



**EUROTHERM
DRIVES**

6053/6055 Modbus Plus Communications Interface

Technical Manual
HA468032U001 Issue 2

Compatible with Version 1.2 (onwards) Firmware

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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 motor speed control utilising AC induction or AC synchronous 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

Acknowledgements

ConfigEd Lite, CELite is a registered trademark of Eurotherm Drives, Inc.

ProWORX NXT are registered trademarks of Schneider Electric, Inc.

IMPORTANT

It is required that the users have CELITE, and ProWORX NXT or other programming packages installed on a computer and have a working knowledge of these software packages.

WARRANTY

Eurotherm Drives warrants the goods against defects in design, materials and workmanship
for the period of 12 months from the date of delivery on the terms detailed in Eurotherm Drives Standard Conditions of Sale IA058393C.

Eurotherm Drives reserves the right to change the content and product specification without notice.

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6053/6055 MODBUS PLUS OPTION

System Overview

Product Features

Available for 690+, and 590+ products

Compact 5H x 3W x 1D inches

Easy snap on installation

Suitable for use with drive models:

590+ firmware version >7.1

690+ firmware version >4.7

Connection using serial cable (shielded twisted pair)

LED's to indicate board and communications status

1 M bits/s

Software-selectable Slave Address

The Modbus PlusTechBox is provided as a plug-in drive option.

Product Code

Part Number: 6053/MBP/00 Modbus PlusTechBox

6055/MBP/00 Modbus PlusTechBox

CELite Requirements

Software version: 5.16 or higher.

WARNING!

Before installing, ensure that the drive wiring is electrically isolated and cannot be made "live" unintentionally by other personnel.
Wait 5 minutes after disconnecting power before working on any part of the system or removing the covers from the drives.

2

Hardware Installation

Installing and Connecting the Modbus PlusTechBox

WARNING!

Prior to starting work ensure all sources of power are isolated.

Installing the Modbus PlusTechBox

The Modbus PlusTechBox plugs into the drive in the slot provided. With the frame “B” 690+, the TechBox is fitted in place of the keypad. Connect the supplied yellow/green wire between the metal TechBox case and one of the chassis earth pillars. If also using the keypad with a 690+ frame “B”, fit a 6052 remote mounting kit. With the 590+ and the 690+ frame “C” and above, the TechBox is installed in the right-hand slot that is located above the terminal strip on the control board. Refer to Figures 2 and 3.

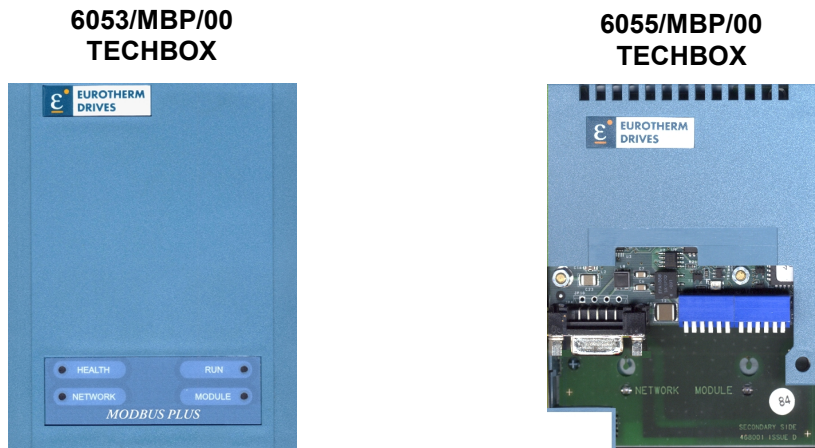


Figure 1. Modbus+ TechBoxes

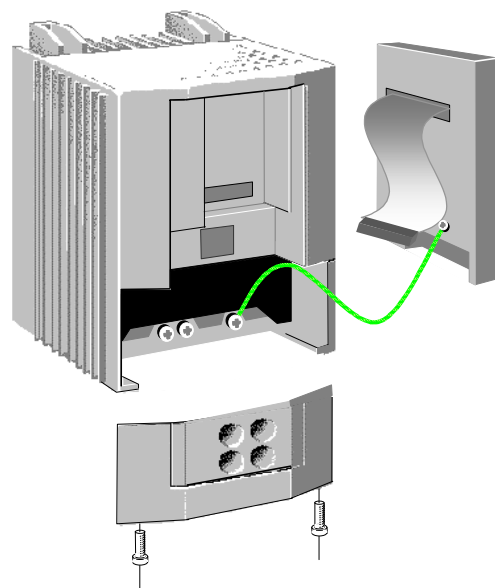


Figure 2. 690+ Frame B

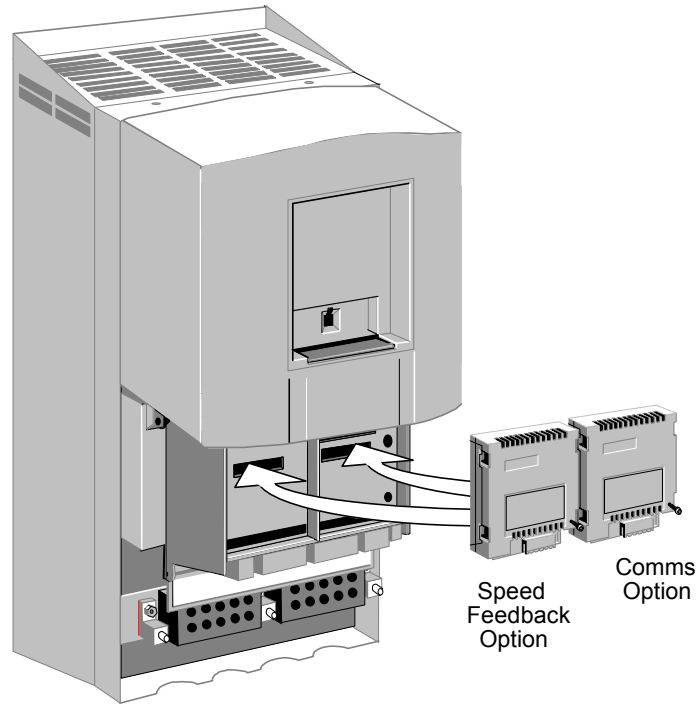
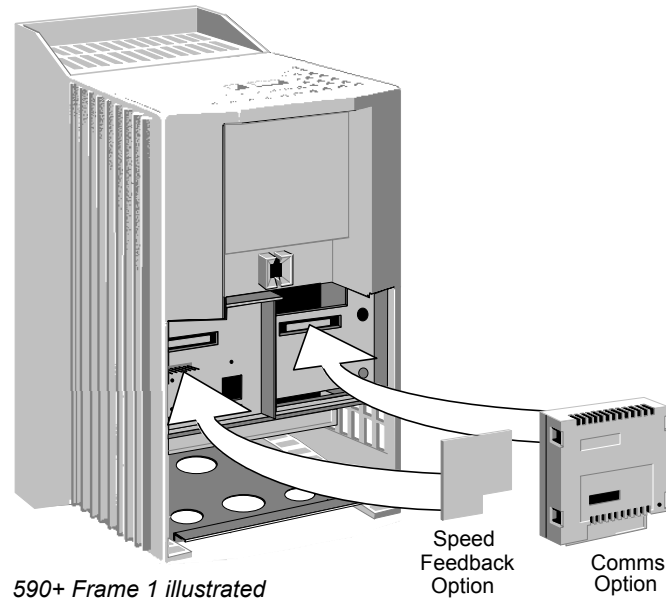


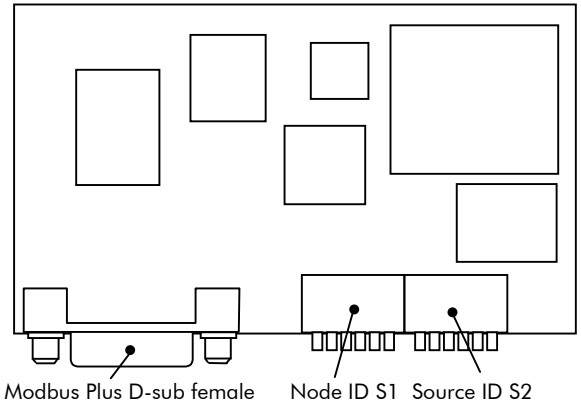
Figure 3. 690+ frames C - J, and 590+ all frame sizes

Cable Specifications

Shielded twisted pair with D-sub connector. Connections are as shown.

Pin	Name
1	Cable Shielding
2	MBP Line B
3	MBP Line A
Housing	PE

Note: Switch positions for "Node ID S1" and "Source ID S2" are irrelevant.



Initial Power-on Checks

With the correct connections to the active PLC/SCADA supervisor, the MODULE LED will be ON continuously. The NETWORK LED will flash to indicate the No Connection State.

Understanding the LED Indications

Network LED			Module LED		
Indicates the state of the connected network. The states indicated are those produced by the PEER STATUS parameter of the TechBox function block.			Indicates the set-up state of the TechBox. The states indicated are those produced by the FAULT parameter of the TechBox function block.		
Network LED Indication		PEER STATUS Parameter	Module LED Indication		FAULT Parameter
ON 	0	NORMAL LINK	ON 	0	NONE
LONG FLASH 	1	DUP STATION	LONG FLASH 	1	PARAMETER
FLASH 	2	ONLY STATION	FLASH 	2	TYPE MISMATCH
FLASH 	3	NO TOKEN	SHORT FLASH 	3	SELF TEST
SHORT FLASH 	4	MONITOR LINK	OFF 	4	HARDWARE
OFF 	5	INITIALISING		5	MISSING
	6	DISABLED			

Figure 4. LED Status Indication

Note: The NETWORK LED is always in the OFF state when the MODULE LED is **not** ON continuously. This indicates that the TechBox is not receiving external communications or the PLC is off.

Configuring the Drive

Begin by configuring the drive to accept the TechBox. Use the keypad (MMI), or ConfigEd Lite to configure the TEC OPTION function block parameters inside the drive before commissioning the Modbus Plus technology option.

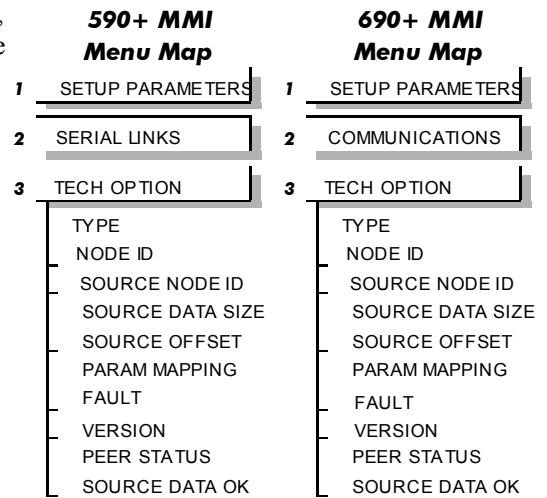
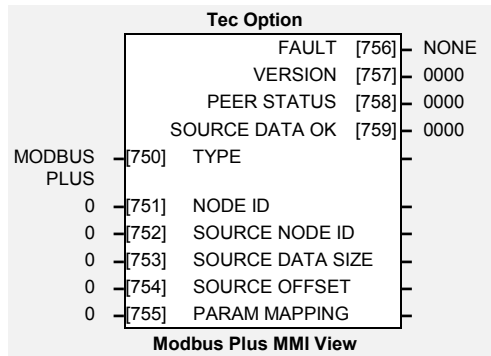
The parameter names and functions in this function block are inter-dependent and will change with different parameter values and various Options that can be fitted.

When the Modbus Plus option is fitted and the TYPE parameter is set to display MODBUS PLUS, the function block parameters take on new identities, as shown in the two cases below.

Note: Note: When using the MMI, remember to save the set-up via the Parameter Save or System/Save Config menu.

The Modbus Plus MMI View

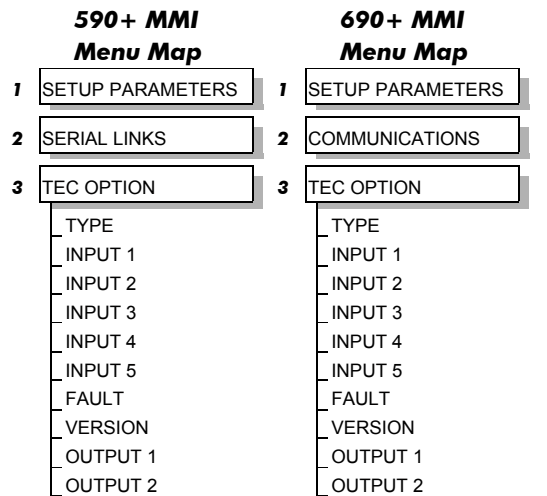
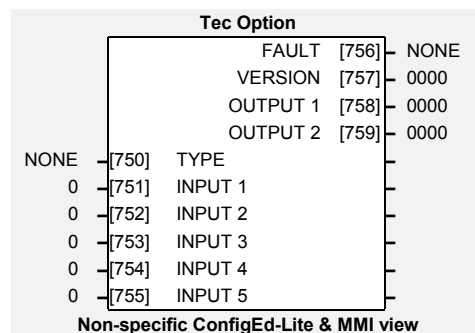
With the Modbus Plus option correctly installed, the TEC OPTION function block will contain the following parameter names when viewed using the MMI.



The Non-specific ConfigEd-Lite & MMI View

This is how the TEC OPTION function block looks when viewed using ConfigEd-Lite.

The MMI also displays these non-specific parameter names when the Modbus Plus option is not yet installed into the drive, or an incorrect TYPE is selected for the fitted Option.



Parameter Descriptions

TYPE

Range: Enumerated - see below

Selects the type of Technology Option.

Enumerated Value : Technology Option

- 0 : NONE
- 1 : RS485
- 2 : PROFIBUS DP
- 3 : LINK
- 4 : DEVICENET
- 5 : CANOPEN
- 6 : LONWORKS
- 7 : CONTROLNET
- 8 : MODBUS PLUS
- 9 : ETHERNET

NODE ID

Range: 0 to 64

Modbus Plus node address.

Note: 0 is an invalid address, if set the Modbus Plus interface will be held in the DISABLED state.

SOURCE NODE ID

Range: 0 to 64

Used for Global Database transactions only. Node Id of the Source Database. If set to 0, no Source Database is selected.

SOURCE DATA SIZE

Range: 0 to 32

Used for Global Database transactions only. Number of words to get from the Source Database. If Size plus Offset is greater than 32, the Size (see next parameter) is limited. For example, if SIZE = 10 and OFFSET = 25, only 7 words of data will be transferred.

SOURCE OFFSET

Range: 0 to 31

Used for Global Database transactions only. Offset , in words, of start of required data in the Source Database.

PARAM MAPPING

Range: Enumerated - see below

Used to select the set of Drive parameters to be read and written over Modbus Plus. See 590+ Point to Point I/O Connection, page 8, and 690+ Point to Point I/O Connection, page 13, for description of sets.

Enumerated Value : PARAM MAPPING state

590+:

- 0 : NONE
- 1 : SET 1
- 2 : SET 2

690+:

- 0 : NONE
- 1 : SET 1
- 2 : SET 2
- 3 : SET 3
- 4 : SET 4

FAULT*Range: Enumerated - see below*

The fault state of the Technology Option.

Enumerated Value : FAULT state

0 : NONE	no faults
1 : PARAMETER	parameter out-of-range
2 : TYPE MISMATCH	TYPE parameter not set to MODBUS PLUS
3 : SELF TEST	hardware fault - internal
4 : HARDWARE	hardware fault - external
5 : MISSING	no option fitted

VERSION*Range: 0000 to FFFF*

The version of the Technology Option card. If no option is fitted then the version is reset to zero. For example, 0101 is version 1.1.

PEER STATUS*Range: Enumerated - see below*

State of the Modbus Plus network connection. Refer to "Appendix B Troubleshooting", page 24 for further details.

Enumerated Value : PEER STATUS

0 : NORMAL LINK
1 : DUP STATION
2 : ONLY STATION
3 : NO TOKEN
4 : MONITOR LINK
5 : INITIALISING
6 : DISABLED

SOURCE DATA OK*Range: FALSE / TRUE*

Used for Global Database transactions only. If TRUE indicates that the a connection has been made to the node with the source database and that the requested data (size and offset) are available.

590+ Point to Point I/O Connection

Point-to-Point I/O connections enable several parameter values to be passed in one transaction. The connections are predefined sets of parameters.

Eurotherm Drives predefined several assembly objects. They are defined on the following pages. These sets are specific to Eurotherm Drives products.

The following table provides a summary of the set numbers that are provided.

Set Number	Read/Write	Number of bytes transferred	Drives applicable
1	Read	36	590+
	Write	14	590+
2	Read	20	590+
	Write	20	590+

Refer to Appendix C for Sequence Status and Remote Sequence details.

590+ Set 1 : Read from TechBox

Byte	Description	Drive Tag Number	Range	
0, 1	Sequence Status	537	0000-FFFF	
2	Bit-field:			
	Bit Number			
	0	Not Program Stop Input B8	80	Binary
	1	Digital Input C3	68	Binary
	2	Digital Input C4	69	Binary
	3	Digital Input C5	70	Binary
	4	Digital Input C6	71	Binary
	5	Digital Input C7	72	Binary
	6	Digital Input C8	73	Binary
	7	Ramping	113	Binary
3	Bit-field:			
	Bit Number			
	0	Digital Output B5	74	Binary
	1	Digital Output B6	75	Binary
	2	Digital Output B7	76	Binary
	3	User Defined Logic 1 (PNO 112)	Indirect 312 ¹	Binary
	4	User Defined Logic 2 (PNO 113)	Indirect 313 ¹	Binary
	5	User Defined Logic 3 (PNO 114)	Indirect 314 ¹	Binary
	6	User Defined Logic 4 (PNO 115)	Indirect 315 ¹	Binary
	7	Reserved		
4, 5	Analogue Input 1	50	± 100%	
6, 7	Analogue Input 2	51	± 100%	
8, 9	Analogue Input 3	52	± 100%	
10, 11	Analogue Input 4	53	± 100%	
12, 13	Analogue Input 5	54	± 100%	
14, 15	Analogue Output 1	55	± 100%	
16, 17	Analogue Output 2	56	± 100%	
18, 19	Health Store Word	116	0000 - FFFF	
20, 21	Health Word	117	0000 - FFFF	
22, 23	Speed Feedback %	207	± 100%	
24, 25	Speed Demand %	89	± 100%	
26, 27	Armature current feedback %	65	± 300%	
28, 29	User Defined Value 1 (PNO 120)	Indirect 320 ¹	Binary	
30, 31	User Defined Value 2 (PNO 121)	Indirect 321 ¹	Binary	
32, 33	User Defined Value 3 (PNO 122)	Indirect 322 ¹	Binary	
34, 35	User Defined Value 4 (PNO 123)	Indirect 323 ¹	Binary	

- Tags 312 to 323 are indirect parameters. Their values are destination tag numbers for DeviceNet data. For example if the value of tag 320 (PNO 120) is 2, then the value of User Defined Value 1 (bytes 4,5) will be read from tag 2 (Ramp Accel Time). If some of the UserDefined parameters are not required, the corresponding destination tag numbers should be set to 0.
- Refer to Appendix C for Sequence Status and Remote Sequence details.

590+ Set 1 : Write to TechBox

Byte	Description	Drive Tag Number	Range	
0, 1	Remote Sequence	536 ¹	0000 - FFFF	
2	Bit-field:			
	Bit Number			
	0	Aux Start	161	Binary
	1	Aux Jog	227	Binary
	2	Aux Enable	168	Binary
	3	User Defined Logic 1 (miniLINK LOGIC 1)	346	Binary
	4	User Defined Logic 2 (miniLINK LOGIC 2)	347	Binary
	5	User Defined Logic 3 (miniLINK LOGIC 3)	348	Binary
	6	User Defined Logic 4 (miniLINK LOGIC 4)	349	Binary
	7	User Defined Logic 5 (miniLINK LOGIC 5)	350	Binary
3	Reserved			
4, 5	Setpoint Sum 1 Input 0 (Speed Reference %)	309	± 100%	
6, 7	User Defined Value 1 (miniLINK VALUE 1)	339	± 100%	
8, 9	User Defined Value 2 (miniLINK VALUE 2)	340	± 100%	
10, 11	User Defined Value 3 (miniLINK VALUE 3)	341	± 100%	
12, 13	User Defined Value 4 (miniLINK VALUE 4)	342	± 100%	

1. Tag 536 functions only when Rem Seq Enable (tag 535) is true.
2. Refer to Appendix C for Sequence Status and Remote Sequence details.
3. The output of Setpoint Sum 1 function block is connected directly to the Speed Loop block by default.

590+ Set 2 : Read from TechBox

Bytes	Description	Drive Tag Number	Range	
0, 1	Sequence Status	537	0000 - FFFF	
2	Bit-field:			
	Bit Number			
	0	User Defined Logic 1 (PNO 112)	Indirect 312 ¹	Binary
	1	User Defined Logic 2 (PNO 113)	Indirect 313 ¹	Binary
	2	User Defined Logic 3 (PNO 114)	Indirect 314 ¹	Binary
	3	User Defined Logic 4 (PNO 115)	Indirect 315 ¹	Binary
	4	User Defined Logic 5 (PNO 116)	Indirect 316 ¹	Binary
	5	User Defined Logic 6 (PNO 117)	Indirect 317 ¹	Binary
	6	User Defined Logic 7 (PNO 118)	Indirect 318 ¹	Binary
	7	User Defined Logic 8 (PNO 119)	Indirect 319 ¹	Binary
3	Reserved			
4, 5	User Defined Value 1 (PNO 120)	Indirect 320 ¹	Tag Dependent	
6, 7	User Defined Value 2 (PNO 121)	Indirect 321 ¹	Tag Dependent	
8, 9	User Defined Value 3 (PNO 122)	Indirect 322 ¹	Tag Dependent	
10, 11	User Defined Value 4 (PNO 123)	Indirect 323 ¹	Tag Dependent	
12, 13	User Defined Value 5 (PNO 124)	Indirect 324 ¹	Tag Dependent	
14, 15	User Defined Value 6 (PNO 125)	Indirect 325 ¹	Tag Dependent	
16, 17	User Defined Value 7 (PNO 126)	Indirect 326 ¹	Tag Dependent	
18, 19	User Defined Value 8 (PNO 127)	Indirect 327 ¹	Tag Dependent	

- Tags 312 to 323 are indirect parameters. Their values are destination tag numbers for DeviceNet data. For example if the value of tag 320 (PNO 120) is 2, then the value of User Defined Value 1 (bytes 4,5) will be read from tag 2 (Ramp Accel Time). If some of the UserDefined parameters are not required, the corresponding destination tag numbers should be set to 0.
- Refer to Appendix C for Sequence Status and Remote Sequence details.

590+ Set 2 : Write to TechBox

Bytes	Description	Drive Tag Number	Range	
0, 1	Remote Sequence	536 ¹	0000 - FFFF	
2	Bit-field:			
	Bit Number			
	0	User Defined Logic 1 (miniLINK LOGIC 1)	346	Binary
	1	User Defined Logic 2 (miniLINK LOGIC 2)	347	Binary
	2	User Defined Logic 3 (miniLINK LOGIC 3)	348	Binary
	3	User Defined Logic 4 (miniLINK LOGIC 4)	349	Binary
	4	User Defined Logic 5 (miniLINK LOGIC 5)	350	Binary
	5	User Defined Logic 6 (miniLINK LOGIC 6)	351	Binary
	6	User Defined Logic 7 (miniLINK LOGIC 7)	352	Binary
	7	User Defined Logic 8 (miniLINK LOGIC 8)	353	Binary
3	Reserved			
4, 5	User Defined Value 1 (miniLINK VALUE 1)	339	± 100%	
6, 7	User Defined Value 2 (miniLINK VALUE 2)	340	± 100%	
8, 9	User Defined Value 3 (miniLINK VALUE 3)	341	± 100%	
10, 11	User Defined Value 4 (miniLINK VALUE 4)	342	± 100%	
12, 13	User Defined Value 5 (miniLINK VALUE 5)	343	± 100%	
14, 15	User Defined Value 6 (miniLINK VALUE 6)	344	± 100%	
16, 17	User Defined Value 7 (miniLINK VALUE 7)	345	± 100%	
18, 19	User Defined Value 8 (miniLINK VALUE 8)	379	± 100%	

1. Tag 536 functions only when Rem Seq Enable (tag 535) is true.
2. Refer to Appendix C for Sequence Status and Remote Sequence details.

690+ Point to Point I/O Connection

Point-to-Point I/O connections enable several parameter values to be passed in one transaction. Lists of parameters to be written to the drive and read from it are in predefined sets.

TechBox sets are detailed below; the sets are specific to Eurotherm Drives products. These indicate the drive tag number that is accessed in each case.

The following table provides a summary of the set numbers that are provided.

Set Number	Number of bytes transferred	Drives applicable
1	10	690+
2	20	690+
3	36	690+
4	34	690+

Lists of parameters to be written to and from the drive are accessed through Preset blocks 7, Preset 8, Demux block 1 and Mux block 1. The user is able to link these function blocks to achieve the desired operation. The following tables provide a description of the different set numbers and the parameters that are accessed.

Refer to Appendix C for Comms Status and Comms Command details.

690+ Set 1 : Read from TechBox

Bytes	Description	Drive Tag Number	Range
0,1	Comms Status	272	0000 - FFFF
2,3	Preset 8::Input 0	554	-327.68– 327.67
4,5	Preset 8::Input 1	555	-327.68– 327.67
6,7	Preset 8::Input 2	556	-327.68– 327.67
8,9	Preset 8::Input 3	557	-327.68– 327.67

690+ Set 1 : Write to TechBox

Bytes	Description	Drive Tag Number	Range
0,1	Comms Command	271	0000 - FFFF
2,3	Preset 8::Input 4	558	-327.68– 327.67
4,5	Preset 8::Input 5	559	-327.68– 327.67
6,7	Preset 8::Input 6	560	-327.68– 327.67
8,9	Preset 8::Input 7	561	-327.68– 327.67

Refer to Appendix C for Comms Status and Comms Command details.

690+ Set 2 : Read from TechBox

Bytes	Description	Drive Tag Number	Range
0,1	Comms Status	272	0000 - FFFF
2,3	Mux 1 Output	598	0000 - FFFF
4,5	Preset 7::Input 0	543	-327.68– 327.67
6,7	Preset 7::Input 1	544	-327.68– 327.67
8,9	Preset 7::Input 2	545	-327.68– 327.67
10,11	Preset 7::Input 3	546	-327.68– 327.67
12,13	Preset 7::Input 4	547	-327.68– 327.67
14,15	Preset 7::Input 5	548	-327.68– 327.67
16,17	Preset 7::Input 6	549	-327.68– 327.67
18,19	Preset 7::Input 7	550	-327.68– 327.67

690+ Set 2 : Write to TechBox

Bytes	Description	Drive Tag Number	Range
0,1	Comms Command	271	0000 - FFFF
2,3	Demux 1::Input	599	0000 - FFFF
4,5	Preset 8::Input 0	554	-327.68– 327.67
6,7	Preset 8::Input 1	555	-327.68– 327.67
8,9	Preset 8::Input 2	556	-327.68– 327.67
10,11	Preset 8::Input 3	557	-327.68– 327.67
12,13	Preset 8::Input 4	558	-327.68– 327.67
14,15	Preset 8::Input 5	559	-327.68– 327.67
16,17	Preset 8::Input 6	560	-327.68– 327.67
18,19	Preset 8::Input 7	561	-327.68– 327.67

Refer to Appendix C for Comms Status and Comms Command details.

690+ Set 3 : Read from TechBox

Bytes	Description	Drive Tag Number	Range
0,1	Comms Status	272	0000 - FFFF
2,3	Mux 1 Output	598	0000 - FFFF
4,5	Preset 7::Input 0	543	-327.68– 327.67
6,7	Preset 7::Input 1	544	-327.68– 327.67
8,9	Preset 7::Input 2	545	-327.68– 327.67
10,11	Preset 7::Input 3	546	-327.68– 327.67
12,13	Preset 7::Input 4	547	-327.68– 327.67
14,15	Preset 7::Input 5	548	-327.68– 327.67
16,17	Preset 7::Input 6	549	-327.68– 327.67
18,19	Preset 7::Input 7	550	-327.68– 327.67
20,21	Preset 5::Input 0	521	-327.68– 327.67
22,23	Preset 5::Input 1	522	-327.68– 327.67
24,25	Preset 5::Input 2	523	-327.68– 327.67
26,27	Preset 5::Input 3	524	-327.68– 327.67
28,29	Preset 5::Input 4	525	-327.68– 327.67
30,31	Preset 5::Input 5	526	-327.68– 327.67
32,33	Preset 5::Input 6	527	-327.68– 327.67
34,35	Preset 5::Input 7	528	-327.68– 327.67

Refer to Appendix C for Comms Status and Comms Command details.

690+ Set 3 : Write to TechBox

Bytes	Description	Drive Tag Number	Range
0,1	Comms Command	271	0000 - FFFF
2,3	Demux 1::Input	599	0000 - FFFF
4,5	Preset 8::Input 0	554	-327.68– 327.67
6,7	Preset 8::Input 1	555	-327.68– 327.67
8,9	Preset 8::Input 2	556	-327.68– 327.67
10,11	Preset 8::Input 3	557	-327.68– 327.67
12,13	Preset 8::Input 4	558	-327.68– 327.67
14,15	Preset 8::Input 5	559	-327.68– 327.67
16,17	Preset 8::Input 6	560	-327.68– 327.67
18,19	Preset 8::Input 7	561	-327.68– 327.67
20,21	Preset 6::Input 0	532	-327.68– 327.67
22,23	Preset 6::Input 1	533	-327.68– 327.67
24,25	Preset 6::Input 2	534	-327.68– 327.67
26,27	Preset 6::Input 3	535	-327.68– 327.67
28,29	Preset 6::Input 4	536	-327.68– 327.67
30,31	Preset 6::Input 5	537	-327.68– 327.67
32,33	Preset 6::Input 6	538	-327.68– 327.67
34,35	Preset 6::Input 7	539	-327.68– 327.67

Refer to Appendix C for Comms Status and Comms Command details.

690+ Set 4 : Read from TechBox

Bytes	Description	Drive Tag Number	Range
0,1	Mux 1 Output	598	0000 - FFFF
2,3	Preset 7::Input 0	543	-327.68– 327.67
4,5	Preset 7::Input 1	544	-327.68– 327.67
6,7	Preset 7::Input 2	545	-327.68– 327.67
8,9	Preset 7::Input 3	546	-327.68– 327.67
10,11	Preset 7::Input 4	547	-327.68– 327.67
12,13	Preset 7::Input 5	548	-327.68– 327.67
14,15	Preset 7::Input 6	549	-327.68– 327.67
16,17	Preset 7::Input 7	550	-327.68– 327.67
18,19	Preset 5::Input 0	521	-327.68– 327.67
20,21	Preset 5::Input 1	522	-327.68– 327.67
22,23	Preset 5::Input 2	523	-327.68– 327.67
24,25	Preset 5::Input 3	524	-327.68– 327.67
26,27	Preset 5::Input 4	525	-327.68– 327.67
28,29	Preset 5::Input 5	526	-327.68– 327.67
30,31	Preset 5::Input 6	527	-327.68– 327.67
32,33	Preset 5::Input 7	528	-327.68– 327.67

690+ Set 4 : Write to TechBox

Bytes	Description	Drive Tag Number	Range
0,1	Demux 1::Input	599	0000 - FFFF
2,3	Preset 8::Input 0	554	-327.68– 327.67
4,5	Preset 8::Input 1	555	-327.68– 327.67
6,7	Preset 8::Input 2	556	-327.68– 327.67
8,9	Preset 8::Input 3	557	-327.68– 327.67
10,11	Preset 8::Input 4	558	-327.68– 327.67
12,13	Preset 8::Input 5	559	-327.68– 327.67
14,15	Preset 8::Input 6	560	-327.68– 327.67
16,17	Preset 8::Input 7	561	-327.68– 327.67
18,19	Preset 6::Input 0	532	-327.68– 327.67
20,21	Preset 6::Input 1	533	-327.68– 327.67
22,23	Preset 6::Input 2	534	-327.68– 327.67
24,25	Preset 6::Input 3	535	-327.68– 327.67
26,27	Preset 6::Input 4	536	-327.68– 327.67
28,29	Preset 6::Input 5	537	-327.68– 327.67
30,31	Preset 6::Input 6	538	-327.68– 327.67
32,33	Preset 6::Input 7	539	-327.68– 327.67

Configuring the PLC/SCADA Supervisor

This chapter contains an example for configuring a PLC.

1. Start a new program and select the PLC processor and chassis type that is used in your project. Our example uses a M1 980-20 Momentum PLC. Remain Offline until you are ready to download the program.
2. Place a MSTR block in the ladder logic. MSTR blocks move data from the PLC data table to the drive or from the drive to the PLC data table. Two MSTR blocks will be necessary for a Read and Write operation. The Read MSTR block is required for proper operation and transfer of data.
3. Right click over the MSTR block, this will access the Register Editor. Use the Register Editor to configure the block. The MSTR block has two types of operations Read or Write. The first register defines the type of operation. In our case address 40100 is used for write command and address 40200 is used for read command. A value of 1 in the data column defines a write operation. A value of 2 in the data column defines a read operation.
4. The second register contains the error status. Refer to Appendix A for a list of the error codes. The PLC software also has help files that contain a list of error codes.

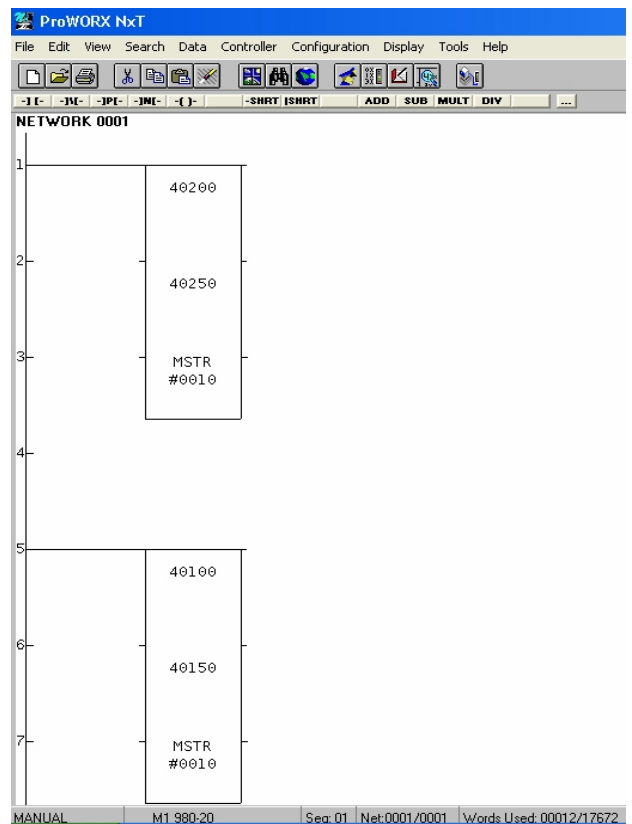


Figure 6 PLC Ladder Logic Showing MSTR Blocks

The screenshot shows the 'MODBUS PLUS Page 1 of 4' window. The 'Operation: Read Registers' is selected. The 'AR:' field is empty. The window displays a table of register addresses and data values. The table is divided into two sections: 'MSTR Operation Code' and 'Source'.

Description	Address/Symbol	Data
MSTR Operation Code	40200	00002 Decimal
Error Status	40201	0000 Hexadecimal
# of Registers	40202	00010 Decimal
Func Dependent Info	40203	00001 Decimal
MB+ Routing A1	40204	00003 Decimal
MB+ Routing A2	40205	00000 Decimal
MB+ Routing A3	40206	00000 Decimal
MB+ Routing A4	40207	00000 Decimal
MB+ Routing A5	40208	00000 Decimal
Source 0001	40250	03143 Decimal
Source 0002	40251	01280 Decimal
Source 0003	40252	00000 Decimal
Source 0004	40253	00000 Decimal
Source 0005	40254	00024 Decimal
Source 0006	40255	00000 Decimal
Source 0007	40256	00000 Decimal

The window also includes an 'Error:' field, 'Prev' and 'Next' buttons, and a 'Program' button. At the bottom, there are buttons for 'Close', 'Edit...', 'Doc...', 'Bits...', 'Operation...', 'Radix...', 'Print', and 'Help'.

Figure 7 Read Registers

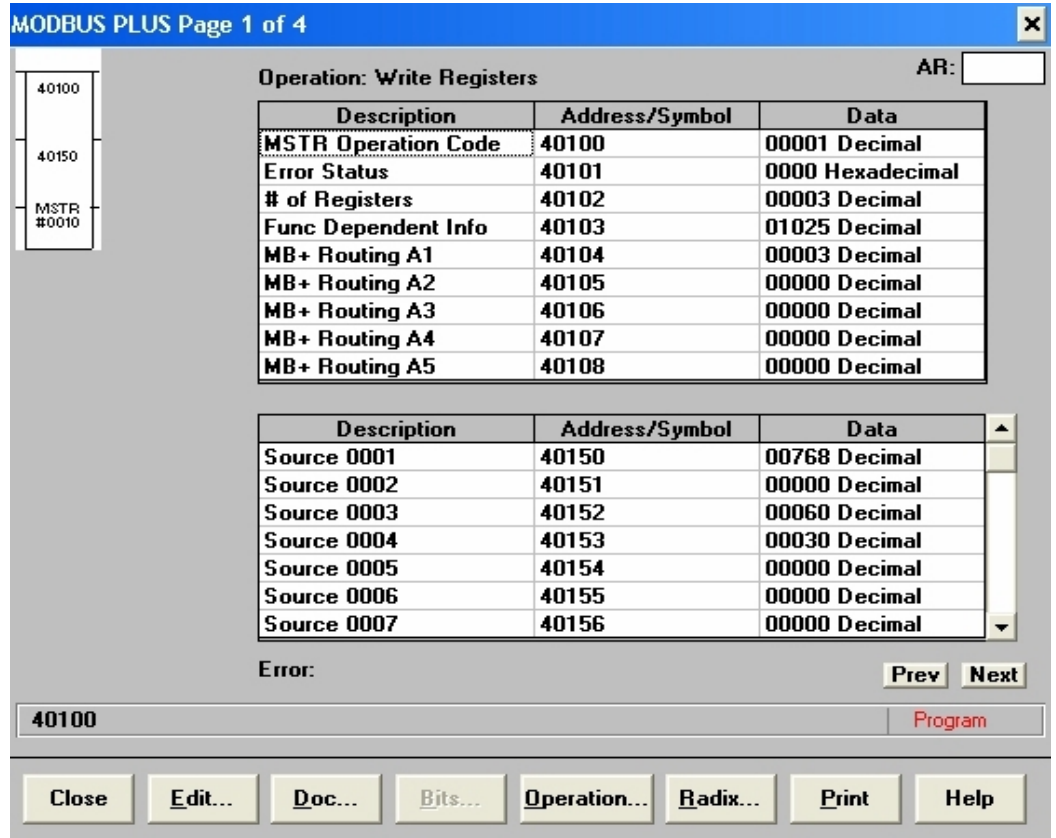


Figure 8 Write Registers

5. The third register defines the data length (address 40102 or address 40202). The value in the data column depends on which parameter set that has been selected in the drive. The value can be smaller than or equal to the selected parameter set.
6. The fourth register defines the read and write locations of the data in the PLC (address 40103 or address 40203). For a read function, this value is set to 1, and for a write function this value is set to 1025.
7. The fifth register defines the slave node address on the Modbus Plus network (address 40104 or address 40204). Registers 6, 7, 8, and 9 are used if the data must be sent through multiple jumps.
8. Our example shows the data registers starting at locations 40150 and 40250.

Appendix A Modbus Error Codes

Error Codes (Modbus Plus & SY/MAX Ethernet)

Error Status Register: 4xxxx + 1 (HEX)

Error Coding: Mmss where M = major code, m = minor code, ss = sub code

- n 16#1001: User initiated abort.
- n 16#20ss: Invalid command errors.
- n 16#30ss: Modbus slave exception response.
- n 16#4001: Inconsistent Modbus slave response.
- n 16#5001: Inconsistent network response.
- n 16#6mss: Routing failure.
- n 16#F001: Selected S985 option is not present.

Invalid Command Errors

Error Status Register: 4xxxx+1 (HEX)

Error Coding: Mmss where M = major code, m = minor code, ss = sub code

- n 2001: Invalid operation type.
- n 2002: User parameter changed.
- n 2003: Invalid length.
- n 2004: Invalid offset.
- n 2005: Invalid length + offset.
- n 2006: Invalid SDDA (Slave Device Data Area).
- n 2007: Invalid SDNA (Slave Device Network Address).
- n 2008: Invalid SDNR (Slave Device Network Routing).
- n 2009: Invalid route (= own address).

- n 200A: Global read request > available.
- n 200B: Peer Cop conflict on write/read global data.
- n 200C: Bad pattern for change address request.
- n 200D: Bad address for change address request.

Modbus Slave Exception Response

Error Status Register: 4xxxx+1 (HEX)

Error Coding: Mmss where M = major code, m = minor code, ss = sub code

- n 3001: Illegal function request (not available in slave).
- n 3002: Illegal data address (not configured in slave).
- n 3003: Illegal data value (Read/Write data not valid).
- n 3004: Not used (unknown error).
- n 3005: Slave accepted long duration program command.
- n 3006: Requested function cannot be performed due to long command in progress.
- n 3007: Slave rejected long program command.

Routing Failures

Error Status Register: 4xxxx + 1 (HEX)

Error Coding: Mmss where M = major code, m = minor code, ss = sub code

Routing failure error code: 6mjj

- n 6m01: No response.
- n 6m02: Program access denied.
- n 6m03: Node is offline and unable to communicate.
- n 6m04: Exception response received.
- n 6m05: Route node data paths busy.
- n 6m06: Slave device down.
- n 6m07: Bad destination address.
- n 6m08: Invalid node type in routing.
- n 6m10: Slave rejected the Modbus command.
- n 6m20: Slave forgot initiated translation.

- n 6m40: Unexpected master output path received.
- n 6m80: Unexpected response received.

Note: m = index to location in the routing information where routing problem was discovered.

0 = local network station

1 = first device in route

2 = second device in route, etc.

Modbus Slave Exception Response























Error Status Register: 4xxxx+1 (HEX)

Error Coding: Mmss where M = major code, m = minor code, ss = sub code

- n 3001: Illegal function request (not available in slave).
- n 3002: Illegal data address (not configured in slave).
- n 3003: Illegal data value (Read/Write data not valid).
- n 3004: Not used (unknown error).
- n 3005: Slave accepted long duration program command.
- n 3006: Requested function cannot be performed due to long command in progress.
- n 3007: Slave rejected long program command.

Appendix B Troubleshooting

6053/6055 Modbus Plus TechBox Status LEDs

LED Indications		Cause/Symptom	Remedy
NETWORK	MODULE		
 (OFF)		No power at the drive.	Check and apply power to the drive.
		Technology Box/Option not installed correctly.	Check connections between Technology Box/Option and drive. On 605A & B, check the ribbon cable.
		Hardware fault. 605A & B WARNING: Remove the terminal cover and the Technology Box whilst connected to see the drive's HEALTH and RUN LEDs. BEWARE OF ELECTRIC SHOCK.	If HEALTH and RUN LEDs are OFF, replace the drive, else replace the Technology Box/Option.
		The self-test has failed.	Replace the Technology Box/Option.
		Incorrect Technology Box/Option fitted or selected.	Fit the correct Technology Box/Option or select the matching value for the TYPE parameter in the TEC OPTION function block. (TYPE = MODBUS PLUS).
		Set-up fault. A TEC OPTION parameter is out-of-range.	Select the correct value for the parameter in the TEC OPTION function block.
		No network connection.	Technology Box/Option not configured correctly (e.g. NODE ID set to 0), or performing self-test.
		No network connection.	Node is offline after just being powered-up or exiting the Duplicate Station state. It remains in this state for 5 seconds and then attempts to go the Normal Link operating state.
		Network connection; the node is not hearing any other nodes, or the node is hearing the token being passed between other nodes, but is never receiving it.	Check the network for an open circuit or defective termination.
		Network connection; the node has heard a valid message from another node using this node's address.	The node remains in this state until the duplicate address is not heard for 5 seconds.
		Network Connection; no faults	The node's normal operating state. Successfully receiving and passing the token.

Appendix C External Control of the Drive

590+ REM. SEQUENCE

Tag 536, Default = 0x0000

Reserved bits are undefined when read and should be set Zero when written.

Bit Number	Mask	Name	Comment
0 (lsb)	0x0001	Remote Enable	
1	0x0002	Remote Start	
2	0x0004	Remote Jog	
3	0x0008	Remote Jog Mode	Selects Jog Speed
4	0x0010	Reserved	
5	0x0020	Reserved	
6	0x0040	Reserved	
7	0x0080	Reserved	
8	0x0100	Remote Alarm Ack	Alarm Acknowledge
9	0x0200	Remote/Remote Trip	Remote Trip (High for OK)
10	0x0400	Reserved	
11	0x0800	Reserved	
12	0x1000	Reserved	
13	0x2000	Reserved	
14	0x4000	Reserved	
15	0x8000	Reserved	

Useful Commands using EI-ASCII - REM. SEQUENCE

Tag 536, Default = 0x0C07

	/Remote Trip	Alarm Ack	Jog Mode	Jog	Start	Enable	Command
Start Drive	1	0	X	0	1	1	0x0203
Stop Drive	1	0	X	0	0	1	0x0201
Disable Drive	1	0	X	X	X	0	0x0200
Jog Setpoint 1	1	0	0	1	0	1	0x0205
Jog Setpoint 2	1	0	1	1	0	1	0x020C
Remote Trip	0	0	X	X	X	X	0x0000
Reset Alarm a)	1	1	0	0	0	0	0x0300
Reset Alarm b)							Healthy Output Bit 11
Reset Alarm c)	1	0	50	0	0	0	0x0200

Drive Enable

To enable the drive in remote mode the following parameters must be TRUE:

REM.SEQ.ENABLE [535] and REM SEQUENCE [536] BIT 1.

Drive Start

To start the drive in remote mode the following parameters must be TRUE:

REM.SEQ.ENABLE [535] and REM SEQUENCE [536] BIT 0.

Drive Jog

To jog the drive in remote mode the following parameters must be TRUE:

REM.SEQ.ENABLE [535] and REM SEQUENCE [536] BIT 3.

Jog Mode

To select the jog setpoint in remote mode the following parameters must be TRUE:

REM.SEQ.ENABLE [535] and REM SEQUENCE [536] BIT 4.

ACK Alarm

To acknowledge an alarm the following parameter must be TRUE:

REM SEQUENCE [536] BIT 8.

NOTE: if remote sequencing is not enabled then REM SEQUENCE [536] BIT 8 is forced TRUE.

SEQ STATUS

Tag 537, (Read Only) , Default = FALSE

Reserved bits are undefined when read.

Bit Number	Mask	Name	Comment
0 (lsb)	0x0001	Coast Stop	Coast Stop demanded
1	0x0002	Program Stop	Program (Fast) Stop demanded
2	0x0004	Disable	/Enable demanded
3	0x0008	Run	Drive Start demanded
4	0x0010	Jog	Drive Jog demanded
5	0x0020	Reserved	Undefined
6	0x0040	Alarm	Unacknowledged alarm (Health Store != 0)
7	0x0080	Reserved	Undefined
8	0x0100	Running	Contactors in and drive ready to be enabled
9	0x0200	Enabled	Drive is enabled.
10	0x0400	Zero Speed	Zero speed Output TAG 17
11	0x0800	Healthy Output	Healthy Output TAG 12
12	0x1000	Ready	Ready Output TAG 559
13	0x2000	Reserved	Undefined
14	0x4000	Reserved	Undefined
15	0x8000	Reserved	Undefined

Useful Bit Patterns and Status words

Sequence Status	Comment
0x1B0B	Running
0x044B	Tripped, Run High
0x0447	Tripped, Run Low, Enable Low
0x0C47	Trip Acknowledged, Healthy o/p TRUE Alarm stays high until drive is restarted.

Remote Trip Alarm

The Remote trip alarm is designed to signal a network fault to the drive. When using the Modbus Plus interface, all outputs are set to zero on link fail. If one of the outputs is REM SEQUENCE [536] the drive will trip after a delay specified by REM TRIP DELAY (541). The Drive will then need a low -> high transition on ACK Alarm and Start before the drive may run again.

REM TRIP INHIBIT [540]	REM TRIP DELAY [541]	REMOTE TRIP [542]
Disable remote trip.	Delay before trip becomes active after bit being cleared.	Status of the Remote trip alarm, OK, Warning (Remote Seq Bit 9 FALSE and delay not expired), Active (Trip active, timer expired and remote not inhibited).

Communications Command

When sequencing is in the Remote Comms mode, the sequencing of the Inverter is controlled by writing to the hidden parameter COMMS COMMAND (Tag 271). This parameter can only be written to using a communications interface. The output parameter (Tag 273) COMMS COMMAND of the COMMS CONTROL function block is provided as a diagnostic.

The COMMS COMMAND parameter is a 16-bit word based on standard fieldbus drive profiles. Some bits are not implemented in this release (see “Supported” column of the table below).

Bit	Name	Description	Supported	Required Value
0	Switch On	OFF1 Operational	√	
1	(Not) Disable Voltage	OFF2 Coast Stop	√	
2	(Not) Quick Stop	OFF3 Fast Stop	√	
3	Enable Operation		√	
4	Enable Ramp Output	=0 to set ramp output to zero		1
5	Enable Ramp	=0 to hold ramp		1
6	Enable Ramp Input	=0 to set ramp input to zero		1
7	Reset Fault	Reset on 0 to 1 transition	√	
8				0
9				0
10	Remote	=1 to control remotely		1
11				0
12				0
13				0
14				0
15				0

Switch On

Replaces the RUN FWD, RUN REV and NOT STOP parameters of the SEQUENCING LOGIC function block. When Set (=1) is the same as:

RUN FWD	=	TRUE
RUN REV	=	FALSE
NOT STOP	=	FALSE

When Cleared (= 0) is the same as :

RUN FWD	=	FALSE
RUN REV	=	FALSE
NOT STOP	=	FALSE

(Not) Disable Voltage

ANDed with the NOT COAST STOP parameter of the SEQUENCING LOGIC function block. When both are Set (=1) is the same as:

= TRUE

When either or both Cleared (= 0) is the same as:

NOT COAST STOP	=	FALSE
----------------	---	-------

(Not) Quick Stop

ANDed with the NOT FAST STOP parameter on the SEQUENCING LOGIC function block. When both are Set (=1) is the same as:

NOT FAST STOP	=	TRUE
---------------	---	------

When either or both Cleared (= 0) is the same as:

NOT FAST STOP	=	FALSE
---------------	---	-------

Enable Operation

ANDed with the DRIVE ENABLE parameter on the SEQUENCING LOGIC function block. When both are Set (=1) is the same as:

DRIVE ENABLE	=	TRUE
--------------	---	------

When either or both Cleared (= 0) is the same as:

DRIVE ENABLE	=	FALSE
--------------	---	-------

Enable Ramp Output, Enable Ramp, Enable Ramp Input

Not implemented. The state of these bits must be set (=1) to allow this feature to be added in the future.

Reset Fault

Replaces the REM TRIP RESET parameter on the SEQUENCING LOCIC function block. When Set (=1) is the same as:

REM TRIP RESET = TRUE

When Cleared (= 0) is the same as:

REM TRIP RESET = FALSE

Remote

Not implemented. It is intended to allow the PLC to toggle between local and remote. The state of this must be set (=1) to allow this feature to be added in the future.

Example Commands

0x047F hexadecimal to RUN
0x047E hexadecimal to STOP

Communications Status

The COMMS STATUS parameter (Tag 272) in the COMMS CONTROL function block monitors the sequencing of the Inverter. It is a 16-bit word based on standard fieldbus drive profiles. Some bits are not implemented in the initial release and are set to 0 (see “Supported” column of the table below).

Bit	Name	Description	Supported
0	Ready To Switch On		√
1	Switched On	Ready for operation (refer control bit 0)	√
2	Operation Enabled	(refer control bit 3)	√
3	Fault	Tripped	√
4	(Not) Voltage Disabled	OFF 2 Command pending	√
5	(Not) Quick Stop	OFF 3 Command pending	√
6	Switch On Disable	Switch On Inhibited	√
7	Warning		
8	SP / PV in Range		
9	Remote	= 1 if Drive will accept Command Word	√
10	Setpoint Reached		
11	Internal Limit Active		
12			
13			
14			
15			

Ready To Switch On

Same as the SWITCH ON ENABLE output parameter of the SEQUENCING LOGIC function block.

Switched On

Same as the SWITCHED ON output parameter of the SEQUENCING LOGIC function block.

Operation Enabled

Same as the RUNNING output parameter of the SEQUENCING LOGIC function block.

Fault

Same as the TRIPPED output parameter of the SEQUENCING LOGIC function block.

(Not) Voltage Disabled

If in Remote Comms mode, this is the same as Bit 1 of the COMMS COMMAND parameter. Otherwise it is the same as the NOT COAST STOP input parameter of the SEQUENCING LOGIC function block.

(Not) Quick Stop

If in Remote Comms mode, this is the same as Bit 2 of the COMMS COMMAND parameter. Otherwise it is the same as the NOT FAST STOP input parameter of the SEQUENCING LOGIC function block.

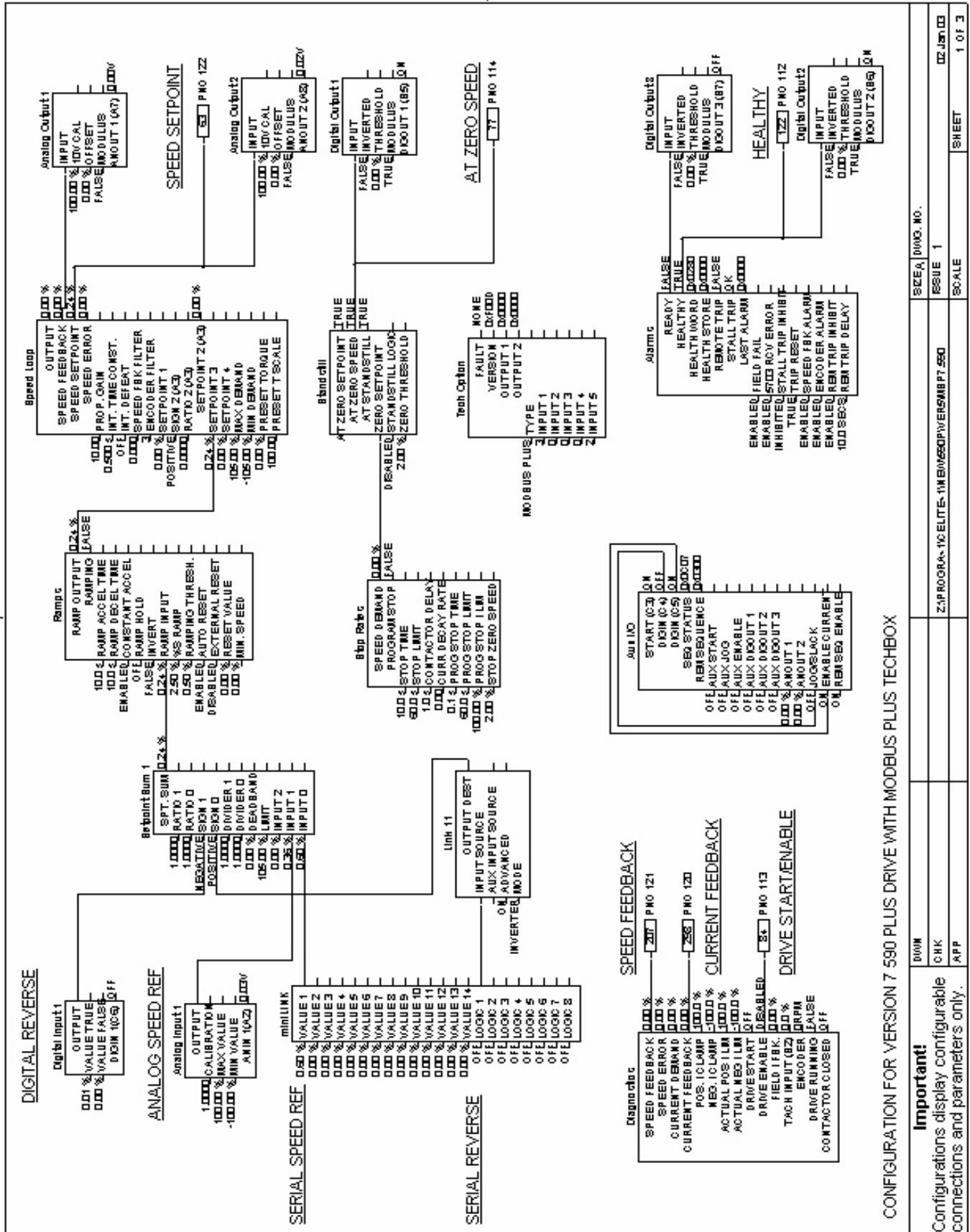
Switch On Disable

Set (=1) only when in START DISABLED state; refer to the Software Product Manual, HA465038Uxxx, Section 4 : Sequencing Logic States.


Remote

This bit is set (= 1) if the Inverter is in Remote mode AND the parameter REMOTE COMMS SEL of the COMMS CONTROL function block is Set (= 1).

Appendix D Sample Configurations



590+ Sample Configuration Using Set 2

ISS.	MODIFICATION	ECN No.	DATE	DRAWN	CHK'D
1	US provisional release	-	-	-	-
2	First printed release of HA468032U001	16551	16/04/03	CM	KJ
FIRST USED ON		MODIFICATION RECORD 6053/6055 Modbus Plus Communications Interface			
 EUROTHERM DRIVES		DRAWING NUMBER ZZ468032			SHT. 1 OF 1