T E C H N I C A L   B U L L E T I N

Doc No.:	**TN30-05**
Date:	**Jan 2003**
Version:	**1.0**
Subject:	**SERCOS TrioBasic command**

Trio SERCOS Setup Procedure

Taken from the Trio SERCOS Spec, 11/04/2002

Function Definitions:

Sercos Function 0 – SERCOS(0, slot , ram/reg, address)

Read Sercos ASIC memory. This function will return the value at the given RAM location (RAM/reg flag=0) or register (RAM/reg flag = 1) in the Sercos ASIC memory.

Sercos Function 1 – SERCOS(0, slot , ram/reg, address, value)

Write Sercos ASIC memory. This function will write to the required Sercos ASIC RAM location or register.

Sercos Function 2 – SERCOS(2, slot , intensity , baudrate)

Initialisation command. This function resets the Sercos ASIC register configuration to the default values. Phase 0 is set. The optional "intensity" parameter sets the light transmission intensity from the SERCOS daughter board and should be in the range of 1..6 (default is 3). The baudrate should be set to 2,4,8 or 16 for the baudrate in MBAUD (default is 16).

Sercos Function 3 – SERCOS(3, <slot>, <slave addr>, <axis>)

Used to register the expected sercos network configuration with the OS. The command associates an axis number to a particular slave (drive) on the sercos network connected to the controller via the daughterboard in the given slot number. The user's basic program can confirm the existence of these slaves on the network at startup, hence if any slaves are not found there must be an error on the network. The configuration stored by the controller is reset (all recorded definitions removed) when the command is called with the slave address and axis both equal to zero (since this is not a valid slave address).

Sercos Function 4 – SERCOS(4, slot , slave address, parameter ID [, parameter size[, list length offset]])

Read parameter command. Parameter size values include 2 (default) for a 2 byte parameter, 4 for a 4 byte parameter, 6 for a list of parameter Ids, and 7 for an ASCII string. The list length offset parameter is used to compensate for different interpretations of the list length indicators. Some drives give the list length as the number of 2-byte parameters in the list (this is the functions default - in which case the parameter can be omitted). However, other drives appear to include the size of the list length indicator (2 words) in the overall length value. To allow for the latter case, an offset of -2 should

be used. Note that this function will return 2 & 4 byte parameters, but print lists.

Sercos Function 5 – SERCOS(5, slot , slave address, parameter ID, parameter size, parameter value [, parameter value …])

Write parameter command. Parameter size values are as for function 4. There must be between one and 7 parameter values (>1 is used for list parameters.)

Sercos Function 6 – SERCOS(6, slot , slave address, parameter ID [, time-out])

Run sercos command. This function will run the command given by Parameter ID, and return 1 if the command runs successful, -1 if the command ran and failed, or 0 if there was a comms timout error. The default time allowed for a command to complete is 10seconds, since some commands can take a long time to execute on the drive. If this time is exceeded the function will return a −2. There is an optional time out (in msec) parameter which can be passed to this function if a value other than the default is required.

Sercos Function 7 – SERCOS(7 , slot , slave address)

Used in Phase 1: Returns 1 if drive is detected, 0 if no drive detected.

Sercos Function 8 – SERCOS(8 , slot , required parameter)

Print required network parameter. This function will print the required network parameter, where the possible 'required parameter' values are

0: to print a semi-colon delimited list of 'slave Id, axis number' duples for the registered network configuration (as defined using function 3). Used in Phase 1: Returns 1 if drive is detected, 0 if no drive detected.

1: to print the baud rate (either 2, 4, 6, or 8), and

2: to print the intensity (a number between 0 and 6).

Sercos Function 10 – SERCOS(10,<slot>)

Function checks whether the fibre optic loop is closed in phase 0. Return value is 1 if network is closed, -1 if it is open, and −2 if there is excessive distortion on the network.

SERCOS Example BASIC Programs:

Sercos Network Configuration
The controller runs through the following states when configuring a sercos network:

1. Initialization.

2. Verify network loop closed.

3. Verify drive presence.

4. Network configuration.

5. Drive initialisation & phase command checks.

6. Normal operation.

Each state must complete successfully before the transition to the next. The presence of each drive on the network is verified during startup since the network configuration is defined during machine commissioning. During the network configuration state each drive is assigned an axis number, which is subsequently used to issue move commands and read the measured position.

MotionPerfect will automatically generate a short startup basic program to run the sercos commands, based on information entered using the Sercos intelligent drives wizard dialog pages.

Atype 16 = speed control mode, and Atype 17 = position control mode.

Indramat

The Rexroth-Indramat drive is run in velocity control mode (velocity command-position feedback).

```
' Example STARTUP file for SERCOS:
' The drive address is 1, and the Sercos daughterboard is in slot 0.
'*******************************************
SERCOS(2,0,3,4)' Intensity=3, Baudrate=4Mhz
SERCOS(3,0,0,0) 'Initialise config
IF SERCOS(10,0)<0 THEN
    PRINT "SERCOS loop open or distorted"
    STOP
ENDIF
'*******************************************
SERCOS_PHASE SLOT(0)=1
IF SERCOS(7,0,1)<0 THEN
    PRINT "Drive not detected"
    STOP
ENDIF

SERCOS(3,0,1,6)' Set drive as axis 6
'*******************************************
SERCOS_PHASE SLOT(0)=2

SERCOS(5,0,1,1,2,1000)'ID1 NC Cycle Time
SERCOS(5,0,1,2,2,1000)'ID2 SERCOS Cycle Time
SERCOS(5,0,1,6,2,50*1)'ID6 AT Transmission Start Time
SERCOS(5,0,1,7,2,700)' ID7 feedback acquisition start time
SERCOS(5,0,1,8,2,800)' ID8 Command Valid Time
SERCOS(5,0,1,9,2,8*1-7)'  ID9 Initial Address in MDT
SERCOS(5,0,1,10,2,8*1)'ID10 Length of MDT
SERCOS(5,0,1,89,2,500)'ID89 MDT Transmit Starting Time
SERCOS(5,0,1,32,2,2)'  ID32 Primary Mode of Operation
SERCOS(5,0,1,15,2,3)'  ID15 Telegram Type Parameter
```

```
IF SERCOS(6,0,1,127)<>1 THEN
    PRINT "Drive Failed Phase 2-3 Transition Check"
    STOP
ENDIF


'*******************************************
SERCOS_PHASE SLOT(0)=3

IF SERCOS(6,0,1,128)<>1 THEN
    PRINT "Drive Failed Phase 3-4 Transition Check"
    STOP
ENDIF


SERCOS_PHASE SLOT(0)=4

ATYPE AXIS(6)=16

PRINT "Sercos network successfully initialised"
```

SanyoDenki

The SanyoDenki drive is run in velocity control mode (velocity command-position feedback). Note that for this drive we run command number 99 in phase 2 in order to clear any error flags set in the drive during power-on or as a result of the phase change.

```
' Example STARTUP file for SERCOS:

' The drive address is 1, and the Sercos daughterboard is in slot 0.

'*******************************************
SERCOS(2,0,3,4)' Intensity=3, Baudrate=4Mhz
SERCOS(3,0,0,0) 'Initialise config

IF SERCOS(10,0)<0 THEN
    PRINT "SERCOS loop open or distorted"
    STOP
ENDIF


'*******************************************
SERCOS_PHASE SLOT(0)=1

IF SERCOS(7,0,1)<0 THEN
    PRINT "Drive not detected"
    STOP
ENDIF

SERCOS(3,0,1,6)' Set drive as axis 6

'*******************************************
SERCOS_PHASE SLOT(0)=2

SERCOS(6,0,1,99)' Clear Errors on drive 1

SERCOS(5,0,1,1,2,1000)'ID1 NC Cycle Time
SERCOS(5,0,1,2,2,1000)'ID2 SERCOS Cycle Time
SERCOS(5,0,1,6,2,50*1)'ID6 AT Transmission Start Time
SERCOS(5,0,1,7,2,700)' ID7 feedback acquisition start time
```

```
SERCOS(5,0,1,8,2,800)' ID8 Command Valid Time
SERCOS(5,0,1,9,2,8*1-7)'   ID9 Initial Address in MDT
SERCOS(5,0,1,10,2,8*1)'ID10 Length of MDT
SERCOS(5,0,1,89,2,500)'ID89 MDT Transmit Starting Time
SERCOS(5,0,1,32,2,2)'  ID32 Primary Mode of Operation
SERCOS(5,0,1,15,2,3)'  ID15 Telegram Type Parameter

SERCOS(5,0,1,33025,2,6)'    ID33025 Hold Direction Limits OFF

IF SERCOS(6,0,1,127)<>1 THEN
    PRINT "Drive Failed Phase 2-3 Transition Check"
    STOP
ENDIF


'*********************************************
SERCOS_PHASE SLOT(0)=3

IF SERCOS(6,0,1,128)<>1 THEN
    PRINT "Drive Failed Phase 3-4 Transition Check"
    STOP
ENDIF


SERCOS_PHASE SLOT(0)=4

ATYPE AXIS(6)=16

PRINT "Sercos network successfully initialised"
```

Pacific Scientific (PC840)

The Pacsi drive should run in position control mode (position command - position feedback), however only managed to run in Phase 4 using velocity command – velocity feedback to date.

```
' Example STARTUP file for SERCOS:

' The drive address is 2, and the Sercos daughterboard is in slot 0.

'************************' Example STARTUP file for SERCOS:

' The drive address is 2, and the Sercos daughterboard is in slot 0.

'*********************************************
SERCOS(2,0,3,4)' Intensity=3, Baudrate=4Mhz
SERCOS(3,0,0,0) 'Initialise config

IF SERCOS(10,0)<0 THEN
    PRINT "SERCOS loop open or distorted"
    STOP
ENDIF

'*********************************************
SERCOS_PHASE SLOT(0)=1

IF SERCOS(7,0,2)<0 THEN
    PRINT "Drive not detected"
    STOP
ENDIF
```

```
SERCOS(3,0,2,6)' set drive as axis 6

'*********************************************
SERCOS_PHASE SLOT(0)=2
SERCOS(5,0,2,1,2,2000)'ID1 NC Cycle Time
SERCOS(5,0,2,2,2,2000)'ID2 SERCOS Cycle Time
SERCOS(5,0,2,6,2,50*1)'ID6 AT Transmission Start Time
SERCOS(5,0,2,7,2,700)' ID7 feedback acquisition start time
SERCOS(5,0,2,8,2,800)' ID8 Command Valid Time
SERCOS(5,0,2,9,2,8*1-7)'   ID9 Initial Address in MDT
SERCOS(5,0,2,10,2,8*1)'ID10 Length of MDT
SERCOS(5,0,2,89,2,500)'ID89 MDT Transmit Starting Time
SERCOS(5,0,2,32,2,3)'ID32 Primary Mode of Operation (position)
SERCOS(5,0,2,15,2,4)'ID15 Telegram Type Parameter

SERCOS(5,0,2,79,4,32768)' ID79 Rotational Position Resolution

SERCOS(5,0,2,32824,4,0)'    ID32824 Set 0 for resolver feedback
SERCOS(5,0,2,32836,4,1)'    ID32836 Commutation Offset Mode
SERCOS(5,0,2,32826,4,0)'    ID32826 Commutation Offset
SERCOS(5,0,2,32853,4,0)'    ID32853 Use resolver for commutation
SERCOS(5,0,2,32807,2,6)'    ID32807 Motor Poles
SERCOS(5,0,2,32828,4,2000)' ID32828 Encoder Lines
SERCOS(5,0,2,106,2,188)'    ID106   KIP
SERCOS(5,0,2,107,2,643)'    ID107   KII
SERCOS(5,0,2,100,2,29)'     ID100   KVP
SERCOS(5,0,2,101,2,172)'    ID101   KVI
SERCOS(5,0,2,32841,4,0)'    ID32841 ARZ0
SERCOS(5,0,2,32842,4,0)'    ID32842 ARZ1
SERCOS(5,0,2,32843,4,15000)'ID32843 ARF0
SERCOS(5,0,2,32844,4,75000)'ID32844 ARF1
SERCOS(5,0,2,104,2,2056)'   ID104   KPP
SERCOS(5,0,2,32840,2,700)'  ID32840 KFF

IF SERCOS(6,0,2,127)<>1 THEN
    PRINT "Drive Failed Phase 2-3 Transition Check"
    STOP
ENDIF

'*********************************************
SERCOS_PHASE SLOT(0)=3

IF SERCOS(6,0,2,128)<>1 THEN
    PRINT "Drive Failed Phase 3-4 Transition Check"
    STOP
ENDIF

SERCOS_PHASE SLOT(0)=4
ATYPE AXIS(6)=16

PRINT "Sercos network successfully initialised"********************
SERCOS(2,0,3,4)' Intensity=3, Baudrate=4Mhz
SERCOS(3,0,0,0) 'Initialise config
```

```
IF SERCOS(10,0)<0 THEN
    PRINT "SERCOS loop open or distorted"
    STOP
ENDIF


'*********************************************
SERCOS_PHASE SLOT(0)=1

IF SERCOS(7,0,2)<0 THEN
    PRINT "Drive not detected"
    STOP
ENDIF

SERCOS(3,0,2,6)' set drive as axis 6

'*********************************************
SERCOS_PHASE SLOT(0)=2
SERCOS(5,0,2,1,2,2000)'ID1 NC Cycle Time
SERCOS(5,0,2,2,2,2000)'ID2 SERCOS Cycle Time
SERCOS(5,0,2,6,2,50*1)'ID6 AT Transmission Start Time
SERCOS(5,0,2,7,2,700)' ID7 feedback acquisition start time
SERCOS(5,0,2,8,2,800)' ID8 Command Valid Time
SERCOS(5,0,2,9,2,8*1-7)'  ID9 Initial Address in MDT
SERCOS(5,0,2,10,2,8*1)'ID10 Length of MDT
SERCOS(5,0,2,89,2,500)'ID89 MDT Transmit Starting Time
SERCOS(5,0,2,32,2,3)'ID32 Primary Mode of Operation (position)
SERCOS(5,0,2,15,2,4)'ID15 Telegram Type Parameter

SERCOS(5,0,2,79,4,32768)' ID79 Rotational Position Resolution

SERCOS(5,0,2,32824,4,0)'    ID32824 Set 0 for resolver feedback
SERCOS(5,0,2,32836,4,1)'    ID32836 Commutation Offset Mode
SERCOS(5,0,2,32826,4,0)'    ID32826 Commutation Offset
SERCOS(5,0,2,32853,4,0)'    ID32853 Use resolver for commutation
SERCOS(5,0,2,32807,2,6)'    ID32807 Motor Poles
SERCOS(5,0,2,32828,4,2000)' ID32828 Encoder Lines
SERCOS(5,0,2,106,2,188)'    ID106   KIP
SERCOS(5,0,2,107,2,643)'    ID107   KII
SERCOS(5,0,2,100,2,29)'     ID100   KVP
SERCOS(5,0,2,101,2,172)'    ID101   KVI
SERCOS(5,0,2,32841,4,0)'    ID32841 ARZ0
SERCOS(5,0,2,32842,4,0)'    ID32842 ARZ1
SERCOS(5,0,2,32843,4,15000)'ID32843 ARF0
SERCOS(5,0,2,32844,4,75000)'ID32844 ARF1
SERCOS(5,0,2,104,2,2056)'   ID104   KPP
SERCOS(5,0,2,32840,2,700)'  ID32840 KFF

IF SERCOS(6,0,2,127)<>1 THEN
    PRINT "Drive Failed Phase 2-3 Transition Check"
    STOP
ENDIF

'*********************************************
SERCOS_PHASE SLOT(0)=3
```

```
IF SERCOS(6,0,2,128)<>1 THEN
    PRINT "Drive Failed Phase 3-4 Transition Check"
    STOP
ENDIF


SERCOS_PHASE SLOT(0)=4
ATYPE AXIS(6)=16


PRINT "Sercos network successfully initialised"
```

Yaskawa/Omron

The Yaskawa drive is run in position control mode (position command – position feedback). Note that parameter 32 (Primary Mode of Operation) must be written in phase 3.

```
' Example STARTUP file for SERCOS:

' The drive address is 3, and the Sercos daughterboard is in slot 0.

'*******************************************
SERCOS(2,0,3,4)' Intensity=3, Baudrate=4Mhz
SERCOS(3,0,0,0) 'Initialise config

IF SERCOS(10,0)<0 THEN
    PRINT "SERCOS loop open or distorted"
    STOP
ENDIF

'*******************************************
SERCOS_PHASE SLOT(0)=1

IF SERCOS(7,0,3)<0 THEN
    PRINT "Drive not detected"
    STOP
ENDIF

SERCOS(3,0,3,6)' Set drive as axis 6

'*******************************************
SERCOS_PHASE SLOT(0)=2

SERCOS(5,0,3,1,2,1000)' ID1 NC Cycle Time
SERCOS(5,0,3,2,2,1000)' ID2 SERCOS Cycle Time
SERCOS(5,0,3,6,2,50*1)' ID6 AT Transmission Start Time
SERCOS(5,0,3,7,2,700)' ID7 feedback acquisition start time
SERCOS(5,0,3,8,2,800)' ID8 Command Valid Time
SERCOS(5,0,3,9,2,8*1-7)' ID9 Initial Address in MDT
SERCOS(5,0,3,10,2,8*1)' ID10 Length of MDT
SERCOS(5,0,3,89,2,500)' ID89 MDT Transmit Starting Time
'Telegram 4 = pos cmd, pos feedback
SERCOS(5,0,3,15,2,4)'  ID15 Telegram Type Parameter

IF SERCOS(6,0,3,127)<>1 THEN
    PRINT "Drive Failed Phase 2-3 Transition Check"
    STOP
ENDIF
```

```
'********************************************
SERCOS_PHASE SLOT(0)=3
TRON
'Mode 3 = position control
SERCOS(5,0,3,32,2,3)'  ID32 Primary Mode of Operation
IF SERCOS(6,0,3,128)<>1 THEN
    PRINT "Drive Failed Phase 3-4 Transition Check"
    STOP
ENDIF

SERCOS_PHASE SLOT(0)=4

'NB following statement no longer required – now use atype=17
'CAN_ADDRESS AXIS(6)=CAN_ADDRESS AXIS(6)+$1000

ATYPE AXIS(6)=17

PRINT "Sercos network successfully initialised"
```