



T500 Elite

MANUAL

(Software Version 3.0.9)

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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.

SAFETY NOTICE TO OUR CUSTOMERS

- A. 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.
- B. 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.
- C. 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.
- D. Please see the last page of this manual for all warranty information regarding this product.

CUSTOMER SAFETY RESPONSIBILITIES

1. 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.

2. 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.

3. 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.

4. 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.

5. 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 4B location who supplied the product or the 24-hour hotline number in the USA -309-698-5611.

6. SERVICE REQUEST AND ONLINE PRODUCT REGISTRATION

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), email (4b-usa@go4b.com), 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

ATTENTION

IMPORTANT SOFTWARE UPDATE

A key lock feature has been added to the T500 software. After 20 seconds of inactivity the keypad will lock. After it is locked if you press any key the display will say “Keypad Locked”. To unlock press ↑→↓ in order. If you make a mistake wait 1 second and try again.

To enter the ‘Setup’ menu T500 unit you will now need a password. The default password for the T500 is ↑←↑↓. This password may be changed by engineering personnel, see section 4.12 for further details.

There is now a relay timer setting when a T500 is used in conjunction with a R500. When you program your sensor input and you reach the relay number section you will be prompted “do you want a timer delay” if yes is selected you will be prompted to enter a relay timer delay. This delay can be set from 0-99 seconds only affects the chosen R500 relay not the internal relay in the T500. If an R500 is not being used this feature can be ignored.

T500 ELITE SENSOR MONITOR

INTRODUCTION

The T500 ELITE is a microprocessor-controlled unit, which is able to accept signals from temperature sensors or voltage free thermostat and relay contacts in groups of 1 to 4, and is able to cause alarm and shutdown of a machine when alarm conditions are detected. The control unit is housed in a self-contained wall-mounting enclosure. The temperature sensors are separate items for mounting on bearings and the contact sensing may be any voltage free contact device having either **Normally Open** or **Normally Closed** contact state. The T500 ELITE will operate from 115v to 230v AC or from 12v to 24v DC.

1. SPECIFICATIONS

1.1 The Control Unit

A plastic enclosure houses the electronics and terminal connectors. The unit contains a printed circuit board to accommodate power supply circuitry, alarm relay, microprocessor and terminals. A short ribbon cable is connected to the lid of the enclosure where the display, keyboard and led indicators are mounted.

Electrical Supply (T5004V46C)	-	115 / 230 Volts AC 50 / 60 Hz
(T5004V4C)	-	12 / 24 Volts DC
Power Consumption	-	12 WATTS MAXIMUM
Alarm Relay Contacts	-	1 Pole normally open 8A@ 250VAC
Sensor Inputs	-	Via an RS485, 2 wire communications network
Sensor Supply	-	24V DC (200 ma available)
Terminals	-	Power 4mm ² 14 AWG max
	-	Signals 2.5mm ² 16 AWG max Plug In
Protection	-	NEMA12,IP55,Class II DIVI,E,F,G
Height	-	9.7", 246mm
Width	-	7.4", 188mm
Depth	-	4", 102mm
Fixing Centres	-	8.75" high x 4" wide, 222mm x 102mm
Cable Entry	-	2 Holes 11/8" DIA, 28mm, 3/4" CONDUIT
Weight	-	3lbs, 1.3Kg
Maximum number of TN4	-	64
Maximum connected sensors	-	256 (4 per TN4)
Maximum alarm relays	-	64 (In groups of 16 by using the optional R5004V4 or R5004V46 interface)
Sensing temperature range	-	-23°F to +230°F (-31°C to +110°C)
Display	-	4 line by 20 characters LCD with backlight.
Keyboard	-	5 programming keys.
Status Indicator Lamps	-	Viewed through front panel
	-	POWER
	-	ALARM

1.2 Bearing Temperature Sensors

1.2.1 Bearing Temperature Sensor, NTC – WDB20V3CA

The temperature Sensor is designed to screw into the bearing housing in a grease nipple hole or other tapped hole and will detect excessive temperature of the bearing housing. The body of the sensor contains a negative temperature coefficient (NTC) thermistor, which has a variable temperature characteristic. Four WDB20V3CA sensors can be connected to a TN4(e) temperature node. A two cores plus drain cable is permanently attached to the sensor body. A grease nipple is provided in the body of the sensor to allow greasing of the bearing in the normal manner.

SENSING TEMPERATURE (TN4e)	-	-23°F to 230°F (-31°C to +110°C)
ACCURACY	-	±1.8°F (1°C)
SENSING VOLTAGE	-	5V DC Approx
NORMAL OPERATING CURRENT	-	1 ma
FIXING THREAD	-	1/8" NPT
CABLE	-	2 Core + drain 0.75mm ² 9ft (3Mtr.) long
PROTECTION	-	CSA Class II Division I GROUPS E, F AND G

1.2.2 Bearing Temperature Sensor, PTC – WDB24V3C (typical example)

The temperature Sensor is designed to screw into the bearing housing in a grease nipple hole or other tapped hole and will detect excessive temperature of the bearing housing. The body of the sensor contains a positive temperature coefficient (PTC) thermistor, which has a fixed temperature characteristic. Four WDB24V3CA sensors can be connected to a TN4e temperature node. A two cores plus drain cable is permanently attached to the sensor body. A grease nipple is provided in the body of the sensor to allow greasing of the bearing in the normal manner.

TRIP TEMPERATURE	-	176°F (80°C) [this example only]
SENSING VOLTAGE	-	5V DC Approx
NORMAL OPERATING CURRENT	-	1 ma
FIXING THREAD	-	1/8" NPT
CABLE	-	2 Core + drain 0.75mm ² 9ft (3Mtr.) long
PROTECTION	-	CSA Class II Division I GROUPS E, F AND G

See page 20 for a list of PTC type numbers and temperatures.

1.3 Temperature Node TN4e.

The TN4e is supplied either in an ABS housing complete with cable glands for use in Europe or in a Crouse-Hinds type CU enclosure. The TN4e is equipped with a microprocessor which will provide up to four scaled and linear temperature readings in the range -23°F to +230°F ±2°F. The microprocessor design ensures a consistently reliable performance. The T500 elite communicates with the TN4e using an industrial standard RS485 communications system. The T500 also provides power for each of the 64 TN4e through the communications cable. When operating with 64 TN4e connected the time taken to update all of the 256 temperatures is approximately 8 seconds. An industrial standard Belden or equivalent two twisted pair communications cable is used to connect the T500 elite to the TN4e. This communications bus is referred to as HOTBUS 2. The HOTBUS 2 uses one pair of cables to carry the communications signals and another pair to carry the power supply. The cable includes an overall screen to provide signal protection.

SENSING TEMPERATURE	-	-23°F to +230°F (-31°C to +110°C)
ACCURACY	-	±2°F (1°C)
SUPPLY VOLTAGE	-	12V-24V DC ±10% (27VDC MAX)
MAX. CURRENT	-	5ma (Peak, Including LED)
PROTECTION	-	CSA CLII Div1 GP E, F & G
	-	-20°C to +55°C IP66
CABLE TYPE	-	BELDEN or equivalent (UL2919)

1.4 Optional Relay Interface.

The optional R50016V345 relay interface unit is equipped with 16 alarm relays. Each relay provides a single pole changeover contact rated 250V AC at 5Amp. The T500 can be programmed to operate with up to 64 alarm relays with any number of sensors programmed to operate any alarm relay. When a sensor exceeds its programmed alarm tolerance, the relay associated with that sensor will operate. Each relay can be programmed to respond immediately or after a programmed delay period.

R5004 Electrical specification	
Electrical Supply R5004V46C	- 100 - 230 Volts AC ±10% @ 50 / 60 Hz
R5004V4C	- 24 Volts DC ±10%
Power Consumption	- 12 WATTS
Alarm Relay Contacts	- 1 Pole change over 5A@ 250VAC x 16
Terminals	- Power 4mm ² 14 AWG max
	- Relay 2.5mm ² 16 AWG max PLUG IN
Protection	- NEMA12,IP55,Class II DIV1,E,F,G
Height	- 9.7", 246mm
Width	- 7.4", 188mm
Depth	- 4", 102mm
Fixing Centres	- 8.75" high x 4" wide, 222mm x 102mm
Cable Entry	- 2 Holes 1 1/8" DIA, 28mm, 3/4" CONDUIT
Weight	- 3lbs, 1.3Kg
Status Indicator Lamps	- POWER
Unit Address range	- 0 – 7 (Factory Default = 0)

The T500 Elite software Version 3.x.x has been designed to support 4 R5004 relay interface units. Together they provide a total of 64 alarm relays. Each relay interface is fitted with a unit address selector switch. This switch allow up to 8 unit addresses although only the first 4 are currently used. Address '0' provides relays in the range of 1 to 16 and address '1' provides relays in the range 17 – 32, address '2' provides relays in the range 33 – 48 and address '3' provides relays in the range 49 - 64. The address must be set BEFORE power is applied. The relay interface units are shipped from the factory set to address '0'. If you intend to use 2, 3 or 4 relay units you must set each of the R500 interfaces to address 1, 2, or 3 accordingly. Additional relay interface units may be connected to the HOTBUS communications network using the same unit address. This will duplicate exactly the functions of the first unit. This can be useful when local and remote alarm indication may be needed.

1.5 HOTBUS

HOTBUS is the term used to refer to the communications system used with the T500 elite and the sensor network. This network is an active communications system and as such is not restricted to monitoring temperatures. Other HOTBUS sensors will become available in the future and can be mixed freely on the HOTBUS system.

2 INSTALLATION INSTRUCTIONS

2.1 The Control Unit

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 and display can be readily seen. The box should have sufficient space to open the lid for wiring. An audible alarm, hooter or visual indicator lamp can be installed in or outside of the control room.



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.

2.2 Bearing Temperature Sensors (Grease through type)

The temperature sensors are screwed into the grease holes of the bearings for the elevator leg head pulley, boot pulley and jockey pulley, where fitted or the bearings for conveyor rollers. Each sensor has a greasing by-pass and is installed in the bearing as Drawing 'C'.

3 ELECTRICAL WIRING

Refer to Drawings A & B

Mount the TN4e housing within 3 meters of the sensors. Connect the sensor cables to the TN4e box SENSOR 1, SENSOR 2, SENSOR 3 and SENSOR 4 inputs using the provided sealing glands and protect the cable from damage. If flexible conduit is to be used ensure the correct glands are also used. Connect the communications/power cable to the TN4e box via the remaining 9-way plug connector. The cable is intended to be daisy chain connected as described in Drawing 'D'.

Any Sensor inputs which are unused may be left unconnected but attention must be paid to ensure that the procedures set out on page 19, items 10 to 12 are carried out.

When installing the equipment in an area which is likely to be hazardous from Ignitable Dusts, use liquid tight conduit and fittings and follow all local codes.

4 OPERATING INSTRUCTIONS

The T500 elite is equipped with 5 programming keys. These are soft keys and change their function according to the operation required at the time. When entering a numeric value, the following format has been adopted.

UP (↑) key will increase the selected number.

DOWN (↓) key will decrease the selected number.

LEFT (←) will move the flashing cursor one digit to the left

RIGHT (→) will move the flashing cursor one digit to the right

SET will accept the number on the screen and move to the next entry.

If the flashing cursor is placed on a digit using the (←) or (→) keys then the number will be increased or decreased by an appropriate amount.

For example:

If the display shows 0000 then pressing (↑) will increase the number by 1

If the display shows 0000 then pressing (↑) will increase the number by 10

If the display shows 0000 then pressing (↑) will increase the number by 100

If the display shows 0000 then pressing (↑) will increase the number by 1000

The (↓) key operates in exactly the same way except that it will decrease the number by the same amount. Each number has a programmed range and will not allow numbers outside of that range. If you press and hold the (↑) or (↓) key for greater than 2 seconds, then the numbers will increase or decrease at a faster rate. Due to a low software priority the key repeat rate will vary, this is normal and should not be a cause for concern. When you are satisfied that the number being displayed is correct, press the **SET** key to save this number and move on to the next entry.

At other times the keys will have different functions. Please refer to those functions in order to determine the key use.

WARNING: If you are in a menu or edit mode and do not press a key for 1 minute, the edit menu will close and any data entered will be lost.

The TEST function

When the T500 is powered up a greetings message is displayed and it automatically enters a self-test mode. All of the internal functions are examined and if no errors are detected the software continues into normal operation. In the event of failure, please contact the factory.

```
**   T500 ELITE   **  
   © 2002-2010  
   DON ELECTRONICS  
**   VERSION 3.0.9   **
```

4.1 Initial Setting up

When power is first applied to the T500 the software checks for the existence of set-up information. If this is not present then it is assumed that the T500 is being set-up for the first time. The warning message opposite will be displayed and the alarm LED will flash.

```
WARNING  
No Configured  
sensors, press SET  
to begin
```

The T500 will not continue until the SET button is pressed. At this point the LCD display will change to the T500 setup screen. This option can be accessed at any time once the initial setup has been performed.

```
- NODE SETUP -  
NODE Number 1  
NODE Address = 0000
```

The T500 has been designed to work with the TN4e temperature sensor node. Although the TN4e has been specifically designed to work with NTC type temperature sensors, it will also work with PTC temperature sensors and thermostatic switches. The switch input is intended to work with voltage free contacts either normally open or normally closed in operation and therefore is not restricted to temperature applications and can be used with other sensors, such as the TS1V4C TouchSwitch or signal relays. NTC type temperature sensors are designed to provide a continuously variable temperature indication. PTC temperature sensors are designed to provide a fixed temperature trip point for temperature monitoring and the contact sensing provides programmable contact change detection from a thermostat or other contact device. Below is an example of the setup procedure for each type of sensor.

4.1.1 HOTBUS Node number.

The T500 elite is capable of being connected to 64 TN4e Nodes and therefore it is essential to determine which of the 64 nodes the information is referring to. Each TN4e node is manufactured with a unique serial number. The last four digits of the serial number are the address of the node. If 683/1023 is the serial number then 1023 is the node address. As each node supports 4 sensors it is important to carefully record which is sensor 1, 2, 3 and which is sensor 4. Before attempting to setup the T500 elite you should plan your sensor network and record the following for later use. Note that all sensors connected to the node can be of different types, see page 13

Node Address: e.g. 1023

Sensor types for the node: NTC, PTC, or CNT (Contact)

The names for sensors 1-4 (20 characters maximum, see sensor name editing on page 16)

4.1.2 Node Setup.

When entering the NODE SETUP mode either for the first time or when editing, the following screen will appear. The first line shows you that you are in the MODE SETUP.

```
- NODE SETUP -  
NODE Number 1  
NODE Address = 0000
```

The second line displays the names of the chosen node (Node 1 by default) and the third line shows the address of the node. The display cursor should be placed to the left of the words 'NODE Number 1'. At this part of the setup procedure, you can use the UP (↑) and DOWN (↓) keys to move your way through the list of 64 nodes. Un-programmed nodes will by default display with a node address of 0000. When you have selected the node you wish to edit, press the SET key.

The cursor will now move to the address portion of the node details. You can now use the UP (↑), DOWN (↓), LEFT (←) or RIGHT (→) keys to edit the node address. When you are satisfied that the number being displayed is correct, press the SET key to save this number and move on to the next entry.

```
- NODE SETUP -  
NODE Number 1  
NODE Address = 1234
```

The T500 then displays the details associated with each of the 4 sensors that make up the TN4e. Using the (↑) and (↓) you must first select which of the 4 sensors you want to edit. If this is the first time you have edited this node then all the sensors will be NTC type otherwise the information for each sensor will be displayed in turn as you scroll through the four sensors. In order to help you identify the sensor more clearly, each sensor has a unique name. The default names for the first 4 sensors (Node 1) is "Sensor Number 1..4" and the second set of 4 sensors (Node 2) is "Sensor Number 5..8" and so on until the sensors for node 64 which are "Sensor Number 253..256". Later we will examine a method by which the sensor names may be changed but for now we will assume that we are using the default sensor names.

```
Sensor Number 1  
TYPE= NTC : Relay 00  
RELATIVE ALARM 30  
ABSOLUTE ALARM 140
```

```
Sensor Number 2  
TYPE= NTC : Relay 00  
RELATIVE ALARM 30  
ABSOLUTE ALARM 140
```

```
Sensor Number 3  
TYPE= NTC : Relay 00  
RELATIVE ALARM 30  
ABSOLUTE ALARM 140
```

Once you have decided which of the 4 sensors you wish to edit press the SET key. The cursor will now move onto the sensor type (NTC in our example opposite). You can change this option as much as you wish by pressing the (↑) and (↓) keys. As you change the sensor type the information on the display will change to reflect the requirements of each sensor type. Once you have decided on the sensor type press the SET key to move on to the entry detail for that specific sensor.

```
Sensor Number 4  
TYPE= NTC : Relay 00  
RELATIVE ALARM 30  
ABSOLUTE ALARM 140
```

4.1.3 Setup for NTC sensors.

If you selected to use the NTC type of sensor then the setup screen should look like it does on the right. The top line shows the name of the sensor, the second line shows the chosen sensor type and the alarm relay number. The third line shows the relative temperature alarm level and the fourth line shows the absolute temperature alarm level.

```
Sensor Number 4  
TYPE= NTC : Relay 00  
RELATIVE ALARM 30  
ABSOLUTE ALARM 140
```

Once you have selected the NTC type sensor the information on line 2 will change. The T500 asks if you would like to use a Relay Delay with the R500 relay. This can be very useful if you don't want the R500 to respond immediately to an alarm. For example, you may want to set the relay delay long enough to avoid accidental activation if operation is expected to vary in normal use. If you do **not** require a delay in the relay activation then touch the Down (↓) arrow to select “No”, otherwise touch the Up (↑) arrow to select “Yes”; having made your choice then touch the “SET” key to complete that part of the entry. If you chose to have an activation delay then display line 2 will change to “**Relay Delay is xx S**”. xx represents the current relay activation delay in seconds. The normal default is 60 seconds but the timer range can be set between 0 and 99 seconds. If you chose “No” to the delay time then the default is automatically set to ‘0’ essentially making the relay operate immediately when a fault is detected.

```
Sensor Number 4
TYPE= NTC : Relay 00
RELATIVE ALARM 30
ABSOLUTE ALARM 140
```

```
Sensor Number 4
Relay Delay ? Yes
RELATIVE ALARM 30
ABSOLUTE ALARM 140
```

```
Sensor Number 4
Relay Delay is 60 S
RELATIVE ALARM 30
ABSOLUTE ALARM 140
```

Once you have completed any adjustments to the time delay or if you chose “No” time delay, touching “SET” causes the software on to ask which relay you would like to assign to this sensor. Line 2 of the display will again change to show the relay number option. The flashing cursor will be placed on the High Temperature Alarm relay. If setting up for the first time then the value will be 00 otherwise it will display the value set previously. The T500 is equipped with an internal alarm warning relay. Any alarm condition will result in this relay operating. The T500 can also have 4 R500 elite relay interface units connected to it. Each R500 is equipped with 16 interface relays providing a maximum of 64 relays all of which can be utilised as part of the temperature monitoring system. If the High Temperature Relay is set to 00 then only the internal warning relay will operate, however, if you set the relay to a number between 1 and 64, then the associated R500 alarm zone relay will also operate. You can adjust the number of the relay by using the keyboard as described on page 7. When you have entered your chosen relay number press SET to continue.

```
Sensor Number 4
TYPE= NTC : Relay 01
RELATIVE ALARM 30
ABSOLUTE ALARM 140
```

The cursor will now move down to the ‘Relative Alarm 30’ prompt. The relative temperature alarm provides the ability to set an alarm level which is relative to the ambient temperature of the system. This provides a close temperature control for the T500 Elite. If the current ambient temperature is 70°F then setting the relative temperature for sensor 1 to 30°F will result in the alarm level of 70°F+30°F = 100°F. If the ambient temperature was to rise to 80°F then the relative temperature alarm would be 80°F+30°F = 110°F in other words the actual alarm is always 30°F above the current ambient. Setting the relative alarm value to 0°F results in the close temperature controls being disabled. A maximum relative temperature alarm limit of 90°F (above ambient) is applied to this feature. The factory default level is 30°F. This alarm type only applies to the NTC sensors. The ambient temperature is measured by a separate NTC temperature sensor located on the TN4(e) node circuit board and applied specifically to the 4 sensors associated with the node. When you have completed your entry, press SET to continue.

```
Sensor Number 4
TYPE= NTC : Relay 00
RELATIVE ALARM 30
ABSOLUTE ALARM 140
```

The cursor will now move down to the 'Absolute Alarm nnn' prompt. If setting up for the first time then the value will be 140°F otherwise the value will be as previously set. This provides an adjustable absolute alarm level for the sensor and can be adjusted between 000°F and 230°F. When the measured temperature exceeds this setting, the T500 will generate an alarm in accordance with the relay settings above. This alarm operates independently of the relative alarm setting and has no relationship with the ambient temperature. It is provided for use when the ambient temperature measurement can not be relied upon or when you require a second and secure alarm. If the ambient sensing system is not set or has failed to operate correctly, then the absolute alarm will protect the system against high temperatures. If a Relative alarm was set to 30°F above ambient and the Absolute alarm was set to 150°F, then the alarm will operate when the measured temperature exceeds 150°F irrespective of the Relative alarm settings. The factory default level is 140°F. When you have entered your chosen Absolute alarm level, press SET to continue.

```
Sensor Number 4
TYPE= NTC : Relay 00
RELATIVE ALARM 30
ABSOLUTE ALARM 140
```

Pressing the SET button completes the entry page but we sometimes make mistakes during entry of data or we need to edit more than one entry before moving on to do other things. Before the new information is finally saved for use you have a number of choices that you can make. Pressing the LEFT (←) key saves the new information and returns you back to select a new node. Pressing the RIGHT (→) key saves the information and returns you back to the sensor edit screen and the SET key just exits the setup mode saving any changes.

```
USE THE KEYS TO
< = Go to NODE edit
> = Go to SENSR edit
SET = Done with edit
```

Once you have pressed the (←), (→) or SET key, the information is saved in permanent memory so that the next time the T500 is powered up, these settings will automatically come into effect.

WARNING: If you do not press a key for 1 minute, the edit menu will close and any data entered will be lost.

NOTE: Alarm relay delays apply to the R500 relay only. The T500 onboard warning relay will operate immediately upon detection of a fault.

4.1.4 Setup for PTC sensors.

If you selected to edit the PTC type of sensor then the screen should look like it does on the right. The top line shows name of the sensor. The second line shows the chosen sensor type and the alarm relay number. The third and fourth line is blank. PTC sensors do not require an alarm temperature as they are designed to work at fixed alarm temperatures (see page 13).

```
Sensor Number 16
TYPE= PTC : Relay 00
```

Once you have selected the PTC type sensor the information on line 2 will change. The T500 asks if you would like to use a Relay Delay with the R500 relay. This can be very useful if you don't want the R500 to respond immediately to an alarm. For example, you may want to set the relay delay long enough to avoid accidental activation if operation is expected to vary in normal use. If you do **not** require a delay in the relay activation then touch the Down (↓) arrow to select “**No**”, otherwise touch the Up (↑) arrow to select “**Yes**”; having made your choice then touch the “**SET**” key to complete that part of the entry. If you chose to have an activation delay then display line 2 will change to “**Relay Delay is xx S**”. xx represents the current relay activation delay in seconds. The normal default is 60 seconds but the timer range can be set between 0 and 99 seconds. If you chose “No” to the delay time then the default is automatically set to ‘0’ essentially making the relay operate immediately when a fault is detected.

```
Sensor Number 16
TYPE= PTC : Relay 00
```

```
Sensor Number 16
Relay Delay ? Yes
```

```
Sensor Number 16
Relay Delay is 60 S
```

Once you have completed any adjustments to the time delay or if you chose “No” time delay, touching “SET” causes the software on to ask which relay you would like to assign to this sensor. Line 2 of the display will again change to show the relay number option. The flashing cursor will be placed on the chosen alarm relay. If setting up for the first time then the value will be 00 otherwise the value will be what was set previously. The T500 is equipped with an internal alarm warning relay. Any alarm condition will result in this relay operating. The T500 can also have 4 R500 elite relay interface units connected to it. Each R500 is equipped with 16 interface relays providing a maximum of 64 relays all of which can be utilised as part of the temperature monitoring system. If the High Temperature Relay is set to 00 then only the internal warning relay will operate, however, if you set the relay to a number between 1 and 64, then the associated R500 alarm relay will also operate. You can adjust the number of the relay by using the keyboard as described on page 7. When you have entered your chosen relay number press SET to continue.

```
Sensor Number 16
TYPE= PTC : Relay 31
```

Pressing the SET button completes the entry page but we sometimes make mistakes during entry of data or we need to edit more than one entry before moving on to do other things. Before the new information is finally saved for use you have a number of choices that you can make. Pressing the LEFT (←) key saves the new information and returns you back to select a new node. Pressing the RIGHT (→) key saves the information and returns you back to the sensor edit screen and the SET key just exits the setup mode saving any changes.

```
USE THE KEYS TO
< = Go to NODE edit
> = Go to SENSR edit
SET = Done with edit
```

Once you have pressed the (←), (→) or SET key, the information is saved in permanent memory so that the next time the T500 is powered up, these settings will automatically come into effect.

WARNING: If you do not press a key for 1 minute, the edit menu will close and any data entered will be lost.

NOTE: Alarm relay delays apply to the R500 relay only. The T500 onboard warning relay will operate immediately upon detection of a fault.

4.1.5 Setup for CNT (contact) sensing.

If you selected to edit the CNT type of sensor then the screen should look like it does on the right. The top line shows the sensor name. The second line shows the chosen sensor type and the alarm relay number. The third line shows the current alarm condition for the contact.

```
Sensor Number 21
TYPE= CNT : Relay 00
ALARM WHEN ON
```

Once you have selected the CNT type sensor the information on line 2 will change. The T500 asks if you would like to use a Relay Delay with the R500 relay. This can be very useful if you don't want the R500 to respond immediately to an alarm. For example, you may want to set the relay delay long enough to avoid accidental activation if operation is expected to vary in normal use. If you do **not** require a delay in the relay activation then touch the Down (↓) arrow to select “No”, otherwise touch the Up (↑) arrow to select “Yes”; having made your choice then touch the “SET” key to complete that part of the entry. If you chose to have an activation delay then display line 2 will change to “**Relay Delay is xx S**”. xx represents the current relay activation delay in seconds. The normal default is 60 seconds but the timer range can be set between 0 and 99 seconds. If you chose “No” to the delay time then the default is automatically set to ‘0’ essentially making the relay operate immediately when a fault is detected.

```
Sensor Number 21
TYPE= CNT : Relay 00
ALARM WHEN ON
```

```
Sensor Number 21
Relay Delay ? Yes
ALARM WHEN ON
```

```
Sensor Number 21
Relay Delay is 60 S
ALARM WHEN ON
```

Once you have completed any adjustments to the time delay or if you chose “No” time delay, touching “SET” causes the software on to ask which relay you would like to assign to this sensor. Line 2 of the display will again change to show the relay number option. The flashing cursor will be placed on the chosen alarm relay. If setting up for the first time then the value will be 00 otherwise the value will be what was set previously. The T500 is equipped with an internal alarm warning relay. Any alarm condition will result in this relay operating. The T500 can also have 4 R500 elite relay interface units connected to it. Each R500 is equipped with 16 interface relays providing a maximum of 64 relays all of which can be utilised as part of the temperature monitoring system. If the High Temperature Relay is set to 00 then only the internal warning relay will operate, however, if you set the relay to a number between 1 and 64, then the associated R500 alarm relay will also operate. You can adjust the number of the relay by using the keyboard as described on page 7. When you have entered your chosen relay number press SET to continue.

```
Sensor Number 21
TYPE= CNT : Relay 22
ALARM WHEN ON
```

Because contact conditions can be applied in one of two known states the ‘ALARM WHEN’ condition can be toggled to either ‘OFF’ or ‘ON’ by using the UP (↑) or DOWN (↓) keys. This means that if your contact is normally ‘ON’, you might want to alarm when it changes to ‘OFF’ or if it is normally ‘OFF’ you might want to alarm when it changes to ‘ON’. This state can be set individually for each of the contact inputs.

```
Sensor Number 16
TYPE= CNT : Relay 22
ALARM WHEN ON
```

Pressing the SET button completes the entry page but we sometimes make mistakes during entry of data or we need to edit more than one entry before moving on to do other things. Before the new information is finally saved for use you have a number of choices that you can make. Pressing the LEFT (←) key saves the new information and returns you back to select a new node. Pressing the RIGHT (→) key saves the information and returns you back to the sensor edit screen and the SET key just exits the setup mode saving any changes.

USE THE KEYS TO
< = Go to NODE edit
> = Go to SENSR edit
SET = Done with edit

Once you have pressed the (←), (→) or SET key, the information is saved in permanent memory so that the next time the T500 is powered up, these settings will automatically come into effect.

WARNING: If you do not press a key for 1 minute, the edit menu will close and any data entered will be lost.

NOTE: Alarm relay delays apply to the R500 relay only. The T500 onboard warning relay will operate immediately upon detection of a fault.

4.1.6 Sensor Network Design.

The HotBus2 sensor monitoring system based upon the T500 has been designed to offer simplicity and flexibility. You can mix the TN4e node installation as freely as you like. It is not necessary to use consecutively numbered TN4e for the system to work. Neither is it necessary to assign the nodes to any logical sequence. If you leave holes in the setup information, for example if you only have three nodes you might assign them like this - Node 1 is address 1000, Node 3 is address 1097 and node 23 is address 1023 then the missing or blank entries are ignored and have no effect on the operation of the T500. It is however, strongly recommended that you consider assigning the Node numbers consecutively 01 – 64 as this makes monitoring the temperatures easier and entering useful and meaningful sensor name is easier. You may find it useful to leave small gaps in the system especially if you intend to add extra TN4e nodes at a later date; however, there is no association between the physical placement of the nodes and the order of programming in the T500 so you are free to place the nodes in any order. Experience has shown that you will benefit greatly by planning the system with some thought to how you intend to use the information. A common format for use is to assign each node to a section or area to be monitored and assign the sensors according the needs of that area, adding more nodes if necessary.

4.1.7 Alarm zoning.

Each TN4e node can read the state of 4 independent sensors. These sensors can be associated with an alarm relay. Alarm relay 00 (default) is the built in warning relay and operates for all alarm conditions. If the optional relay interfaces are fitted (R50016V345) then up to a further 64 alarm channels are available for the user. Setting the relay number for any of the sensors to between 01 and 64 will associate the alarm relay 01 to 64 to that sensor. Any number of sensors can be associated with an alarm relay. For example:

Node 1001	Sensor 1 = 00	T500 alarm warning relay only. (WR)
	Sensor 2 = 04	Optional alarm relay 4 + (WR)
	Sensor 3 = 01	Optional alarm relay 1 + (WR)
	Sensor 4 = 14	Optional alarm relay 14 + (WR)
Node 1003	Sensor 1 = 01	Optional alarm relay 1 + (WR)
	Sensor 2 = 02	Optional alarm relay 2 + (WR)
	Sensor 3 = 03	Optional alarm relay 3 + (WR)
	Sensor 4 = 04	Optional alarm relay 4 + (WR)

It can be seen from the examples above that a number of sensors can be zoned together, Node 1001 Sensor 3, Node 1003 Sensor 1 are both associated with alarm relay 1. Any one or both of these sensors, which exceed the programmed limits, will operate relay 1 of the R500 relay interface. Any alarm will always trigger the internal alarm relay of the T500 elite. Any number of sensors can be associated with an alarm relay in this way.

4.1.8 Temperature sensor types.

Two types of NTC sensor are available for use with the T500

Brass Body Version Steel Body Version

<u>Part No. (Europe)</u>	<u>Part No. (USA)</u>	<u>Temperature</u>
WDB10V34AI	WDB20V34C	Max 110°C/230°F

PTC sensors have a fixed alarm level which is determined by the type of sensor. The table below lists some of the sensor types available.

Brass Body Version Steel Body Version

<u>Part No. (Europe)</u>	<u>Part No. (USA)</u>	<u>Temperature</u>
WDB11V34AI	WDB21V34C	50°C/122°F
WDB12V34A I	WDB22V34C	60°C/140°F
WDB13V34A I	WDB23V34C	70°C /158°F
WDB14V34AI	WDB24V34C	80°C /176°F
WDB15V34AI	WDB25V34C	90°C /194°F
WDB16V34AI	WDB26V34C	100°C /212°F

4.2 Normal Operation.

Once the initial setup has been performed and at least 1 TN4e has been connected to the system then the T500 will enter the normal monitoring mode. During normal operation, the T500 will continuously scan all of the programmed sensors and respond to their programmed alarm settings. This mode displays the status of a single sensor connected to the T500. The actual sensor being displayed can be selected by using the Up(↑) and Down(↓) arrow keys. During the normal sensor display the software is capable of showing any one of the 256 sensors, which may be available. As each TN4e node has 4 sensors connected to it, the display shows consecutively connected sensors. For example if you were to connect three nodes 1,2 and 3 to the T500 then the display will show the settings for sensors 1 to 12. If a sensor is connected and working correctly then its actual state will be displayed in either °C or °F if the sensor is an NTC type, NORMAL or HIGH if the sensor is a PTC type and ON or OFF if the sensor is a CNT type. If a node is not programmed (see the section on setting up the T500) then the display will show <-> as the current sensor value (including <-> ambient if the sensor is an NTC type). All 256 sensors can be displayed in this manner. As you scroll up or down through the sensors, the alarm zone number and alarm trip level or alarm condition associated with each sensor will update automatically on the screen. Although no restrictions are placed upon the order of programming for the nodes, it can be seen that it is to your advantage to programme them in a logical order. Three nodes programmed consecutively will result in the first 12 sensors being displayed. This makes it easy to choose the sensor, which you want to monitor. If you programme the nodes with holes in the sequence, 1,15 and 26 for example, then the associated sensors numbers will be 1..4 for node 1, 57..60 for node 15 and 101..104 for node 26. It can be seen that this is not an efficient way in which to programme the nodes as it takes a long time to scroll through the list to reach a programmed sensor.

Sensor Number 1 Temperature = 082°F Amb 070°F :Relay 10 Rel 30: Abs 140: NTC
Sensor Number 2 Temperature = 080°F Amb 070°F :Relay 10 Rel 30: Abs 140: NTC
Sensor Number 3 Contact State = OFF Alarm = ON :Relay 11 Sensor Type = CNT
Sensor Number 4 Contact State = OFF Alarm = ON :Relay 12 Sensor Type = CNT
Sensor Number 5 Temperature = NORMAL Alarm Relay = 27 Sensor Type = PTC
Sensor Number 6 Temperature = NORMAL Alarm Relay = 27 Sensor Type = PTC
Sensor Number 200 Temperature = <->°F Amb <->°F :Relay 00 Rel 30: Abs 150: NTC

When power is applied details for sensor 1 will be displayed by default. While displaying the detail for sensor 1, pressing the Down(↓) key will cause the T500 to display the details for sensor 256. The reverse of this is also permitted. When displaying the details for sensor 256, pressing the Up(↑) key will cause the T500 to display the result in the details for sensor 1.

If a decimal point (period) appears between the word “Relay” and the relay number (Relay. 01) then this indicates that the relay has an activation delay timer set. If no timer is set then the period will not be displayed.

Sensor Number 200 Temperature = 082°F Amb 070°F :Relay. 01 Rel 30: Abs 140: NTC
--

4.3 Sensor Alarm Detection and Display.

Each programmed node will have its status constantly updated on a first to last basis. As the sensor data is read from a node, the status is compared with the programmed alarm setting. If the actual status matches the programmed alarm condition an alarm is generated. If the alarm zone was programmed at the default 00, then only the T500 alarm relay will operate. If the alarm zone was programmed with a number between 01 and 64, then the associated alarm relay on the optional R5004 relay interface will operate as well as the T500 warning relay. When an alarm is detected, the display changes to show the details for the sensor, which generated the alarm. Up to 20 alarms can be detected and displayed in this manner. The display will toggle between the original NORMAL display as described above and the ALARM display at approximately three second intervals. If for example three sensors alarmed the display would show the TEMPERATURE DISPLAY followed by the ALARM for the first alarmed sensor then the TEMPERATURE DISPLAY followed by ALARM for the second alarmed sensor followed by the TEMPERATURE DISPLAY then followed by ALARM for the third alarmed sensor. The process would then repeat with a three second delay between screens. The bottom line of the ALARM screen shows the total number of detected alarms and which of those alarms is currently being displayed. NTC sensors are monitored for fault conditions. As well as reporting the over temperature alarm the T500 will also show when it detects an NTC sensor which it believes to be open or short circuit. These alarm conditions are displayed in much the same was as the other alarms listed

```
*ALARM* DETECTED ON  
Sensor Number 1  
OVER SET TEMPERATURE  
ALARM 01 OF 05
```

```
*ALARM* DETECTED ON  
Sensor Number 3  
CONTACT CHANGE ALARM  
ALARM 02 OF 05
```

```
*ALARM* DETECTED ON  
Sensor Number 6  
HOT BEARING ALARM  
ALARM 03 OF 05
```

```
*ALARM* DETECTED ON  
Sensor Number 12  
OPEN SENSOR FAULT?  
ALARM 04 OF 05
```

```
*ALARM* DETECTED ON  
Sensor Number 24  
OVER TEMPERATUR RANGE  
ALARM 05 OF 05
```

In order that the system maintains integrity at all times all programmed nodes are monitored for communications faults. If a programmed node is disconnected by unplugging it from the communication system or if a node should fail a communications alarm will be generated and the T500 internal warning relay will be operated. The remaining nodes and their sensors will continue to operate as normal and for as long as the HOTBUS cable integrity is maintained.

```
*ALARM* DETECTED ON  
NODE ADDRESS 1023  
COMMUNICATION ERR.C5  
ALARM 01 OF 01
```

Any alarm relays associated with the disconnected node will not be updated and no further alarms can be generated for those sensors. If the communications problem is resolved then the alarm will be cleared and the monitoring of that node will continue as normal.

There are 5 communication errors reported by the T500 for each Node connected and they are C1 to C5. C5 is the most frequently seen communication error as this is the result of a complete failure of communication with the node. If a node becomes unplugged or fails in some way then this is the error that you would normally expect to see. The other errors usually occur when there is a problem with the installation of the cable or when there is electrical interference which is disrupting the communication system. A chapter is included later to offer advice should communications errors happen in you installation.

Communications errors are not uncommon especially those which are due to electrical interference, The T500 will reject intermittent communications errors when they are caused by random electrical interference. If a communications problem persists, then the T500 will correctly respond to the error by triggering an alarm and placing an entry into the alarm log as described below.

4.4 Alarm Log

The T500 is equipped with a simple ALARM LOG. Every alarm detected by the T500 will be entered into this log no matter how briefly the alarm exists. This is a useful feature for finding troublesome intermittent alarms. The log has space for 20 alarms and the newest alarm is always at the top of the list at position 1. As the alarms are entered into the alarm log, the log is pushed down by 1 each time making room for the latest alarm to be entered. Eventually, when the log is full the oldest alarm (alarm 20) will be discarded. Using the ALARM LOG option in the main menu, you can examine the log at any time. The log is erased when power is removed from the T500.

4.5 Warning Relay Cancel (Acknowledge).

If during any alarm condition and whilst the T500 internal alarm warning relay is in operation, the SET key is pressed, then the internal alarm relay and LED warning will be cancelled. If the alarm condition persists, after a programmed period of time (see menu options) the warning relay and LED indicator will operate again. The warning alarm may be cancelled in this way any number of times. This version of software has a facility for remote alarm acknowledge through the F500 fieldbus interface. See the section titled 'F500 remote acknowledge' later in this manual.

4.6 Alarm condition stop. (Shut Down)

The T500 is not equipped with any shutdown or stop relays. It was intended that the internal alarm relay be used for audible or visual warnings. However, providing that the correct ratings are observed, there is no reason why the relay cannot be used for indirect control of a stop/start circuit. The T500 relay operates as a normally open relay and will close contact when an alarm is generated. If you require greater flexibility in your alarm/stop circuits then we recommend the use of the optional relay interface R5004. This unit provides 16 additional relays each with a single pole changeover contact rated 250 VAC @ 5Amp, which are more suited to use in interface applications. Four R5004 relay interface units may be connected to a T500 elite sensor monitoring system providing a total of 64 relays. None of the relay contacts are 'SAFETY' contacts and as such must not be relied upon for emergency stop purposes.

4.7 T500 Menu selection.

During normal operation, pressing the SET key will select the main menu. The main menu has 3 options SETUP, DOWNLOAD and ALARM LOG. Pressing the LEFT (←) key selects SETUP, pressing the RIGHT (→) key selects the DOWNLOAD option, pressing the UP (↑) key selects the ALARM LOG option and pressing the SET key cancels the menu and returns the T500 to normal operation.

MAIN MENU:- < = SETUP > = DOWNLOAD ^ = Alarm Log

Selecting SETUP from the main menu opens a new display asking you to enter the 'Engineers Code'. This code is used to protect the T500 from un-authorized adjustments being made. If you enter the correct engineer's code then you are passed on to the main setup menu which allows 4 further selections to be made as described in the box to the

right. Selecting NODE SETUP will take you to the main node setup area as described on page 8 and selecting T500 SETUP will select the menu option shown below. See section 4.9 for the ‘^ = Sensor Display’ option. Selecting ‘v = Manage Password’ allows you to change the ‘Engineers Code’. See section 4.12

```
< = Node Setup
> = T500 Setup
^ = Sensor Display
v = Manage Password
```

The T500 SETUP menu has three options. Selecting the FIELDBUS SETUP allows features to be selected when the T500 is used in conjunction with the F500 FieldBus communications interface (see the chapter titled Fieldbus Interface).

```
< = Fieldbus Setup
> = Display in °F
^ = Warning Relay
SET = EXIT
```

Selecting the ‘Display In °F’ option will toggle this from °F to °C to °F each time the key is pressed. This option is used to set the T500 to display temperature information and alarm settings in °F or °C.

WARNING: We strongly recommend that you set this option *BEFORE* you set up any NTC node alarms. Temperature alarms are done on the basis of a straight comparison between the value measured and the programmed alarm level. Setting the alarm level to 40 means either °C or °F depending upon which option has been selected here. Setting the alarm level to 40°C and then switching to display in °F changes the alarm level to 40°F which may already be below the current temperature which would then result in an immediate temperature alarm.

Selecting ‘Warning Relay’ allows an adjustment to the ALARM WARNING REACTIVATION TIMER. This is the timer used to reactivate the T500 alarm warning relay and LED when any existing alarm warning has been cancelled. The default value is 3 minutes and values between 0 and 5 minutes can be set in 1 minute increments by pressing the UP(↑) and DOWN(↓) keys. If the SET button was pressed to reset the alarm warning condition and a new alarm occurs during the timing period, then the alarm warning relay will automatically reactivate and the timer will be reset. Setting this value to 0 means that the warning will NOT reactivate until a new alarm has occurred.

```
ALARM WARNING
REACTIVATION TIMER
SET TO 03 MINUTES
```

4.8 Fieldbus Interface

The T500 can be connected to an optional F500 communications device. The F500 provides a high level communications interface where up to 4 T500 can be monitored simultaneously (dependant upon the Fieldbus type selected). The two most popular types are catered for by the T500 and they are Ethernet TCP/Modbus TCP and DeviceNet. Using the fieldbus setup option, you can set the basic configurations required by each interface type. First select **Fieldbus Setup** from the menu. You can then chose from “<=ETH” which means press the LEFT (←) key to select ETHernet as the fieldbus option, or “>=DEV” which means press the RIGHT (→) key to select DEVicenet as the fieldbus option, or you can press “SET” which means move on to edit the data for the selected fieldbus type.

```
The Current Fieldbus
Interface is ETH-NET

<=ETH >=DEV SET=Nxt
```

4.8.1 Ethernet Fieldbus: (Applies to F500 software V1.3.2 ETH-NET and above)

Please refer to the F500 Ethernet manual for complete details about this product and how it works. This manual is only concerned with the T500 settings.

Two menu options are available. Firstly you must choose how many sensors you wish to transmit from **this** T500 to the F500. Using the UP(↑) and DOWN(↓) keys you can select between sensors 1-64, 1-128, 1-192 or 1-256. 256 is the maximum number of sensors that the F500 can monitor so if you want to monitor 2 T500, you can only allocate 1-128 sensors for each of the T500 (2 x 128 = 256 sensors). Once you have selected the number of sensors that suits your needs press the SET key. Each T500 must have a unique identifier so the F500 knows where the data has come from. To achieve this you can set the T500 address to between 0 and 4. The 0 setting effectively stops the T500 from sending data to the F500. Each T500 must have a unique setting (but they can all be set to 0). If you have 2 T500 then you would logically set them to address 1 and address 2. Setting them to 2 and 4 would still work but the F500 data area would have large gaps in it and make reading the data that much harder. Using the UP(↑) and DOWN(↓) keys you can select between T500 address 0 to 4. Once you have decided what address you want to use, press the SET key to save the settings. The T500 will now configure data internally to suit the F500 Ethernet interface. These settings will be effective immediately as far as the T500 is concerned but the F500 will require power to be recycled in order for the changes to become effective.

```
ETHERNET setup
For Sensors 1 - 64
T500 Unit Number - 00
```

```
ETHERNET setup
For Sensors 1 - 64
T500 Unit Number - 01
```

4.8.2 DeviceNet Fieldbus: (Applies to F500 software V2.1.0 DEV-NET and above)

Please refer to the F500 Ethernet manual for complete details about this product and how it works. This manual is only concerned with the T500 settings.

Two options are available. The first option is the allocation of free space bytes. DeviceNet and its implementation are governed by a set of rules determined by the ODVA (www.odva.org). The F500 has been designed with as much flexibility in mind as possible. However, when using the F500 with other DeviceNet systems such as Allen Bradley a number of limitations apply. The F500 is a DeviceNet slave and will not instigate the transmitting of data without the proper instruction from a master unit, which in most cases is a DeviceNet scanner or bridge module. An example of this is the Allen Bradley 1756 DNB module. This DeviceNet scanner allows a PLC or other appropriate device to be connected to a DeviceNet system with multiple slave nodes attached of which the F500 is one of them. The 1756 DNB has a limited amount of memory available to it and each slave unit connected will require the use of some of this memory. Currently the 1756 DNB has 490 bytes of data memory of which a maximum of 255 bytes can be allocated to a single slave unit. Therefore, the **maximum** amount of data that can be read from an F500 is 255 bytes. Each sensor node connected to the T500 has 4 sensors inputs and an ambient temperature sensor. This means that the data for 5 sensors is available from each node. Therefore, the amount of TN4 nodes that can have their data retrieved by the F500 is determined by the amount of memory available to the scanner module. If a scanner module has 255 bytes free, then $255 / 5 = 51$, the maximum amount of memory available is 255 bytes and each nodes presents 5 bytes of data so you can read the data for 51 nodes. There is also a two byte overhead for the

```
DEVICENET setup
Free Space 070 Bytes
T500 Unit Number - 00
```

activity counter (Byte 0 and Byte 1) which means that a maximum of 50 nodes can be read by a scanner module.

This applies to a scanner dedicated to the F500 but in many cases the scanner is part of a much bigger system where existing DeviceNet nodes are in place and are using some of the scanners memory allocation. This means that the scanner will have to read fewer than the maximum of 50 nodes as calculated above. The **minimum** is 1 node and this requires 5 bytes + 2 bytes so 7 bytes in total.

In order that the F500 and DeviceNet scanner module communicate successfully they must both be configured with the same amount of data bytes. Once you have decided, using the calculation above, how many bytes of data are required by the DeviceNet scanner module, you can configure the T500 to match. You can now use the UP (↑), DOWN (↓), LEFT (← or RIGHT (→) keys to change the “Free Space xxx Bytes” entry to any value between 5 which is the minimum and 255 which is the maximum. This information is later passed to the F500 to configure the DeviceNet interface. If this value is incorrectly set, the DeviceNet interface will not initialise correctly. Once you have selected the number of bytes that suits your need press the SET key. The T500 must have a unique identifier so the F500 knows where the data has come from. To achieve this you can set the T500 address to between 0 and 1. The 0 setting effectively stops the T500 from sending data to the F500. Using the UP(↑) and DOWN(↓) keys you can select between T500 address 0 and 1. Once you have decided what address you want to use, press the SET key to save the settings. The T500 will now configure data internally to suit the F500 DeviceNet interface. These settings will be effective immediately as far as the T500 is concerned but the F500 will require power to be recycled in order for the changes to become effective.

```
DEVICENET setup
Free Space 070 Bytes
T500 Unit Number - 01
```

4.8.3 F500 remote acknowledge.

This software version (and versions above) is equipped with the ability to have the F500 fieldbus interface perform a remote alarm acknowledge. This is done by passing a request through the fieldbus interface of the F500 to the T500. This method does not interfere in any way with the T500 local alarm acknowledge function which can be found in section 4.5. At the present time remote alarms acknowledge can only be performed through the Ethernet series interface.

4.9 Status Display.

By default the T500 will display the information for each programmed node (see section 4.2 Normal Operation. However, there is a special Status Display available. This screen displays information relating to the communications with the HotBus nodes and with the F500 interface if connected. This is a simple diagnostics display and is an aid to installation only. If the T500 and F500 communicate successfully and the data exchange is valid, then the F500 Poll count will increase by 1 with each event. Every time the T500 communicates successfully with a node then the HotBus Poll count will increase by 1 with each poll. Because of the update times involved, this number might increase by amounts bigger than 1 each time, but this is normal. The bottom line shows how many nodes are responding correctly to the poll. This number doesn't reflect the number of physical nodes connected to the system but represents the number of nodes that the T500 can communicate with. The

```
Status Display
F500 Poll 00000
HotBus Poll 00000
Updating 03 Nodes
```

Status Display can be selected at any time by pressing the SET key to select the main menu. From the main menu pressing the UP (↑) key will select the “Status Display” option, and pressing SET again will select the “Sensor Display” (normal display) option. If an alarm occurs while viewing the Status Display, then the alarm display will operate as normal, however, you will need to select “Sensor Display” to be able to view the offending sensor and the alarm condition.

4.10 Sensor name editing.

In order that the information displayed on the T500 LCD screen is as meaningful as possible, the T500 is equipped with the ability to display a name associated with each of the 64 sensors. The T500 is supplied with a default set of sensor names, Sensor 1, Sensor 2....Sensor 255, Sensor 256. PC software is available to allow the editing and then downloading of the sensor names to the T500 Elite. Each name is limited to 20 characters in length and once edited; the names can be saved on the PC for use again later.

4.11 Downloading.

If DOWNLOAD is selected from the main menu then the T500 will stop monitoring the sensors and enter the download mode. This mode allows you to download useful sensor names from a PC via the sensor naming utility software. If this option is selected by mistake pressing the SET key will abort the download without any changes taking place. If download is selected and download fails for whatever reason, then the download will automatically abort after 1 minute. Pressing SET during a download will abort the download at the next available point and therefore data downloaded to that point will still be valid.

DOWNLOADING . . PRESS SET TO ABORT
--

The T500 must be connected to the PC through the standard RS232 serial port using a standard serial communications lead. Only three pins are used TX, RX, and Ground so it is acceptable to use a null modem cable.

The PC software has been designed to allow you to give names to all 256 sensors which apply more appropriately than the default name Sensor Number 1, Sensor Number 2... Each name is limited to 20 characters in length and can be any combination of letters numbers and spaces. The 20 character limit is applied because the display used on the T500 has lines of 20 characters and a single line has been allocated to the displaying of the sensor name. Please refer to the manual accompanying the PC software for further detail of its use. To download the sensor names run the PC software, load your saved name file or if this is the first time then edit your names and save them; connect the PC to the T500 as described above and using the T500 menu as described above select DOWNLOAD. Clicking the “TEST CONNECTION” button on the PC screen will check the communications connections with the T500 and ensure that the software is correctly set up. Now click the DOWNLAOD button on the PC screen. The names for the 256 sensors will be downloaded in order to the T500. Each downloaded name is check for errors and the T500 confirms that the data is valid before the next name is downloaded. In order to help keep you informed of the progress of the download the T500 will show the number of the sensor that was most recently successfully downloaded. The PC software will also display confirmation of the download process. If an error is detected then the download will retry a number of times before eventually aborting the download. Any names that have been successfully download before the error will be retained by the T500 and only the data following the error will be lost. If a download is terminated by an error then the download

can be started again immediately by clicking the DOWNLOAD button the PC screen and the download will begin from the start of the process. If the download is unattended and fails to complete the software will automatically time out and return back to the normal monitoring state after 1 minute. The download can be manually aborted at any time by pressing the SET key on the T500, or the download abort button on the PC, this will bring the download to a stop at the end of the current name. When a download is complete the T500 will display a completion message for 2 seconds and then it returns back to the normal operation mode.

```
DOWNLOADING . .  
COMPLETE
```

4.12 Managing Passwords (The engineer's code).

If 'Manage Password' is selected from the main menu then the T500 will stop monitoring the sensors and enter the password mode. The engineering code is used to protect the T500 from un-authorized modifications being made which might lead to incorrect or un-safe operation of the T500. The T500 is shipped with a default engineer's code $\uparrow\leftarrow\uparrow\downarrow$ (Up, Left, Up, Down) so that the T500 can be commissioned and tested straight from the box. It is then recommended that you change the engineer's code to protect the T500 once commissioning is complete.

Once you have selected the 'manage password' option from the main menu you will see the display as shown on the right. The Factory Code number (1234 in our example) is a special code that is generated by the T500. You need to contact your supplier and give them this code. They will give you a code in return which might be something like UP, DOWN, LEFT, RIGHT. This code represents an access code and only works once with the number that is displayed as the Factory Code on the screen. Each time you press a key the next "." on the display is replaced by a "*" to show how many keys you have pressed. If you enter the code and get it wrong then the T500 will generate a new Factory Code and you will have to begin again.

```
Factory Code  
1234  
Enter 4 Digit Code  
. . . .
```

```
CODE ERROR  
ACCESS DENIED  
...SEE MANUAL
```

If you enter the correct access code you can then change the engineer's code to something that only you know.

WARNING: Once you have changed the engineer's code there is no way of retrieving the code so it is important that you remember it. If you forget the code you will need to contact your supplier and tell them what has happened. They will then help you recover from the lost code.

```
ENTER NEW ENG. CODE  
. . . .
```

```
ENTER NEW ENG. CODE  
. . . .  
ENTER CODE AGAIN
```

When you have entered a good access code you can change the engineer's code. The display prompts you to enter a new code. The code is made up of 4 key presses and can be any combination of the arrow keys ($\uparrow\downarrow\leftarrow\rightarrow$) in any order. Once you have entered the code you will be prompted to enter it again. If you enter the code again and it correctly matched the first time you entered the code then the new code is accepted and will be saved.

```
NEW ENG. CODE SAVED
```

If you make a mistake in entering the code you will be denied access and the new engineer's code will be discarded. You are then returned back to the main menu and you will have to begin again.

CODE ERROR
CODES DON'T MATCH

WARNING: If you do not press a key for 1 minute, the password menu will close and any data entered will be lost. If you wish to change the Engineer's code I is recommended that you contact your supplier from a mobile phone next to the T500 because if the menu times out and clears the display the factory code will automatically change and any access code you may have will not work for the new factory code.

CHECKLIST

For problems after initial start-up

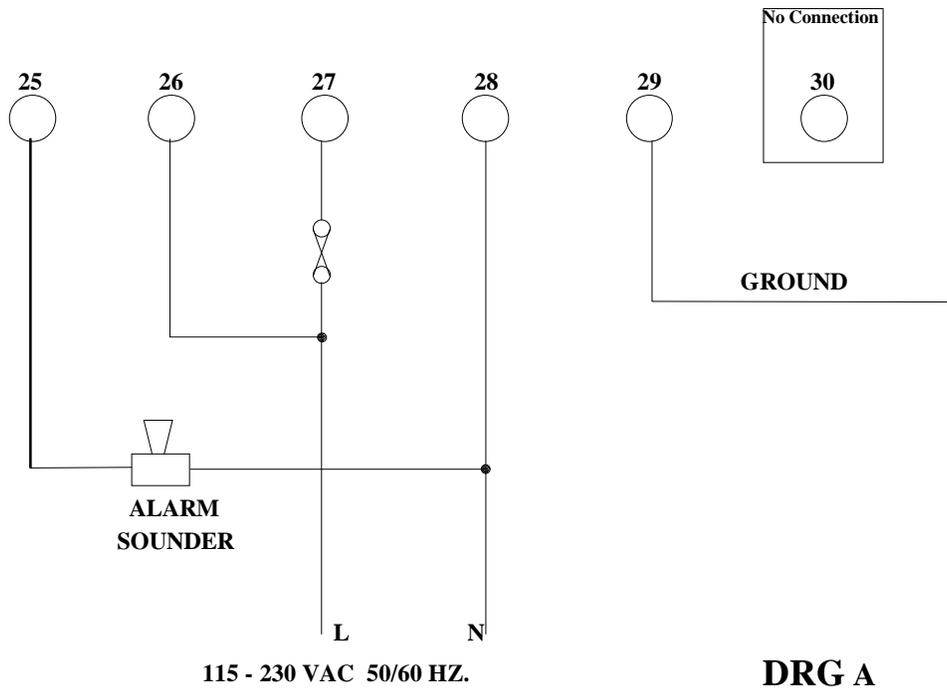
1. Is there excessive interference on the electrical power supply? Power conditioners and surge (spike) suppressor may have to be fitted.
2. Has the wiring for the Sensors been routed away from power cables? See paragraph 3.
3. Is the T500 Elite circuit properly grounded?
4. Is the Micro-processor control unit overheating? If so mount it in a temperature-controlled environment of maximum temperature 104°F (40°C).
5. Check that high powered two way radios are not operated immediately near the T500 Elite control unit or Sensors as this will affect the performance.
6. Check that the communications/power cable is connected correctly and in accordance with DRG 'D', 'H' and 'J'.
7. If the T500 display shows only information similar to this example and does not update the temperature on screen then you are attempting to run the T500 without having configured sensors first. This can happen when you pressed SET to exit the setup screen without first saving any configuration. To clear this problem, remove power from the T500, wait approximately 5 seconds and then re apply power. The T500 should now enter the initial set up mode as described in section 4.1.

```
Sensor Number 1
Temperature = <->°F
Amb <->°F :Relay 00
Rel 30: Abs 140: NTC
```
8. Have you set the optional R5004 address switch correctly?
9. If you are using NTC sensors have you set the Relative and/or Absolute alarm level **ABOVE the NORMAL** working conditions for the sensor.
10. If you have programmed an NTC sensor and do not have a sensor connected, then an open circuit sensor alarm will occur. Unused sensors on a TN4e should be programmed as CNT type, see 11 below.
11. Ensure that any unused CNT inputs are programmed as 'ALARM WHEN ON' to avoid unexpected alarms.
12. Ensure that any unused PTC inputs have a wire link connected across the sensor terminals to avoid unexpected alarms.

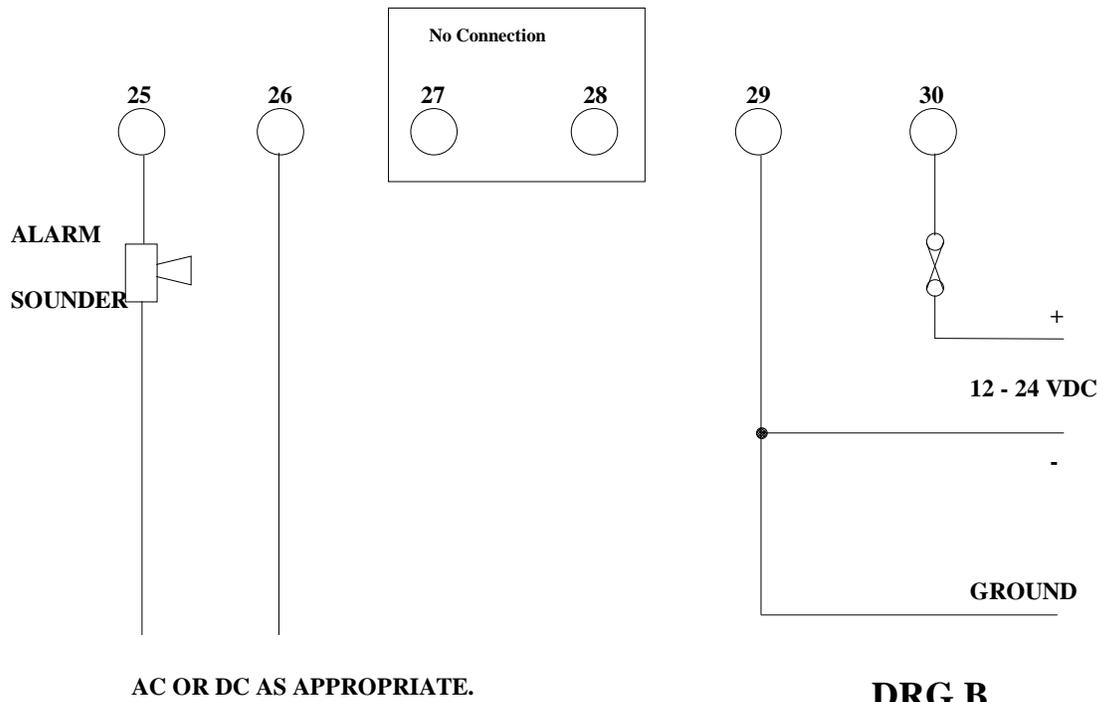
5. CONTACT INFORMATION



www.go4b.com

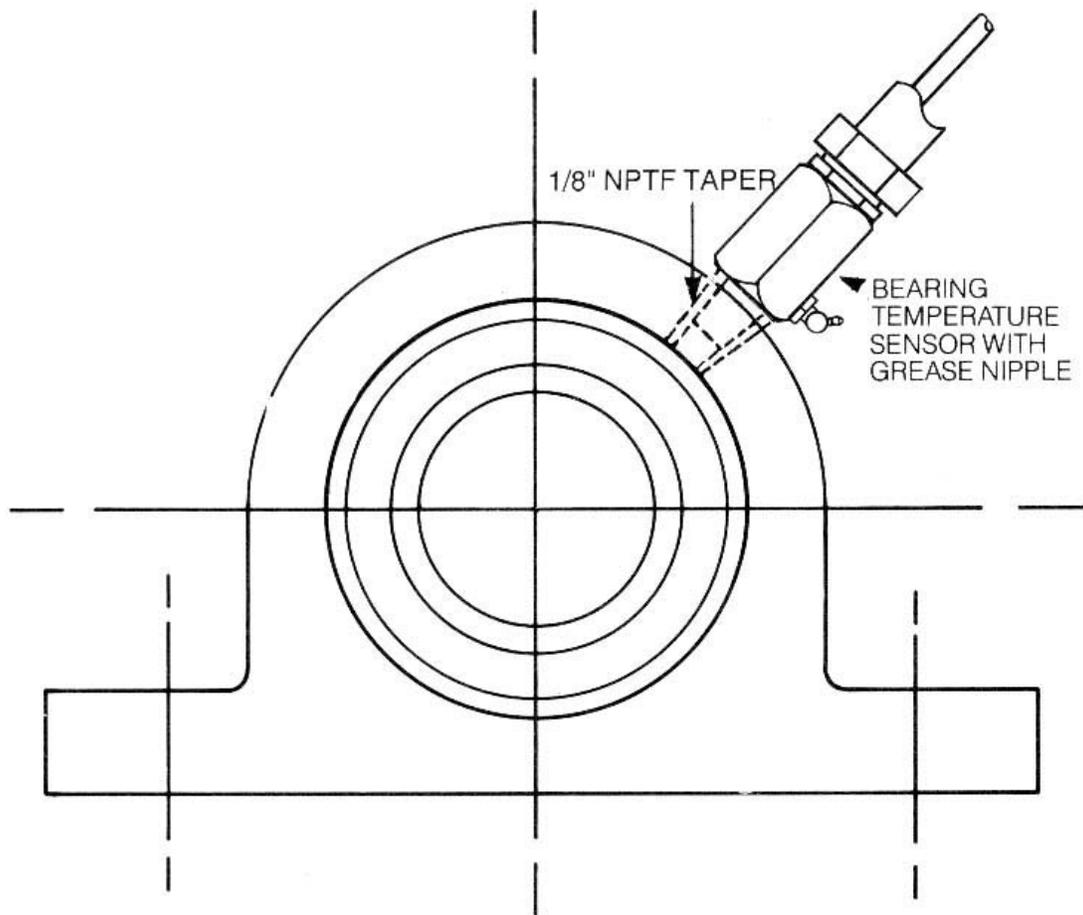


DRG A



DRG B

T500 Elite, supply connection details.

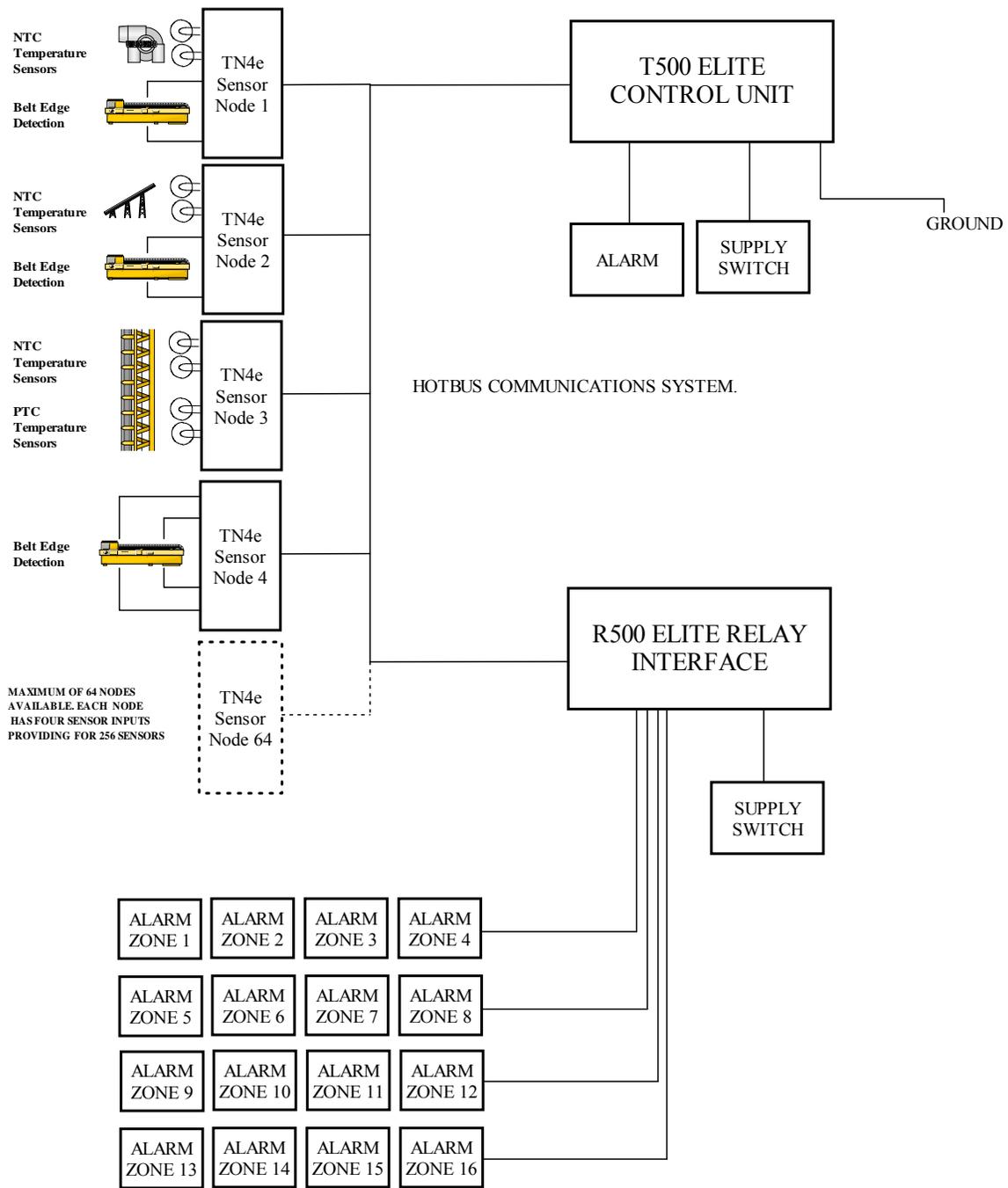


FITMENT TO BEARING OF TEMPERATURE SENSOR

NOTE

The special temperature sensor probe for use in a Class II Division 1 location has a connection for liquidtight flexible metal conduit.

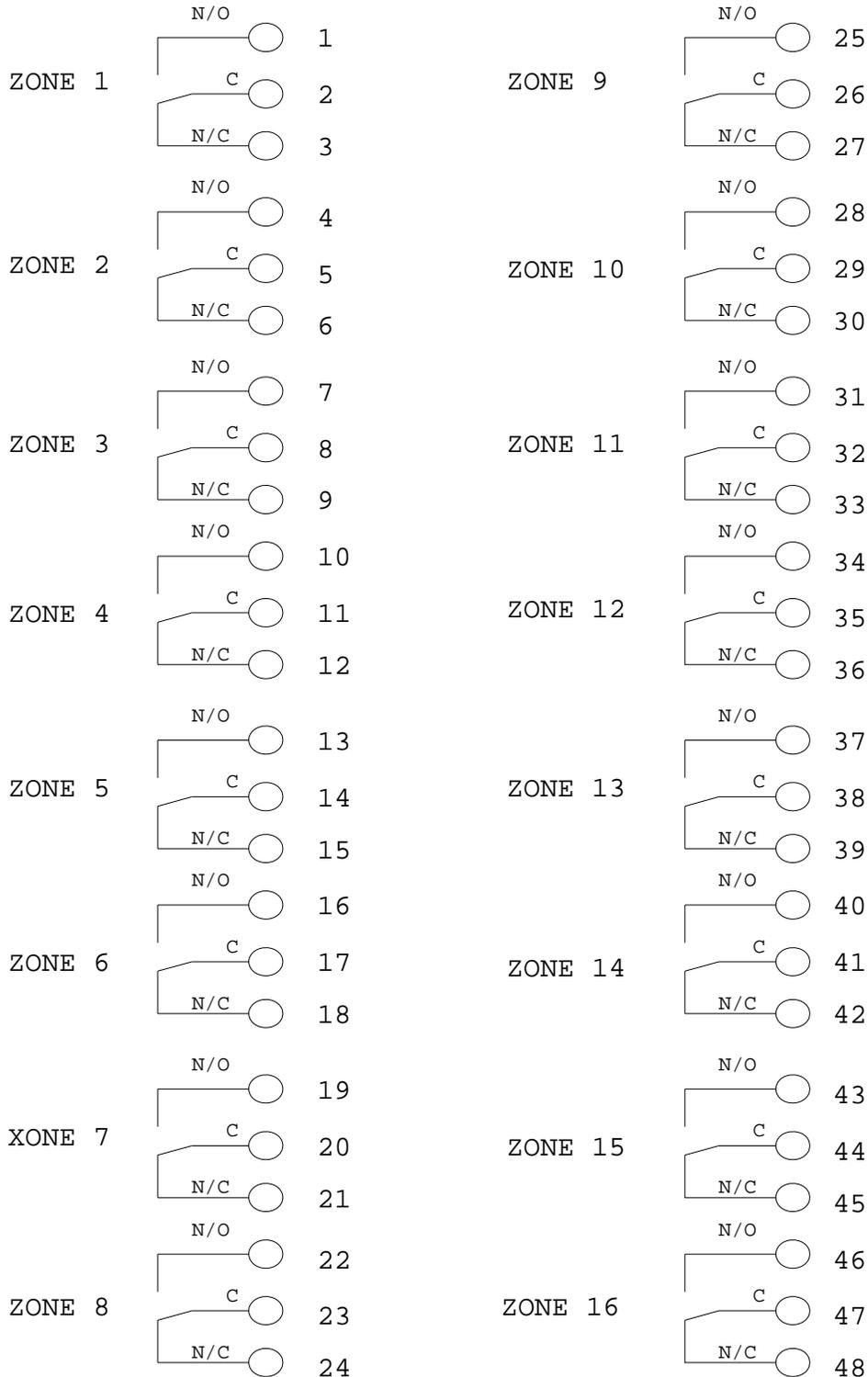
DRG. 'C'



BLOCK DIAGRAM AND SENSOR WIRING

DRG. 'D'

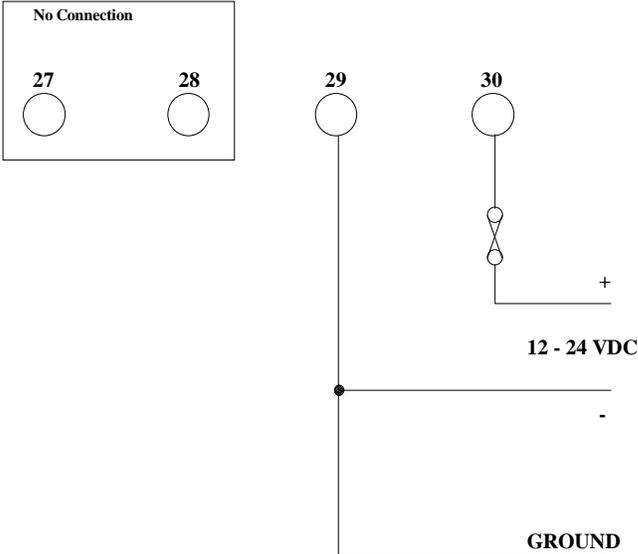
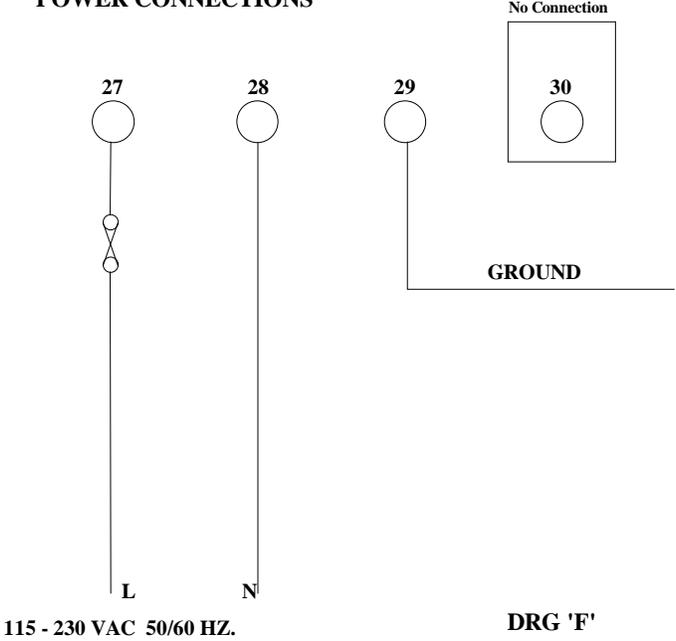
R500 RELAY INTERFACE.
RELAY CONNECTION DETAILS.



CONTACTS RATED AT 5A 240v AC

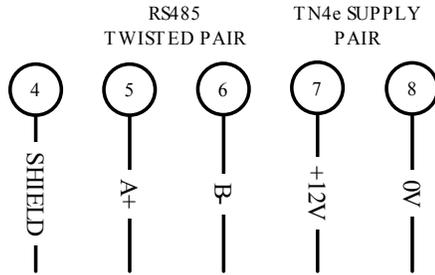
DRG'E'

**R500 RELAY INTERFACE
POWER CONNECTIONS**



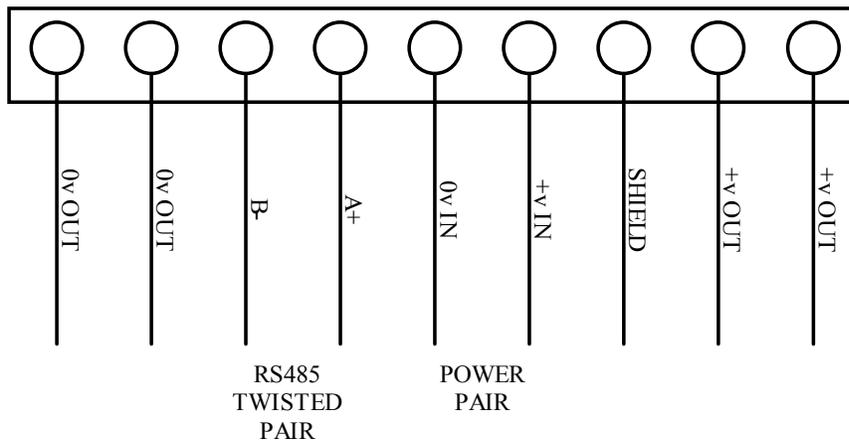
DRG 'G'

T500/R500 HOTBUS CONNECTIONS

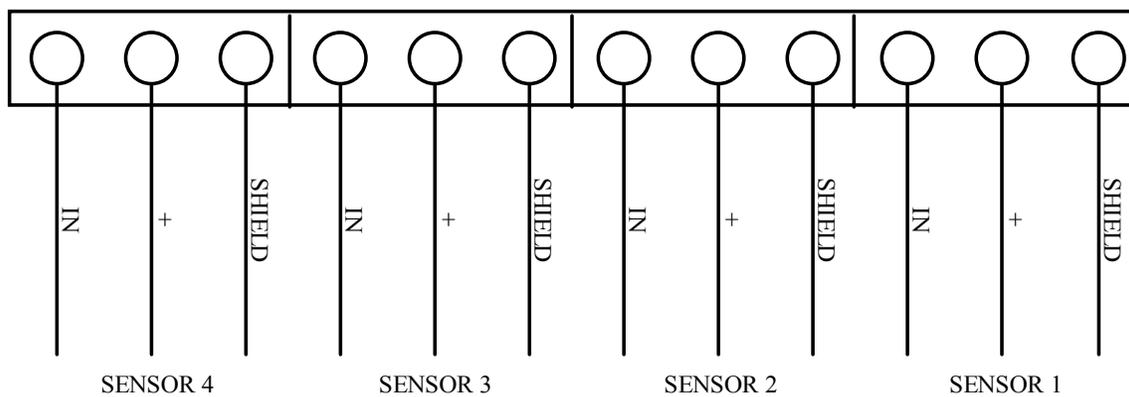


DRG 'H'

TN4e HOTBUS CONNECTIONS



TN4e SENSOR CONNECTIONS



DRG J

Installation information.

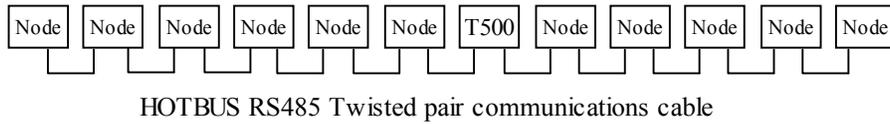


FIG.1 (This is equivalent to fig.2)

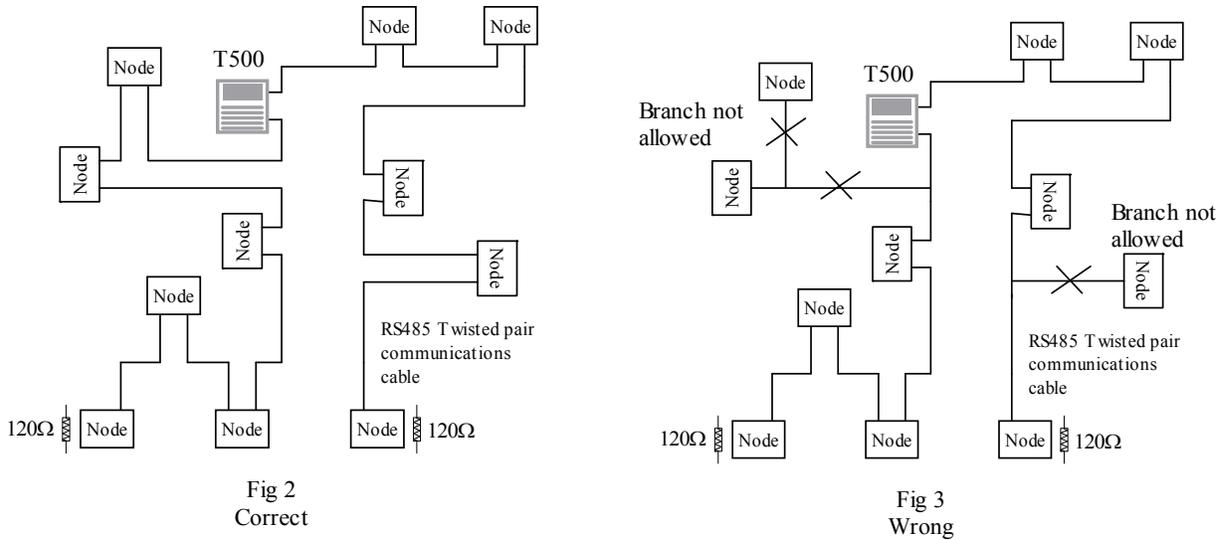


Figure 2 shows the correct approach to wiring the T500 HotBus system with nodes. The maximum cable distance between ends is 1KM, but this is only possible with good wiring practice.

Figure 3 shows an example of the wrong way to wire the T500 HotBus system. You are NOT allowed to wire branches off of the main cable run. Incorrect wiring will cause signal reflections in the wire which in turn causes poor communications reliability.

Each end of the communications cable MUST be terminated with a 120OHM resistor ¼ watt or above.

There is no minimum cable distance between nodes.

Ensure that the wiring is neat and tidy. Avoid loose wires which may cause shorting.

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