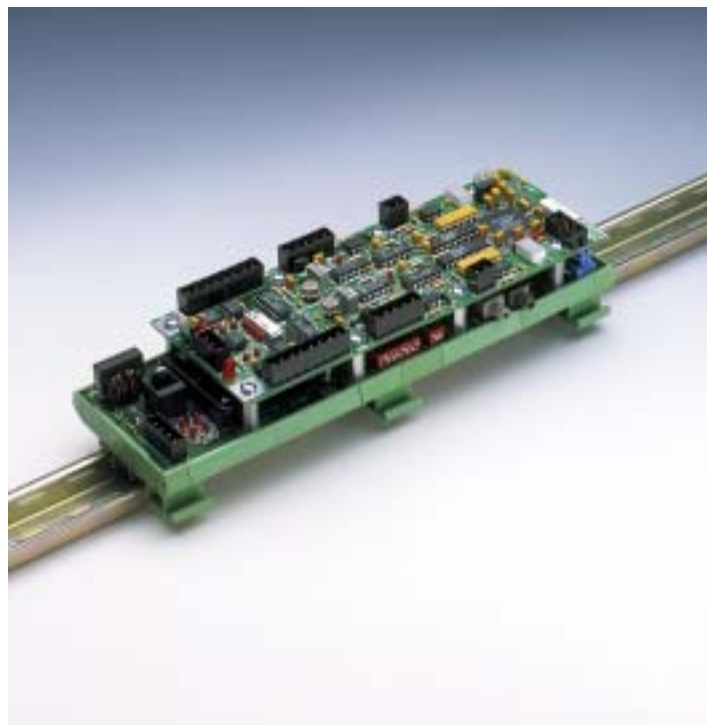


IB-11B039

MOTION CONTROL SYSTEMS

NOVEMBER 2004

# TSC-200



## INSTRUCTION BOOK

INDUSTRIAL INDEXING SYSTEMS, Inc.

REVISION - A  
Approved By:

Proprietary information of Industrial Indexing Systems, Inc. furnished for customer use only.  
No other uses are authorized without the prior written permission of  
**Industrial Indexing Systems, Inc.**

## TABLE OF CONTENTS

<b>SECTION 1 - INTRODUCTION.....</b>	<b>2</b>
<b>SECTION 2 - HARDWARE OVERVIEW.....</b>	<b>3</b>
<b>SECTION 3 - HARDWARE SPECIFICATIONS.....</b>	<b>4</b>
3.1 Functional Characteristics.....	4
3.2 Performance Characteristics .....	4
3.3 Physical Characteristics.....	5
3.4 External Power Supply Requirements .....	5
3.5 Sercos Interface .....	5
<b>SECTION 4 - WIRING CONNECTIONS .....</b>	<b>6</b>
4.1 SSE-101 Slave Engine Connection (Bottom Board) .....	6
4.2 TSI-201 Drive Interface Board (Top Board).....	7
<b>SECTION 5 - STATUS DISPLAYS.....</b>	<b>8</b>
5.1 Sercos Adapter Status Leds .....	8
5.2 Axis Status Display .....	9
<b>SECTION 6 - SERCOS COMMUNICATIONS .....</b>	<b>10</b>
6.1 HARDWARE SWITCH SETTINGS.....	10
6.1.1 Sw1 - Sercos Device Address .....	10
6.1.2 Sw2 - Sercos Baudrate.....	10
6.2 Identification Numbers .....	11
6.2.1 Idn List .....	11
6.2.2 Idn By Function.....	12
6.2.3 Idn Description - Sercos Specific.....	14
6.2.4 Idn Description - IIS Specific .....	28

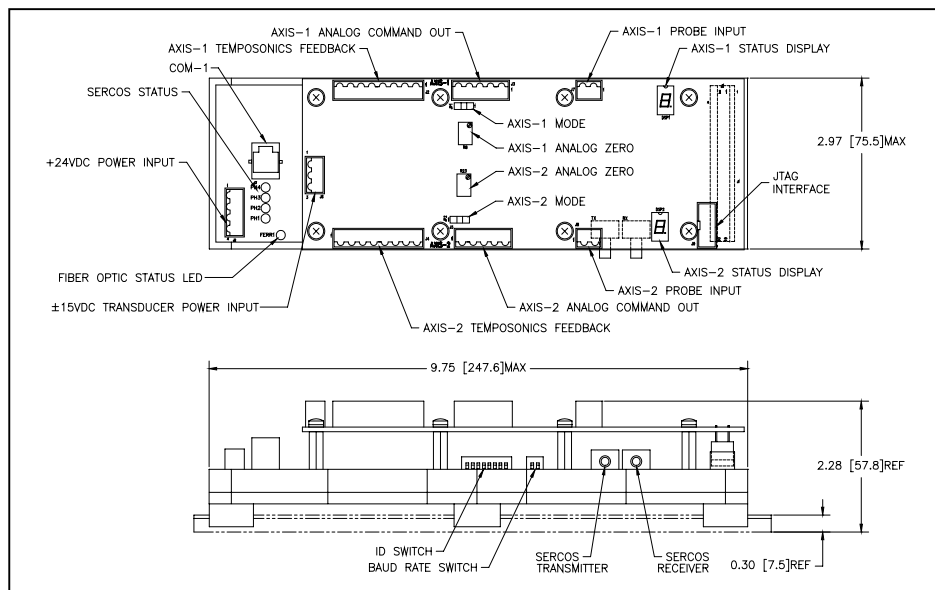
## SECTION 1 - INTRODUCTION

The TSC-200 is 2-axis slave linear servo drive controller that communicates as a slave device on the SERCOS Interface<sup>TM1</sup>. TSC-200 is made up of a TSI-201 2-axis interface option card stacked on top of the SSE-100 SERCOS Slave Engine.

The TSC-200 utilizes a velocity controlled analog output and a linear Temposonics transducer input to provide precision position loop control to linear analog servo drives applications. The controller is din rail mountable and has removable screw terminals for ease of installation and service.

This operator's manual provides setup and operational information necessary to implement up to 2 axes of servo control with the TSC-200 connected to a SERCOS Compatible Master Controller.

## SECTION 2 - HARDWARE OVERVIEW



**Figure 2.1**

**+24 VDC POWER INPUT** - Provides input power to operate the TSC-200.

**±15 VDC TRANSDUCER POWER INPUT** - Provides a single supply interface to power the 2 isolated Temposonic transducer feedback interfaces.

**SERCOS STATUS DISPLAY** - Provides current status information for the TSC-200 SERCOS interface.

**COM1** - An RS-232 Serial Port to allow field updates of the TSC-200 firmware via PC software download tools.

**TEMPOSONIC FEEDBACK** (Axis 1 or Axis 2) - Provides the Wiring interface to connect the Temposonic transducer.

**ANALOG COMMAND OUT** (Axis 1 or Axis 2) - Provides the analog output to the drive.

**PROBE INPUT** (Axis 1 or Axis 2) - Provides a digital input to trap the current position of the Temposonic transducer.

**AXIS STATUS DISPLAY** (Axis 1 or Axis 2) - Displays the current operation status of the Axis.

**MODE JUMPER** (Axis 1 or Axis 2) - Allows selection of +/- 10 volt or +/- 60mA modes for the ANALOG COMMAND OUTPUT.

**ANALOG ZERO POT** (Axis 1 or Axis 2) - Allows quick adjustment to zero the analog command output.

**ID SWITCH** - Set the SERCOS Loop Communication Device ID's for Axis 1 and Axis 2.

**BAUDRATE SWITCH** - Sets the SERCOS Loop Communication baud rate for the TSC-200.

**SERCOS TRANSMITTER** - Fiber optic transmitter that interfaces to the receiver of the next device on the SERCOS Loop.

**SERCOS RECEIVER** - Fiber optic receiver that interfaces to the transmitter of the previous device on the SERCOS Loop.

## SECTION 3 - HARDWARE SPECIFICATIONS

### 3.1 FUNCTIONAL CHARACTERISTICS

Drive Enable Control	(Optically Isolated)
Off Voltage	30V dc
On Voltage	1.5V dc, 20mA
Drive Command Output (POS OUT)	+/-10V dc @ 10mA or +/-60mA dc
Digital Compensation	PID loop with 1KHz Digital Signal Processing Sample Rate
Feedback Device	Temposonics (Control Transmitter type)

### 3.2 PERFORMANCE CHARACTERISTICS

Positional Range	+2147483647 / -2147483648 bits
Resolution	$1 \div [\text{gradient} * 28 \text{ mHz} * \# \text{ of recirculations}]$
Repeatability	Equals resolution
Environmental	
Operating Temperature	32° to 140° F (0° to 60° C)
Operating Humidity	30 to 90% (Non-condensing)
Ventilation	Unit must have 5 inches of free airflow above

#### NOTE

**Resolution and repeatability are dependent on the Temposonics transducer and the number of recirculations.**

**i.e. Gradient = 9 us/inch**

**# of recirculations = 4**

**Resolution =  $1 \div [9 \text{ us/inch} * 28 \text{ mHz} * 4] = .001 \text{ inch}$**

### 3.3 PHYSICAL CHARACTERISTICS

Dimensions	
Length	9.75 in. ( 247.65 mm )
Width	3.00 in. ( 76.20 mm )
Depth	2.50 in. ( 63.50 mm )
Weight	1 lb. (0.45 Kg.)
Mounting	Din Rail

### 3.4 EXTERNAL POWER SUPPLY REQUIREMENTS

Main Input Voltage:	24V DC $\pm$ 10%
Main Input Current:	1 Amp Maximum
Transducer Input Voltage	$\pm$ 15V DC $\pm$ 10%
Transducer Input Current	0.3 Amp Maximum

### 3.5 SERCOS INTERFACE

Supported Baud Rates	2,4,8 and 16 Megabits/Second
Loop Update Rate	1mSec to 5mSec

## SECTION 4 - WIRING CONNECTIONS

### 4.1 SSE-101 SLAVE ENGINE CONNECTION (BOTTOM BOARD)

#### +24 VDC POWER INPUT

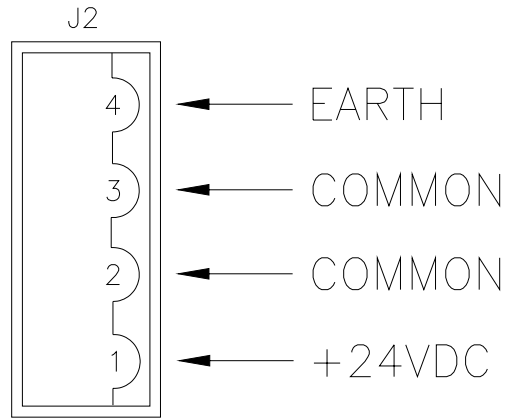


Figure 4.1

#### COM1

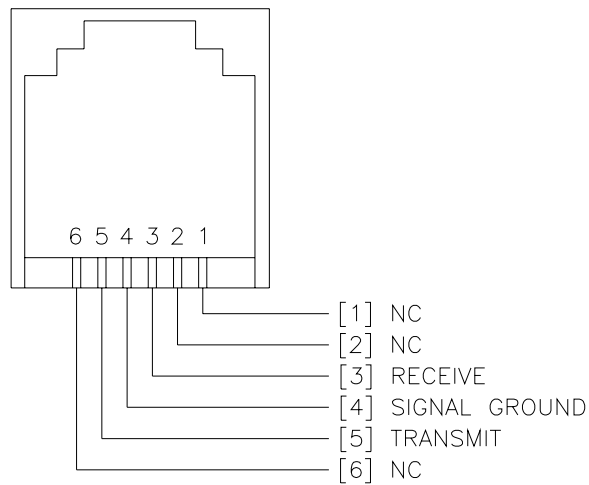


Figure 4.2

## 4.2 TSI-201 DRIVE INTERFACE BOARD (TOP BOARD)

### TEMPOSONIC FEEDBACK INTERFACE

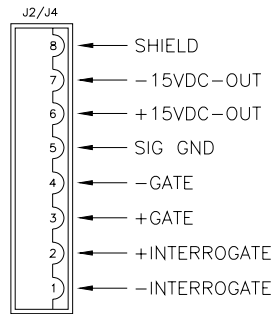


Figure 4.3

### ANALOG COMMAND OUT / MODE JUMPER

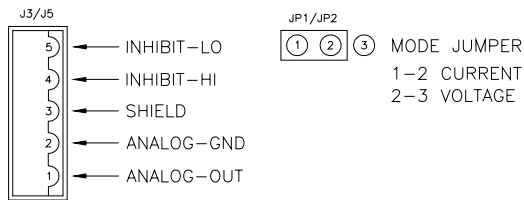


Figure 4.4

### ±15 VDC TRANSDUCER POWER INPUT

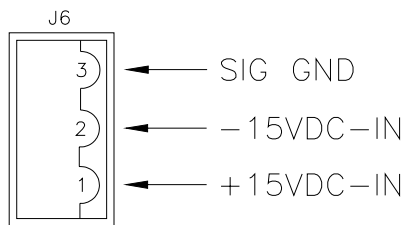


Figure 4.5

### PROBE INPUT

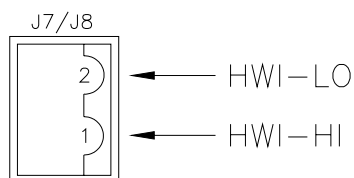


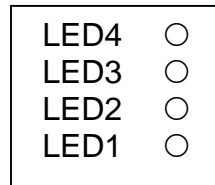
Figure 4.6



## SECTION 5 - STATUS DISPLAYS

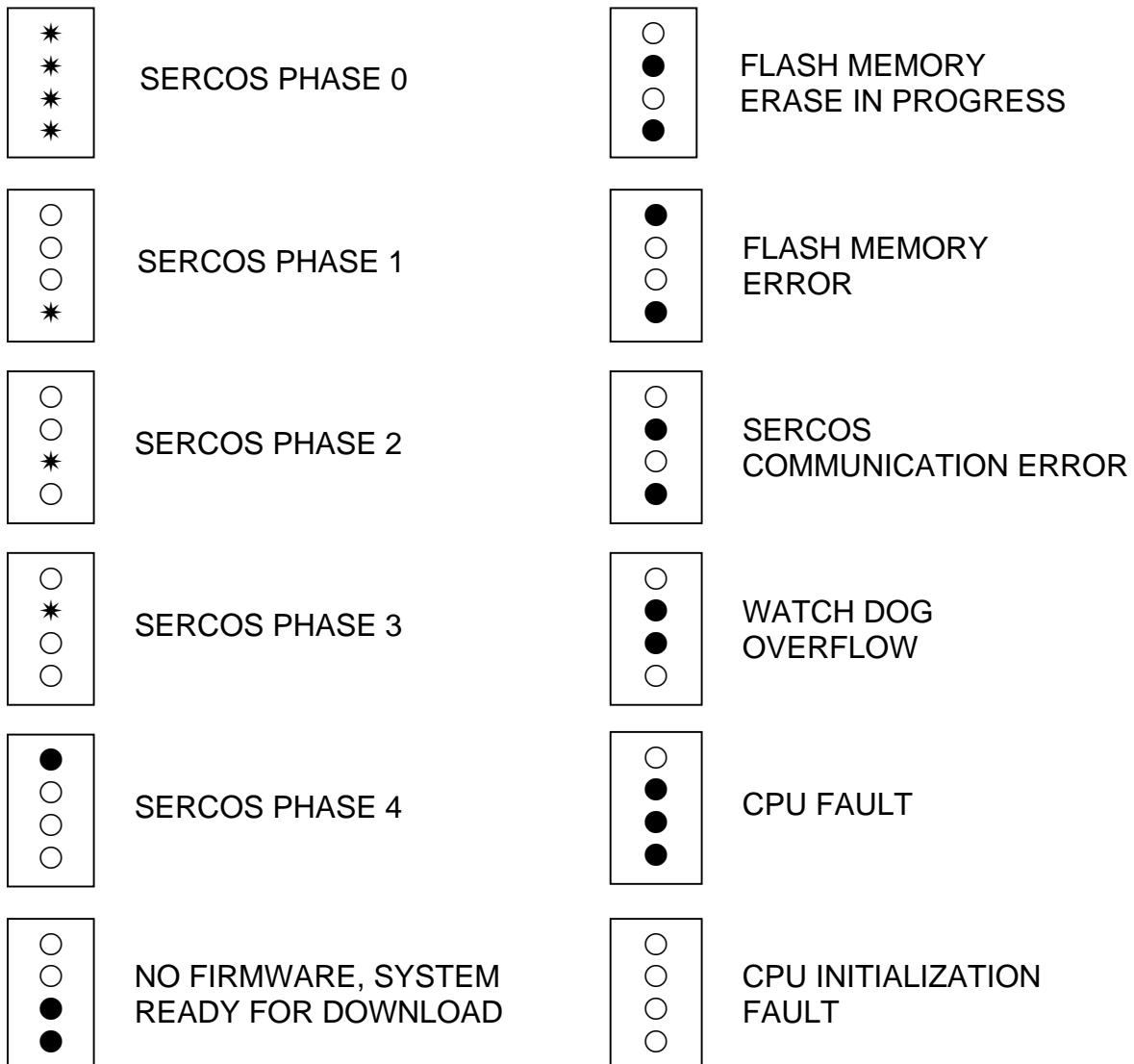
### 5.1 SERCOS ADAPTER STATUS LEDS

There are 4 LEDS on the SERCOS Adapter Card (Lower Board) that are arranged as shown:



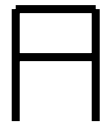



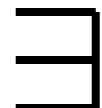
SERCOS Adapter LED Status Display where:

○ = LED OFF, \* = LED FLASHING, ● = LED ON



## 5.2 AXIS STATUS DISPLAY

They're a two 7-segment axis status displays (DSP1 and DSP2) that provide operation status of each of the axes. The Axis Status Code is:

	-	Axis Disabled
	-	Axis Enabled
	-	Feedback Error
	-	Following Error
	-	Bad Operation State

### NOTE

The number of recirculations cannot be chosen so as to prevent a valid read in 1 msec. Updates requiring greater than 1 msec will result in a feedback error.

Max Update time =  $1.2 * \# \text{ of recirculation} * \text{gradient} * [\text{stroke length} + 3]$

i.e. Gradient = 9 us/inch  
Recirculations = 4  
Stroke length = 2

Max Update time =  $1.2 * 4 * 9 [2 + 3] = 216 \text{ us}$

Since Max Update time < 1mSec then there should not be an error.

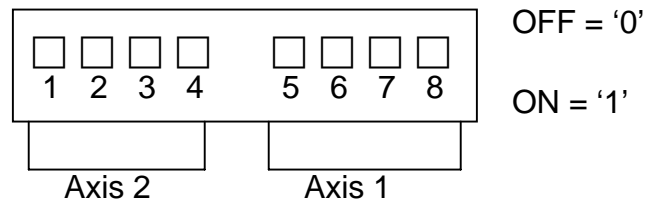
## SECTION 6 - SERCOS COMMUNICATIONS

This section gives information on the settings needed in order for a SERCOS Master to communicate to the TSC-200 over the SERCOS ring. It also details the Operation Data and Procedure Commands that can be transmitted over the SERCOS Communication ring.

### 6.1 HARDWARE SWITCH SETTINGS

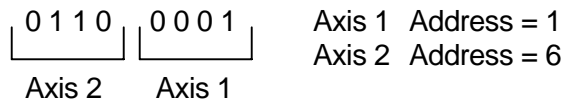
There are 2 switch banks on the SERCOS communication adapter card. There is an 8-position dipswitch bank SW1 to set the SERCOS Device Address. There is also a 2-position dipswitch bank to setup the SERCOS communication baud rate.

#### 6.1.1 SW1 - SERCOS DEVICE ADDRESS

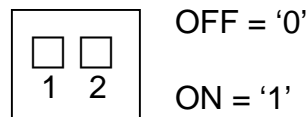


Address Range 1 - 15

Example:



#### 6.1.2 SW2 - SERCOS BAUDRATE



- 00 = 2 Megabits/Second
- 10 = 4 Megabits/Second
- 01 = 8 Megabits/Second
- 11 = 16 Megabits/Second

## 6.2 IDENTIFICATION NUMBERS

The TSC-200 has an extensive list of SERCOS Identification Numbers (IDN) to access the Operation Data and Procedure Commands that can be transmitted over the SERCOS Communication ring.

### 6.2.1 IDN LIST

<b>IDN</b>	<b>NAME</b>
<b>(SERCOS SPECIFIC)</b>	
00001	Control Unit Cycle Time ( $t_{Ncyc}$ )
00002	Communication Cycle Time ( $t_{Scyc}$ )
00003	Shortest AT Transmission Starting Time ( $t_{1min}$ )
00004	Transmit/Receive Transition Time ( $t_{ATMT}$ )
00005	Minimum Feedback Processing Time ( $t_5$ )
00006	AT Transmission Starting Time ( $t_1$ )
00007	Feedback Acquisition Capture Point ( $t_4$ )
00008	Command Value Valid Time ( $t_3$ )
00009	Position of Data Record in MDT
00010	Length of MDT
00011	Class 1 diagnostic (C1D)
00014	Interface Status
00015	Telegram Type Parameter
00016	Configuration List of AT
00017	IDN - List of all Operation Data
00018	IDN - List of Operation Data for Phase 2
00019	IDN - List of Operation Data for Phase 3
00021	IDN - List of Invalid Operation Data for Phase 2
00022	IDN - List of Invalid Operation Data for Phase 3
00024	Configuration List of MDT
00025	IDN - List of all Procedure Commands
00028	MST Error Counter
00029	MDT Error Counter
00030	Manufacturer Version
00032	Primary Operation Mode
00033	Secondary Operation Mode 1
00034	Secondary Operation Mode 2
00035	Secondary Operation Mode 3
00036	Velocity Command
00040	Velocity Feedback
00047	Position Command Value
00051	Position Feedback Value 1(Motor Feedback)
00087	Transmit to Transmit Recovery Time
00088	Receive to Receive Recovery Time ( $t_{MTSY}$ )
00089	MDT Transmission Starting Time ( $t_2$ )
00090	Command Value Proceeding Time ( $t_{MTSG}$ )
00095	Diagnostic Message
00096	Slave Arrangement (SLKN)
00099	Reset Class 1 Diagnostics
00127	Phase 3 Transition Check
00128	Phase 4 Transition Check
00129	Product Specific Class 1 Diagnostics
00134	Master Control Word
00135	Drive Status Word
00138	Bipolar Acceleration Limit
00140	Controller Type
00142	Application Type

### 6.2.1 IDN LIST (cont'd)

#### **IDN NAME (SERCOS SPECIFIC)**

---

00143	SERCOS Interface Version
00159	Monitoring Window
00185	Length of the configurable Data Record in the AT
00186	Length of the configurable Data Record in the MDT
00187	IDN - List of configurable Data Record in the AT
00188	IDN - List of configurable Data Record in the MDT

#### **(IIS SPECIFIC)**

---

33768	Position Loop Proportional Gain
33769	Position Loop Integral Gain
33770	Position Loop Derivative Gain
33771	Velocity Feed Forward

### 6.2.2 IDN BY FUNCTION

#### **IDN NAME**

##### **Position Control**

---

00032	Primary Operation Mode
00047	Position Command Value
00051	Position Feedback Value 1(Motor Feedback)
00159	Monitoring Window

##### **Velocity Control**

---

00036	Velocity Command
00040	Velocity Feedback

##### **SERCOS Communications**

---

00001	Control Unit Cycle Time ( $t_{Ncyc}$ )
00002	Communication Cycle Time ( $t_{Scyc}$ )
00003	Shortest AT Transmission Starting Time ( $t_{1min}$ )
00004	Transmit/Receive Transition Time ( $t_{ATMT}$ )
00005	Minimum Feedback Processing Time ( $t_5$ )
00006	AT Transmission Starting Time ( $t_1$ )
00007	Feedback Acquisition Capture Point ( $t_4$ )
00008	Command Value Valid Time ( $t_3$ )
00009	Position of Data Record in MDT
00010	Length of MDT
00014	Interface Status
00015	Telegram Type Parameter
00016	Configuration List of AT
00017	IDN - List of all Operation Data
00018	IDN - List of Operation Data for Phase 2
00019	IDN - List of Operation Data for Phase 3
00021	IDN - List of Invalid Operation Data for Phase 2
00022	IDN - List of Invalid Operation Data for Phase 3
00024	Configuration List of MDT
00025	IDN - List of all Procedure Commands
00088	Receive to Receive Recovery Time ( $t_{MTSY}$ )

## 6.2.2 IDN BY FUNCTION (cont'd)

### **IDN      NAME**

#### **SERCOS Communications**

00089	MDT Transmission Starting Time ( $t_2$ )
00090	Command Value Proceeding Time ( $t_{MTSG}$ )
00096	Slave Arrangement (SLKN)
00127	Phase 3 Transition Check
00128	Phase 4 Transition Check
00134	Master Control Word
00135	Drive Status Word
00185	Length of the configurable Data Record in the AT
00186	Length of the configurable Data Record in the MDT
00187	IDN - List of configurable Data Record in the AT
00188	IDN - List of configurable Data Record in the MDT

#### **Diagnostics**

00011	Class 1 diagnostic (C1D)
00028	MST Error Counter
00029	MDT Error Counter
00095	Diagnostic Message
00099	Reset Class 1 Diagnostics
00129	Product Specific Class 1 Diagnostics

#### **Drive Tuning**

33768	Position Loop Proportional Gain
33769	Position Loop Integral Gain
33770	Position Loop Derivative Gain
33771	Velocity Feed Forward

#### **Information**

00030	Manufacturer Version
00140	Controller Type
00142	Application Type
00143	SERCOS Interface Version

### 6.2.3 IDN DESCRIPTION - SERCOS SPECIFIC

#### 00001: CONTROL UNIT CYCLE TIME, ( $t_{Ncyc}$ )

The control unit cycle time defines the cyclic interval during which the control unit makes new command values available. The control unit cycle time ( $t_{Ncyc}$ ) must be set equal to the communication cycle time ( $t_{Scyc}$ ). This value is calculated and loaded into the drive by the Master Control Unit in Phase 2. This value becomes active in phase 3.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Unsigned Decimal	2 bytes	1000-5000	1 uSec	Phases 2, 3 and 4	Phase 2

#### 00002: COMMUNICATION CYCLE TIME, ( $t_{Scyc}$ )

The communication cycle time of the interface defines the intervals during which the cyclic data are transferred. The communication cycle can be set from 1000uSec to 5000 uSec in steps of 1000 uSec. This value is calculated and loaded into the drive by the Master Control Unit in Phase 2. This value becomes active in phase 3.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Unsigned Decimal	2 bytes	500-5000	1 uSec	Phases 2, 3 and 4	Phase 2

#### 00003: SHORTEST AT TRANSMISSION STARTING TIME, ( $t_{1min}$ )

Indicates the time requirement of the drive between the end of the reception of the MST and the start of the transmission of the AT. Read by the Master Controller in Phase 2,  $t_{1min}$  is used to calculate the AT Transmission Starting Time,  $t_1$  (IDN 00006).

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Unsigned Decimal	2 bytes	15	1 uSec	Phases 2, 3 and 4	None

#### 00004: TRANSMIT/RECEIVE TRANSITION TIME, ( $t_{ATMT}$ )

Time required by the drive to switch from transmitting the AT to receiving the MDT. Read by the Master Controller in Phase 2 and is used to determine the MDT starting time,  $t_2$  (IDN 00089).

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Unsigned Decimal	2 bytes	0	1 uSec	Phases 2, 3 and 4	None

### 6.2.3 IDN DESCRIPTION - SERCOS SPECIFIC (cont'd)

#### 00005: MINIMUM FEEDBACK PROCESSING TIME, (t<sub>5</sub>)

Time required by the drive between the start of feedback acquisition and the arrival of the next MST. This value is loaded by the Master Controller in Phase 2 and becomes active in Phase 3.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Unsigned Decimal	2 bytes	150	1 uSec	Phases 2, 3 and 4	None

#### 00006: AT TRANSMISSION STARTING TIME, (t<sub>1</sub>)

The time the drive sends the AT after the end of the MST. This value is loaded by the Master Controller in Phase 2 and becomes active in Phase 3. ( $t_1 \geq t_{1min}$ )

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Unsigned Decimal	2 bytes	15-5000	1 uSec	Phases 2, 3 and 4	Phase 2

#### 00007: FEEDBACK ACQUISITION CAPTURE POINT, (t<sub>4</sub>)

The time the drive captures the AT Data. This value is loaded by the Master Controller in Phase 2 and becomes active in Phase 3.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Unsigned Decimal	2 bytes	0 - (tScyc - t <sub>5</sub> )	1 uSec	Phases 2, 3 and 4	Phase 2

#### 00008: COMMAND VALUE VALID TIME, (t<sub>3</sub>)

The time the drive can start using the data sent in the MDT. Set by the Master Controller in Phase 2.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Unsigned Decimal	2 bytes	0-5000	1 uSec	Phases 2, 3 and 4	Phase 2

#### 00009: POSITION OF DATA RECORD IN MDT

The position within the MDT that the drives command data can be obtained. Set by the Master Controller in Phase 2.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Unsigned Decimal	2 bytes	0-65535	1 byte	Phases 2, 3 and 4	Phase 2



### 6.2.3 IDN DESCRIPTION - SERCOS SPECIFIC (cont'd)

#### 00010: LENGTH OF MDT

The length of the MDT, expressed in bytes, includes data records for all drives. Set by the Master Controller in Phase 2.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Unsigned Decimal	2 bytes	4-65534	1 byte	Phases 2, 3 and 4	Phase 2

#### 00011: CLASS 1 DIAGNOSTICS (C1D)

Indicates a Drive Shutdown Error.

A Drive error situation leads to the following.

- a) Drive safely decelerates to and releases torque when stopped.
- b) The shutdown error Bit (Bit 13) is set to 1 in the drive status. IDN 99 must be issued and no Class 1 diagnostic errors exist to clear the error bit.

Bit supported by drive:

BIT NUMBER	DESCRIPTION
Bit 0:	Reserved
Bit 1:	Reserved
Bit 2:	Reserved
Bit 3:	Reserved
Bit 4:	Reserved
Bit 5:	Feedback Fault
Bit 6:	Reserved
Bit 7:	Reserved
Bit 8:	Reserved
Bit 9:	Reserved
Bit 10:	Reserved
Bit 11:	Excessive Position Deviation
Bit 12:	Communication Error
Bit 13:	Reserved
Bit 14:	Reserved
Bit 15:	Manufacturer Specific Fault

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Binary	2 bytes	0-65535	1 byte	Phases 2, 3 and 4	None

### 6.2.3 IDN DESCRIPTION - SERCOS SPECIFIC (cont'd)

#### 00014: INTERFACE STATUS

Status of the SERCOS Interface. When an interface error occurs, the error and the phase the error occurred is recorded. Can only be cleared by the Reset Class 1 Diagnostics (IDN 00099).

Bit supported by drive:

BIT NUMBER	DESCRIPTION
Bit 2 - 0:	Phase Error Occurred
Bit 3:	MST Failure
Bit 4:	MDT Failure
Bit 5:	Invalid Phase (Phase > 4)
Bit 6:	Error During Phase Upshift (Invalid Sequence)
Bit 7:	Error During Phase Downshift (Not To Phase 0)
Bit 8:	Phase Switching without Ready Acknowledge
Bit 9:	Switching to Uninitialized Operating Mode
Bit 9 - 15:	Reserved

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Binary	2 bytes	0-65535	1 byte	Phases 2, 3 and 4	None

#### 00015: TELEGRAM TYPE PARAMETER

Selects the Telegram Configuration Type of the AT and the MDT cyclic data. Set by the Master Controller in Phase 2.

TYPE	CONFIGURATION
0	No AT or MDT IDNs
1	IDN 80 (Torque Command) in the MDT
2	IDN 36 (Velocity Command) in the MDT and IDN 40 (Velocity Feedback) in the AT
3	IDN 36 (Velocity Command) in the MDT and IDN 51 (Position Feedback) in the AT
4	IDN 47 (Position Command) in the MDT and IDN 51 (Position Feedback) in the AT
5	IDN 47 (Position Command), IDN 36 (Velocity Command) in the MDT and IDN 51 (Position Feedback), IDN 40 (Velocity Feedback) in the AT
6	IDN 36 (Velocity Command) in the MDT
7	User Defined At and MDT (See IDNs 16 and 24)

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Binary	2 bytes	0-7		Phases 2, 3 and 4	Phase 2

### 6.2.3 IDN DESCRIPTION - SERCOS SPECIFIC (cont'd)

#### 00016: CONFIGURATION LIST OF AT

List of IDNs that are to be included in the User Defined AT Cyclic Data. Set by the Master Controller in Phase 2. Only Valid if Telegram Type 7 is selected for IDN 00015. (Refer to IDN 00185 and IDN 00187.)

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	IDN	Variable			Phases 2, 3 and 4	Phase 2

#### 00017: IDN – LIST OF ALL OPERATION DATA

Returns the list of all valid operation Data IDNs

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	IDN	Variable			Phases 2, 3 and 4	None

#### 00018: IDN – LIST OF OPERATION DATA FOR PHASE 2

Returns the list of all IDNs that must be written by the Master in Phase 2.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	IDN	Variable			Phases 2, 3 and 4	None

#### 00019: IDN – LIST OF OPERATION DATA FOR PHASE 3

Returns the list of all IDNs that must be written by the Master in Phase 3.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	IDN	Variable			Phases 2, 3 and 4	None

#### 00021: IDN – LIST OF INVALID OPERATION DATA FOR PHASE 2

Returns the list of all operation Data IDNs for Phase 2 that is considered invalid by the drive and will need to be written before switchover to phase 3 can be made.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	IDN	Variable			Phases 2, 3 and 4	None

### 6.2.3 IDN DESCRIPTION - SERCOS SPECIFIC (cont'd)

#### 00022: IDN – LIST OF INVALID OPERATION DATA FOR PHASE 3

Returns the list of all operation Data IDNs for Phase 3 that is considered invalid by the drive and will need to be written before switchover to phase 4 can be made.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	IDN	Variable			Phases 2, 3 and 4	None

#### 00024: CONFIGURATION LIST OF MDT

List of IDNs that are to be included in the User Defined MDT Cyclic Data. Set by the Master Controller in Phase 2. Only Valid if Telegram Type 7 is selected for IDN 00015. (Refer to IDN 00186 and IDN 00188.)

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	IDN	Variable			Phases 2, 3 and 4	Phase 2

#### 00025: IDN – LIST OF ALL PROCEDURE COMMANDS

Returns the list of all valid Procedure Command IDNs on drive.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	IDN	Variable			Phases 2, 3 and 4	None

#### 00028: MST ERROR COUNTER

The MST error counter counts all invalid MST's in Communication Phase 3 and 4. In the case where more than 2 consecutive MST's are invalid, only the first two are counted. The MST error counter counts up to a maximum of  $2^{16} - 1$ . This means that if a value of 65535 is set in the counter, there may have been a noisy transmission over a long period of time.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Unsigned Decimal	2 bytes	0-65535		Phases 2, 3 and 4	Phases 2, 3 and 4

### 6.2.3 IDN DESCRIPTION - SERCOS SPECIFIC (cont'd)

#### 00029: MDT ERROR COUNTER

The MDT error counter counts all invalid MDT's in Communication Phase 3 and 4. In the case where more than 2 consecutive MDT's are invalid, only the first two are counted. The MDT error counter counts up to a maximum of  $2^{16} - 1$ . This means that if a value of 65535 is set in the counter, there may have been a noisy transmission over a long period of time.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Unsigned Decimal	2 bytes	0-65535		Phases 2, 3 and 4	Phases 2, 3 and 4

#### 00030: MANUFACTURER VERSION

Identifies the current software version number in the drive.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Text	Variable			Phases 2, 3 and 4	None

#### 00032: PRIMARY OPERATION MODE

#### 00033: SECONDARY OPERATION MODE 1

#### 00034: SECONDARY OPERATION MODE 2

#### 00035: SECONDARY OPERATION MODE 3

The drive operation mode defined by this ID Number becomes active when the appropriate Operation mode is set in the Control word of the MDT. Must be configured in phase 2.

VALUES	VALID MODES
0	No Command Mode
2	Velocity Control using Cyclic command values
3	Position Control using Cyclic command values

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Binary	2 bytes	0-65535		Phases 2, 3 and 4	Phases 2

#### 00036: VELOCITY COMMAND VALUE

In the velocity control operating mode in the drive, the control unit transfers the velocity command values to the drive. The velocity is commanded as a percent of maximum velocity.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Signed Decimal	4 bytes	-8192 - +8191	1 bit	Phases 2, 3 and 4	Phase 4

### 6.2.3 IDN DESCRIPTION - SERCOS SPECIFIC (cont'd)

#### 00040: VELOCITY FEEDBACK VALUE

The velocity feedback value is transferred from the drive to the control unit in order to allow the control unit to periodically display the velocity.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Signed Decimal	4 bytes	-8192 - +8191	1 bit	Phases 2, 3 and 4	None

#### 00047: POSITION COMMAND VALUE

During the position control drive operation mode, the position command values are transferred from the control unit to the drive according to the time pattern of the control unit cycle.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Signed Decimal	4 bytes	$-2^{31} - +2^{31} - 1$	1 bit	Phases 2, 3 and 4	Phase 4

#### 00051: POSITION FEEDBACK VALUE 1 (MOTOR FEEDBACK)

The position feedback value 1 is transferred from the drive to the control unit.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Signed Decimal	4 bytes	$-2^{31} - +2^{31} - 1$	1 bit	Phases 2, 3 and 4	None

#### 00087: TRANSMIT TO TRANSMIT RECOVERY TIME ( $t_{atat}$ )

The time required between two ATs when sent by the same slave. The transmit to transmit recovery time is read by the master during CP2 in order to correctly calculate the AT transmission starting time  $t_1$  (IDN 00006).

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Unsigned Decimal	2 bytes	0	1 $\mu$ s	Phases 2, 3 and 4	None

#### 00088: RECEIVE TO RECEIVE RECOVERY TIME ( $t_{mtsy}$ )

Recovery time of the slave after reception of a MDT to switch over to receive the next MST. The master reads this time during CP2 to ensure that the interval will be sufficient between the end of the MDT and the beginning of the MST.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Unsigned Decimal	2 bytes	0	1 $\mu$ s	Phases 2, 3 and 4	None

### 6.2.3 IDN DESCRIPTION - SERCOS SPECIFIC (cont'd)

#### 00089: MDT TRANSMISSION STARTING TIME ( $t_2$ )

The MDT transmission starting time determines when the master shall send its MDT during CP<sub>3</sub> and CP<sub>4</sub>, following the MST. This parameter is transferred by the master to the slave during CP<sub>2</sub> and becomes active during CP<sub>3</sub>.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Unsigned Decimal Number	2 bytes	1 - 5000	1 $\mu$ s	Phases 2, 3 and 4	Phase 2

#### 00090: COMMAND VALUE PROCEEDING TIME ( $t_{mtsg}$ )

The time required by the slave to make command values available for a drive after receipt of a MDT. This time is read by the master during CP<sub>2</sub> in order to calculate correctly the command value valid time  $t_3$  (IDN 00008).

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Unsigned Decimal	2 bytes	1	1 $\mu$ s	Phases 2, 3 and 4	None

#### 00095: DIAGNOSTIC MESSAGE

Not currently supported at this time.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Text	Variable			Phases 2, 3 and 4	None

### 6.2.3 IDN DESCRIPTION - SERCOS SPECIFIC (cont'd)

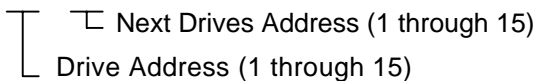
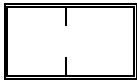
#### 00096: SLAVE ARRANGEMENT (SLKN)

During initialization, the master needs to recognize which physical slaves and their associated drives are present in order to optimize the automatic timeslot computation. The master can request this information from the drives during CP<sub>2</sub>. By this entry the master recognizes other drives which belong to the same physical slave. Valid drive addresses are all decimal values from 1 to 254, in accordance with hexadecimal values (01)<sub>H</sub> through (FE)<sub>H</sub>.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Unsigned Decimal	2 bytes		1 μs	Phases 2, 3 and 4	Phases 2, 3 and 4

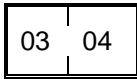
SLKN:

The TSC-200 is configured with 2 drives per slave the format for the SKLN is

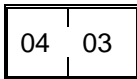


Example 1:

If Axis 1 has an address of "03" and Axis 2 has an address of "04" then the SKLN for Axis 1 would be:

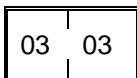


The SKLN for axis 2 would be:



Example 2:

If Axis 1 has an address of "03" and Axis 2 has an address of "00" then Adapter only has axis 1 active on the SERCOS ring. The SKLN for Axis 1 would be:



**There is no SKLN for axis 2 because it is inactive.**



### 6.2.3 IDN DESCRIPTION - SERCOS SPECIFIC (cont'd)

#### 00099: RESET CLASS 1 DIAGNOSTIC

When this procedure command is received by the drive via the service channel and no error exists, C1D, the interface status, the manufacturer's C1D, the drive shutdown error (drive status bit 13), and the drive shutdown mechanism in the drive are all reset (see IDN 00011, IDN 00014, and IDN 00129).

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Procedure Command	Binary	2 bytes			Phases 2, 3 and 4	Phases 2, 3 and 4

#### 00127: CP<sub>3</sub> TRANSITION CHECK

The master uses this procedure command to instruct the slave to check that all necessary parameters have been transferred for CP<sub>3</sub>. Otherwise, this procedure command results in an error (see IDN 00021). After the procedure command is performed correctly, the control unit has to cancel the procedure command. The control unit can then activate CP<sub>3</sub> in the MST.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Procedure Command	Binary	2 bytes			Phases 2, 3 and 4	Phases 2

#### 00128: CP<sub>4</sub> TRANSITION CHECK

The master uses this procedure command to instruct the slave to check that all necessary parameters have been transferred for CP<sub>4</sub>. Otherwise, this procedure command results in an error. (See IDN 00022). After the procedure command is performed correctly, the control unit has to cancel the procedure command. The control unit can then activate CP<sub>4</sub> in the MST.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Procedure Command	Binary	2 bytes			Phases 2, 3 and 4	Phases 3

### 6.2.3 IDN DESCRIPTION – SERCOS SPECIFIC (cont'd)

#### 00129: MANUFACTURER CLASS 1 DIAGNOSTIC

If an error is set in the manufacturer class 1 diagnostic, the manufacturer-specific error bit in class 1 diagnostic (see IDN 00011) is set as well. The drive cancels the manufacturer-specific error and resets to '0' only if the error in manufacturer class 1 diagnostic has been eliminated and on receiving the command 'reset class 1 diagnostic' (see IDN 00099) via the service channel. (Currently No bits are supported)

Bits supported by drive: (Currently No bits are supported)

BIT NUMBER	DESCRIPTION
Bit 0:	Bad Operation State
Bit 15:	Reserved

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Binary	2 bytes			Phases 2, 3 and 4	None

#### 00134: MASTER CONTROL WORD

Allows reading of the master control word on the control unit screen, via the service channel. (This can be useful during start-up and error recovery.)

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Binary	2 bytes			Phases 2, 3 and 4	None

#### 00135: DRIVE STATUS WORD

Allows reading of the drive status word on the control unit screen, via the service channel. (This can be useful during start-up and error recovery.)

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Binary	2 bytes			Phases 2, 3 and 4	None

#### 00138: BIPOLAR ACCELERATION LIMIT

The bipolar acceleration parameter limits the maximum acceleration ability of the drive symmetrically to the programmed value in both directions. This value only effects velocity mode operation.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Signed Decimal	4	1-8191	1 bit/msec	Phases 2, 3 and 4	Phases 2, 3 and 4

### 6.2.3 IDN DESCRIPTION – SERCOS SPECIFIC (cont'd)

#### 00140: CONTROLLER TYPE

The operation data of the controller type contains the name of the company and the manufacturer controller type.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Text	Variable	DELTA-S		Phases 2, 3 and 4	None

#### 00142: APPLICATION TYPE

The operation data of the application type contains the type of the drive application (e.g., main spindle drive, round axis).

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Text	Variable			Phases 2, 3 and 4	Phases 2, 3 and 4

#### 00143: SYSTEM INTERFACE VERSION

The operation data of SYSTEM interface version contains the version of the SYSTEM Interface specification.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Text	Variable			Phases 2, 3 and 4	None

#### 00159: MONITORING WINDOW

By means of the monitoring window, the maximum position deviation, as referenced to the active actual position value, can be defined for the position feedback value. When the position error value exceeds the maximum position window value, the drive sets an error for excessive position deviation in C1D (IDN 00011).

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Signed Decimal	4 bytes	0-+2 <sup>31</sup> - 1		Phases 2, 3 and 4	Phases 2, 3 and 4

### 6.2.3 IDN DESCRIPTION - SERCOS SPECIFIC (cont'd)

#### 00185: LENGTH OF THE CONFIGURABLE DATA RECORD IN THE AT

This parameter indicates the maximum length, in bytes, which can be processed in the configurable data record of the AT.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Unsigned Decimal	2 bytes		1 Byte	Phases 2, 3 and 4	None

#### 00186: LENGTH OF THE CONFIGURABLE DATA RECORD IN THE MDT

This parameter indicates the maximum length, in bytes, which can be processed in the configurable data record of the MDT.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Unsigned Decimal	2 bytes		1 Byte	Phases 2, 3 and 4	None

#### 00187: IDN-LIST OF CONFIGURABLE DATA IN THE AT

In this list the IDNs of operation data that can be processed by the drive cyclically as feedback values.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	IDN	Variable			Phases 2, 3 and 4	Phases 2, 3 and 4

#### 00188: IDN-LIST OF CONFIGURABLE DATA IN THE MDT

In this list the IDNs of operation data that can be processed by the drive cyclically as command values.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	IDN	Variable			Phases 2, 3 and 4	Phases 2, 3 and 4

## 6.2.4 IDN DESCRIPTION - IIS SPECIFIC

### 33768: POSITION LOOP PROPORTIONAL GAIN

This parameter is used to set the position loop proportion gain for the servo axis.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Unsigned Decimal	2 bytes	1-128	None	Phases 2, 3 and 4	Phases 2, 3 and 4

### 33769: POSITION LOOP INTEGRAL GAIN

This parameter is used to set the position loop integral gain for the servo axis.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Unsigned Decimal	2 bytes	0-10	None	Phases 2, 3 and 4	Phases 2, 3 and 4

### 33770: POSITION LOOP DERIVATIVE GAIN

This parameter is used to set the position loop derivative gain for the servo axis.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Unsigned Decimal	2 bytes	0-10	None	Phases 2, 3 and 4	Phases 2, 3 and 4

### 33771: VELOCITY FEED FORWARD

This parameter is used to set the velocity feed forward for the servo axis.

IDN TYPE	DATA TYPE	DATA LENGTH	SETTING RANGE	SCALING/ RESOLUTION	READ ACCESS	WRITE ACCESS
Operation Data	Unsigned Decimal	4 bytes	0 –10	None	Phases 2, 3 and 4	Phases 2, 3 and 4

IB-11B039



**INDUSTRIAL  
INDEXING SYSTEMS  
INC.**

**626 FISHERS RUN  
VICTOR, NEW YORK 14564**

**(585) 924-9181  
FAX: (585) 924-2169**

PRINTED IN USA  
© 2003