



F500 Elite

T500 FIELDBUS ADAPTER -
PROFINET



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PART No. F5004V46C
VOLTAGE 24 VDC 100-240 VAC 12 WATT
SER. No. 1072D/001/08
APPROVED FOR

REMOVE POWER BEFORE OPENING COVER - DO NOT APPLY POWER WHEN COVER IS OPEN
WARNING: STATIC HAZARD - CLEAN ONLY WITH A DAMP CLOTH

INSTALLATION INSTRUCTIONS

OPERATION MANUAL

Part No. F5004V46CAI-PRN / F5004V4CAI-PRN

Software Version 7.0.5

www.go4b.com

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Dear 4B Customer:

Congratulations on your purchase. 4B appreciates your business and is pleased you have chosen our products to meet your needs.

Please read in its entirety and understand the literature accompanying the product before you place the product into service. Please read the safety precautions carefully before operating the product. With each product you purchase from 4B, there are some basic but important safety considerations you must follow to be sure your purchase is permitted to perform its design function and operate properly and safely, giving you many years of reliable service. Please read and understand the Customer Safety Responsibilities listed below. Failure to follow this safety directive and the Operation Manuals and other material furnished or referenced, may result in serious injury or death.

1. SAFETY NOTICE TO OUR CUSTOMERS

In order to maximize efficiency and safety, selecting the right equipment for each operation is vital. The proper installation of the equipment, and regular maintenance and inspection is equally important in continuing the proper operation and safety of the product. The proper installation and maintenance of all our products is the responsibility of the user unless you have asked 4B to perform these tasks.

All installation and wiring must be in accordance with Local and National Electrical Codes and other standards applicable to your industry. (Please see the article “Hazard Monitoring Equipment Selection, Installation and Maintenance” at www.go4b.com.) The installation of the wiring should be undertaken by an experienced and qualified professional electrician. Failure to correctly wire any product and/or machinery can result in the product or machine failing to operate as intended, and can defeat its design function.

Periodic inspection by a qualified person will help assure your 4B product is performing properly. 4B recommends a documented inspection at least annually and more frequently under high use conditions.

Please see the last page of this manual for all warranty information regarding this product.

2. CUSTOMER SAFETY RESPONSIBILITIES

3. READ ALL LITERATURE PROVIDED WITH YOUR PRODUCT

Please read all user, instruction and safety manuals to ensure that you understand your product operation and are able to safely and effectively use this product.

4. YOU BEST UNDERSTAND YOUR NEEDS

Every customer and operation is unique, and only you best know the specific needs and capabilities of your operation. Please call the 24-hour hotline at 309-698-5611 for assistance with any questions about the performance of products purchased from 4B. 4B is happy to discuss product performance with you at any time.

5. SELECT A QUALIFIED AND COMPETENT INSTALLER

Correct installation of the product is important for safety and performance. If you have not asked 4B to perform the installation of the unit on your behalf, it is critical for the safety of your operation and those who may perform work on your operation that you select a qualified and competent electrical installer to undertake the installation. The product must be installed properly to perform its designed functions. The installer should be qualified, trained, and competent to perform the installation in accordance with Local and National Electrical Codes, all relevant OSHA Regulations, as well as any of your own standards and preventive maintenance requirements, and other product installation information supplied with the product. You should be prepared to provide the installer with all necessary installation information to assist in the installation.

6. ESTABLISH AND FOLLOW A REGULAR MAINTENANCE AND INSPECTION SCHEDULE FOR YOUR 4B PRODUCTS

You should develop a proper maintenance and inspection program to confirm that your system is in good working order at all times. You will be in the best position to determine the appropriate frequency for inspection. Many different factors known to the user will assist you in deciding the frequency of inspection. These factors may include but are not limited to weather conditions; construction work at the facility; hours of operation; animal or insect infestation; and the real-world experience of knowing how your employees perform their jobs. The personnel or person you select to install, operate, maintain, inspect or perform any work whatsoever, should be trained and qualified to perform these important functions. Complete and accurate records of the maintenance and inspection process should be created and retained by you at all times.

7. RETAIN AND REFER TO THE OPERATION MANUAL FOR 4B'S SUGGESTED MAINTENANCE AND INSPECTION RECOMMENDATIONS

As all operations are different, please understand that your specific operation may require additional adjustments in the maintenance and inspection process essential to permit the monitoring device to perform its intended function. Retain the Operation Manual and other important maintenance and service documents provided by 4B and have them readily available for people servicing your 4B equipment. Should you have any questions, please call the free 24-hour hotline number (309-698-5611).

6. SERVICE REQUEST

If you have questions or comments about the operation of your unit or require the unit to be serviced please contact the 4B location who supplied the product or send your request via fax (309-698-5615) or call us via our 24-hour hotline number in the USA (309-698-5611). Please have available product part numbers, serial numbers, and approximate date of installation. In order to assist you, after the product has been placed into service, complete the online product registration section which is accessed via our website www.go4b.com/usa.

WARNING

- Rotating machinery can cause serious injury or death
- Always lockout and tagout the machine prior to installation

1. PRODUCT OVERVIEW

The F500 Elite Fieldbus Adapter is a communications gateway that allows a single point access to a number of 4B T500 Elite communication systems (up to four) or ten 4B Watchdog™ Elites via Fieldbus protocol. Depending on the F500 model different Fieldbus communication protocols are supported, including the most popular ones like Ethernet IP, Profinet, Modbus TCP, Modbus RTU, DeviceNet, Profibus and others. The unit is housed in a self-contained wall-mounting plastic enclosure.

This manual is for the T500 Elite Hotbus™ to Profinet model. Contact 4B for information on other Fieldbus protocols, or if you are interfacing with a Watchdog™ hazard monitoring system.

F500 Key Features -

- CSA (USA and Canada), ATEX and IECEx approved
- Profinet Communications - This is the main communication protocol for Siemens PLCs. Fully compliant.
- MODBUS TCP - This protocol is supported by all major PLC manufacturers allowing a full and easy integration into SCADA/DCS system
- Seamless Integration with T500 System - This unit has been specifically designed to work with T500 systems, which results in full interoperability
- Multi-Voltage Power Supply - F500 unit can be powered by 24 VDC as well as 120 to 240 VAC (Note: see models below)

2. SPECIFICATIONS

Supply Voltage	120 to 240 VAC or 24 VDC (F5004V46CAI-PRN) 24 VDC (F5004V4CAI-PRN)
Power Consumption (Max.)	12 Watts Maximum
Power Terminals	14 AWG / 4 mm ²
T500 Terminals	RS485 Shielded - 2 Twisted Pair
Fieldbus Connection	Ethernet RJ45 Connector
Dimensions (H x W x D)	9.7 x 7.4 x 4 (inches) / 246 x 188 x 102 (mm)
Fixing Centers (H x W)	8.75 x 4 (inches) / 222 x 102 (mm)
Cable Entry	2 Holes; 25 mm Diameter
Weight	3 lbs / 1.3 kg

3. APPROVALS

ATEX	<p>V46 Ex II 3D Ex tc IIIC T125°Dc IP66 TAMB -20°C to +45°C Baseefa11ATEX 0033X</p> <p>V4 ExII2D ExtbIIICT125° DbIP66TAMB-20°Cto+50°CBaseefa04ATEX0131X</p>
IECEX	<p>V46 Ex tc IIIC T125°Dc IP66 TAMB -20°C to +45°C IECEX BAS11.0018X</p> <p>V4 Ex tb IIIC T125° Db IP66 TAMB -20°C to +50°C IECEX BAS05.0026X</p>
CSA	<p>V46 CLII DIV2 Groups F & G Ex tc IIIC T125°C Dc IP66 Tamb -20°C to +45°C Zone 22 AEx tc IIIC T125°C Dc IP66 Tamb -20°C to +45°C</p> <p>V4 CLII DIV1 Groups E,F & G (When used with a Class2 power supply) Ex tb IIIC T125°C Db IP66 Tamb -20°C to +50°C Zone 21 AEx tb IIIC T125°C Db IP66 Tamb -20°C to +50°C</p>

4. CONDITIONS OF SAFE USE

- The equipment shall be suitably earth bonded via the PCB mounted terminal inside the equipment enclosure.
- Warning: The equipment is a potential static hazard, clean only with a damp cloth.
- Do not allow dust to build up on the equipment.

5. INSTALLATION

All wiring must be in accordance with local and national electrical codes and should be undertaken by an experienced and qualified electrician. For electrical wiring instructions please refer to Appendix 1 and Appendix 2.

Always use dust/liquid tight flexible metal conduit (if applicable in the country of installation) with approved fittings to protect the sensor cables. Use rigid metal conduit (if applicable in the country of installation) to protect the cables from the sensors to the control unit. Conduit systems can channel water due to ingress and condensation directly to sensors and sensor connections which over time will adversely affect the performance of the system. As such, the installation of low point conduit drains is recommended for all sensors.

The Control Unit box should be installed in a suitable control or starter switch room and mounted at an eye level position so that the warning lights can be readily seen. The box should have sufficient space to open the lid for wiring and adjustment

! WARNING

The Control Unit is susceptible to static voltage. Connection of a clean ground to terminal 29 is essential for optimum performance. Prior to this connection, static handling precautions should be taken.

6. HARDWARE DESCRIPTION

The F500 is equipped with an RS232 and RS485 communications ports and a Fieldbus Ethernet port. The RS485 port is a four wire, twin twisted pair full duplex serial port and has been specifically configured to work with the T500. You should not connect any other devices to this port. The RS232 port has a standard D9-SUB connector and should be used for diagnostics and maintenance only. See for communication port locations.

- System Components -**
1. Ethernet Port
 2. RS232 Port
 3. F500 Status LED
 4. RS485 Port
 5. Power / Alarm Terminal

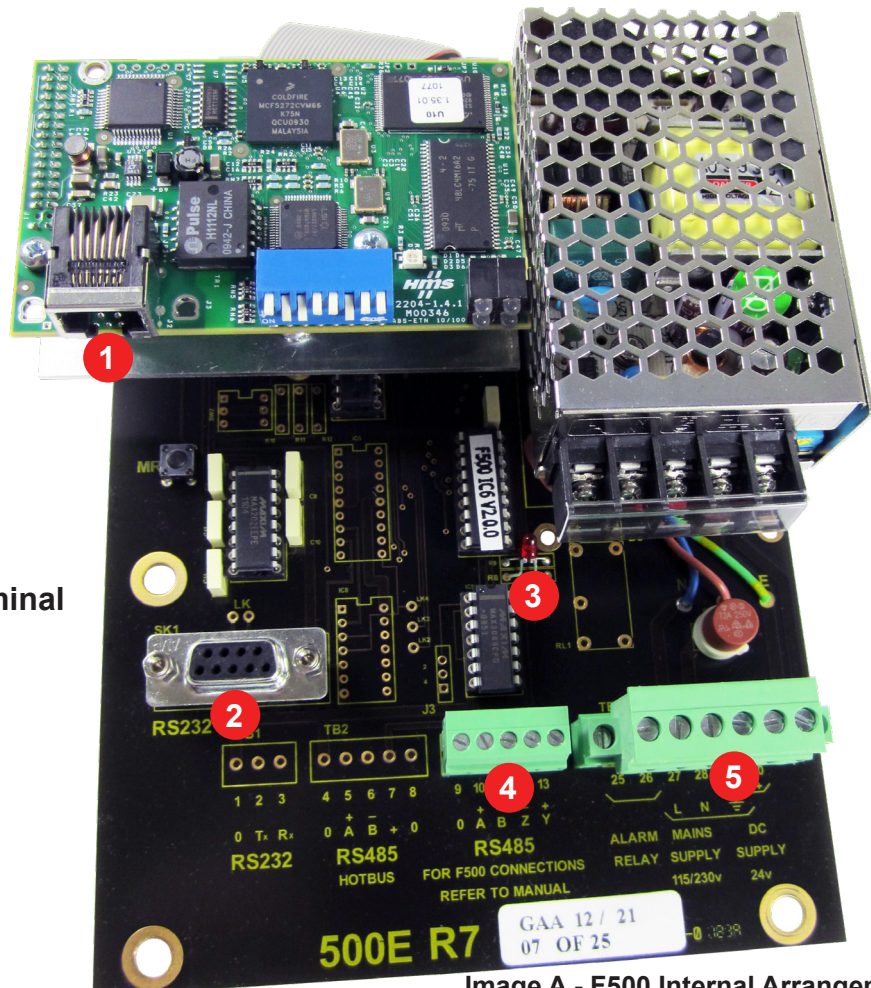


Image A - F500 Internal Arrangement

7. OPERATION DESCRIPTION

The F500 Fieldbus gateway has to be used together with the T500 controller. In order for the F500 to operate all the T500's (the F500 supports up to four) have to be correctly wired to the F500 and should have unique addresses as well as the total number of blocks preset. Please see the T500 manual for more information. Having finished this basic configuration it is necessary to cycle the power to the system for the F500 to go through the initialization procedure.

NOTE

Additional diagnostics information is available via the RS-232 DB9 connector during the initialization procedure. Please configure the serial port to 19200 baud, no parity, 8 data bits, 1 stop bit to view this.

8. ETHERNET SETTINGS SETUP

The Ethernet port is a standard 10/100 Base-T twisted pair Ethernet physical layer. The Ethernet module supports industry standard Modbus TCP protocols. The Fieldbus module should be connected through a standard Ethernet switch. Alternatively, a peer to peer connection could be made using a single crossover cable. The Fieldbus Profinet module supports up to 16 simultaneous Ethernet connections. The F500 is shipped with the default Ethernet settings shown in the Table 1.

DEFAULT ETHERNET SETTINGS	
IP Address	192.168.0.x (Note Below)
Subnet Mask	255.255.255.0
Gateway Address	0.0.0.0
Modbus TCP Port Number	502

Table 1

The unit supports DHCP addressing, but it is advisable to use static IP address settings, as this makes the setup process simpler and the unit's address will never change. If the DHCP scheme is employed then a DHCP server must be present on the network. The process of configuring the DHCP settings via the F500-s website is described in the F500 e-View section. The RJ-45 connector complies with standard Ethernet RJ-45 connection scheme. Details are given in Table 2.

The Ethernet module has a bank of status LED's as shown in Image B. The statuses are explained in Table 3.

The F500 is capable of providing data for up to 64 HOTBUS2 network nodes. Up to four T500 units can be connected to a single F500, providing that the total number of nodes does not exceed 64. Depending on the node type each node may hold different number of sensors. For example a TN4 node has 4 sensor inputs and an on-board node ambient temperature; SN2 however has two speed inputs. Please refer to the T500 manual for more information.

PIN #	NAME	DESCRIPTION
1	TD+	Positive Transmit Data
2	TD-	Negative Transmit Data
3	RD+	Positive Receive Data
4		No Connection
5		No Connection
6	RD-	Negative Receive Data
7		No Connection
8		No Connection
Casing	PE	Ground

Table 2 - Address Switch Settings

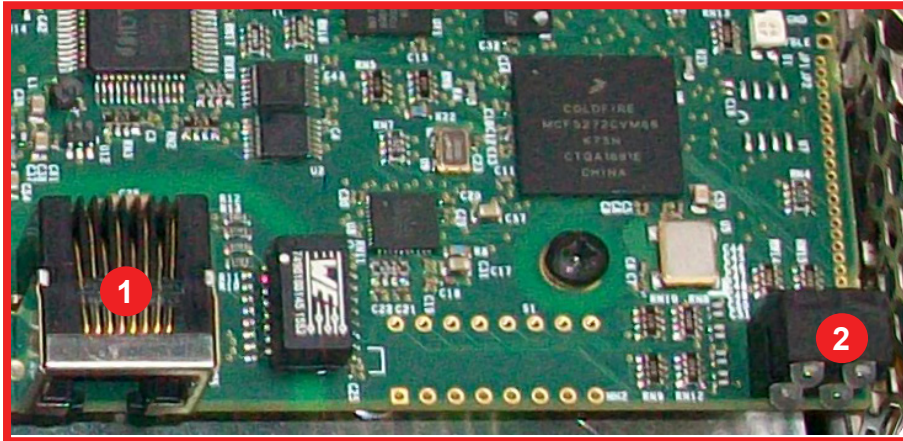
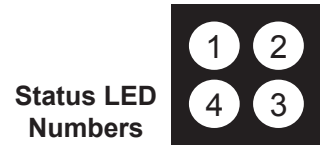


Image A - Image A - Ethernet Module
 1. Ethernet Connector
 2. Status LED's



STATUS LED NUMBERS	COLOR	DESCRIPTION
LED 1	Green - Solid	F500 Connected to Ethernet Network (Link)
LED 2	Green - Solid	Operating Normally
	Green - Flashing	Standby - Module Not Configured
	Red - Flashing	Minor Fault
	Red - Solid	Major Fault
	Red / Green - Flashing	Self Test in Progress
LED 3	Green - Flashing	Ethernet Connection Established
	Green - Solid	No Active Ethernet Connections
	Red - Flashing	Existing Ethernet Connection Timed Out, Power Cycle F500
	Red - Solid	Duplicate IP Address Detected, Change Address
	Red / Green - Flashing	Self Test in Progress
LED 4	Green - Flashing	Receiving & Transmitting Packets (Activity)

Table 3 - Status LED Descriptions

NOTE

LED's 2 and 3 will flash together when the F500 is correctly initialized and connected to an Ethernet Switch. If only LED 2 is flashing, then the Ethernet module has not yet initialized or a connection has not yet been established.

9. F500 PLC DATA ACCESS - MODBUS TCP / Profinet

The F500 Fieldbus Adapter supports two PLC protocols - Modbus TCP and Profinet. Only Modbus TCP is covered in this manual as it is most commonly used. For information on Profinet protocol (mainly used with Siemens PLCs) and more in-depth information on Modbus TCP as well application notes on how to configure the PLC, contact 4B.

9.1. MODBUS TCP CONNECTION SETTINGS -

The F500 unit supports the following Modbus connection settings:

NAME	VALUE	DESCRIPTION
Port Number	502	Standard Modbus TCP Port
Slave ID	1	----
Supported Functions	03 - Read Holding Registers	Allows PLC to Read Data from F500, see <i>F500 Data Storage Table</i>
Supported Address Range	0 to 220	Word Address Range for 03 Function Code (16 bit)
Alarm Acknowledge Words Addresses	1023, 1024	Alarm Acknowledge Words

Table 7

9.2. T500 BLOCKS -

When T500's are connected to the F500 it is necessary to set up the communication address and block number settings within the T500's beforehand (see T500 manual for details). Each T500 must have a unique non-zero communication address. The number of blocks field relates to the number of nodes each T500 reports to the F500. Each block contains 16 nodes. As the total number of nodes should not exceed 64, the total number of blocks within all the connected T500's should not exceed 4. Table 8 illustrates some of the possible configurations. The minimum system is one T500 connected to one F500 and monitoring one block of sensor data (16 nodes).

T500-1 BLOCKS	T500-2 BLOCKS	T500-3 BLOCKS	T500-4 BLOCKS	TOTAL NODES
1	0	0	0	16
1	1	0	0	32
1	1	1	0	48
1	1	1	1	64
1	2	1	0	64
2	2	0	0	64
2	1	1	0	64
1	1	2	0	64
0	1	0	1	32
0	0	1	1	32
0	0	0	1	16
4	0	0	0	64
0	4	0	0	64
3	1	0	0	64
1	0	3	0	64
0	0	0	4	64

Table 8

9.3. F500 DATA STORAGE TABLE -

MODBUS DATA WORD #	FIELD NAME	DESCRIPTION
0	T500 #1 Number of Active Blocks	Can Take Values of 0 to 4
1	T500 #1 Activity Counter	Increments Every Time T500 Data is Gathered
2	T500 #2 Number of Active Blocks	Can Take Values of 0 to 4
3	T500 #2 Activity Counter	Increments Every Time T500 Data is Gathered
4	T500 #3 Number of Active Blocks	Can Take Values of 0 to 4
5	T500 #3 Activity Counter	Increments Every Time T500 Data is Gathered
6	T500 #4 Number of Active Blocks	Can Take Values of 0 to 4
7	T500 #4 Activity Counter	Increments Every Time T500 Data is Gathered
8	F500 Fault Code	0 - No Faults Detected 1 - Total Blocks Detected is 0 2 - Total Blocks Greater Than 4 (Over 64 Nodes) 3 - One or More T500's Set to DeviceNet 4 to 255 - Not Used
9	Not Used	N/A
10	Block 1, Node 1, Bytes 1 and 2	Sensor Data (S1 – MSB; S2 – LSB)
11	Block 1, Node 1, Bytes 3 and 4	Sensor Data (S3 – MSB; S4 – LSB)
12	Block 1, Node 2, Bytes 1 and 2	Sensor Data (S1 – MSB; S2 – LSB)
13	Block 1, Node 2, Bytes 3 and 4	Sensor Data (S3 – MSB; S4 – LSB)
...
40	Block 1, Node 16 Bytes 1 and 2	Sensor Data (S1 – MSB; S2 – LSB)
41	Block 1, Node 16, Bytes 3 and 4	Sensor Data (S3 – MSB; S4 – LSB)
42	Block 2, Node 1, Bytes 1 and 2	Sensor Data (S1 – MSB; S2 – LSB)
43	Block 2, Node 1, Bytes 3 and 4	Sensor Data (S3 – MSB; S4 – LSB)
...
72	Block 2, Node 16, Bytes 1 and 2	Sensor Data (S1 – MSB; S2 – LSB)
73	Block 2, Node 16, Bytes 3 and 4	Sensor Data (S3 – MSB; S4 – LSB)
74	Block 3, Node 1, Bytes 1 and 2	Sensor Data (S1 – MSB; S2 – LSB)
75	Block 3, Node 1, Bytes 3 and 4	Sensor Data (S3 – MSB; S4 – LSB)
...
104	Block 3, Node 16, Bytes 1 and 2	Sensor Data (S1 – MSB; S2 – LSB)
105	Block 3, Node 16, Bytes 3 and 4	Sensor Data (S3 – MSB; S4 – LSB)
106	Block 4, Node 1, Bytes 1 and 2	Sensor Data (S1 – MSB; S2 – LSB)
107	Block 4, Node 1, Bytes 3 and 4	Sensor Data (S3 – MSB; S4 – LSB)
...
136	Block 4, Node 16, Bytes 1 and 2	Sensor Data (S1 – MSB; S2 – LSB)
137	Block 4, Node 16, Bytes 3 and 4	Sensor Data (S3 – MSB; S4 – LSB)
138	Not Used	N/A
139	Not Used	N/A
140	Block 1, Node 1 and Node 2 Status/ Ambient Temperature	Node Status Data (A1 – MSB; A2 – LSB)
...

MODBUS DATA WORD #	FIELD NAME	DESCRIPTION
147	Block 1, Node 15 and Node 16 Status/ Ambient Temperature	Node Status Data (A15 – MSB; A16 – LSB)
148	Block 2, Node 1 and Node 2 Status/ Ambient Temperature	Node Status Data (A1 – MSB; A2 – LSB)
...
155	Block 2, Node 15 and Node 16 Status / Ambient Temperature	Node Status Data (A15 – MSB; A16 – LSB)
156	Block 3, Node 1 and Node 2 Status/ Ambient Temperature	Node Status Data (A1 – MSB; A2 – LSB)
...
163	Block 3, Node 15 and Node 16 Status / Ambient Temperature	Node Status Data (A15 – MSB; A16 – LSB)
164	Block 4, Node 1 and Node 2 Status/ Ambient Temperature	Node Status Data (A1 – MSB; A2 – LSB)
...
171	Block 4, Node 15 and Node 16 Status / Ambient Temperature	Node Status Data (A15 – MSB; A16 – LSB)
172 - 178	Not Used	N/A
179	T500 #1 and T500 #2 Alarm	T500 Alarm (T500 #1 – MSB; T500 #2 – LSB)
180	T500 #3 and T500 #4 Alarm	T500 Alarm (T500 #3 – MSB; T500 #4 – LSB)
181 - 184	Not Used	N/A
185	Node Alarms Bytes 1 and 2	Individual Sensor Alarm Information
...
200	Node Alarms Bytes 31 and 32	Individual Sensor Alarm Information
201 - 204	Not Used	N/A
205	Node Type Bytes 1 and 2	Individual Sensor Type Information
...
220	Node Type Bytes 31 and 32	Individual Sensor Type Information

Table 9

Abbreviations:

Most Significant Byte (MSB)

Least Significant Byte (LSB)

9.4. SYSTEM INFORMATION (WORD 0 TO 9) -

- Number of Active Block (T500-1 to T500-4) - This field provides the information on the number of blocks configured within each of the four T500-s. It can take values of 0 to 4
- Activity Counter - This field provides means of checking if the communication between the F500 and each T500 is active. This field will increment by 1 every time new data has been successfully received from the T500. The value will increment from 0 to 255 and then roll over back to 0. Depending on the system size, it may take up to 8 seconds for this value to update. It is recommended that the operator be alerted if the value has not been updated for 15 seconds.
- F500 Fault Code - This field gives the current F500 Fault State. Please refer to Table 9 for more information

9.5. NODE TYPES (WORD 205 TO 220) -

The F500 and T500 support multiple types of communication nodes - TN4 and SN2. The sensor data is encoded differently depending on the node type. Therefore it is crucial to know what the current node type is before decoding the sensor data (Table 11).

The information for all 64 node types is stored in 16 Words or 32 Bytes. Each node requires 4 bits to store its type. This means that each word contains information for 4 nodes. Table 10 below describes the data alignment.

WORD 205			
Bits 15:12	Bits 11:8	Bits 7:4	Bits 3:0
Node 2	Node 1	Node 4	Node 3
WORD 206			
Bits 15:12	Bits 11:8	Bits 7:4	Bits 3:0
Node 6	Node 5	Node 8	Node 7
...			
WORD 220			
Bits 15:12	Bits 11:8	Bits 7:4	Bits 3:0
Node 62	Node 61	Node 64	Node 63

Table 10

Supported Node Types:

VALUE	NODE TYPE
0	Not Scanned
1	TN4
2	SN2

Table 11

9.6. SENSOR ALARMS (WORD 185 TO 200) -

This section provides information on whether each individual sensor is in alarm or not. This is the absolute minimum that is required by the PLC to successfully decode the sensor state to alarm or healthy.

The information for all 64 node alarms is stored in 16 words or 32 bytes. Each node can have up to 4 sensors and therefore requires 4 bits to store the alarms. This means that each word stored contains information for alarms on 4 nodes. Table 12 below describes the data alignment.

WORD 185			
Bits 15:12	Bits 11:8	Bits 7:4	Bits 3:0
Node 2	Node 1	Node 4	Node 3
WORD 186			
Bits 15:12	Bits 11:8	Bits 7:4	Bits 3:0
Node 6	Node 5	Node 8	Node 7
...			
WORD 200			
Bits 15:12	Bits 11:8	Bits 7:4	Bits 3:0
Node 62	Node 61	Node 64	Node 63

Table 12

The individual sensor alarm bits within each node have different meaning depending on the node type. The decoding is shown in Table 13. If the bit reads 1, then the input is in alarm. If the bit reads 0 then the input is not in alarm.

TN4			
Bit 3	Bit 2	Bit 1	Bit 0
Sensor 4	Sensor 3	Sensor 2	Sensor 1
SN2			
Bit 3	Bit 2	Bit 1	Bit 0
Input 2 - Underspeed Alarm	Input 2 - Underspeed Stop	Input 1 - Underspeed Alarm	Input 1 - Underspeed Stop

Table 13

9.7. SENSOR DATA (WORD 10 TO 137) -

Each node takes up two words of information. Depending on the node type, the meaning of the data in these two words changes. Having determined the node type (Table 11), it is possible to decode the data for individual sensors.

9.8. TN4 SENSOR DATA DECODING

If the node type is TN4 then each node has four sensors. Each sensor occupies one byte and the data is aligned in the following manner shown in Table 14.

WORD 10		WORD 11	
Most Significant Byte	Least Significant Byte	Most Significant Byte	Least Significant Byte
Sensor 1	Sensor 2	Sensor 3	Sensor 4

Table 14

Each sensor byte should then be decoded as shown in Table 15.

VALUE (DECIMAL)	VALUE (HEX)	DESCRIPTION
0 to 110	0x00 to 0x6E	NTC Positive Temperature (0°C to 110°C)
127 to 158	0x7F to 0x9E	NTC Negative Temperature (-0°C to -31°C) *
238	0xEE	NTC Sensor Open Circuit
239	0xEF	Lost Communication Between T500 and Node
240	0xF0	PTC Sensor Healthy / Cold
241	0XF1	PTC Sensor Tripped / Hot
250	0xFA	Contact Sensor Open / OFF
251	0xFB	Contact Sensor Closed / ON
253	0XFD	Sensor Not Scanned by T500
254	0XFE	NTC Sensor Over Temperature Fault, Temperature Cannot be Measured Reliably
255	0XFF	NTC Sensor Short Circuit

Table 15

* For negative temperatures equation 1 should be used to convert values in the range of 127-158 to negative temperature:

- Equation 1: $t [^{\circ}\text{C}] = 127 - \text{Value (Decimal)}$

The temperatures are always reported in °C regardless of the display units on the T500. The PLC program has to convert the units into °F if required. Please use equation 2 for the conversion.

- Equation 2: $t [^{\circ}\text{F}] = (t [^{\circ}\text{C}] \times 1.8) + 32$

9.9. SN2 SENSOR DATA DECODING -

The SN2 node has two speed and two interlock inputs. The interlock inputs are used together with speed values to create SN2 input states which are described in the Node State / Ambient Temperature Section (Word 140 to 171). The four bytes of sensor data is used for reporting the two machine speeds in pulses per minute (PPM). Two bytes are used for each speed input. The speed data decoding is illustrated below in Table 16.

WORD 10		WORD 11	
Most Significant Byte	Least Significant Byte	Most Significant Byte	Least Significant Byte
Speed Input 1	Speed Input 1	Speed Input 2	Speed Input 2

Table 16

NOTE: When using a four pulse Whirligig®, this will be four times the RPM. You can display RPM by dividing PPM by four.

9.10. NODE STATE / AMBIENT TEMPERATURE SECTION (WORD 140 TO 171) -

Depending on the node type this section of data should either be decoded as node ambient temperature for TN4 or Input Statuses for SN2. This section occupies 32 Words or 64 Bytes of data. This means that each node is allocated with a byte of data. See Table 17 for node allocation information.

WORD 140	
Most Significant Byte	Least Significant Byte
Node 1	Node 2
WORD 141	
Most Significant Byte	Least Significant Byte
Node 3	Node 4
...	
WORD 171	
Most Significant Byte	Least Significant Byte
Node 63	Node 64

Table 17

9.11. TN4 NODE AMBIENT DECODING -

For the TN4 node type the data in this section represents the node ambient temperature in °C. This data should be decoded as shown in Table 15, equations 1 and 2.

9.12. SN2 INPUT STATUS DECODING -

For the SN2 node type the data in this section represents detailed individual input statuses. Each byte contains information for two inputs. Each input status is 4 bits long. See Table 18 below for more information.

WORD 140			
Bits 15:12	Bits 11:8	Bits 7:4	Bits 3:0
Node 1, Input 2	Node 1, Input 1	Node 2, Input 2	Node 2, Input 1
WORD 141			
Bits 15:12	Bits 11:8	Bits 7:4	Bits 3:0
Node 3, Input 2	Node 3, Input 1	Node 4, Input 2	Node 4, Input 1
...			
WORD 171			
Bits 15:12	Bits 11:8	Bits 7:4	Bits 3:0
Node 63, Input 2	Node 63, Input 1	Node 64, Input 2	Node 64, Input 1

Table 18

Each input state should be decoded as stated below in Table 19.

VALUE (DECIMAL)	STATE	DESCRIPTION
0	Invalid	Invalid State
1	Stopped	Machine Stopped
2	Starting	Machine Start Up Delay
3	Running	Machine Running Normally
4	Interlock Off	Interlock Removed, Machine Still Running
5	Underspeed Alarm	10% Underspeed Condition Detected
6	Underspeed Stop	20% Underspeed Condition Detected
7	Calibrating	SN2 Input Calibration in Progress
8 - 14	Invalid	Reserved for Future Use
15	Comms Lost!	Lost Communication Between T500 and SN2 Node

Table 19

10. TROUBLESHOOTING GUIDE

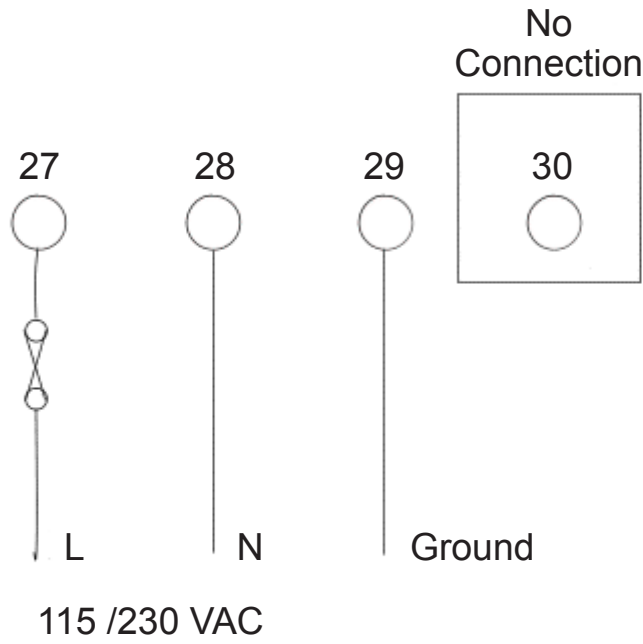
FAULT	REMEDY
After Initial Start Up, F500 Status LED (Image A) is Flashing Red or Solid Red for Several Minutes	<ol style="list-style-type: none">1. Make sure wiring for F500 has been routed away from power cables.2. Make sure F500 is properly grounded.3. Check that high powered two-way radios are not being operated near the T500 or F500 as this will affect performance.4. Check that communications / power cable is connected correctly (Appendix 2 and 3).5. Ensure the T500 Fieldbus settings are correct.
Excessive Interference on Power Supply	Power conditioners and surge suppressors may have to be installed.
Control Unit is Overheating	Mount the unit in a temperature controlled room with a maximum temperature of 113° F (45°C).
T500 is not Responding or Intermittent Signals	Check that the 120 Ohm termination resistors are installed correctly.

NOTE

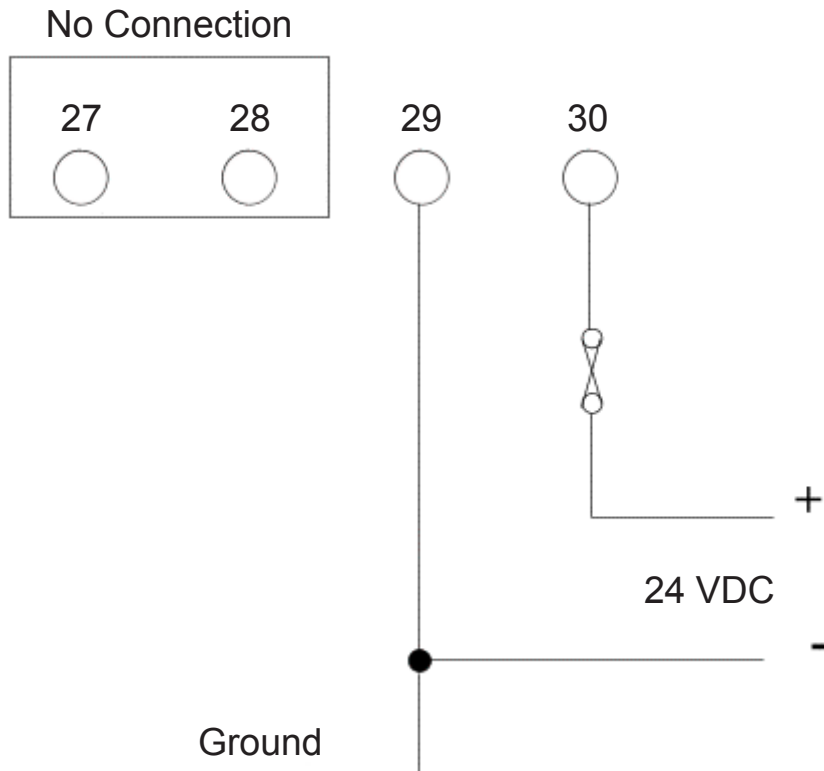
After any changes are made to the network or F500, you must re-start the F500 in order for the changes to be applied.

11. APPENDIX 1

SUPPLY VOLTAGE WIRING (120 to 240 VAC)

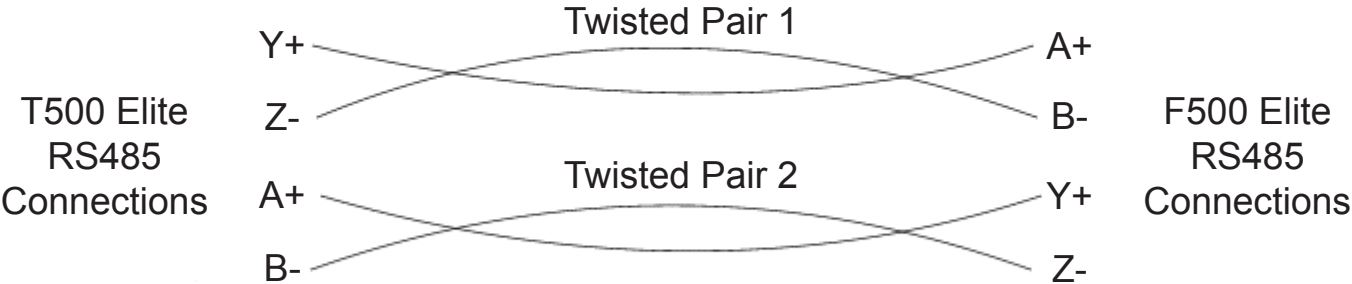
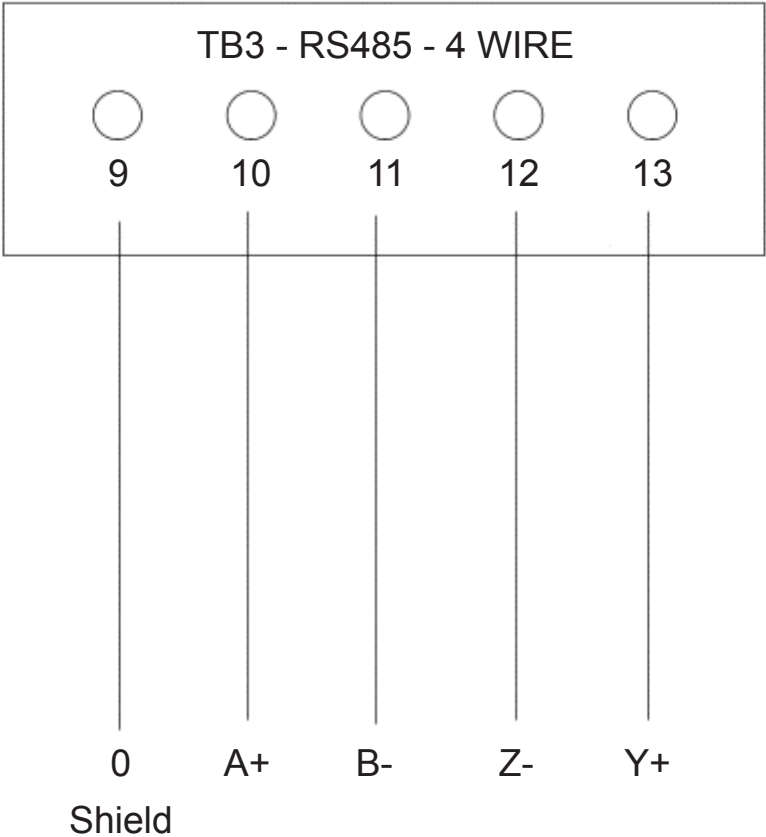


SUPPLY VOLTAGE WIRING (24 VDC)

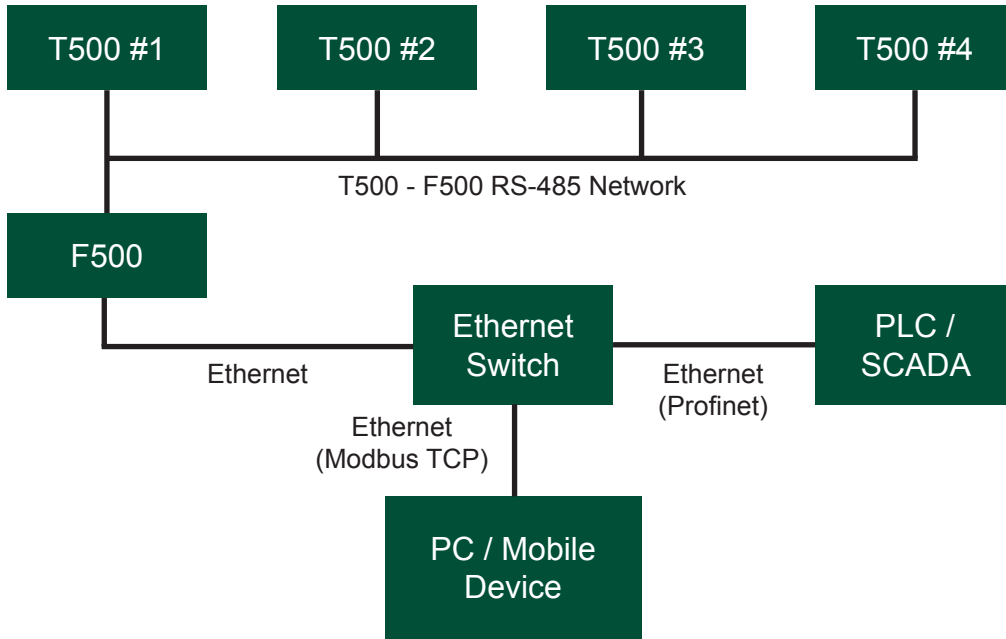


12. APPENDIX 2

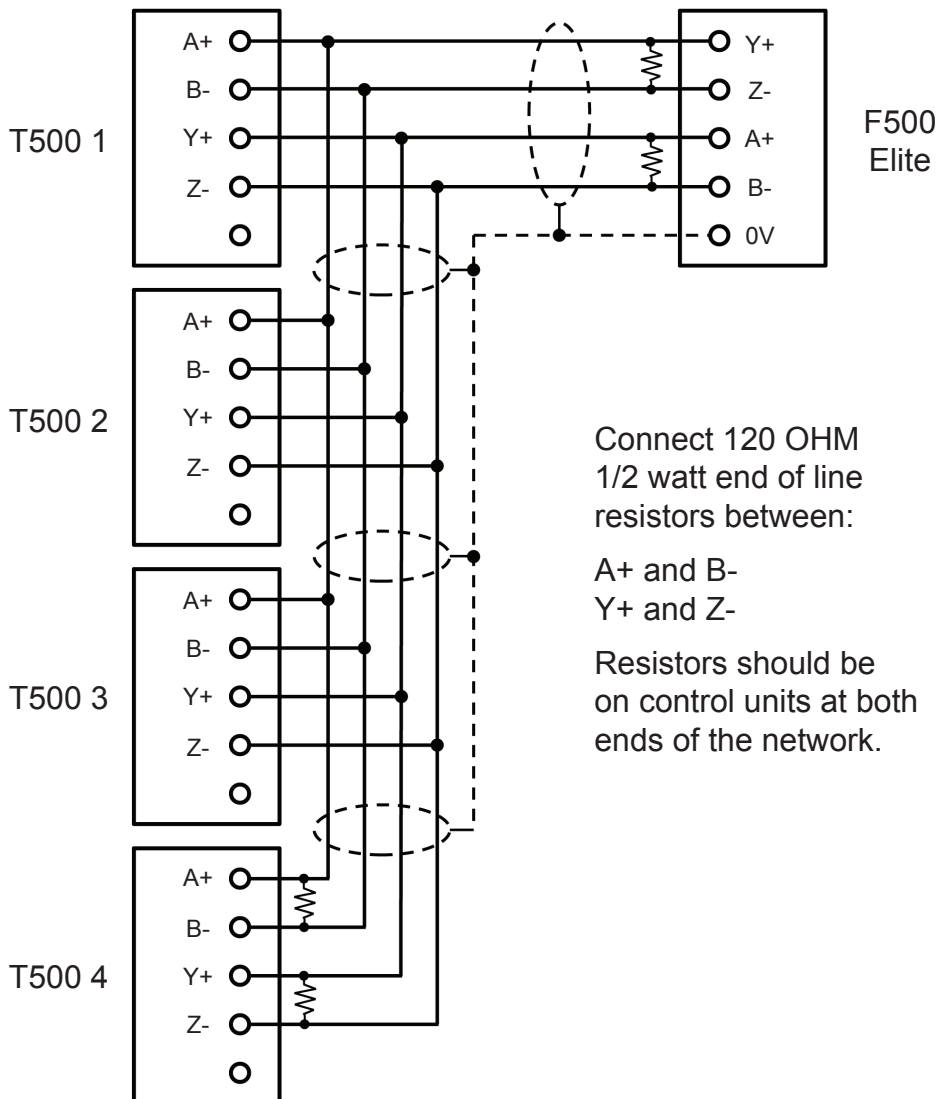
T500 ELITE TO F500 ELITE CONNECTION DIAGRAM



13. APPENDIX 3



General Connection Detail For T500 Elite to F500 Elite



15. PRODUCT WARRANTY

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