF);
// ON_OFF: 0 – Servo Power OFF; 1 – Servo Power ON
```

8) Start motion control (Using point to point motion control as an example)
   Click on the "→" or "←" button to execute the following procedure:
   rt = _DMC_01_start_sa_move(gDMCCardNo, NodeID, SlotID, Distance, StrVel, MaxVel, acc, dec); // Motion displacement using absolute coordinates with S-curve velocity cross-section
   rt = _DMC_01_start_ta_move(gDMCCardNo, NodeID, SlotID, Distance, StrVel, MaxVel, acc, dec); // Motion displacement using absolute coordinates with T-curve velocity cross-section
   rt = _DMC_01_start_sr_move(gDMCCardNo, NodeID, SlotID, Distance, StrVel, MaxVel, acc, dec); // Motion displacement using relative coordinates with S-curve velocity cross-section
   rt = _DMC_01_start_tr_move(gDMCCardNo, NodeID, SlotID, Distance, StrVel, MaxVel, acc, dec); // Motion displacement using relative coordinates with T-curve velocity cross-section

9) Set Interrupt function to Normal Stop Interrupt:
   After moving a set distance or pressing the Stop button halfway, using the following API to read
   Int_Count will increase the value by 1. This is shown above in Figure 3.128 Normal Stop Counter.
   rt = _DMC_01_get_int_counter(gDMCCardNo, NodeID, &Int_Count);

10) Stop motion
   Click on the "STOP" button to execute slow down stop for current point to point motion.
   rt = _DMC_01_sd_stop(gDMCCardNo, NodeID, SlotID, dec);
   In this example, deceleration is used to stop displacement motion. Here the velocity is gradually reduced to 0 over the set deceleration time. For a detailed description of Stop motion, please refer to "Chapter 14 Stop Motion API".

11) Exit procedure
   Click on the "Exit" button to quit and exit the procedure.
   Exit function requires "_DMC_01_reset_card" and _DMC_01_close" to be used. For a detailed description of these two API please refer to section 3.1.2 4) Exit procedure.

3.26 MasterCard Security

3.26.1 Function List

Table 3.26

Function Name
_DMC_01_check_userpassword
_DMC_01_write_userpassword
_DMC_01_read_serialno
_DMC_01_write_verifykey
_DMC_01_check_verifykey
_DMC_01_read_security
_DMC_01_read_security_status
_DMC_01_write_security
_DMC_01_write_security_status
_misc_security

3.26.2 Sample Application

Program Appearance

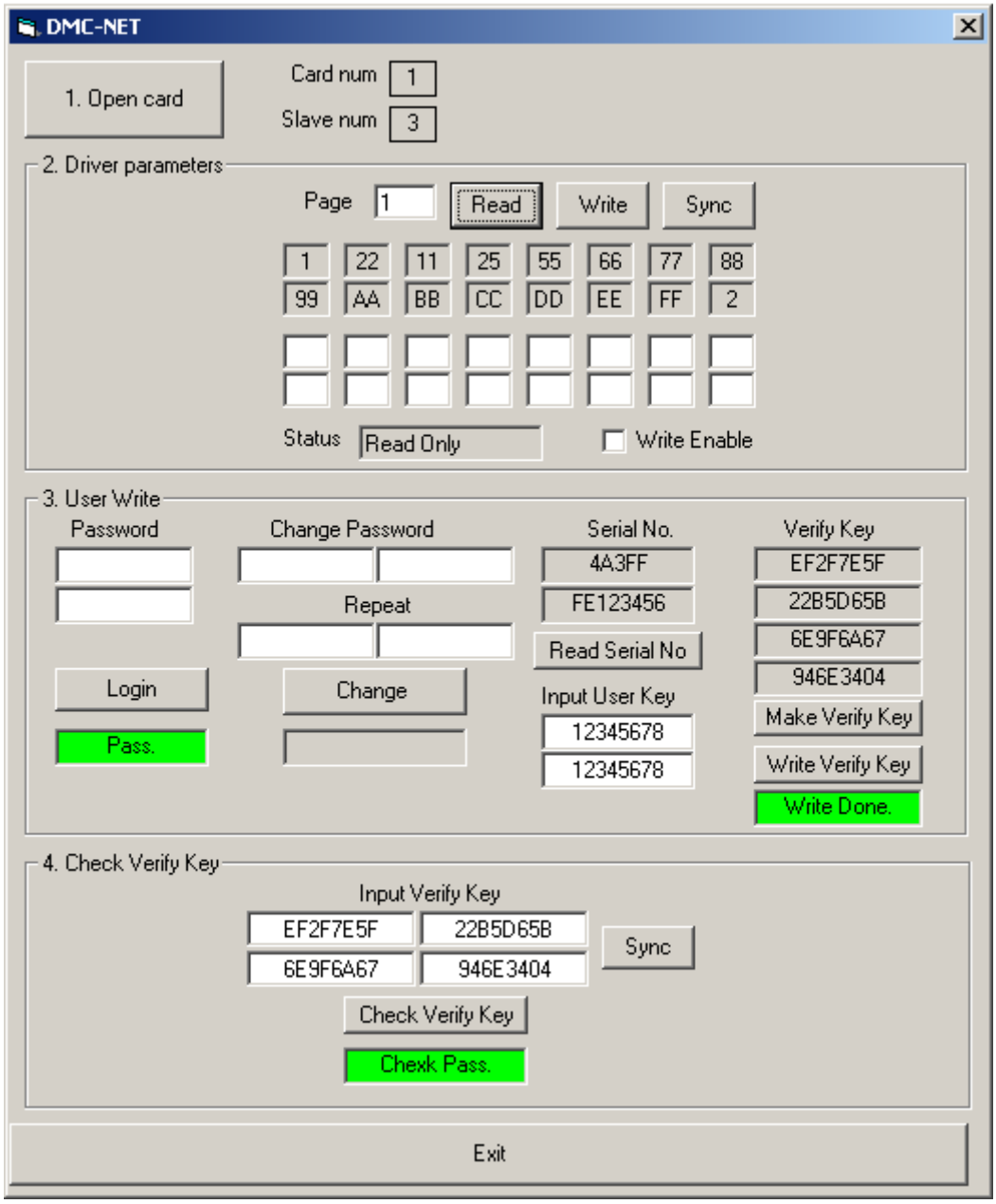


Figure 3.129

1) Card initialization:

   Click on the “Open card” button to start card initialization.

   For a detailed description of card initialization, please refer to Section 3.1.2 - 1) Open card.

2) Start motion card login operation. (SerialNo, Verifykey, Memory Read/Write all require Check
Password Pass to operate).

Figure 3.130

Password item: Enter two sets of 1~8 bit 0~F hexadecimal values. Default motion card passwords (Password1: FFFFFFFF Password2:FFFFFFFF).
Login item: Check password.
Status item: If password is correct then “Pass” is displayed in the status below. If password is wrong, “Failed” appears in the status display.

3) Change motion card password:

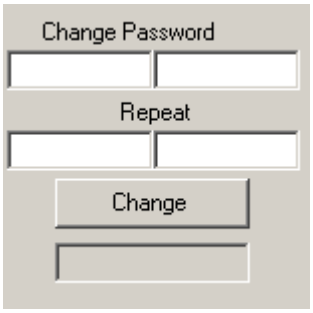


Figure 3.131

Change Password item: Enter two sets of 1~8 bit 0~F hexadecimal values.
Repeat item: Enter the two sets of 1~8 bit 0~F hexadecimal values again. (Same inputs as Change Password).
Change item: Click on Change button to change password. \
Status item: If the passwords entered in Change Password and Repeat are the same then when the Change button is clicked, the password is successfully changed and “Pass” appears in the status display. If the passwords entered in Change Password and Repeat do not match, “Please rewrite it” appears in the status display, in which case please try Change Password again.

4) Set up Verifykey

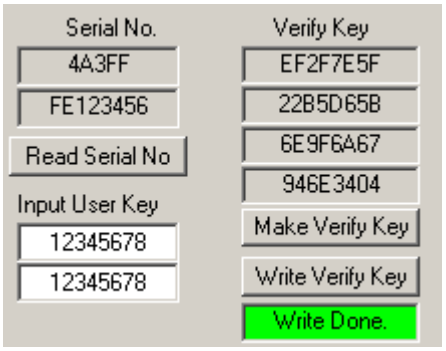


Figure 3.132

SerialNo. display: The motion card's serial number is displayed here.
Read Serial No item: Read the serial number of the motion card.
Input User Key item: Enter two sets of customer-selected 1~8 bit 0~F hexadecimal values as the Key values.
Verify key display: The generated verifykey is displayed here.
Make Verify Key item: Encrypt the SerialNo and customer provided Userkey to generate four sets of VerifyKey.
Write Verify Key item: Write the generated Verifykey to the motion card.
Status item: If Verifykey is successfully written then “Write Done” appears in the status display. If write fails, then “Failed” appears in the status display.

5) Check Verify key

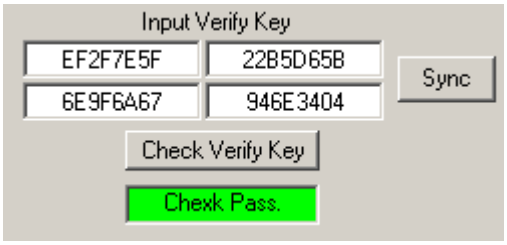


Figure 3.133

Input Verify key item: Enter the motion card Verify key to check.
Sync item: Copy the Verify key value generated by the above procedure to the Input Verify key field.
Check Verify key item: Check Verify Key. If the Key value is correct then “Check Pass” appears in the status display. If Key value is wrong then “Lock” appears in the status display.

6) Check Verify key

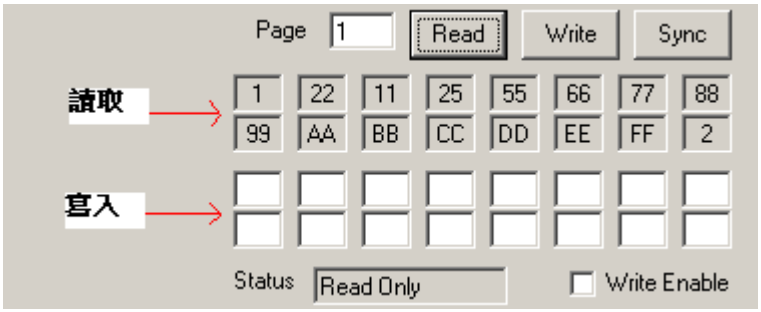


Figure 3.134

Page item: Enter the value of the Memory Page (0 ~ 9) to read or write.
Read item: Execute read of selected Memory Page and display in “Read” item.
Write Enable item: Before executing the write operation, the Write Enable checkbox must be checked.
The status bar will now display “Write/Read”.
Sync item: Clicking on Sync button copies the value from the “Read” to “Write”.
Write item: Write the value in the “Write” position to Memory.
Status item: Default is “Read Only”. When Write Enable option is checked, “Write/Read” will be displayed.

7) Clicking on the Login button in Fig. 3.130 below executes the following procedure:

```
/* Check Password function*/
rt = _DMC_01_check_userpassword(gDMCCardNo, Password(0),state);
```

Clicking on Change button in Fig. 3.131 below executes the following procedure:

```
/* Change Password operation */
rt = _DMC_01_write_userpassword(gDMCCardNo, chpassword(0));
```

Clicking on the Read Serial No button in Fig. 3.132 below executes the following procedure:

```
/* Read Serial No. operation*/
rt = _DMC_01_read_serialno(gDMCCardNo, serial(0));
```

Clicking on the Make Verify Key button in Fig. 3.132 below executes the following procedure:

```
/* Makes encrypted Verify Key*/
rt = _misc_security(userkey(0),userkey(1),SerialNo(0),SerialNo(1),verifykey(0) ,
                    verifykey(1) ,verifykey(2) ,verifykey(3));
```

Clicking on the Write Verify Key button in Fig. 3.132 below executes the following procedure:

```
/* Write Verify Key to Memory*/
rt =_DMC_01_write_verifykey(gDMCCardNo,verifykey(0));
```

Clicking on the Check Verify Key button in Fig. 3.133 below executes the following procedure:

```
/* Check to see if value of Verify Key is correct*/
rt =_DMC_01_check_verifykey(gDMCCardNo,verifykey(0),state);
```

Clicking on Read button in Fig. 3.134 below executes the following procedure:

```
/*Read the data from the selected Page and display data in the “Read” position*/
rt =_DMC_01_read_security(gDMCCardNo,page,ary(0));
```

Clicking on Write button in Fig. 3.134 below executes the following procedure:

```
/* Write the data in the “Write” position to the Memory at the selected Page*/
rt =_DMC_01_write_security(gDMCCardNo,page,ary(0));
```

Checking the WriteEnable option in Fig. 3.134 executes the following procedure:

```
/* Write the data in the “Write” position to the Memory at the selected Page*/
rt =_DMC_01_write_security_status(gDMCCardNo,on_off);
```

8) Exit procedure

Click on the “Exit” button to quit and exit the procedure.

Exit function requires “_DMC_01_reset_card” and _DMC_01_close” to be used. For a detailed description of these two API please refer to section 3.1.2 4) Exit procedure.

3.27 Remote Analog Input/Output Module

3.27.1 Function List

Table 3.27

Function Name
_DMC_01_rm_04da_set_output_value
_DMC_01_rm_04da_get_output_value
_DMC_01_rm_04da_get_return_code
_DMC_01_rm_04da_read_data
_DMC_01_rm_04da_set_output_range
_DMC_01_rm_04da_set_output_enable
_DMC_01_rm_04da_set_output_overrange
_DMC_01_rm_04da_set_output_error_clear
_DMC_01_rm_04da_set_output_error_handle
_DMC_01_rm_04da_set_output_offset_value
_DMC_01_rm_04da_get_output_offset_value
_DMC_01_set_04ad_input_range
_DMC_01_get_04ad_input_range
_DMC_01_set_04ad_zero_scale
_DMC_01_get_04ad_zero_scale
_DMC_01_set_04ad_full_scale
_DMC_01_get_04ad_full_scale
_DMC_01_set_04ad_conversion_time
_DMC_01_get_04ad_conversion_time
_DMC_01_get_04da_data
_DMC_01_set_04ad_average_mode
_DMC_01_get_04ad_average_mode
_DMC_01_set_04ad_input_enable

3.27.2 Sample Application

Program Appearance

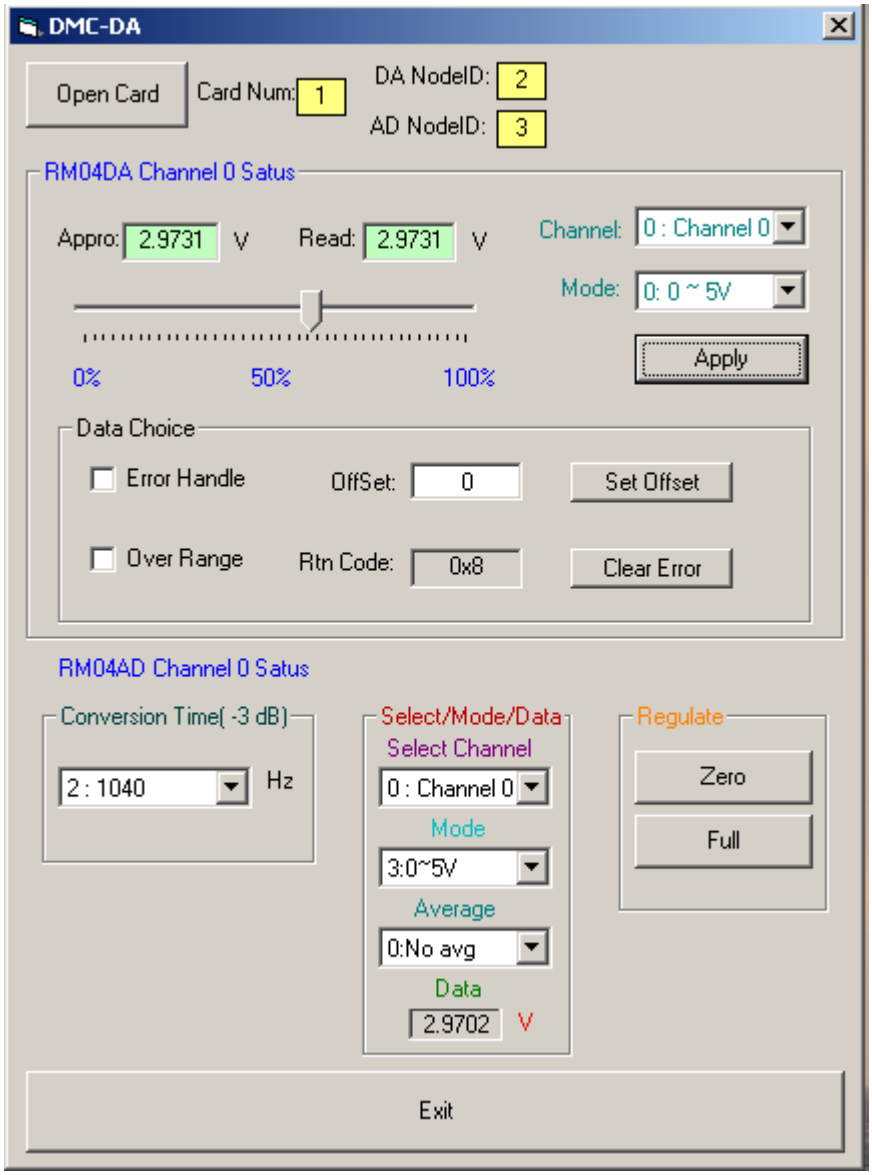


Figure 3.135

1) Card initialization:
   Click on the “Initial” button to start card initialization.
   For a detailed description of card initialization, please refer to Section 3.1.2 - 1) Open card.

2) DA Channel and display mode selection

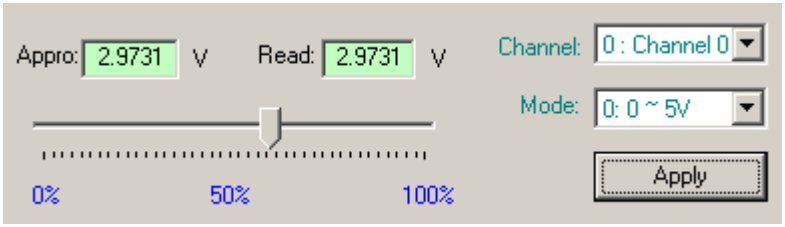


Figure 3.136

Channel item: Enter the ID of the DA Channel to be used (0~3).
Mode item: Select DA display range. API function's argument variable “mode”.
Appro item: Show approximate voltage or current based on the selected display range and lever position.
Read item: Display actual output voltage or current.
Apply item: Click on Apply button converts estimated current or voltage from Appro to actual output.

3) DA Data Choice:

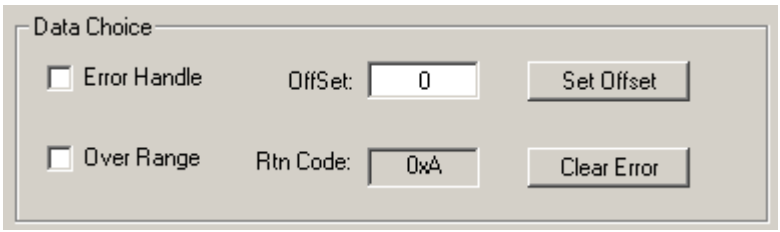


Figure 3.137

Error Handle item: Check this item to keep previous status when re-executing this program.
Over Range item: Check this item to increase voltage or current output by 10%.
Set Offset item: Set DA offset.
ClearError item: Clear the Error status indicated by Rtn Code.

4) Select AD Conversion Time mode:

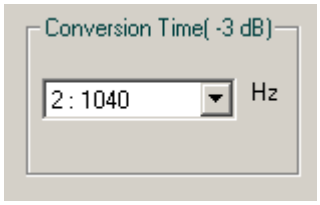


Figure 3.138

Conversion Time item: Select Conversion Time mode.

5) Select AD Channel / Display mode / Average data.

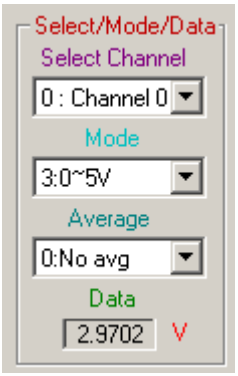


Figure 3.139

Channel item: Select Channel for AD enable input.
Mode item: Select AD display range.
Average item: Select wave display calculation frequency.
Data item: Enter AD voltage or current display position.

6) AD reset and maximum:

Figure 3.140

Zero item: Click this button to carry out re-zero (e.g. selectDA Mode -5~5, set lever to 0 position then click on Zero button to complete zeroing operation)
Full item: Click this button to set maximum (e.g. select DA Mode -10~10, set lever to 10 then click on Full button to complete the set maximum operation)

7) If the Mode option in Fig. 3.136 is selected, execute the following procedure:

```
/*First, reset Offset to 0 */
rt = _DMC_01_rm_04da_set_output_offset_value(gDMCCardNo,DANodeID,SlotID,
    ChannelDA,0);
/* Next, Output Disable */
rt = _DMC_01_rm_04da_set_output_enable(gDMCCardNo,DANodeID,SlotID,
    ChannelDA,0);
/* Set DA selection mode */
rt = _DMC_01_rm_04da_set_output_range(gDMCCardNo,DANodeID,SlotID,
    ChannelDA,DAmode);
```

If the Apply option in Fig. 3.136 is selected, execute the following procedure:

```
/* Set DA output value */
rt = _DMC_01_rm_04da_set_output_value(gDMCCardNo,DANodeID,SlotID,
    ChannelDA,AppValue);
```

If the Error Handle option in Fig. 3.137 is checked, execute the following procedure:

```
/* Enable Error Handle*/
rt =_DMC_01_rm_04da_set_output_error_handle(gDMCCardNo,DANodeID,SlotID,
    ChannelDA,1);
```

If the Over Range option in Fig. 3.137 is checked, execute the following procedure:

```
\/* Enable Over Range*/
rt =_DMC_01_rm_04da_set_output_overrange(gDMCCardNo,DANodeID,SlotID,
ChannelDA,1);
```

If Set Offset option in Fig. 3.137 is selected, execute the following procedure:

```
/* Set the entered Offset value in DA */
rt =_DMC_01_rm_04da_set_output_offset_value(gDMCCardNo,DANodeID,SlotID,
    ChannelDA,offset);
```

If Clear Error option in Fig. 3.137 is selected, execute the following procedure:

```
/* Clear Error status */
rt =_DMC_01_rm_04da_set_output_error_clear(gDMCCardNo,DANodeID,SlotID,
    ChannelDA,1);
```

If the Conversion Time option in Fig. 3.138 is selected, execute the following procedure:

```
/* Set Conversion Time mode*/
rt =_DMC_01_set_04ad_conversion_time(gDMCCardNo,ADNodeID,SlotID,mode);
```

If the Mode option in Fig. 3.139 is selected, execute the following procedure:

```
/* Set AD input range mode*/
rt =_DMC_01_set_04ad_input_range(gDMCCardNo,ADNodeID,SlotID,ChannelAD,
    mode);
```

If the Average option in Fig. 3.139 is selected, execute the following procedure:

```
/* Set AD waveform output calculation frequency*/
rt =_DMC_01_set_04ad_average_mode(gDMCCardNo,ADNodeID,SlotID,
    ChannelAD,mode);
```

For the Data display in Fig. 3.139, execute the following procedure:

```
/* Display AD input voltage or current */
rt =_DMC_01_get_04ad_data(gDMCCardNo,ADNodeID,SlotID,ChannelAD,data);
```

If the Zero option in Fig. 3.140 is selected, execute the following procedure:

```
/* Reset selected Channel */
rt =_DMC_01_set_04ad_zero_scale(gDMCCardNo,ADNodeID,SlotID,Channel);
rt =_DMC_01_get_04ad_zero_scale_status(gDMCCardNo,ADNodeID,SlotID,
    Channel,flag); /* flag=1 means setup incomplete, flag=0 means setup
    completed. */
```

If the Full option in Fig. 3.140 is selected, execute the following procedure:

```
/* Adjust maximum value of selected Channel */
rt =_DMC_01_set_04ad_full_scale(gDMCCardNo,ADNodeID,SlotID,Channel);
rt =_DMC_01_get_04ad_full_scale_status(gDMCCardNo,ADNodeID,SlotID,
    Channel,flag); /* flag=1 means setup incomplete, flag=0 means setup
    completed. */
```

8) Exit procedure

Click on the “Exit” button to quit and exit the procedure.

Exit function requires “_DMC_01_reset_card” and _DMC_01_close” to be used. For a detailed description of these two API please refer to section 3.1.2 4) Exit procedure.

3.28 Spiral Interpolation Motion Control -Spiral

3.28.1 Function List

Table 3.28

Function Name
_DMC_01_start_spiral_xy
_DMC_01_start_spiral2_xy

3.28.2 Sample Application

Program Appearance

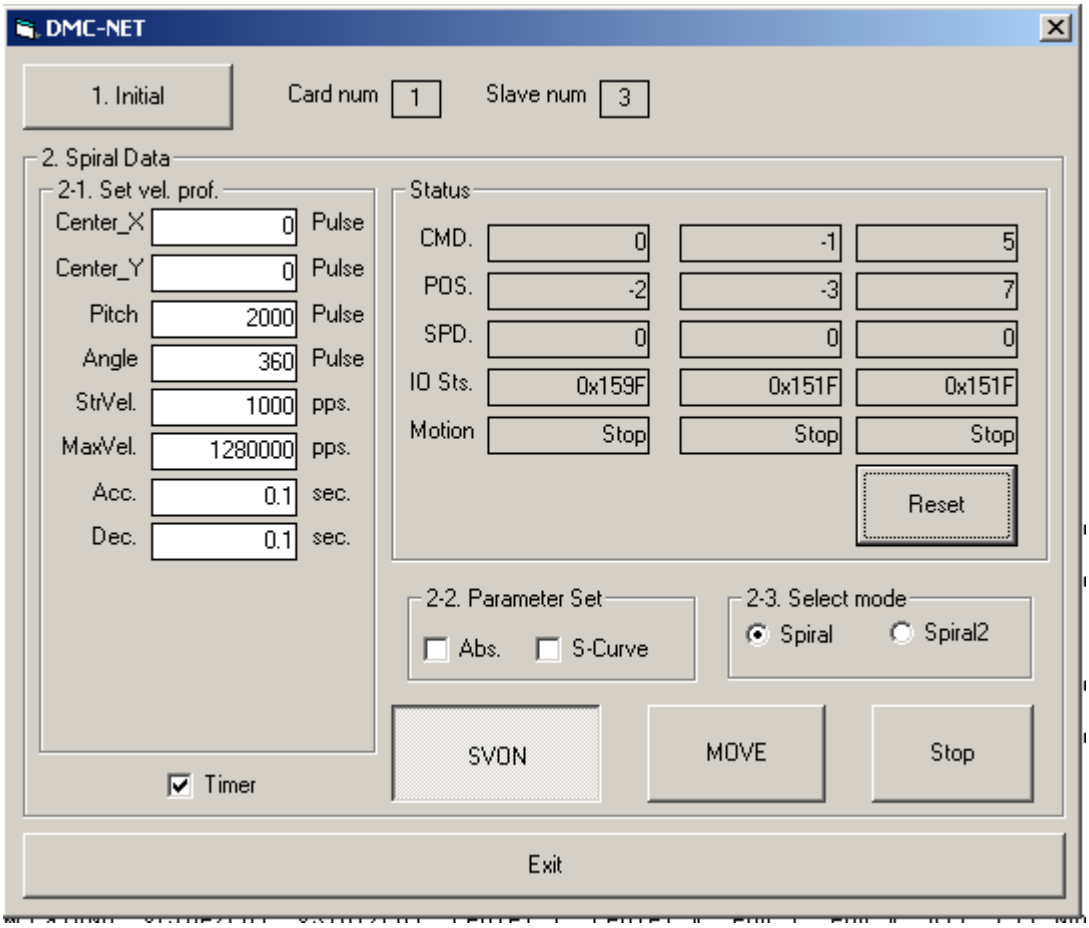


Figure 3.141

1) Card initialization:
   Click on the “Initial” button to start card initialization.
   For a detailed description of card initialization, please refer to Section 3.1.2 - 1) Open card.

2) Enable motion status display

Figure 3.142

Timer Checkbox: Check to display the motion status. Uncheck to disable display.

3) Spiral motion parameter settings:

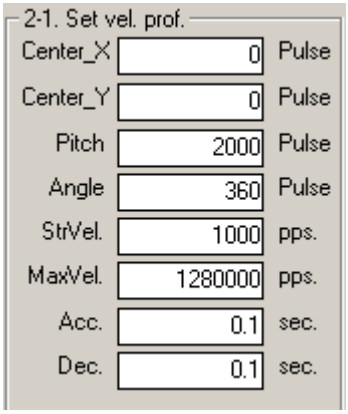


Figure 3.143

Center_X item: Spiral center point's X-coordinate, API function's argument variable “Center_X”.

Center_Y item: Spiral center point's Y-coordinate, API function's argument variable “Center_Y”.

Pitch item: Interval between circles in Spiral, API function's argument variable “Pitch”.

Angle item: Total sum of angles in Spiral. For example, 720 degrees is 2 circles, API function's argument variable “Angle”.

StrVel item: Starting velocity. API function's argument variable “StrVel”.

MaxVel item: Maximum velocity. API function's argument variable “MaxVel”.

Acc. item: Time required to reach maximum velocity. API function's argument variable “acc”.

Dec item: Time required to go from maximum velocity to 0. API function's argument variable “dec”.

4) Spiral2 motion parameter settings:

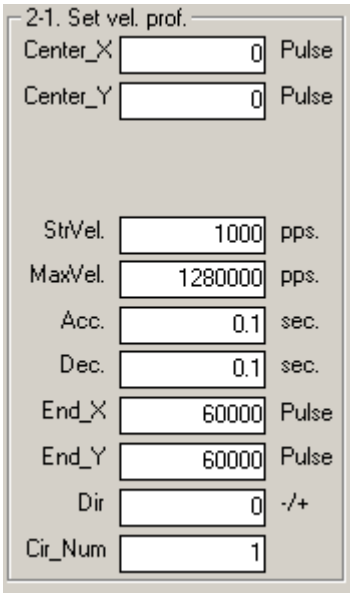


Figure 3.144

Center_X item: Spiral center point's X-coordinate, API function's argument variable “Center_X”.

Center_Y item: Spiral center point's Y-coordinate, API function's argument variable “Center_Y”.

StrVel item: Starting velocity. API function's argument variable “StrVel”.

MaxVel item: Maximum velocity. API function's argument variable “MaxVel”.

Acc. item: Time required to reach maximum velocity. API function's argument variable “acc”.

Dec item: Time required to go from maximum velocity to 0. API function's argument variable “dec”

Dir item: Direction of spiral motion: 0: clockwise; 1: counterclockwise. API function's argument variable “Dir”.

Cir_Num item: Number of Spiral circles. API function's argument variable “Cir_Num”.

End_X item: Spiral endpoint's X-coordinate, API function's argument variable “End_X”.

End_Y item: Spiral endpoint's Y-coordinate, API function's argument variable “End _Y”.

5) Select motion mode

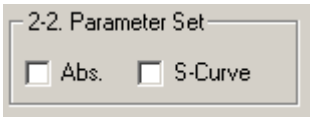


Figure 3.145

Abs. Checkbox: You must check this if you want motion displacement to use absolute coordinates.

S-Curve checkbox: You must check this box if you wish to use the S-curve velocity curve.

6) Select Spiral motion mode

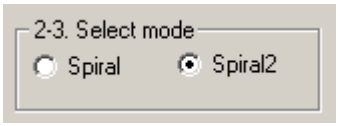


Figure 3.146

Spiral item: Click this if you wish to perform Spiral motion.

Spiral2 item: Click this if you wish to perform Spiral 2 motion.

7) Set Servo Motor Power ON/OFF(servo on/servo off)
Click on the “SVON” button to execute the following procedure:
rt = _DMC_01_ipo_set_svon(gDMCCardNo, NodeID, SlotID , ON_OFF);
// ON_OFF: 0 – Servo Power OFF; 1 – Servo Power ON

8) Start motion control. Click on the “MOVE” button to execute the following procedure:
rt = _DMC_01_start_spiral_xy(gDMCCardNo, gLine2, gSlot2, Center_X, Center_Y, StrVel, MaxVel, acc, dec, 2 , 1); // Motion displacement using absolute coordinates with S-curve velocity cross-section
rt = _DMC_01_start_spiral_xy(gDMCCardNo, gLine2, gSlot2, Center_X, Center_Y, StrVel, MaxVel, acc, dec, 1 , 1); // Motion displacement using absolute coordinates with T-curve velocity cross-section
rt = _DMC_01_start_spiral_xy(gDMCCardNo, gLine2, gSlot2, Center_X, Center_Y, StrVel, MaxVel, acc, dec, 2 , 0); // Motion displacement using relative coordinates with S-curve velocity cross-section
rt = _DMC_01_start_spiral_xy(gDMCCardNo, gLine2, gSlot2, Center_X, Center_Y, StrVel, MaxVel, acc, dec, 1 , 0); // Motion displacement using relative coordinates with T-curve velocity cross-section

9) Stop motion

Click on the “STOP” button to execute slow down stop for current point to point motion.

rt = _DMC_01_sd_stop(gDMCCardNo, NodeID, SlotID, dec);

In this example, deceleration is used to stop displacement motion. Here the velocity is gradually reduced to 0 over the set deceleration time. For a detailed description of Stop motion, please refer to “Chapter 14 Stop Motion API”.

10) Exit procedure

Click on the “Exit” button to quit and exit the procedure.

Exit function requires “_DMC_01_reset_card” and _DMC_01_close” to be used. For a detailed description of these two API please refer to section 3.1.2 4) Exit procedure.

3.29 Position Compare

3.29.1 Function List

Table 3.29

Function Name
_DMC_01_set_compare_channel_position
_DMC_01_get_compare_channel_position
_DMC_01_set_compare_ipulse_mode
_DMC_01_set_compare_channel_direction
_DMC_01_set_compare_channel_trigger_time
_DMC_01_set_compare_channel_one_shot
_DMC_01_set_compare_channel_source
_DMC_01_channel0_position_cmp
_DMC_01_channel1_output_enable
_DMC_01_channel1_output_mode
_DMC_01_channel1_get_io_status
_DMC_01_channel1_get_gpio_out
_DMC_01_channel1_get_fifo_status
_DMC_01_channel1_get_fifo_counter
_DMC_01_channel1_position_compare_table
_DMC_01_channel1_position_compare_table_level
_DMC_01_channel1_position_compare_table_cnt
_DMC_01_set_compare_channel_polarity

3.29.2 Sample Application

Program Appearance

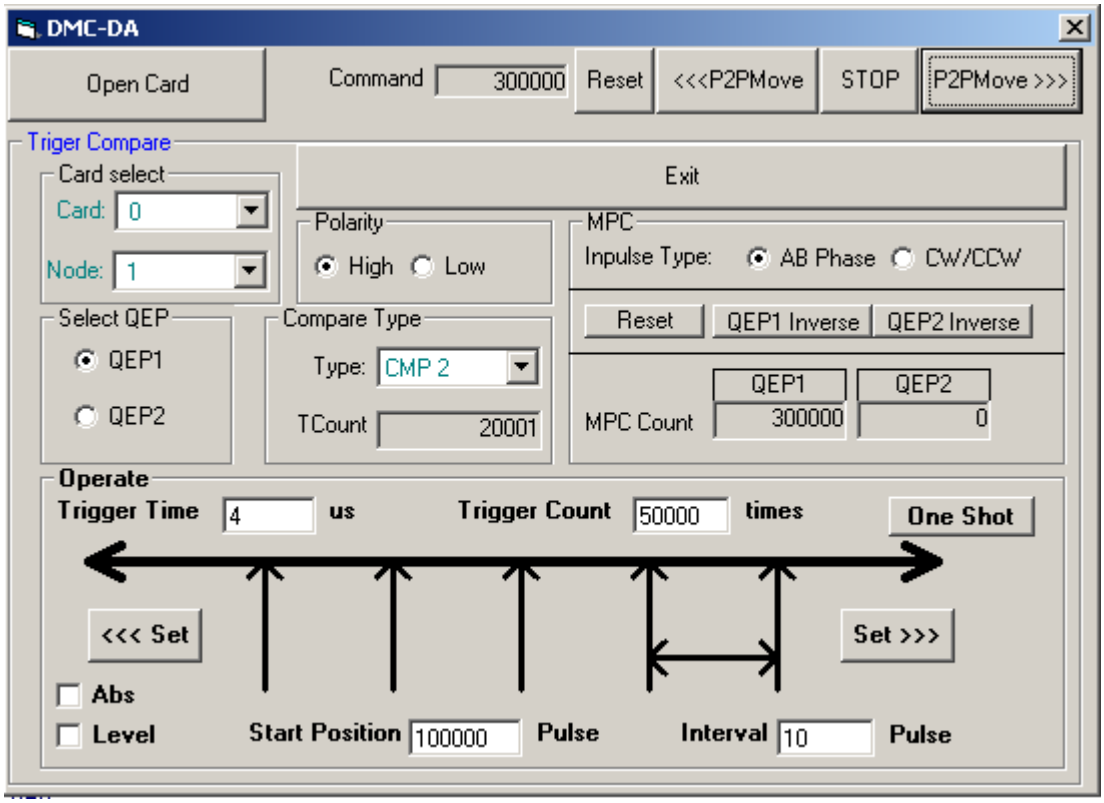


Figure 3.147

1) Card initialization:

※First, check to ensure hat the card you have installed is the PCI-DMC-B01 interface card.

Click on the “Open card” button to start card initialization.

For a detailed description of card initialization, please refer to Section 3.1.2 - 1) Open card.

2) Card ID, Node ID, and QEP option:

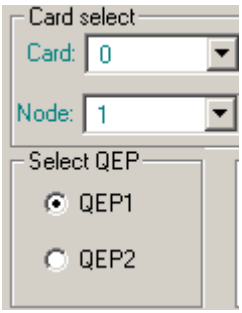


Figure 3.148

Card item: Enter ID of PCI_DMC_B01 card to use.
Node item: Select Node ID. This should match the QEP1 or QEP2.
QEP1 item: Example: If Channel 0 is selected, then Node ID should be Node 1.
QEP2 item: Example: If Channel 1 is selected, Node ID should be Node2.

3) Compare Type Select and Polarity settings:

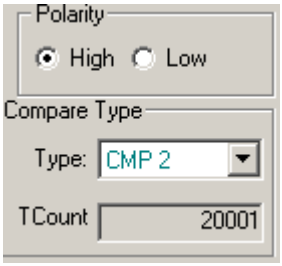


Figure 3.149

High item: Check this item to execute the following settings: **0: High**
rt = _DMC_01_set_compare_channel_polarity(CpCardNo,0);
Low item: Check this item to execute the following settings: **1: Low**
rt = _DMC_01_set_compare_channel_polarity(CpCardNo,1);
Type item: Select Compare1 or Compare2 function.
rt = _DMC_01_set_compare_channel_source(CpCardNo,Compare_Type,CpQEP);
//Compare_type:0=COMP1, 1=COMP2
TCount item: Trigger counter.

4) MPC parameter settings:

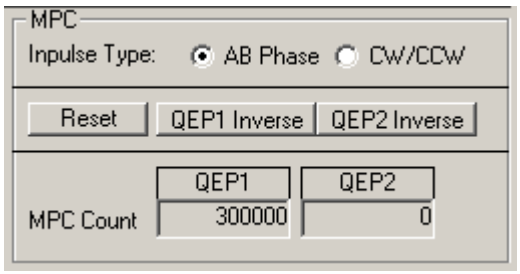


Figure 3.150

Inpulse Type item: Select AB Phase or CW/CCW mode. Execute the following settings:
rt = _DMC_01_set_compare_ipulse_mode(CpCardNo,mode);
// 0: AB Phase 1: CW/CCW
Reset item: Click this button **to clear** MPC Count for QEP1 and QEP2. Execute the following settings:
rt = _DMC_01_set_compare_channel_position(CpCardNo,channel,0);

QEP1 Inverse item: Reverse. Click on this button to execute the following settings:

rt = _DMC_01_set_compare_channel_direction(CpCardNo,0,dir); // dir:0 or 1

QEP2 Inverse item: Reverse. Click on this button to execute the following settings:

rt = _DMC_01_set_compare_channel_direction(CpCardNo,1,dir); // dir:0 or 1

5) Operate data settings:

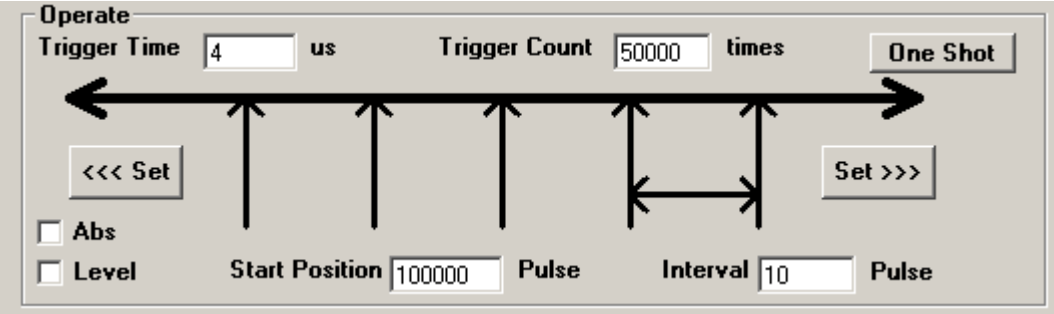


Figure 3.151

Trigger Time item: Enter a Trigger enable time.

Trigger count item: Enter Trigger enable total count.

Start Position item: Enter Trigger enable starting position.

Interval item: Enter Trigger enable frequency. For example, 10 means enable once every 10 pulses.

Abs. Checkbox: Check this option if you wish to use absolute coordinates for trigger enable.

Level Checkbox: Check this to execute the following settings:

rt = _DMC_01_channel1_output_mode(CpCardNo,mode);

// mode: 0 is Normal mode, 1 is Custom mode(See Chapter 39 Compare API for details)

One Shot item: Click this button to set only one Trigger for executing the following settings:

rt = _DMC_01_set_compare_channel_trigger_time(CpCardNo,compare_channel, time_us); // time_us=Trigger time

rt = _DMC_01_set_compare_channel_one_shot(CpCardNo,compare_channel);

Set item: Select a direction from >>> and <<< then click this button to execute the following settings:

rt = _DMC_01_get_compare_channel_position(CpCardNo,compare_channel, position);

rt = _DMC_01_set_compare_channel_trigger_time(CpCardNo,compare_channel, time_us); // time_us = Trigger time

If CompareType=CMP1 //Compare1

rt = _DMC_01_channel0_position_cmp(CpCardNo,start,dir,interval);

// dir->0:CMP1¡A1:CMP2

```
Else                                    //Compare2
  First, set output to disable
  rt = _DMC_01_channel1_output_enable(CpCardNo,0); // 0:off 1:on
```

- **If Level checkbox is checked, then execute the following setting:**

```
rt = _DMC_01_channel1_position_compare_table(CpCardNo,pos_table,tab_size);
```

- **If not checked, then execute the following settings:**

```
rt = _DMC_01_channel1_position_compare_table_level(CpCardNo,pos_table,
    level_table,tab_size);
At the end, set output to enable
rt = _DMC_01_channel1_output_enable(CpCardNo,1); // 0:off 1:on
```

6) Command display and testing area:

Figure 3.152

Reset item: Click this button to execute Reset motion.
P2PMove item: Click this button to move in positive or negative direction.
STOP item: Click this button to stop motion.
Command item: Display current motion position.

9) Exit procedure
Click on the “Exit” button to quit and exit the procedure.
Exit function requires “_DMC_01_reset_card” and _DMC_01_close” to be used. For a detailed description of these two API please refer to section 3.1.2 4) Exit procedure.

3.30 Axis Group

3.30.1 Function List

Table 3.30

Function Name
_DMC_01_set_group

3.30.2 Sample Application

Program Appearance

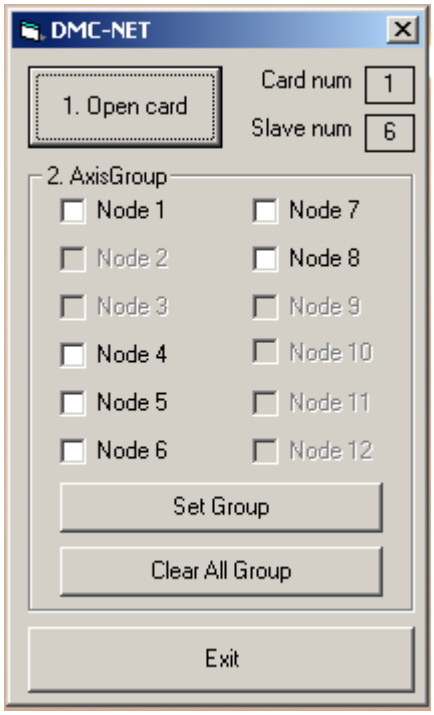


Figure 3.153

1) Card initialization:
   Click on the “Open card” button to start card initialization.
   For a detailed description of card initialization, please refer to Section 3.1.2 - 1) Open card.

2) Card number, Slave number:

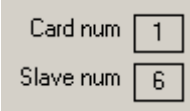


Figure 3.154

Card num item: Display number of cards.
Slave num item: Display number of slaves.

3) Group settings and reset:

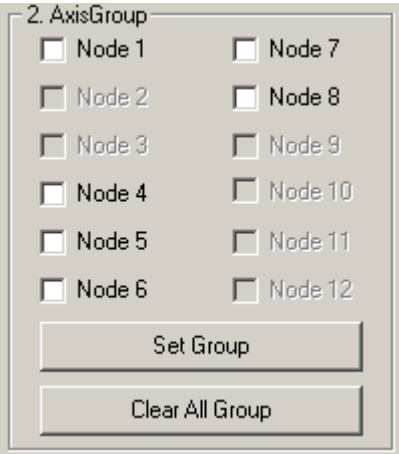


Figure 3.155

Nodexx item: Display details for Node ID.
Set Group item: 1. Up to 6 groups can be set per card.
2. If Node 7 and Node 8 are set as one group and a link error occurs nearby, both Node 7 & Node 8 will stop. Nodes 1, 4, 5, 6 will remain unaffected and continue working normally.
3. Once you have selected the nodes to place in a group, click on “Set Group” to execute the following settings.

```
rt = _DMC_01__DMC_01_set_group (gDMCCardNo, NodeID, SlotID, NodeNum, 1); //1: Set all selected Node to the same group.
```

Clear All Group item: When “Clear All Group” is clicked this will execute the following settings.

```
rt = _DMC_01_set_group(gDMCCardNo, (U16*)1, 0, 1, 0);
//0: Clear all group settings on this card
```

4) Exit procedure

Click on the “Exit” button to quit and exit the procedure.

Exit function requires “_DMC_01_reset_card” and _DMC_01_close” to be used. For a detailed description of these two API please refer to section 3.1.2 4) Exit procedure.

3.31 Speed Continue

3.31.1 Function List

Table 3.31

Function Name
_DMC_01_speed_continue
_DMC_01_speed_continue_mode
_DMC_01_speed_continue_combine_ratio

3.31.2 Sample Application

Program Appearance

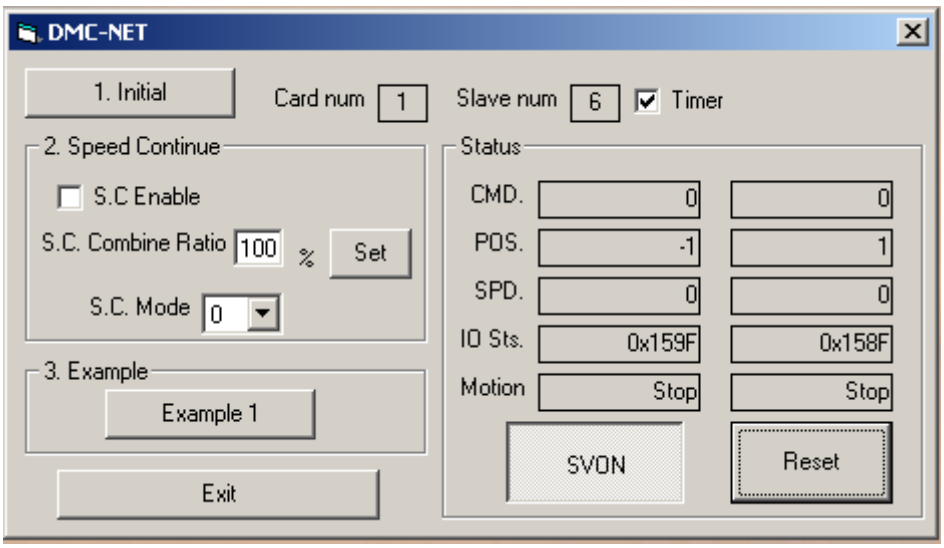


Figure 3.156

1) Card initialization:
   Click on the “Open card” button to start card initialization.
   For a detailed description of card initialization, please refer to Section 3.1.2 - 1) Open card.

2) Card number, Slave number and Timer setting:

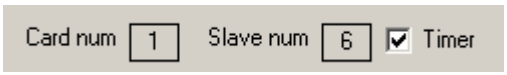


Figure 3.157

Card num item: Display number of cards.
Slave num item: Display number of slaves.
Timer Checkbox: Check to display the motion status. Uncheck to disable display.

3) Speed Continue parameter setting:

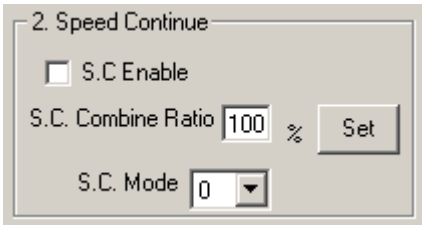


Figure 3.158

S.CEnable checkbox: Check this to enter Speed Continue mode and execute the following setting:
rt = _DMC_01_speed_continue(gDMCCardNo,gpNodeID[0], 0, flag);
//flag=1 means set as Speed Continue mode; flag=0 means cancel Speed Continue mode.
S.CCombine Ratio item: Set Speed Continue Combine Percentage. Clicking on “Set” button will execute the following setting:
rt = _DMC_01_speed_continue_combine_ratio(gDMCCardNo, gpNodeID[0], 0, Ratio); //Ratio:Indicates the Speed Continue Combine Percentage (see 41.3 Speed Continue API for details).
S.C Mode item: Clicking on “S.C Mode” will execute the following settings.
rt = _DMC_01_speed_continue_mode(gDMCCardNo, gpNodeID[0], 0, Mode);
//Mode=0 set as Equivalent Acceleration mode
//Mode=1 set as Acceleration/Deceleration mode
//Mode=2 set as Maximum Velocity mode
//(Please refer to 41.2 Speed Continue API for details)

4) Demonstration:

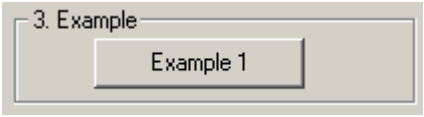


Figure 3.159

Example 1 item: Clicking on this will enter a Speed Continue demonstration programs shown in Fig. 3.158.
The selected Speed Continue parameters will execute the following procedure in order:

```
rt = _DMC_01_start_tr_move_xy(gDMCCardNo, NodeID, SlotID, 0, 10000, 0, 5000, 0.1, 0.1);
rt = _DMC_01_start_tr_arc_xy(gDMCCardNo, NodeID, SlotID, 2000, 0, 90, 0, 2500, 0.1, 0.1);
rt = _DMC_01_start_tr_move_xy(gDMCCardNo, NodeID, SlotID, 10000, 0, 0, 5000, 0.1, 0.1);
rt = _DMC_01_start_tr_arc_xy(gDMCCardNo, NodeID, SlotID, 0, -2000, 90, 0, 2500, 0.1, 0.1);
rt = _DMC_01_start_tr_move_xy(gDMCCardNo, NodeID, SlotID, 0, -10000, 0, 5000, 0.1, 0.1);
rt = _DMC_01_start_tr_arc_xy(gDMCCardNo, NodeID, SlotID, -2000, 0, 90, 0, 2500, 0.1, 0.1);
rt = _DMC_01_start_tr_move_xy(gDMCCardNo, NodeID, SlotID, -10000, 0, 0, 5000, 0.1, 0.1);
rt = _DMC_01_start_tr_arc_xy(gDMCCardNo, NodeID, SlotID, 0, 2000, 90, 0, 2500, 0.1, 0.1);
```

5) Exit procedure
Click on the “Exit” button to quit and exit the procedure.
Exit function requires “_DMC_01_reset_card” and _DMC_01_close” to be used. For a detailed description of these two API please refer to section 3.1.2 4) Exit procedure.

3.32 Spiral Interpolation - Helix Using -Sp1_ Normal Follow

3.32.1 Function List

Table 3.32

Function Name
_DMC_01_start_tr_heli_xy

3.32.2 Sample Application

Program Appearance

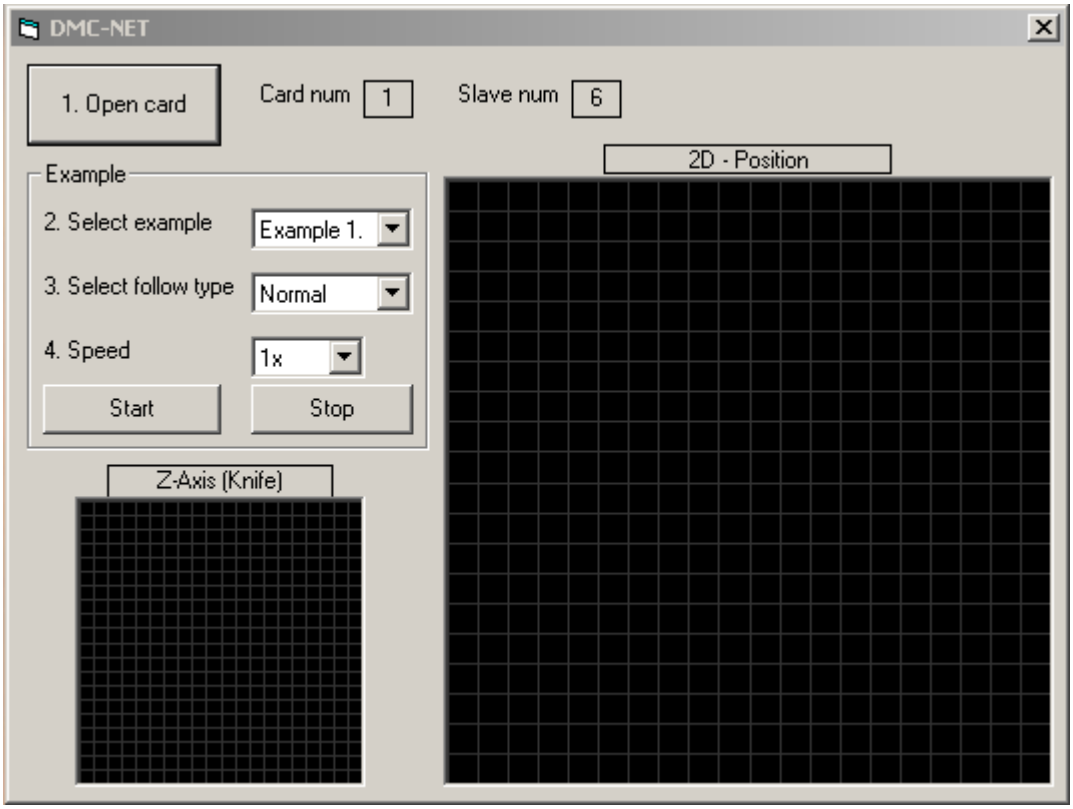


Figure 3.160

1) Card initialization:
   Click on the “Open card” button to start card initialization.
   For a detailed description of card initialization, please refer to Section 3.1.2 - 1) Open card.

2) Card number, Slave number:

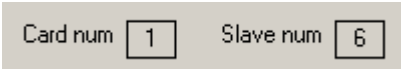


Figure 3.161

Card num item: Display number of cards.
Slave num item: Display number of slaves.

3) Example of parameter setting and operation:

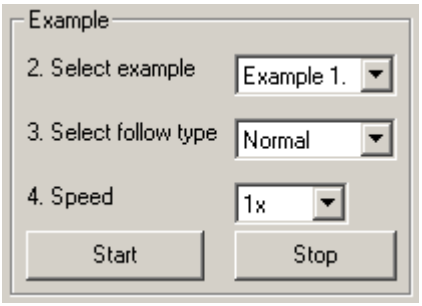


Figure 3.162

Select example item: Can choose Example1 or Example2.
Select follow type item: Can choose Normal or Tangent.
Speed item: Select default speed ratio.
Start item: Click on the “Start” button to execute the following settings:
_DMC_01_start_tr_heli_xy(CardNo,NodeID,SlotID,CenterX,CenterY, Depth,Pitch, Dir, StartVel, MaxVel, Tacc, Tdec);

Parameters:
CardNo: Card number.
NodeID: 3-axis Node ID array.
SlotID: 3-axis Slot ID array.
CenterX: Center point (X-coordinate) for circular motion on X, Y axes.
CenterY: Center point (Y-coordinate) for circular motion on X, Y axes.
Depth: DistanceZ-axis is to move (equal to angle of circle divided by 360 then multiplied by Pitch).
Pitch: Net distance for one revolution of the Z-axis (always positive)
Dir: Direction of circular motion; 0 is CW,. 1 is CCW.

Remarks: If Z-axis completes one revolution CW over the distance of Pitch, then if Dr = 0 Depth is a positive number as well. If Dir = 1 then Depth is a negative number; if Z-axis completes one revolution CCW over the distance of pitch, then the opposite is true.

When Example 1 and Normal are selected, the result is as shown below:

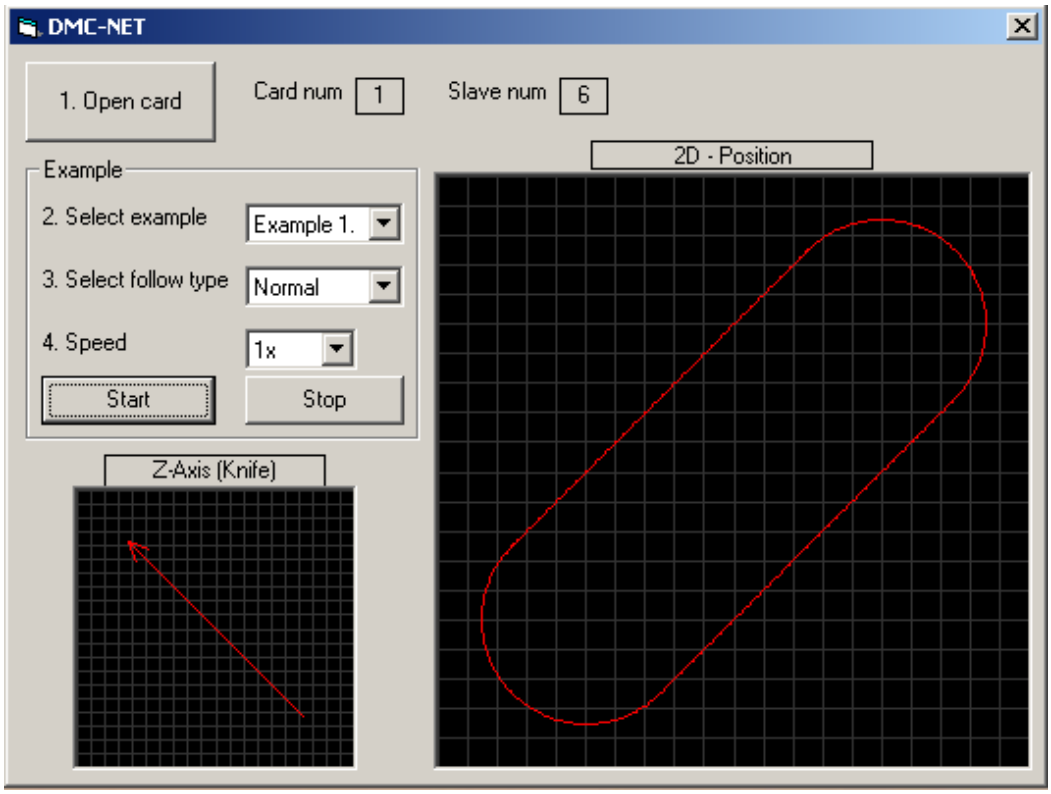


Figure 3.163

When Example 2 and Tangent are selected, the result is as shown below:

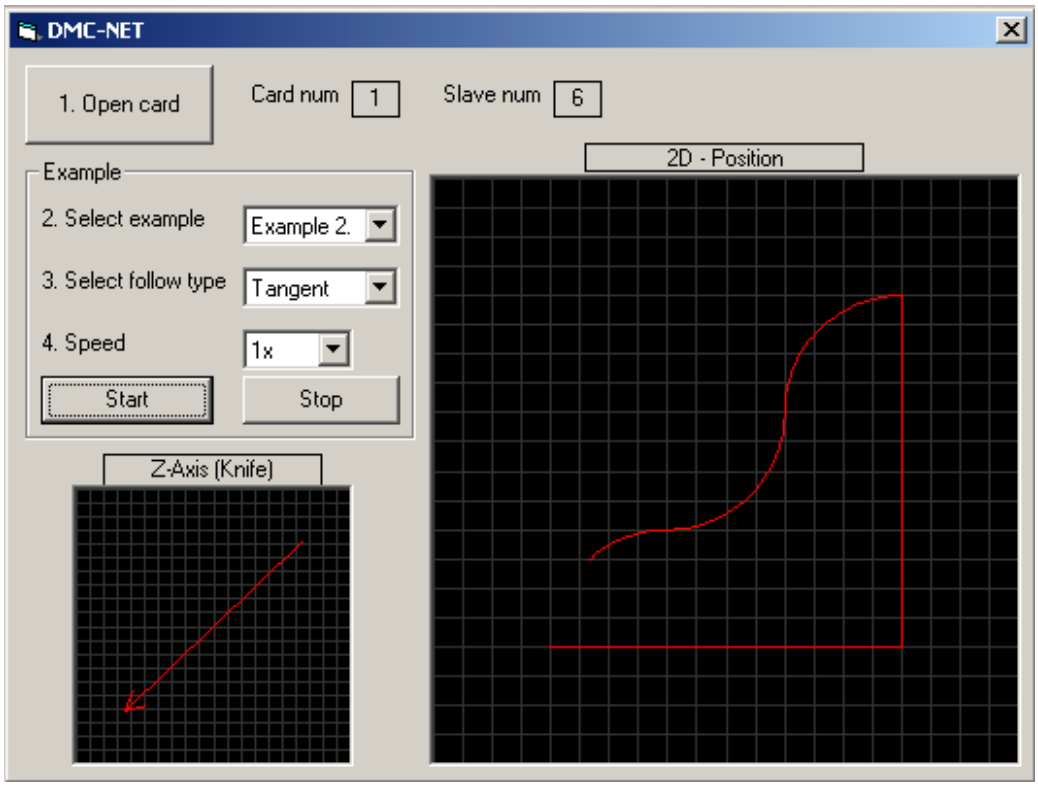
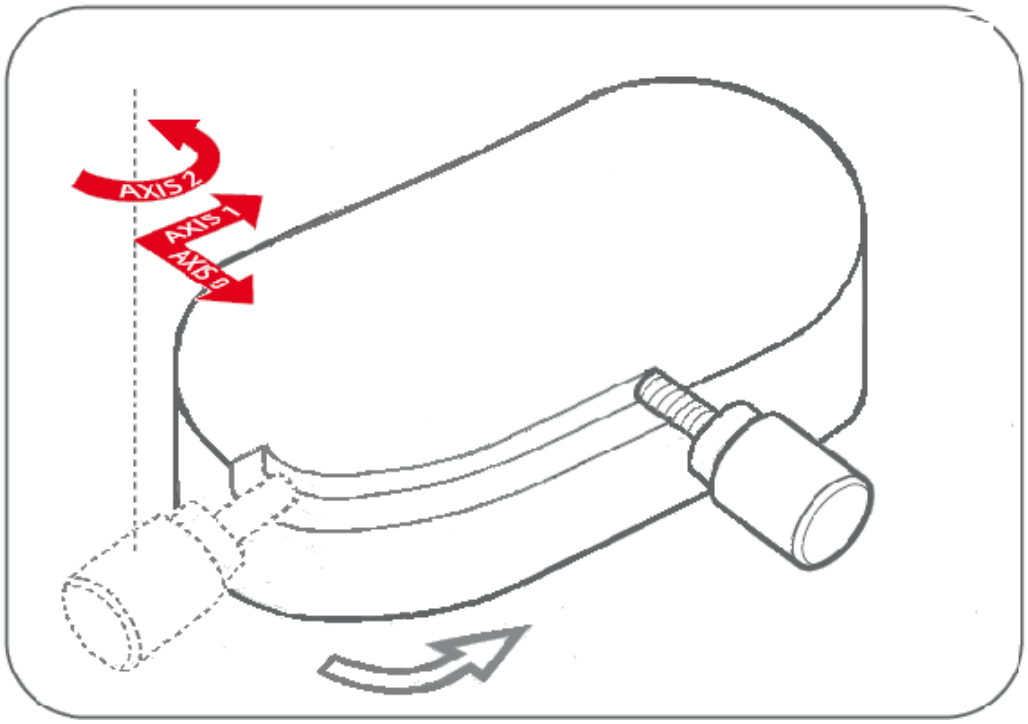


Figure 3.164

Example 1: In this example, X and Y axes are used to make the tool move along rounded corner and straight lines. The tool on the Z-axis is always at a normal or tangent to the outer edge of the shape.
(The following explanation uses the C language and is executed using a state machine. Please see Sample for details)



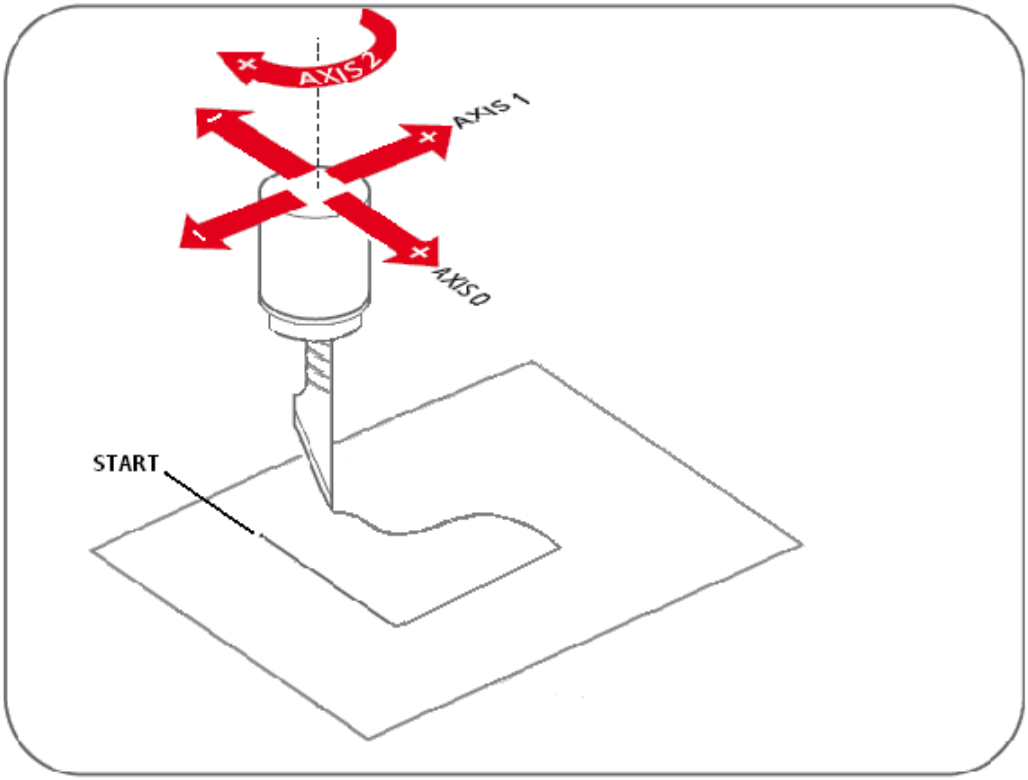
```
/* MotionStep1. Move the three axes to job start point */
_DMC_01_start_sa_move(CardNo, NodeID3[0], SlotID3[0], 0, 0, MaxVel, 0.1, 0.1);
_DMC_01_start_sa_move(CardNo, NodeID3[1], SlotID3[1], 0, 0, MaxVel, 0.1, 0.1);
_DMC_01_start_sa_move(CardNo, NodeID3[2], SlotID3[2], -13500, 0, MaxVel, 0.1,
0.1);

/* MotionStep2. Wait for Motion Done and confirm that Step 1 was completed */
for(i=0;i<3;i++)
{
      rt[i] = _DMC_01_get_command(CardNo, NodeID3[i], SlotID3[i], &Cmd[i]);
}

if((rt[0] + rt[1] + rt[2] == 0) && (Cmd[0] == 0) && (Cmd[1] == 0) && (Cmd[2] ==
-13500))
{
      MotionStep = 3;
}

/* MotionStep3. Start processing */
_DMC_01_start_tr_move_xy(CardNo, NodeID2, SlotID2, 40000, 40000, MaxVel/2,
                              MaxVel, 0.1, 0.1);
_DMC_01_start_tr_heli_xy(CardNo, NodeID3, SlotID3, -10000, 10000,
                              -Pitch*(180.0/360), Pitch,1, MaxVel/2, MaxVel, 0.1, 0.1);
_DMC_01_start_tr_move_xy(CardNo, NodeID2, SlotID2, -40000, -40000, MaxVel/2,
                              MaxVel, 0.1,0.1);
_DMC_01_start_tr_heli_xy(CardNo, NodeID3, SlotID3, 10000, -10000, - Pitch
                              *(180.0/360), Pitch, 1, MaxVel/2, MaxVel,0.1,0.1);
```

Example 2: In this example, X and Y axes are used to make the tool move along rounded corner and straight lines. The tool on the Z-axis is always at a normal or tangent to the shape.
(The following explanation uses the C language and is executed using a state machine. Please see Sample for details)




```
/* MotionStep1. Move the three axes to job start point */
_DMC_01_start_sa_move(CardNo, NodeID3[0], SlotID3[0], 0, 0, MaxVel, 0.1, 0.1);
_DMC_01_start_sa_move(CardNo, NodeID3[1], SlotID3[1], 0, 0, MaxVel, 0.1, 0.1);
_DMC_01_start_sa_move(CardNo, NodeID3[2], SlotID3[2], 0, 0, MaxVel, 0.1, 0.1);

/* MotionStep2. Wait for Motion Done and confirm that Step 1 was completed */
for(i=0;i<3;i++)
{
    rt[i] = _DMC_01_get_command(CardNo, NodeID3[i], SlotID3[i], &Cmd[i]);
}

if((rt[0] + rt[1] + rt[2] == 0) && (Cmd[0] == 0) && (Cmd[1] == 0) && (Cmd[2] == 0))
{
    MotionStep = 3;
}
/* MotionStep3. start 1st step of job (straight line) */
_DMC_01_start_ta_move_xy(CardNo, NodeID2, SlotID2, 30000, 0, MaxVel/2,
MaxVel, 0.1, 0.1);
```

```
/* MotionStep4. Wait for first step of job to finish executing */
rt[0] = _DMC_01_get_command(CardNo, NodeID3[0], SlotID3[0], &Cmd[0]);
rt[1] = _DMC_01_get_command(CardNo, NodeID3[1], SlotID3[1], &Cmd[1]);
if ((rt[0] + rt[1] == 0) && (Cmd[0] == 30000) && (Cmd[1] == 0))
{
    MotionStep = 5;
}

/* MotionStep5. Rotate Z-axis to keep tool on a tangent (or normal) */
rt[0] = _DMC_01_start_tr_move(CardNo, NodeID3[2], SlotID3[2],
                              -Pitch*(90.0/360.0), MaxVel/2, MaxVel, 0.1, 0.1);

/* MotionStep6. Wait for Z-axis tool to move into position (End action) */
rt[2] = _DMC_01_get_command(CardNo, NodeID3[2], SlotID3[2], &Cmd[2]);
if ((rt[2] == 0) && (Cmd[2] == TempSaveData))
{
    MotionStep = 7;
}

/* MotionStep7. Start 2nd step of job (straight line) */
_DMC_01_start_ta_move_xy(CardNo, NodeID2, SlotID2, 30000, 30000, MaxVel/2,
                         MaxVel, 0.1, 0.1);

/* MotionStep8. Wait for 2nd step of job to finish */
rt[0] = _DMC_01_get_command(CardNo, NodeID3[0], SlotID3[0], &Cmd[0]);
rt[1] = _DMC_01_get_command(CardNo, NodeID3[1], SlotID3[1], &Cmd[1]);
if ((rt[0] + rt[1] == 0) && (Cmd[0] == 30000) && (Cmd[1] == 30000))
{
    MotionStep = 9;
}

/* MotionStep9. Rotate Z-axis to keep tool on a tangent (or normal) */
_DMC_01_start_tr_move(CardNo, NodeID3[2], SlotID3[2], -Pitch*(90.0/360.0),
                      MaxVel/2, MaxVel, 0.1, 0.1);
```

```
/* MotionStep10. Wait for Z-axis tool to move into position (End action) */
rt[2] = _DMC_01_get_command(CardNo, NodeID3[2], SlotID3[2], &Cmd[2]);
if ((rt[2] == 0) && (Cmd[2] == TempSaveData))
{
      MotionStep = 11;
}

/* MotionStep11. Start job (Continuous Arc) */
_DMC_01_start_tr_heli_xy(CardNo, NodeID3, SlotID3, 0, -10000,
                                -Pitch*(90.0/360.0), Pitch, 1, MaxVel/2, MaxVel, 0.1,
                                0.1);
_DMC_01_start_tr_heli_xy(CardNo, NodeID3, SlotID3, -10000, 0, Pitch
                                *(90.0/360.0), Pitch, 0, MaxVel/2, MaxVel, 0.1, 0.1);
_DMC_01_start_tr_heli_xy(CardNo, NodeID3, SlotID3, 0, -10000, - Pitch
                                 *(90.0/360.0), Pitch, 1, MaxVel/2, MaxVel, 0.1, 0.1)
```

3.33 Logger

3.33.1 Function List

Table 3.99

Function Name
_misc_set_record_debuging
_misc_open_record_debuging_file

3.33.2 Sample Application

Program Appearance

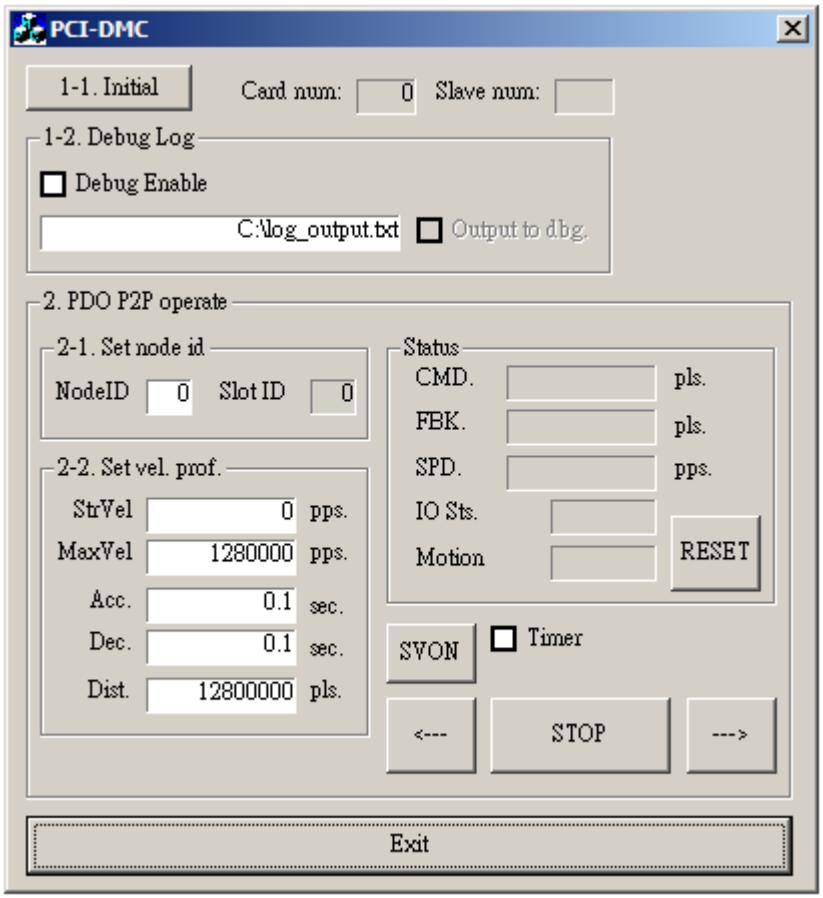


Figure 3.165

1) Card initialization:
   Click on the “Initial” button to open and initialize the card.
   For a detailed description of card initialization, please refer to “Open card” and “Card initialization” in Section 3.1.2.

2) Debug enable and disable

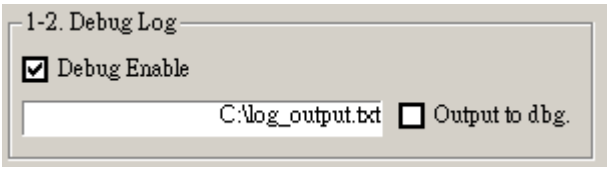


Figure 3.166

If you wish to enable the Debug function, you must execute the following procedure:

```
rt = _misc_set_record_debuging(enable);
// If the value of enable argument is 1, debug is enabled
```

3) Enter the path of the record file and select output method for record

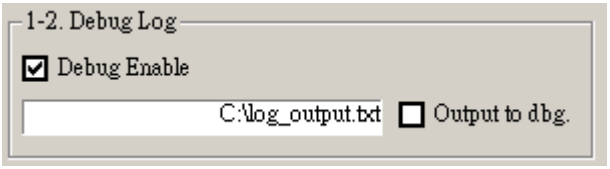


Figure 3.167

If you wish to view the log record generated by motion control, you must execute the following procedure:

```
rt = _misc_open_record_debuging_file(file_name, open);
// “file_name” is a character array variable used for storing the file path of the debug record. The “open” variable is used to decide whether the debug record should be output to the document at the file path you selected. When “open” has a value of 1, the debug record will be output and stored in the document at your selected file path. If the value is 0, then the record will only appear in the debug window of Visual Studio 6's development environment.
```

4) Start any kind of motion control under PDO mode

5) Log record output

Fig. 3.998 is shows the log of functions and value changes used by motion control displayed in the debug window of the Visual Studio 6 development environment. Fig. 3.123 shows that the functions and value changes of the log record will be output to a file named “log-output.txt”.

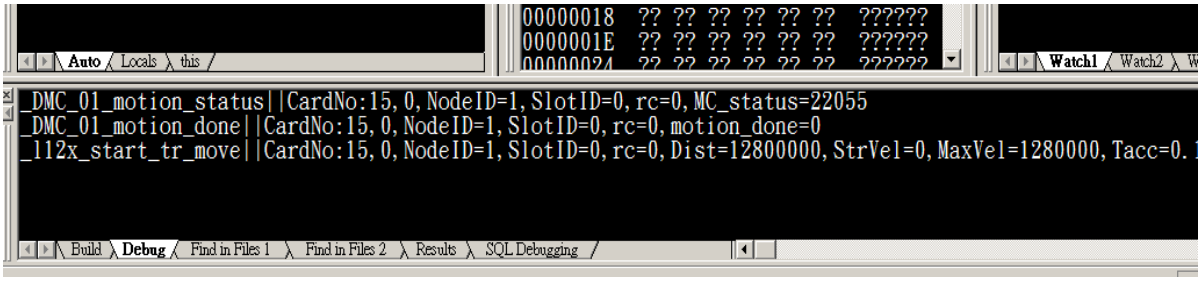


Figure 3.168

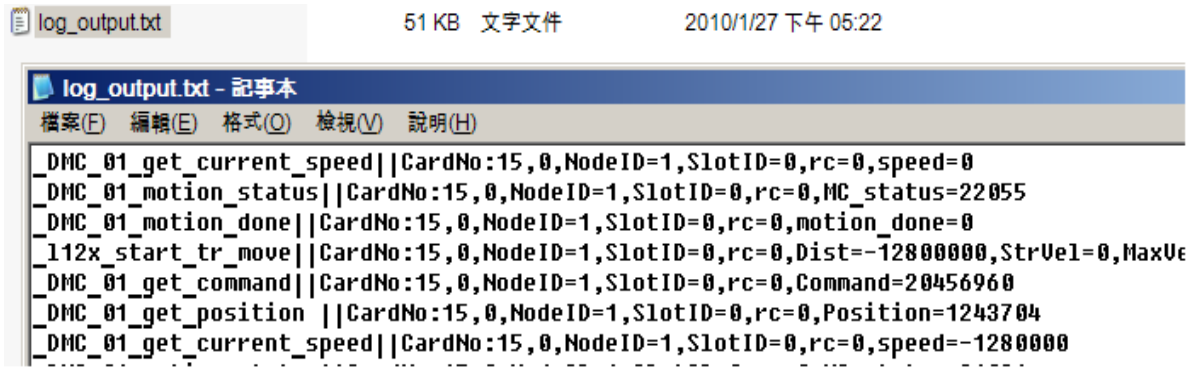


Figure 3.169

Chapter 4 Control API

4.1 Data Type and Range

Under the “inc\VC\” folder in the installation is a file named “TYPE_DEF.H”. The file defines all the standard data types.

Table 4.1 below shows the types, names, meanings, and ranges defined in the file.

Table 4.1

Name	Description	Range
U8	8-bit ASCII character	0 to 255
I16	16-bit Signed Integer	-32768 to 32767
U16	16-bit Unsigned Integer	0 to 65535
I32	32-bit Signed Long Integer	-2147483648 to 2147483647
U32	32-bit Unsigned Integer	0 to 4294967295
F32	32-bit Single Precision Floating Point	-3.402823E38 to 3.402823E38
F64	64-bit Double Precision Floating Point	-1.797683134862315E308 to 1.797683134862315E309
Boolean	Boolean	TRUE, FALSE

4.2 Function Description

Table 4.2

Hardware Initialization API	
_DMC_01_open	Initialize system resources when program is run
_DMC_01_close	Release all system resources
_DMC_01_get_CardNo_seq	Get the number of all PCI-DMC-A01 interface cards on the system
_DMC_01_pci_initial	Initialize this PCI card
_DMC_01_get_card_version	Get motion card version
Interface API	
_DMC_01_initial_bus	Initialize external bus
_DMC_01_start_ring	Start ring communication
_DMC_01_get_device_table	Get device table
_DMC_01_get_node_table	Get node table
_DMC_01_check_card_running	Check to see if card is running
_DMC_01_reset_card	Reset selected card
_DMC_01_check_nodeno	Check to see if node already exists
_DMC_01_get_master_connect_status	Get the connection status between the Master Card and expansion module
_DMC_01_get_mailbox_Error	Get number of MailBox errors
_DMC_01_get_mailbox_cnt	Get MailBox counter value
_DMC_01_get_dsp_cnt	Get Interrupt counter value
_DMC_01_set_dio_output	Set GPIO output pin status
_DMC_01_get_dio_output	Get GPIO output pin status
_DMC_01_get_dio_input	Get GPIO input pin status
_DMC_01_get_cycle_time	Get current cycle time for finding/checking devices
_DMC_01_initial_bus2	Initialize all external bus
_DMC_01_motion_cnt	Get MailBox and DSP counter values
Servo Drive Parameter Read/Write API	
_DMC_01_read_servo_parameter	Read servo drive parameter
_DMC_01_write_servo_parameter	Write servo drive parameter
Use SDO protocol API	
_DMC_01_check_canopen_lock	Under SDO mode. check to see if next command can be executed
_DMC_01_get_canopen_ret	Get data returned by CANOPEN (SDO related data)
_DMC_01_set_pdo_mode	Set to use CANopen protocol (PDO or SDO)
_DMC_01_send_message	Send SDO command message to data buffer

_DMC_01_send_message3	Send SDO command message to data buffer and exit data buffer once command is set
_DMC_01_read_message	Read last SDO command message into data buffer
_DMC_01_read_message2	Read the last SDO command message into data buffer and return number of reads
_DMC_01_get_message	Get SDO command message and place in data buffer
_DMC_01_reset_sdo_choke	When SDO command is blocked, reset SDO
_DMC_01_get_sdo_retry_history	Get number of SDO resends
Point to Point Motion Control Packet Protocol API	
_DMC_01_set_sdo_driver_speed_profile	Set speed parameter for packet protocol
_DMC_01_start_sdo_driver_r_move	Start relative motion displacement
_DMC_01_start_sdo_driver_a_move	Start absolute motion displacement
_DMC_01_start_sdo_driver_new_position _move	Perform motion displacement with new position value
Homing Motion Control Packet Protocol API	
_DMC_01_set_home_config	Set home configuration
_DMC_01_set_home_move	Start home motion
_DMC_01_escape_home_move	Stop homing motion
Velocity Motion Control Packet Protocol API	
_DMC_01_set_velocity_mode	Set velocity motion control parameter profile
_DMC_01_set_velocity	Start velocity motion control
_DMC_01_set_velocity_stop	Stop velocity motion control
_DMC_01_set_velocity_torque_limit	Set torque limit for velocity mode
Torque Motion Control Packet Protocol API	
_DMC_01_set_torque_mode	Torque motion control parameter profile
_DMC_01_set_torque	Start torque motion
_DMC_01_set_torque_stop	Stop torque motion
_DMC_01_set_torque_velocity_limit	Set velocity limit in torque mode
Use PDO Protocol API	
_DMC_01_ipo_set_svon	Set Servo ON/OFF under PDO protocol mode
_DMC_01_get_buffer_length	Get motion command to be executed
_DMC_01_command_buf_clear	Reset dwell time (buffer dwell counter value)
_DMC_01_buf_dwell	Interval between two motion commands
_DMC_01_set_group	Set group
Stop Motion Control API	
_DMC_01_emg_stop	All motion commands in buffer will execute immediate stop

_DMC_01_sd_stop	All motion commands in buffer will execute slow down stop based on deceleration time
_DMC_01_sd_abort	Current motion command will execute deceleration time stop
_DMC_01_set_sd_mode	Set Sd_stop mode
Motion Status API	
_DMC_01_motion_done	Return current motion stage of the Master Card
_DMC_01_motion_status	Return current motion status of the Master Card
Motion Counter Value API	
_DMC_01_get_command	Get Command counter value
_DMC_01_set_command	Set new Command counter value
_DMC_01_get_position	Get current position counter value
_DMC_01_set_position	Set new position counter value
_DMC_01_get_target_pos	Get current position's position value
_DMC_01_get_torque	Get and return the current torque counter value
_DMC_01_get_current_speed	Get motion speed
_DMC_01_get_current_speed_rpm	Get current RPM multiplied by 10
Software Limit API	
_DMC_01_set_soft_limit	Set reference values for software positive/negative limits
_DMC_01_enable_soft_limit	Enable/disable software limit and stop method after contact with limit
_DMC_01_disable_soft_limit	Disable software limit
_DMC_01_get_soft_limit_status	Get status of software positive/negative limit during motion
1-Axis Motion Control API	
_DMC_01_start_tr_move	Motion displacement using relative coordinates with T-curve velocity cross-section
_DMC_01_start_sr_move	Motion displacement using relative coordinates with S-curve velocity cross-section
_DMC_01_start_ta_move	Motion displacement using absolute coordinates with T-curve velocity cross-section
_DMC_01_start_sa_move	Motion displacement using absolute coordinates with S-curve velocity cross-section
_DMC_01_p_change	Replace current position with new position value
_DMC_01_v_change	Replace current motion velocity with new velocity value
_DMC_01_start_tr_move_2seg	2nd motion displacement using relative coordinates with T-curve velocity cross-section

_DMC_01_start_sr_move_2seg	2nd motion displacement using relative coordinates with S-curve velocity cross-section
_DMC_01_start_ta_move_2seg	2nd motion displacement using absolute coordinates with T-curve velocity cross-section
_DMC_01_start_sa_move_2seg	2nd motion displacement using absolute coordinates with S-curve velocity cross-section
_DMC_01_start_tr_move_2seg2	2nd motion displacement using relative coordinates with T-curve velocity cross-section
_DMC_01_start_sr_move_2seg2	2nd motion displacement using relative coordinates with S-curve velocity cross-section
_DMC_01_start_ta_move_2seg2	2nd motion displacement using absolute coordinates with T-curve velocity cross-section
_DMC_01_start_sa_move_2seg2	2nd motion displacement using absolute coordinates with S-curve velocity cross-section
_DMC_01_feedrate_overwrite	Change motion speed or speed ratio
_DMC_01_start_v3_move	Single-axis motion displacement with EndVel added
2-Axis Linear Interpolation Motion Control API	
_DMC_01_start_tr_move_xy	2-axis Linear interpolation motion using relative coordinates with T-curve velocity cross-section
_DMC_01_start_sr_move_xy	2-axis Linear interpolation motion using relative coordinates with S-curve velocity cross-section
_DMC_01_start_ta_move_xy	2-axis Linear interpolation motion using absolute coordinates with T-curve velocity cross-section
_DMC_01_start_sa_move_xy	2-axis Linear interpolation motion using absolute coordinates with S-curve velocity cross-section
_DMC_01_start_v3_move_xy	2-axis linear interpolation motion with EndVel added
2-Axis Arc Interpolation Motion Control API	
_DMC_01_start_tr_arc_xy	2-axis arc interpolation motion using relative coordinates with T-curve velocity cross-section (Known conditions: Center point coordinates, angle)
_DMC_01_start_sr_arc_xy	2-axis arc interpolation motion using relative coordinates with S-curve velocity cross-section (Known conditions: Center point coordinates, angle)
_DMC_01_start_ta_arc_xy	2-axis arc interpolation motion using absolute coordinates with T-curve velocity cross-section (Known conditions: Center point coordinates, angle)
_DMC_01_start_sa_arc_xy	2-axis arc interpolation motion using absolute coordinates with S-curve velocity cross-section (Known conditions: Center point coordinates, angle)

_DMC_01_start_tr_arc2_xy	2-axis arc interpolation motion using relative coordinates with T-curve velocity cross-section (Known conditions: Endpoint coordinates, angle)
_DMC_01_start_sr_arc2_xy	2-axis arc interpolation motion using relative coordinates with S-curve velocity cross-section (Known conditions: Endpoint coordinates, angle)
_DMC_01_start_ta_arc2_xy	2-axis arc interpolation motion using absolute coordinates with T-curve velocity cross-section (Known conditions: Endpoint coordinates, angle)
_DMC_01_start_sa_arc2_xy	2-axis arc interpolation motion using absolute coordinates with S-curve velocity cross-section (Known conditions: Endpoint coordinates, angle)
_DMC_01_start_tr_arc3_xy	2-axis arc interpolation motion using relative coordinates with T-curve velocity cross-section (Known conditions: Center point coordinates, endpoint coordinates)
_DMC_01_start_sr_arc3_xy	2-axis arc interpolation motion using relative coordinates with S-curve velocity cross-section (Known conditions: Center point coordinates, endpoint coordinates)
_DMC_01_start_ta_arc3_xy	2-axis arc interpolation motion using absolute coordinates with T-curve velocity cross-section (Known conditions: Center point coordinates, endpoint coordinates)
_DMC_01_start_sa_arc3_xy	2-axis arc interpolation motion using absolute coordinates with S-curve velocity cross-section (Known conditions: Center point coordinates, endpoint coordinates)
_DMC_01_start_spiral_xy	2-axis spiral motion (Known conditions: Center coordinates for X and Y axes)
_DMC_01_start_spiral2_xy	2-axis spiral motion (Known conditions: Center coordinates for X and Y axes, endpoint coordinates for X and Y axes)
_DMC_01_start_v3_arc_xy	2-axis arc interpolation motion with EndVel added (Known conditions: Center point coordinates, angle)
_DMC_01_start_v3_arc2_xy	2-axis arc interpolation motion with EndVel added (Known conditions: Endpoint coordinates, angle)

_DMC_01_start_v3_arc3_xy	2-axis arc interpolation motion with EndVel added (Known conditions: Center point coordinates, endpoint coordinates)
_DMC_01_start_v3_spiral_xy	2-axis spiral motion with EndVel added (Known conditions: Center coordinates for X and Y axes)
_DMC_01_start_v3_spiral2_xy	2-axis spiral motion with EndVel added (Known conditions: Center coordinates for X and Y axes, endpoint coordinates for X and Y axes)
3-Axis Linear Interpolation Motion Control API	
_DMC_01_start_tr_move_xyz	3-axis Linear interpolation motion using relative coordinates with T-curve velocity cross-section
_DMC_01_start_sr_move_xyz	3-axis Linear interpolation motion using relative coordinates with S-curve velocity cross-section
_DMC_01_start_ta_move_xyz	3-axis Linear interpolation motion using absolute coordinates with T-curve velocity cross-section
_DMC_01_start_sa_move_xyz	3-axis Linear interpolation motion using absolute coordinates with S-curve velocity cross-section
_DMC_01_start_v3_move_xyz	3-axis linear interpolation motion with EndVel added
3-Axis Spiral Interpolation Motion Control API	
_DMC_01_start_tr_heli_xy	3-axis Spiral interpolation motion using relative coordinates with T-curve velocity cross-section
_DMC_01_start_sr_heli_xy	3-axis Spiral interpolation motion using relative coordinates with S-curve velocity cross-section
_DMC_01_start_ta_heli_xy	3-axis Spiral interpolation motion using absolute coordinates with T-curve velocity cross-section
_DMC_01_start_sa_heli_xy	3-axis Spiral interpolation motion using absolute coordinates with S-curve velocity cross-section
_DMC_01_start_v3_heli_xy	3-axis Spiral interpolation motion with EndVel added
Velocity Motion Control API	
_DMC_01_tv_move	Velocity motion control with T-curve velocity cross-section
_DMC_01_sv_move	Velocity motion control with S-curve velocity cross-section
Synchronization Motion Control API	
_DMC_01_sync_move	Start motion sync
_DMC_01_sync_move_config	Enable/disable motion sync
Remote I/O Module Control API	
_DMC_01_get_rm_input_value	Retrieve the value for bit 0 to bit 15 of the remote I/O module's input port

_DMC_01_set_rm_input_filter	Set software filter level for input port of the remote I/O module
_DMC_01_set_rm_input_filter_enable	Enable software mask for bit 0 to bit 15 of the remote I/O module's input port
_DMC_01_set_rm_output_value	Set the value for bit 0 to bit 15 of the remote I/O module's output port
_DMC_01_set_rm_output_value_error_handle	Set the output value returned when remote I/O module encounters an error
_DMC_01_get_rm_output_value	Get output of remote I/O module
_DMC_01_get_rm_output_value_error_handle	Get output of remote I/O module and decide whether to retain or discard value if there is an error
_DMC_01_set_rm_output_active	Enable/disable output from remote I/O module
MPG and JOG Operation API	
_DMC_01_set_rm_mpg_axes_enable	Set MPG motion control
_DMC_01_set_rm_mpg_axes_enable2	MPG motion control (can numerator for motor rotation ratio)
_DMC_01_set_rm_jog_axes_enable	Set JOG motion control
4-Channel Pulse Interface API	
_DMC_01_set_rm_04pi_ipulse_mode	Set input phase mode for pulse interface module
_DMC_01_set_rm_04pi_opulse_mode	Set output phase mode for pulse interface module
_DMC_01_set_rm_04pi_svon_polarity	Set POWER ON (SVON) level
_DMC_01_set_rm_04pi_DO2	Enable DO2 port
_DMC_01_set_rm_04pi_homing_ratio	Set homing torque ratio
_DMC_01_04pi_set_poweron	Enable/disable POWER ON (SVON)
_DMC_01_rm_04PI_get_buffer	Get buffered motion command
4-Channel Pulse Interface (Mode 1) Motion Control API	
_DMC_01_rm_04pi_md1_start_move	Perform 1-axis motion control under RM04PI Mode 1.
_DMC_01_rm_04pi_md1_v_move	Perform velocity motion control under RM04PI Mode 1.
_DMC_01_rm_04pi_md1_start_line2	Perform 2-axis linear interpolation motion control under RM04PI Mode 1
_DMC_01_rm_04pi_md1_start_line3	Perform 3-axis linear interpolation motion control under RM04PI Mode 1
_DMC_01_rm_04pi_md1_start_line4	Perform 4-axis linear interpolation motion control under RM04PI Mode 1
_DMC_01_rm_04pi_md1_start_arc	Perform 2-axis arc interpolation motion control under RM04PI Mode 1 (Known conditions: Center point coordinates, angle)

_DMC_01_rm_04pi_md1_start_arc2	Perform 2-axis arc interpolation motion control under RM04PI Mode 1 (Known conditions: Endpoint coordinates, angle)
_DMC_01_rm_04pi_md1_start_arc3	Perform 2-axis arc interpolation motion control under RM04PI Mode 1 (Known conditions: Center point coordinates, endpoint coordinates)
_DMC_01_rm_04pi_md1_start_heli	Perform 3-axis spiral interpolation motion control under RM04PI Mode 1
_DMC_01_rm_04pi_md1_p_change	Replace current position value with new position value under RM04PI Mode 1
_DMC_01_rm_04pi_md1_v_change	Replace current velocity with new velocity value under RM04PI Mode 1
_DMC_01_rm_04pi_md1_set_gear	Enable and set Gear parameters under RM04PI Mode 1
_DMC_01_rm_04pi_md1_set_soft_limit	Enable/disable software limit under RM04PI Mode 1
_DMC_01_rm_04pi_md1_get_soft_limit_status	Get current 4-axis software limit contact status under RM04PI Mode 1
_DMC_01_rm_04pi_md1_set_sld	Enable SLD port (DI3) and set profile
_DMC_01_rm_04pi_md1_get_mc_error_code	When alarm code is 299, get motion control error message under RM04PI Mode 1
_DMC_01_set_rm_04pi_ref_counter	Select reference counter for re-connection under RM04PI Mode 1
4-Channel Analog Output Remote I/O Module API	
_DMC_01_rm_04da_set_output_value	Set DA output value
_DMC_01_rm_04da_get_output_value	Read DA output
_DMC_01_rm_04da_get_return_code	Read DA status
_DMC_01_rm_04da_set_output_range	Set DA output range
_DMC_01_rm_04da_set_output_enable	Enable/disable pin output
_DMC_01_rm_04da_set_output_overrange	Increase output range by 10%
_DMC_01_rm_04da_set_output_error_clear	Clear error status
_DMC_01_rm_04da_read_data	Get current DA number
_DMC_01_rm_04da_set_output_error_handle	Keep original DA settings if the connection is broken
_DMC_01_rm_04da_set_output_offset_value	Set DA offset
_DMC_01_rm_04da_get_output_offset_value	Read DA offset

4-Channel Analog Input Remote Module API	
_DMC_01_set_04ad_input_range	Set AD input range
_DMC_01_get_04ad_input_range	Get current AD Input range
_DMC_01_set_04ad_zero_scale	Set AD zero level for range calibration
_DMC_01_get_04ad_zero_scale_status	Check if AD zero calibration is complete
_DMC_01_set_04ad_full_scale	Set AD maximum level for range calibration
_DMC_01_get_04ad_full_scale_status	Check if AD maximum level calibration is complete
_DMC_01_set_04ad_conversion_time	Set AD conversion time
_DMC_01_get_04ad_conversion_time	Get current AD conversion time
_DMC_01_get_04ad_data	Read input voltage
_DMC_01_set_04ad_average_mode	Set AD average mode
_DMC_01_get_04ad_average_mode	Get AD average mode
_DMC_01_set_04ad_input_enable	Enable/disable AD Channel Input feedback
Slave Data	
_DMC_01_get_devicetype	Get Slave device type
_DMC_01_get_slave_version	Get Slave device firmware version
Parameter Monitoring API	
_DMC_01_set_monitor	Set parameter to monitor
_DMC_01_get_monitor	Get value for monitored parameter
_DMC_01_get_servo_command	Get servo drive command value
_DMC_01_get_servo_DI	Get servo drive DI message value
_DMC_01_get_servo_DO	Get servo drive DO message value
Alarm Message API	
_DMC_01_set_ralm	Reset output servo drive alarm message
_DMC_01_get_alm_code	Get Slave alarm code
_DMC_01_master_alm_code	Get the Master Card connection alarm code
_DMC_01_slave_error	Get number of consecutive errors during Slave communication
Multi-Axis Motion Control API	
_DMC_01_multi_axes_move	Set motion control for more than 2 axes
_ DMC_01_liner_speed_master	Set multi-axis linear motion control velocity
_DMC_01_start_v3_multi_axes	Multi-axis (more than 2 axes) motion control with added EndVel
Buffer Operation API	
_DMC_01_set_trigger_buf_function	Use DI3 (SLD) trigger to get buffer data
Interrupt API	
_DMC_01_set_int_factor	Set interrupt mode. Total of 8 modes available.
_DMC_01_int_enable	Enable interrupt feedback
_DMC_01_int_disable	Disable disable interrupt.

_DMC_01_get_int_count	Interrupt count.
_DMC_01_get_int_status	Get current interrupt status
_DMC_01_Link_interrupt	Link handling procedure. Called if interrupt enabled.
Security API	
_DMC_01_read_security	Master Card: read security data at specified memory block
_DMC_01_read_security_status	Master Card: get read/write status of current memory
_DMC_01_write_security	Master Card: write security data to specified memory block
_DMC_01_write_security_status	Master Card: write memory to function enable before writing security data
_DMC_01_check_userpassword	Master Card: check user has read/write access to memory
_DMC_01_write_ userpassword	Master Card: change password
_DMC_01_check_verifykey	Master Card: check verify key
_DMC_01_write_ verifykey	Master Card: write verify key
_DMC_01_read_serialno	Master Card: read product serial number
_misc_slave_check_userpassword	Slave(04PI): check user has read/write access to memory
_misc_slave_write_userpassword	Slave(04PI): change password
_misc_slave_get_serialno	Slave(04PI): read product serial number
_misc_security	Encrypt and generate verify key from User Key and SerialNo
_misc_slave_write_verifykey	Slave(04PI): write verify key
_misc_slave_check_verifykey	Slave(04PI): check verify key
_misc_slave_user_data_buffer_read	Slave(04PI): read data from specified memory block
_misc_slave_user_data_buffer_write	Slave(04PI): write security data to specified memory block
_misc_slave_user_data_to_flash	Slave(04PI): write data from Buffer to Flash
Limit Reversal API	
_DMC_01_rm_04pi_set_MEL_polarity	Set negative limit direction
_DMC_01_rm_04pi_get_MEL_polarity	Get negative limit status
_DMC_01_rm_04pi_set_PEL_polarity	Set positive limit direction
_DMC_01_rm_04pi_get_PEL_polarity	Get positive limit status
Compare API	
_DMC_01_set_compare_channel_position	Set new Channel Position
_DMC_01_get_compare_channel_position	Read current Channel position
_DMC_01_set_compare_ipulse_mode	Set input phase mode for pulse interface module

_DMC_01_set_compare_channel_direction	Set Channel pulse direction
_DMC_01_set_compare_channel_trigger_time	Set Trigger enable time
_DMC_01_set_compare_channel_one_shot	Set Trigger to one-time enable
_DMC_01_set_compare_channel_source	Compare source
_DMC_01_channel0_position_cmp	Set Compare Type to Compare0
_DMC_01_channel1_output_enable	Set Compare1 output to enable/disable
_DMC_01_channel1_output_mode	Compare1 output mode
_DMC_01_channel1_get_io_status	Read Compare1 status
_DMC_01_channel1_set_gpio_out	Set GPIO output pin status
_DMC_01_channel1_position_compare_table	Set Compare1 to standard Compare data
_DMC_01_channel1_position_compare_table_level	Set Compare1 to custom Compare data
_DMC_01_channel1_position_compare_table_cnt	Read Compare counter
_DMC_01_set_compare_channel_polarity	Set Compare polarity
_DMC_01_channel0_position_cmp_by_gpio	Set Compare trigger to GPIO control
_DMC_01_channel1_position_re_compare_table	Use previous Compare condition and-execute Channel1 Compare again
_DMC_01_channel1_position_re_compare_table_level	Use previous Compare condition and-execute Channel1 Compare (Level mode) again
Linear and Arc Interpolation Motion Control API	
_DMC_01_start_rline_xy	2-axis linear, arc R-angle interpolation motion control
_DMC_01_start_rline_xyz	3-axis linear, arc R-angle interpolation motion control
_DMC_01_start_v3_rline_xy	2-axis linear, arc interpolation motion control with added EndVel
_DMC_01_start_v3_rline_xyz	3-axis linear, arc interpolation motion control with added EndVel
Speed Continue API	
_DMC_01_speed_continue	Get endpoint coordinates (X, Y) required for arc interpolation
_DMC_01_speed_continue_mode	Get center point coordinates (X, Y) required for arc interpolation
_DMC_01_speed_continue_combine_ratio	Is Debug log function enabled

Other API	
_misc_app_get_circle_endpoint	Get endpoint coordinates (X, Y) required for arc interpolation
_misc_app_get_circle_center_point	Get center point coordinates (X, Y) required for arc interpolation
_misc_set_record_debuging	Is Debug log function enabled
_misc_open_record_debuging_file	Set Debug output log file path
_DMC_01_enable_dda_mode	Enable DDA Table writing function
_DMC_01_set_dda_data	Enter DDA Table data
_DMC_01_get_dda_cnt	Get number of remaining entries in DDA Table

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Chapter 5 Hardware Initialization API

Table 5.1

Function Name	Description
_DMC_01_open	Initialize system resources when program is run
_DMC_01_close	Release all system resources
_DMC_01_get_CardNo_seq	Get the number of all PCI-DMC-A01 interface cards on the system
_DMC_01_pci_initial	Initialize this PCI card
_DMC_01_get_card_version	Get motion card version

5.1 _DMC_01_open

- **FORMAT**

  I16 PASCAL _DMC_01_open (I16* existcard)

- **Purpose**

  Initializes system resources when program is run.

- **Parameters**

Name	Data Type	Unit	Description
Existcard	I16*	cards	To get the number of these cards installed in the system

- **Example**

```
I16 existCards;
I16 status = _DMC_01_open (&existCards);
```

5.2 _DMC_01_close

- **FORMAT**

  Void PASCAL _DMC_01_close ()

- **Purpose**

  Releases all system resources.

- **Parameters**

  No parameters.

- **Example**

```
U16 CardNo=0;
_DMC_01_close ();
```

5.3 _DMC_01_get_CardNo_seq

■ FORMAT

I16 PASCAL _DMC_01_get_CardNo_seq(U16 CardNo_seq,U16* CardNo)

■ Purpose

Retrieves the number of all PCI-DMC-A01 interface cards in the system.

■ Parameters

Name	Data Type	Unit	Description
CardNo_seq	U16	Number Unit	Serial number
CardNo	U16*	Number Unit	Interface Card No is between 0~15 and is Set using SW1.

■ Example

/* When there is only one PCI-DMC-A01 in the system and the SW1 is set to 3, then the Card No is 3 for that card.

When 2 or more PCI-DMC-A01 are connected to the system, the CardNo will be the SW1 value on the first 1 PCI-DMC-A01 detected. The CardNo of other cards are then acquired one by one.

For more information about setting SW1, please see PCI-DMC-A01 User Manual Section 1.5.5. */

When one PCI-DMC-A01 is installed in the system:

```
U16 CardNo_seq = 0;
U16 CardNo;
U16 status = _DMC_01_get_CardNo_seq(CardNo_seq, &CardNo);
```

When two or more PCI-DMC-A01 are installed in the system:

```
U16 CardNo_seq = 0;
U16 CardNo;
U16 status;
I16 existCards;    //For the value of existCards, please see _DMC_01_open API in Section 5.1 of the Programming Manual.
  for(CardNo_seq=0; CardNo_seq <existCards; CardNo_seq ++)
  {
      status = _DMC_01_get_CardNo_seq(CardNo_seq, &CardNo);
  }
```

5.4 _DMC_01_pci_initial

- **FORMAT**

  I16 PASCAL _DMC_01_pci_initial (U16 CardNo)

- **Purpose**

  Initializes this PCI card.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15

- **Example**

```
U16 CardNo = 0;
_DMC_01_pci_initial (CardNo);
```

5.5 _DMC_01_get_card_version

- **FORMAT**

  I16 PASCAL _DMC_01_get_card_version (U16 CardNo, U16 *ver)

- **Purpose**

  Retrieves the motion card version.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
Ver	U16*	Number	Motion card version data. 0X6x is PCI_DMC_A01 0X7x is PCI_DMC_B01

- **※PCI_DMC_A01 Motion Card Version 0x64 now provides GPIO with Input x 8/Output x 4.**

- **Example**

```
U16 CardNo = 0;
U16 ver;

_ DMC_01_get_card_version (CardNo,&ver);
```

Chapter 6 Interface API

Table 6.1

Function Name	Description
_DMC_01_initial_bus	Initialize external bus
_DMC_01_start_ring	Start ring communication
_DMC_01_get_device_table	Get device table
_DMC_01_get_node_table	Get node table
_DMC_01_check_card_running	Check to see if card is running
_DMC_01_reset_card	Reset selected card
_DMC_01_check_nodeno	Check to see if node already exists
_DMC_01_get_master_connect_status	Get the connection status between the Master Card and expansion module
_DMC_01_get_mailbox_Error	Get number of MailBox errors
_DMC_01_get_mailbox_cnt	Get MailBox counter value
_DMC_01_get_dsp_cnt	Get Interrupt counter value
_DMC_01_set_dio_output	Set GPIO output pin status
_DMC_01_get_dio_output	Get GPIO output pin status
_DMC_01_get_dio_input	Get GPIO input pin status
_DMC_01_get_cycle_time	Get current cycle time for finding/checking devices

6.1 _DMC_01_initial_bus

■ **FORMAT**

I16 PASCAL _DMC_01_initial_bus (U16 CardNo)

■ **Purpose**

Initializes the external bus.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15

■ **Example**

U16 CardNo = 0;

I16 status = _DMC_01_initial_bus (CardNo);

6.2 _DMC_01_start_ring

■ **FORMAT**

I16 PASCAL _DMC_01_start_ring (U16 CardNo, U8 RingNo)

■ **Purpose**

Starts ring communication.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
RingNo	U8	Number Unit	Number of ring to operate

■ **Example**

U16 CardNo = 0;

U8 RingNo = 0;

I16 status = _DMC_01_start_ring (CardNo, RingNo);

6.3 _DMC_01_get_device_table

- **FORMAT**

  I16 PASCAL _DMC_01_get_device_table (U16 CardNo, U16* value)

- **Purpose**

  Retrieves the device table.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
value	U16*	Number Unit	Device number table

- **Example**

```
U16 CardNo=0;
U16 value=0;
I16 status = _DMC_01_get_device_table (CardNo, &value);
```

6.4 _DMC_01_get_node_table

- **FORMAT**

  I16 PASCAL _DMC_01_get_node_table (U16 CardNo, U32* NodeIDTable)

- **Purpose**

  Retrieves the Node ID table.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeIDTable	U32*	Number Unit	Node ID table

- **Example**

```
U16 CardNo=0;
U32 NodeIDTable=0;
I16 status= _DMC_01_get_node_table( CardNo, &NodeIDTable);
```

6.5 _DMC_01_check_card_running

- **FORMAT**

  I16 PASCAL _DMC_01_check_card_running (U16 CardNo, U16* running)

- **Purpose**

  Checks to see if the card is running.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
running	U16*	Selection	0: Not executed 1: Already executed

- **Example**

```
U16 CardNo=0;
U16 running=0;
I16 status= _DMC_01_check_card_running (CardNo, &running)
```

6.6 _DMC_01_reset_card

- **FORMAT**

  I16 PASCAL _DMC_01_reset_card (U16 CardNo)

- **Purpose**

  Resets the selected card.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15

- **Example**

```
U16 CardNo=0;
I16 status = _DMC_01_reset_card (CardNo);
```

6.7 _DMC_01_check_nodeno

■ **FORMAT**

I16 PASCAL _DMC_01_check_nodeno(U16 CardNo, U16 NodeID,U16 SlotID,U16* exist)

■ **Purpose**

Checks to see if the node already exists.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
exist	U16*	Selection	0: Node ID does not exist 1: Node ID exists

■ **Example**

```
U16 CardNo=0;
U16 NodeID =1;
U16 SlotID =0; //If Slot ID is set to 0, then the Slave is a servo drive
U16 exist =0;
I16 status= _DMC_01_check_nodeno (CardNo, NodeID, SlotID, &exist);
```

6.8 _DMC_01_get_master_connect_status

■ **FORMAT**

I16 PASCAL _DMC_01_get_master_connect_status (U16 CardNo, U16* Protocol)

■ **Purpose**

Retrieves the connection status between the Master Card and the expansion module.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
Protocol	U16*	Selection	1: No link to module Node1 3: Link with module Node1 normal 4: Link with module Node1 broken

■ **Example**

```
U16 CardNo=0;
U16 Protocol =0;
I16 status = _DMC_01_get_master_connect_status (CardNo, &Protocol);
```

6.9 _DMC_01_get_mailbox_Error

■ **FORMAT**

I16 PASCAL _DMC_01_get_mailbox_Error (U16 CardNo, U32* error_cnt)

■ **Purpose**

Retrieves the number of MailBox errors.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
error_cnt	U32*	Number Unit	Value of MailBox error counter

■ **Example**

```
U16 CardNo=0;
U32 error_cnt =0;
I16 status= _DMC_01_get_mailbox_Error (CardNo, &error_cnt);
```

6.10 _DMC_01_get_mailbox_cnt

■ **FORMAT**

I16 PASCAL _DMC_01_get_mailbox_cnt (U16 CardNo, U32* PC_cnt, U32* DSP_cnt)

■ **Purpose**

Retrieves the MailBox counter value.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
PC_cnt	U32*	Frequency	Mailbox counter value from PC
DSP_cnt	U32*	Frequency	Mailbox counter value from DSP

■ **Example**

```
U16 CardNo = 0;
U32 PC_cnt = 0, DSP_cnt = 0;
I16 status = _DMC_01_get_mailbox_cnt (CardNo, &PC_cnt, &DSP_cnt);
```

6.11 _DMC_01_get_dsp_cnt

■ **FORMAT**

I16 PASCAL _DMC_01_get_dsp_cnt (U16 CardNo, U32* int_cnt, U32* main_cnt)

■ **Purpose**

Retrieves the Interrupt counter value.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
int_cnt	U32*	Frequency	Number of interrupts generated while establishing communications
main_cnt	U32*	Frequency	Number of interrupts generated while establishing DSP

■ **Example**

```
U16 CardNo=0;
U32 int_cnt =0, main_cnt=0;
I16 status= _DMC_01_get_dsp_cnt (CardNo, &int_cnt, &main_cnt);
```

6.12 _DMC_01_set_dio_output

- **FORMAT**

  I16 PASCAL _DMC_01_set_dio_output (U16 CardNo, U16 On_Off)

- **Purpose**

  Sets GPIO output pin status.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
On_Off	U16	Selection	0: Disable 1: Enable

- **Example**

```
U16 CardNo=0;
U16 On_Off =1;
I16 status= _DMC_01_set_dio_output (CardNo, On_Off);
```

6.13 _DMC_01_get_dio_output

- **FORMAT**

  I16 PASCAL _DMC_01_get_dio_output (U16 CardNo, U16* On_Off)

- **Purpose**

  Retrieves GPIO output pin status.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
On_Off	U16*	Selection	0: Disable 1: Enable

- **Example**

```
U16 CardNo = 0;
U16 On_Off = 0;
I16 status = _DMC_01_get_dio_output (CardNo, &On_Off);
```

6.14 _DMC_01_get_dio_input

- **FORMAT**

  I16 PASCAL _DMC_01_get_dio_input (U16 CardNo, U16* On_Off)

- **Purpose**

  Retrieves GPIO input pin status.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
On_Off	U16*	Selection	0: Disable 1: Enable

- **Example**

```
U16 CardNo=0;
U16 On_Off =0;
I16 status= _DMC_01_get_dio_input (CardNo, &On_Off);
```

6.15 _DMC_01_get_cycle_time

- **FORMAT**

  I16 PASCAL _DMC_01_get_cycle_time (U16 CardNo, I32 *time)

- **Purpose**

  Retrieves current cycle time for finding/checking devices. Time must be less than 1000 us.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
time	I32*	Number	Time value must be less than 1000

- **Example**

```
U16 CardNo=0;
I32 taskTime=0;
/* Get device cycle time. Value of taskTime must be less than 1000 */
I16 status= _DMC_01_get_cycle_time (CardNo, &taskTime);
```

6.16 _DMC_01_initial_bus2

- **FORMAT**

  I16 PASCAL _DMC_01_initial_bus2 ( )

- **Purpose**

  Initializes all external buses.

- **Parameters**

  Function has no parameters.

- **Example**

  I16 status= _DMC_01_initial_bus2 ( );

6.17 _DMC_01_motion_cnt

- **FORMAT**

  I16 PASCAL _DMC_01_motion_cnt (U16 CardNo, U16 NodeID, U16 SlotID,
  U16 *pc_mc_cnt, U16 *dsp_mc_cnt)

- **Purpose**

  Retrieves MailBox and DSP counter values.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
pc_mc_cnt	U16*	Number	MailBox Command count on PC
dsp_mc_cnt	U16*	Number	Command count that DSP got from MailBox

- **Example**

```
U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
U16 pc_mc_cnt;
U16 dsp_mc_cnt;

I16 status= _DMC_01_motion_cnt (CardNo, NodeID, SlotID, &pc_mc_cnt, &pc_mc_cnt);
```

Chapter 7 Servo Drive Parameter Read/Write API

Table 7.1

Function Name	Description
_DMC_01_read_servo_parameter	Read servo drive parameter data
_DMC_01_write_servo_parameter	Write servo drive parameter data

7.1 _DMC_01_read_servo_parameter

- **FORMAT**

  I16 PASCAL _DMC_01_read_servo_parameter (U16 CardNo, U16 NodeID, U16 SlotID, U16 group,U16 idx,U32* data)

- **Purpose**

  Reads servo drive parameter.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
group	U16	Number	Device (Servo) group number
idx	U16	Number	Index value for Servo parameter group
data	U32*	Number	Data returned by group index

- **Example**

```
U16 CardNo=0;
U16 NodeID =1;
U16 SlotID = 0;
U16 group = 3;
U16 idx = 0;          // In this example, you will read Servo parameter “P3-00”
U32 data;
I16 status= _DMC_01_read_servo_parameter(CardNo, NodeID, SlotID, group, idx, &data);
```

7.2 _DMC_01_write_servo_parameter

■ **FORMAT**

I16 PASCAL _DMC_01_write_servo_parameter (U16 CardNo, U16 NodeID, U16 SlotID, U16 group,U16 idx,U32 data)

■ **Purpose**

Writes servo drive parameter.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
group	U16	Number	Device (Servo) group number
idx	U16	Number	Index value for Servo parameter group
data	U32	Number	Data to write to group index

■ **Example**

```
U16 CardNo=0;
U16 NodeID =1;
U16 SlotID = 0;
U16 group = 3;
U16 idx = 0;        // In this example, you will write the data to Servo parameter “P3-00”
U32 data = 1;
I16 status= _DMC_01_write_servo_parameter(CardNo, NodeID, SlotID, group, idx, data);
```

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Chapter 8 Using SDO Protocol API

Table 8.1

Function Name	Description
_DMC_01_check_canopen_lock	Under SDO mode, check to see if next command can be executed
_DMC_01_get_canopen_ret	Get data returned by CANopen (SDO related data)
_DMC_01_set_pdo_mode	Set to use CANopen protocol (PDO or SDO)
_DMC_01_send_message	Send SDO command message to data buffer
_DMC_01_send_message3	Send SDO command message to data buffer and exit data buffer once command is set
_DMC_01_read_message	Read last SDO command message into data buffer
_DMC_01_read_message2	Read the last SDO command message into data buffer and return number of reads
_DMC_01_get_message	Get SDO command message and place in data buffer
_DMC_01_reset_sdo_choke	When SDO command is blocked, reset SDO
_DMC_01_get_sdo_retry_history	Get number of SDO resends

8.1 CANopen SDO protocol

※Sample SDO Packet Format for CANopen 1 – Index Read/Write successful

When Index read is “Successful”, the return value is in the following format:

Table 8.2

Field name:	Datatype	Index low	Index high	Sub index	Data1	Data2	Data3	Data4
Command	0x40	0x64	0x60	0x00	0x00	0x00	0x00	0x00
Return	0x43	0x64	0x60	0x00	0x11	0x22	0x33	0x44

Table description:

(1) Read Feedback PUU (CANopen's Index is set as 0x6064 and SubIdx set as 0x00).

(2) Datatype is set as 0x40 to indicate read.

(3) Datatype is then returned as 0x43.
If the returned Datatype is 0x43, then the data received is 32bit [Data1~Data4 all valid].
If value is 0x4b, then the data received is 16bit [Data1~Data2 are valid].
If value is 0x4f, then the data received is 8bit [Data1 is valid].

(4) Data1~Data4 fields are read from the low Word first. Higher invalid data are all 0.
The value returned by the above table to indicate that it has received Feedback PUU is therefore 0x44332211.

When Index write is “Success”, the return value is in the following format:

Table 8.3

Field name:	Datatype	Index low	Index high	Sub index	Data1	Data2	Data3	Data4
Command	0x2b	0x40	0x60	0x00	0x08	0x00	0x00	0x00
Return	0x60	0x40	0x60	0x00	0x00	0x00	0x00	0x00

Table description:

(1) Write control code ControlWord (CANopen's Index is set as 0x6040 and SubIdx set as 0x00).

(2) Datatype set to 0x2b to indicate write.

(3) If entered Datatype value is 0x23 this means the data being written is 32bit [Data1~Data4 all valid].
Input value of 0x2b means data being written is 16bit [Data1~Data2 are valid].
Input value of 0x2f means data being written 8bit [Data1 is valid].

(4) If the returned Datatype is 0x60, this means the write was successful; Data1 ~ Data4 returned at this time are not applicable.

(5) Data1~Data4 fields use low Word first. Higher Data that are invalid is replaced by 0. Based on the above, the control code returned by the array to indicate data has been written is a ControlWord with the value 0x00000008.

(6) The Index data length is based on Delta Electronics' ASDA-A2 CANopen Technical Guide.

※Sample SDO Packet Format for CANopen2 – Index Read/Write failure

When index read is “Failed” (no such index), the return value is in the following format:

Table 8.4

Field name:	Datatype	Index low	Index high	Sub index	Data1	Data2	Data3	Data4
Command	0x40	0x59	0x60	0x00	0x00	0x00	0x00	0x00
Return	0x80	0x59	0x60	0x00	0x00	0x00	0x02	0x06

Table description:

(1) Read an invalid index (Here CANopen's Index is set as 0x6059 and SubIdx as 0x00).
(2) Datatype is set as 0x40 to indicate read.
(3) There is no such index in the servo, so read fails. Datatype is then returned 0x80 to indicate read failure.
(4) The field in the above table indicates that the returned data made up of Data1~Data4 is 0x06020000 indicating the [No Such Index] error.
(5) For a detailed explanation, please refer to Delta Electronics SDA-A2 CANopen Technical Guide's section on SDO Abort Code.

When Index write “fail” (The value is out of the set range), the return value is in the following format:

Table 8.5

Field name:	Datatype	Index low	Index high	Sub index	Data1	Data2	Data3	Data4
Command	0x2f	0x60	0x60	0x00	0x0F	0x00	0x00	0x00
Return	0x80	0x60	0x60	0x00	0x30	0x00	0x09	0x06

Table description:

(1) Write operation mode (Here CANopen's Index value is set as 0x6060 and SubIdx is set as 0x00).
(2) Datatype is set as 0x2f to indicate the data being written is 8 bit [Data1 is valid].
(3) As the operating range is between 0x00~0x07, this command is written as operation failed / Subsequent datatype then returns a value of 0x80 to indicate write failed.
(4) The field in above table The above table shows that the data made up of Data1~Data4 is the 0x06090030 [Write value out of range] error code.
(5) The Index data length is based on Delta Electronics' ASDA-A2 CANopen Technical Guide.

For a detailed explanation, please refer to Delta Electronics SDA-A2 CANopen Technical Guide's section on SDO Abort Code.

※Sample SDO Packet Format for CANopen 3 – Read/Write ASDA-A2 Parameter

When reading the ASDA-A2 parameter, the return value is in the following format:

Table 8.6

Field name:	Datatype	Index low	Index high	Sub index	Data1	Data2	Data3	Data4
Command	0x40	0x00	0x23	0x00	0x00	0x00	0x00	0x00
Return	0x4b	0x00	0x23	0x00	0x7F	0x00	0x00	0x00

Table description:

(1) Can use the standard CANopen SDO format to read from A2 parameter.

(2) P3-00[Node ID] (CANopen's Index is set as 0x2300 and SubIdx is set as 0x00).
Format: **P**△**-**○○ [Servo parameter] ←→ **0x2**△□□ [Index value] (□□Expressed as ○○hexadecimal).
If Index is set as 0x2300 this means read parameter at P3-00
If Index is set as 0x212D this means read parameter at P1-45 (2D is the hexadecimal notation for 45)

(3) SubIdx are all set to 0x00.

To write to ASDA-A2 parameter, the return value is in the following format:

Table 8.7

Field name:	Datatype	Index low	Index high	Sub index	Data1	Data2	Data3	Data4
Command	0x2b	0x00	0x23	0x00	0x7F	0x00	0x00	0x00
Return	0x60	0x00	0x23	0x00	0x00	0x00	0x00	0x00

Table description:

(1) Can use the standard CANopen SDO format to write to A2 parameter.

(2) P3-00[Node ID] (CANopen's Index is set as 0x2300 and SubIdx is set as 0x00).
Format: **P**△**-**○○ [Servo parameter] ←→ **0x2**△□□ [Index value] (□□Expressed as ○○hexadecimal).

(3) SubIdx are all set to 0x00.

(4) ASDA-A2 parameter's data length is 16bit or 32bit

(5) You may refer to the ASDA-A2 EDS file to find the DataType for the corresponding parameter Index.
If DataType 3, data length is 16 bit and the DataType for command write should be 0x2b
If DataType 4, data length is 32 bit and the DataType for command write should be 0x23b

8.2 _DMC_01_check_canopen_lock

- **FORMAT**

  I16 PASCAL _DMC_01_check_canopen_lock (U16 CardNo, U16 *lock)

- **Purpose**

  Checks to see if the next command can be executed under SDO mode.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
lock	U16*	Selection	0: Not locked. Can execute next command. 1: Locked, must wait for current execution to finishing executing.

- **Example**

```
U16 CardNo=0;
U16 lock;

I16 status = _DMC_01_check_canopen_lock (CardNo, &lock);
```

8.3 _DMC_01_get_canopen_ret

- **FORMAT**

  I16 PASCAL _DMC_01_get_canopen_ret (U16 CardNo, U16* COBID, U8* value)

- **Purpose**

  Retrieves data returned by CANOPEN (SDO related data).

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
COBID	U16*	Number	CAN object ID
value	U8*	Number	Data contained within object Value[0]: SDO Message response If content is 32-bit long, value is 43 If content is 16-bit long, value is 4b If content is 8-bit long, value is 4f Write successful, value is 60 Error report, value is 80 Value[1]: Index(Low byte) Value[2]: Index(High byte) Value[3]: Sub index Value[4]: Data low word (Low byte) Value[5]: Data low word (High byte) Value[6]: Data high word (Low byte) Value[7]: Data high word (High byte)

- **Example**

```
U16 CardNo=0;
U16 COBID=0;
U8 value[8]={0};
I16 status= _DMC_01_get_canopen_ret (CardNo, &COBID, value);
```

8.4 _DMC_01_set_pdo_mode

- **FORMAT**

  I16 PASCAL _DMC_01_set_pdo_mode (U16 CardNo, U16 NodeID, U16 SlotID, U16 Enable)

- **Purpose**

  Sets the use of CANopen protocol (PDO or SDO).

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
Enable	U16	Selection	0: PDO: DisablePDO, use SDO 1: PDO: enable PDO

- **Example**

```
U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0; //If Slot ID is set to 0, then the Slave is a servo drive
U16 Enable=1;

I16 status= _DMC_01_set_pdo_mode (CardNo, NodeID, SlotID, Enable);
```

8.5 _DMC_01_send_message

■ **FORMAT**

I16 PASCAL _DMC_01_send_message (U16 CardNo, U16 NodeID,U16 SlotID, U16 Index,U16 SubIdx,U16 DataType,U16 Value0,U16 Value1,U16 Value2,U16 Value3)

■ **Purpose**

Sends SDO command message to the data buffer. (This API function will wait for the command to be sent before exiting)

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
Index	U16	Number	Index of object dictionary
SubIdx	U16	Number	Sub-index of object dictionary
DataType	U16	Number	Datatype of object dictionary
Value0	U16	Number	Message buffer (Data1) – index (Low byte), CMD (High byte)
Value1	U16	Number	Message buffer (Data2) – Sub-Idx (High byte), index high (Low byte)
Value2	U16	Number	Message buffer (Data3) – Data (Low byte)
Value3	U16	Number	Message buffer (Data4) – Data (High byte)

■ **Example**

```
/*
   CardNo: Card No; NodeID: NodeID; SlotID: SlotID;   Index: SDO Index;   SubIdx: SDO
   Subindex;   DataType: (Read Command) Read data, set as 0x40;     (Write Command)
   Write 8-bit, set as 0x2f; (Write Command) Write 16-bit, set as 0x2f; (Write Command) Write
   32-bit, set as 0x23f;
      Value0: SDO data low word (Low byte), Value1: SDO data low word (High byte);
      Value2: GSDO data high word (Low byte), Value3: GSDO data high word (High byte)
*/
   U16 CardNo=0, NodeID=1, SlotID=0;
   U16 Index=0x6060, SubIdx=0, DataType=0x2f, value0=0x1, value1=0, value2=0, value3=0;
   I16 status= _DMC_01_send_message (CardNo, NodeID, SlotID, Index, SubIdx, DataType,
               value0, value1, value2, value3);
```

8.6 _DMC_01_send_message3

- **FORMAT**

  I16 _DMC_01_send_message3 (I16 CardNo, U16 Index,U16 SubIdx,U16 DataType, U16 Value0,U16 Value1,U16 Value2,U16 Value3)

- **Purpose**

  Sends SDO command message to the data buffer and exits the data buffer once the command is sent.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
Index	U16	Number	Index of object dictionary
SubIdx	U16	Number	Sub-index of object dictionary
DataType	U16	Number	Datatype of object dictionary
Value0	U16	Number	Message buffer (Data1) – index (Low byte), CMD (High byte)
Value1	U16	Number	Message buffer (Data2) – Sub-Idx (High byte), index high (Low byte)
Value2	U16	Number	Message buffer (Data3) – Data (Low byte)
Value3	U16	Number	Message buffer (Data4) – Data (High byte)

- **Example**

```
U16 CardNo=0;
U16 lock;
U16 Index=0x6060, SubIdx=0, DataType=0x2f, value0=0x1, value1=0, value2=0, value3=0;

I16 status= _DMC_01_send_message3 (CardNo, Index, SubIdx, DataType, value0, value1,
value2, value3);
status = _DMC_01_check_canopen_lock (CardNo, &lock);
while(lock){ };
value0=0x2;
status= _DMC_01_send_message3 (CardNo, Index, SubIdx, DataType, value0, value1,
value2, value3);
```

8.7 _DMC_01_read_message

■ **FORMAT**

I16 PASCAL _DMC_01_read_message (I16 CardNo, U16* Cmd, U16* COBID, U16* DataType,U16* Value0,U16* Value1,U16* Value2,U16* Value3)

■ **Purpose**

Reads the last SDO command message into the data buffer.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
Cmd	U16*	Number	Index of object dictionary
COBID	U16*	Number	CAN object ID(0x580 + current Node ID)
DataType	U16*	Number	Datatype of object dictionary
Value0	U16*	Number	Message buffer (Data1) – Idx low (High byte), CMD (Low byte)
Value1	U16*	Number	Message buffer (Data2) – Sub-Idx (High byte) Idx high (Low byte)
Value2	U16*	Number	Message buffer (Data3) – Data (Low byte)
Value3	U16*	Number	Message buffer (Data4) – Data (High byte)

■ **Example**

```
/*
   CardNo: Card No; NodeID: NodeID; Index: SDO Index; SubIdx: SDO Subindex;
   DataType: (Read Command) Read data, set as 0x40; (Write Command) Write 8-bit, set as
   0x2f;
   (Write Command) Write 16-bit, set as 0x2f; (Write Command) Write 32-bit, set as 0x23f;
   Value0: SDO data low word (Low byte), Value1: SDO data low word (High byte);
   Value2: SDO data high word (Low byte), Value3: SDO data high word (High word);
*/
U16 CardNo=0,
U16 Cmd, COBID, DataType, Value0, Value1, Value2, Value3;
I16 status= _DMC_01_read_message (CardNo, &Cmd, & COBID, &DataType,
            &Value0, &Value1, &Value2, &Value3);
```

8.8 _DMC_01_read_message2

- **FORMAT**

  I16 PASCAL _DMC_01_read_message2 (I16 CardNo, U16 NodeID, U16 *Cmd,
  U16 *COBID ,U16 *DataType,U16 *Value0,U16 *Value1,U16 *Value2,U16 *Value3,U16 *cnt)

- **Purpose**

  Reads the last SDO command message into the data buffer and returns the number of reads.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
Cmd	U16*	Number	Index of object dictionary
COBID	U16*	Number	CAN object ID(0x580 + current Node ID)
DataType	U16*	Number	Datatype of object dictionary
Value0	U16*	Number	Message buffer (Data1) – Idx low (High byte), CMD (Low byte)
Value1	U16*	Number	Message buffer (Data2) – Sub-Idx (High byte) Idx high (Low byte)
Value2	U16*	Number	Message buffer (Data3) – Data (Low byte)
Value2	U16*	Number	Message buffer (Data3) – Data (Low byte)
cnt	U16*	Number	Number of commands completed

- **Example**

```
U16 CardNo=0, Cmd, COBID, Value0, Value1, Value2, Value3, cnt, temp;
U16 Index=0x6060, SubIdx=0, DataType=0x2f, value0=0x1, value1=0, value2=0, value3=0;

I16 status= _DMC_01_read_message2(CardNo, NodeID , &Cmd, &COBID, &DataType,
            &Value0, &Value1, &Value2, &Value3, &cnt)
temp = cnt;
status= _DMC_01_send_message3 (CardNo, Index, SubIdx, DataType, value0, value1,
             value2, value3);
status= _DMC_01_read_message2(CardNo, NodeID , &Cmd, &COBID, &DataType, &Value0,
            &Value1, &Value2, &Value3, &cnt)
if(cnt-temp)
        status= _DMC_01_send_message3 (CardNo, Index, SubIdx, DataType, value0,
                value1,value2, value3);
```

8.9 _DMC_01_get_message

■ **FORMAT**

I16 PASCAL _DMC_01_get_message (I16 CardNo, U16 NodeID, U16 SlotID, U16 Index, U16* Cmd, U16* COBID, U16* DataType, U16* Value0, U16* Value1, U16* Value2, U16* Value3)

■ **Purpose**

Retrieves the SDO command message and places it in the data buffer.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
Index	U16	Number	Index of object dictionary
SubIdx	U16	Number	Sub-index of object dictionary
Cmd	U16*	Number	Index of object dictionary
COBID	U16*	Number	CAN object ID
DataType	U16*	Number	Datatype of object dictionary
Value0	U16*	Number	Message buffer (Data1) – Idx low (High byte), CMD (Low byte)
Value1	U16*	Number	Message buffer (Data2) – Sub-Idx (High byte) Idx high (Low byte)
Value2	U16*	Number	Message buffer (Data3) – Data (Low byte)
Value3	U16*	Number	Message buffer (Data4) – Data (High byte)

■ **Example**

U16 CardNo=0, NodeID=1, SlotID=0, Index=0x6060, SubIdx=0;
U16 Cmd, COBID, DataType, Value0, Value1, Value2, Value3;

I16 status= _DMC_01_get_message(CardNo, NodeID, SlotID, Index, SubIndex, &Cmd, &COBID, &DataType, &Value0, &Value1, &Value2, &Value3);

8.10 _DMC_01_reset_sdo_choke

- **FORMAT**

  I16 PASCAL _DMC_01_reset_sdo_choke (U16 CardNo)

- **Purpose**

  Resets SDO when SDO command is blocked.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15

- **Example**

```
U16 CardNo=0;
I16 status= _DMC_01_reset_sdo_choke (CardNo);
```

8.11 _DMC_01_get_sdo_retry_history

- **FORMAT**

  I16 PASCAL _DMC_01_get_sdo_retry_history (U16 CardNo, U32* cnt)

- **Purpose**

  Retrieves the number of SDO resends.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
cnt	U32*	Frequency	Return number of SDO message resends

- **Example**

```
U16 CardNo=0;
U32 cnt=0;
I16 status= _DMC_01_get_sdo_retry_history (CardNo , &cnt);
```

Chapter 9 Point to Point Motion Control Packet Protocol API

Table 9.1

Function Name	Description
_DMC_01_set_sdo_driver_speed_profile	Set speed profile for packet protocol
_DMC_01_start_sdo_driver_r_move	Start relative motion displacement
_DMC_01_start_sdo_driver_a_move	Start absolute motion displacement
_DMC_01_start_sdo_driver_new_position_move	Perform motion displacement with new position value

9.1 _DMC_01_set_sdo_driver_speed_profile

- **FORMAT**

  I16 PASCAL _DMC_01_set_sdo_driver_speed_profile (U16 CardNo, U16 NodeID, U16 SlotID, U32 MaxVel, F64 acc, F64 dec)

- **Purpose**

  Sets the speed profile for packet protocol.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
MaxVel	U32	Pulses per second	Maximum velocity parameter
acc	F64	Second	Specified acceleration time
dec	F64	Second	Specified deceleration time

- **Example**

```
U16 CardNo=0;
U16 NodeID =1;
U16 SlotID = 0; //If Slot ID is set to 0, then the Slave is a servo drive
U16 MaxVel =1000000;
F64 acc=0.1;
F64 dec=0.1;
I16 status= _DMC_01_set_sdo_driver_speed_profile (CardNo, NodeID, SlotID, MaxVel, acc, dec);
```

9.2 _DMC_01_start_sdo_driver_r_move

■ FORMAT

I16 PASCAL _DMC_01_start_sdo_driver_r_move (U16 CardNo, U16 NodeID, U16 SlotID, I32 Distance)

■ Purpose

Starts relative motion displacement.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
Distance	I32	Number of pulses	Relative motion distance

■ Example

```
U16 CardNo=0;
U16 NodeID =1;
U16 SlotID = 0; //If Slot ID is set to 0, then the Slave is a servo drive
I32 Distance =10000000;
I16 status= _DMC_01_start_sdo_driver_r_move (CardNo, NodeID, SlotID, Distance);
```

9.3 _DMC_01_start_sdo_driver_a_move

- **FORMAT**

  I16 PASCAL _DMC_01_start_sdo_driver_a_move (I16 CardNo, U16 NodeID, U16 SlotID, I32 Position)

- **Purpose**

  Starts absolute motion displacement.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
Position	I32	Number of pulses	Absolute motion position

- **Example**

```
U16 CardNo=0;
U16 NodeID =1;
U16 SlotID = 0; //If Slot ID is set to 0, then the Slave is a servo drive
I32 Position =10000000;
I16 status= _DMC_01_start_sdo_driver_a_move (CardNo, NodeID, SlotID, Position);
```

9.4 _DMC_01_start_sdo_driver_new_position_move

■ FORMAT

I16 PASCAL _DMC_01_start_sdo_driver_new_position_move (I16 CardNo, U16 NodeID, U16 SlotID, I32 Position,U16 abs_rel)

■ Purpose

Performs motion displacement with new position value.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
Position	I32	Number	Value of new position
abs_rel	U16	Selection	0: Use absolute coordinates as reference 1: Use relative coordinates as reference

■ Example

U16 CardNo=0;
U16 NodeID =1;
I32 Position =20000000;
U16 abs_rel =1; //Motion displacement using relative coordinates as a reference
I16 status= _DMC_01_start_sdo_driver_r_move (CardNo, NodeID, SlotID, Position, abs_rel);

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Chapter 10 Homing Motion Control Packet Protocol API

Table 10.1

Function Name	Description
_DMC_01_set_home_config	Set home configuration
_DMC_01_set_home_move	Start home motion
_DMC_01_escape_home_move	Stop homing motion

10.1 _DMC_01_set_home_config

■ **FORMAT**

I16 PASCAL _DMC_01_set_home_config (U16 CardNo,U16 NodeID,U16 SlotID ,
U16 Mode,I32 offset,U16 lowSpeed,U16 highSpeed,F64 acc)

■ **Purpose**

Sets home configuration.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
Mode	U16	Selection	Homing mode: 1~35 (See notes on next page)
offset	I32	Number of pulses	Homing offset
lowSpeed	U16	Revolutions per minute	Find the velocity parameter used by each limit (Range:1~500)
highSpeed	U16	Revolutions per minute	Velocity parameter to use for homing (Range: 1~2000)
acc	F64	Second	Acceleration time used for homing

※ The unit of lowSpeed and highSpeed parameters will vary depending on the connected Slave module.
Servo Drive (ASDA-A2F) ➔ Revolutions per minute
Pulse interface module (RM04PI, GE01PI, GE01PH) ➔ **Pulse/Sec**
Linear motor➔ **um/sec**

■ **Example**

U16 CardNo=0, NodeID =1, SlotID=0, Mode=1;
I32 offset =200;
U16 lowSpeed=200, highSpeed=2000;
F64 acc=0.1;

/* Use Homing mode*/
I16 status= _DMC_01_set_home_config (CardNo, NodeID, SlotID, Mode, offset, lowSpeed, highSpeed, acc);

NOTE

#1. Homing mode using negative limit and index pulse message

Using this method, if the negative limit switch is disabled (low voltage level), then it will begin by moving left. The home position is the index pulse offset to the right when it touches the negative limit switch.

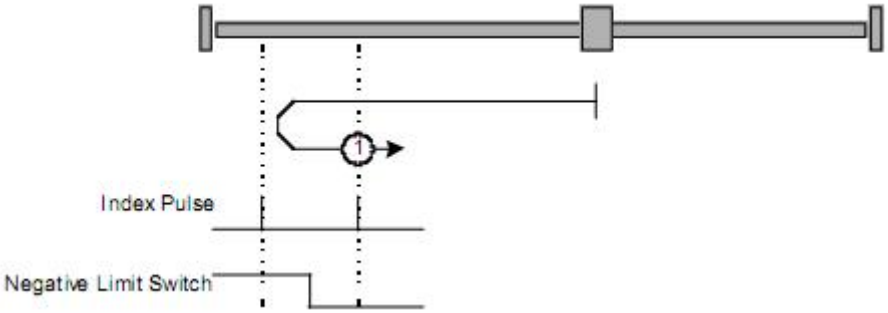

Figure 10.1

#2. Homing mode using positive limit and index pulse message

Using this method, if the positive limit switch is disabled (low voltage level) then it will begin by moving right. The home position is the index pulse offset to the left when it touches the negative limit switch.

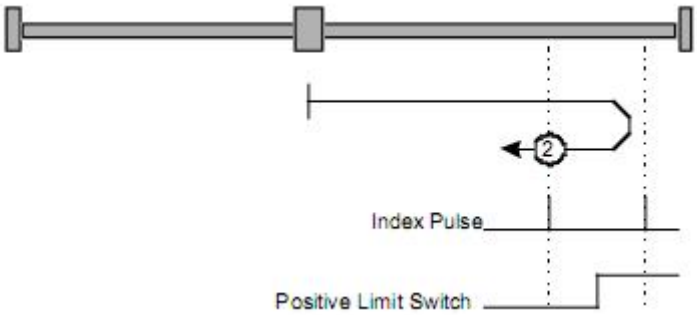

Figure 10.2

#3 and #4. Homing using positive voltage level at Home Switch and index pulse message

When using method 3 or 4, the initial direction will depend on the current status of the Home switch. The Home position depends on the index pulse to the left or right when the Home switch status changes. If the initial position of the Homing is index pulse then it must reverse direction of motion. Any further changes after the direction is reversed depends on the current status of the Home switch.

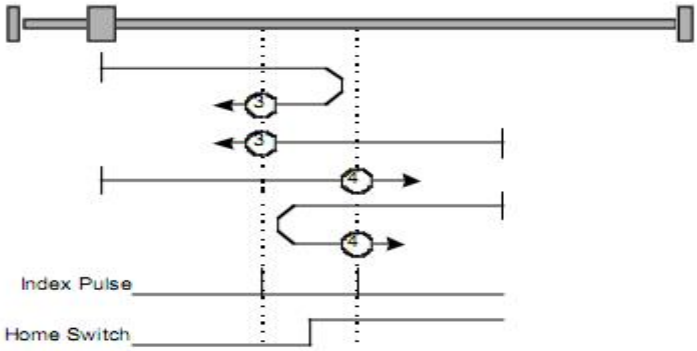

Figure 10.3

#5 and #6. Homing using negative voltage level at Home Switch and index pulse message

When using method 5 or 6, the initial direction will depend on the current status of the Home switch. The Home position depends on the index pulse to the left or right when the Home switch status changes. If the initial position of the Homing is index pulse then it must reverse direction of motion. Any further changes after the direction is reversed depends on the current status of the Home switch.

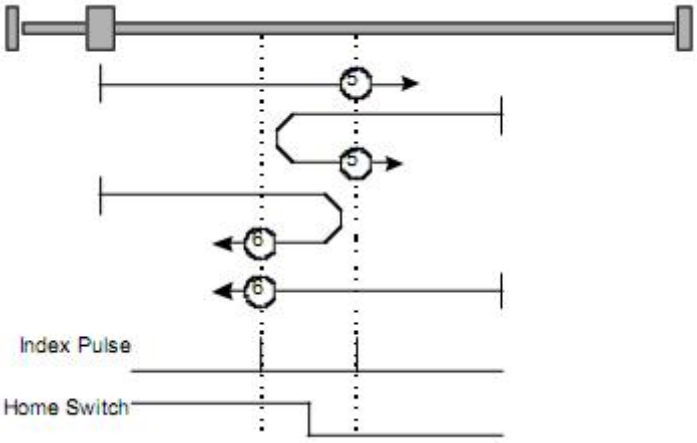

Figure 10.4

#7 to 14. Homing mode based on index pulse and Home switch

These methods use a Home switch that is only activated during some types of motion. In actual fact, it can be activated when Position passes the switch on that axis.

With methods 7 to 10, initial movement is to the right. With methods 11 to 14, initial movement is to the left. If the Home switch is already activated at the start of motion, then the direction it initially moves in will depend on the edge it finds. The home position for this mode is at the index pulse on a Home switch located on either side of the positive or negative edge. The two diagrams below show how if initial direction did not the Home switch, this motion must come into contact with a limit switch before it reverses direction.

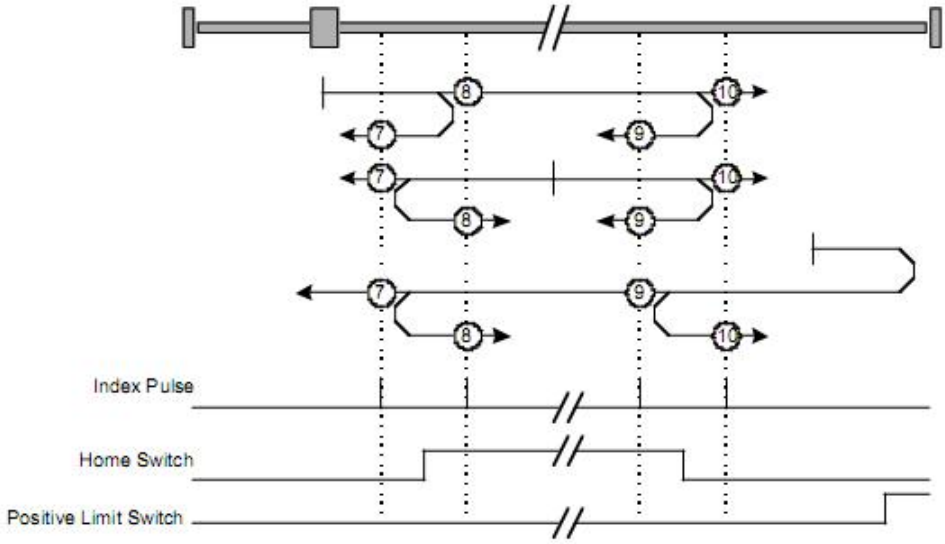

Figure 10.5

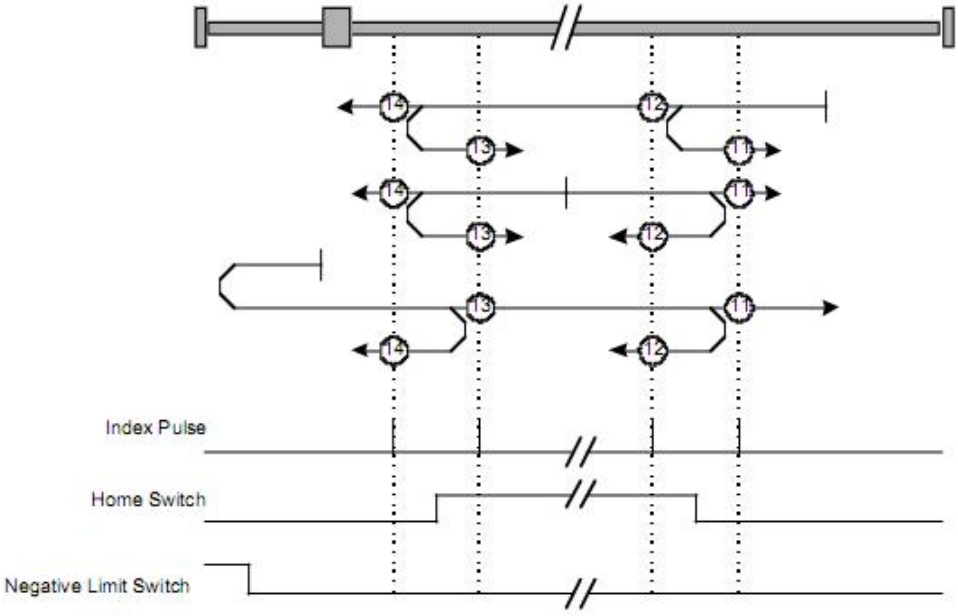

Figure 10.6

#15 and 16. Reserved

This is reserved for adding other homing modes in the future.

#17 to 30. Homing mode independent of index pulse

These methods are similar to methods 1 to 14. The difference being that these Homing modes do not require an index pulse. Homing depends solely on switching Home and limit switches. Example: Method 19 and 20 uses a homing mode similar to methods 3 and 4 as shown below in Fig. 11.7.

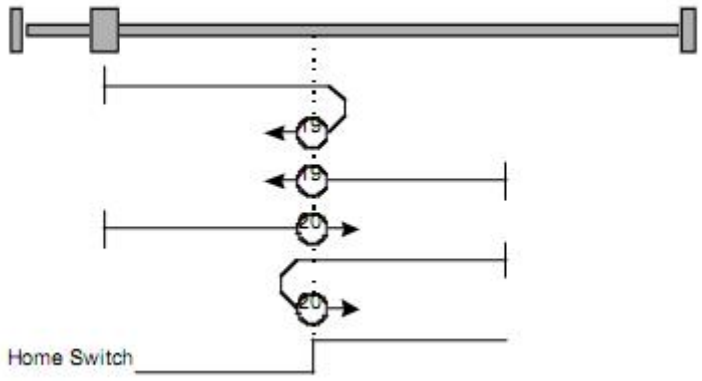

Figure 10.7

#31 and 32. Reserved

This is reserved for adding other homing modes in the future.

#33 and 34. Homing mode related to index pulse

With methods 33 and 34, the positive and negative direction of homing is determined by the index pulse it detects.

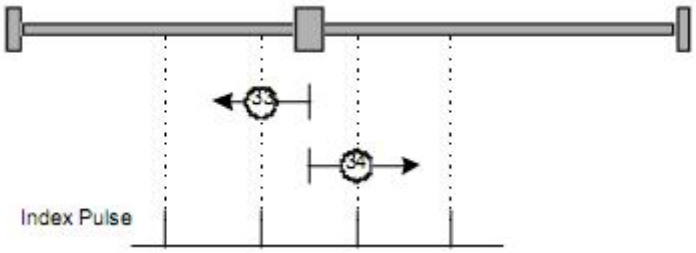

Figure 10.8

#35. Homing based on current position

Mode 35 uses the current position as the Home.

10.2 _DMC_01_set_home_move

- **FORMAT**

  I16 PASCAL _DMC_01_set_home_move (U16 CardNo, U16 NodeID, U16 SlotID)

- **Purpose**

  Starts home motion.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID

- **Example**

```
U16 CardNo=0;
U16 NodeID =1;
U16 SlotID=0; //If Slot ID is set to 0, then the Slave is a servo drive

I16 status= _DMC_01_set_home_move (CardNo, NodeID, SlotID);
```

NOTE

※After executing _DMC_01_set_home_move, MDS0 in MC_status returned by _DMC_01_motion_status API can be used to judge the Home status. Please set dwell time of 30 ~ 100 ms after executing _DMC_01_set_home_move (this value can be adjusted based on CPU performance and programming approach) before executing _DMC_01_motion_status to ensure that the data is correct.

10.3 _DMC_01_escape_home_move

- **FORMAT**

  I16 PASCAL _DMC_01_escape_home_move (U16 CardNo, U16 NodeID, U16 SlotID)

- **Purpose**

  Stops homing motion.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID

- **Example**

```
U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;

I16 status= _DMC_01_escape_home_move (CardNo, NodeID, SlotID);
```

Chapter 11 Velocity Motion Control Packet Protocol API

Table 11.1

Function Name	Description
_DMC_01_set_velocity_mode	Set velocity motion control parameter profile
_DMC_01_set_velocity	Start velocity motion control
_DMC_01_set_velocity_stop	Stop velocity motion control
_DMC_01_set_velocity_torque_limit	Set torque limit for velocity mode

11.1 _DMC_01_set_velocity_mode

- **FORMAT**

  I16 PASCAL _DMC_01_set_velocity_mode (U16 CardNo, U16 NodeID, U16 SlotID, F64 Tacc,F64 Tdec)

- **Purpose**

  Sets the velocity motion control parameter profile.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time

- **Example**

```
U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
F64 Tacc=0.1, Tdec=0.1;

/* Set velocity mode parameter (value for acceleration and deceleration time)) */
I16 status = _DMC_01_set_velocity_mode (CardNo, NodeID, SlotID, Tacc, Tdec);
```

11.2 _DMC_01_set_velocity

- **FORMAT**

  I16 PASCAL _DMC_01_set_velocity (U16 CardNo, U16 NodeID, U16 SlotID,I32 rpm)

- **Purpose**

  Starts velocity motion control.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
rpm	I32	Number	Actual torque is 1/10 of this variable (RPM)

- **Example**

  U16 CardNo=0;
  U16 NodeID=1;
  U16 SlotID=0;
  I32 rpm =-1000; //In this case, motion is counterclockwise so actual value of torque is |-1000| / 10 => 100RPM

  I16 status= _DMC_01_set_velocity (CardNo, NodeID, SlotID, rpm);

11.3 _DMC_01_set_velocity_stop

- **FORMAT**

  I16 PASCAL _DMC_01_set_velocity_stop (U16 CardNo,U16 NodeID,U16 SlotID,U16 stop)

- **Purpose**

  Stops velocity motion control.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
stop	U16	Selection	0: Maintain current velocity motion status 1: Stop velocity motion

- **Example**

```
U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
U16 stop=1;
I16 rpm=2000; // /In this case, motion is clockwise so actual value of torque is |2000| / 10 =>
200RPM

/* Start velocity motion */
I16 status= _DMC_01_set_velocity (CardNo, NodeID, SlotID, rpm);
/* Stop current velocity motion */
status = _DMC_01_set_velocity_stop (CardNo, NodeID, SlotID, stop);
```

11.4 _DMC_01_set_velocity_torque_limit

- **FORMAT**

  I16 PASCAL _DMC_01_set_velocity_torque_limit (U16 CardNo, U16 NodeID, U16 SlotID, U32 torque_limit)

- **Purpose**

  Sets the torque limit for velocity mode.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
torque_limit	U32	Number	Maximum torque

- **Example**

```
U16 CardNo=0;
U16 NodeID =1;
U16 SlotID=0;
U32 torque_limit =50;
I16 status= _DMC_01_set_velocity_torque_limit (CardNo, NodeID, SlotID, torque_limit);
```

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Chapter 12 Torque Motion Control Packet Protocol API

Table 12.1

Function Name	Description
_DMC_01_set_torque_mode	Torque motion control parameter profile
_DMC_01_set_torque	Start torque motion
_DMC_01_set_torque_stop	Stop torque motion
_DMC_01_set_torque_velocity_limit	Set velocity limit in torque mode

12.1 _DMC_01_set_torque_mode

- **FORMAT**

  I16 PASCAL _DMC_01_set_torque_mode (U16 CardNo, U16 NodeID, U16 SlotID, U16 slope)

- **Purpose**

  Sets the torque motion control parameter profile (slope value).

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
slope	U16	ms	Time required to go from 0 to 100% rate torque.

- **Example**

```
U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
U16 slope=500; // 500 ms

I16 status= _DMC_01_set_torque_mode (CardNo, NodeID, SlotID, slope);
```

12.2 _DMC_01_set_torque

- **FORMAT**

  I16 PASCAL _DMC_01_set_torque (U16 CardNo, U16 NodeID, U16 SlotID, I16 ratio)

- **Purpose**

  Starts torque motion.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
ratio	I16	Number	Thousandths of rated torque. (CCW if less than zero and clockwise if otherwise)

- **Example**

```
U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
I16 ratio=-50; // If ratio is 50 then -50 divided by 1000 means rated torque is 5% and motor is running CCW

/* Set ratio and begin torque motion */
I16 status=_DMC_01_set_torque(CardNo, NodeID, SlotID, ratio);
// If value of ratio is less than 0 then motor is running CCW. If value is greater than 0, motor is running clockwise.
```

12.3 _DMC_01_set_torque_stop

- **FORMAT**

  I16 PASCAL _DMC_01_set_torque_stop (U16 CardNo, U16 NodeID, U16 SlotID, U16 stop)

- **Purpose**

  Stops torque motion.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
stop	U16	Selection	0: Current motion status. 1: Stop torque motion

- **Example**

```
U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
U16 stop=1;
I16 ratio=100; // If value of ratio is 100, then 100 divided by 1000 means rated torque is 10% and motor is running clockwise.

/* Set ratio and begin torque motion */
I16 status=_DMC_01_set_torque(CardNo, NodeID, SlotID, ratio);
/* Stop torque motion */
status= _DMC_01_set_torque_stop(CardNo, NodeID, SlotID, stop);
```

12.4 _DMC_01_set_torque_velocity_limit

- **FORMAT**

  I16 PASCAL _DMC_01_set_torque_velocity_limit (U16 CardNo, U16 NodeID, U16 SlotID, U32 velocity_limit)

- **Purpose**

  Sets the velocity limit in torque mode.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
velocity_limit	U32	Number	Velocity limit

- **Example**

```
U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
U32 velocity_limit =2000;

/* Set limit for Velocity. velocity_limit may not exceed 30000 */
I16 status=_DMC_01_set_torque_velocity_limit (CardNo, NodeID, SlotID, velocity_limit);
```

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Chapter 13 Using PDO Protocol API

Table 13.1

Function Name	Description
_DMC_01_ipo_set_svon	Set Servo ON/OFF under PDO protocol mode
_DMC_01_get_buffer_length	Get motion command to be executed
_DMC_01_command_buf_clear	Reset dwell time (buffer dwell counter value)
_DMC_01_buf_dwell	Interval between two motion commands
_DMC_01_set_group	Set group

13.1 _DMC_01_ipo_set_svon

■ **FORMAT**

I16 PASCAL _DMC_01_ipo_set_svon (U16 CardNo, U16 NodeID, U16 SlotID, U16 ON_OFF)

■ **Purpose**

Sets Servo ON/OFF under PDO protocol mode.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
ON_OFF	U16	Selection	0: Servo OFF 1: Servo ON

■ **Example**

U16 CardNo=0;
U16 NodeID =1;
U16 SlotID =0;
U16 ON_OFF=1;

I16 status= _DMC_01_ipo_set_svon (CardNo, NodeID, SlotID, ON_OFF);

13.2 _DMC_01_get_buffer_length

■ **FORMAT**

I16 PASCAL _DMC_01_get_buffer_length (U16 CardNo, U16 NodeID, U16 SlotID, U16* bufferLength)

■ **Purpose**

Retrieves the motion command which has yet to be executed.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
bufferLength	U16*	Integer	Un-executed motion command

■ **Example**

```
U16 CardNo=0;
U16 NodeID =1;
U16 SlotID =0;
U16 bufferLength;
I16 status;

/* Start synchronized motion control command */
status= _DMC_01_sync_move(CardNo);
/* Get un-executed motion commands from each Node */
status= _DMC_01_get_buffer_length (CardNo, NodeID, SlotID, &bufferLength);
```

13.3 _DMC_01_command_buf_clear

- **FORMAT**

  I16 PASCAL _DMC_01_command_buf_clear (U16 CardNo, U16 NodeID, U16 SlotID)

- **Purpose**

  Resets dwell time (buffer dwell counter value).

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID

- **Example**

  U16 CardNo=0; U16 NodeID =1; U16 SlotID=0; I32 dwell_cnt=3;
  I16 status=_DMC_01_buf_dwell(CardNo, NodeID, SlotID, dwell_cnt); //Set dwell buffer interval
  status= _DMC_01_command_buf_clear (CardNo, NodeID,SlotID); //Clear dwell buffer interval

13.4 _DMC_01_buf_dwell

- **FORMAT**

  I16 PASCAL _DMC_01_buf_dwell (I16 CardNo, U16 NodeID, U16 SlotID, I32 dwell_cnt)

- **Purpose**

  The interval time between two motion commands.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
dwell_cnt	I32	Frequency	Dwell buffer interval (Delay time is 2 x dwell_cnt + 2)

- **Example**

  U16 CardNo=0; U16 NodeID =1; U16 SlotID=0;
  I32 dwell_cnt=3; //If dwell_cnt has a value of 0 then delay time is 4 ms; In this example, the value is 3 so delay time is 2*3+2=8ms
  I16 status=_DMC_01_buf_dwell (CardNo, NodeID, SlotID, dwell_cnt);

13.5 _DMC_01_set_group

- **FORMAT**

  I16 PASCAL _DMC_01_set_group (U16 CardNo, U16* NodeID,U16* SlotID,
  U16 NodeID_Num, U16 enable)

- **Purpose**

  Sets a group.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
NodeID_Num	U16	Number	Group number
Enable	U16	Number Unit	0: Clear group. 1: Set as group.

- **Example**

```
U16 CardNo=0;
U16 NodeID[4] ={1,3,5};
U16 SlotID[4]={0,0,0};
U16 NodeID_Num=3; //Set 3 cards in the same group.
U16 enable=1;

I16 status=_DMC_01_set_group (CardNo, NodeID, SlotID, NodeID_Num, enable);
```

Chapter 14 Stop Motion Control API

Table 14.1

Function Name	Description
_DMC_01_emg_stop	All motion commands in buffer will execute immediate stop
_DMC_01_sd_stop	All motion commands in buffer will execute slow down stop based on deceleration time
_DMC_01_sd_abort	Current motion command will execute deceleration time stop
_DMC_01_set_sd_mode	Set Sd_stop mode

14.1 _DMC_01_emg_stop

■ FORMAT

I16 PASCAL _DMC_01_emg_stop (U16 CardNo, U16 NodeID, U16 SlotID)

■ Purpose

All motion commands in the buffer will execute an emergency stop.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID

■ Example

U16 CardNo=0;U16 NodeID =1; U16 SlotID=0;
I16 status= _DMC_01_emg_stop (CardNo, NodeID, SlotID);

14.2 _DMC_01_sd_stop

■ FORMAT

I16 PASCAL _DMC_01_sd_stop (U16 CardNo, U16 NodeID,U16 SlotID,F64 Tdec)

■ Purpose

All motion commands in the buffer will execute a slow down stop based on deceleration time.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
Tdec	F64	Second	Specified deceleration time

■ Example

U16 CardNo=0, U16 NodeID =1, SlotID=0;
F64 Tdec=0.1;
I16 status= _DMC_01_sd_stop (CardNo, NodeID, SlotID, Tdec);

14.3 _DMC_01_sd_abort

- **FORMAT**

  I16 PASCAL _DMC_01_sd_abort (U16 CardNo, U16 NodeID, U16 SlotID, F64 Tdec)

- **Purpose**

  Current motion command will execute a slow down stop.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
Tdec	F64	Second	Specified deceleration time

- **Example**

  U16 CardNo=0, U16 NodeID =1, SlotID=0;

  F64 Tdec=0.1;

  I16 status= _DMC_01_sd_abort (CardNo, NodeID, SlotID, Tdec);

14.4 _DMC_01_set_sd_mode

■ FORMAT

I16 PASCAL _DMC_01_set_sd_mode (U16 CardNo, U16 NodeID, U16 SlotID, U16 mode)

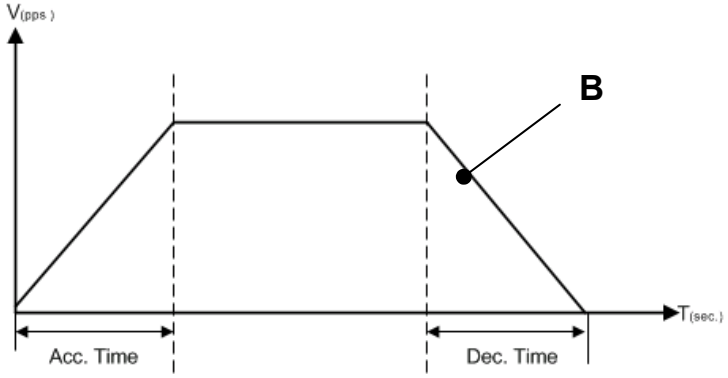
■ Purpose

Sets the Sd_stop(slow down stop) mode.

■ Parameters

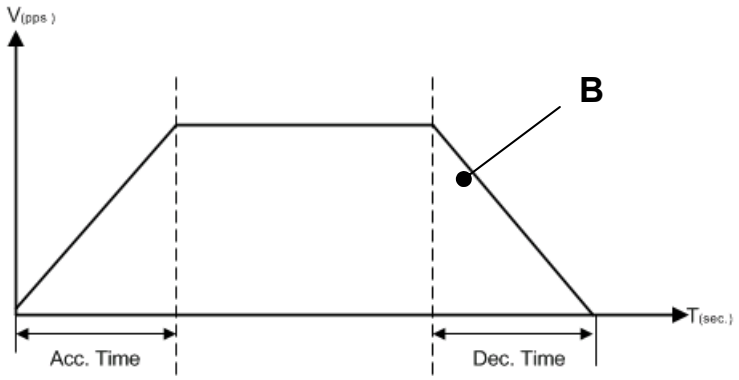
Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
Mode	U16	Selection	0: position and command have the same value (default) 1: value of position may be greater than command

■ Description



When slow down command is issued at B, start deceleration time stop. Stop when Position = Command.

Figure 14.1 Sd Mode instructions (Mode = 0)



When slow down command is issued at B, start deceleration time stop. Stop when Position >

Figure 14.2 Sd Mode instructions (Mode = 1)

Example

```
U16 CardNo=0;
U16 NodeID =1, SlotID=0;
U16 Mode=1;
F64 Tdec=0.1;

I16 status= _DMC_01_set_sd_mode (CardNo, NodeID, SlotID, Mode);
```

Chapter 15 Motion Status API

Table 15.1

Function Name	Description
_DMC_01_motion_done	Return current motion stage of the Master Card
_DMC_01_motion_status	Return current motion status of the Master Card

15.1 _DMC_01_motion_done

■ FORMAT

I16 PASCAL _DMC_01_motion_done (U16 CardNo, U16 NodeID, U16 SlotID, U16* MC_status)

■ Purpose

Returns the current stage of motion of the Master Card.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
MoSt	U16*	Selection	0: Stop motion displacement 1: Carry out motion displacement according to acceleration time 2: Carry out motion displacement according to velocity limit 3: Carry out motion displacement according to deceleration time

■ Example

```
U16 CardNo=0;
U16 NodeID =1;
U16 SlotID=0;
U16 MoSt=0;
I16 status= _DMC_01_motion_done (CardNo, NodeID, SlotID, &MoSt);
```

15.2 _DMC_01_motion_status

■ **FORMAT**

I16 PASCAL _DMC_01_motion_status (U16 CardNo, U16 NodeID, U16 SlotID, U32* MC_status)

■ **Purpose**

Returns current motion status of the Master Card.

■ **Parameters**

<table>
<tr><th>Name</th><th>Data Type</th><th>Unit</th><th>Description</th></tr>
<tr><td>CardNo</td><td>U16</td><td>Number Unit</td><td>CardNo is between 0~15</td></tr>
<tr><td>NodeID</td><td>U16</td><td>Number Unit</td><td>Node ID</td></tr>
<tr><td>SlotID</td><td>U16</td><td>Number Unit</td><td>Slot ID</td></tr>
<tr><td>MoSt</td><td>U32*</td><td>Selection</td><td>Motion status (bit0~bit15)
<table>
<tr><th>Byte</th><th>Tag</th><th>Description</th></tr>
<tr><td>0 ~ 3</td><td>Mode0 ~ Mode3</td><td>Enable selection mode</td></tr>
<tr><td>4</td><td>DI3</td><td>DI3 (SLD) status map</td></tr>
<tr><td>5</td><td>WR</td><td>Alarm message</td></tr>
<tr><td>6</td><td>DR</td><td>Data error message</td></tr>
<tr><td>7</td><td>TG</td><td>Trigger mode bit</td></tr>
<tr><td>8</td><td>PWRON</td><td>Motor excitation enable bit</td></tr>
<tr><td>9</td><td>DriverErr</td><td>Servo error bit</td></tr>
<tr><td>10</td><td>Target</td><td>Target reached bit</td></tr>
<tr><td>11</td><td>N/A</td><td>Reserved, default value is 0</td></tr>
<tr><td>12</td><td>MDS0</td><td>Mode specific</td></tr>
<tr><td>13</td><td>MDS1</td><td>Mode specific</td></tr>
<tr><td>14</td><td>PEL</td><td>Positive limit bit</td></tr>
<tr><td>15</td><td>MEL</td><td>Negative limit bit</td></tr>
</table></td></tr>
</table>

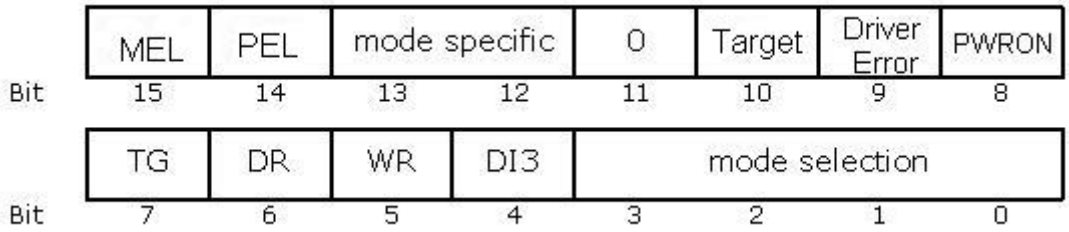


Figure 15.1 Motion status

For a description of “Mode specific” bits” (bit 12 and bit 13), please see Table 15.2.
With the mode selection bits (bit 0 ~ bit 3) there are only 2 modes for the user to choose from. These are MODE1 (bit 0 is ON) and MODE6 (bit 1 and bit 2 are ON)

Table 15.2 Mode specific bit description for motion status

Mode item	**Mode-specific**	
	Bit 13 is 1	**Bit 12 is 1**
Homing mode (MODE6)	Homing error	Can carry out Homing motion
DMCNET mode (MODE1)	No Definition	Mode enabled

- **Example**

```
U16 CardNo=0;
U16 NodeID =1;
U16 SlotID=0;
U32 MoSt=0;
I16 status= _DMC_01_motion_status (CardNo, NodeID, SlotID, &MoSt);
```

Chapter 16 Motion Counter Value API

Table 16.1

Function Name	Description
_DMC_01_get_command	Get Command counter value
_DMC_01_set_command	Set new Command counter value
_DMC_01_get_position	Get current position counter value
_DMC_01_set_position	Set new position counter value
_DMC_01_get_target_pos	Get current position's position value
_DMC_01_get_torque	Get and return current torque counter value
_DMC_01_get_current_speed	Get motion speed
_DMC_01_get_current_speed_rpm	Get current RPM multiplied by 10

16.1 _DMC_01_get_command

■ **FORMAT**

I16 PASCAL _DMC_01_get_command (U16 CardNo, U16 NodeID, U16 SlotID, I32* cmd)

■ **Purpose**

Retrieves the Command counter value.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
cmd	I32*	Number of pulses	Current value of Command counter

■ **Example**

U16 CardNo=0, NodeID=1, SlotID=0; I32 cmd;

I16 status= _DMC_01_get_command (CardNo, NodeID, SlotID, &cmd);

16.2 _DMC_01_set_command

■ **FORMAT**

I16 PASCAL _DMC_01_set_command (U16 CardNo, U16 NodeID, U16 SlotID, I32 cmd)

■ **Purpose**

Sets the new Command counter value.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
cmd	I32	Number of pulses	New Command counter value to be set

■ **Example**

U16 CardNo=0, NodeID =1, SlotID=0; I32 cmd=1000000;

I16 status= _DMC_01_set_command (CardNo, NodeID, SlotID, cmd);

16.3 _DMC_01_get_position

■ **FORMAT**

I16 PASCAL _DMC_01_get_position (U16 CardNo, U16 NodeID, U16 SlotID, I32* pos)

■ **Purpose**

Retrieves the current position counter value.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
pos	I32*	Number of pulses	Returned current value of position counter

■ **Example**

U16 CardNo=0, NodeID =1, SlotID=0; I32 pos;

I16 status= _DMC_01_get_position (CardNo, NodeID, SlotID, &pos);

16.4 _DMC_01_set_position

■ **FORMAT**

U16 PASCAL _DMC_01_set_position (U16 CardNo, U16 NodeID, U16 SlotID, I32 pos)

■ **Purpose**

Sets the new position counter value.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
pos	I32	Number of pulses	Set position counter value.

■ **Example**

U16 CardNo=0, NodeID =1, SlotID=0; I32 pos =500000;

I16 status= _DMC_01_set_position (CardNo, NodeID, SlotID, pos);

16.5 _DMC_01_get_target_pos

■ **FORMAT**

I16 PASCAL _DMC_01_get_target_pos (U16 CardNo, U16 NodeID, U16 SlotID, I32* pos)

■ **Purpose**

Retrieves the current value of the target position.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
pos	I32*	Number of pulses	Position counter value for current position (see the Notes below for explanation)

■ **Example**

```
U16 CardNo=0;
U16 NodeID =1;
U16 SlotID = 0;
I32 pos=0;

I16 status= _DMC_01_get_target_pos (CardNo, NodeID, &pos);
```

NOTE

※After issuing a motion command, if you are relying on _DMC_01_get_target_pos to return the pos so you can decide the next step, put in a delay of 10~100ms (this value can be adjusted based on CPU performance and programming approach) before executing _DMC_01_get_target_pos to ensure that the data is correct.

16.6 _DMC_01_get_torque

■ FORMAT

I16 PASCAL _DMC_01_get_torque (U16 CardNo, U16 NodeID, U16 SlotID, U16* torque)

■ Purpose

Retrieves and returns the current torque counter value.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
torque	U16*	Number	Current torque

■ Example

```
U16 CardNo=0;
U16 NodeID =1;
U16 SlotID=0;
U16 torque;

I16 status= _DMC_01_get_torque (CardNo, NodeID, SlotID, &torque);
```

16.7 _DMC_01_get_current_speed

■ **FORMAT**

I16 PASCAL _DMC_01_get_current_speed (U16 CardNo, U16 NodeID, U16 SlotID, I32* speed)

■ **Purpose**

Retrieves motion speed.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
speed	I32*	Pulses per second	Retrieves motion speed

■ **Example**

```
U16 CardNo=0;
U16 NodeID =1;
U16 SlotID=0;
I32 speed;

I16 status= _DMC_01_get_current_speed (CardNo, NodeID, SlotID, &speed);
```

16.8 _DMC_01_get_current_speed_rpm

■ **FORMAT**

I16 PASCAL _DMC_01_get_current_speed_rpm (U16 CardNo, U16 NodeID, U16 SlotID, I32 *rpm)

■ **Purpose**

Retrieves current RPM x 10.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
rpm	I32*	Revolutions/second	Actual torque is 1/10 of this variable (RPM)

■ **Example**

```
U16 CardNo=0;
U16 NodeID =1;
U16 SlotID=0;
I32 rpm;

I16 status= _DMC_01_get_current_speed_rpm (CardNo, NodeID, SlotID, &rpm);
// If you get a torque value of 1000, the actual speed is 100RPM.
```

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Chapter 17 Software Limit API

Table 17.1

Function Name	Description
_DMC_01_set_soft_limit	Sets reference values for software positive/negative limits
_DMC_01_enable_soft_limit	Enable/disable software limit and stop method after contact with limit
_DMC_01_disable_soft_limit	Disable software limit
_DMC_01_get_soft_limit_status	Retrieves the positive/negative status of the software limit during motion

17.1 _DMC_01_set_soft_limit

- **FORMAT**

  I16 PASCAL _DMC_01_set_soft_limit (U16 CardNo, U16 NodeID, U16 SlotID, I32 PLimit, I32 NLimit)

- **Purpose**

  Sets reference values for software positive/negative limits.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
PLimit	I32	Number	Value of positive software limit
NLimit	I32	Number	Value of negative software limit

- **Example**

```
U16 CardNo=0;
U16 NodeID =1;
U16 SlotID =0;
I32 PLimit =8000;
I32 NLimit =2000;

I16 status= _DMC_01_set_soft_limit (CardNo, NodeID, SlotID, PLimit, NLimit);
```

17.2 _DMC_01_enable_soft_limit

■ **FORMAT**

I16 PASCAL _DMC_01_enable_soft_limit (U16 CardNo, U16 NodeID, U16 SlotID, I16 Action)

■ **Purpose**

Enables/disables the software limit and stop method after touching the limit.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
Action	I16	Selection	1: Emergency stop after touching limit 2: Slow down stop after touching limit

■ **Example**

U16 CardNo=0, NodeID =1, SlotID=0;
I16 Action=1; // Select emergency stop after touching limit
I16 status= _DMC_01_enable_soft_limit (CardNo, NodeID, SlotID, Action);

17.3 _DMC_01_disable_soft_limit

■ **FORMAT**

I16 PASCAL _DMC_01_disable_soft_limit (U16 CardNo, U16 NodeID,U16 SlotID)

■ **Purpose**

Disables the software limit.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID

■ **Example**

U16 CardNo=0, NodeID=1, SlotID=0;
I16 status = _DMC_01_disable_soft_limit(CardNo, NodeID, SlotID);

17.4 _DMC_01_get_soft_limit_status

■ **FORMAT**

I16 PASCAL _DMC_01_get_soft_limit_status (U16 CardNo, U16 NodeID, U16 SlotID, U16* PLimit_sts,U16* NLimit_sts)

■ **Purpose**

Retrieves the positive/negative status of the software limit during motion.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
PLimit_sts	U16*	Flag	0: No contact with positive software limit 1: Contact with positive software limit
NLimit_sts	U16*	Flag	0: No contact with negative software limit 1: Contact with negative software limit

■ **Example**

U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
U16 PLimit_sts, NLimit_sts;
I16 status= _DMC_01_get_soft_limit_status(CardNo, NodeID, SlotID, &PLimit_sts, &NLimit_sts)

Chapter 18 1-Axis Motion Control API

Table 18.1

Function Name	Description
_DMC_01_start_tr_move	Motion displacement using relative coordinates with T-curve velocity cross-section.
_DMC_01_start_sr_move	Motion displacement using relative coordinates with S-curve velocity cross-section.
_DMC_01_start_ta_move	Motion displacement using absolute coordinates with T-curve velocity cross-section.
_DMC_01_start_sa_move	Motion displacement using absolute coordinates with S-curve velocity cross-section.
_DMC_01_p_change	Replace current position with new position value
_DMC_01_v_change	Replace current motion velocity with new velocity value
_DMC_01_start_tr_move_2seg	2nd motion displacement using relative coordinates with T-curve velocity cross-section
_DMC_01_start_sr_move_2seg	2nd motion displacement using relative coordinates with S-curve velocity cross-section
_DMC_01_start_ta_move_2seg	2nd motion displacement using absolute coordinates with T-curve velocity cross-section
_DMC_01_start_sa_move_2seg	2nd motion displacement using absolute coordinates with S-curve velocity cross-section
_DMC_01_start_tr_move_2seg2	2nd motion displacement using relative coordinates with T-curve velocity cross-section
_DMC_01_start_sr_move_2seg2	2nd motion displacement using relative coordinates with S-curve velocity cross-section
_DMC_01_start_ta_move_2seg2	2nd motion displacement using absolute coordinates with T-curve velocity cross-section
_DMC_01_start_sa_move_2seg2	2nd motion displacement using absolute coordinates with S-curve velocity cross-section
_DMC_01_feedrate_overwrite	Change motion speed or speed ratio
_DMC_01_start_v3_move	Single-axis motion displacement with EndVel added

18.1 _DMC_01_start_tr_move

■ FORMAT

I16 PASCAL _DMC_01_start_tr_move(U16 CardNo, U16 NodeID,U16 SlotID, I32 Dist, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec)

■ Purpose

Motion displacement using relative coordinates with T-curve velocity cross-section. Please see Fig. 18.1 for more detailed information.

※When setting StrVel, make sure its value is smaller than MaxVel.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
Dist	I32	Number of pulses	Specified distance in relative coordinates
StrVel	I32	Pulses per second	Starting velocity
MaxVel	I32	Pulses per second	Maximum velocity
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time

■ Description

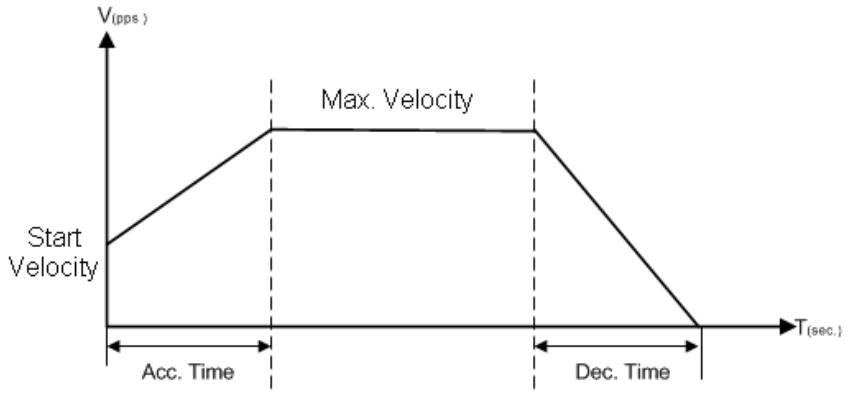


Figure 18.1 Motion displacement using relative coordinates with T-curve velocity cross-section

■ Example

U16 CardNo=0, NodeID =1, SlotID=0;
I32 Dist=100000, StrVel=0, MaxVel=50000;
F64 Tacc=0.1, Tdec=0.1;
I16 status= _DMC_01_start_tr_move (CardNo, NodeID, SlotID, Dist, StrVel, MaxVel, Tacc, Tdec);

18.2 _DMC_01_start_sr_move

■ FORMAT

I16 PASCAL _DMC_01_start_sr_move(U16 CardNo, U16 NodeID,U16 SlotID, I32 Dist, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec)

■ Purpose

Motion displacement using relative coordinates with S-curve velocity cross-section. Please see Fig. 18.2 for more detailed information.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
Dist	I32	Number of pulses	Specified distance in relative coordinates
StrVel	I32	Pulses per second	Starting velocity
MaxVel	I32	Pulses per second	Maximum velocity
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time

■ Description

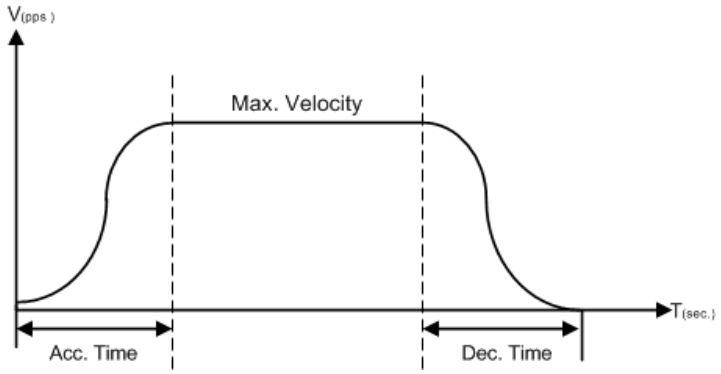


Figure 18.2 Motion displacement using relative coordinates with S-curve velocity cross-section

■ Example

U16 CardNo=0, NodeID =1, SlotID=0;
I32 Dist=100000, StrVel=0, MaxVel=30000;
F64 Tacc=0.1, Tdec=0.1;
I16 status= _DMC_01_start_sr _move (CardNo, NodeID, SlotID, Dist, StrVel, MaxVel, Tacc, Tdec);

18.3 _DMC_01_start_ta_move

■ FORMAT

I16 PASCAL _DMC_01_start_ta_move(U16 CardNo, U16 NodeID,U16 SlotID, I32 Dist, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec)

■ Purpose

Motion displacement using absolute coordinates with T-curve velocity cross-section.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
Dist	I32	Number of pulses	Specified distance in absolute coordinates
StrVel	I32	Pulses per second	Starting velocity
MaxVel	I32	Pulses per second	Maximum velocity
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time

■ Example

U16 CardNo=0, NodeID =1, SlotID=0;
I32 Dist=100000;
I32 StrVel=0, MaxVel=50000;
F64 Tacc=0.1, Tdec=0.1;

I16 status= _DMC_01_start_ta_move (CardNo, NodeID, SlotID, Dist, StrVel, MaxVel, Tacc, Tdec);

18.4 _DMC_01_start_sa_move

■ **FORMAT**

I16 PASCAL _DMC_01_start_sa_move(U16 CardNo, U16 NodeID,U16 SlotID, I32 Dist, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec)

■ **Purpose**

Carries out motion displacement using absolute coordinates with S-curve velocity cross-section

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
Dist	I32	Number of pulses	Specified distance in absolute coordinates
StrVel	I32	Pulses per second	Starting velocity
MaxVel	I32	Pulses per second	Maximum velocity
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time

■ **Example**

U16 CardNo=0, NodeID =1, SlotID=0;
I32 Dist=100000;
I32 StrVel=0, MaxVel=30000;
F64 Tacc=0.1, Tdec=0.1;

I16 status= _DMC_01_start_sa_move (CardNo, NodeID, SlotID, Dist, StrVel, MaxVel, Tacc, Tdec);

18.5 _DMC_01_p_change

■ FORMAT

I16 PASCAL _DMC_01_p_change (U16 CardNo, U16 NodeID, U16 SlotID, I32 NewPos)

■ Purpose

Replaces the current position with a new position value.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
NewPos	I32	Number of pulses	Position parameter to be replaced

■ Example

U16 CardNo=0;U16 NodeID =1, SlotID=0;
I32 NewPos=100000;
I16 status= _DMC_01_p_change (CardNo, NodeID, SlotID, NewPos);

18.6 _DMC_01_v_change

■ FORMAT

I16 PASCAL _DMC_01_v_change (U16 CardNo, U16 NodeID, U16 SlotID, I32 NewSpeed, F64 sec)

■ Purpose

Replaces the current motion velocity with a new velocity value.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
NewSpeed	I32	Pulses per second	Velocity parameter to be changed
sec	F64	Second	Specified acceleration/deceleration time for velocity change.

■ Description

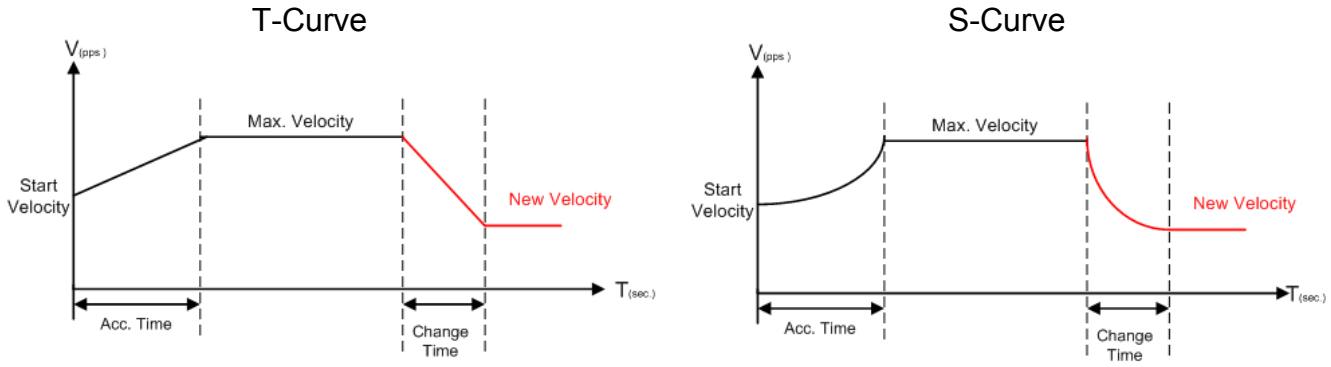


Figure 18.3 Changing the velocity parameter

■ Example

U16 CardNo=0;U16 NodeID =1, SlotID=0;
I32 NewSpeed=3000;
F64 sec=0.1;
I16 status= _DMC_01_v_change (CardNo, NodeID, SlotID, NewSpeed, sec);

※The V-change command can be used in both single- and multi-axis motions. For multi-axis motion, simply issue the command to the main servo.

18.7 _DMC_01_start_tr_move_2seg

■ FORMAT

I16 PASCAL _DMC_01_start_tr_move_2seg(U16 CardNo, U16 NodeID,U16 SlotID, I32 Dist, I32 Dist2, I32 StrVel, I32 MaxVel, I32 MaxVel2, F64 Tacc, F64 Tsec, F64 Tdec)

■ Purpose

2nd motion displacement using relative coordinates with T-curve velocity cross-section.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
Dist	I32	Number of pulses	Relative coordinates for first segment
Dist2	I32	Number of pulses	Relative coordinates for second segment
StrVel	I32	Pulses per second	Starting velocity
MaxVel	I32	Pulses per second	Maximum velocity for first segment
MaxVel2	I32	Pulses per second	Maximum velocity for second segment
Tacc	F64	Second	Specified acceleration time
Tsec	F64	Second	Acceleration/deceleration time when switching from first segment to second segment
Tdec	F64	Second	Deceleration time

■ Description

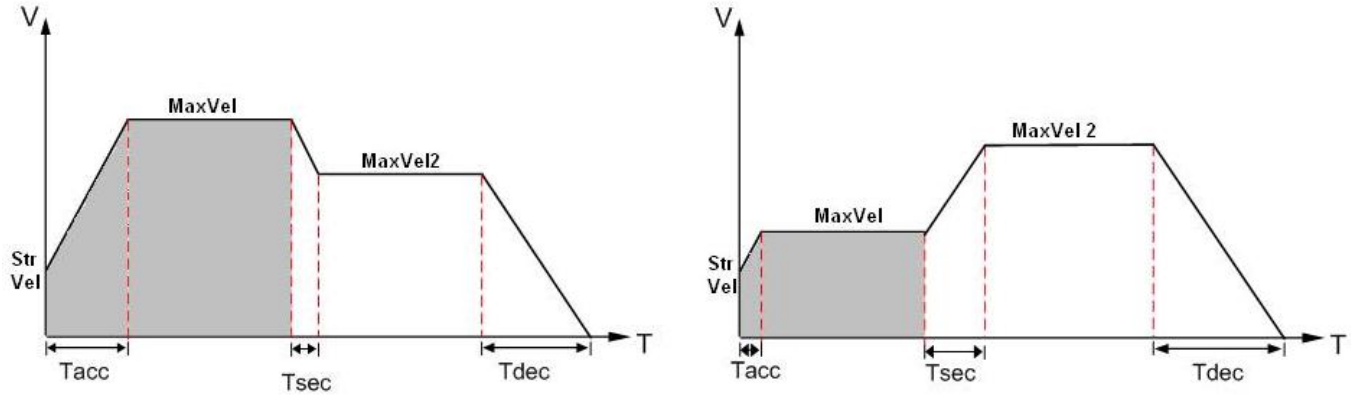


Figure 18.4 Motion displacement using relative coordinates with T-curve velocity cross-section (Gray area indicates Dist, white area indicates Dist2)

■ Example

```
U16 CardNo=0;
U16 NodeID =1;
U16 SlotID=0;
I32 Dist=500000;
I32 Dist2=500000
I32 StrVel=1000;
I32 MaxVel=10000;
I32 MaxVel2=30000;
F64 Tacc=0.1;
F64 Tsec=0.1;
F64 Tdec=0.1;

I16 status= _DMC_01_start_tr_move_2seg (CardNo, NodeID, SlotID, Dist, Dist2, StrVel,
            MaxVel, MaxVel2, Tacc, Tsec, Tdec);
```

※Please note that Dist and Dist2 in the API parameters must be in the “same direction”. An example of incorrect settings is shown in Fig. 18.5.

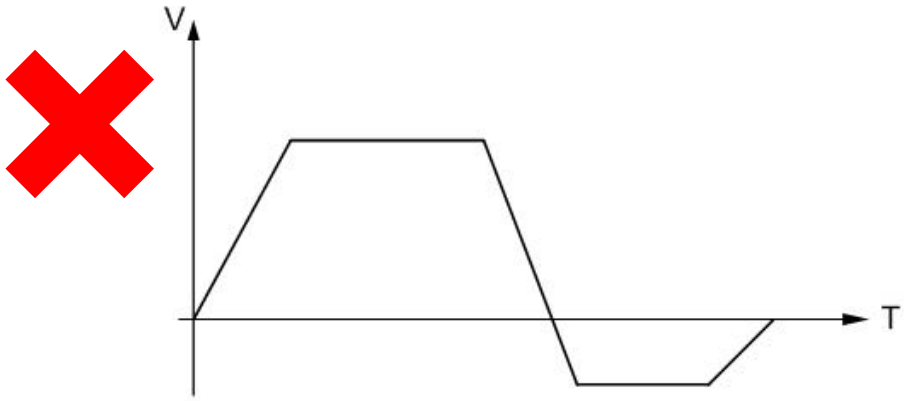


Figure 18.5 Incorrect settings: Dist and Dist2 are not in the same direction

18.8 _DMC_01_start_sr_move_2seg

■ **FORMAT**

I16 PASCAL _DMC_01_start_sr_move_2seg(U16 CardNo, U16 NodeID,U16 SlotID, I32 Dist, I32 Dist2, I32 StrVel, I32 MaxVel, I32 MaxVel2, F64 Tacc, F64 Tsec, F64 Tdec)

■ **Purpose**

2nd motion displacement using relative coordinates with S-curve velocity cross-section.

※Motion Buffer will be cleared before this function is executed.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
Dist	I32	Number of pulses	Relative coordinates for first segment
Dist2	I32	Number of pulses	Relative coordinates for second segment
StrVel	I32	Pulses per second	Starting velocity
MaxVel	I32	Pulses per second	Maximum velocity for first segment
MaxVel2	I32	Pulses per second	Maximum velocity for second segment
Tacc	F64	Second	Specified acceleration time
Tsec	F64	Second	Acceleration/deceleration time when switching from first segment to second segment
Tdec	F64	Second	Deceleration time

■ **Example**

```
U16 CardNo=0, NodeID =1, SlotID=0;
I32 Dist=500000, Dist2=500000
I32 StrVel=1000;
I32 MaxVel=10000, MaxVel2=30000;
F64 Tacc=0.1;
F64 Tsec=0.1;
F64 Tdec=0.1;
I16 status= _DMC_01_start_sr_move_2seg (CardNo, NodeID, SlotID, Dist, Dist2, StrVel,
            MaxVel, MaxVel2, Tacc, Tsec, Tdec);
```

18.9 _DMC_01_start_ta_move_2seg

■ **FORMAT**

I16 PASCAL _DMC_01_start_ta_move_2seg(U16 CardNo, U16 NodeID,U16 SlotID, I32 Dist, I32 Dist2, I32 StrVel, I32 MaxVel, I32 MaxVel2, F64 Tacc, F64 Tsec, F64 Tdec)

■ **Purpose**

2nd motion displacement using absolute coordinates with T-curve velocity cross-section.
※Motion Buffer will be cleared before this function is executed.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
Dist	I32	Number of pulses	Absolute coordinates for first segment
Dist2	I32	Number of pulses	Absolute coordinates for second segment
StrVel	I32	Pulses per second	Starting velocity
MaxVel	I32	Pulses per second	Maximum velocity for first segment
MaxVel2	I32	Pulses per second	Maximum velocity for second segment
Tacc	F64	Second	Specified acceleration time
Tsec	F64	Second	Acceleration/deceleration time when switching from first segment to second segment
Tdec	F64	Second	Deceleration time

■ **Example**

```
U16 CardNo=0, NodeID =1, SlotID=0;
I32 Dist=500000, Dist2=500000
I32 StrVel=1000;
I32 MaxVel=10000, MaxVel2=30000;
F64 Tacc=0.1;
F64 Tsec=0.1;
F64 Tdec=0.1;
I16 status= _DMC_01_start_ta_move_2seg (CardNo, NodeID, SlotID, Dist, Dist2, StrVel,
            MaxVel, MaxVel2, Tacc, Tsec, Tdec);
```

18.10 _DMC_01_start_sa_move_2seg

■ **FORMAT**

I16 PASCAL _DMC_01_start_sa_move_2seg(U16 CardNo, U16 NodeID,U16 SlotID, I32 Dist, I32 Dist2, I32 StrVel, I32 MaxVel, I32 MaxVel2, F64 Tacc, F64 Tsec, F64 Tdec)

■ **Purpose**

2nd motion displacement using absolute coordinates with S-curve velocity cross-section.
※Motion Buffer will be cleared before this function is executed.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
Dist	I32	Number of pulses	Absolute coordinates for first segment
Dist2	I32	Number of pulses	Absolute coordinates for second segment
StrVel	I32	Pulses per second	Starting velocity
MaxVel	I32	Pulses per second	Maximum velocity for first segment
MaxVel2	I32	Pulses per second	Maximum velocity for second segment
Tacc	F64	Second	Specified acceleration time
Tsec	F64	Second	Acceleration/deceleration time when switching from first segment to second segment
Tdec	F64	Second	Deceleration time

■ **Example**

```
U16 CardNo=0, NodeID =1, SlotID=0;
I32 Dist=500000, Dist2=500000
I32 StrVel=1000;
I32 MaxVel=10000, MaxVel2=30000;
F64 Tacc=0.1;
F64 Tsec=0.1;
F64 Tdec=0.1;
I16 status= _DMC_01_start_sa_move_2seg (CardNo, NodeID, SlotID, Dist, Dist2, StrVel,
            MaxVel, MaxVel2, Tacc, Tsec, Tdec);
```

18.11 _DMC_01_start_tr_move_2seg2

■ FORMAT

I16 PASCAL _DMC_01_start_tr_move_2seg2 (U16 CardNo, U16 NodeID,U16 SlotID, I32 Dist, I32 Dist2, I32 StrVel, I32 MaxVel, I32 MaxVel2, F64 Tacc, F64 Tsec, F64 Tdec)

■ Purpose

2nd motion displacement using relative coordinates with T-curve velocity cross-section.

※Motion Buffer will be cleared before this function is executed.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
Dist	I32	Number of pulses	Relative coordinates for first segment
Dist2	I32	Number of pulses	Relative coordinates for second segment
StrVel	I32	Pulses per second	Starting velocity
MaxVel	I32	Pulses per second	Maximum velocity for first segment
MaxVel2	I32	Pulses per second	Maximum velocity for second segment
Tacc	F64	Second	Specified acceleration time
Tsec	F64	Second	Acceleration/deceleration time when switching from first segment to second segment
Tdec	F64	Second	Deceleration time

■ Description

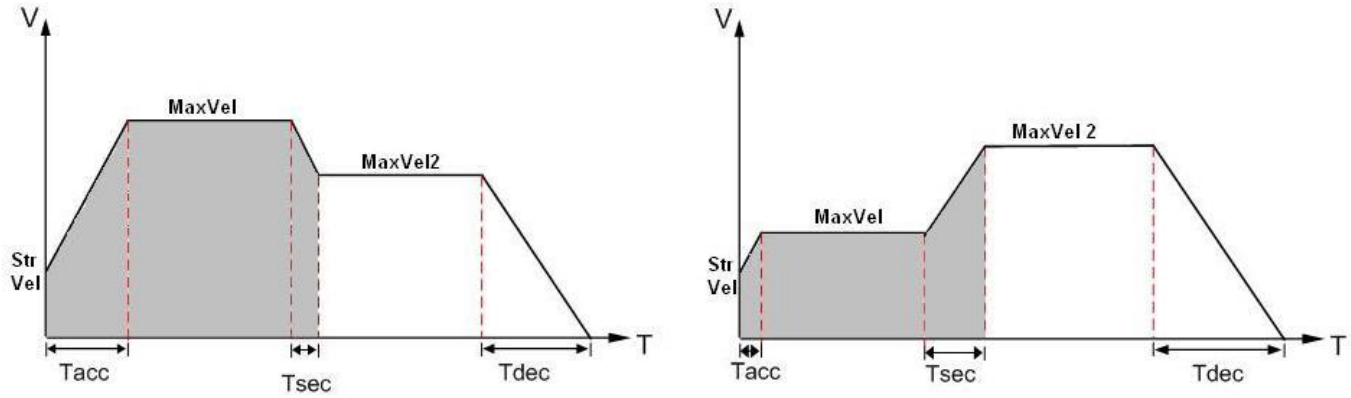


Figure 18.6 Motion displacement using relative coordinates with T-curve velocity cross-section (Gray area indicates Dist, white area indicates Dist2)

■ **Example**

```
U16 CardNo=0, NodeID =1, SlotID=0;
I32 Dist=500000, Dist2=500000
I32 StrVel=1000;
I32 MaxVel=10000, MaxVel2=30000;
F64 Tacc=0.1;
F64 Tsec=0.1;
F64 Tdec=0.1;

I16 status= _DMC_01_start_tr_move_2seg2 (CardNo, NodeID, SlotID, Dist, Dist2, StrVel,
            MaxVel, MaxVel2, Tacc, Tsec, Tdec);
```

18.12 _DMC_01_start_sr_move_2seg2

■ **FORMAT**

I16 PASCAL _DMC_01_start_sr_move_2seg2 (U16 CardNo, U16 NodeID,U16 SlotID, I32 Dist, I32 Dist2, I32 StrVel, I32 MaxVel, I32 MaxVel2, F64 Tacc, F64 Tsec, F64 Tdec)

■ **Purpose**

2nd motion displacement using relative coordinates with S-curve velocity cross-section.
※Motion Buffer will be cleared before this function is executed.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
Dist	I32	Number of pulses	Relative coordinates for first segment
Dist2	I32	Number of pulses	Relative coordinates for second segment
StrVel	I32	Pulses per second	Starting velocity
MaxVel	I32	Pulses per second	Maximum velocity for first segment
MaxVel2	I32	Pulses per second	Maximum velocity for second segment
Tacc	F64	Second	Specified acceleration time
Tsec	F64	Second	Acceleration/deceleration time when switching from first segment to second segment
Tdec	F64	Second	Deceleration time

■ **Example**

```
U16 CardNo=0, NodeID =1, SlotID=0;
I32 Dist=500000, Dist2=500000
I32 StrVel=1000;
I32 MaxVel=10000, MaxVel2=30000;
F64 Tacc=0.1;
F64 Tsec=0.1;
F64 Tdec=0.1;
I16 status= _DMC_01_start_sr_move_2seg2 (CardNo, NodeID, SlotID, Dist, Dist2, StrVel,
            MaxVel, MaxVel2, Tacc, Tsec, Tdec);
```

18.13 _DMC_01_start_ta_move_2seg2

■ **FORMAT**

I16 PASCAL _DMC_01_start_ta_move_2seg2 (U16 CardNo, U16 NodeID,U16 SlotID, I32 Dist, I32 Dist2, I32 StrVel, I32 MaxVel, I32 MaxVel2, F64 Tacc, F64 Tsec, F64 Tdec)

■ **Purpose**

2nd motion displacement using absolute coordinates with T-curve velocity cross-section.
※Motion Buffer will be cleared before this function is executed.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
Dist	I32	Number of pulses	Absolute coordinates for first segment
Dist2	I32	Number of pulses	Absolute coordinates for second segment
StrVel	I32	Pulses per second	Starting velocity
MaxVel	I32	Pulses per second	Maximum velocity for first segment
MaxVel2	I32	Pulses per second	Maximum velocity for second segment
Tacc	F64	Second	Specified acceleration time
Tsec	F64	Second	Acceleration/deceleration time when switching from first segment to second segment
Tdec	F64	Second	Deceleration time

■ **Example**

```
U16 CardNo=0, NodeID =1, SlotID=0;
I32 Dist=500000, Dist2=500000
I32 StrVel=1000;
I32 MaxVel=10000, MaxVel2=30000;
F64 Tacc=0.1;
F64 Tsec=0.1;
F64 Tdec=0.1;
I16 status= _DMC_01_start_ta_move_2seg2 (CardNo, NodeID, SlotID, Dist, Dist2, StrVel,
            MaxVel, MaxVel2, Tacc, Tsec, Tdec);
```

18.14 _DMC_01_start_sa_move_2seg2

■ **FORMAT**

I16 PASCAL _DMC_01_start_sa_move_2seg2 (U16 CardNo, U16 NodeID,U16 SlotID, I32 Dist, I32 Dist2, I32 StrVel, I32 MaxVel, I32 MaxVel2, F64 Tacc, F64 Tsec, F64 Tdec)

■ **Purpose**

2nd motion displacement using absolute coordinates with S-curve velocity cross-section.
※Motion Buffer will be cleared before this function is executed.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
Dist	I32	Number of pulses	Absolute coordinates for first segment
Dist2	I32	Number of pulses	Absolute coordinates for second segment
StrVel	I32	Pulses per second	Starting velocity
MaxVel	I32	Pulses per second	Maximum velocity for first segment
MaxVel2	I32	Pulses per second	Maximum velocity for second segment
Tacc	F64	Second	Specified acceleration time
Tsec	F64	Second	Acceleration/deceleration time when switching from first segment to second segment
Tdec	F64	Second	Deceleration time

■ **Example**

```
U16 CardNo=0, NodeID =1, SlotID=0;
I32 Dist=500000, Dist2=500000
I32 StrVel=1000;
I32 MaxVel=10000, MaxVel2=30000;
F64 Tacc=0.1;
F64 Tsec=0.1;
F64 Tdec=0.1;
I16 status= _DMC_01_start_sa_move_2seg2 (CardNo, NodeID, SlotID, Dist, Dist2, StrVel,
            MaxVel, MaxVel2, Tacc, Tsec, Tdec);
```

18.15 _DMC_01_feedrate_overwrite

■ FORMAT

I16 PASCAL _DMC_01_feedrate_overwrite (U16 CardNo, U16 NodeID, U16 SlotID, U16 Mode, I32 New_Speed, F64 sec)

■ Purpose

Changes motion speed or speed ratio.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
Mode	U16	Selection	0: Like V_Change, this changes speed of current motion. 1: Can be executed whether there is a motion in progress or not. Changes the velocity for the current and all subsequent motions. 2: Can be executed whether there is a motion in progress or not. Changes the speed ratio of current and all subsequent motions. Range is 0% ~ 1000%.
NewSpeed	I32	Pulses per second	Velocity parameter to be changed
sec	F64	Second	Specified acceleration/deceleration time for velocity change.

■ Description

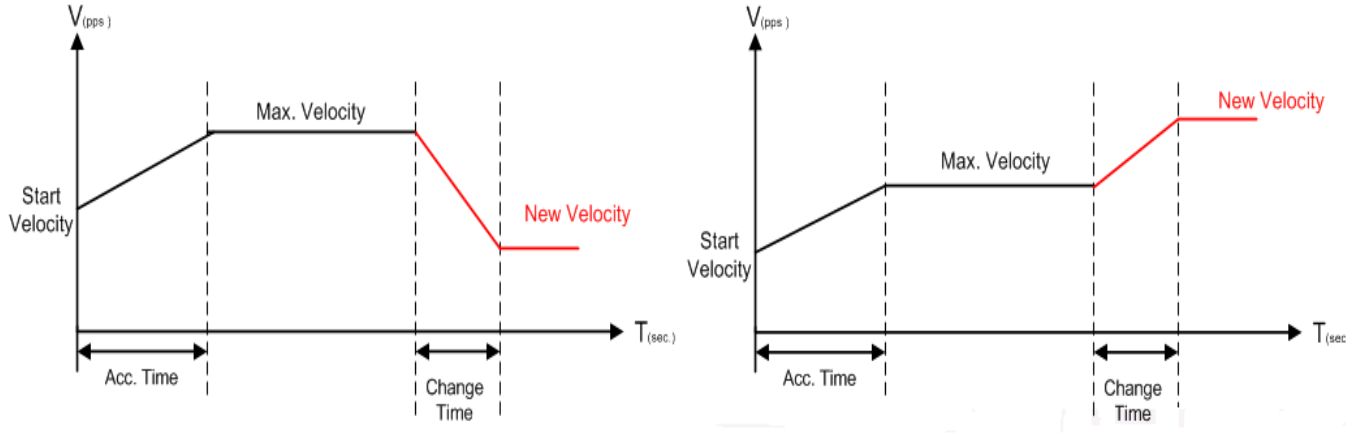


Figure 18.7 Mode = 0 change to new speed

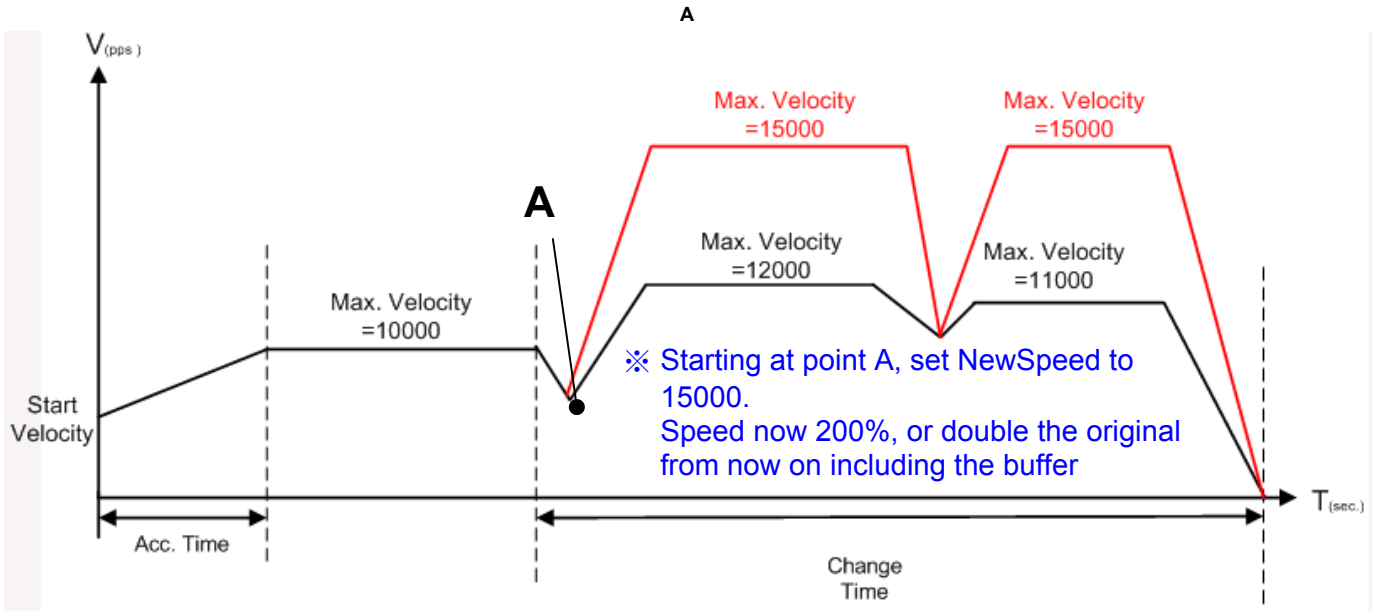


Figure 18.8 Mode = 1 change to new speed

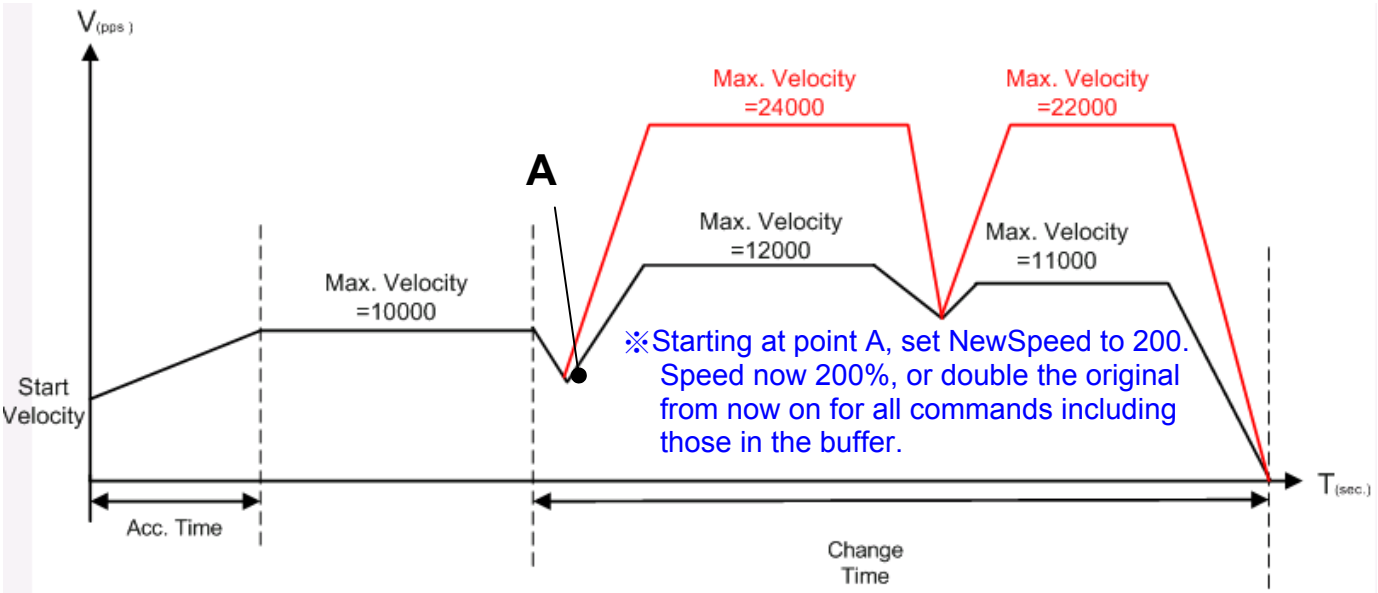


Figure 18.9 Mode = 2 change to new speed ratio

■ Example

U16 CardNo=0; U16 NodeID =1, SlotID=0, Mode=0;

I32 NewSpeed=3000;

F64 sec=0.1;

I16 status= _DMC_01_feedrate_overwrite (CardNo, NodeID, SlotID, Mode, NewSpeed, sec);

18.16 _DMC_01_start_v3_move

■ FORMAT

I16 PASCAL _DMC_01_start_v3_move(U16 CardNo, U16 NodeID,U16 SlotID, I32 Dist, I32 StrVel, I32 ConstVel, I32 EndVel, F64 TPhase1, F64 TPhase2, U16 m_curve, U16 m_r_a)

■ Purpose

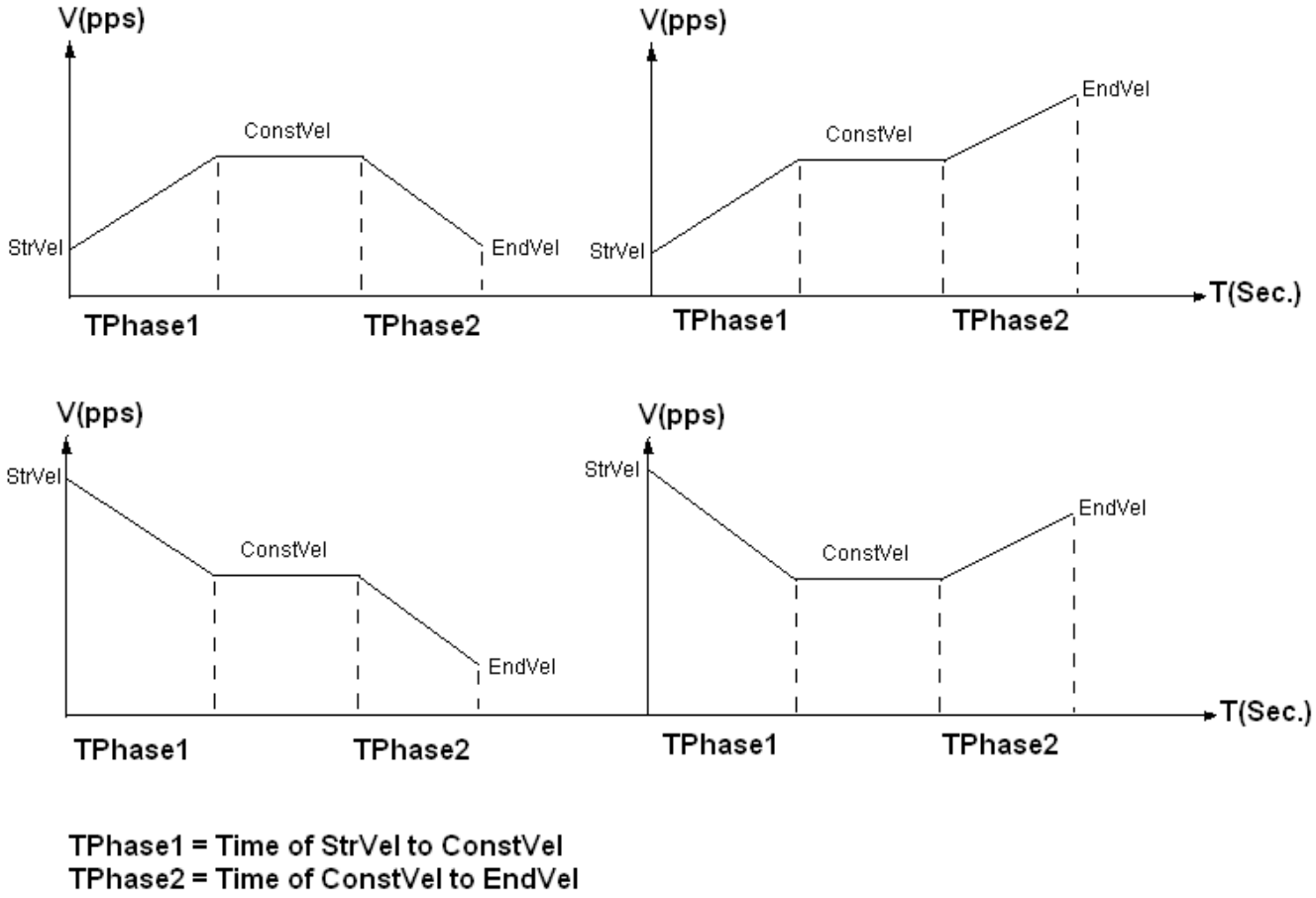
Single-axis motion displacement with EndVel added.

※Values of StrVel and EndVel can be greater than ConstVel.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
Dist	I32	Number of pulses	Specified motion path
StrVel	I32	Pulses per second	Starting velocity
ConstVel	I32	Pulses per second	Constant velocity
EndVel	I32	Pulses per second	End velocity
TPhase1	F64	Second	Time from StartVel to ConstVel
TPhase2	F64	Second	Time from ConstVel to EndVel
m_curve	U16	Selection	1: T-curve 2: S-curve
m_r_a	U16	Selection	0: Relative motion displacement 1: Absolute motion displacement

■ Description



TPhase1 = Time of StrVel to ConstVel
TPhase2 = Time of ConstVel to EndVel

Figure 18.10 Explanation of TPhase1 and TPhase2

■ Example

U16 CardNo=0; U16 NodeID =1, SlotID=0;
I32 Dist=100000, StrVel=0, ConstVel=50000, EndVel=20000;
F64 TPhase1=0.2, TPhase2=0.1;
U16 m_curve=1, m_r_a=0;

I16 status= _DMC_01_start_v3_move (CardNo, NodeID, SlotID, Dist, StrVel, ConstVel, EndVel, TPhase1, TPhase2, m_curve, m_r_a);

Chapter 19 2-Axis Linear Interpolation Motion Control API

Table 19.1

Function Name	Description
_DMC_01_start_tr_move_xy	2-axis Linear interpolation motion using relative coordinates with T-curve velocity cross-section
_DMC_01_start_sr_move_xy	2-axis Linear interpolation motion using relative coordinates with S-curve velocity cross-section
_DMC_01_start_ta_move_xy	2-axis Linear interpolation motion using absolute coordinates with T-curve velocity cross-section
_DMC_01_start_sa_move_xy	2-axis Linear interpolation motion using absolute coordinates with S-curve velocity cross-section
_DMC_01_start_v3_move_xy	2-axis linear interpolation motion with EndVel added

19.1 _DMC_01_start_tr_move_xy

■ **FORMAT**

I16 PASCAL _DMC_01_start_tr_move_xy(U16 CardNo, U16* NodeID,U16* SlotID, I32 DisX, I32 DisY, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec)

■ **Purpose**

2-axis linear interpolation motion using relative coordinates with T-curve velocity cross-section.

※When setting StrVel, make sure that its value is smaller than MaxVel.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	Node ID of card used for motion displacement along X-axis and Y-axis
NodeIDArray	U16*	Number Unit	Holds Node ID sets used for linear interpolation NodeIDArray[0] holds the 1st set of Node ID NodeIDArray[1] holds the 2nd set of Node ID
SlotID	U16*	Number Unit	Slot ID
DisX	I32	Number of pulses	Relative path parameter for motion of Node ID on X-axis
DisY	I32	Number of pulses	Relative path parameter for motion of Node ID on Y-axis
StrVel	I32	Pulses per second	Starting velocity parameter
MaxVel	I32	Pulses per second	Maximum velocity parameter
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time

■ Description

As shown in Fig. 19.1, 2-axis linear interpolation means Position moving by X and Y from P0 to P1. The two axes will start and end at the same time. Motion displacement will also be on the same straight line.

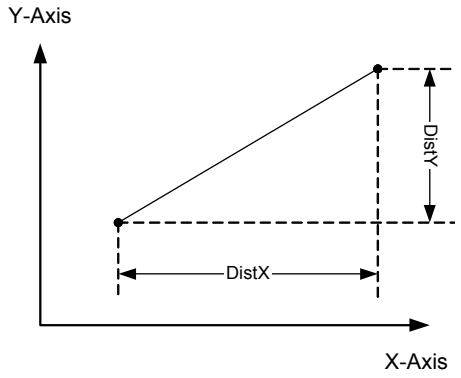


Figure 19.1

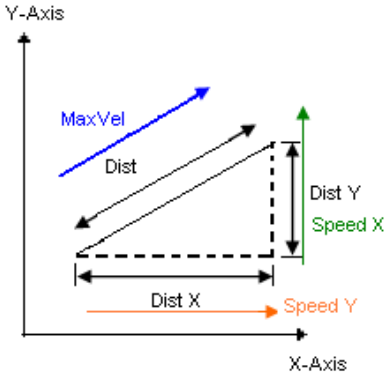


Figure 19.2

The relationship between speed ratio and velocity when moving along the X and Y axes (DistX:DistY) is as follows:

$$\frac{\Delta P}{\Delta t} = \sqrt{\left(\frac{DistX}{\Delta t}\right)^2 + \left(\frac{DistY}{\Delta t}\right)^2}$$

From the above, as shown in Fig. 19.2, it can be seen that the relationship between Maximum velocity (MaxVel), speed of X-axis (speed X), and speed of Y-axis (speed Y) is as follows:

$$\text{Speed X} = \frac{\text{MaxVel} \times \text{Dist X}}{\text{Dist}} \quad , \quad \text{Speed Y} = \frac{\text{MaxVel} \times \text{Dist Y}}{\text{Dist}}$$

■ Example

```
U16 CardNo=0;
U16 NodeIDArray[2]={1,2};
U16 SlotID[2] ={0, 0};
I32 DisX=30000;
I32 DisY=40000;
I32 StrVel=0;
I32 MaxVel=3000;
F64 Tacc=0.1;
F64 Tdec=0.1;

I16 status= _DMC_01_start_tr_move_xy (CardNo, NodeIDArray, SlotID, DistX, DistY, StrVel,
MaxVel, Tacc, Tdec);
// When MaxVel is set as 3000RPM, speed X is then 1800RPM; speed Y is 2400RPM
```

19.2 _DMC_01_start_sr_move_xy

■ **FORMAT**

I16 PASCAL _DMC_01_start_sr_move_xy(U16 CardNo, U16* NodeID,U16* SlotID, I32 DisX, I32 DisY, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec)

■ **Purpose**

2-axis linear interpolation motion using relative coordinates with S-curve velocity cross-section.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	Node ID of card used for motion displacement along X-axis and Y-axis
NodeIDArray	U16*	Number Unit	Holds Node ID sets used for linear interpolation NodeIDArray[0] holds the 1st set of Node ID NodeIDArray[1] holds the 2nd set of Node ID
SlotID	U16*	Number Unit	Slot ID
DisX	I32	Number of pulses	Relative path parameter for motion of Node ID on X-axis
DisY	I32	Number of pulses	Relative path parameter for motion of Node ID on Y-axis
StrVel	I32	Pulses per second	Starting velocity parameter
MaxVel	I32	Pulses per second	Maximum velocity parameter
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time

- **Example**

```
U16 CardNo=0;
U16 NodeIDArray[2]={1,2};
U16 SlotID[2] ={0, 0};
I32 DisX=50000;
I32 DisY 100000;
I32 StrVel=0;
I32 MaxVel=50000;
F64 Tacc=0.1;
F64 Tdec=0.1;
I16 status= _DMC_01_start_sr_move_xy (CardNo, NodeIDArray, SlotID, DistX, DistY, StrVel,
MaxVel, Tacc, Tdec);
```

19.3 _DMC_01_start_ta_move_xy

- **FORMAT**

  I16 PASCAL _DMC_01_start_ta_move_xy(U16 CardNo, U16* NodeID,U16* SlotID, I32 DisX, I32 DisY, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec)

- **Purpose**

  2-axis linear interpolation motion using absolute coordinates with T-curve velocity cross-section.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	Node ID of card used for motion displacement along X-axis and Y-axis
NodeIDArray	U16*	Number Unit	Holds Node ID sets used for linear interpolation NodeIDArray[0] holds the 1st set of Node ID NodeIDArray[1] holds the 2nd set of Node ID
SlotID	U16*	Number Unit	Slot ID
DisX	I32	Number of pulses	Absolute path parameter for motion of Node ID on X-axis
DisY	I32	Number of pulses	Absolute path parameter for motion of Node ID on Y-axis
StrVel	I32	Pulses per second	Starting velocity parameter
MaxVel	I32	Pulses per second	Maximum velocity parameter
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time

Example

```
U16 CardNo=0;
U16 NodeIDArray[2]={1,2};
U16 SlotID[2] ={0, 0};
I32 DisX=50000;
I32 DisY 100000;
I32 StrVel=0;
I32 MaxVel=50000;
F64 Tacc=0.1;
F64 Tdec=0.1;

I16 status= _DMC_01_start_ta_move_xy (CardNo, NodeIDArray, SlotID, DistX, DistY, StrVel,
MaxVel, Tacc, Tdec);
```

19.4 _DMC_01_start_sa_move_xy

- **FORMAT**

  I16 PASCAL _DMC_01_start_sa_move_xy(U16 CardNo, U16* NodeID,U16* SlotID, I32 DisX, I32 DisY, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec)

- **Purpose**

  2-axis linear interpolation motion using absolute coordinates with S-curve velocity cross-section.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	Node ID of card used for motion displacement along X-axis and Y-axis
NodeIDArray	U16*	Number Unit	Holds Node ID sets used for linear interpolation NodeIDArray[0] holds the 1st set of Node ID NodeIDArray[1] holds the 2nd set of Node ID
SlotID	U16*	Number Unit	Slot ID
DisX	I32	Number of pulses	Absolute path parameter for motion of Node ID on X-axis
DisY	I32	Number of pulses	Absolute path parameter for motion of Node ID on Y-axis
StrVel	I32	Pulses per second	Starting velocity parameter
MaxVel	I32	Pulses per second	Maximum velocity parameter
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time

- **Example**

```
U16 CardNo=0;
U16 NodeIDArray[2]={0,1};
U16 SlotID[2]={0, 0};
I32 DisX=50000;
I32 DisY 100000;
I32 StrVel=0;
I32 MaxVel=50000;
F64 Tacc=0.1;
F64 Tdec=0.1;

I16 status= _DMC_01_start_sa_move_xy (CardNo, NodeIDArray, SlotID, DistX, DistY, StrVel,
MaxVel, Tacc, Tdec);
```

19.5 _DMC_01_start_v3_move_xy

■ **FORMAT**

I16 PASCAL _DMC_01_start_v3_move_xy(U16 CardNo, U16* NodeID,U16* SlotID, I32 DisX, I32 DisY, I32 StrVel, I32 ConstVel, I32 EndVel, F64 TPhase1, F64 TPhase2, U16 m_curve, U16 m_r_a)

■ **Purpose**

2-axis linear interpolation motion with EndVel added.

※Values of StrVel and EndVel can be greater than MaxVel.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	Node ID of card used for motion displacement along X-axis and Y-axis
NodeIDArray	U16*	Number Unit	Holds Node ID sets used for linear interpolation NodeIDArray[0] holds the 1st set of Node ID NodeIDArray[1] holds the 2nd set of Node ID
SlotID	U16*	Number Unit	Slot ID
DisX	I32	Number of pulses	Distance corresponding to motion of Node ID on X-axis
DisY	I32	Number of pulses	Path for motion of Node ID on Y-axis
StrVel	I32	Pulses per second	Starting velocity parameter
ConstVel	I32	Pulses per second	Constant velocity
EndVel	I32	Pulses per second	End velocity
TPhase1	F64	Second	Time from StartVel to ConstVel
TPhase2	F64	Second	Time from ConstVel to EndVel
m_curve	U16	Selection	1: GT-curve 2: GS-curve
m_r_a	U16	Selection	0: Relative motion displacement 1: Absolute motion displacement

■ **Example**

```
U16 CardNo=0;
U16 NodeIDArray[2]={0,1};
U16 SlotID[2]={0, 0};
I32 DisX=50000;
I32 DisY= 100000;
I32 StrVel=0;
I32 ConstVel=50000;
I32 EndVel=20000;
F64 TPhase1=0.2;
F64 TPhase2=0.1;
U16 m_curve=1, m_r_a=0;

I16 status= _DMC_01_start_v3_move_xy (CardNo, NodeIDArray, SlotID, DistX, DistY, StrVel,
ConstVel, EndVel, TPhase1, TPhase2, m_curve, m_r_a);
```

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Chapter 20 2-Axis Arc Interpolation Motion Control API

Table 20.1

Function Name	Description
_DMC_01_start_tr_arc_xy	2-axis arc interpolation motion using relative coordinates with T-curve velocity cross-section (Known conditions: Center point coordinates, angle)
_DMC_01_start_sr_arc_xy	2-axis arc interpolation motion using relative coordinates with S-curve velocity cross-section (Known conditions: Center point coordinates, angle)
_DMC_01_start_ta_arc_xy	2-axis arc interpolation motion using absolute coordinates with T-curve velocity cross-section (Known conditions: Center point coordinates, angle)
_DMC_01_start_sa_arc_xy	2-axis arc interpolation motion using absolute coordinates with S-curve velocity cross-section (Known conditions: Center point coordinates, angle)
_DMC_01_start_tr_arc2_xy	2-axis arc interpolation motion using relative coordinates with T-curve velocity cross-section (Known conditions: Endpoint coordinates, angle)
_DMC_01_start_sr_arc2_xy	2-axis arc interpolation motion using relative coordinates with S-curve velocity cross-section (Known conditions: Endpoint coordinates, angle)
_DMC_01_start_ta_arc2_xy	2-axis arc interpolation motion using absolute coordinates with T-curve velocity cross-section (Known conditions: Endpoint coordinates, angle)
_DMC_01_start_sa_arc2_xy	2-axis arc interpolation motion using absolute coordinates with S-curve velocity cross-section (Known conditions: Endpoint coordinates, angle)

Function Name	Description
_DMC_01_start_tr_arc3_xy	2-axis arc interpolation motion using relative coordinates with T-curve velocity cross-section (Known conditions: Center point coordinates, endpoint coordinates)
_DMC_01_start_sr_arc3_xy	2-axis arc interpolation motion using relative coordinates with S-curve velocity cross-section (Known conditions: Center point coordinates, endpoint coordinates)
_DMC_01_start_ta_arc3_xy	2-axis arc interpolation motion using absolute coordinates with T-curve velocity cross-section (Known conditions: Center point coordinates, endpoint coordinates)
_DMC_01_start_sa_arc3_xy	2-axis arc interpolation motion using absolute coordinates with S-curve velocity cross-section (Known conditions: Center point coordinates, endpoint coordinates)
_DMC_01_start_spiral_xy	2-axis spiral motion (Known conditions: Center coordinates for X and Y axes)
_DMC_01_start_spiral2_xy	2-axis spiral motion (Known conditions: Center coordinates for X and Y axes, endpoint coordinates for X and Y axes)
_DMC_01_start_v3_arc_xy	2-axis arc interpolation motion with EndVel added (Known conditions: Center point coordinates, angle)
_DMC_01_start_v3_arc2_xy	2-axis arc interpolation motion with EndVel added (Known conditions: Endpoint coordinates, angle)
_DMC_01_start_v3_arc3_xy	2-axis arc interpolation motion with EndVel added (Known conditions: Center point coordinates, endpoint coordinates)
_DMC_01_start_v3_spiral_xy	2-axis spiral motion with EndVel added (Known conditions: Center coordinates for X and Y axes)
_DMC_01_start_v3_spiral2_xy	2-axis spiral motion with EndVel added (Known conditions: Center coordinates for X and Y axes, endpoint coordinates for X and Y axes)

20.1 _DMC_01_start_tr_arc_xy

■ FORMAT

I16 PASCAL _DMC_01_start_tr_arc_xy(U16 CardNo, U16* NodeID,U16* SlotID,
I32 Center_X, I32 Center_Y, F64 Angle, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec)

■ Purpose

2-axis arc interpolation motion using relative coordinates with T-curve velocity cross-section (Known conditions: center point coordinates, angle).

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	Node ID of card used for motion displacement along X-axis and Y-axis
NodeIDArray	U16*	Number Unit	Holds Node ID sets used for arc interpolation NodeIDArray[0] holds the 1st set of Node ID NodeIDArray[1] holds the 2nd set of Node ID
SlotID	U16*	Number Unit	Slot ID
Center_X	I32	Number of pulses	Relative center point X-coordinate on the specified axis
Center_Y	I32	Number of pulses	Relative center point Y-coordinate on the specified axis
Angle	F64	Degree (°)	Set arc angle. One full arc is 360^{o}
StrVel	I32	Pulses per second	Starting velocity parameter
MaxVel	I32	Pulses per second	Tangential velocity parameter
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time

■ Description

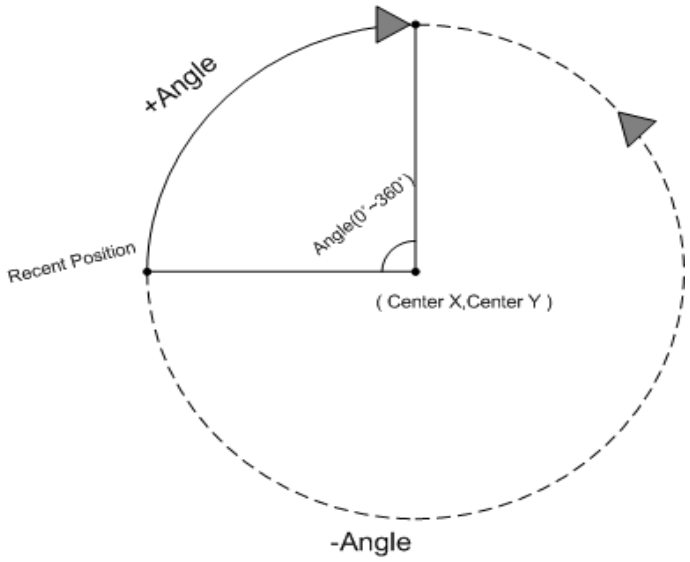


Figure 20.1

■ Example

```
U16 CardNo=0;
U16 NodeIDArray[2]={1,2};
U16 SlotID[2]={0, 0};
I32 Center_X =50000;
I32 Center_Y =50000;
I32 StrVel=0;
I32 MaxVel=50000;
F64 Angle=180;
F64 Tacc=0.1;
F64 Tdec=0.1;

I16 status= _DMC_01_start_tr_arc_xy (CardNo, NodeIDArray, SlotID, Center_X, Center_Y,
Angle, StrVel, MaxVel, Tacc, Tdec);
```

20.2 _DMC_01_start_sr_arc_xy

■ FORMAT

I16 PASCAL _DMC_01_start_sr_arc_xy(U16 CardNo, U16* NodeID,U16* SlotID,
I32 Center_X, I32 Center_Y, F64 Angle, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec)

■ Purpose

2-axis arc interpolation motion using relative coordinates with S-curve velocity cross-section (Known conditions: center point coordinates, angle).

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	Node ID of card used for motion displacement along X-axis and Y-axis
NodeIDArray	U16*	Number Unit	Holds Node ID sets used for arc interpolation NodeIDArray[0] holds the 1st set of Node ID NodeIDArray[1] holds the 2nd set of Node ID
SlotID	U16*	Number Unit	Slot ID
Center_X	I32	Number of pulses	Relative center point X-coordinate on the specified axis
Center_Y	I32	Number of pulses	Relative center point Y-coordinate on the specified axis
Angle	F64	Degree (°)	Set arc angle. One full arc is 360^{o}
StrVel	I32	Pulses per second	Starting velocity parameter
MaxVel	I32	Pulses per second	Tangential velocity parameter
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time

Example

```
U16 CardNo=0;
U16 NodeIDArray[2]={1,2};
U16 SlotID[2]={0, 0};
I32 Center_X =50000;
I32 Center_Y =50000;
I32 StrVel=0;
I32 MaxVel=50000;
F64 Angle=180;
F64 Tacc=0.1;
F64 Tdec=0.1;

I16 status= _DMC_01_start_sr_arc_xy (CardNo, NodeIDArray, SlotID, Center_X, Center_Y,
Angle, StrVel, MaxVel, Tacc, Tdec);
```

20.3 _DMC_01_start_ta_arc_xy

■ FORMAT

I16 PASCAL _DMC_01_start_ta_arc_xy(U16 CardNo, U16* NodeID,U16* SlotID,
I32 Center_X, I32 Center_Y, F64 Angle, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec)

■ Purpose

2-axis arc interpolation motion using absolute coordinates with T-curve velocity cross-section (Known conditions: center point coordinates, angle).

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	Node ID of card used for motion displacement along X-axis and Y-axis
NodeIDArray	U16*	Number Unit	Holds Node ID sets used for arc interpolation NodeIDArray[0] holds the 1st set of Node ID NodeIDArray[1] holds the 2nd set of Node ID
SlotID	U16*	Number Unit	Slot ID
Center_X	I32	Number of pulses	Absolute center point X-coordinate on the specified axis
Center_Y	I32	Number of pulses	Absolute center point Y-coordinate on the specified axis
Angle	F64	Degree (°)	Set arc angle. One full arc is 360^{o}
StrVel	I32	Pulses per second	Starting velocity parameter
MaxVel	I32	Pulses per second	Tangential velocity parameter
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time

Example

```
U16 CardNo=0;
U16 NodeIDArray[2]={1,2};
U16 SlotID[2]={0, 0};
I32 Center_X =50000;
I32 Center_Y =50000;
I32 StrVel=0;
I32 MaxVel=50000;
F64 Angle=180;
F64 Tacc=0.1;
F64 Tdec=0.1;

I16 status= _DMC_01_start_ta_arc_xy (CardNo, NodeIDArray, SlotID, Center_X, Center_Y,
Angle, StrVel, MaxVel, Tacc, Tdec);
```

20.4 _DMC_01_start_sa_arc_xy

■ FORMAT

I16 PASCAL _DMC_01_start_sa_arc_xy(U16 CardNo, U16* NodeID,U16* SlotID,
I32 Center_X, I32 Center_Y, F64 Angle, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec)

■ Purpose

2-axis arc interpolation motion using absolute coordinates with S-curve velocity cross-section (Known conditions: center point coordinates, angle).

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	Node ID of card used for motion displacement along X-axis and Y-axis
NodeIDArray	U16*	Number Unit	Holds Node ID sets used for arc interpolation NodeIDArray[0] holds the 1st set of Node ID NodeIDArray[1] holds the 2nd set of Node ID
SlotID	U16*	Number Unit	Slot ID
Center_X	I32	Number of pulses	Absolute center point X-coordinate on the specified axis
Center_Y	I32	Number of pulses	Absolute center point Y-coordinate on the specified axis
Angle	F64	Degree (°)	Set arc angle. One full arc is 360°
StrVel	I32	Pulses per second	Starting velocity parameter
MaxVel	I32	Pulses per second	Tangential velocity parameter
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time

Example

```
U16 CardNo=0;
U16 NodeIDArray[2]={1,2};
U16 SlotID[2]={0, 0};
I32 Center_X =50000;
I32 Center_Y =50000;
I32 StrVel=0;
I32 MaxVel=50000;
F64 Angle=180;
F64 Tacc=0.1;
F64 Tdec=0.1;

I16 status= _DMC_01_start_sa_arc_xy (CardNo, NodeIDArray, SlotID, Center_X, Center_Y,
Angle, StrVel, MaxVel, Tacc, Tdec);
```

20.5 _DMC_01_start_tr_arc2_xy

■ FORMAT

I16 PASCAL _DMC_01_start_tr_arc2_xy(U16 CardNo, U16* NodeID,U16* SlotID, I32 End_X, I32 End_Y, F64 Angle, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec)

■ Purpose

2-axis arc interpolation motion using relative coordinates with T-curve velocity cross-section (Known conditions: endpoint coordinates, angle).

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	Node ID of card used for motion displacement along X-axis and Y-axis
NodeIDArray	U16*	Number Unit	Holds Node ID sets used for arc interpolation NodeIDArray[0] holds the 1st set of Node ID NodeIDArray[1] holds the 2nd set of Node ID
SlotID	U16*	Number Unit	Slot ID
End_X	I32	Number of pulses	Relative endpoint X-coordinate on the specified axis
End_Y	I32	Number of pulses	Relative endpoint Y-coordinate on the specified axis
Angle	F64	Degree (°)	Set arc angle. One full arc is 360^{o}
StrVel	I32	Pulses per second	Starting velocity parameter
MaxVel	I32	Pulses per second	Tangential velocity parameter
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time

■ Description

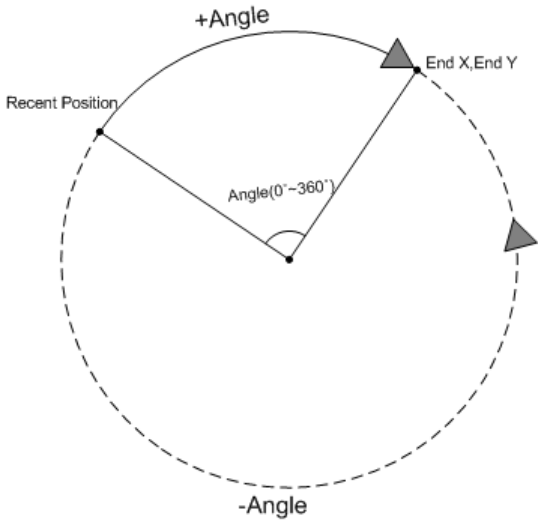


Figure 20.2

■ Example

```
U16 CardNo=0;
U16 NodeIDArray[2]={1,2};
U16 SlotID[2]={0, 0};
I32 End_X =-50000;
I32 End_Y =-50000;
I32 StrVel=0;
I32 MaxVel=50000;
F64 Angle=180;
F64 Tacc=0.1;
F64 Tdec=0.1;

I16 status= _DMC_01_start_tr_arc2_xy (CardNo, NodeIDArray, SlotID, End_X, End_Y, Angle,
StrVel, MaxVel, Tacc, Tdec);
```

20.6 _DMC_01_start_sr_arc2_xy

■ FORMAT

I16 PASCAL _DMC_01_start_sr_arc2_xy(U16 CardNo, U16* NodeID,U16* SlotID, I32 End_X, I32 End_Y, F64 Angle, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec)

■ Purpose

2-axis arc interpolation motion using relative coordinates with S-curve velocity cross-section (Known conditions: endpoint coordinates, angle).

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	Node ID of card used for motion displacement along X-axis and Y-axis
NodeIDArray	U16*	Number Unit	Holds Node ID sets used for arc interpolation NodeIDArray[0] holds the 1st set of Node ID NodeIDArray[1] holds the 2nd set of Node ID
SlotID	U16*	Number Unit	Slot ID
End_X	I32	Number of pulses	Relative endpoint X-coordinate on the specified axis
End_Y	I32	Number of pulses	Relative endpoint Y-coordinate on the specified axis
Angle	F64	Degree (°)	Set arc angle. One full arc is 360^{o}
StrVel	I32	Pulses per second	Starting velocity parameter
MaxVel	I32	Pulses per second	Tangential velocity parameter
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time

Example

```
U16 CardNo=0;
U16 NodeIDArray[2]={1,2};
U16 SlotID[2]={0, 0};
I32 End_X =-50000;
I32 End_Y =-50000;
I32 StrVel=0;
I32 MaxVel=50000;
F64 Angle=180;
F64 Tacc=0.1;
F64 Tdec=0.1;

I16 status= _DMC_01_start_sr_arc2_xy (CardNo, NodeIDArray, SlotID, End_X, End_Y, Angle,
StrVel, MaxVel, Tacc, Tdec);
```

20.7 _DMC_01_start_ta_arc2_xy

■ **FORMAT**

I16 PASCAL _DMC_01_start_ta_arc2_xy(U16 CardNo, U16* NodeID,U16* SlotID, I32 End_X, I32 End_Y, F64 Angle, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec)

■ **Purpose**

2-axis arc interpolation motion using absolute coordinates with T-curve velocity cross-section (Known conditions: endpoint coordinates, angle).

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	Node ID of card used for motion displacement along X-axis and Y-axis
NodeIDArray	U16*	Number Unit	Holds Node ID sets used for arc interpolation NodeIDArray[0] holds the 1st set of Node ID NodeIDArray[1] holds the 2nd set of Node ID
SlotID	U16*	Number Unit	Slot ID
End_X	I32	Number of pulses	Absolute endpoint X-coordinate on the specified axis
End_Y	I32	Number of pulses	Absolute endpoint Y-coordinate on the specified axis
Angle	F64	Degree (°)	Set arc angle. One full arc is 360^{o}
StrVel	I32	Pulses per second	Starting velocity parameter
MaxVel	I32	Pulses per second	Tangential velocity parameter
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time

Example

```
U16 CardNo=0;
U16 NodeIDArray[2]={1,2};
U16 SlotID[2]={0, 0};
I32 End_X =-50000;
I32 End_Y =-50000;
I32 StrVel=0;
I32 MaxVel=50000;
F64 Angle=180;
F64 Tacc=0.1;
F64 Tdec=0.1;

I16 status= _DMC_01_start_ta_arc2_xy (CardNo, NodeIDArray, SlotID, End_X, End_Y, Angle,
StrVel, MaxVel, Tacc, Tdec);
```

20.8 _DMC_01_start_sa_arc2_xy

■ FORMAT

I16 PASCAL _DMC_01_start_sa_arc2_xy(U16 CardNo, U16* NodeID,U16* SlotID, I32 End_X, I32 End_Y, F64 Angle, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec)

■ Purpose

2-axis arc interpolation motion using absolute coordinates with S-curve velocity cross-section (Known conditions: endpoint coordinates, angle).

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	Node ID of card used for motion displacement along X-axis and Y-axis
NodeIDArray	U16*	Number Unit	Holds Node ID sets used for arc interpolation NodeIDArray[0] holds the 1st set of Node ID NodeIDArray[1] holds the 2nd set of Node ID
SlotID	U16*	Number Unit	Slot ID
End_X	I32	Number of pulses	Absolute endpoint X-coordinate on the specified axis
End_Y	I32	Number of pulses	Absolute endpoint Y-coordinate on the specified axis
Angle	F64	Degree (°)	Set arc angle. One full arc is 360^{o}
StrVel	I32	Pulses per second	Starting velocity parameter
MaxVel	I32	Pulses per second	Tangential velocity parameter
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time

Example

```
U16 CardNo=0;
U16 NodeIDArray[2]={1,2};
U16 SlotID[2]={0, 0};
I32 End_X =-50000;
I32 End_Y =-50000;
I32 StrVel=0;
I32 MaxVel=50000;
F64 Angle=180;
F64 Tacc=0.1;
F64 Tdec=0.1;

I16 status= _DMC_01_start_sa_arc2_xy (CardNo, NodeIDArray, SlotID, End_X, End_Y,
Angle, StrVel, MaxVel, Tacc, Tdec);
```

20.9 _DMC_01_start_tr_arc3_xy

- **FORMAT**

  I16 PASCAL _DMC_01_start_tr_arc3_xy(U16 CardNo, U16* NodeID,U16* SlotID, I32 Center_X, I32 Center_Y,I32 End_X,I32 End_Y, I16 Dir, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec)

- **Purpose**

  2-axis arc interpolation motion using relative coordinates with T-curve velocity cross-section (Known conditions: center point coordinates, endpoint coordinates).

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	Node ID of card used for motion displacement along X-axis and Y-axis
NodeIDArray	U16*	Number Unit	Holds Node ID sets used for arc interpolation NodeIDArray[0] holds the 1st set of Node ID NodeIDArray[1] holds the 2nd set of Node ID
SlotID	U16*	Number Unit	Slot ID
Center_X	I32	Number of pulses	Relative center point X-coordinate on the specified axis
Center_Y	I32	Number of pulses	Relative center point Y-coordinate on the specified axis
End_x	I32	Number of pulses	Relative endpoint X-coordinate on the specified axis
End_y	I32	Number of pulses	Relative endpoint Y-coordinate on the specified axis
Dir	I16	Selection	Specified direction (Clockwise if value is 1; CCW if value is 0)
StrVel	I32	Pulses per second	Starting velocity parameter
MaxVel	I32	Pulses per second	Tangential velocity parameter
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time

■ Description

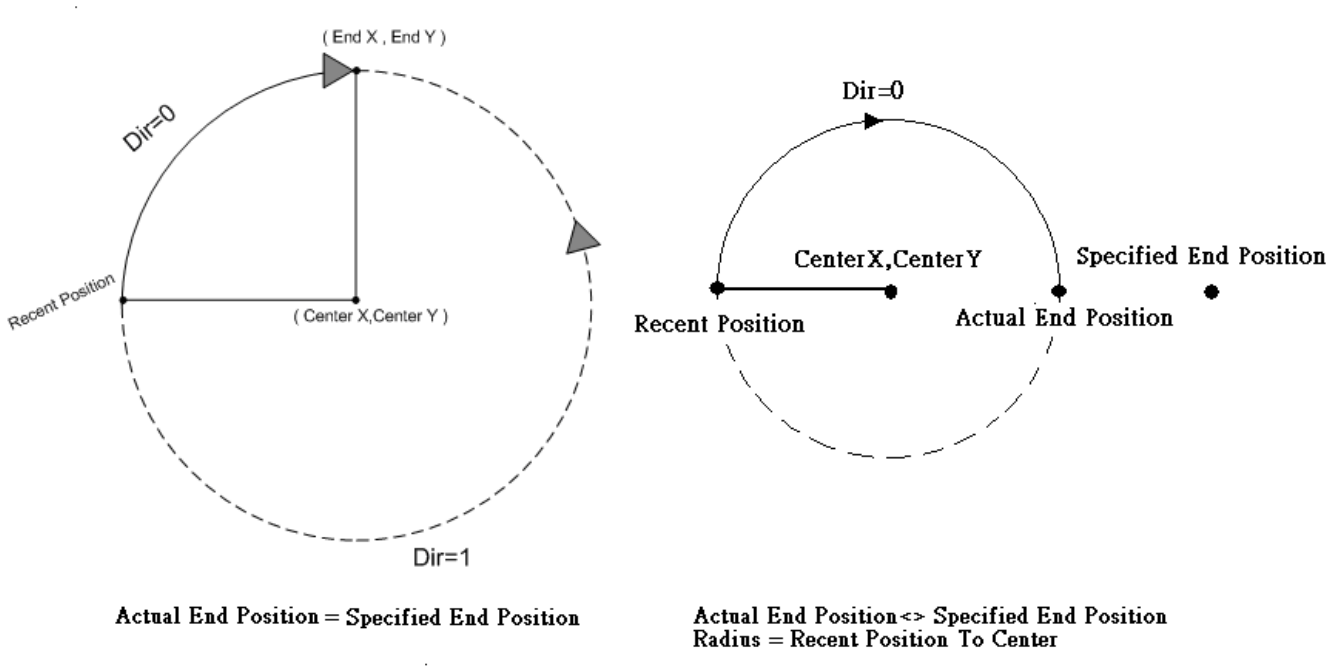


Figure 20.3

■ Example

```
U16 CardNo=0;
U16 NodeIDArray[2]={1,2};
U16 SlotID[2]={0, 0};
I32 Center_X =25000;
I32 Center_Y =25000;
I32 StrVel=0;
I32 MaxVel=50000;
I32 End_x=50000;
I32 End_y=50000;
I16 Dir=1; //This value is 1, indicating a clockwise arc interpolation.
F64 Tacc=0.1;
F64 Tdec=0.1;

I16 status= _DMC_01_start_tr_arc3_xy (CardNo, NodeIDArray, SlotID, Center_X, Center_Y,
End_x, End_y,Dir, StrVel, MaxVel, Tacc, Tdec);
```

20.10 _DMC_01_start_sr_arc3_xy

- **FORMAT**

  I16 PASCAL _DMC_01_start_sr_arc3_xy(U16 CardNo, U16* NodeID,U16* SlotID, I32 Center_X, I32 Center_Y,I32 End_X,I32 End_Y, I16 Dir, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec)

- **Purpose**

  2-axis arc interpolation motion using relative coordinates with S-curve velocity cross-section (Known conditions: center point coordinates, endpoint coordinates).

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	Node ID of card used for motion displacement along X-axis and Y-axis
NodeIDArray	U16*	Number Unit	Holds Node ID sets used for arc interpolation NodeIDArray[0] holds the 1st set of Node ID NodeIDArray[1] holds the 2nd set of Node ID
SlotID	U16*	Number Unit	Slot ID
Center_X	I32	Number of pulses	Relative center point X-coordinate on the specified axis
Center_Y	I32	Number of pulses	Relative center point Y-coordinate on the specified axis
End_x	I32	Number of pulses	Relative endpoint X-coordinate on the specified axis
End_y	I32	Number of pulses	Relative endpoint Y-coordinate on the specified axis
Dir	I16	Selection	Specified direction (Clockwise if value is 1; CCW if value is 0)
StrVel	I32	Pulses per second	Starting velocity parameter
MaxVel	I32	Pulses per second	Tangential velocity parameter
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time

Example

```
U16 CardNo=0
U16 NodeIDArray[2]={1,2};
U16 SlotID[2]={0, 0};
I32 Center_X =25000, Center_Y =25000;
I32 StrVel=0, MaxVel=50000;
I32 End_x=50000, End_y=50000;
I16 Dir=1; // This value is 1, indicating a clockwise arc interpolation.
F64 Tacc=0.1, Tdec=0.1;

I16 status= _DMC_01_start_sr_arc3_xy (CardNo, NodeIDArray, SlotID, Center_X, Center_Y,
End_x, End_y, Dir, StrVel, MaxVel, Tacc, Tdec);
```

20.11 _DMC_01_start_ta_arc3_xy

- **FORMAT**

  I16 PASCAL _DMC_01_start_ta_arc3_xy(U16 CardNo, U16* NodeID,U16* SlotID, I32 Center_X, I32 Center_Y,I32 End_X,I32 End_Y, I16 Dir, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec)

- **Purpose**

  2-axis arc interpolation motion using absolute coordinates with T-curve velocity cross-section (Known conditions: center point coordinates, endpoint coordinates).

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	Node ID of card used for motion displacement along X-axis and Y-axis
NodeIDArray	U16*	Number Unit	Holds Node ID sets used for arc interpolation NodeIDArray[0] holds the 1st set of Node ID NodeIDArray[1] holds the 2nd set of Node ID
SlotID	U16*	Number Unit	Slot ID
Center_X	I32	Number of pulses	Absolute center point X-coordinate on the specified axis
Center_Y	I32	Number of pulses	Absolute center point Y-coordinate on the specified axis
End_x	I32	Number of pulses	Absolute endpoint X-coordinate on the specified axis
End_y	I32	Number of pulses	Absolute endpoint Y-coordinate on the specified axis
Dir	I16	Selection	Specified direction (Clockwise if value is 1; CCW if value is 0)
StrVel	I32	Pulses per second	Starting velocity parameter
MaxVel	I32	Pulses per second	Tangential velocity parameter
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time

Example

```
U16 CardNo=0
U16 NodeIDArray[2]={1,2};
U16 SlotID[2]={0, 0};
I32 Center_X =25000, Center_Y =25000;
I32 StrVel=0, MaxVel=50000;
I32 End_x=50000, End_y=50000;
I16 Dir=1;
F64 Tacc=0.1, Tdec=0.1;

I16 status= _DMC_01_start_ta_arc3_xy (CardNo, NodeIDArray, SlotID, Center_X, Center_Y,
End_x, End_y,Dir, StrVel, MaxVel, Tacc, Tdec);
```

20.12 _DMC_01_start_sa_arc3_xy

- **FORMAT**

  I16 PASCAL _DMC_01_start_sa_arc3_xy(U16 CardNo, U16* NodeID,U16* SlotID, I32 Center_X, I32 Center_Y,I32 End_X,I32 End_Y, I16 Dir, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec)

- **Purpose**

  2-axis arc interpolation motion using absolute coordinates with S-curve velocity cross-section (Known conditions: center point coordinates, endpoint coordinates).

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	Node ID of card used for motion displacement along X-axis and Y-axis
NodeIDArray	U16*	Number Unit	Holds Node ID sets used for arc interpolation NodeIDArray[0] holds the 1st set of Node ID NodeIDArray[1] holds the 2nd set of Node ID
SlotID	U16*	Number Unit	Slot ID
Center_X	I32	Number of pulses	Absolute center point X-coordinate on the specified axis
Center_Y	I32	Number of pulses	Absolute center point Y-coordinate on the specified axis
End_x	I32	Number of pulses	Absolute endpoint X-coordinate on the specified axis
End_y	I32	Number of pulses	Absolute endpoint Y-coordinate on the specified axis
Dir	I16	Selection	Specified direction (Clockwise if value is 1; CCW if value is 0)
StrVel	I32	Pulses per second	Starting velocity parameter
MaxVel	I32	Pulses per second	Tangential velocity parameter
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time

Example

```
U16 CardNo=0
U16 NodeIDArray[2]={1,2};
U16 SlotID[2]={0, 0};
I32 Center_X =25000, Center_Y =25000;
I32 StrVel=0, MaxVel=50000;
I32 End_x=50000, End_y=50000;
I16 Dir=1;
F64 Tacc=0.1, Tdec=0.1;

I16 status= _DMC_01_start_sa_arc3_xy (CardNo, NodeIDArray, SlotID, Center_X, Center_Y,
End_x, End_y,Dir, StrVel, MaxVel, Tacc, Tdec);
```

20.13 _DMC_01_start_spiral_xy

■ **FORMAT**

I16 PASCAL _DMC_01_start_spiral_xy (U16 CardNo, U16* NodeID, U16* SlotID, I32 Center_X, I32 Center_Y, I32 spiral_interval, I32 spiral_angle, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec,U16 m_curve,U16 m_r_a)

■ **Purpose**

Carries out 2-axis spiral motion (Known conditions: center coordinates for X and Y axes).

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	Node ID of card used for motion displacement along X-axis and Y-axis
NodeID	U16*	Number Unit	Holds Node ID sets used for carrying out spiral motion NodeID[0] holds 1st set of Node ID NodeID[1] holds 2nd set of Node ID
SlotID	U16*	Number Unit	Slot ID
Center_X	I32	Number of pulses	Center X-coordinate on specified axis
Center_Y	I32	Number of pulses	Center Y-coordinate on specified axis
spiral_interval	I32	Number of pulses	Relative distance between spirals
spiral_angle	I32	Number	Total angle of spiral motion (one revolution is 360 degrees)
StrVel	I32	Pulses per second	Starting velocity parameter
MaxVel	I32	Pulses per second	Tangential velocity parameter
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time
m_curve	U16	Selection	1: T-curve 2: S-curve
m_r_a	U16	Selection	0: Relative motion displacement 1: Absolute motion displacement

Example

```
U16 CardNo=0
U16 NodeID[2]={1,2};
U16 SlotID[2]={0, 0};
I32 Center_X =25000, Center_Y =25000,
I32 Spiral_interval= 20000,Spiral_angle=1800;
I32 StrVel=0, MaxVel=50000;
F64 Tacc=0.1, Tdec=0.1;
U16 m_curve=1;
U16 m_r_a=0;

I16 status= _DMC_01_start_spiral_xy (CardNo, NodeID, SlotID, Center_X, Center_Y,
Spiral_interval, Spiral_angle,    StrVel, MaxVel, Tacc, Tdec, m_curve, m_r_a);
```

20.14 _DMC_01_start_spiral2_xy

- **FORMAT**

  I16 PASCAL _DMC_01_start_spiral2_xy (U16 CardNo, U16* NodeID, U16* SlotID, I32 center_x, I32 center_y, I32 end_x, I32 end_y, U16 dir, U16 circlenum, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec, U16 m_curve, U16 m_r_a)

- **Purpose**

  Carries out 2-axis spiral motion (Known conditions: center coordinates for X and Y axes; endpoint coordinates for X and Y axes).

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	Node ID of card used for motion displacement along X-axis and Y-axis
NodeID	U16*	Number Unit	Holds Node ID sets used for carrying out spiral motion NodeID[0] holds 1st set of Node ID NodeID[1] holds 2nd set of Node ID
SlotID	U16*	Number Unit	Slot ID
center_X	I32	Number of pulses	Center X-coordinate on specified axis
center_Y	I32	Number of pulses	Center Y-coordinate on specified axis
end_X	I32	Number of pulses	Endpoint X-coordinate on specified axis
end_Y	I32	Number of pulses	Endpoint Y-coordinate on specified axis
dir	U16	Selection	Direction of spiral arc motion. Clockwise: 1 ; Counterclockwise: 0
circlenum	U16	Number	Number of circles in spiral motion
StrVel	I32	Pulses per second	Starting velocity parameter
MaxVel	I32	Pulses per second	Tangential velocity parameter
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time
m_curve	U16	Selection	1: T-curve 2: S-curve
m_r_a	U16	Selection	0: Relative motion displacement 1: Absolute motion displacement

Example

```
U16 CardNo=0
U16 NodeID[2]={1,2};
U16 SlotID[2]={0, 0};
I32 center_x =25000, center_y=25000;
I32 end_x =25000, end_y =25000;
U16 dir= 1,circelnum=5;
I32 StrVel=0, MaxVel=50000;
F64 Tacc=0.1, Tdec=0.1;
U16 m_curve=1;
U16 m_r_a=0;

I16 status= _DMC_01_start_spiral2_xy (CardNo, NodeID, SlotID, center_x, center_y,
end_x, end_y, dir, circelnuml, StrVel, MaxVel, Tacc, Tdec, m_curve, m_r_a);
```

20.15 _DMC_01_start_v3_arc_xy

- **FORMAT**

  I16 PASCAL _DMC_01_start_v3_arc_xy(U16 CardNo, U16* NodeID,U16* SlotID,
  I32 Center_X, I32 Center_Y, F64 Angle, I32 StrVel, I32ConstVel, I32 EndVel, F64 TPhase1,
  F64 TPhase2, U16 m_curve, U16 m_r_a)

- **Purpose**

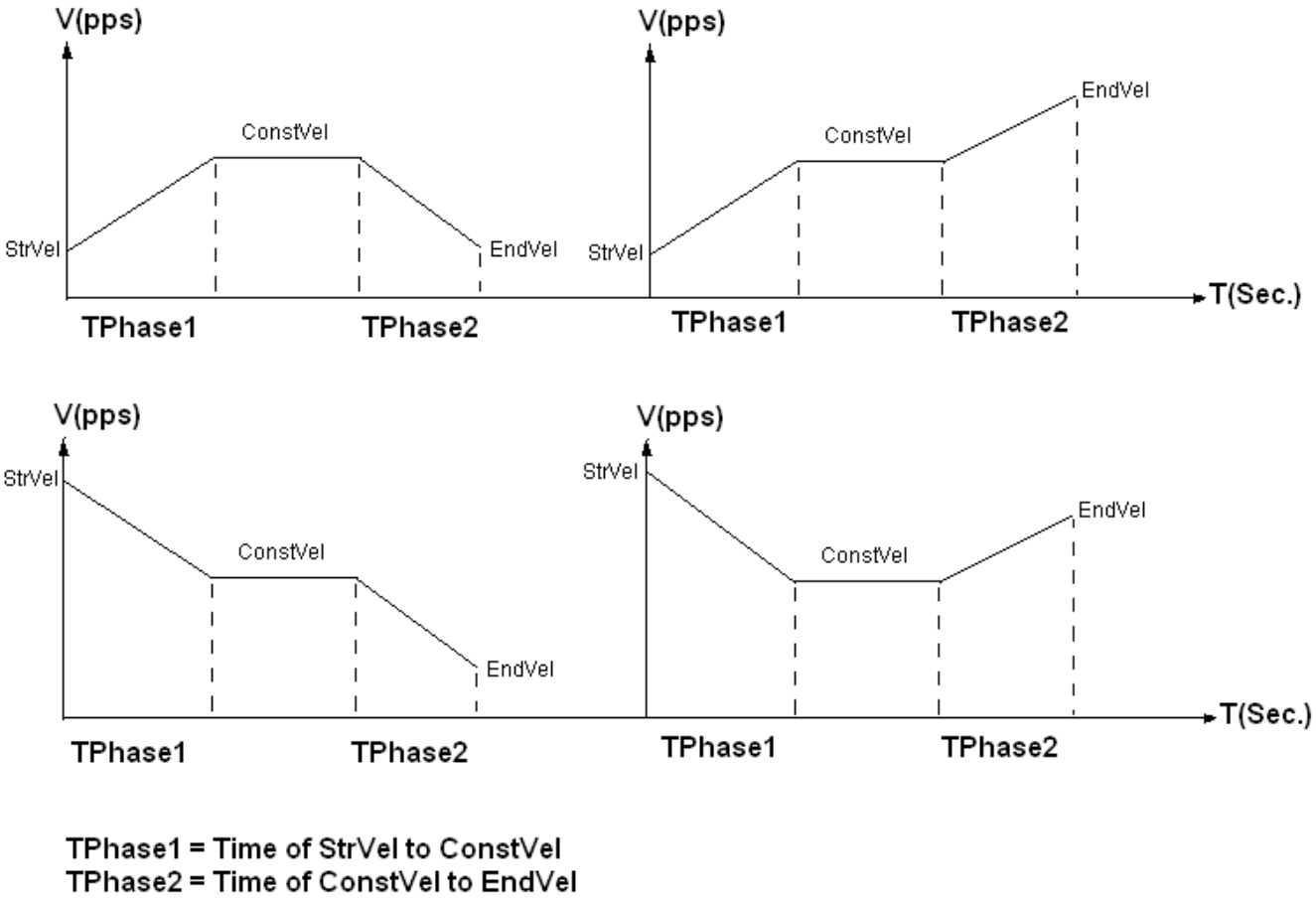
  2-axis arc interpolation motion with EndVel added (Known conditions: center point coordinates, angle).

  ※Values of StrVel and EndVel can be greater than MaxVel.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	Node ID of card used for motion displacement along X-axis and Y-axis
NodeIDArray	U16*	Number Unit	Holds Node ID sets used for arc interpolation NodeIDArray[0] holds the 1st set of Node ID NodeIDArray[1] holds the 2nd set of Node ID
SlotID	U16*	Number Unit	Slot ID
Center_X	I32	Number of pulses	Absolute center point X-coordinate on the specified axis
Center_Y	I32	Number of pulses	Absolute center point Y-coordinate on the specified axis
Angle	F64	Degree (°)	Set arc angle. One full arc is 360^{o}
StrVel	I32	Pulses per second	Starting velocity parameter
ConstVel	I32	Pulses per second	Constant velocity
EndVel	I32	Pulses per second	End velocity
TPhase1	F64	Second	Time from StartVel to ConstVel
TPhase2	F64	Second	Time from ConstVel to EndVel
m_curve	U16	Selection	1: T-curve 2: S-curve
m_r_a	U16	Selection	0: Relative motion displacement 1: Absolute motion displacement

■ Description



TPhase1 = Time of StrVel to ConstVel
TPhase2 = Time of ConstVel to EndVel

Figure 20.4 Explanation of TPhase1 and TPhase2

■ Example

```
U16 CardNo=0, NodeIDArray[2]={1,2}, SlotID[2]={0, 0};
I32 Center_X =50000;
I32 Center_Y =50000;
F64 Angle=180;
I32 StrVel=0;
I32 MaxVel=50000;
I32 EndVel=20000;
F64 TPhase1=0.2;
F64 TPhase2=0.1;
U16 m_curve=1, m_r_a=0;

I16 status= _DMC_01_start_sa_arc_xy (CardNo, NodeIDArray, SlotID, Center_X, Center_Y,
Angle, StrVel, ConstVel, EndVel, TPhase1, TPhase2, m_curve, m_r_a);
```

20.16 _DMC_01_start_v3_arc2_xy

■ **FORMAT**

I16 PASCAL _DMC_01_start_v3_arc2_xy(U16 CardNo, U16* NodeID,U16* SlotID, I32 End_X, I32 End_Y, F64 Angle, I32 StrVel, I32 ConstVel, I32 EndVel, F64 TPhase1, F64 TPhase2, U16 m_curve,U16 m_r_a)

■ **Purpose**

2-axis arc interpolation motion with EndVel added (Known conditions: endpoint coordinates, angle).

※Values of StrVel and EndVel can be greater than MaxVel.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	Node ID of card used for motion displacement along X-axis and Y-axis
NodeIDArray	U16*	Number Unit	Holds Node ID sets used for arc interpolation NodeIDArray[0] holds the 1st set of Node ID NodeIDArray[1] holds the 2nd set of Node ID
SlotID	U16*	Number Unit	Slot ID
End_X	I32	Number of pulses	Absolute endpoint X-coordinate on the specified axis
End_Y	I32	Number of pulses	Absolute endpoint Y-coordinate on the specified axis
Angle	F64	Degree (°)	Set arc angle. One full arc is 360°
StrVel	I32	Pulses per second	Starting velocity parameter
ConstVel	I32	Pulses per second	Constant velocity
EndVel	I32	Pulses per second	End velocity
TPhase1	F64	Second	Time from StartVel to ConstVel
TPhase2	F64	Second	Time from ConstVel to EndVel
m_curve	U16	Selection	1: T-curve 2: S-curve
m_r_a	U16	Selection	0: Relative motion displacement 1: Absolute motion displacement

Example

```
U16 CardNo=0;
U16 NodeIDArray[2]={1,2};
U16 SlotID[2]={0, 0};
I32 End_X =-50000;
I32 End_Y =-50000;
I32 StrVel=0;
I32 MaxVel=50000;
I32 EndVel=20000;
F64 TPhase1=0.2;
F64 TPhase2=0.1;
U16 m_curve=1, m_r_a=0;

I16 status= _DMC_01_start_ta_arc2_xy (CardNo, NodeIDArray, SlotID, End_X, End_Y, Angle,
StrVel, ConstVel, EndVel, TPhase1, TPhase2, m_curve, m_r_a);
```

20.17 _DMC_01_start_v3_arc3_xy

■ FORMAT

I16 PASCAL _DMC_01_start_v3_arc3_xy(U16 CardNo, U16* NodeID,U16* SlotID, I32 Center_X, I32 Center_Y,I32 End_X,I32 End_Y, I16 Dir, I32 StrVel, I32 ConstVel, I32 EndVel, F64 TPhase1, F64 TPhase2, U16 m_curve,U16 m_r_a)

■ Purpose

2-axis arc interpolation motion with EndVel added (Known conditions: center point coordinates, endpoint coordinates).

※Values of StrVel and EndVel can be greater than MaxVel.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	Node ID of card used for motion displacement along X-axis and Y-axis
NodeIDArray	U16*	Number Unit	Holds Node ID sets used for arc interpolation NodeIDArray[0] holds the 1st set of Node ID NodeIDArray[1] holds the 2nd set of Node ID
SlotID	U16*	Number Unit	Slot ID
Center_X	I32	Number of pulses	Absolute center point X-coordinate on the specified axis
Center_Y	I32	Number of pulses	Absolute center point Y-coordinate on the specified axis
End_x	I32	Number of pulses	Absolute endpoint X-coordinate on the specified axis
End_y	I32	Number of pulses	Absolute endpoint Y-coordinate on the specified axis
Dir	I16	Selection	Specified direction (Clockwise if value is 1; CCW if value is 0)
StrVel	I32	Pulses per second	Starting velocity parameter
ConstVel	I32	Pulses per second	Constant velocity
EndVel	I32	Pulses per second	End velocity
TPhase1	F64	Second	Time from StartVel to ConstVel
TPhase2	F64	Second	Time from ConstVel to EndVel
m_curve	U16	Selection	1: T-curve 2: S-curve
m_r_a	U16	Selection	0: Relative motion displacement 1: Absolute motion displacement

Example

```
U16 CardNo=0
U16 NodeIDArray[2]={1,2};
U16 SlotID[2]={0, 0};
I32 Center_X =25000, Center_Y =25000;
I32 End_x=50000, End_y=50000;
I16 Dir=1;
I32 StrVel=0, ConstVel=50000 , EndVel=20000;
F64 TPhase1=0.2;
F64 TPhase2=0.1;
U16 m_curve=1, m_r_a=0;

I16 status= _DMC_01_start_v3_arc3_xy (CardNo, NodeIDArray, SlotID, Center_X, Center_Y,
End_x, End_y,Dir, StrVel, ConstVel, EndVel, TPhase1, TPhase2, m_curve, m_r_a);
```

20.18 _DMC_01_start_v3_spiral_xy

■ **FORMAT**

I16 PASCAL _DMC_01_start_v3_spiral_xy (U16 CardNo, U16* NodeID, U16* SlotID, I32 Center_X, I32 Center_Y, I32 spiral_interval, I32 spiral_angle, I32 StrVel, I32 ConstVel, I32 EndVel, F64 TPhase1, F64 TPhase2, U16 m_curve,U16 m_r_a)

■ **Purpose**

2-axis spiral motion with EndVel added (Known conditions: center coordinates for X and Y axes).

※Values of StrVel and EndVel can be greater than MaxVel.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	Node ID of card used for motion displacement along X-axis and Y-axis
NodeID	U16*	Number Unit	Holds Node ID sets used for carrying out spiral motion NodeID[0] holds 1st set of Node ID NodeID[1] holds 2nd set of Node ID
SlotID	U16*	Number Unit	Slot ID
Center_X	I32	Number of pulses	Center X-coordinate on specified axis
Center_Y	I32	Number of pulses	Center Y-coordinate on specified axis
spiral_interval	I32	Number of pulses	Relative distance between spirals
spiral_angle	I32	Number	Total angle of spiral motion (one revolution is 360 degrees)
StrVel	I32	Pulses per second	Starting velocity parameter
ConstVel	I32	Pulses per second	Constant velocity
EndVel	I32	Pulses per second	End velocity
TPhase1	F64	Second	Time from StartVel to ConstVel
TPhase2	F64	Second	Time from ConstVel to EndVel
m_curve	U16	Selection	1: T-curve 2: S-curve
m_r_a	U16	Selection	0: Relative motion displacement 1: Absolute motion displacement

Example

```
U16 CardNo=0
U16 NodeID[2]={1,2};
U16 SlotID[2]={0, 0};
I32 Center_X =25000, Center_Y =25000,
I32 Spiral_interval= 20000, Spiral_angle=1800;
I32 StrVel=0, MaxVel=50000;
I32 EndVel=20000;
F64 TPhase1=0.2;
F64 TPhase2=0.1;
U16 m_curve=1, m_r_a=0;

I16 status= _DMC_01_start_spiral_xy (CardNo, NodeID, SlotID, Center_X, Center_Y,
Spiral_interval, Spiral_angle, StrVel, ConstVel, EndVel, TPhase1, TPhase2, m_curve, m_r_a);
```

20.19 _DMC_01_start_v3_spiral2_xy

■ FORMAT

I16 PASCAL _DMC_01_start_v3_spiral2_xy (U16 CardNo, U16* NodeID, U16* SlotID, I32 center_x, I32 center_y, I32 end_x, I32 end_y, U16 dir, U16 circlenum, I32 StrVel, 32 ConstVel, I32 EndVel, F64 TPhase1, F64 TPhase2, U16 m_curve,U16 m_r_a)

■ Purpose

2-axis spiral motion with EndVel added (Known conditions: center coordinates for X and Y axes, endpoint coordinates for X and Y axes).

※Values of StrVel and EndVel can be greater than MaxVel.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	Node ID of card used for motion displacement along X-axis and Y-axis
NodeID	U16*	Number Unit	Holds Node ID sets used for carrying out spiral motion NodeID[0] holds 1st set of Node ID NodeID[1] holds 2nd set of Node ID
SlotID	U16*	Number Unit	Slot ID
center_X	I32	Number of pulses	Center X-coordinate on specified axis
center_Y	I32	Number of pulses	Center Y-coordinate on specified axis
end_X	I32	Number of pulses	Endpoint X-coordinate on specified axis
end_Y	I32	Number of pulses	Endpoint Y-coordinate on specified axis
dir	U16	Selection	Direction of spiral arc motion. Clockwise: 1 ; Counterclockwise: 0
circlenum	U16	Number	Number of circles in spiral motion
StrVel	I32	Pulses per second	Starting velocity parameter
ConstVel	I32	Pulses per second	Constant velocity
EndVel	I32	Pulses per second	End velocity
TPhase1	F64	Second	Time from StartVel to ConstVel
TPhase2	F64	Second	Time from ConstVel to EndVel
m_curve	U16	Selection	1: T-curve 2: S-curve
m_r_a	U16	Selection	0: Relative motion displacement 1: Absolute motion displacement

Example

```
U16 CardNo=0
U16 NodeID[2]={1,2};
U16 SlotID[2]={0, 0};
I32 center_x =25000, center_y=25000;
I32 end_x =25000, end_y =25000;
U16 dir= 1, circelnum=5;
I32 StrVel=0, MaxVel=50000;
I32 EndVel=20000;
F64 TPhase1=0.2;
F64 TPhase2=0.1;
U16 m_curve=1, m_r_a=0;

I16 status= _DMC_01_start_v3_spiral2_xy (CardNo, NodeID, SlotID, center_x, center_y,
end_x, end_y, dir, circelnuml, StrVel, ConstVel, EndVel, TPhase1, TPhase2, m_curve,
m_r_a);
```

Chapter 21 3-Axis Linear Interpolation Motion Control API

Table 21.1

Function Name	Description
_DMC_01_start_tr_move_xyz	3-axis Linear interpolation motion using relative coordinates with T-curve velocity cross-section
_DMC_01_start_sr_move_xyz	3-axis Linear interpolation motion using relative coordinates with S-curve velocity cross-section
_DMC_01_start_ta_move_xyz	3-axis Linear interpolation motion using absolute coordinates with T-curve velocity cross-section
_DMC_01_start_sa_move_xyz	3-axis Linear interpolation motion using absolute coordinates with S-curve velocity cross-section
_DMC_01_start_v3_move_xyz	3-axis linear interpolation motion with EndVel added

21.1 _DMC_01_start_tr_move_xyz

■ FORMAT

I16 PASCAL _DMC_01_start_tr_move_xyz(U16 CardNo, U16* NodeID,U16* SlotID, I32 DisX, I32 DisY, I32 DisZ, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec)

■ Purpose

3-axis linear interpolation motion using relative coordinates with T-curve velocity cross-section.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeIDArray	U16*	Number Unit	Holds Node ID sets used for linear interpolation NodeIDArray[0] = Node_1 NodeIDArray[1] = Node_2 NodeIDArray[2] = Node_3
SlotID	U16*	Number Unit	Slot ID
DisX	I32	Number of pulses	Relative path parameter for motion of Node ID on X-axis
DisY	I32	Number of pulses	Relative path parameter for motion of Node ID on Y-axis
DisZ	I32	Number of pulses	Relative path parameter for motion of Node ID on Z-axis
StrVel	I32	Pulses per second	Starting velocity parameter
MaxVel	I32	Pulses per second	Maximum velocity parameter
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time

■ Example

```
U16 CardNo=0;
U16 NodeIDArray[3]={1,2,3};
U16 SlotID[3]={0, 0, 0};
I32 DisX =25000, DisY =50000 , DisZ =75000 ;
I32 StrVel=0, MaxVel=50000;
F64 Tacc=0.1. Tdec=0.1;

I16 status= _DMC_01_start_tr_move_xyz (CardNo, NodeIDArray, SlotID, DisX, DisY, DisZ,
            StrVel, MaxVel, Tacc, Tdec);
```

21.2 _DMC_01_start_sr_move_xyz

■ **FORMAT**

I16 PASCAL _DMC_01_start_sr_move_xyz(U16 CardNo, U16* NodeID,U16* SlotID, I32 DisX, I32 DisY, I32 DisZ, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec)

■ **Purpose**

3-axis linear interpolation motion using relative coordinates with S-curve velocity cross-section.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeIDArray	U16*	Number Unit	Holds Node ID sets used for linear interpolation NodeIDArray[0] = Node_1 NodeIDArray[1] = Node_2 NodeIDArray[2] = Node_3
SlotID	U16*	Number Unit	Slot ID
DisX	I32	Number of pulses	Relative path parameter for motion of Node ID on X-axis
DisY	I32	Number of pulses	Relative path parameter for motion of Node ID on Y-axis
DisZ	I32	Number of pulses	Relative path parameter for motion of Node ID on Z-axis
StrVel	I32	Pulses per second	Starting velocity parameter
MaxVel	I32	Pulses per second	Maximum velocity parameter
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time

■ **Example**

```
U16 CardNo=0;
U16 NodeIDArray[3]={1,2,3};
U16 SlotID[3]={0, 0, 0};
I32 DisX =25000, DisY =50000 , DisZ =75000 ;
I32 StrVel=0, MaxVel=50000;
F64 Tacc=0.1. Tdec=0.1;

I16 status= _DMC_01_start_sr_move_xyz (CardNo, NodeIDArray, SlotID, DisX, DisY, DisZ,
            StrVel, MaxVel, Tacc, Tdec);
```

21.3 _DMC_01_start_ta_move_xyz

■ FORMAT

I16 PASCAL _DMC_01_start_ta_move_xyz (U16 CardNo, U16* NodeID,U16* SlotID, I32 DisX, I32 DisY, I32 DisZ, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec)

■ Purpose

3-axis linear interpolation motion using absolute coordinates with T-curve velocity cross-section.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeIDArray	U16*	Number Unit	Holds Node ID sets used for linear interpolation NodeIDArray[0] = Node_1 NodeIDArray[1] = Node_2 NodeIDArray[2] = Node_3
SlotID	U16*	Number Unit	Slot ID
DisX	I32	Number of pulses	Absolute path parameter for motion of Node ID on X-axis
DisY	I32	Number of pulses	Absolute path parameter for motion of Node ID on Y-axis
DisZ	I32	Number of pulses	Absolute path parameter for motion of Node ID on Z-axis
StrVel	I32	Pulses per second	Starting velocity parameter
MaxVel	I32	Pulses per second	Maximum velocity parameter
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time

■ Example

```
U16 CardNo=0;
U16 NodeIDArray[3]={1,2,3};
U16 SlotID[3]={0, 0, 0};
I32 DisX =25000, DisY =50000 , DisZ =75000 ;
I32 StrVel=0, MaxVel=50000;
F64 Tacc=0.1. Tdec=0.1;

I16 status= _DMC_01_start_ta_move_xyz (CardNo, NodeIDArray, SlotID, DisX, DisY, DisZ,
            StrVel, MaxVel, Tacc, Tdec);
```

21.4 _DMC_01_start_sa_move_xyz

■ **FORMAT**

I16 PASCAL _DMC_01_start_sa_move_xyz(U16 CardNo, U16* NodeID,U16* SlotID, I32 DisX, I32 DisY, I32 DisZ, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec)

■ **Purpose**

3-axis linear interpolation motion using absolute coordinates with S-curve velocity cross-section.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeIDArray	U16*	Number Unit	Holds Node ID sets used for linear interpolation NodeIDArray[0] = Node_1 NodeIDArray[1] = Node_2 NodeIDArray[2] = Node_3
SlotID	U16*	Number Unit	Slot ID
DisX	I32	Number of pulses	Absolute path parameter for motion of Node ID on X-axis
DisY	I32	Number of pulses	Absolute path parameter for motion of Node ID on Y-axis
DisZ	I32	Number of pulses	Absolute path parameter for motion of Node ID on Z-axis
StrVel	I32	Pulses per second	Starting velocity parameter
MaxVel	I32	Pulses per second	Maximum velocity parameter
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time

■ **Example**

```
U16 CardNo=0;
U16 NodeIDArray[3]={1,2,3};
U16 SlotID[3]={0, 0, 0};
I32 DisX =25000, DisY =50000 , DisZ =75000 ;
I32 StrVel=0, MaxVel=50000;
F64 Tacc=0.1. Tdec=0.1;

I16 status= _DMC_01_start_sa_move_xyz (CardNo, NodeIDArray, SlotID, DisX, DisY, DisZ,
            StrVel, MaxVel, Tacc, Tdec);
```

21.5 _DMC_01_start_v3_move_xyz

■ **FORMAT**

I16 PASCAL _DMC_01_start_v3_move_xyz(U16 CardNo, U16* NodeID,U16* SlotID, I32 DisX, I32 DisY, I32 DisZ, I32 StrVel, I32 ConstVel, I32 EndVel, F64 TPhase1, F64 TPhase2, U16 m_curve,U16 m_r_a)

■ **Purpose**

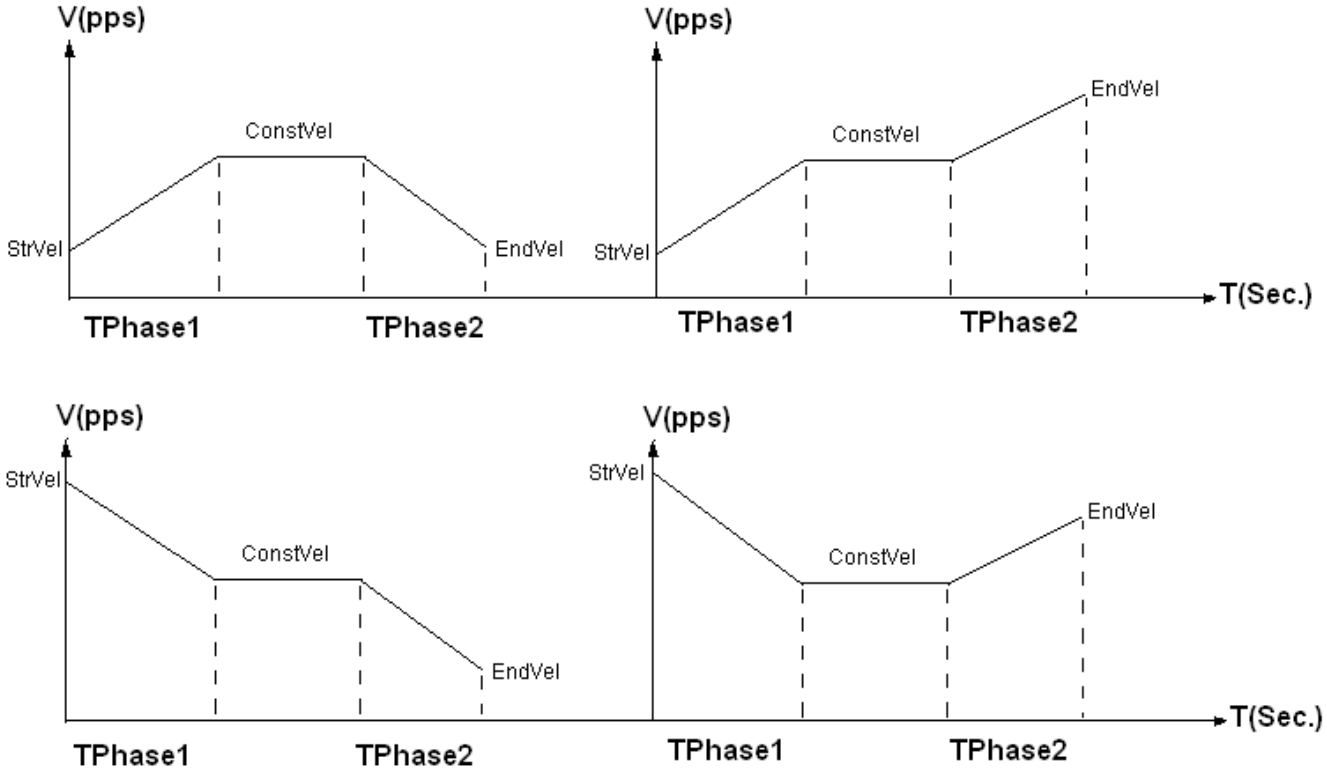
3-axis linear interpolation motion with EndVel added.

※Values of StrVel and EndVel can be greater than MaxVel.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeIDArray	U16*	Number Unit	Holds Node ID sets used for linear interpolation NodeIDArray[0] = Node_1 NodeIDArray[1] = Node_2 NodeIDArray[2] = Node_3
SlotID	U16*	Number Unit	Slot ID
DisX	I32	Number of pulses	Absolute path parameter for motion of Node ID on X-axis
DisY	I32	Number of pulses	Absolute path parameter for motion of Node ID on Y-axis
DisZ	I32	Number of pulses	Absolute path parameter for motion of Node ID on Z-axis
StrVel	I32	Pulses per second	Starting velocity parameter
ConstVel	I32	Pulses per second	Constant velocity
EndVel	I32	Pulses per second	End velocity
TPhase1	F64	Second	Time from StartVel to ConstVel
TPhase2	F64	Second	Time from ConstVel to EndVel
m_curve	U16	Selection	1¡GT-curve 2¡GS-curve
m_r_a	U16	Selection	0: Relative motion displacement 1: Absolute motion displacement

■ Description



TPhase1 = Time of StrVel to ConstVel
TPhase2 = Time of ConstVel to EndVel

Figure 21.4 Explanation of TPhase1 and TPhase2

■ Example

```
U16 CardNo=0;
U16 NodeIDArray[3]={1,2,3};
U16 SlotID[3]={0, 0, 0};
I32 DisX =25000, DisY =50000 , DisZ =75000 ;
I32 StrVel=0, MaxVel=50000;
I32 EndVel=20000;
F64 TPhase1=0.2;
F64 TPhase2=0.1;
U16 m_curve=1, m_r_a=0;

I16 status= _DMC_01_start_sa_move_xyz (CardNo, NodeIDArray, SlotID, DisX, DisY, DisZ,
            StrVel, ConstVel, EndVel, TPhase1, TPhase2, m_curve, m_r_a);
```

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Chapter 22 3-Axis Spiral Interpolation Motion Control API

Table 22.1

Function Name	Description
_DMC_01_start_tr_heli_xy	3-axis Spiral interpolation motion using relative coordinates with T-curve velocity cross-section
_DMC_01_start_sr_heli_xy	3-axis Spiral interpolation motion using relative coordinates with S-curve velocity cross-section
_DMC_01_start_ta_heli_xy	3-axis Spiral interpolation motion using absolute coordinates with T-curve velocity cross-section
_DMC_01_start_sa_heli_xy	3-axis Spiral interpolation motion using absolute coordinates with S-curve velocity cross-section
_DMC_01_start_v3_heli_xy	3-axis Spiral interpolation motion with EndVel added

22.1 _DMC_01_start_tr_heli_xy

■ **FORMAT**

I16 PASCAL _DMC_01_start_tr_heli_xy(U16 CardNo, U16* NodeID,U16* SlotID, I32 Center_X, I32 Center_Y, I32 Depth, I32 Pitch, I16 Dir, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec)

■ **Purpose**

3-axis Spiral interpolation motion using relative coordinates with T-curve velocity cross-section.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeIDArray	U16*	Number Unit	Holds Node ID sets used for spiral interpolation NodeIDArray[0] = Node_1 NodeIDArray[1] = Node_2 NodeIDArray[2] = Node_3
SlotID	U16*	Number Unit	Slot ID
Center_X	I32	Number of pulses	Relative center point X-coordinate on the specified axis
Center_Y	I32	Number of pulses	Relative center point Y-coordinate on the specified axis
Depth	I32	Number of pulses	Relative depth to position on specified axis (height in direction of Z)
Pitch	I32	Number of pulses	Relative height between two spirals
Dir	I16	Selection	Direction of spiral arc motion. Clockwise: 1 ; Counterclockwise: 0
StrVel	I32	Pulses per second	Starting velocity parameter
MaxVel	I32	Pulses per second	Maximum velocity parameter
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time

■ Description

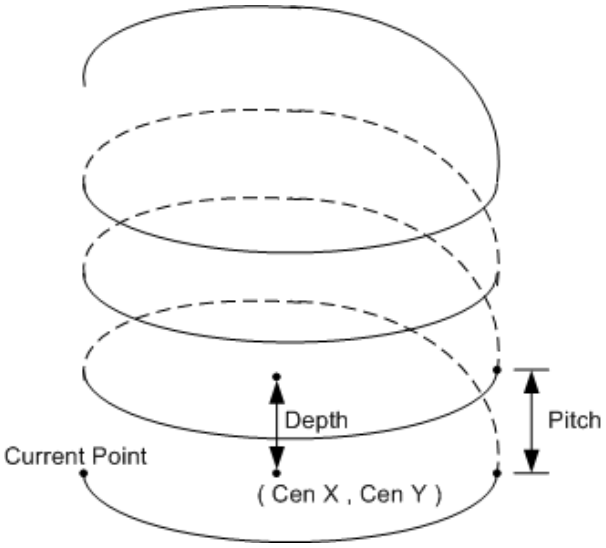


Figure 22.1

■ Example

```
U16 CardNo=0;
U16 NodeIDArray[3]={1,2,3};
U16 SlotID[3]={0, 0, 0};
I32 Center_X =25000;
I32 Center_Y =50000;
I32 Depth =10000;
I32 Pitch = 20000;
I16 Dir=1; //Value is 1, indicating a spiral arc motion in the clockwise direction
I32 StrVel=0;
I32 MaxVel=50000;
F64 Tacc=0.1;
F64 Tdec=0.1;

I16 status= _DMC_01_start_tr_heli_xy (CardNo, NodeIDArray, SlotID, Center_X, Center_Y,
                Depth, Pitch, Dir, StrVel, MaxVel, Tacc, Tdec);
```

22.2 _DMC_01_start_sr_heli_xy

- **FORMAT**

  I16 PASCAL _DMC_01_start_sr_heli_xy(U16 CardNo, U16* NodeID,U16* SlotID, I32 Center_X, I32 Center_Y, I32 Depth, I32 Pitch, I16 Dir, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec)

- **Purpose**

  3-axis Spiral interpolation motion using relative coordinates with S-curve velocity cross-section.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeIDArray	U16*	Number Unit	Holds Node ID sets used for spiral interpolation NodeIDArray[0] = Node_1 NodeIDArray[1] = Node_2 NodeIDArray[2] = Node_3
SlotID	U16*	Number Unit	Slot ID
Center_X	I32	Number of pulses	Relative center point X-coordinate on the specified axis
Center_Y	I32	Number of pulses	Relative center point Y-coordinate on the specified axis
Depth	I32	Number of pulses	Relative depth to position on specified axis (height in direction of Z)
Pitch	I32	Number of pulses	Relative height between two spirals
Dir	I16	Selection	Direction of spiral arc motion. Clockwise: 1 ; Counterclockwise: 0
StrVel	I32	Pulses per second	Starting velocity parameter
MaxVel	I32	Pulses per second	Maximum velocity parameter
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time

Example

```
U16 CardNo=0;
U16 NodeIDArray[3]={1,2,3};
U16 SlotID[3]={0, 0, 0};
I32 Center_X =25000, Center_Y =50000, Depth =10000, Pitch = 20000;
I16 Dir=1;
I32 StrVel=0, MaxVel=50000;
F64 Tacc=0.1, Tdec=0.1;
I16 status= _DMC_01_start_sr_heli_xy (CardNo, NodeIDArray, SlotID, Center_X, Center_Y,
            Depth, Pitch, Dir, StrVel, MaxVel, Tacc, Tdec);
```

22.3 _DMC_01_start_ta_heli_xy

- **FORMAT**

  I16 PASCAL _DMC_01_start_ta_heli_xy(U16 CardNo, U16* NodeID,U16* SlotID, I32 Center_X, I32 Center_Y, I32 Depth, I32 Pitch, I16 Dir, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec)

- **Purpose**

  3-axis Spiral interpolation motion using absolute coordinates with T-curve velocity cross-section.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeIDArray	U16*	Number Unit	Holds Node ID sets used for spiral interpolation NodeIDArray[0] = Node_1 NodeIDArray[1] = Node_2 NodeIDArray[2] = Node_3
SlotID	U16*	Number Unit	Slot ID
Center_X,	I32	Number of pulses	Absolute center point X-coordinate on the specified axis
Center_Y	I32	Number of pulses	Absolute center point Y-coordinate on the specified axis
Depth	I32	Number of pulses	Absolute depth to position on specified axis (height in direction of Z)
Pitch	I32	Number of pulses	Absolute height between two spirals
Dir	I16	Selection	Direction of spiral arc motion. Clockwise: 1 ; Counterclockwise: 0
StrVel	I32	Pulses per second	Starting velocity parameter
MaxVel	I32	Pulses per second	Maximum velocity parameter
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time

Example

```
U16 CardNo=0;
U16 NodeIDArray[3]={1,2,3};
U16 SlotID[3]={0, 0, 0};
I32 Center_X =25000, Center_Y =50000, Depth =10000, Pitch = 20000;
I16 Dir=1;
I32 StrVel=0, MaxVel=50000;
F64 Tacc=0.1, Tdec=0.1;

I16 status= _DMC_01_start_ta_heli_xy (CardNo, NodeIDArray, SlotID, Center_X, Center_Y,
            Depth, Pitch, Dir, StrVel, MaxVel, Tacc, Tdec);
```

22.4 _DMC_01_start_sa_heli_xy

- **FORMAT**

  I16 PASCAL _DMC_01_start_sa_heli_xy(U16 CardNo, U16* NodeID,U16* SlotID, I32 Center_X, I32 Center_Y, I32 Depth, I32 Pitch, I16 Dir, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec)

- **Purpose**

  3-axis Spiral interpolation motion using absolute coordinates with S-curve velocity cross-section.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeIDArray	U16*	Number Unit	Holds Node ID sets used for spiral interpolation NodeIDArray[0] = Node_1 NodeIDArray[1] = Node_2 NodeIDArray[2] = Node_3
SlotID	U16*	Number Unit	Slot ID
Center_X	I32	Number of pulses	Absolute center point X-coordinate on the specified axis
Center_Y	I32	Number of pulses	Absolute center point Y-coordinate on the specified axis
Depth	I32	Number of pulses	Absolute depth to position on specified axis (height in direction of Z)
Pitch	I32	Number of pulses	Absolute height between two spirals
Dir	I16	Selection	Direction of spiral arc motion. Clockwise: 1 ; Counterclockwise: 0
StrVel	I32	Pulses per second	Starting velocity parameter
MaxVel	I32	Pulses per second	Maximum velocity parameter
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time

Example

```
U16 CardNo=0;
U16 NodeIDArray[3]={1,2,3};
U16 SlotID[3]={0, 0, 0};
I32 Center_X =25000, Center_Y =50000, Depth =10000, Pitch = 20000;
I16 Dir=1;
I32 StrVel=0, MaxVel=50000;
F64 Tacc=0.1, Tdec=0.1;

I16 status= _DMC_01_start_sa_heli_xy (CardNo, NodeIDArray, SlotID, Center_X, Center_Y,
            Depth, Pitch, Dir, StrVel, MaxVel, Tacc, Tdec);
```

22.5 _DMC_01_start_v3_heli_xy

■ FORMAT

I16 PASCAL _DMC_01_start_v3_heli_xy(U16 CardNo, U16* NodeID,U16* SlotID,
I32 Center_X, I32 Center_Y, I32 Depth, I32 Pitch, I16 Dir, I32 StrVel, 32 ConstVel, I32 EndVel,
F64 TPhase1, F64 TPhase2, U16 m_curve, U16 m_r_a)

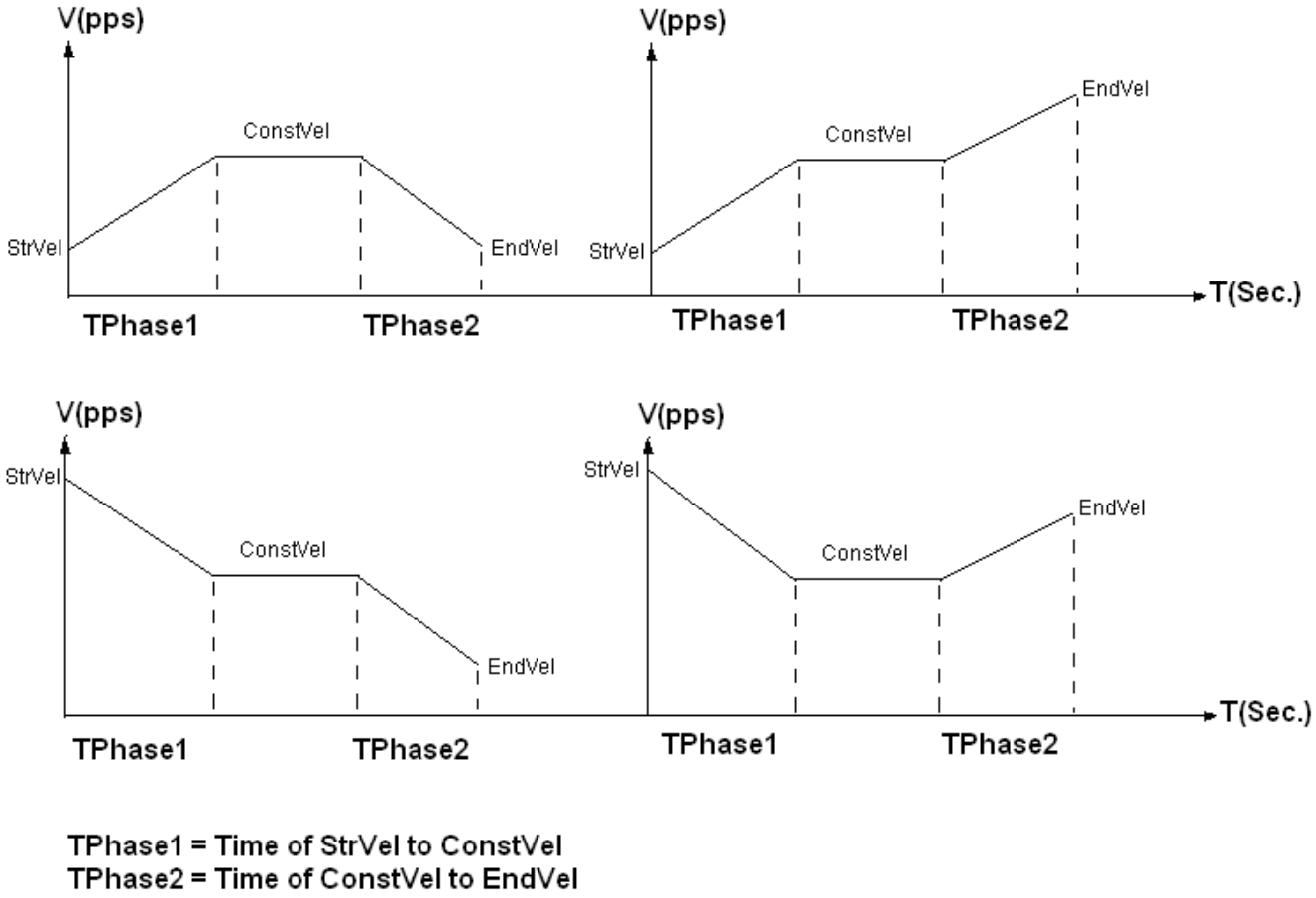
■ Purpose

3-axis Spiral interpolation motion with EndVel added.
※Values of StrVel and EndVel can be greater than MaxVel.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeIDArray	U16*	Number Unit	Holds Node ID sets used for spiral interpolation NodeIDArray[0] = Node_1 NodeIDArray[1] = Node_2 NodeIDArray[2] = Node_3
SlotID	U16*	Number Unit	Slot ID
Center_X	I32	Number of pulses	Absolute center point X-coordinate on the specified axis
Center_Y	I32	Number of pulses	Absolute center point Y-coordinate on the specified axis
Depth	I32	Number of pulses	Absolute depth to position on specified axis (height in direction of Z)
Pitch	I32	Number of pulses	Absolute height between two spirals
Dir	I16	Selection	Direction of spiral arc motion. Clockwise: 1 ; Counterclockwise: 0
StrVel	I32	Pulses per second	Starting velocity parameter
ConstVel	I32	Pulses per second	Constant velocity
EndVel	I32	Pulses per second	End velocity
TPhase1	F64	Second	Time from StartVel to ConstVel
TPhase2	F64	Second	Time from ConstVel to EndVel
m_curve	U16	Selection	1: T-curve 2: S-curve
m_r_a	U16	Selection	0: Relative motion displacement 1: Absolute motion displacement

■ Description



TPhase1 = Time of StrVel to ConstVel
TPhase2 = Time of ConstVel to EndVel

Figure 22.2 Explanation of TPhase1 and TPhase2

■ Example

```
U16 CardNo=0;
U16 NodeIDArray[3]={1,2,3};
U16 SlotID[3]={0, 0, 0};
I32 Center_X =25000, Center_Y =50000, Depth =10000, Pitch = 20000;
I16 Dir=1;
I32 StrVel=0, MaxVel=50000;
I32 EndVel=20000;
F64 TPhase1=0.2;
F64 TPhase2=0.1;
U16 m_curve=1, m_r_a=0;

I16 status= _DMC_01_start_sa_heli_xy (CardNo, NodeIDArray, SlotID, Center_X, Center_Y,
            Depth, Pitch, Dir, StrVel, ConstVel, EndVel, TPhase1, TPhase2, m_curve, m_r_a);
```

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Chapter 23 Velocity Motion Control API

Table 23.1

Function Name	Description
_DMC_01_tv_move	Velocity motion control with T-curve velocity cross-section
_DMC_01_sv_move	Velocity motion control with S-curve velocity cross-section

23.1 _DMC_01_tv_move

■ FORMAT

I16 PASCAL _DMC_01_tv_move(U16 CardNo, U16 NodeID,U16 SlotID, I32 StrVel, I32 MaxVel, F64 Tacc,I16 Dir)

■ Purpose

Velocity motion control with T-curve velocity cross-section.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
StrVel	I32	Pulses per second	Starting velocity parameter
MaxVel	I32	Pulses per second	Maximum velocity parameter
Tacc	F64	Second	Specified acceleration time
Dir	I16	Selection	0: In positive direction 1: In negative direction

■ Description

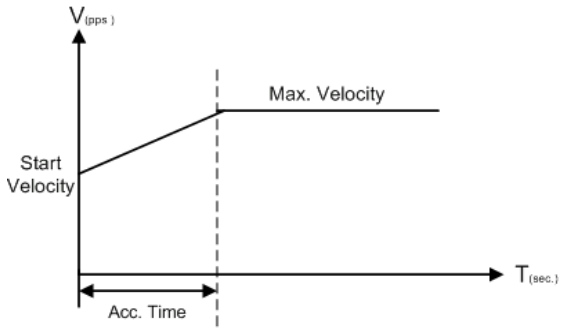

Figure. 23.1 Illustration of trapezoidal motion speed constant

■ Example

```
U16 CardNo=0, NodeID=1, SlotID=0, PDO_enable=1;
I32 StrVel=100, MaxVel=5000;
F64 Tacc=0.1;
I16 Dir =1;
I16 status= _DMC_01_tv_move(CardNo, NodeID, SlotID, StrVel, MaxVel, Tacc, Dir);
//Velocity motion control under PDO mode
```

23.2 _DMC_01_sv_move

■ FORMAT

I16 PASCAL _DMC_01_sv_move(U16 CardNo, U16 NodeID,U16 SlotID, I32 StrVel, I32 MaxVel, F64 Tacc,I16 Dir)

■ Purpose

Velocity motion control with S-curve velocity cross-section.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
StrVel	I32	Pulses per second	Starting velocity parameter
MaxVel	I32	Pulses per second	Maximum velocity parameter
Tacc	F64	Second	Specified acceleration time
Dir	I16	Selection	0: In positive direction 1: In negative direction

■ Description

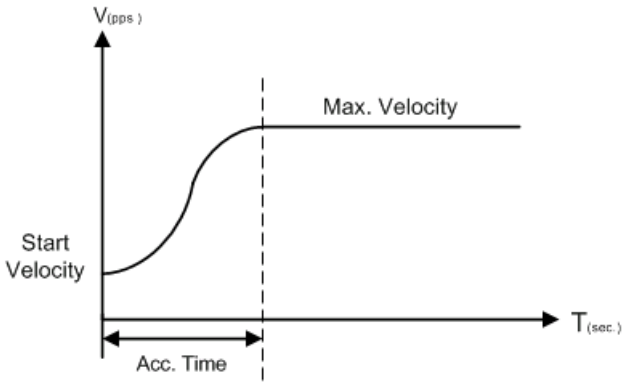

Figure 23.2 Illustration of S-curve motion speed constant

■ Example

U16 CardNo=0, NodeID=1, SlotID=0, PDO_enable=1;
I32 StrVel=100, MaxVel=5000;
F64 Tacc=0.1;
I16 Dir =1;
I16 status= _DMC_01_sv_move(CardNo, NodeID, SlotID, StrVel, MaxVel, Tacc, Dir);

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Chapter 24 Synchronization Motion Control API

Table 24.1

Function Name	Description
_DMC_01_sync_move	Start motion sync
_DMC_01_sync_move_config	Enable/disable motion sync

24.1 _DMC_01_sync_move

- **FORMAT**

  I16 PASCAL _DMC_01_sync_move(I16 CardNo)

- **Purpose**

  Starts motion sync.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15

- **Example**

```
U16 CardNo=0;
I16 status = DMC_01_sync_move (I16 CardNo);
```

24.2 _DMC_01_sync_move_config

- **FORMAT**

  I16 PASCAL _DMC_01_sync_move_config (I16 CardNo, U16 NodeID,U16 SlotID,I16 enable)

- **Purpose**

  Enables/disables motion sync.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
enable	I16	Selection	0: Disable sync 1: Enable sync

- **Example**

```
U16 CardNo=0, NodeID=1, SlotID=0;
I16 enable=1;

I16 status = _DMC_01_sync_move_config(I16 CardNo, U16 NodeID,U16 SlotID,I16 enable);
```

Chapter 25 Remote Module Control API

Table 25.1

Function Name	Description
_DMC_01_get_rm_input_value	Retrieve the value for bit 0 to bit 15 of the remote I/O module's input port
_DMC_01_set_rm_input_filter	Set software filter level for input port of the remote I/O module
_DMC_01_set_rm_input_filter_enable	Enable software mask for bit 0 to bit 15 of the remote I/O module's input port.
_DMC_01_set_rm_output_value	Set the value for bit 0 to bit 15 of the remote I/O module's output port
_DMC_01_set_rm_output_value_error_handle	Set the output value returned when remote I/O module encounters an error
_DMC_01_get_rm_output_value	Get output of remote I/O module
_DMC_01_get_rm_output_value_error_handle	Get output of remote I/O module and decide whether to retain or discard value if there is an error
_DMC_01_set_rm_output_active	Enable/disable output from remote I/O module.

25.1 _DMC_01_get_rm_input_value

- **FORMAT**

  I16 PASCAL _DMC_01_get_rm_input_value(U16 CardNo, U16 NodeID,U16 SlotID, U16 port,U16 *value)

- **Purpose**

  Retrieves the value for bit 0 to bit 15 of the remote I/O module's input port.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
Port	U16	Selection	0: Port 0 1: Port 1 2: Port 2 3: Port 3
Value	U16*	Number	Received data

- **Example**

```
U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
U16 Port=0;
U16 Value;

/* Data received by Port 0 of Remote digital input module */
I16 status = _DMC_01_get_rm_input_value(CardNo, NodeID, SlotID, Port, &Value);
```

25.2 _DMC_01_set_rm_input_filter

■ **FORMAT**

I16 PASCAL _DMC_01_set_rm_input_filter(U16 CardNo, U16 NodeID,U16 SlotID , U16 port,U16 value)

■ **Purpose**

Sets software filter level for input port of the remote I/O module. (When the value of the variable is 0, the software filter time becomes 1 ms. When the value is 1, the software filter time becomes 2 ms, and so on.)

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
port	U16	Selection	0: Port 0 1: Port 1 2: Port 2 3: Port 3
value	U16	Number	Value of software filter. Value of 0 means filter time of 1 ms.

■ **Example**

```
U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
U16 Port=0;
U16 Value=2; // In this example, the value is 2, so software filter time is 3 ms.

/* Set software filter time of Port 0 on Remote digital input module to 3 ms */
I16 status = _DMC_01_set_rm_input_filter(CardNo, NodeID, SlotID, Port, Value);
```

25.3 _DMC_01_set_rm_input_filter_enable

- **FORMAT**

  I16 PASCAL _DMC_01_set_rm_input_filter_enable(U16 CardNo, U16 NodeID, U16 SlotID,U16 port,U16 enable)

- **Purpose**

  Enables software mask for bit 0 to bit 15 of the remote I/O module's input port.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
port	U16	Selection	0: Port 0 1: Port 1 2: Port 2 3: Port 3
enable	U16	Number	Port 0/1/2/3 bit0~bit15 software filter (Value 0~0xFFFF)

- **Example**

```
U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
U16 Port=0;
U16 Enable=0xFF;

/* Set bit 0 ~ bit 7 of filter mask for Port 0 of Remote digital input module to ON */
I16 status = _DMC_01_set_rm_input_filter_enable(CardNo, NodeID, SlotID, Port, Enable);
```

25.4 _DMC_01_set_rm_output_value

- **FORMAT**

  I16 PASCAL _DMC_01_set_rm_output_value(U16 CardNo, U16 NodeID,U16 SlotID, U16 port,U16 value)

- **Purpose**

  Sets the value for bit 0 to bit 15 of the remote I/O module's output port.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
port	U16	Selection	0: Port 0 1: Port 1 2: Port 2 3: Port 3
value	U16	Number	Value to set for bit 0 to bit 15 of Port 0/1/2/3 on digital output module (ON/OFF)

- **Example**

```
U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
U16 Port=0;
U16 Value=0xF;

/* Set bit 0 ~ bit 3 of Port 0 of Remote digital input module to ON */
I16 status = _DMC_01_set_rm_output_value(CardNo, NodeID, SlotID, Port, Value);
```

25.5 _DMC_01_set_rm_output_value_error_handle

■ **FORMAT**

I16 PASCAL _DMC_01_set_rm_output_value_error_handle(U16 CardNo, U16 NodeID, U16 SlotID,U16 port,U16 value)

■ **Purpose**

Sets the output value returned when remote I/O module encounters an error.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
port	U16	Selection	0: Port 0 1: Port 1 2: Port 2 3: Port 3
value	U16	Selection	0: When an error occurs, the error output value will be reset to 0 1: When an error occurs, retain the value until system is powered off

■ **Example**

```
U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
U16 Port=0;
U16 Value=1;

I16 status = _DMC_01_set_rm_output_value_error_handle(CardNo, NodeID, SlotID, port,
             Value);
```

25.6 _DMC_01_get_rm_output_value

■ **FORMAT**

I16 PASCAL _DMC_01_get_rm_output_value (U16 CardNo, U16 NodeID, U16 SlotID, U16 port, U16* value)

■ **Purpose**

Retrieves output value of the remote I/O module.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
port	U16	Selection	0: Port 0 1: Port 1 2: Port 2 3: Port 3
value	U16*	Number	Get value set for bit 0 to bit 15 of Port 0/1/2/3 on digital output module (ON/OFF)

■ **Example**

```
U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
U16 Port=0;
U16 Value=0;

I16 status = _DMC_01_get_rm_output_value (CardNo, NodeID, SlotID, Port, &Value);
```

25.7 _DMC_01_get_rm_output_value_error_handle

■ **FORMAT**

I16 PASCAL _DMC_01_get_rm_output_value_error_handle (U16 CardNo, U16 NodeID, U16 SlotID,U16 port,U16* value)

■ **Purpose**

Retrieves output value of the remote I/O module and determines whether to retain or discard the value if an error occurs.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
port	U16	Selection	0: Port 0 1: Port 1 2: Port 2 3: Port 3
value	U16*	Selection	Get value. If value is 0: When an error occurs, the error output value will be reset to 0 1: When an error occurs, retain the value until system is powered off

■ **Example**

```
U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
U16 Port=0;
U16 Value=0;

I16 status = _DMC_01_get_rm_output_value_error_handle(CardNo, NodeID, SlotID, port,
             &Value);
```

25.8 _DMC_01_set_rm_output_active

■ **FORMAT**

I16 PASCAL _DMC_01_set_rm_output_active (U16 CardNo, U16 NodeID, U16 SlotID, U16 Enable)

■ **Purpose**

Enables/disables output from the remote I/O module.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
Enable	U16	Selection	0: Disable output 1: Enable output and send output value to target

■ **Example**

U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
U16 Enable=1;

I16 status = _DMC_01_set_rm_output_active (CardNo, NodeID, SlotID, Enable);

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Chapter 26 MPG and JOG Operation API

Table 26.1

Function Name	Description
_DMC_01_set_rm_mpg_axes_enable	Set MPG motion control
_DMC_01_set_rm_mpg_axes_enable2	MPG motion control (can numerator for servo rotation ratio)
_DMC_01_set_rm_jog_axes_enable	Set JOG motion control

26.1 _DMC_01_set_rm_mpg_axes_enable

■ **FORMAT**

I16 PASCAL _DMC_01_set_rm_mpg_axes_enable (U16 CardNo, U16 MasterNodeID, U16 MasterSlotID, U16* NodeID, U16* SlotID, U16 enable, U16 pulse_ratio, U32 *ratio, U32 *slope)

■ **Purpose**

Sets MPG motion control.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
MasterNodeID	U16	Number Unit	RM-MN64 Node ID used
MasterSlotID	U16	Number Unit	RM-MN64 Slot ID used
NodeID	U16*	Number Unit	Node ID in use (Up to 4 axes)
SlotID	U16*	Number Unit	Servo Slot ID in use (Up to 4 axes)
enable	U16	Selection	0: Disable MPG function 1: Enable MPG function
pulse_ratio	U16	Selection	Ratio between each click of MPG and pulse output 1: Four clicks of MPG produces 1 pulse output. 4: One click of MPG produces 1 pulse output.
ratio	U32*	Number	Adjust ratio of one full MPG turn to pulse output (motor rotations).
slope	U32*	Number	Set Maximum velocity slope for MPG. (PPS/sec, Max=1000).

■ Example

I16 rt = 0;
U16 CardNo = 0, MasterNodeID = 1, MasterSlotID = 0; //RM-64 Node ID is 1
U16 NodeID[4] = {2, 3, 0, 0}, SlotID[4] = {0}; //Use two ASD-A2F servo motors assigned to Node 2 and Node 3.
U16 enable = 1, pulse_ratio = 4; //Set ratio of MPG click to output pulse ratio
U32 ratio[4] = {1, 1, 0, 0}; //Set ratio of one full MPG turn to pulse output (motor rotations).
U32 slope[4] = {100}; //Set slope of MPG Maximum velocity to 100

rt = _DMC_01_set_rm_mpg_axes_enable(CardNo, MasterNodeID, MasterSlotID, NodeID, SlotID, enable, pulse_ratio, ratio, slope);
If the same conditions are used in step-motor and 04PI, the results are as follows:
One turn MPG (100 clicks) = Pulse output of 100*10=1000

Example 2: (ratio setting)
Conditions: Assume that if MPG has 100 clicks in a revolution, then it is equal to MPG ratio x 10, pulse_ratio = 4, ratio = 2, slope = 1000
Results: One full turn of MPG (100 clicks) = 2 motor rotations (128000*10*2=2560000)
If the same conditions are used in step-motor and 04PI, the results are as follows:
One full turn of the MPG (100 clicks) = Pulse output is 100*10=1000. Value of ratio does not affect output pulse. It only affects the MPG ratio setting.

Example 3: (slope setting)
Conditions: Assume that if MPG has 100 clicks in a revolution, then it is equal to MPG ratio x 100, pulse_ratio = 4, ratio = 1, slope = 100
The correct result is then: One full turn of MPG (100 clicks) = 1 motor rotation (128000*100 * 1=12800000)
Actual result: One full turn of MPG (100 clicks) = 1 actual motor rotation (12531200). Because the maximum slope for MPG is 100 (PPS/sec), the excess speed of the MCG is filtered out.

Example: For step motor and 04PI, the result is as follows:
Conditions: Assume that if MPG has 100 clicks in a revolution, then it is equal to MPG ratio x 100, pulse_ratio = 4, ratio = 1, slope = 100
The correct result is then: One full turn of MPG (100 clicks) = Pulse output of 100*100=10000
Actual result: One full turn of MPG (100 clicks) = Pulse output = 3560. Like the servo, the part above the slope is filtered out.

26.2 _DMC_01_set_rm_mpg_axes_enable2

- **FORMAT**

  I16 PASCAL _DMC_01_set_rm_mpg_axes_enable2 (U16 CardNo, U16 MasterNodeID, U16 MasterSlotID, U16* NodeID, U16* SlotID, U16 enable,U16 pulse_ratio, U32 *ratio, U32 *slope, U16 *denominator)

- **Purpose**

  MPG motion control (can set numerator for motor rotation ratio).

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
MasterNodeID	U16	Number Unit	RM-MN64 Node ID used
MasterSlotID	U16	Number Unit	RM-MN64 Slot ID used
NodeID	U16*	Number Unit	Node ID in use (Up to 4 axes)
SlotID	U16*	Number Unit	Servo Slot ID in use (Up to 4 axes)
enable	U16	Selection	0: Disable MPG function 1: Enable MPG function
pulse_ratio	U16	Selection	Ratio between each click of MPG and pulse output 1: Four clicks of MPG produces 1 pulse output. 4: One click of MPG produces 1 pulse output.
Ratio	U32*	Number Unit	Adjust ratio (denominator) of one full MPG turn to pulse output (motor rotations).
Slope	U32*	Number Unit	Set Maximum velocity slope for MPG. (PPS/sec, Max=1000).
Denominator	U16*	Number Unit	Adjust ratio (numerator) of one full MPG turn to pulse output (motor rotations).

- **Example**

```
I16 rt = 0;
U16 CardNo = 0, MasterNodeID = 1, MasterSlotID = 0; RM-64 Node ID is 1
U16 NodeID[4] = {2, 3, 0, 0}, SlotID[4] = {0}; //Use two ASD-A2F servo motors assigned to Node 2 and Node 3.
U16 enable = 1, pulse_ratio = 4; //Set ratio of MPG click to output pulse ratio
U32 ratio[4] = {10, 10, 0, 0}; //Set ratio of one full MPG turn to pulse output (motor rotations).
U32 slope[4] = {1000}; //Set slope of MPG Maximum velocity to 1000
U16 denominator [4] = {36,36, 36, 36}; //Set output ratio (numerator) for every turn of MPG

rt = _DMC_01_set_rm_mpg_axes_enable2(CardNo, MasterNodeID, MasterSlotID, NodeID, SlotID, enable, pulse_ratio, ratio, slope, denominator);
```

NOTE

The above example is explained below:

Conditions:

Assuming one full turn of MPG is 100 clicks, MPG ratio X10, ratio=10, Denominator=36, pulse_ratio =4, slope=1000, electronic gear ratio is P1.44/P1.45 = 1

1 click of MPG = Number of motor rotation pulses (**128000 * 10 / 100 * 10 / 36=355.55**) * **P1.45/P1.44**

* This is sufficient to rotate the disc driven by the motor by 1 degree (**1/360 * 1280000=355.55**)

Formula:

One full turn of MPG (100 clicks) =
Number of motor rotation pulses (**128000 * MPG ratio * ratio / Denominator**) * **P1.45 / P1.44**.

Conversion Ratio:

MPG ratio	Ratio	Denominator	Slope	MPG rotation (1 full turn)	Servo rotation
X1	1	1	1000	100	128000
X10	1	1	1000	1000	1280000
X100	1	1	1000	10000	12800000
X1	2	1	1000	100	256000
X1	1	2	1000	100	64000

Example using Delta servo P1.44 and P1.45: MPG rotates X clicks, Servo moves Y pulses

A: Basic P1.44 / P1.45 adjustment ratio =640(1280000 / 2000).
B: Basic et_rm_mpg_axes_enable2 Ratio / Denominator value =1.
C: This is the current ratio for P1.44/p1.45 adjustment.
D: Need to find value of Ratio/Denominator in set_rm_mpg_axes_enable2.

Algorithm is: **D = B * C / A * Y / X** → **D = 0.5 * C / 640 * Y / X**

26.3 _DMC_01_set_rm_jog_axes_enable

■ **FORMAT**

I16 PASCAL _DMC_01_set_rm_jog_axes_enable (U16 CardNo, U16 MasterNodeID, U16 MasterSlotID, U16* NodeID, U16* SlotID, U16 enable, U16 jog_mode, I32 *jog_speed, F64 *sec)

■ **Purpose**

Sets JOG motion control.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
MasterNodeID	U16	Number Unit	RM-MN64 Node ID used
MasterSlotID	U16	Number Unit	RM-MN64 Slot ID used
NodeID	U16*	Number Unit	Node ID in use (Up to 4 axes)
SlotID	U16*	Number Unit	Servo Slot ID in use (Up to 4 axes)
enable	U16	Selection	0: Disable JOG port 1: Enable JOG
jog_mode	U16	Selection	JOG axis selection method 0: RM mode 1: MPG mode
jog_speed	I32*	Pulses per second	JOG speed
sec	F64	Pulses per second	JOG acceleration time

■ **Example**

```
I16 rt;
U16 CardNo = 0, MasterNodeID = 1, MasterSlotID = 0; RM-64 Node ID is 1
U16 NodeID[4] = {2, 3, 4, 0}, SlotID[4] = {0}; //Using three ASD-A2F servo motors assigned to Node 2, 3 and 4.
U16 enable = 1;
U16 jog_mode = 0; //Use RM module IO to select X, Y and Z axes
I32 jog_speed[4] = {128000, 128000, 128000, 0}; //Set JOG speed as 128000 pps. (= 0.1 rps)
F64 sec = 0.1;

rt = _DMC_01_set_rm_jog_axes_enable (CardNo, MasterNodeID, MasterSlotID, NodeID, SlotID, enable, jog_mode, jog_speed, sec);
//Motor Node 2 is X axis. Node 3 is Y axis, Node 4 is Z axis. Three axes in total.
```

Chapter 27 4-Channel Pulse Interface API

Table 27.1

Function Name	Description
_DMC_01_set_rm_04pi_ipulse_mode	Set input phase mode for pulse interface module
_DMC_01_set_rm_04pi_opulse_mode	Set output phase mode for pulse interface module
_DMC_01_set_rm_04pi_svon_polarity	Set PWR ON (SVON) level
_DMC_01_set_rm_04pi_DO2	Enable DO2 port configuration
_DMC_01_set_rm_04pi_homing_ratio	Set homing torque ratio
_DMC_01_04pi_set_poweron	Set POWER ON (SVON) level
_DMC_01_rm_04PI_get_buffer	Get buffered motion command

27.1 _DMC_01_set_rm_04pi_ipulse_mode

■ **FORMAT**

I16 PASCAL _DMC_01_set_rm_04pi_ipulse_mode (U16 CardNo, U16 NodeID, U16 SlotID, U16 mode)

■ **Purpose**

Sets input phase mode for pulse interface module.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
mode	U16	Selection	0: AB phase 1: CW / CCW

■ **Example**

```
U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
U16 mode=0; //Set input phase as AB phase

I16 status = _DMC_01_set_rm_04pi_ipulse_mode (CardNo, NodeID, SlotID, mode);
```

27.2 _DMC_01_set_rm_04pi_opulse_mode

■ FORMAT

I16 PASCAL _DMC_01_set_rm_04pi_opulse_mode (U16 CardNo, U16 NodeID, U16 SlotID ,U16 mode)

■ Purpose

Sets output phase mode for pulse interface module.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
mode	U16	Selection	0: AB phase 1: CW / CCW 2: Pulse Direction DIR+ in low level 3: Pulse Direction DIR+ in high level

■ Description

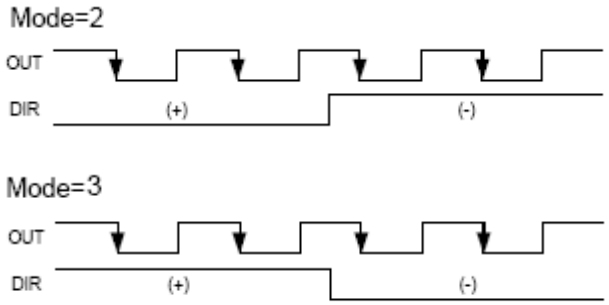

Figure 27.1 Parameter mode function

■ Example

U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
U16 mode=0; //Set input phase as AB phase.

I16 status = _DMC_01_set_rm_04pi_opulse_mode (CardNo, NodeID, SlotID, mode);

27.3 _DMC_01_set_rm_04pi_svon_polarity

■ **FORMAT**

I16 PASCAL _DMC_01_set_rm_04pi_svon_polarity (U16 CardNo, U16 NodeID, U16 SlotID, U16 polarity)

■ **Purpose**

Sets POWER ON (SVON) level.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
polarity	U16	Selection	0: Normal high 1: Normal low

■ **Example**

```
U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
U16 ON_OFF= 1;
U16 polarity = 0; //Set as Normal high

/* Enable POWER ON (Servo ON) */
I16 status = _DMC_01_04pi_set_poweron (CardNo, NodeID, SlotID, polarity);

/* When servo is Low active, the polarity value of this function must be set to 0 (Normal high) */
status = _DMC_01_set_rm_04pi_svon_polarity(CardNo, NodeID, SlotID, polarity);
```

27.4 _DMC_01_set_rm_04pi_DO2

■ **FORMAT**

I16 PASCAL _DMC_01_set_rm_04pi_DO2 (U16 CardNo, U16 NodeID, U16 SlotID, U16 ON_OFF)

■ **Purpose**

Enables DO2 port configuration.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
ON_OFF	U16	Selection	0: Disable DO2 port 1: Enable DO2 port

■ **Example**

```
U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
U16 ON_OFF=1; // Enable DO2 port

I16 status = _DMC_01_set_rm_04pi_DO2 (CardNo, NodeID, SlotID, ON_OFF);
```

27.5 _DMC_01_set_rm_04pi_homing_ratio

■ **FORMAT**

I16 PASCAL _DMC_01_set_rm_04pi_homing_ratio (U16 CardNo, U16 NodeID, U16 SlotID, U16 ratio)

■ **Purpose**

Sets the rated torque multiplier for Homing mode.

※When using RM04PI to carry out Homing motion this executes "_DMC_01_set_home_config" function. The velocity parameter of the function has type of unsigned short (16 bit), so Maximum velocity can only be set up to 65535; to use a velocity higher than 65535, the "_DMC_01_set_rm_04pi_homing_ratio" function must be used.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
ratio	U16	Number Unit	Home velocity gain ratio

■ **Example**

```
U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
U16 ratio=100; // Execute "_DMC_01_set_home_config" function to carry out Homing motion.
               // Function parameter lowSpeed has a value of 200 and highSpeed has a value
               of 2000. The ratio here is 100.
               // The actual velocity of RM04PI during Homing motion is then:
               //   lowSpeed * ratio = 200 * 100 = 2000
               //   highSpeed * ratio = 2000 * 100 = 200000

I16 status = _DMC_01_set_rm_04pi_homing_ratio( CardNo, NodeID, SlotID, ratio);
```

27.6 _DMC_01_04pi_set_poweron

■ **FORMAT**

I16 PASCAL _DMC_01_04pi_set_poweron (U16 CardNo, U16 NodeID, U16 SlotID, U16 ON_OFF)

■ **Purpose**

Enables/disables PWR ON(SVON).

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
ON_OFF	U16	Selection	0: OFF 1: ON (enable SVON)

■ **Example**

U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
U16 ON_OFF= 1;
U16 polarity=0; //Set as Normal high (Please see section 27.3 Description)

I16 status = _DMC_01_04pi_set_poweron (CardNo, NodeID, SlotID, polarity);
status = _DMC_01_set_rm_04pi_svon_polarity(CardNo, NodeID, SlotID, polarity);

27.7 _DMC_01_rm_04PI_get_buffer

■ **FORMAT**

I16 PASCAL _DMC_01_rm_04PI_get_buffer (U16 CardNo, U16 NodeID, U16 SlotID, U16 *bufferLength)

■ **Purpose**

Retrieves the buffered motion command.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16*	Number Unit	Node ID in use (Up to 4 axes)
SlotID	U16*	Number Unit	Servo Slot ID in use (Up to 4 axes)
bufferLength	U16*	Number	Un-executed motion command

■ **Example**

```
U16 CardNo=0;
U16 NodeID =1;
U16 SlotID =0;
U16 bufferLength;
I16 status;

/* Start synchronized motion control command */
status= _DMC_01_sync_move(CardNo);
/* Get un-executed motion commands from each Node */
status= _DMC_01_get_buffer_length (CardNo, NodeID, SlotID, &bufferLength);
```

Chapter 28 4-Channel Pulse Interface (Mode 1) Motion Control API

Table 28.1

Function Name	Description
_DMC_01_rm_04pi_md1_start_move	Perform 1-axis motion control under RM04PI Mode 1.
_DMC_01_rm_04pi_md1_v_move	Perform velocity motion control under RM04PI Mode 1.
_DMC_01_rm_04pi_md1_start_line2	Perform 2-axis linear interpolation motion control under RM04PI Mode 1
_DMC_01_rm_04pi_md1_start_line3	Perform 3-axis linear interpolation motion control under RM04PI Mode 1
_DMC_01_rm_04pi_md1_start_line4	Perform 4-axis linear interpolation motion control under RM04PI Mode 1
_DMC_01_rm_04pi_md1_start_arc	Perform 2-axis arc interpolation motion control under RM04PI Mode 1 (Known conditions: Center point coordinates, angle)
_DMC_01_rm_04pi_md1_start_arc2	Perform 2-axis arc interpolation motion control under RM04PI Mode 1 (Known conditions: Endpoint coordinates, angle)
_DMC_01_rm_04pi_md1_start_arc3	Perform 2-axis arc interpolation motion control under RM04PI Mode 1 (Known conditions: Center point coordinates, endpoint coordinates)
_DMC_01_rm_04pi_md1_start_heli	Perform 3-axis spiral interpolation motion control under RM04PI Mode 1
_DMC_01_rm_04pi_md1_p_change	Replace current position value with new position value under RM04PI Mode 1
_DMC_01_rm_04pi_md1_v_change	Replace current velocity with new velocity value under RM04PI Mode 1
_DMC_01_rm_04pi_md1_set_gear	Enable and set Gear parameters under RM04PI Mode 1

Function Name	Description
_DMC_01_rm_04pi_md1_set_soft_limit	Enable/disable software limit under RM04PI Mode 1
_DMC_01_rm_04pi_md1_get_soft_limit_status	Get current 4-axis software limit contact status under RM04PI Mode 1
_DMC_01_rm_04pi_md1_set_sld	Enable SLD port (DI3) and set profile
_DMC_01_rm_04pi_md1_get_mc_error_code	When alarm code is 299, get motion control error message under RM04PI Mode 1
_DMC_01_set_rm_04pi_ref_counter	Select reference counter for re-connection under RM04PI Mode 1

28.1 _DMC_01_rm_04pi_md1_start_move

■ **FORMAT**

I16 PASCAL _DMC_01_rm_04pi_md1_start_move(U16 CardNo, U16 NodeID,U16 SlotID, I32 Dist, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec,U16 m_curve,U16 m_r_a)

■ **Purpose**

Performs 1-axis motion control under RM04PI Mode 1.

※When setting StrVel, make sure its value is smaller than MaxVel.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16*	Number Unit	Node ID
SlotID	U16*	Number Unit	Slot ID
Dist	I32	Number of pulses	Specified path
StrVel	I32	Pulses per second	Starting velocity
MaxVel	I32	Pulses per second	Maximum velocity
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time
m_curve	U16	Selection	1: Referenced against T-curve velocity cross-section 2: Referenced against S-curve velocity cross-section
m_r_a	U16	Selection	0: Displacement in relative coordinates 1: Displacement in absolute coordinates

Example

```
U16 CardNo=0;
U16 NodeID =1;
U16 SlotID = 0;
I32 Dist = 1280000;
U16 StrVel = 1000, MaxVel =12800;
F64 Tacc=0.1, Tdec=0.1;
U16 m_curve = 1;
U16 m_r_a = 0;

/* RM04PI MODE1 carries out motion displacement in relative coordinates with T-curve
velocity cross-section*/
I16 status= _DMC_01_rm_04pi_md1_start_move (CardNo, NodeID, SlotID, Dist, StrVel,
            MaxVel, Tacc, Tdec, m_curve, m_r_a);
```

28.2 _DMC_01_rm_04pi_md1_v_move

■ **FORMAT**

I16 PASCAL _DMC_01_rm_04pi_md1_v_move(U16 CardNo, U16 NodeID,U16 SlotID, I32 StrVel, I32 MaxVel, F64 Tacc,I16 dir,U16 m_curve)

■ **Purpose**

Performs velocity motion control under RM04PI Mode 1.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16*	Number Unit	Slot ID
StrVel	I32	Pulses per second	Starting velocity
MaxVel	I32	Pulses per second	Maximum velocity
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time
dir	I16	Selection	0: Move in positive direction 1: Move in negative direction
m_curve	U16	Selection	1: Referenced against T-curve velocity cross-section 2: Referenced against S-curve velocity cross-section

■ **Example**

```
U16 CardNo=0;
U16 NodeID =1;
U16 SlotID = 0;
I32 StrVel = 1000, MaxVel =12800;
F64 Tacc=0.1, Tdec=0.1;
I16 dir = 0; // Direction is positive
U16 m_curve = 1; //Referenced against T-curve velocity cross-section

/* RM04PI MODE1 moving in positive direction */
I16 status= _DMC_01_rm_04pi_md1_v_move (CardNo, NodeID, SlotID, StrVel, MaxVel, Tacc,
            Tdec, dir, m_curve);
```

28.3 _DMC_01_rm_04pi_md1_start_line2

■ **FORMAT**

I16 PASCAL _DMC_01_rm_04pi_md1_start_line2(U16 CardNo, U16 NodeID,U16 *SlotID, I32 *Dist, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec,U16 m_curve,U16 m_r_a)

■ **Purpose**

Performs 2-axis linear interpolation motion control under RM04PI Mode 1.

※For motion description, please see Chapter 19 “2-Axis Linear Interpolation Motion Control API”.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16*	Number Unit	SlotID[0] holds first set of Slot ID SlotID[1] holds second set of Slot ID
Dist	I32*	Number of pulses	Path parameter corresponding to SlotID[0] motion Path parameter corresponding to SlotID[1] motion
StrVel	I32	Pulses per second	Starting velocity parameter
MaxVel	I32	Pulses per second	Maximum velocity parameter
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time
m_curve	U16	Selection	1: Referenced against T-curve velocity cross-section 2: Referenced against S-curve velocity cross-section
m_r_a	U16	Selection	0: Displacement in relative coordinates 1: Displacement in absolute coordinates

Example

```
U16 CardNo=0, NodeID=1, SlotID[2] ={0, 1};
I32 Dist[2]={30000, 40000};
I32 StrVel=0, MaxVel=3000;
F64 Tacc=0.1, Tdec=0.1;
U16 m_curve=2; //Referenced against S-curve velocity cross-section
U16 m_r_a=1; //Use displacement in absolute coordinates

I16 status = _DMC_01_rm_04pi_md1_start_line2(CardNo, NodeID, SlotID, Dist, StrVel,
             MaxVel, Tacc, Tdec, m_curve, m_r_a);
```

28.4 _DMC_01_rm_04pi_md1_start_line3

■ FORMAT

I16 PASCAL _DMC_01_rm_04pi_md1_start_line3(U16 CardNo, U16 NodeID,U16 *SlotID, I32 *Dist, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec,U16 m_curve,U16 m_r_a)

■ Purpose

Performs 3-axis linear interpolation motion control under RM04PI Mode 1.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16*	Number Unit	SlotID[0] holds first set of Slot ID SlotID[1] holds second set of Slot ID SlotID[2] holds third set of Slot ID
Dist	I32*	Number of pulses	Path parameter corresponding to SlotID[0] motion Path parameter corresponding to SlotID[1] motion Path parameter corresponding to SlotID[2] motion
StrVel	I32	Pulses per second	Starting velocity parameter
MaxVel	I32	Pulses per second	Maximum velocity parameter
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time
m_curve	U16	Selection	1: Referenced against T-curve velocity cross-section 2: Referenced against S-curve velocity cross-section
m_r_a	U16	Selection	0: Displacement in relative coordinates 1: Displacement in absolute coordinates

Example

```
U16 CardNo=0, NodeID=1, SlotID[3] ={0,1,2};
I32 Dist[3]={10000, 20000, 30000};
I32 StrVel=0, MaxVel=3000;
F64 Tacc=0.1, Tdec=0.1;
U16 m_curve=1; //Referenced against T-curve velocity cross-section
U16 m_r_a=1; //Use displacement in absolute coordinates
I16 status = _DMC_01_rm_04pi_md1_start_line3 (CardNo, NodeID, SlotID, Dist,StrVel,
             MaxVel, Tacc, Tdec, m_curve, m_r_a);
```

28.5 _DMC_01_rm_04pi_md1_start_line4

■ FORMAT

I16 PASCAL _DMC_01_rm_04pi_md1_start_line4(U16 CardNo, U16 NodeID,U16 *SlotID, I32 *Dist, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec,U16 m_curve,U16 m_r_a)

■ Purpose

Performs 4-axis linear interpolation motion control under RM04PI Mode 1.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Holds Node ID sets used for linear interpolation
SlotID	U16*	Number Unit	SlotID[0] holds first set of Slot ID SlotID[1] holds second set of Slot ID SlotID[2] holds third set of Slot ID SlotID[3] holds fourth set of Slot ID
Dist	I32*	Number of pulses	Path parameter corresponding to SlotID[0] motion Path parameter corresponding to SlotID[1] motion Path parameter corresponding to SlotID[2] motion Path parameter corresponding to SlotID[3] motion
StrVel	I32	Pulses per second	Starting velocity parameter
MaxVel	I32	Pulses per second	Maximum velocity parameter
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time
m_curve	U16	Selection	1: Referenced against T-curve velocity cross-section 2: Referenced against S-curve velocity cross-section
m_r_a	U16	Selection	0: Displacement in relative coordinates 1: Displacement in absolute coordinates

- **Example**

U16 CardNo=0, NodeID=1, SlotID[4] ={0,1,2,3};
I32 Dist[4]={10000, 20000, 30000, 40000};
I32 StrVel=0, MaxVel=3000;
F64 Tacc=0.1, Tdec=0.1;
U16 m_curve=1, m_r_a=1; //Perform motion in absolute coordinates with T-curve velocity cross-section

I16 status = _DMC_01_rm_04pi_md1_start_line4 (CardNo, NodeID, SlotID, Dist, StrVel, MaxVel, Tacc, Tdec, m_curve, m_r_a);

28.6 _DMC_01_rm_04pi_md1_start_arc

■ **FORMAT**

I16 PASCAL _DMC_01_rm_04pi_md1_start_arc(U16 CardNo, U16 NodeID,U16* SlotID, I32* Center, F64 Angle, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec,U16 m_curve,U16 m_r_a)

■ **Purpose**

Performs 2-axis arc interpolation motion control under RM04PI Mode 1 (Known conditions: center point coordinates, angle).

※For motion description, please see Chapter 20 “2-Axis Arc Interpolation Motion Control API”.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16*	Number Unit	SlotID[0] holds first set of Slot ID SlotID[1] holds second set of Slot ID
Center	I32*	Number of pulses	Center[0] holds first set of center point coordinates Center[1] holds second set of center point coordinates
Angle	F64	Degree (°)	Set arc angle. One full arc is 360°
StrVel	I32	Pulses per second	Starting velocity parameter
MaxVel	I32	Pulses per second	Maximum velocity parameter
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time
m_curve	U16	Selection	1: Referenced against T-curve velocity cross-section 2: Referenced against S-curve velocity cross-section
m_r_a	U16	Selection	0: Displacement in relative coordinates 1: Displacement in absolute coordinates

- **Example**

U16 CardNo=0, NodeID=1, SlotID[2]={0,1};
I32 Center[2]={5000,5000}, StrVel=0, MaxVel=1000;
F64 Tacc=0.1, Tdec=0.1;
U16 m_curve=1, m_r_a=1; //Perform motion in absolute coordinates with T-curve velocity cross-section

I16 status = _DMC_01_rm_04pi_md1_start_arc(CardNo, NodeID, SlotID, Center, Angle, StrVel, MaxVel, Tacc, Tdec, m_curve, m_r_a);

28.7 _DMC_01_rm_04pi_md1_start_arc2

■ FORMAT

I16 PASCAL _DMC_01_rm_04pi_md1_start_arc2(U16 CardNo, U16 NodeID,U16* SlotID, I32* End, F64 Angle, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec,U16 m_curve,U16 m_r_a)

■ Purpose

Performs 2-axis arc interpolation motion control under RM04PI Mode 1 (Known conditions: endpoint coordinates, angle)

※For motion description, please see Chapter 20 “2-Axis Arc Interpolation Motion Control API”.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16*	Number Unit	SlotID[0] holds first set of Slot ID SlotID[1] holds second set of Slot ID
End	I32*	Number of pulses	End[0] holds first set of endpoint coordinates End[1] holds second set of endpoint coordinates
Angle	F64	Degree (°)	Set arc angle. One full arc is 360°
StrVel	I32	Pulses per second	Starting velocity parameter
MaxVel	I32	Pulses per second	Maximum velocity parameter
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time
m_curve	U16	Selection	1: Referenced against T-curve velocity cross-section 2: Referenced against S-curve velocity cross-section
m_r_a	U16	Selection	0: Displacement in relative coordinates 1: Displacement in absolute coordinates

- **Example**

```
U16 CardNo=0, NodeID=1, SlotID[2]={0,1};
I32 End[2]={5000,5000}, StrVel=0, MaxVel=1000;
F64 Tacc=0.1, Tdec=0.1;
U16 m_curve=1, m_r_a=1; //Perform motion in absolute coordinates with T-curve velocity
cross-section

I16 status = _DMC_01_rm_04pi_md1_start_arc2(CardNo, NodeID, SlotID, End, Angle, StrVel,
             MaxVel, Tacc, Tdec, m_curve, m_r_a);
```

28.8 _DMC_01_rm_04pi_md1_start_arc3

■ **FORMAT**

I16 PASCAL _DMC_01_rm_04pi_md1_start_arc3(U16 CardNo, U16 NodeID,U16* SlotID, I32* Center,I32* End, I16 dir, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec,U16 m_curve, U16 m_r_a)

■ **Purpose**

Performs 2-axis arc interpolation motion control under RM04PI Mode 1 (Known conditions: center point coordinates, endpoint coordinates)

※For motion description, please see Chapter 20 “2-Axis Arc Interpolation Motion Control API”.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16*	Number Unit	SlotID[0] holds first set of Slot ID SlotID[1] holds second set of Slot ID
Center	I32*	Number of pulses	Center[0] holds first set of center point coordinates Center[1] holds second set of center point coordinates
End	I32*	Number of pulses	End[0] holds first set of endpoint coordinates End[1] holds second set of endpoint coordinates
dir	I16	Selection	Specified direction (Clockwise if value is 1; CCW if value is 0)
StrVel	I32	Pulses per second	Starting velocity parameter
MaxVel	I32	Pulses per second	Tangential velocity parameter
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time
m_curve	U16	Selection	1: Referenced against T-curve velocity cross-section 2: Referenced against S-curve velocity cross-section
m_r_a	U16	Selection	0: Displacement in relative coordinates 1: Displacement in absolute coordinates

Example

```
U16 CardNo=0, NodeID=1, SlotID[2]={0,1}, m_curve=1, m_r_a=1;
I32 Center[2]={5000,2500}, End[2]={10000,5000}, StrVel=0, MaxVel=1000;
I16 dir=1; //Clockwise
F64 Tacc=0.1, Tdec=0.1;

I16 status = _DMC_01_rm_04pi_md1_start_arc3(CardNo, NodeID, SlotID, Center, End, dir,
             StrVel, MaxVel, Tacc, Tdec, m_curve, m_r_a);
```

28.9 _DMC_01_rm_04pi_md1_start_heli

■ FORMAT

I16 PASCAL _DMC_01_rm_04pi_md1_start_heli(U16 CardNo, U16 NodeID,U16* SlotID, I32* Center,I32 Depth, I32 Pitch, I16 dir, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec, U16 m_curve,U16 m_r_a)

■ Purpose

Performs 3-axis spiral interpolation motion control under RM04PI Mode 1.

※For motion description, please see Chapter 22 “3-Axis Spiral Interpolation Motion Control API”.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16*	Number Unit	SlotID[0] holds first set of Slot ID SlotID[1] holds second set of Slot ID SlotID[2] holds third set of Slot ID
Center	I32*	Number of pulses	Center[0] holds first set of center point coordinates Center[1] holds second set of center point coordinates Center[2] holds third set of center point coordinates
Depth	I32	Number of pulses	Relative depth to position on specified axis (height in direction of Z)
Pitch	I32	Number of pulses	Relative height between two spirals
dir	I16	Selection	Direction of spiral arc motion. Clockwise: 1; Counterclockwise: 0
StrVel	I32	Pulses per second	Starting velocity parameter
MaxVel	I32	Pulses per second	Tangential velocity parameter
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time
m_curve	U16	Selection	1: Referenced against T-curve velocity cross-section 2: Referenced against S-curve velocity cross-section
m_r_a	U16	Selection	0: Displacement in relative coordinates 1: Displacement in absolute coordinates

Example

```
U16 CardNo=0, NodeID=1, SlotID[3]={0,1,2}, m_curve=1, m_r_a=1;
I32 Center[3]={5000,2500,2500}, Depth = 2500, Pitch = 500, StrVel = 0, MaxVel = 1000;
I16 dir=1; //Clockwise
F64 Tacc=0.1, Tdec=0.1;
I16 status = _DMC_01_rm_04pi_md1_start_heli(CardNo, NodeID, SlotID, Center, Depth,
            Pitch, dir, StrVel, MaxVel, Tacc, Tdec, m_curve, m_r_a);
```

28.10 _DMC_01_rm_04pi_md1_p_change

- **FORMAT**

  I16 PASCAL _DMC_01_rm_04pi_md1_p_change (U16 CardNo, U16 NodeID, U16 SlotID, I32 NewPos)

- **Purpose**

  Replaces the current position with a new position value under RM04PI Mode 1.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
NewPos	I32	Number of pulses	Position parameter to be replaced

- **Example**

  U16 CardNo=0, NodeID =1, SlotID=0;
  I32 NewPos=100000;
  I16 status= _ DMC_01_rm_04pi_md1_p_change (CardNo, NodeID, SlotID, NewPos);

28.11 _DMC_01_rm_04pi_md1_v_change

■ **FORMAT**

I16 PASCAL _DMC_01_rm_04pi_md1_v_change (U16 CardNo, U16 NodeID, U16 SlotID, I32 NewSpeed, F64 sec)

■ **Purpose**

Replaces the current velocity with a new velocity value under RM04PI Mode 1.

※Please refer to section 18.6 "_DMC_01_v_change" for details.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
NewSpeed	I32	Pulses per second	Velocity parameter to be changed
sec	F64	Second	Specified acceleration/deceleration time for velocity change.

■ **Example**

U16 CardNo=0, NodeID =1, SlotID=0;

I32 NewSpeed=3000;

F64 sec=0.1;

I16 status= _ DMC_01_rm_04pi_md1_v_change (CardNo, NodeID, SlotID, NewSpeed, sec);

28.12 _DMC_01_rm_04pi_md1_set_gear

■ FORMAT

I16 PASCAL _DMC_01_rm_04pi_md1_set_gear (U16 CardNo, U16 NodeID, U16 SlotID, I16 numerator,I16 denominator,U16 Enable)

■ Purpose

Enables and sets Gear parameters under RM04PI Mode 1.

※As a step motor does not offer an electronic gear ratio, this function is used instead.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
numerator	I16	Number Unit	Electronic gear denominator
denominator	I16	Number Unit	Electronic gear numerator
Enable	U16	Selection	0: Disable Gear 1: Enable Gear

■ Example

U16 CardNo=0, NodeID =1, SlotID=0;
I16 numerator=1, denominator=2;
U16 Enable=1;

I16 status = _DMC_01_rm_04pi_md1_set_gear (CardNo, NodeID, SlotID, numerator, denominator, Enable);

28.13 _DMC_01_rm_04pi_md1_set_soft_limit

■ **FORMAT**

I16 PASCAL _DMC_01_rm_04pi_md1_set_soft_limit(U16 CardNo, U16 NodeID,U16 SlotID, I32 PLimit, I32 NLimit,U16 Enable)

■ **Purpose**

Enables/disables software limit under RM04PI Mode 1.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
PLimit	I32	Number Unit	Value of positive software limit
NLimit	I32	Number Unit	Value of negative software limit
Enable	U16	Selection	0: Disable software limit 1: Enable software limit

■ **Example**

U16 CardNo=0; U16 NodeID =1, SlotID=0;
I32 PLimit=5000, NLimit=-5000;
U16 Enable=1;

```
I16 status = _DMC_01_rm_04pi_md1_set_soft_limit (CardNo, NodeID, SlotID, PLimit, NLimit,
             Enable);
```

28.14 _DMC_01_rm_04pi_md1_get_soft_limit_status

- **FORMAT**

  I16 PASCAL _DMC_01_rm_04pi_md1_get_soft_limit_status (U16 CardNo, U16 NodeID, U16 SlotID ,U16* NLimit_status,U16* PLimit_status)

- **Purpose**

  Retrieves current 4-axis software limit contact status under RM04PI Mode 1.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
NLimit_status	U16*	Number Unit	Return contact status of negative software limit
PLimit_status	U16*	Number Unit	Return contact status of positive software limit

- **Example**

```
U16 CardNo=0; U16 NodeID =1, SlotID=0;
U16 NLimit_status, PLimit_status;

I16 status = _DMC_01_rm_04pi_md1_get_soft_limit_status(CardNo, NodeID, SlotID ,
             &NLimit_status, &PLimit_status);
             // If there is contact with negative software limit, NLimit_status returns 1; Return 0 otherwise
             // If there is contact with positive software limit, PLimit_status returns 1; Return 0 otherwise
```

28.15 _DMC_01_rm_04pi_md1_set_sld

- **FORMAT**

  I16 PASCAL _DMC_01_rm_04pi_md1_set_sld (U16 CardNo, U16 NodeID, U16 SlotID, I16 enable, I16 sd_logic,I16 mode)

- **Purpose**

  Enables SLD port (DI3) and sets the profile.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
enable	I16	Selection	0: Disable SLD port 1: Enable SLD port
sd_logic	I16	Selection	0: Normal high 1: Normal low
mode	I16	Selection	1: Use EMG stop (emergency stop) 2: Use Slow down stop (slow down stop)

- **Example**

```
U16 CardNo=0, NodeID =1, SlotID=0;
I16 enable=1;
I16 sd_logic=1; //Port polarity is Normal high
I16 mode=1; //Stop mode used is EMG stop

I16 status= _DMC_01_rm_04pi_md1_set_sld(CardNo, NodeID, SlotID, enable, sd_logic,
            mode);
```

28.16 _DMC_01_rm_04pi_md1_get_mc_error_code

■ FORMAT

I16 PASCAL _DMC_01_rm_04pi_md1_get_mc_error_code (U16 CardNo, U16 NodeID, U16 SlotID, U16 error_code)

■ Purpose

When the alarm code is 299, retrieves the motion control error message under RM04PI Mode 1.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
error_code	U16*	Number Unit	Motion control error code

■ Example

```
U16 CardNo=0;
U16 NodeID =1;
U16 SlotID=0;
U16* error_code;
U32* alm_code;

/* Get Slave error message */
I16 status= _DMC_01_get_alm_code (CardNo, NodeID, SlotID, &alm_code);

/* Use this function when alm_code has a value of 299.
   Get error code for current motion of RM04PI.    */
I16 status= _DMC_01_rm_04pi_md1_get_mc_error_code (CardNo, NodeID, SlotID,
&error_code);
//Example: error_code of 127 means" Motion command buffer is full" (For a detailed
  description of erro_code, please refer to PCI_DMC_01_Err.h)
```

28.17 _DMC_01_set_rm_04pi_ref_counter

■ **FORMAT**

I16 PASCAL _DMC_01_set_rm_04pi_ref_counter (U16 CardNo, U16 NodeID, U16 SlotID , U16 mode)

■ **Purpose**

Selects the reference position after re-connecting to module under M04PI Mode 1.

※Check that link feedback is enabled when using this function.

If yes, set mode parameter to 1; if there is no feedback, set parameter to 0.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
mode	U16	Selection	0: Reference command counter 1: Reference position counter

■ **Example**

```
U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
U16 mode=0; //Reference command counter

I16 status =_DMC_01_set_rm_04pi_ref_counter (CardNo, NodeID, SlotID, mode);
```

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Chapter 29 4-Channel Analog Output Remote I/O Module API

Table 29.1

Function Name	Description
_DMC_01_rm_04da_set_output_value	Set DA output value
_DMC_01_rm_04da_get_output_value	Read DA output
_DMC_01_rm_04da_get_return_code	Read DA status
_DMC_01_rm_04da_set_output_range	Set DA output range
_DMC_01_rm_04da_set_output_enable	Enable/disable pin output
_DMC_01_rm_04da_set_output_overrange	Increase output range by 10%
_DMC_01_rm_04da_set_output_error_clear	Clear error status
_DMC_01_rm_04da_read_data	Get current DA number
_DMC_01_rm_04da_set_output_error_handle	Keep original DA settings if the connection is broken
_DMC_01_rm_04da_set_output_offset_value	Set DA offset
_DMC_01_rm_04da_get_output_offset_value	Read DA offset

29.1 _DMC_01_rm_04da_set_output_value

■ FORMAT

I16 PASCAL _DMC_01_rm_04da_set_output_value (U16 CardNo, U16 NodeID, U16 SlotID, U16 ChannelNo, U16 Value)

■ Purpose

Sets value of DA output.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID is between 0~12
SlotID	U16*	Number Unit	0
ChannelNo	U16	Number Unit	Channel ID is between 0~3
Value	U16	Number Unit	Output is between 0 ~ 65535

■ Example

```
U16 CardNo = 0;
U16 NodeID = 1;
U16 SlotID = 0;
U16 ChannelNo = 0;
U16 Value = 0x5ff;

I16 status = _DMC_01_rm_04da_set_output_value (CardNo, NodeID, SlotID, ChannelNo,
             Value);
```

29.2 _DMC_01_rm_04da_get_output_value

■ FORMAT

I16 PASCAL _DMC_01_rm_04da_get_output_value (U16 CardNo, U16 NodeID,U16 SlotID, U16 ChannelNo, U16 *Value)

■ Purpose

Reads the value of the DA output.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID is between 0~12
SlotID	U16*	Number Unit	0
ChannelNo	U16	Number Unit	Channel ID is between 0~3
Value	U16	Number Unit	Output is between 0 ~ 65535

■ Example

```
U16 CardNo = 0;
U16 NodeID = 1;
U16 SlotID = 0;
U16 ChannelNo = 0;
U16 Value = 0;

I16 status = _DMC_01_rm_04da_get_output_value (CardNo, NodeID, SlotID, ChannelNo,
             &Value);
```

29.3 _DMC_01_rm_04da_get_return_code

■ **FORMAT**

I16 PASCAL _DMC_01_rm_04da_get_return_code (U16 CardNo, U16 NodeID, U16 SlotID, U16 ChannelNo, U16* ReturnCode)

■ **Purpose**

Reads DA status.

■ **Parameters**

<table>
<tr><th>Name</th><th>Data Type</th><th>Unit</th><th>Description</th></tr>
<tr><td>CardNo</td><td>U16</td><td>Number Unit</td><td>CardNo is between 0~15</td></tr>
<tr><td>NodeID</td><td>U16</td><td>Number Unit</td><td>Node ID is between 0~63</td></tr>
<tr><td>SlotID</td><td>U16</td><td>Number Unit</td><td>0</td></tr>
<tr><td>ChannelNo</td><td>U16</td><td>Number Unit</td><td>Channel ID is between 0~3</td></tr>
<tr><td>Data</td><td>U16</td><td>Number Unit</td><td>Get return status parameter
<table>
<tr><th>D3</th><th>D2</th><th>D1</th><th>D0</th></tr>
<tr><td>out enable</td><td colspan="3">out range mode</td></tr>
<tr><th>D7</th><th>D6</th><th>D5</th><th>D4</th></tr>
<tr><td colspan="2">return code</td><td>error handle</td><td>over range</td></tr>
<tr><th>D11</th><th>D10</th><th>D9</th><th>D8</th></tr>
<tr><td colspan="4">return code</td></tr>
<tr><th>D15</th><th>D14</th><th>D13</th><th>D12</th></tr>
<tr><td colspan="4">return code</td></tr>
</table></td></tr>
</table>

■ **Example**

```
U16 CardNo = 0;
U16 NodeID = 1;
U16 SlotID = 0;
U16 ChannelNo = 1;
U16 ReturnCode = 0;

I16 status = _DMC_01_rm_04da_get_return_code (CardNo, NodeID, SlotID, ChannelNo,
             &ReturnCode);
```

29.4 _DMC_01_rm_04da_set_output_range

■ FORMAT

I16 PASCAL _DMC_01_rm_04da_set_output_range (U16 CardNo, U16 NodeID, U16 SlotID, U16 ChannelNo, U16 Range)

■ Purpose

Sets the DA output range.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID is between 0~63
SlotID	U16	Number Unit	0
ChannelNo	U16	Number Unit	Channel ID is between 0~3
Range	U16	Number Unit	Gain is 0 ~ 7 Number: 0 — Definition: Output range: 0-5V (default) Number: 1 — Definition: Output range: 0-10V Number: 2 — Definition: Output range: ±5V Number: 3 — Definition: Output range: ±10V Number: 5 — Definition: Output range: 4-20mA Number: 6 — Definition: Output range: 0-20mA Number: 7 — Definition: Output range: 0-24mA

■ Example

```
U16 CardNo = 0;
U16 NodeID = 1;
U16 SlotID = 0;
U16 ChannelNo = 2;
U16 Range = 3; //Select mode 3

I16 status = _DMC_01_rm_04da_set_output_range (CardNo, NodeID, SlotID, ChannelNo, range);
```

29.5 _DMC_01_rm_04da_set_output_enable

■ FORMAT

I16 PASCAL _DMC_01_rm_04da_set_output_enable (U16 CardNo, U16 NodeID,U16 SlotID, U16 ChannelNo, U16 Enable)

■ Purpose

Enables/disables pin output.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID is (0~12)
SlotID	U16	Number Unit	0
ChannelNo	U16	Number Unit	Channel ID is between 0~3
Enable	U16	Selection	0: Output disable 1: Output enable. Set and send the output value to target

■ Example

```
U16 CardNo = 0;
U16 NodeID = 1;
U16 SlotID = 0;
U16 ChannelNo = 3;
U16 Enable = 1; //Enable

I16 status = _DMC_01_rm_04da_set_output_enable (CardNo, NodeID, SlotID, ChannelNo,
             Enable);
```

29.6 _DMC_01_rm_04da_set_output_overrange

■ FORMAT

I16 PASCAL _DMC_01_rm_04da_set_output_overrange (U16 CardNo, U16 NodeID, U16 SlotID, U16 ChannelNo, U16 On_Off)

■ Purpose

Increases output range by 10%.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID is (0~12)
SlotID	U16	Number Unit	0
ChannelNo	U16	Number Unit	Channel ID is between 0~3
On_Off	U16	Selection	0: Disable Overrange 1: Enable Overrange

■ Example

```
U16 CardNo = 0;
U16 NodeID = 1;
U16 SlotID = 0;
U16 ChannelNo = 0;
U16 On_Off = 1; // enable OverRange

I16 status = _DMC_01_rm_04da_set_output_overrange (CardNo, NodeID, SlotID, ChannelNo,
                On_Off);
```

29.7 _DMC_01_rm_04da_set_output_error_clear

■ FORMAT

I16 PASCAL _DMC_01_rm_04da_set_output_error_clear (U16 CardNo, U16 NodeID, U16 SlotID, U16 ChannelNo, U16 On_Off)

■ Purpose

Clears error status.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID is between 0~12
SlotID	U16	Number Unit	0
ChannelNo	U16	Number Unit	Channel ID is between 0~3
On_Off	U16	Selection	0: Disable CleanError 1: Enable CleanError

■ Example

```
U16 CardNo = 0;
U16 NodeID = 1;
U16 SlotID = 0;
U16 ChannelNo = 0;
U16 On_Off = 1; //Clear Error

I16 status = _DMC_01_rm_04da_set_output_error_clear (CardNo, NodeID, SlotID,
                ChannelNo, On_Off);
```

29.8 _DMC_01_rm_04da_read_data

- **FORMAT**

  I16 PASCAL _DMC_01_rm_04da_read_data (U16 CardNo, U16 NodeID, U16 SlotID, U16 ChannelNo, U16* data)

- **Purpose**

  Retrieves current DA number.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID is between 0~63
SlotID	U16	Number Unit	0
ChannelNo	U16	Number Unit	Channel ID is between 0~3
Data	U16	Number Unit	Get data 0 ~ 65535

- **Example**

```
U16 CardNo = 0;
U16 NodeID = 1;
U16 SlotId = 0;
U16 ChannelNo = 2;
U16 Data = 0;

I16 status = _DMC_01_rm_04da_read_data (CardNo, NodeID, SlotID, ChannelNo, &Data);
```

29.9 _DMC_01_rm_04da_set_output_error_handle

■ **FORMAT**

I16 PASCAL _DMC_01_rm_04da_set_output_error_handle (U16 CardNo, U16 NodeID, U16 SlotID, U16 ChannelNo, U16 On_Off)

■ **Purpose**

Keeps original DA settings if the connection is broken.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID is between 0~12
SlotID	U16	Number Unit	0
ChannelNo	U16	Number Unit	Channel ID is between 0~3
On_Off	U16	Selection	0: Disable ErrorHandle 1: Enable ErrorHandle

■ **Example**

```
U16 CardNo = 0;
U16 NodeID = 1;
U16 SlotId = 0;
U16 ChannelNo = 3;
U16 On_Off = 1; // enable ErrorHandle

I16 status = _DMC_01_rm_04da_set_output_error_handle (CardNo, NodeID, SlotID,
             ChannelNo, On_Off);
```

29.10 _DMC_01_rm_04da_set_output_offset_value

■ **FORMAT**

I16 PASCAL _DMC_01_rm_04da_set_output_offset_value (U16 CardNo, U16 NodeID, U16 SlotID, U16 ChannelNo, I16 Value)

■ **Purpose**

Sets the DA offset value.

■ **Parameters**

<table>
<tr><th>Name</th><th>Data Type</th><th>Unit</th><th>Description</th></tr>
<tr><td>CardNo</td><td>U16</td><td>Number Unit</td><td>CardNo is between 0~15</td></tr>
<tr><td>NodeID</td><td>U16</td><td>Number Unit</td><td>Node ID is between 0~63</td></tr>
<tr><td>SlotID</td><td>U16</td><td>Number Unit</td><td>0</td></tr>
<tr><td>ChannelNo</td><td>U16</td><td>Number Unit</td><td>Channel ID is between 0~3</td></tr>
<tr><td>SetValue</td><td>I16</td><td>Selection</td><td>Value is +127 ~ -128
■ 1 Step of Value = 38.14μv
■ Adjust the offset of the channel by -16 LSBs to +15.875 LSBs in increments of 1/8 LSB
<table>
<tr><th>Number</th><th>Definition</th></tr>
<tr><td>127</td><td>Offset Adjustment: +15.875 LSBs (4.844mv)</td></tr>
<tr><td>126</td><td>Offset Adjustment: +15.75 LSBs (4.806mv)</td></tr>
<tr><td>…</td><td>……</td></tr>
<tr><td>0</td><td>No Adjustment (default)</td></tr>
<tr><td>…</td><td>……</td></tr>
<tr><td>-127</td><td>Offset Adjustment: -15.875 LSBs(- 4.844mv)</td></tr>
<tr><td>-128</td><td>Offset Adjustment: -16 LSBs(- 4.882mv)</td></tr>
</table></td></tr>
</table>

■ **Example**

```
U16 CardNo = 0;
U16 NodeID = 1;
U16 SlotId = 0;
U16 ChannelNo = 0;
I16 Value = 0xf; //Set offset as 0xf

I16 status = _DMC_01_rm_04da_set_output_offset_value (CardNo, NodeID, SlotID,
             ChannelNo, Value);
```

29.11 _DMC_01_rm_04da_get_output_offset_value

■ **FORMAT**

I16 PASCAL _DMC_01_rm_04da_get_output_offset_value (U16 CardNo, U16 NodeID, U16 SlotID, U16 ChannelNo, I16 *Value)

■ **Purpose**

Reads the DA offset value.

■ **Parameters**

<table>
<tr><th>Name</th><th>Data Type</th><th>Unit</th><th>Description</th></tr>
<tr><td>CardNo</td><td>U16</td><td>Number Unit</td><td>CardNo is between 0~15</td></tr>
<tr><td>NodeID</td><td>U16</td><td>Number Unit</td><td>Node ID is between 0~63</td></tr>
<tr><td>SlotID</td><td>U16</td><td>Number Unit</td><td>0</td></tr>
<tr><td>ChannelNo</td><td>U16</td><td>Number Unit</td><td>Channel ID is between 0~3</td></tr>
<tr><td>SetValue</td><td>I16</td><td>Selection</td><td>Value is +127 ~ -128
■ 1 Step of Value = 38.14μv
■ Adjust the offset of the channel by -16 LSBs to +15.875 LSBs in increments of 1/8 LSB
<table><tr><th>Number</th><th>Definition</th></tr><tr><td>127</td><td>Offset Adjustment: +15.875 LSBs (4.844mv)</td></tr><tr><td>126</td><td>Offset Adjustment: +15.75 LSBs (4.806mv)</td></tr><tr><td>…</td><td>……</td></tr><tr><td>0</td><td>No Adjustment (default)</td></tr><tr><td>…</td><td>……</td></tr><tr><td>-127</td><td>Offset Adjustment: -15.875 LSBs(- 4.844mv)</td></tr><tr><td>-128</td><td>Offset Adjustment: -16 LSBs(- 4.882mv)</td></tr></table></td></tr>
</table>

■ **Example**

```
U16 CardNo = 0, NodeID = 1, SlotId = 0;
U16 ChannelNo = 0;
I16 Value = 0;

I16 status = _DMC_01_rm_04da_get_output_offset_value (CardNo, NodeID, SlotID,
             ChannelNo, & Value);
```

Chapter 30 4-Channel Analog Input Remote I/O Module API

Table 30.1

Function Name	Description
_DMC_01_set_04ad_input_range	Set AD input range
_DMC_01_get_04ad_input_range	Get current AD Input range
_DMC_01_set_04ad_zero_scale	Set AD zero level for range calibration
_DMC_01_get_04ad_zero_scale_status	Check if AD zero calibration is complete
_DMC_01_set_04ad_full_scale	Set AD maximum level for range calibration
_DMC_01_get_04ad_full_scale_status	Check if AD maximum level calibration is complete
_DMC_01_set_04ad_conversion_time	Set AD conversion time
_DMC_01_get_04ad_conversion_time	Get current AD conversion time
_DMC_01_get_04ad_data	Read input voltage
_DMC_01_set_04ad_average_mode	Set AD average mode
_DMC_01_get_04ad_average_mode	Get AD average mode
_DMC_01_set_04ad_input_enable	Enable/disable AD Channel Input feedback

30.1 _DMC_01_set_04ad_input_range

■ FORMAT

I16 _DMC_01_set_04ad_input_range (U16 CardNo, U16 NodeID, U16 SlotID, U16 channelno, U16 range)

■ Purpose

Sets the AD input range.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID is between 0~12
SlotID	U16	Number Unit	0
ChannelNo	U16	Number Unit	Channel ID is between 0~3
Range	U16	Number Unit	Input value is 0 ~ 3

Number	Definition
0	Input range: -10V~10V
1	Input range: 0V~10V
2	Input range: -5V~5V
3	Input range: 0V~5V

■ Example

```
U16 CardNo = 0;
U16 NodeID = 1;
U16 SlotID = 0;
U16 channelno = 0;
U16 range = 1; //Select Range -10 ~ 10V

I16 status = _DMC_01_set_04ad_input_range (CardNo, NodeID, SlotID, channelno, range);
```

30.2 _DMC_01_get_04ad_input_range

■ FORMAT

I16 _DMC_01_get_04ad_input_range (U16 CardNo, U16 NodeID, U16 SlotID, U16 channelno, U16 *range)

■ Purpose

Retrieves the current AD Input range.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID is between 0~63
SlotID	U16	Number Unit	0
ChannelNo	U16	Number Unit	Channel ID is between 0~3
Range	U16	Number Unit	Get return parameter. Value is 0 ~ 3

Number	Definition
0	Input range: -10V~10V
1	Input range: 0V~10V
2	Input range: -5V~5V
3	Input range: 0V~5V

■ Example

```
U16 CardNo = 0;
U16 NodeID = 1;
U16 SlotID = 0;
U16 channelno = 1;
U16 range;

I16 status = _DMC_01_get_04ad_input_range (CardNo, NodeID, SlotID, channelno, &range);
```

30.3 _DMC_01_set_04ad_zero_scale

- **FORMAT**

  I16 _DMC_01_set_04ad_zero_scale (U16 CardNo, U16 NodeID, U16 SlotID, U16 channelno)

- **Purpose**

  Sets AD zero level for range calibration.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID is between 0~63
SlotID	U16	Number Unit	0
ChannelNo	U16	Number Unit	Channel ID is between 0~3

- **Example**

```
U16 CardNo = 0;
U16 NodeID = 1;
U16 SlotID = 0;
U16 channelno = 2;

I16 status = _DMC_01_set_04ad_zero_scale (CardNo, NodeID, SlotID, channelno);
```

30.4 _DMC_01_get_04ad_zero_scale_status

■ FORMAT

I16 _DMC_01_get_04ad_zero_scale_status (U16 CardNo, U16 NodeID, U16 SlotID, U16 channelno, U16* status)

■ Purpose

Checks if AD zero calibration is complete.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID is between 0~63
SlotID	U16	Number Unit	0
ChannelNo	U16	Number Unit	Channel ID is between 0~3
Status	U16	Selection	0: Zero calibration completed. 1: Zero calibration not completed.

■ Example

```
U16 CardNo = 0;
U16 NodeID = 1;
U16 SlotID = 0;
U16 channelno = 3;
U16 status;

I16 status = _DMC_01_get_04ad_zero_scale_status (CardNo, NodeID, SlotID, channelno,
             &status);
```

30.5 _DMC_01_set_04ad_full_scale

- **FORMAT**

  I16 _DMC_01_set_04ad_full_scale (U16 CardNo, U16 NodeID, U16 SlotID, U16 channelno)

- **Purpose**

  Sets AD maximum level for range calibration.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID is (0~12)
SlotID	U16	Number Unit	0
ChannelNo	U16	Number Unit	Channel ID is between 0~3

- **Example**

```
U16 CardNo = 0;
U16 NodeID = 1;
U16 SlotID = 0;
U16 channelno = 0;

I16 status = _DMC_01_set_04ad_full_scale (CardNo, NodeID, SlotID, channelno);
```

30.6 _DMC_01_get_04ad_full_scale_status

■ FORMAT

I16 _DMC_01_get_04ad_full_scale_status (U16 CardNo, U16 NodeID, U16 SlotID, U16 channelno, U16* status)

■ Purpose

Checks if AD maximum level calibration is complete.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID is (0~12)
SlotID	U16	Number Unit	0
ChannelNo	U16	Number Unit	Channel ID is between 0~3
Status	U16	Selection	0: Zero calibration completed. 1: Zero calibration not completed.

■ Example

```
U16 CardNo = 0;
U16 NodeID = 1;
U16 SlotID = 0;
U16 channelno = 0;
U16 status;

I16 status = _DMC_01_get_04ad_full_scale_status (CardNo, NodeID, SlotID, channelno,
                &status);
```

30.7 _DMC_01_set_04ad_conversion_time

■ **FORMAT**

I16 _DMC_01_set_04ad_conversion_time (U16 CardNo, U16 NodeID, U16 SlotID, U16 mode)

■ **Purpose**

Sets AD conversion time.

■ **Parameters**

<table>
<tr><th>Name</th><th>Data Type</th><th>Unit</th><th>Description</th></tr>
<tr><td>CardNo</td><td>U16</td><td>Number Unit</td><td>CardNo is between 0~15</td></tr>
<tr><td>NodeID</td><td>U16</td><td>Number Unit</td><td>Node ID is (0~12)</td></tr>
<tr><td>SlotID</td><td>U16</td><td>Number Unit</td><td>0</td></tr>
<tr><td>Mode</td><td>U16</td><td>Selection</td><td>Input value is 0 ~ 6
<table>
<tr><th>Number</th><th>Output frequency (Hz)</th><th>-3 dB frequency (Hz)</th><th>RMS noise (μv)</th></tr>
<tr><td>0</td><td>372</td><td>200</td><td>9.6</td></tr>
<tr><td>1</td><td>1001</td><td>520</td><td>15.5</td></tr>
<tr><td>2</td><td>2005</td><td>1040</td><td>22.7</td></tr>
<tr><td>3</td><td>2534</td><td>1300</td><td>26.1</td></tr>
<tr><td>4</td><td>4826</td><td>2500</td><td>39.2</td></tr>
<tr><td>5</td><td>6041</td><td>3100</td><td>46.0</td></tr>
<tr><td>6</td><td>12166</td><td>6300</td><td>120.0</td></tr>
</table></td></tr>
</table>

■ **Example**

U16 CardNo = 0;
U16 NodeID = 1;
U16 SlotID = 0;
U16 mode = 1;

I16 status = _DMC_01_set_04ad_conversion_time (CardNo, NodeID, SlotID, mode);

30.8 _DMC_01_get_04ad_conversion_time

■ **FORMAT**

I16 _DMC_01_get_04ad_conversion_time (U16 CardNo, U16 NodeID, U16 SlotID, U16* mode)

■ **Purpose**

Retrieves current AD conversion time.

■ **Parameters**

<table>
<tr><th>Name</th><th>Data Type</th><th>Unit</th><th>Description</th></tr>
<tr><td>CardNo</td><td>U16</td><td>Number Unit</td><td>CardNo is between 0~15</td></tr>
<tr><td>NodeID</td><td>U16</td><td>Number Unit</td><td>Node ID is (0~12)</td></tr>
<tr><td>SlotID</td><td>U16</td><td>Number Unit</td><td>0</td></tr>
<tr><td>Mode</td><td>U16</td><td>Selection</td><td>Output is between 0 ~ 6
<table>
<tr><th>Number</th><th>Output frequency (Hz)</th><th>-3 dB frequency (Hz)</th><th>RMS noise (μv)</th></tr>
<tr><td>0</td><td>372</td><td>200</td><td>9.6</td></tr>
<tr><td>1</td><td>1001</td><td>520</td><td>15.5</td></tr>
<tr><td>2</td><td>2005</td><td>1040</td><td>22.7</td></tr>
<tr><td>3</td><td>2534</td><td>1300</td><td>26.1</td></tr>
<tr><td>4</td><td>4826</td><td>2500</td><td>39.2</td></tr>
<tr><td>5</td><td>6041</td><td>3100</td><td>46.0</td></tr>
<tr><td>6</td><td>12166</td><td>6300</td><td>120.0</td></tr>
</table></td></tr>
</table>

■ **Example**

```
U16 CardNo = 0;
U16 NodeID = 1;
U16 SlotId = 0;
U16 mode;

I16 status = _DMC_01_get_04ad_conversion_time(CardNo, NodeID, SlotID, &mode);
```

30.9 _DMC_01_get_04ad_data

- **FORMAT**

  I16 _DMC_01_get_04ad_data (U16 CardNo, U16 NodeID, U16 SlotID, U16 channelno, U16* value)

- **Purpose**

  Reads input voltage.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID is between 0~63
SlotID	U16	Number Unit	0
ChannelNo	U16	Number Unit	Channel ID is between 0~3
ReturnData	U16	Number Unit	0~65535

- **Example**

  U16 CardNo = 0;
  U16 NodeID = 1;
  U16 SlotId = 0;
  U16 channelno = 2;
  U16 value;

  I16 status = _ DMC_01_get_04ad_data (CardNo, NodeID, SlotID, channelno, &value);

30.10 _DMC_01_set_04ad_average_mode

■ **FORMAT**

I16 _DMC_01_set_04ad_average_mode (U16 CardNo, U16 NodeID, U16 SlotID, U16 channelno, U16 mode)

■ **Purpose**

Sets AD average mode.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID is between 0~63
SlotID	U16	Number Unit	0
ChannelNo	U16	Number Unit	Channel ID is between 0~3
Mode	U16	Number Unit	Input value 0~5

Number	Set frequency of average value
0	0
1	2
2	4
3	8
4	16
5	32

■ **Example**

```
U16 CardNo = 0;
U16 NodeID = 1;
U16 SlotID = 0;
U16 channelno = 1;
U16 mode = 1;

I16 status = _DMC_01_set_04ad_average_mode(CardNo, NodeID, SlotID, channelno,
             mode);
```

30.11 _DMC_01_get_04ad_average_mode

■ **FORMAT**

I16 _DMC_01_get_04ad_average_mode (U16 CardNo, U16 NodeID, U16 SlotID, U16 channelno, U16* mode)

■ **Purpose**

Retrieves AD average mode.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID is between 0~63
SlotID	U16	Number Unit	0
ChannelNo	U16	Number Unit	Channel ID is between 0~3
Mode	U16	Number Unit	Read value 0~5

Number	Set frequency of average value
0	0
1	2
2	4
3	8
4	16
5	32

■ **Example**

```
U16 CardNo = 0;
U16 NodeID = 1;
U16 SlotID = 0;
U16 channelno = 1;
U16 mode;

I16 status = _ DMC_01_get_04ad_average_mode (CardNo, NodeID, SlotID, channelno,
             &mode);
```

30.12 _DMC_01_set_04ad_input_enable

- **FORMAT**

  I16 _DMC_01_set_04ad_input_enable (U16 CardNo, U16 NodeID, U16 SlotID, U16 channelno, U16 ON_OFF)

- **Purpose**

  Enables/disables AD Channel Input feedback.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID is between 0~63
SlotID	U16	Number Unit	0
ChannelNo	U16	Number Unit	Channel ID is between 0~3
On_Off	U16	Number Unit	0:Disable 1:Enable

- **Example**

```
U16 CardNo = 0;
U16 NodeID = 1;
U16 SlotID = 0;
U16 channelno = 1;
U16 ON_OFF=1;

I16 status = _DMC_01_ set_04ad_input_enable (CardNo, NodeID, SlotID, channelno,
             ON_OFF);
```

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Chapter 31 Slave Data API

Table 31.1

Function Name	Description
_DMC_01_get_devicetype	Get Slave device type
_DMC_01_get_slave_version	Get Slave device firmware version

31.1 _DMC_01_get_devicetype

■ **FORMAT**

I16 PASCAL _DMC_01_get_devicetype (I16 CardNo, U16 NodeID, U16 SlotID, U32 *DeviceType, U32 *IdentityObject)

■ **Purpose**

Retrieves slave device type.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	I16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
DeviceType	U32*	Number	Slave device type (see Notes on the following page for details)
IdentityObject	U32*	Number	Object dictionary code for device

■ **Example**

```
I16 CardNo=0, NodeID=1, SlotID=0;
U32 DeviceType, IdentityObject;
I16 status = _DMC_01_get_devicetype (CardNo, NodeID, SlotID, &DeviceType,
             &IdentityObject);
```

NOTE

※Table of device type codes used for the DeviceType variable:

Device Type	Code	Device Type	Code
A2 Series Servo Drives	0x04020192	M Series Servo Drives	0x06020192
A2R Series Servo Drives	0x08020192	S Series Servo Drives	0x09020192
ASD-DMC-RM32MN	0x04110191	ASD-DMC-RM64MN	0x08110191
ASD-DMC-RM32NT	0x04120191	ASD-DMC-RM64NT	0x08120191
ASD-DMC-RM04PI(MD1)	0x1C100191	ASD-DMC-RM04AD	0x08140191
ASD-DMC-RM04PI(MD2)	0x14100191	ASD-DMC-RM04DA	0x08180191
ASD-DMC-RM32PT	0x04130191	ASD-DMC-GE01PG	0x21200191
ASD-DMC-GE01PI	0x11200191	ASD-DMC-GE16MN	0x08230191 (Note 1)
ASD-DMC-GE01PH	0x11210191	ASD-DMC-GE16NT	

【Note 1】 For ASD-DMC-GE's I/O module (GE16MN/GE16NT), its 64-point I/O is treated as 1 Device type. i.e. It is one Node.

※Table of the object dictionary codes for each device type:

Object Dictionary	Code
A2 Series Servo Drives	0x6000
M Series Servo Drives	0x6030
A2R Series Servo Drives	0x6040
S Series Servo Drives	0x6050
Remote module	0x1000
Gateway module	0x2000

31.2 _DMC_01_get_slave_version

- **FORMAT**

  I16 PASCAL _DMC_01_get_slave_version (I16 CardNo, U16 NodeID,U16 SlotID, U16* version)

- **Purpose**

  Retrieves slave device firmware version.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	I16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
version	U16*	Version number	Slave firmware version

- **Example**

```
I16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
U16 version;

I16 status = _DMC_01_get_slave_version(CardNo, NodeID, SlotID, &version);
```

Chapter 32 Parameter Monitoring API

Table 32.1

Function Name	Description
_DMC_01_set_monitor	Set parameter to monitor
_DMC_01_get_monitor	Get value for monitored parameter
_DMC_01_get_servo_command	Get servo drive command value
_DMC_01_get_servo_DI	Get servo drive DI message value
_DMC_01_get_servo_DO	Get servo drive DO message value

32.1 _DMC_01_set_monitor

■ **FORMAT**

I16 PASCAL _DMC_01_set_monitor (U16 CardNo, U16 NodeID, U16 SlotID, U16 monitorw)

■ **Purpose**

Sets parameter to monitor.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
monitorw	U16	Number	Parameter to monitor

■ **Example**

U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
U16 monitorw=122; //Set DMCNET operation time

I16 status = _DMC_01_set_monitor (CardNo, NodeID, SlotID, monitorw);

※Please see table 32.2 for monitor values

■ Reference

Table 32.2

Monitor item index	Monitor item	Unit	Data length	04PI Servo
0	Motor feedback pulse (after electronic gear comparison)	User	32-bit[signed integer]	□ ■
1	Pulse command input count (after electronic gear comparison)	User	32-bit[signed integer]	□ ■
2	Difference between control command pulse and feedback pulse	User	32-bit[signed integer]	□ ■
3	Motor feedback pulse	1,280,000 Pulse/rev	32-bit[signed integer]	□ ■
4	Pulse command input count (before electronic gear comparison)	Number of pulses	32-bit[signed integer]	□ ■
5	Difference pulses (after electronic gear)	Number of pulses	32-bit[signed integer]	□ ■
6	Pulse command input frequency	Number of forwarded packets (K/sec)	16-bit[signed integer]	□ ■
7	Motor rotation speed	0.1 revolutions/minute	32-bit[signed integer]	□ ■
8	Velocity input command	0.01V	16-bit[signed integer]	□ ■
9	Velocity input command	0.1 revolutions/minute	32-bit[signed integer]	□ ■
10	Torque input command	0.01V	16-bit[signed integer]	□ ■
11	Torque input command	Percentage (%)	16-bit[signed integer]	□ ■
12	Average torque	Percentage (%)	16-bit[signed integer]	□ ■
13	Peak torque	Percentage (%)	16-bit[signed integer]	□ ■
14	Main circuit voltage (BUS voltage)	Volt	16-bit[unsigned integer]	□ ■

Monitor item index	Monitor item	Unit	Data length	04PI Servo	
15	Load/motor inertia ratio	0.1 times	16-bit[unsigned integer]	□	■
16	IGBT temperature	°C	16-bit[signed integer]	□	■
17	Resonant frequency	Hertz	16-bit[unsigned integer]	□	■
18	Value at Z-phase Home (Number of pulses)	-5000 ~ +5000	16-bit[signed integer]	□	■
19	Parameter map #1: P0 - 25	Number	32-bit[unsigned integer]	□	■
20	Parameter map #2: P0 - 26	Number	32-bit[unsigned integer]	□	■
21	Parameter map #3: P0 - 27	Number	32-bit[unsigned integer]	□	■
22	Parameter map #4: P0 - 28	Number	32-bit[unsigned integer]	□	■
23	Monitored variable #1: P0 - 09	Number	32-bit[signed integer]	□	■
24	Monitored variable #2: P0 - 10	Number	32-bit[signed integer]	□	■
25	Monitored variable #3: P0 - 11	Number	32-bit[signed integer]	□	■
26	Monitored variable #4: P0 – 12	Number	32-bit[signed integer]	□	■
27	Value at Z-phase Home (after electronic gear comparison)	-Half circle ~ + Half circle	32-bit[signed integer]	□	■
28	Error code	Number	32-bit[unsigned integer]	■	■
39	DI status		16-bit[unsigned integer]	■	■
40	DO status		16-bit[unsigned integer]	■	■
120	DMCNET communication status		16-bit[unsigned integer]	□	■
121	DMCNET packet error counter		32-bit[unsigned integer]	□	■
122	DMCNET operation time	Second	16-bit[unsigned integer]	□	■

32.2 _DMC_01_get_monitor

- **FORMAT**

  I16 PASCAL _DMC_01_set_command (U16 CardNo, U16 NodeID, U16 SlotID, U32 cmd)

- **Purpose**

  Retrieves value of monitored parameter.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
value	U32*	Number	Current value of monitored parameter

- **Example**

```
U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
U32 value;

/* Please refer to Table 32.2 for returned value*/
I16 status = _DMC_01_get_monitor (CardNo, NodeID, SlotID, &value);
```

32.3 _DMC_01_get_servo_command

- **FORMAT**

  I16 PASCAL _DMC_01_get_servo_command (U16 CardNo, U16 NodeID, U16 SlotID, U32 *servo_cmd)

- **Purpose**

  Retrieves servo drive command value.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
servo_cmd	U32*	Number	Server command value

- **Example**

```
U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
U32 servo_cmd;

/* Value of servo_cmd is the value of the command for returning to servo position */
I16 status = _DMC_01_get_servo_command (CardNo, NodeID, SlotID, &servo_cmd);
```

32.4 _DMC_01_get_servo_DI

■ **FORMAT**

I16 PASCAL _DMC_01_get_servo_DI (U16 CardNo, U16 NodeID, U16 SlotID,
U16 *servo_DI)

■ **Purpose**

Retrieves server DI message value.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
servo_DI	U16*	Number	Value of signals DI1 ~ DI8 on server

■ **Example**

```
U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
U16 servo_DI;

I16 status = _DMC_01_get_servo_DI (CardNo, NodeID, SlotID, &servo_DI);
```

32.5 _DMC_01_get_servo_DO

■ **FORMAT**

I16 PASCAL _DMC_01_get_servo_DO (U16 CardNo, U16 NodeID, U16 SlotID, U16 *servo_DO)

■ **Purpose**

Retrieves server DO message value.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
servo_DO	U16*	Number	Value of signals DO1 ~ DO5 on server

■ **Example**

```
U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
U16 servo_DO;

I16 status = _DMC_01_get_servo_DO (CardNo, NodeID, SlotID, &servo_DO);
```

Chapter 33 Alarm Message API

Table 33.1

Function Name	Description
_DMC_01_set_ralm	Reset output servo drive alarm message
_DMC_01_get_alm_code	Get Slave alarm code
_DMC_01_master_alm_code	Get the Master Card connection alarm code
_DMC_01_slave_error	Get number of consecutive errors during Slave communication

33.1 _DMC_01_set_ralm

- **FORMAT**

  I16 PASCAL _DMC_01_set_ralm (U16 CardNo, U16 NodeID, U16 SlotID)

- **Purpose**

  Resets output servo drive alarm message.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID

- **Example**

```
U16 CardNo=0;
U16 NodeID =1;
U16 SlotID =0; //If Slot ID is set to 0, then the Slave is a servo drive

I16 status= _DMC_01_set_ralm (CardNo, NodeID, SlotID);
```

33.2 _DMC_01_get_alm_code

■ **FORMAT**

I16 PASCAL _DMC_01_get_alm_code (U16 CardNo, U16 NodeID, U16 SlotID, U32 *alm_code)

■ **Purpose**

Retrieves slave alarm code.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
alm_code	U32*	Number Unit	Slave error code

■ **Example**

```
U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
U32 alm_code;

/* Value of alm_code represents Slave error information. Please refer to the server manual for details on server error codes. */
I16 status= _DMC_01_get_alm_code (CardNo, NodeID, SlotID, &alm_code);
```

33.3 _DMC_01_master_alm_code

- **FORMAT**

  I16 PASCAL _DMC_01_master_alm_code (U16 CardNo,U16* alm_code)

- **Purpose**

  Retrieves the Master Card connection alarm code.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
alm_code	U16*	Number	Error code for Master Card connection failure

- **Example**

```
U16 CardNo=0;
U16 alm_code;
I16 status= _DMC_01_master_alm_code (CardNo , &alm_code);
```

- **Error Code List**

Error code	Error Description
185	Unstable link

33.4 _DMC_01_slave_error

■ **FORMAT**

I16 PASCAL _DMC_01_slave_error (U16 CardNo, U16 NodeID,U16 SlotID,U16* alm_cnt)

■ **Purpose**

Retrieves number of consecutive errors during slave communications.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
alm_cnt	U16*	Frequency	Number of consecutive errors during Slave communications

■ **Example**

```
U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
U16 alm_code;
I16 status= _DMC_01_slave_error (CardNo, NodeID, SlotID, &alm_code);
```

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Chapter 34 Multi-Axis Motion Control API

Table 34.1

Function Name	Description
_DMC_01_multi_axes_move	Set motion control for more than 2 axes
_ DMC_01_liner_speed_master	Set multi-axis linear motion control velocity
_DMC_01_start_v3_multi_axes	Multi-axis (more than 2 axes) motion control with added EndVel

34.1 _DMC_01_multi_axes_move

■ **FORMAT**

I16 PASCAL _DMC_01_multi_axes_move(U16 CardNo,U16 AxisNum, U16* NodeID, U16* SlotID, I32 *DistArrary, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec,U16 m_curve, U16 m_r_a)

■ **Purpose**

Sets motion control for more than 2 axes.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
AxisNum	U16	Number Unit	Axis ID
NodeID	U16*	Number Unit	Node ID
SlotID	U16*	Number Unit	Slot ID
DistArrary	I32*	Number of pulses array	Motion to be executed by each axis
StrVel	I32	Pulses per second	Starting velocity
MaxVel	I32	Pulses per second	Maximum velocity
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time
m_curve	U16	Selection	1: T-curve 2: S-curve
m_r_a	U16	Selection	0: Relative motion displacement 1: Absolute motion displacement

■ **Example**

```
U16 CardNo=0, AxisNum=4;
U16 NodeID[4]={1,2,3,4}, SlotID[4]={0,1,2,3};
I32 DistArrary[4]={1000, 2000, 3000, 6000};
I32 StrVel=1000, MaxVel=50000;
F64 Tacc=0.1, Tdec=0.1;
U16 m_curve=1;
U16 m_r_a=0;

/*Set as multi-axis motion control using absolute coordinates with T-curve velocity
cross-section.  */
I16 status = _DMC_01_multi_axes_move(CardNo, AxisNum, NodeID, SlotID, DistArrary,
             StrVel, MaxVel, Tacc, Tdec, m_curve, m_r_a);
```

34.2 _ DMC_01_liner_speed_master

- **FORMAT**

  I16 PASCAL _ DMC_01_liner_speed_master (U16 CardNo,U16 AxisNum, U16* NodeID, U16* SlotID, I32 *DistArrary, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec,U16 m_curve, U16 m_r_a)

- **Purpose**

  When setting the multi-axis (Line2, Line3, Multi_Axis) motion velocity, the original motion velocity setting (Mode=0) is for velocity while (Mode=1) has velocity set as the component velocity speed for the axis with the greatest travel (Once the Master axis is configured, the velocities for other axes will be automatically calculated based on the value of the Master axis).

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16*	Number Unit	Node ID
SlotID	U16*	Number Unit	Slot ID
Mode	U16	Selection	0: Velocity (Default setting). 1: Maximum component velocity for axis with longest travel.

- **Example**

```
U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
U16 Mode=1;

I16 status = _ DMC_01_liner_speed_master (CardNo, NodeID, SlotID, Mode);
```

34.3 _DMC_01_start_v3_multi_axes

■ **FORMAT**

I16 PASCAL _DMC_01_start_v3_multi_axes(U16 CardNo,U16 AxisNum, U16* NodeID, U16* SlotID, I32 *DistArrary, I32 StrVel, I32 ConstVel, I32 EndVel, F64 TPhase1, F64 TPhase2, U16 m_curve,U16 m_r_a)

■ **Purpose**

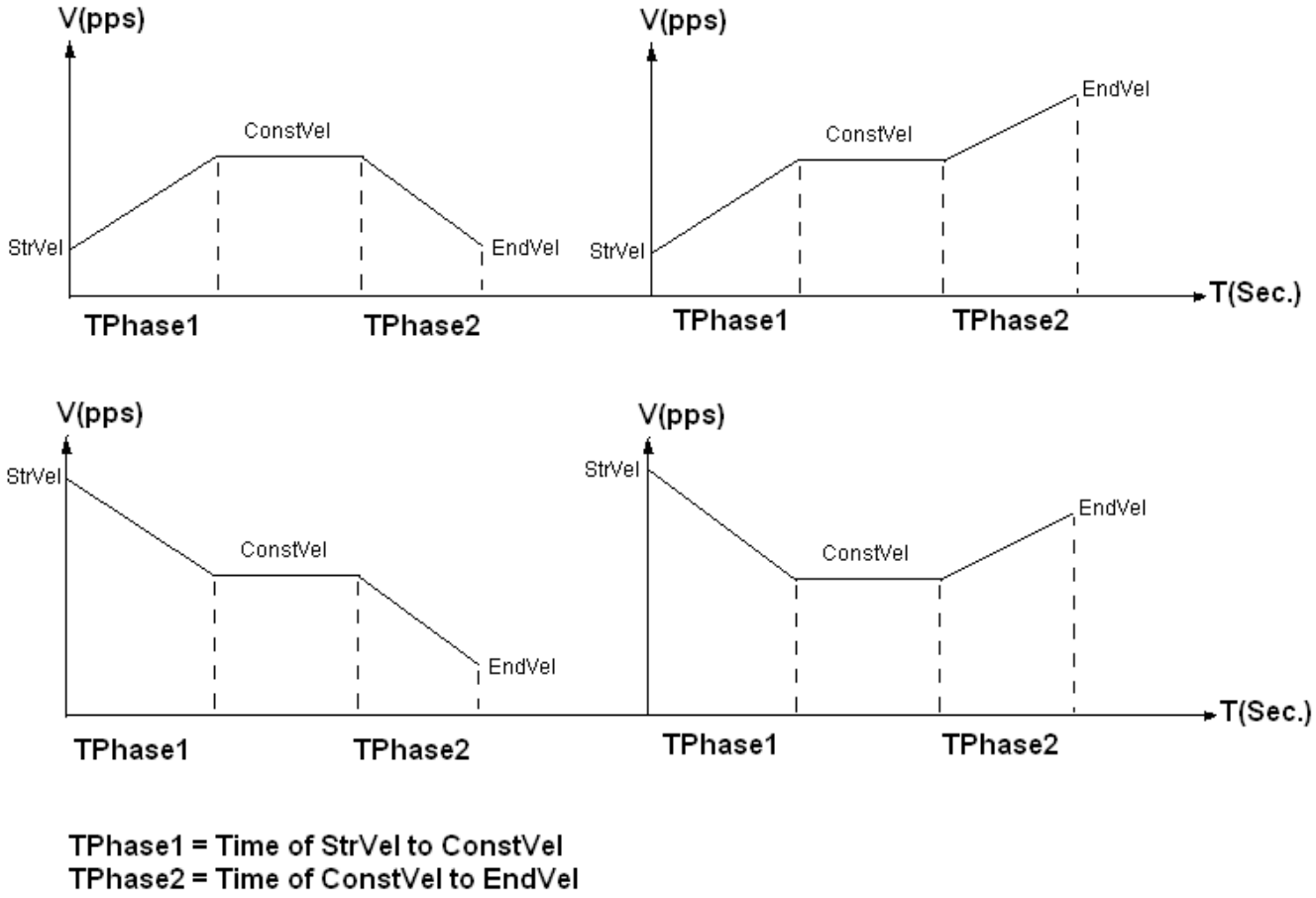
Multi-axis (more than 2 axes) motion control with added EndVel.

※Values of StrVel and EndVel can be greater than MaxVel.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
AxisNum	U16	Number Unit	Axis ID
NodeID	U16*	Number Unit	Node ID
SlotID	U16*	Number Unit	Slot ID
DistArrary	I32*	Number of pulses array	Motion to be executed by each axis
StrVel	I32	Pulses per second	Starting velocity
ConstVel	I32	Pulses per second	Constant velocity
EndVel	I32	Pulses per second	End velocity
TPhase1	F64	Second	Time from StartVel to ConstVel
TPhase2	F64	Second	Time from ConstVel to EndVel
m_curve	U16	Selection	1: T-curve 2: S-curve
m_r_a	U16	Selection	0: Relative motion displacement 1: Absolute motion displacement

■ Description



TPhase1 = Time of StrVel to ConstVel
TPhase2 = Time of ConstVel to EndVel

Figure 34.1 Explanation of TPhase1 and TPhase2

■ Example

```
U16 CardNo=0, AxisNum=4;
U16 NodeID[4]={1,2,3,4}, SlotID[4]={0,1,2,3};
I32 DistArrary[4]={1000, 2000, 3000, 6000};
I32 StrVel=1000, MaxVel=50000;
I32 EndVel=20000;
F64 TPhase1=0.2;
F64 TPhase2=0.1;
U16 m_curve=1, m_r_a=0;

I16 status = _DMC_01_multi_axes_move (CardNo, AxisNum, NodeID, SlotID, DistArrary,
             StrVel, ConstVel, EndVel, TPhase1, TPhase2, m_curve, m_r_a);
```

Chapter 35 Buffer Operation API

Table 35.1

Function Name	Description
_DMC_01_set_trigger_buf_function	Use servo drive DI3 (SLD) to trigger Motion command

35.1 _DMC_01_set_trigger_buf_function

■ **FORMAT**

I16 PASCAL _DMC_01_set_trigger_buf_function (I16 CardNo, U16 NodeID, U16 SlotID, U16 enable)

■ **Purpose**

Uses servo drive DI3 (SLD) to trigger Motion command.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	I16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
enable	U16	Selection	0: Execute any motion command in buffer 1: Use to DI to trigger motion command in buffer

■ **Example**

I16 CardNo=0

U16 NodeID=1, SlotID=0;

U16 enable=1; //Enable this functionTrigger DI3 (SLD) to get motion command in buffer

I16 status = _DMC_01_set_trigger_buf_function (CardNo, NodeID, SlotID, enable);

Chapter 36 Interrupt API

Table 36.1

Function Name	Description
_DMC_01_set_int_factor	Set interrupt mode. Total of 8 modes available.
_DMC_01_int_enable	Enable interrupt feedback
_DMC_01_int_disable	Disable disable interrupt.
_DMC_01_get_int_count	Interrupt count.
_DMC_01_get_int_status	Get current interrupt status
_DMC_01_Link_interrupt	Link handling procedure. Called if interrupt enabled.

36.1 _DMC_01_ set_int_factor

■ **FORMAT**

I16 PASCAL _DMC_01_set_int_factor (U16 CardNo, U16 NodeID, U16 int_factor)

■ **Purpose**

Sets interrupt mode.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
int_factor	U16	Selection	There are 8 modes in total: 1. Normal Stop 2. Next Buffer 3. Acceleration End 4. Deceleration Start 5. Sdo Finish (unavailable) 6. DMC Cycle Start 7. RM04PI-FIFO 8. User Defined (unavailable)

■ **Example**

```
U16 CardNo=0;
U16 NodeID=1;
U16 int_facter=1; //Normal Stop

I16 status = _DMC_01_set_int_factor (CardNo, NodeID, int_factor);
```

36.2 _DMC_01_ int_enable

- **FORMAT**

  I16 PASCAL _DMC_01_int_enable (U16 CardNo, U16 NodeID)

- **Purpose**

  Enables interrupt.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID

- **Example**

```
U16 CardNo=0;
U16 NodeID=1;

I16 status = _DMC_01_int_enable (CardNo, NodeID);
```

36.3 _DMC_01_ int_disable

- **FORMAT**

  I16 PASCAL _DMC_01_int_disable (U16 CardNo, U16 NodeID)

- **Purpose**

  Enables disable interrupt.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID

- **Example**

```
U16 CardNo=0;
U16 NodeID=1;

I16 status = _DMC_01_int_disable (CardNo, NodeID);
```

36.4 _DMC_01_ get_int_count

- **FORMAT**

  I16 PASCAL _DMC_01_get_int_count (U16 CardNo, U16 NodeID, U16 count)

- **Purpose**

  Reads interrupt count.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
count	U16	Number of interrupts	Number of successful interrupts

- **Example**

```
U16 CardNo=0;
U16 NodeID=1;
U16*count;

I16 status =_ DMC_01_get_int_count (CardNo, NodeID, &count);
```

36.5 _DMC_01_ get_int_status

- **FORMAT**

  I16 PASCAL _DMC_01_get_int_status (U16 CardNo, U16 NodeID, U16 event_int_status)

- **Purpose**

  Reads current interrupt mode.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
Event_int_status	U16	Selection	Current interrupt mode

- **Example**

```
U16 CardNo=0;
U16 NodeID=1;
U16 event_int_status;

I16 status = _DMC_01_get_int_status (CardNo, NodeID, & event_int_status);
```

36.6 _DMC_01_link_ interrupt

■ **FORMAT**

I16 PASCAL _DMC_01_link_interrupt (U16 CardNo, void (__stdcall *callbackAddr)
(U16 CardNo, U16 NodeID))

■ **Purpose**

Sets a handler procedure. When interrupt occurs, enter this handler.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
lpCallBackProc	U16	Handler	Default interrupt handler

■ **Example**

```
U16 CardNo=0
__stdcall *callbackAddr

I16 status = _DMC_01_link_interrupt (CardNo, , CallBack);

void _stdcall CallBack(U16 CardNo, U16 NodeID)
{
    U16 i;
    i = CardNo + NodeID;
}
```

Chapter 37 Security API

Table 37.1

Function Name	Description
_DMC_01_read_security	Master Card: read security data at specified memory block
_DMC_01_read_security_status	Master Card: get read/write status of current memory
_DMC_01_write_security	Master Card: write security data to specified memory block
_DMC_01_write_security_status	Master Card: write memory to function enable before writing security data
_DMC_01_check_userpassword	Master Card: check user has read/write access to memory
_DMC_01_write_ userpassword	Master Card: change password
_DMC_01_check_verifykey	Master Card: check verify key
_DMC_01_write_ verifykey	Master Card: write verify key
_DMC_01_read_serialno	Master Card: read product serial number
_misc_slave_check_userpassword	Slave(04PI): check user has read/write access to memory
_misc_slave_write_userpassword	Slave(04PI): change password
_misc_slave_get_serialno	Slave(04PI): read product serial no.
_misc_security	Encrypt and generate verify key from User Key and SerialNo
_misc_slave_write_verifykey	Slave(04PI): write verify key
_misc_slave_check_verifykey	Slave(04PI): check verify key
_misc_slave_user_data_buffer_read	Slave(04PI): read data from specified memory block
_misc_slave_user_data_buffer_write	Slave(04PI): write security data to specified memory block
_misc_slave_user_data_to_flash	Slave(04PI): write data from Buffer to Flash

37.1 _DMC_01_ read_security

- **FORMAT**

  I16 PASCAL _DMC_01_read_security (U16 CardNo, U16 page, U16 array)

- **Purpose**

  Reads security data specified by the Master Card from memory.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
Page	U16	Number Unit	Specified memory page number for read
array	U16	Number	Read data from specified memory

- **Example**

```
U16 CardNo=0;
U16 Page=0;     // 0~F, 16 pages in total
U16 array;

I16 status = _ DMC_01_read_security (CardNo, page ,&array);
```

37.2 _DMC_01_ read_security_status

- **FORMAT**

  I16 PASCAL _DMC_01_read_security_status (U16 CardNo, U16 status)

- **Purpose**

  Reads current read/write status of the Master Card.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
status	U16	Flag	&H4(Read Only) or &H6(Read/Write)

- **Example**

```
U16 CardNo=0;
U16 *status;

I16 status = _DMC_01_read_seacurity_status (CardNo, &status );
```

37.3 _DMC_01_write_security

- **FORMAT**

  I16 PASCAL _DMC_01_write_security (U16 CardNo, U16 page, U16 array)

- **Purpose**

  Writes security data to memory block specified by the Master Card.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
Page	U16	Number Unit	Specified memory page number for write
array	U16	Number	Security data to write to specified memory

- **Example**

```
U16 CardNo=0;
U16 page=0;
U16 array={1,4,7,11,0a,ff,12,8,0b,10,3,5,c1,14,0d,6};

I16 status =_DMC_01_wtite_security( CardNo, page, array );
```

37.4 _DMC_01_ write_security_status

- **FORMAT**

  I16 PASCAL _DMC_01_write_security_status (U16 CardNo, U16 status)

- **Purpose**

  Before the Master Card writes security data, writes function enable to memory.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
status	U16	Flag	Write function enable (0:disable,1:enable) to memory

- **Example**

```
U16 CardNo=0;
U16 status=1;

I16 status = _DMC_01_write_security_status (CardNo, status);
```

37.5 _DMC_01_ check_userpassword

■ **FORMAT**

I16 PASCAL _DMC_01_ check_userpassword (U16 CardNo, U32 password_data, U16 password_state)

■ **Purpose**

Before reading/writing data on the Master Card, checks that user has permission to read/write to memory.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
Password_data	U32	Number	Enter password to check
Password_state	U16	Flag	Response after password check. 0→Fail 1→OK

■ **Example**

```
U16 CardNo=0;
U32 Password_data; //64bit data
U16 Password_state;

I16 status = _DMC_01_ check_userpassword ( CardNo, Password_data, &Password_state );
```

37.6 _DMC_01_write_ userpassword

■ **FORMAT**

I16 PASCAL _DMC_01_write_ userpassword (U16 CardNo, U32 password_data)

■ **Purpose**

Master Card: Changes user password.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
Password_data	U32	Number	Enter password to change

■ **Example**

```
U16 CardNo=0;
U32 Password_data; //64bit data

I16 status = _DMC_01_ write_userpassword ( CardNo, Password_data );
```

37.7 _DMC_01_check_verifykey

■ **FORMAT**

I16 PASCAL _DMC_01_check_verifykey (U16 CardNo, U32 Verifykey, U16state)

■ **Purpose**

Master Card: Checks verify key matches.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
Verifykey	U32	Number	Verify key to check
State	U16	Flag	Response after verify key check. 0→Lock 1→Pass

■ **Example**

```
U16 CardNo=0;
U32 Verifykey; //128bit data
U16 State;

I16 status = _DMC_01_ check_verifykey ( CardNo, Verifykey, &state );
```

37.8 _DMC_01_write_verifykey

■ **FORMAT**

I16 PASCAL _DMC_01_write_verifykey (U16 CardNo, U32 Verifykey)

■ **Purpose**

Writes verify key to the Master Card.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
Verifykey	U32	Number	Verify key data to write

■ **Example**

```
U16 CardNo=0;
U32 Verifykey; //128bit data

I16 status = _DMC_01_ write_verifykey (CardNo, Verifykey);
```

37.9 _DMC_01_ read_serialno

- **FORMAT**

  I16 PASCAL _DMC_01_ read_serialno (U16 CardNo, U32 Serialno)

- **Purpose**

  Reads product serial number in the Master Card memory.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
Serialno	U32	Number	Product serial number in memory

- **Example**

```
U16 CardNo=0;
U32 Serialno;

I16 status = _DMC_01_ read_serialno ( CardNo, &Serialno );
```

37.10 misc_slave_check_userpassword

- **FORMAT**

  I16 PASCAL _misc_slave_check_userpassword (U16 CardNo, U16 NodeID, U16 SlotID, U32 Password_data, U16 *Password_state)

- **Purpose**

  Before read/write data on Slave (04PI), checks that user has permission to read/write to memory.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Selection	Node ID
SlotID	U16	Number Unit	Slot ID
Password_data	U32	Number	Enter password to check
Password_state	U16*	Flag	Response after password check. 0→Fail 1→OK

- **Example**

```
U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
U32 Password_data; //64bit data
U16 Password_state;

I16 status = _ misc_slave_check_userpassword (CardNo, NodeID, SlotID, Password_data,
             &Password_state);
```

37.11 _misc_slave_write_userpassword

- **FORMAT**

  I16 PASCAL _misc_slave_write_userpassword (U16 CardNo, U16 NodeID, U16 SlotID, U32 Password_datae)

- **Purpose**

  Writes user password to Slave(04PI).

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Selection	Node ID
SlotID	U16	Number Unit	Slot ID
Password_data	U32	Number	Password change data to be written to memory

- **Example**

  U16 CardNo=0;
  U16 NodeID=1;
  U16 SlotID=0;
  U32 Password_data;

  I16 status = _ misc_slave_write_userpassword (CardNo, NodeID, SlotID, Password_data);

37.12 _misc_slave_get_serialno

- **FORMAT**

  I16 PASCAL _misc_slave_get_serialno (U16 CardNo, U16 NodeID, U16 SlotID, U32 Serialno)

- **Purpose**

  Reads Slave(04PI) product serial number.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Selection	Node ID
SlotID	U16	Number Unit	Slot ID
Serialno	U32	Number	Read product serial number in memory

- **Example**

  U16 CardNo=0;
  U16 NodeID=1;
  U16 SlotID=0;
  U32 Serialno;

  I16 status = _misc_slave_get_serialno (CardNo, NodeID, SlotID, &Serialno);

37.13 _misc_security

- **FORMAT**

  I16 PASCAL _misc_security (U32 OtherWord0, U32 OtherWord1, U32 SyntekWord0, U32 SyntekWord1, U32 *Password0, U32 *Password1, U32 *Password2, U32 *Password3)

- **Purpose**

  Slave(04PI): Feeds user specified 64bit key and 64bit Serialno into encryption algorithm to derive 128bit verify key.

- **Parameters**

Name	Data Type	Unit	Description
OtherWord0	U32	Number	32bit(0) user specified key
OtherWord1	U32	Number	32bit(1) user specified key
SyntekWord0	U32	Number	32bit (0)Serialno
SyntekWord1	U32	Number	32bit (1)Serialno
Password0	U32*	Number	32bit(0) verify key generated by encryption function
Password1	U32*	Number	32bit(1) verify key generated by encryption function
Password2	U32*	Number	32bit(2) verify key generated by encryption function
Password3	U32*	Number	32bit(3) verify key generated by encryption function

- **Example**

```
U32 OtherWord0; //32bit
U32 OtherWord1; //32bit
U32 SyntekWord0; //32bit
U32 SyntekWord1; //32bit
U32 Password0;
U32 Password1;
U32 Password2;
U32 Password3;

I16 status = _misc_security (OtherWord0, OtherWord1, SyntekWord0, SyntekWord1,
                &Password0, &Password1, &Password2, &Password3);
```

37.14 _misc_slave_write_verifykey

■ **FORMAT**

I16 PASCAL _misc_slave_write_verifykey (U16 CardNo, U16 NodeID, U16 SlotID, U32 Verifykey)

■ **Purpose**

Writes verify key to Slave(04PI).

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Selection	Node ID
SlotID	U16	Number Unit	Slot ID
Verifykey	U32	Number	Write verify key to memory

■ **Example**

```
U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
U32 Verifykey; //128bit data

I16 status = _misc_slave_write_verifykey (CardNo, NodeID, SlotID, Verifykey);
```

37.15 _misc_slave_check_verifykey

- **FORMAT**

  I16 PASCAL _misc_slave_check_verifykey (U16 CardNo, U16 NodeID, U16 SlotID, U32 Verifykey, U16 *Lock_state)

- **Purpose**

  Checks verify key against Slave (04PI).

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Selection	Node ID
SlotID	U16	Number Unit	Slot ID
Verifykey	U32	Number	Verify key to check
Lock_state	U16*	Flag	Response after verify key check. 0: LOCK 1: PASS

- **Example**

```
U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
U32 Verifykey; //128bit data
U16 Lock_state;

I16 status =_misc_slave_check_verifykey (CardNo, NodeID, SlotID, Verifykey, &Lock_state);
```

37.16 _misc_slave_user_data_buffer_read

■ **FORMAT**

I16 PASCAL _ misc_slave_user_data_buffer_read (U16 CardNo, U16 NodeID, U16 SlotID U16 Address, U32* Data)

■ **Purpose**

Reads data from memory specified by Slave (04PI).

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Selection	Node ID
SlotID	U16	Number Unit	Slot ID
Address	U16	Number	Position to read
Data	U32*	Number	Data stored in memory

■ **Example**

U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
U16 Address;
U32 Data;

I16 status = _ misc_slave_user_data_buffer_read (CardNo, NodeID, SlotID, Address, &Data);

37.17 _misc_slave_user_data_buffer_write

- **FORMAT**

  I16 PASCAL _misc_slave_user_data_buffer_write (U16 CardNo, U16 NodeID, U16 SlotID U16 Address, U32 Data)

- **Purpose**

  Writes data to buffer.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Selection	Node ID
SlotID	U16	Number Unit	Slot ID
Address	U16	Number	Position to write to
Data	U32	Number	Data to write

- **Example**

  U16 CardNo=0;
  U16 NodeID=1;
  U16 SlotID=0;
  U16 Address;
  U32 Data;

  I16 status = _ misc_slave_user_data_buffer_write (CardNo, NodeID, SlotID, Address, Data);

37.18 _misc_slave_user_data_to_flash

- **FORMAT**

  I16 PASCAL _ misc_slave_user_data_to_flash (U16 CardNo, U16 NodeID, U16 SlotID)

- **Purpose**

  Writes data in buffer to position specified by Slave(04PI).

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Selection	Node ID
SlotID	U16	Number Unit	Slot ID

- **Example**

```
U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;

I16 status = _ misc_slave_user_data_to_flash (CardNo, NodeID, SlotID);
```

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Chapter 38 Limit Reversal API

Table 38.1

Function Name	Description
_DMC_01_rm_04pi_set_MEL_polarity	Set negative limit direction
_DMC_01_rm_04pi_get_MEL_polarity	Get negative limit status
_DMC_01_rm_04pi_set_PEL_polarity	Set positive limit direction
_DMC_01_rm_04pi_get_PEL_polarity	Get positive limit status

38.1 _ DMC_01_rm_04pi_set_MEL_polarity

■ **FORMAT**

I16 PASCAL _DMC_01_rm_04pi_set_MEL_polarity (U16 CardNo, U16 NodeID, U16 SlotID U16 inverse)

■ **Purpose**

Reverses direction of negative limit.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Selection	Node ID
SlotID	U16	Number Unit	Slot ID
Inverse	U16	Selection data	0: Positive 1: Negative

■ **Example**

U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
U16 Inverse=1; //Reverse direction of negative limit

I16 status = _DMC_01_rm_04pi_set_MEL_polarity (CardNo, NodeID, SlotID, inverse);

38.2 _ DMC_01_rm_04pi_get_MEL_polarity

■ **FORMAT**

I16 PASCAL _DMC_01_rm_04pi_get_MEL_polarity (U16 CardNo, U16 NodeID, U16 SlotID U16 *data)

■ **Purpose**

Retrieves current status of negative limit.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Selection	Node ID
SlotID	U16	Number Unit	Slot ID
Data	U16	Selection data	0: Positive 1: Negative

■ **Example**

U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
U16 Data ;

I16 status = _DMC_01_rm_04pi_get_MEL_polarity (CardNo, NodeID, SlotID, &data);

38.3 _ DMC_01_rm_04pi_set_PEL_polarity

■ **FORMAT**

I16 PASCAL _DMC_01_rm_04pi_set_PEL_polarity (U16 CardNo, U16 NodeID, U16 SlotID U16 inverse)

■ **Purpose**

Reverses direction of positive limit.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Selection	Node ID
SlotID	U16	Number Unit	Slot ID
Inverse	U16	Selection data	0: Positive 1: Negative

■ **Example**

U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
U16 Inverse=1; /Reverse direction of positive limit

I16 status = _DMC_01_rm_04pi_set_PEL_polarity (CardNo, NodeID, SlotID, inverse);

38.4 _ DMC_01_rm_04pi_get_PEL_polarity

■ **FORMAT**

I16 PASCAL _DMC_01_rm_04pi_get_PEL_polarity (U16 CardNo, U16 NodeID, U16 SlotID U16 *data)

■ **Purpose**

Retrieves positive limit status.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Selection	Node ID
SlotID	U16	Number Unit	Slot ID
Data	U16	Flag	0: Positive; 1: Negative

■ **Example**

U16 CardNo=0;
U16 NodeID=1;
U16 SlotID=0;
U16 Data;

I16 status = _DMC_01_rm_04pi_get_PEL_polarity (CardNo, NodeID, SlotID, &data);

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Chapter 39 Compare API

Table 39.1

Function Name	Description
_DMC_01_set_compare_channel_position	Set new Channel Position
_DMC_01_get_compare_channel_position	Read current Channel position
_DMC_01_set_compare_ipulse_mode	Set input phase mode for pulse interface module
_DMC_01_set_compare_channel_direction	Set Channel pulse direction
_DMC_01_set_compare_channel_trigger_time	Set Trigger enable time
_DMC_01_set_compare_channel_one_shot	Set Trigger to one-time enable
_DMC_01_set_compare_channel_source	Compare source
_DMC_01_channel0_position_cmp	Set Compare Type to Compare1
_DMC_01_channel1_output_enable	Set Compare2 output to enable/disable
_DMC_01_channel1_output_mode	Compare2 output mode
_DMC_01_channel1_get_io_status	Read Compare2 status
_DMC_01_channel1_set_gpio_out	Set GPIO output pin status
_DMC_01_channel1_position_compare_table	Set Compare2 to standard Compare data
_DMC_01_channel1_position_compare_table_level	Set Compare2 to custom Compare data
_DMC_01_channel1_position_compare_table_cnt	Read Compare counter
_DMC_01_set_compare_channel_polarity	Set Compare polarity
_DMC_01_channel0_position_cmp_by_gpio	Set Compare trigger to GPIO control
_DMC_01_channel1_position_re_compare_table	Use previous Compare condition and-execute Channel1 Compare again
_DMC_01_channel1_position_re_compare_table_level	Use previous Compare condition and-execute Channel1 Compare (Level mode) again

39.1 _ DMC_01_set_compare_channel_position

■ FORMAT

I16 PASCAL _ DMC_01_set_compare_channel_position (U16 CardNo,
U16 compare_channel, I32 position)

■ Purpose

Sets new value for Position counter of Channel.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
Compare_Channel	U16	Number Unit	Channel No is 0~1
Position	I32	Number Unit	New position value to set

■ Example

```
U16 CardNo = 0;
U16 Compare_Channel = 0;
I32 Position = 0;

I16 status = _ DMC_01_set_compare_channel_position (CardNo, compare_channel,
             position);
```

39.2 _DMC_01_get_compare_channel_position

■ **FORMAT**

I16 PASCAL _DMC_01_get_compare_channel_position (U16 CardNo,
U16 compare_Channel, I32 *position)

■ **Purpose**

Reads current value of Position counter for that Channel.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
Compare_Channel	U16	Number Unit	Channel No is 0~1
Position	I32*	Number of pulses	Read positive value

■ **Example**

```
U16 CardNo = 0;
U16 Compare_channel = 0;
I32 Position = 100000;

I16 status = _DMC_01_get_compare_channel_position (CardNo, compare_channel,
             &position);
```

39.3 _DMC_01_set_compare_ipulse_mode

■ **FORMAT**

I16 PASCAL _DMC_01_set_compare_ipulse_mode (U16 CardNo, U16 mode)

■ **Purpose**

Sets input phase mode for pulse interface module.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
Mode	U16	Number Unit	0: AB Phase 1: CW/CCW

■ **Example**

```
U16 CardNo = 0;
U16 mode = 0;       //AB Phase

I16 status = _ DMC_01_set_compare_ipulse_mode (CardNo, mode);
```

39.4 _DMC_01_set_compare_channel_direction

■ **FORMAT**

I16 PASCAL _DMC_01_set_compare_channel_direction (U16 CardNo,
U16 compare_channel, U16 dir)

■ **Purpose**

Sets Channel pulse direction.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
Compare_channel	U16	Number Unit	Channel No¬°0~1
Dir	U16	Number Unit	0:Normal 1:Inverse

■ **Example**

```
U16 CardNo = 0;
U16 Compare_channel = 0;
U16 Dir = 1; //Inverse

I16 status = _DMC_01_set_compare_channel_direction (CardNo, compare_channel, dir);
```

39.5 _DMC_01_set_compare_channel_trigger_time

■ **FORMAT**

I16 PASCAL _DMC_01_set_compare_channel_trigger_time (U16 CardNo,
U16 compare_channel, U32 time_us)

■ **Purpose**

Sets Trigger enable duration.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
Compare_channel	U16	Number Unit	Channel No is 0~1
Time_us	U32	Time	Enter the duration for each Trigger enable

■ **Example**

```
U16 CardNo = 0;
U16 Compare_channel = 0;
U16 Time_us = 20; //20us

I16 status = _DMC_01_set_compare_channel_trigger_time(CardNo, compare_channel,
             time_us);
```

39.6 _DMC_01_set_compare_channel_one_shot

- **FORMAT**

  I16 PASCAL _DMC_01_set_compare_channel_one_shot (U16 CardNo,
  U16 compare_channel)

- **Purpose**

  Sets Trigger to one-time enable.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
Compare_channel	U16	Number Unit	Channel No is 0~1

- **Example**

  U16 CardNo = 0;
  U16 Compare_channel=0;

  I16 status = _DMC_01_set_compare_channel_one_shot (CardNo, compare_channel);

39.7 _DMC_01_set_compare_channel_source

■ **FORMAT**

I16 PASCAL _DMC_01_set_compare_channel_source (U16 CardNo,
U16 compare_channel, U16 source)

■ **Purpose**

Sets comparison source.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
Compare_channel	U16	Number Unit	Channel No is 0~1
Source	U16	Number Unit	0: QEP1 1: QEP2

■ **Example**

```
U16 CardNo = 0;
U16 Compare_channel = 0;
U16 Source = 0;

I16 status = _DMC_01_set_compare_channel_source (CardNo, compare_channel, Source);
```

39.8 _DMC_01_channel0_position_cmp

■ **FORMAT**

I16 PASCAL _DMC_01_channel0_position_cmp (U16 CardNo, I32 start, U16 dir, U16 interval, U32 trigger_cnt)

■ **Purpose**

Executes Compare1.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
Start	I32	Number Unit	Starting position for Compare
Dir	U16	Number Unit	0: Positive 1: Negative
Interval	U16	Number of pulses	Pulse Compare intervals
Trigger_cnt	U32	Number Unit	Trigger Compare total

■ **Example**

```
U16 CardNo = 0;
I32 Start = 100000;
U16 Dir = 0;
U16 Interval = 10; //10 pulse
U32 Trigger_cnt = 50000;

I16 status = _DMC_01_channel0_position_cmp (CardNo, start, dir, interval, trigger_cnt);
```

39.9 _DMC_01_channel1_output_enable

- **FORMAT**

  I16 PASCAL _DMC_01_channel1_output_enable (U16 CardNo, U16 on_off)

- **Purpose**

  Sets Compare2 output to enable/disable.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
On_off	U16	Number Unit	0: Off 1: On

- **Example**

```
U16 CardNo = 0;
U16 On_off = 1;

I16 status = _DMC_01_channel1_output_enable (CardNo, on_off);
```

39.10 _DMC_01_channel1_output_mode

■ **FORMAT**

I16 PASCAL _DMC_01_channel1_output_mode (U16 CardNo, U16 Mode)

■ **Purpose**

Compare2 output mode.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
Mode	U16	Number Unit	0: Normal mode 1: Custom mode

■ **Description**

Normal mode

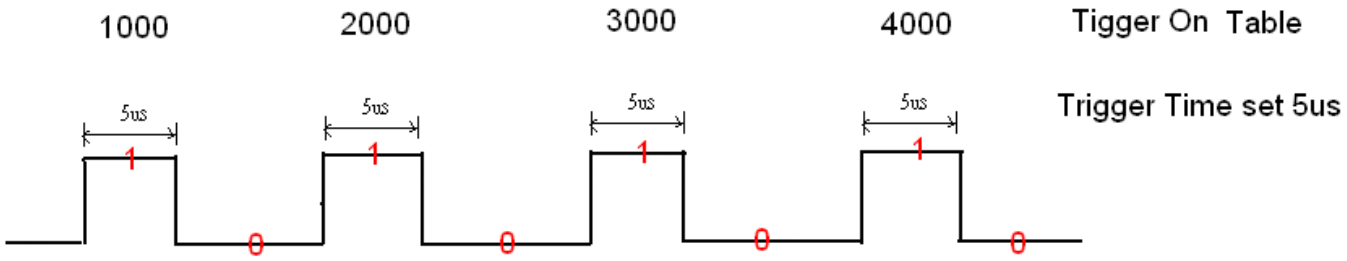


Figure 39.1 Compare Output Normal mode

※Trigger On's position table is set using the “table_size” parameter in API”_DMC_01_channel1_position_compare_table”.

※Trigger time is set using the “time_us” parameter in API”_DMC_01_set_compare_channel_trigger_time”.

Custom mode

When set to custom mode, level table's value is set to 0x88880000 as shown in Fig. 39.2.

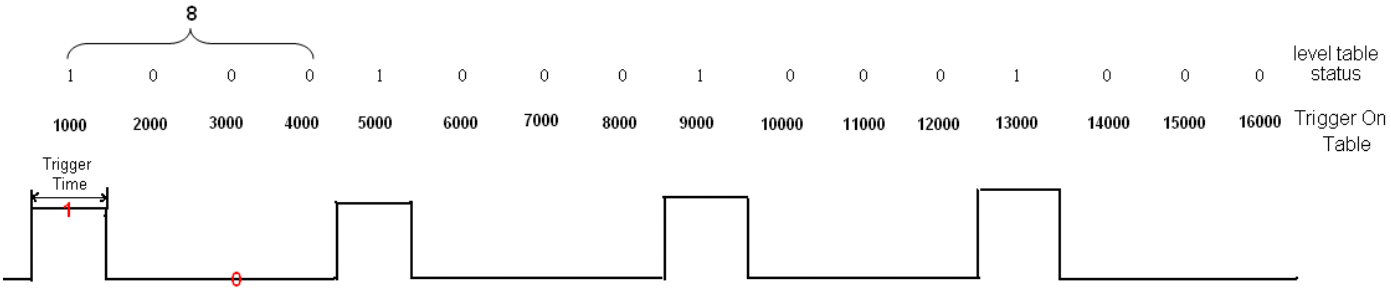


Figure 39.2 Compare Output's custom mode

※In custom mode, Trigger On's position table is set using the “level_table” parameter in API”_DMC_01_channel1_position_compare_table_level”.

※Trigger time is the time required to reach the next position (ex. time taken to move from position 1000 to position 2000)

■ Example

```
U16 CardNo = 0;
U16 Mode = 1;

I16 status = _DMC_01_channel1_output_mode (CardNo, mode);
```

39.11 _DMC_01_channel1_get_io_status

- **FORMAT**

  I16 PASCAL _DMC_01_channel1_get_io_status (U16 CardNo, U16* io_status)

- **Purpose**

  Reads Compare2 status.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
Io_status	U16*	Number Unit	Compare2 status

- **Example**

```
U16 CardNo = 0;
U16 Io_status = 1;

I16 status = _DMC_01_channel1_get_io_status (CardNo,& io_status);
```

39.12 _DMC_01_channel1_set_gpio_out

- **FORMAT**

  I16 PASCAL _DMC_01_channel1_set_gpio_out (U16 CardNo, U16 on_off)

- **Purpose**

  Sets GPIO output pin status.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
On_off	U16	Number Unit	0: Off 1: On

- **Example**

```
U16 CardNo = 0;
U16 On_off = 1;

I16 status = _DMC_01_channel1_set_gpio_out (CardNo, on_off);
```

39.13 _DMC_01_channel1_position_compare_table

■ **FORMAT**

I16 PASCAL _DMC_01_channel1_position_compare_table (U16 CardNo, I32* pos_table, U32 table_size,)

■ **Purpose**

Sets Compare2 to standard Compare data.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
Pos_table	I32*	Number Unit	Calculate the Pos_Table for compare based on the given data
Table_size	U32	Number Unit	Size of Pos_table to Compare

■ **Example**

```
U16 CardNo = 0;
I32 Pos_table[4] = {1000,2000,3000,4000};
U32 Table_size =50000;

I16 status = _DMC_01_channel1_position_compare_table t (CardNo, pos_table, table_size);
```

39.14 _DMC_01_channel1_position_compare_table_level

- **FORMAT**

  I16 PASCAL _DMC_01_channel1_position_compare_table_level (U16 CardNo, I32* pos_table, U32* level_table, U32 table_size)

- **Purpose**

  Sets Compare2 to custom Compare data.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
Pos_table	I32*	Number Unit	Calculate the Pos_Table for compare based on the given data
Level_table	U32*	Number Unit	Set Level_table for Compare
Table_size	U32	Number Unit	Size of Pos_table to Compare

- **Example**

```
U16 CardNo = 0;
I32 Pos_table[4] ={1000,2000,3000,4000};
U32 Level_table[4] ={1,0,0,0};
U32 Table_size =50000;

I16 status = _DMC_01_channel1_position_compare_table_level (CardNo, pos_table,
             level_table, table_size);
```

39.15 _DMC_01_channel1_position_compare_table_cnt

- **FORMAT**

  I16 PASCAL _DMC_01_channel1_position_compare_table_cnt (U16 CardNo, U32* cnt)

- **Purpose**

  Reads Compare counter.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
Cnt	U32*	Number Unit	Read Compare counter

- **Example**

```
U16 CardNo = 0;
U32 Cnt = 12000;

I16 status = _DMC_01_channel1_position_compare_table_cnt (CardNo,& cnt);
```

39.16 _DMC_01_set_compare_channel_polarity

■ **FORMAT**

I16 PASCAL _DMC_01_set_compare_channel_polarity (U16 CardNo, U16 inverse)

■ **Purpose**

Sets Compare level.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
Inverse	U16	Number Unit	0: Normal 1: Inverse

■ **Example**

U16 CardNo = 0;

U16 Inverse = 1;

I16 status = _DMC_01_set_compare_channel_polarity (CardNo, inverse);

39.17 _DMC_01_channel0_position_cmp_by_gpio

■ **FORMAT**

I16 PASCAL _DMC_01_channel0_position_cmp_by_gpio (U16 CardNo, U16 dir, U16 interval, I32 trigger_cnt)

■ **Purpose**

Sets Compare trigger to GPIO control.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
Dir	U16	Number Unit	0: Positive 1: Negative
Interval	U16	Number Unit	Pulse Compare intervals
Trigger _cnt	I32	Number Unit	Trigger Compare total

■ **Example**

```
U16 CardNo = 0;
U16 Dir = 1;
U16 Interval;
I32 trigger_cnt;

I16 status = _DMC_01_channel0_position_cmp_by_gpio (CardNo, Dir, Interval, trigger_cnt);
```

39.18 _DMC_01_channel1_position_re_compare_table

- **FORMAT**

  I16 PASCAL _DMC_01_channel1_position_re_compare_table (U16 CardNo)

- **Purpose**

  Uses previous Compare condition and re-executes Channel1 Compare.

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15

- **Example**

```
U16 CardNo = 0;

I16 status = _DMC_01_channel1_position_re_compare_table (CardNo);
```

39.19 _DMC_01_channel1_position_re_compare_table_level

- **FORMAT**

  I16 PASCAL _DMC_01_channel1_position_re_compare_table_level (U16 CardNo)

- **Purpose**

  Uses previous Compare condition and re-executes Channel1 Compare (Level mode).

- **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15

- **Example**

```
U16 CardNo = 0;

I16 status = _DMC_01_channel1_position_re_compare_table_level (CardNo);
```

Chapter 40 Linear and Arc Interpolation Motion Control API

Table 40.1

Function Name	Description
_DMC_01_start_rline_xy	2-axis linear, arc R-angle interpolation motion control
_DMC_01_start_rline_xyz	3-axis linear, arc R-angle interpolation motion control
_DMC_01_start_v3_rline_xy	2-axis linear, arc interpolation motion control with added EndVel
_DMC_01_start_v3_rline_xyz	3-axis linear, arc interpolation motion control with added EndVel

40.1 _DMC_01_start_rline_xy

■ FORMAT

I16 PASCAL _DMC_01_start_rline_xy (U16 CardNo, U16* NodeID, U16* SlotID, I32 pos1_x, I32 pos1_y, I32 pos2_x, I32 pos2_y, U16 mode, F64 param, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec,U16 m_curve, U16 m_r_a)

■ Purpose

2-axis linear, arc R-angle interpolation motion control.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16*	Number Unit	Node ID
SlotID	U16*	Number Unit	Slot ID
Pos1_x	I32	Number Unit	X-coordinate of first position
Pos1_y	I32	Number Unit	Y-coordinate of first position
Pos2_x	I32	Number Unit	X-coordinate of second position
Pos2_y	I32	Number Unit	Y-coordinate of second position
Mode	U16	Selection	0: Perpendicular distance from arc to right angle (A→B) 1: Perpendicular distance from start of arc to right angle (A→B) 2: Arc radius (A→B)
Param	F64	Number Unit	Relative mode distance
StrVel	I32	Pulses per second	Starting velocity
MaxVel	I32	Pulses per second	Maximum velocity
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time
m_curve	U16	Selection	1: T-curve 2: S-curve
m_r_a	U16	Selection	0: Relative motion displacement 1: Absolute motion displacement

■ Description

Mode Parameter Settings

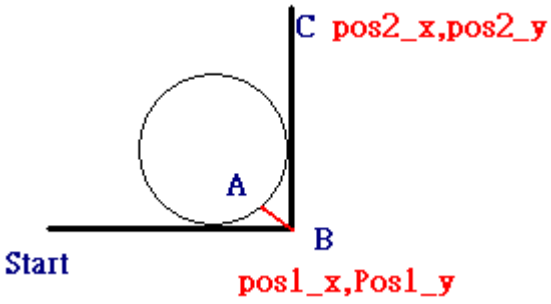


Figure 40.1 Mode = 0 Perpendicular distance from arc to right angle (AB→)

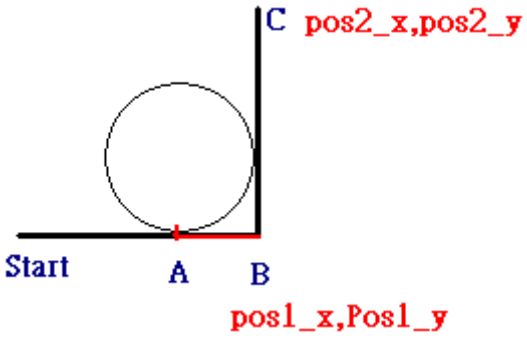


Figure 40.2 Mode = 1 Perpendicular distance from start of arc to right angle (A→B)

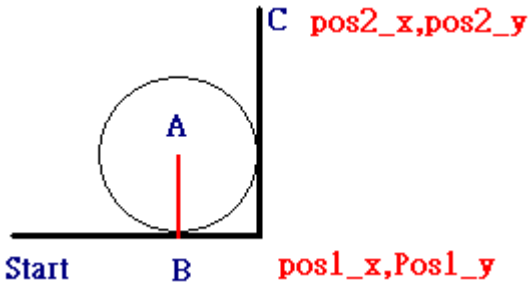


Figure 40.3 Mode = 2 Arc radius (A→B)

■ Example

```
U16 CardNo=0, *NodeID=1, *SlotID=0;
I32 pos1_x=0, I32 pos1_y=10000;
I32 pos2_x=10000, I32 pos2_y=10000;
U16 mode=1; param=3000;
I32 StrVel=100, MaxVel=5000;
F64 Tacc=0.1, Tdec=0.1;
U16 m_curve=1;
U16 m_r_a=0;

/*Set as multi-axis motion control using absolute coordinates with T-curve velocity
cross-section.   */
I16 status = _DMC_01_start_rline_xy (CardNo, &NodeID, &SlotID, pos1_x, pos1_y, pos2_x,
                pos2_y, mode, param, StrVel, MaxVel, Tacc, Tdec, m_curve, m_r_a);
```

40.2 _DMC_01_start_rline_xyz

■ **FORMAT**

I16 PASCAL _DMC_01_start_rline_xyz (U16 CardNo, U16* NodeID, U16* SlotID, I32 pos1_x, I32 pos1_y, I32pos1_z, I32 pos2_x, I32 pos2_y, pos2_z, U16 mode, F64 param, I32 StrVel, I32 MaxVel, F64 Tacc, F64 Tdec,U16 m_curve, U16 m_r_a)

■ **Purpose**

3-axis linear, arc R-angle interpolation motion control

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16*	Number Unit	Node ID
SlotID	U16*	Number Unit	Slot ID
Pos1_x	I32	Number Unit	X-coordinate of first position
Pos1_y	I32	Number Unit	Y-coordinate of first position
Pos1_z	I32	Number Unit	Z-coordinate of first position
Pos2_x	I32	Number Unit	X-coordinate of second position
Pos2_y	I32	Number Unit	Y-coordinate of second position
Pos2_z	I32	Pulses per second	Z-coordinate of second position
Mode	U16	Selection	0: Perpendicular distance from arc to right angle (A→B) 1: Perpendicular distance from start of arc to right angle (A→B) 2: Arc radius (A→B)
Param	F64	Number Unit	Relative mode distance
StrVel	I32	Pulses per second	Starting velocity
MaxVel	I32	Pulses per second	Maximum velocity
Tacc	F64	Second	Specified acceleration time
Tdec	F64	Second	Specified deceleration time
m_curve	U16	Selection	1: T-curve 2: S-curve
m_r_a	U16	Selection	0: Relative motion displacement 1: Absolute motion displacement

■ Description

Mode Parameter Settings

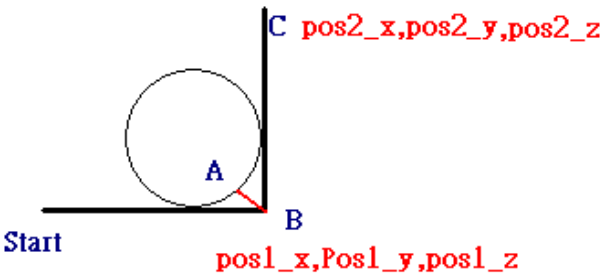


Figure 40.4 Mode = 0 Perpendicular distance from arc to right angle (A→B)

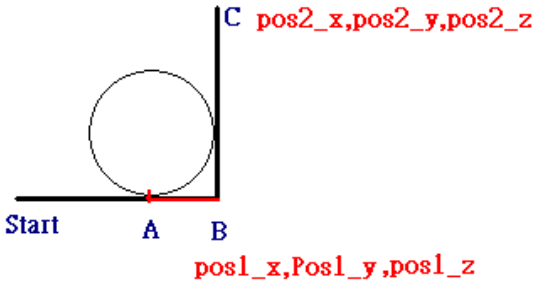


Figure 40.5 Mode = 1 Perpendicular distance from start of arc to right angle

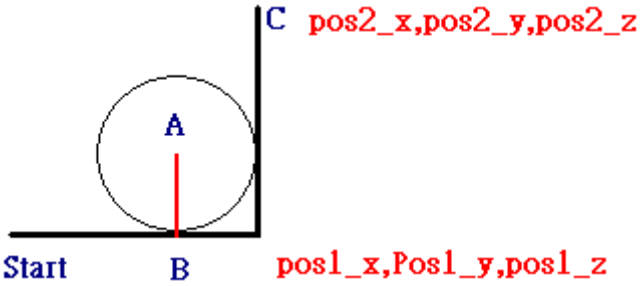


Figure 40.6 Mode = 2 Arc radius (A→B)

■ Example

```
U16 CardNo=0, *NodeID=1, *SlotID=0;
I32 pos1_x=0, I32 pos1_y=10000, I32 pos1_z=10000;
I32 pos2_x=10000, I32 pos2_y=10000, I32 pos2_z=10000;
U16 mode=1; param=3000;
I32 StrVel=100, MaxVel=5000;
F64 Tacc=0.1, Tdec=0.1;
U16 m_curve=1;
U16 m_r_a=0;

/*Set as multi-axis motion control using absolute coordinates with T-curve velocity
cross-section.   */
I16 status = _DMC_01_start_rline_xyz (CardNo, &NodeID, &SlotID, pos1_x, pos1_y, pos1_z,
             pos2_x, pos2_y, pos2_z, mode, param, StrVel, MaxVel, Tacc, Tdec, m_curve,
             m_r_a);
```

40.3 _DMC_01_start_v3_rline_xy

■ FORMAT

I16 PASCAL _DMC_01_start_v3_rline_xy (U16 CardNo, U16* NodeID, U16* SlotID, I32 pos1_x, I32 pos1_y, I32 pos2_x, I32 pos2_y, U16 mode, F64 param, I32 StrVel, I32 ConstVel, I32 EndVel, F64 TPhase1, F64 TPhase2, U16 m_curve, U16 m_r_a)

■ Purpose

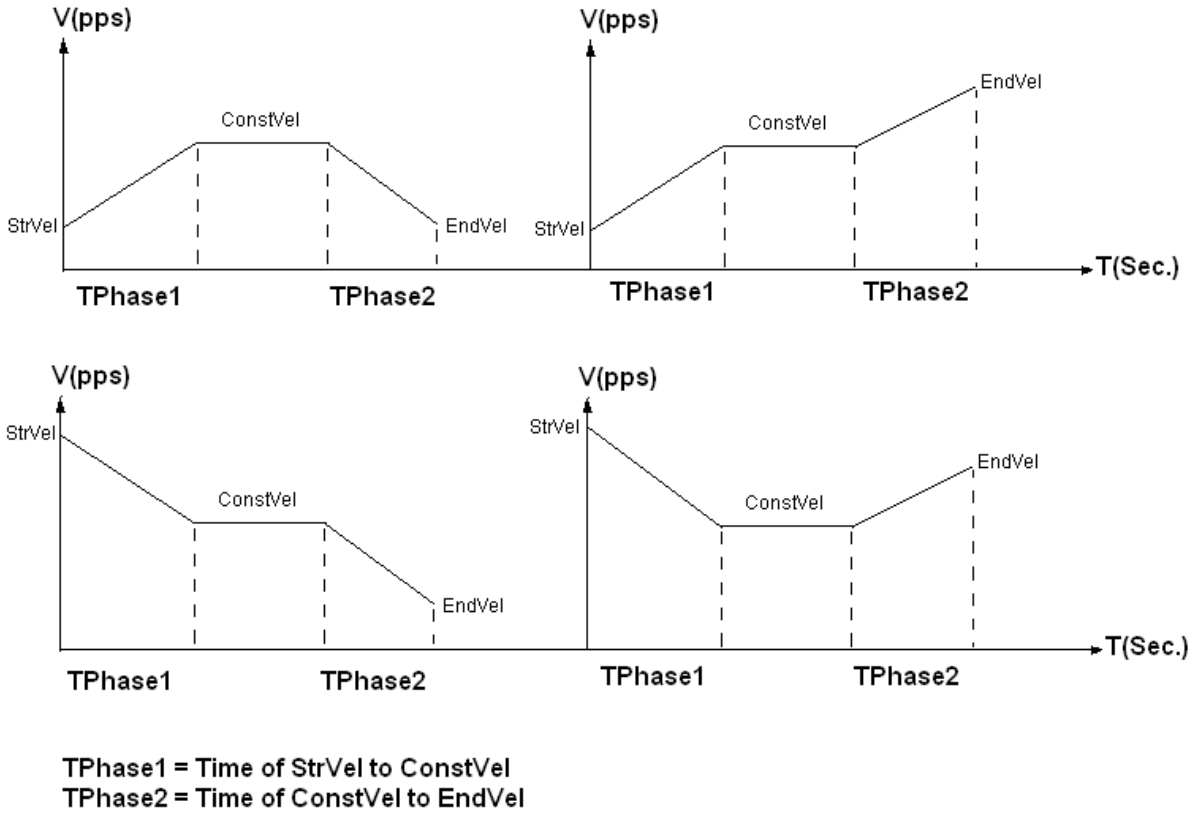
2-axis linear, arc interpolation motion control with added EndVel.

※Values of StrVel and EndVel can be greater than MaxVel.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16*	Number Unit	Node ID
SlotID	U16*	Number Unit	Slot ID
Pos1_x	I32	Number Unit	X-coordinate of first position
Pos1_y	I32	Number Unit	Y-coordinate of first position
Pos2_x	I32	Number Unit	X-coordinate of second position
Pos2_y	I32	Number Unit	Y-coordinate of second position
Mode	U16	Selection	0: Perpendicular distance from arc to right angle (A→B) 1: Perpendicular distance from start of arc to right angle (A→B) 2: Arc radius (A→B)
Param	F64	Number Unit	Relative mode distance
StrVel	I32	Pulses per second	Starting velocity
ConstVel	I32	Pulses per second	Constant velocity
EndVel	I32	Pulses per second	End velocity
TPhase1	F64	Second	Time from StartVel to ConstVel
TPhase2	F64	Second	Time from ConstVel to EndVel
m_curve	U16	Selection	1: T-curve 2: S-curve
m_r_a	U16	Selection	0: Relative motion displacement 1: Absolute motion displacement

■ Description



TPhase1 = Time of StrVel to ConstVel
TPhase2 = Time of ConstVel to EndVel

Figure 40.7 Explanation of TPhase1 and TPhase2

Mode Parameter Settings

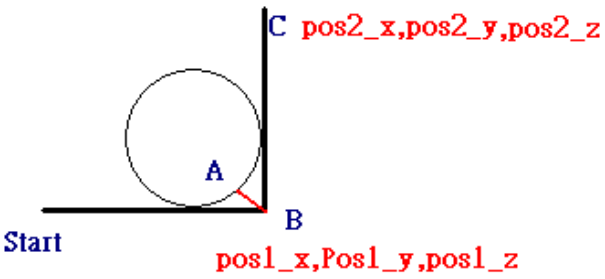


Figure 40.8 Mode = 0 Perpendicular distance from arc to right angle (AB→)

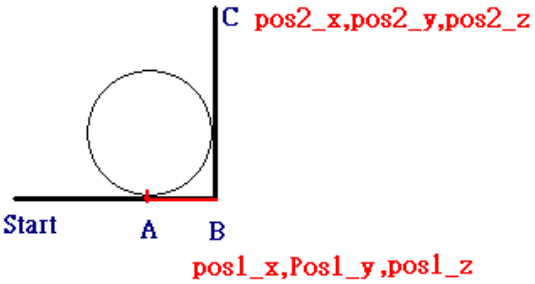


Figure 40.9 Mode = 1 Perpendicular distance from start of arc to right angle (AB→)

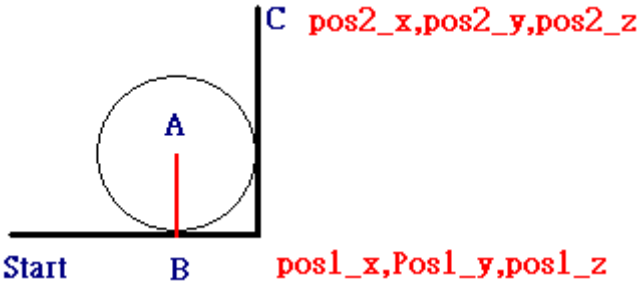


Figure 40.10 Mode = 2 Arc radius (AB→)

Example

```
U16 CardNo=0, *NodeID=1, *SlotID=0;
I32 pos1_x=0, I32 pos1_y=10000;
I32 pos2_x=10000, I32 pos2_y=10000;
U16 mode=1; param=3000;
I32 StrVel=100, MaxVel=50000;
I32 EndVel=20000;
F64 TPhase1=0.2;
F64 TPhase2=0.1;
U16 m_curve=1, m_r_a=0;

/*Set as multi-axis motion control using absolute coordinates with T-curve velocity
cross-section.   */
I16 status = _DMC_01_start_v3_rline_xy (CardNo, &NodeID, &SlotID, pos1_x, pos1_y,
             pos2_x, pos2_y, mode, param, StrVel, ConstVel, EndVel, TPhase1, TPhase2,
             m_curve, m_r_a);
```

40.4 _DMC_01_start_v3_rline_xyz

■ FORMAT

I16 PASCAL _DMC_01_start_v3_rline_xyz (U16 CardNo, U16* NodeID, U16* SlotID,
I32 pos1_x, I32 pos1_y, I32pos1_z, I32 pos2_x, I32 pos2_y, pos2_z, U16 mode,
F64 param, I32 StrVel, I32 ConstVel, I32 EndVel, F64 TPhase1, F64 TPhase2, U16 m_curve,
U16 m_r_a)

■ Purpose

3-axis linear, arc interpolation motion control with added EndVel.
※Values of StrVel and EndVel can be greater than MaxVel.

■ Parameters

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16*	Number Unit	Node ID
SlotID	U16*	Number Unit	Slot ID
Pos1_x	I32	Number Unit	X-coordinate of first position
Pos1_y	I32	Number Unit	Y-coordinate of first position
Pos1_z	I32	Number Unit	Z-coordinate of first position
Pos2_x	I32	Number Unit	X-coordinate of second position
Pos2_y	I32	Number Unit	Y-coordinate of second position
Pos2_z	I32	Pulses per second	Z-coordinate of second position
Mode	U16	Selection	0: Perpendicular distance from arc to right angle (A→B) 1: Perpendicular distance from start of arc to right angle (A→B) 2: Arc radius (A→B)
Param	F64	Number Unit	Relative mode distance
StrVel	I32	Pulses per second	Starting velocity
ConstVel	I32	Pulses per second	Constant velocity
EndVel	I32	Pulses per second	End velocity
TPhase1	F64	Second	Time from StartVel to ConstVel
TPhase2	F64	Second	Time from ConstVel to EndVel
m_curve	U16	Selection	1: T-curve 2: S-curve
m_r_a	U16	Selection	0: Relative motion displacement 1: Absolute motion displacement

Example

```
U16 CardNo=0, *NodeID=1, *SlotID=0;
I32 pos1_x=0, I32 pos1_y=10000, I32 pos1_z=10000;
I32 pos2_x=10000, I32 pos2_y=10000, I32 pos2_z=10000;
U16 mode=1; param=3000;
I32 StrVel=100, MaxVel=50000;
I32 EndVel=20000;
F64 TPhase1=0.2;
F64 TPhase2=0.1;
U16 m_curve=1, m_r_a=0;

/*Set as multi-axis motion control using absolute coordinates with T-curve velocity
cross-section. */
I16 status = _DMC_01_start_rline_xyz (CardNo, &NodeID, &SlotID, pos1_x, pos1_y, pos1_z,
             pos2_x, pos2_y, pos2_z, mode, param, StrVel, ConstVel, EndVel, TPhase1,
             TPhase2, m_curve, m_r_a);
```

Chapter 41 Speed Continue API

Table 41.1

Function Name	Description
_DMC_01_speed_continue	Enable/disable speed continue
_DMC_01_speed_continue_mode	Speed continue mode
_DMC_01_speed_continue_combine_ratio	Speed continue combine ratio

41.1 _DMC_01_speed_continue

■ **FORMAT**

I16 PASCAL _DMC_01_speed_continue (U16 CardNo, U16 NodeID, U16 SlotID, U16 enable)

■ **Purpose**

Enables/disables speed continue.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
Enable	U16	Selection	0: Disable speed continue 1: Enable speed continue

■ **Example**

U16 CardNo=0, U16 NodeID=1, SlotID=0;
U16 enable=1;

I16 status = _DMC_01_speed_continue (CardNo, NodeID, SlotID, enable);

NOTE

※When you set _DMC_01_speed_continue parameter enable=1, all further motion commands must have StrVel parameter set to 0 in order to achieve the Speed Continue effect.

41.2 _DMC_01_speed_continue_mode

■ **FORMAT**

I16 PASCAL _DMC_01_speed_continue_mode (U16 CardNo, U16 NodeID, U16 SlotID, U16 mode)

■ **Purpose**

Sets Speed Continue mode.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
Mode	U16	Selection	0: Equivalent Acceleration mode 1: Acceleration/deceleration mode 2: Maximum velocity mode

■ **Description**

Mode is 0

Assume conditions are set to Dist is 1000, MaxVel is 20000, Tacc and Tdec are both 0.1. The above conditions mean the MaxVel of 20000 is impossible to reach during this Dist movement using the original acceleration/deceleration time. When mode is set to 0, MaxVel, Tacc and Tdec are reduced proportionally. Carry out with equivalent acceleration. Fig. 41.1 shows the original path in black and the actual path in red.

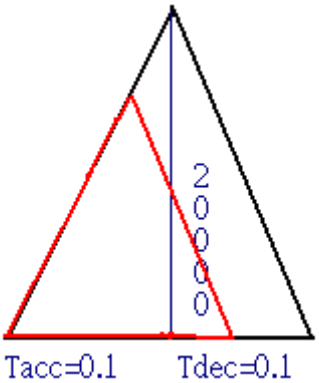


Figure 41.1

Mode is 1

Assume conditions are set to Dist is 1000, MaxVel is 20000, Tacc and Tdec are both 0.1. The above conditions mean the MaxVel of 20000 is impossible to reach during this Dist movement using the original acceleration/deceleration time. So when mode is 1, Tac and Tdec will stay as 0.1 but MaxVel is automatically reduced. Fig. 41.2 shows the original path in black and the actual path in red.

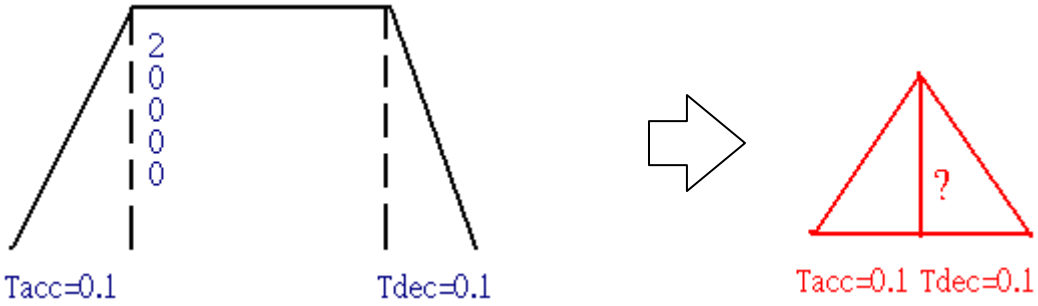


Figure 41.2

Mode is 2

Assume conditions are set to Dist is 1000, MaxVel is 20000, Tacc and Tdec are both 0.1. The above conditions mean the MaxVel of 20000 is impossible to reach during this Dist movement using the original acceleration/deceleration time. When mode is 2, MaxVel will remain unchanged but Tacc and Tdec will vary as required. Fig. 41.3 shows the original path in black and the actual path in red.

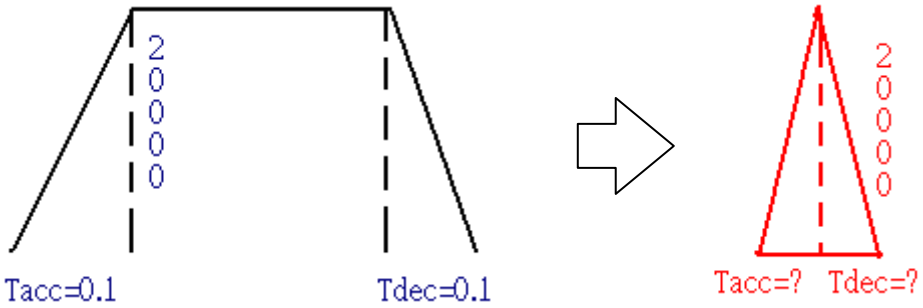


Figure 41.3

■ **Example**

U16 CardNo=0, U16 NodeID=1, U16 SlotID=0;
U16 mode=1;

I16 status = _DMC_01_speed_continue_mode (CardNo, NodeID, SlotID, mode);

41.3 _DMC_01_speed_continue_combine_ratio

■ **FORMAT**

I16 PASCAL _DMC_01_speed_continue_combine_ratio (U16 CardNo, U16 NodeID, U16 SlotID, U16 ratio)

■ **Purpose**

Sets Speed Continue combined percentage.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
NodeID	U16	Number Unit	Node ID
SlotID	U16	Number Unit	Slot ID
Ratio	U16	Number Unit	Combined percentage

■ **Description**

Ratio is 100

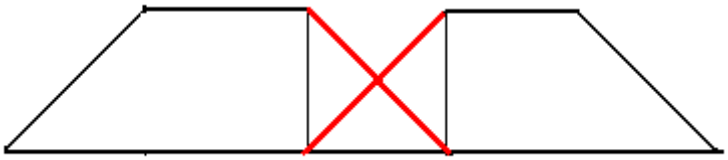


Figure 41.4

Ratio is 50

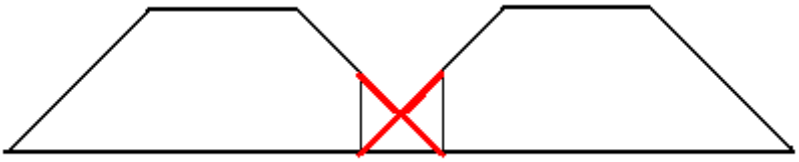


Figure 41.5

■ **Example**

U16 CardNo=0, U16 NodeID=1, U16 SlotID=0;
U16 ratio=100;

I16 status = _DMC_01_speed_continue_combine_ratio (CardNo, NodeID, SlotID, ratio);

NOTE

※When axes 1 ~ 6 carry out Speed Continue, the resources of axes 7 ~ 12 will be used. Thus, when axes 1~6 are set to Speed Continue Enable, axes 7~12 cannot perform P2P and Continue motions.
Speed Continue must be disabled for axes 7 ~ 12 to carry out further motions.

Chapter 42 Other API

Table 42.1

Function Name	Description
_misc_app_get_circle_endpoint	Get endpoint coordinates (X, Y) required for arc interpolation
_misc_app_get_circle_center_point	Get center point coordinates (X, Y) required for arc interpolation
_misc_set_record_debuging	Is Debug log function enabled
_misc_open_record_debuging_file	Set Debug output log file path
_DMC_01_enable_dda_mode	Enable DDA Table writing function
_DMC_01_set_dda_data	Enter DDA Table data
_DMC_01_get_dda_cnt	Get number of remaining entries in DDA Table

42.1 _misc_app_get_circle_endpoint

■ **FORMAT**

I16 PASCAL _misc_app_get_circle_endpoint (I32 Start_X, I32 Start_Y, I32 Center_X, I32 Center_Y, F64 Angle, I32* End_x, I32* End_y)

■ **Purpose**

Retrieves endpoint coordinates (X, Y) required for arc interpolation.

■ **Parameters**

Name	Data Type	Unit	Description
Start_X	I32	Number of pulses	Starting X-coordinate
Start_Y	I32	Number of pulses	Starting Y-coordinate
Center_X	I32	Number of pulses	Center point's X-coordinate.
Center_Y	I32	Number of pulses	Center point's Y-coordinate.
Angle	F64	Degree (°)	Set arc angle. One full arc is 360^{o}
End_x	I32*	Number of pulses	Endpoint's X-coordinate.
End_y	I32*	Number of pulses	Endpoint's Y-coordinate.

■ **Example**

```
I32 Start_X=0, Start_Y=0;
I32 Center_X=100000, Center_Y=0;
I32 End_x, End_y;
F64 Angle=180;

I16 status = _misc_app_get_circle_endpoint (Start_X, Start_Y, Center_X, Center_Y, Angle,
&End_x, &End_y);
```

42.2 _misc_app_get_circle_center_point

■ **FORMAT**

I16 PASCAL _misc_app_get_circle_center_point (I32 Start_X, I32 Start_Y, I32 End_x, I32 End_y, F64 Angle, I32* Center_X, I32* Center_Y)

■ **Purpose**

Retrieves center point coordinates (X, Y) required for arc interpolation.

■ **Parameters**

Name	Data Type	Unit	Description
Start_X	I32	Number of pulses	Starting X-coordinate
Start_Y	I32	Number of pulses	Starting Y-coordinate
End_x	I32	Number of pulses	Endpoint's X-coordinate.
End_y	I32	Number of pulses	Endpoint's Y-coordinate.
Angle	F64	Degree (°)	Set arc angle. One full arc is 360º
Center_X	I32*	Number of pulses	Center point's X-coordinate.
Center_Y	I32*	Number of pulses	Center point's Y-coordinate.

■ **Example**

```
I32 Start_X=0, Start_Y=0;
I32 End_x=100000, End_y0;
I32 Center_X, Center_Y;
F64 Angle=180;

I16 status = _misc_app_get_circle_center_point (Start_X, Start_Y , End_x, End_y, Angle,
&Center_X, &Center_Y);
```

42.3 _misc_set_record_debuging

■ **FORMAT**

I16 PASCAL _misc_set_record_debuging (U16 enable)

■ **Purpose**

Shows whether Debug log function is enabled.

■ **Parameters**

Name	Data Type	Unit	Description
Enable	U16	Selection	0: Disable Debug log 1: Enable Debug log

■ **Example**

U16 Enable = 1;

I16 status = _misc_set_record_debuging (Enable);

42.4 _misc_open_record_debuging_file

■ **FORMAT**

I16 PASCAL _misc_open_record_debuging_file (Char* file_name, U16 open)

■ **Purpose**

Sets Debug output log file path.

■ **Parameters**

Name	Data Type	Unit	Description
file_name	Char*	Character Array	Debug document file path
open	U16	Selection	0: Store in VC6 compiler development environment's debug window 1: Store log at file path specified in file_name

■ **Example**

Char file_name[20]=“log_output.txt”;

U16 open=1;

I16 status = _misc_open_record_debuging_file(file_name, U16 open);

42.5 _DMC_01_enable_dda_mode

■ **FORMAT**

I16 PASCAL _DMC_01_enable_dda_mode (U16 CardNo, U16 enable)

■ **Purpose**

Enables DDA Table writing function.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	Interface card CardNo are 0~15.
Enable	U16	Selection	0: Disable DDA Table writing function. 1: Enable DDA Table writing function. Bit0:Node1 Bit1:Node2 Bit2:Node3 Bit3:Node4 Bit4:Node5 Bit5:Node6 Bit6:Node7 Bit7:Node8 Bit8:Node9 Bit9:Node10 Bit10:Node11 Bit11:Node12

■ **Example**

```
U16 CardNo = 0;
U16 Enable = 5;    // Enable Node1,3

I16 status = _DMC_01_enable_dda_mode (CardNo, Enable);
```

42.6 _DMC_01_set_dda_data

■ **FORMAT**

I16 PASCAL _DMC_01_set_dda_data (U16 CardNo, U32* abs_pos)

■ **Purpose**

Enters DDA Table data.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
Abs_Pos	U32*	Numerical data	This field is a an array for data from 12 axes

■ **Example**

U16 CardNo = 0;
U32 Abs_Pos[0][11] = {1000,2000,0,0,0,0,0,0,0,0,0,0};
//Abs_Pos is a 12-axis data array. Maximum Buffer is 1000 entries. One DDA Table entry is executed each ms. Please note that other commands will not be accepted before the Buffer finishes executing (e.g. Sd_Stop).
I16 status = _DMC_01_set_dda_data (CardNo, Abs_Pos);
//Other Node without DDA Table enabled can continue to execute other actions as normal.

42.7 _DMC_01_get_dda_cnt

■ **FORMAT**

I16 PASCAL _DMC_01_get_dda_cnt (U16 CardNo, U16* dda_cnt)

■ **Purpose**

Retrieves number of remaining entries in DDA Table.

■ **Parameters**

Name	Data Type	Unit	Description
CardNo	U16	Number Unit	CardNo is between 0~15
dda_cnt	U16*	Numerical data	Current number of remaining entries in DDA Table

■ **Example**

U16 CardNo = 0;
U16 dda_cnt;

I16 status = _DMC_01_get_dda_cnt (CardNo, & dda_cnt);;