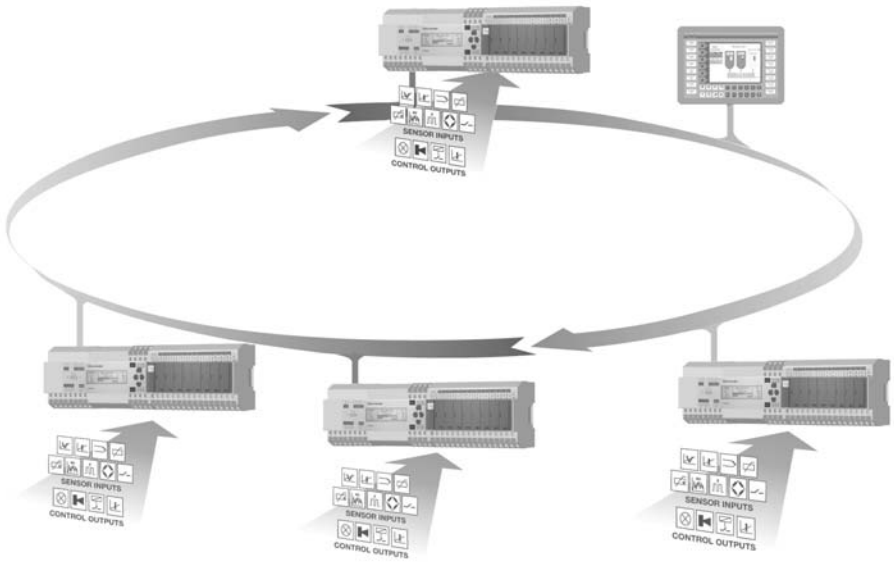
COMMANDER TX2100 for INDUSTRY



TROLEX LIMITED
Newby Road
Hazel Grove, Stockport,
Cheshire SK7 5DY, UK.
tel: +44 (0)161-483 1435
e-mail: sales@trolex.com
internet: www.trolex.com

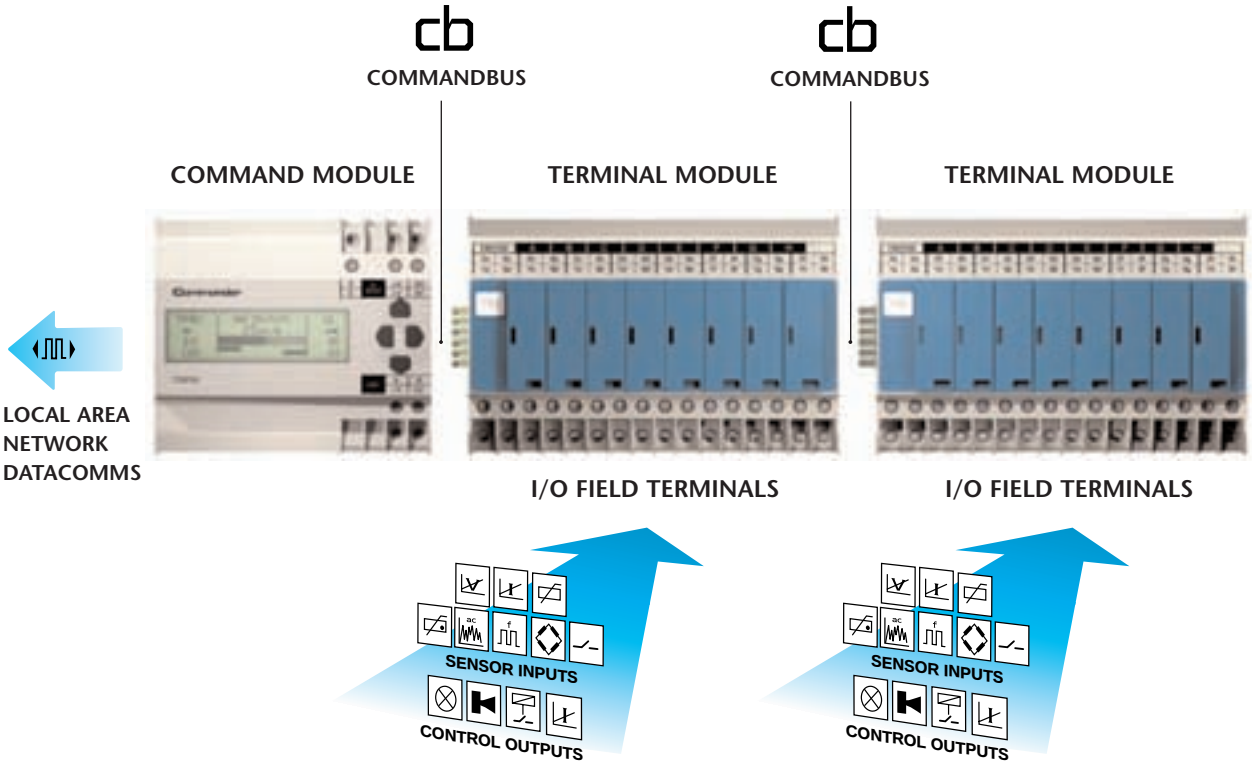
Further copies of this document are available from
trolex.com

Page

PART 1

commander

1 commander profile



PART 1
1. COMMANDER PROFILE

I/O COMMAND AND CONTROL SYSTEM FOR SENSORS, CONTROL DEVICES AND ALARMS

Modular Bus Configuration for simple compilation of local monitoring and control systems or large scale distributed Minewide monitoring installations.

- **Bus expandable I/O up to a possible maximum of 960 addresses: analogue inputs, pulse/frequency inputs, switch inputs, output switching, analogue output control.**
- **User Configurable input signals and output drivers by simple channel card insertion.**
- **Programmable sensor response functions.**
- **Programmable monitoring and control functions.**
- **Data logging, up to 4000 readings for each I/O.**
- **Datacomms for distributed Minewide systems.**
- **Bus architecture for minimal cabling and wiring connections.**
- **Easy-to-use direct input programming through the navigator keypad.**

Complete versatility of sensor and control device management with a vast range of operating options giving unparalleled simplicity of application.

1.1 AREA APPLICATION

GENERAL PURPOSE APPLICATION

- General Purpose industrial applications operating at 24V dc supply.
- Sensors and control devices are generally 24V dc supply.

SERIES

.03

1.2 COMMANDER PROFILE

DESIGN INTEGRITY

Operational safety to eliminate the possibility of incorrect plant output for a given input state is largely dependent upon correct software operation. Commander is designed within rigorous quality control techniques to ensure maximum reliability.

CHECKING AND SYSTEM MONITORING.

- All system communications links incorporate error checking and retry routines.
- All processor functions are 'watchdogged' against malfunction.
- Built-in self-test routines implement functional checks on all systems at system bootup, prior to permitting outputs to be changed under software control.
- All outputs are held in hardware-defined default states until all systems have been validated and will retain the 'last command' condition.
- Wherever practicable all input and output circuits are continuously monitored for short circuit and open circuit conditions. Output control relays have failsafe configuration. Fault conditions identified are individually alerted on the Command module and selective alarms can be initiated.

SYSTEM INTEGRITY

High levels of system security can be configured into a Commander system by adopting various design options.

- All I/O channel cards can be individually replaced without interrupting the normal function of the system.
- Additional I/O channel cards can be added without interrupting the normal function of the system.
- Input command signals can be 'voted' in any combination and I/O channels can be 'paralleled' for added security.
- Dual power supplies may be connected onto the Commandbus for standby failure protection where safety parameters permit.

CAUTION Commander is a software-based system and relies on a single communications backbone and non-redundant processors. Safety critical installations where system multiple redundancy is required, must be combined with systems incorporating hard-wired safety circuits to provide redundancy capacity.

PART 1
1. COMMANDER PROFILE

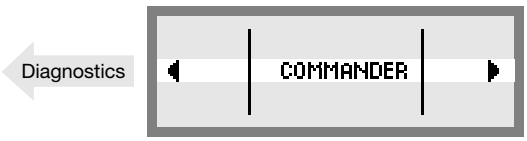
SAFETY INTEGRITY

- All modules and elements of the Commander system are individually coded to prevent incompatible or unsafe combinations.
- All Commander modules and their combinations are manufactured in compliance with European EMC protection requirements for both radiated and received electromagnetic influence.

DIAGNOSTICS

Protected access is available to built-in menu based fault diagnostics. Various levels of software and function routines can be examined in detail for system analysis.

Access is also available to comms monitoring intelligence data.



CHECK POINT

Entry into these facilities is protected by an individual security keycode. This is available, together with user information, from the Trolex Commander application department.

TECHNICAL SUPPORT AND TRAINING

- The Trolex team of system design engineers is available to assist with Commander applications. Alternatively, we can design and configure a complete functioning system including sensors, software and final commissioning to specification.

HELPLINE

+44 161 285 8866

COMMANDER TRAINING

One day training courses in Commander applications including a free Commander Configuration Software Package and hands-on practical system design examples.

CONTACT
sales@trolex.com

2 TX2101 command module

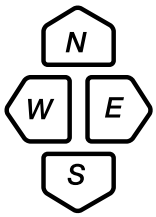
PART 1
2. TX2101 COMMAND MODULE

The COMMAND MODULE is the hub of the Commander System. A powerful data processor with a graphical data display, data communications and navigator programming.

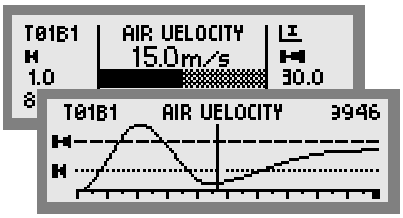
- Standard rail mounting modules to DIN 43 880 or panel mounting option.

- Commandbus communications to field I/O Terminal Modules up to a possible maximum of 960 I/O.

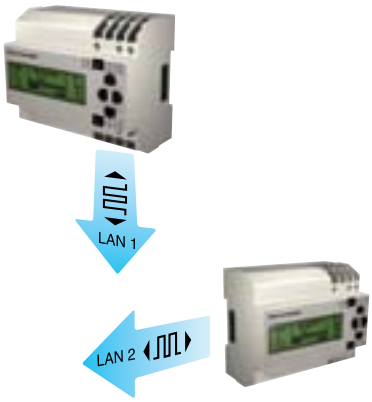
- Power distribution through the Commandbus: cb



- Navigator keypad for convenient direct user programming of all functions:
  - Sensor input signal response characterisation.
  - Control output driver characteristics.
  - Data logging.
  - System diagnostics.



- Graphical LCD readout:
  - Sensor input signal display with selectable display format or trending.
  - Output driver status display.
  - Menu driven programming.



- LAN 1 datacomms port for local area networks, distributed Commander systems, external comms repeaters, PLC or PC user interface and data downloading. Screw terminals format for plant cable connections.

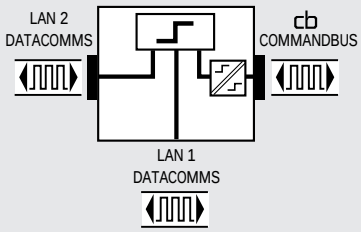
- LAN 2 datacomms port. Same as LAN 1 but outputted on a plug and socket connection for direct interface with data downloading devices.

PART 1
2. TX2101 COMMAND MODULE

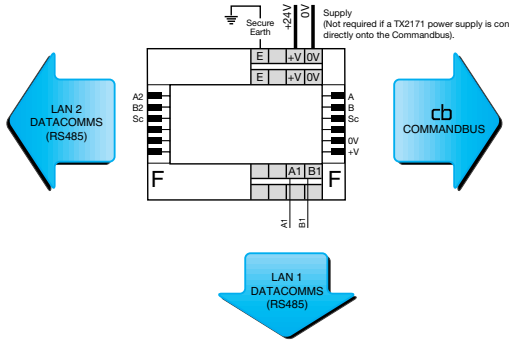
2.1 TX2101.03 COMMAND MODULE

GENERAL PURPOSE

- System command and control centre.
- Expandable COMMANDBUS for I/O data up to 960 points of I/O.
- Same COMMANDBUS distributes the power.
- Programmable sensor response characteristics and output control functions.
- Integral LCD readout for I/O status and function programming.
- LAN 1 datacomms with screw terminal connections.
- LAN 2 datacomms with plug & socket connection.
- DIN rail mounting.
- Galvanically isolated Commandbus data.



Connections:



CHECK POINT *The module must be mounted in a protective metal housing (eg: TX9202 or TX9204).*

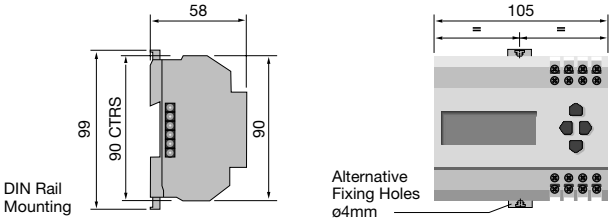
CAUTION • *The screen on the Commandbus is internally connected to the 0V terminal. Connect 0V to a secure earth at this point ONLY if required.*

CHECK POINT • *The screen on the LAN 1/LAN 2 data cable is internally connected to the 0V terminal and may be connected to a secure earth if required.*

Supply Voltage:	24V dc from the COMMANDBUS if a TX2171 power supply is fitted on the COMMANDBUS or from an external power supply through terminals +V and 0V (section 6).
Current Consumption:	60mA.

	LAN 1 DATACOMMS	LAN 2 DATACOMMS	cb COMMANDBUS
Physical Layer:	RS485	RS485	Trolex proprietary
Speed:	300...115k Baud	300...115k Baud	153k Baud
Protocol	Modbus	Modbus	Trolex proprietary
Maximum Comms Points	30	30	30 Terminal Modules
Maximum I/O	–	–	960 locations
Recommended Cable (with power)	2 twisted pair • Individually Screened • Collectively Screened • B5308 pt1		
Recommended Cable (no power)	1 twisted pair • Collectively Screened • B5308 pt1		
Max Cable Length: (Dependent upon cable type & baud rate)	1000m	1000m	1000/2000m
Isolation:	–	–	Galvanically isolated
Max Permitted Supply Current (+V & 0V):	–	–	6 Amps

Dimensions:



All dimensions in mm.

Order Reference: **TX2101.03** COMMAND MODULE GENERAL PURPOSE

2.3 TX2104 COMMAND MODULE. PANEL MOUNTING OPTION

The TX2104 series of Command modules has the same function as the TX2101 Command module. It is suitable for flush mounting into panel and control desks for convenient integration into control layouts.

- Connect the TX2104 Command module directly to the COMMANDBUS using a COMMANDBUS cable (section 8).

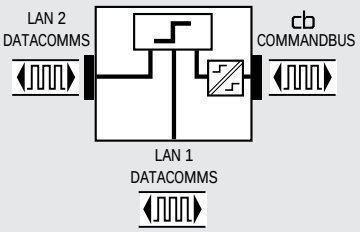
- The TX2104 Command module can also be connected to the COMMANDBUS through a TX2131 convertor module where screw terminal connections are preferred (section 5). This method is also useful when the Command module is located some distance away.

PART 1
2. TX2104 COMMAND MODULE

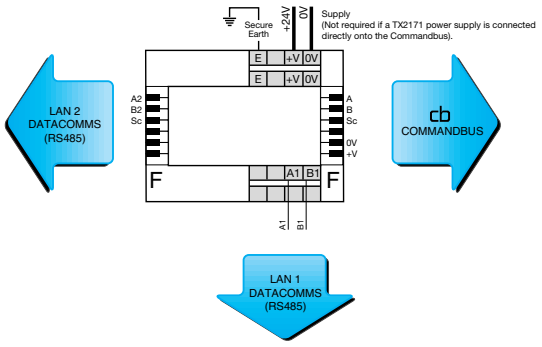
2.4 TX2104.03 COMMAND MODULE

GENERAL PURPOSE

- System command and control centre.
- Expandable COMMANDBUS for I/O data up to 960 points of I/O.
- Same COMMANDBUS distributes the power.
- Programmable sensor response characteristics and output control functions.
- Integral LCD readout for I/O status and function programming.
- LAN 1/LAN 2 datacomms output.
- Panel mounting.
- Galvanically isolated Commandbus data.



Connections:



CHECK POINT *The rear of the module must be mounted in a protective metal housing (eg: TX9202 or TX9204).*

CHECK POINT
- *Supplied with two six way connectors:*
  - *Commandbus connector.*
  - *LAN 2 datacomms connector.*

See page 85 for corresponding 6 core connecting cable.

CAUTION
- *The screen on the Commandbus is internally connected to the 0V terminal. Connect 0V to a secure earth at this point ONLY if required.*

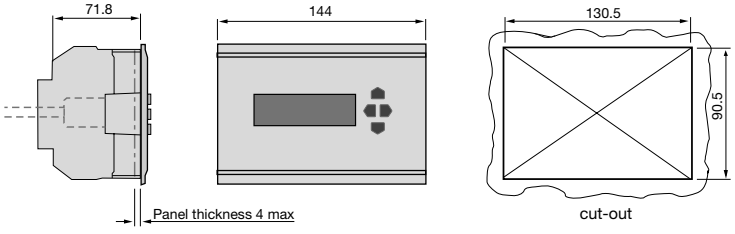
CHECK POINT
- *The screen on the LAN 1/LAN 2 data cable is internally connected to the 0V terminal and may be connected to a secure earth if required.*

Supply Voltage:	24V dc from the COMMANDBUS if a TX2171 power supply is fitted on the COMMANDBUS or from an external power supply through terminals +V and 0V (section 6).
Current Consumption:	60mA.

	LAN 1 DATACOMMS	LAN 2 DATACOMMS	cb COMMANDBUS
Physical Layer:	RS485	RS485	Trolex proprietary
Speed:	300...115k Baud	300...115k Baud	153k Baud
Protocol	Modbus	Modbus	Trolex proprietary
Maximum Comms Points	30	30	30 Terminal Modules
Maximum I/O	–	–	960 locations
Recommended Cable (with power)	2 twisted pair • Individually Screened • Collectively Screened • B5308 pt1		
Recommended Cable (no power)	1 twisted pair • Collectively Screened • B5308 pt1		
Max Cable Length: (Dependent upon cable type & baud rate)	1000m	1000m	1000/2000m
Isolation:	–	–	Galvanically isolated
Max Permitted Supply Current (+V & 0V):	–	–	6 Amps

Dimensions:

The front of panel is environment proof to IP65

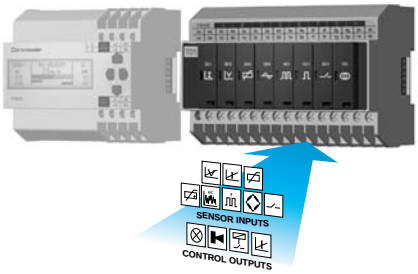


All dimensions in mm.

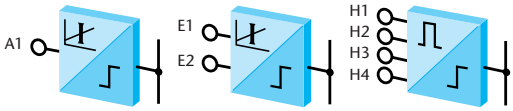
Order Reference: **TX2104.03 COMMAND MODULE GENERAL PURPOSE**

3 TX2102 terminal module

The TERMINAL MODULE accommodates up to 8 CHANNEL CARDS in any combination of I/O functions.



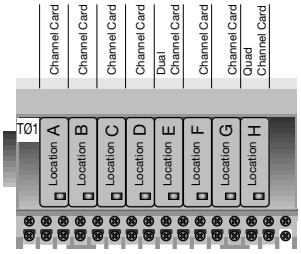
3.1 CHANNEL CARD ADDRESS



- SINGLE, DUAL or QUAD function channel cards can be fitted in any position (section 4).

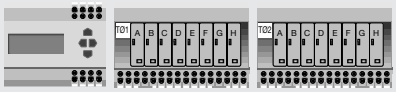
- Each I/O function on a channel card is called a LOCATION. The ADDRESS of a location is determined by the position it takes up in the TERMINAL MODULE, eg:

Address	Terminal Module	Channel Card Location	Type
T 01 A1	01	A1	single
T 01 E1 T 01 E2	01	E1 E2	dual
T 01 H1 T 01 H2 T 01 H3 T 01 H4	01	H1 H2 H3 H4	quad



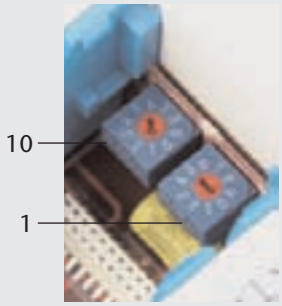
ADDRESS ALLOCATION

Each terminal module must be allocated with a unique address number - T01 up to T30. (A self adhesive label is provided for marking the appropriate terminal module reference).



- Remove the cover panel to reveal the setup switches and set a module reference number : 01 to 30.

- Numbers may be allocated in any order of distribution on the Commandbus.



CHECK POINT A terminal module with a reference number set at 00 will be disregarded by the Commandbus - useful for maintenance purposes.

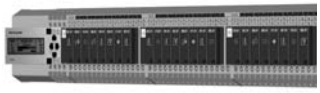
PART 1
TX2101
COMMAND
MODULE

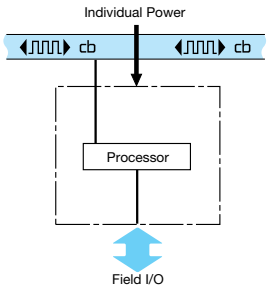
3.2 TERMINAL MODULES couple directly to the COMMAND MODULE through the COMMANDBUS.

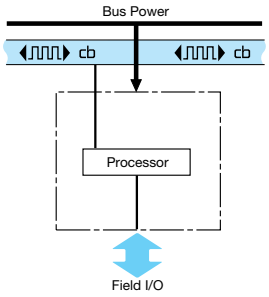
- Up to 30* TERMINAL MODULES can be combined on one Commandbus permitting a total maximum of 240 channel cards.
  Any of the channel cards may be SINGLE, DUAL or QUAD location types (section 4).
  (Theoretical maximum locations: 240 x QUAD = 960).
  (*Subject to certification limitations).

3.3 SYSTEM POWER DISTRIBUTION

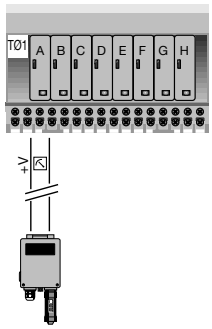
- Power is also distributed via the COMMANDBUS.
- The power source that provides power to the COMMAND MODULE will also power the TERMINAL MODULES of a close-coupled Commander system, through the cb connector.
- The same power can also be supplied to *dispersed* TERMINAL MODULES through the Commandbus data cable, when the power connecting cores of the cable are utilised (section 8.1).
- If the power demand of a Commander system exceeds the current capability of a single power supply, additional power supplies can be added at selected TERMINAL MODULES or COMMANDER STATIONS (section 5.4).
- The internal power supply system within each TERMINAL MODULE also provides power at the appropriate voltage for energising sensors and field devices that are connected to the channel cards (section 3.10).







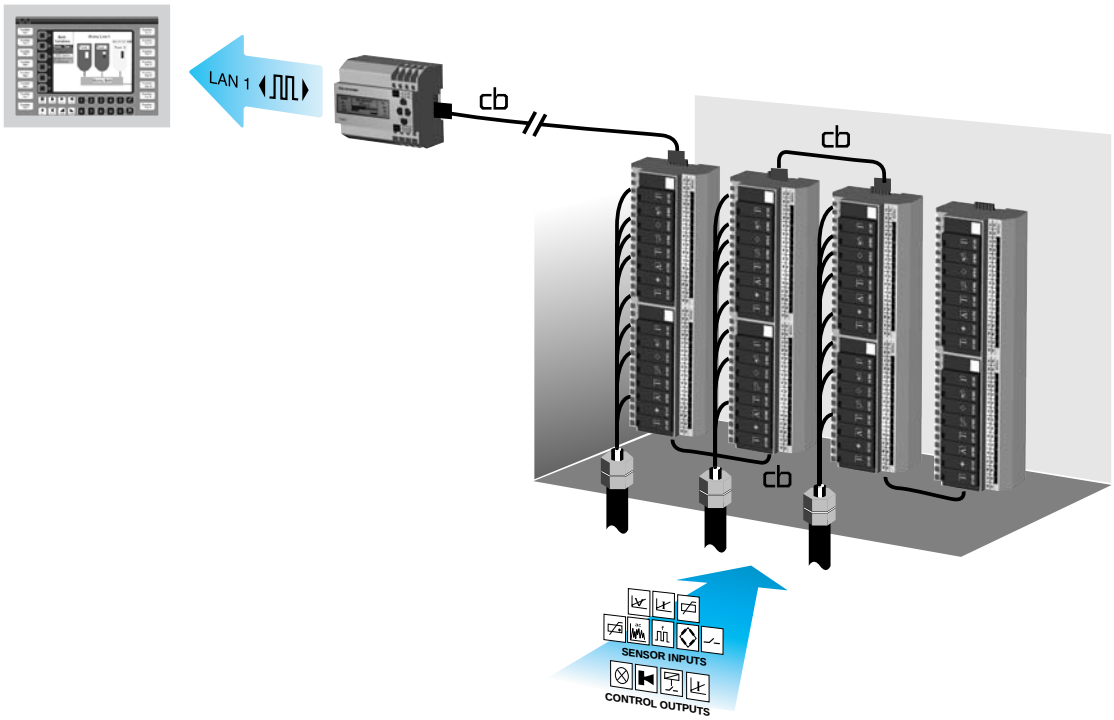
3.4 CONNECTING SENSORS & PLANT DEVICES TO A TX2102 TERMINAL MODULE



Incoming cable connections from remote sensors and plant control devices can be connected *directly* to the connecting terminals of each terminal module.

The heavy duty, clamp type terminals will easily accommodate cable conductors up to 2.5mm^2, so the terminal modules can, in effect, be used as the incoming termination port of the system. This completely eliminates the additional internal wiring that is normally necessary to interconnect with a conventional terminal rail.

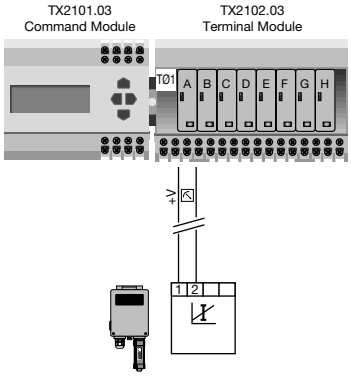
Similarly, the individual *through* wiring is not needed from the terminal rail as the I/O data is now carried in a single COMMANDBUS cable to the control or display system employed.



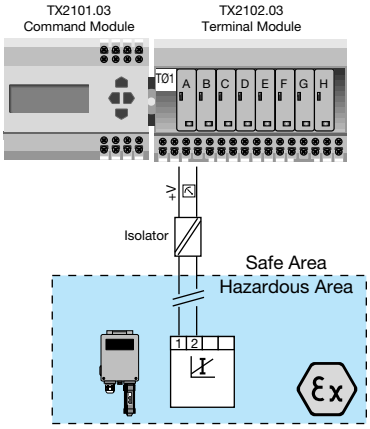
3.5 GENERAL PURPOSE SYSTEMS (SERIES 03)

A typical 2 wire 4...20mA sensor connected to a terminal module.

The system voltage is 24V dc and the sensor is powered from the signal line.



A similar sensor that is also certified Intrinsically Safe can be mounted in a hazardous area if a standard safety barrier or isolator is connected in the signal line.



3.8 FAILURE MODE

The system is designed to ensure that data will continue to pass through the Commandbus, in the unlikely event that a Terminal Module processor should fail. The remainder of the Commandbus will be fully supported and a 'Fail' status report will appear at the Command Module.

If there is a total loss of data on the Commandbus, all outputs will retain the 'last command' condition and a 'loss of data' report will be given at the Command Module.

PART 1
TX2101
COMMAND
MODULE

3.9 POWER DISTRIBUTION *within* the TERMINAL MODULE and CURRENT AUDITING.

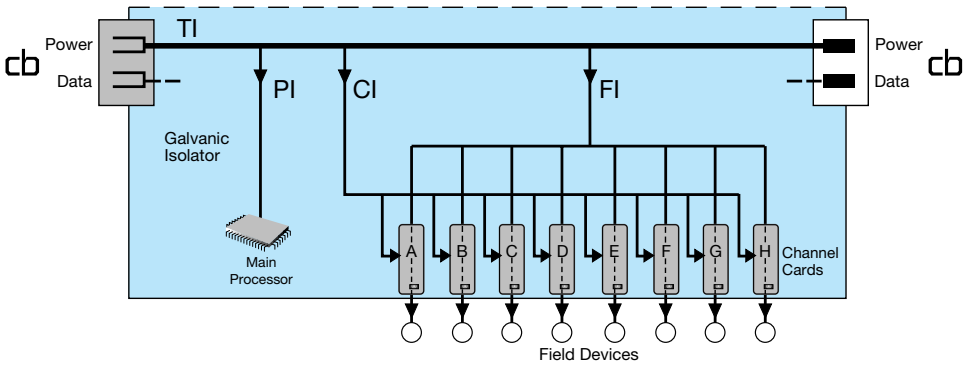
- **All the power consumed by a Terminal Module is derived from the power rail of the Commandbus that runs through the Commandbus connectors situated at each end of the module (section 5.4).**

The total aggregate power taken by an individual Terminal Module comprises three main elements:

1. Processor Current (PI): The nominal current required to drive the main processor of the Terminal Module (section 3.10).

2. Channel Card Current (CI): The current required to drive the processor of each individual channel card. This is a variable value related to the quantity and types of channel card fitted in the Terminal Module (section 4).

3. Field Device Current (FI): Auxiliary current is made available at each channel card to power up sensors and field devices. On some channel cards the power for the field device (FI) is a pre-determined or insignificant value. On others the field device current (FI) is dependent upon the type of device connected and the method of connection (section 4).

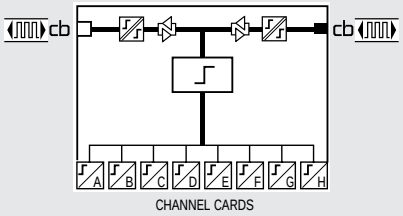


Terminal Module Current (TI) = PI
+ CI_A + CI_B + CI_C + CI_D + CI_E + CI_F + CI_G + CI_H (as applicable)
+ FI_A + FI_B + FI_C + FI_D + FI_E + FI_F + FI_G + FI_H (as applicable)

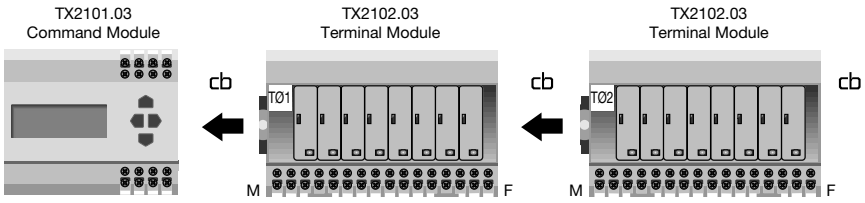
3.10 TX2102.03 TERMINAL MODULE

GENERAL PURPOSE

- Accommodates 8 single, dual or quad location channel cards.
- Terminal modules couple together using integral Commandbus connectors.
- Power distribution on the same COMMANDBUS.
- Bus expandable up to 30 similar Terminal Modules on one Commandbus.
- DIN rail mounting.
- Galvanically isolated channel cards and Commandbus.
- Integral comms repeater for transmission to dispersed Terminal Modules on the cb network.



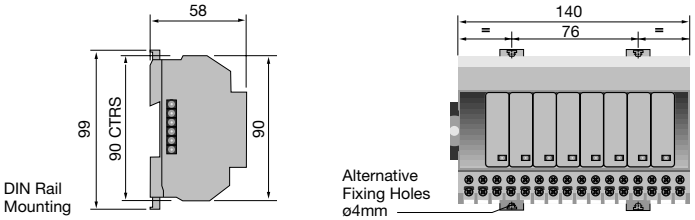
Connections:



Individual terminal connections are appropriate to each channel (section 4).

Supply Voltage:	24V dc direct from the Commandbus (section 6). (NOT isolated between Commandbus ports).
Processor Current (PI):	30mA (excluding channel cards).
Isolation:	Galvanically isolated Commandbus on both data ports.
Max Cable Length:	1000/2000m (dependent upon installation parameters). Each Terminal Module is equipped with a comms repeater so the cb data is refreshed for onward retransmission to other DISPERSED Terminal Modules on the cb network.
cb Limit:	30 Terminal Modules on one Commandbus.

Dimensions:



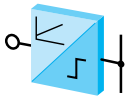
All dimensions in mm.

Order Reference: **TX2102.03 TERMINAL MODULE GENERAL PURPOSE**

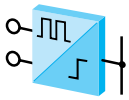
4 TX2141 channel cards and accessories

PART 1
4. TX2141 CHANNEL CARDS

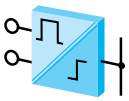
The function of each I/O location is determined by the CHANNEL CARDS.



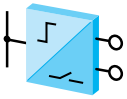
4.1 ANALOGUE INPUT CHANNEL CARDS.
for analogue sensing devices.



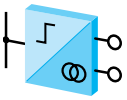
4.2 PULSE FREQUENCY INPUT CHANNEL CARDS.
Pulse processing and counting.



4.3 ONOFF/STATE INPUT CHANNEL CARDS.
Switches, NAMUR sensors, fire and alarm systems.

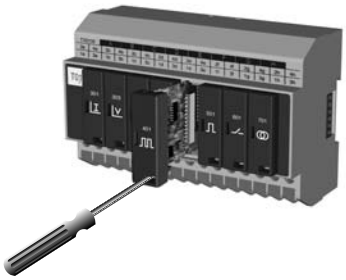


4.4 ONOFF/STATE OUTPUT CHANNEL CARDS
for plant control devices, alarms and interfacing signals.



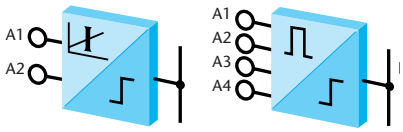
4.5 ANALOGUE OUTPUT CHANNEL CARDS.
Motorised valves, servos and controllers.

CHANNEL FORMAT



- Each TX2102 TERMINAL MODULE has accommodation for up to 8 CHANNEL CARDS which can be assembled in any combination.

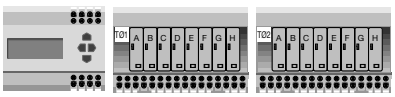
  The cards are plug-in and can be changed at any time without interrupting the system. Insert a small screwdriver to release the latch when removing a channel card.



(Channel A typical)

- Many CHANNEL CARDS are dual or quad function so up to 32 function LOCATIONS can be operated in a TERMINAL MODULE.

- An LED on the front of each channel card flashes RED when command instructions are being executed. The LED will remain either permanently ON or permanently OFF if a channel FAULT occurs.



- The ADDRESS of a location is determined by the position it takes up in the TERMINAL MODULE and into which terminal module it is fitted (section 3).

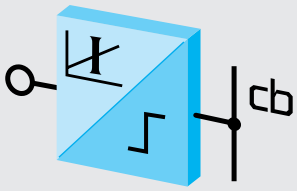
4.1 ANALOGUE INPUT CHANNEL CARDS.

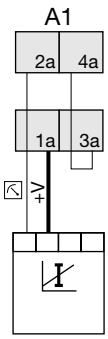
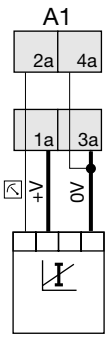
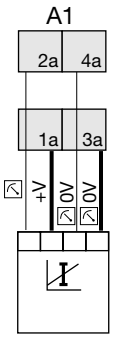
4.1.1 TX2141.301 CHANNEL CARD

ANALOGUE INPUT

4...20mA signal

- 2, 3 or 4 wire current regulated process input signals.
- Power supply output available for sensor.
- Configurable to other current sensing ranges i.e. 0...20mA, 0...10mA, etc. to specification.



Connections: (Channel A)	2 wire	3 wire	4 wire
	 • *2 wire signal loop* • *Line powered sensor*	 • *2 wire signal loop* • *Additional wire for sensor power 0V*	 • *2 wire signal loop* • *2 wires for power +V, 0V*
Field Device Current (FI):	20mA for the signal loop.	20mA for the signal loop + additional current to power the sensor.	

	TX2141.301.03	TX2141.301.02
Sensor Voltage:	24V dc	
Channel Card Current (CI):	15mA	
Maximum Cable Length:		
1mm²	4000m	10000m
2.5mm²	10000m	10000m
Max External Loop Resistance:	600 ohms	
Recommended Cable:	2, 3 or 4 core.	

Order Reference: **TX2141.301.03** **CHANNEL CARD** **GENERAL PURPOSE**

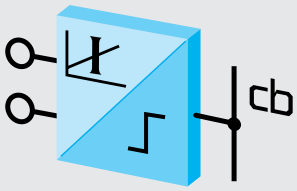
Please specify: • **Specific current measuring range.**

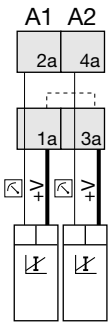
4.1.2 TX2141.302 CHANNEL CARD

DUAL ANALOGUE INPUT

4...20mA signals

- Two independent inputs.
- 2 wire current regulated process input signals.
- Line powered sensors.
- Configurable to other current sensing ranges i.e. 0...20mA, 0...10mA, etc. to specification.



Connections: (Channel A)	
Field Device Current (FI):	20mA for each connected sensor.

	TX2141.302.03	TX2141.302.02
Sensor Voltage:	24V dc	
Channel Card Current (CI):	15mA	
Maximum Cable Length: 1mm² 2.5mm²	 4000m 10000m	 10000m 10000m
Max External Loop Resistance:	600 ohms	
Recommended Cable:	2, 3 or 4 core.	

Order Reference:	TX2141.302.03 CHANNEL CARD	GENERAL PURPOSE

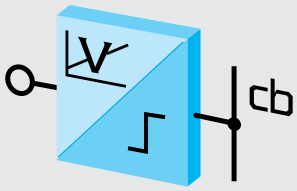
Please specify: • Specific current measuring ranges (For A1 and A2 locations).

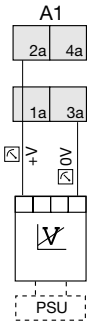
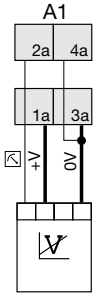
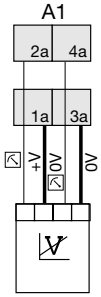
4.1.3 TX2141.303 CHANNEL CARD

ANALOGUE INPUT

0.4...2 Volt signal

- 2, 3 or 4 wire voltage signals.
- Power supply output available for sensor.
- Configurable to other voltage sensing ranges i.e. 0...5V, 0...2V, 0...1V, etc.



Connections: (Channel A)	2 wire	3 wire	4 wire
	 • *2 wire voltage signal* • *Sensor fed by independent or integral power supply*	 • *2 wire voltage signal* • *+V power supply to sensor* • *0V power supply to sensor combined with 0V*	 • *2 wire voltage signal* • *+V power supply to sensor* • *Separate 0V power to sensor*
Maximum Cable Length:	– –	10mA Sensor 40mA Sensor	10mA Sensor 40mA Sensor
1mm²	4000m	80m 20m	2000m 2000m
2.5mm²	10000m	200m 50m	
		Volt drop introduced on to the common 0V line by the supply feed to the sensor will be superimposed on to the signal. The signal accuracy shift caused by this is the factor that limits the cable length.	*The potential cable length is limited by the permissible volt drop in the +V and 0V power supply feed conductors to the sensor that will ensure an adequate operating voltage supply at the sensor.*
Field Device Current (FI):	Insignificant.	Current required to power the sensor.	

	TX2141.303.03	TX2141.303.02
Sensor Voltage:	24V dc	
Channel Card Current (CI):	15mA	
Max. Sensor Supply Current:	100mA	
Input Impedance:	>10k ohms	
Recommended Cable:	2, 3 or 4 core	

Order Reference: **TX2141.303.03** **CHANNEL CARD** **GENERAL PURPOSE**

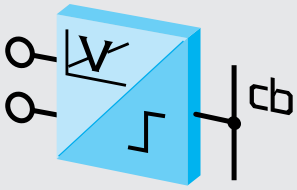
Please specify: • **Specific voltage measuring range.**

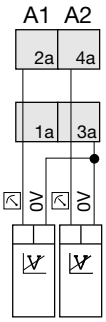
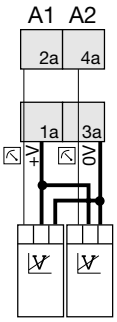
4.1.4 TX2141.304 CHANNEL CARD

DUAL ANALOGUE INPUT

0.4...2 Volt signals

- Two independent inputs.
- Power supply output available for sensors.



Connections: (Channel A)	2 wire	3 wire
	 • *Dual 2 wire voltage signals* • *Sensors have independent or integral power supply*	 • *Dual 2 wire voltage signals* • *+V power supply to sensors* • *0V power supply to sensors combined with ⊘ 0V*
Maximum Cable Length: 1mm² 2.5mm²	 4000m 10000m	10mA Sensor / 40mA Sensor 80m / 20m 200m / 50m *Volt drop introduced on to the common 0V line by the supply feed to the sensor will be superimposed on to the signal. The signal accuracy shift caused by this is the factor that limits the cable length.*
Field Device Current (FI):	Insignificant.	Current required to power the sensor.

	TX2141.304.03	TX2141.304.02
Sensor Voltage:	24V dc	
Channel Card Current (CI):	30mA	
Max. Sensor Supply Current:	100mA	
Input Impedance:	>10k ohms	
Recommended Cable:	2, 3 or 4 core	
Isolation:	Group isolated from the Commandbus.	

Order Reference:	TX2141.304.03 CHANNEL CARD	GENERAL PURPOSE

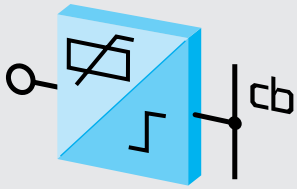
Please specify: • **Specific voltage measuring ranges (For A1 and A2 locations).**

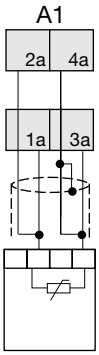
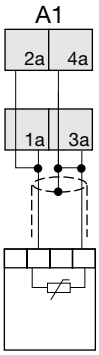
4.1.6 TX2141.306 CHANNEL CARD

ANALOGUE INPUT

PT100 temperature signal

- Standardised to DIN 43760, BS 1904 and IEC 751.
- Ranges: Selectable scaling from –50°C. up to 400°C.
- Optional 4 wire or 2 wire connection.



Connections: (Channel A)	4 wire 	2 wire 
Maximum Cable Length: 1mm² 2.5mm²	 100m 100m	 10m 25m
Field Device Current (FI):	1mA	

	TX2141.306.03	TX2141.306.02
Channel Card Current (CI):	15mA	
Recommended Cable:	2 core • overall screen or 4 core • overall screen	

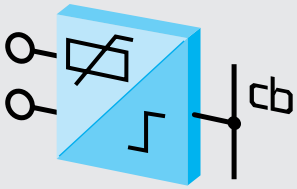
Order Reference: **TX2141.306.03** CHANNEL CARD GENERAL PURPOSE

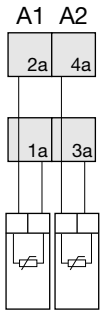
4.1.7 TX2141.307 CHANNEL CARD

DUAL ANALOGUE INPUT

PT100 temperature signals

- Two independent inputs.
- Standardised to DIN 43760 and BS 1904.
- Ranges: Selectable scaling from –50°C. up to 400°C.



Connections: (Channel A)	
Field Device Current (FI):	1mA per location

	TX2141.307.03	TX2141.307.02
Channel Card Current (CI):	15mA	
Maximum Cable Length: 1 mm² 2.5 mm²	 10m 25m	
Recommended Cable:	2 core • overall screen per input	

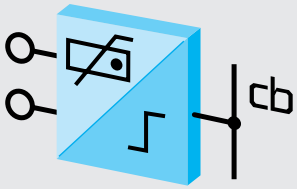
Order Reference: **TX2141.307.03** CHANNEL CARD GENERAL PURPOSE

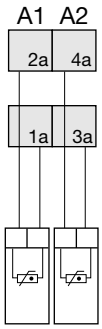
4.1.8 TX2141.308 CHANNEL CARD

DUAL ANALOGUE INPUT

semiconductor temperature signals

- Two independent inputs.
- Linearised input.
- Selectable scaling from –50°C up to 200°C.
  (KTY21: –50°C...100°C) (KTY84: –50°C...200°C)



Connections: (Channel A)	
Field Device Current (FI):	1mA per location

	TX2141.308.03	TX2141.308.02
Channel Card Current (CI):	15mA	
Maximum Cable Length:	200m	
Recommended Cable:	2 core	

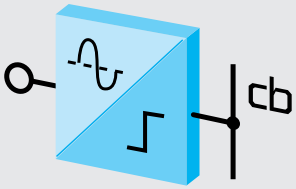
Order Reference:	TX2141.308.03 CHANNEL CARD	GENERAL PURPOSE

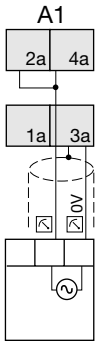
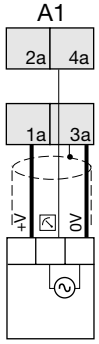
4.1.9 TX2141.309 CHANNEL CARD

ANALOGUE INPUT

ac voltage signals

- ac voltage signals from Vibration Sensors, load cells, ac generators, power measuring instruments.
- ac RMS detection.
- Bandpass frequency response (3dB): 10Hz...100Hz (Velocity).
  500Hz...10kHz (Acceleration).
- ICP and dc powered sensors.
- For use with Trolex TX5630 Series Vibration Sensors.



Connections: (Channel A)	ICP Sensor (TX5630)	dc Powered Sensor
		
Field Device Current (FI):	Insignificant.	

	TX2141.309.03	TX2141.309.02
Channel Card Current:	30mA	
Maximum Cable Length:	200m	
Recommended Cable:	ICP Sensor: 2 core • overall screen dc Powered Sensor: 3 core • overall screen	

CHECK POINT *Please refer to Trolex Application Data for Vibration Monitoring.*

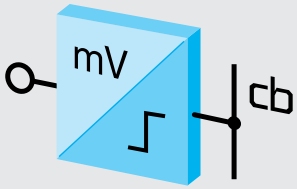
Order Reference: **TX2141.309.03 CHANNEL CARD** **GENERAL PURPOSE**

Please specify:
- Bandpass frequency 10Hz...100Hz (Velocity)
- Bandpass frequency 500Hz...10kHz (Acceleration)
- Specific input filter range.
- Sensor sensitivity (mV/g).

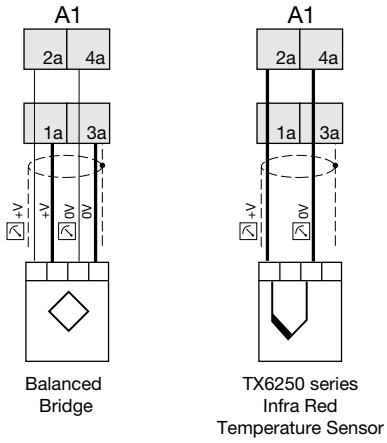
4.1.10 TX2141.310 CHANNEL CARD

ANALOGUE INPUT

mV signals



- Low level inputs from balanced bridges, load cells, strain gauges, pressure sensors and gas sensors.
- Measuring range options.
- Current regulated sensor energising supply output.
- Zero offset and span calibration.
- Accepts input signals from TX6250 series Infra-Red Temperature Sensors. Application specific ranges from –20°C up to 400°C.

Connections: (Channel A)	
Field Device Current (FI):	Current required to power the sensor.

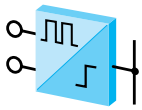
	TX2141.310.03	TX2141.310.02
Channel Card Current (CI):	15mA	
Measuring Ranges:	0...2mV / 0...5mV / 0...10mV / 0...50mV / 0...100mV / 0...1000mV / 0...2000mV	
Sensor Current Regulation:	0...50mA	
Input Impedance:	100k ohms Ⓟ	
Max Sensor Supply Current:	100mA	
Maximum Cable Length:	200m	
Recommended Cable:	4 core • overall screen	

Order Reference: **TX2141.310.03** **CHANNEL CARD** **GENERAL PURPOSE**

Please specify:
- Measuring range 0...2mV
- Measuring range 0...5mV
- Measuring range 0...10mV
- Measuring range 0...50mV
- Measuring range 0...100mV
- Measuring range 0...1V
- Measuring range 0...2V
- Measuring range Specific Voltage

4.2 PULSE FREQUENCY INPUT CHANNEL CARD.

4.2.1 TX2141.401 Pulse/frequency input

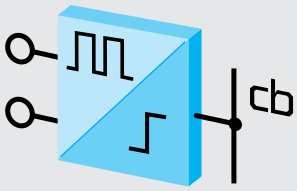


4.2.1 TX2141.401 CHANNEL CARD

DIGITAL INPUT

pulse/frequency signals

- Pulse frequency signals from switches, proximity sensors, photocells and pulse wheels, frequency generators.
- Two independent inputs for function options.
- Frequency range: 0...10kHz.
- Programmable for: counting, pulse interval, pulse frequency, differential frequency, percentage pulse comparison, slip frequency, differential slip.

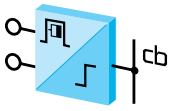
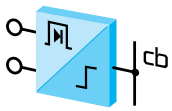
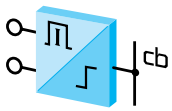
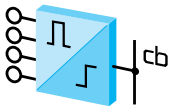


Connections:			
(Channel A) Input Signal +V Present 0V Absent	A1 2a 4a 1a 3a P1 P2 +V +V • *Input switches (section 12.2.2 D1).*	A1 2a 4a 1a 3a P1 P2 +V +V • *NAMUR proximity sensors DIN 19234* • *Discrete fault alarm generated for OPEN CIRCUIT and SHORT CIRCUIT line condition. (section 12.2.2).*	A1 2a 4a 1a 3a P1 P2 +V +V • *Solid state or photocell input (section 12.2.2 D1).*
Field Device Current (FI):	Insignificant	2mA per NAMUR	Insignificant

	TX2141.401.03	TX2141.401.02
Channel Card Current (CI):	30mA	
Maximum Cable Length:	500m	
Recommended Cable:	2 core • overall screen (per input)	
Sensor Voltage:	8.2V	
Frequency Range:	0...10kHz	

Order Reference: **TX2141.401.03** **CHANNEL CARD** **GENERAL PURPOSE**

4.3 ONOFF/STATE INPUT CHANNEL CARD.

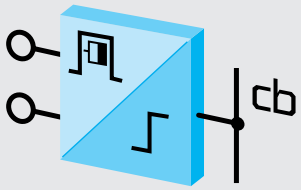
4.3.1	TX2141.501	Dual NAMUR inputs	
4.3.2	TX2141.502	Dual Switch inputs with line monitoring	
4.3.3	TX2141.503	Dual Current state change inputs	
4.3.4	TX2141.504	Quad Switch inputs	

4.3.1 TX2141.501 CHANNEL CARD

DUAL DIGITAL INPUT

NAMUR inputs

- Change of state signals.
- Two independent inputs for NAMUR sensor inputs.
- Two independent inputs for simple ON/OFF switches.



Connections: **(Channel A)** Input Signal +V — Present 0V — Absent	A1 A2 2a 4a 1a 3a +V +V • *2 x NAMUR proximity sensors to DIN 19234.* • *Discrete FAULT alarm generated for OPEN CIRCUIT and SHORT CIRCUIT line condition (section 12.2.3 ☞).* A1 A2 2a 4a 1a 3a +V +V • *Can also be used with 2 x conventional ON/OFF switches. (section 12.2.3 D1).*
Field Device Current (FI):	2mA max per NAMUR

	TX2141.501.03	TX2141.501.02
Channel Card Current (CI):	30mA	
Maximum Cable Length:	500m	
Recommended Cable:	2 core • overall screen (per input)	
Supply Voltage:	8.2V	
Max Switch Frequency:	10Hz	

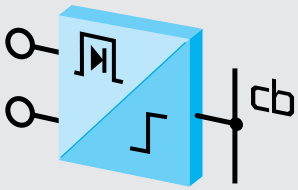
Order Reference: **TX2141.501.03** **CHANNEL CARD** **GENERAL PURPOSE**

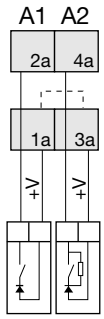
4.3.2 TX2141.502 CHANNEL CARD

DUAL DIGITAL INPUT

Switch inputs with line monitoring

- Change of state signals.
- Two independent inputs for simple ON/OFF switches with sensor line monitoring.



Connections: **(Channel A)** Input Signal +V Present 0V Absent	 • *Switches with series diode* • *Detection of SHORT CIRCUIT switch line, with series diode* • *Detection of OPEN CIRCUIT switch line also, when contact shunt resistor is added* • *Discrete FAULT alarms generated for OPEN CIRCUIT and SHORT CIRCUIT line condition (section 12.2.3)*
Field Device Current (FI):	1mA per location

	TX2141.502.03	TX2141.502.02
Channel Card Current (CI):	15mA	
Maximum Cable Length:	500m	
Recommended Cable:	2 core • overall screen (per input)	

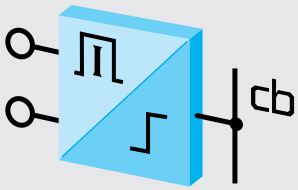
Order Reference: **TX2141.502.03** CHANNEL CARD GENERAL PURPOSE

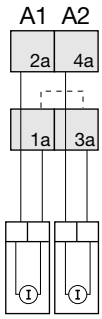
4.3.3 TX2141.503 CHANNEL CARD

DUAL DIGITAL INPUT

Current state inputs

- Change of state signals.
- Two independent inputs for sensors with current STATE CHANGE for fire and gas applications, smoke, flame, breakglass, etc.



Connections: **(Channel A)** Input Signal +V Present 0V Absent	 • *Discrete FAULT alarms generated for OPEN CIRCUIT or SHORT CIRCUIT condition (section 12.2.3)* • *Current level state change. Normal: Less than 8mA Alarm: More than 20mA* • *Maximum number of loop devices: 25* Ⓟ
Field Device Current (FI):	Insignificant.

	TX2141.503.03	TX2141.503.02
Channel Card Current (CI):	30mA	
Maximum Cable Length:	500m	
Recommended Cable:	2 core • overall screen (per input)	

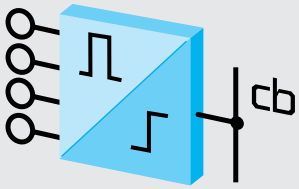
Order Reference:	TX2141.503.03 CHANNEL CARD	GENERAL PURPOSE

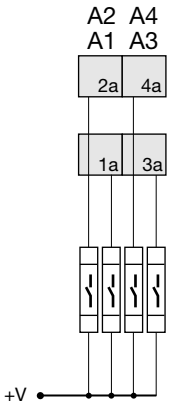
4.3.4 TX2141.504 CHANNEL CARD

QUAD DIGITAL INPUT

Switch inputs

- Change of state signals.
- Four independent inputs for simple ON/OFF switches.
- Limit switches, pressure switches, level switches, etc.



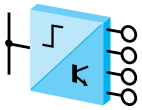
Connections: **(Channel A)** Input Signal +V — Present 0V — Absent	
Field Device Current (FI):	Insignificant.

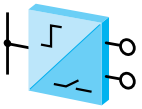
	TX2141.504.03
Channel Card Current (CI):	15mA
Maximum Cable Length:	500m
Recommended Cable:	2 core
Max Switch Input Voltage:	30V dc. • May be sourced from a separate power supply. • The 0V of both systems must be common.
Max Switch Frequency:	10Hz

Order Reference: **TX2141.504.03** CHANNEL CARD GENERAL PURPOSE

4.4 ONOFF/STATE OUTPUT CHANNEL CARDS.

4.4.3	TX2141.603	Quad Solid State Output
4.4.4	TX2141.604	Dual Relay Output



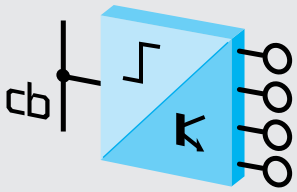


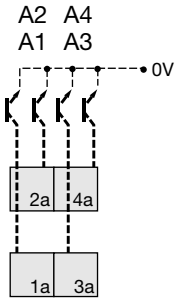
4.4.3 TX2141.603 CHANNEL CARD

QUAD ONOFF/STATE OUTPUT

solid state switch

- Four individual open collector solid state NPN switches.
- Output Rating: 400mA at 24V dc max.



Connections: (Channel A) Selectable for the preferred failsafe RESET STATE: OUTPUT CIRCUIT CLOSED (ON) OUTPUT CIRCUIT CLOSED (OFF) (section 12.2.4)	 • *Each output circuit is current limited to protect against short circuit conditions.* • *An alarm warning will be generated if a switching failure occurs (section 12.2.4)*
Field Device Current (FI):	Insignificant.

	TX2141.603.03
Max Load Voltage:	10...25V dc • May be sourced from a separate power supply. • The 0V of both systems must be common.
Max Load Current:	100mA.
Output Voltdrop:	Less than 1V.
Channel Card Current (CI):	30mA

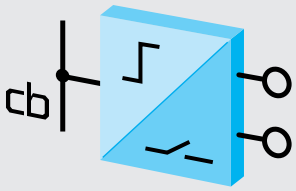
Order Reference: **TX2141.603.03** CHANNEL CARD GENERAL PURPOSE

4.4.4 TX2141.604 CHANNEL CARD

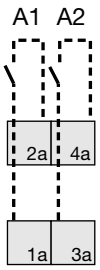
DUAL ONOFF/STATE OUTPUT

relay

- Two individual medium duty relays.
- Voltage free output contacts.
- Contact Rating: 2A 30V ac/dc.
- Contact Format: 1 N/O on each relay.
- Galvanically isolated output from the Commandbus.



Connections: (Channel A)	
Programmable in the SETUP section for the preferred failsafe RESET STATE: (section 12.2.4)	Standard contacts are wired NORMALLY OPEN NB: Contacts can also be supplied wired as NORMALLY CLOSED to specification.
OUTPUT CIRCUIT CLOSED (ON)	
OUTPUT CIRCUIT CLOSED (OFF)	• *Relay shown de-energised – no power* • *FAULT alarm generated if a relay operation failure is detected (12.2.4)*
Field Device Current (FI):	Insignificant.

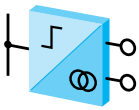


	TX2141.604
Max Contact Voltage:	30V ac/dc
Max Contact Current:	2A (resistive load)
Contact Format:	1 normally open
Channel Card Current (CI):	30mA
Isolation:	Output contacts are galvanically isolated

Order Reference: **TX2141.604.03** CHANNEL CARD GENERAL PURPOSE

4.5 ANALOGUE OUTPUT CHANNEL CARD.

4.5.1 TX2141.701 Dual 4...20mA Output

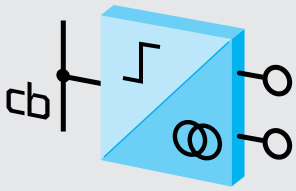


4.5.1 TX2141.701 CHANNEL CARD

DUAL ANALOGUE OUTPUT

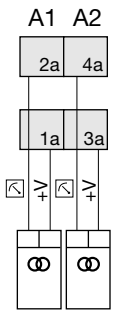
4...20mA

- Two independent outputs.
- Output control for motorised valves, controllers, servo devices, process loops, inverters, recorders, speed controllers, heat controllers.
- 4...20mA repeater when driven from an analogue channel card.
- Can be data code driven when a specific program is installed in the Command module (LAN 1/LAN 2).



Connections:

(Channel A)



- *UNDER RANGE/OVER RANGE will be indicated (section 10.2).*
- *LOW FAULT/HIGH FAULT will be indicated (section 10.2 and section 12.2.4 ☞).*

CAUTION• *Must only be interconnected with approved field apparatus when used in hazardous area applications.* Ex

Field Device Current (FI):	20mA for each field device connected.

	TX2141.701.03	TX2141.701.02
Channel Card Current (CI):	15mA	
Output Signal:	4...20mA	
Maximum Load:	450 ohms	

Order Reference: **TX2141.701.03** CHANNEL CARD GENERAL PURPOSE

4.6 ACCESSORIES.

TX2141.08 **Blank Channel Card to cover unused locations.**

TX2141.09 **Marking tag bar**

Self-adhesive fixing to the TX2102 Terminal Module. Supplied complete with 8 white tags for marking the specific duty reference of each channel.

4.7 COMMANDER CONNECTING TERMINALS.

Commander modules are fitted with large size, high integrity screw terminals, housing captive spring clamping washers for ease of access, and security of connection even in conditions where vibration in present.

- **Direct Connection**
  Two 2.5mm^2 conductors side by side.

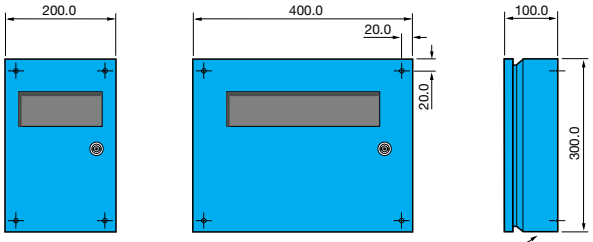
- **Crimp Connection**
  Two Bootlace crimps side by side or single Fork crimps: 6.5mm wide.

- **Screwdriver**
  4mm Flatblade or size 1 Pozidrive.

4.8 HOUSINGS FOR COMMANDER SYSTEMS.

TX9200 Series stainless steel Commander housings.

- Robust welded stainless steel construction.
- Mounting rails fitted.
- Observation window.
- Hinged cover with lockable fastening.
- Wall fixing facilities.
- IP66 environmental protection.



Moulded Polycarbonate weatherproof housings in a range of sizes.

- Transparent waterproof hinged covers.
- Wall fixing kit.
- Mounting rails fitted.
- Masking plates provided.
- Choice of cable entry facilities.

Stand-alone Wall Mounting Command Module.

Terminal Module with Commandbus Convertor

Compilation Commander Station
- Command Module
- Comms Repeater
- Terminal Module
- Commandbus Convertor

5 TX2131 commandbus convertor module

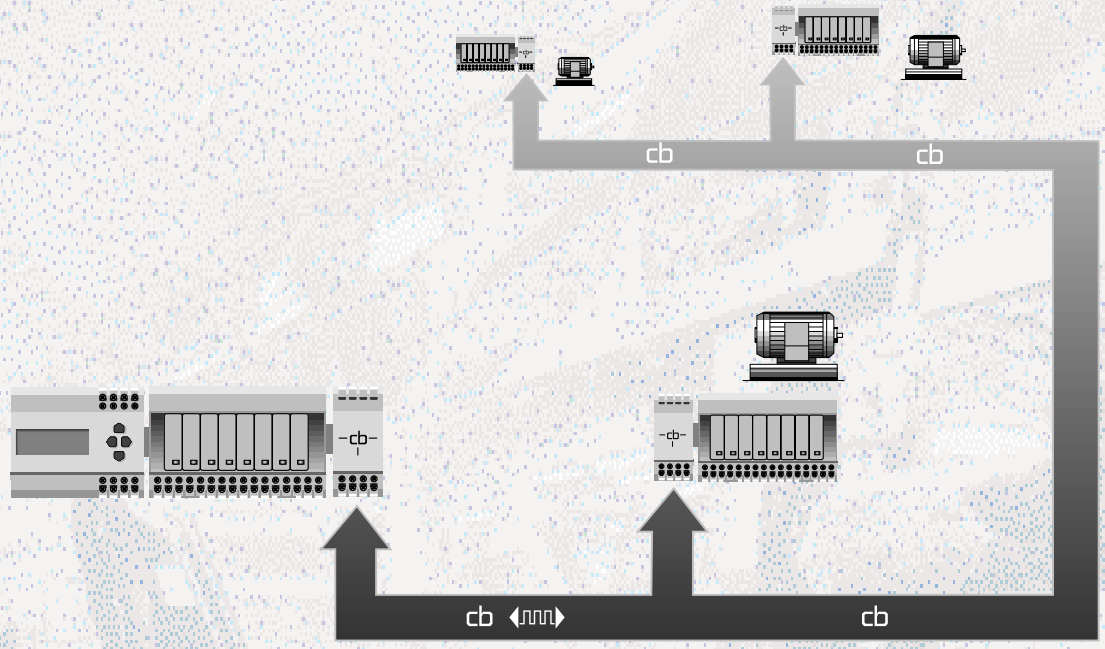
TX2121 commandbus repeater module

PART 1
5. TX2131 COMMANDBUS CONVERTOR MODULES

The TX2131 Convertor Module couples directly to the Commandbus and provides a hard wired conversion to screw terminal connections for cabling the Commandbus to Terminal Modules that are DISPERSED at some distance away.

5.1 Data cable connection to a dispersed Terminal Module

5.2 Locally dispersed Commander system communicating data to and from a central Command Module

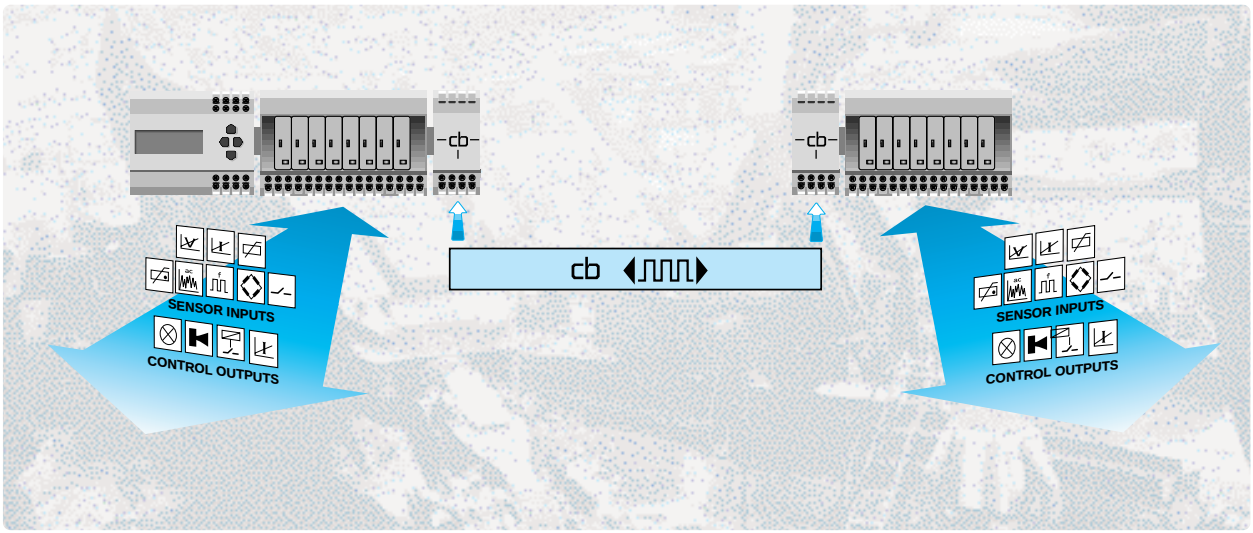


- Total line length (without repeaters) can be up to 1000m dependent upon application condition,or a maximum of 30 Terminal Modules.

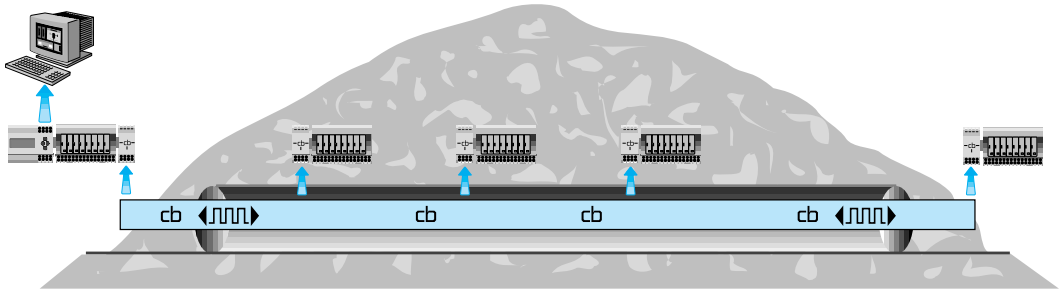
CHECK POINT **Power supply considerations (section 5.4)**

5.3 A Commander System programmed to function in Complementary Mode.

I/O signals and data entering at one end of the system are directly replicated as I/O at the other end, using a single data cable.



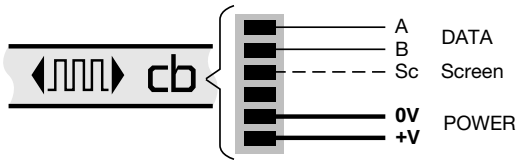
A Commander system in complementary mode exchanging data and control signals along a tunnel.



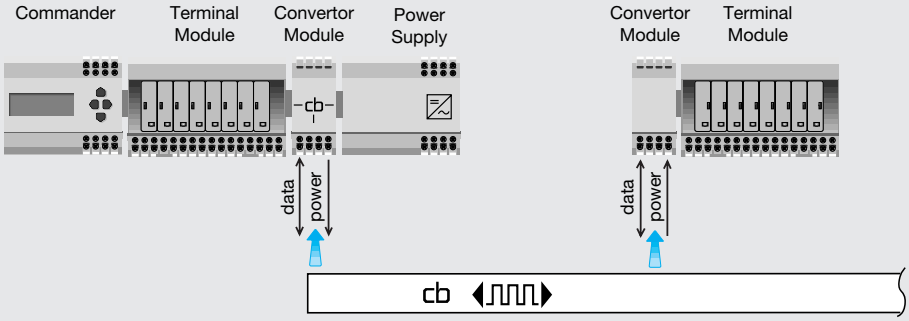
The transmission distance of the Commandbus may be increased at any point by using a TX2121 comms repeater module (section 5).

5.4 Power Supply distribution to dispersed Commander Stations.

The dc power supply to energise a Commander System is normally an integral part of the Commandbus.

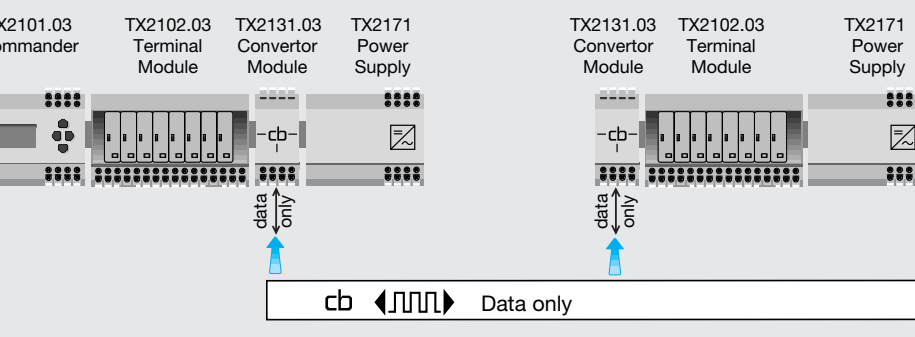


- Both data and power can be transmitted to dispersed Commander Stations.
- Recommended cable (with power): 2 twisted pairs • Individually screened pairs, Collectively screened • BS 5308 pt1.
- The screen of the Commandbus is ultimately internally connected to the 0V terminal on the Command Module ONLY. Connect the Command Module 0V to a secure Earth at this point ONLY if required.



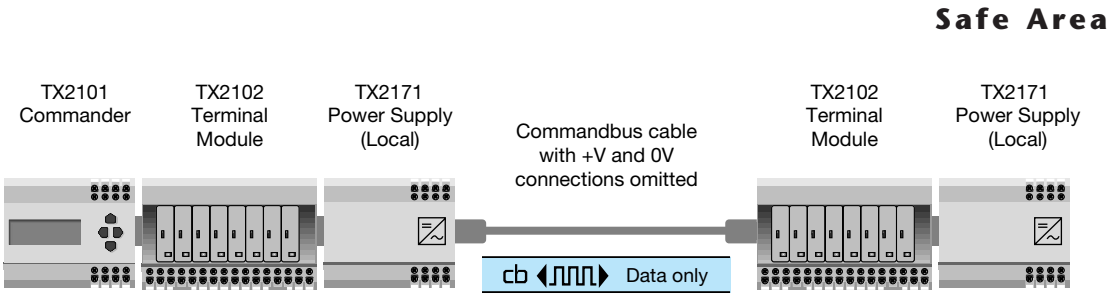
If independent power supplies are installed at EACH dispersed Commander station it means that the Commandbus cable can be reduced to 2 cores (1 twisted pair), as the +V and 0V power conductors are now eliminated. This fact can also, potentially, increase the transmitting distance because the supply voltage delivered to the Commander modules will be no longer influenced by volt drop in the run of interconnecting cable.

Larger scale systems can also be assembled now that the total power supply capability is not limited by the current capacity of the power supply at the Commander base station.

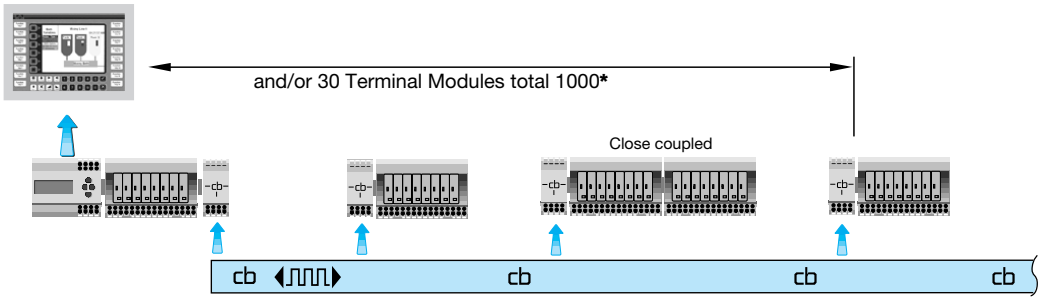


PART 1
5. TX2131 COMMANDBUS CONVERTOR MODULES

Even on non-dispersed Commander systems, where Commandbus convertor modules are not needed - the same principles can be employed to introduce multiple power supplies where a single power supply will not drive the channel capacity required.



5.5 Transmission Distance of the Commandbus on dispersed Datalinks

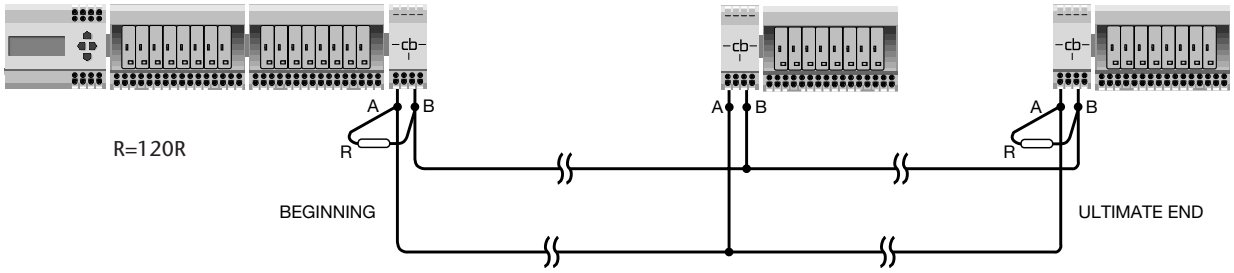


COMMANDBUS PARAMETERS

- Physical layer: RS485 (Multidrop).
- Max. number of Terminal modules: 30 (subject to Ex restrictions).
- Maximum distance: 1000m TOTAL (without Commandbus repeaters).

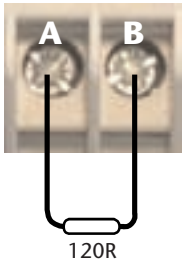
5.6 Impedance Matching of Commandbus dispersed Datalinks

Dispersed Commandbus datalinks will perform best when the live impedance of a Commander system is correctly matched. Impedance conditions will vary from one installation to the next, dependent upon the type of cable used, the length of the cable, the data rate adopted by the Command module and the general architecture of the system installed.



- As a general rule, fitting an End-of-Line Termination Resistor at the BEGINNING of a data cable run, and one at the ULTIMATE END of the data cable run, will usually achieve optimum results.

- The resistor can be connected directly across the 'A' and 'B' conductors of the data cable using the appropriate terminals on the Commandbus Convertor module.

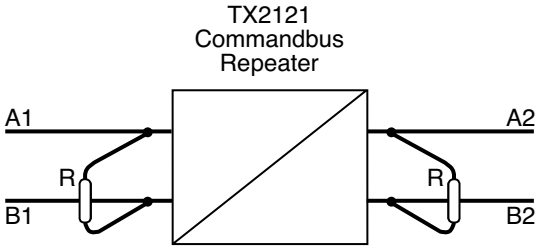


CHECK POINT • Do not use more than two Termination Resistors on a system except when TX2121 Commandbus Repeaters are incorporated into a datalink (section 5.7).

- In some instances, Termination Resistors may not be needed or will not have the desired effect and can sometimes make matters worse – it all depends upon prevailing circumstances.
  More detailed circuit examination may be necessary and additional information is available in Trolex document: COMMUNICATING WITH COMMANDER.

5.7 Using a TX2121 Commandbus Repeater

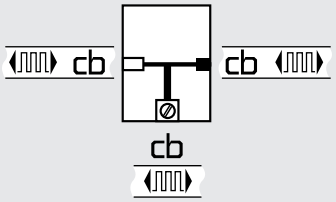
In most applications where a TX2121 Commandbus Repeater is incorporated into a dispersed Commandbus, it will be necessary to connect Termination Resistors to **BOTH** ports of the Repeater in addition to the ones at the BEGINNING and ULTIMATE END of the datalink.



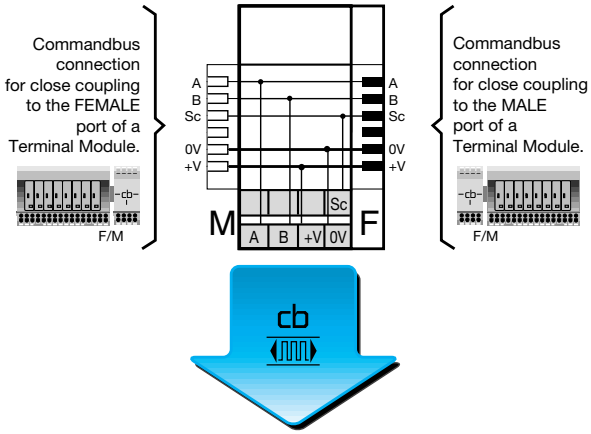
Here again, this may need further expert analysis where unusual conditions prevail.

5.6 TX2131 COMMANDBUS CONVERTOR MODULE

- Converts the Commandbus to screw terminal connections to enable cable connection runs to locally dispersed Commander systems.
- Internally hard-wired passive device.



Connections:

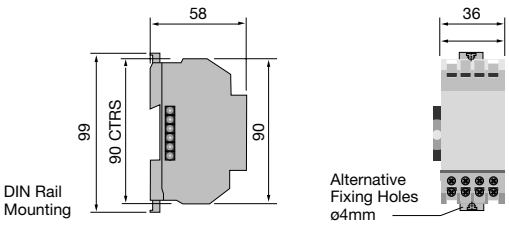


CAUTION • *The screen of the Commandbus is ultimately internally connected to the 0V terminal on the Command Module ONLY. Connect the Command Module 0V to a secure Earth at this point ONLY if required.*

CAUTION • *The Commandbus Convertor MUST only be connected to one port (M or F). Do not use it as a 'branch' connection.*

Recommended Cable (with power):	2 twisted pair • Individually Screened • Collectively Screened • B5308 pt1
Recommended Cable (no power):	1 twisted pair • Collectively Screened • B5308 pt1
Maximum Power Supply Current:	6 Amps (system total).

Dimensions:

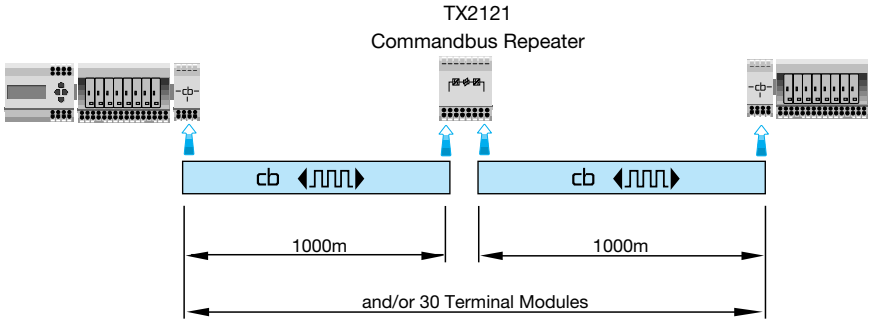


All dimensions in mm.

Order Reference: **TX2131** COMMANDBUS CONVERTOR MODULE

EXTENSION OF THE TRANSMISSION DISTANCE

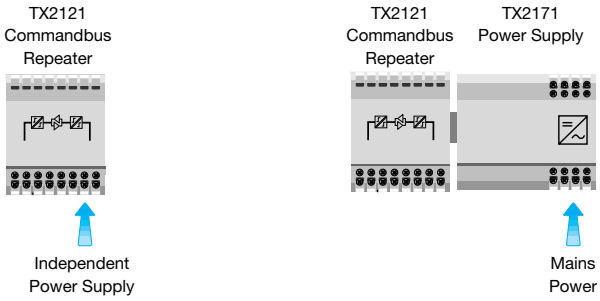
The transmission distance of a Commandbus link can be increased by incorporating a TX2121 Commandbus Repeater.
Each Repeater Module will increase the operating distance of the Commandbus by 1000 metres depending upon the cable and installation parameters.



The power supply for the Repeater Module can be derived from the Commandbus in the normal way, where system conditions permit. (Terminals +V and 0V on the Repeater Module).

USING A LOCAL POWER SUPPLY TO POWER THE COMMANDBUS REPEATER MODULE

The Repeater Module can be powered from a local independent power source or from a directly connected TX2171 or TX2172 power supply.



CAUTION THE POWER CONNECTIONS OF THE COMMANDBUS **MUST** BE OMITTED WHEN THE COMMANDBUS REPEATER IS LOCALLY POWERED.

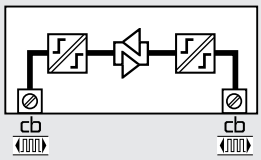
PART 1
5. TX2121 COMMANDBUS REPEATER MODULES

TX2121.03 COMMANDBUS REPEATER MODULE

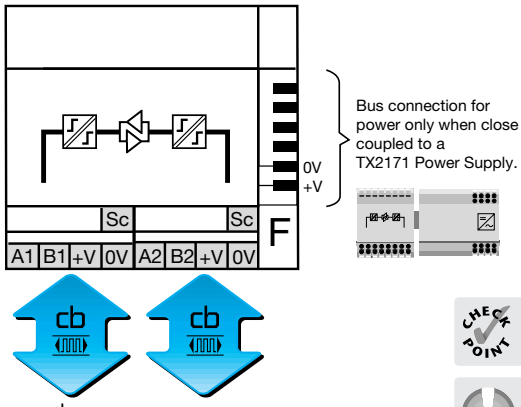
GENERAL PURPOSE

cb isolated datacomms

- Commandbus repeater with galvanic isolation.
- Increase distance on Commandbus networks.



Connections:



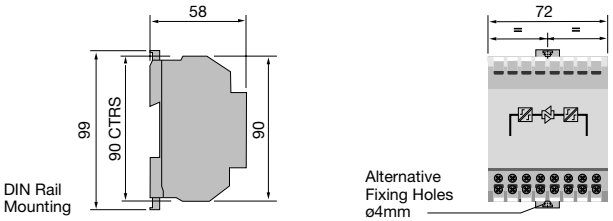
The cb data ports are bipolar and data flow can be either direction

CHECK POINT *The module must be mounted in a protective metal housing (eg: TX9202 or TX9204).*

CAUTION
- *The screen of the Commandbus is ultimately internally connected to the 0V terminal on the Command Module ONLY. Connect the Command Module 0V to a secure Earth at this point ONLY if required.*

Power Supply:	• 24V on terminals +V and 0V (Can be derived from the Commandbus cable where operating conditions permit). • Power can also be supplied locally from an approved 24V dc supply connected to terminals +V and 0V. THE POWER CONNECTIONS OF THE COMMANDBUS **MUST** BE OMITTED. • Power can also be supplied locally from a directly connected TX2171 24V dc power supply through the bus power connection. THE POWER CONNECTIONS OF THE COMMANDBUS **MUST** BE OMITTED.
Current Consumption:	30mA
Physical Layer:	RS485.
Protocol:	Trolex proprietary.
Additional cb Distance:	1000m (Dependent upon cable and installation parameters).
Recommended Cable:	Twisted pair • Collectively Screened • B5308 pt1

Dimensions:

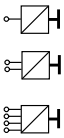


All dimensions in mm.

Order Reference: **TX2121.03 COMMANDBUS REPEATER MODULE.** **GENERAL PURPOSE**

COMMANDER SYSTEM DESIGN

Commandbus System Capacity

- Maximum TERMINAL MODULES :  30
- Maximum CHANNEL CARDS :  30 x 8 = 240
- Maximum LOCATIONS :  240 x Single = 240
  240 x Dual = 480
  240 x Quad = 960
  } (or any combination of these)

Maximum Cable Distance : 1000m total line length without Commandbus repeaters (dependent upon installation parameters)
A TX2121Commandbus Repeater will give a further 1000m distance.

Commandbus Response Time

Response time of a given Commander system configuration is a function of the number of Terminal Modules in the network.

Response Time cb = TERMINAL MODULES x 100 milliseconds

System Architecture

In practice, the structural architecture and operating distribution of a Commander system are both influenced by related technical parameters:

- The topology and distribution of the plant.
- The type of sensors and plant devices.
- System power requirements and power distribution.
- The type of cable used for the databus.
- The overall resultant time response of the system.

Our Commander system application engineers can provide technical assessment of individual installation designs.

CHECK POINT • Power supply considerations (section 5.4).

6 power supplies

CHECK POINT

AUDITING THE TOTAL SYSTEM CURRENT.

Before selecting a power supply, do a Commander System Current Audit. Summate the power requirement of all Commander Modules that are served by a single power supply.

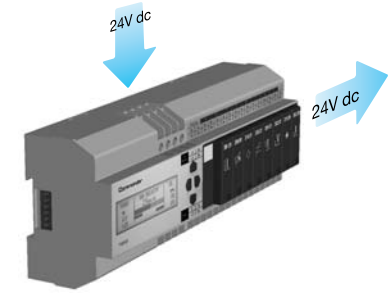
Command Module (section 2)	**mA**
Terminal Modules (section 3.9)	**mA**
Commandbus Repeater Modules (section 5.6)	**mA**
TOTAL:	**mA**

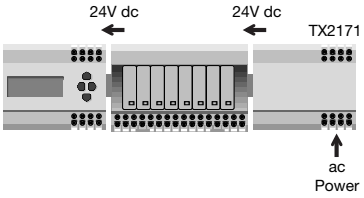
PART 1
6. POWER SUPPLIES

Several options are available to power Commander systems, the choice is dependent upon the type of system being installed:

6.1 GENERAL PURPOSE 24V dc.

- General purpose systems may be powered from a proprietary external stabilised 24V dc power supply. It is only necessary to feed the power to the COMMAND MODULE as power is distributed to the remainder of the system through the COMMANDBUS.
  (Maximum total COMMANDBUS current: 6 Amps).
- The TX2171 Power Supply provides a very convenient method of powering General Purpose systems. It couples directly onto the COMMANDBUS distributing a stabilised 24V dc supply to the complete system through the Commandbus.

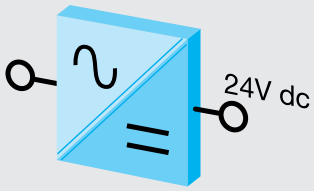




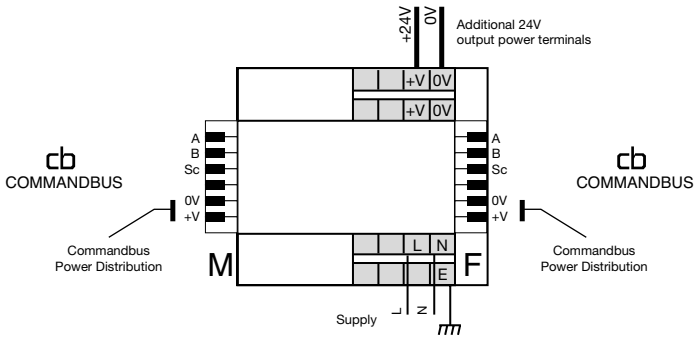
6.1 TX2171 POWER SUPPLY MODULE

GENERAL PURPOSE

- 24V dc power supply.
- Convenient, direct coupling to the Commandbus.



Connections:

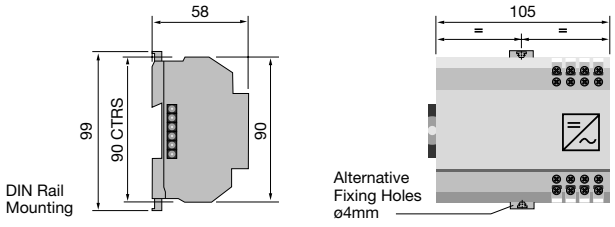


CHECK POINT *The module must be mounted in a protective metal housing when installed in a SAFE AREA (eg: TX9202 or TX9204).*

CHECK POINT *Power supply considerations (Section 5.4).*

Input Voltage:	85V ac...264V ac universal.
Output Voltage:	24V dc ±0.5V.
Output Current:	1 amp.

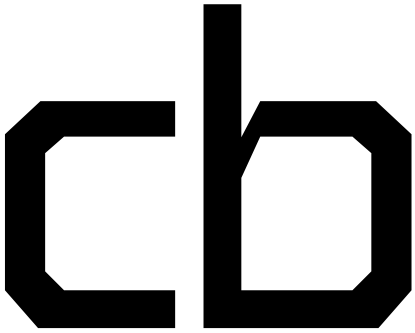
Dimensions:



All dimensions in mm.

Order Reference: **TX2171 POWER SUPPLY MODULE GENERAL PURPOSE**

8 commandbus cables



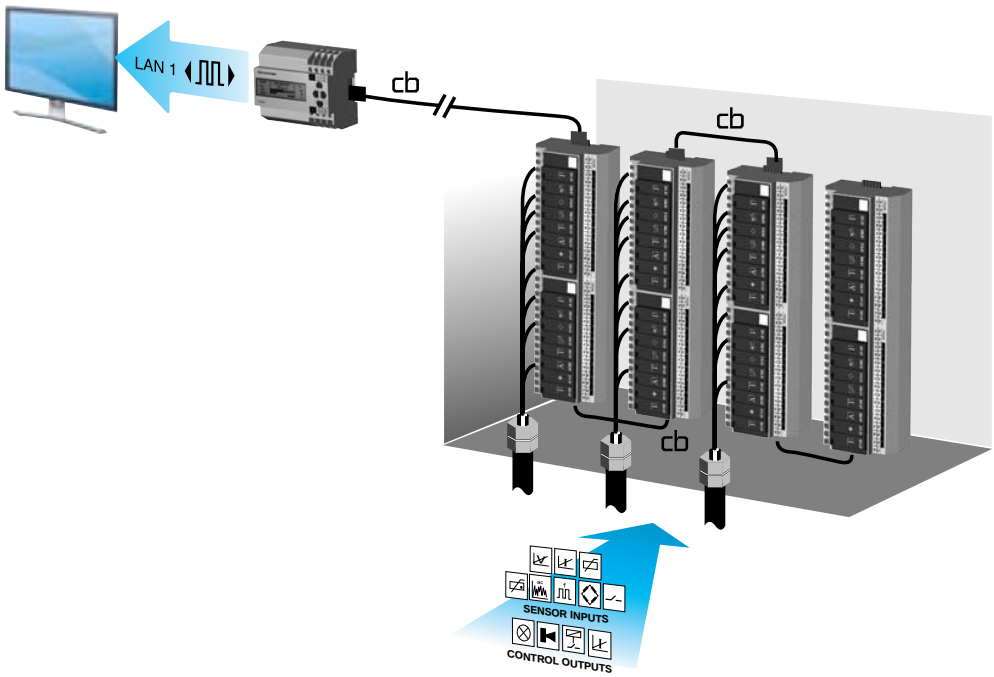
PART 1
8. COMMANDBUS CABLES

- Commander modules are designed to be conveniently close coupled together on a standard DIN rail using the integral Commandbus connecting system.

- Commandbus cables may be used to extend to locally dispersed Commandbus groups:

- Control panel wiring can be almost eliminated by connecting incoming field cables directly to the Commander terminal modules.

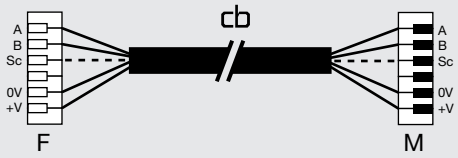
  Control room cabling can also be simplified by using the Commandbus communication to interface with display systems.



CAUTION • *Power Supply Considerations (Section 5.4).*

8.1 COMMANDBUS CABLES

- Interconnecting cables and connectors for locally dispersed Commandbus systems.



Order Reference:

TX2151 **COMMANDBUS CABLE HEADER. MALE**
(Internal screw terminal connections).
The housing of the connector is fitted with two retaining screws for anchoring to the TX2104 Series Command Modules, panel mounting version.

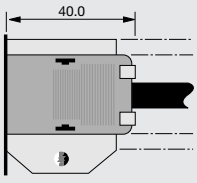
TX2152 **COMMANDBUS CABLE HEADER • FEMALE**
(Internal screw terminal connections)

TX2153 **COMMANDBUS CABLE HEADER • MALE**
(Internal screw terminal connections)

TX2154 **6 CORE (5 used) COMMANDBUS CABLE**
(For use with TX2151, TX2152 and TX2153)

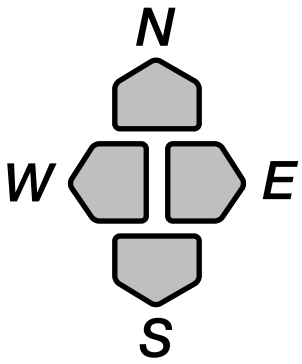
per metre

TX2158 **DIN RAIL END CLAMP**

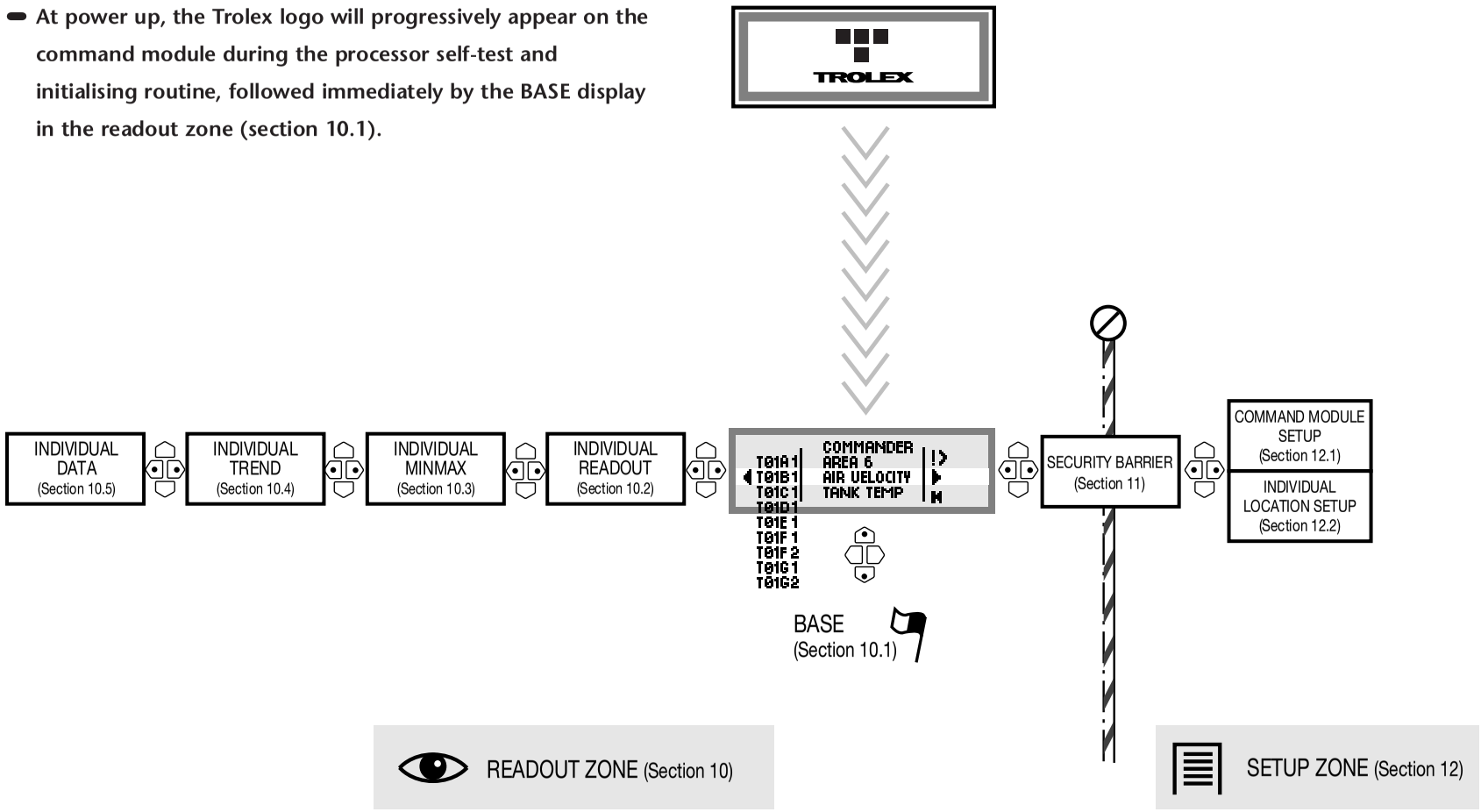


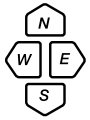
TX2159 **END CLAMP WITH CABLE ANCHOR**
Commandbus cable headers can be secured in position by using the retainer provided on this end clamp

9 navigator map



- At power up, the Trolex logo will progressively appear on the command module during the processor self-test and initialising routine, followed immediately by the BASE display in the readout zone (section 10.1).



- Traverse the Navigator Map using the NAVIGATOR KEYPAD. 

Each key operation will click: 

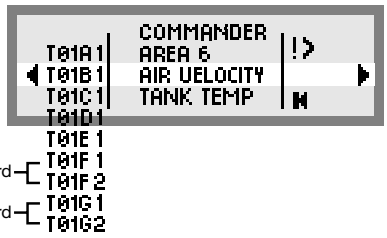
10 readout zone

readout zone

The Command Module will display CURRENT data relating to the input signals, or the output driver signals, at each LOCATION.

10.1 BASE

The BASE readout will show the current data about the first items in the list of locations:



T O1B1 : Location address.

AIR UELOCITY : Duty text (section 12.2.1).

: An alarm setpoint is ON (section 12).

: Cursor indicating direction to READOUT ZONE.

: Cursor indicating direction to SETUP ZONE.

!> : Over range input signal.

<! : Under range input signal.

F >> : HIGH fault.

<< F : LOW fault.

EXC : Channel card STATUS is EXCLUDE (section 12.2.1).

<S> : Scan failure.

CHECK POINT Unused locations will not appear in the BASE READOUT.

: Scroll *N/S* to a selected location.

: Key and hold for rapid auto keying.

10.2 INDIVIDUAL READOUT

Step *W* for a more detailed readout of a selected location.

T 01B1 : Location address (Terminal module '01'/LOCATION 'B1').

AIR VELOCITY : Duty text (section 12.2.1).

: Type of channel card (section 4).

25m/s : Signal status with units (section 12.2.1).

: Bar graph of input signal STATIC.

: Bar graph of input signal INCREASING TENDENCY.

: Bar graph of input signal DECREASING TENDENCY.

: Setpoint 1 marker (section 12.2.1) denoting an UNDER alarm.
: Setpoint 2 marker (section 12.2.1) denoting an OVER alarm.

: SETPOINT 1 activated (ON) (section 12.2.1).

: SETPOINT 2 activated (ON) (section 12.2.1).

1.0 : LOWER SCALE MEASURING value (section 12.2.1).

30 : UPPER SCALE MEASURING value (section 12.2.1).

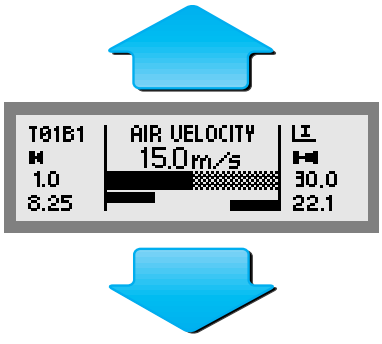
8.25 : SETPOINT 1 value (section 12.2.1).

22.1 : SETPOINT 2 value (section 12.2.1).

EXC : Channel card STATUS is EXCLUDE (section 12.2.1).

<S> : Scan failure.

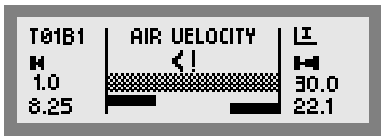
Scroll *N/S* to other individual locations.



UNDER RANGE/OVER RANGE INPUT

Indication will be given if the input signal on a particular channel location transgresses beyond the normal operating range:

- The Analogue input signal level is UNDER RANGE.



eg: Below 4mA

- The Analogue input signal level is OVER RANGE.

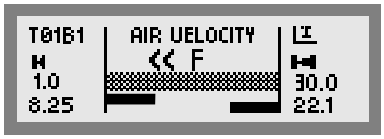
eg: Above 20mA

FAULT INPUT

Indication will be given if the input signal on a particular channel location transgresses beyond 10% above or below the normal operating range.

A FAULT alarm state will also be initiated
(section 12.2.1 / 12.2.2 / 12.2.3 / 12.2.4 / 12.2.5 ☞):

- The Analogue input signal level is LOW FAULT.

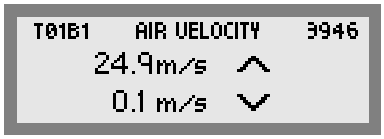


eg: Below 3.6mA

- The Analogue input signal level is HIGH FAULT.

eg: Above 22mA

10.3 INDIVIDUAL MINMAX



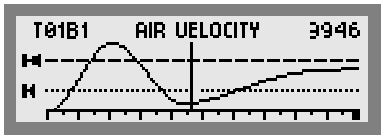
Step *W* for details of the MINIMUM and MAXIMUM measured values attained since last reset (section 12.2.1).

AIR VELOCITY : Duty text (section 12.2.1).

: Maximum.

: Minimum.

10.4 INDIVIDUAL TREND



Step *W* for historical trend graph (Hold for accelerated stepping).

AIR VELOCITY : Duty text (section 12.2.1).

3946 : Log number.

: Setpoint 2 (section 12.2.1).

: Setpoint 1 (section 12.2.1).

: Cursor (section 10.5).

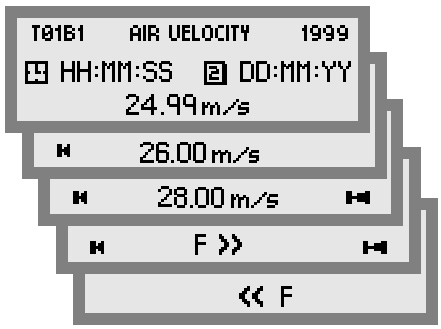
: Zero baseline.

: Century marker. The display graph represents 100 logged readings. Each increment represent the next 100 readings. Total maximum logged readings: 4000.

Scroll *N/S* to TRAVERSE the cursor (Key and hold for self scrolling).

CHECK POINT
- Setpoint 1 and Setpoint 2 are PRESENT values only.
- When the cursor reaches one of the extremities of a display field it will transfer to the mid-point of the succeeding display field.

10.5 INDIVIDUAL DATA



Step *W* for details of the data present at the cursor position selected (section 10.4).
This data is recorded in the log (section 12.1.5).

(Key and hold for scroll).

Additional EVENT data is also displayed and recorded as shown.

F : Fault condition.

: Alarm event.

Step *E* to return.

11 security barrier

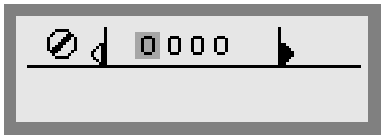
security barrier

Attempts to step *EAST* into the SETUP ZONE will be halted if the security barrier is closed. Enter the KEYCODE to open the barrier:

Scroll ***E/W*** to TRAVERSE the digits.

Scroll ***N/S*** to CHANGE the digits.

Step ***E*** to PASS into the setup zone.



CHECK POINT This routine will not appear if the security barrier is open (section 12.1.1).

12 setup zone

setup zone

The fundamental operating characteristics of the Commander System can be SETUP as preferred.

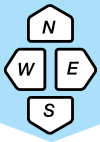
The first SETUP task is:

12.1 COMMAND MODULE SETUP

followed by

12.2 INDIVIDUAL LOCATION SETUPS

ENTER THE REQUIRED SETUPS BY USING THE COMMAND MODULE NAVIGATOR KEYPAD



CHECK POINT

Conventions during the SETUP routines:

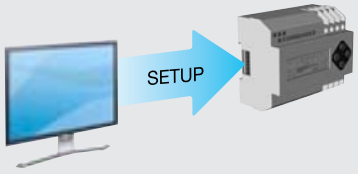
Step ***E*** to CONFIRM data
(followed by AUTOMATIC RETURN to menu).

Step ***W*** to EXIT data.

Step ***W*** to RETURN to BASE.

ALSO

The complete setup can also be installed directly into the Command Module through the LAN 1 or LAN 2 data ports, using the TX2199 Commander Configuration Software Package (section 13).



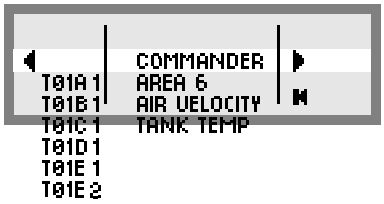
PART 1
12. SETUP ZONE

12.1 COMMAND MODULE SETUP

Starting from BASE (section 10.1).

Scroll *N/S* to COMMANDER.

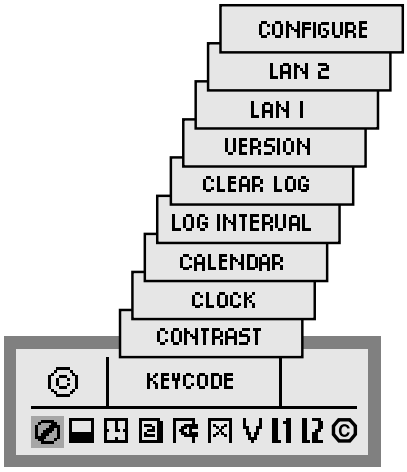
Step *E* to the COMMAND MODULE setup.



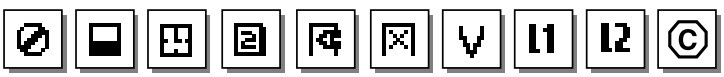
CHECK POINT The security barrier may be closed at this point and deny access. (section 11).

Scroll the cursor *E/W* to SELECT.

Step *N* to CONFIRM.



12.1.1



12.1.1 SECURITY KEYCODE

- **Close or open the security barrier.**
- **Enter a security code.**

Scroll ***N/S*** to CLOSE/OPEN the security barrier.

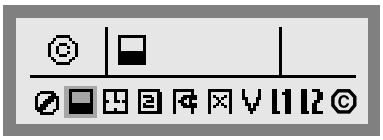
Step ***E/W*** to TRAVERSE the digits.

Scroll ***N/S*** to CHANGE the digits.

Step ***E*** to CONFIRM.

12.1.2 DISPLAY CONTRAST

The contrast of the LCD characters can be adjusted for best visual clarity.



Scroll ***N/S*** to ADJUST the level of contrast.

Step ***E*** to CONFIRM.

12.1.3 CLOCK

Time information is used in the log record.

Step ***E/W*** to TRAVERSE Hours, Minutes, Seconds.

Scroll ***N/S*** to SET the time.

Step ***E*** to CONFIRM.

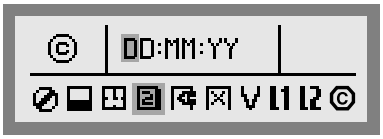
12.1.4 CALENDAR

The date information is used in the log record.

Step ***E/W*** to TRAVERSE Days, Months, Years.

Scroll ***N/S*** to SET the date.

Step ***E*** to CONFIRM.



CHECK POINT The Clock and Calendar section is powered by a miniature lithium cell having a life expectancy in excess of 10 years.

12.1.5 LOG INTERVAL

Readings of data for each location will be continuously recorded at predetermined intervals (section 10.5).
The interval is adjustable between 1 second and 999 minutes.

Step ***E/W*** to TRAVERSE the minutes and seconds.

Scroll ***N/S*** to SET the digits.

Step ***E*** to CONFIRM.

Range: 1 sec...999 minutes

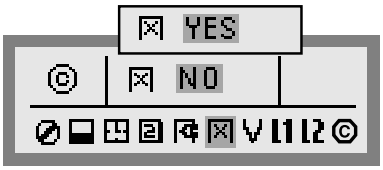
ALSO
- Periodic recorded data for each location:
  - Location address
  - Signal value with units
  - Time and date
- Events recorded for each location:
  - F – Fault condition
  - – Alarm event
  - – Entry into SETUP (section 12.1).
- The maximum number of readings per location is 4000.

12.1.6 CLEAR LOG

All data stored in the log (section 12.1.4) can be cleared from all channels simultaneously.

Scroll *N/S* for YES/NO.

Step *E* to CONFIRM.



CHECK POINT Only PERIODIC log readings are cleared.
EVENT log readings are permanently retained.

CAUTION Always clear the log if any changes are made to the COMMAND MODULE SETUP or the LOCATION SETUP to avoid ambiguous data recording.

12.1.7 VERSION

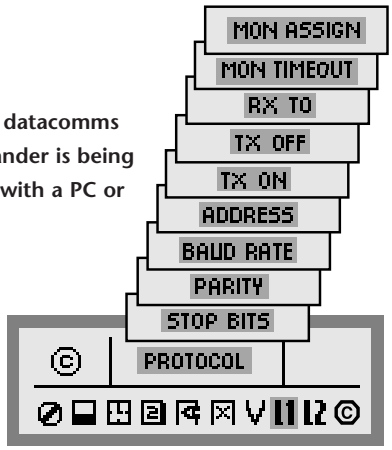
Software version will be displayed.

Scroll *N/S* for data.

L1 12.1.8 LAN 1 DATACOMMS

L2 12.1.9 LAN 2 DATACOMMS

The protocol characteristics required for the LAN 1 and LAN 2 datacomms can be individually setup. This is only necessary where Commander is being integrated into a wider communication network, to interface with a PC or user display.



Scroll *N/S* to SELECT.

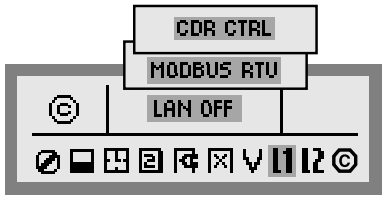
Step *E* to ENTER.

PROTOCOL SELECTION

The standard communication protocol is MODBUS (BINARY).

A COMMANDER CONTROL option is also available for use with the TX2199 Commander Configuration Software Package (section 13) or for interfacing with special control programmes which may be installed in the Command Module.

There is also an option to disable the LAN input completely when required.



Scroll *N/S* to SELECT.

Step *E* to CONFIRM.

Scroll *N/S* to DEFINE values

Step *E* to CONFIRM

PROTOCOL	MODBUS	COMMANDER CONTROL
Stopbits:	1/2	———
Parity:	None/Odd/Even	———
Baud Rate:	300/600/1200/2400/4800/9600 / 14K4/19K2/28K8/38K4/57K6/115K2	
Address	1 to 250 (protocol dependent)	
TX On:	0.1 – 99ms	
TX Off:	0.1 – 99ms	
Monitor Timeout:	OFF/1sec/5sec/10sec/30sec/60sec	———
Monitor Assign:	1 T16A1 ✓	———

COMMUNICATIONS MONITOR

The integrity of the LAN1/LAN2 MODBUS communication link can be monitored over successive periods. The period can be selected from 1 second up to 60 seconds or OFF.

If a communications failure is detected, an alarm can be assigned to any selected channel card location.

ASSIGNING A COMMS MONITOR FAILURE ALARM

1	T	10	B	1	✓
Assignation Identity	Constant	Destination Address	Channel Address	Input location at the channel address	Execution at the assigned destination
1 2 3 4 5 6 7 8	(Terminal module)	0...30	A B C D E F G H	Single 1 / Dual 1 2 / Quad 1 2 3 4	✓:GO ✘:RESET A latched output relay (section 12.2.4 M)
	C (The setpoint is assigned to the Command Module for use in a specific program).				

CONFIGURE

When a Commander system has been assembled and loaded with channel cards, the Command Module must be instructed to scan the system to automatically identify (REFRESH) the type of card at each location and number of Terminal Modules fitted in that system.

The same goes for a system that has been modified.
To avoid confusion, this function is only executed when instructed to do so by the user.

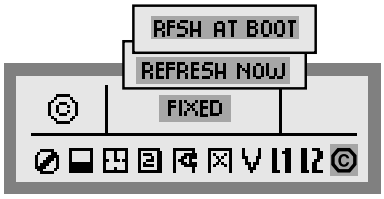
FIXED: No REFRESH at any time.

REFRESH NOW: REFRESH when CONFIRMED from the keypad.

RFSH AT BOOT: REFRESH whenever the Commander system is switched ON.

Scroll ***N/S*** for YES/NO.

Step ***E*** to CONFIRM.



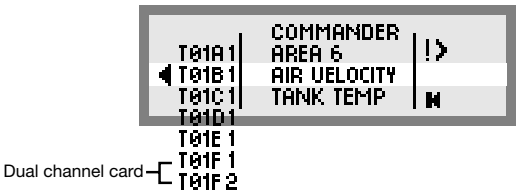
PART 1
12. SETUP ZONE

12.2 INDIVIDUAL LOCATION SETUPS

Starting from BASE (section 10.1).

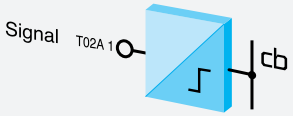
Scroll *N/S* to selected LOCATION.

Step *E* to LOCATION setup.

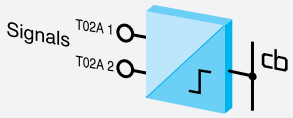


CHECK POINT The security barrier may be closed at this point and deny access (section 11).

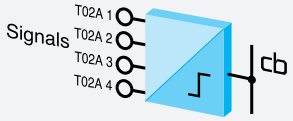
CHECK POINT
- A SINGLE FUNCTION channel card LOCATION ADDRESS (section 3).



- A DUAL FUNCTION channel card LOCATION ADDRESSES, (section 3).



- A QUAD FUNCTION channel card LOCATION ADDRESSES, (section 3).



The SETUP menu offered will vary depending upon which type of channel card is present at the location selected.

ANALOGUE INPUT CHANNEL CARDS 12.2.1

PULSE FREQUENCY INPUT CHANNEL CARDS 12.2.2

ONOFF/STATE INPUT CHANNEL CARDS 12.2.3

ONOFF/STATE OUPUT CHANNEL CARDS 12.2.4

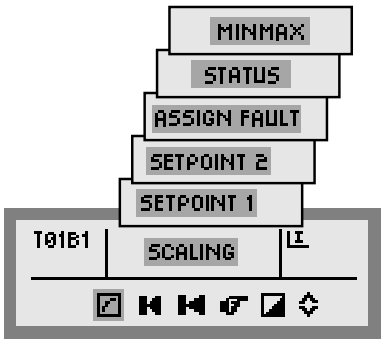
ANALOGUE OUTPUT CHANNEL CARDS 12.2.5

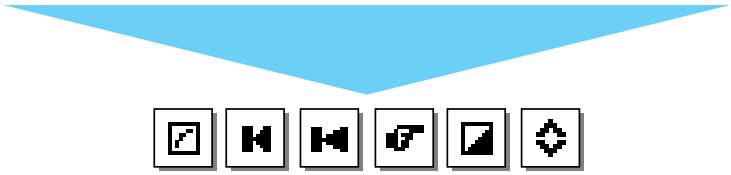
CHECK POINT CONFIGURATION OF CHANNEL CARDS
Channel card locations are automatically identified and addressed by the Command Module dependent, upon the position that they take up in a Commander System (section 4).
To avoid confusion, this function is only executed when instructed to do so by the user (section 12 ©).

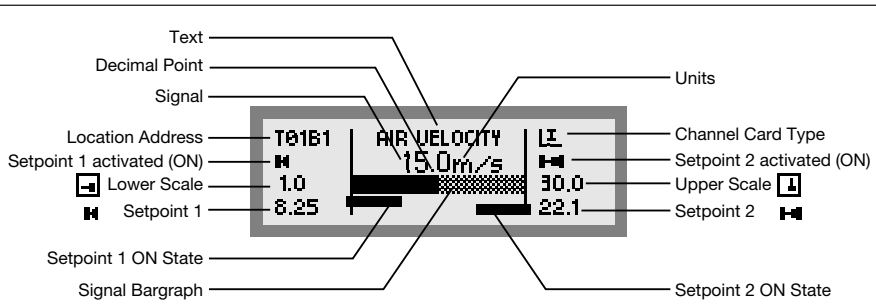
12.2.1 ANALOGUE INPUT CHANNEL CARDS

Scroll *E/W* to SELECT.

Step *N* to CONFIRM.







CHECK POINT FAULT conditions will also be displayed (section 10.2).

PART 1
12. SETUP ZONE
12.2.1

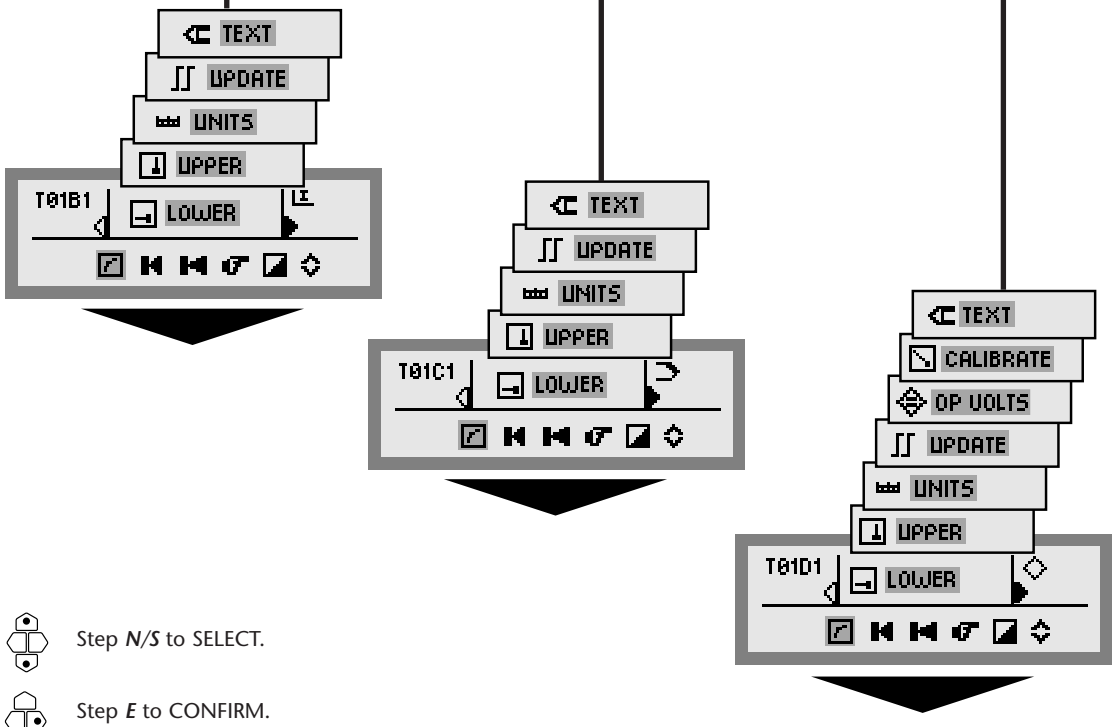
SCALING

- The various characteristics of the analogue input scale values can be determined.
- The setup menu offered will vary depending upon which ANALOGUE channel card is present at the location selected.

CURRENT & VOLTAGE CHANNEL CARDS	
TX2141.301	(4...20mA)
TX2141.302	(Dual 4...20mA)
TX2141.303	(0.4...2V)
TX2141.304	(Dual 0.4...2V)
TX2141.309	(ac)

TEMPERATURE CHANNEL CARDS	
TX2141.306	(PT100)
TX2141.307	(Dual PT100.)
TX2141.308	(Dual semicon.)

mV CHANNEL CARDS	
TX2141.310	(mV)



Step *N/S* to SELECT.

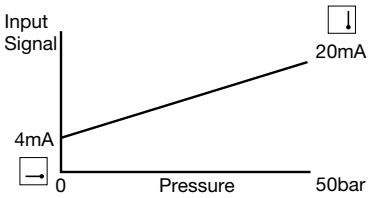
Step *E* to CONFIRM.

PART 1
12. SETUP ZONE
12.2.1

Lower

Upper

Independently adjustable, these two items are closely inter-related. They set the desired LOWER limit and UPPER limit of the display reading for a given magnitude of input signal span. This can be any numeric value and the polarity can be any negative value through to any positive value. The indicating 'range' from zero to full scale of the display can be programmed to show 'true' unit values incorporating multiplication factors or zero offset values.
This relates engineering units to the basic measured signal range.



Step ***E/W*** to TRAVERSE the cursor.

Scroll ***N/S*** to SCROLL the digits.

Step ***E*** to CONFIRM.

Range: –9999.9 ... +9999.9
with decimal point

CHECK POINT
- The signal response between LOWER and UPPER will be assumed to be linear.
- Signals from non-conforming devices such as temperature sensors will be automatically linearised to the appropriate standard.

CHECK POINT
Temperature channel cards, TX2141.306 / TX2141.307 / TX2141.308 will always measure the specified range. The VISIBLE DISPLAY range can be 'offset' if required (sections 4.1.6, 4.1.7 and 4.1.8).

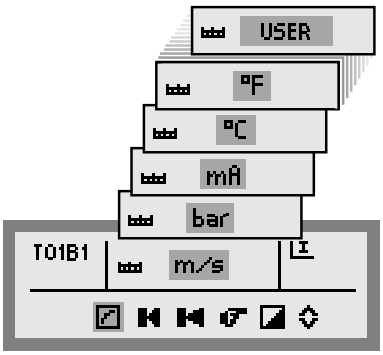
PART 1
12. SETUP ZONE
12.2.1

UNITS

A menu of standard engineering units is available for adding on to the signal value display to define the actual parameter being measured, eg. bar, mA, m/sec, °C, etc.

Scroll ***N/S*** to SELECT.

Step ***E*** to CONFIRM.



Menu:
V, mV, A, mA, °C, °F, °K, g, kg, mbar, bar, Pa, kPa, PSI, %, ppm, %RH, mm, m, mm/s, m/s, m^3/s, m^3/m, m^3/h, l/s, l/m, l/h, g/s, g/m, g/h, kg/s, kg/m, kg/h, rpm, pps, Hz, kHz, secs, mins, hrs, USER.

An option called USER will appear in the units menu choice.
Specific user defined units can be configured. Up to 4 digits of text can be entered into the display and there is a menu of letters, numbers and symbols to choose from.

Step ***E/W*** to TRAVERSE the characters.

Scroll ***N/S*** to SET.

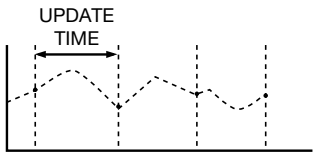
Step ***E*** to CONFIRM.

CHECK POINT For temperature cards only °C, °F and °K are offered.

UPDATE

The INPUT SIGNAL is sampled at pre-determined intervals and the update time period is adjustable. Signal values are AVERAGED between samples.

A low setting will give rapid reaction to the input signal and higher settings may be entered where damping of a fluctuating input is necessary, or simply as a means of applying a delay to the input. This is particularly appropriate in electrically noisy environments.



ALSO Magnitude comparisons of each successive UPDATE will determine the status of the input signal.

STABLE
INCREASING
DECREASING

Step ***E/W*** to TRAVERSE the cursor.

Scroll ***N/S*** to SET the value.

Step ***E*** to CONFIRM.

Range: 0.1 ... 60 seconds

OUTPUT VOLTAGE

This additional item will appear in the menu when a mV input location is selected for SETUP.

The TX2141.312 channel card provides a regulated variable output current for powering sensors and strain gauges.

The output current may be set to concur with that of the sensing device being used (section 4.1.10).

Step ***E/W*** to TRAVERSE the digits.

Scroll ***N/S*** to SET the digits.

Step ***E*** to CONFIRM.

Range: 0...50mA

CAUTION Adjust the current to the correct value using a suitable meter BEFORE connecting the sensor.

CHECK POINT The output of the mV supply card is self regulating and will automatically limit if it is operated beyond its rated parameters.

TEXT

Duty Text can be entered to denote the Input duty, the location or the tag reference of the input device.

Up to 12 digits of text can be entered into the display and there is a menu of Letters, Numbers and Symbols to choose from.

Step ***E/W*** to TRAVERSE the characters.

Scroll ***N/S*** to SET the characters.

Step ***E*** to CONFIRM.

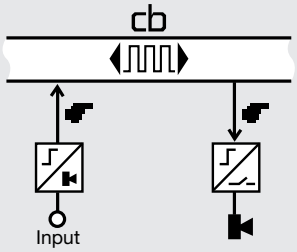
CHECK POINT A default message will appear if no user text is entered.

PART 1
12. SETUP ZONE
12.2.1

SETPOINT 1

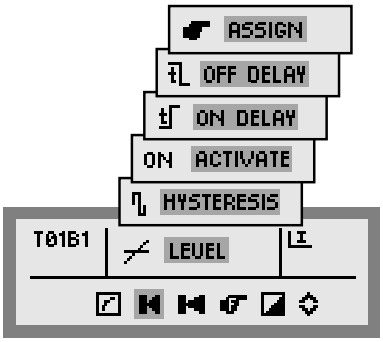
SETPOINT 2

- Each input channel location has two individual SETPOINTS (SP1 and SP2) which can be activated ON for ALARM or CONTROL functions.
- The various operating response characteristics of each setpoint can be individually setup.
- Setpoint ON states are transferred onto the Commandbus and can be assigned to selected output driver channel locations to INITIATE field output actions.
- A setpoint that is activated ON = ALARM or CRITICAL condition.



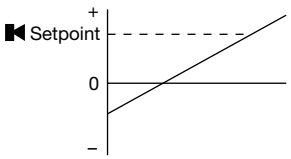
Step *N/S* to SELECT.

Step *E* to CONFIRM.



PART 1
12. SETUP ZONE
12.2.1

LEVEL



The ON level of the setpoint can be setup. This can be set for any numerical value and the polarity can be positive or negative as required.

Scroll ***E/W*** to TRAVERSE the cursor.

Scroll ***N/S*** to SET the digit.

Step ***E*** to CONFIRM.

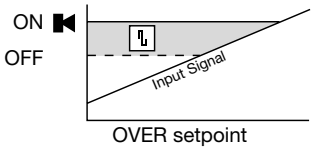
Range limited to the LOWER and UPPER values setup (section)

HYSTERESIS

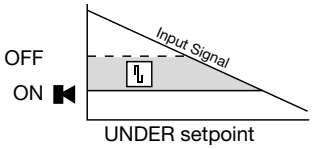
The Hysteresis is the DEADBAND between the setpoint ACTIVATING ON and ACTIVATING OFF as the input signal increases and decreases.

The OFF level can be defined with respect to the ON setpoint (section 12.2.1 ON).

• OFF level values less than the ON level.



• OFF level values greater than the ON level.



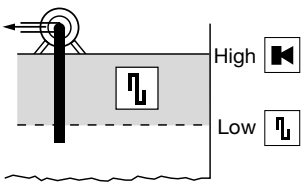
Scroll ***E/W*** to TRAVERSE the cursor.

Scroll ***N/S*** to SET the digit.

Step ***E*** to CONFIRM.

A low value of hysteresis, is often used to override fluctuating signal levels and to prevent 'hunting' in closed loop control systems.

A high value of hysteresis can also be used as a control function as when controlling the operation of pumps. The pump will start at high level and continue pumping until low level is reached at the bottom of the hysteresis band.

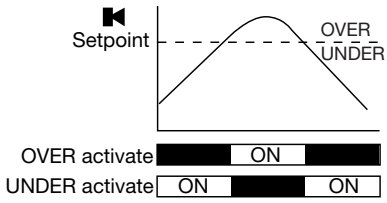


ON ACTIVATE

The setpoint can be setup to be ON when the input signal is OVER the setpoint level or ON when the input signal is UNDER the setpoint level.

For example; when monitoring overspeed on a conveyor, the setpoint can be set to be ON when the level of the input signal from the sensor is OVER the setpoint value to give a failsafe alarm function.

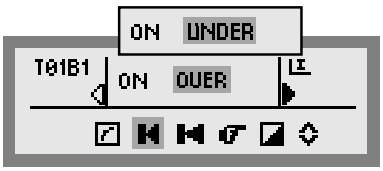
Conversely, when monitoring underspeed, the setpoint can be set to be ON when the input signal from the sensor is UNDER the setpoint.



ALSO Both modes can be combined using the two setpoints (SP1 and SP2) to provide boundary protection.

Step *N/S* to SELECT.

Step *E* to CONFIRM.



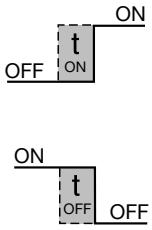
ON DELAY

OFF DELAY

The activation ON of the setpoint can be delayed by an adjustable time period (t ON). This is useful for alarm verification, to apply time delay in a process control action, or to override a spurious fluctuation of the input signal.

The activation OFF of the setpoint can also be delayed by an adjustable time period (t OFF).

If the input signal recedes from the setpoint level before the time has elapsed, the timer will reset to zero, ready to start again.



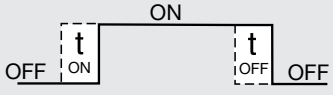
Step *E/W* to TRAVERSE the digits.

Scroll *N/S* to SET the time t.

Step *E* to CONFIRM.

Range: 0 ... 255 seconds

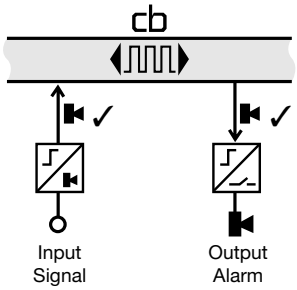
ALSO Both t ON and t OFF can be Combined.



PART 1
12. SETUP ZONE
12.2.1

ASSIGN

- **A SETPOINT ON state is transferred onto the Commandbus.**
- **It can be SETUP to be ASSIGNED to a choice of up to 8 ONOFF/STATE output channel card location addresses to initiate action.**
- **All potential destination addresses available in the Commander system (including the Command Module) can be sequentially presented on the display and selected as desired.**

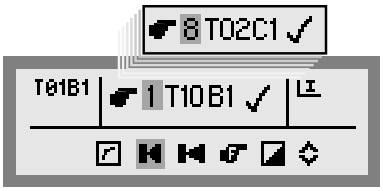


Scroll ***N/S*** to SELECT the address identities available.

Step ***E/W*** to TRAVERSE the address.

Scroll ***N/S*** to SET ✓ or ✘.

Step ***E*** to CONFIRM.



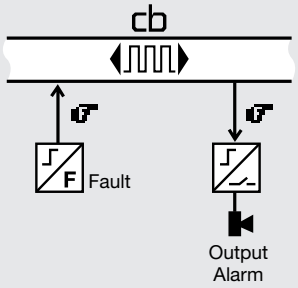
ASSIGNATIONS

1	T	10	B	1	✓
Assignation Identity	Constant	Destination Address	Channel Address	Input location at the channel address	Execution at the assigned destination
1 2 3 4 5 6 7 8	(Terminal module)	0...30	A B C D E F G H	Single Dual Quad	✓:GO ✘:RESET A latched output relay (section 12.2.4 M)
	C (The setpoint is assigned to the Command Module for use in a specific program).				

PART 1
12. SETUP ZONE
12.2.1

ASSIGN FAULT

- Each channel card location will give a common FAULT output state for:
  - Analogue input signal UNDER RANGE (section 10.2).
  - Analogue input signal OVER RANGE (section 10.2).
  - Analogue signal LOW FAULT (section 10.2).
  - Analogue signal HIGH FAULT (section 10.2).
  - Sensor fault.
  - Channel card fault.
- The FAULT state is transferred onto the Commandbus.
- It can be SETUP to be ASSIGNED to a choice of up to 8 ONOFF/ output channel card location addresses to initiate action.
- All potential destination addresses available in the Commander system (including the Command Module) can be sequentially presented on the display and selected as desired.



Scroll *N/S* to SELECT the address identities available.

Step *E/W* to TRAVERSE the address.

Scroll *N/S* to SET ✓ or ✘.

Step *E* to CONFIRM.

ASSIGNATIONS

1	T	16	A	1	✓
Assignation Identity	Constant	Destination Address	Channel Address	Input location at the channel address	Execution at the assigned destination
1 2 3 4 5 6 7 8	(Terminal module)	0...30	A B C D E F G H	Single Dual Quad	✓:GO ✘:RESET A latched output relay (section 12.2.4 M)
	C (The setpoint is assigned to the Command Module for use in a specific program).				

PART 1
12. SETUP ZONE
12.2.1

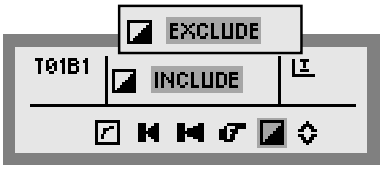
STATUS

As a result of plant maintenance, it may be necessary to temporarily disable a particular channel card location.

The location can be properly EXCLUDED to prevent false alarm states occurring.

Scroll ***N/S*** to SELECT.

Step ***E*** to CONFIRM.



CHECK POINT Reinstate INCLUDE after the interruption is over.

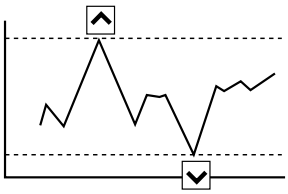
CAUTION
- Always EXCLUDE a channel card location when changing a channel card otherwise the Command module will perceive a FAULT.
- Remember that where a channel card that has been EXCLUDED and replaced, the new card will need to be first SETUP, INCLUDED and REFRESHED (section 12.2.1)

MINMAX

The maximum value and minimum value that the signal has reached since the last RESET, is stored.

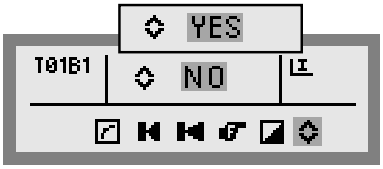
Dangerously HIGH or LOW sensor conditions may have occurred previously and this feature enables historic trends to be examined (section 10.3).

Stored values of previous MIN and MAX can be RESET to the current value.



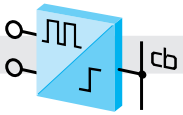
Scroll ***N/S*** for YES/NO.

Step ***E*** to CONFIRM.



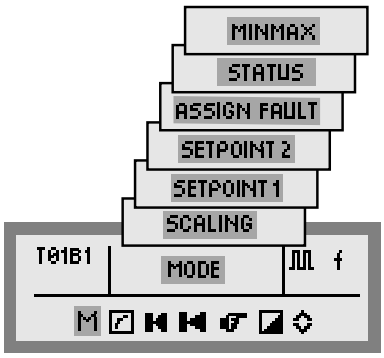
ALSO Data will be recorded in the log (section 12.1.5 and section 9).

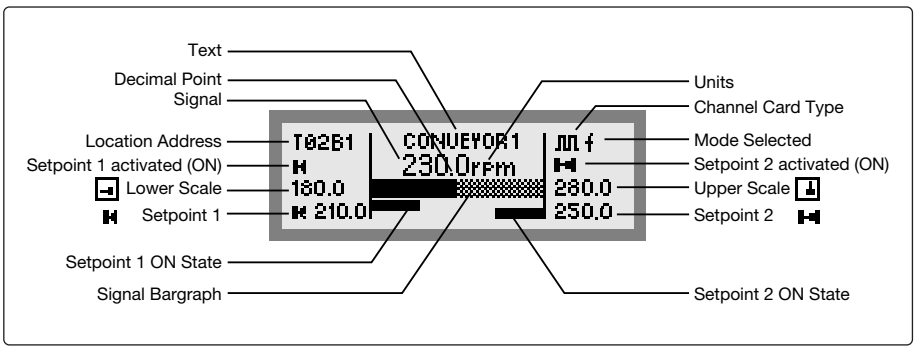
12.2.2 PULSE FREQUENCY INPUT CHANNEL CARDS



Step *E/W* to SELECT.

Step *N* to CONFIRM.

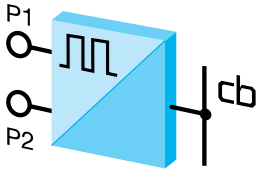




PART 1
12. SETUP ZONE
12.2.2

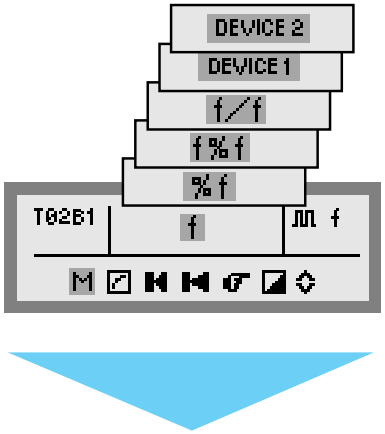
M MODE

- This item will appear in the menu where a PULSE/FREQUENCY digital input channel card is present at a location.
- Each channel card has two inputs, P1 and P2, which are used in different ways depending upon which PULSE mode is selected.
- A pulse/frequency channel card can be setup into a choice of four different pulse processing modes. The first task is to determine which one is required before continuing with the SETUP.
- Also setup for NAMUR input devices or simple SWITCHING input devices . The input signal threshold voltage level can also be setup on simple switch inputs to eliminate spurious signals where background 'noise' levels are high.



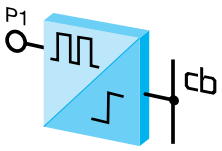
Scroll *N/S* to SELECT.

Step *E* to CONFIRM.

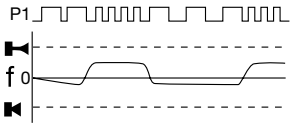


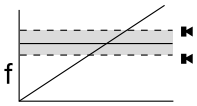
PART 1
12. SETUP ZONE
12.2.2
M

f FREQUENCY

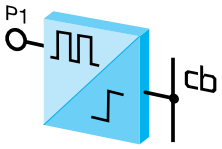


- The FREQUENCY level or pulse rate on P1 is measured.
- P2 is not used.
- Speed monitoring, flow rates, etc.
- Each SETPOINT is determined as an ABSOLUTE frequency value.

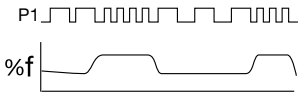


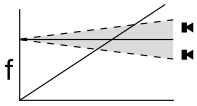


%f % FREQUENCY

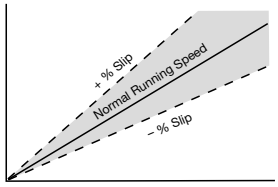


- The FREQUENCY level or pulse rate on P1 is compared with a FIXED frequency value that is entered [3f].
- P2 is not used.
- Each SETPOINT is determined as a PERCENTAGE frequency value.





- The PERCENTAGE FREQUENCY mode is most often used for monitoring the rotational speed of a machine shaft or speed measuring device by determining the pulse rate from a toothed wheel attached to the shaft and comparing it to a fixed reference speed.
- Overspeed or underspeed can be detected and is assessed as a percentage related to the NORMAL running speed (ie. 5% SLIP FREQUENCY or 5% UNDERSPEED).



PART 1
12. SETUP ZONE
12.2.2

%f % FREQUENCY - continued

FIX f

- The NORMAL running speed (f) of the machine or speed sensor must first be FIXED to be used as the base measuring reference.

  This can be done in two ways:

Scroll *N/S* to SELECT.

Step *E* to CONFIRM.

- **CREATE**

  Create a base reference or NORM by entering a prescribed value of f.

Step *E/W* to TRAVERSE the cursor.

Scroll *N/S* to SET the digits.

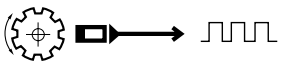
Step *E* to CONFIRM.

Range: 0 ... 999999
with decimal point

- **ADOPT**

  It is not always possible to know or measure the NORMAL running speed of a machine, or it may be difficult to establish the speed/pulse relationship, particularly where gearing or belts are being used.

  If the machine is running at its normal speed at the time of setup, the resulting incoming frequency measured on P1 will be shown in the display. The value of f displayed can be ADOPTED as the base reference.



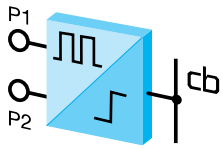
Step *E* to ADOPT.

ALSO The value of f adopted can also be adjusted if required by returning to the CREATE mode.

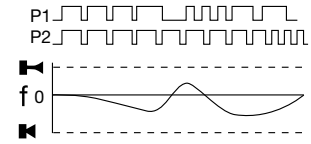
PART 1
12. SETUP ZONE
12.2.2

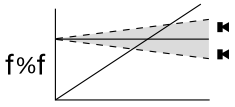
f%f

PERCENTAGE DIFFERENTIAL FREQUENCY



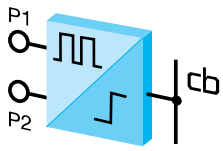
- The FREQUENCY level or pulse rate on P1 is compared with the frequency level or pulse rate on P2.
- Speed comparison between two rotating components or frequency comparisons. Slip measurement on conveyors.
- Setpoints are determined as a PERCENTAGE difference between the two input frequencies with respect to the frequency on P1.



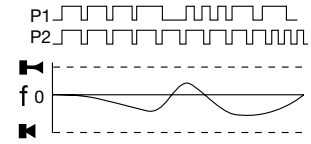


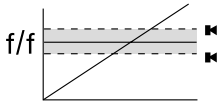
f/f

DIFFERENTIAL FREQUENCY



- The FREQUENCY level or pulse rate on P1 is compared with the frequency level or pulse rate on P2.
- Setpoint levels are determined as an ABSOLUTE frequency difference.





D1

DEVICE 1 (P1)

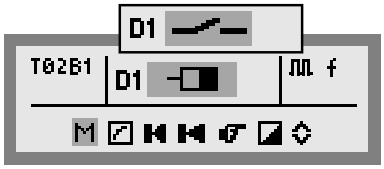
D2

DEVICE 2 (P2)

- Inputs P1 and P2 are normally configured to accept inputs from two NAMUR type sensors, also providing line fault monitoring of the sensors.
- Inputs P1 and P2 will also accept simple switch inputs such as reed switches or voltage levels. It is not possible to discriminate between genuine input signals and line faults on SWITCH inputs, so the appropriate fault alarms will be inhibited.

Scroll *N/S* to SELECT or .

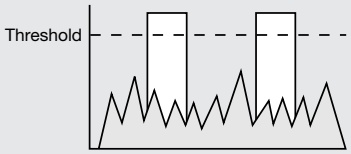
Step *E* to CONFIRM.



PART 1
12. SETUP ZONE
12.2.2

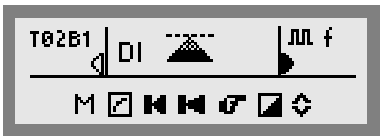
THRESHOLD

- When a simple switch input is selected, voltage THRESHOLD adjustment will next be offered.
- The input signal threshold voltage level can be set so that only pulse amplitudes above a preset magnitude will be accepted by the input.
- Background noise or spurious interference can be eliminated in this way. This is particularly useful in a high speed, pulse processing system where a simple time delay on the pulse would be unacceptably slow.
- The default setting is 3.3V.



Scroll ***N/S*** to SET the value.

Step ***E*** to CONFIRM.



Range: 0.5 ... 7.1V

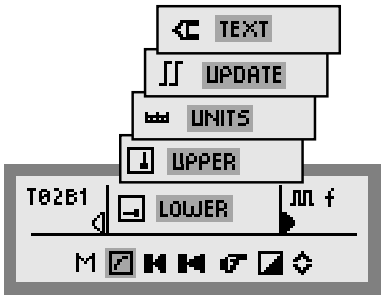
PART 1
12. SETUP ZONE
12.2.2

SCALING

- The various characteristics of the DIGITAL input scale values can be determined.
- The setup menu offered will also vary depending upon which PULSE MODE is selected for a channel card.

Step *N/S* to SELECT.

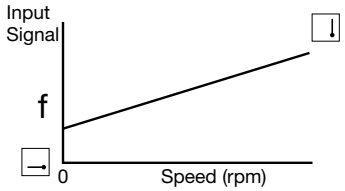
Step *E* to CONFIRM.



Lower

Upper

Independently adjustable, these two items are closely inter-related.
They set the desired LOWER limit and UPPER limit of the display reading for a given magnitude of resultant frequency span. This can be any numeric value and the polarity can be any negative value through to any positive value.
The indicating 'range' from zero to full scale of the display can be programmed to show 'true' unit values incorporating multiplication factors or zero offset values.



Step ***E/W*** to TRAVERSE the cursor.

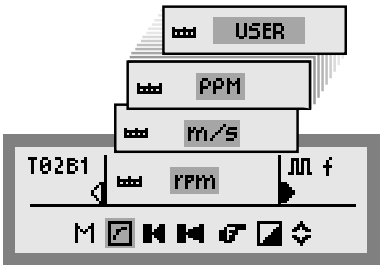
Scroll ***N/S*** to SCROLL the digits.

Step ***E*** to CONFIRM.

Range: –9999.9...+9999.9
with decimal point.

UNITS

A menu of standard engineering units is available for adding on to the signal value display to represent the actual parameter being measured, ie. Hz, l/m, m/sec, etc.



Menu:
V, mV, A, mA, °C, °F, °K, g, kg, mbar, bar, Pa, kPa, PSI, %, ppm, %RH, mm, m, mm/s, m/s, m^3/s, m^3/m, m^3/h, l/s, l/m, l/h, g/s, g/m, g/h, kg/s, kg/m, kg/h, rpm, pps, Hz, kHz, secs, mins, hrs, USER.

Scroll ***N/S*** to SELECT.

Step ***E*** to CONFIRM.

An option called USER will appear in the units menu choice. Specific user defined units can be configured. Up to 4 digits of text can be entered into the display and there is a menu of letters, numbers and symbols to choose from.

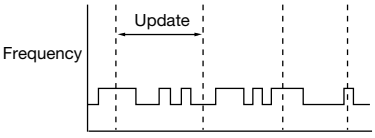
Step ***E/W*** to TRAVERSE the characters.

Scroll ***N/S*** to SET.

Step ***E*** to CONFIRM.

UPDATE

Automatic dual measuring mode is employed for optimum accuracy.



At low frequency rates the processor will determine the frequency by measuring the period between successive pulses. It calculates an average over the selected update period.

At higher frequencies the processor counts the pulses and calculates the mean over the selected update period. The longer the update period, the more accurate the displayed reading.

ALSO Magnitude comparisons of each successive UPDATE will determine the status of the input signal.

STABLE
INCREASING
DECREASING

Step ***E/W*** to TRAVERSE the cursor.

Scroll ***N/S*** to SET the value.

Step ***E*** to CONFIRM.

Range: 0.1 ... 60 seconds

TEXT

Duty Text can be entered to denote the Input duty, the location or the tag reference of the input device.

Up to 12 digits of text can be entered into the display and there is a menu of Letters, Numbers and Symbols to choose from.

Step ***E/W*** to TRAVERSE the characters.

Scroll ***N/S*** to SET the characters.

Step ***E*** to CONFIRM.

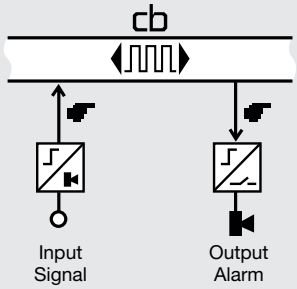
CHECK POINT A default message will appear if no user text is entered.

PART 1
12. SETUP ZONE
12.2.2

SETPOINT 1

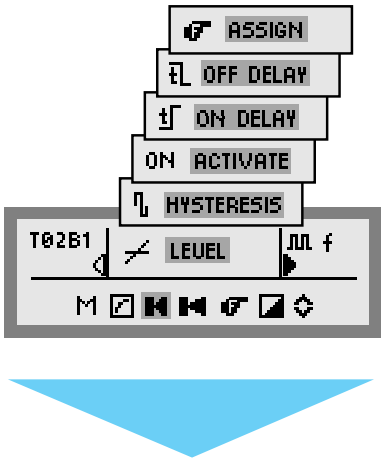
SETPOINT 2

- Each input channel location has two individual SETPOINTS (SP1 and SP2) which can be activated ON for ALARM or CONTROL functions.
- The various operating response characteristics of each setpoint can be individually setup.
- Setpoint ON states are transferred onto the Commandbus and can be assigned to selected output driver channel locations to INITIATE field output actions.
- A setpoint that is activated ON = ALARM or CRITICAL condition.



Step *N/S* to SELECT.

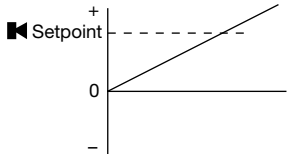
Step *E* to CONFIRM.



PART 1
12. SETUP ZONE
12.2.2

LEVEL

The ON level of the setpoint can be setup.



Scroll ***E/W*** to TRAVERSE the cursor.

Scroll ***N/S*** to SET the digit.

Step ***E*** to CONFIRM.

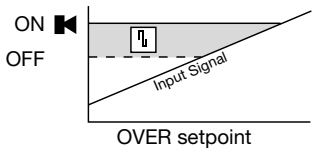
Range is limited to the LOWER and UPPER values setup (section)

HYSTERESIS

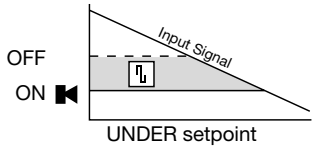
The Hysteresis is the DEADBAND between the setpoint ACTIVATING ON and ACTIVATING OFF as the input signal increases and decreases.

The OFF level can be defined with respect to the ON setpoint (Section 12.2.2 ON).

• OFF level values less than the ON level.



• OFF level values greater than the ON level.



Scroll ***E/W*** to TRAVERSE the cursor.

Scroll ***N/S*** to SET the digit.

Step ***E*** to CONFIRM.

A low value of hysteresis, is often used to override fluctuating signal levels and to prevent 'hunting' in closed loop control systems.

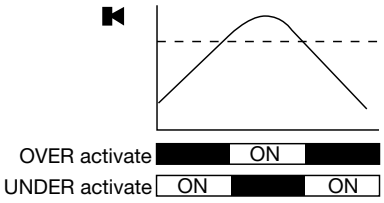
PART 1
12. SETUP ZONE
12.2.2

ON ACTIVATE

The setpoint can be setup to be activated ON when the input signal is OVER the setpoint value or activated ON when the input signal is UNDER the setpoint value.

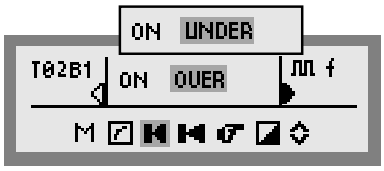
For example; when monitoring excess speed or high frequency, the setpoint can be set to be activated ON when the level of the input signal from the sensor is OVER the setpoint value to give a failsafe alarm function.

Conversely, when monitoring flow failure or under speed, the setpoint can be set to be activated ON when the input signal from the sensor is UNDER the setpoint.



Step ***N/S*** to SELECT.

Step ***E*** to CONFIRM.



ALSO Both modes can be combined using the two setpoints (SP1 and SP2) to provide boundary protection.

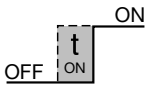
ON DELAY

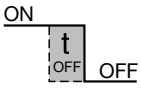
OFF DELAY

The activation ON of the setpoint can be delayed by an adjustable time period (t ON). This is useful for alarm verification, to apply time delay in a process control action, or to override a spurious fluctuation of the input signal.

The activation OFF of the setpoint can also be delayed by an adjustable time period (t OFF).

If the input signal recedes from the setpoint level before the time has elapsed, the timer will reset to zero, ready to start again.





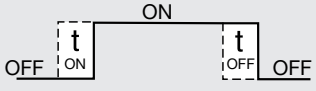
Step ***E/W*** to TRAVERSE the digits.

Scroll ***N/S*** to SET the time t.

Step ***E*** to CONFIRM.

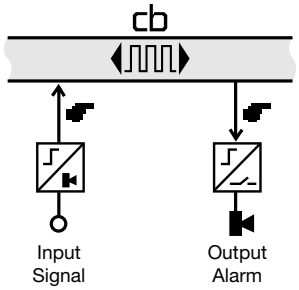
Range: 0 ... 255 seconds

ALSO Both t ON and t OFF can be Combined.



PART 1
12. SETUP ZONE
12.2.2

ASSIGN



- **A SETPOINT ON state is transferred onto the Commandbus.**
- **It can be SETUP to be ASSIGNED to a choice of up to 8 ONOFF/STATE output channel card location addresses to initiate action.**
- **All potential destination addresses available in the Commander system (including the Command Module) can be sequentially presented on the display and selected as desired.**

Scroll ***N/S*** to SELECT the address identities available.

Step ***E/W*** to TRAVERSE the address.

Scroll ***N/S*** to SET ✓ or ✘.

Step ***E*** to CONFIRM.

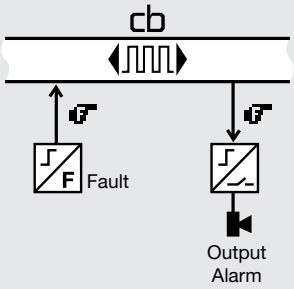
ASSIGNATIONS

1	T	12	A	1	✓
Assignation Identity	Constant	Destination Address	Channel Address	Input location at the channel address	Execution at the assigned destination
1 2 3 4 5 6 7 8	(Terminal module)	0...30	A B C D E F G H	Single Dual Quad	✓:GO ✘:RESET A latched output relay (section 12.2.4 M)
	C (The setpoint is assigned to the Command Module for use in a specific program).				

PART 1
12. SETUP ZONE
12.2.2

ASSIGN FAULT

- Each channel card location will give a common FAULT output state for:
  - Pulse/frequency signal UNDER RANGE (section 10.2).
  - Pulse/frequency signal OVER RANGE (section 10.2).
  - Sensor fault.
  - Channel card fault.
  - OPEN CIRCUIT switch line. NAMUR inputs only (section 12.2.2 D1).
  - SHORT CIRCUIT switch line. NAMUR inputs only (section 12.2.2 D1).
- The FAULT state is transferred onto the Commandbus.
- It can be SETUP to be ASSIGNED to a choice of up to 8 ONOFF/ output channel card location addresses to initiate action.
- All potential destination addresses available in the Commander system (including the Command Module) can be sequentially presented on the display and selected as desired.

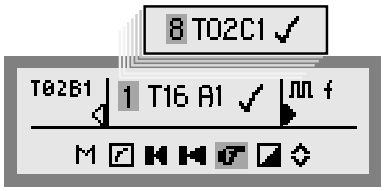


Scroll *N/S* to SELECT the address identities available.

Step *E/W* to TRAVERSE the address.

Scroll *N/S* to SET ✓ or ✘.

Step *E* to CONFIRM.



ASSIGNATIONS

1	T	16	A	1	✓
Assignation Identity	Constant	Destination Address	Channel Address	Input location at the channel address	Execution at the assigned destination
1 2 3 4 5 6 7 8	(Terminal module)	0...30	A B C D E F G H	Single Dual Quad	✓:GO ✘:RESET A latched output relay (section 12.2.4 M)
	C (The setpoint is assigned to the Command Module for use in a specific program).				

STATUS

As a result of plant maintenance, it may be necessary to temporarily disable a particular channel card location.

The location can be properly EXCLUDED to prevent false alarm states occurring.

Scroll ***N/S*** to SELECT.

Step ***E*** to CONFIRM.

CHECK POINT Reinstate INCLUDE after the interruption is over.

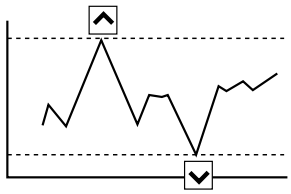
CAUTION
- Always EXCLUDE a channel card location when changing a channel card otherwise the Command module will perceive a FAULT.
- Remember that where a channel card that has been first EXCLUDED and replaced, the new card will need to be SETUP, INCLUDED and REFRESHED (section 12.2.1)

MINMAX

The maximum value and minimum value that the signal has reached since last RESET is stored.

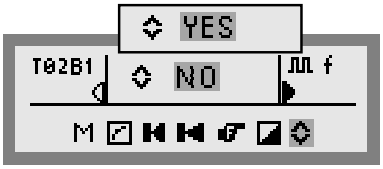
Dangerously HIGH or LOW sensor conditions may have occurred previously and this feature enables historic trends to be examined (section 10.2).

Stored values of previous MIN and MAX can be RESET to the current value.



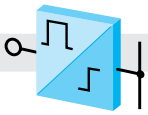
Scroll ***N/S*** for YES/NO.

Step ***E*** to CONFIRM.



ALSO Data will be recorded in the log (section 12.1.5 and section 9).

12.2.3 ONOFF/STATE INPUT CHANNEL CARDS

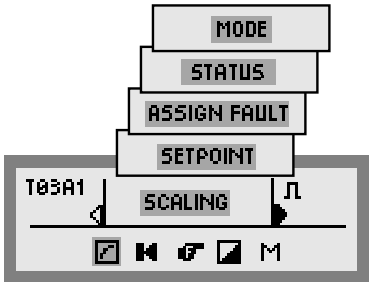


- The menu offered will vary depending upon which ONOFF/State input channel card is present at the location selected.

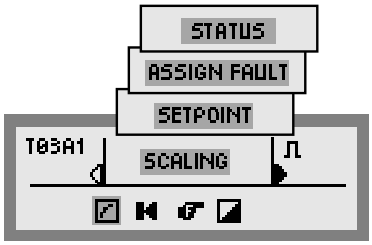
Step *E/W* to SELECT.

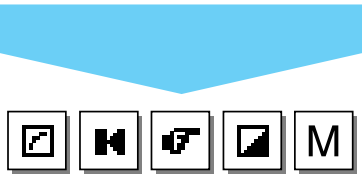
Step *N* to CONFIRM.

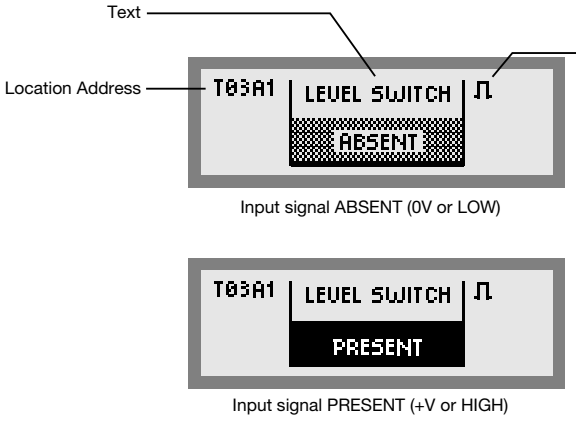
TX2141.501
TX2141.502



TX2141.503
TX2141.504







CHECK POINT FAULT conditions will also be displayed (section 10.2).

PART 1
12. SETUP ZONE
12.2.3

SCALING

- The update period and text can be determined.

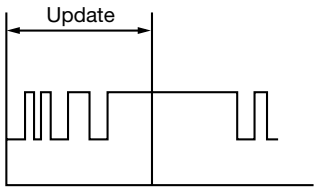
Step *N/S* to SELECT.

Step *E* to CONFIRM.

UPDATE

The INPUT STATE is sampled at pre-determined intervals and the update time period is adjustable.

A low setting will give rapid reaction to the input signal and higher settings may be entered as a means of applying a delay to the input.



Step ***E/W*** to traverse the cursor.

Scroll ***N/S*** to SET the value.

Step ***E*** to CONFIRM.

Range: 0.1 ... 60 seconds

TEXT

Duty Text can be entered to denote the Input duty, the location or the tag reference of the input device.

Up to 12 digits of text can be entered into the display and there is a menu of Letters, Numbers and Symbols to choose from.

Step ***E/W*** to TRAVERSE the characters.

Scroll ***N/S*** to SET the characters.

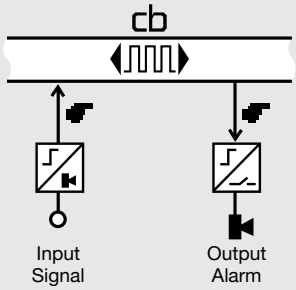
Step ***E*** to CONFIRM.

CHECK POINT A default message will appear if no user text is entered.

PART 1
12. SETUP ZONE
12.2.3

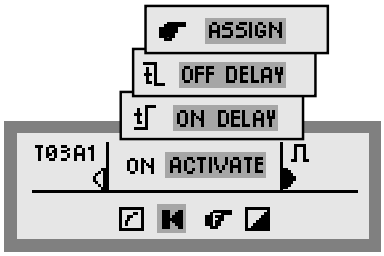
SETPOINT

- Each input channel location has one SETPOINT (SP) which can be activated ON for ALARM or CONTROL functions.
- The various operating response characteristics of the setpoint can be individually setup.
- Setpoint ON states are transferred onto the Commandbus and can be assigned to selected output driver channel locations to INITIATE field output actions.
- A setpoint that is activated ON = ALARM or CRITICAL condition.



Step *N/S* to SELECT.

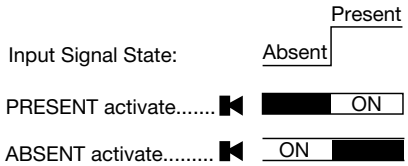
Step *E* to CONFIRM.



PART 1
12. SETUP ZONE
12.2.3

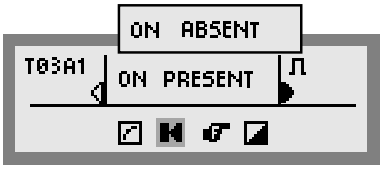
ON ACTIVATE

The setpoint can be setup to be activated ON when the input signal is PRESENT or activated ON when the input signal is ABSENT.



Step *N/S* to SELECT.

Step *E* to CONFIRM.



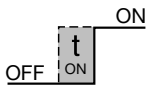
ON DELAY

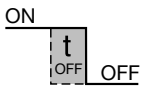
OFF DELAY

The activation ON of the setpoint can be delayed by an adjustable time period (t ON). This is useful for alarm verification, to apply time delay in a process control action, or to override a spurious fluctuation of the input signal.

The activation OFF of the setpoint can also be delayed by an adjustable time period (t OFF).

If the setpoint goes to OFF before the time has elapsed, the timer will reset to zero, ready to start again.



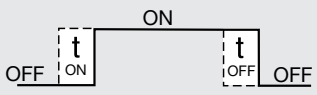


Scroll *N/S* to SET the time t.

Step *E* to CONFIRM.

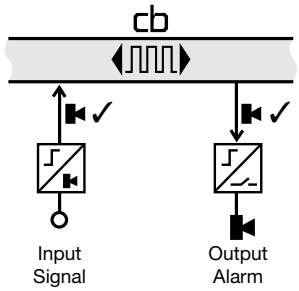
Range: 0 ... 255 seconds

ALSO Both t ON and t OFF can be Combined.



PART 1
12. SETUP ZONE
12.2.3

ASSIGN



- **A SETPOINT ON state is transferred onto the Commandbus.**
- **It can be SETUP to be ASSIGNED to a choice of up to 8 ONOFF/STATE output channel card location addresses to initiate action.**
- **All potential destination addresses available in the Commander system (including the Command Module) can be sequentially presented on the display and selected as desired.**

Scroll ***N/S*** to SELECT the address identities available.

Step ***E/W*** to TRAVERSE the address.

Scroll ***N/S*** to SET ✓ or ✘.

Step ***E*** to CONFIRM.

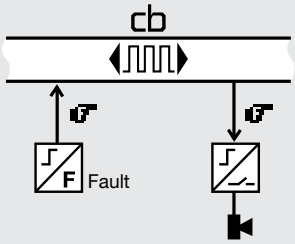
ASSIGNATIONS

1	T	01	A	2	✓
Assignation Identity	Constant	Destination Address	Channel Address	Input location at the channel address	Execution at the assigned destination
1 2 3 4 5 6 7 8	(Terminal module)	0...30	A B C D E F G H	Single Dual Quad	✓:GO ✘:RESET A latched output relay (section 12.2.4 M)
	C (The setpoint is assigned to the Command Module for use in a specific program).				

PART 1
12. SETUP ZONE
12.2.3

ASSIGN FAULT

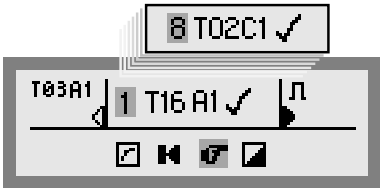
- Each channel card location will give a common FAULT output state for:
  - OPEN CIRCUIT switch line. NAMUR inputs only (section 12.2.3 D1).
  - SHORT CIRCUIT switch line. NAMUR inputs only (section 12.2.3 D1).
  - Sensor fault.
  - Channel card fault.
- The FAULT state is transferred onto the Commandbus.
- It can be ASSIGNED to a choice of up to 8 ONOFF/STATE output channel card location addresses.
- All potential destination addresses available in the Commander system (including the Command Module) can be sequentially presented on the display and selected as desired.



Step ***E/W*** to TRAVERSE the address.

Scroll ***N/S*** to SET ✓ or ✘.

Step ***E*** to CONFIRM.



ASSIGNATIONS

1	T	16	A	1	✓
Assignation Identity	Constant	Destination Address	Channel Address	Input location at the channel address	Execution at the assigned destination
1 2 3 4 5 6 7 8	(Terminal module)	0...30	A B C D E F G H	Single Dual Quad	✓:GO ✘:RESET A latched output relay (section 12.2.4 M)
	C (The setpoint is assigned to the Command Module for use in a specific program).				

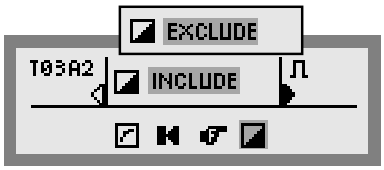
STATUS

As a result of plant maintenance, it may be necessary to temporarily disable a particular channel card location.

The location can be properly EXCLUDED to prevent false alarm states occurring.

Scroll *E/W* to SELECT.

Step *S* to CONFIRM.



CHECK POINT Reinstate INCLUDE after the interruption is over.

CAUTION
- Always EXCLUDE a channel card location when changing a channel card otherwise the Command module will perceive a FAULT.
- Remember that where a channel card that has been first EXCLUDED and replaced, the new card will need to be SETUP, INCLUDED and REFRESHED (section 12.2.3)

PART 1
12. SETUP ZONE
12.2.3

M MODE

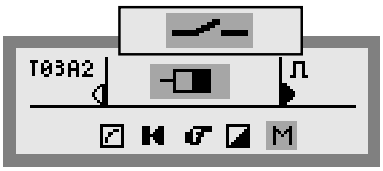
- This additional item will appear in the menu when a TX2141.501 channel card is fitted.
- The input is normally configured to accept a signal from a standard NAMUR type sensor.
- The channel card will also respond to UNDERRANGE and OVERRANGE line conditions, occurring, by generating appropriate LOW FAULT or HIGH FAULT alarms (section 10).
- The input will also accept a simple SWITCH input, typically; pressure switches, limit switches, photocells etc.

  It is not possible to discriminate between genuine input signals and line fault conditions on a SWITCH input, so the FAULT alarms will be automatically inhibited when this type of sensor is defined.

  It will be necessary to SETUP which type of input device is being used.

Scroll *N/S* to SELECT or .

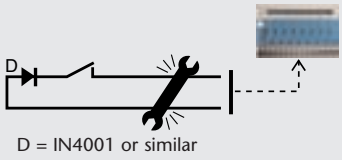
Step *E* to CONFIRM.



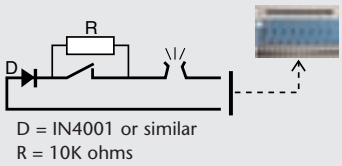
PART 1
12. SETUP ZONE
12.2.3

M MODE

- This additional item will appear in the menu when a TX2141.502 channel card is fitted.
- The input is configured to accept an input from switching devices such as pressure switches, limit switches and thermostats, etc. with a diode connected in SERIES at the remote point.
- The channel card will also respond to a SHORT-CIRCUIT condition, occurring, by generating a HIGH FAULT alarm (section 10).
- Also connect a shunt resistor in PARALLEL with the switching device at the remote point and the channel card will also be able to DISCRIMINATE between a normal contact opening function and an OPEN-CIRCUIT line condition. An OPEN-CIRCUIT condition will generate a LOW FAULT alarm (section 10).
- It will be necessary to SETUP the fact that a shunt resistor is being used.



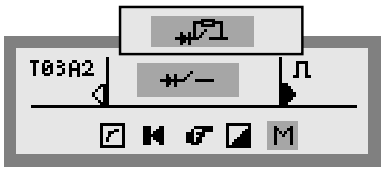
D = IN4001 or similar



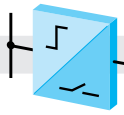
D = IN4001 or similar
R = 10K ohms

Scroll *N/S* to SELECT or .

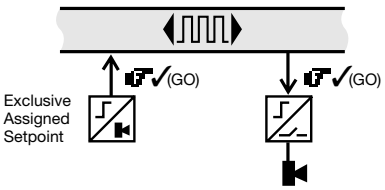
Step *E* to CONFIRM.



12.2.4 ONOFF/STATE OUTPUT CHANNEL CARDS

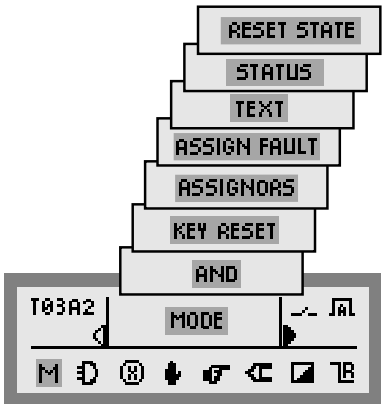


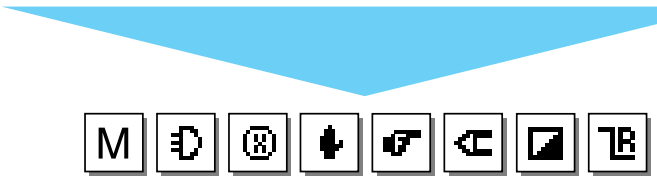
- An ONOFF/STATE OUTPUT channel card location is initiated when it recognises an exclusive GO command from the Commandbus.
- Each location will accept GO commands from any number of GO setpoints that may be setup and assigned to it from INPUT CHANNEL CARD LOCATIONS.

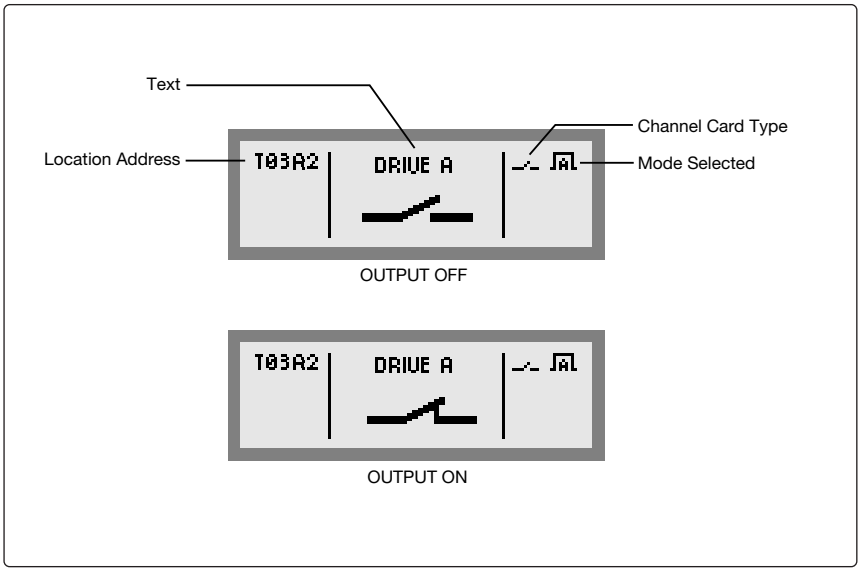



Step *E/W* to SELECT.


Step *N* to CONFIRM.



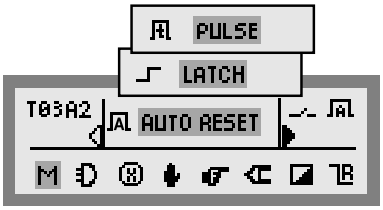




PART 1
12. SETUP ZONE
12.2.4

M MODE

- **The output operating MODE can be setup.**



Scroll ***N/S*** to SELECT.

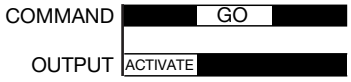
Step ***E*** to CONFIRM.

AUTO RESET

- The channel will ACTIVATE when the GO command is PRESENT and RESET when the GO command is ABSENT.

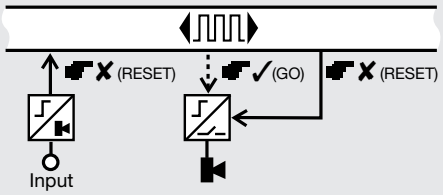
LATCH

- The channel will ACTIVATE when the GO command is PRESENT and LATCH until RESET.



CHECK POINT

- Each location will accept RESET commands from any number of RESET setpoints that may be setup and assigned to it from INPUT CHANNEL CARD LOCATIONS.
- A LATCHED output switch can also be reset from the Command module keypad (section 12.2.4 ⊗).



PULSE

- The channel will ACTIVATE when the GO command appears and RESET after an adjustable time.

Step ***E/W*** to TRAVERSE the digits.

Scroll ***N/S*** to SET the time 't'.

Step ***E*** to CONFIRM.

Range: 0.1 ... 25 seconds

ALSO

The RESET STATE of the output switching device can also be selected for the preferred failsafe condition (section 12.2.4)

- Output circuit closed (ON) when RESET or
- Output circuit open (OFF) when RESET.

CAUTION

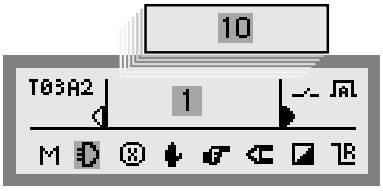
For failsafe reasons, the standard contact format is wired NORMALLY OPEN when the relay is de-energised. Contacts can be supplied wired NORMALLY CLOSED to specification, for alternative failsafe operation.

AND

The output function can be set to initiate ONLY when several GO commands are present at the SAME TIME.

Scroll ***N/S*** to SET the number of GO commands required to initiate the output function.

Step ***E*** to CONFIRM.

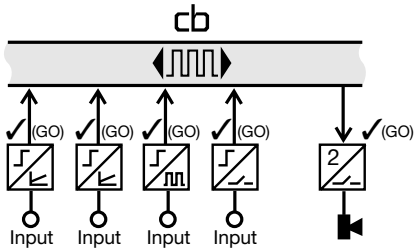


Range: 1 ... 10 simultaneous GO commands

VOTING INPUTS

This mode can also be used for VOTING inputs eg:

If GO commands are assigned to the output channel card location from say 4 other input channel cards, set the AND at 2.
The output will activate on a VOTE of any 2 out of 4.

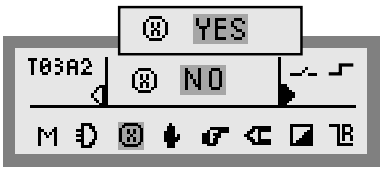


KEY RESET

- A latched output switch can be reset from the Command module keypad if no GO signals are present.

Scroll *N/S* to for YES/NO.

Step *E* to CONFIRM.



ASSIGNORS

Identify the origin and status of all setpoint GO or RESET commands that are assigned to this address from input channel card locations.

Scroll *N/S* to REVEAL assignors.

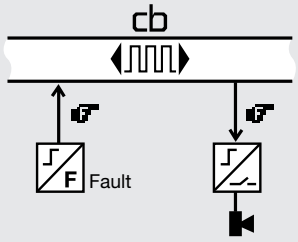
ASSIGNORS

	T	16	A	1	: 1	[1]	✓
Incoming Setpoint Status	Constant	Source Address	Channel Address Source	Input location at the Source Channel Address	Setpoint at the Source	Assignation Identity	Execution
:ON :OFF	(Terminal module)	0...30	A B C D E F G H	Single Dual Quad	1...2	1...8	✓:GO ✘:RESET A latched output relay (section 12.2.4 M)
	C (The setpoint originates from the Command Module).						
	LAN 1 LAN 2						

PART 1
12. SETUP ZONE
12.2.4

ASSIGN FAULT

- Each channel card location will give a FAULT output state for:
  - Output operation failure
  - Channel card fault
- The FAULT state is transferred onto the Commandbus.
- It can be SETUP to be ASSIGNED to a choice of up to 8 ONOFF/ output channel card location addresses to initiate action.
- All potential destination addresses available in the Commander system (including the Command Module) can be sequentially presented on the display and selected as desired.



Scroll *N/S* to SELECT the address identities available.

Step *E/W* to TRAVERSE the address.

Scroll *N/S* to SET ✓ or ✘.

Step *E* to CONFIRM.

ASSIGNATIONS

1	T	16	A	1	✓
Assignation Identity	Constant	Destination Address	Channel Address	Input location at the channel address	Execution at the assigned destination
1 2 3 4 5 6 7 8	(Terminal module)	0...30	A B C D E F G H	Single Dual Quad	✓:GO ✘:RESET A latched output relay (section 12.2.4 M)
	C (The setpoint is assigned to the Command Module for use in a specific program).				

TEXT

Duty Text can be entered to denote the Input duty, the location or the tag reference of the input device.

Up to 12 digits of text can be entered into the display and there is a menu of Letters, Numbers and Symbols to choose from.

Step ***E/W*** to TRAVERSE the characters.

Scroll ***N/S*** to SET the characters.

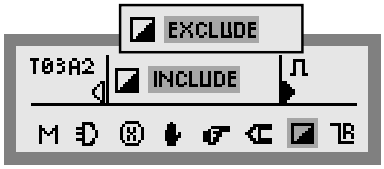
Step ***E*** to CONFIRM.

CHECK POINT A default message will appear if no user text is entered.

STATUS

As a result of plant maintenance, it may be necessary to temporarily disable a particular channel card location.

The location can be properly EXCLUDED to prevent false alarm states occurring.



Scroll ***E/W*** to SELECT.

Step ***S*** to CONFIRM.

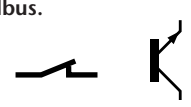
CHECK POINT Reinstate INCLUDE after the interruption is over.

CAUTION
- Always EXCLUDE a channel card location when changing a channel card otherwise the Command module will perceive a FAULT.
- Remember that where a channel card that has been EXCLUDED and replaced, the new card will need to be first SETUP, INCLUDED and REFRESHED (section 12.2.3)

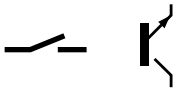
RESET STATE

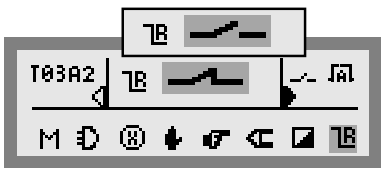
The channel will ACTIVATE and RESET in response to commands from the Commandbus.

- **For normal, failsafe alarm functions, the RESET STATE may be selected for: OUTPUT CIRCUIT CLOSED (ON).**



- **When the signal is being used to start drives, or to initiate machine functions, the RESET STATE may be selected for: OUTPUT CIRCUIT OPEN (OFF).**



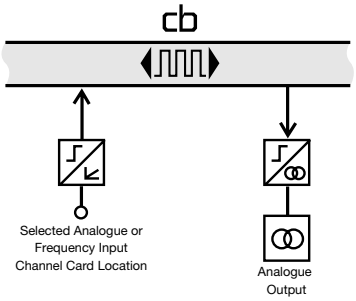


Scroll ***N/S*** to SELECT.

Step ***E*** to CONFIRM.

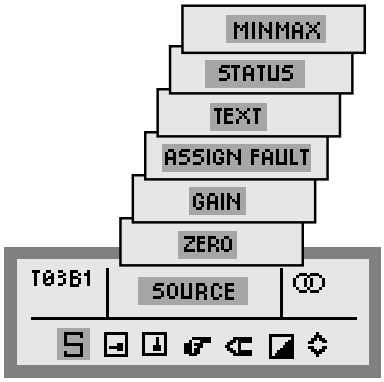
12.2.5 ANALOGUE OUTPUT CHANNEL CARD

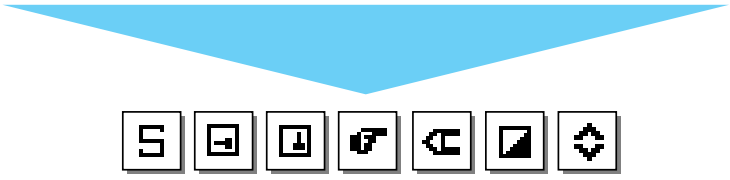
- Analogue output for driving motorised valve positioners, servo devices, process signal loops, invertors, recorders, speed controllers and heat controllers.
- Output signal standard: 4...20mA.
- The analogue output signal value can be controlled by any selected analogue or pulse/frequency input channel card location source as a signal repeater.
- The analogue output signal value can be controlled by programme data codes sourced from one of the LAN inputs on the Command module.

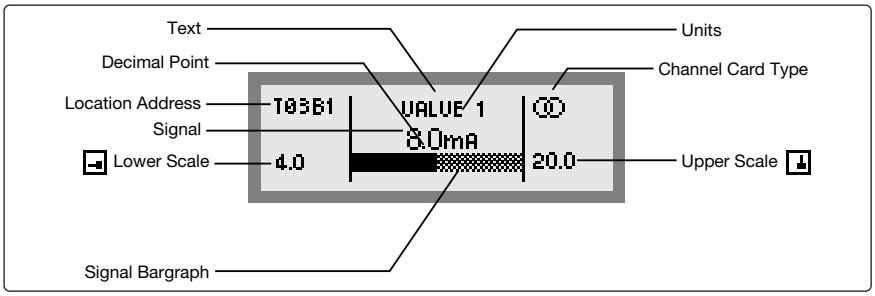


Step *E/W* to SELECT.

Step *N* to CONFIRM.



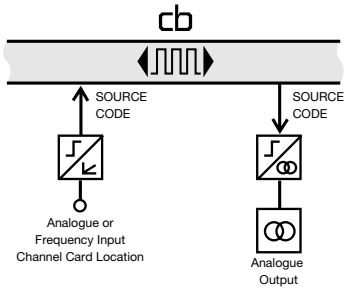




SOURCE

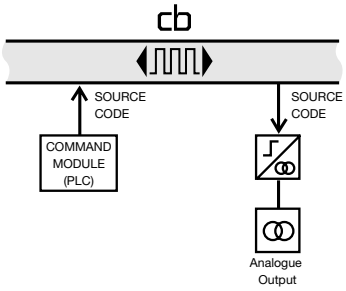
- The analogue output signal value can be determined from three optional control sources:

1. The analogue input signal value generated by any selected input location on a channel card.



2. LAN 1 / LAN 2.

2. Data codes generated by values that are programmed into the command module when special control function software is installed in the Command module (section 13).



- All potential source addresses available in the Commander system (including the Command Module) can be sequentially presented on the display and selected as desired.

Scroll ***N/S*** to SELECT a channel card source or a LAN source.

Step ***E*** to CONFIRM.

Scroll ***N/S*** to SELECT the address identity available.

Step ***E*** to CONFIRM.

CHANNEL CARD SOURCE			
T	**16**	**A**	**1**
Constant	Source Address	Channel Address	Input location at the Channel Address
(Terminal module)	0...30	A, B, C, D, E, F, G, H	Single, Dual, Quad

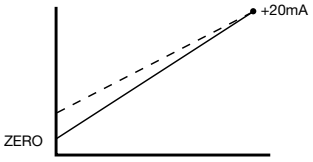
LAN SOURCE
LAN 1
LAN 2
LAN1,2

PART 1
12. SETUP ZONE
12.2.5

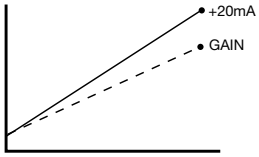
OFFSET ZERO

OFFSET GAIN

- **The value of the ZERO point can be OFFSET to match the characteristics of the field device.**



- **The value of an analogue output level or GAIN can be OFFSET to match the characteristics of the field device and to compensate for any line losses.**



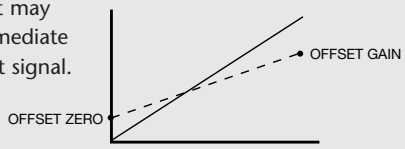
Scroll ***N/S*** to change the analogue output signal until it complies with the requirement of the field device.

Step ***E*** to CONFIRM.

Range: ±10%

CHECK POINT

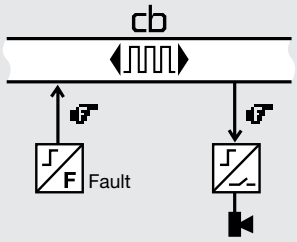
- Both OFFSET ZERO and OFFSET GAIN may be applied to an output signal.
- The output signal will assume linearity between OFFSETS that are CONFIRMED.
- OFFSET or GAIN adjustment may be extrapolated to an intermediate value of an analogue output signal.



PART 1
12. SETUP ZONE
12.2.5

ASSIGN FAULT

- Each channel card location will give a common FAULT output state for:
  - Analogue output signal UNDER RANGE (section 10.2).
  - Analogue output signal OVER RANGE (section 10.2).
  - Channel card fault.
- The FAULT state is transferred onto the Commandbus.
- It can be SETUP to be ASSIGNED to a choice of up to 8 ONOFF/ output channel card location addresses to initiate action.
- All potential destination addresses available in the Commander system (including the Command Module) can be sequentially presented on the display and selected as desired.



Scroll *N/S* to SELECT the address identities available.

Step *E/W* to TRAVERSE the address.

Scroll *N/S* to SET ✓ or ✘.

Step *E* to CONFIRM.

ASSIGNATIONS

1	T	16	A	1	✓
Assignation Identity	Constant	Destination Address	Channel Address	Input location at the channel address	Execution at the assigned destination
1 2 3 4 5 6 7 8	(Terminal module)	0...30	A B C D E F G H	Single Dual Quad	✓:GO ✘:RESET A latched output relay (section 12.2.4 M)
	C (The setpoint is assigned to the Command Module for use in a specific program).				

TEXT

Duty Text can be entered to denote the Input duty, the location or the tag reference of the input device.

Up to 12 digits of text can be entered into the display and there is a menu of Letters, Numbers and Symbols to choose from.

Step ***E/W*** to TRAVERSE the characters.

Scroll ***N/S*** to SET the characters.

Step ***E*** to CONFIRM.

CHECK POINT A default message will appear if no user text is entered.

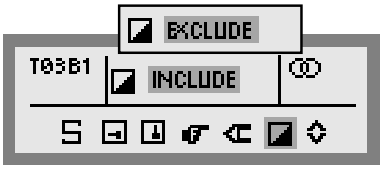
STATUS

As a result of plant maintenance, it may be necessary to temporarily disable a particular channel card location.

The location can be properly EXCLUDED to prevent false alarm states occurring.

Scroll ***N/S*** to SELECT.

Step ***E*** to CONFIRM.



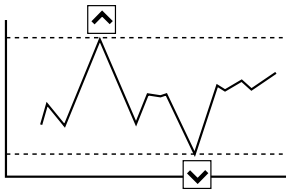
CHECK POINT Reinstate INCLUDE after the interruption is over.

CAUTION
- Always EXCLUDE a channel card location when changing a channel card otherwise the Command module will perceive a FAULT.
- Remember that where a channel card that has been first EXCLUDED and replaced, the new card will need to be SETUP, INCLUDED and REFRESHED (section 12.2.3)

MINMAX

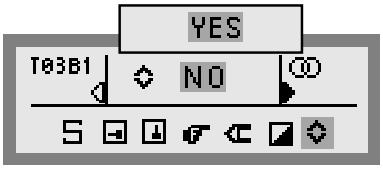
The maximum value and minimum value that the output signal has reached since the last RESET is stored.

Stored values of previous MIN and MAX can be RESET to the current value.



Scroll ***N/S*** for YES/NO.

Step ***E*** to CONFIRM.



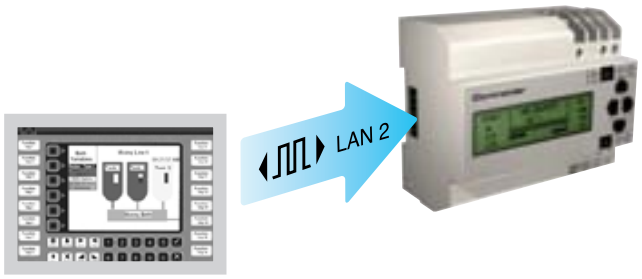
ALSO Data will also be recorded in the Log (section 12.1.5 and section 9).

13 special control and monitoring functions

PART 1
13. SPECIAL CONTROL AND MONITORING FUNCTIONS

- The standard Command module is equipped with a processor program that provides the alarm configuration routines described in section 12, enabling elementary monitoring and shutdown functions to be programmed by the user directly through the keypad.

- Special function routines or system upgrades can also be installed into the Command module for control programs & function blocks of greater complexity. The program is installed through the LAN 1 data connecting terminals or the LAN 2 data plug-in connector (section 2.1).



ALSO The complete Commander setup can also be installed into the Command module through the LAN 1 or LAN 2 data ports, using a standard PC programming tool (section 2).

The standard communication protocol is MODBUS and it is provided with the system in CD format. An RS485/RS232 connector will be required for the PC data port.
Please contact our technical sales department for details.

TX2199: Commander Configuration Software Package.

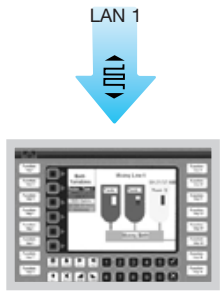
14 adding an operator interface or PC

PART 1
14. ADDING AN OPERATOR INTERFACE OR PC

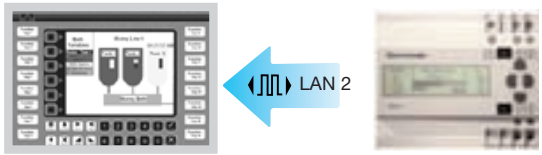
The standard Command module will display all program and dynamic operating information on its integral graphic LCD readout. (section 12).

- This same data can be transferred via Modbus to an operator interface panel or PC to provide a larger and more comprehensive information display.

  The LAN 1 or the LAN 2 datacomms ports can be used for this purpose. (section 2).

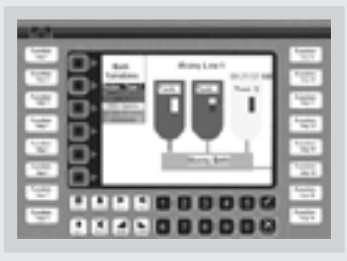


- SCADA software can be loaded into the operator interface to produce a comprehensive plant graphic display tailored to individual requirements. Configuration software in WINDOWS format is available from TROLEX for this purpose.

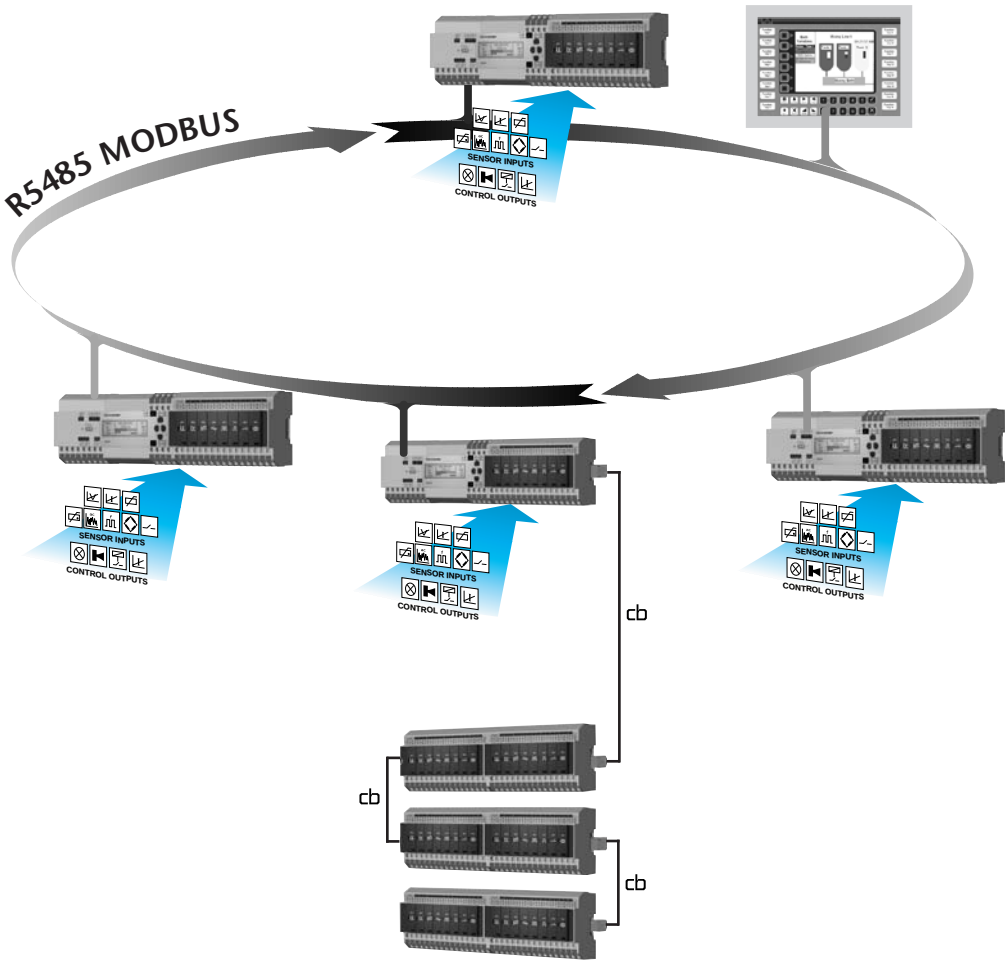


SYSTEM DESIGN

Commander Systems can be supplied with an installed processor program and SCADA graphic package to specific design requirements, complete with an Operator Interface panel.

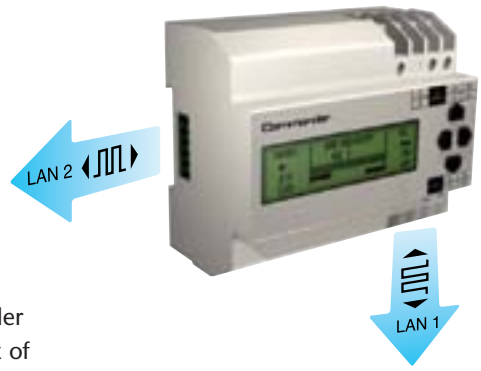


15 distributed commander systems



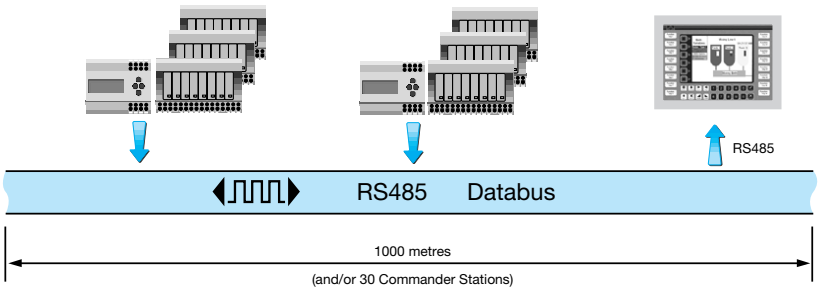
Distributed individual commander systems can be combined on a data network to communicate data to a *master* PC or central control room.

15.1 DATA COMMUNICATIONS



All functional data accumulated by the Command module is available from both the LAN 1 and LAN 2 output ports of the command module in the form of multidrop RS485 datacomms (section 2). This will support MODBUS protocol and up to 30 Commander stations can be combined on the databus over a total distance of about 1000 metres.
In practice the communications capability is influenced by the type of cable used and the system architecture - our Commander system applications engineers can provide technical assessment of individual installation designs.

Protocol characteristics of the LAN 1 and LAN 2 datacomms outputs are fully menu selectable (section 12).



Additional technical data for the application of Commander in distributed monitoring and control systems is available in the Trolex publication 'COMMUNICATION WITH COMMANDER'

assembling systems

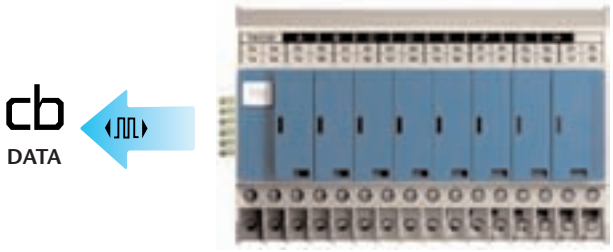
COMMANDER APPLICATION SIMPLICITY

In order to exploit the unique benefits of the Commander philosophy, it is necessary to think about a Control and Monitoring system in a completely different way.

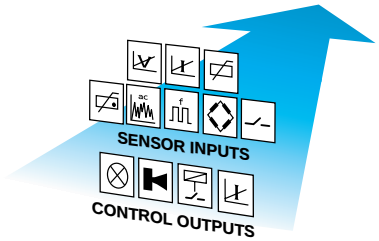
Traditionally field devices, out on a plant or process, are cabled back to a rail of terminal blocks at the control centre. Individual wires continue the transfer of the data acquired, back to a central data interface or display usually routed in large and complex wiring harnesses.

• Conventional Panel Wiring

Commander Terminal modules are rail mounted in the same way as conventional terminals. They have heavy duty screw-clamp terminals, each capable of accepting two large conductors side by side. Their performance and size are similar to that of normal heavy duty rail mounted terminals – Commander Terminal modules ARE the plant cable terminations, with the advantage that they are also 'smart' or data intelligent.



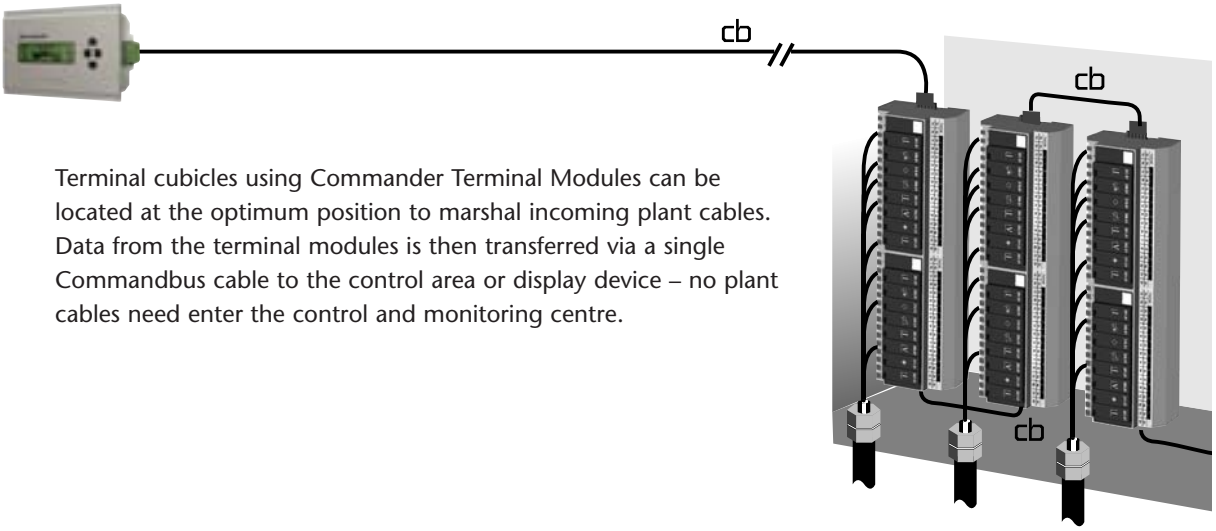
I/O FIELD TERMINALS



All plant I/O data is transmitted from the Commander Terminal Modules to the central interface by a single Commandbus data cable so eliminating practically all the panel wiring as well as dramatically reducing manufacturing costs. Reliability is improved and fault diagnosis is considerably simplified.

• Complex Cable Looms

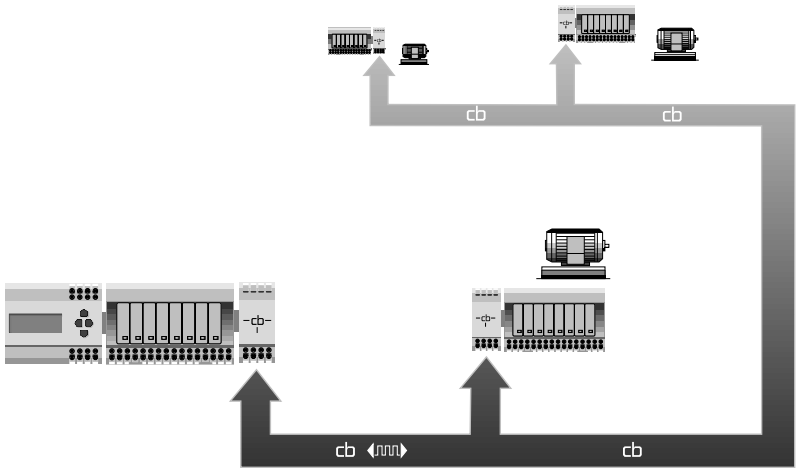
PLAN YOUR COMMANDER SYSTEM LAYOUT WITH THIS IN MIND.



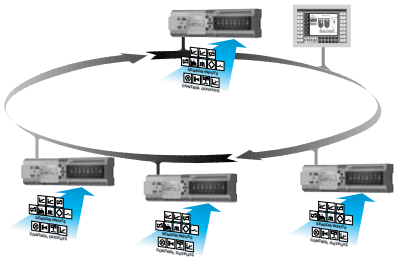
Terminal cubicles using Commander Terminal Modules can be located at the optimum position to marshal incoming plant cables. Data from the terminal modules is then transferred via a single Commandbus cable to the control area or display device – no plant cables need enter the control and monitoring centre.

FIELD I/O

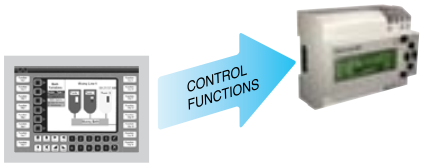
This principle can be maximised even further – the Commandbus can extend out into the plant and connect to a Terminal Module dispersed at a convenient location, collecting I/O data from groups of sensors or commanding control devices. Complex and expensive cable runs can be eliminated.



COMMANDER DESIGN VERSATILITY



Whether the installation is a few sensors and control devices monitoring a small machine or a major distributed process monitoring project, the same Commander system can deal with it. Furthermore, a Commander system design does not need to be 'committed' at an early stage in the project. Once the Commander back-bone is in place, the format can be adapted or changed to suit the design requirements of the plant as it develops. System configuration can be modified as required, sensor and control device functions can be individually programmed and control/alarm functions can be decided during final commissioning. The same versatility can be exploited for later plant upgrades and changes.



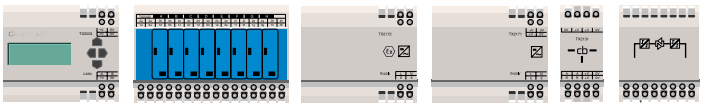
Install a standard software package or a PLC database into the Command Module and highly complex control and monitoring functions can be executed.

17 system planning

17 SYSTEM PLANNING

ICON LIBRARY

Drawings of the various modules in the Commander range can be provided for use on a PC in JPEG format. This simplifies the design and planning of an overall Commander System and ensures consistency of layout.



SETUP DATA

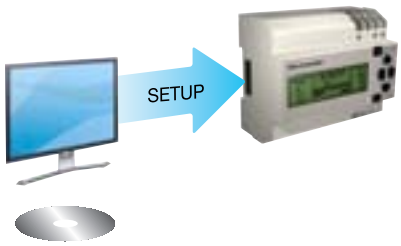
It is vitally important that all SETUP data for the Command module and the Channel Cards are correctly recorded. A series of 6 SETUP data forms is provided in the following section so that programming information can be logged.

This can be done prior to the installation and commissioning of the system as an implementation instruction to the installation engineer, or it may be used to post-record the data that is entered during the installation process.a PC.

COMMANDER SYSTEM CONFIGURATION FROM A PC

DIRECT CONFIGURATION

The complete Commander setup can also be installed into the Command module through the LAN 1 or LAN 2 data ports, using a standard PC programming tool (section 2).



The standard communication protocol is MODBUS and it is available in CD format complete with a LAN 2 interconnecting cable. An RS485/RS232 connector will be required for the PC data port.

PART 3
17. SYSTEM PLANNING

PART 3
17. SYSTEM PLANNING

PART 3
17. SYSTEM PLANNING

PART 3
17. SYSTEM PLANNING

18 which channel card?

PART 3
18. WHICH CHANNEL CARD?

I ANALOGUE INPUT CHANNEL CARDS

4...20mA INPUT

TX2141.301
TX2141.302

- Current regulated 4...20 process signals.
- 2, 3 and 4 wire connections.
- Loop powered sensors.
- Sensors, signal loops, process instruments.

TX6531
TX6532
Sentro Gas Sensor

TX6273
TX6274
Temperature Sensor

TX6363
TX6373
TX6383
Gas Sensor
- Electrochemical
- Infra Red
- Pellistor

TX6114
Pressure Sensor

TX6141
TX6143
Pressure Sensor

TX5921
TX5922
TX5923
Vortex Flow Sensor

TX5634
to
TX5638
Vibration Sensor

PART 3
18. WHICH CHANNEL CARD?

I ANALOGUE INPUT CHANNEL CARDS

0.4...2V SIGNALS

TX2141.303
TX2141.304

- Sensors and monitoring devices with analogue voltage outputs.
- Voltage signal generators.

TX6273
TX6274
Temperature Sensor

TX6531
TX6532
Sentro Gas Sensor

TX6363
TX6373
TX6383
Gas Sensor
- Electrochemical
- Infra Red
- Pellistor

TX6141
TX6143
Pressure Sensor

TX5921
TX5922
TX5923
Vortex Flow Sensor

PART 3
18. WHICH CHANNEL CARD?

I ANALOGUE INPUT CHANNEL CARDS

PT100 SIGNALS

TX2141.306
TX2141.307

- Standardised to DIN43760.
- –50°C to 400°C ranges.
- Linearised response.
- Line compensation.

TX2070
Temperature Sensor
• PT100 element

SEMICONDUCTOR SIGNALS

TX2141.308

- Linearised input.
- –50°C to 300°C ranges.
- Economical.

TX2070
Temperature Sensor
• KTY21 & KTY84
• Semiconductor element

ac VOLTAGE SIGNALS

TX2141.309

- ac RMS detection.
- Vibration sensors.
- Load cells.
- ac generators.
- ac measuring instruments.
- 10Hz to 20KHz ranges.

TX5631
TX5632
TX5633
Vibration Sensor

mV SIGNALS

TX2141.310

- Strain gauges.
- Load cells.
- Bridge sensing circuits.
- Pressure sensors.
- Measuring devices.
- 1mV/V to 100mV/V ranges.

TX6251
Infra Red Temperature Sensor

TX6384
Remote Flammable Gas Sensor

PART 3
18. WHICH CHANNEL CARD?

I PULSE FREQUENCY INPUT CHANNEL CARDS

PULSE FREQUENCY INPUT

TX2141.401

- Pulse or frequency signals.
- Switches,proximity sensors, pulse wheels, frequency generators, photocells.
- Frequency measurement, speed sensing, slip monitoring, differential frequency, pulse comparison, frequency generators.
- Sensors with frequency outputs 5...15Hz, 0...10kHz etc.
- Pulse generating flow sensing devices and turbines.
- Motor and conveyor monitoring.

TX5924
TX5925
Vortex Flow Sensor

PART 3
18. WHICH CHANNEL CARD?

I ONOFF/STATE INPUT CHANNEL CARDS

ONOFF/STATE INPUT

TX2141.501

TX2141.502

TX2141.503

TX2141.504

- Simple ONOFF switches; pressure switches, reed switches, limit switches, thermostats.
- NAMUR proximity sensors, position sensing, interlocking.
- Fail safe switch line monitoring.
- Current state change for fire and gas applications. Smoke, flame, break glass, etc.

TX2020 Insertion Thermostat

TX2010 Surface Thermostat

TX1115 Tilt Switch

TX5800 Level Switch

TX1120 Capacitive Level Switch

TX5901 Differential Pressure Flow Sensor

TX6001 Insertion Flow Sensor

TX1000 series Proximity Switches

TX5521 Flexiprobe

ONOFF/STATE OUTPUT CHANNEL CARDS

ONOFF/STATE OUTPUT  TX2141.603	▬ Solid state output switch. ▬ Relay driver, small lamp driver, logic driver. ▬ Economical output switching. ▬ Quad output – high density.	
ONOFF/STATE OUTPUT  TX2141.604	▬ Voltage free contact. ▬ Isolated switching power for relays, contactors and alarm devices.	

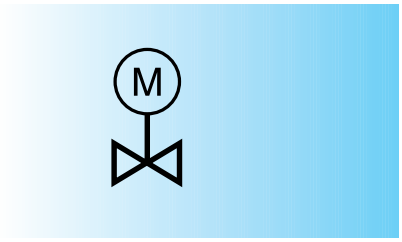
PART 3
18. WHICH CHANNEL CARD?

ANALOGUE OUTPUT CHANNEL CARDS

ANALOGUE OUTPUT

TX2141.701

- Motorised valves, servo controllers, process loops, regulators, positioning devices
- Signal repeaters



19 conformity check

PART 3
19. CONFORMITY CHECK

➖ Ensure the correct Supply Voltage system.	24V dc
➖ Ensure the correct Sensors and Plant Devices	24V dc compatible

➖ Ensure correct Datacomms compatibility for LAN1 and LAN2 and associated equipment.

➖ Do the channel card types concur with the plant devices being used.

➖ Fit DIN RAIL end clamps. Secure Commandbus cables.

➖ Group II (02) Commander Modules MUST be mounted into approved metal housings.

➖ Check that all terminals are properly tightened.

➖ Segregate power and signal cabling.

➖ Carry out a power audit of each Terminal Module (section 3.8).

➖ Check that the total power consumption is within the power rating of the power supply being used and the limits individually specified for Hazardous Area Commander Systems.

Command Module (section 2)	mA
Terminal Modules (section 3.9)	mA
Commandbus Repeater Modules (section 5.6)	mA
TOTAL:	mA

CAUTION **If more than one Power Supply is used on a Commander system ensure that interlinking power conductors have been omitted from the commandbus (section 5.4).**

➖ Check that the cable lengths do not exceed permissible restrictions.

➖ Fit End-of-Line Termination Resistors on DISPERSED Commandbus systems (sections 5.6 and 5.7).

20 approvals and certification

Intrinsically Safe

The Commander system is certified Intrinsically Safe Group II apparatus for use in potentially explosive atmospheres to EURONORM standards when used with an approved power supply or safety barrier.

Group II: **[EEx ia] IIC T4**

ATEX

The system is designed to comply with the **ATEX directive (94/9/EEC).**

Electro Magnetic Compatibility

The system is designed to comply with the EC directive on EMC (89/336/EEC).

PROTECTING THE ENVIRONMENT

Many of our products are often used to monitor the quality of environmental conditions consequently Trolex is also particularly aware of the need to protect human health and the environment in which we live.

The Company has instituted a radical environment protection policy to ensure that all aspects of our manufacturing programme have the minimum possible detrimental impact on the environment. This covers all stages beginning with sustainable product design supported by careful selection of the materials used in their production, through to managed recovery and disposal at the end of the useful life of a product.

This policy also incorporates the principles of the Waste Electrical and Electronics Equipment (WEEE) directive, and the associated Restriction of Hazardous Substances (RoHS) directive, to be implemented in EU countries.

Progress is already well advanced on the introduction of a completely new range of products that maximise the central principle of sustainable design with the intention of reducing the end-of-life cost to the end user.

All Trolex products are manufactured to exacting standards in accordance with our stringent quality control ethos. Having chosen to use one of our products will, in itself, guarantee extended durability and a long operating life, endorsed by our commitment to recycling and recovery.

- All packaging materials are carefully selected to be bio-degradable or re-cycleable where possible.
- All plastic materials are identified for recycling purposes and re-cycled materials are used where it is possible to do so.
- Printing paper and material are sourced from suppliers that have a declared environmental management system.
- Product design centred around high quality and long term durability. Modular architecture both in construction and software design suitable for future upgrades and adaptability to alternative duty.
- Ease of product disassembly, minimisation of fixing devices, and clear separation of functional parts to benefit re-use and re-cycling.
- Control and monitoring of suppliers of components and sub-assemblies. Deal only with suppliers that have a defined commitment to environmental monitoring principles.
- Control the use of restricted substances within the design process. Deal only with suppliers that have a defined commitment to the control of restricted substances.
- Provide an efficient high speed service within Trolex for repair, refurbishing and conversion of products for alternative duty.
- Provision of an end-of-life product Take-back service for recovery, re-use, and recycling of electrical and electronic components. Retain the packaging of a new product and re-use it to return the device to us at the end of its working life. Trolex will guarantee to recover all materials and components, where practicable and arrange for them to be re-cycled in an appropriate and in a safe manner.

TROLEX LIMITED
Newby Road, Hazel Grove, Stockport, Cheshire SK7 5DY, UK.
T: +44 (0)161-483 1435
E: sales@trolex.com W: www.trolex.com