EUROTHERM
DRIVES

RS485 COMMS Option Board

Technical Manual

HA467210 Issue 1

Safety Information

Please read this information BEFORE installing the equipment.

Intended Users

This manual is to be made available to all persons who are required to install, configure or service equipment described herein, or any other associated operation.

The information given is intended to highlight safety issues, and to enable the user to obtain maximum benefit from the equipment.

Application Area

The equipment described is intended for industrial (non consumer) motor speed control utilising dc shunt machines.

Personnel

Installation, operation and maintenance of the equipment should be carried out by qualified personnel. A qualified person is someone who is technically competent and familiar with all safety information and established safety practices; with the installation process, operation and maintenance of this equipment; and with all the hazards involved.

REFER TO YOUR MAIN PRODUCT MANUAL FOR SPECIFIC SAFETY INFORMATION ABOUT THE DEVICE YOU ARE CONTROLLING

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RS485 COMMS OPTION BOARD

A System Overview

The RS485 COMMS Option Board provides a serial data port, allowing VSDs (variable speed drives) to be linked to form a network. Using a PLC/SCADA or other intelligent device, this network can be continuously controlled to provide supervision and monitoring for each VSD in the system.

With each unit under local control, the central supervisor performs only periodic setpoint updating, control sequencing and data collection.

In the system, the PLC/SCADA supervisor acts as the Master, and the VSD as the Slave.

The network of VSDs can be set-up using just one unit's MMI/Operator Station, or connection to ConfigEd Lite (or other suitable PC programming tool).

Advantages with this type of control system

1. Multi-wire analog transmission from a central programmable controller is replaced by a bussed digital system using serial data transmission over differential twisted-pair wires.
2. Digital transmission is fundamentally less noise-prone than analog methods, and the accuracy of the transmitted data is unaffected by the transmission medium. The use of intelligent devices at either end of the data link allows error checking to be used. This virtually eliminates the effects of electrical noise on data integrity. It is therefore possible to issue setpoints to drives with much higher accuracy using this method.
3. The communication standard used allows up to 32 drives to be connected to a single link which can be driven from a computer serial port. Additional drives can be readily accommodated through additional ports. Most computers are equipped with RS232 serial ports which can be easily converted to accommodate the RS485 standard. Modules are available from Eurotherm Drives to make this conversion.
4. The chosen standard and protocol are compatible with other Eurotherm Group products. Temperature controls, process controls, data loggers and drives can communicate easily with a common supervisory system.

The BISYNCH Protocol

The communications protocol used comes under the heading of Binary Synchronous Communications Data Link Control (BSCDLC).

This is all part of an internationally recognised ANSI standard protocol called BISYNCH (Binary Synchronous) and is known by the abbreviation x3.28.

This is widely used by manufacturers of computers, computer peripherals, and communications equipment.

EI BISYNCH, the specific form of communication used, corresponds with the following full American National Standard definition:

- ANSI Standard: x3.28, Revision: 1976
- Establishment and Termination Control Procedures Sub-category 2.5:
  Two-way Alternate, Non-switched Multi-point with Centralised Operation & Fast Select
- Message Transfer Control Procedure Sub-category B1:
  Message Associated Blocking with Longitudinal Checking & Single Acknowledgement

This is known by the abbreviation ANSI - x3.28 - 2.5 - B1.

Further Reading

Manual HP022047C: Eurotherm International BISYNCH Communications Handbook.

Product Features

- Suitable for use with:
  590 software version 3.x onwards
- Hardware self-test
- connection using shielded, twisted-pair cable
- Configured using Function Block inputs
- Diagnostics using Function Block outputs
- 4-wire operation
- Software-selectable Baud Rate
- Software-selectable Slave Address
- Direct tag access for all parameters

Product Code and Contents

The Eurotherm Drives' product is fully identified using a nine or 11 block alphanumeric code which records how the product was assembled, and its various settings when despatched from the factory.

The Option can be supplied with the drive product, or supplied separately:

Supplied with the 590: 590C/XXXX/X/X/X/X/**1**/XX/XXX

A "COMMS Option" plug-in card for use with the 590: AH385826U001

(The same option is used with all models of 590 and 591 Converter).

Installation

Wiring the System

WARNING!

Before installing, ensure that the drive and all wiring is electrically isolated and cannot be made "live" unintentionally by other personnel.

The RS485 Option is operated as a 4-wire system.

- A 4-wire system is suitable for use on a network in which the Master does not have or use its tri-state capability. It permits simultaneous transmit and receive (full duplex).

The driver in an RS485 system has tri-state capability (i.e. its output can be disabled) which allows multiple transmitters to be connected to the same bus. RS485 thus supports "multi-drop" operation. In multi-drop systems there is always one device which is a "Master" and which sends messages to or requests data from the "Slaves". A Slave never initiates a communication.

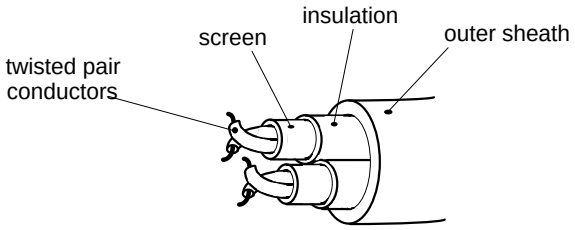
Note: *It is possible to make serial communications operate without adhering to the following recommendations, however, the recommendations will promote greater reliability.*

PLC/SCADA Supervisor

If possible, avoid using a PLC/SCADA supervisor which take its transmitter to a high impedance state (tri-state) when idling. If it is unavoidable, then it is essential to use properly screened cable.

Cable Specification

Use cable which has two twisted pairs, with each pair individually screened as shown. The characteristic impedance should be in the range 100 to 165 Ohms.



Recommended Cable Specification	
Characteristic Impedance	100-165Ω at 3-20MHz
Cable Capacitance	<30pF/m
Core Diameter	0.34mm² (22 AWG)
Cable Type	Twisted pair cable
Resistance	<110Ω/km
Shielding	Copper braid, or braid & foil

Note: *Belden B3079A cable meets the above specification, but there are others.*

Cable Routing

Daisy chain one Converter to the next. The supervisor should be at one end of the run. Avoid spurs.

Earthing/Grounding

Connect the screens of both pairs of wires to ground at the supervisor. If possible, connect the supervisor's transmitter/receiver 0V reference to earth. Connect all screens as shown in the diagram below.

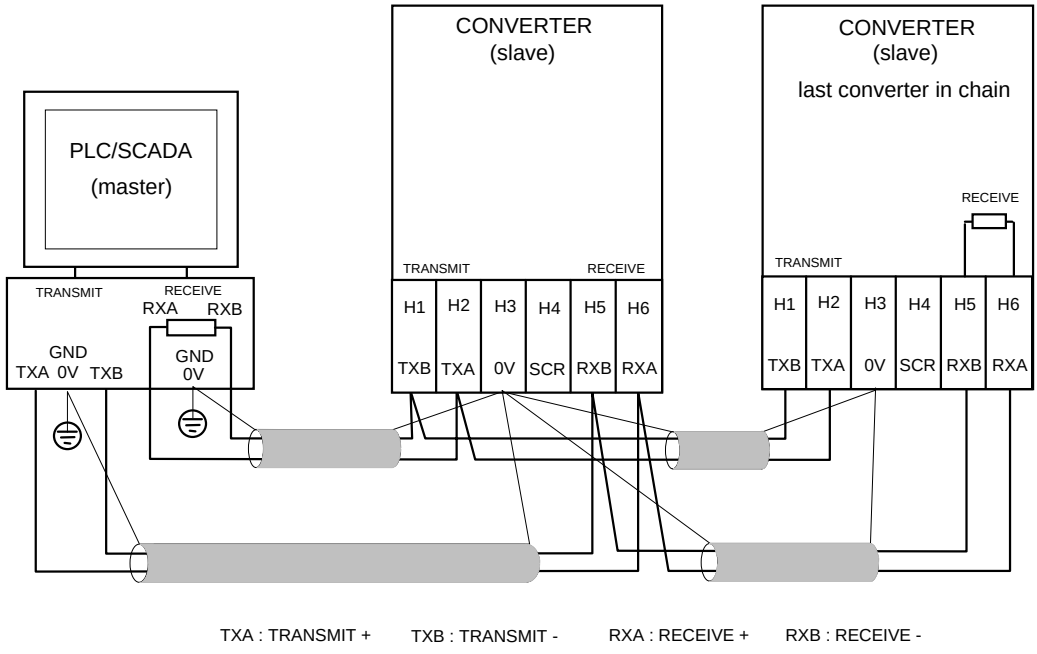


Figure 1 Typical 4-Wire Wiring Diagram for the 590 Converter

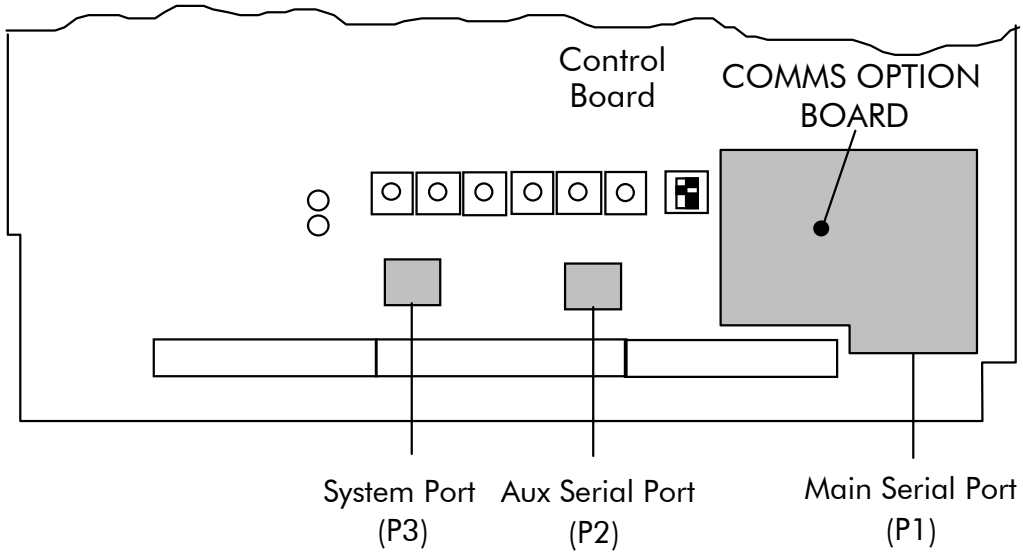
Fitting and Connecting to the COMMS Option Board

WARNING!
Ensure that all wiring is isolated and the drive is de-energised.

When fitting the option board, observe static control precautions.

- Lift the terminal cover flap.
- Fit the option board to the control board on the 10-pin connector and locating pins. Carefully press into position.
- Plug the ribbon cable into the COMMS Option Boards to connect the drive units or PLC/SCADA.

Lower the terminal cover flap.



User Connections to the Main Serial Port (P1)

The serial port on the Option allows the following RS485 links to be made.

	RS485
Electrical Connections	4-wire differential
Number of transmitters and transceivers allowed per differential pair of wires	32 drivers 32 receivers
Maximum cable length	4000ft/1200 metres

Terminators

- The unit logically furthest from the supervisor must must have a terminating resistor.
- All other units in the system should have the terminating resistor snipped out.

The supervisor's receiver input should also have a terminating resistor, chosen to match the characteristic impedance of the cable, typically 100 to 165 Ohms.

Initial Set-up

Configuring the 590 Converter

MMI Menu Map

1 SERIAL LEVEL

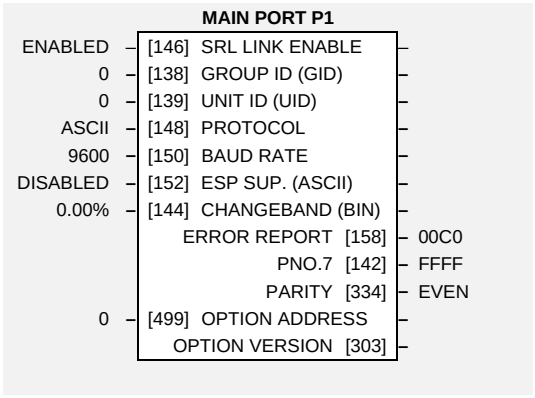
2 MAIN PORT P1

- SRL IINK ENABLE
- GROUP ID (GID)
- UNIT ID (UID)
- PROTCOL
- BAUD RATE
- ESP SUP. (ASCII)
- CHANGEBAND (BIN)
- ERROR REPORT
- PNO.7
- PARITY
- OPTION ADDRESS
- OPTION VERSION

Using the MMI or other suitable PC programming tool, the MAIN PORT P1 function block requires configuring before the RS485 option can be used.

ConfigEd Lite is Eurotherm Drives' Windows-based block programming software.

Refer to Chapter 6: "Programming Your Application" - MAIN PORT P1 in the Product Manual for parameter details.



Configuring the PLC/SCADA Supervisor

By referring to the Parameter Specification Tables starting on page 24 you can enter the parameter information you require.

The Parameter Specification Tables provide the information in the following way:

Block 1

PNO (ID)		TAG	DATA FORMAT			LIMITS	ACCESS	DESCRIPTION
DEC	ASCII		BIT	ASCII	BINARY	MIN TO MAX		
8	08	063	-	21	xxx.xx		R/O	Speed Setpoint
9	09	089	-	21	xxx.xx		R/O	Speed Demand
10	0A	062	-	21	xxx.xx		R/O	Speed Feedback
		066	-	21			R/O	Current D

Example only

The ASCII column provides the character mnemonic (of the tag number).

Explaining the EI BISYNCH Data Transfer Sequence

Data can be transferred in two formats: ASCII or Binary, i.e. a value of 100 is represented by the three ASCII characters 1, 0, 0; or by the Binary equivalent of 100 in 16 bit data format, 0064 Hex.

ASCII Communications

What Information Can I Transfer?

The data transfer sequence in the ASCII mode offers the following facilities:

i) Parameter enquiry (known as polling)

a. Single Parameter Poll
b. Continuous Polling of a Parameter
c. Sequential Polling (fast polling down the parameter list)

ii) Setting parameters (known as selection)

a. Single Parameter Selection
b. Continuous Selection of a Parameter
c. Sequential Selection (fast selection down the parameter list)

Note: *For examples of all the above refer to "Transferring Data - ASCII Example Messages", page 12.*

How is the Information Transferred?

There are two types of data transfer message:

1. Reading information from the Converter
2. Writing information to the Converter

In both cases the supervisor must have an established connection with the device, which will then respond. The role of master and slave exchanges during the transfer.

A message consists of a sequence of characters which we identify as

- Control Characters
- Instrument Address
- Parameter Mnemonic
- Data

Note: *Refer to "EI BISYNCH Message Protocol - ASCII" page 9, where these four types of character are discussed in detail.*

The following events take place in transmitting a successful message:

- Establish Connection
- Enquiry or Set Parameter
- Response
- Further Transmission and/or Termination

Establish Connection

Connection is established with a particular device by sending its two-digit address (i.e. INSTRUMENT ADDRESS as above).

You can set the address in the MAIN PORT P1, AUX PORT P2 and P3 SETUP menus.

Enquiry or Set Parameter

The message is either an enquiry (reading information from the Converter), or a message to set a parameter (writing information to the Converter).

Response to a `Set Parameter' Message

The Converter will respond to a Set Parameter message in one of three ways:

1. Positive Acknowledgement (ACK)
2. Negative Acknowledgement (NAK)
3. No Reply: Under certain circumstances the supervisor may not receive a reply from the Converter. This could be due to any of the following reasons:

- Group/Unit address identifiers not recognised.
- An error (e.g. parity) is found in one or more of the characters up to and including (ENQ).
- Communications loop failure perhaps due to noise or wrong Baud Rate being selected.
- Hardware failure.
- Serial link is disabled on the Operator Station.

In these cases the supervisor should be programmed to "time-out", i.e. wait for a response for a short time (160 msec minimum) before trying again.

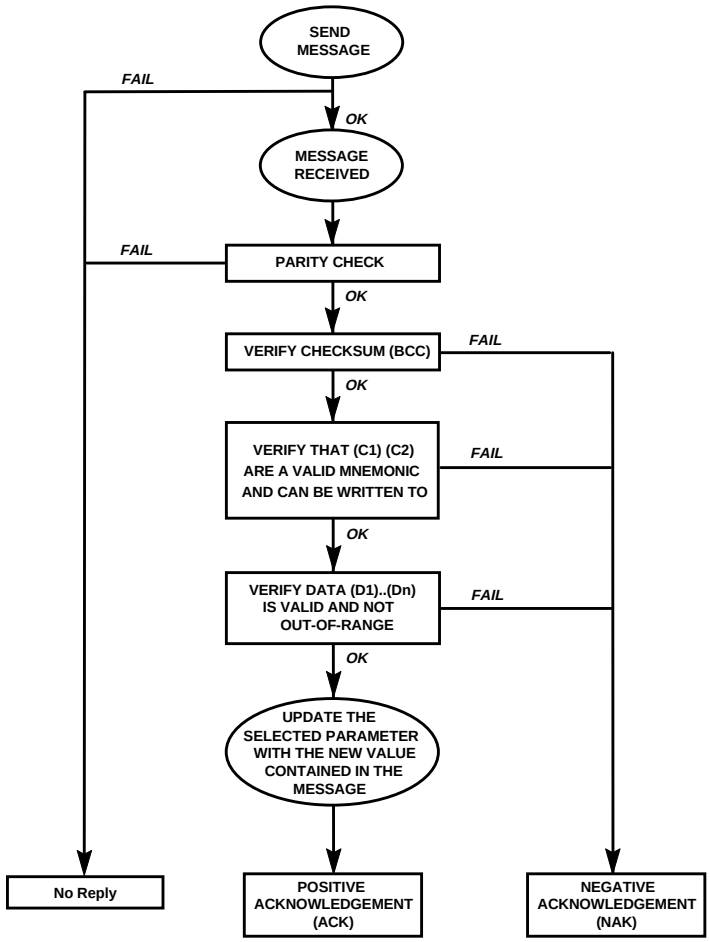


Figure 2 Converter Response Sequence to an ASCII Selection Message

Further Transmission and/or Termination

Further Transmission

If the supervisor still has an established connection with the device, you can repeat the previous message without re-establishing connection.

In both cases, writing to or reading from the device, you can use this to re-select the previous parameter or to select the next parameter in the parameter list. Refer to “Transferring Data - ASCII Example Messages”, page 12 for further explanation.

Termination (EOT)

If you wish to terminate connection with a particular device and establish connection with another, send the 'Establish Connection' sequence preceded by the (EOT) control character, (End Of Transmission).

The (EOT) character resets all devices on the data link to be responsive to the next four characters, i.e. the (GID)(GID)(UID)(UID) address (this would be .

In 4-wire operation, an (EOT) can be sent at any time, including when the device has Master status.

Programmer's Information

ASCII (American Standard Code for Information Interchange)

The RS485 Option communicates using ASCII, a binary code which represents letters, digits, and control signals (collectively called characters).

The code, originated by the American National Standards Institute (ANSI), has become a world-wide standard for information interchange. It uses a seven bit binary word to represent all the letters, digits, punctuation marks and control signals.

Handling of Numerical Data

(Format 21 - Free Format Numeric)

Numerical Data is transferred as a string of characters. The length of the string required to transmit the data value is determined by the value itself, however, no leading zeros are added to pad out the string length and trailing zeros are omitted, i.e.

1.00, 1.0, 1. or 1	is converted to	1
-2.20 or -2.2	is converted to	-2.2

Handling of Status Information

(Format 23 - Hexadecimal)

Status Information is transmitted by first encoding the data into a hexadecimal format. The length of a string is then determined by the number of characters in the encoded data. The hexadecimal data is preceded by a '>' sign to differentiate it from numerical data.

Note: *Hexadecimal refers to the common practice of counting to the base of 16 in computing rather than the base of 10. The sixteen `numbers' used being 0 to 9, A to F. Thus an 8 bit byte is represented by two characters in the range 00 to FF, while a 16 bit word is represented by four characters in the range 0000 to FFFF.*

Block Check Character (BCC)

This is a checksum value generated by taking the exclusive OR (XOR) of the ASCII values of all the characters transmitted after and excluding (STX) up to and including (ETX). For example, the shaded characters are included in the (BCC) of the following message:

(EOT)	(GID)	(GID)	(UID)	(UID)	(STX)	(C1)	(C2)	(D1)	(D2)	(D3)	(ETX)	(BCC)

Example 5: Set Parameter

For Beginners:

You can calculate this easily by converting the ASCII values to Binary and progressively adding the Binary values together, obeying the following rules:

$$\begin{array}{r} 0 \\ +\,0 \\ \hline 0 \end{array} \quad \begin{array}{r} 1 \\ +\,1 \\ \hline 0 \end{array} \quad \begin{array}{r} 1 \\ +\,0 \\ \hline 1 \end{array} \quad \begin{array}{r} 0 \\ +\,1 \\ \hline 1 \end{array}$$

Referring to Example 5 again (page 15), the calculation of (BCC) becomes:

As Characters	HEX	ASCII	Binary
(C1)	37	7	0 1 1 1 0 1 1
(C2)	31	1	0 0 0 1 0 1 1
			0 1 1 0 0 0 0 (sub-total)
(D1)	33	3	0 1 1 0 0 1 1
			0 0 0 0 0 1 1 (sub-total)
(D2)	30	0	0 1 1 0 0 0 0
			0 1 1 0 0 1 1 (sub-total)
(D3)	2E	.	0 1 0 1 1 1 0
			0 0 1 1 1 0 1 (sub-total)
(ETX)	03	(ETX)	0 0 0 0 0 1 1
(BCC)	E1	(RS)	0 0 1 1 1 1 0 (TOTAL)

EI BISYNCH Message Protocol - ASCII

Transmission Standard	:	RS485
Protocol	:	ANSI-X3.28-2.5-B1
Data Rates	:	300, 600, 1200, 2400, 4800, 9600 or 19200 Baud
Character Format	:	1 start + 7 bit ASCII data + 1 parity + 1 stop bit (10 bits)
Parity	:	Even

The Protocol defines the string or sequence of characters (called a Message) which must be sent between communicating instruments to produce specific responses. The message usually comprises:

- Control Characters
- Instrument Address
- Parameter Mnemonic
- Data

Control Characters

Control Characters are ASCII codes that define actions rather than information. Six ASCII codes are supported:

Keyboard	***HEX***	***ASCII***	
^B	02	(STX)	*Start of Text*
^C	03	(ETX)	*End of Text*
^D	04	(EOT)	*End of Transmission*
^E	05	(ENQ)	*Enquiry*
^F	06	(ACK)	*Positive Acknowledge*
^U	15	(NAK)	*Negative Acknowledge*

Instrument Address

The Converter has a two-digit address, the first digit being the “group” ID number (GID) in the range 0 to F, the second digit is a “unit” ID number (UID) in the range 0 to F. There are therefore 256 different addresses from 00 to FF.

The Instrument Address (01 for example) is repeated in the message (i.e. 0011) for security as it is not included in a Checksum.

Parameter Mnemonic

Each parameter in the Converter’s menu system is identified by a unique Tag Number. Information is exchanged across the system by use of a two character Mnemonic that is derived from the Tag Number.

Examples are:

81 : the SETPOINT 1 parameter from the SETPOINTS function block

3b : the I DMD. ISOLATE parameter from the CURRENT LOOP function block

Note: *Refer to Parameter Specification Tables, page 24 for a full list of tag mnemonics. - see the ASCII column.*

Data (EI-BISYNCH Prime Set)

Information is exchanged across the system using Mnemonics. The parameters are known as the EI-BISYNCH Prime Set.

EI-BISYNCH Prime Set

The following prime set parameters are supported:

Mnemonic	Description	Function	Access
BL	Buffer Length	Returns 464616 indicating that both transmit and receive buffers are 4616 bytes long.	Read Only
CI	Configuration Information	Returns 4CCC16 indicating that the drive supports both fixed and variable length data formats, and that the drive is a single-function device.	Read Only
EE	Error Report	Returns a hexadecimal code to indicate the status of serial link transmissions: Writing any value to mnemonic EE resets it to 00C0, i.e. no error. Refer to "Reference" - ERROR REPORT (EE) later in this chapter for a list of codes.	Read/Write
II	Instrument Identifier	Returns the value of a parameter, the default value of which is 5900.	Read/Write
MN	Mode Number	Returns a fixed value 08C1 (the full Eurotherm standard is not supported).	Read Only
V0	Version Number	Returns the issue number in the upper two characters, and the release number in the lower two characters. For example, issue 3.4 returns 0304.	Read Only

In addition to the Prime Set, each drive or instrument supports an application set of parameters to allow fast access to commonly required variables such as:

- Process variables
- Setpoints
- PI gains

All parameters can be found by polling the instrument identifier parameter and then sequenctially polling until the instrument identifier parameter is repeated. This results in a circular list that contains all parameters supported by the instrument.

ASCII Sequence Diagrams

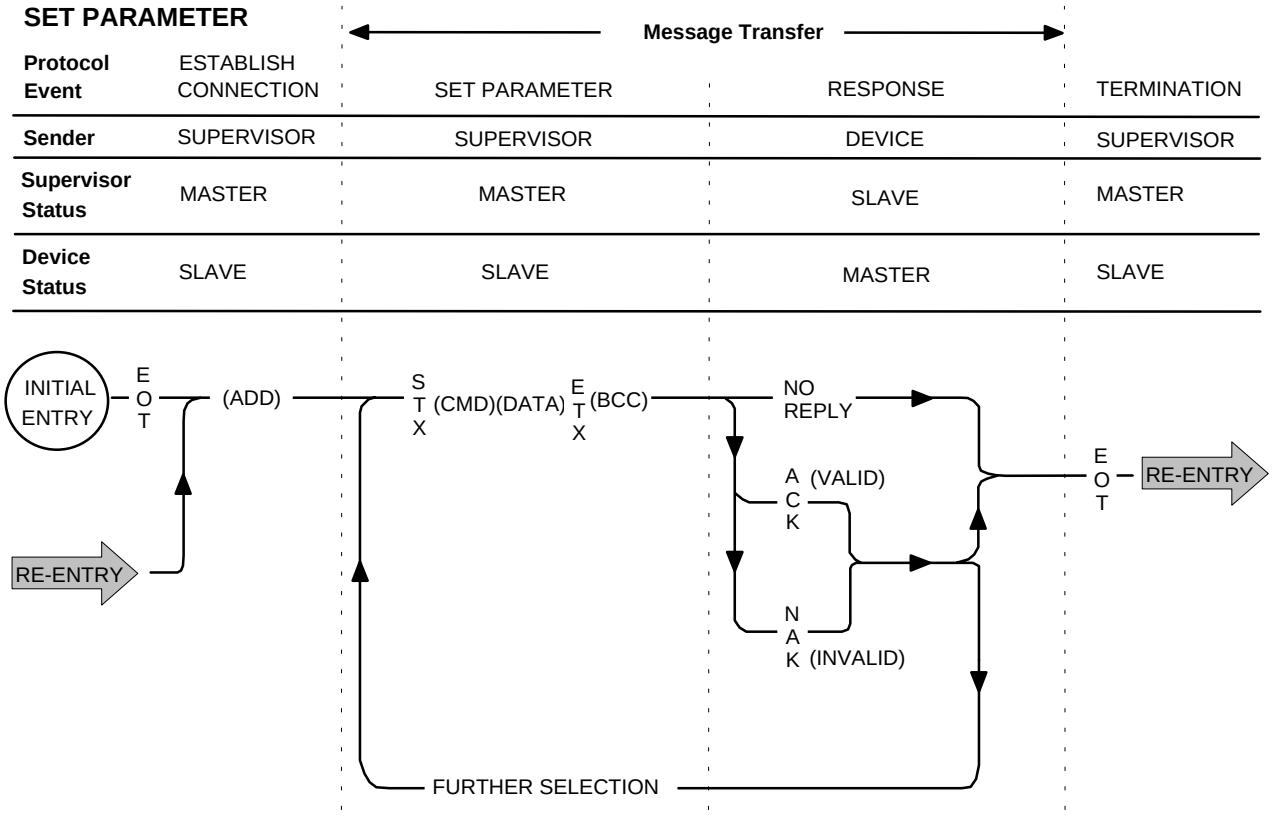


Figure 3 Selection Sequence for Writing Information to the Converter

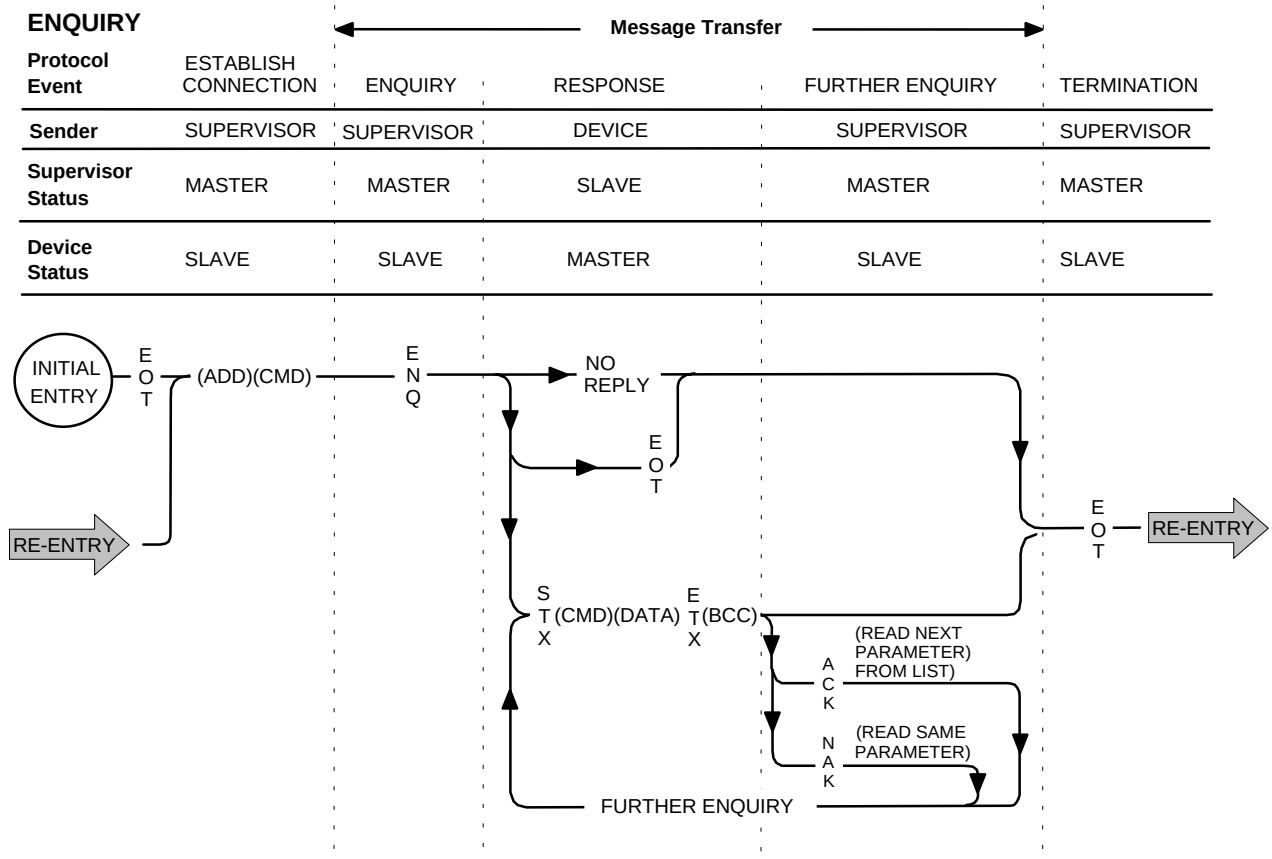


Figure 4 Poll Sequence for Reading Information from the Converter

Transferring Data - ASCII Example Messages

The following examples show how data transfer takes place using the network, they will also help to verify your communications if you have just finished installing the COMMS Option Board. Many users will not become involved in generating low-level code, but for those experienced in programming, the examples include ASCII, HEX and Control Character information.

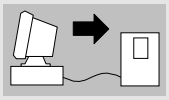
Note: *Refer to "Control Character Definitions", page 17 for a more detailed explanation of all control characters.*

Example 1: EI BISYNCH Prime Set

Note: *Refer to "EI-BISYNCH Prime Set", page 10 for a full list of EI BISYNCH Prime Set mnemonics supported.*

Using this set of mnemonics, you can enquire about the Converter. For instance, you could enquire about the Instrument Identity:

ENQUIRY



- ***For software users:***
  Enter the known address of the Converter (say 01), II, and that it is an enquiry.
- ***For programmers, in ASCII:***

(EOT)	0	0	1	1	I	I	(ENQ)

- ***For programmers, in HEX:***

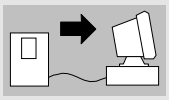
04	30	30	31	31	49	49	05

- ***As Characters - Establish Connection | Ask Question:***

(EOT)	(GID)	GID)	(UID)	(UID)	(C1)	(C2)	(ENQ)

Note: *The (GID)(UID) address is always entered twice.*
Refer to "Instrument Address", page 9 for a more detailed explanation.

RESPONSE



- ***For software users:***
  The Instrument Identity will be returned, in our case 5900 (representing a 590 Converter)
- ***For programmers, in ASCII:***

(STX)	I	I	5	9	0	0	(ETX)	(NUL)

- ***For programmers, in HEX:***

02	49	49	35	39	30	30	03	00

- ***As Characters - Valid Response:***

(STX)	(C1)	(C2)	(D1)	(D2)	(D3)	(D4)	(ETX)	(BCC)

Note: *The BCC checksum (XOR) of the data after and excluding (STX) up to and including (ETX) is "**(NUL)**" and >**00**. Refer to "Block Check Character (BCC)", page 8 for a more detailed explanation.*

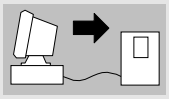
In Example 1, connection to a new device is being made, i.e. the "Establish Connection" information is transmitted. However, these examples can be transmitted without the "Establish Connection" information if connection to the correct device is already established. This is shown by Examples 3, 4, 6 & 7.

Example 2: Tag Access (Single Parameter Poll)

Here we ask a question of a single parameter: *what is the value of SETPOINT 1?*

(Tag 289, SETPOINT 1, ID 81, Type INT - see the Parameter Specification Table in the Product Manual for this information)

ENQUIRY



- ***For software users:***
  Enter the known address of the Converter (say 01), 81, and that it is an enquiry.
- ***For programmers, in ASCII:***

(EOT)	0	0	1	1	8	1	(ENQ)

- ***For programmers, in HEX:***

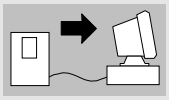
04	30	30	31	31	38	31	05

- ***As Characters - Establish Connection | Ask Question:***

(EOT	(GID)	GID)	(UID)	(UID)	(C1)	(C2)	(ENQ)

Note: *The (GID)(UID) address is always entered twice.*
Refer to "Instrument Address", page 9 for a more detailed explanation.

RESPONSE



- ***For software users:***
  The SETPOINT 1 value will be returned, say 30. (representing 30.00%)
- ***For programmers, in ASCII:***

(STX)	8	1	3	0	.	(ETX)	n

- ***For programmers, in HEX:***

02	38	31	33	30	2E	03	6E

- ***As Characters - Valid Response:***

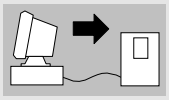
(STX)	(C1)	(C2)	(D1)	(D2)	(D3)	(ETX)	(BCC)

Note: *The BCC checksum (XOR) of the data after and excluding (STX) up to and including (ETX) is "**n**" and >**6E**. Refer to "Block Check Character (BCC))", page 8 for a more detailed explanation.*

Example 3: Tag Access (Continuous Polling of a Parameter)

After receiving a valid response (from Example 2), you can cause the Converter to repeat that response without having to re-establish the connection. You can use this to continuously monitor a parameter.

ENQUIRY



- ***For software users:***
  Send (NAK).
- ***For programmers, in ASCII:***

  (NAK)

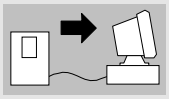
- ***For programmers, in HEX:***

  15

- ***As Characters - Repeat Parameter:***

  (NAK)

RESPONSE

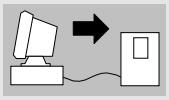


The response will be as for Example 2, however the returned data will be an updated value, i.e. SETPOINT 1 may now be 32. (representing 32.00%).

Example 4: Tag Access (Sequential Polling)

After receiving a valid response (from Example 2), you can cause the Converter to fetch the next parameter from the parameter list (i.e. as given in the Parameter Specification Table in the Product Manual). You can use this to continuously sequence through all of the Converter's parameters.

ENQUIRY



- ***For software users:***
  Send (ACK).
- ***For programmers, in ASCII:***

  (ACK)

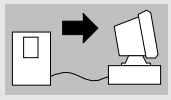
- ***For programmers, in HEX:***

  06

- ***As Characters - Scroll Mode:***

  (ACK)

RESPONSE

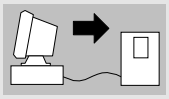


The response will be as for Example 2, however the data will be for the next parameter in the parameter list, i.e. in the case of the 590 Converter, SETPOINT 2 at say 50. (representing 50.00%).

Example 5: Tag Access (Single Parameter Selection)

Here we are writing a value to a single parameter: *the value of TAKE UP 1 is 30.00%*.

SET PARAMETER



(Tag 253, TAKE UP 1, ID 71, Type INT - see the Parameter Specification Table for this information)

- ***For software users:***
  Enter the known address of the Converter (say 01), (STX), 71, 30. and (ETX).
- ***For programmers, in ASCII:***

(EOT)	0	0	1	1	(STX)	7	1	3	0	.	(ETX)	o

- ***For programmers, in HEX:***

04	30	30	31	31	02	37	31	33	30	2E	03	6F

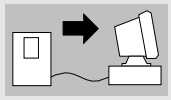
- ***As Characters - Establish Connection | Data Transfer:***

(EOT)	(GID)	(GID)	(UID)	(UID)	(STX)	(C1)	(C2)	(D1)	(D2)	(D3)	(ETX)	(BCC)

Note: *The (GID)(UID) address is always entered twice.*
Refer to "Instrument Address", page 9 for a more detailed explanation.

*The BCC checksum (XOR) of the data after and excluding (STX) up to and including (ETX) is "**o**" and >**6F**. Refer to "Block Check Character (BCC)", page 8 for a more detailed explanation.*

RESPONSE



- ***For software users:***
  The response will be either (ACK), (NAK) or no reply. If (ACK), the parameter value will be updated at the Converter.
- ***For programmers, in ASCII:***

either (ACK), (NAK) or no reply

- ***For programmers, in HEX:***

either 06, 15 or no reply

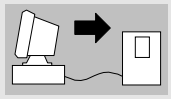
- ***As Characters:***

either (ACK), (NAK) or no reply

Example 6: Tag Access (Continuous Selection of a Parameter)

You can repeat a valid selection (from Example 5) without having to re-establish connection to the Converter. You can use this to continuously update a parameter. Lets say the new value is 35. (representing 35.00%).

SET PARAMETER



- ***For software users:***
  Send (STX), 71, 35. and (ETX).
- ***For programmers, in ASCII:***

(STX)	7	1	3	5	.	(ETX)	j

- ***For programmers, in HEX:***

02	37	31	33	35	2E	03	6A

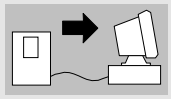
- ***As Characters - Data Transfer:***

(STX)	(C1)	(C2)	(D1)	(D2)	(D3)	(ETX)	(BCC)

Note: *The BCC Checksum is the result of the new value you are sending to the Converter. Refer to "Block Check Character (BCC)", page 8 for a more detailed explanation.*

RESPONSE

The response will be as for Example 5.

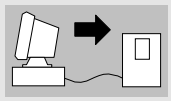


Example 7: Tag Access (Sequential Selection)

You can also repeat a valid selection (as above) without having to re-establish the connection to the Converter to update any other specified parameter. Lets say the next parameter you want to update is I DMD. ISOLATE whose new value is to be ENABLED (1).

(Tag 119, I DMD. ISOLATE , ID 3b, Type BOOL - see the Parameter Specification Table for this information)

SET PARAMETER



- ***For software users:***
  Send (STX), 3b, 1 and (ETX).
- ***For programmers, in ASCII:***

(STX)	3	b	1	(ETX)	`

- ***For programmers, in HEX:***

02	33	62	31	03	60

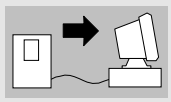
- ***As Characters - Data Transfer:***

(STX)	(C1)	(C2)	(D1)	(ETX)	(BCC)

Note: *The BCC Checksum is the result of the new information you are sending to the Converter.*

RESPONSE

The response will be as for Example 5.



Reference

Parameter Types

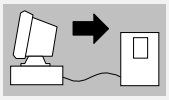
Type	Description	Encoding	Comments
BOOL	Boolean	FALSE >0 TRUE >1 *ESP SUP. (ASCII) enabled:* FALSE >0000 TRUE >0001	Will accept >0 and >1 (unless ESP SUP. (ASCII) is enabled)
WORD	16-bit Bitstring	>0000 to >FFFF	Will accept leading zero suppression, except >0
INT	16-bit Signed Integer	-XXXXX. to XXXXX. -XXXX.X to XXXX.X -XXX.XX to XXX.XX -XX.XXX to XX.XXX -X.XXXX to X.XXXX	Leading zeros suppressed up to digit before decimal point. Trailing zeroes suppressed after decimal point.

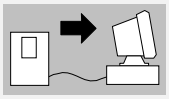
Character Definitions

Standard Character Definitions	
(GID)	The Group address Identifier (repeated for security)
(UID)	The Unit address identifier (repeated for security)
(C1) (C2)	The two characters of the parameter mnemonic (from the Tag number)
(D1)..(Dn)	The value of the requested parameter (string may be any length, determined by the data).
(BCC)	Block Check Character: a character generated by taking the exclusive OR (XOR) of the ASCII values of all the characters transmitted after and excluding (STX) up to and including (ETX)

Control Character Definitions

Standard Control Character Definitions	
(STX)	Start of text
(ETX)	End of text
(EOT)	End of Transmission: resets all instruments on the link and causes them to examine the next four transmitted characters to see if they correspond with their Group/Unit address identifiers Also sent to terminate communication with a particular device.

Control Character Definitions when Reading Information 	
(ENQ)	Indicates the end of the message, and that it is an enquiry
(ACK)	Sequential Polling: when transmitted after a valid response, this fetches data from the next parameter in the parameter list
(NAK)	Continuous Polling: when transmitted after a valid response, this fetches data from the previously requested parameter
(EOT)	The information received contained an error

Control Character Definitions when Writing Information 	
(ACK)	Positive Acknowledgement: the message was correctly received and the parameter updated
(NAK)	Negative Acknowledgement: the message received by the Converter contained an error and the parameter was not updated

ERROR REPORT (EE)

The EI-BISYNCH Prime Set contains the EE mnemonic. This is also an output parameter in the MAIN PORT (P1), AUX PORT (P2) and SYSTEM PORT (P3) function blocks, where the parameter value can be read and reset. Refer to “Configuring the 590 Converter”, page 5.

The following values are returned if an enquiry (reading information from the Converter) is performed on this Read/Write parameter.

Writing any value to this parameter will set the value to >00C0. Clearing the last error value may be useful in seeing a repetitive error re-occurring.

Value	Description
>00C0	No error
>01C7	Invalid mnemonic
>02C2	Checksum (BCC) error
>03C1	Parity error on received data
>03C2	Framing or overrun error
>05C8	Attempt to write to a read-only parameter
>07C7	Invalid message format
>08C8	Data out of range

Binary Communications

This mode has many similarities with the ASCII mode, and so what follows is a summary of the differences to the ASCII mode.

Character Format
Each byte is transmitted as 11 bits rather than adapting the 10-bit format used by the ASCII mode. The format is represented by the following:-

1	Start bit (lo)	
7	Data bits (LSB first)	
1	Control bit *	
1	Even parity bit (default)	
1	Stop bit (hi)	* 0 = Control character, 1 = Data character

How is the Information Transferred?

During serial communications, the 590 Converter acts as a slave and responds to messages sent from the Supervisor. Messages received from the Supervisor are categorised into Main Messages and Continuation Messages.

The Binary mode introduces several different Control and Data Characters. Refer to “EI BISYNCH Message Protocol - Binary”, page 20.

Response to a `Selection’ Message

The response is very similar to the ASCII mode but differs in that the ASCII (GID)/(UID) address is replaced by the Binary (INO), Instrument Number. Also, the ASCII parameter mnemonic (C1)(C2) is replaced by the Binary (PNO) character.

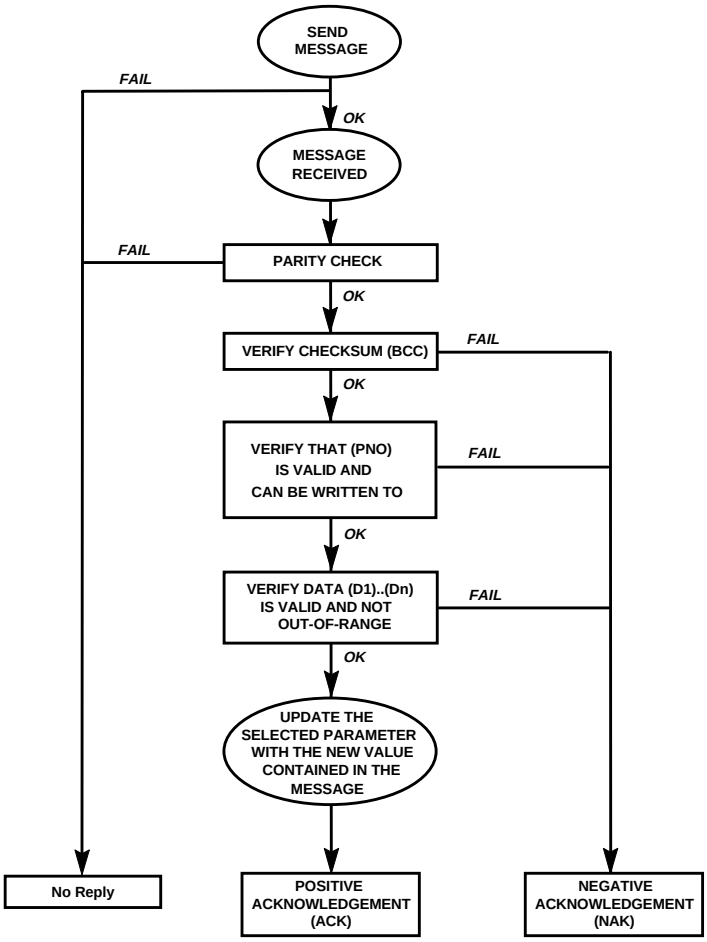


Figure 5 Converter Response Sequence to a Binary Selection Message

EI BISYNCH Message Protocol - Binary

Transmission Standard	:	RS485 (RS422 bi-directional)
Protocol	:	ANSI-X3.28-2.5-B1
Data Rates	:	300, 600, 1200, 2400, 4800, 9600 or 19200 Baud
Character Format	:	1 start + 8 bit ASCII data + 1 parity + 1 stop bit (10 bits)
Parity	:	Even

Control Character Definitions

(EOT) End of Transmission (clears the line sent by the master starting of a new message)

(STX) Start of Text.

(ENQ) Enquiry (sent by the master as the last character of any type of polling message)

(ETX) End of Text (is followed by the checksum)

(ETB) End of Block (sent by the 590 instead of (ETX) when replying to a multi parameter enquiry. It indicates the end of a block, but not the end of a message. It is used in replies to Enquiry Polling and Multi-parameter Polling.

(ACK) Positive Acknowledgement

(NAK) Negative Acknowledgement

Data Character Definitions

(INO) Instrument Number (contains the address of the slave drive and is equivalent to the combination of the GID, UID characters of the ASCII mode)

(PNO) Parameter Number (equivalent to the combination of the (C1) and (C2) characters of the ASCII mode and is sent as a hexadecimal number rather than two ASCII characters)

(D1), (D2) and (D3) These three characters contain both the value and the mode number. Refer to "Data Format" below.

(CCC) Connection Check Control (contains the checksum of all the characters following the (EOT) character in the message)

(BCC) Block Check Charceter (checksum value generated by taking the exclusive OR (XOR) of the ASCII values of all characters transmitted after and excluding (STX) up to and including (ETX).

Data Format

Data values are presented in three consecutive characters, (D1), (D2) and (D3). These characters include the mode name and value read from, or to be written to, one of the parameters.

A data character is represented by setting its MSB (bit 7). The contents of these characters are as follows:

D1 : bits 2 [→] 6 mode number

Number format is:

0 = XXXX
1 = XXX.X
2 = XX.XX
3 = X.XXX
4 = .XXXX

bits 0 and 1 bits 14 and 15 of the value.

D2 : bits 0 [→] 6 bits 7 to 13 of the value.

D3 : bits 0 [→] 6 bits 0 to 6 of the value.

List of PNO Assignments

The serial link parameter numbers (PNO) include dedicated parameters, and also 16 configurable parameters.

The 16 configurable parameters have PNO's 112 to 127 (ASCII mnemonics 70 to 7F). These can be made to point to any TAG number, either via the MMI (PNO CONFIG), or via the serial link.

PNO's 96 to 111 (ASCII mnemonics 60 to 6F) are pointers associated with PNO's 112 to 127.

For example:

If PNO 96 = 123, then PNO 112 will access TAG number 123.

If PNO 100 = 234, then PNO 116 will access TAG number 234

Enquiry Polling

In normal Enquiry Polling mode, block 1 is polled.

References

HP022047C. Eurotherm International Bisynch Communications Handbook.

Transferring Data - Binary Example Messages

There are two message types:

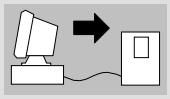
1. Main Messages
2. Continuation Messages

Main Messages

The main messages are in four types:

SELECTION

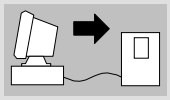
The Supervisor writes to one parameter. The (BCC) character contains the checksum of all characters following the (STX).



(EOT)	(INO)	(CCC)	(STX)	(PNO)	(D1)	(D2)	(D3)	(ETX)	(BCC)

POLLING

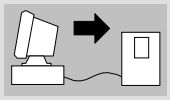
The Supervisor requests to read the value of one parameter.



(EOT)	(INO)	(PNO)	(CCC)	(ENQ)

ENQUIRY POLLING

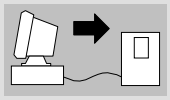
The Supervisor requests to read all parameters in block 1 that have changed since last read by an amount greater than or equal to CHANGEBAND (PNO 4).



(EOT)	(INO)	(CCC)	(ENQ)

MULTI-PARAMETER POLLING

The Supervisor requests to read a given number of parameters. That number is referred to as the count number (CNO), it is included in the request message and the reply will be sent by the drive, in blocks of up to 8 parameters.



(EOT)	(INO)	(PNO)	(CNO)	(CCC)	(ENQ)

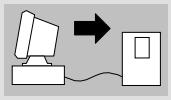
Note: *The (CCC) is the checksum of the characters following an (EOT) and is therefore equal to (INO) in Selection and Enquiry Polling messages.*

If PNO is the first in a block (i.e. 0, 8, 16, etc.) and CNO = 8, then a pseudo-Enquiry Poll is performed on the block, controlled by PNO 7.

Continuation Messages

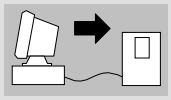
There are two types of continuation messages sent by the Supervisor:

NEXT (send next item from a list)
Only valid if sent following a multi-parameter poll.



(ACK)

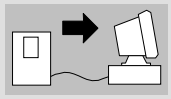
REPEAT (repeat last response)
Only valid if sent following any type of poll. It requests a repetition of the previous response.



(NAK)

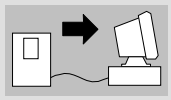
Serial Transmission Responses

SELECTION MESSAGE RESPONSE (one character)
Sent after the correct reception of a Selection message.



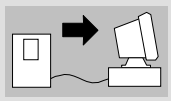
(ACK)

FAULT DETECTION RESPONSE (one character)
Sent in the case of detecting a fault.



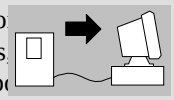
(NAK)	or	(EOT)

POLLING MESSAGE RESPONSE (more than one character)



(STX)	(PNO)	(D1)	(D2)	(D3)	(ETX)	(BCC)

MULTI-POLLING MESSAGE RESPONSE (more than one character)
The response can consist of a group of messages (blocks). The (ETX) character is o
the end of the last block (as for Polling Message Response above). For other blocks,
is replaced by an (ETB) to indicate an end of a block rather than the end of the resp



Parameter Specification Tables

Block 0		
PNO	**ACCESS**	**DESCRIPTION**
0	R/O	Instrument Identifier. Same as ASCII mnemonic II.
1	R/W	Error report. Same as ASCII mnemonic EE
2	R/O	Drive Software Version Number.
3	R/W	P1 Option Software Version Number.*
4	R/W	Change band. In an enquiry poll or pseudo-enquiry poll (see PNO 7), a value must have changed by an amount equal to or greater than the change band before it will be reported. Change band is measured in the smallest units applicable to each parameter. For example, if hysteresis = 10, then a parameter with one decimal point must change by 1.0, and a parameter with two decimal points must change by 0.10 before they will be reported.
5	R/W	Serial link configuration. Bit Numbers. — Description 0 - 3 — 0 = 300 1 = 600 2 = 1200 3 = 2400 4 = 4800 5 = 9600 (default) 6 = 19200 4 - 15 — Reserved
6	R/W	P1 Option Address*
7	R/W	Control word for multi-parameter polling. For the purpose of multi-parameter polling, the PNOs are arranged in 16 blocks of 8. Bit 0 of this parameter controls block 0 (PNO 0 to 7), bit 1 controls block 1 (PNO 8 to 15) .... bit 15 controls block 15 (PNO 120 to 127). When a bit is 1 (default), a multi-parameter poll on this block operates normally, as defined in ref. 1. When a bit is 0, a multi-parameter poll on this block with PNO = multiple of 8, and PNO = 8 performs an enquiry poll instead (a pseudo-enquiry poll).

** Note: for future 590 software releases.*

Block 1								
PNO (ID)		**TAG**	**DATA FORMAT**			**LIMITS**	**ACCESS**	**DESCRIPTION**
DEC	**ASCII**		**BIT**	**ASCII**	**BINARY**	**MIN TO MAX**		
8	08	063	-	21	xxx.xx		R/O	Speed Setpoint
9	09	089	-	21	xxx.xx		R/O	Speed Demand
10	0A	062	-	21	xxx.xx		R/O	Speed Feedback
11	0B	066	-	21	xxx.xx		R/O	Current Demand
12	0C	065	-	21	xxx.xx		R/O	Current Feedback
13	0D	183	-	21	xxx.xx		R/O	Field Demand
14	0E	181	-	21	xxx.xx		R/O	Field Feedback
15	0F	115	-	23	xxxxx		R/O	Health Word
			0					Over Speed
			1					Missing Pulse
			2					Field Over Current
			3					Fin Over Temperature
			4					Motor Over Temperature
			5					Over Volts

Block 1

PNO (ID)		TAG	DATA FORMAT			LIMITS	ACCESS	DESCRIPTION
DEC	ASCII		BIT	ASCII	BINARY	MIN TO MAX		
			6					Speed Feedback
			7					Encoder Fail
			8					Field Fail
			9					Three Phase
			10					Phase Lock Loop
			11					5703 Receive Error
			12					Stall Trip
			13					Over Current Trip
			14					Cal. Card
			15					ACCTS Failed.

Block 2

PNO (ID)		TAG	DATA FORMAT			LIMITS	ACCESS	DESCRIPTION
DEC	ASCII		BIT	ASCII	BINARY	MIN TO MAX		
16	10	050	-	21	xxx.xx		R/O	Analogue I/P 1
17	11	051	-	21	xxx.xx		R/O	Analogue I/P 2
18	12	052	-	21	xxx.xx		R/O	Analogue I/P 3
19	13	053	-	21	xxx.xx		R/O	Analogue I/P 4
20	14	054	-	21	xxx.xx		R/O	Analogue I/P 5
21	15	067	-	21	xxx.xx		R/O	Actual +ve Current Limit
22	16	061	-	21	xxx.xx		R/O	Actual -ve Current Limit
23	17	040	-	23	xxxxx		R/O	
-		068	0					Start Input
-		069	1					Jog Input
-		070	2					Enable Input
-		071	3					Digital Input 1
-		072	4					Digital Input 2
-		073	5					Digital Input 3
-		-	6					Program Stop Input
-		-	7					Coast Stop Input
-		074	8					Digital Output 1
-		075	9					Digital Output 2
-		076	10					Digital Output 3
-		-	11-15					Reserved

Block 3

PNO (ID)		TAG	DATA FORMAT			LIMITS	ACCESS	DESCRIPTION
DEC	ASCII		BIT	ASCII	BINARY	MIN TO MAX		
24	18	030		21	xxx.xx	-200.00/200.00	R/W	Additional Current Demand
25	19	015		21	xxx.xx	0/200.00	R/W	Main Current Limit
26	1A	087		21	xxx.xx	0/200.00	R/O	+ve Current Clamp
27	1B	088		21	xxx.xx	0/200.00	R/O	-ve Current Clamp

Block 3								
PNO (ID)		TAG	DATA FORMAT			LIMITS	ACCESS	DESCRIPTION
DEC	ASCII		BIT	ASCII	BINARY	MIN TO MAX		
28	1C	016		21	xxx.xx	0/200.00	R/W	Current Loop P Gain
29	1D	017		21	xxx.xx	0/200.00	R/W	Current Loop I Gain
30	1E	171		21	xxx.xx	0/100.00	R/W	Field Current Setpoint
31	1F	116		23	xxxxx		R/O	Health Store
			0					Over Speed
			1					Missing Pulse
			2					Field Over Current
			3					Fin Over Temperature
			4					Motor Over Temperature
			5					Field Over Volts
			6					Speed Feedback
			7					Encoder Fail
			8					Field Fail
			9					Three Phase
			10					Phase Lock Loop
			11					5703 Receive Error
			12					Stall Trip
			13					Over Current Trip
			14					Cal. Card
			15					ACCTS Failed.

Block 4								
PNO (ID)		TAG	DATA FORMAT			LIMITS	ACCESS	DESCRIPTION
DEC	ASCII		BIT	ASCII	BINARY	MIN TO MAX		
32	20	060		21	xxx.xx		R/O	Back EMF
33	21	058		21	xxx.xx		R/O	Analogue Tach
34	22	059		21	xxxxx		R/O	Encoder
35	23	064		21	xxx.xx		R/O	Speed Error
36	24	132		21	x.xxxx	-3.0000/3.0000	R/W	P3 Setpoint Ratio
37	25	014		21	xxx.xx	0/200.00	R/W	Speed Loop P Gain
38	26	013		21	xx.xxx	0.001/ 30.000	R/W	Speed Loop Time Constant (SEC)
39	27			23	xxxxx			
		161	0			0/1	R/W	Aux. Start
		168	1			0/1	R/W	Aux. Enable
			2.7				-	Reserved
		288	8			0/1	R/W	External Ramp Reset
		287	9			0/1	R/W	Auto Reset
		113	10				R/O	Ramping
		303	11			0/1	R/W	Reset Ramp to Speed Feedback

Block 5

PNO (ID)		TAG	DATA FORMAT			LIMITS	ACCESS	DESCRIPTION
DEC	ASCII		BIT	ASCII	BINARY	MIN TO MAX		
40	28	006		21	x.xxxx	-3.0000/3.0000	R/W	Ratio 1
41	29	007		21	x.xxxx	-3.0000/3.0000	R/W	Ratio 2
42	2A	086		21	xxx.xx		R/O	Set Point Sum Output
43	2B	002		21	xxx.x	0.1/600.0	R/W	Ramp Accel. Time
44	2C	003		21	xxx.x	0.1/600.0	R/W	Ramp Decel. Time
45	2D	085		21	xxx.xx	-	R/O	Ramp Output
46	2E	041		21	xxx.xx	-100.00/100.00	R/W	Speed Setpoint 4
47	2F			23	xxxxx			
		082	0				R/O	Drive Start
		084	1				R/O	Drive Enable
		122	2				R/O	Health Flag
		125	3				R/O	Ready
			4 - 7					Reserved
		079	8				R/O	At Standstill
		112	9				R/O	Stall Trip Warning
			10 - 15					Reserved

Block 6

PNO (ID)		TAG	DATA FORMAT			LIMITS	ACCESS	DESCRIPTION
DEC	ASCII		BIT	ASCII	BINARY	MIN TO MAX		
48	30	027		21	xxx.x	0.1/600.0	R/W	Stop time
49	31	026		21	xxx.x	0.1/600.0	R/W	P-Stop time
50	32	091		21	xxx.xx	0/200.00	R/W	P-Stop Current Limit
51	33	029		21	xxx.xx	0/100.00	R/W	Stop Zero Speed Threshold
52	34	005		21	xxx.xx	-100.00/100.00	R/W	Ramp Input
53	35	100		21	xxx.xx	-200.00/200.00	R/O	Setpoint Sum Input 1
54	36	309		21	xxx.xx	-200.00/200.00	R/W	Setpoint Sum Input 0
55	37			23	xxxxx			
		94	0			0/1	R/W	Aux. Digital Output 1
		95	1			0/1	R/W	Aux. Digital Output 2
		96	2			0/1	R/W	Aux. Digital Output 3
		-	3 - 7					Reserved
		292	8			0/1	R/W	Sign 0
		8	9			0/1	R/W	Sign 1
		9	10			0/1	R/W	Sign 2
			11 - 15					Reserved

Block 7

PNO (ID)		TAG	DATA FORMAT			LIMITS	ACCESS	DESCRIPTION
DEC	ASCII		BIT	ASCII	BINARY	MIN TO MAX		
56	38	055		21	xxx.xx		R/O	Analogue Output 1
57	39	056		21	xxx.xx		R/O	Analogue Output 2
58	3A	128		21	xxx.xx	-100.00/100.00	R/W	Aux. Analogue Output 1
59	3B	129		21	xxx.xx	-100.00/100.00	R/W	Aux. Analogue Output 2
60	3C	266		21	xxx.xx	0/100.00	R/W	% S-Ramp
61	3D	264		21	xxx.xx		R/O	Raise / Lower Output
62	3E	255		21	xxx.xx	-300.00/300.00	R/W	Raise / Lower Reset Value
63	3F	-		23	xxxxx			
-		261	0			0 1	R/W	Raise / Lower Raise Input
-		262	1			0 1	R/W	Raise/Lower Lower Input
-		307	2			0 1	R/W	Raise / Lower Reset

Block 8

PNO (ID)		TAG	DATA FORMAT			LIMITS	ACCESS	DESCRIPTION
DEC	ASCII		BIT	ASCII	BINARY	MIN TO MAX		
64	40	218		21	xxx.xx	-100.00/100.00	R/W	Jog Speed 1
65	41	219		21	xxx.xx	-100.00/100.00	R/W	Jog Speed 2
66	42	253		21	xxx.xx	-100.00/100.00	R/W	Take Up 1
67	43	254		21	xxx.xx	-100.00/100.00	R/W	Take Up 2
68	44	225		21	xxx.xx	-100.00/100.00	R/W	Crawl Speed
71	47	-		23	xxxxx			
-		228	0			0 1	R/W	Jog Mode
-		227	1			0 1	R/W	Auxiliary Jog

Block 9

PNO (ID)		TAG	DATA FORMAT			LIMITS	ACCESS	DESCRIPTION
DEC	ASCII		BIT	ASCII	BINARY	MIN TO MAX		
72	48	208		21	x.xxxx	-3.0000/+3.0000	R/W	Ratio 0
73	49	309		21	xxx.xx	-100.00/+100.00	R/W	Input 0
74	4A	48		21	xxx.xx	-100.00/+100.00	R/W	Pre-set -ve Current Limit
75	4B	301		21	xxx.xx	-100.00/+100.00	R/W	Pre-set +ve Current Limit

Block 10

PNO (ID)		TAG	DATA FORMAT			LIMITS	ACCESS	DESCRIPTION
DEC	ASCII		BIT	ASCII	BINARY	MIN TO MAX		
80	50	103		21	xxx.xx	-300.00 /+300.00	R/W	Value for TRUE Digital Input 1
81	51	104		21	xxx.xx	-300.00 /+300.00	R/W	Value for FALSE Digital Input 1
82	52	106		21	xxx.xx	-300.00 /+300.00	R/W	Value for TRUE Digital Input 2
83	53	107		21	xxx.xx	-300.00 /+300.00	R/W	Value for FALSE Digital Input 2
84	54	109		21	xxx.xx	-300.00 /+300.00	R/W	Value for TRUE Digital Input 3
85	55	110		21	xxx.xx	-300.00/+300.00	R/W	Value for FALSE Digital Input 3

Block 11

PNO (ID)		TAG	DATA FORMAT			LIMITS	ACCESS	DESCRIPTION
DEC	ASCII		BIT	ASCII	BINARY	MIN TO MAX		
88	58	339		21	xxx.xx	-300.00/+300.00	R/W	Value 1
89	59	340		21	xxx.xx	-300.00/+300.00	R/W	Value 2
90	5A	341		21	xxx.xx	-300.00/+300.00	R/W	Value 3
91	5B	342		21	xxx.xx	-300.00/+300.00	R/W	Value 4
92	5C	343		21	xxx.xx	-300.00/+300.00	R/W	Value 5
93	5D	344		21	xxx.xx	-300.00/+300.00	R/W	Value 6
94	5E	345		21	xxx.xx	-300.00/+300.00	R/W	Value 7
95	5F	-		23	xxxxx			
-		346	0			0 1	R/W	Logic 1
-		347	1			0 1	R/W	Logic 2
-		348	2			0 1	R/W	Logic 3
-		349	3			0 1	R/W	Logic 4
-		350	4			0 1	R/W	Logic 5
-		351	5			0 1	R/W	Logic 6
-		352	6			0 1	R/W	Logic 7
-		353	7			0 1	R/W	Logic 8

Block 12

PNO (ID)		TAG	DATA FORMAT			LIMITS	ACCESS	DESCRIPTION
DEC	ASCII		BIT	ASCII	BINARY	MIN TO MAX		
96	60	312		21	xxxxx		R/W	Pointer for PNO 112
97	61	313		21	xxxxx		R/W	Pointer for PNO 113
98	62	314		21	xxxxx		R/W	Pointer for PNO 114
99	63	315		21	xxxxx		R/W	Pointer for PNO 115
100	64	316		21	xxxxx		R/W	Pointer for PNO 116
101	65	317		21	xxxxx		R/W	Pointer for PNO 117
102	66	318		21	xxxxx		R/W	Pointer for PNO 118
103	67	319		21	xxxxx		R/W	Pointer for PNO 119

Block 13

PNO (ID)		TAG	DATA FORMAT			LIMITS	ACCESS	DESCRIPTION
DEC	ASCII		BIT	ASCII	BINARY	MIN TO MAX		
104	68	320		21	xxxxx		R/W	Pointer for PNO 120
105	69	321		21	xxxxx		R/W	Pointer for PNO 121
106	6A	322		21	xxxxx		R/W	Pointer for PNO 122
107	6B	323		21	xxxxx		R/W	Pointer for PNO 123
108	6C	324		21	xxxxx		R/W	Pointer for PNO 124
109	6D	325		21	xxxxx		R/W	Pointer for PNO 125
110	6E	326		21	xxxxx		R/W	Pointer for PNO 126
111	6F	327		21	xxxxx		R/W	Pointer for PNO 127

Block 14								
PNO (ID)		TAG	DATA FORMAT			LIMITS	ACCESS	DESCRIPTION
DEC	ASCII		BIT	ASCII	BINARY	MIN TO MAX		
112	70	PNO 96		*	*	*	*	Configurable PNO 0
113	71	PNO 97		*	*	*	*	Configurable PNO 1
114	72	PNO 98		*	*	*	*	Configurable PNO 2
115	73	PNO 99		*	*	*	*	Configurable PNO 3
116	74	PNO 100		*	*	*	*	Configurable PNO 4
117	75	PNO 101		*	*	*	*	Configurable PNO 5
118	76	PNO 102		*	*	*	*	Configurable PNO 6
119	77	PNO 103		*	*	*	*	Configurable PNO 7

Block 15								
PNO (ID)		TAG	DATA FORMAT			LIMITS	ACCESS	DESCRIPTION
DEC	ASCII		BIT	ASCII	BINARY	MIN TO MAX		
120	78	PNO 104		*	*	*	*	Configurable PNO 8
121	79	PNO 105		*	*	*	*	Configurable PNO 9
122	7A	PNO 106		*	*	*	*	Configurable PNO 10
123	7B	PNO 107		*	*	*	*	Configurable PNO 11
124	7C	PNO 108		*	*	*	*	Configurable PNO 12
125	7D	PNO 109		*	*	*	*	Configurable PNO 13
126	7E	PNO 110		*	*	*	*	Configurable PNO 14
127	7F	PNO 111		*	*	*	*	Configurable PNO 15

** = These fields depend upon the destination TAG number*

Troubleshooting

Cause/Symptom	Remedy
No power at the Converter.	Check power supply to the Converter.
Check all wiring.	Wiring to RXA and RXB terminals may be transposed.
No data is being received from PLC/SCADA.	Check that the COMMS Option board is installed correctly.
No data is being received from PLC/SCADA.	Fit the correct COMMS Option board or select the matching value for the PROTOCOL parameter in the MAIN PORT P1 function block.
No data is being received from PLC/SCADA.	Enable the PLC/SCADA application program.
No data is being received from PLC/SCADA.	Check power for all equipment on the network, e.g. RS232 to RS485 converter or repeater.
Incorrect data format.	Check the PLC/SCADA has 7 data bits selected.
Incorrect parity.	Check the PLC/SCADA has even parity selected.
Set-up fault.	A MAIN PORT P1 parameter is out-of-range. Select the correct value for the parameter in the MAIN PORT P1 function block.
Baud rate incorrect.	Set the same baud rate on the Converter and PLC/SCADA.
Converter not being addressed.	Check the GID and UID Converter address matches the address sent by the PLC/SCADA.
ERROR REPORT = 00C0 PLC/SCADA receives invalid/corrupted reply.	Check the GID and UID Converter address is unique to the network.
ERROR REPORT = 00C0 * Wiring from TXA/TXB incorrect	Correct the TXA/TXB wiring.
ERROR REPORT = 01C7 * Mnemonic from PLC/SCADA not recognised.	Send the correct mnemonic from the PLC/SCADA.
ERROR REPORT = 02C2 * Converter received an incorrect checksum.	Check (BCC) if manually entered, or try sending the message again.
ERROR REPORT = 03C1 ??	Check parity setting on PLC/SCADA
ERROR REPORT = 03C2 Framing or overrun error	Check number of data bits.
ERROR CODE = 05C8 PLC/SCADA tried to write to a read-only parameter.	Correct the PLC/SCADA program so that it doesn't try to write to a read-only parameter.
ERROR REPORT = 07C7 Invalid message format	Correct the PLC/SCADA to send the correct format for the message.
ERROR CODE = 08C8 PLC/SCADA sent a value outside the permissible range of the parameter.	Correct the PLC/SCADA program so that it doesn't send out-of-range parameter values.

* *If this is an intermittent problem, it may indicate poor wiring and/or poor cable routing in an electrically `noisy' environment. Also check that terminating resistors are present and correctly set.*

ASCII Table

BINARY				b_6	0	0	0	0	1	1	1	1
				b_5	0	0	1	1	0	0	1	1
				b_4	0	1	0	1	0	1	0	1
b_3	b_2	b_1	b_0	**HEX**	**0x**	**1**	**2**	**3**	**4**	**5**	**6**	**7**
0	0	0	0	**x0**	NUL	DLE	SP	0	@	P	`	p
0	0	0	1	**1**	SOH	DC_1	!	1	A	Q	a	q
0	0	1	0	**2**	STX	DC_2	"	2	B	R	b	r
0	0	1	1	**3**	ETX	DC_3	#	3	C	S	c	s
0	1	0	0	**4**	EOT	DC_4	$	4	D	T	d	t
0	1	0	1	**5**	ENQ	NAK	%	5	E	U	e	u
0	1	1	0	**6**	ACK	SYN	&	6	F	V	f	v
0	1	1	1	**7**	BEL	ETB	'	7	G	W	g	w
1	0	0	0	**8**	BS	CAN	(	8	H	X	h	x
1	0	0	1	**9**	HT	EM	)	9	I	Y	i	y
1	0	1	0	**A**	LF	SUB	*	:	J	Z	j	z
1	0	1	1	**B**	VT	ESC	+	;	K	[	k	{
1	1	0	0	**C**	FF	FS	,	<	L	\	l	|
1	1	0	1	**D**	CR	GS	-	=	M	]	m	}
1	1	1	0	**E**	SO	RS	.	>	N	^	n	~
1	1	1	1	**F**	SI	US	/	?	O	_	o	DEL