D397-54-880
Issue A Original

Instruction Manual

TIC and DX/nEXT Profibus Module

Description	Item Number	Description	Item Number
TIC Profibus Module	D397-54-000	DX/nEXT Pump Profibus Module	D397-55-000

EDWARDS
www.edwardsvacuum.com

Declaration of Conformity

We, Edwards,
Manor Royal,
Crawley,
West Sussex, RH10 9LW, UK

declare under our sole responsibility, as manufacturer and person within the EU authorised to assemble the technical file, that the product(s)

TIC Profibus Module	D397-54-000
DX/nEXT Pump Profibus Module	D397-55-000

to which this declaration relates is in conformity with the following standard(s) or other normative document(s)

EN61010-1: 2001	Safety Requirements for Electrical Equipment for Measurement, Control and Laboratory Use. General Requirements
EN 61326-1: 2006 (Industrial location, Class B Emissions)	Electrical equipment for measurement, control and laboratory Use. EMC requirements. General requirements.

and fulfils all the relevant provisions of

2004/108/EC	Electromagnetic Compatibility (EMC) Directive

Note: This declaration covers all product serial numbers from the date this Declaration was signed onwards.

L. G. Marini

Mr L Marini, Technical Manager

03-02-2011 Eastbourne

Date and Place

This product has been manufactured under a quality system registered to ISO9001

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1 Introduction

1.1 Scope and definitions

This manual provides installation, operation and maintenance instructions for the Edwards Turbo Instrument Controller (TIC) Profibus Module and the Edwards DX/nEXT Turbo Pump Profibus Module. You must use the Controller as specified in this manual.

Read this manual before you install and operate your Controller. Important safety information is highlighted as WARNING and CAUTION instructions; you must obey these instructions. The use of WARNINGS and CAUTIONS is defined below.

WARNING

Warnings are given where failure to observe the instruction could result in injury or death to people.

CAUTION

Cautions are given where failure to observe the instruction could result in damage to the equipment, associated equipment and process.

Throughout this manual, page, figure or title numbers are sequential.

The following labels appear on the Controller:

Warning - refer to accompanying documentation.

Edwards offer European customers a recycling service.

The units used throughout this manual conform to the SI international system of units of measurement.

1.2 Product description

WARNING

Improper use of the equipment may impair the protection provided and could cause damage to it.

WARNING

The equipment is used to remotely control other equipment that could be hazardous if used inappropriately. The responsibility for the safe operation and maintenance of the equipment being controlled is with the user.

WARNING

The data received from this unit should not be used for safety purposes.

There are two variants of the Profibus Module, both of which are provided with a standard Profibus connection, DC power input connection and connection to the Edwards equipment. The TIC Profibus Module is provided with a short serial cable to connect the module to the TIC serial comms port. The DX/nEXT Profibus Module is provided with a 15 way connector. The 15 way flying lead attached to the DX/nEXT pump can be directly connected for both power and control.

This manual explains how to control and monitor the TIC and DX/nEXT Pump modules with a Profibus system. Please refer to the following manuals for operation of TIC controllers and DX/nEXT pumps:

D397-01-880	TIC Instrument Controller - 6 Gauge
D397-12-880	Turbo Controller
D397-21-880	Instrument Controller
D397-22-880	Turbo Instrument controller
D397-30-880	TIC serial comms manual
B722-40-880	DX Pumps
B800-00-880	nEXT Pumps

2 Technical data

2.1 Electrical data

Table 1 - Electrical data

Power connector type	2 Way cable-mount Terminal Block (supplied) Suitable parts include: Phoenix MSTB 2.5/2-ST-5.08; Weidmuller BLZ 5.08/2; Amp 796634-2; IMO 21.950/2
Electrical supply	
TIC Profibus Module	9 V d.c. min to 52 V d.c. max
DX/nEXT Pump Profibus Module for EXT75DX, EXT255DX and nEXT 240, 300, 400	21.6 V d.c. min to 25.2 V d.c. max
Power consumption	5W maximum Switch on surge 500 mA max. ***Note:*** *DX/nEXT Pump Profibus Modules also supply power to the pump. Additional supply requirement: 6 A for EXT75DX, 10 A for EXT255DX and nEXT. Refer to manuals for other DX/nEXT Turbo Pumps.*
Fuse	
TIC Profibus Module	No internal fuse
DX/nEXT Pump Profibus Module	Fitted with 10 A internal fuse. Suitable fuses available from Edwards (Part No. D39751830).

WARNING

(DX/nEXT version only)

Incorporate a suitable isolation device in the electrical supply. Locate the switch in an easily accessible position and mark it as the disconnecting device for the DX/nEXT pump. If you do not, you will not be able to switch off the DX/nEXT pump in an emergency.

WARNING

Do not exceed the maximum supply voltage. Excessive supply voltage will cause permanent damage to the control electronics and may result in a mechanical hazard in some failure conditions.

Profibus cable	Should be screened and comply with EN50170
RS232 cable (TIC version only)	25 m max. Screening not required.
DX/nEXT pump cable (DX/nEXT pump version only)	Use (1 m) cable supplied with DX/nEXT pump only or Edwards DX/nEXT pump extension cables.

2.2 Operating and storage data

Table 2 - Operating and storage data

Ambient operating temperature range	0 °C to 40 °C
Ambient storage temperature range	-30 °C to 70 °C
Maximum ambient operating humidity	Max 90% RH non condensing
Maximum operating altitude	2000 m max
IP rating	IP30 - indoor use only

2.3 Mechanical data

Table 3 - Mechanical data

Weight	0.28 kg
Dimensions	See Section 3.2

2.4 Connections

2.4.1 Profibus connector

Table 4 - Profibus connector

Connector type	9-way sub-miniature 'D' type socket (refer to Figure 1)
Profibus Data signals	Electrically compliant with RS485 specification. Isolated from chassis.
Profibus Power Supply	10 ma supply (protected) for external terminator resistors if required.
Chassis	For Profibus cable screen connection
Repeater control sign	Digital signal, nominally 0-5 V but with series 340 ohm resistor. High = module transmitting. Low = Receiving or Idle.

Figure 1 - Pin connections for 9-way sub-miniature 'D' type socket

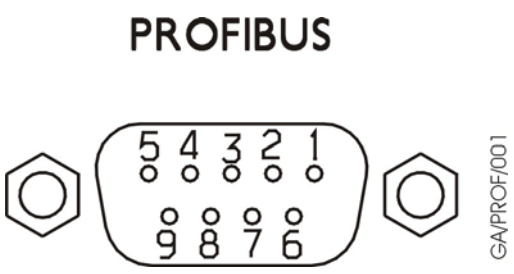


Table 5 - Pin connections for 9-way sub-miniature 'D' type socket

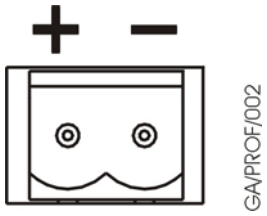
Pin	Allocation
1	Chassis (box)
2	Not connected
3	Profibus Data + (B)
4	Control Signal for Repeater
5	Profibus Data reference (Isolated)
6	Profibus 5 V output (Isolated)
7	Not connected
8	Profibus Data - (A)
9	Not connected
Shell	Chassis (box)

2.4.2 D.C. Power connector

Table 6 - D.C. power connector

Connector type	2 Way Receptacle. Mating part is cable-mount Terminal Block (supplied). Suitable parts include: Phoenix MSTBV 2.5/2-G-5.08; Weidmuller BLZ 5.08/2; Amp 796634-2; IMO 21.950/2 (Refer to Figure 2).
Requirements	See Section 2.1

Figure 2 - Pin connections for the 2-way Power Connector



2.4.3 RS232 Connector (TIC Version only)

Table 7 - RS232 connector (TIC version only)

Connector type	9-way sub-miniature 'D' type Plug (refer to Figure 3) For connection to serial comms port of Turbo Instrument Controller only.
RS232 protocol	9600 baud, 1 stop bit, 8 data bits, no parity

Figure 3 - Pin connections for 9-way sub-miniature 'D' type plug

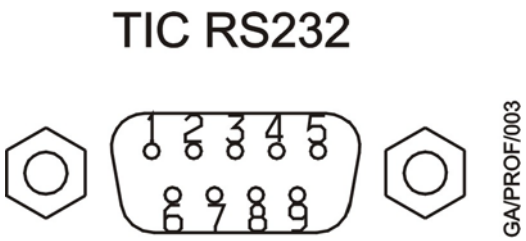


Table 8 - Pin connections for 9-way sub-miniature 'D' type plug

Pin	Allocation
1	Not connected
2	RS232 receive
3	RS232 transmit
4	Not connected
5	RS232 common
6	Not connected
7	Not connected
8	Not connected
9	Not connected
Shell	Chassis (box)

2.4.4 DX/nEXT Pump Connector (DX/nEXT pump version only)

Table 9 - DX/nEXT pump connector (DX/nEXT pump version only)

Connector type	15-way sub-miniature 'D' type Socket (refer to Figure 4)
Cable type	Connection must be either direct to the DX/nEXT pump flying lead or an Edwards DX/nEXT pump extension cable. Refer to the specification in the DX pump manual B722-40-880 and nEXT pump manual B800-00-880 for further information.
Power connections	Refer to caution below

CAUTION

When connecting the DX/nEXT pump to the power supply, ensure that all 3 pins for the 24 V connection and all 3 pins for the 0 V connection on your connector mating half are connected to the power supply.

RS232 protocol	9600 baud, 1 stop bit, 8 data bits, no parity.

Figure 4 - Pin connections for 15-way sub-miniature 'D' type socket

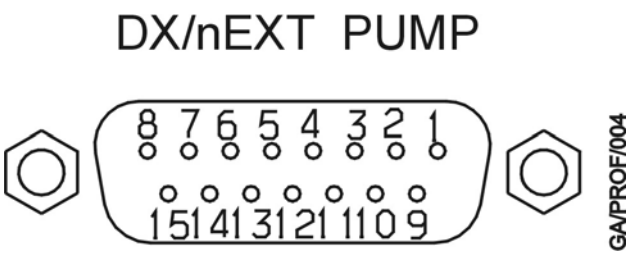


Table 10 - Pin connections for 15-way sub-miniature 'D' type socket

Pin	Allocation
1	+24 V d.c. power output *(Connect all three 24 V pins)*
2	Not connected
3	Not connected
4	RS232 Transmit
5	Serial enable link (Resistor to 0 V)
6	+24 V d.c. power output
7	RS232 Receive
8	0 V power *(Connect all three 0 V pins)*
9	+24 V d.c. power output *(Connect all three 24 V pins)*
10	Chassis (box)
11	+24 V d.c. power output *(Connect all three 24 V pins)*
12	Not connected
13	0 V power *(Connect all three 0 V pins)*
14	0 V power *(Connect all three 0 V pins)*
15	Not connected
Shell	Chassis (box)

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3 Installation

3.1 Unpack and inspect

Remove all of the packaging material and check the Module. If the Module is damaged, follow the Edwards return of equipment procedures that are laid out in the back of this manual. Do not use the Module if it is damaged.

Check that your package contains the items that are listed in Table 11. If any of these items are missing, notify your supplier in writing within three days. If the Module is not to be used immediately, store the Module in suitable conditions as described in Section 6.1.

Table 11 - Component checklist

Quantity	Description	Check (✓)
1	Module	☐
1	Quick Guide and Health and Safety Information	☐
1	Profibus Module CD (includes main manual, GSD files)	☐
1	DC Power Connector	☐
2	DIN Rail clips	☐
2	Mounting screws	☐
1	Serial cable (TIC version only)	☐
1	Spare Fuse (DX/nEXT Pump version only)	☐
4	Rubber feet	☐

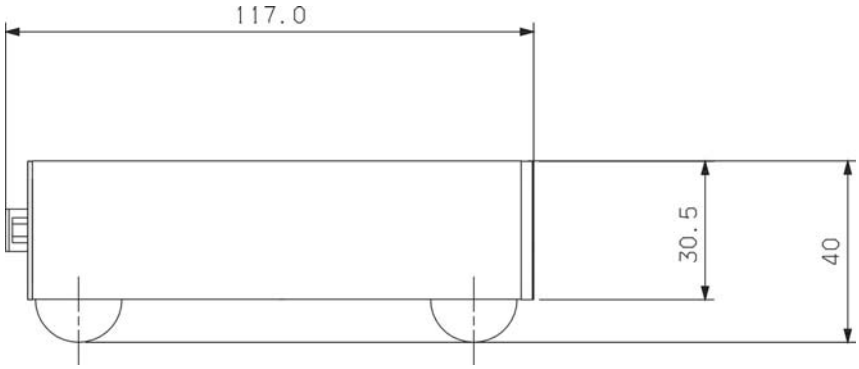
3.2 Fitting the Module

WARNING

If access to the DC power connector is restricted an additional isolation device should be provided which will be easily accessible by an operator.

The Module can be fitted in a rack or DIN-rail mounted. If either of these methods are not used, the module should be laid with one of it's largest faces down, to ensure stability. Figure 5 shows the dimensions of the Profibus module.

Figure 5 - Dimensions of the Profibus module (mm)



WARNING

Ensure that all electrical wiring is safely secured so that people cannot trip on them.

Sufficient space must be provided at the rear of the unit for the cables. For this reason it is suggested that the customer uses a straight Profibus connection. If a right-angled connection is to be used space will be required above the height on the module.

CAUTION

Do not "Hot-swap" the DX/nEXT pump connection. Power must be removed before connecting or disconnecting a turbo pump.

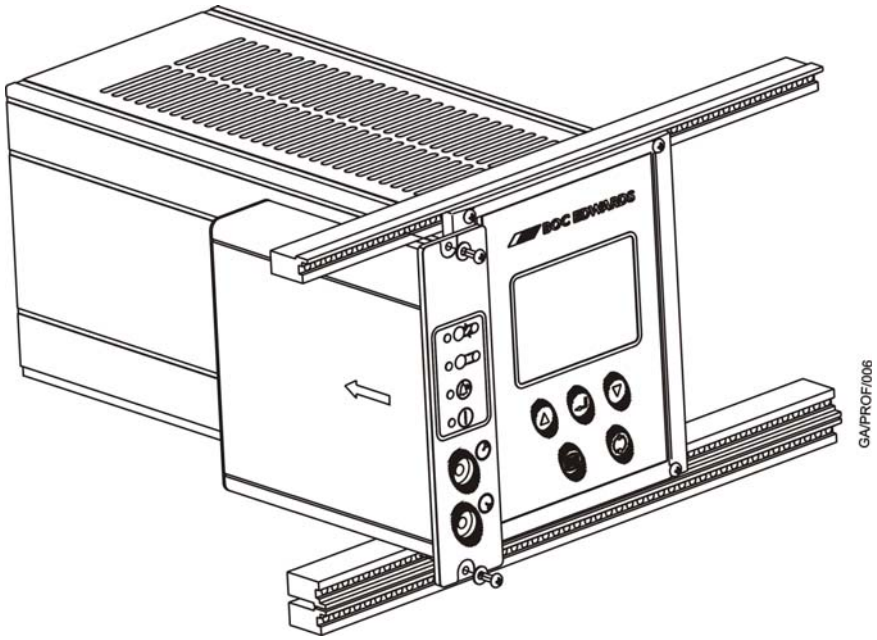
CAUTION

The unit is IP30 rated. Please ensure that the unit is not installed where fluids can enter into the Controller.

3.2.1 Rack mounting

For Rack mounting the unit should fit in a 6HP wide, 3U High space using the 2-off M2.5 screws provided, as shown in Figure 6.

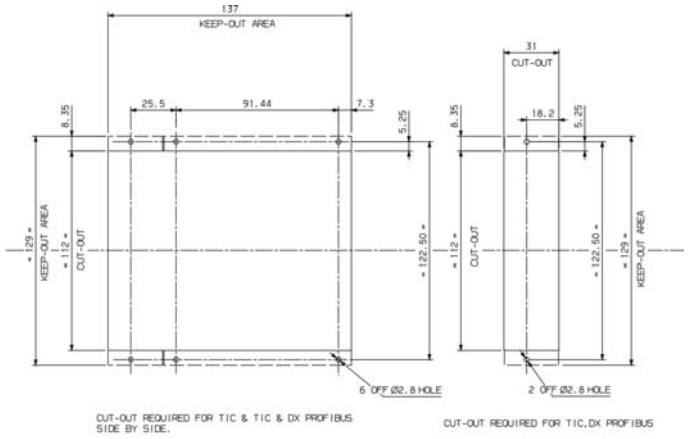
Figure 6 - Rack mounting the Module



3.2.2 Panel mounting

For panel mounting cut the aperture in the panel using the dimensions shown in Figure 7. The module can be fixed into the panel with the 2-off M2.5 screws.

Figure 7 - Panel mounting the Module

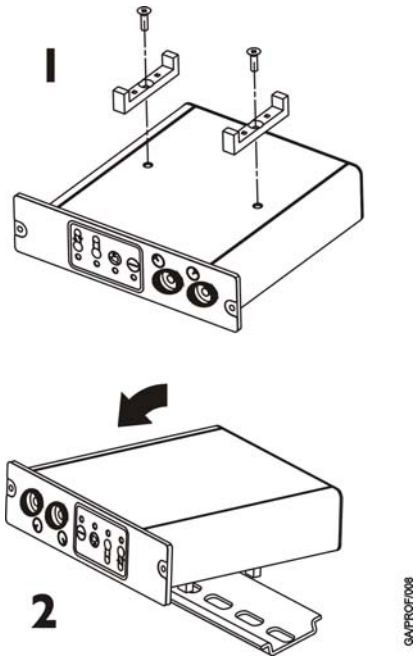


3.2.3 DIN rail mounting

For DIN rail mounting the 2 clips should be attached to the module using 2-off M3 screws provided (one in the centre of each clip), as shown in Figure 8. The clips should then be roughly aligned with the box sides. The clips can then be fitted to a suitable DIN-rail, as shown in Figure 8.

It is recommended to use end stops on a DIN rail system.

Figure 8 - DIN rail mounting the Module

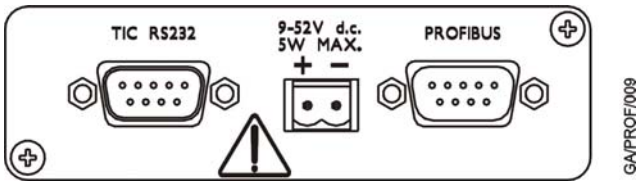


3.3 Electrical connections

Fit the electrical connections as specified in Section 2.

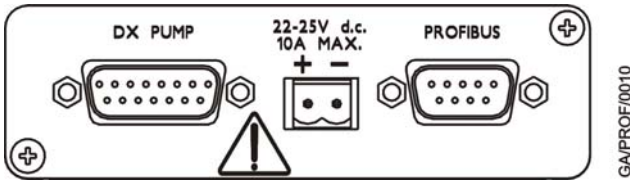
3.3.1 TIC Profibus module rear connections

Figure 9 - TIC Profibus module rear connections



3.3.2 DX/nEXT Profibus module rear connections

Figure 10 - DX/nEXT Profibus module rear connections



3.4 Bus termination

Bus-termination is not supplied with the module, but must be used as for a normal Profibus DP system. Bus termination must be used at both ends of the Profibus trunk and not anywhere else. If the module is placed at one end of the trunk a connector containing the standard termination resistors should be used. The appropriate 5V and 0V signals are supplied on the standard pins for this purpose.

4 Operation

4.1 Profibus system information

The Edwards Profibus Modules are for connection to a Profibus DP network and operate as V0 slaves only. The required performance is described in standard EN50170.

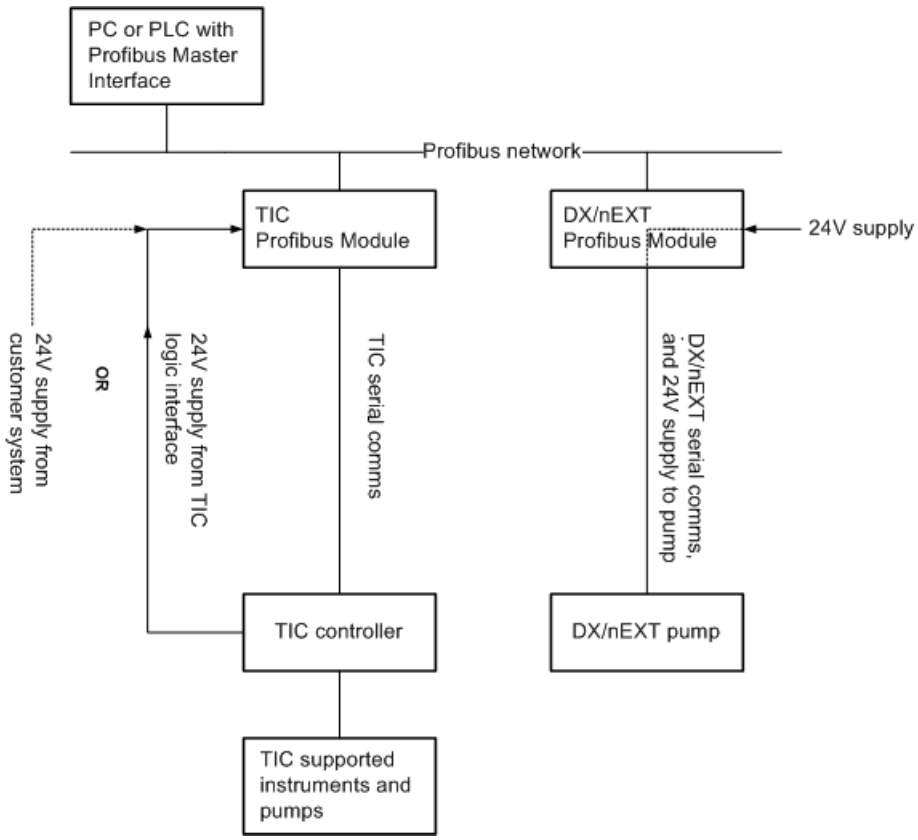
The Profibus master requires a GSD file for each slave and these are provided on the CD included with the unit. The TIC and DX/nEXT pump versions require different GSD files so please ensure the relevant file (only) is installed. The "ident" numbers are unique for each type, and are registered with the Profibus association. The numbers are:

TIC	0D25
DX	0D26

Note: *If the wrong GSD file is selected it will not operate the module. The GSD files must not be altered.*

4.2 Start up sequence

The diagram below provides an overview of how the TIC Profibus module and the DX/nEXT Profibus module fit within a Profibus Fieldbus system.



4.2.1 Simple set up instructions for the TIC version

1. Make all the connections to the TIC as appropriate to the system needs and as defined in the TIC instruction manual.
2. Ensure the TIC protocol is set to 'RS232' (not RS485) and the 'comms address' is set to '00' which is the TIC's factory default. This can be done from the TIC's parameters/units menu.
3. Connect the short serial cable provided between the TIC and Profibus module.
4. Connect the Profibus cable (provided by customer) to the Profibus connection.
5. Set address switches.
6. Load the GSD file into the Profibus system configurator (provided by customer).
7. Select module 904 to provide on and off control of a turbo pump connected to the TIC and select modules 913-915 to provide gauge control.

Note: *The TIC controller is provided with factory set defaults, which are suitable for basic operation of the controller.*

8. Connect the 24V power supply to the Profibus module.
9. Connect the mains supply to the TIC, and turn the TIC on.
10. The TIC controller is available for basic operation within a Profibus Fieldbus system.

4.2.2 Simple set up instructions for the DX/nEXT version

1. Connect the 15 way flying lead from the DX/nEXT pump to the Profibus module.
2. Connect the Profibus cable (provided by customer) to the Profibus connection.
3. Set address switches.
4. Load the GSD file into the Profibus system configurator (provided by customer).
5. Select module 852 to provide on and off control.

Note: *The DX/nEXT pump is provided with factory set defaults, which are suitable for basic operation of the pump.*

6. Connect the 24V power supply to the Profibus module.
7. The DX/nEXT pump is available for basic operation within a Profibus Fieldbus system.

4.3 Front panel display

Figure 11 - Profibus front panel display

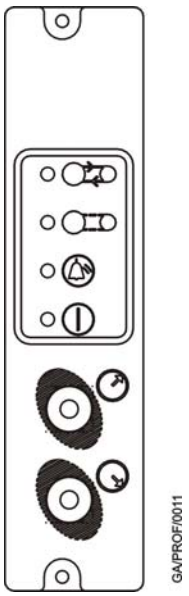


Table 12 - Front panel symbols and their functions

Symbol	Name	Function
	Data exchange	Module is in data exchange as defined by the Profibus standard.
	Off-line	Module is not in data exchange as defined by the Profibus standard.
	Error	ON at the same time as Offline LED = Configuration or parameterisation error. Flashing at 1 Hz = Invalid address selected.
	Power	Internal 5 V supply is operating.
	Upper address switch	Sets value of upper nibble of address (Hexadecimal).
	Lower address switch	Sets value of lower nibble of address (Hexadecimal).

4.4 Address set-up

The module address can be set from 0 to 125 using the two hexadecimal rotary switches on the front panel. The lower switch defines the lower half of the address byte (nibble) and the upper switch defines the upper half of the address byte. Each node on a Profibus network must have a unique address. The address switches will only be read by the unit at power-up. Any change of address setting after power-up will be ignored until next power-up.

The following table may assist.

Table 13 - Address switch settings

Address in Decimal	Upper switch setting	Lower switch setting	Address in Decimal	Upper switch setting	Lower switch setting
0	0	0	63	3	F
1	0	1	64	4	0
2	0	2	65	4	1
3	0	3	66	4	2
4	0	4	67	4	3
5	0	5	68	4	4
6	0	6	69	4	5
7	0	7	70	4	6
8	0	8	71	4	7
9	0	9	72	4	8
10	0	A	73	4	9
11	0	B	74	4	A
12	0	C	75	4	B
13	0	D	76	4	C
14	0	E	77	4	D
15	0	F	78	4	E
16	1	0	79	4	F
17	1	1	80	5	0
18	1	2	81	5	1
19	1	3	82	5	2
20	1	4	83	5	3
21	1	5	84	5	4
22	1	6	85	5	5
23	1	7	86	5	6
24	1	8	87	5	7
25	1	9	88	5	8
26	1	A	89	5	9
27	1	B	90	5	A
28	1	C	91	5	B
29	1	D	92	5	C

Address in Decimal	Upper switch setting 	Lower switch setting 	Address in Decimal	Upper switch setting 	Lower switch setting 
30	1	E	93	5	D
31	1	F	94	5	E
32	2	0	95	5	F
33	2	1	96	6	0
34	2	2	97	6	1
35	2	3	98	6	2
36	2	4	99	6	3
37	2	5	100	6	4
38	2	6	101	6	5
39	2	7	102	6	6
40	2	8	103	6	7
41	2	9	104	6	8
42	2	A	105	6	9
43	2	B	106	6	A
44	2	C	107	6	B
45	2	D	108	6	C
46	2	E	109	6	D
47	2	F	110	6	E
48	3	0	111	6	F
49	3	1	112	7	0
50	3	2	113	7	1
51	3	3	114	7	2
52	3	4	115	7	3
53	3	5	116	7	4
54	3	6	117	7	5
55	3	7	118	7	6
56	3	8	119	7	7
57	3	9	120	7	8
58	3	A	121	7	9
59	3	B	122	7	A
60	3	C	123	7	B
61	3	D	124	7	C
62	3	E	125	7	D

Note: *If the address is set to a value greater than 125 (decimal) the RED error LED will flash at around 1 Hz and the module will not go on-line. If this occurs either, change the address and cycle the power or remove power and change the address.*

4.5 Baud-rate

All 10 standard DP baud-rates are supported. These are: 9.6Kbd; 19.2Kbd; 45.45Kbd; 93.75Kbd; 187.5Kbd; 500Kbd; 1.5Mbd; 3Mbd; 6Mbd; 12Mbd. The unit has no facility for adjusting baud-rate as detection is automatic, and it will therefore respond to the baud-rate chosen by the master.

4.6 Software format

The Slave software is based upon a modular configurable architecture so the user has considerable control of the contents of the Data exchange messages.

The software modules (defined in the GSD files) generally follow the TIC and DX/nEXT pump serial communications objects. In terms of the TIC/DX/nEXT serial comms the Profibus input data is provided by ?V, output data is sent by !C and parameterisation by !S. The unit uses ?S to check that parameterisation has succeeded but this data is not returned over the Profibus network as there is no equivalent Profibus message.

When the unit is linked onto the Profibus it will be parameterised and then configured before entering data exchange. The parameterisation and configuration choices are in the GSD file and its comments describe the data content of the input, output and parameterisation bytes. These choices will often be made using a third party configurator such as SyCon that presents an user-friendlier interface.

16-bit values are transmitted with the MSB first and the LSB last.

4.6.1 Parameterisation

The TIC version has one common parameterisation - front panel lock/unlock. The other parameters are modular and will only be sent when a module is selected in the configuration. The TIC and the DX/nEXT remember the parameterisation during power down so if it is required to alter a parameterisation you must send it (include it in the configuration list). Parameter settings do not go to default during a power down. On the TIC if a module is in the parameterisation do not alter its settings from the front panel. Conversely if a module is not in the parameterisation then you could sensibly set up from the TIC front panel.

In order to speed up the true data exchange rate (the serial comms information transfer is relatively slow or very slow compared to Profibus) the configuration list might not include all modules and therefore those modules left out will not be parameterised. As the TIC and DX/nEXT remember their settings during power down this will not normally cause a problem once the TIC or DX/nEXT has been initially set up. However, if the TIC or DX/nEXT is replaced with a different one it will not be fully set up by the parameterisation and the user must takes steps to correct this by either setting up the missing modules using the front panel or temporarily adding the modules to the configuration.

The TIC and DX/nEXT come with factory default settings that suit simple operation, it is not necessary to alter these settings to simply turn a pump on/off or read a gauge, see their respective manuals for further details. In general the GSD defaults match the TIC and DX/nEXT factory defaults.

4.6.2 Configuration

During configuration the user can define what modules are required and in which order the data is transferred. The unit simply adds the input and output data bytes to the message maps in the order that they are defined in the configuration message.

A module must only be defined once in the list. If a module is declared more than once it may cause a parameterisation/configuration failure or may not update the data content correctly.

Example:

Module = Mod_A 3 bytes in (Ai1, Ai2, Ai3), 1 byte out (Ao1)

Module = Mod_B 2 bytes in (Bi1, Bi2), 2 bytes out (Bo1, Bo2)

A) Configure Mod_A, Mod_B gives

Output map: -

Byte1	Byte 2	Byte 3
Ao1	Bo1	Bo2

Input map: -

Byte1	Byte 2	Byte 3	Byte 4	Byte 5
Ai1	Ai2	Ai3	Bi1	Bi2

B) Configure Mod_B, Mod_A gives

Output map: -

Byte1	Byte 2	Byte 3
Bo1	Bo2	Ao1

Input map: -

Byte1	Byte 2	Byte 3	Byte 4	Byte 5
Bi1	Bi2	Ai1	Ai2	Ai3

Data is always referred to the Master so output data is Control data from Master to Slave and Input data is feedback data from Slave to Master.

There are many software modules, (TIC has over 30), and many bytes of data (TIC has over 100 input bytes), care must be taken in correctly selecting and aligning the data into your system.

Configuration may take up to 5 seconds to occur. During this period the Profibus Slave will signal to the Master that is is "not-ready" for data exchange.

4.6.3 Configuration failure

Some variants of the TIC do not have all functional items present and the modules related to these items will not be valid. An inappropriate configuration will lead to parameterisation or configuration failure and the slave will not enter data exchange. The number of the first failed module will be placed in the extended diagnostic data. See GSD or Section 4.6.5 for description of the extended diagnostics.

4.6.4 Parameterisation failure

Some parameterisation will not be valid in particular combinations. The TIC and/or DX/nEXT will determine this and the Slave will not enter data exchange. The number of the first failed module will be placed in the extended diagnostic data. As per current recommendations this is not flagged as a critical diagnostic in the mandatory diagnostics (octet 1 bit 3).

4.6.5 Diagnostics description

The modules use extended diagnostics in the format below.

Max_Diag_Data_Len = 12

Bytes	1-6	7	8 and 9	10 and 11	12
Description	Mandatory	No of bytes of extended diagnostics (6)	Module failed parameterisation, MSB in 8, LSB in 9	Module failed configuration, MSB in 10, LSB in 11	Serial comms lost (0=OK, 1=lost).

Note: *An appropriately configured software module will be shown as a parameterisation failure if that module contains parameterisation data as the Profibus standard is for parameterisation to occur before configuration. If there is more than one bad parameterisation or configuration entry, the module number will be the first bad module in the order of configuration.*

4.7 Details of DX/nEXT Pump Software modules

Introduction

This section applies only to the DX/nEXT pump Profibus module. The table below provides a summary of the modules.

Table 14 - DX/nEXT pump module summary

Module No	Module description	Compatibility	No of output bytes	No of input bytes	No of Parameter bytes
852	DX/nEXT pump control	75DX, 255DX/nEXT	1	6	None
853	DX/nEXT pump set-up	75DX only	None	1 (Dummy)	7
853	DX/nEXT pump set-up	255DX/nEXT	None	1 (Dummy)	7
859	DX/nEXT pump temperature	75DX, 255DX/nEXT	None	2	None
860	DX/nEXT pump power	75DX, 255DX/nEXT	None	2	None
869	DX/nEXT pump speed demand	75DX,255DX/nEXT	1	None	4
875	DX/nEXT vent valve close	75DX or 255DX/nEXT with a TIC controller supporting turbo controller	1	None	None
880	Service set-up	nEXT	None	1 (Dummy)	3
881	Service Status	nEXT	None	4	None
882	Controller Run Time	nEXT	None	8	None
883	Pump run time	nEXT	None	8	None
884	Pump cycles	nEXT	None	4	None
885	Bearing run time	nEXT	None	8	None
886	Oil cartridge run time	nEXT	None	8	None
902	DX/nEXT Profibus module Software Version	DX/nEXT Profibus Module	None	2	None

4.7.1 Software module 852 - DX/nEXT Pump Control

General Description

Main DX/nEXT Pump control and monitoring module. This module must be selected for pump control.

Output bytes (from Master)

1st	Stop if value 0. Run if value 1.

Input bytes (to Master)

1st	Form a 16-bit number, which is the motor speed in Revolutions per Second. (0-1800).
2nd	
3rd	Form a 32-bit system status word. The Upper two bytes (3rd and 4th) are reserved. Each bit of lower 2 bytes is a flag. To decode the status first convert the value to binary. Refer to Table 15 to interpret each bit.
4th	
5th	
6th	

Associated Parameter options

None.

Table 15 - DX/nEXT status flags

Bit No.	Status Flag Name	Meaning if Flag 0	Meaning if Flag 1
0	Fail	Not failed	Failure condition
1	Stopped Speed	Pump in motion	Pump at rest
2	Normal Speed	Below normal speed	Above normal speed
3	Vent valve	Valve output not powered	Valve output powered
4	Start	Not commanded to start	Commanded to start
5	Serial Enable	Serial control disabled	Serial control enabled
6	Standby	Standby not commanded	Standby commanded
7	50% speed	Below 50% speed	Above 50% speed
8	Parallel control	Not in Parallel control mode	In Parallel control mode
9	Serial control	Not in Serial control mode	In Serial control mode
10	Software Compatibility	Podule software not mis-matched	Invalid Podule software
11	Software Completion	Podule upload complete	Podule Config or Cal failed
12	Timer State	Timer duration not exceeded	Timer (for 50% speed) expired
13	Hardware Trip	No trip	Overspeed or Overcurrent trip
14	Thermistor Error	Internal temp system good	Internal temp system failed
15	Serial Interlock	Serial enable good	Serial enable bad

Note: *There are slight differences in the status between the DX and nEXT. For example, DX clears faults on a stop command and nEXT clears faults on the start command (a stop command should be sent first). The TIC attempts to hide these differences in its returned data (objects 900+).*

4.7.2 Software module 853 - DX/nEXT Pump Set-up

There are two versions of this module for the two ranges of pumps - 75DX and 255DX/nEXT. The software modules have different power limit values. The correct module for the pump in use must be selected.

General Description

DX/nEXT Pump set-up and configuration.

Output bytes (from Master)

None.

Input bytes (to Master)

1st	Dummy byte (always zero).

Associated Parameter options

Bytes	Parameter Option	Description of Parameter
1st	Module number	Cannot be changed.
2nd		
3rd	Vent options	8 options with textual descriptions. More information available on each option from the DX/nEXT pump manual.
4th	Ramp and droop timer setting	Value of the timeout period for both initial speed ramp-up and if the speed drops below 50%. Value is in minutes (1-30).
5th	Power limit	Sets the maximum power that the DX/nEXT pump motor will be allowed to consume (in Watts). The range is different for the two pump ranges.
6th	Effect if speed drops below 50%	Options are stop immediately or stop if timing period exceeded.
7th	Brake use	Whether Electronic braking is enabled or disabled.

4.7.3 Software module 859 - DX/nEXT Pump Temperatures

General Description

Read DX/nEXT Pump controller and motor temperatures.

Output bytes (from Master)

None.

Input bytes (to Master)

1st	Motor temperature in °C.
2nd	Controller temperature in °C.

Associated Parameter options

None.

4.7.4 Software module 860 - DX/nEXT Pump Power

General Description

Read DX/nEXT Pump motor power consumption.

Output bytes (from Master)

None.

Input bytes (to Master)

1st	Forms a 16-bit (signed) number, which is the motor power in 10th's of Watts.
2nd	

Associated Parameter options

None.

4.7.5 Software module 869 - DX/nEXT Pump Speed Demand

General Description

Controls DX/nEXT Pump speed demand (value).

Output bytes (from Master)

1st	Speed demand (if pump started) is full speed if value 0, and standby speed if value 1.

Input bytes (to Master)

None.

Associated Parameter options

Bytes	Parameter Option	Description of Parameter
1st	Module number	Cannot be changed.
2nd		
3rd	Normal speed indication	The value as a percentage of the full speed to define normal speed indication. (50-100%).
4th	Standby speed	The value as a percentage of the full speed to define standby speed. (55-100%).

4.7.6 Software module 875 - DX/nEXT Vent Valve close

General Description

Forces vent valve closed (by powering it) regardless of vent valve control set-up.

Output bytes (from Master)

1st	Not forced closed if value 0. Forced closed if value 1.

Note: *Once a "forced close" command has been sent it can only be cleared in the DX/nEXT pump podule by demanding the pump to stop (using software module 852).*

Input bytes (to Master)

None.

Associated Parameter options

None.

4.7.7 Software module 880 - nEXT Service Set-up

This module must only be selected if there is a nEXT pump connected to the TIC.

General Description

Set-up how a service alert is communicated.

Output bytes (from Master)

None.

Input bytes (to Master)

1st	Dummy byte (always 0)

Associated Parameter options

Bytes	Parameter Option	Description of Parameter
1st and 2nd	Module number	Cannot be changed.
3rd	Service set-up	0: Service indication on Status LED 1: Service indication on Status LED and FAIL line 2: No service indication on Status LED or FAIL line 3: Service indication on FAIL line

4.7.8 Software module 881 - nEXT Service Status

This module must only be selected if there is a nEXT pump connected to the TIC.

General Description

Overall service status.

Output bytes (from Master)

None.

Input bytes (to Master)

1st,2nd,3rd, 4th	From a 32-bit system status word. The Upper three bytes (2nd, 3rd and 4th) are reserved. Each bit of the lower byte is a flag. To decode the status first convert the value to binary. Refer to Table 16 to interpret each bit.

Table 16 - Converting the value to binary

Bit Number	Status flag	Active flag means
0	Oil cartridge service due	Set when hours until oil cartridge service due = 0
1	Bearing service due	Set when hours until bearing service due = 0
2	Pump service due	Set when hours until pump service due = 0 or cycles until pump service due = 0
3	Controller service due	Set when hours until controller service due = 0
4	Reserved	-
5	Reserved	-
6	Reserved	-
7	Service due	Service operation required may be determined by checking the bits above
8 - 31	Reserved	-

Associated Parameter options

None.

4.7.9 Software module 882 - nEXT Controller Run Time

This module must only be selected if there is a nEXT pump connected to the TIC.

General Description

Read Hours run by controller and Hours until controller service.

Output bytes (from Master)

None.

Input bytes (to Master)

1st,2nd,3rd and 4th	Hours run by controller 0..999999
5th, 6th, 7th and 8th	Hours until controller service 0..999999

Associated Parameter options

None.

4.7.10 Software module 883 - nEXT Pump Run Time

This module must only be selected if there is a nEXT pump connected to the TIC.

General Description

Read Hours run by pump and Hours until pump service.

Output bytes (from Master)

None.

Input bytes (to Master)

1st,2nd,3rd and 4th	Hours run by pump 0..999999
5th, 6th, 7th and 8th	Hours until pump service 0..999999

Associated Parameter options

None.

4.7.11 Software module 884 - nEXT Pump Cycles

This module must only be selected if there is a nEXT pump connected to the TIC.

General Description

Read cycles run by pump and cycles until pump service.

Output bytes (from Master)

None.

Input bytes (to Master)

1st and 2nd	Cycles run by pump 0..65535
3rd and 4th	Cycles until pump service 0..65535

Associated Parameter options

None.

4.7.12 Software module 885 - nEXT Bearing Run Time

This module must only be selected if there is a nEXT pump connected to the TIC.

General Description

Read Hours run by bearing and Hours until bearing service.

Output bytes (from Master)

None.

Input bytes (to Master)

1st,2nd,3rd and 4th	Hours run by bearing 0..999999
5th, 6th, 7th and 8th	Hours until bearing service 0..999999

Associated Parameter options

None.

4.7.13 Software module 886 - nEXT Oil Cartridge Run Time

This module must only be selected if there is a nEXT pump connected to the TIC.

General Description

Read Hours run by oil cartridge and Hours until oil cartridge service.

Output bytes (from Master)

None.

Input bytes (to Master)

1st,2nd,3rd and 4th	Hours run by oil cartridge 0..999999
5th, 6th, 7th and 8th	Hours until oil cartridge service 0..999999

Associated Parameter options

None.

4.7.14 Software module 902 - DX/nEXT Profibus module Software Version

General Description

Module used in DX/nEXT Profibus unit to read the software version it contains. This would normally only be used during setup or test; as it can't alter during data exchange it would not normally be present.

Output bytes (from Master)

None.

Input bytes (to Master)

1st	Release state of software in ASCII, should be '4' for production. e.g. ASCII ’4’ = 34 h.
2nd	Version letter of software in ASCII, normally A to Z. e.g. ASCII ’A’ = 41 h.

Associated Parameter options

None.

4.8 Details of TIC Software modules

This section applies only to the TIC controllers' Profibus module. The table below provides a summary of the modules that can be configured.

Table 17 - TIC Controller Module summary

Module No.	Module description	Compatibility	No of output bytes	No of input bytes	No of Parameter bytes
853	DX/nEXT pump set-up	75DX with a TIC controller supporting turbo control	None	1 (Dummy)	7
853	DX/nEXT pump set-up	255DX/nEXT with a TIC controller supporting turbo control	None	1 (Dummy)	7
859	DX/nEXT pump temperature	75DX, 255DX/nEXT with a TIC controller supporting turbo control	None	2	None
860	DX/nEXT pump power	75DX or 255DX/nEXT with a TIC controller supporting turbo control	None	2	None
869	DX/nEXT pump speed set up	75DX or 255DX/nEXT with a TIC controller supporting turbo control	1	None	4
875	DX/nEXT vent valve close	75DX or 255DX/nEXT with a TIC controller supporting turbo control	1	None	None
880	Service set-up	nEXT with a TIC controller supporting turbo control	None	1 (Dummy)	3
881	Service Status	nEXT with a TIC controller supporting turbo control	None	4	None
882	Controller Run Time	nEXT with a TIC controller supporting turbo control	None	8	None
883	Pump run time	nEXT with a TIC controller supporting turbo control	None	8	None
884	Pump cycles	nEXT with a TIC controller supporting turbo control	None	4	None
885	Bearing run time	nEXT with a TIC controller supporting turbo control	None	8	None
886	Oil cartridge run time	nEXT with a TIC controller supporting turbo control	None	8	None
902	TIC Profibus module Software Version	TIC Profibus Module	None	2	None
904	Turbo pump control	Any TIC controller with turbo control	1	3	15
905	Turbo pump speed	Any TIC controller with turbo control	None	4	4
906	Turbo pump power	Any TIC controller with turbo control	None	4	None

Module No.	Module description	Compatibility	No of output bytes	No of input bytes	No of Parameter bytes
907	Turbo normal	Any TIC controller with turbo control	None	3	None
908	Turbo standby	Any TIC controller with turbo control	1	3	None
909	Turbo cycle time	Any TIC controller with turbo control	None	5	None
910	Backing pump control	Any TIC controller with backing control	1	3	None
911	Backing pump speed *(Reserved)*	Any TIC controller with backing control	0	4	None
912	Backing pump power	Any TIC controller with backing control	None	4	None
913	Gauge1	Any TIC controller with gauge control	1	8	17
914	Gauge2	Any TIC controller with gauge control	1	8	17
914	Gauge3	Any TIC controller with gauge control	1	8	17
916	Relay 1	Any TIC controller	1	3	14
917	Relay 2	Any TIC controller	1	3	14
918	Relay 3	Any TIC controller	1	3	14
919	TIC power supply temp	Any TIC controller with turbo control	None	4	None
920	TIC internal temp	Any TIC controller	None	4	None
921	Analogue output	Any TIC controller	None	3	4
922	TIC vent valve	Any TIC controller with turbo control	None	3	3
923	Heater band	Any TIC controller with turbo control	1	5	3
924	Air cooler (Fan)	Any TIC controller with turbo control	None	3	3
933	System	Any TIC controller with turbo control	1	None	None
934	Gauge 4	Any 6 Gauge controller	1	8	27
935	Gauge 5	Any 6 Gauge controller	1	8	27
936	Gauge 6	Any 6 Gauge controller	1	8	27
937	Relay 4	Any non-turbo TIC controller	1	3	14
938	Relay 5	Any non-turbo TIC controller	1	3	14
939	Relay 6	Any non-turbo TIC controller	1	3	14

4.8.1 Front panel lock

A "Common" parameter. The options are either locked or unlocked. This parameter is always sent. The panel lock allows monitoring only and scrolling through screens.

Note: *It is advised that the locked option is selected. Front panel control may be overridden by the Profibus command leading to unexpected pump or gauge behaviour.*

Bytes	Parameter Option	Description of Parameter
1st	Module number	Cannot be changed.
2nd		
3rd	State	0 = unlocked, 1 = control locked.

4.8.2 Software module 853 - DX/nEXT Pump Set-up

There are two versions of this module for the two ranges of pumps - 75DX and 255DX/nEXT. The software modules have different power limit values. The correct module for thie pump in use must be selected.

To use this module with nEXT you will need TIC version D39700640N or later.

General Description

DX/nEXT Pump set-up and configuration.

Output bytes (from Master)

None.

Input bytes (to Master)

1st	Dummy byte (always zero).

Associated Parameter options

Bytes	Parameter Option	Description of Parameter
1st	Module number	Cannot be changed.
2nd		
3rd	Vent options	8 options with textual descriptions. More information available on each option from the DX/nEXT pump manual.
4th	Ramp and droop timer setting	Value of the timeout period for both ramp time and droop time. Value is in minutes (1-30).
5th	Power limit	Sets the maximum power that the DX/nEXT pump motor will be allowed to consume (in Watts). The range is different for the two pump types.
6th	Effect if speed drops below 50%	Options are stop immediately or stop if timing period exceeded.
7th	Brake use	Whether Electronic braking is enabled or disabled.

4.8.3 Software module 859 - DX/nEXT Pump Temperatures

This module must only be selected if there is a DX/nEXT pump connected to the TIC.

General Description

Read DX/nEXT Pump controller and motor temperatures.

Output bytes (from Master)

None.

Input bytes (to Master)

1st	Motor temperature in °C.
2nd	Controller temperature in °C.

Associated Parameter options

None.

4.8.4 Software module 860 - DX/nEXT Pump Power

This module must only be selected if there is a DX/nEXT pump connected to the TIC.

General Description

Read DX/nEXT Pump motor power consumption.

Output bytes (from Master)

None.

Input bytes (to Master)

1st	Forms a 16-bit (unsigned) number, which is the motor power in 10th's of Watts.
2nd	

Associated Parameter options

None.

4.8.5 Software module 869 - DX/nEXT Pump Speed Set-up

This module must only be selected if there is a DX/nEXT pump connected to the TIC.

General Description

Defines DX/nEXT Pump normal and standby speeds.

Output bytes (from Master)

1st	Not used with a TIC (preferably leave as zero). Use Module 908 to go to standby.

Input bytes (to Master)

None.

Associated Parameter options

Bytes	Parameter Option	Description of Parameter
1st	Module number	Cannot be changed.
2nd		
3rd	Normal speed indicator	The value as a percentage of the full speed to define normal speed indication. (50-100%).
4th	Standby speed	The value as a percentage of the full speed to define standby speed. (55-100%).

4.8.6 Software module 875 - DX/nEXT Vent Valve close

This module must only be selected if there is a DX/nEXT pump connected to the TIC.

General Description

Forces vent valve closed (by powering it) regardless of vent valve control set-up.

Output bytes (from Master)

1st	Not forced closed if value 0. Forced closed if value 1.

Once a "forced close" command has been sent it can only be cleared in the DX/nEXT pump podule by demanding the pump to stop (using software module 904).

Input bytes (to Master)

None.

Associated Parameter options

None.

4.8.7 Software module 880 - nEXT Service Set-up

This module must only be selected if there is a nEXT pump connected to the TIC.

General Description

Set-up how a service alert is communicated.

Output bytes (from Master)

None.

Input bytes (to Master)

1st	Dummy byte (always 0)

Associated Parameter options

Bytes	Parameter Option	Description of Parameter
1st and 2nd	Module number	Cannot be changed.
3rd	Service set-up	0: Service indication on Status LED 1: Service indication on Status LED and FAIL line 2: No service indication on Status LED or FAIL line 3: Service indication on FAIL line

4.8.8 Software module 881 - nEXT Service Status

This module must only be selected if there is a nEXT pump connected to the TIC.

General Description

Overall service status.

Output bytes (from Master)

None.

Input bytes (to Master)

1st,2nd,3rd, 4th	From a 32-bit system status word. The Upper three bytes (2nd, 3rd and 4th) are reserved. Each bit of the lower byte is a flag. To decode the status first convert the value to binary. Refer to Table 16 to interpret each bit.

Table 18 - Converting the value to binary

Bit Number	Status flag	Active flag means
0	Oil cartridge service due	Set when hours until oil cartridge service due = 0
1	Bearing service due	Set when hours until bearing service due = 0
2	Pump service due	Set when hours until pump service due = 0 or cycles until pump service due = 0
3	Controller service due	Set when hours until controller service due = 0
4	Reserved	-
5	Reserved	-
6	Reserved	-
7	Service due	Service operation required may be determined by checking the bits above
8 - 31	Reserved	-

Associated Parameter options

None.

4.8.9 Software module 882 - nEXT Controller Run Time

This module must only be selected if there is a nEXT pump connected to the TIC.

General Description

Read Hours run by controller and Hours until controller service.

Output bytes (from Master)

None.

Input bytes (to Master)

1st,2nd,3rd and 4th	Hours run by controller 0..999999
5th, 6th, 7th and 8th	Hours until controller service 0..999999

Associated Parameter options

None.

4.8.10 Software module 883 - nEXT Pump Run Time

This module must only be selected if there is a nEXT pump connected to the TIC.

General Description

Read Hours run by pump and Hours until pump service.

Output bytes (from Master)

None.

Input bytes (to Master)

1st,2nd,3rd and 4th	Hours run by pump 0..999999
5th, 6th, 7th and 8th	Hours until pump service 0..999999

Associated Parameter options
None.

4.8.11 Software module 884 - nEXT Pump Cycles

This module must only be selected if there is a nEXT pump connected to the TIC.

General Description
Read cycles run by pump and cycles until pump service.

Output bytes (from Master)
None.

Input bytes (to Master)

1st and 2nd	Cycles run by pump 0..65535
3rd and 4th	Cycles until pump service 0..65535

Associated Parameter options
None.

4.8.12 Software module 885 - nEXT Bearing Run Time

This module must only be selected if there is a nEXT pump connected to the TIC.

General Description
Read Hours run by bearing and Hours until bearing service.

Output bytes (from Master)
None.

Input bytes (to Master)

1st,2nd,3rd and 4th	Hours run by bearing 0..999999
5th, 6th, 7th and 8th	Hours until bearing service 0..999999

Associated Parameter options
None.

4.8.13 Software module 886 - nEXT Oil Cartridge Run Time

This module must only be selected if there is a nEXT pump connected to the TIC.

General Description
Read Hours run by oil cartridge and Hours until oil cartridge service.

Output bytes (from Master)
None.

Input bytes (to Master)

1st,2nd,3rd and 4th	Hours run by oil cartridge 0..999999
5th, 6th, 7th and 8th	Hours until oil cartridge service 0..999999

Associated Parameter options
None.

4.8.14 Software module 902 - TIC Software Version

General Description

Module used in TIC Profibus unit to read the software version it contains. This would normally only be used during setup or test; as it can't alter during data exchange it would not normally be present.

Output bytes (from Master)

None.

Input bytes (to Master)

1st	Release state of software in ASCII, should be '4' for production. e.g. ASCII '4' = 34 h.
2nd	Version letter of software in ASCII, normally A to Z. e.g. ASCII 'A' = 41 h.

Associated Parameter options

None.

4.8.15 Software module 904 - Turbo Pump control

This module should be used with any Turbo pump that is compatible with a TIC unit.

General Description

Controls Turbo pumps connected to a TIC.

Output bytes (from Master)

1st	Stop if value 0. Run if value 1. Leave alone if value 99 (dec). See note in Section 4.8.24.

Input bytes (to Master)

1st	State - refer to table in Appendix A1.
2nd	Alert - refer to table in Appendix A2.
3rd	Priority - refer to table in Appendix A3.

Associated Parameter options

Bytes	Parameter Option	Description of Parameter
1st	Module number	Cannot be changed.
2nd		
3rd	Control gauge	Allows the turbo pump operation to be controlled by one of the gauges if desired. Options include none, but if this option is selected it is recommended that the enable option is set to disabled.
4th		
5th	Gauge units	Setpoint units. Options are Pascals or volts.
6th	Turbo setpoint ON	These are four byte numbers in IEEE-754 format. A conversion utility must be used. See note in Section 4.8.24.
7th		
8th		
9th		
10th	Turb setpoint OFF	These are four byte numbers in IEEE-754 format. A conversion utility must be used. See note in Section 4.8.24.
11th		
12th		
13th		
14th	Control enable	Enables or disables control at the chosen setpoint by the chosen gauge.
15th	Start delay	In minutes from zero to 99.

4.8.16 Software module 905 - Turbo Pump Speed

This module can be used with any Turbo pump that is compatible with a TIC unit.

General Description

Monitors speeds and sets failures times.

Output bytes (from Master)

None.

Input bytes (to Master)

1st	This is a signed word. The pump speed in 200th's of percent.
2nd	
3rd	Alert - refer to table in Appendix A2.
4th	Priority - refer to table in Appendix A3.

Associated Parameter options

Note: *A DX/nEXT pump does not use these options, it uses 853 instead; leave at default values for DX/nEXT.*

Bytes	Parameter Option	Description of Parameter
1st	Module number	Cannot be changed.
2nd		
3rd	Start/fail time in minutes (1-30).	This is the time allowed from start to reach 50% speed. If the speed is not reached in this time a failure condition is entered.
4th	Droop fail time in minutes (0-30).	This is the time allowed for the speed to drop below 50%. If the speed is below 50% for longer than this time a failure condition is entered.

4.8.17 Software module 906 - Turbo Pump Power

This module can be used with any Turbo pump that is compatible with a TIC unit.

General Description

Monitors turbo power.

Output bytes (from Master)

None.

Input bytes (to Master)

1st	Form a 16-bit number, which is the motor power 10th's of Watts.
2nd	
3rd	Alert - refer to table in Appendix A2.
4th	Priority - refer to table in Appendix A3.

No Alerts currently exist for this software module so the 3rd and 4th bytes will always be zeros.

Associated Parameter options

None.

4.8.18 Software module 907 - Turbo Normal

This module can be used with any Turbo pump that is compatible with a TIC unit.

General Description

Monitors whether turbo pump is at normal speed.

Output bytes (from Master)

None.

Input bytes (to Master)

1st	Whether at Normal speed: 0 =No; 4 = Yes.
2nd	Alert - refer to table in Appendix A2.
3rd	Priority - refer to table in Appendix A3.

No Alerts currently exist for these software modules so the 2nd and 3rd bytes will always be zero.

Associated Parameter options

None.

4.8.19 Software module 908 - Turbo Standby

This module can be used with any Turbo pump that is compatible with a TIC unit.

General Description

Set up a pump standby speed mode and monitors whether this has occurred.

Output bytes (from Master)

1st	Standby command (1 = standby mode; 0= normal mode).

Input bytes (to Master)

1st	Whether Standby speed mode is set: 0 =No; 4 = Yes.
2nd	Alert - refer to table in Appendix A2.
3rd	Priority - refer to table in Appendix A3.

No Alerts currently exist for these software modules so the 2nd and 3rd bytes will always be zero.

Associated Parameter options

None.

4.8.20 Software module 909 - Turbo Cycle Time

This module can be used with any Turbo pump that is compatible with a TIC unit.

General Description

Monitors turbo pump and if it is running shows running time, since it was last started.

Output bytes (from Master)

None.

Input bytes (to Master)

1st	First two bytes form a 16-bit number which is the turbo running time in hours since the pump was started. 0=pump off or run time is less than 1 hour.
2nd	
3rd	State - 4=monitoring is on.
4th	Alert - refer to table in Appendix A2.
5th	Priority - refer to table in Appendix A3.

No Alerts currently exist for these software modules so the 4th and 5th bytes will always be zero.

Associated Parameter options

None.

4.8.21 Software module 910 - Backing pump control

This module can be used with any TIC that includes pump control.

General Description

Controls Backing Pump.

Output bytes (from Master)

1st	Backing pump control (1 = run; 0= stop).

Input bytes (to Master)

1st	State - refer to table in Appendix A1.
2nd	Alert - refer to table in Appendix A2.
3rd	Priority - refer to table in Appendix A3.

No Alerts currently exist for these software modules so the 2nd and 3rd bytes will always be zero.

Associated Parameter options

None.

4.8.22 Software module 911 - Backing pump speed

This module can be used with TIC compatible backing pumps with speed feedback.

Note: *Provided to support future backing pump enhancements.*

General Description

Monitors Backing Pump speed (if pump has compatible speed feedback).

Output bytes (from Master)

None.

Input bytes (to Master)

1st	This is a signed word. The pump speed in 200th's of percent. Half speed = 10,000 (dec) = 2710 (hex).
2nd	
3rd	Alert - refer to table in Appendix A2.
4th	Priority - refer to table in Appendix A3.

No Alerts currently exist for these software modules so the 3rd and 4th bytes will always be zero.

Associated Parameter options

None.

4.8.23 Software module 912 - Backing pump power

This software module for use with 24Vdc backing pumps compatible with a TIC controller.

General Description

Monitors Backing Pump power (if pump is 24vdc powered from the TIC).

Output bytes (from Master)

None.

Input bytes (to Master)

1st	Form a 16-bit number, which is the motor power in 10th's of Watts.
2nd	
3rd	Alert - refer to table in Appendix A2.
4th	Priority - refer to table in Appendix A3.

No Alerts currently exist for these software modules so the 3rd and 4th bytes will always be zero.

Associated Parameter options

None.

4.8.24 Linking gauges and pumps

The TIC Profibus module can be used to link items. Further information about linking can be read in the TIC instruction manual D397 22 880 Section 4.13. The information below provides details about linking using the TIC Profibus module.

Controlled gauges (AIMs and AIGX) and Turbo pumps can be controlled over Profibus in Data exchange. Linking can also be set up by parameterisation of the TIC such that the TIC will turn on/off linked items at the specified pressures, voltages or speeds from a controlling item (master object).

However, the linked state will soon be overwritten by the Data Exchange value. To let the TIC linking be in complete control, a value of '99' (Device 'leave alone') should be used in the Output data from the Profibus master.

If master conditions are such that the controlled item should be off, an output data exchange value requesting the controlled item should turn on will be ignored.

If master conditions are such that the controlled item should be on, an output data exchange value requesting the controlled item should turn on or off will be followed - manual override. This allows, for example, a gauge to be turned off before a rapid vent or before a gas feed is turned on that would contaminate the gauge if it were running.

Note: *See Section 5.1, concern with TIC version D39700640C and earlier.*

The TIC cancels a manual override when the master conditions alter such that the controlled item should change state.

Controlling item (master object) - This is the item that will control the gauge.

Note: *If an inappropriate choice is selected e.g. controlling gauge 1 with gauge 1 or controlling with turbo speed when the TIC is an instrument only unit the TIC may appear to create a link but will not actually control using the master object selected.*

Units - The unit value must be a suitable type for the controlling item or the set-up will be ignored by the TIC i.e. must use speed for a Turbo pump and must use pressure or volts for a gauge.

Setpoint On and Off - The setpoint value formats depend on the units selected. Both Pascal's and volts require an IEEE-754 floating-point format number (32-bit). Use of IEEE-754 format to represent floating point numbers is commonplace in PLCs. A useful conversion tool can be found at the following web address: http://babbage.cs.qc.edu/courses/cs341/IEEE-754.html or at www.schmidt.net.

Percentage speed is a 16-bit integer with the number in 200th's of a percent i.e. 50% = 10,000 (decimal) = 2710 (hex) so number entered, for example in SyCon, should be 27 10 (00002710).

Enable - Enables or disables control at the chosen setpoint by the chosen master object. If this is set to "disabled" the configured control link will not function.

4.8.25 Software module 913 - Gauge 1

This module can be used with any TIC version that includes gauges.

General Description

Control and monitoring of Gauge connected to gauge port number 1.

Output bytes (from Master)

1st	Gauge commands - refer to table in Appendix A4.

Note: *The value '5' (Degas) should be used with caution, It should not be used for any gauge type except AIGX. With an AIGX the gauge should first be turned on (Value 1) then put into degas. After initiating degas the value should be returned to 1 and degas will continue for the remainder of the 3 min period. If the value is left at 5, degas will be continuously used. If value is set to zero before degas is completed, the TIC will no longer control the degas line correctly (version D397-00-640 Issue D and earlier).*

Input bytes (to Master)

1st	First four bytes form a 32-bit IEEE-754 format floating point gauge value.
2nd	
3rd	
4th	
5th	Value units. (Pascals =59; volts =66). Taken from the gas type parameterisation.
6th	State - refer to table in Appendix A5.
7th	Alert - refer to table in Appendix A2.
8th	Priority - refer to table in Appendix A3.

Associated Parameter options (bytes 3-14 relate to linking gauges)

Bytes	Parameter Option	Description of Parameter
1st	Module number	Cannot be changed.
2nd		
3rd	Controlling item	Master object.
4th		
5th	Units	For Master object not Slave object.
6th	Setpoint ON	IEEE-754 format for pressure and voltage.
7th		
8th		
9th		
10th	Setpoint OFF	IEEE-754 format for pressure and voltage.
11th		
12th		
13th		
14th	Enable	Enables or disables control at the chosen setpoint.
15th	Gas type	This option also determines signal units. All except voltage options will be in Pascal's (IEEE-754 format).
16th	Filter	Either no gauge signal filtering or a 1 second averaging filter can be selected.
17th	ASG range	If the gauge is a strain gauge the full-scale range must be selected as either 1000 mbar or 2000 mbar.

4.8.26 Software module 914 - Gauge 2

This module can be used with any TIC version that includes gauge control.

General Description

Control and monitoring of Gauge connected to gauge port number 2.
See Gauge 1 for output, input and parameter options.

4.8.27 Software module 915 - Gauge 3

This module can be used with any TIC version that includes gauge control.

General Description

Control and monitoring of Gauge connected to gauge port number 3.
See Gauge 1 for output, input and parameter options.

4.8.28 Linking Relay set point outputs

The TIC Profibus module can be used to provide relay set point outputs based on gauge pressure, volts, or pump speed. Further information about relay set point outputs can be read in the TIC instruction manual D397 22 880 Section 4.16. The information below provides details about linking using the TIC Profibus module.

Linking can be set up by parameterisation of the TIC such that the linked items will turn on/off at the specified pressures, voltages or speeds from a master item.

Controlling item (Master object) - The item that will control the relay.

Units - The unit value must be a suitable type for the controlling item or the set-up will be ignored by the TIC i.e. must use speed for a Turbo pump and must use pressure or volts for a gauge.

Setpoint On and Off - The setpoint value formats depend on the units selected. Both Pascal's and volts require an IEEE-754 floating point format number (32-bit). Use of IEEE-754 format to represent floating point numbers is commonplace in PLCs. A useful conversion tool can be found at the following web address: http://babbage.cs.qc.edu/courses/cs341/IEEE-754.html.

Percentage speed is a 16-bit integer with the number in 200th's of a percent i.e. 50% = 10,000 (decimal) = 2710 (hex) so number entered, for example in SyCon, should be 00002710h.

Enable - Enables or disables control at the chosen setpoint by the chosen master object. If this is set to "disabled" the configured control link will not function

4.8.29 Software module 916 - Relay 1

General Description

Control, set-up and monitoring of Relay 1 output.

Output bytes (from Master)

1st	Relay control (0=Off, 1=On, 99=leave alone)

Input bytes (to Master)

1st	State - 0 = off, 4 = on.
2nd	Alert - refer to table in Appendix A2.
3rd	Priority - refer to table in Appendix A3.

No Alerts currently exist for these software modules so the 2nd and 3rd bytes will always be zero.

Associated Parameter options

Bytes	Parameter Option	Description of Parameter
1st	Module number	Cannot be changed.
2nd		
3rd	Controlling item	Master object.
4th		
5th	Units	For Master object not Slave object.
6th	Setpoint ON	IEEE-754 format for pressure and voltage.
7th		
8th		
9th		
10th	Setpoint OFF	IEEE-754 format for pressure and voltage.
11th		
12th		
13th		
14th	Enable	Enables or disables control at the chosen setpoint.

4.8.30 Software module 917 - Relay 2

General Description

Control, set-up and monitoring of Relay 2 output.
See Relay 1 for output, input and parameter options.

4.8.31 Software module 918 - Relay 3

General Description

Control, set-up and monitoring of Relay 3 output.
See Relay 1 for output, input and parameter options.

4.8.32 Software module 919 - TIC Power supply temperature

Note: *This module will not work with an instrument only version of the TIC.*

General Description

Monitors TIC power supply temperature.

Output bytes (from Master)

None.

Input bytes (to Master)

1st 2nd	First two bytes form a 16-bit number which is the temperature in 10th's of a degree Celsius-274 e.g. freezing water = 2740.
3rd	Alert - refer to table in Appendix A2.
4th	Priority - refer to table in Appendix A3.

No Alerts currently exist for this software module so the 3rd and 4th bytes will always be zero.

Associated Parameter options

None.

4.8.33 Software module 920 - TIC internal temperature

General Description

Monitors TIC motherboard temperature.

Output bytes (from Master)

None.

Input bytes (to Master)

1st 2nd	First two bytes form a 16-bit number which is the temperature in 10th's of a degree Celsius-274 e.g. freezing water = 2740.
3rd	Alert - refer to table in Appendix A2.
4th	Priority - refer to table in Appendix A3.

No Alerts currently exist for these software modules so the 3rd and 4th bytes will always be zero.

Associated Parameter options

None.

4.8.34 Software module 921 - Analogue output

General Description

Set-up and monitoring of the TIC Analogue output.

Output bytes (from Master)

None - No direct user control.

Input bytes (to Master)

1st	Indication of the Analogue output voltage as a number from 0 to 255. (0-10.34V). This voltage depends on the Master object selected (see below).
2nd	Alert - refer to table in Appendix A2.
3rd	Priority - refer to table in Appendix A3.

No Alerts currently exist for these software modules so the 2nd and 3rd bytes will always be zero.

Associated Parameter options

Bytes	Parameter Option	Description of Parameter
1st	Module number	Cannot be changed.
2nd		
3rd	Master object	Determines which object the analogue output represents. Choices are: none; gauge1 signal; gauge2 signal; gauge3 signal and turbo speed. If a gauge is selected the analogue output is the same as the gauge voltage (regardless of gauge units). If turbo speed is selected, 0 - 10V represents 0 - 100%.
4th		

4.8.35 Software module 922 - TIC Vent valve

General Description

Set-up and monitoring of the TIC vent valve.

Output bytes (from Master)

None - No direct user control.

Input bytes (to Master)

1st	State - 0 = off, 4 = on.
2nd	Alert - refer to table in Appendix A2.
3rd	Priority - refer to table in Appendix A3.

No Alerts currently exist for these software modules so the 2nd and 3rd bytes will always be zero.

Associated Parameter options

Bytes	Parameter Option	Description of Parameter
1st	Module number	Cannot be changed.
2nd		
3rd	Vent option	Determines the operation of the vent valve. Options are either: Vent when turbo speed reaches 50% OR vent when turbo is commanded to stop.

4.8.36 Software module 923 - Heater band

General Description

Control, set-up and monitoring of the Heater band control output.

Output bytes (from Master)

1st	Manual control (0=Off, 1=On, 99=leave alone)

Note: *Manual control is only available when the turbo pump has reached 'normal speed' and either the heater band on time is set to '0' or the heater time has not expired.*

Input bytes (to Master)

1st	First two bytes form a 16-bit number which is the time in minutes that the heater band has remaining.
2nd	
3rd	State - 0 = on, 4 = off.
4th	Alert - refer to table in Appendix A2.
5th	Priority - refer to table in Appendix A3.

No Alerts currently exist for this software module so the 4th and 5th bytes will always be zero.

Associated Parameter options

Bytes	Parameter Option	Description of Parameter
1st	Module number	Cannot be changed.
2nd		
3rd	Heater band on time	The number of hours that the heater band will be on for once started. The turbo pump reaching normal speed initiates heater band operation. If the turbo speed drops below normal the heater band will switch off and the timer will be reset. If this facility is to be used the output byte value should be 99.

4.8.37 Software module 924 - Air Cooler (Fan)

General Description

Set-up and monitoring of the TIC Air cooler (fan).

Output bytes (from Master)

None - No direct user control.

Input bytes (to Master)

1st	State - 0 = off, 4 = on.
2nd	Alert - refer to table in Appendix A2.
3rd	Priority - refer to table in Appendix A3.

No Alerts currently exist for this software module so the 2nd and 3rd bytes will always be zero.

Associated Parameter options

Bytes	Parameter Option	Description of Parameter
1st	Module number	Cannot be changed.
2nd		
3rd	Function	Determines the operation of the air cooler output. Options are either: Always On=0. On with the turbo=1.

4.8.38 Software module 933 - System

This module must only be selected for TIC and TC variants.

General Description

Control System.

Output bytes (from Master)

1st	System control (0=Off, 1=On, 99=leave alone)

Input bytes (to Master)

None.

Associated Parameter options

None.

4.8.39 Software module 934 - Gauge 4

This module must only be selected for 6 Gauge IC variants.

General Description

Control and monitoring of Gauge connected to gauge port number 4. Only the CapMan variant of the 6 Gauge IC supports CapMans.

Output bytes (from Master)

1st	Gauge commands - refer to table in Appendix A4.

Note: *The value '5' (Degas) should be used with caution. It should not be used for any gauge types except AIGX and Ion Gauge Controller. Refer to 6 Gauge TIC manual D397-01-880 and appropriate gauge manual for correct use.*

Input bytes (to Master)

1st, 2nd, 3rd, 4th	First four bytes form a 32-bit IEEE-754 format floating point gauge value.
5th	Value units. (Pascals=59; volts=66). Taken from the gas type parameterisation.
6th	State - refer to table in Appendix A5.
7th	Alert - refer to table in Appendix A2.
8th	Priority - refer to table in Appendix A3.

Associated Parameter options
Bytes 3-14 relate to linking gauges.

Bytes	Parameter Option	Description of Parameter
1st,2nd	Module number	Cannot be changed.
3rd,4th	Controlling item	Master object.
5th	Units	For Master object not Slave object.
6th,7th,8th, 9th	Setpoint ON	IEEE-754 format for pressure and voltage.
10th,11th, 12th,13th	Setpoint OFF	IEEE-754 format for pressure and voltage.
14th	Enable	Enables or disables control at the chosen setpoint.
15th	Gas type	This option also determines signal units. All except voltage options will be in Pascal's. 0 = "Nitrogen" 1 = "Helium" 2 = "Argon" 3 = "Carbon Dioxide" 4 = "Neon" 5 = "Krypton" 6 = "Voltage"
16th	Filter	Either no gauge signal filtering or a 1 second averaging filter can be selected.
17th	ASG range	If the gauge is a strain gauge the full-scale range must be selected as either 0 = 1000 mbar or 1 = 2000 mbar.
18th	IGC filament	Select filament. 1 = 1, 2 = 2.
19th	IGC head	Select head. 1 = A, 2 = B.
20th	IGC emission	Select emission level. 0 = auto, 1 = 100µAmp, 2 = 1mAmp, 3 = 10mAmp.
21st	IGC restrike	Restrike behaviour. 0 = Off, 1 = On.
22nd,23rd	IGC Constant 1	Constant value. 0.020 to 0.480.
24th,25th	IGC Constant 2	Constant value. 0.020 to 0.480.
26th	CapMan range	Select range. 0 = 0.05, 1 = 0.1, 2 = 0.2, 3 = 1, 4 = 2, 5 = 10, 6 = 20, 7 = 100, 8 = 200, 9 = 1000, 10 = 2000.
27th	CapMan units	Select range units. 2 = mBar, 3 = Torr.

4.8.40 Software module 935 - Gauge 5

This module must only be selected for 6 Gauge IC variants.

General Description

Control and monitoring of Gauge connected to gauge port number 5. Only the CapMan variant of the 6 Gauge IC supports CapMans.

See Gauge 4 for output, input and parameter options.

4.8.41 Software module 936 - Gauge 6

This module must only be selected for 6 Gauge IC variants.

General Description

Control and monitoring of Gauge connected to gauge port number 6. Only the CapMan variant of the 6 Gauge IC supports CapMans.

See Gauge 4 for output, input and parameter options.

4.8.42 Software module 937 - Relay 4

General Description

Control, set-up and monitoring of Relay 4 output.
See Relay 1 for output, input and parameter options.

4.8.43 Software module 938 - Relay 5

General Description

Control, set-up and monitoring of Relay 5 output.
See Relay 1 for output, input and parameter options.

4.8.44 Software module 939 - Relay 6

General Description

Control, set-up and monitoring of Relay 6 output.
See Relay 1 for output, input and parameter options.

4.9 Response time calculations & Measurements

The TIC & DX/nEXT pump Profibus units response times (due to a change in output data) and true data update times vary significantly depending on the data exchange configuration and the attached equipment. For both unit types there is also a time delay due to the bus speed. For 9.6Kbd this is approximately 50ms. For 19.2Kdb it is approximately 25ms. For all other bus speeds the delay is relatively negligible.

The nEXT pumps response to a setup change is much slower than that of the DX pump. Parameterising multiple items on the nEXT can take several seconds delaying entry into data exchange.

For a DX/nEXT pump Profibus unit on a high speed network, the response time on average is roughly:

120ms for the first software module
+ 30ms extra for each additional configured software module.

For a TIC Profibus unit on a high speed network, the response time on average is roughly:

30 ms
+ 30ms extra for each configured software modules with a 900 number
+ 140ms extra for each configured software modules with a 800 number
+ 50ms extra if a DX/nEXT turbo pump is attached
+ 300ms extra if the measure of response time is gauge pressure update time.

Example: A TIC Profibus module fitted to a network operating at 19.2Kbd with a DX/nEXT pump and 2 gauges fitted, with the configuration 913, 914, 904, 860. To determine the likely average gauge update rate the calculation is

25ms (for bus speed)
+ 50ms (for DX/nEXT pump)
+ 30ms (fixed)
+ 3 x 30ms = 90 ms (for 900 modules)
+ 140ms (for 800 module)
+ 300ms (for gauge update time as the measure)
= 635ms

Note: *The Sync and Freeze Profibus functions are supported by the TIC & DX/nEXT pump Profibus units, but should be used with caution due to the variable time delays associated with the units.*

5 Maintenance

5.1 Fault finding

In the event of a TIC or DX/nEXT Pump Profibus module failing to respond check the following:

Table 19 - Fault finding guide

Symptom	Fault
Power LED not lit	No DC supply or internal regulator faulty.
Power LED lit but no power to DX/nEXT pump. DX/nEXT version only.	The fuse may have blown. If this is suspected the cable to the DX/nEXT pump can be removed from the Profibus module and a voltmeter used between pins 1 and 13 of the 15W D-type socket. 24V should be output. Likely cause of the fuse to blow is a short-circuit in the wiring to the DX/nEXT pump. Check using a DVM between all three +24V connections on the 15W D-type free plug (pins 1, 6 & 11) and all three 0V connections (pins 8, 13 & 14). Also check between each pin and pump body. All must be high resistance.
Off-line not lit and Error LED flashing.	Address selection is above 125, correct the address and re-power unit.
Off-line LED is lit and Error LED is lit.	Unsuitable parameterisation or configuration, check extended diagnostics for module number.
Off-line LED is lit and Error LED is not lit.	Check unit's address matches that being used by the master.
Power LED is lit and all other LED's are not lit.	Serial connection to TIC or DX/nEXT disconnected or faulty or TIC not powered on.
Data exchange LED is lit but data is not changing.	Serial connection has become faulty after entering data exchange. Check extended diagnostics for serial comms lost indication.
Data exchange LED is lit but a parameterised function is not behaving as expected.	Unsuitable parameterisation detected during serial comms transfer, check extended diagnostics for module number.
Master is controlling an output on a TIC but it sometimes changes state for several seconds.	Has the output been parameterised with slaving enabled? If yes, then manual override is only sensible under certain conditions, at other times send the 'leave alone' command value.
Master is controlling an output on a TIC but the output is toggling on and off at about a 10 second rate.	Known concern on TIC version D39700640D and earlier. Upgrade to an appropriate version. Work around:- If only manual control required ensure that in the slaving parameter the master object is set to none and setpoint disabled. If slaving only operation is required send the 'leave alone' command value at all times. If slaving operation with occasional manual override is required then send the on or off command for approx. 0.5 seconds then return to 'leave alone'.
Selected set-points will not function	See notes in Sections 4.8.24 and 4.8.28. The TIC Profibus module requires software that can accept 32-bit numbers in the parameterisation field. If using Hilscher Sycon software, the Profibus DLL of that software suite must be either revision 2,7,5,0 or later.

5.2 Factory defaults

DX/nEXT PUMP VERSION

Table 20 - Profibus Module default set-up values (DX/nEXT pump version)

Software Module No.	Parameter	Units	Default value
853	Vent Option	Numbered options	0 (= Full vent when speed drops below 50% full rotational speed for a stop command or a fail).
853	Ramp and Droop timer	Minutes	8
853	Power Limit	Watts	80 **IF 75DX** 160 **IF 255DX/nEXT**
853	Effect if speed drops below 50%	Numbered options	1 (= Stop if timing period exceeded)
853	Brake Use	Numbered options	0 (= Disabled)
869	Normal Speed	Percent	80
869	Standby Speed	Percent	70
880	nEXT Service Setting	Numbered options	0 = Status LED

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TIC VERSION

Table 21 - Profibus Module default set-up values (TIC version)

Software Module No.	Parameter	Units	Default value
928	Front panel control lock	Numbered options	1 (= Locked).
853	Vent Option	Numbered options	0 (= Full vent when speed drops below 50% full rotational speed for a stop command or a fail).
853	Ramp and Droop timer	Minutes	8
853	Power Limit	Watts	80 IF 75DX 160 IF 255DX
853	Effect if speed drops below 50%	Numbered options	1 (= Stop if timing period exceeded)
853	Brake Use	Numbered options	0 (= Disabled)
869	Normal Speed	Percent	80
869	Standby Speed	Percent	70

Software Module No.	Parameter	Units	Default value
880	nEXT Service Setting	Numbered options	0 = Status LED
904	Master gauge	Numbered options	0 (= None)
904	Master gauge units	Numbered options	59 (= Pascals)
904	ON Setpoint	IEEE-754 format	0x40200000 (= 2.5E-4 pascals)
904	OFF setpoint	IEEE-754 format	0x41200000 (= 1.0E-3 pascals)
904	Control from gauge selected.	Numbered options	0 (= disabled)
904	Start delay	Minutes	0
905	Max ramp time to 50% speed.	Minutes	8
905	Max droop time below 50% speed	Minutes	8
913	Master object	Numbered options	0 (= None)
913	Master object units	Numbered options	59 (= Pascals)
913	ON Setpoint	IEEE-754 format	0x40200000 (= 2.5E-4 pascals)
913	OFF setpoint	IEEE-754 format	0x41200000 (= 1.0E-3 pascals)
913	Control from object selected.	Numbered options	0 (= disabled)
913	Gas type	Numbered options	0 (= Nitrogen)
913	Filter	Numbered options	0 (= Filter off)
913	ASG range	Numbered options	0 (= 1000 mbar)
914	Master object	Numbered options	0 (= None)
914	Master object units	Numbered options	59 (= Pascals)

Software Module No.	Parameter	Units	Default value
914	ON Setpoint	IEEE-754 format	0x40200000 (= 2.5E-4 pascals)
914	OFF setpoint	IEEE-754 format	0x41200000 (= 1.0E-3 pascals)
914	Control from object selected.	Numbered options	0 (= disabled)
914	Gas type	Numbered options	0 (= Nitrogen)
914	Filter	Numbered options	0 (= Filter off)
914	ASG range	Numbered options	0 (= 1000 mbar)
915	Master object	Numbered options	0 (= None)
915	Master object units	Numbered options	59 (= Pascals)
915	ON Setpoint	IEEE-754 format	0x40200000 (= 2.5E-4 pascals)
915	OFF setpoint	IEEE-754 format	0x41200000 (= 1.0E-3 pascals)
915	Control from object selected.	Numbered options	0 (= disabled)
915	Gas type	Numbered options	0 (= Nitrogen)
915	Filter	Numbered options	0 (= Filter off)
915	ASG range	Numbered options	0 (= 1000 mbar)
916	Master object	Numbered options	0 (= None)
916	Master object units	Numbered options	59 (= Pascals)
916	ON Setpoint	IEEE-754 format	0x40200000 (= 2.5E-4 pascals)
916	OFF setpoint	IEEE-754 format	0x41200000 (= 1.0E-3 pascals)

Software Module No.	Parameter	Units	Default value
916	Control from object selected.	Numbered options	0 (= disabled)
917	Master object	Numbered options	0 (= None)
917	Master object units	Numbered options	59 (= Pascals)
917	ON Setpoint	IEEE-754 format	0x40200000 (= 2.5E-4 pascals)
917	OFF setpoint	IEEE-754 format	0x41200000 (= 1.0E-3 pascals)
917	Control from object selected.	Numbered options	0 (= disabled)
918	Master object	Numbered options	0 (= None)
918	Master object units	Numbered options	59 (= Pascals)
918	ON Setpoint	IEEE-754 format	0x40200000 (= 2.5E-4 pascals)
918	OFF setpoint	IEEE-754 format	0x41200000 (= 1.0E-3 pascals)
918	Control from object selected.	Numbered options	0 (= disabled)
921	Master object	Numbered options	0 (= None)
922	TIC Vent valve operation	Numbered options	1 (= Vent on 50% speed)
923	Heater band time	Hours	0
924	Air Cooler use	Numbered options	1 (= On with Turbo)
934	Master object	Numbered options	0 (= None)
934	Master object units	Numbered options	59 (= Pascals)
934	ON Setpoint	IEEE-754 format	0x40200000 (= 2.5E-4 pascals)
934	OFF setpoint	IEEE-754 format	0x41200000 (= 1.0E-3 pascals)

Software Module No.	Parameter	Units	Default value
934	Control from object selected	Numbered options	0 (= disabled)
934	Gas type	Numbered options	0 (= Nitrogen)
934	Filter	Numbered options	0 (= Filter off)
934	ASG range	Numbered options	0 (= 1000 mbar)
934	IGC filament	Numbered options	1
34	IGC head	Numbered options	1
934	IGC emission	Numbered options	0
934	IGC restrike	Numbered options	0
934	IGC constant 1	Number	100
934	IGC constant 2	Number	100
934	Cap Man range	Numbered options	10
934	Cap Man units	Numbered options	2
935	See 934 Gauge 4		
936	See 934 Gauge 4		
937	See 916 Relay 1		
938	See 916 Relay 1		
939	See 916 Relay 1		

5.3 Fuse replacement (DX/nEXT version only)

If the fuse must be replaced the replacement fuse must conform to the following specification: Guaranteed not to trip at 10A in less than 1 hour and guaranteed to trip at 20A in less than 30 secs. Replacement fuses are available from Edwards D39751830 DX/nEXT PROFIBUS SPARE FUSE X2.

Replacement is a simple task. Remove power to the module, then remove the two rear panel screws and slide out the pcb (with the rear panel attached). The fuse can be removed and replaced. The PCB should be secured back inside the module housing before power is reapplied.

6 Storage and Disposal

6.1 Storage

Store the Profibus Module in clean dry conditions in accordance with the technical specifications. Refer to Section 2.2.

6.2 Disposal

Dispose of the Profibus Module and any components safely in accordance with all local and national safety and environmental requirements.

Alternatively, you may be able to recycle the Profibus Module and/or cables; contact Edwards or your supplier for advice (also see below).

The Profibus Module and associated cables are within the scope of the European Directive on Waste Electrical and Electronic Equipment, 2002/96/EC. Edwards offer European customers a recycling service for the Profibus Module/ cables at the end of the product's life. Edwards' Registration Number as a UK producer of electrical and electronic products is WEE/BF0054TQ. Contact Edwards for advice on how to return the Profibus Module/cables for recycling.

WARNING

Do not incinerate the Profibus Module. If the Profibus Module is heated to very high temperatures, dangerous gases may be emitted and internal components may explode.

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7 Spares and Accessories

7.1 Introduction

Edwards products, spares and accessories are available from Edwards companies in Belgium, Brazil, Canada, France, Germany, Hong Kong, Italy, Japan, Korea, Switzerland, United Kingdom, U.S.A. and a world-wide network of distributors. The majority of these centres employ Service Engineers who have undergone comprehensive Edwards training courses.

Order spare parts and accessories from your nearest Edwards company or distributor. When you order, please state for each part required:

- Model and Item Number of your equipment
- Serial number (if any)
- Item Number and description of the part.

7.2 Spares

D397-51-830	DX/nEXT PROFIBUS SPARE FUSE (X 2)

7.3 Accessories

D397-50-835	TIC PROFIBUS 24V CABLE (0.3 m)
D397-50-016	TIC PROFIBUS RS232 CABLE (0.3 m)
D397-50-836	TIC PROFIBUS UPGRADE CABLE (2 m)
D397-51-831	DX/nEXT PROFIBUS UPGRADE CABLE (2 m)

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Appendix A1 TIC Full Pump States

Stopped	= 0
Starting Delay	= 1
Accelerating	= 5
Running	= 4
Stopping Short Delay	= 2
Stopping Normal Delay	= 3
Fault Braking	= 6
Braking	= 7

Appendix A2 Alert ID

No Alert	= 0
ADC Fault	= 1
ADC Not Ready	= 2
Over Range	= 3
Under Range	= 4
ADC Invalid	= 5
No Gauge	= 6
Unknown	= 7
Not supported	= 8
New ID	= 9
Over Range	= 10
Under Range	= 11
Over Range	= 12
Ion EM Timeout	= 13
Not Struck	= 14
Filament Fail	= 15
Mag Fail	= 16
Striker Fail	= 17
Not Struck	= 18
Filament Fail	= 19
Cal Error	= 20
Initialising	= 21
Emission Error	= 22
Over Pressure	= 23
ASG Cant Zero	= 24
RampUp Timeout	= 25
Droop Timeout	= 26
Run Hours High	= 27
SC Interlock	= 28
ID Volts Error	= 29
Serial ID Fail	= 30
Upload Active	= 31
DX Fault	= 32
Temp Alert	= 33
Sys Inhibit	= 34
Ext Inhibit	= 35
Temp Inhibit	= 36
No Reading	= 37
No Message	= 38
NOV Failure	= 39
No Tube	= 42
Use Gauge 4-6	= 43
Degas Inhibit	= 44
IGC Inhibit	= 45
Brownout/Short	= 46
nEXT Service Due	= 47

Appendix A3 Priority

OK	= 0
warning	= 1
alarm	= 2/3

Appendix A4 Command List

Device Off	= 0	//general off/on e.g. pumps, relays
Device On	= 1	
Device 'leave alone'	= 99	
Gauge Off	= 0	
Gauge On	= 1	
Gauge New_Id	= 2	
Gauge Zero	= 3	
Gauge Cal	= 4	
Gauge Degas	= 5	

Appendix A5 Active Gauge States

Gauge Not Connected	= 0
Gauge Connected	= 1
New Gauge Id	= 2
Gauge Change	= 3
Gauge in Alert	= 4
Off	= 5
Striking	= 6
Initialising	= 7
Calibrating	= 8
Zeroing	= 9
Degassing	= 10
On	= 11

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