Honeywell

Honeywell Binary Serial Communications User Manual

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TotalPlant

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About This Document

Abstract

This document provides generic information for Honeywell instruments implementing the Honeywell Binary Serial Communications protocol. These instruments include Speedomax 25000 Recorder, Micromax LPU (Local Processing Unit), CTX/UDC5300, RSX, VPR, and VRX.

Contacts

The following list identifies important contacts within Honeywell.

Organization	Address
Technical Support	1-800-423-9883
Please have your instrument's complete model number, serial number, and software version available.	
List of frequently asked questions and answers	1-888-423-9883 (Honeywell's TACFACS: USA and Canada only) http://support.totalplant.honeywell.com (Honeywell's web site)

Contents

1. Introduction

This manual covers use of the serial digital communications interface to the following Honeywell instruments: Speedomax 25000 Recorder, Micromax LPU (Local Processing Unit), CTX/UDC5300, RSX, VPR and VRX. The term “Unit” is used throughout this document as a general reference to these instruments.

The serial digital communications interface is bi-directional: data can be read from as well as written to each unit. All electrical design complies with EIA Standard RS-422A and EIA Standard RS-485. A jumper-selectable RS232C interface is also available on the 25000 Recorder only. Protocol is modeled after ANSI X3.28 “Procedures for the Use of the Communication Control Characters of American National Standard Code for Information Interchange in Specified Data Links”.

2. Overview

This serial digital communication interface is designed for a single Host computer with multiple Units. It is a dedicated “Master-to-Slave” type, where the Unit is the “Slave” responding to the “Master”, or Host computer, request. No direct Unit-to-Unit path can be established; each Unit listens only to the Host computer.

MODES OF RESPONSE

The protocol provides a choice of two primary modes of response when data is requested from a Unit:

1. The Host computer can elect to wait for data to be sent back from the Unit immediately (i.e., within the expected response turn-around time).
2. The Host computer can elect to make a request for data from a Unit and then later repoll the unit for the data.

A variation of the second response mode is when the Host computer requests data from all Units, and then later repolls for the data. This mode of response is referred to as “Broadcast”.

SINGLE ACCESS REQUESTS

The most common Host computer request to a Unit is composed of a single access: read, write, or repoll.

MULTIPLE ACCESS REQUESTS

This enhancement of the protocol allows for a single transaction to be composed of multiple access requests (reads and/or writes). The following restrictions apply:

1. Receive Length - The received application message must not exceed 2000 bytes.
2. Transmit Length - The transmitted application message must not exceed 2000 bytes. If a Read request detects buffer overflow, an error indication is returned.
3. The Repoll Host computer request remains a single transaction.
4. A Simple Poll Request can be issued starting with any mode byte of a multiple access request.

FIXED DATA PACKETS

The protocol provides for the read and write of specified “Packets” of data in order to minimize link transaction time.

DYNAMICALLY ALLOCATED DATA PACKETS

The addition of this feature to the Micromax and Speedomax 25000 lines allows the Host computer to dynamically describe the packets or blocks of data being requested. This approach reduces the number of required fixed data packets.

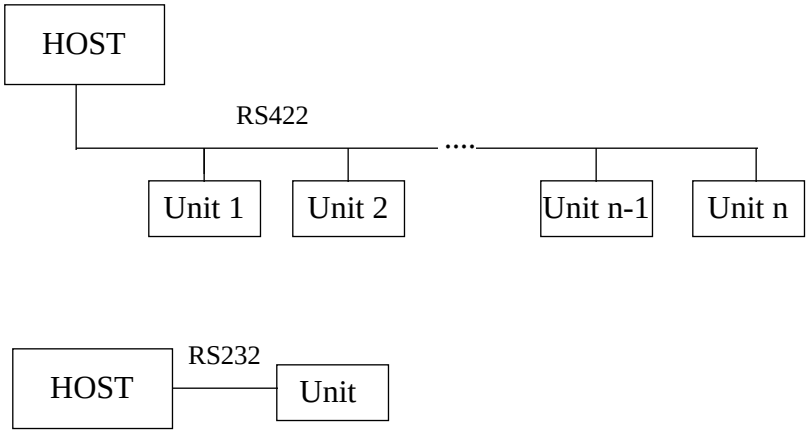
3. Network Configuration

If the RS-485 multi-drop type of configuration is used, the maximum number of physical connections (drops) on a single link is dependent on the type of Unit, as indicated in the following table:

UNIT CLASS	CONNECTIONS
Speedomax 25000	60
Micromax 1	30
Micromax 2	60
CTX/UDC5300/RSX/ VPR/VRX	31

The maximum number of links which can be used depends on the ports available in the Host computer. With multiple links, it is possible to have up to 254 Units assigned, each identified by a unique address. No data interchange is possible between Units, except that which is routed through the Host computer. Transmission is over a four wire connection, using half-duplex operation in most cases.

A three wire RS232 is also provided for the Speedomax 25000 recorder, but the link is then restricted to one Host and one recorder.



3.1 Communication Levels

The serial digital communications interface supports two layers or levels of hardware/software: Physical and Data Link. This is consistent with the ISO/OSI Communications Layered Model. The Physical level is supported by the RS-422A/RS-485 or RS232C interface. The Data Link level uses guidelines provided in ANSI X3.28, and is responsible for maintaining an interchange between the Host computer and a unit.

The Network level, which determines the path, and the higher levels of the communications model up to the Application level are the responsibility of the software programmer.

3.2 Physical Configuration

3.2.1 Terminations and Interconnections for RS-422/RS-485

The location at which the cables from the Host computer's RS-422/RS-422 port terminate at a Unit is found in the table below. Each screw terminal on the board accepts two #22 gage conductors. The recommended cable type is two twisted pairs, each pair of which is shielded (typical Belden No. 8723 or 8728). The maximum recommended cable length is listed in the last column of the table.

A terminating resistor is provided on the receive port of every unit. It must be used only in the last unit on the communication link. It is selected by positioning the unit's associated jumper(s) as indicated in the table.

For Host computers with RS-232-C ports, use shielded 3 conductor, 22 AWG cable. The maximum recommended cable length is 50 feet.

UNIT	TERMINATION LOCATION	JUMPER ID	JUMPER POSITION	CABLE LENGTH (FEET)
Speedomax 25000	30-Terminal Board	Port A: W1, W2 W3(RS485) W3(RS232) Port B: W4, W5 W6(RS485) W6(RS232)	 1-2 1-2 2-3 1-2 1-2 2-3	2000
Micromax 1 LPU	5-Terminal Board (TB5)	W2	1-2	1000
Micromax 2 LPU	5-Terminal Board (TB5)	W2	1-2	2000
CTX/UDC5300/ RSX/VPR/VRX	Terminal Board	W2, W3	1-2	2000

4. UNIT CONFIGURATION

Refer to the following manuals for detailed information concerning the configuration of a Unit:

UNIT	MANUAL	PART NUMBER
Speedomax	25000 Recorder Operator's Manual	277800
Micromax 2	Process Management System Instruction Manual	70-MX-25-03
CTX	CTX Controller User Manual	51-52-25-47
UDC5300	UDC5300 User Manual	51-52-25-58
RSX	RSX Video Recorder User Manual	43-DR-25-10
VPR/VRX	VPR/VRX Programmer Recorder User Manual	57-77-25-15

4.1 Unit Address

Each unit on the communications link requires a unique address, as indicated in the following table.

UNIT ADDRESS (DECIMAL)	UNIT ADDRESS (HEX)	DESCRIPTION
0	00	De-selects unit
1-254	01-FE	Unit Address
255	FF	De-selects unit

4.2 Parity and Baud Rate

The selection of odd, even, or no parity is dependent on the Host computer's requirements; parity is recommended.

The following table lists the baud rates available for selection for each type of Unit.

BAUD RATE	BIT TIME (MS)	Speedomax 25000	Micromax LPU	CTX/UDC5300/RSX/ VPR/VRX
76800	0.01302			X
38400	0.02604		X	X
19200	0.05208	X	X	X
9600	0.10417	X	X	X
4800	0.20834			X
2400	0.41668			X
1200	0.83333	X	X	X

5. Data Formats

The serial communications interface supports the following data formats: Binary, Text, and Floating Point.

5.1 Binary Format

Binary format applies to data comprised of one or more contiguous unsigned bytes. In general, when referring to bytes by number or position, the rightmost byte is the first byte (byte 1). Each byte consists of 8 bits. The data can be looked at as a stream of individual bits, or as individual bytes, depending on the parameter.

5.1.1 Number Conversions

The follow section covers binary to decimal and decimal to binary conversions.

5.1.1.1 BINARY TO DECIMAL CONVERSION

The general equation for converting a binary (base 2) number to a decimal (base 10) number is the following:

$$?_{10} = a_m 2^m + a_{m-1}2^{m-1} + \ldots + a_0 2^0 + a_{-1}2^{-1} + \ldots + a_{-(n-1)}2^{-(n-1)} + a_{-n}2^{-n}$$

Where:

?	= Decimal Number
a	= Coefficient (0 or 1)
m	= One less than the number of binary digits to the left of the decimal point
n	= The number of binary digits to the right of the decimal point.

Example: Convert 110011.10101 to a decimal number.

Solution:

m = 5
n = 5

$$?_{10} = 1\times 2^5 + 1\times 2^4 + 0\times 2^3 + 0\times 2^2 + 1\times 2^1 + 1\times 2^0 + 1\times 2^{-1} + 0\times 2^{-2} + 1\times 2^{-3} + 0\times 2^{-4} + 1\times 2^{-5}$$

$$?_{10} = 32 + 16 + 0 + 0 + 2 + 1 + .5 + 0 + .125 + 0 + .03125$$

$$?_{10} = 51.66$$

5.1.1.2 DECIMAL TO BINARY CONVERSION

When converting an integer number from base 10 (decimal) to base 2 (binary), the integer to be converted is repeatedly divided by 2. The consecutive divisions determine the coefficients (0 or 1) of each binary digit. The first division corresponds to 2^0, the second to 2^1, and so on. If the number being converted is divisible by 2, the power of two is multiplied by 0; while if a remainder is generated, the power of two is multiplied by 1.

Example: Convert 25_{10} to its binary equivalent.

DIVISION	REMAINDER	POWER OF 2
$25 \div 2 = 12$	1	2^0
$12 \div 2 = 6$	0	2^1
$6 \div 2 = 3$	0	2^2
$3 \div 2 = 1$	1	2^3
$1 \div 2 = 0$	1	2^4

Check:

$$25_{10} = 1 \times 2^4 + 1 \times 2^3 + 0 \times 2^2 + 0 \times 2^1 + 1 \times 2^0$$
$$25_{10} = 16 + 8 + 0 + 0 + 1$$

5.1.2 8-Bit Binary Format

The 8-Bit Binary Format applies to data comprised of a single byte consisting of 8 bits, numbered from 7 to 0, left to right. Bit 7 is the high-order bit, and bit 0 is the low-order bit.

5.1.3 16-Bit Binary Format

The 16-Bit Binary Format applies to data comprised of two contiguous bytes. The bits are numbered from 15 to 0, left to right. Bit 15 is the high-order bit. Byte 1 contains bits 15 to 8; byte 2 contains bits 7 to 0.

5.1.4 32-Bit Binary Format

The 32-Bit Binary format applies to data comprised of four contiguous bytes. The bits are numbered from 31 to 0, left to right. Bit 31 is the high-order bit. Byte 4 contains bits 31-24, byte 3 contains bits 23 to 16, and so on.

5.2 Text Format

Text format applies to data comprised of one or more contiguous bytes containing ASCII character codes. In general, when referring to bytes by number or position, the leftmost byte is the first byte (byte 1). Each byte consists of 8 bits, numbered from 7 to 0. Bit 7 is the high-order bit, and bit 0 is the low-order bit. Each bit number corresponds to an exponent of 2. Bits 6 to 0 contain the ASCII character code. For example, the ASCII representation of the letter “A” in binary is 100 0001, which equals

$$1x2^6 + 0x2^5 + 0x2^4 + 0x2^3 + 0x2^2 + 0x2^1 + 1x2^0$$

or decimal 65 (hexadecimal 41).

5.2.1 ASCII CODE AND CHARACTER SET

The codes detailed in the following table are per the ANSI Standard X3.4-1968 and are supported by all Honeywell instruments.

Example: the letter (capital) A has a hexadecimal code of 41. Its binary representation is 0100 0001.

BITS	6-4	000	001	010	011	100	101	110	111
3-0	HEX	0	1	2	3	4	5	6	7
0000	0	NUL	DLE	SP	0	@	P	\	p
0001	1	SOH	DC1	!	1	A	Q	a	q
0010	2	STX	DC2	“	2	B	R	b	r
0011	3	ETX	DC3	#	3	C	S	c	s
0100	4	EOT	DC4	$	4	D	T	d	t
0101	5	ENQ	NAK	%	5	E	U	e	u
0110	6	BEL	SYN	&	6	F	V	f	v
0111	7	ACK	ETB	‘	7	G	W	g	w
1000	8	BS	CAN	)	8	H	X	h	x
1001	9	HT	EM	(	9	I	Y	I	y
1010	A	LF	SUB	*	:	J	Z	j	z
1011	B	VT	ESC	+	;	K		k	{
1100	C	FF	FS	,	<	L	¢	l	↑
1101	D	CR	GS	-	=	M		m	}
1110	E	S0	RS	.	>	N		n	◦
1111	F	S1	US	/	?	O	_	o	DEL

The Speedomax 24000/25000 Series Recorder line also supports the use of hexadecimal codes 80 through AD of the IBM Extended ASCII character set. This portion of the extended character set includes characters specific to the French and Spanish languages.

5.3 Floating Point Format

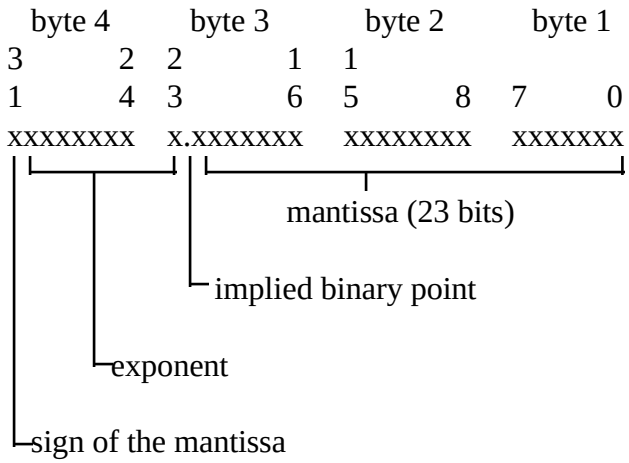
Floating point format is per the IEEE Standard for Binary Floating Point Arithmetic (TASK P754). This format conforms to that of the Unit’s Math Firmware and/or Co-Processor.

5.3.1 IEEE 754 Format

The Floating Point data format consists of four contiguous bytes containing a 23-bit signed binary mantissa with an 8-bit biased binary exponent. The bits are numbered from 31 to 0, left to right. Byte 4 contains bits 31-24, byte 3 contains bits 23 to 16, and so on. A description of the layout and accompanying figure follow:

BITS	DESCRIPTION
0-22	Mantissa
23-30	Exponent: 8-bit unsigned value
31	Sign of the mantissa: 0 = positive, 1 = negative

An implied binary point exists between bits 22 and 23. Note that the transmission order is byte 1 to byte 4.



The formula for calculating the floating point number is: $+/-.\text{mantissa x } 2^{\text{exponent}}$

5.3.1 Mantissa and Sign

The mantissa is defined by a sign bit (31) and a 23-bit binary fraction. This binary fraction is combined with an "implied" value of 1 to create a mantissa value which is greater than or equal to 1.0 and less than 2.0.

The mantissa is positive if the sign bit is zero (reset), and negative if the sign bit is one (set). For example:

DECIMAL	HEXADECIMAL	BINARY
100	42C80000	01000010 11001000 00000000 00000000

The sign bit is zero, indicating a positive mantissa. Removing the sign bits and exponent bits, the mantissa becomes:

HEXADECIMAL	BINARY
480000	xxxxxxxx x1001000 00000000 00000000

Add an "implied" value of one to the left of the binary point:

BINARY
1.1001000 00000000 00000000

Using positioned notation, this binary number is equal to:

$$1.0 + (1x2^{-1}) + (0x2^{-2}) + (0x2^{-3}) + (1x2^{-4}) = 1.0 + 0.5 + 0.0 + 0.0 + 0.0625 = 1.5625$$

5.3.2 Exponent

The exponent is defined by an unsigned 8-bit binary value (bits 23 through 30). The value of the exponent is derived by performing a signed subtraction of 127 (decimal) from the 8-bit exponent value.

DECIMAL	HEXADECIMAL	BINARY
100	42C80000	01000010 11001000 00000000 00000000

removing the sign and mantissa bits, the exponent becomes:

DECIMAL	HEXADECIMAL	BINARY
133	85	x1000010 1xxxxxxx xxxxxxxx xxxxxxxx

or:

$$1x2^7 + 0x2^6 + 0x2^5 + 0x2^4 + 0x2^3 + 1x2^2 + 0x2^1 + 1x2^0$$

Subtract a bias of 127 from the exponent to determine its value: 133 – 127 = 6.

5.3.3 Mantissa and Exponent Combination

Combining the mantissa and exponent from the two previous examples:

$$\text{float number} = \text{mantissa x } 2^{\text{exponent}}$$

$$\text{float number} = 1.5625 \text{ x } 2^6 = 1.5625 \text{ x } 64 = 100.0$$

Below is a list of sample float values in IEEE 754 format:

DECIMAL	HEXADECIMAL
100.0	42C80000
-100.0	C2C80000
0.5	3F000000
-1.75	BFE00000
0.0625	3D800000

5.3.4 Reserved Operands

Per the Standard certain exceptional forms of floating point operands are excluded from the numbering system. These are as follows:

EXCEPTION	EXPONENT	MANTISSA
+/- Infinity	All 1's	All 0's
Not-a-Number (NAN)	All 1's	Other than 0's
Denormalized Number	All 0's	Other than 0's

6 COMMUNICATION CONVENTIONS

The data transfer is half-duplex, using a 4-wire connection and a fifth wire used for a common. Data transmission is asynchronous. The data format, detailed in Section 5, is a “Non-Return-to-Zero” (NRZ) format; i.e., the bit level is maintained for the entire bit time. Additional bits of information are attached to each byte delineating its Start, Stop, and Parity (if Parity applies to the Unit):

Start Bit (0) / Data (8 Bits) / Parity Bit / Stop Bit (1)

7 DATA LINK LEVEL CONTROL

7.1 Transparency Data Encoding

The protocol uses the Data Link Escape (DLE) method of encoding to differentiate communication control characters from the binary data transmission. This method is consistent with ANSI X3.28.

7.2 Control Encoding

In order to be interpreted as a control character, the following codes must be immediately preceded by the DLE (0x10) code:

FUNCTION	LABEL	CODE
Abort	ENQ	0x05
Acknowledge	ACK	0x06
End of Text	ETX	0x03
Not Acknowledge	NAK	0x15
Start of Text	STX	0x02
Transmission Off	DC2	0x12
Transmission On	DC1	0x11

7.3 Data Encoding

Whenever the DLE character is encountered in the data, it is sent twice to prevent the byte that follows from being interpreted as a control character.

7.4 Data Transmission Control

The following control codes control the data flow from the Unit (Slave) to the Host computer (Master).

7.4.1 Transmission Off

When the Unit receives the Transmission Off/STOP (DLE DC2) control code, it stops its transmission to the Host computer. The Unit resumes transmission upon receipt of a Transmission On/START control code. Receiving an Abort (ENQ) or Start of Text (STX) aborts the transmission and previous request. The Unit is then ready to respond to a new request.

Note that upon receipt of the Transmission Off/STOP request, a maximum of 10 characters will be transmitted before the transmission actually stops.

7.4.2 Transmission On

Upon receipt of a Transmission On/START (DLE DC1) request, the Unit reactivates transmission.

7.4.3 Abort

Upon receipt of the Abort (DLE ENQ) request, the Unit terminates transmission and the previous request. The Unit is then ready to respond to a new request.

8 Message Format

The figures below lay out the general structure of a message from the Host computer (Master) to a Unit (Slave), and from a Unit to the Host Computer.

Host Computer to Unit - READ

DLE	STX	UNIT	MODE	TYPE	ADDR	DLE	ETX	CHK

Unit to Host Computer - READ

DLE	STX	MODE	TYPE	ADDR	DA … TA	DLE	STX	CHK

Note that the UNIT field appears only in Master to Slave messages. The MODE field determines the presence of the TYPE, ADDR, and DATA fields. If the message is a multiple access request, then more than one MODE [, TYPE, ADDR, DATA] grouping is present, and the message may contain both reads and writes.

8.1 STX – Start of Text

The STX field delineates the beginning of a message at the Data Link level. It consists of two bytes and contains the DLE character followed by the Start of Text communications control code: DLE STX.

8.2 UNIT –Unit Identification

The UNIT field is used by the Host computer at the Data Link level to identify the target Unit. It consists of one byte and contains a Unit's unique address (refer to Section 4.1). If a Unit's address is de-selected (i.e., equals 0x00 or 0xFF), that Unit will not listen to the communications port.

Instead of a particular Unit's address, the Host computer may send the "NO SELECT" (0x00) or "BROADCAST" (0xFF) codes. In the No Select situation, no Unit responds to the Host computer's message. In the Broadcast situation, all Units listen to the Host computer's message, but there is no response from the Units, not even at the Data Link level.

8.3 MODE – Response Identification

The MODE field contains several pieces of information, as described below. It consists of a single byte, with the bits numbered from left to right, 7 to 0.

BIT	DESCRIPTION	SECTION
7	Response Turnaround	8.3.1
6	Request Simple Poll	8.3.2
5	Data Block Continuation	8.3.3
4	Request Configuration Download	8.3.4
0-3	Response Mode	8.3.5

8.3.1 Response Turnaround

The Response Turnaround bit of the MODE field defines the type of response turnaround expected by the Host computer.

If this bit is reset (0), the Host computer expects an immediate Data Link level acknowledge (ACK: 0x06) with the Application Level data following in an accepted period of time.

If this bit is set (1), the Host computer expects only an immediate Data Link level acknowledge. The Host computer will later repoll the Unit and at that time will there be an Application Level response (acknowledge or data).

8.3.2 Request Simple Poll

The Request Simple Poll bit is used by the Unit to signal the Host computer that it has a status change for an off-normal condition. By setting this bit, the Unit is requesting the Host computer to poll for this data.

8.3.3 Data Block Continuation

The Data Field Continuation bit is used by the Micromax LPU to indicate to the Host computer that the amount of data to be transmitted exceeds the allowable message length. By setting this bit, the Unit indicates to the Host computer that the present data block is full and that more data will be transmitted when the Host issues a new request.

8.3.4 Request Configuration Download

The Request Configuration Download bit is used by the Micromax LPU to signal the Host computer (Master Station) that a configuration download is necessary. By setting this bit, the Unit is requesting the Host computer to return configuration information via the Pass Through response mode. In turn, the Unit will pass the configuration data on to its Local Station Host computer's Application level.

8.3.5 Response Mode

The Response Mode sub-field consists of 4 bits and contains a code representing the Host computer's desired response from the Unit, and the Unit's response in return, as described in the following table.

HOST TO UNIT:	CODE	SECTION
Read	0x01	8.3.5.1
Write	0x02	8.3.5.2
Simple Poll	0x07	8.3.5.3
Repoll	0x08	8.3.5.4

UNIT TO HOST:	CODE	SECTION
Application Level A-NAK	0x09	8.3.5.5
Application Level A-ACK	0x0A	8.3.5.6
Pass Through	0x0B	8.3.5.7

The response turnaround time for the Repoll response mode is typically within a few character times. That for the Read/Write response modes, from the Host computer request to start of DATA or A-ACK from the Unit's Application level, is as follows:

Single/Group Read (Flt. Pt.) 500 milliseconds
Single Write (Flt. Pt.) 1 second

8.3.5.1 Read

The Host computer issues a Read (0x01) request when it desires to access data from a Unit. This type of request requires the presence of the TYPE and ADDR fields (Section 8.4) which identify the data for transfer. If the Response Turnaround bit is set, the Host computer does not expect any response from the Unit, as it will later Repoll for the data.

If the Read request is successful, the Unit responds with a message containing the MODE, TYPE, ADDR and associated data in the DATA field (Section 8.5). Otherwise, the Unit returns an A-NAK followed by the corresponding reason code for the error.

8.3.5.2 Write

The Host computer issues a Write (0x02) request when it has data to be written to a Unit. This type of request requires the presence of the TYPE, ADDR, and DATA fields which identify the data for transfer. If the Response Turnaround bit is set, the Host computer does not expect any response from the Unit, as it will later Repoll for the status of the Write request.

If the Write request is successful, the Unit responds with an A-ACK. Otherwise, the Unit returns an A-NAK followed by the corresponding reason code for the error.

8.3.5.3 Simple Poll

The Host computer issues a Simple Poll (0x07) request upon receipt of a response which has the Request Simple Poll bit set. A Unit can set this bit on the detection of an alarm, event, or diagnostic change. This type of request requires only the presence of the MODE field. In response to this request from the Host computer, the Unit responds with a TYPE 0x19, ADDR 0x03 data packet and clears the request bit.

The Host computer can also issue this request at frequent intervals for alarm or diagnostic polling. If a Unit does not have any information for the Host computer, it returns an A-NAK with reason code 007.

8.3.5.4 Repoll

The Host computer issues a Repoll (0x08) request when a previous Read or Write request had been issued with the Response Turnaround bit set. If that previous request had not been successful, the Unit returns an A-NAK with the corresponding reason code.

For a successful Write, the Unit responds with an A-ACK. For a successful Read, the Unit responds with the requested data in the DATA field.

8.3.5.5 A-NAK

The A-NAK (0x09) response mode indicates that a Unit could not acknowledge (i.e., successfully complete) the Host computer's request. This response mode requires only the presence of the DATA field which consists of a single byte and contains a code representing the reason for the failure. Section 0, **Application NAK Summary**, contains a complete list of all reason codes and associated descriptions.

8.3.5.6 A-ACK

The Unit responds with an A-ACK (0x0A) response mode to indicate the successful completion of a Host computer Write request. This response also occurs after a Repoll for a previous Write request. No other information is required with this response.

8.3.5.7 Pass Through

The Pass Through (0x0B) response mode applies only to the Micromax LPU. The Master Station Host computer issues a Pass Through request upon receipt of a response which has the Request Configuration Download bit set. This response mode informs the Unit that the following message is to be passed on to its Local Station Host computer's Application level.

8.4 TYPE, ADDR – Data Identification and Transfer

The TYPE and ADDR fields uniquely identify the data for transfer. TYPE is a one byte field. It contains a number (0x00 – 0xFF) which represents a general parameter category selection. TYPEs fall into the following broad classifications:

1. Single – a single parameter or item reference
2. Program/Packet – a collection of Single items
3. Recipe – a binary block of data
4. Dynamic Packet – a special case of item 2 where the Host computer defines the list of Single items
5. Dynamic Block – a special case of item 3 where the Host computer can define the starting address and size of a binary memory dump

ADDR is a one byte field which is a further breakdown of the TYPE classification. It contains a number (0x00 – 0xFF) which is a specific index to an item within the general parameter category.

For example, TYPE 0x03 ADDR 0x01 refers to Loop 1's Process Variable. Section 0, 5.3 Floating **Point Format.**

Communication Summary, contains descriptions of all data available for transfer.

8.5 DATA

The DATA field is present in the following situations:

1. When the Host computer sends a Write request to a Unit
2. When the Unit responds with the data from a successful Read request
3. When the Unit responds after the detection of an error at the Application Level

The size and contents of this field are dependent on the parameter (TYPE, ADDR) being successfully read/written in situations 1 and 2 above. Section 0, 5.3 Floating **Point Format.**

Communication Summary, contains descriptions of all data available for transfer.

When an error is detected at the Application level, this field consists of a single byte containing a code representing the reason for the error. Section 0, 5.3 Floating **Point Format.**

Communication Summary, lists all codes and associated error conditions.

8.6 ETX – End of Text

The ETX field delineates the end of a message at the Data Link level. It consists of two bytes and contains the DLE character followed by the End of Text communications control code: DLE ETX.

8.7 CHK – Checksum Error Detection

The CHK (checksum) field is used at the Data Link level to provide error detection of data blocks. (This is in addition to the parity which is generated on each byte.) It consists of a single byte.

The associated algorithm adds the bytes comprising the MODE, TYPE, ADDR, and DATA fields; the UNIT field is NOT included. The sum (truncated if necessary to 8 bits) follows the ETX field. Note that the summation does not include duplicate DLE (i.e., data transparency) characters encountered in those fields. Also note that when this byte is transmitted, data transparency is applied to it; that is, if it equals the value of the DLE character, it will be transmitted twice.

9 Sample Protocol Exchanges

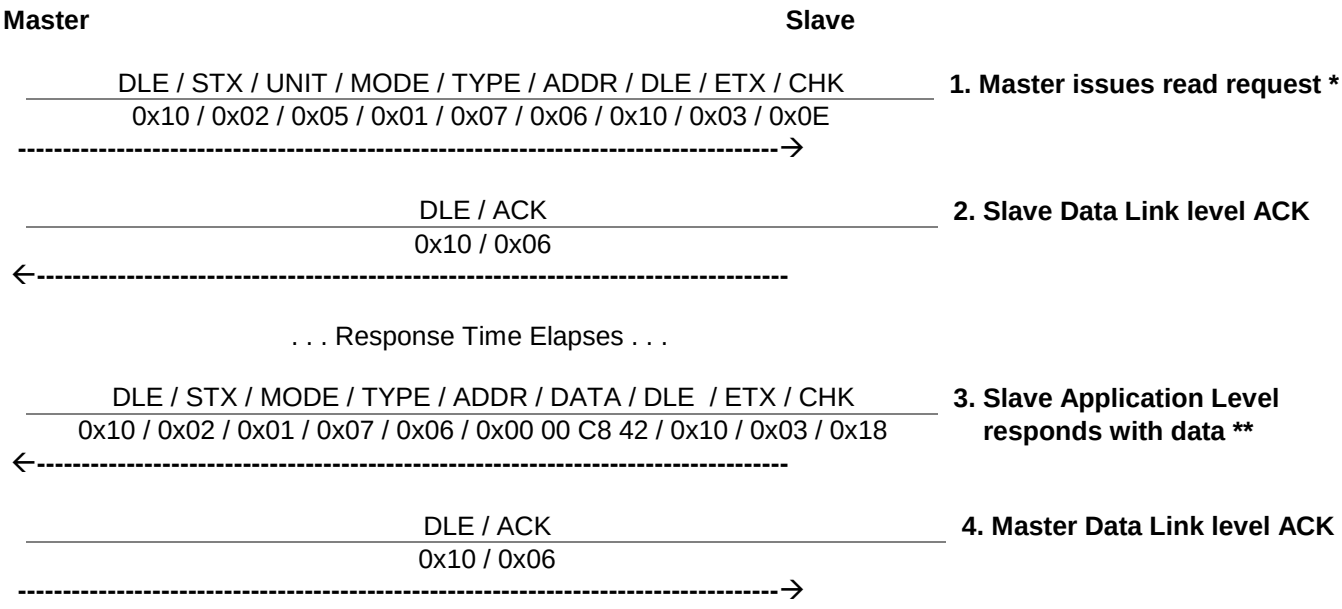
This section contains samples of protocol exchanges between a Host computer and a Unit. Throughout these examples, the terms Master and Slave are used interchangeably for Host computer and Unit, respectively. Where specific examples are given, the numbers shown are hexadecimal. Where appropriate, the DLE character also appears.

9.1 Read

The following sections contain samples of standard Read response mode requests.

9.1.1 Read Single Request - No Error Detected

This sample protocol exchange also includes a specific example where the Master is requesting a Read of the Analog Input #06 value for Unit 05. The Slave responds with the value 100.0.



*****Note that CHK is the sum of the MODE, TYPE, and ADDR fields: 0x01 + 0x07 + 0x06 = 0x0E.

******Note that here CHK is the truncated summation of the MODE, TYPE, ADDR, and DATA fields: 0x01 + 0x07 + 0x06 + 0x00 + 0x00 +0xC8 + 0x42 = 0x118, which when truncated to 8 bits equals 0x18.

9.1.2 Read Multiple Request - No Error Detected

This sample protocol exchange also includes a specific example where the Master is requesting a Read of the Analog Input #06 and Analog Input #2 values for Unit 05. The Slave responds with the value 100.0.

Master **Slave**

DLE / STX / UNIT / MODE / TYPE / ADDR / MODE / TYPE / ADDR / DLE / ETX / CHK
0x10 / 0x02 / 0x05 / 0x01 / 0x07 / 0x06 / 0x01 / 0x07 / 0x02 / 0x10 / 0x03 / 0x18
----------→ **1. Master issues read request ***

DLE / ACK
0x10 / 0x06
←---------- **2. Slave Data Link level ACK**

. . . Response Time Elapses . . .

DLE / STX / MODE / TYPE / ADDR / DATA / DLE / ETX / CHK
0x10 / 0x02 / 0x01 / 0x07 / 0x06 / 0x00 00 C8 42 / 0x01 / 0x07 / 0x06 / 0x00 00 C8 42 / 0x10 / 0x03 / 0x2C
←---------- **3. Slave Application Level responds with data ****

DLE / ACK
0x10 / 0x06
----------→ **4. Master Data Link level ACK**

***Note that CHK is the sum of all the MODE, TYPE, and ADDR fields:
0x01 + 0x07 + 0x06 + 0x01 + 0x07 + 0x02 = 0x018

****Note that here CHK is the truncated summation of the MODE, TYPE, ADDR, and DATA fields:
0x01 + 0x07 + 0x06 + 0x00 + 0x00 +0xC8 + 0x42 + 0x01 + 0x07 + 0x02 + 0x00 + 0x00 +0xC8 + 0x42 = 0x22C, which when truncated to 8 bits equals 0x2C.

9.1.3 Read – Error Detected at the Data Link Level

This sample protocol exchange outlines a transaction where an error is detected at the Data Link level:

Master	Slave	
DLE / STX / UNIT / MODE / TYPE / ADDR / DLE / ETX /CHK		**1. Master issues read request**
----------→		
	DLE / NAK	**2. Slave Data Link level NAK**
	←----------	
DLE / STX / UNIT / MODE / TYPE / ADDR / DLE/ ETX / CHK		**3. Master re-transmits request**
----------→		
	DLE / ACK	**4. Slave Data Link level ACK**
	←----------	
.	. . Response time elapses . . .	
DLE / STX / MODE / TYPE / ADDR / DATA / DLE / ETX / CHK		**5. Slave Application Level responds with data**
←----------		
	DLE / NAK	**6. Master Data Link level NAK**
----------→		
DLE / STX / MODE / TYPE / ADDR / DATA / DLE / ETX / CHK		**7. Slave re-transmits data**
←----------		
	DLE / ACK	**8. Master Data Link level ACK**
----------→		

9.1.4 Read – Error Detected at the Application Level

This sample protocol exchange outlines a transaction where an error is detected at the Application level. In this situation, the Slave responds with A-NAK and associated reason code for data. The Master acknowledges and will act accordingly.

Master	Slave	
DLE / STX / UNIT / MODE / TYPE / ADDR / DLE / ETX / CHK		**1. Master issues read request**
----------→		
	DLE / ACK	**2. Slave Data Link level ACK**
	←----------	
	. . . Response Time Elapses . . .	
DLE / STX / A-NAK / DATA / DLE / ETX / CHK		**3. Slave Application level responds with A-NAK**
←----------		
	DLE / ACK	**4. Master Data Link level ACK**
----------→		

9.2 Write

The following sections contain samples of standard Write response mode requests.

9.2.1 Write – No Error Detected

This sample protocol exchange also includes a specific example where the Master is requesting a Write of the value 100.0 to the Constant Value #3 of Unit 0x01.

Master **Slave**

DLE / STX / UNIT / MODE / TYPE / ADDR / DATA / DLE / ETX / CHK
0x10 / 0x02 / 0x01 / 0x02 / 0x25 / 0x03 / 0x0000C842 / 0x10 / 0x03 / 0x34
---------- ----------→ **1. Master issues write request ***

DLE / ACK
0x10 / 0x06
←---------- **2. Slave Data Link level ACK**

. . . Response time elapses . . .

DLE / STX / A-ACK / DLE / ETX / CHK
0x10 / 0x02 / 0x0A / 0x10 / 0x03 / 0x0A
←---------- **3. Slave Application Level A-ACK**

DLE / ACK
0x10 / 0x06
----------→ **4. Master Data Link level ACK**

*****Note that here CHK is the truncated summation of the MODE, TYPE, ADDR, and DATA fields: 0x02 + 0x25 + 0x03 + 0x00 + 0x00 +0xC8 + 0x42 = 0x134, which when truncated to 8 bits equals 0x34.

******Note that since only the MODE field is present, CHK equals A-ACK, 0x0A.

9.2.2 Write – Error Detected at the Data Link Level

This sample protocol exchange outlines a transaction where an error is detected at the Data Link level:

Master	Slave	
DLE / STX / UNIT / MODE / TYPE / ADDR / DATA / DLE / ETX / CHK	----------→	**1. Master issues write request**
	DLE / NAK	**2. Slave Data Link level NAK**
←----------		
DLE / STX / UNIT / MODE / TYPE / ADDR / DATA / DLE / ETX / CHK	----------→	**3. Master retransmits**
	DLE / ACK	**4. Slave Data Link level ACK**
←----------		
	. . . Response time elapses . . .	
	DLE / STX / A-ACK / DLE / ETX / CHK	**5. Slave Application level A-ACK**
←----------		
	DLE / ACK	**6. Master Data Link level ACK**
	----------→	

9.2.3 Write – Error Detected at the Application Level

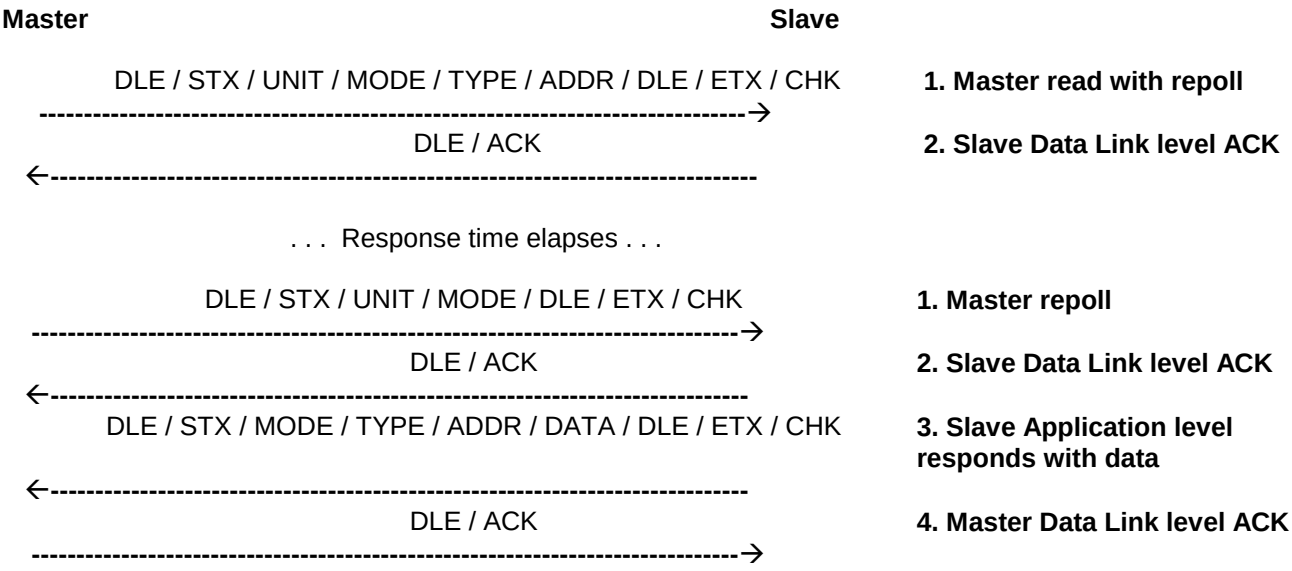
This sample protocol exchange outlines a transaction where an error is detected at the Application level. In this situation, the Slave responds with A-NAK and associated reason code for data; the current request is ignored. The Master acknowledges and will act accordingly.

Master	Slave	
DLE / STX / UNIT / MODE / TYPE / ADDR / DATA / DLE / ETX / CHK	----------→	**1. Master issues write request**
	DLE / ACK	**2. Slave Data Link level ACK**
←----------		
	. . . Response time elapses . . .	
	DLE / STX / A-NAK / DATA / DLE / ETX / CHK	**3. Slave Application level A-NAK**
←----------		
	DLE / ACK	**4. Master Data Link level ACK**
	----------→	

9.3 Read With Repoll

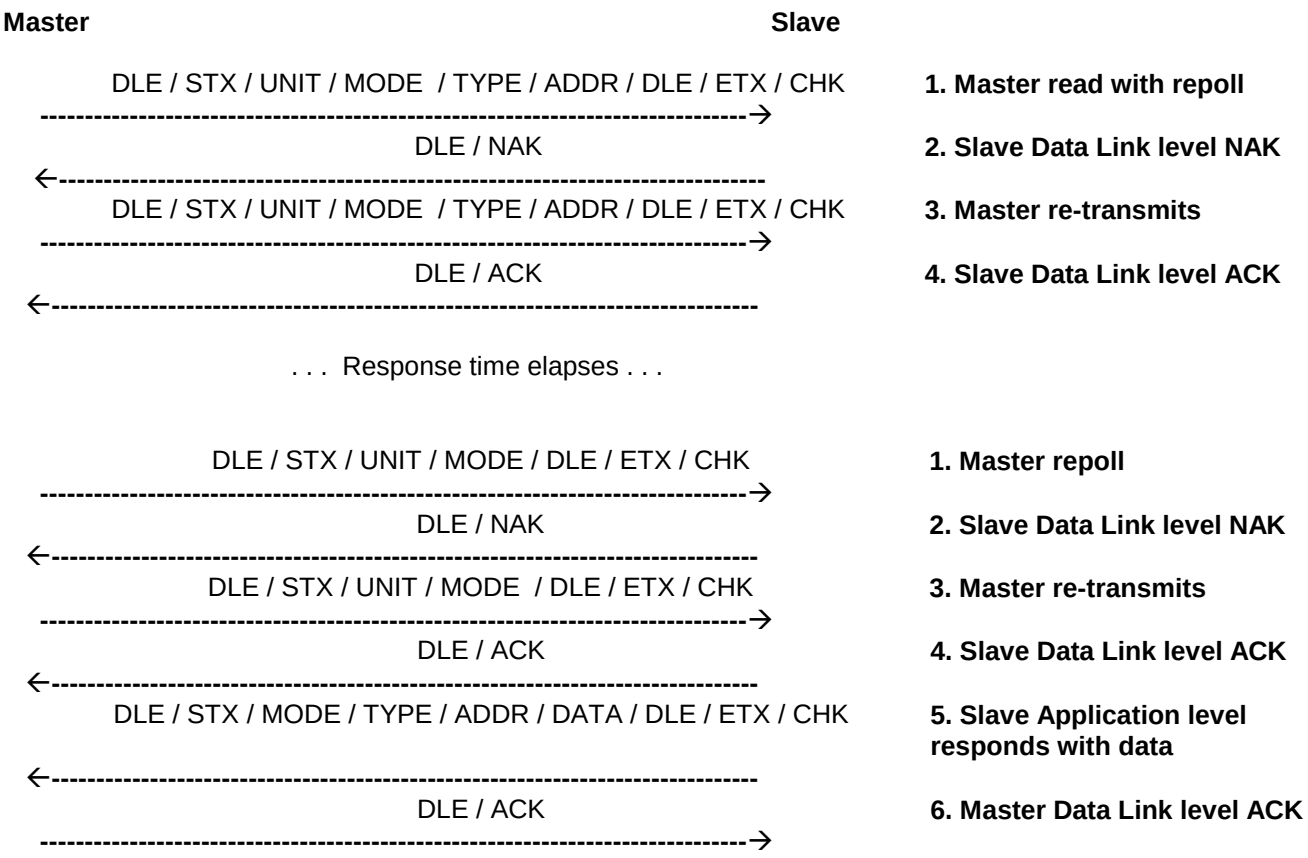
The following sections contain examples of Read requests which involve a later Repoll. The initial requests issued by the Master have the Response Turnaround bit set.

9.3.1 Read With Repoll – No Error Detected



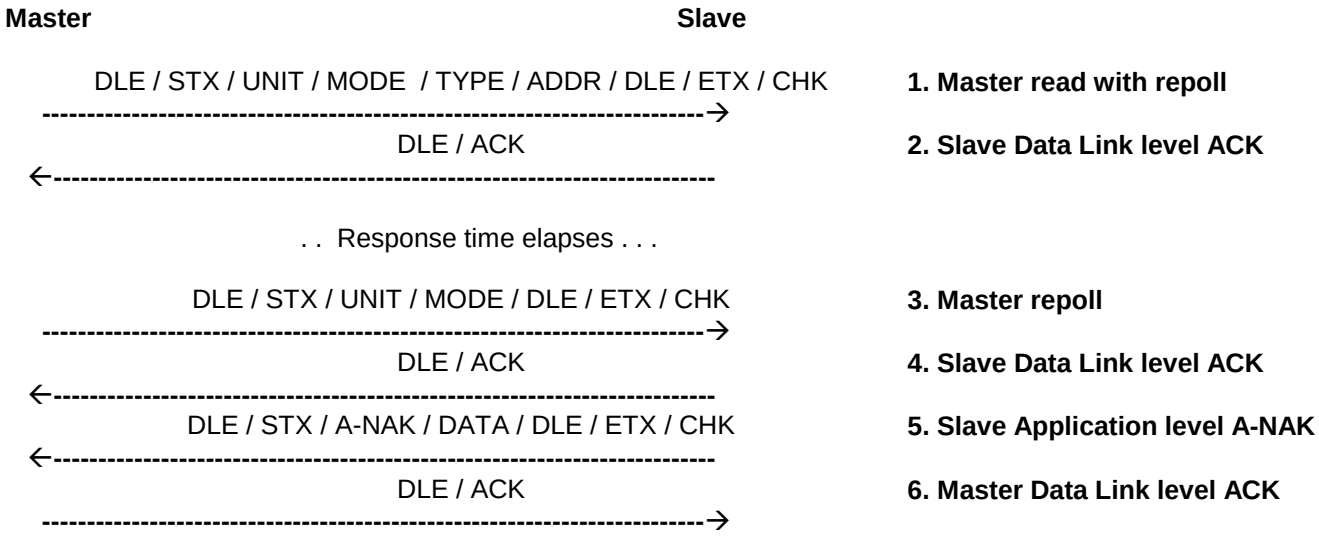
9.3.2 Read With Repoll – Error Detected at the Data Link Level

This sample protocol exchange outlines a transaction where an error is detected at the Data Link level:



9.3.3 Read With Repoll – Error Detected at the Application Level

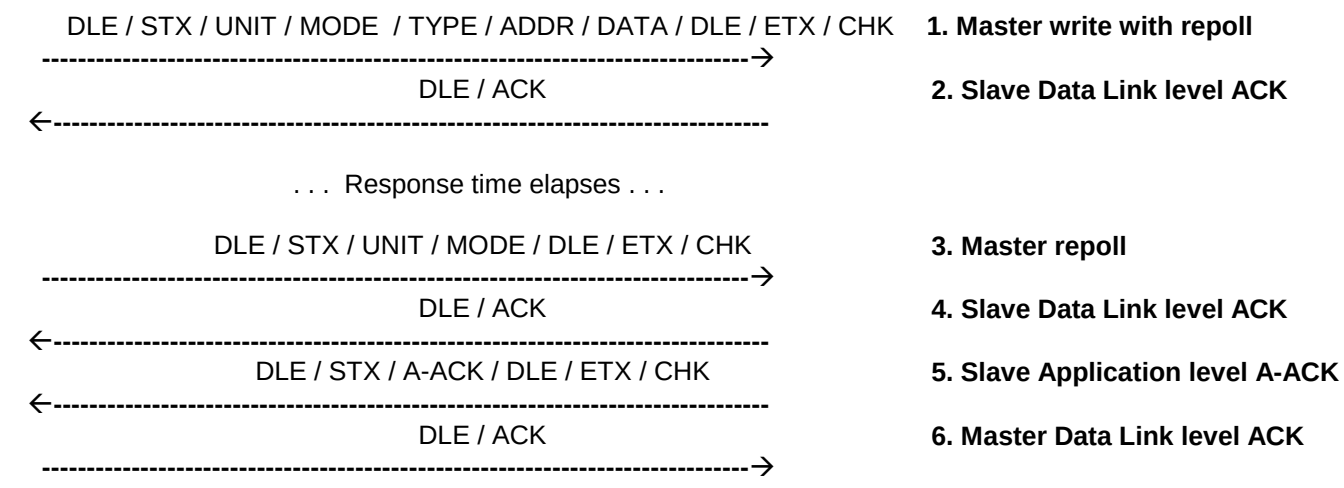
This sample protocol exchange outlines a transaction where an error is detected at the Application level. In this situation, the Slave responds with A-NAK and associated reason code for data; the current request is ignored. The Master acknowledges and will act accordingly.



9.4 Write With Repoll

The following sections contain examples of Write requests which involve a later Repoll. The initial requests issued by the Master have the Response Turnaround bit set.

9.4.1 Write With Repoll – No Error Detected



9.4.2 Write With Repoll – Error Detected at the Data Link Level

This sample protocol exchange outlines a transaction where an error is detected at the Data Link level:

Master		Slave
DLE / STX / UNIT / MODE / TYPE / ADDR / DATA / DLE / ETX / CHK	→	**1. Master write with repoll**
DLE / NAK	←	**2. Slave Data Link level NAK**
DLE / STX / UNIT / MODE / TYPE / ADDR / DATA / DLE / ETX / CHK	→	**3. Master re-transmits**
DLE / ACK	←	**4. Slave Data Link level ACK**
. . . Response time elapses . . .		
DLE / STX / UNIT / MODE / DLE / ETX / CHK	→	**5. Master repoll**
DLE / ACK	←	**6. Slave Data Link level ACK**
DLE / STX / A-ACK / DLE / ETX / CHK	←	**7. Slave Application level A-ACK**
DLE / NAK	→	**8. Master Data Link level NAK**
DLE / STX / A-ACK / DLE / ETX / CHK	←	**9. Slave re-transmits**
DLE / ACK	→	**10. Master Data Link level ACK**

9.4.3 Write With Repoll – Error Detected at the Application Level

This sample protocol exchange outlines a transaction where an error is detected at the Application level. In this situation, the Slave responds with A-NAK and associated reason code for data; the current request is ignored. The Master acknowledges and will act accordingly.

Master		Slave
DLE / STX / UNIT / MODE / TYPE / ADDR / DATA / DLE / ETX / CHK	→	**1. Master write with repoll**
DLE / ACK	←	**2. Slave Data Link level ACK**
. . . Response time elapses . . .		
DLE / STX / UNIT / MODE / DLE / ETX / CHK	→	**3. Master repoll**
DLE / ACK	←	**4. Slave Data Link level ACK**
DLE / STX / A-NAK / DATA / DLE / ETX / CHK	←	**5. Slave Application level A-NAK**
DLE / ACK	→	**6. Master Data Link level ACK**

9.5 Simple Poll

The following sample illustrates a Simple Poll request. The first exchange is a standard read request from the Master. The Application level response from the Slave has the Request Simple Poll (Section 8.3.2) bit set. This indication is recognized by the Master, who in turn issues a Simple Poll request.

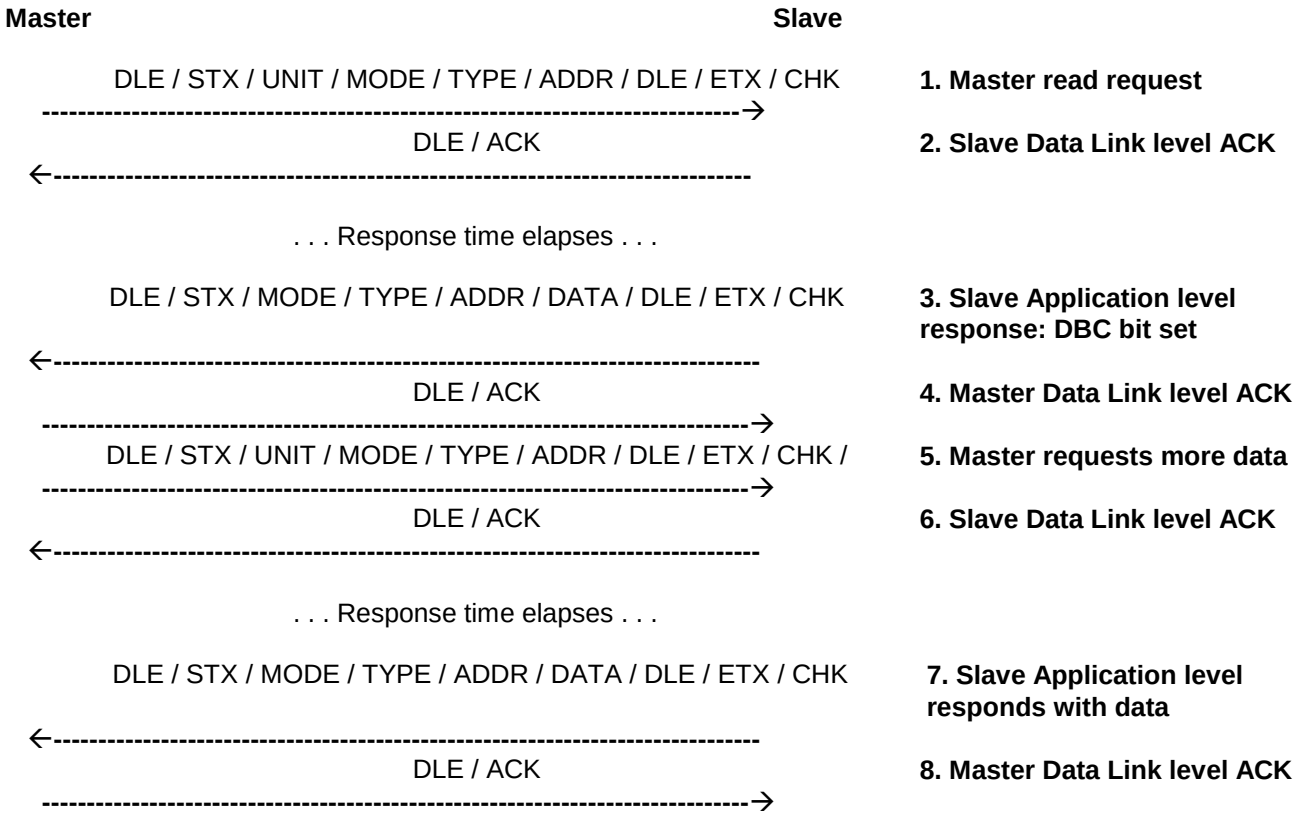
Master	**Slave**	
DLE / STX / UNIT / MODE / TYPE / ADDR / DLE / ETX / CHK	----------→	**1. Master read request**
←----------	DLE / ACK	**2. Slave Data Link level ACK**
. . . Response time elapses . . .		
DLE / STX / MODE / TYPE / ADDR / DATA / DLE / ETX / CHK	←----------	**3. Slave Application level response: simple poll bit set**
----------→	DLE / ACK	**4. Master Data Link level ACK**
	. . .	
DLE / STX / UNIT / MODE / DLE / ETX / CHK	----------→	**5. Master simple poll request**
←----------	DLE / ACK	**6. Slave Data Link level ACK**
. . . Response time elapses . . .		
DLE / STX / MODE / TYPE / ADDR / DATA / DLE / ETX / CHK	←----------	**7. Slave Application level response: Type 0x19 Addr 0x03**
----------→	DLE / ACK	**8. Master Data Link level ACK**

9.6 Data Continuation

The Micromax LPU provides for the transmission of large blocks of data in sections indicated by the Data Block Continuation bit in the MODE field. The following sections contain sample protocol exchanges for the Read and Write of large blocks of data.

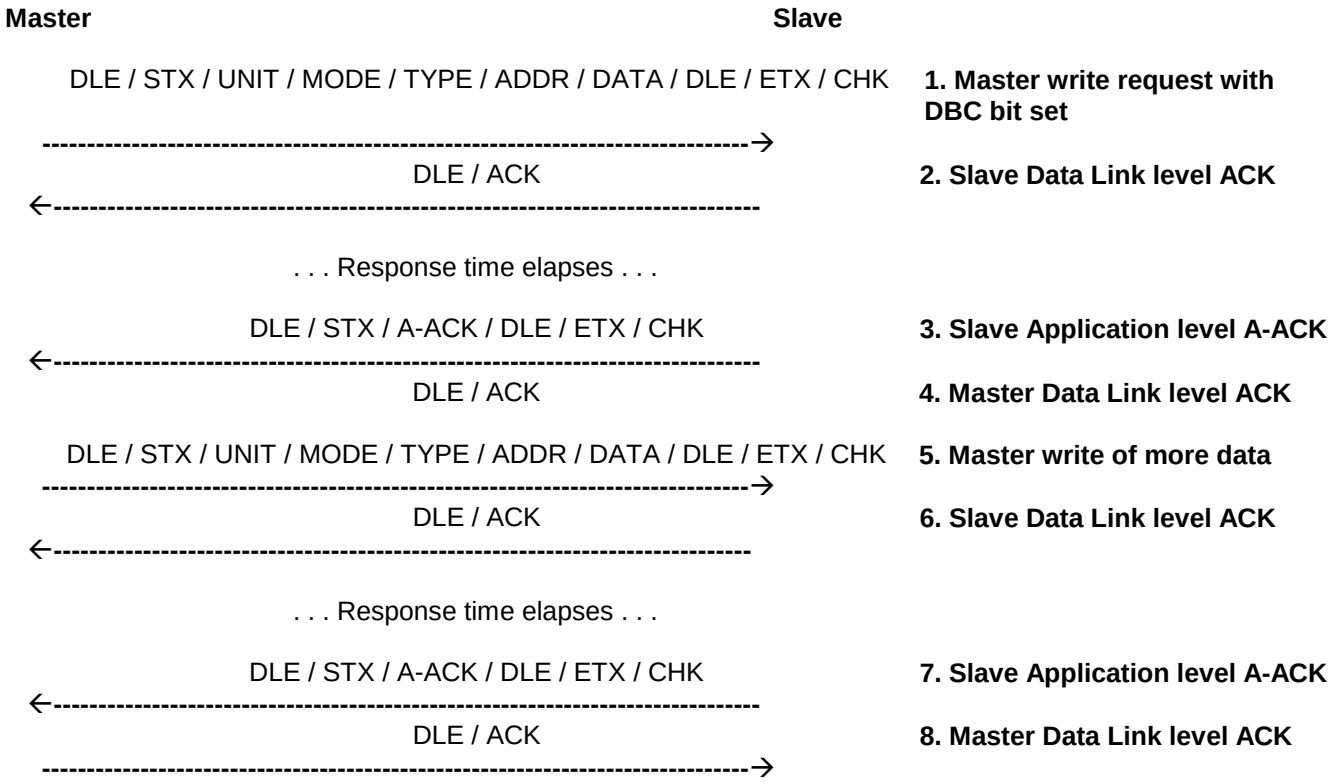
9.6.1 Read

This following is the sample protocol when the Master reads a large block of data:



9.6.2 Write

This following is the sample protocol when the Master writes a large block of data:



10 Common Mistakes Developing Driver Software

The following sections address the most common problems when developing a software device driver for these instruments, I hope this section helps avoid unnecessary development time.

10.1Checksum Calculation

See Section 8.7, **CHK – Checksum Error Detection**

10.2Forgotten A-ACK

See Section 9, **Sample Protocol Exchanges**

10.3IEEE Floating Point Format Problems

See Section 5.3 **Floating Point Format**.

11. Communication Summary

This section summarizes the Application Level data available for Read and/or Write access. The information is presented in tabular format and includes:

HEADING	CONTENTS	FOR MORE INFO
Parameter Description	Brief description of parameter available for read and/or write access	
Type	General classification of parameter	Section 8.4
Addr	Further breakdown of classification	Section 8.4
Data Format	BINARY/FLOAT/TEXT/BLOCK	
R/W	Read/Write access	R: Read Only W: Write Only R/W: Read or Write
Size	Size of parameter	Number of bytes
Unit Code	Type of Unit to which parameter applies	S: Speedomax 25000 M: Micromax LPU (M1, M2)* P: CTX/UDC5300/RSX/VPR/VRX Family
Page	Reference to detailed description of parameter	
*Where a distinction is needed between Micromax1 and Micromax2 M1 and M2 will be used as the unit code. M1 represents all LPU(s) with software revisions A – G. M2 represents all LPU(s) with software revisions >= H.		

If a parameter is associated with a function block, a mnemonic for the function block appears as part of the parameter description. A function block can apply to than one type of Unit. In these cases, the address column may show a range: e.g., 0x01-xx. Refer to the following table to determine a parameter's end range value for the Speedomax and Micromax Units. NA indicates "Not Applicable".

FUNCTION BLOCK		Speedomax	Micromax1	Micromax2
AI:	Analog Input	135	75	225
AL:	Alarm	120	150	150
AO:	Analog Output	16	16	16
CN:	Constant	50	100	200
CR:	Control Relays	NA	999	999
CV:	Calculated Value	NA	NA	NA
DI:	Discrete Input	135	225	225
DO:	Discrete Output	135	225	225
LP:	Control Loop	NA	16	16
PP:	Pseudo Point	60	255	255
SPP:	Setpoint Profiler	NA	2	4
TL:	Totalizer	NA	NA	NA

For CTX/UDC5300/RSX/VPR/VRX, the parameter's end range value is determined by accessing the associated function block's count, as indicated in the following table:

FUNCTION BLOCK		PARAMETER	TYPE	ADDR
AI:	Analog Input	AI: Count	0x02	0x51
AL:	Alarm	AL: Count	0x02	0x56
AO:	Analog Output	AO: Count	0x02	0x52
CN:	Constant	CN: Count	0x02	0x55
CR:	Control Relay	NA	NA	NA
CV:	Calculated Variable	CV: Count	0x02	0x59
DI:	Discrete Input	DI: Count	0x02	0x53
DO:	Discrete Output	DO: Count	0x02	0x54
LP:	Control Loop	LP: Count	0x02	0x58
PP:	Pseudo Point	NA	NA	NA
SPP:	Setpoint Profile	SPP: Count	0x02	0x57
TL:	Totalizer	TL: Count	0x02	0x60

ANALOG INPUT DATA

ANALOG INPUT PARAMETER DESCRIPTION	TYPE	ADDR	DATA FORMAT	SIZE	R/W MODE	UNIT CODE	PG.
OUTPUTS:							
AI: Output Value	0x07	0x01-xx	FLOAT	4	R	S,M,P	68
AI: Output Values and Status	0x9C	0x01-xx	float+byte	5	R	S,M,P	89
AI: RJ Compensation	0x9B	0x01-xx	FLOAT	4	R	S,M,P	89
PARAMETERS:							
AI: Adjustment Value	0x15	0x01-xx	FLOAT	4	RW	S,M,P	71
AI: Count	0x02	0x51	BINARY	2	R	P	66
AI: Default Value	0x95	0x01-xx	FLOAT	4	R	S,M	89
AI: Engineering Units Text	0xCC	0x01-0x87	TEXT	6	RW	S	93
AI: Engineering Units Text	0xCC	0x01-xx	TEXT	6	R	P	93
AI: Function Block Description	0xC0	0x01-xx	TEXT	14	RW	S,P	92
AI: Function Block Description	0xD6	0x01-xx	TEXT	16	RW	P	94
AI: Function Block Tag	0xC6	0x01-xx	TEXT	7	RW	S,P	93
AI: Packet 1 – AI Output	0x19	0x00	BLOCK	300	R	M	71
AI: Packet 1 – AI Output	0x19	0x12	BLOCK	540	R	S	74
AI: Packet 6 – AI Status	0x19	0x05	BLOCK	75	R	M	72
AI: Packet 6 – AI Status	0x19	0x16	BLOCK	135	R	S	74
AI: Range High	0xBB	0x01-xx	FLOAT	4	R	S,M,P	92
AI: Range Low	0xBA	0x01-xx	FLOAT	4	R	S,M,P	92
AI: Raw Value	0x1A	0x01-xx	FLOAT	4	R	P	75
STATUS:							
AI: Point Status/Assignment	0x28	0x01-xx	BINARY	1	R	S,M,P	77

ALARM DATA

ALARM PARAMETER DESCRIPTION	TYPE	ADDR	DATA FORMAT	SIZE	R/W MODE	UNIT CODE	PG.
INPUTS:							
AL: Set Point	0x11	0x01-xx	FLOAT	4	RW	S,M,P	69
OUTPUTS:							
AL: Output Status	0x12	0x01-xx	BINARY	1	R	S,M,P	69
PARAMETERS:							
AL: Count	0x02	0x56	BINARY	2	R	P	67
AL: Function Block Description	0xE1	0x01-xx	TEXT	16	RW	P	95
AL: Function Block Tag	0xE2	0x01-xx	TEXT	7	RW	P	95
AL: Hysteresis	0x13	0x00	FLOAT	4	R	M	69
AL: Hysteresis	0x13	0x01-xx	FLOAT	4	RW	P	69
AL: Off Label Text	0xE4	0x01-xx	TEXT	6	R	P	95
AL: On Label Text	0xE3	0x01-xx	TEXT	6	R	P	95
AL: On/Off Label Text	0xE5	0x01-xx	TEXT	6	R	P	95
AL: Packet 5 – AL Status Packed	0x19	0x04	BLOCK	19	R	S,M	72

ANALOG OUTPUT DATA

ANALOG OUTPUT PARAMETER DESCRIPTION	TYPE	ADDR	DATA FORMAT	SIZE	R/W MODE	UNIT CODE	PG.
INPUTS:							
AO: Input Source/Set Point	0x3D	0x01-xx	FLOAT	4	R	S,M,P	80
AO: Slidewire	0x3F	0x01-xx	FLOAT	4	R	M,P	80
OUTPUTS:							
AO: Output Value	0x3E	0x01-xx	FLOAT	4	R	S,M,P	80
PARAMETERS:							
AO Card Type	0x02	0x12-0x19	BINARY	1	R	M	59
AO Card Type	0x02	0x34-0x3B	BINARY	1	R	S	65
AO: Count	0x02	0x52	BINARY	2	R	P	66
AO: Decreasing Slew Rate Limit	0x4C	0x01-xx	FLOAT	4	RW	P	81
AO: Drive Unit Sensitivity	0x46	0x01-xx	FLOAT	4	RW	M,P	81
AO: Drive Unit Speed	0x70	0x01-xx	FLOAT	4	RW	M,P	85
AO: Failsafe/Preset 1 Value	0x4A	0x01-xx	FLOAT	4	RW	M,P	81
AO: Failsafe/Preset Value	0x36	0x01-xx	FLOAT	4	RW	P	79
AO: Function Block Description	0xC1	0x01-xx	TEXT	14	RW	S,P	92
AO: Function Block Description	0xD7	0x01-xx	TEXT	16	RW	P	94
AO: Function Block Tag	0xC7	0x01-xx	TEXT	7	RW	S,P	93
AO: Impulse Time	0x42	0x01-xx	FLOAT	4	RW	M,P	80
AO: Increasing Slew Rate Limit	0x45	0x01-xx	FLOAT	4	RW	P	80
AO: Minimum OFF Time	0x44	0x01-xx	FLOAT	4	RW	M,P	80
AO: Minimum ON Time	0x43	0x01-xx	FLOAT	4	RW	M,P	80
AO: Output Decreasing	0x6F	0x01-0x10	BINARY	1	R	M	85
AO: Output High Limit	0x90	0x01-xx	FLOAT	4	RW	S,M,P	88
AO: Output Increasing	0x6E	0x01-0x10	BINARY	1	R	M	85
AO: Output Low Limit	0x91	0x01-xx	FLOAT	4	RW	S,M,P	88
AO: Process Variable High Lim	0x40	0x01-xx	FLOAT	4	RW	S,M,P	80
AO: Process Variable Low Lim	0x41	0x01-xx	FLOAT	4	RW	S,M,P	80
AO: Slew Rate Time	0x45	0x01-0x10	FLOAT	4	RW	M	80

CONSTANT PARAMETERS

CONSTANT PARAMETER DESCRIPTION	TYPE	ADDR	DATA FORMAT	SIZE	R/W MODE	UNIT CODE	PG.
OUTPUTS:							
CN: Value	0x25	0x01-xx	FLOAT	4	RW	S,M,P	77
PARAMETERS:							
CN: Count	0x02	0x55	BINARY	2	R	P	66
CN: Function Block Description	0xC3	0x01-xx	TEXT	14	RW	S,P	92
CN: Function Block Description	0xD9	0x01-xx	TEXT	16	RW	P	94
CN: Function Block Tag	0xC9	0x01-xx	TEXT	7	RW	S,P	93
CN: Packet 1-200	0x17	0x06	BLOCK	800	RW	M	71
CN: Packet 1-25 (Recipe #1)	0x17	0x00	BLOCK	100	RW	M	71
CN: Packet 101-125 (Recipe #3)	0x17	0x03	BLOCK	100	RW	M	71
CN: Packet 126-150 (Recipe #4)	0x17	0x04	BLOCK	100	RW	M	71
CN: Packet 151-200	0x17	0x05	BLOCK	200	RW	M	71
CN: Packet 26-50 (Recipe #2)	0x17	0x01	BLOCK	100	RW	M	71

CONSTANT PARAMETER DESCRIPTION	TYPE	ADDR	DATA FORMAT	SIZE	R/W MODE	UNIT CODE	PG.
CN: Packet 51-100	0x17	0x02	BLOCK	200	RW	M	71

CONTROL RELAY DATA

CONTROL RELAY PARAMETER DESCRIPTION	TYPE	ADDR	DATA FORMAT	SIZE	R/W MODE	UNIT CODE	PG.
OUTPUTS:							
CR: Control Relays Output	0x7B	0x01-0xFF	BINARY	1	R	M	86
PARAMETERS:							
CR: Block 2	0x7C	0x00-0xFF	BINARY	1	R	M	87
CR: Block 3	0x7D	0x00-0xFF	BINARY	1	R	M	87
CR: Block 4	0x7E	0x00-0xE7	BINARY	1	R	M	87
CR: Packet 9 – CR: 1-999 Output	0x19	0x08	BLOCK	134	R	M	74

CALCULATED VALUE/PSEUDO POINT DATA

CALC'D VALUE/PSEUDO POINT PARAMETER DESCRIPTION	TYPE	ADDR	DATA FORMAT	SIZE	R/W MODE	UNIT CODE	PG.
INPUTS:							
CV: Back Calc Input Value	0x48	0x01-xx	FLOAT	4	R	P	81
OUTPUTS:							
CV/PP: Output Value (256-511)	0x1F	0x01-0xFF	FLOAT	4	R	M	76
CV:/PP: Output Status	0x85	0x01-xx	BINARY	1	R	S,M,P	87
CV:/PP: Output Status 2	0x87	0x01-xx	BINARY	1	R	S,M	87
CV:/PP: Output Status 3	0x89	0x01-xx	BINARY	1	R	S,M	87
CV:/PP: Output Status 4	0x8B	0x01-xx	BINARY	1	R	S,M	88
CV:/PP: Output Value (1-255)	0x1E	0x01-xx	FLOAT	4	R	S,M,P	76
PARAMETERS:							
CV: Count	0x02	0x59	BINARY	2	R	P	67
CV:/PP: Engineering Units Text	0xCD	0x01-0x3C	TEXT	6	RW	S	93
CV:/PP: Engineering Units Text	0xCD	0x01-xx	TEXT	6	R	P	93
CV:/PP: Function Block Descr.	0xC2	0x01-xx	TEXT	14	RW	S,P	92
CV:/PP: Function Block Descr.	0xD8	0x01-xx	TEXT	16	RW	P	94
CV:/PP: Function Block Tag	0xC8	0x01-xx	TEXT	7	RW	S,P	93
CV:/PP: Limit Clamp	0x8D	0x01-xx	BINARY	1	R	S,M	88
CV:/PP: Output High Limit	0x49	0x01-xx	FLOAT	4	RW	S,M	81
CV:/PP: Output High Limit	0x49	0x01-xx	FLOAT	4	R	P	81
CV:/PP: Output Low Limit	0x4B	0x01-xx	FLOAT	4	RW	S,M	81
CV:/PP: Output Low Limit	0x4B	0x01-xx	FLOAT	4	R	P	81
CV:/PP: Packet 2 – CV/PP Output	0x19	0x01	BLOCK	1016	R	M	72
CV:/PP: Packet 2 – CV/PP Output	0x19	0x13	BLOCK	240	R	S	74
CV:/PP: Packet 3 – CV/PP Output	0x19	0x02	BLOCK	1020	R	M	72

DIGITAL INPUT DATA

DIGITAL INPUT PARAMETER DESCRIPTION	TYPE	ADDR	DATA FORMAT	SIZE	R/W MODE	UNIT CODE	PG.
OUTPUTS:							
DI: Output Status	0x21	0x01-xx	BINARY	1	RW	S,M,P	76
PARAMETERS:							
DI: Count	0x02	0x53	BINARY	2	R	P	66
DI: Function Block Description	0xC4	0x01-xx	TEXT	14	RW	S,P	93
DI: Function Block Description	0xDA	0x01-xx	TEXT	16	RW	P	95
DI: Function Block Tag	0xCA	0x01-xx	TEXT	7	RW	S,P	93
DI: Off Label Text	0xD0	0x01-0x87	TEXT	6	RW	S	94
DI: Off Label Text	0xD0	0x01-xx	TEXT	6	R	P	94
DI: On Label Text	0xCE	0x01-0x87	TEXT	6	RW	S	93
DI: On Label Text	0xCE	0x01-xx	TEXT	6	R	P	93
DI: On/Off Label Text	0xD2	0x01-xx	TEXT	6	R	S,P	94
DI: Packet 7 – DI Output	0x19	0x06	BLOCK	30	R	M	73
DI: Packet 7 – DI Output	0x19	0x17	BLOCK	18	R	S	75

DIGITAL OUTPUT DATA

DIGITAL OUTPUT PARAMETER DESCRIPTION	TYPE	ADDR	DATA FORMAT	SIZE	R/W MODE	UNIT CODE	PG.
OUTPUTS:							
DO: Output Status	0x23	0x01-xx	BINARY	1	RW	S,M,P	76
PARAMETERS:							
DO: Count	0x02	0x54	BINARY	2	R	P	66
DO: Function Block Description	0xC5	0x01-xx	TEXT	14	RW	S,P	93
DO: Function Block Description	0xDB	0x01-xx	TEXT	16	RW	P	95
DO: Function Block Tag	0xCB	0x01-xx	TEXT	7	RW	S,P	93
DO: Off Label Text	0xD1	0x01-0x87	TEXT	6	RW	S	94
DO: Off Label Text	0xD1	0x01-xx	TEXT	6	R	P	94
DO: On Label Text	0xCF	0x01-0x87	TEXT	6	RW	S	94
DO: On Label Text	0xCF	0x01-xx	TEXT	6	R	P	94
DO: On/Off Label Text	0xD3	0x01-xx	TEXT	6	R	S,P	94
DO: Packet 8 – DO Output	0x19	0x07	BLOCK	30	R	M	73
DO: Packet 8 – DO Output	0x19	0x18	BLOCK	18	R	S	75

CONTROL LOOP DATA

CONTROL LOOP PARAMETER DESCRIPTION	TYPE	ADDR	DATA FORMAT	SIZE	R/W MODE	UNIT CODE	PG.
INPUTS:							
LP: Carbon; CO Compensation	0x98	0x01-0x10	FLOAT	4	R	M	89
LP: Carbon; Furnace Factor	0x99	0x01-0x10	FLOAT	4	R	M	89
LP: Carbon; Furnace Temp	0x97	0x01-0x10	FLOAT	4	R	M	89
LP: Carbon; Optional Selection	0x9A	0x01-0x10	BINARY	1	R	M	89
LP: Carbon; Sensor	0x96	0x01-0x10	FLOAT	4	R	M	89

CONTROL LOOP PARAMETER DESCRIPTION	TYPE	ADDR	DATA FORMAT	SIZE	R/W MODE	UNIT CODE	PG.
LP: Control Feedback 1 Value	0x47	0x01-xx	FLOAT	4	R	M,P	81
LP: Control Feedback 2 Value	0x48	0x01-0x10	FLOAT	4	R	M	81
LP: Control Feedback Value	0x38	0x01-xx	FLOAT	4	R	M,P	79
LP: Local Set Point (SP1)	0x04	0x01-xx	FLOAT	4	RW	M,P	68
LP: Process Variable	0x03	0x01-xx	FLOAT	4	R	M,P	67
LP: Remote Set Point (SP2)	0x05	0x01-xx	FLOAT	4	RW	M,P	68
LP: Self Tune Process Variable	0x67	0x01-0x10	FLOAT	4	R	M	84
OUTPUTS:							
LP: Back Calc Output Value	0x31	0x01-xx	FLOAT	4	R	M,P	79
LP: Cascade Status	0x5B	0x01-0x10	BINARY	1	R	M	83
LP: Control Action Selection	0x59	0x01-xx	BINARY	1	W	M,P	83
LP: Control Action Status	0x58	0x01-xx	BINARY	1	R	M,P	82
LP: Control Auto/Manual Status	0x55	0x01-0x10	BINARY	1	R	M	82
LP: Control Auto/Manual Status	0x55	0x01-xx	BINARY	1	RW	P	82
LP: Deviation	0x06	0x01-xx	FLOAT	4	R	M,P	68
LP: Integral Hold Status	0x60	0x01-0x10	BINARY	1	R	M	83
LP: Manual Output Value	0x3C	0x01-xx	FLOAT	4	RW	M,P	80
LP: Output 1	0x69	0x01-xx	FLOAT	4	RW	M,P	84
LP: Output 2	0x6A	0x01-0x10	FLOAT	4	RW	M	84
LP: Output ON/OFF Status	0x66	0x01-0x10	BINARY	1	R	M	84
LP: Output ON/OFF Status	0x66	0x01-xx	BINARY	1	RW	P	84
LP: Output Value	0x08	0x01-0x10	FLOAT	4	R	M	68
LP: Output Value	0x08	0x01-xx	FLOAT	4	RW	P	68
LP: Set Point Status	0x52	0x01-0x10	BINARY	1	R	M	82
LP: Set Point Status	0x52	0x01-xx	BINARY	1	RW	P	82
LP: Tuning Parameter Status	0x64	0x01-xx	BINARY	1	R	M,P	84
LP: Windup Status	0x5E	0x01-0x10	BINARY	1	R	M	83
LP: Working Set Point	0x2D	0x01-xx	FLOAT	4	R	M,P	78
LP: Working Set Point (%)	0x6B	0x01-0x10	FLOAT	4	RW	M	84
PARAMETERS:							
LP: Approach Value High	0x0F	0x01-xx	FLOAT	4	RW	M,P	68
LP: Approach Value Low	0x10	0x01-xx	FLOAT	4	RW	M,P	69
LP: Bias (P: Manual Reset)	0x33	0x01-xx	FLOAT	4	RW	P	79
LP: Bias 1 (P: Manual Reset)	0x62	0x01-xx	FLOAT	4	RW	M,P	84
LP: Bias 2	0x68	0x01-0x10	FLOAT	4	RW	M	84
LP: Cascade 1 Select	0x5C	0x01-0x10	BINARY	1	R	M	83
LP: Cascade 2 Select	0x5D	0x01-0x10	BINARY	1	R	M	83
LP: Control Action Change	0x5A	0x01-xx	BINARY	1	R	M,P	83
LP: Control Auto/Man Selection	0x56	0x01-0x10	BINARY	1	W	M	82
LP: Control Auto/Man Selection	0x56	0x01-xx	BINARY	1	RW	P	82
LP: Control Forceback	0x39	0x01-0x10	FLOAT	4	RW	M	80
LP: Control Output Force Manual	0x57	0x01-xx	BINARY	1	R	M,P	82
LP: Control Preset Output (PID)	0x36	0x01-0x10	FLOAT	4	RW	M	79
LP: Count	0x02	0x58	BINARY	2	R	P	67
LP: Deadband	0x3B	0x01-xx	FLOAT	4	RW	M,P	80
LP: Decreasing Slew Rate Limit	0x30	0x01-xx	FLOAT	4	RW	P	79
LP: Error Square	0x35	0x01-0x10	FLOAT	4	RW	M	79
LP: Feed Forward Value	0x37	0x01-xx	FLOAT	4	RW	M,P	79
LP: Force Bumpless Trnsfr Select	0x61	0x01-0x10	BINARY	1	RW	M	83
LP: Force Local Set Point	0x54	0x01-0x10	BINARY	1	R	M	82

CONTROL LOOP PARAMETER DESCRIPTION	TYPE	ADDR	DATA FORMAT	SIZE	R/W MODE	UNIT CODE	PG.
LP: Force Off Select	0x65	0x01-0x10	BINARY	1	RW	M	84
LP: Function Block Description	0xDC	0x01-xx	TEXT	16	RW	P	95
LP: Function Block Tag	0xD4	0x01-xx	TEXT	7	RW	P	94
LP: Gain 1	0x0B	0x01-xx	FLOAT	4	RW	M,P	68
LP: Gain 2	0x09	0x01-xx	FLOAT	4	RW	M,P	68
LP: Increasing Slew Rate Limit	0x22	0x01-xx	FLOAT	4	RW	P	76
LP: Integral Hold Selection	0x5F	0x01-0x10	BINARY	1	RW	M	83
LP: Local SP Engineering Units	0x32	0x01-xx	FLOAT	4	R	M,P	79
LP: Manual Reset	0x33	0x01-0x10	FLOAT	4	RW	M	79
LP: PID Loop Type	0x6D	0x01-xx	BINARY	2	R	M,P	84
LP: Process Variable High Limit	0x2B	0x01-xx	FLOAT	4	RW	M,P	78
LP: Process Variable Low Limit	0x2C	0x01-xx	FLOAT	4	RW	M,P	78
LP: Rate 1	0x0D	0x01-xx	FLOAT	4	RW	M,P	68
LP: Rate 2	0x3A	0x01-xx	FLOAT	4	RW	M,P	80
LP: Ratio	0x6C	0x01-xx	FLOAT	4	RW	M,P	84
LP: Reset 1	0x0C	0x01-xx	FLOAT	4	RW	M,P	68
LP: Reset 2	0x0A	0x01-xx	FLOAT	4	RW	M,P	68
LP: Reset Limit	0x34	0x01-xx	FLOAT	4	RW	M,P	79
LP: Set Point Selection	0x53	0x01-0x10	BINARY	1	W	M	82
LP: Set Point Selection	0x53	0x01-xx	BINARY	1	RW	P	82
LP: Set Point Slew Rate	0x30	0x01-0x10	FLOAT	4	RW	M	79
LP: Set Point Tracking	0xA0	0x01-xx	BINARY	1	R	M,P	90
LP: Tuning Parameter Selection	0x63	0x01-xx	BINARY	1	RW	M,P	84
LP: Wild Variable	0x0E	0x01-xx	FLOAT	4	R	M,P	68
LP: Working Set Point High Limit	0x2E	0x01-xx	FLOAT	4	RW	M,P	78
LP: Working Set Point Low Limit	0x2F	0x01-xx	FLOAT	4	RW	M,P	79

PLC DATA

PLC PARAMETER DESCRIPTION	TYPE	ADDR	DATA FORMAT	SIZE	R/W MODE	UNIT CODE	PG.
INPUTS:							
PLC: Counter Count Input	0xA3	0x01-0x50	BINARY	1	R	M	91
PLC: Counter Preset Value	0x82	0x01-0x50	FLOAT	4	RW	M	87
PLC: Counter Reset Input	0xA5	0x01-0x50	BINARY	1	R	M	91
PLC: Drum Advance Step Input	0xA8	0x01-0x04	BINARY	1	R	M	91
PLC: Drum Jog Input	0xA7	0x01-0x04	BINARY	1	R	M	91
PLC: Drum Reset Input	0xA9	0x01-0x04	BINARY	1	R	M	91
PLC: Drum Run/Hold Input	0xA6	0x01-0x04	BINARY	1	R	M	91
PLC: Timer Preset Value	0x80	0x01-0x50	FLOAT	4	RW	M	87
PLC: Timer Reset Input	0xA2	0x01-0x50	BINARY	1	R	M	91
PLC: Timer Time Input	0xA1	0x01-0x50	BINARY	1	R	M	90
OUTPUTS:							
PLC: Run Status	0xAC	0x01	BINARY	1	R	M	91
PLC: Counter Current Value	0x81	0x01-0x50	FLOAT	4	R	M	87
PLC: Counter Down/Up	0xA4	0x01-0x50	BINARY	1	R	M	91
PLC: Drum 2 Outputs	0xBC	0x01-0x10	BINARY	1	R	M	92
PLC: Drum 3 Outputs	0xBD	0x01-0x10	BINARY	1	R	M	92
PLC: Drum 4 Outputs	0xBE	0x01-0x10	BINARY	1	R	M	92

PLC PARAMETER DESCRIPTION	TYPE	ADDR	DATA FORMAT	SIZE	R/W MODE	UNIT CODE	PG.
PLC: Drum Outputs (packed)	0x71	0x01-0x04	BINARY	2	R	M	85
PLC: Drum Outputs (single)	0x8F	0x01-0x10	BINARY	1	R	M	88
PLC: Drum Step Number	0x83	0x01-0x04	FLOAT	4	RW	M	87
PLC: Drum Step Time	0x84	0x01-0x04	FLOAT	4	RW	M	87
PLC: MCR Coil Status	0xAA	0x00	BINARY	1	R	M	91
PLC: Skip Coil Status	0xAB	0x01	BINARY	1	R	M	91
PLC: Timer Current Value	0x7F	0x01-0x50	FLOAT	4	R	M	87
PARAMETERS:							
PLC: Drum Jog	0x92	0x01-0x04	FLOAT	4	R	M	88

SET POINT PROGRAMMER DATA

SETPOINT PROGRAMMER PARAMETER DESCRIPTION	TYPE	ADDR	DATA FORMAT	SIZE	R/W MODE	UNIT CODE	PG.
OUTPUTS:							
SPP: #1 Current Events	0x79	0x01-0x10	BINARY	1	R	M,P	86
SPP: #2 Current Events	0x7A	0x01-0x10	BINARY	1	R	M,P	86
SPP: #3 Current Events	0x26	0x01-0x10	BINARY	1	R	M,P	77
SPP: #4 Current Events	0x27	0x01-0x10	BINARY	1	R	M,P	77
SPP: Current Step Number	0x50	0x01-xx	FLOAT	4	R	M,P	81
SPP: Output Value	0x4D	0x01-xx	FLOAT	4	R	M,P	81
SPP: Program Elapsed Time	0x4E	0x01-xx	FLOAT	4	R	M,P	81
SPP: Status	0x78	0x01-xx	BINARY	1	R	M,P	86
SPP: Step Time Remaining	0x4F	0x01-xx	FLOAT	4	R	M,P	81
PARAMETERS:							
SPP: #1 Current Recipe Index	0x9F	0x00	FLOAT	4	R	M	90
SPP: #2 Current Recipe Index	0x9F	0x01	FLOAT	4	R	M	90
SPP: #3 Current Recipe Index	0x9F	0x02	FLOAT	4	R	M	90
SPP: #4 Current Recipe Index	0x9F	0x03	FLOAT	4	R	M	90
SPP: Advance	0x76	0x01-xx	BINARY	1	W	M,P	86
SPP: Count	0x02	0x57	BINARY	2	R	P	67
SPP: Events (packed)	0x9D	0x01-xx	BINARY	2	R	M,P	90
SPP: Function Block Description	0xDD	0x01-xx	TEXT	16	RW	P	95
SPP: Function Block Tag	0xD5	0x01-xx	TEXT	7	RW	P	94
SPP: Hold	0x75	0x01-xx	BINARY	1	W	M,P	86
SPP: Jog	0x77	0x01-xx	BINARY	1	W	M	86
SPP: Jog to Segment	0x51	0x01-xx	FLOAT	4	R	M	82
SPP: Reset	0x74	0x01-xx	BINARY	1	W	M,P	86
SPP: Start	0x73	0x01-xx	BINARY	1	W	M,P	85
SPP: #1 Step Duration/Time	0x8A	0x01-0x3F	FLOAT	4	RW	P	88
SPP: #1 Step Value	0x88	0x01-0x3F	FLOAT	4	RW	P	87
SPP: #2 Step Duration/Time	0x8E	0x01-0x3F	FLOAT	4	RW	P	88
SPP: #2 Step Value	0x8C	0x01-0x3F	FLOAT	4	RW	P	88
SPP: #3 Step Duration/Time	0x24	0x01-0x3F	FLOAT	4	RW	P	77
SPP: #3 Step Value	0x1B	0x01-0x3F	FLOAT	4	RW	P	76
SPP: #4 Step Duration/Time	0xE7	0x01-0x3F	FLOAT	4	RW	P	96
SPP: #4 Step Value	0xE6	0x01-0x3F	FLOAT	4	RW	P	96
SPP: Time	0x72	0x01-xx	BINARY	3	R	M	85

SELF TUNE DATA

SELF TUNE PARAMETER DESCRIPTION	TYPE	ADDR	DATA FORMAT	SIZE	R/W MODE	UNIT CODE	PG.
INPUTS:							
Self Tune: Hold Input	0xB9	0x01	BINARY	1	R	M	92
OUTPUTS:							
Self Tune: % Complete	0xB8	0x01	FLOAT	4	R	M	92
PARAMETERS:							
Self Tune: Advance	0xB6	0x01	BINARY	1	RW	M	92
Self Tune: Current Gain	0xAD	0x01	FLOAT	4	R	M	91
Self Tune: Current Rate	0xAE	0x01	FLOAT	4	R	M	91
Self Tune: Current Reset	0xAF	0x01	FLOAT	4	R	M	91
Self Tune: Hold	0xB5	0x01	BINARY	1	RW	M	92
Self Tune: Optune Gain	0xB0	0x01	FLOAT	4	R	M	91
Self Tune: Optune Rate	0xB1	0x01	FLOAT	4	R	M	91
Self Tune: Optune Reset	0xB2	0x01	FLOAT	4	R	M	91
Self Tune: Reset	0xB4	0x01	BINARY	1	RW	M	92
Self Tune: Start	0xB3	0x01	BINARY	1	RW	M	92
Self Tune: Status	0xB7	0x01	BINARY	1	R	M	92

SYSTEM/UNIT DATA

SYSTEM/UNIT PARAMETER DESCRIPTION	TYPE	ADDR	DATA FORMAT	SIZE	R/W MODE	UNIT CODE	PG.
COMMUNICATIONS:							
Comm Configuration	0x02	0x1A	BINARY	1	RW	M,P	59
Local Station Link Status	0X02	0x2A	BINARY	6	RW	M	63
Main/Port A Comm Address	0x02	0x22	BINARY	1	R	S,M	61
Main/Port A Comm Configuration	0X02	0x23	BINARY	1	R	S,M	61
Optional/Port B Comm Address	0X02	0x24	BINARY	1	R	S,M	62
Optional/Port B Comm Config.	0X02	0x25	BINARY	1	R	S,M	62
Port A Baud Rate	0x02	0x41	BINARY	1	R	M	66
Port A Unit Address	0x02	0x40	BINARY	1	R	M	66
Port B Baud Rate	0x02	0x43	BINARY	1	R	M	66
Port B Unit Address	0x02	0x42	BINARY	1	R	M	66
Security Code – Comm Channels	0x02	0x44	BINARY	8	RW	M	66
DIAGNOSTICS:							
AI: Calibration	0x02	0x2B	BINARY	3	W	P	64
AO: Calibration	0x02	0x2C	BINARY	3	W	P	64
Copy Block (AI)	0x02	0x45	BINARY	4	W	P	66
Decrement/Escape	0x02	0x1E	BINARY	1	W	M,P	60
Diagnostic Display	0x00	0x01	TEXT	16	R	S,M	56
Diagnostic Error Status	0x14	0x01-xx	BINARY	1	R	S,M	69
Enter	0x02	0x1D	BINARY	1	W	M,P	60
Increment/Advance	0x02	0x1F	BINARY	1	W	M,P	60
Mode DIP Switch	0x02	0x21	BINARY	1	R	S,M	61

SYSTEM/UNIT PARAMETER DESCRIPTION	TYPE	ADDR	DATA FORMAT	SIZE	R/W MODE	UNIT CODE	PG.
Rack Loading AL: Time Usage	0x94	0x04	FLOAT	4	R	M	89
Rack Loading Free Space	0x94	0x01	FLOAT	4	R	M	88
Rack Loading PLC Free Space	0x94	0x06	FLOAT	4	R	M	89
Rack Loading PLC Time Usage	0x94	0x05	FLOAT	4	R	M	89
Rack Loading PP: Time Usage	0x94	0x03	FLOAT	4	R	M	89
Rack Loading Time Units	0x94	0x07	FLOAT	4	R	M	89
Rack Loading Time Usage	0x94	0x02	FLOAT	4	R	S,M	88
Slot Diagnostics	0x93	0x01-0x0F	BINARY	1	R	M	88
OUTPUTS:							
Reference Temperature	0x16	0x01-0xxx	FLOAT	4	R	P	71
Program Number	0x02	0x2E	FLOAT	4	RW	P	64
PARAMETERS:							
Card Type	0X02	0x2B-0x33	BINARY	1	R	S	63
Chart Mode	0x02	0x3C	BINARY	1	R	S	65
Chart Speed 1	0x02	0x3D	FLOAT	4	R	S	65
Chart Speed 2	0x02	0x3E	FLOAT	4	R	S	65
Chart Speed Select	0x02	0x3F	BINARY	1	RW	S	65
Chart Status	0x02	0x40	BINARY	1	RW	S	66
Clock	0x02	0x2F	BINARY	7	RW	P	65
Configuration Download	0x02	0xC0	TEXT	---	W	P	97
Configuration Index	0x02	0x2D	BINARY	1	W	P	64
Configuration Upload	0x02	0xC1	BINARY	---	W	P	98
Configuration Upload	0x02	0xC2	TEXT	---	R	P	98
CPU Type	0x02	0x65	BINARY	1	R	P	67
Database Programming	0x20	0x00	---	---	RW	S,M	76
Dynamic Packet Definition	0x29	0x00-0x04	---	---	RW	S,M	78
Dynamic Packet Definition	0x29	0x04	---	---	RW	P	78
Dynamic Packet/Block Access	0x2A	0x00-0x04	---	---	RW	S,M	78
Dynamic Packet/Block Access	0x2A	0x04	---	---	RW	P	78
Firmware Part Number	0x01	0x00-0x03	TEXT	16	R	M,P	56
Local Relays	0X02	0x27	BINARY	1	RW	M	62
Local Time	0x1D	0x00	BINARY	3	RW	S,M,P	75
Mains Frequency	0x02	0x30	BINARY	1	RW	P	65
Packet 10 - Card Types	0x19	0x09	BLOCK	23	R	M	74
Packet 10 - Card Types	0x19	0x19	BLOCK	17	R	S	75
Packet 11 - Diagnostics	0x19	0x0A	BLOCK	23	R	M	74
Packet 11 - Diagnostics	0x19	0x1A	BLOCK	60	R	S	75
Packet 4 - Simple Poll	0x19	0x03	BLOCK	26-326	R	S,M,P	72
Rack Card Type	0x02	0x03-0x11	BINARY	1	R	M	58
Rack Card Type	0x02	0x-03-0x12	BINARY	1	R	P	58
Response Queue	0x9E	0x00	BINARY	1-301	R	S,M	90
Security Access Groups - Local	0x02	0x1C	BINARY	1	RW	M	60
Security Access Groups - PMC	0x02	0x1B	BINARY	1	RW	M	59
Unit Type	0x00	0x00	TEXT	16	R	S,M,P	56
Update Rate	0x02	0x01	BINARY	1	R	S,M,P	57
STATUS:							
Data Base Status	0X02	0x26	BINARY	2	RW	M	62
Local Station 1 Storage	0X02	0x28	BINARY	6	RW	M	62
Local Station 2 Storage	0X02	0x29	BINARY	6	RW	M	62
Operation Status	0x02	0x20	BINARY	1	W	S,M	60

SYSTEM/UNIT PARAMETER DESCRIPTION	TYPE	ADDR	DATA FORMAT	SIZE	R/W MODE	UNIT CODE	PG.
Operation Status	0x02	0x20	BINARY	1	RW	P	60
Profile Count	0x02	0x63	BINARY	2	R	P	67
System Status	0x02	0x00	BINARY	4	R	S,M,P	56

TOTALIZER DATA

TOTALIZER PARAMETER DESCRIPTION	TYPE	ADDR	DATA FORMAT	SIZE	R/W MODE	UNIT CODE	PG.
OUTPUTS:							
TL: Output Status	0x86	0x01-xx	BINARY	1	R	P	87
TL: Output Value	0x1C	0x01-xx	FLOAT	4	R	P	76
PARAMETERS:							
TL: Count	0x02	0x60	BINARY	2	R	P	67
TL: Engineering Units Text	0xE0	0x01-xx	TEXT	6	R	P	95
TL: Function Block Description	0xDE	0x01-xx	TEXT	16	RW	P	95
TL: Function Block Tag	0xDF	0x01-xx	TEXT	7	RW	P	95

Sorted by Communication Type

PARAMETER DESCRIPTION	TYPE	ADDR	DATA FORMAT	SIZE	R/W MODE	UNIT CODE	PAGE
Unit Type	0x00	0x00	TEXT	16	R	S,M,P	56
Diagnostic Display	0x00	0x01	TEXT	16	R	S,M	56
Firmware Part Number	0x01	0x00-0x03	TEXT	16	R	M,P	56
System Status	0x02	0x00	BINARY	4	R	S,M,P	56
Update Rate	0x02	0x01	BINARY	1	R	S,M,P	57
Rack Card Type	0x02	0x03-0x11	BINARY	1	R	M	58
Rack Card Type	0x02	0x03-0x12	BINARY	1	R	P	58
AO Card Type	0x02	0x12-0x19	BINARY	1	R	M	59
Comm Configuration	0x02	0x1A	BINARY	1	RW	M,P	59
Security Access Groups - PMC	0x02	0x1B	BINARY	1	RW	M	59
Security Access Groups - Local	0x02	0x1C	BINARY	1	RW	M	60
Enter	0x02	0x1D	BINARY	1	W	M,P	60
Decrement/Escape	0x02	0x1E	BINARY	1	W	M,P	60
Increment/Advance	0x02	0x1F	BINARY	1	W	M,P	60
Operation Status	0x02	0x20	BINARY	1	W	S,M	60
Operation Status	0x02	0x20	BINARY	1	RW	P	60
Mode DIP Switch	0x02	0x21	BINARY	1	R	S,M	61
Main/Port A Comm Address	0x02	0x22	BINARY	1	R	S,M	61
Main/Port A Comm Configuration	0X02	0x23	BINARY	1	R	S,M	61
Optional/Port B Comm Address	0X02	0x24	BINARY	1	R	S,M	62
Optional/Port B Comm Config.	0X02	0x25	BINARY	1	R	S,M	62
Data Base Status	0X02	0x26	BINARY	2	RW	M	62
Local Relays	0X02	0x27	BINARY	1	RW	M	62
Local Station 1 Storage	0X02	0x28	BINARY	6	RW	M	62
Local Station 2 Storage	0X02	0x29	BINARY	6	RW	M	62
Local Station Link Status	0X02	0x2A	BINARY	6	RW	M	63
Card Type	0X02	0x2B-0x33	BINARY	1	R	S	63
AI: Calibration	0x02	0x2B	BINARY	3	W	P	64
AO: Calibration	0x02	0x2C	BINARY	3	W	P	64
Configuration Index	0x02	0x2D	BINARY	1	W	P	64
Program Number	0x02	0x2E	FLOAT	4	RW	P	64
Clock	0x02	0x2F	BINARY	7	RW	P	65
Mains Frequency	0x02	0x30	BINARY	1	RW	P	65
AO Card Type	0x02	0x34-0x3B	BINARY	1	R	S	65
Chart Mode	0x02	0x3C	BINARY	1	R	S	65
Chart Speed 1	0x02	0x3D	FLOAT	4	R	S	65
Chart Speed 2	0x02	0x3E	FLOAT	4	R	S	65
Chart Speed Select	0x02	0x3F	BINARY	1	RW	S	65
Chart Status	0x02	0x40	BINARY	1	RW	S	66
Port A Unit Address	0x02	0x40	BINARY	1	R	M	66
Port A Baud Rate	0x02	0x41	BINARY	1	R	M	66
Port B Unit Address	0x02	0x42	BINARY	1	R	M	66
Port B Baud Rate	0x02	0x43	BINARY	1	R	M	66
Security Code - Comm Channels	0x02	0x44	BINARY	8	RW	M	66
Copy Block (AI)	0x02	0x45	BINARY	4	W	P	66
AI: Count	0x02	0x51	BINARY	2	R	P	66
AO: Count	0x02	0x52	BINARY	2	R	P	66
DI: Count	0x02	0x53	BINARY	2	R	P	66
DO: Count	0x02	0x54	BINARY	2	R	P	66

PARAMETER DESCRIPTION	TYPE	ADDR	DATA FORMAT	SIZE	R/W MODE	UNIT CODE	PAGE
CN: Count	0x02	0x55	BINARY	2	R	P	66
AL: Count	0x02	0x56	BINARY	2	R	P	67
SPP: Count	0x02	0x57	BINARY	2	R	P	67
LP: Count	0x02	0x58	BINARY	2	R	P	67
CV: Count	0x02	0x59	BINARY	2	R	P	67
TL: Count	0x02	0x60	BINARY	2	R	P	67
Profile Count	0x02	0x63	BINARY	2	R	P	67
CPU Type	0x02	0x65	BINARY	1	R	P	67
Configuration Download	0x02	0xC0	TEXT	---	W	P	67
Configuration Upload	0x02	0xC1	BINARY	---	W	P	98
Configuration Upload	0x02	0xC2	TEXT	---	R	P	98
LP: Process Variable	0x03	0x01-xx	FLOAT	4	R	M,P	67
LP: Local Set Point (SP1)	0x04	0x01-xx	FLOAT	4	RW	M,P	68
LP: Remote Set Point (SP2)	0x05	0x01-xx	FLOAT	4	RW	M,P	68
LP: Deviation	0x06	0x01-xx	FLOAT	4	R	M,P	68
AI: Output Value	0x07	0x01-xx	FLOAT	4	R	S,M,P	68
LP: Output Value	0x08	0x01-0x10	FLOAT	4	R	M	68
LP: Output Value	0x08	0x01-xx	FLOAT	4	RW	P	68
LP: Gain 2	0x09	0x01-xx	FLOAT	4	RW	M,P	68
LP: Reset 2	0x0A	0x01-xx	FLOAT	4	RW	M,P	68
LP: Gain 1	0x0B	0x01-xx	FLOAT	4	RW	M,P	68
LP: Reset 1	0x0C	0x01-xx	FLOAT	4	RW	M,P	68
LP: Rate 1	0x0D	0x01-xx	FLOAT	4	RW	M,P	68
LP: Wild Variable	0x0E	0x01-xx	FLOAT	4	R	M,P	68
LP: Approach Value High	0x0F	0x01-xx	FLOAT	4	RW	M,P	68
LP: Approach Value Low	0x10	0x01-xx	FLOAT	4	RW	M,P	69
AL: Set Point	0x11	0x01-xx	FLOAT	4	RW	S,M,P	69
AL: Output Status	0x12	0x01-xx	BINARY	1	R	S,M,P	69
AL: Hysteresis	0x13	0x00	FLOAT	4	R	M	69
AL: Hysteresis	0x13	0x01-xx	FLOAT	4	RW	P	69
Diagnostic Error Status	0x14	0x01-xx	BINARY	1	R	S,M	69
AI: Adjustment Value	0x15	0x01-xx	FLOAT	4	RW	S,M,P	71
SY: Reference Temperature	0x16	0x01	FLOAT	4	R	P	71
CN: Packet 1-25 (Recipe #1)	0x17	0x00	BLOCK	100	RW	M	71
CN: Packet 26-50 (Recipe #2)	0x17	0x01	BLOCK	100	RW	M	71
CN: Packet 51-100	0x17	0x02	BLOCK	200	RW	M	71
CN: Packet 101-125 (Recipe #3)	0x17	0x03	BLOCK	100	RW	M	71
CN: Packet 126-150 (Recipe #4)	0x17	0x04	BLOCK	100	RW	M	71
CN: Packet 151-200	0x17	0x05	BLOCK	200	RW	M	71
CN: Packet 1-200	0x17	0x06	BLOCK	800	RW	M	71
AI: Packet 1 - AI Output	0x19	0x00	BLOCK	300	R	M	71
CV:/PP: Packet 2 - CV/PP Output	0x19	0x01	BLOCK	1016	R	M	72
CV:/PP: Packet 3 - CV/PP Output	0x19	0x02	BLOCK	1020	R	M	72
Packet 4 - Simple Poll	0x19	0x03	BLOCK	26-326	R	S,M,P	72
AL: Packet 5 - AL Status Packed	0x19	0x04	BLOCK	19	R	S,M	72
AI: Packet 6 - AI Status	0x19	0x05	BLOCK	75	R	M	72
DI: Packet 7 - DI Output	0x19	0x06	BLOCK	30	R	M	73
DO: Packet 8 - DO Output	0x19	0x07	BLOCK	30	R	M	73
CR: Packet 9 - CR: 1-999 Output	0x19	0x08	BLOCK	134	R	M	74
Packet 10 - Card Types	0x19	0x09	BLOCK	23	R	M	74
Packet 11 - Diagnostics	0x19	0x0A	BLOCK	23	R	M	74

PARAMETER DESCRIPTION	TYPE	ADDR	DATA FORMAT	SIZE	R/W MODE	UNIT CODE	PAGE
AI: Packet 1 - AI Output	0x19	0x12	BLOCK	540	R	S	74
CV:/PP: Packet 2 - CV/PP Output	0x19	0x13	BLOCK	240	R	S	74
AI: Packet 6 - AI Status	0x19	0x16	BLOCK	135	R	S	74
DI: Packet 7 - DI Output	0x19	0x17	BLOCK	18	R	S	75
DO: Packet 8 - DO Output	0x19	0x18	BLOCK	18	R	S	75
Packet 10 - Card Types	0x19	0x19	BLOCK	17	R	S	75
Packet 11 - Diagnostics	0x19	0x1A	BLOCK	60	R	S	75
AI: Raw Value	0x1A	0x01-xx	FLOAT	4	R	P	75
SPP: #3 Step Value	0x1B	0x01-0x3F	FLOAT	4	RW	P	76
TL: Output Value	0x1C	0x01-xx	FLOAT	4	R	P	76
Local Time	0x1D	0x00	BINARY	3	RW	S,M,P	75
CV:/PP: Output Value (1-255)	0x1E	0x01-xx	FLOAT	4	R	S,M,P	76
CV/PP: Output Value (256-511)	0x1F	0x01-0xFF	FLOAT	4	R	M	76
Database Programming	0x20	0x00	---	---	RW	S,M	76
DI: Output Status	0x21	0x01-xx	BINARY	1	RW	S,M,P	76
LP: Increasing Slew Rate Limit	0x22	0x01-xx	FLOAT	4	RW	P	76
DO: Output Status	0x23	0x01-xx	BINARY	1	RW	S,M,P	76
SPP: #3 Step Duration/Time	0x24	0x01-0x3F	FLOAT	4	RW	P	77
CN: Value	0x25	0x01-xx	FLOAT	4	RW	S,M,P	77
SPP: #3 Current Events	0x26	0x01-0x10	BINARY	1	R	M	77
SPP: #4 Current Events	0x27	0x01-0x10	BINARY	1	R	M	77
AI: Point Status/Assignment	0x28	0x01-xx	BINARY	1	R	S,M,P	77
Dynamic Packet Definition	0x29	0x00-0x04	---	---	RW	S,M	78
Dynamic Packet Definition	0x29	0x04	---	---	RW	P	78
Dynamic Packet/Block Access	0x2A	0x00-0x04	---	---	RW	S,M	78
Dynamic Packet/Block Access	0x2A	0x04	---	---	RW	P	78
LP: Process Variable High Limit	0x2B	0x01-xx	FLOAT	4	RW	M,P	78
LP: Process Variable Low Limit	0x2C	0x01-xx	FLOAT	4	RW	M,P	78
LP: Working Set Point	0x2D	0x01-xx	FLOAT	4	R	M,P	78
LP: Working Set Point High Limit	0x2E	0x01-xx	FLOAT	4	RW	M,P	78
LP: Working Set Point Low Limit	0x2F	0x01-xx	FLOAT	4	RW	M,P	79
LP: Set Point Slew Rate	0x30	0x01-0x10	FLOAT	4	RW	M	79
LP: Decreasing Slew Rate Limit	0x30	0x01-xx	FLOAT	4	RW	P	79
LP: Back Calc Output Value	0x31	0x01-xx	FLOAT	4	R	M,P	79
LP: Local SP Engineering Units	0x32	0x01-xx	FLOAT	4	R	M,P	79
LP: Manual Reset	0x33	0x01-0x10	FLOAT	4	RW	M	79
LP: Bias (P: Manual Reset)	0x33	0x01-xx	FLOAT	4	RW	P	79
LP: Reset Limit	0x34	0x01-xx	FLOAT	4	RW	M,P	79
LP: Error Square	0x35	0x01-0x10	FLOAT	4	RW	M	79
LP: Control Preset Output (PID)	0x36	0x01-0x10	FLOAT	4	RW	M	79
AO: Failsafe/Preset Value	0x36	0x01-xx	FLOAT	4	RW	P	79
LP: Feed Forward Value	0x37	0x01-xx	FLOAT	4	RW	M,P	79
LP: Control Feedback Value	0x38	0x01-xx	FLOAT	4	R	M,P	79
LP: Control Forceback	0x39	0x01-0x10	FLOAT	4	RW	M	80
LP: Rate 2	0x3A	0x01-xx	FLOAT	4	RW	M,P	80
LP: Deadband	0x3B	0x01-xx	FLOAT	4	RW	M,P	80
LP: Manual Output Value	0x3C	0x01-xx	FLOAT	4	RW	M,P	80
AO: Input Source/Set Point	0x3D	0x01-xx	FLOAT	4	R	S,M,P	80
AO: Output Value	0x3E	0x01-xx	FLOAT	4	R	S,M,P	80
AO: Slidewire	0x3F	0x01-xx	FLOAT	4	R	M,P	80
AO: Process Variable High Lim	0x40	0x01-xx	FLOAT	4	RW	S,M,P	80

PARAMETER DESCRIPTION	TYPE	ADDR	DATA FORMAT	SIZE	R/W MODE	UNIT CODE	PAGE
AO: Process Variable Low Lim	0x41	0x01-xx	FLOAT	4	RW	S,M,P	80
AO: Impulse Time	0x42	0x01-xx	FLOAT	4	RW	M,P	80
AO: Minimum ON Time	0x43	0x01-xx	FLOAT	4	RW	M,P	80
AO: Minimum OFF Time	0x44	0x01-xx	FLOAT	4	RW	M,P	80
AO: Slew Rate Time	0x45	0x01-0x10	FLOAT	4	RW	M	80
AO: Increasing Slew Rate Limit	0x45	0x01-xx	FLOAT	4	RW	P	80
AO: Drive Unit Sensitivity	0x46	0x01-xx	FLOAT	4	RW	M,P	81
LP: Control Feedback 1 Value	0x47	0x01-xx	FLOAT	4	R	M,P	81
LP: Control Feedback 2 Value	0x48	0x01-0x10	FLOAT	4	R	M	81
CV: Back Calc Input Value	0x48	0x01-xx	FLOAT	4	R	P	81
CV:/PP: Output High Limit	0x49	0x01-xx	FLOAT	4	RW	S,M	81
CV:/PP: Output High Limit	0x49	0x01-xx	FLOAT	4	R	P	81
AO: Failsafe/Preset 1 Value	0x4A	0x01-xx	FLOAT	4	RW	M,P	81
CV:/PP: Output Low Limit	0x4B	0x01-xx	FLOAT	4	RW	S,M	81
CV:/PP: Output Low Limit	0x4B	0x01-xx	FLOAT	4	R	P	81
AO: Decreasing Slew Rate Limit	0x4C	0x01-xx	FLOAT	4	RW	P	81
SPP: Output Value	0x4D	0x01-xx	FLOAT	4	R	M,P	81
SPP: Program Elapsed Time	0x4E	0x01-xx	FLOAT	4	R	M,P	81
SPP: Step Time Remaining	0x4F	0x01-xx	FLOAT	4	R	M,P	81
SPP: Current Step Number	0x50	0x01-xx	FLOAT	4	R	M,P	81
SPP: Jog to Segment	0x51	0x01-xx	FLOAT	4	R	M	82
LP: Set Point Status	0x52	0x01-0x10	BINARY	1	R	M	82
LP: Set Point Status	0x52	0x01-xx	BINARY	1	RW	P	82
LP: Set Point Selection	0x53	0x01-0x10	BINARY	1	W	M	82
LP: Set Point Selection	0x53	0x01-xx	BINARY	1	RW	P	82
LP: Force Local Set Point	0x54	0x01-0x10	BINARY	1	R	M	82
LP: Control Auto/Manual Status	0x55	0x01-0x10	BINARY	1	R	M	82
LP: Control Auto/Manual Status	0x55	0x01-xx	BINARY	1	RW	P	82
LP: Control Auto/Man Selection	0x56	0x01-0x10	BINARY	1	W	M	82
LP: Control Auto/Man Selection	0x56	0x01-xx	BINARY	1	RW	P	82
LP: Control Output Force Manual	0x57	0x01-xx	BINARY	1	R	M,P	82
LP: Control Action Status	0x58	0x01-xx	BINARY	1	R	M,P	82
LP: Control Action Selection	0x59	0x01-xx	BINARY	1	W	M,P	83
LP: Control Action Change	0x5A	0x01-xx	BINARY	1	R	M,P	83
LP: Cascade Status	0x5B	0x01-0x10	BINARY	1	R	M	83
LP: Cascade 1 Select	0x5C	0x01-0x10	BINARY	1	R	M	83
LP: Cascade 2 Select	0x5D	0x01-0x10	BINARY	1	R	M	83
LP: Windup Status	0x5E	0x01-0x10	BINARY	1	R	M	83
LP: Integral Hold Selection	0x5F	0x01-0x10	BINARY	1	RW	M	83
LP: Integral Hold Status	0x60	0x01-0x10	BINARY	1	R	M	83
LP: Force Bumpless Trnsfr Select	0x61	0x01-0x10	BINARY	1	RW	M	83
LP: Bias 1 (P: Manual Reset)	0x62	0x01-xx	FLOAT	4	RW	M,P	84
LP: Tuning Parameter Selection	0x63	0x01-xx	BINARY	1	RW	M,P	84
LP: Tuning Parameter Status	0x64	0x01-xx	BINARY	1	R	M,P	84
LP: Force Off Select	0x65	0x01-0x10	BINARY	1	RW	M	84
LP: Output ON/OFF Status	0x66	0x01-0x10	BINARY	1	R	M	84
LP: Output ON/OFF Status	0x66	0x01-xx	BINARY	1	RW	P	84
LP: Self Tune Process Variable	0x67	0x01-0x10	FLOAT	4	R	M	84
LP: Bias 2	0x68	0x01-0x10	FLOAT	4	RW	M	84
LP: Output 1	0x69	0x01-xx	FLOAT	4	RW	M,P	84
LP: Output 2	0x6A	0x01-0x10	FLOAT	4	RW	M	84

PARAMETER DESCRIPTION	TYPE	ADDR	DATA FORMAT	SIZE	R/W MODE	UNIT CODE	PAGE
LP: Working Set Point (%)	0x6B	0x01-0x10	FLOAT	4	RW	M	84
LP: Ratio	0x6C	0x01-xx	FLOAT	4	RW	M,P	84
LP: PID Loop Type	0x6D	0x01-xx	BINARY	2	R	M,P	84
AO: Output Increasing	0x6E	0x01-0x10	BINARY	1	R	M	85
AO: Output Decreasing	0x6F	0x01-0x10	BINARY	1	R	M	85
AO: Drive Unit Speed	0x70	0x01-xx	FLOAT	4	RW	M,P	85
PLC: Drum Outputs (packed)	0x71	0x01	BINARY	2	R	M	85
SPP: Time	0x72	0x01-xx	BINARY	3	R	M	85
SPP: Start	0x73	0x01-xx	BINARY	1	W	M,P	85
SPP: Reset	0x74	0x01-xx	BINARY	1	W	M,P	86
SPP: Hold	0x75	0x01-xx	BINARY	1	W	M,P	86
SPP: Advance	0x76	0x01-xx	BINARY	1	W	M,P	86
SPP: Jog	0x77	0x01-xx	BINARY	1	W	M	86
SPP: Status	0x78	0x01-xx	BINARY	1	R	M,P	86
SPP: #1 Current Events	0x79	0x01-0x10	BINARY	1	R	M,P	86
SPP: #2 Current Events	0x7A	0x01-0x10	BINARY	1	R	M	86
CR: Control Relays Output	0x7B	0x01-0xFF	BINARY	1	R	M	86
CR: Block 2	0x7C	0x00-0xFF	BINARY	1	R	M	87
CR: Block 3	0x7D	0x00-0xFF	BINARY	1	R	M	87
CR: Block 4	0x7E	0x00-0xE7	BINARY	1	R	M	87
PLC: Timer Current Value	0x7F	0x01-0x50	FLOAT	4	R	M	87
PLC: Timer Preset Value	0x80	0x01-0x50	FLOAT	4	RW	M	87
PLC: Counter Current Value	0x81	0x01-0x50	FLOAT	4	R	M	87
PLC: Counter Preset Value	0x82	0x01-0x50	FLOAT	4	RW	M	87
PLC: Drum Step Number	0x83	0x01	FLOAT	4	RW	M	87
PLC: Drum Step Time	0x84	0x01	FLOAT	4	RW	M	87
CV:/PP: Output Status	0x85	0x01-xx	BINARY	1	R	S,M,P	87
TL: Output Status	0x86	0x01-xx	BINARY	1	R	P	87
CV:/PP: Output Status 2	0x87	0x01-xx	BINARY	1	R	S,M	87
SPP: #1 Step Value	0x88	0x01-0x3F	FLOAT	4	RW	P	87
CV:/PP: Output Status 3	0x89	0x01-xx	BINARY	1	R	S,M	87
SPP: #1 Step Duration/Time	0x8A	0x01-0x3F	FLOAT	4	RW	P	88
CV:/PP: Output Status 4	0x8B	0x01-xx	BINARY	1	R	S,M	88
SPP: #2 Step Value	0x8C	0x01-0x3F	FLOAT	4	RW	P	88
CV:/PP: Limit Clamp	0x8D	0x01-xx	BINARY	1	R	S,M	88
SPP: #2 Step Duration/Time	0x8E	0x01-0x3F	FLOAT	4	RW	P	88
PLC: Drum Outputs (single)	0x8F	0x01-0x10	BINARY	1	R	M	88
AO: Output High Limit	0x90	0x01-xx	FLOAT	4	RW	S,M,P	88
AO: Output Low Limit	0x91	0x01-xx	FLOAT	4	RW	S,M,P	88
PLC: Drum Jog	0x92	0x01	FLOAT	4	R	M	88
Slot Diagnostics	0x93	0x01-0x0F	BINARY	1	R	M	88
Rack Loading Free Space	0x94	0x01	FLOAT	4	R	M	88
Rack Loading Time Usage	0x94	0x02	FLOAT	4	R	S,M	88
Rack Loading PP: Time Usage	0x94	0x03	FLOAT	4	R	M	89
Rack Loading AL: Time Usage	0x94	0x04	FLOAT	4	R	M	89
Rack Loading PLC Time Usage	0x94	0x05	FLOAT	4	R	M	89
Rack Loading PLC Free Space	0x94	0x06	FLOAT	4	R	M	89
Rack Loading Time Units	0x94	0x07	FLOAT	4	R	M	89
AI: Default Value	0x95	0x01-xx	FLOAT	4	R	S,M	89
LP: Carbon; Sensor	0x96	0x01-0x10	FLOAT	4	R	M	89
LP: Carbon; Furnace Temp	0x97	0x01-0x10	FLOAT	4	R	M	89

PARAMETER DESCRIPTION	TYPE	ADDR	DATA FORMAT	SIZE	R/W MODE	UNIT CODE	PAGE
LP: Carbon; CO Compensation	0x98	0x01-0x10	FLOAT	4	R	M	89
LP: Carbon; Furnace Factor	0x99	0x01-0x10	FLOAT	4	R	M	89
LP: Carbon; Optional Selection	0x9A	0x01-0x10	BINARY	1	R	M	89
AI: RJ Compensation	0x9B	0x01-xx	FLOAT	4	R	S,M,P	89
AI: Output Values and Status	0x9C	0x01-xx	float+byte	5	R	S,M,P	89
SPP: Events (packed)	0x9D	0x01-xx	BINARY	2	R	M,P	90
Response Queue	0x9E	0x00	BINARY	1-301	R	S,M	90
SPP: #1 Current Recipe Index	0x9F	0x00	FLOAT	4	R	M	90
SPP: #2 Current Recipe Index	0x9F	0x01	FLOAT	4	R	M	90
SPP: #3 Current Recipe Index	0x9F	0x02	FLOAT	4	R	M	90
SPP: #4 Current Recipe Index	0x9F	0x03	FLOAT	4	R	M	90
LP: Set Point Tracking	0xA0	0x01-xx	BINARY	1	R	M,P	90
PLC: Timer Time Input	0xA1	0x01-0x50	BINARY	1	R	M	90
PLC: Timer Reset Input	0xA2	0x01-0x50	BINARY	1	R	M	91
PLC: Counter Count Input	0xA3	0x01-0x50	BINARY	1	R	M	91
PLC: Counter Down/Up	0xA4	0x01-0x50	BINARY	1	R	M	91
PLC: Counter Reset Input	0xA5	0x01-0x50	BINARY	1	R	M	91
PLC: Drum Run/Hold Input	0xA6	0x01	BINARY	1	R	M	91
PLC: Drum Jog Input	0xA7	0x01	BINARY	1	R	M	91
PLC: Drum Advance Step Input	0xA8	0x01	BINARY	1	R	M	91
PLC: Drum Reset Input	0xA9	0x01	BINARY	1	R	M	91
PLC: MCR Coil Status	0xAA	0x00	BINARY	1	R	M	91
PLC: Skip Coil Status	0xAB	0x01	BINARY	1	R	M	91
PLC: Run Status	0xAC	0x01	BINARY	1	R	M	91
Self Tune: Current Gain	0xAD	0x01	FLOAT	4	R	M	91
Self Tune: Current Rate	0xAE	0x01	FLOAT	4	R	M	91
Self Tune: Current Reset	0xAF	0x01	FLOAT	4	R	M	91
Self Tune: Optune Gain	0xB0	0x01	FLOAT	4	R	M	91
Self Tune: Optune Rate	0xB1	0x01	FLOAT	4	R	M	91
Self Tune: Optune Reset	0xB2	0x01	FLOAT	4	R	M	91
Self Tune: Start	0xB3	0x01	BINARY	1	RW	M	92
Self Tune: Reset	0xB4	0x01	BINARY	1	RW	M	92
Self Tune: Hold	0xB5	0x01	BINARY	1	RW	M	92
Self Tune: Advance	0xB6	0x01	BINARY	1	RW	M	92
Self Tune: Status	0xB7	0x01	BINARY	1	R	M	92
Self Tune: % Complete	0xB8	0x01	FLOAT	4	R	M	92
Self Tune: Hold Input	0xB9	0x01	BINARY	1	R	M	92
AI: Range Low	0xBA	0x01-xx	FLOAT	4	R	S,M,P	92
AI: Range High	0xBB	0x01-xx	FLOAT	4	R	S,M,P	92
PLC: Drum 2 Outputs	0xBC	0x01-0x10	BINARY	1	R	M	92
PLC: Drum 3 Outputs	0xBD	0x01-0x10	BINARY	1	R	M	92
PLC: Drum 4 Outputs	0xBE	0x01-0x10	BINARY	1	R	M	92
AI: Function Block Description	0xC0	0x01-xx	TEXT	14	RW	S,P	92
AO: Function Block Description	0xC1	0x01-xx	TEXT	14	RW	S,P	92
CV:/PP: Function Block Descr.	0xC2	0x01-xx	TEXT	14	RW	S,P	92
CN: Function Block Description	0xC3	0x01-xx	TEXT	14	RW	S,P	92
DI: Function Block Description	0xC4	0x01-xx	TEXT	14	RW	S,P	93
DO: Function Block Description	0xC5	0x01-xx	TEXT	14	RW	S,P	93
AI: Function Block Tag	0xC6	0x01-xx	TEXT	7	RW	S,P	93
AO: Function Block Tag	0xC7	0x01-xx	TEXT	7	RW	S,P	93
CV:/PP: Function Block Tag	0xC8	0x01-xx	TEXT	7	RW	S,P	93

PARAMETER DESCRIPTION	TYPE	ADDR	DATA FORMAT	SIZE	R/W MODE	UNIT CODE	PAGE
CN: Function Block Tag	0xC9	0x01-xx	TEXT	7	RW	S,P	93
DI: Function Block Tag	0xCA	0x01-xx	TEXT	7	RW	S,P	93
DO: Function Block Tag	0xCB	0x01-xx	TEXT	7	RW	S,P	93
AI: Engineering Units Text	0xCC	0x01-0x87	TEXT	6	RW	S	93
AI: Engineering Units Text	0xCC	0x01-xx	TEXT	6	R	P	93
CV:/PP: Engineering Units Text	0xCD	0x01-0x3C	TEXT	6	RW	S	93
CV:/PP: Engineering Units Text	0xCD	0x01-xx	TEXT	6	R	P	93
DI: On Label Text	0xCE	0x01-0x87	TEXT	6	RW	S	93
DI: On Label Text	0xCE	0x01-xx	TEXT	6	R	P	93
DO: On Label Text	0xCF	0x01-0x87	TEXT	6	RW	S	94
DO: On Label Text	0xCF	0x01-xx	TEXT	6	R	P	94
DI: Off Label Text	0xD0	0x01-0x87	TEXT	6	RW	S	94
DI: Off Label Text	0xD0	0x01-xx	TEXT	6	R	P	94
DO: Off Label Text	0xD1	0x01-0x87	TEXT	6	RW	S	94
DO: Off Label Text	0xD1	0x01-xx	TEXT	6	R	P	94
DI: On/Off Label Text	0xD2	0x01-xx	TEXT	6	R	S,P	94
DO: On/Off Label Text	0xD3	0x01-xx	TEXT	6	R	S,P	94
LP: Function Block Tag	0xD4	0x01-xx	TEXT	7	RW	P	94
SPP: Function Block Tag	0xD5	0x01-xx	TEXT	7	RW	P	94
AI: Function Block Description	0xD6	0x01-xx	TEXT	16	RW	P	94
AO: Function Block Description	0xD7	0x01-xx	TEXT	16	RW	P	94
CV:/PP: Function Block Descr.	0xD8	0x01-xx	TEXT	16	RW	P	94
CN: Function Block Description	0xD9	0x01-xx	TEXT	16	RW	P	94
DI: Function Block Description	0xDA	0x01-xx	TEXT	16	RW	P	95
DO: Function Block Description	0xDB	0x01-xx	TEXT	16	RW	P	95
LP: Function Block Description	0xDC	0x01-xx	TEXT	16	RW	P	95
SPP: Function Block Description	0xDD	0x01-xx	TEXT	16	RW	P	95
TL: Function Block Description	0xDE	0x01-xx	TEXT	16	RW	P	95
TL: Function Block Tag	0xDF	0x01-xx	TEXT	7	RW	P	95
TL: Engineering Units Text	0xE0	0x01-xx	TEXT	6	R	P	95
AL: Function Block Description	0xE1	0x01-xx	TEXT	16	RW	P	95
AL: Function Block Tag	0xE2	0x01-xx	TEXT	7	RW	P	95
AL: On Label Text	0xE3	0x01-xx	TEXT	6	R	P	95
AL: Off Label Text	0xE4	0x01-xx	TEXT	6	R	P	95
AL: On/Off Label Text	0xE5	0x01-xx	TEXT	6	R	P	95
SPP: #4 Step Value	0xE6	0x01-0x3F	FLOAT	4	RW	P	96
SPP: #4 Step Duration/Time	0xE7	0x01-0x3F	FLOAT	4	RW	P	96

12. Application NAK Summary

Whenever an error occurs at its Application level, the Unit (Slave) responds with a message containing an A-NAK and corresponding reason code for the error. The following table lists all reason codes and associated text descriptions.

REASON CODE	DESCRIPTION
001	INVALID OR UNRECOGNIZABLE MESSAGE
002	UNIT NOT IN CORRECT MODE TO RECEIVE A PACKET, PROGRAM, OR RECIPE LOAD 11 Operator attempted to configure a Pseudo-Point, analog range, control loop, etc., but the unit was not in the Program Mode. 12 Communications attempted to operate the INC, DEC, or ENTER key functions while the unit was not in the Cal/Test Mode.
003	READ/WRITE VIOLATION - PARTICULAR ACCESS IS NOT ALLOWED 13 Communications attempted to operate the INC, DEC, or ENTER key functions on the unit using an invalid data byte code.
004	BUSY/NOT READY TO RECEIVE TRANSMISSION 14 This error is returned when the operator initiates a configuration download to the Local Station(s). It is only a problem if the error occurs more than once during a single configuration download.
005	VALUE OUTSIDE ALLOWABLE LIMITS 15 Operator attempted to write a value that is outside either program limits or allowable limits.
006	CANNOT WRITE DUE TO DIAGNOSTIC ERROR
007	NO DATA AVAILABLE - UNIT HAS NO DATA FOR REQUEST 16 Indicates that there is no data to be transmitted in response to a Simple Poll request.
008	OPTION NOT PRESENT: OPTION PROM NOT PRESENT OR WRONG OPTION 17 Operator attempted to program an Analog Output which is not physically present in the unit. 18 Pseudo Point programming (internal error): Communications attempted to schedule a control loop with an unrecognized loop-type code. 19 The “PID present” bit is not set in System Status (Type 02, Address 00) when a Loop Compare equation is written to the unit.
009	IMPROPER DATA FIELD LENGTH 20 Too much or too little data to write 21 A communications message contained an invalid data-byte count.
010	INVALID MODE BYTE 22 A communications message contained an invalid code in the mode byte.
011	INVALID TYPE BYTE 23 A communications message contained an invalid code in the type byte.
012	INVALID ADDRESS BYTE 24 A communications message contained an invalid address code in the address byte.
013	WRITE VIA CURRENT POINT NOT ALLOWED 25 The operator attempted to change a value (e.g., a control Setpoint, gain, rate, reset) which has been redirected to point to a write-protected variable (e.g., an Analog Input, a Pseudo Point).
014	INVALID FLOATING POINT NUMBER FORMAT 26 A communications message contained a floating point value with an illegal value or format.
015	ERROR GROUP HAS INVALID TYPE 27 The operator attempted to configure an alarm or event for a discrete element which is not present in the unit. 28 The host computer has attempted to create a dynamic packet which contains analog or discrete elements which are not present in the unit database.
016	GROUP HAS INVALID ADDRESS 29 The operator attempted to configure an alarm or event for a discrete element which is not

REASON CODE	DESCRIPTION
	present in the unit. 30 The host computer has attempted to create a dynamic packet which contains analog or discrete elements which are not present in the unit database
017	WRITE NOT ALLOWED 31 The alternate gain, rate, or reset variables have been redirected to point to a write-protected variable within the unit. 32 The operator attempted to enter a gain, rate, or reset value for a loop that is not programmed or not scheduled. 33 The Self Tune process is not in the STOP mode. 34 The user attempted a download of a configuration when it was locked. 35 In general, communications has attempted to alter a unit variable which is write-protected.
018	WRITE VIA CURRENT MASK NOT ALLOWED 36 Communications has attempted to alter a digital unit variable which is write-protected.
019	PACKET LENGTH ASSIGNED 37 The operator attempted to configure more than 100 alarms and events for a single unit. 38 The host computer has attempted to create a dynamic packet which contains more than 100 elements.
020	INVALID ASSIGNMENT CODE 39 A Type 20 configuration message contained an invalid type-of-assignment code.
021	READ NOT ALLOWED 40 In general, communications has attempted to access a unit variable which is Write-Only.
022	GROUP HAS INVALID DATA FORMAT 41 Communications has attempted to include an analog variable in the time_tag processing list.
023	BYTE COUNT INVALID
024	REQUESTED ELEMENT IS NOT DEFINED 42 Communications attempted to read an element of the unit which has not been programmed. 43 The loop specified on the Self Tune screen has not been programmed. 44 The operator attempted to switch a Setpoint to an undefined Setpoint.
025	RETURN BUFFER WOULD OVERFLOW - NO DATA RETURNED 45 Insufficient space in the unit's communications buffer to contain the requested data.
026	
027	
028	
029	
030	TYPE ADDRESS NOT AVAILABLE 46 One or more of the elements in the communications request does not exist in the unit. Check request against hardware configuration or software features installed.
031	INVALID SEQUENCE NUMBER 47 The operator entered a sequence number greater than 250 or less than 0. 48 The operator attempted to program a PLC rung with a number greater than 200 or less than zero. This is an internal error for the normal PLC interface.
032	PREVIOUSLY ASSIGNED 49 The operator attempted to assign a Loop or Setpoint Programmer which is already assigned as another Pseudo Point.
033	INVALID PSEUDO POINT LIMIT 50 Operator did not enter limits. 51 Both low and high limits are set to the same value. 52 Limit values are not valid for the type of function selected.
034	INVALID PSEUDO POINT NUMBER 53 The unit was requested to configure a Pseudo Point with a number greater than 250 or less than 1.

REASON CODE	DESCRIPTION
035	INVALID FUNCTION CODE 54 The unit was requested to configure an unrecognized canned function.
036	SYNTAX 55 The order of operands within a Pseudo Point Math equation is in error. Types of errors could include missing or unneeded parentheses, operators, or variables. 56 The unit received an incomplete Custom Input programming message. 57 The order of the elements within a PLC configuration message is out of sequence.
037	TOO MANY PARENS 58 The operator entered a Pseudo Point Math equation which used more than ten levels of nesting of parenthetical expressions.
038	RUN TIME ARRAYS FULL <u>PLC:</u> 59 The operator has too many elements in the PLC ladder diagram. 60 The operator has more than 100 transitional contacts in the PLC ladder diagram. 61 The operator has more than 100 interfacing coils in the PLC ladder diagram. <u>Pseudo Points:</u> 62 The unit database cannot accept additional functions of the type being programmed. (It is important to note that other types of Pseudo Point functions may still be programmable.)
039	TOO MANY LEVELS ASSIGNED 63 Operator attempted to assign the same Data Point to more than four alarm levels.
040	TOO MANY ASSIGNS PLC ELEMENT 64 A PLC configuration message contained a reference to a non-existent PLC element type
041	VARIABLE INVALID FOR ARGUMENT 65 An illegal assignment of an existing variable was made during programming.
042	VARIABLE MISSING 66 The communications message for a Pseudo Point configuration is incomplete. 67 One of the parameters of a function block is missing in the configuration.
043	INVALID NUMBER OF INPUTS 68 The communications message for a Pseudo Point configuration contained too many args. 69 One of the parameters of a function block is missing in the configuration.
044	INVALID CHOICE <u>Pseudo Points:</u> 70 A loop number less than one or greater than 16 was specified. 71 A Setpoint Programmer number less than 1 or greater than 4 was specified. 72 A parameter has been programmed with an invalid value. <u>SPP:</u> 73 A non-existent Start Time was specified. 74 No segments have been defined. 75 The number of the “recycle from” segment is greater than the total number of segments in the current Setpoint Program. 76 The number of the “recycle to” segment is greater than the number of the “recycle from” segment. 77 The number of the “jog to” segment is greater than the total number of segments in the current Setpoint Program. 78 The “ramp rate” value is less than or equal to zero. 79 The “soak time” value is less than or equal to zero. 80 The last segment in the current Setpoint Program is not a soak. 81 Invalid Loop Programming 82 Invalid Jump Programmed

REASON CODE	DESCRIPTION
	83 Invalid Batch Start or Batch End Porgrammed, must point to a programmed segment.
045	RANGE LOW INVALID 84 The value entered for Range Low is not valid for the Input Type selected.
046	RANGE HIGH INVALID 85 The value entered for Range High is not valid for the Input Type selected.
047	INVALID RANGE TYPE 86 The operator attempted to SAVE an analog input that has an invalid Range Number. 87 "Range X" is selected as the Input Type and assigned to an analog input before the Custom Input data is programmed.
048	REVERSED INPUT 88 The Range Low value is greater than or equal to the Range High value.
049	CIRCUIT LOW INVALID 89 The Electrical Range Low value is less than the low limit of the measuring circuit of the analog input card..
050	CIRCUIT HIGH INVALID 90 The Electrical Range High value is greater than the high limit of the measuring circuit of the analog input card.
051	INVALID CIRCUIT TYPE 91 The Electrical Units code in the communications message is not Volts or Millivolts.
052	INVALID SPAN 92 The electrical span defined by the range is less than the minimum span specification for the analog input card to which the range is assigned. For DIRECT ranges, span = Displayed Range High - Displayed Range Low For INDIRECT ranges, span = Electrical Range High - Electrical Range Low
053	ANALOG INPUT CARD INCOMPATIBLE WITH SELECTED RANGE TYPE 93 The operator attempted to assign a range whose Input Type is not compatible with the Card Type of the analog input card: e.g., Input Type "Type J TC" cannot be assigned to an RTD card.
054	COMPOSER ASSIGNMENT STRUCTURE 94 The communications message to configure an element within the unit is incomplete.
055	INVALID CR DO ASSIGN 95 An attempt was made to assign an analog variable to a digital function.
056	INVALID DISCRETE ASSIGN 96 One or more of the digital elements in the program request do not exist in the unit.
057	INVALID COMPOSER MODE 97 The communications message to configure an element in the unit contained an unrecognized code in the mode byte.
058	PLC UNABLE TO COMPOSE 98 The communications message to configure the PLC contained invalid data.
059	PLC COPY OF LADDER FULL 99 There are too many elements on the PLC Ladder diagram.
060	CURRENT DATA COEFFS IN USE 100 The operator attempted to SAVE the Custom Input data screen while there are analog inputs still assigned to Range X. All analog inputs assigned to Range X must be re-assigned to a "dummy" range before the Custom Input data may be changed.
061	INVALID DATA POINT INCREMENT 101 Increment is a value less than or equal to zero.
062	ERROR IN DATA POINT COUNT 102 This error occurs when the operator enters either too many or too few data points for the specified custom range.

REASON CODE	DESCRIPTION
	The number of data points entered should be equal to: (Range High - Range Low) / Increment
063	RANGE LOW GREATER THAN RANGE HIGH 103 The Range High value must be greater than the Range Low value. “Reversed” ranges are not allowed.
064	CANNOT FIT CURVE WITHIN CONFORMITY 104 The curve described by the custom input data cannot be fit to the conformity specified. The operator must either make the conformity value larger or provide a more detailed description of the curve by providing additional data points.
065	NO FIT POSSIBLE DATA TOO NONLINEAR 105 The curve described by the custom input data cannot be described as a third-order polynomial.
066	UNIT CYCLE TIME EXCEEDED 106 PLC: The PLC elements programmed on the ladder exceed the amount of time available for PLC in the unit. 107 The number of alarm levels and Pseudo Points programmed in the unit will exceed the amount of processing time available in the unit.
067	
068	
069	
070	INTERNAL CONVERT TYPE ADDRESS
071	FEATURE REQUIRES HARDWARE
072	PP VECTOR ARRAY FULL
073	COPY OF EQUATION ARRAY FULL
074	DISCRETE ARRAY FULL
075	PP PREVIOUS-VALUE ARRAY FULL
076	PP MATH-OPERATOR ARRAY FULL
077	PP CONST ARRAY FULL
078	FUNCTION IS NOT ACTIVE
079	
080	INTERNAL MODE READ
081	INTERNAL READ SINGLE
082	INTERNAL SINGLE READ FLOAT
083	INTERNAL SINGLE READ BINARY
084	INTERNAL READ GROUP RANDOM
085	INTERNAL READ GROUP CONTINUOUS
086	
087	
088	
089	
090	INTERNAL MODE WRITE
091	INTERNAL WRITE SINGLE
092	INTERNAL SINGLE WRITE FLOAT
093	INTERNAL SINGLE WRITE BINARY
094	INTERNAL WRITE GROUP RANDOM
095	INTERNAL WRITE GROUP CONTINOUS
096	
097	
098	
099	
100	OUT OF RAM MEMORY 108 No more RAM available.

REASON CODE	DESCRIPTION
101	OUT OF EEPROM MEMORY 109 No more Non-Volatile memory.
102	INVALID INPUT CONNECTION 110 A function block has been programmed with a wrong input type.
103	DATABASE CHECKSUM ERROR 111 This error occurs during software upgrade. To correct, restore configuration.
104	INVALID BLOCK PERIOD
105	NUMBER OF FRAMES OUT OF RANGE 112 The number of samples for the Rolling Average Calculated Value is less than 1 or greater than 60.
106	TEMP SCALE OUT OF RANGE
107	TYPE INCOMPATIBLE WITH HARDWARE 113 The Analog Output type is different from the hardware setting. For example, an AO is programmed as CAT, but the hardware is set to VAT.
108	TYPE REQUIRES HARDWARE 114 Hardware is missing for the programmed function block.
109	IMPULSE RATE LESS THAN OR EQUAL TO 0 115 The impulse time on a DAT output cannot be less than or equal to zero.
110	DRIVE UNIT SPEED LESS THAN OR EQUAL TO 0 116 For the PAT type analog outputs, the drive unit speed must be greater than zero.
111	CONDITION TYPE OUT OF RANGE 117 Internal error - no user action.
112	HYSTERESIS LESS THAN 0 118 The alarm hysteresis parameter must be greater than or equal to zero.
113	LAG OR DELAY LESS THAN 0 119 The Analog Input lag or delay parameter is less than zero.
114	PAIRS INCONSISTENT 120 The operator has attempted to program a Custom Analog Input curve with inconsistent X,Y-coordinate pairs. For example, specifying less than two pairs, or supplying an X-value without a Y-value or vice versa.
115	X AXIS MUST INCREASE 121 The operator has attempted to program a Custom AI with X-values that are not ascending in value; i.e., Xn is greater than or equal to Xn+1.
116	X AXIS NOT ENOUGH CHANGE 122 The operator has attempted to program a Custom AI with X-values that do not increase by at least 0.00001.
117	Y AXIS NOT INCREASED ENOUGH 123 The operator has attempted to program a Custom AI which requires Reference Junction compensation and whose Y-values do not increase by at least 0.0001.
118	INCOMPATIBLE CURVE TYPE
119	RJ NOT IN CURVE 124 The operator has attempted to program a Custom AI which requires Reference Junction compensation and whose Y-values do not contain the range 0-65 degrees C (32-149 degrees F).
120	BLOCK PHASE GREATER THAN BLOCK PERIOD
121	INVALID BLOCK PERIOD
122	MONTHLY PERIODS MUST BE PHASED
123	VOTE MAX GREATER THAN VOTE MAX LIMIT
124	VOTE MIN GREATER THAN OR EQUAL TO VOTE MAX
125	MACHINE UPDATE RATE OUT OF RANGE
126	PROFILE DATA INCONSISTENT 125 Setpoint Profiler contains a step time and step value that are not both OFF or that are not

REASON CODE	DESCRIPTION
	both a value.
127	DEVIATION LIMIT MUST BE POSITIVE 126 Setpoint Profiler Deviation Low Limit and Deviation High Limit must be positive.
128	MUST HAVE AT LEAST ONE STEP 127 Setpoint Profiler was programmed with no steps.
129	INCORRECT INPUT COORDINATES 128 The Advanced Splitter Calculated Value was programmed with input limits for Output #2 (A2) only, or for Outputs #1 and #3 (A1 and A3) only, or for Output #3 (A3) only.
130	INCORRECT OUTPUT COORDINATES 129 The Advanced Splitter Calculated Value was programmed with output limits for Output #2 (A2) only, or for Outputs #1 and #3 (A1 and A3) only, or for Output #3 (A3) only

13. Application Messages Detail

Unit Type
Type: 0x00 Address: 0x00 Format: Text Size: 16 Mode: R

UNIT	TEXT
S	25000 REC ISS xx
M	MICROMAX LPU xx
P	PROGENY yyy xx

NOTE: yyy = Product code (i.e. CTX, RSX, ADO, etc)
xx = Revision (A, B, B0, C1, P, etc.)

Diagnostic Display
Type: 0x00 Address: 0x01 Format: TEXT Size: 16 Mode: R
Actual message from 4-digit display on CPU card

Firmware Part Number
Type: 0x01 Address: 0x00-0x03 Format: TEXT Size: 16 Mode: R

UNIT	TEXT
S,M,P	L+N ###### REV x

NOTE: x = Revision letter
= 6-digit L+N part number

System Status
Type: 0x02 Address: 0x00 Format: BINARY Size: 4 Mode: R

BIT	MEANING	S	M	P
0	Offline	X	X	
1	Offline diagnostic	X	X	
2	Offline calibration	X	X	
3	Diagnostic hold/ Maintenance mode	X	X	X
4	Run/Online mode	X	X	X
5	Cold start	X	X	
6	Warm start	X	X	
7	Program mode	X	X	X
8	First time power up	X		
9	spare			
10	Data Storage present			X
11	Opt RAM board present	X	X	
12	Opt ROM board present	X	X	
13	Opt comm board present		X	X
14	PID present		X	
15	PLC present		X	
16	ESC key pressed	X		
17	+/- key pressed	X		
18	ENTER key pressed	X		
19	50 Hz operation	X		

BIT	MEANING	S	M	P
20	reserved	X		
21	reserved	X		
22	reserved	X		
23	Operator MMI active	X		
24	Program MMI active	X		
25	spare			
26	spare			
27	spare			
28	spare			
29	Comm Port B present	X		
30	Comm Port A present	X		
31	Printer present	X		

Update Rate

Type: 0x02 Address: 0x01 Format: BINARY Size: 1 Mode: R

UNIT	VALUE	UPDATE RATE
S	100	1 second
M	25	250 ms
	50	500 ms
	75	750 ms
P	12	125 ms
	25	250 ms
	50	500 ms
	75	750 ms
	100	1 second
	200	2 seconds

Rack Card Type
Type: 0x02 Address: 0x03-0xxx Format: BINARY Size: 1 Mode: R

Micromax & Speedomax
Address: 0x03-0x11
RACK CARD TYPE SENSE
card position #1 - #5: Address 0x03-0x07
EXTENSION RACK 1
card position #1 - #5: Address 0x08-0x0C
EXTENSION RACK 2
card position #1 - #5 Address 0x0D-0x11

FORMAT FOR ABOVE:

CODE	FUNCTION	CODE	FUNCTION
0xE1	1-15 AI low level inputs	0xE8 or 0x1A	Comm 2 channel (no switches)
0xE2	1-10 AI low level inputs	0xE9 or 0x1B	Comm 2 channel
0xE3	1-10 AI RTD inputs	0xEA or 0x1C	Comm 1 channel (no switches)
0xE4	1-8 AI high level inputs	0xEB or 0x 1D	Comm 1 channel
0xE5	1-5 AI pulse inputs	0xF0	AO (base card has 4 cards)
0xE6	1-15 DI Solid State	0xF1	1-10 DO Solid State
0xE7	1-8 DO, 9-15 DI (SS)	0xF2	1-10 DO relay output
		0xFF	no card

VRX180
Address: 0x03-0x12
FORMAT FOR ABOVE:

CODE	FUNCTION	CODE	FUNCTION
0x00	6 channel DI logic	0x07	6 channel DO – AC
0x01	4 channel universal AI	0x08	6 channel DO – DC
0x02	6 channel DO Relay	0x40	6 channel DI DC
0x03	4 channel AO CAT	0x80	6 channel DI AC
		0xFF	No card

Slot:	1	2	3	4	5	6	7	8
Address:	3	4	5	6	7	8	9	A
Slot:	9	10	11	12	13	14	15	16
Address:	B	C	D	E	F	10	11	12

VRX180				VRX250			
Slot	**Contains**	**Slot**	**Contains**	**Slot**	**Contains**	**Slot**	**Contains**
1	none	9	none	1	AI1-AI4	9	AI33-A36
2	none	10	none	2	AI5-AI8	10	AI37-AI40
3	AI1-AI4	11	AI25-AI28	3	AI9-A12	11	AI41-A44
4	AI5-AI8	12	AI29-AI32	4	AI13-AI16	12	AI45-AI48
5	AI9-A12	13	AI33-A36	5	AI17-AI20	13	AI49-AI52
6	AI13-AI16	14	AI37-AI40	6	AI21-AI24	14	AI53-AI56
7	AI17-AI20	15	AI41-A44	7	AI25-AI28	15	AI57-AI60
8	AI21-AI24	16	AI45-AI48	8	AI29-AI32	16	AI61-AI64

Slots 1, 2, 9, 10 are reserved for VRX250.

AO Card Type
Type: 0x02 Address: 0x12-0x19 Format: BINARY Size: 1 Mode: R

ANALOG OUTPUT CARD TYPE
card position #1
daughter card 1 - 4: Address 0x12-0x15
card position #2
daughter card 1- 4 Address 0x16-0x19

FORMAT FOR ABOVE:

CODE	FUNCTION
0x00	no card
0x08	dual VAT outputs
0x0A	dual DAT relay outputs
0x0C	dual CAT outputs
0x0D	dual PAT outputs
0x0E	dual DAT triac
0x0E	dual DAT triac
0x0F	no card

Comm Configuration
Type: 0x02 Address: 0x1A Format: BINARY Size: 1 Mode: RW

DATA FORMAT:

BITS	MEANING
0-1	Simple Poll Request: 00 = None 01 = Set on alarm change 10 = Set on diag change 11 = Set on both
2-3	Transmit buffer length - Fixed at 2K
4-5	Parity: 00 = None 01 = Odd 10 = Even 11 = None
6	Communications Status: 0 = Read/Write 1 = Read Only
7	spare

Security Access Groups - PMC
Type: 0x02 Address: 0x1B Format: BINARY Size: 1 Mode: RW

BIT	FUNCTION
0	GROUP 1 write access = 1
	thru
7	GROUP 8 write access = 1

Security Access Groups - Local
Type: 0x02 Address: 0x1C Format: BINARY Size: 1 Mode: RW

BIT	FUNCTION
0	GROUP 1 write access = 1
	thru
7	GROUP 8 write access = 1

Enter
Type: 0x02 Address: 0x1D Format: BINARY Size: 1 Mode: W **

Decrement/Escape
Type: 0x02 Address: 0x1E Format: BINARY Size: 1 Mode: W **
Number of decrements to be performed (P only)

Increment/Advance
Type: 0x02 Address: 0x1F Format: BINARY Size: 1 Mode: W **
Number of increments to be performed (P only)

**** NOTE** A write of binary data 0x55 will activate these functions (M, S).

These cells are not readable since they are one-shot occurrences.

Operation Status
Type: 0x02 Address: 0x20 Format: BINARY Size: 1 Mode: W (S,M)
RW (P)

BITS	MEANING
0	Offline diagnostic
1	Offline calibration
2	Offline (Maintenance)
3	Program
4	Cold start(rack reset)
5	Online
6-7	spare

Mode DIP Switch
Type: 0x02 Address: 0x21 Format: BINARY Size: 1 Mode: R

BIT	Speedomax	BIT	Micromax
0	not used	0	option communications board: 0 = SLAVE TO HOST COMPUTER 1 = LOCAL STATION HOST
1	0 = IBM AT keyboard 1 = IBM PC/XT keyboard	1,2	update rate: 00 = automatic selection 01 = 250 ms 10 = 500 ms 11 = 750 ms
2	not used		
3	1 = force to calib. mode	3	1 = calibration mode request
4	0 = select 60 Hz operation 1 = select 50 Hz operation	4	1 = select 50 Hz operation
5	1 = default config at power up	5-6	not used
6	1 = cold start on reset		
7	1 = perform offline diags	7	1 = perform offline diagnostics

Main/Port A Comm Address
Type: 0x02 Address: 0x22 Format: BINARY Size: 1 Mode: R

This parameter has an 8-bit binary format, with values ranging from 0 through 255 decimal, or 0x00 through 0xFF hexadecimal. Note that values 0 and 255 (0xFF) de-select the unit.

Optional/Port B Comm Address
Type: 0x02 Address: 0x24 Format: BINARY Size: 1 Mode: R

This parameter has an 8-bit binary format, with values ranging from 0 through 255 decimal, or 0x00 through 0xFF hexadecimal. Note that values 0 and 255 (0xFF) de-select the unit.

Main/Port A Comm Configuration
Type: 0x02 Address: 0x23 Format: BINARY Size: 1 Mode: R

Optional/Port B Comm Configuration
Type: 0x02 Address: 0x25 Format: BINARY Size: 1 Mode: R

FORMAT FOR THE ABOVE:

BIT	Speedomax	BIT	Micromax
0-1	Baud Rate: 00 = unused 01 = 1200 BAUD 10 = 9600 BAUD 11 = 19200 BAUD	0-1	Baud Rate: 00 = 300 BAUD 01 = 1200 BAUD 10 = 9600 BAUD 11 = 19200 BAUD
2	spare	2	spare
3-4	Parity: 00 = no parity 01 = odd 10 = even 11 = unused	3-4	Parity 00 = no parity 01 = odd 10 = even 11 = unused
5-7	spare	5	Read/Write Status: 0 = Read/write 1 = Read only
		6-7	spare

Data Base Status
Type: 0x02 Address: 0x26 Format: BINARY Size: 2 Mode: RW

BYTE 1	BYTE 2	MEANING
0x55	0xAA	Data base OK
0xAA	0x55	Initialize Data base new
any other value	any other value	Data base questionable

Local Relays
Type: 0x02 Address: 0x27 Format: BINARY Size: 1 Mode: RW

BIT	FUNCTION: CURRENT STATUS	BIT	FUNCTION: ACK OF PRECEDING
0	1 = diagnostic failure	4	1 = ack diagnostic
1	1 = open input	5	1 = ack open
2	1 = local comm alarm w/o ack	6	not used
3	1 = local comm alarm a ack	7	1 = ack alarm w ack

Local Station 1 Storage
Type: 0x02 Address: 0x28 Format: BINARY Size: 6 Mode: RW

Local Station 2 Storage
Type: 0x02 Address: 0x29 Format: BINARY Size: 6 Mode: RW

Local Station Link Status
Type: 0x02 Address: 0x2A Format: BINARY Size: 6 Mode: RW

BIT	LOCAL STATION LINK STATUS
0	1 = local station 1 linked
1	1 = local station 2 linked
2-7	unused

Card Type
Type: 0x02 Address: 0x2B-0x33 Format: BINARY Size: 1 Mode: R

CARD TYPE:
card position #1 - #4: Address 0x2B-0x2E
RECORDER EXPANSION UNIT (only available on the 25000 Recorder):
card position #1 - #5: Address 0x2F-0x33

The following I/O cards are available on the 25000 Recorder:

CODE	FUNCTION
0xE1	1-15 AI low level inputs
0xE2	1-10 AI low level inputs
0xE3	1-10 AI RTD inputs
0xE4	1-8 AI high level inputs
0xE5	1-5 AI pulse inputs
0xE6	1-15 DI Solid State
0xE7	1-8 DO, 9-15 DI (SS)
0xE8	Comm card, 2 channel
0xEA	Comm card, single channel
0xEB or 0x1D	Comm 1 channel
0xF0	AO (base card has 4 pairs)
0xF1	1-10 DO Solid State
0xF2	1-10 DO relay output
0xFF	no card

The following I/O cards are available on the 24000 Recorder:

CODE	FUNCTION
0xE1	1-15 AI low level inputs
0xE7	1-8 DO, 9-10 DI (SS)
0xEA	Comm card, single channel
0xFF	no card

AI Calibration
Type: 0x02 Address: 0x2B Format: BINARY Size: 3 Mode: W

FORMAT FOR THE ABOVE:
Bytes 0,1: Channel number
e.g., 0x00 0x01 = Channel 1
Byte 2: Range as indicated in table below:

VALUE	RANGE
0	5V
1	1V
2	75 mV
3	25 mV
4	100 Ohm
5	500 Ohm
6	10 Ohm
7	25 Ohm
8	ADO Cal ADC Zero
9	ADO Cal ADC Max
10	ADO Cal 350 Zero
11	ADO Cal 350 Max
12	ADO Cal 35 Zero
13	ADO Cal 35 Max
14	ADO Cal 3.5 Zero
15	ADO Cal 3.5 Max
16	ADO Cal .35 Zero
17	ADO Cal .35 Max

AO Calibration
Type: 0x02 Address: 0x2C Format: BINARY Size: 3 Mode: W

FORMAT FOR THE ABOVE:
Bytes 0,1: Channel number
e.g., 0x00 0x01 = Channel 1
Byte 2: Range
0 = 20%, 1 = Span

Configuration Index
Type: 0x02 Address: 0x2D Format: BINARY Size: 1 Mode: W

Configuration index number: 0 clears configuration (does not clear calibration). Any other number selects the factory configuration to load.

Program Number
Type: 0x02 Address: 0x2E Format: FLOAT Size: 4 Mode: RW

Read: Value is currently loaded Program.
Write: Loads Program selected.

Clock
Type: 0x02 Address: 0x2F Format: BINARY Size: 7 Mode: RW

BYTE	CONTENTS
0	Year: century
1	Year: year
2	Month (1-12)
3	Day in month (1-31)
4	Hour (00-23)
5	Minute (00-59)
6	Second (00-59)

Mains Frequency
Type: 0x02 Address: 0x30 Format: BINARY Size: 1 Mode: RW
50 Hz = 50
60 Hz = 60

AO Card Type
Type: 0x02 Address: 0x34-0x3B Format: BINARY Size: 1 Mode: R

ANALOG OUTPUT CARD TYPE - available only on the 25000 Recorder
card position #1
daughter card 1 - 4: Address 0x34-0x37
card position #2
daughter card 1- 4 Address 0x38-0x3B

FORMAT FOR ABOVE:

CODE	FUNCTION
0x00	no card
0x08	dual VAT outputs
0x0A	dual DAT relay outputs
0x0C	dual CAT outputs
0x0D	dual PAT outputs
0x0E	dual DAT triac
0x0F	no card

Chart Mode
Type: 0x02 Address: 0x3C Format: BINARY Size: 1 Mode: R

Chart mode: 1 = trend; 2 = datalog

Chart Speed 1
Type: 0x02 Address: 0x3D Format: FLOAT Size: 4 Mode: R

Chart Speed 2
Type: 0x02 Address: 0x3E Format: FLOAT Size: 4 Mode: R

Chart Speed Select
Type: 0x02 Address: 0x3F Format: BINARY Size: 1 Mode: RW

Chart Speed Select: 1 = speed 1; 2 = speed 2

Chart Status
Type: 0x02 Address: 0x40 Format: BINARY Size: 1 Mode: RW

Chart Status: 0 = chart off
1 = chart on
3 = out of service

The “out of service” indication results from one of the following conditions:
- the recorder is out of paper
- the recorder platen assembly has been lowered
- the printer system has encountered an internal error which prevents further printing

This condition can be cleared by selecting a chart function (trend or datalog) from the Operator’s Keyboard or by restarting the recorder.

Port A Unit Address
Type: 0x02 Address: 0x40 Format: BINARY Size: 1 Mode: R

Port A Baud Rate
Type: 0x02 Address: 0x41 Format: BINARY Size: 1 Mode: R

Port B Unit Address
Type: 0x02 Address: 0x42 Format: BINARY Size: 1 Mode: R

Port B Baud Rate
Type: 0x02 Address: 0x43 Format: BINARY Size: 1 Mode: R

Security Code for Communication Channels
Type: 0x02 Address: 0x44 Format: BINARY Size: 8 Mode: RW

Copy Block
Type: 0x02 Address: 0x45 Format: BINARY Size: 4 Mode: W
Copies AI block from source AI channel to destination AI channel. If destination AI channel is 0, copies to all AI channels. If destination channel is greater than source channel, copies to all AI channels greater than source channel. First 16 bit value is source channel, second 16 bit value is destination channel.

DATA FORMAT: Value - 0x0001

BYTE	VALUE
0	0x00
1	0x01

AI Count
Type: 0x02 Address: 0x51 Format: BINARY Size: 2 Mode: R

AO Count
Type: 0x02 Address: 0x52 Format: BINARY Size: 2 Mode: R

DI Count
Type: 0x02 Address: 0x53 Format: BINARY Size: 2 Mode: R

DO Count
Type: 0x02 Address: 0x54 Format: BINARY Size: 2 Mode: R

CN Count
Type: 0x02 Address: 0x55 Format: BINARY Size: 2 Mode: R

AL Count
Type: 0x02 Address: 0x56 Format: BINARY Size: 2 Mode: R

SPP Count
Type: 0x02 Address: 0x57 Format: BINARY Size: 2 Mode: R

LP Count
Type: 0x02 Address: 0x58 Format: BINARY Size: 2 Mode: R

CV Count
Type: 0x02 Address: 0x59 Format: BINARY Size: 2 Mode: R

TL Count
Type: 0x02 Address: 0x60 Format: BINARY Size: 2 Mode: R

Profile Count
Type: 0x02 Address: 0x63 Format: BINARY Size: 2 Mode: R

DATA FORMAT: Value - 0x0001

BYTE	VALUE
0	0x00
1	0x01

CPU Type
Type: 0x02 Address: 0x65 Format: BINARY Size: 1 Mode: R

CPU Type: 0 = Basic; 1 = Enhanced

Configuration Download
Type: 0x02 Address: 0xC0 Format: TEXT Size: -- Mode: W
ASCII language compatible with the LNC file format

Each message is one line from the LNC file format. Excluding the header line, all ASCII strings MUST NOT have CR LF in the string and MUST be terminated by a NULL character. Refer to Section 0 for more information.

Configuration Upload Control
Type: 0x02 Address: 0xC1 Format: TEXT Size: -- Mode: W

Refer to Page 98 Section 0 for more information.

Configuration Upload
Type: 0x02 Address: 0xC2 Format: TEXT Size: -- Mode: R

Each message is one line from the LNC file format. Excluding the header line. Refer to Section 980 for more information.

LP Process Variable
Type: 0x03 Address: 0x01-xx Format: FLOAT Size: 4 Mode: R
where xx = 0x10 (M), LP: Count (P)

LP Local Set Point (SP1)
Type: 0x04 Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx = 0x10 (M), LP: Count (P)

LP Remote Set Point (SP2)
Type: 0x05 Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx = 0x10 (M), LP: Count (P)

LP Deviation
Type: 0x06 Address: 0x01-xx Format: FLOAT Size: 4 Mode: R
where xx = 0x10 (M), LP: Count (P)

AI Output Value
Type: 0x07 Address: 0x01-xx Format: FLOAT Size: 4 Mode: R
where xx = 0x87 (S), 0x4B (M1), 0xE1 (M2), AI: Count (P)

NOTE: For S, a “write”of an AI value will only be permitted if the AI has been configured as a “REMOTE” AI. See AI Programming, Type 0x20, Subtype 0x32.

LP Output Value
Type: 0x08 Address: 0x01-xx Format: FLOAT Size: 4 Mode: R (M); RW (P)
where xx = 0x10 (M), LP: Count (P)

LP Gain 2
Type: 0x09 Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx = 0x10 (M), LP: Count (P)

LP Reset 2
Type: 0x0A Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx = 0x10 (M), LP: Count (P)

LP Gain 1
Type: 0x0B Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx = 0x10 (M), LP: Count (P)

LP Reset 1
Type: 0x0C Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx = 0x10 (M), LP: Count (P)

LP Rate 1
Type: 0x0D Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx = 0x10 (M), LP: Count (P)

LP Wild Variable
Type: 0x0E Address: 0x01-xx Format: FLOAT Size: 4 Mode: R
where xx = 0x10 (M), LP: Count (P)

LP Approach Value High

Type: 0x0F Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx = 0x10 (M), LP: Count (P)

LP Approach Value Low

Type: 0x10 Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx = 0x10 (M), LP: Count (P)

AL Set Point

Type: 0x11 Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx = 0x78 (S), 0x96 (M), AL: Count (P)

AL Output Status

Type: 0x12 Address: 0x01-xx Format: BINARY Size: 1 Mode: R
where xx = 0x78 (S), 0x96 (M), AL: Count (P)

AL Hysteresis

Type: 0x13 Address: 0x00 Format: FLOAT Size: 4 Mode: R (M)

Type: 0x13 Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW (P)
where xx = AL: Count (P)

Diagnostic Error Status

Type: 0x14 Address: 0x01-xx Format: BINARY Size: 1 Mode: R
where xx = 0x3B (S), 0x1F (M)

DATA FORMAT FOR Speedomax:

ADDRESS	BIT	FUNCTION
0x00	0	CPU TIME OVERRUN
	1	D 0x01 : Invalid Slot 1 ID
	2	D 0x02 : Invalid Slot 2 ID
	3	D 0x03 : Invalid Slot 3 ID
	4	D 0x04 : Invalid Slot 4 ID
	5	D 0x05 : Invalid Slot 5 ID
	6	D 0x06 : Invalid Slot 6 ID
	7	D 0x07 : Invalid Slot 7 ID
		---- through ----
0x22	0	D 0x110: Chart Data base Error
	1	D 0x111: No trendable points
	2	D 0x112: More than 30 pt trend
	3	D 0x113: Bad zone combination
	4	D 0x114: Chart Pt Hold invalid
	5	D 0x115: Cannot trend discretes
	6	D 0x116: RPD calib. Checksum error
	7	D 0x117: Prom upgrade complete
0x23-0x3B	--	reserved for future expansion

For a complete and detailed list of these diagnostics, refer to Service Manual 277801.

DATA FORMAT FOR Micromax:

CELL	ADDRESS	BIT	FUNCTION
1	0x00	0	power up (program reset)
		1	calibration area error
		2	calculation area error
		3	user program area error
		4	unspecified error
		5	REAL TIME CLOCK time lost
		6	unused
		7	low battery
2	0x01	8	communications
		9-15	not defined
3	0x02	16	slot 1 diag flag
		17	slot 2 diag flag
		18	slot 3 diag flag
		19	slot 4 diag flag
		20	slot 5 diag flag
		21	slot 6 diag flag
		22	slot 7 diag flag
		23	slot 8 diag flag
4	0x03	24	slot 9 diag flag
		25	slot 10 diag flag
		26	slot 11 diag flag
		27	slot 12 diag flag
		28	slot 13 diag flag
		29	slot 14 diag flag
		30	slot 15 diag flag
		31	not defined
.	.	.	.
.	.	.	.
.	.	.	.
13	0x0C	96	not used
		97	slave ram failure
		98	adc stopped
		99	counter stopped
		100	novram nonvolatile fail
		101	novram ram fail
		102	measurement cycle active
		103	not defined
14	0x0D	104-111	not defined
15	0x0E	112	not defined
		113	pos #1/out A data fail
		114	pos #1/out B data fail
		115	pos #2/out A data fail
		116	pos #2/out B data fail
		117	pos #3/out A data fail
		118	pos #3/out B data fail
		119	pos #4/out A data fail
16	0x0F	120	pos #4/out B data fail
		121	pos #1 type mismatch
		122	pos #2 type mismatch
		123	pos #3 type mismatch
		124	pos #4 type mismatch
		125	not defined

AI Adjustment Value
Type: 0x15 Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx = 0x87 (S), 0x4B (M1), 0xE1 (M2), AI: Count (P)

Note for (S): If the AI adjustment value is written to a “remote” AI, the value written will be clamped between the Left Scale Value and the Right Scale Value programmed for that AI. If clamping is not desired, write values to the AI using comm Type 0x07 instead.

SY Reference Temperature
Type: 0x16 Address: 0x01-0xXX Format: FLOAT Size: 4 Mode: R

Constant Values 1-25 (Recipe #1)
Type: 0x17 Address: 0x00 Format: BLOCK Size: 100 Mode: RW

Block consists of 25 four-byte floating point Constant values

Constant Values 26-50 (Recipe #2)
Type: 0x17 Address: 0x01 Format: BLOCK Size: 100 Mode: RW

Block consists of 25 four-byte floating point Constant values

Constant Values 51-100
Type: 0x17 Address: 0x02 Format: BLOCK Size: 200 Mode: RW

Block consists of 50 four-byte floating point Constant values

Constant Values 101-125 (Recipe #3)
Type: 0x17 Address: 0x03 Format: BLOCK Size: 100 Mode: RW

Block consists of 25 four-byte floating point Constant values

Constant Values 126-150 (Recipe #4)
Type: 0x17 Address: 0x04 Format: BLOCK Size: 100 Mode: RW

Block consists of 25 four-byte floating point Constant values

Constant Values 151-200
Type: 0x17 Address: 0x05 Format: BLOCK Size: 200 Mode: RW

Block consists of 50 four-byte floating point Constant values

Constant Values 1-200
Type: 0x17 Address: 0x06 Format: BLOCK Size: 800 Mode: RW

Block consists of 200 four-byte floating point Constant values

Packet 1 - AI
Type: 0x19 Address: 0x00 Format: BLOCK Size: 300 Mode: R

Block consists of 75 four-byte floating point Analog Input values (type 0x07, addresses 0x01-0x4B).

Packet 2 - PP
Type: 0x19 Address: 0x01 Format: BLOCK Size: 1020 Mode: R

Block consists of 255 four-byte floating point Pseudo Point values (type 0x1E, addresses 0x01-0xFF).

Packet 3 - PP
Type: 0x19 Address: 0x02 Format: BLOCK Size: 1020 Mode: R

Block consists of 255 four-byte floating point Pseudo Point values (type 0x1F, addresses 0x01-0xFF).

Packet 4 - Simple Poll
Type: 0x19 Address: 0x03 Format: BLOCK Size: 26-326 Mode: R

Block consists of the following parameters:

PARAMETER	TYPE	ADDR	SIZE
Local Time	0x1D	0x00	3
Packet 5 - AL:	0x19	0x04	19
System Status	0x02	0x00	4
Response Queue	0x9E	0x00	1-301

Packet 5 - AL
Type: 0x19 Address: 0x04 Format: BLOCK Size: 19 Mode: R

Block consists of 19 bytes, one bit per Alarm Level, structured as follows. A set bit indicates that its associated alarm level is in alarm.

BYTE	BIT	ALARM LEVEL STATUS
1	0 1-7	unused Alarm Levels 1 - 7
2 . . . 15	0-7 . . . 0-7	Alarm Levels 8 - 15 . . . Alarm Levels 112-119
16	0 1-7	Alarm Level 120 (Note: last AL for (S)) Alarm Levels 121-127
17	0-7	Alarm Levels 128 - 135
18	0-7	Alarm Levels 136-143
19	0-6 7	Alarm Levels 144 - 150 unused

Packet 6 - Point Assign
Type: 0x19 Address: 0x05 Format: BLOCK Size: 75 Mode: R

Block consists of 75 one-byte binary AI Point Assignment values (type 0x28, addresses 0x01-0x4B).

Packet 7 - DI

Type: 0x19 Address: 0x06 Format: BLOCK Size: 30 Mode: R

Block consists of 30 bytes, one bit per DI, structured as follows. A set bit indicates that its associated DI contact is closed.

BYTE	BIT	DI STATUS
1	0-7	DIs 1 - 8
2	0-6 7	DIs 9 - 15 unused
3	0-7	DIs 16-23
4	0-6 7	DIs 24-30 unused
. . .	. . .	. . .
29	0-7	DIs 211-218
30	0-6 7	DIs 219-225 unused

Packet 8 - DO

Type: 0x19 Address: 0x07 Format: BLOCK Size: 30 Mode: R

Block consists of 30 bytes, one bit per DO, structured as follows. A set bit indicates that its associated DO contact is closed.

BYTE	BIT	DO STATUS
1	0-7	DOs 1 - 8
2	0-6 7	DOs 9 - 15 unused
3	0-7	DOs 16-23
4	0-6 7	DOs 24-30 unused
. . .	. . .	. . .
29	0-7	DOs 211-218
30	0-6 7	DOs 219-225 unused

Packet 9 - CR 1-999
Type: 0x19 Address: 0x08 Format: BLOCK Size: 134 Mode: R

Block consists of 30 bytes, one bit per CR, structured as follows. A set bit indicates that its associated CR contact is closed.

BYTE	BIT	CR STATUS
1	0-7	CRs 1- 8
2	0-6 7	CRs 9- 15 unused
3	0-7	CRs 16-23
4	0-6 7	CRs 24-30 unused
. . .	. . .	. . .
133	0-7	CRs 991-998
134	0 1-7	CR 999 unused

Packet 10 - Card Types
Type: 0x19 Address: 0x09 Format: BLOCK Size: 23 Mode: R

Block consists of 23 one-byte binary Rack and AO Card Type values (type 0x02, addresses 0x03-0x19).

Packet 11 - Diagnostics
Type: 0x19 Address: 0x0A Format: BLOCK Size: 32 Mode: R

Block consists of 32 one-byte binary Diagnostic Error Status cells (type 0x14, addresses 0x00-0x1F).

Packet 1 - AI
Type: 0x19 Address: 0x12 Format: BLOCK Size: 540 Mode: R

Block consists of 135 four-byte floating point Analog Input values (type 0x07, addresses 0x01-0x87).

Packet 2 - PP
Type: 0x19 Address: 0x13 Format: BLOCK Size: 240 Mode: R

Block consists of 60 four-byte floating point Pseudo Point values (type 0x1E, addresses 0x01-0x3C).

Packet 6 - Point Assign
Type: 0x19 Address: 0x16 Format: BLOCK Size: 135 Mode: R

Block consists of 135 one-byte binary AI Point Assignment values (type 0x28, addresses 0x01-0x87).

Packet 7 - DI
Type: 0x19 Address: 0x17 Format: BLOCK Size: 18 Mode: R

Block consists of 18 bytes, one bit per DI, structured as follows. A set bit indicates that its associated DI contact is closed.

BYTE	BIT	DI STATUS
1	0-7	DIs 1 - 8
2	0-6 7	DIs 9 - 15 unused
3	0-7	DIs 16-23
4	0-6 7	DIs 24-30 unused
. . .	. . .	. . .
17	0-7	DIs 121-128
18	0-6 7	DIs 129-135 unused

Packet 8 - DO
Type: 0x19 Address: 0x18 Format: BLOCK Size: 18 Mode: R

Block consists of 18 bytes, one bit per DO, structured as follows. A set bit indicates that its associated DO contact is closed.

BYTE	BIT	DO STATUS
1	0-7	DOs 1 - 8
2	0-6 7	DOs 9 - 15 unused
3	0-7	DOs 16-23
4	0-6 7	DIs 24-30 unused
. . .	. . .	. . .
17	0-7	DOs 121-128
18	0-6 7	DOs 129-135 unused

Packet 10 - Card Types
Type: 0x19 Address: 0x19 Format: BLOCK Size: 17 Mode: R

Block consists of 17 one-byte binary Rack and AO Card Type values (type 0x02, addresses 0x2B-0x3B).

Packet 11 - Diagnostics
Type: 0x19 Address: 0x1A Format: BLOCK Size: 60 Mode: R

Block consists of 60 one-byte binary Diagnostic Error Status cells (type 0x14, addresses 0x00-0x3B).

AI Raw Value
Type: 0x1A Address: 0x01-xx Format: FLOAT Size: 4 Mode: R
where xx = AI: Count (P)

SPP #3 Step Value
Type: 0x1B Address: 0x01-0x3F Format: FLOAT Size: 4 Mode: RW
The address is the step number.

TL Output Value
Type: 0x1C Address: 0x01-xx Format: FLOAT Size: 4 Mode: R
where xx = TL: Count (P)

Local Time
Type: 0x1D Address: 0x00 Format: BINARY Size: 3 Mode: RW

DATA FORMAT:

BYTE	DESCRIPTION
0	Hour (00-23)
1	Minute (00-59)
2	Second (00-59)

TRANSMISSION ORDER: byte 0, 1, 2, first to last respectively.

CV/PP Output Value (1-255)
Type: 0x1E Address: 0x01-xx Format: FLOAT Size: 4 Mode: R
where xx = 0x3C (S), 0xFF (M), CV: Count (P)

PP Output Value (256-511)
Type: 0x1F Address: 0x01-0xFF Format: FLOAT Size: 4 Mode: R

Database Programming
Type: 0x20 Address: 0x00 Format: --- Size: -- Mode: RW

The following sections contain detailed descriptions of the Configuration Protocol for each Unit type:

UNIT	SECTION
Speedomax	
Micromax	
CTX/UDC5300/RSX/ VPR/VRX	0

DI Output Status
Type: 0x21 Address: 0x01-xx Format: BINARY Size: 1 Mode: RW ***
where xx = 0x87 (S), 0xE1 (M), DI: Count (P)

DATA FORMAT:

BIT	FUNCTION
0	data
1-6	not used
7	0 = not forced 1 = force

LP Increasing Slew Rate Limit
Type: 0x22 Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx = LP: Count (P)

DO Output Status

Type: 0x23 Address: 0x01-xx Format: BINARY Size: 1 Mode: RW ***
where xx = 0x87 (S), 0xE1 (M), DO: Count (P)

DATA FORMAT:

BIT	FUNCTION
0	data
1-6	not used
7	0 = not forced 1 = force

***** NOTE:** Speedomax DI and DO point positions which have no associated I/O card may be used as "remote" points. Refer to DI Programming (Type 0x20, Subtype 0x35) and DO Programming (Type 0x20, Subtype 0x38) for details concerning the creation of remote points. Unused DI and DO points may be written to only if programmed as "remote" points.

SPP #3 Step Duration/Time

Type: 0x24 Address: 0x01-0x3F Format: FLOAT Size: 4 Mode: RW
The address is the step number.

CN Value

Type: 0x25 Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx = 0x32 (S), 0x64 (M1), 0xC8 (M2), CN: Count (P)

SPP #3 Current Events

Type: 0x26 Address: 0x01-0x10 Format: BINARY Size: 1 Mode: R

SPP #4 Current Events

Type: 0x27 Address: 0x01-0x10 Format: BINARY Size: 1 Mode: R

AI Point Status/Assignment

Type: 0x28 Address: 0x01-xx Format: BINARY Size: 1 Mode: R
where xx = 0x87 (S), 0x4B (M1), 0xE1 (M2), AI: Count (P)

DATA FORMAT:

BIT	FUNCTION	IF SET:	S	M	P
0	Open Input Status	Reported	X	X	X
1	AI Comp/Emmiss	Active	X	X	X
2	Underrange	Under		X	X
3	Overrange	Over		X	X
4	Point Skip	Skip	X	X	X
5	Open Status	Open	X	X	X
6	Open Check	Enable	X	X	X
7	deg F/C	deg F	X	X	X

Point not present indication: 0xFA (S), 0xFF (M), A-NAK (P).

Dynamic Packet Definition
Type: 0x29 Address: 0x01-0x04 Format: --- Size: -- Mode: RW

Dynamic Packet Definition
Type: 0x29 Address: 0x04 Format: --- Size: -- Mode: RW

Definitions for Dynamic Packets 1 thru 5: Addresses 0x00 - 0x04

STRUCTURE OF PACKET:

AA	Number of assignments
TT[1],AA[1]	First type/address assignment
thru	
TT[n],AA[n]	Last type/address assignment - up to 100 TT,AA pairs allowed
ZZ	Low byte of checksum (present for read only)

NOTE: Dynamic Packet Definition 5, type 0x29 address 0x04, is used for state change reporting. When items in the list change state they are reported to the Response Queue (type 0x9E). This packet is restricted to DI, DO, and (for Micromax only) CR types. See Type 0x2A for additional information.

Dynamic Packet/Block Access
Type: 0x2A Address: 0x01-0x04 Format: --- Size: -- Mode: RW

Dynamic Packet/Block Access
Type: 0x2A Address: 0x04 Format: --- Size: -- Mode: RW

Dynamic Packets 1 through 5: Addresses 0x01-0x04

STRUCTURE OF PACKET:

DATA[1]	Data of first type/address assignment
thru	
DATA[n]	Data of last type/address assignment
ZZ	Low byte of checksum from type 0x29 assignment pairs (can be used to flag change of assignment via type 0x29)

NOTE: Dynamic Packet 5, type 0x2A address 0x04, contains digital status in a bit-packed form which can be read. Bit 7 is used for alarm reporting: 0 = alarm/ 1 = event. The other dynamic packets return data as defined by their type and address specifications.

LP Process Variable High Limit
Type: 0x2B Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx = 0x10 (M), LP: Count (P)

LP Process Variable Low Limit
Type: 0x2C Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx = 0x10 (M), LP: Count (P)

LP Working Set Point
Type: 0x2D Address: 0x01-xx Format: FLOAT Size: 4 Mode: R
where xx = 0x10 (M), LP: Count (P)

LP Working Set Point High Limit
Type: 0x2E Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx = 0x10 (M), LP: Count (P)

LP Working Set Point Low Limit
Type: 0x2F Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx = 0x10 (M), LP: Count (P)

LP Set Point Slew Rate
Type: 0x30 Address: 0x01-0x10 Format: FLOAT Size: 4 Mode: RW

LP Decreasing Slew Rate Limit
Type: 0x30 Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx = LP: Count (P)

LP Back Calc Output Value
Type: 0x31 Address: 0x01-xx Format: FLOAT Size: 4 Mode: R
where xx = 0x10 (M), LP: Count (P)

LP Local Set Point Engineering Units
Type: 0x32 Address: 0x01-xx Format: FLOAT Size: 4 Mode: R
where xx = 0x10 (M), LP: Count (P)

LP Manual Reset
Type: 0x33 Address: 0x01-0x10 Format: FLOAT Size: 4 Mode: RW

LP Bias (P: Manual Reset)
Type: 0x33 Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx = LP: Count (P)

LP Reset Limit
Type: 0x34 Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx = 0x10 (M), LP: Count (P)

Error Square
Type: 0x35 Address: 0x01-0x10 Format: FLOAT Size: 4 Mode: RW

LP Control Preset Output (PID)
Type: 0x36 Address: 0x01-0x10 Format: FLOAT Size: 4 Mode: RW

AO Failsafe/Preset Value
Type: 0x36 Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx = AO: Count (P)

LP Feed Forward Value
Type: 0x37 Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx = 0x10 (M), LP: Count (P)

LP Control Feedback Value
Type: 0x38 Address: 0x01-xx Format: FLOAT Size: 4 Mode: R
where xx = 0x10 (M), LP: Count (P)

LP Control Forceback
Type: 0x39 Address: 0x01-0x10 Format: FLOAT Size: 4 Mode: RW

LP Rate 2
Type: 0x3A Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx = 0x10 (M), LP: Count (P)

LP Deadband
Type: 0x3B Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx = 0x10 (M), LP: Count (P)

LP Manual Output Value
Type: 0x3C Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx = 0x10 (M), LP: Count (P)

AO Input Source/Set Point
Type: 0x3D Address: 0x01-xx Format: FLOAT Size: 4 Mode: R
where xx = 0x17 (S), 0x17 (M), AO: Count (P)

AO Output Value
Type: 0x3E Address: 0x01-xx Format: FLOAT Size: 4 Mode: R
where xx = 0x17 (S), 0x17 (M), AO: Count (P)

AO Slidewire
Type: 0x3F Address: 0x01-xx Format: FLOAT Size: 4 Mode: R
where xx = 0x17 (M), AO: Count (P)

AO Process Variable High Limit
Type: 0x40 Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx = 0x17 (S), 0x17 (M), AO: Count (P)

AO Process Variable Low Limit
Type: 0x41 Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx = 0x17 (S), 0x17 (M), AO: Count (P)

AO Impulse Time
Type: 0x42 Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx = 0x17 (M), AO: Count (P)

AO Minimum ON Time
Type: 0x43 Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx = 0x17 (M), AO: Count (P)

AO Minimum OFF Time
Type: 0x44 Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx = 0x17 (M), AO: Count (P)

AO Slew Rate Time
Type: 0x45 Address: 0x01-0x17 Format: FLOAT Size: 4 Mode: RW

AO Increasing Slew Rate Limit
Type: 0x45 Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx =AO: Count (P)

AO Drive Unit Sensitivity
Type: 0x46 Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx = 0x17 (M), AO: Count (P)

LP Control Feedback 1 Value
Type: 0x47 Address: 0x01-xx Format: FLOAT Size: 4 Mode: R
where xx = 0x10 (M), LP: Count (P)

LP Control Feedback 2 Value
Type: 0x48 Address: 0x01-0x10 Format: FLOAT Size: 4 Mode: R

CV Back Calc Input Value
Type: 0x48 Address: 0x01-xx Format: FLOAT Size: 4 Mode: R
where xx = CV: Count (P)

CV/PP Output High Limit
Type: 0x49 Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW (M, S)
R (P)
where xx = 0x3C (S), 0xFF (M), CV: Count (P)

AO Failsafe/Preset 1 Value
Type: 0x4A Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx = 0x10 (M), AO: Count (P)

CV/PP Output Low Limit
Type: 0x4B Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW (M, S)
R (P)
where xx = 0x3C (S), 0xFF (M), CV: Count (P)

AO Decreasing Slew Rate Limit
Type: 0x4C Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx = AO: Count (P)

SPP Output Value
Type: 0x4D Address: 0x01-xx Format: FLOAT Size: 4 Mode: R
where xx = 0x02 (M1), 0x04 (M2), SPP: Count (P)

SPP Program Elapsed Time
Type: 0x4E Address: 0x01-xx Format: FLOAT Size: 4 Mode: R
where xx = 0x02 (M1), 0x04 (M2), SPP: Count (P)

SPP Step Time Remaining
Type: 0x4F Address: 0x01-xx Format: FLOAT Size: 4 Mode: R
where xx = 0x02 (M1), 0x04 (M2), SPP: Count (P)

SPP Current Step Number
Type: 0x50 Address: 0x01-xx Format: FLOAT Size: 4 Mode: R
where xx = 0x02 (M1), 0x04 (M2), SPP: Count (P)

SPP Jog to Segment
Type: 0x51 Address: 0x01-xx Format: FLOAT Size: 4 Mode: R
where xx = 0x02 (M1), 0x04 (M2)

LP Set Point Status
Type: 0x52 Address: 0x01-xx Format: BINARY Size: 1 Mode: R (M)
RW (P)
where xx = 0x10 (M), LP: Count (P)

DATA FORMAT: 0 = local (SP1)
1 = remote (SP2)

LP Set Point Selection
Type: 0x53 Address: 0x01-xx Format: BINARY Size: 1 Mode: W (M)
RW (P)
where xx = 0x10 (M), LP: Count (P)

DATA FORMAT: 0 = local (SP1)
1 = remote (SP2)

LP Force Local Set Point
Type: 0x54 Address: 0x01-0x10 Format: BINARY Size: 1 Mode: R

DATA FORMAT: 0 = force local

LP Control Auto/Manual Status
Type: 0x55 Address: 0x01-xx Format: BINARY Size: 1 Mode: R (M)
RW (P)
where xx = 0x10 (M), LP: Count (P)

DATA FORMAT: 0 = manual
1 = auto

LP Control Auto/Man Selection
Type: 0x56 Address: 0x01-xx Format: BINARY Size: 1 Mode: W (M)
RW (P)
where xx = 0x10 (M), LP: Count (P)

DATA FORMAT: 0 = manual
1 = auto

LP Control Output Force Manual
Type: 0x57 Address: 0x01-xx Format: BINARY Size: 1 Mode: R
where xx = 0x10 (M), LP: Count (P)

DATA FORMAT: 0 = force manual

LP Control Action Status
Type: 0x58 Address: 0x01-xx Format: BINARY Size: 1 Mode: R
where xx = 0x10 (M), LP: Count (P)

DATA FORMAT: 0 = reverse
1 = direct

LP Control Action Selection
Type: 0x59 Address: 0x01-xx Format: BINARY Size: 1 Mode: W
where xx = 0x10 (M), LP: Count (P)

DATA FORMAT: 0 = reverse
1 = direct

LP Control Action Change
Type: 0x5A Address: 0x01-xx Format: BINARY Size: 1 Mode: R
where xx = 0x10 (M), LP: Count (P)

DATA FORMAT: 0 = inactive
1 = change action

LP Cascade Status
Type: 0x5B Address: 0x01-0x10 Format: BINARY Size: 1 Mode: R

DATA FORMAT: 0 = in cascade
1 = out cascade

LP Cascade 1 Select
Type: 0x5C Address: 0x01-0x10 Format: BINARY Size: 1 Mode: R

DATA FORMAT: 0 = in cascade
1 = out cascade

LP Cascade 2 Select
Type: 0x5D Address: 0x01-0x10 Format: BINARY Size: 1 Mode: R

DATA FORMAT: 0 = in cascade
1 = out cascade

LP Windup Status
Type: 0x5E Address: 0x01-0x10 Format: BINARY Size: 1 Mode: R

DATA FORMAT: 0 = inactive
1 = woundup

LP Integral Hold Selection
Type: 0x5F Address: 0x01-0x10 Format: BINARY Size: 1 Mode: RW

DATA FORMAT: 1 = hold

LP Integral Hold Status
Type: 0x60 Address: 0x01-0x10 Format: BINARY Size: 1 Mode: R

DATA FORMAT: 1 = hold

LP Force Bumpless Transfer Select
Type: 0x61 Address: 0x01-0x10 Format: BINARY Size: 1 Mode: RW

LP Bias 1 (P: Manual Reset)
Type: 0x62 Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx = 0x10 (M), LP: Count (P)

DATA FORMAT: Change from 0 to 1 causes bumpless transfer.

LP Tuning Parameter Selection
Type: 0x63 Address: 0x01-xx Format: BINARY Size: 1 Mode: RW
where xx = 0x10 (M), LP: Count (P)

DATA FORMAT: 0 = primary
1 = secondary

LP Tuning Parameter Status
Type: 0x64 Address: 0x01-xx Format: BINARY Size: 1 Mode: R
where xx = 0x10 (M), LP: Count (P)

DATA FORMAT: 0 = primary
1 = secondary

LP Force OFF Select
Type: 0x65 Address: 0x01-0x10 Format: BINARY Size: 1 Mode: RW

DATA FORMAT: 1 = force off

LP Output ON/OFF Status
Type: 0x66 Address: 0x01-xx Format: BINARY Size: 1 Mode: R (M)
RW (P)
where xx = 0x10 (M), LP: Count (P)

DATA FORMAT: 0 = off
1 = on

LP Self Tune Process Variable
Type: 0x67 Address: 0x01-0x10 Format: FLOAT Size: 4 Mode: R

LP Bias 2
Type: 0x68 Address: 0x01-0x10 Format: FLOAT Size: 4 Mode: RW

LP Output 1
Type: 0x69 Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx = 0x10 (M), LP: Count (P)

LP Output 2
Type: 0x6A Address: 0x01-0x10 Format: FLOAT Size: 4 Mode: RW

LP Working Set Point (%)
Type: 0x6B Address: 0x01-0x10 Format: FLOAT Size: 4 Mode: RW

LP Ratio
Type: 0x6C Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx = 0x10 (M), LP: Count (P)

LP PID Loop Type
Type: 0x6D Address: 0x01-xx Format: BINARY Size: 2 Mode: R
where xx = 0x10 (M), LP: Count (P)

BYTE 1 FORMAT:

VALUE	MEANING	VALUE	MEANING
0	PID (not programmed)	5	PID ratio
1	PID simple	6	CASCADE primary
2	PID medium	7	CASCADE secondary
3	PID complex	8	slit output
4	on-off ratio	9	carbon potential

BYTE 2 FORMAT: (NOTE: for P, always zero)

BITS	MEANING
0-3	other cascade loop (0000 = 1 thru 1111 = 16)
4	sp tracks pv = 1
5	sp tracks rsp = 1

AO Output Increasing
Type: 0x6E Address: 0x01-0x10 Format: BINARY Size: 1 Mode: R

AO Output Decreasing
Type: 0x6F Address: 0x01-0x10 Format: BINARY Size: 1 Mode: R

AO Drive Unit Speed
Type: 0x70 Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx = 0x10 (M), AO: Count (P)

PLC Drum Outputs (packed)
Type: 0x71 Address: 0x01-0x04 Format: BINARY Size: 2 Mode: R

SPP Time
Type: 0x72 Address: 0x01-xx Format: BINARY Size: 3 Mode: R
where xx = 0x02 (M1), 0x04 (M2)

DATA FORMAT:

BYTE	DESCRIPTION
2	Hour (00-23)
1	Minute (00-59)
0	Second (00-59)

SPP Start
Type: 0x73 Address: 0x01-xx Format: BINARY Size: 1 Mode: W
where xx = 0x02 (M1), 0x04 (M2), SPP: Count (P)

NOTE: A write of binary data 0x55 will activate the function. This cell is not readable since it is a one-shot occurrence.

SPP Reset
Type: 0x74 Address: 0x01-xx Format: BINARY Size: 1 Mode: W
where xx = 0x02 (M1), 0x04 (M2), SPP: Count (P)

NOTE: A write of binary data 0x55 will activate the function. This cell is not readable since it is a one-shot occurrence.

SPP Hold
Type: 0x75 Address: 0x01-xx Format: BINARY Size: 1 Mode: W
where xx = 0x02 (M1), 0x04 (M2), SPP: Count (P)

NOTE: A write of binary data 0x55 will activate the function. This cell is not readable since it is a one-shot occurrence.

SPP Advance
Type: 0x76 Address: 0x01-xx Format: BINARY Size: 1 Mode: W
where xx = 0x02 (M1), 0x04 (M2), SPP: Count (P)

NOTE: A write of binary data 0x55 will activate the function. This cell is not readable since it is a one-shot occurrence.

SPP Jog
Type: 0x77 Address: 0x01-xx Format: BINARY Size: 1 Mode: W
where xx = 0x02 (M1), 0x04 (M2)

NOTE: A write of binary data 0x55 will activate the function. This cell is not readable since it is a one-shot occurrence.

SPP Status
Type: 0x78 Address: 0x01-xx Format: BINARY Size: 1 Mode: R
where xx = 0x02 (M1), 0x04 (M2), SPP: Count (P)

DATA FORMAT:

BIT	FUNCTION
0,1	0 = stop 1 = run 2 = delayed start 3 = hold
2	1 = start
7	time display units: 0 = minute 1 = hours

SPP #1 Current Events
Type: 0x79 Address: 0x01-0x10 Format: BINARY Size: 1 Mode: R

SPP #2 Current Events
Type: 0x7A Address: 0x01-0x10 Format: BINARY Size: 1 Mode: R

CR Control Relays
Type: 0x7B Address: 0x01-0xFF Format: BINARY Size: 1 Mode: R
Relays 1 through 255

CR Block 2
Type: 0x7C Address: 0x00-0xFF Format: BINARY Size: 1 Mode: R
Relays 256 through 511

CR Block 3
Type: 0x7D Address: 0x00-0xFF Format: BINARY Size: 1 Mode: R
Relays 512 through 767

CR Block 4
Type: 0x7E Address: 0x00-0xE7 Format: BINARY Size: 1 Mode: R
Relays 768 through 999

PLC Timer Current Value
Type: 0x7F Address: 0x01-0x50 Format: FLOAT Size: 4 Mode: R

PLC Timer Preset Value
Type: 0x80 Address: 0x01-0x50 Format: FLOAT Size: 4 Mode: RW

PLC Counter Current Value
Type: 0x81 Address: 0x01-0x50 Format: FLOAT Size: 4 Mode: R

PLC Counter Preset Value
Type: 0x82 Address: 0x01-0x50 Format: FLOAT Size: 4 Mode: RW

PLC Drum Step Number
Type: 0x83 Address: 0x01-0x04 Format: FLOAT Size: 4 Mode: RW

PLC Drum Step Time
Type: 0x84 Address: 0x01-0x04 Format: FLOAT Size: 4 Mode: RW

CV/PP Output Status
Type: 0x85 Address: 0x01-xx Format: BINARY Size: 1 Mode: R
where xx = 0x3C (S), 0xFF (M), CV: Count (P)

TL Output Status
Type: 0x86 Address: 0x01-xx Format: BINARY Size: 1 Mode: R
where xx = TL: Count (P)

PP Output Status 2
Type: 0x87 Address: 0x01-xx Format: BINARY Size: 1 Mode: R
where xx = 0x3C (S), 0xFF (M)

SPP #1 Step Value
Type: 0x88 Address: 0x01-0x10 Format: FLOAT Size: 4 Mode: RW
The address is the step number.

PP Output Status 3
Type: 0x89 Address: 0x01-xx Format: BINARY Size: 1 Mode: R
where xx = 0x3C (S), 0xFF (M)

SPP #1 Step Duration/Time
Type: 0x8A Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
The address is the step number.
where xx = 0x3F (P), 0x10 (M)

PP Output Status 4
Type: 0x8B Address: 0x01-xx Format: BINARY Size: 1 Mode: R
where xx = 0x3C (S), 0xFF (M)

SPP #2 Step Value
Type: 0x8C Address: 0x01-0x3F Format: FLOAT Size: 4 Mode: RW
The address is the step number.

PP Limit Clamp
Type: 0x8D Address: 0x01-xx Format: BINARY Size: 1 Mode: R
where xx = 0x3C (S), 0xFF (M)

DATA FORMAT:

BIT	FUNCTION
0	pp flags 1-set
4	hi limit clamp
5	lo limit clamp
6	limit clamped

SPP #2 Step Duration/Time
Type: 0x8E Address: 0x01-0x3F Format: FLOAT Size: 4 Mode: RW
The address is the step number.

PLC Drum Outputs (single)
Type: 0x8F Address: 0x01-0x10 Format: BINARY Size: 1 Mode: R

AO Output High Limit
Type: 0x90 Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx = 0x17 (S), 0x17 (M), AO: Count (P)

AO Output Low Limit
Type: 0x91 Address: 0x01-xx Format: FLOAT Size: 4 Mode: RW
where xx = 0x17 (S), 0x17 (M), AO: Count (P)

PLC Drum Jog
Type: 0x92 Address: 0x01-0x04 Format: FLOAT Size: 4 Mode: R

Slot Diagnostics
Type: 0x93 Address: 0x01-0x0F Format: BINARY Size: 1 Mode: R

Rack Loading Free Space
Type: 0x94 Address: 0x01 Format: FLOAT Size: 4 Mode: R

Rack Loading Time Usage
Type: 0x94 Address: 0x02 Format: FLOAT Size: 4 Mode: R

Rack Loading PP Time Usage
Type: 0x94 Address: 0x03 Format: FLOAT Size: 4 Mode: R

Rack Loading AL Time Usage
Type: 0x94 Address: 0x04 Format: FLOAT Size: 4 Mode: R

Rack Loading PLC Time Usage
Type: 0x94 Address: 0x05 Format: FLOAT Size: 4 Mode: R

Rack Loading PLC Free Space
Type: 0x94 Address: 0x06 Format: FLOAT Size: 4 Mode: R

Rack Loading Time Units
Type: 0x94 Address: 0x07 Format: FLOAT Size: 4 Mode: R

AI Default Value
Type: 0x95 Address: 0x01-xx Format: FLOAT Size: 4 Mode: R
where xx = 0x87 (S), 0x4B (M1), 0xE1 (M2)

Carbon Potential - Carbon Sensor
Type: 0x96 Address: 0x01-0x10 Format: FLOAT Size: 4 Mode: R

Carbon Potential - Furnace Temperature
Type: 0x97 Address: 0x01-0x10 Format: FLOAT Size: 4 Mode: R

Carbon Potential - CO Compensation
Type: 0x98 Address: 0x01-0x10 Format: FLOAT Size: 4 Mode: R

Carbon Potential - Furnace Factor
Type: 0x99 Address: 0x01-0x10 Format: FLOAT Size: 4 Mode: R

Carbon Potential - Optional Selection
Type: 0x9A Address: 0x01-0x10 Format: BINARY Size: 1 Mode: R

AI RJ Compensation
Type: 0x9B Address: 0x01-xx Format: FLOAT Size: 4 Mode: R
where xx = 0x09 (S), 0x05 (M1), 0x0F (M2), AI: Count (P)

AI Output Values and Status
Type: 0x9C Address: 0x01-xx Format: float+byte Size: 5 Mode: R
where xx = 0x87 (S), 0x4B (M1), 0xE1 (M2)

DATA FORMAT FOR STATUS BYTE:

BIT	FUNCTION	IF SET:	S	M	P
0	Open Input Status	Reported	X	X	X
1	AI Comp/Emmiss	Active	X	X	X
2	Underrange	Under		X	X
3	Overrange	Over		X	X
4	Point Skip	Skip	X	X	X
5	Open Status	Open	X	X	X
6	Open Check	Enable	X	X	X
7	deg F/C	deg F	X	X	X

SPP Events (packed)
Type: 0x9D Address: 0x01-xx Format: BINARY Size: 2 Mode: R
where xx = 0x02 (M1), 0x04 (M2), SPP: Count (P)

DATA FORMAT:
The data are the events for the current SPP step.

Event 01 = bit 0 of byte 1 Event 08 = bit 7 of byte 1
Event 09 = bit 0 of byte 2 Event 16 = bit 7 of byte 2

Response Queue
Type: 0x9E Address: 0x00 Format: BINARY Size: 1-301 Mode: R

DATA FORMAT:

BYTE	CONTENT
1	Bits 0-6: Number of queued messages 7: Queue overflow indicator - 1 = yes
2-301	Up to 50 six-byte messages consisting of: Byte 1: Type Byte 2: Address Byte 3: Data State Byte 4: Time (hours) Byte 5: Time (minutes) Byte 6: Time (seconds)

The Response Queue is filled based on state changes of user-defined response packet (Type 0x29, Address 0x04) and diagnostic changes. The queue is implemented as a FIFO and is emptied upon reading. The queue holds up to 50 messages. To avoid overflow the queue should be read periodically.

SPP #1 Current Recipe Index
Type: 0x9F Address: 0x00 Format: FLOAT Size: 4 Mode: R

SPP #2 Current Recipe Index
Type: 0x9F Address: 0x01 Format: FLOAT Size: 4 Mode: R

SPP #3 Current Recipe Index
Type: 0x9F Address: 0x02 Format: FLOAT Size: 4 Mode: R

SPP #4 Current Recipe Index
Type: 0x9F Address: 0x03 Format: FLOAT Size: 4 Mode: R

LP Set Point Tracking
Type: 0xA0 Address: 0x01-xx Format: BINARY Size: 1 Mode: R
where xx = 0x10 (M), LP: Count (P)

LP Set Point Tracking: 0 = no track; 1 = track pv; 2 = track rem sp

PLC Timer Time Input
Type: 0xA1 Address: 0x01-0x50 Format: BINARY Size: 1 Mode: R

PLC Timer Reset Input
Type: 0xA2 Address: 0x01-0x50 Format: BINARY Size: 1 Mode: R

PLC Counter Count Input
Type: 0xA3 Address: 0x01-0x50 Format: BINARY Size: 1 Mode: R

PLC Counter Down/Up
Type: 0xA4 Address: 0x01-0x50 Format: BINARY Size: 1 Mode: R

PLC Counter Reset Input
Type: 0xA5 Address: 0x01-0x50 Format: BINARY Size: 1 Mode: R

PLC Drum Run/Hold Input
Type: 0xA6 Address: 0x01-0x04 Format: BINARY Size: 1 Mode: R
Data: 1=RUN, 0=HOLD

PLC Drum Jog Input
Type: 0xA7 Address: 0x01-0x04 Format: BINARY Size: 1 Mode: R

PLC Drum Advance Step Input
Type: 0xA8 Address: 0x01-0x04 Format: BINARY Size: 1 Mode: R

PLC Drum Reset Input
Type: 0xA9 Address: 0x01-0x04 Format: BINARY Size: 1 Mode: R

PLC MCR Coil Status
Type: 0xAA Address: 0x00 Format: BINARY Size: 1 Mode: R

PLC Skip Coil Status
Type: 0xAB Address: 0x01 Format: BINARY Size: 1 Mode: R

PLC Run Status
Type: 0xAC Address: 0x01 Format: BINARY Size: 1 Mode: R

Self Tune Current Gain
Type: 0xAD Address: 0x01 Format: FLOAT Size: 4 Mode: R

Self Tune Current Rate
Type: 0xAE Address: 0x01 Format: FLOAT Size: 4 Mode: R

Self Tune Current Reset
Type: 0xAF Address: 0x01 Format: FLOAT Size: 4 Mode: R

Self Tune Optune Gain
Type: 0xB0 Address: 0x01 Format: FLOAT Size: 4 Mode: R

Self Tune Optune Rate
Type: 0xB1 Address: 0x01 Format: FLOAT Size: 4 Mode: R

Self Tune Optune Reset
Type: 0xB2 Address: 0x01 Format: FLOAT Size: 4 Mode: R

Self Tune Start
Type: 0xB3 Address: 0x01 Format: BINARY Size: 1 Mode: RW

Self Tune Reset
Type: 0xB4 Address: 0x01 Format: BINARY Size: 1 Mode: RW

Self Tune Hold
Type: 0xB5 Address: 0x01 Format: BINARY Size: 1 Mode: RW

Self Tune Advance
Type: 0xB6 Address: 0x01 Format: BINARY Size: 1 Mode: RW

Self Tune Status
Type: 0xB7 Address: 0x01 Format: BINARY Size: 1 Mode: R

Self Tune % Complete
Type: 0xB8 Address: 0x01 Format: FLOAT Size: 4 Mode: R

Self Tune Hold Input
Type: 0xB9 Address: 0x01 Format: BINARY Size: 1 Mode: R

AI Range Low
Type: 0xBA Address: 0x01-xx Format: FLOAT Size: 4 Mode: R
where xx = 0x87 (S), 0x4B (M1), 0xE1 (M2), AI: Count (P)

AI Range High
Type: 0xBB Address: 0x01-xx Format: FLOAT Size: 4 Mode: R
where xx = 0x87 (S), 0x4B (M1), 0xE1 (M2), AI: Count (P)

PLC Drum 2 Outputs
Type: 0xBC Address: 0x01-0x10 Format: BINARY Size: 1 Mode: R

PLC Drum 3 Outputs
Type: 0xBD Address: 0x01-0x10 Format: BINARY Size: 1 Mode: R

PLC Drum 4 Outputs
Type: 0xBE Address: 0x01-0x10 Format: BINARY Size: 1 Mode: R

AI Function Block Description
Type: 0xC0 Address: 0x01-xx Format: Text Size: 14 Mode: RW
where xx = 0x87 (S), AI: Count (P)

AO Function Block Description
Type: 0xC1 Address: 0x01-xx Format: Text Size: 14 Mode: RW
where xx = 0x10 (S), AO: Count (P)

CV/PP Function Block Description
Type: 0xC2 Address: 0x01-xx Format: Text Size: 14 Mode: RW
where xx = 0x3C (S), CV: Count (P)

CN Function Block Description

Type: 0xC3 Address: 0x01-xx Format: Text Size: 14 Mode: RW
where xx = 0x32 (S), CN: Count (P)

DI Function Block Description

Type: 0xC4 Address: 0x01-xx Format: Text Size: 14 Mode: RW
where xx = 0x87 (S), DI: Count (P)

DO Function Block Description

Type: 0xC5 Address: 0x01-xx Format: Text Size: 14 Mode: RW
where xx = 0x87 (S), DO: Count (P)

AI Function Block Tag

Type: 0xC6 Address: 0x01-xx Format: Text Size: 7 Mode: RW
where xx = 0x87 (S), AI: Count (P)

AO Function Block Tag

Type: 0xC7 Address: 0x01-xx Format: Text Size: 7 Mode: RW
where xx = 0x10 (S), AO: Count (P)

CV/PP Function Block Tag

Type: 0xC8 Address: 0x01-xx Format: Text Size: 7 Mode: RW
where xx = 0x3C (S), CV: Count (P)

CN Function Block Tag

Type: 0xC9 Address: 0x01-xx Format: Text Size: 7 Mode: RW
where xx = 0x32 (S), CN: Count (P)

DI Function Block Tag

Type: 0xCA Address: 0x01-xx Format: Text Size: 7 Mode: RW
where xx = 0x87 (S), DI: Count (P)

DO Function Block Tag

Type: 0xCB Address: 0x01-xx Format: Text Size: 7 Mode: RW
where xx = 0x87 (S), DO: Count (P)

AI Engineering Units Text

Type: 0xCC Address: 0x01-0x87 Format: Text Size: 6 Mode: RW

Type: 0xCC Address: 0x01-xx Format: Text Size: 6 Mode: R
where xx = AI: Count (P)

PP Engineering Units Text

Type: 0xCD Address: 0x01-0x3C Format: Text Size: 6 Mode: RW

CV Engineering Units Text

Type: 0xCD Address: 0x01-xx Format: Text Size: 6 Mode: R
where xx = CV: Count (P)

DI On Label Text

Type: 0xCE	Address: 0x01-0x87	Format: Text	Size: 6	Mode: RW
Type: 0xCE	Address: 0x01-xx where xx = DI: Count (P)	Format: Text	Size: 6	Mode: R

DO On Label Text

Type: 0xCF	Address: 0x01-0x87	Format: Text	Size: 6	Mode: RW
Type: 0xCF	Address: 0x01-xx where xx = DO: Count (P)	Format: Text	Size: 6	Mode: R

DI Off Label Text

Type: 0xD0	Address: 0x01-0x87	Format: Text	Size: 6	Mode: RW
Type: 0xD0	Address: 0x01-xx where xx = DI: Count (P)	Format: Text	Size: 6	Mode: R

DO Off Label Text

Type: 0xD1	Address: 0x01-0x87	Format: Text	Size: 6	Mode: RW
Type: 0xD1	Address: 0x01-xx where xx = DO: Count (P)	Format: Text	Size: 6	Mode: R

DI On/Off Label Text

Type: 0xD2	Address: 0x01-xx where xx = 0x87 (S), DI: Count (P)	Format: Text	Size: 6	Mode: R

DO On/Off Label Text

Type: 0xD3	Address: 0x01-xx where xx = 0x87 (S), DO: Count (P)	Format: Text	Size: 6	Mode: R

LP Function Block Tag

Type: 0xD4	Address: 0x01-xx where xx = LP: Count (P)	Format: Text	Size: 7	Mode: RW

SPP Function Block Tag

Type: 0xD5	Address: 0x01-xx where xx = SPP: Count (P)	Format: Text	Size: 7	Mode: RW

AI Function Block Description (16)

Type: 0xD6	Address: 0x01-xx where xx = AI: Count (P)	Format: Text	Size: 16	Mode: RW

AO Function Block Description (16)

Type: 0xD7	Address: 0x01-xx where xx = AO: Count (P)	Format: Text	Size: 16	Mode: RW

CV Function Block Description (16)

Type: 0xD8	Address: 0x01-xx where xx = CV: Count (P)	Format: Text	Size: 16	Mode: RW

CN Function Block Description (16)

Type: 0xD9	Address: 0x01-xx where xx = CN: Count (P)	Format: Text	Size: 16	Mode: RW

DI Function Block Description (16)

Type: 0xDA	Address: 0x01-xx where xx = DI: Count (P)	Format: Text	Size: 16	Mode: RW

DO Function Block Description (16)

Type: 0xDB	Address: 0x01-xx where xx = DO: Count (P)	Format: Text	Size: 16	Mode: RW

LP Function Block Description (16)

Type: 0xDC	Address: 0x01-xx where xx = LP: Count (P)	Format: Text	Size: 16	Mode: RW

SPP Function Block Description (16)

Type: 0xDD	Address: 0x01-xx where xx = SPP: Count (P)	Format: Text	Size: 16	Mode: RW

TL Function Block Description (16)

Type: 0xDE	Address: 0x01-xx where xx = TL: Count (P)	Format: Text	Size: 16	Mode: RW

TL Function Block Tag

Type: 0xDF	Address: 0x01-xx where xx = TL: Count (P)	Format: Text	Size: 7	Mode: RW

TL Engineering Units Text

Type: 0xE0	Address: 0x01-xx where xx = TL: Count (P)	Format: Text	Size: 6	Mode: R

AL Function Block Description (16)

Type: 0xE1	Address: 0x01-xx where xx = AL: Count (P)	Format: Text	Size: 16	Mode: RW

AL Function Block Tag

Type: 0xE2	Address: 0x01-xx where xx = AL: Count (P)	Format: Text	Size: 7	Mode: RW

AL On Label Text

Type: 0xE3	Address: 0x01-xx where xx = AL: Count (P)	Format: Text	Size: 6	Mode: R

AL Off Label Text

Type: 0xE4	Address: 0x01-xx where xx = AL: Count (P)	Format: Text	Size: 6	Mode: R

AL On/Off Label Text

Type: 0xE5	Address: 0x01-xx where xx = AL: Count (P)	Format: Text	Size: 6	Mode: R

SPP #4 Step Value

Type: 0xE6 Address: 0x01-0x3F Format: FLOAT Size: 4 Mode: RW

The address is the step number.

SPP #4 Step Duration/Time

Type: 0xE7 Address: 0x01-0x3F Format: FLOAT Size: 4 Mode: RW

The address is the step number.

14. CTX/UDC5300/RSX/VPR/VRX Configuration Protocol

14.1 Download Protocol

The download to the device is achieved via a write to type 0x02 and address 0xC0. The data for the message is one line from the Configuration Language file (.LNC, etc.). The line must be terminated with a null character and the line must not include any carriage return or line feed characters.

Example:

0x02	0x02	0xC0	SY,1,TAG_DESC,RSX	0x00
↑	↑	↑	↑	↑
M	T	A	LNC Message	NULL

Note: M = Mode, T = Type, A = Address.
0x## is a hex number where ## is the 8 bit hex code.
There are no spaces between fields in the message, spacing shown only to show separation of the fields in the message.

A simple way of achieving the download is to open an existing LNC file and strip off the header line (first line) and then write via 0x02-0xC0 each remaining line in the file (one line per message).

If the line downloaded successfully the slave will respond with the following.

Example:

0x0A
↑
A-ACK

If any line is found to be in error the slave will A-NAK the message and report the standard Serial Instrument Protocol code followed by the text for the error message in the currently selected language. The Serial Instrument Protocol codes are found in the current Micromax Serial Communication User's Manual.

Example:

0x09	0x##
↑	↑
A-NAK	Code

Note: 0x## is a hex number where ## is the 8 bit hex protocol error code. There are no spaces between fields in the message, spacing shown only to show separation of the fields in the message.

The host station should hold onto all of the error codes and the line number that the error was found on and displayed the following data to the customer.

Example:
AI,1,COMPILE
^ Line #203: AI Limits Outside of Table

The error message that the customer sees is a translated message from the error code returned by the slave unit.

After every line is written from the file to the product the configuration is downloaded.

There will be different link turnaround times depending on the length, data type or structure of the line being transmitted. There will also be a delay when the COMPILE line is transmitted due to EEPROM delays. The host computer should not be concerned with the delays, I only mention this so the host can

make the link turnaround time large enough to accommodate the largest message. At this time I do not know the ideal turnaround time, it will have to be discovered during testing.

14.2 Upload Protocol

The upload from the device is achieved via two communications commands. The first command is a control command: it describes what is to be uploaded and starting from what line number, it also determines when to stop the transmission. The second command is used to read the configuration data. The upload should continue until the read next message is responded to with the UPLOAD COMPLETE A-NAK.

14.2.1 Control Message

Type 0x02 - Address 0xC1 (Write Only):

Byte 0: control byte:
- 0x00 - Stop upload.
- 0x01 - upload all configuration information.
- 0x02 - upload calibration information.
- 0x03 - upload specific function block.
- 0x04 - upload specific profile.

Bytes 1 - 4: Starting record number (Binary zero based)

Bytes 5 - 10: identifier code (optional block and profile upload)
- Byte 1 - 3: Type code (i.e. AI, AO, DI, DO, SP, etc.) (ASCII - space filled)
- Byte 4 - 6: Channel code (i.e. 001, 005, etc.) (ASCII - zero filled)

14.2.2 Data Message

Type 0x02 - Address 0xC2 (Read Only):

Bytes 0 - n: Configuration Language line (LNC)

14.2.3 Example Upload Sequence For Entire Configuration

1. Start sequence by sending:
   Master Message:

0x02	0x02	0xC1	0x01	0x00000000
↑	↑	↑	↑	↑
M	T	A	All	Start at line #0

   Slave Response (Success):

0x0A
↑
A-ACK

   Slave Response (Failure):

0x09	0x##
↑	↑
A-NAK	Reason Code

2. Read Sequential Lines.
   Master Message:

0x01	0x02	0xC2
↑	↑	↑
M	T	A

   Slave Response (Success):

0x01	0x02	0xC2	SY,1,TAG_DESC,RSX	0x00
↑	↑	↑	↑	↑
M	T	A	Data	NULL

   Slave Response (Failure):

0x09	0x##
↑	↑
A-NAK	Reason Code

14.2.4 Clear Configuration:

The unit's configuration may be cleared by sending the 0x02 0x2D message writing a zero for the configuration index.

14.3 Configuration Language Overview (LNC, LNL, LNS)

These languages are used to backup and restore the configuration, calibration and profile data.

Currently the RSX and CTX revision B2 products produce the entire configuration on the media when a store is requested. What is meant by the entire configuration is as follows: all the AI, DI, DO, AO, LP, TL, CN, AL, etc. points configuration, whether defaults or customer programming. CV points are on the media if the customer programmed them. If the customer never programmed a CV point the point will not exist on the media.

Any configuration loaded into the CTX or RSX product will take the data that is on the media and place it into the product in an overlay fashion, which means no block will be deleted prior to loading the data. If any block is not in the configuration file it will not be modified by the load process, i.e. if the product contains CV #1 as a math block prior to the load and the configuration does not have a CV #1 the load process will not effect CV #1.

14.3.1 Grammar

NOTE: Any future development of the CTX/UDC5300/RSX/VPR/VRX family MUST NOT write code to parse this syntax. All syntax parsing is available using database backup and restore routines provided by the database shell.

<lnc-program> ::= <header>
<lnc-series>

<header> ::= LNCFCONFIG <product> <revision>

<product> ::= <string>

<revision> ::= <string>

<lnc-series> ::= <lnc-statement> | <lnc-series>, <lnc-statement>

<lnc-statement> ::= <type>,<channel>,<parameter>,<lnc-value>

<type> ::= <string>

<channel> ::= <value>

<parameter> ::= <string>

<lnc-value> ::= <parameter-value> | <input-value>

<parameter-value> ::= <value> | <value-series>

<input-value> ::= <direct-value> | <indirect-value>

<direct-value> ::= D,<parameter-value>

<indirect-value> ::= I,<tag>,<parameter>

<tag> ::= <string>

<value-series> ::= <value> | <value>,<value-series>

<value> ::= <digit> | <value> <digit>

<string> ::= <letter> | <string> <letter>

<letter> ::= a | b | c | d | e | f | g | h | I | j | k | l | m | n | o | p | q | r | s | t | u | v | w | x | y | z | A | B | C | D | E | F | G | H | I | J | K | L | M | N | O | P | Q | R | S | T | U | V | W | X | Y | Z

<digit> ::= 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9

Non-Terminals:
<lnc-program>, <header>, <product>, <version>, <lnc-series>, <lnc-statement>, <type>, <channel>, <parameter>, <lnc-value>, <parameter-value>, <input-value>, <direct-value>, <indirect-value>, <tag>, <value-series>, <value>, <string>, <letter>, <digit>

Terminals:
a, b, c, d, e, f, g, h, I, j, k, l, m, n, o, p, q, r, s, t, u, v, w, x, y, z, A, B, C, D, E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, Z, 0, 1, 2, 3, 4, 5, 6, 7, 8, 9, ‘,’, LNCFCONFIG

Rules:
1. The LNC file must start with block descriptions. These block descriptions consist of two statements per block. Statement one is the ALGORITHM statement. Statement two is the TAG statement.
   Example: AI,1,ALGORITHM,Analog In
   AI,1,FB_TAG,AI 1
2. The type field must be the standard family type name.
3. The parameter field must be the standard family parameter name.
4. The data for the ALGORITHM parameter is defined in products.
5. The type of data represented for each parameter is dependent on the data type of that parameter.
6. The header and each lnc-statement must be on a separate line.
7. After each block’s data is listed the compile line for this block must be on the next line.
   Example: AI,1,COMPILE

14.3.2 Example LNC

```
LNCFCONFIG  PROGENY RSX  Rev B2
SY,1,ALGORITHM,System
SY,1,FB_TAG,SY 1
AI,1,ALGORITHM,Analog In
AI,1,FB_TAG,AI 1
SY,1,TAG_DESC,RSX
SY,1,OUT_SCALE,150.000000,0.000000,0,2
SY,1,COMPILE
AI,1,TAG_DESC,Analog In 1
AI,1,OUT_SCALE,5.000000,0.000000,0,2
AI,1,RJTEMP,D,0.000000AI,1,COMPILE
```

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