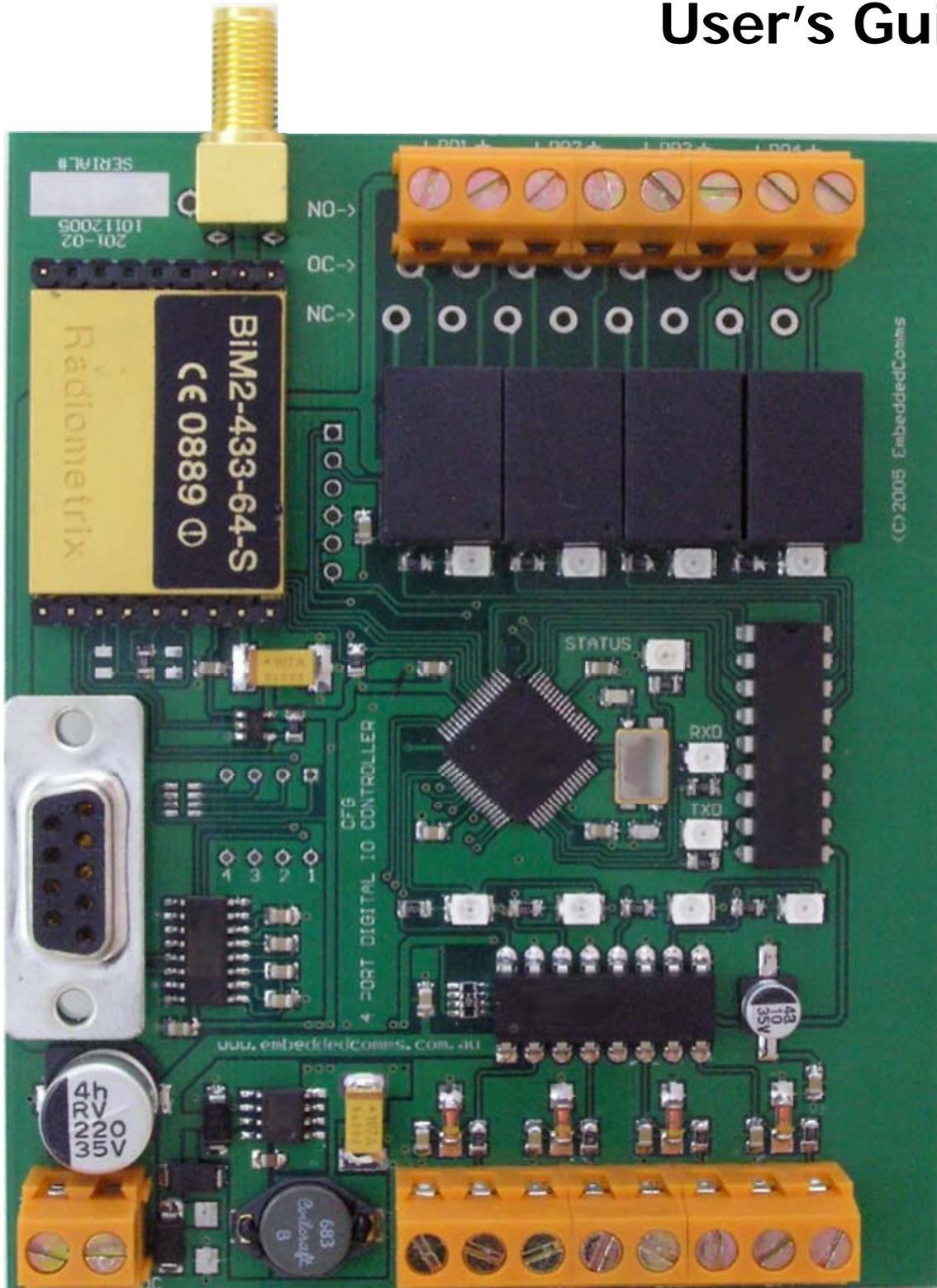


# TCM3-4DIO Telemetry Control Module User's Guide



**Embedded Communications Systems**

*Specialists in Embedded RF Data Communications,*

*Monitoring and Control Systems*

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*embeddedcomms TCM3-4DIO Telemetry Control Module User's Guide*

First Edition January 2006 (Covers firmware version 1.00a. Hardware 201-01)

## Disclaimer

This manual has been validated and reviewed for accuracy. The instructions and descriptions it contains are accurate for the *embeddedcomms* TCM3-4DIO-433 Telemetry Control Module at the time of this manual's publication. However succeeding products and manuals are subject to change without notice. Embedded Communications Systems assumes no liability for damages incurred directly or indirectly from errors, omissions or discrepancies between the TCM3-4DIO controller and the manual.

These radio devices may be subject to radio interference and may not function as intended if interference is present. Systems should be designed to tolerate such interference.

RF transmission power levels are subject to regulatory approval in countries: consequently, it is possible that some radio interface functionality is not provided in your country. This will be detailed in this manual if applicable.

## Radio and EMC Regulations

The user of the TCM3-4DIO Telemetry Control Module must satisfy all relevant EMC and other regulations applicable in the intended country of use.

The radio modules used in the TCM3-4DIO Telemetry Control Modules are type approved to EN 300 220-3 and EMC conformant to EN 301 493-3.

## Problem Reporting and Feedback

To report operational problems, documentation problems, suggested product enhancements or obtain technical assistance please email technical support at **[techsupport@embeddedcomms.com.au](mailto:techsupport@embeddedcomms.com.au)**. Please include in all email correspondence your name, company, controller type, module serial number and firmware version.

All information supplied to Embedded Communications Systems will be treated in the strictest of confidence.

# About this Manual

## How to Use This Manual

In order to obtain the maximum benefit from your TCM3-4DIO product, it is recommended that you read at least the introduction chapter and the installation & operation chapter.

## Warnings

1. Incorrect termination of the supply lines may result in internal damage to your TCM3-4DIO module and will void your warranty. To avoid any such issues please double check all wiring prior to applying power to the module.
2. It is strongly recommended that each TCM3-4DIO module be checked operationally on the work bench prior to being wired into the final application.
3. To avoid potential accidents during installation and maintenance of remote controlled equipment, all equipment should be disconnected and electrically isolated from the TCM3-4DIO module.
4. All equipment connected to the TCM3-4DIO module should be clearly labelled with a warning indicating that the equipment is subject to automatic operation and may start without warning.
5. The TCM3-4DIO is not suitable for use in explosive environments or for life critical applications.
6. The TCM3-4DIO power regulation and relays may become warm during operation. This is normal and as a result good ventilation should be provided around the power regulation components on the module.

## Package Contents

The TCM3-4DIO IO Control module is supplied only as an OEM PCB. A serial D9 extension cable is required for connection to a serial terminal program for configuration and is an optional part that can be ordered from your supplier.

Printed manuals are not supplied with the IO Controller. Instead the manual is supplied in electronic form with you order.

Antennas are not provided with the TCM3-4DIO Controller module. Please contact your supplier for a selection of antennas to use.

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# Chapter 1

## Introduction

### General

This manual covers the TCM3-4DIO-xxx range of low cost short range telemetry control modules. These modules have been specifically designed to operate in the international license exempt ISM radio band.

The acronym **TCM3** will be used as a generic reference throughout this manual when referring to anyone of the Telemetry Control Module variants mentioned above. Any detail relating specifically to a particular model will be noted by reference to the full module name.

### The TCM3 – Telemetry Control Module

The TCM3-4DIO Telemetry Control module is a fully configurable 4 channel digital IO controller used for relaying digital I/O signals over long distances without the need for a wired connection.

### Features

Following are a list of the features offered by the TCM3.

- 4 x Opto-isolated inputs
- 4 x Normally Open Relay Outputs (NC & OC optional)
- 1 output configurable as Link Failure Output
- Individual port mappings to other remote units
- Built-in serial configuration
- Password protected configuration

### Applications

The applications of the TCM3 are many and varied in all areas of control and monitoring. Following are a list of some of the applications:

- Remote pump control
- Mining equipment control
- Water and sewage equipment
- Building management and control
- Agricultural and irrigation systems

# Chapter 2 Installation

## General

Prior to installing a new system of networked TCM3's in the field, it is strongly recommended to bench test the entire system. Configuring and fault finding a system of TCM3's is easier when all devices are close together and accessible.

After installation of a new system or system unit, most problems are caused by poor radio communications. This can be the result of an incorrectly installed antenna, interference on the radio channel or an inadequate radio path.

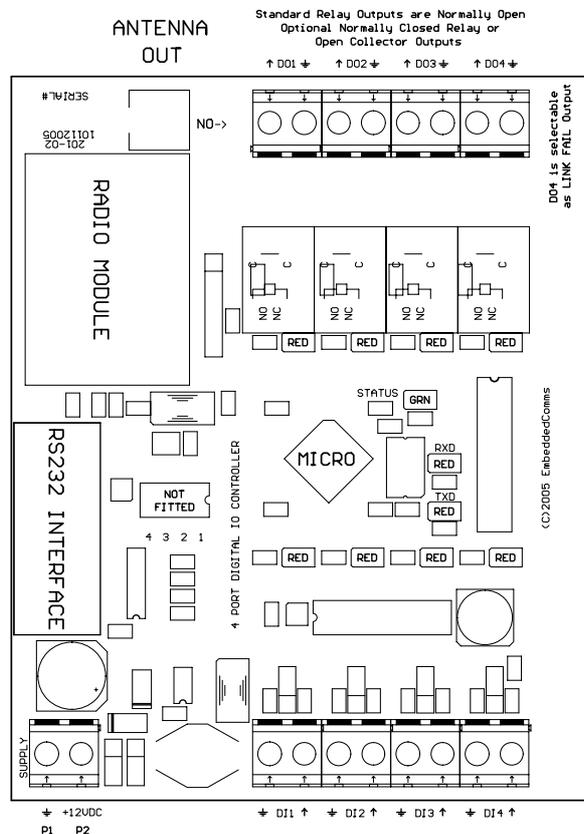
Assuming the radio path is at fault due to long path lengths or obstructions in the line-of-sight, then higher performance antennas or a more elevated mounting point for the antenna may fix the problem.

Each TCM3 should be adequately earthed using a ground terminal (GND) on the TCM3. This will ensure effective and reliable operation of surge protection circuits in the TCM3.

## TCM3 Interface Connections

The diagram below shows the connections, as described in the following sub-sections, available on the TCM3.

### TELEMETRY CONTROL MODULE : TCM3-4DIO-xxx PINOUT AND GENERAL OVERLAY



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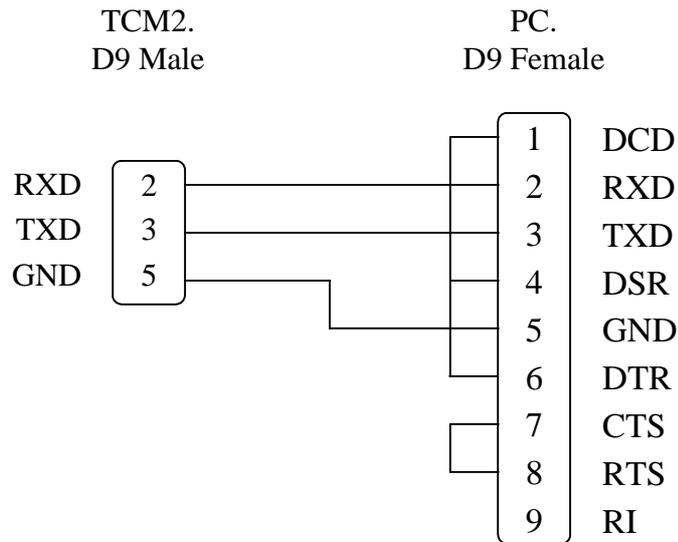
## Enclosure

The TCM3 is compatible with the 107mm DIN rail PCB holders. It is therefore suitable for DIN rail mounting in equipment rack, or enclosures equipped with a length of standard DIN rail tracking.

## RS232 Serial Port

The serial port is a standard 9 pin female D9 style connector providing a 3 wire RS232 interface to a connected serial device. The serial port is wired as a DCE device and used to connect to a terminal or PC for configuration and field testing.

The serial protocol, by default, is set at 9600 baud, 8 data, one stop bit and no parity.



## Power Supply

The TCM3 is powered through an efficient switching regulator and can accept only DC voltages. It is recommended that the TCM3 be mounted in a manner that provides good ventilation and airflow.

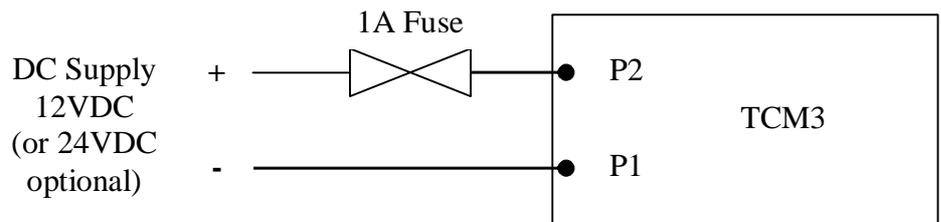
Following are the acceptable operating input voltage limits for the TCM3:

12V Version : 12VDC +/- 5%

24V Version : 12VDC +/- 5%

## DC Supply

A DC supply can be connected to terminals P1 and P2. The DC supply should be floating relative to earth. The following diagram details connection of the DC supply.



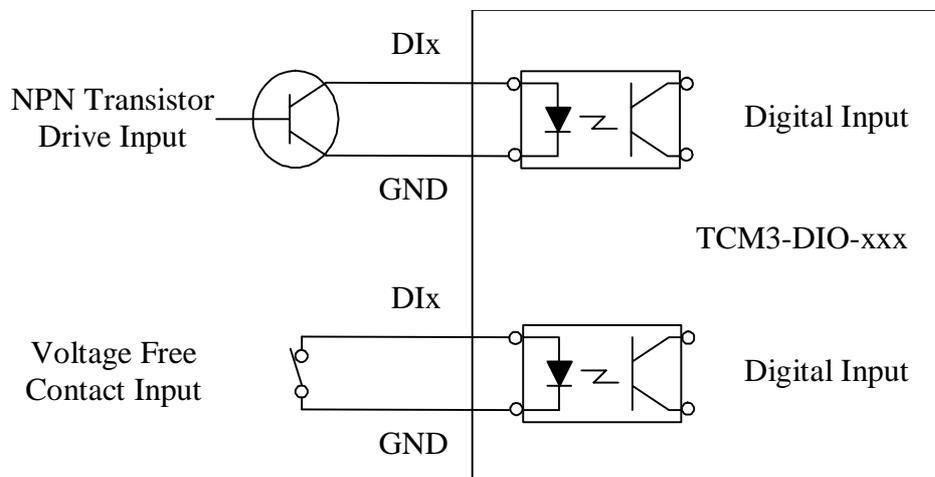
## Digital Inputs

The TCM3 modules are provided with four fully protected opto-isolated digital inputs with an isolation rating of 5000 volts.

The inputs are compatible with voltage free contacts such as relays and other mechanical switches or NPN transistor devices. They are however not suitable for PNP transistor type switching devices. A contact wetting current of approximately 5mA is provided to ensure reliable operation of driving devices. The resistance of the switching device must be less than 200 ohms to guarantee activation of the digital input.

The digital input state is indicated by a red LED that is lit when the input contact is closed.

Connection of the digital input is between DI<sub>x</sub> (DI1 to DI4) and GND (ground). This is indicated in the following diagram.



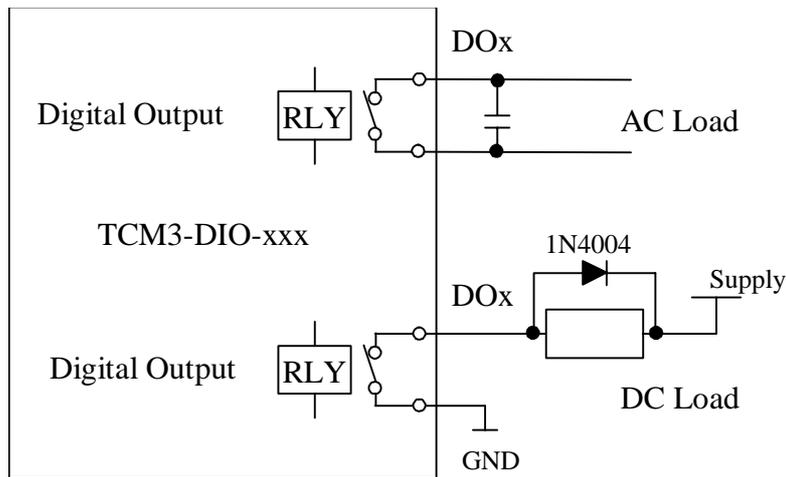
## Digital Outputs

The TCM3 modules provide five voltage free relay contacts. Four relay contacts are normally open and one relay contact a normally closed contact for the fail safe link fail condition. The relay contacts have the following ratings.

|                   |            |
|-------------------|------------|
| AC Resistive Load | 1A/125VAC  |
| DC Resistive Load | 0.5A/30VDC |

Further information on the relay contact rating can be found on the relay datasheet provided at [embeddedcomms.com](http://embeddedcomms.com).

The TCM3 can be provided with higher specification switching relays upto 3A. Please enquire if you require this option.



## Indicator LEDs

The TCM3 provides a visual indication of its current input, output and internal state by way of 14 LEDs in various colours.

The state of each digital input and output is indicated by way of a RED LED. The LED is lit when the input is active, in other words the input contact is closed. Likewise with the digital outputs, the LED is lit when the output relay is activated and its contacts are closed.

There is a status indicator LED which displays the current internal state of the TCM3. The LED is labelled on the TCM3 circuit board as STATUS. The following table details the meaning of this LED.

| Name         | State      | Condition        | Meaning   |
|--------------|------------|------------------|---|
| SYS<br>GREEN | ON         | In Configurator  | If in the configurator this LED is lit permanently.           |
|              | OFF        | Fault            | Controller is not functioning.                                |
|              | Pulsing ON | Normal operation | A short pulse indicates the controller is operating normally. |

The radio controller interface contains two indicator LEDs to show the state of the radio. These LEDs are both RED and are labelled TXD and RXD. The receive indicator LED lights red when the radio is receiving data. The transmit indicator lights red when the radio is transmitting a data packet.

## Fail Safe Operation

The TCM3 provides a configurable option allowing one of the digital outputs to be used as a link fail output.

During normal operation, once a link is established with a remote controller the link fail output becomes active. If the communications link for some reason is lost the link fail relay will close its contacts. Normally closed contacts are brought out from the relay but connectors are not fitted as standard.

## Current Consumption

The following table details the current consumption of the TCM3 module.

| <b>Operating State</b> | <b>Average current consumption</b> |
|------------------------|------------------------------------|
| Standby                | 15mA                               |
| Input closed           | 10mA per input                     |
| Output closed          | 25mA per output                    |

The following are two examples of calculating the total current consumption.

1. All inputs closed; output open  
Standby + Input \* 4  
 $15\text{mA} + 10\text{mA} * 4$   
 $= 55\text{mA}$
2. All output closed; inputs open  
Standby + Output \* 4  
 $15\text{mA} + 25\text{mA} * 5$   
 $= 115\text{mA}$
3. All inputs closed; all outputs closed  
Standby + Input \* 4 + Output \* 4  
 $15\text{mA} + 10\text{mA} * 4 + 25\text{mA} * 4$   
 $= 155\text{mA}$

# Chapter 3

## Operation

### Event Reporting

The TCM3 is capable of reporting events to the serial port for the purpose of event logging. Main system events that are reported, when reporting is enabled, are input and output state changes and communications failures.

Following details the format of the messages:

#### Digital Inputs

<uXX:diY=Z>                      eg: <u01:di1=O>

where:

XX is the unit number,

Y is the input number

Z is 'O' for input open or 'C' for input closed.

#### Digital Outputs

<uXX:doY=Z>                      eg: <u01:di1=O>

where:

XX is the unit number,

Y is the output number,

Z is 'O' for relay open or 'C' for relay closed.

#### Communications Failure

<uXX:diY=CF>                      eg: <u01:di1=CF>

where:

XX is the unit number,

Y is the input or output number,

CF stands for communications failure.

# Chapter 4

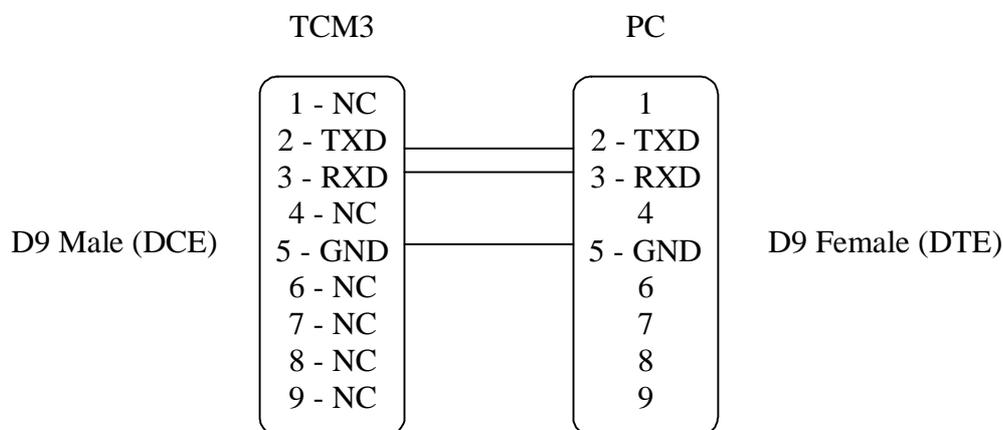
## TCM3 Configuration

### General

Configuring the TCM3 is relatively straight forward and easy. The following chapter provides details on using and connecting to the serial configurator. It also describes in detail the configuration commands available to the user and their meaning.

### The Serial Interface

The TCM3 is configured using a terminal device via the serial port, thus no expensive complicated configuration software is required. The serial port of the TCM3 complies with RS232 voltages and uses a 3 wire interface to communicate. These being transmit data (TXD), receive data (RXD) and ground (GND).



*Basic 3 wire Serial Interface from a TCM3 to a PC*

The terminal device used to configure the TCM3 can be anything from a basic dumb serial terminal, a PC running HyperTerminal or other communications software, or a handheld PDA. Anything that has an RS232 serial port and can act as a text based terminal program can be used.

The serial port on the TCM3 is configured as a DCE interface. The serial protocol settings are 8 data bits, 1 stop bit and no parity at 9600 baud. Simply use a serial cable to connect your TCM3 to a serial port on a PC or laptop, launch your favourite terminal program – you're now ready to configure the TCM3.

Applying power to your TCM3 at this stage should result in a sign on message being sent by the TCM3. If the TCM3 is already powered up, then press enter to see the command prompt.

```
-----  
Telemetry Control Module  
Model:      TCM3-4DIO-433  
Freq:      433.920 MHz  
SNo: 00198   F/w V1.00a  
.....  
>
```

*Typical signon message at powerup*

Note: Ensure hardware flow control is disabled in your terminal program.

## Entering the Configurator

Upon powering up, the TCM3 module configures itself before running its internal control and monitoring program. The TCM3 must therefore be stopped before the configurator can be entered in order to change operating parameters.

Typing **stop** at the command prompt will cause the internal control and monitoring operation to stop and enter the configurator.

If however password protection is enabled, then the password must be entered, using the **pwd** command, prior to attempting to stop the control and monitoring operation.

## Password Protection

The TCM3 allows password protection over the configuration settings to be set, thus ensuring only authorised personnel can either stop the TCM3 and/or change its configuration.

As default, password protection is not enabled when the TCM3 is shipped from the factory. Thus a password is not required to be entered to stop and change the configuration.

It is strongly advised that a password is set prior to installing the TCM3 in the field. Note, that the password must be the same across all installed units as the password is used to directly encrypt the data transmitted over the radio.

Note, the password can be a maximum of 8 characters and can contain both numbers and letters. All characters entered into the TCM3 are converted to lower case before processing, so using upper case characters have no effect. Thus the password can be entered as upper or lower case.

Once the password is set within the configurator, the password cannot be viewed. So ensure you test the password before exiting the configurator, to ensure you have got it right. While in the configurator the password can be cleared, however once the TCM3 is reset and running, its not possible to bypass a forgotten password to enter the configurator to subsequently clear it!

*WARNING: Ensure you record and keep the password in a safe place to prevent unauthorised tampering with the TCM3 configuration.*

## Data Encryption

By default the TCM3 does not employ data encryption to transmitted data. Having the TCM3 configured with a password enables encryption of the transmitted data over the radio. Setting the password not only protects the TCM3 from unauthorised access it is also used as the key to encrypt the transmitted data.

All units within a site that are expected to communicate with each other should be configured with same password.

## Addressing Scheme

Each IO Controller is configured with a site address and a unique unit address. The site address is common to all IO Controllers working within a particular system, and prevents cross communications with other IO Controllers in different systems.

Multiple systems may operate within close proximity without affecting each other. The IO Controller supports up to 254 different site addresses.

Each IO Controller working within a system must have a unique unit address. A system of IO Controllers can support up to 254 unique units in any one site. A unit address of zero is reserved for system wide broadcast messages within a site.

## **Port Numbering**

Input ports on the TCM3 have the following number scheme:

- D - Digital
- I - Input
- n - Port number 1 to 4

Output ports on the TCM3 have the following number scheme:

- D - Digital
- O - Output
- n - Port number 1 to 4

## **Types of Configuration Settings**

The TCM3 has three types of configurable settings. They are as follows:

- User Options – Basic interface and operating settings
- Port Mapping – Port mapping settings
- Port Settings – Port control settings

Default settings for these configuration categories are covered in the following sections. Later in this chapter the actual configuration commands are presented in detail.

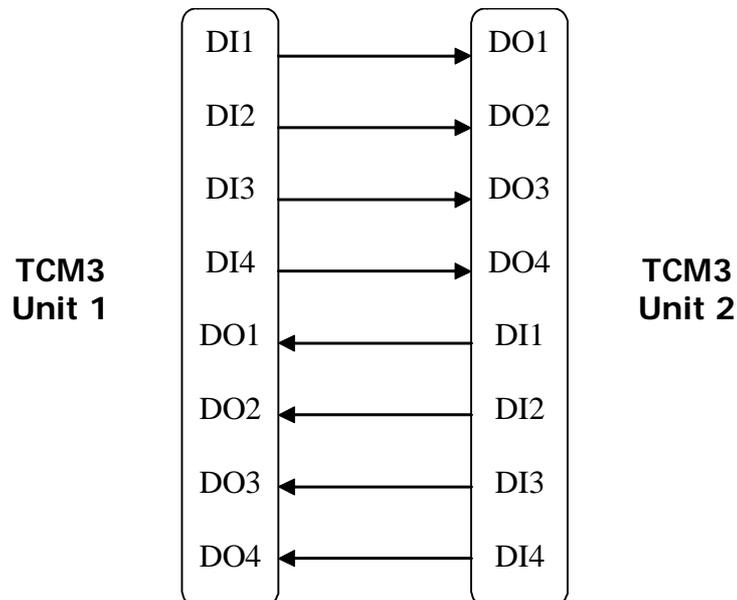
## Default User Options

The TCM3 has a number of user options that control the operating interface and TCM3 addressing. Following table details the default user options for the TCM3:

| User Option           | Default Setting |
|-----------------------|-----------------|
| Serial port baud rate | 9600 baud       |
| TCM3 unit address     | 1               |
| TCM3 site address     | 1               |
| Password/Encryption   | none            |
| Event reporting       | off             |
| Link fail on DO4      | disabled        |

## Default Port Mapping

Factory default port mapping is set such that all inputs on TCM3 Unit 1 are mapped directly to the corresponding outputs of TCM3 Unit 2. And all inputs on TCM3 Unit 2 are mapped to the corresponding outputs on TCM3 Unit 1. The following diagram details the default mapping.



### *Default Port Mapping*

Use the '*map clear*' command sequence to reset the port mapping back to the default as shown above.

Using '*map clear*' not only resets the port mapping to a one to one scheme but also sets the destination (map to) address as either the one above the current unit (if the local unit address is odd) or one below (if the local unit address is even). See the map command in the configuration chapter for more information.

Default port mapping does not set or reset any action on Communications Failure or battery low condition. Instead use the port command to set default IO port parameters.

## Default Port Settings

The TCM3 has a number of settings that can be applied to individual input and output ports. Following table details the default user options for the TCM3:

| Input Port Setting | Command                    | Default Setting                         |
|--------------------|----------------------------|---|
| Enable/Disable     | port <id> [enable disable] | Enabled                                 |
| Invert             | port <id> invert [on off]  | Off                                     |
| Debounce time      | port <id> dbnce [n]        | 0.5 seconds<br>= 50 (x10ms)             |
| Update period      | port <id> updper [n]       | 10 seconds (0.5 mins)<br>= 300 (x100ms) |
| Rate of change     | port <id> change [n]       | 1 seconds<br>= 10 (x100ms)              |
| Halt on CommsFail  | port <id> cfhalt [on off]  | Off                                     |

| Output Port Setting         | Default Setting       |
|-----------------------------|-----------------------|
| Enable/Disable              | Enabled               |
| Update period               | 10 seconds (0.5 mins) |
| Halt on CommsFail           | Off                   |
| Reset port on CommsFail     | Off                   |
| Reset delay after CommsFail | 0 seconds             |

These port settings can be changed by using the port command in the configurator. For more information please refer to the port command in the configuration section.

## General Commands in Detail

**help            Display basic help information**

This command is used to display brief help information. For detailed help information the manual should always be consulted!

**stop            Stop the controller and enter the configurator**

Entering this command will effectively stop the IO controller from sending updates and responding to received remote requests. After stopping the IO controller the user is passed into the configurator allowing the user to then change the operating configuration.

Note: all outputs are reset back to their initial *off* state once the IO controller is stopped.

**reset           Exit the configurator and restart the controller**

This command exits the configurator and restarts the TCM3. After the reset the updated settings will take immediate effect.

**restart        Restart all local IO Controller on same site address**

This command exits the configurator and restarts the TCM3. As part of the restart sequence it broadcasts a reset to all modules using the current site number. This has the effect of re-synchronising the network especially if port mappings have changed.

Note, a device left in the configurator will also be restarted by this broadcast message.

**serial         Display the unit serial number**

This command displays the serial number. The serial number is also displayed in the startup string when the TCM3 is restarted.

## User Option Commands

### **baud**            **Serial interface baud rate**

This command sets the host interface (DTE) baud rate. The updated DTE baud rate will take effect after leaving the configurator and restarting the TCM3 using the *reset* command.

Command format

**baud [n]**

where: n =

600, 1200, 2400, 4800, 9600, 14400  
19200, 38400, 57600, 115200

### **unit**            **Set TCM3 unit address**

This command sets the device unit address. Each TCM3 must be set with a unique unit address that is not identical to any other unit on the network. This unit address is used when mapping input ports to the output ports of a remote TCM3.

The unit address is combined with the site address to allow distinct groups of TCM3 modules to be used within close proximity of each other without interference.

Command format:

**unit [n]**

where: n =

**[1-255]**    TCM3 unit address.

### **site**            **Set TCM3 network site address**

This command sets the device site code. Each site code can effectively support up to 255 different unit addresses.

Command format:

**site [n]**

where: n =

**[1-255]**    TCM3 site code.

### **pwd**            **Used to enter a password**

If password access is enabled, this command is used to enter a password prior to stopping the IO controller and entering the configurator. Due to security reasons it's not possible to reset a forgotten password thus it's **important to record the password once set**.

The TCM3 cannot be stopped, and hence the configurator cannot be entered unless a valid password is given.

Command format:

**pwd [<s>]**

where: s =

**[a-z:0-9]** The password can be up to 6 characters and consist of the characters 'a' thru 'z' and the numbers '0' thru '9'.

### **setpwd Set password**

This command can only be used from within the configurator, hence the TCM3 must be stopped. The command is used to both clear and set the password.

Command format:

**setpwd [clear/ <s>]**

where: s =

**[a-z:0-9]** The password can be up to 6 characters and consist of the characters 'a' thru 'z' and the numbers '0' thru '9'. The password will be saved and is then subsequently required to enter the configurator.

**clear** This is used to erase the password. By clearing the password the TCM3 can be stopped and changes made to the configuration without requiring to enter a password.

### **report Enable event reporting to the serial port**

This command can only be used from within the configurator, hence the TCM3 must be stopped. The command is used to enable event reporting to the serial port of port change, communications failure and battery fault events. Refer to a description of event reporting in Chapter 3.

Command format:

**report [n]**

where: n =

**on** Enables event information to be sent to the serial port.

**off** Disables event reporting.

### **lfail Enable LINK FAIL relay output on DO4**

This command can only be used from within the configurator, hence the TCM3 must be stopped. The command is used to enable or disable the output function of Link Fail on DO4 upon a communications failure with a remote unit.

Command format:

**lfail [enable/disable]**

where: n =

**enable** Enables LINK FAIL on output DO4. This disables the output functionality of DO4. It also prevents a remote mapped port from changing the state of DO4.

**disable** Disables LINK FAIL on output DO4 and restores it to a fully operational output port.





**port <port id> enable** Enable the port for operation

**disable Disable the port operation**

An input port that is disabled from operation will not respond to changes in the input state.

Command format:

**port <port id> disable** Enable the port for operation

**invert Invert the state of the input**

The logic state of the input port is inverted.

Command format:

**port <port id> invert [on/off]** Enable or disable the inversion of the input state

**dbnce Set the input port debounce time**

The input debounce time can be set in order to prevent false triggering due to noise, power spikes and other potential interference.

Command format:

**port <port id> dbnce [1-255]** Set the debounce time from 10ms (1 x 10ms) to 2.55secs (255 x 10ms).

**updper Set the port update period**

This command sets the update period for the given input port. If a state change has not occurred on the given input port for the period of time specified by this parameter, then an update will automatically be sent to the remote output port that this input is mapped to.

Command format:

**port <port id> updper [50-60000]** Set the update period from 5sec (50 x 100ms) to 100min (60,000 x 100ms).

**change Set the rate of change**

This sets the rate of change that can be fed to this input. Thus a new change of state on the given input is not recognised until after the change period.

Command format:

**port <port id> change [1-255]** Set the rate of change time from 10ms (1 x 10ms) to 2.55secs (255 x 10ms).

**retry Set the number of transmission retries**

Upon a state change on an input a message is sent to the remote mapped port. If for some reason the remote port does not respond within a random time period, the transmission will be attempted again. The retransmissions will continue for the number of retries. Should the number of retransmissions exceed the set number, the port is considered to be in a communications failure state.

Command format:

**port <port id> retry [1-10]** Set the number of transmission retries.

**cfhalt Set the action upon comms failure**

Should the input port be unable to communicate a port state to the remote unit after the set number of retries, the port then has two options. The first is to carry on trying to communicate its state to the remote device at the update period rate. The other option is to halt the port and thus prevent it from trying to send its state to the remote device. Halting the port will require a manually intervened reset of the device to get it running again. A reset can be either a power cycle, or using the serial configurator to stop and reset the controller.

Command format:

**port <port id> cfhalt [on/off]** Select halt on comms fail.

## Output port settings

The following list of commands is valid for output ports. Their function and purpose is described.

**enable Enable the output port for operation**

Should the output port be disabled, any received state update for this port shall be ignored.

Command format:

**port <port id> [enable/disable]** Enable/disable the output port.

**updper Set the update period**

This sets the update period for receiving state changes. Should the update period be reached without communications from the remote input port, the controller will request an update from the remote input port by way of a polling request.

Command format:

**port <port id> updper [100-60000]** Set the update period from 10sec (100 x 100ms) to 100min (60,000 x 100ms).

**retry Set the number of transmission retries**

Should an output port update period be exceeded then the controller will poll the remote input port for a state update. If for some reason the remote input port does not respond within a random time period, the poll request will be attempted again. The retransmission of the polling request will continue for the number of retries. Should the number of retransmissions exceed the set number, the port is considered to be in a communications failure state.

Command format:

**port <port id> retry [1-10]** Set the number of transmission retries.

**cfhalt      Set the rate of change**

This sets the rate of change that can be fed to this input. Thus a new change of state on the given input is not recognised until after the change period.

Command format:

**port <port id> change [1-255]**      Set the rate of change  
time from 10ms (1 x 10ms) to 2.55secs (255 x 10ms).

**cfreset      Reset output port on comms failure**

In the event of a communications failure this setting allows the given output port to be reset to its initial state.

Command format:

**port <port id> cfreset [on/off]**      Enable the output port to be  
reset in the event of a communications failure.

**rstdly      Set the delay before the port is reset**

In the event of a communications failure, and assuming **cfreset** is set to **on**, this delay occurs before the output is reset to its initial state.

Command format:

**port <port id> rstdly [0-255]**      Set the delay before reset from  
0ms (0 x 10ms) to 2.55secs (255 x 10ms).

# Chapter 5

## Product Version Information

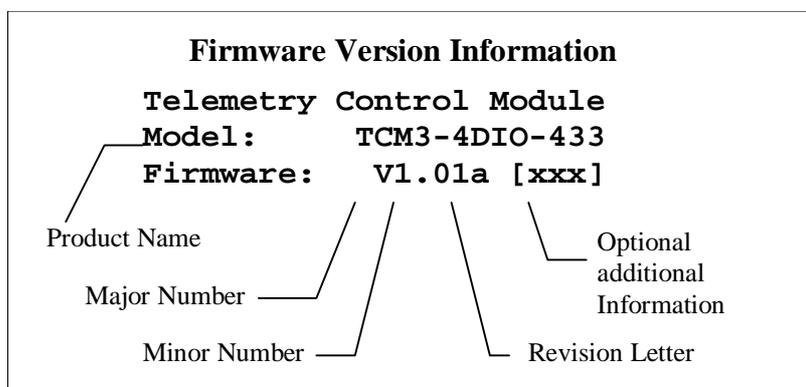
### Version Information

The TCM3-4DIO products contain a firmware version string.

The firmware version string provides some information regarding compatibility with previous firmware versions. The firmware version number is displayed both with the signon message and upon entering the command line configurator.

### Firmware Version Numbering Scheme

The firmware version information is displayed at power up if the startup message is enabled, otherwise the information is displayed upon entering the configurator.



#### Product Name:

Identifies the major product category name.

#### Major and Minor Number

The major number reflects the hardware compatibility of the firmware. It may also be incremented upon a major overhaul and upgrade of the firmware.

The minor number is incremented as new functionality is added which renders the firmware functionally different with previous versions. This can include additions to functionality.

Combined, these two values make up the version number.

#### Revision:

The revision reflects bug fixes and minor changes that do not render the firmware significantly different from previous versions.

#### Additional Info:

Firmware with specific customer or country requirements will be identified here with a unique string identifier. These versions will always be incompatible with their air interface encoding.

# Chapter 6

## Ordering Information and Modification History

### Hardware

Version 201-02

Initial hardware platform release.

### Firmware

Version 1.00a

Initial firmware release.

### Part Numbering

#### **TCM3 – 4DIO – xxxP / 241AE**

**TCM3** – Model number

**4DIO** – IO Options. 4 Digital Input and 4 Digital Output

**xxx** – Operating frequency. Options are given below

**P** – Indicates 100mW high power (on VHF modules only)

**24** – Operating voltage option. Omitted for 12VDC operation

**1** – Relay contact rating.

**A** – Output options. Relays NC, NO, OC, etc.

**E** – Common Earth for all output relays

Available IO options are:

**4DIO** = 4 Digital inputs and 4 Digital outputs.

**16DIO** = 16 Digital inputs and 16 Digital outputs.

Available operating frequency options are:

**151** = 151.300MHz, **151.6** = 151.600MHz

**173** = 173.250MHz (NZ & EU), **173.2** = 173.225MHz (NZ & EU)

**433** = 433.920MHz (Aus, NZ, EU, US), **869** = 869.850MHz (EU)

**914** = 914.500MHz (US), **918** = 918.525MHz (Aus)

Available Operating Voltage options are:

**12** or Not shown = 12 Volt DC +/- 5%

**24** = 24 Volt DC +/- 5%

Relay contact ratings are:

**1** or Not shown = 1A @ 24VDC or 0.5A @ 125VAC

**3** = 3A @ 24VDC or 1A @ 125VAC

Available output options are:

**A** or Not shown = NO – Normally Open connectors fitted

**B** = NC – Normally Closed connectors fitted

**C** = OC – Open collector connectors fitted

**D** = NO & NC – Connectors for NO and NC fitted.

Available grounding options are:

**E** = Common earth

Not shown – Isolated relay outputs