Ex~i Flow Measurement Ltd

DESIGNERS OF FLOW MEASUREMENT
EQUIPMENT FOR THE OIL AND GAS INDUSTRY

SFC3000
FLOW COMPUTER

INSTRUMENT INSTRUCTION MANUAL

COMPLETE FLOW
COMPUTER FOR ALL
MEASURING APPLICATIONS
MULTISTREAM | LIQUID | GAS

WEB AND NETWORK ENABLED
AUDIT | ALARM | DATA LOGGING

IMPORTANT INFORMATION

Ex~i Flow Measurement Ltd. Pursues a policy of continuous development and product improvement. The Information contained in this document is, therefore subject to change without notice. Some display descriptions and menus may not be exactly as described in this manual. However, due to the straight forward nature of the display this should not cause any problem in use.

To the best of our knowledge, the information contained in this document is accurate. However, Ex~i Flow Measurement Ltd. Cannot be held responsible for any errors, omissions or inaccuracies or any losses incurred as a result of them.

In the design and construction of this equipment and instructions contained in this manual, due consideration has been given to safety requirements in respect of statutory industrial regulations

Users are reminded that these regulations similarly apply to installation, operation and maintenance, safety being mainly dependent upon the skill of the operator and strict supervisory control

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DECLARATION OF CONFORMITY

We

Ex~i Flow Measurement Ltd.

of

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Declare under our sole responsibility that the product (s)

Model SFC3000 Flow Computer

to which this declaration relates is in conformity with the essential requirements of the following standards or other normative documents.

EMC Directive 2004/108/EC

Environment Industrial environments

EN 61326-1:2006	**Equipment for measurement, control and laboratory use, from which:**
EN 55011:2007	**Emission Class A**
EN 61000-4-2:2001	**Electrostatic discharge (ESD) immunity**
EN 61000-4-3:2006	**Radiated Electro-Magnetic field immunity**
EN 61000-4-4:2004	**Electrical fast transient (EFT) immunity**
EN 61000-4-5:2006	**Surge transient immunity**
EN 6100-4-6:1996 +A1:2001	**Conducted Radio-Frequency disturbances**
EN 61000-4-8:1993 +A1:2001	**Power Frequency magnetic field immunity**
EN 61000-4-11:2004	**Voltage dips immunity**

Additional EMC requirements

OIML R117-1:2007	**International Recommendation. Dynamic measuring systems for liquids other than water. Part 1 metrological and technical requirements Clause A.11 electrical disturbance tests.**
IEC 61000-4-17:2002	**EMC part 4-17 ripple on DC input power port immunity**

MID Directive 2004/22/EC

EN 12405-1:2005	**Gas meters Conversion devices Volume Conversion**

LVD Directive 2006/95/EC

EN 61010-1:2001 (2nd Edition)	**Safety requirements for electrical equipment for measurement, control and laboratory use.**

CE

Date and Place of Issue:

Ford, UK **2020**

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Ex~i Flow Measurement Ltd.

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Figure List

1.0 About this manual and getting started

1.1 Information in this manual

The information in this manual distinguishes between two service levels for maintenance:

OPERATOR LEVEL (here after designated OPERATOR) with information of how to configure, operate and undertake minor service tasks on the SFC3000.

QUALIFIED TRAINED STAFF LEVEL (here after designated QUALIFED STAFF) with information of how to install, configure, operate and undertake more complicated service tasks, information is also given regarding troubleshooting typical problems that may occur. However, the troubleshooting information is at an assembly replacement level only and this manual is not intended to be used for component level service.

Where a particular service level training is required to undertake a specific task, this is indicated in the manual section.

This manual does not cover any devices or peripheral components that are to be installed and connected to the SFC3000 it is assumed that such devices are installed in accordance with the operating instructions supplied with them.

1.2 Safety Information

Please read these instructions carefully before assembling or installing this product to avoid danger to people, pets and devices. Installation of this product may only be performed by qualified personnel.

IMPORTANT

The SFC3000 will come with all Links and internal switches set to Factory Default settings see Section 5.0.

Before any Power or signal connections are applied to the SFC3000 the QUALIFIED STAFF should ensure that the links are set the correct position for the appropriate to the intended use. Failure to do so could result in damage to the SFC3000 and any associated equipment.

This device is Powered from +24V dc. Do not touch any of the internal parts whilst the unit is powered.

Turn off the power to the device before opening the device or installing the product. Only switch power on when the device is fully configured, installed and all covers are securely in place.

1.3 Who should use this manual

This manual is intended to be used by anyone who operates, installs, uses or services the SFC3000

1.4 Versions covered in this manual

All Versions.

1.5 Getting Started

This chapter tells where to start, unpacking, configuring.

1.6 Packing List

The box the SFC3000 comes packed in should contain the following items:

SFC3000 Flow Computer with option cards pre-installed

Memory stick containing configuration software and operating Instructions

Terminal connecting blocks for the fitted option boards

USB A-B standard cable.

Backup Battery

NOTE: The Backup Battery may be pre-installed (See Section 4.1.3 and 4.1.4 for installation procedures)

2.0 General Description

2.1 SFC3000 Description

The SFC3000 is an advanced device for measuring and calculating the flow of Gases and Liquids, using connected metering devices, Transducers and internal algorithms to International standards.

The SFC3000 is configured using the supplied configuration software running on a PC or laptop computer.

Initially there are a number of basic decisions that need to be made in order to configure the device for use the configuration software will guide the OPERATOR through the various choices that need to be made the most important types are as follows:

Machine Type, Standard or Liquid Prover or Gas Prover

Measurement type, Gas Turbine, Rotary or other pulse meter type
Gas Ultrasonic Meter
Gas DP Orifice or Venturi type
Liquid Turbine or other pulse meter type
Liquid Ultrasonic Meter
Liquid Coriolis Meter
Steam Ultrasonic Meter

Number of Streams to be configured 1, 2, 3, 4 or 5

Secondary transducer types to be used
Pressure
Temperature
Density
Relative Density
Differential Pressure
Gas Component

Secondary transducer measurement methods
HART
4-20mA
PRT
Pulse Input
Serial Connection.

A complete list of all calculations and configuration settings is contained in Pub003 Manual SFC3000Bk3Calculations.

3.0 Operation

3.1 Front Panel Controls

There are two basic front panel controls on the SFC3000, the touch screen and 360degree rotary control. Both these controls allow the user to access the main menu and view, edit or manipulate the items of data shown on the main display panel.

3.1.1 Touch Panel

The touch panel is the display area, any button or menu item or similar that is shown on the display can be touched to operate or perform the specified function e.g. if the Main Menu button is pressed , then the main menu will appear on the display at the left hand side. A button will generally indicate it has been pressed by either changing colour or by giving the appearance of movement or by highlighting the area pressed.

3.1.2 Rotary Control

The rotary control operates in two ways, firstly as a continuously variable 360 degree control that steps through each of the possible buttons on a display page highlighting each button in tern with red indicators on the sides or corners. To use the control, rotate the control either clockwise or counter clockwise until the desired item is highlighted or shown with the red indicators. To select or operate the selected control, press the rotary control until it clicks. The selected item with then be highlighted or shown with green indicators. As shown in Figures 1 and 2.

Figure 1 Button highlighted by Rotary Control

Figure 2 Button selected by Rotary Control

3.2 Display

3.2.1 Main Menu

The main operating Menu of the Model SFC3000 can be accessed by selecting the Main Menu Button which is always on the bottom left corner of the display screen.

A typical list of items available in the Main menu item list are as follows:

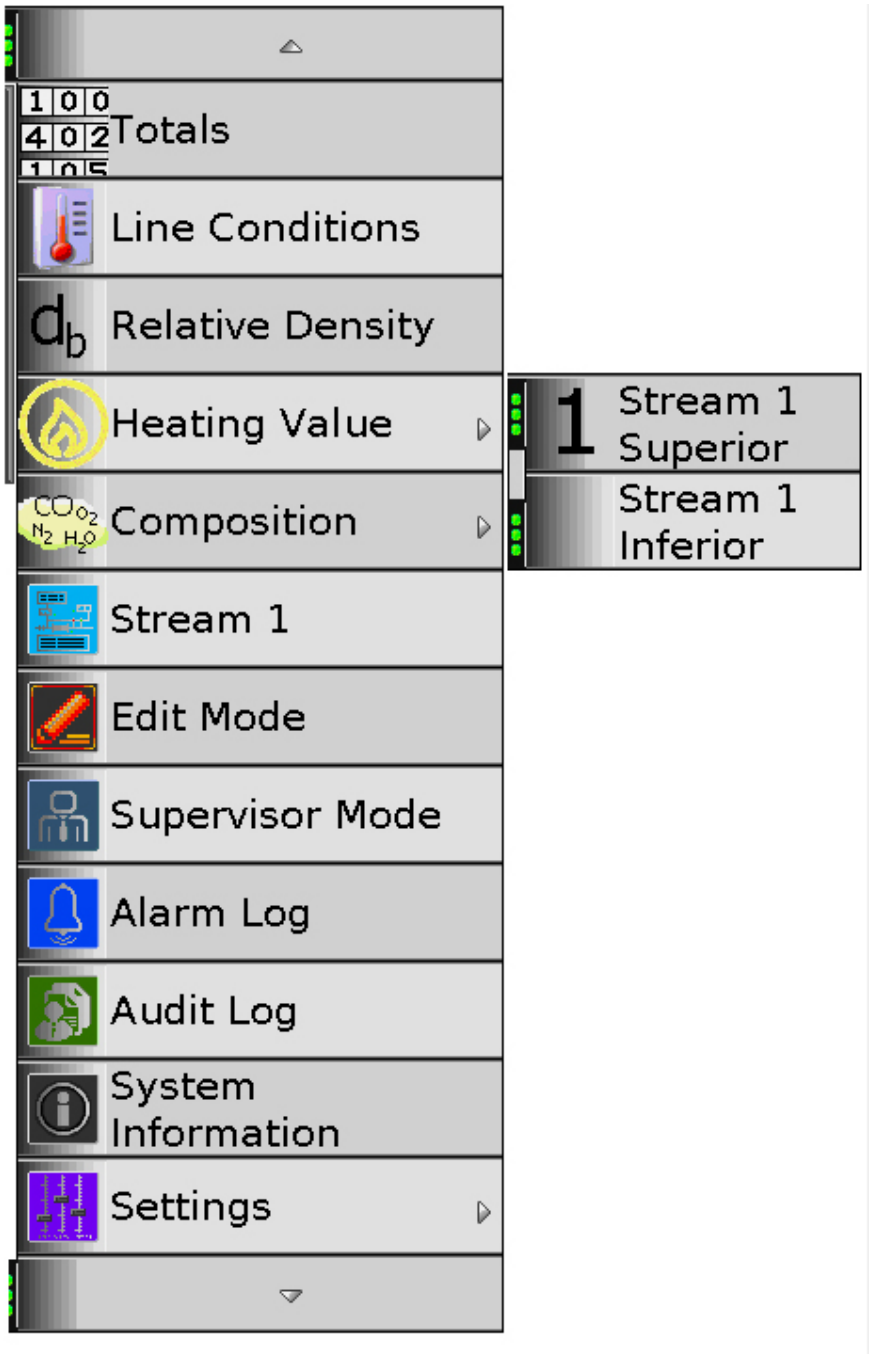


Figure 3 Typical Main Menu

3.2.2 Navigation Controls Main Menu

The main menu can be selected by pressing the Main Menu button which is available on every screen in the bottom left hand corner of the display.

The menu items will appear as a list on the right-hand side of the display screen Navigation controls ▲ at the top of the list and ▼ at the bottom allow access to all items in the menu.

If a menu item is selected and has more than one page, then page navigation controls will appear at the bottom of the screen as shown in Figure 4.

The indicator shows the current page number and how many pages under that menu item, and the arrow keys give access to the first, page, last page or allow the number numbers to be incremented or decremented.

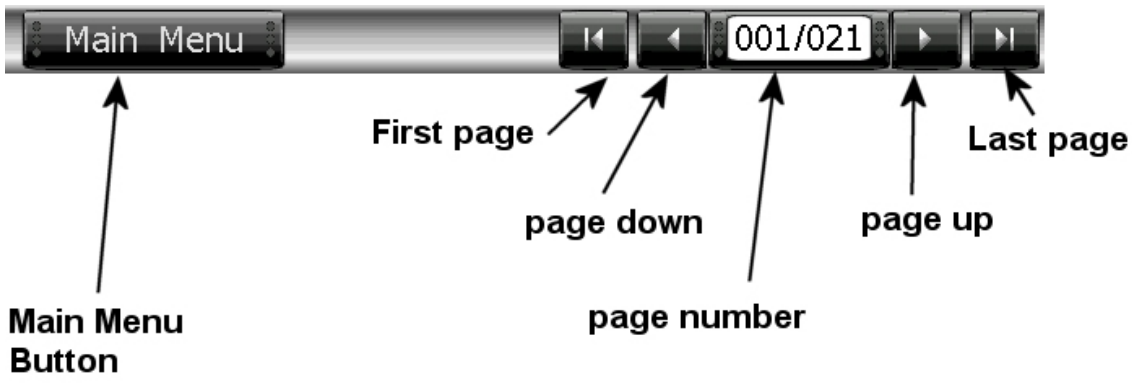


Figure 4 Menu Navigation Controls

3.2.3 Main Menu items

The majority of Main Menu items are basically short cuts to groups of Display pages, e.g. Totals is a short cut to pages that include totals of all types. The following pages however, have additional functions which are explained in this paragraph.

Edit Mode
Supervisor
Alarm Log
Audit Log
Supervisory (Mimic Diagrams, Stream 1, Station, Prover)
System Information
Settings
Calibration
MID Information

3.2.3.1 Edit Mode

The Edit Mode allows User determined items to be altered using the front panel controls.

When this menu item is selected the user will be prompted to enter a four-digit numeric password, to gain access to the calibration pages. It is possible to set-up a maximum of three different passwords and each of these passwords can be set to allow access or not to the calibration pages, these passwords are the same as used in the EDIT mode.

In its factory default condition, the three available passwords are 1111, 2222 and 3333.

The User must then select an item to be edited from the list of available items, then using the Navigation and Keyboard keys 0-9 etc. a new value can be entered and so on. Once all items to be changed have been updated, Edit mode can be left using the Main Menu key, and at this point data can be committed into the operational memory of the SFC3000.

3.2.3.2 Supervisor Mode

The Supervisor Mode is an advanced Edit Mode it allows a User to log into the machine, once logged into the machine the user has free access to all display pages and has continuous access to alter any preset data or operate any function buttons or commands without having to log into the machine for every operation.

When the Supervisor Mode is first entered the user will be prompted to enter a previously entered alpha numeric Password of at least 5 characters. If the password is correctly entered a system message of Supervisor Mode enabled is displayed which must be acknowledged, a Supervisor Mode Icon will be shown in the top edge of the display. See Figure 5.

Depending on the initial configuration of the Supervisor mode the user can opt to either
Commit any data changes instantly, as they occur
or
Commit any data changes via a single sub menu item option, with an acknowledgement.
Again, depending upon the initial configuration of the Supervisor mode
Logout can be configured to occur automatically after a user entered time in minutes of no keyboard presses
or
Logout upon command of a sub menu button under the Supervisor mode main menu item.

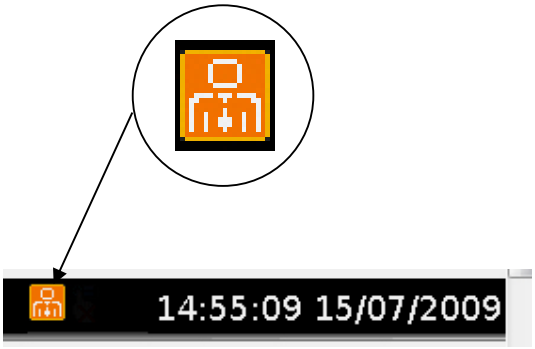


Figure 5 Supervisory Mode Enabled

3.2.3.3 Alarm Log

A typical Alarm log display is shown in Figure 6.

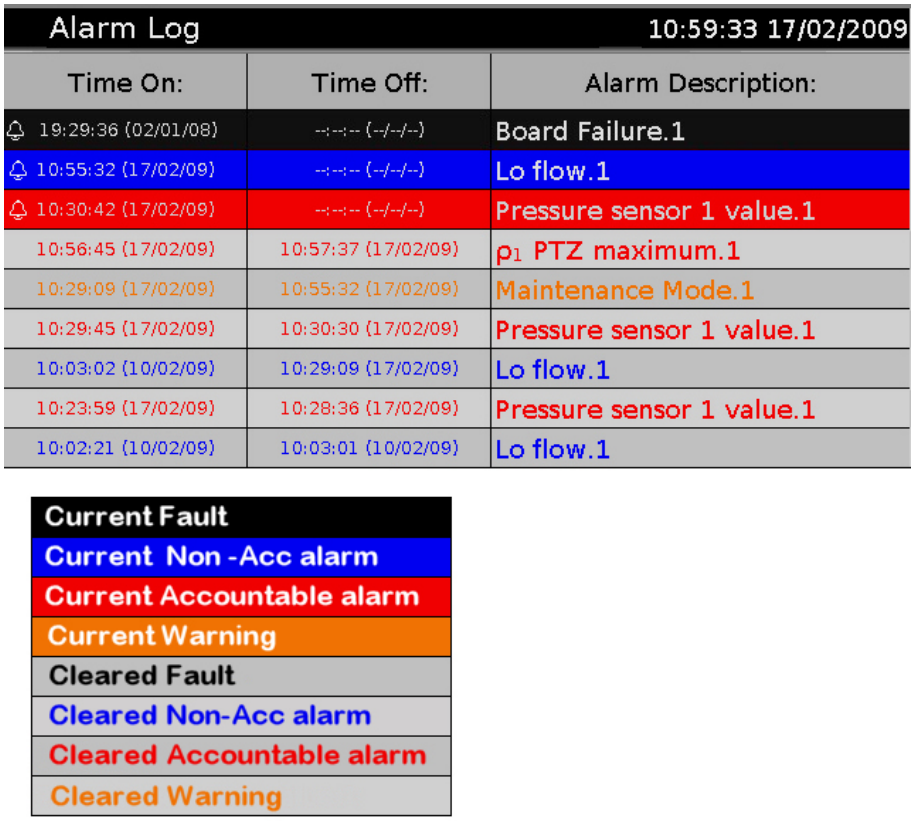


Figure 6 Alarm Page Example

Accountable alarms are shown in Red
Non accountable alarms in Blue
Warnings in Orange
Faults in Black.

Any current Alarm will be accompanied by a FLASHING LED of the corresponding alarm type. This means the Alarms occurrence has not been acknowledged, any un-acknowledged alarm will also be shown with a bell symbol at the start of the alarm record on the alarm page, see Figure 6. An Alarm can be acknowledged by pressing the Acknowledge button at the bottom of the Alarm Log page. Once acknowledged the corresponding Alarm LED with stop flashing and change to on continuously and the bell symbol will clear.

Past alarms can be cleared from the Alarm Log by pressing the Clear button at the button of the Alarm Log page.

3.2.3.4 Audit Log

A typical Audit Log display is shown in Figure 7, the audit log will contain all items that could affect the operation of the flow computer, e.g. Change of Data, or Alarm status.

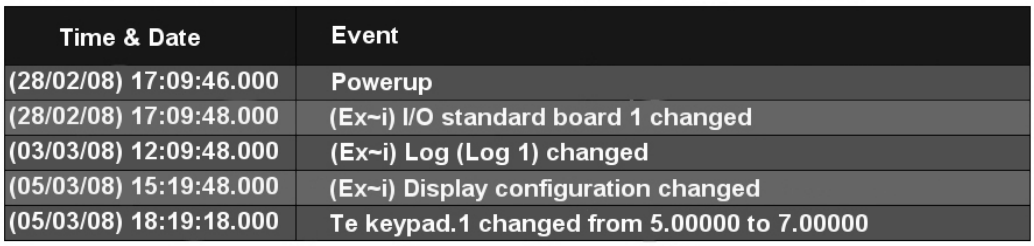


Figure 7 Audit Log Example

3.2.3.5 Supervisory (Mimic Diagram)

The Supervisory or Mimic Diagram page is used to display a diagrammatical view of the basic system set up. Such a display would include Meters, Transmitters and can give a summary idea of the flowing conditions. Depending upon the machine type set up this page can appear in the main menu list as Stream N, Station or Prover.

3.2.3.6 System Information

The System Information Page and Board information page, contains all relevant information as to Software and Hardware Versions fitted in the Unit, together with Silicon Serial Numbers of all fitted circuit boards.

3.2.3.7 Settings

The Settings Page, contains the following non critical display controls:

Display Settings
- Language selection
- Display Brightness

Display Test
- Display On (white Screen)
- Display Off (black Screen)
- Test Card.

Touch Screen Calibration

Touch Screen Enable	Allows the Touch screen to be disabled so all display navigation is done using the Rotary control, when the touch screen is disabling an icon is displayed in the top display bar See Figure 8.
Calibrate	Follow the on-screen instruction for touch screen calibration
Set Sensitivity	Follow the on-screen instruction for touch screen calibration See Figure 8.
Test	Follow the on-screen instruction for touch screen calibration

NOTE: The Touch screen comes Factory Calibrated, however should the need arise a simple on-screen procedure can be followed to Calibrate and Test the Touch screen operation

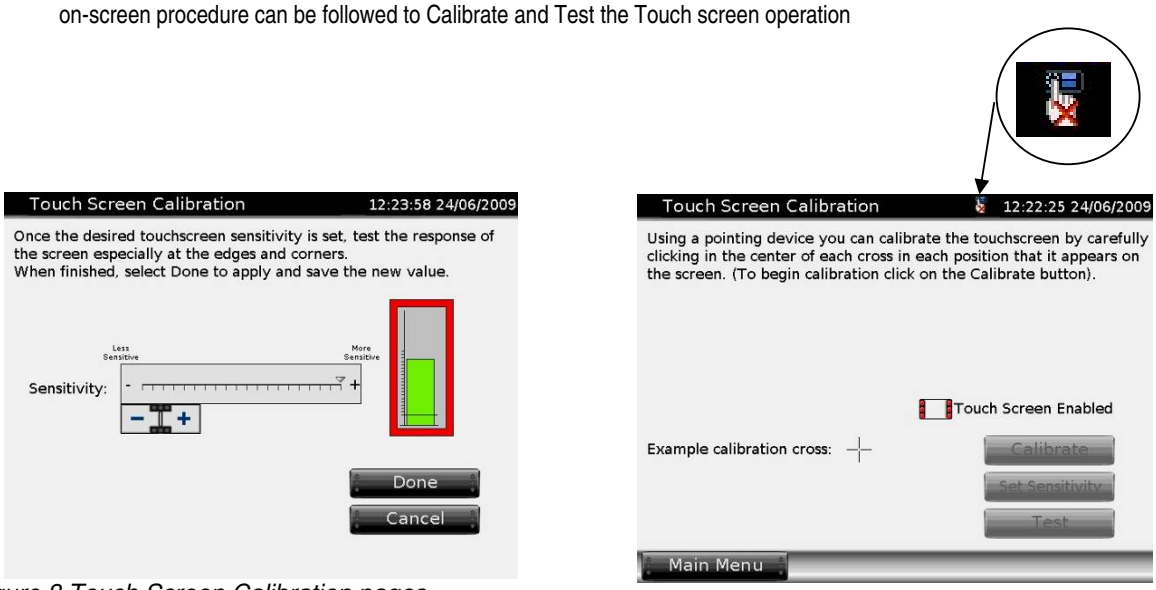


Figure 8 Touch Screen Calibration pages

3.2.3.8 Calibration

The Edit Mode also allows access to the Calibration, under the same password entry. Calibration allows the user to calibrate and inputs and outputs on a specific I/O Board. Details of Calibration procedures for all input and output types can be found in section 4.

3.2.3.9 MID Information

The MID Information pages (s) is a read only item, that includes all the essential data related to MID approval.

3.3 Front panel Indicators

There are five indicator LED's on the Front panel of the Model SFC3000, from top to bottom these are as shown in Figure 9 below.

Power ON	GREEN
Accountable Alarm	RED
Non-accountable Alarm	RED
Fault	RED
Low or High Flow Limit	YELLOW

Figure 9 Front Panel LEDs

3.4 Front panel Programming Port

The programming port on the Front panel is a USB standard type B version. The programming port is used for downloading of configuration and setup data and files and for up loading of result, table and report data. It should always be used in conjunction with the Model SFC3000 Windows software as supplied with the unit.

On first connection to a PC loaded with the SFC3000 Windows software and USB Drivers, message as shown on Figure 10 will appear on the PC screen. Once installed the USB port will recognise the SFC3000 device each time it is connected via the USB socket. Once the USB port is correctly configured for using an SFC3000 flow computer. The supplied windows software can be used to configure, and download information to the connected SFC3000. Instructions for the installation and operation of the Software are contained on the supplied memory stick or CD.

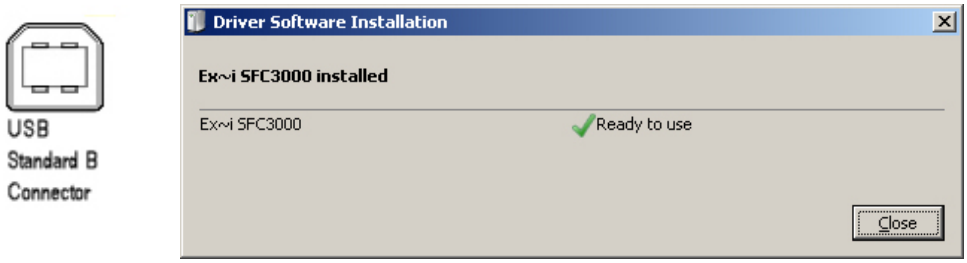


Figure 10 USB Connector and Messages

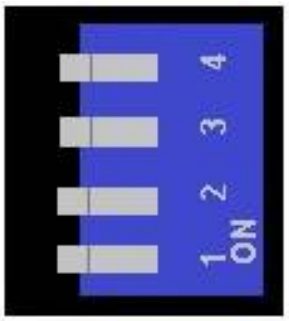
3.5 Rear panel Controls Mode Switches

On the rear panel are 4 Mode or Function switches. These controls determine the basic operating mode of the SFC3000.

The designation and function of the mode switches is as follows:

Normal RUN mode:

The designation and function of the mode switches is as follows:



Switch No.	ON	OFF
4	Security 1 On	Security 1 Off
3	Security 2 On	Security 2 Off
2	No Function	
1	Run Mode	Boot Mode

Figure 11 Mode Switch settings

For Normal operation the Unit should be set to Run Mode, Boot Mode should only be used for downloading of New Software Versions in conjunction with the supplied Windows operating software.

If Both Security switches 1 and 2 are set to OFF then the security mode of the machine is OPEN
If Both Security switches 1 and 2 are set to ON then the security mode of the machine is FULL
If either Mode switch 1 or Mode switch 2 is set to ON then the security mode of the machine is PARTIAL
The current setting of the Security mode of the machine is shown on the System Information page in the Security Mode window as shown below.

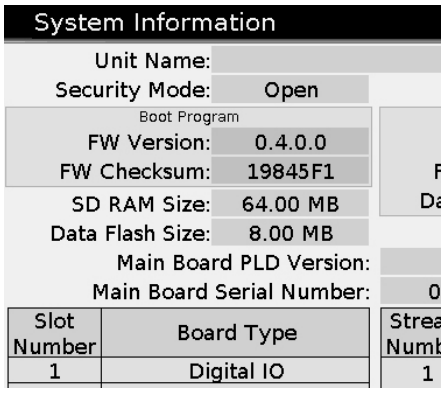


Figure 12 System information page

3.6 Functions

3.6.1 Meter Linearization

A facility is provided which gives the option to apply a linear correction to the meter input which is connected to the high frequency input. The options available are:

off No correction.

20 pnt Linearity correction using 20-point interpolation.

The meter is characterised by entering up to twenty co-ordinates for flow and corresponding error values which are stored in the flow computer memory. A linear correction is applied to the corrected flow by interpolating between the co-ordinate points. Correction is applied to the uncorrected flow rates, uncorrected and corrected total flows.

The value entered into the %Qmax n data location is in % of maximum flow (Q max.) of the meter, this figure can range from – Qmax to + Qmax to allow for different linearity in the opposite flow direction and the value entered in the corresponding %Er.rd n location is the % error of reading. If the output from the meter is less than the actual flow through the meter then the error is entered as a negative value.

%Er.rd n = the % error in reading of the meter flow rate at %Qmax n flow rate.

n is an integer between 0 and 19

The lowest value of flow in this case nearest to –Qmax (or nearest to zero flow if the flow is only in the +ve direction) must be entered at the position n = 0. The rest of the data points must be entered in ascending value of Q up to the top point.

If the flow is above Qmax then the %Er.rd value used is the value for Q max. If the flow is below Qmin then no correction is applied.

In addition, linear correction is only applied if the meter produces at least 10 pulses per second at Qmin.

4.0 Service, Maintenance, Installation and Calibration

In this section two service levels are recognised:

OPERATOR with information of how to configure, operate and undertake minor service tasks on the Flow Computer SFC3000.

QUALIFIED STAFF with information of how to install, configure, operate and undertake more complicated service tasks, information is also given regarding troubleshooting typical problems that may occur.

4.1 Service

4.1.1 Fuse F2 Replacement

The SFC3000 contains a rear fuse F2 see Figure 41, the function of this fuse is to protect the DC output. This operation can be carried out by either an OPERATOR or a QUALIFIED STAFF.

Isolate the main power to the Flow Computer SFC3000.

Rotate Fuse holder F2 counter clockwise and remove fuse to be replaced. Replace fuse F2 only with a replacement fuse type as follows and replace the fuse F2 in the fuse holder and rotate clockwise in the holder.

Fuse F2 Type

SCHURTER Type SPT
DC Voltage :300VDC
Current 1.6A
Type: SPT 5 x 20mm Ceramic
Characteristics: Time-Lag T
Applicable Standards: IEC60127-2/5, UL248-14, CSA22.2 no248.14

4.1.2 Fuse F1 Replacement

The SFC3000 contains an internal fuse F1 see Figures 40 and 41, the function of this fuse is to protect the DC input circuits. This operation can only be carried out by QUALIFIED STAFF.

Isolate the main power to the Flow Computer SFC3000.

Remove the rear panel as detailed in Figure 41. Withdraw the PSU Board and identify F1 as detailed in Figure 40. Replace fuse F1 only with a replacement fuse type:

Fuse F1 Type

SCHURTER Type SPT
DC Voltage :300VDC
Current 3.15A
Type: SPT 5 x 20mm Ceramic
Characteristics: Time-Lag T
Applicable Standards: IEC60127-2/5, UL248-14, CSA22.2 no248.14

4.1.3 Backup Battery First Time Installation

The SFC3000 requires a Backup Battery to be fitted on the Auxiliary Card, this Battery is to keep the Real Time Clock and internal Totals backed up, whilst main DC power to the unit is disconnected.

This operation can only be carried out by QUALIFED STAFF.

In models of the SFC3000 supplied before 2013 the Backup battery was supplied packed separately from the SFC3000 and needed to be installed as detailed in Section 4.1.4

In more recent models the battery is supplied pre-installed and just needs to be commissioned as follows:

Disconnect all cables from the rear of the SFC3000 and remove the rear panel as shown in Figure 13 and 41.

Carefully remove the insulated tab by pulling in the direction of the arrow as shown in Figure 14, whilst making sure that the battery cannot slide out of the holder. NOTE: It is not necessary to remove the Auxiliary Board from the chassis to carry this operation out.

When the operation is complete refit the Rear Panel taking care to engage the fuse holder and mode switches through the panel apertures.

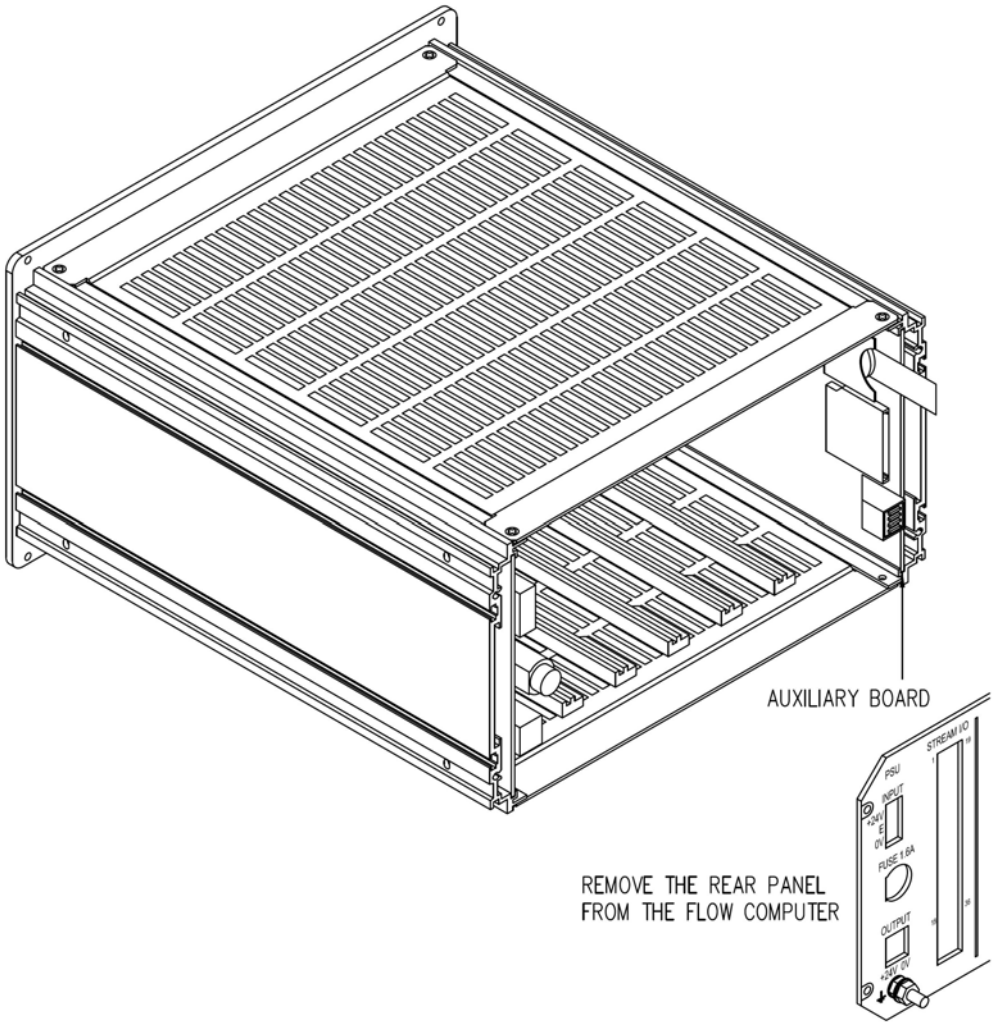


Figure 13 Battery Insulation Tab Position

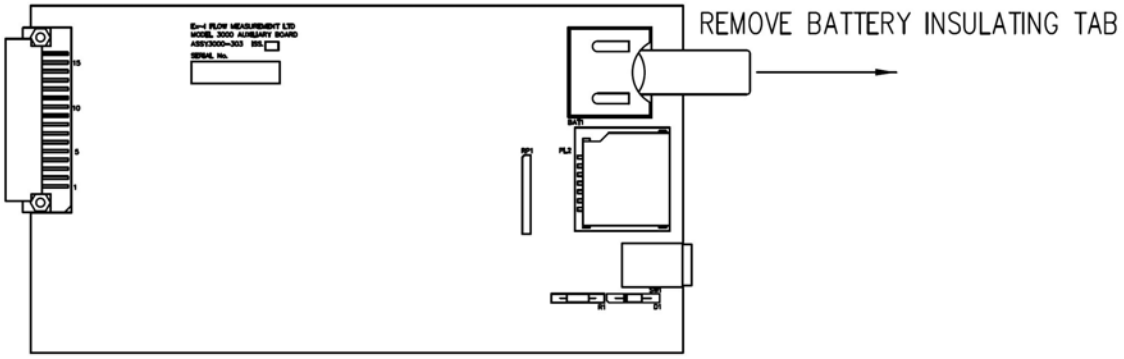


Figure 14 Battery Insulation Tab Removal

4.1.4 Backup Battery Replacement

The SFC3000 contains a Backup Battery on the Auxiliary Card, this Battery is to keep the Real Time Clock and internal Totals backed up, whilst main DC power to the unit is disconnected.

This operation can only be carried out by QUALIFED STAFF.

If operated under normal operating circumstances and if the flow computer is kept continuously powered, the Backup Battery should only need to be replaced every 10 years. It is recommended if the unit is to be left un-powered for any length of time in excess of 1 month then the battery should be removed and stored separately. The Battery should be replaced under the following circumstances:

Battery has been in service in excess of 10 years.

Battery has been left in an un-powered unit for a time period of greater than 2 months.

When a “BAD” battery condition is indicated, via the Windows software.

When the Battery “Bad” indicator is shown on the main display, see Figure 15.

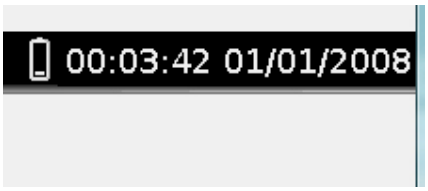


Figure 15 Display Low Battery Indication

NOTE: When the Battery is missing or requires replacement the flashing battery symbol as above will be shown adjacent to the Time on Date on all display screens. When the Battery is within operating parameters no symbol will be shown.

To replace or install for the first time the battery as follows:

Record Main totals as these will be lost during power down.

Disconnect all cables from the rear of the SFC3000 and remove the rear panel as shown in Figure 41.

Withdraw the Auxiliary Card from the Chassis and then remove the Battery as shown in Figure 39.

Replace the Battery only with a new replacement type as detailed below:

Battery Replacement Type

Type Panasonic Lithium Battery CR2032 or BR2032
Maximum Voltage: 3V
Maximum Current (Charge / Discharge): 5mA
Dimensions: 20mm Dia. by 3.2mm height
Capacity: BR2032 200mA, CR2032 220mA
Approval UL 1642 file MH12210

Battery Polarity Precautions

Care should be taken by the QUALIFED STAFF undertaking the Battery replacement that the Battery is installed in the correct polarity orientation as shown in Figure 39. Positive terminal + connected to the Battery holder.

Refit Auxiliary card and Rear Panel. Refit all cables and Power UP the unit.

Main Totals can be restored using the windows software, the Real Time clock will need to be set to the correct time, by any of the alternative methods.

4.2 Maintenance

No routine maintenance is required to ensure continuous operation, however should a system failure occur during operation, then the most likely cause of malfunction is that of a requirement not being fully or correctly implemented. If a fault or warning occurs, the cause should be determined in a logical and systematic manner and a guide is given below. All maintenance tasks should be carried out by QUALIFED STAFF only.

Caution Static Precautions

Some parts of the instrument such as circuit boards may be damaged by static electricity. It is therefore essential when carrying out any Maintenance or Installation work that an earthed wrist strap be worn whenever internal parts of the instrument are handled.

4.2.1 Initial Checks

1) Check that the power supply is of the correct type and value.
2) Check the internal fuse F1 and that the power supply polarity is correct (See 4.1.2)
3) Ensure that all input and output connections to the plugs and sockets at the rear of the Model SFC3000 are satisfactory and the plugs are engaged firmly and in the correct sockets.
4) Ensure that all of the data entered via the keyboard or programmed via software is correct and that all of the calibration data has been entered and is correct.
5) Switch off the power to the Model SFC3000 and check that all of the circuit boards are fully engaged in their sockets and are positioned in the correct location.
6) Carry out a visual inspection of all wires and cables for obvious loose or broken connections.
7) Check that all external signal transmitters have the correct power supply voltages and that they are operational.

4.2.2 Replacement Parts

The following user replacement parts are available for service/maintenance purposes:

Description	**Part No.**
PSU Board	3000-302
Auxiliary Board	3000-303
Digital Input/output Board	3000-304
Communication Board	3000-305
Analogue Input/output Board	3000-306
Switch Input/output Board	3000-307
Dual Ethernet Communication Board	3000-308
Digital Input/output Board 2	3000-309
USB A-B Cable	USB A-B Cable
Auxiliary Board Replacement Battery	CR/BR2032
Fuse F1	Fuse F1
Fuse F2	Fuse F2
SD Card 1Gb	
SD Card 2Gb	

When replacement boards are fitted it may be necessary to change the customer link settings. The position and function of all customer links is described in Section 5

4.2.4 SD Card Replacement

The SFC3000 contains a replaceable SD memory Card on the Auxiliary Card, this Card can be used to store, Audit and Data log Information. It can be replaced at any time by withdrawing from the connector on the rear panel and a new card inserted. When a new card is inserted it is automatically detected and depending upon its formatting and use, possible messages and instructions will appear on the main screen. Follow the instructions, and the card should be prepared ready for use.

Once removed a filled or partially filled card can have its data read using a standard PC Card reader and the supplied Windows software.

4.2.5 Cleaning of Front Panel Touch Screen

Clean Front panel of SFC3000 only with a moist cloth.

4.3 Installation

4.3.1 Mechanical Installation

All Installation tasks should be undertaken by QUALIFED STAFF. The outline chassis dimensions are given in Figure 16 and provide for mounting in either a panel or standard rack. The chassis should be installed such a position that the ventilation slots on the upper and lower surfaces, are kept clear from any obstruction. Where the SFC3000 may be subject to high ambient temperatures- e.g. near heat producing apparatus or in direct strong sunlight. Adequate ventilation should be provided. The operating environment should be clean, dry and free from a corrosive atmosphere.

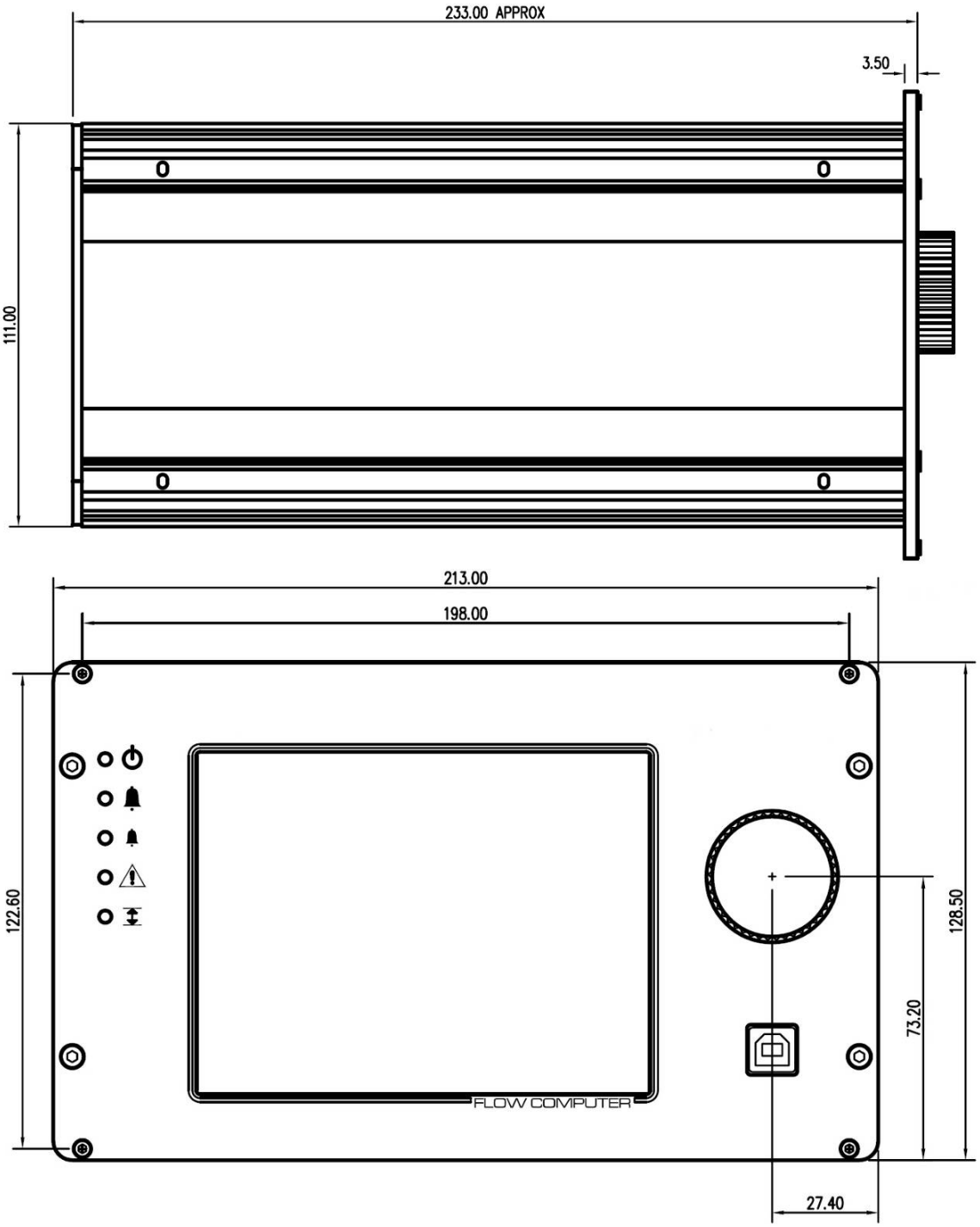


Figure 16 Chassis Dimensions

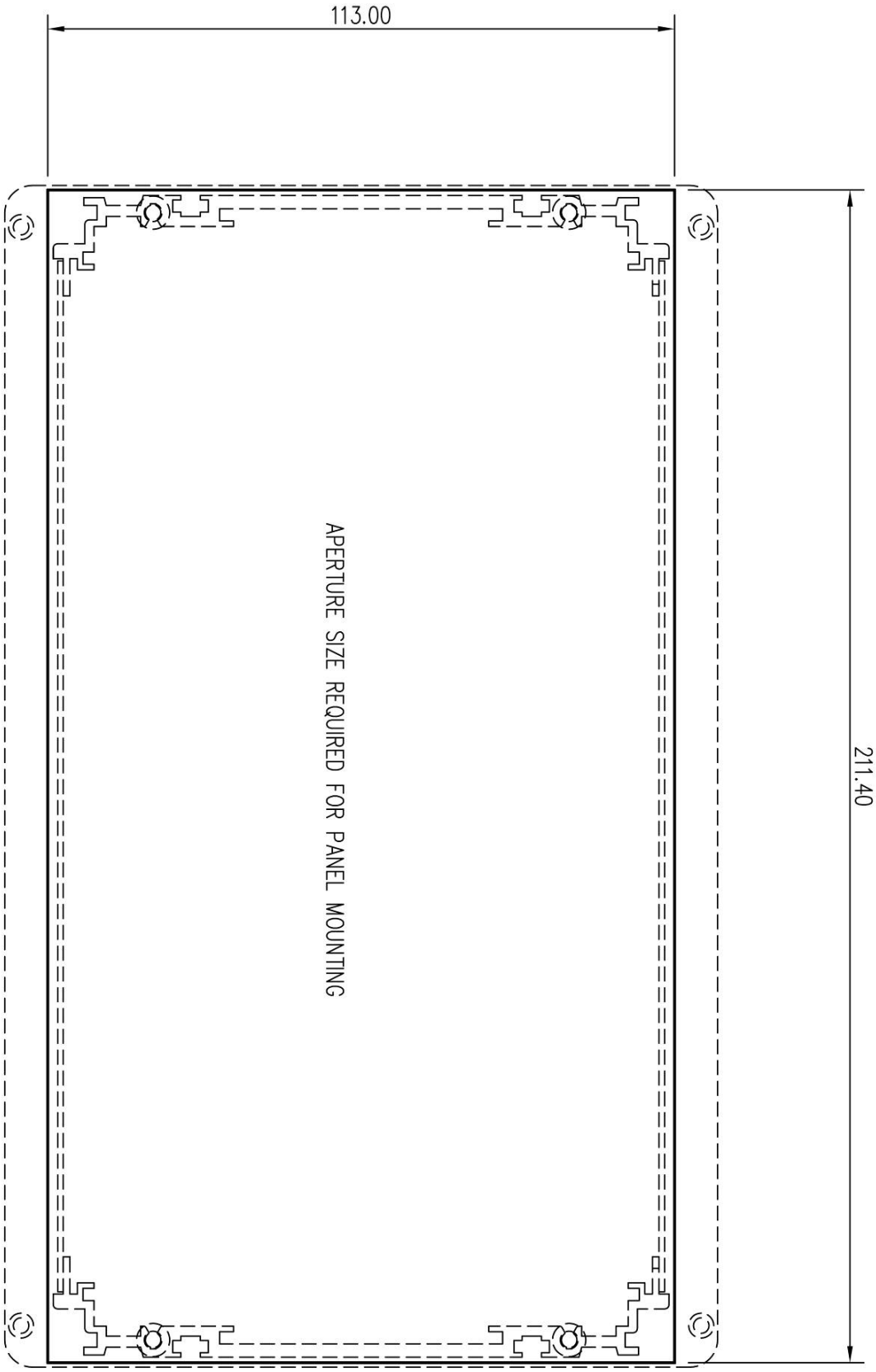


Figure 17 Panel Cut out Dimensions

NOTE: When used as a part of MID and subject to the requirements of EN 12405 the flow computer device should be mounted in a case of ingress protection index (IP) of at least severity level IP65 and suitable for outdoor use.

4.3.2 Electrical Installation

The Flow Computer SFC3000 is certified to be in compliance with IEC 61010-1:2001 provided that is installed in conjunction with the details contained within paragraph 4.3.2.1.

4.3.2.1 Power Supply and Power supply wiring

The Flow Computer SFC3000 must be powered from a power supply type:

Power Supply Type

Power Supply :24VDC +/- 10%
NEC Class 2 (LV/LC)
Currents I-max is limited to 8A
Max. Power is limited to 150VA

A Class 2 power supply is defined by article 725.41 of the National Electrical Code (NEC Codebook) and has limited output power.

In addition, the wiring used to connect the SFC3000 to the power supply must be sufficiently rated with a minimum cross section area of 1.5mm^2 10A rated with PVC insulation.

When installing the SFC3000 a suitably rated switch or circuit breaker must be included to allow the power supply to the SFC3000 to be isolated, this device should be mounted as near to the equipment as practically possible.

The Model SFC3000 Flow Computer must be connected to a suitable Ground or Earth Connection via the M4 Earth Stud located at the rear of the chassis. See Figure 41 for details.

4.3.2.2 Transmitters Input Connections

The input transmitter circuits are connected to the Model SFC3000 via the 36-way terminal connections on the rear panel of the Model SFC3000. Before any of the transmitters are connected reference should be made to the instrument instruction manuals applicable to the individual transmitters. The majority of applications where input devices are connected to an SFC3000 flow computer, will require adherence to the applicable manufacturers Safety requirements and installation requirements appropriate to the device being connected and the use to which it is put. Suggested connection methods are simply that a basic indication of how the devices can be connected together.

WARNING:
IN HAZARDOUS ENVIRONMENTS A TRANSMITTER MUST BE CONNECTED IN ACCORDANCE WITH THE SAFETY CERTIFICATE CONDITIONS SPECIFIED FOR THE INDIVIDUAL TRANSMITTER.

TERMINAL BLOCK TENSION CLAMP Operating Instructions

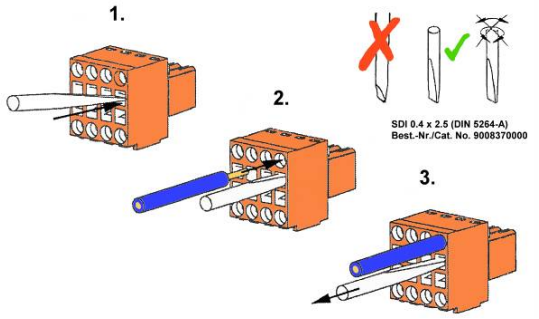
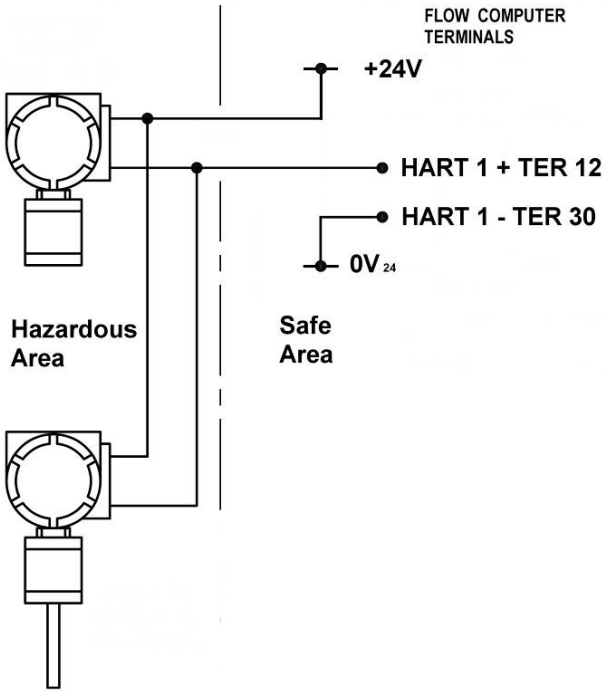


Figure 18 Terminal Block Tension Clamp

4.3.2.3 HART Transmitter Input Connections

The Hart transmitters can be connected in parallel as a multidrop system and each transmitter must have a different address.



It is essential that the transmitters have their addresses programmed and the burst mode operation turned off before they are connected to the Model SFC3000. All transmitters on the same Hart Loop must be assigned different short addresses it is recommended that the pressure transmitter must be programmed with a short address of 01 and the temperature transmitter with a short address of 02.

Refer to the transmitter operating manuals for the programming procedures.

A typical method of connecting transmitters is given in Figure 19 and the terminal pin designations refer to the Digital I/O board connections as shown in Appendix 1.

Figure 19 Typical HART Transmitter Connections

4.3.2.4 Digital Transmitter Input Connections

These inputs are generally used for connection to pulse counting meters such as Rotary or Turbine meters, frequency measuring transmitters such as Density or Relative Density transmitters or simple switch inputs. In all cases the required connections are basically the same and as shown in Figure 20. It is intended that the Input be connected to a +24V pulse input with Link LK8 in the off position this allows an input current of 10mA to flow. If the pulse source is operated from different voltage sources then LK8 should be switched to the ON position and an external resistor of value that will allow 10mA to flow should be fitted in series with the D i/P1+ Terminal., typical voltages and resistor values are given below:

15V	1k5
12V	1k1
5V	510

The terminal pin designations refer to the Digital I/O board connections as shown in Appendix 1.

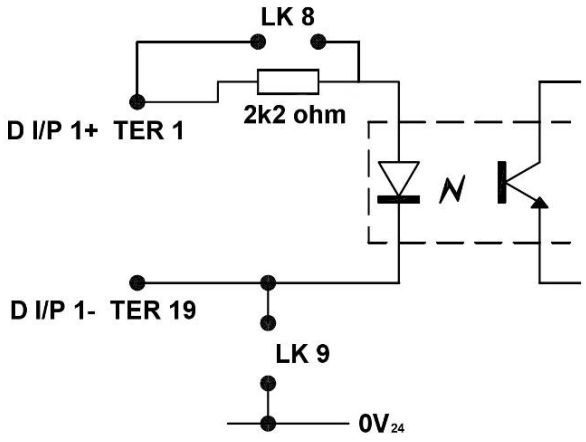


Figure 20 Digital Input internal circuit

Reference should be made to the meter or transmitter manuals for correction installation and connection in accordance with the manufacturer's guidance.

4.3.2.5 Analogue Transmitter Input Connections

NOTE: Only available when Analogue I/O Board fitted

Any analogue inputs used are generally used for connection to 4-20mA type transmitters for measurement of pressure, temperature or similar.

Refer to the transmitter operating manuals for the installation procedures.

A typical method of connecting transmitters is shown in Figure 21 and the terminal pin designations refer to the Analogue I/O board connections as shown in Appendix 1.

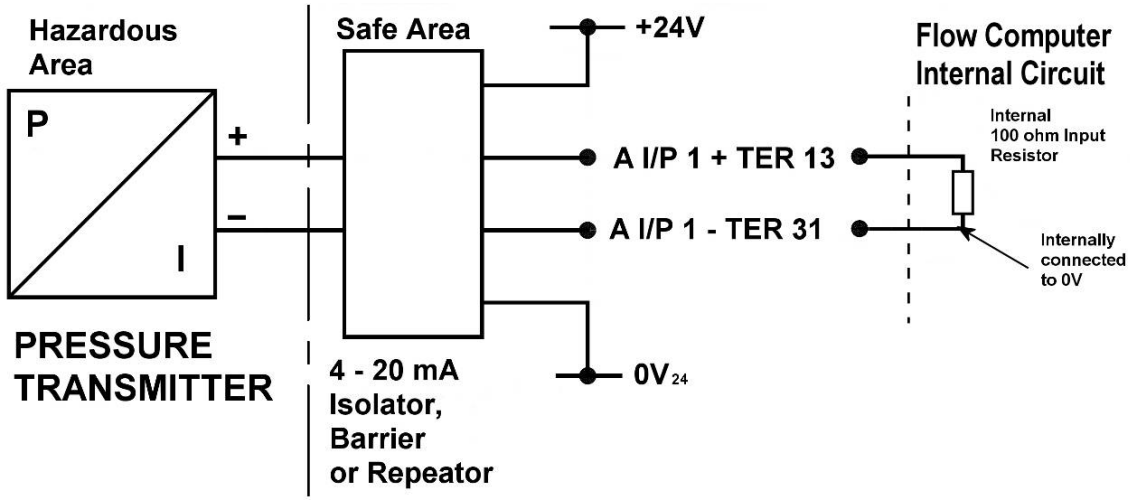


Figure 21 Typical Analogue Input Connections

4.3.2.6 Direct PRT Input Connections

A Direct PRT measurement can be made using a typical 4 wire PRT of Resistance 100 ohms at 0°C

Refer to the transmitter operating manuals for the installation procedures.

A typical method of connecting transmitters is shown in Figure 22 and the terminal pin designations refer to the Digital I/O board connections as shown in Appendix 1.

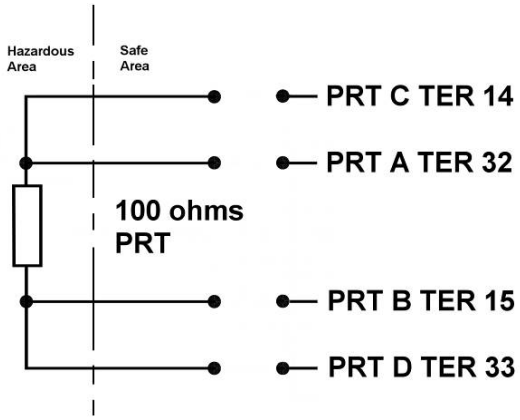


Figure 22 Direct PRT Connection

4.3.2.7 RS232/RS485 Communication Connections

All types of I/O Board Digital, Digital 2, Switch and Analogue have an RS232/RS485 connection intended for connection to serial communication to meters or similar devices. These connections are not galvanically isolated from the internal supplies of the SFC3000 and it is therefore recommended that external barrier devices are used in conjunction with these connections.

For RS232 connection use a:
Phoenix Contact PSM-ME-RS232/RS232-P

For RS485 connection use a:
Phoenix Contact PSM-ME-RS485/RS485-P or
Phoenix Contact PSM-ME-RS232/RS485-P

The Communication Board and Dual Ethernet Communication Board both have 3 separate galvanically isolated RS232/RS485 connections intended for serial connection to printers, supervisory systems or gas chromatographs.

If RS485 communication is to be used on any of the boards, an optional terminating chain can be used See Figure 23. Typically, this terminating chain should only be switched ON, under conditions of cable lengths greater than 10 metres and high-speed communication. To connect the Termination resistor chain both Links associated with the RS485 connection should be set to the ON position.

NOTE: Figure 23 shows and Link references for the Digital and Analogue I/O Board only refer to paragraph 5.2.3 for Link references for the Communication, Switch, Digital 2 and Network Boards.

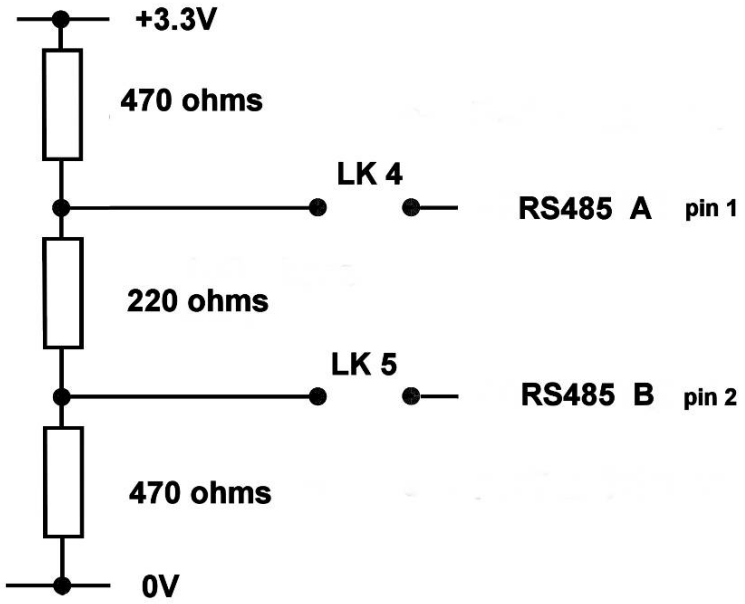


Figure 23 Internal RS485 Termination network

Reference should be made to the instruction manuals of any connected devices for correction installation, configuration and connection in accordance with the manufacturer's guidance.

4.4 Calibration

Calibration should be carried out by QUALIFIED STAFF. Calibration allows the QUALIFIED STAFF to Calibrate any available Input or Outputs, this can be done using connected Windows software the procedure is described in the Help Menu or from the from panel of the flow computer as described as follows. Calibrate mode is entered as a sub menu from the Edit Mode, the entry procedure is described in full in section 3 Operation.

The card to be calibrated is selected from a list of available cards in the flow computer. The Calibrate button should then be operated. status of the selected Card will be read and a Calibration window will appear.

The following types of different Inputs and Outputs can be Calibrated, and are selected by the individual items in the Calibration list.

4.4.1 Input Signals

4.4.1.1 Frequency Input

Advanced section for factory calibration only.

4.4.1.2 HART Input Signals

The Hart pressure and temperature transmitters must be calibrated themselves in accordance with the manufacturer's instructions. The transmitters are connected to the flow computer in parallel as a multidrop system and each transmitter must have a different address.

It is essential that the transmitters have their addresses programmed and the burst mode operation turned off before they are connected to the flow computer. Use the Rosemount Smart Family Interface Model 268 to programme and calibrate the transmitters referring to the Rosemount operating manuals for the programming procedures.

Communication on any one connection loop can be suspended to all transmitters, or individually.
The Start Communication and Stop Communication buttons are used for this purpose.
All transmitter communication will automatically be re-started irrespective of the button status, when the Close button is pressed.

4.4.1.3 Analogue Input Signals

4.4.1.3.1 PRT Input Signals

Main Controls:
Start Calibrate, starts the calibration process
Write, write the new calibration data to the flow computer
Discard, discards any calibration changes made.
Default, reverts to default factory calibration.
Stop Calibrate, stops the calibration process.

PRT Calibration Procedure
Apply the Lower Calibration input to the unit (e.g. set the PRT input to 0°C)
Type in 0 to the Wanted box for Point 1 above
Press the Set button for Point 1
Wait for stabilization.
Apply the Upper Calibration input to the unit (e.g. set the PRT input to 100°C)
Type in 100 to the Wanted box for Point 2 above.
Press the Set button for Point 2.

Wait for Stabilization.

NOTE: other calibration points can be used the above is an example.
It will be necessary to repeat the above steps a number of time until the predicted value is stable and correct for both the lower and upper calibration points.
Once the Calibration is correct and stable for both points press the Write button to commit the calibration to memory.
Press the Close button to leave the PRT Calibration menu.

4.4.1.3.2 Analogue Input Signals (Analogue I/O Board Only)

Main Controls:
Start Calibrate, starts the calibration process
Write, write the new calibration data to the flow computer
Discard, discards any calibration changes made.
Default, reverts to default factory calibration.
Stop Calibrate, stops the calibration process.

Analogue Input Calibration Procedure
Apply the Lower Calibration input to the unit on the input to be calibrated
(e.g. set the 4-20mA Input to 4.8mA i.e. 5% i.e. 5 BARA assuming the input to calibrate is Pressure)
Type in 5.0 to the Wanted box for Point 1
Press the Set button for Point 1
Wait for stabilization.
Apply the Upper Calibration input to the unit
(e.g. set the 4-20mA Input to 19.2 mA i.e. 95% i.e. 95BARA)
Type in 95.0 to the Wanted box for Point 2 above.
Press the Set button for Point 2.

Wait for Stabilization.

NOTE: other calibration points can be used the above is an example.
It will be necessary to repeat the above steps a number of time until the predicted value is stable and correct for both the lower and upper calibration points.
Once the Calibration is correct and stable for both points press the Write button to commit the calibration to memory.
Press the Close button to leave the Analogue Input Calibration menu.

4.4.2 Output Signals

4.4.2.1 Digital Output Signals

The Digital Output signals in the Model SFC3000 do not require any customer calibration to be carried out.

4.4.2.2 Analogue Output Signals

The Analogue Output signals are factory calibrated and should not require any customer adjustment.

Analogue Output Calibration
Main Controls:
Start Calibrate, starts the calibration process
Write, write the new calibration data to the flow computer
Discard, discards any calibration changes made.
Default, reverts to default factory calibration.
Stop Calibrate, stops the calibration process.

Analogue Output Calibration Procedure
Connect a standard 100 Ohm resistance across the Analogue Output to be calibrated.
Connect a DVM capable of reading 0-2 V across the 100 Ohm resistance
Press the Set to 4mA button on the Calibrate page.
Use the up and down arrow buttons to raise and lower the output until 0.400V is indicated on the DVM.
Press the Set to 20mA button on the calibrate page.
Use the up and down arrow buttons to raise and lower the output until 2.000V is indicated on the DVM.
It may be necessary to repeat this process a number of times, until the indicated values are correct in both positions.
Once the Calibration is correct and stable for both points press the Write button to commit the calibration to memory.
Press the Close button to leave the Analogue Output Calibration menu.

5.0 Circuit Board Description and Settings

5.1 Circuit Board Description

5.1.1 Digital Input/ Output Board Description

The Digital Input Output Board is a QUALIFIED STAFF exchangeable plug in card up to a maximum of 5 can be inserted in any of the User plug in slots in the SFC3000 chassis. It provides stream input and output functions as follows:

3 off Pulse counting/frequency measuring inputs for use with turbine /rotary meters and frequency output density or relative density transducers.

2 off Digital Status inputs for use with switch or contact inputs.

2 off Smart Transmitter (HART) loops each loop can provide for connection to up to 3 transmitters for use with such transmitters as Pressure, Temperature or Differential Pressure transmitters.

1 off Direct 4 wire RTD Resistance Thermometer Input for direct measurement of temperature.

5 off Digital transistor switch outputs for use in Telemetry systems or for alarm indication.

NOTE: Only Configure Pulse O/P 1 for Prover Corrected Bus

2 off Analogue 4-20 mA current outputs for use in telemetry or control systems.

1 of Serial Communication Port using either RS232 or RS485 standards providing connection to gas meters, gas chromatographs or other equipment that uses serial communication for data transfer.

It is normally intended that each Digital Input / Output board provides all the necessary inputs and outputs for an individual measurement stream. However, as the function of each individual input and output can be separately configured, the use of any particular function is not limited to any measurement stream.

5.1.2 Digital Input/ Output Board 2 Description

The Digital Input Output Board 2 is a QUALIFIED STAFF exchangeable plug in card up to a maximum of 5 can be inserted in any of the User plug in slots in the SFC3000 chassis. It provides stream input and output functions as follows:

3 off Pulse counting/frequency measuring inputs for use with turbine /rotary meters and frequency output density or relative density transducers.

1 off Digital Status inputs for use with switch or contact inputs.

2 off Smart Transmitter (HART) loops each loop can provide for connection to up to 3 transmitters for use with such transmitters as Pressure, Temperature or Differential Pressure transmitters.

6 off Digital transistor switch outputs for use in Telemetry systems or for alarm indication.

4 off Analogue 4-20 mA current outputs for use in telemetry or control systems.

1 of Serial Communication Port using either RS232 or RS485 standards providing connection to gas meters, gas chromatographs or other equipment that uses serial communication for data transfer.

It is normally intended that each Digital Input / Output board 2 provides all the necessary inputs and outputs for an individual measurement stream. However, as the function of each individual input and output can be separately configured, the use of any particular function is not limited to any measurement stream.

5.1.3 Analogue Input / Output Board Description

The Analogue Input Output Board is a QUALIFIED STAFF exchangeable plug in card up to a maximum of 5 can be inserted in any of the User plug in slots in the SFC3000 chassis. It provides stream input and output functions as follows:

3 off Pulse counting/frequency measuring inputs for use with turbine /rotary meters and frequency output density or relative density transducers.

2 off Digital Status inputs for use with switch or contact inputs.

1 off Smart Transmitter (HART) loop each loop can provide for connection to up to 3 transmitters for use with such transmitters as Pressure, Temperature or Differential Pressure transmitters.

1 off Direct 4 wire RTD Resistance Thermometer Input for direct measurement of temperature.

4 off 4-20mA current inputs for use with such devices as Analogue transmitters for Pressure, Temperature and differential pressure.

3 off Digital transistor switch outputs for use in Telemetry systems or for alarm indication.

NOTE: Only Configure Pulse O/P 1 for Prover Corrected Bus

3 off Analogue 4-20 mA current outputs for use in telemetry or control systems.

1 of Serial Communication Port using either RS232 or RS485 standards providing connection to gas meters, gas chromatographs or other equipment that uses serial communication for data transfer.

It is normally intended that each Digital Input / Output board provides all the necessary inputs and outputs for an individual measurement stream. However, as the function of each individual input and output can be separately configured, the use of any particular function is not limited to any measurement stream.

NOTE: Certain of the Inputs and Outputs require the setting of individual links to connect the functional devices to the Main Terminal Connection Block. This applies to Digital Outputs 4 and 5 and Analogue Input 4 and Analogue Output 3. Care should be taken to ensure the Links are set to the correct position, BEFORE and power is applied to the SFC3000.Refer to Figure 31 for Link Details.

5.1.4 Switch Input/ Output Board Description

The Switch Input Output Board is a QUALIFIED STAFF exchangeable plug in card up to a maximum of 5 can be inserted in any of the User plug in slots in the SFC3000 chassis. It provides switch input and output functions as follows:

3 off Pulse counting/frequency measuring inputs for use with turbine /rotary meters and frequency output density or relative density transducers.

3 off Digital Status inputs for use with switch or contact inputs.

6 off Digital transistor switch outputs for use in Telemetry systems or for alarm indication.

6 off Digital I/O connections which can either be set to:

Digital transistor switch outputs for use in Telemetry systems or for alarm indication.

or Digital Status inputs for use with switch or contact inputs.

1 of Serial Communication Port using either RS232 or RS485 standards providing connection to gas meters, gas chromatographs or other equipment that uses serial communication for data transfer.

It is normally intended that each Switch Input / Output board provides additional switch inputs and outputs over and above that required for an individual measurement stream, for example when used in a prover configuration. However, as the function of each individual switch input and output can be separately configured, the use of any particular function is not limited to any particular function.

5.1.5 Communication Board Description

The Communication Board is a QUALIFIED STAFF exchangeable plug in card up to a maximum of 5 can be inserted in any of the User plug in slots in the SFC3000 chassis. It provides system communication functions as follows:

1 off galvanically isolated Serial Communication Port using either RS232 with full hand shaking or RS485 standards providing connection to a serial printer.

2 off galvanically isolated Serial Communication Ports using either RS232 or RS485 standards providing connections to data logging or supervisory devices.

1 of Serial Communication Port using Ethernet 10/1000 providing connection to other Network enabled equipment.

5.1.6 Dual Ethernet Communication Board Description

The Dual Ethernet Communication Board is a QUALIFIED STAFF exchangeable plug in card up to a maximum of 5 can be inserted in any of the User plug in slots in the SFC3000 chassis. It provides system communication functions as follows:

1 off galvanically isolated Serial Communication Port using either RS232 with full hand shaking or RS485 standards providing connection to a serial printer.

2 off galvanically isolated Serial Communication Ports using either RS232 or RS485 standards providing connections to data logging or supervisory devices.

2 of Serial Communication Ports using Ethernet 10/1000 providing connection to other Network enabled equipment.

5.1.7 Auxiliary Board Description

The Auxiliary Board is a QUALIFIED STAFF exchangeable plug in card only one card is required in each chassis and this must be positioned only in the most right-hand chassis slot position. The function of the Auxiliary card is to provide the following functions:

Mounting for replaceable Battery

Mounting for Optional SD memory Card

Rear Panel Mode switches.

5.1.8 PSU Board Description

The PSU Board is a QUALIFIED STAFF exchangeable plug in card only one card is required in each chassis and this must be positioned only in the most left-hand chassis slot position. The function of the PSU card is to provide the power supply requirements of the SFC3000.

5.2 Circuit Board Settings

5.2.1 Digital Input/ Output Board Settings

The following sections contain details of the User controls and settings for the Digital Input Output Board.

5.2.1.1 Digital Input Settings

Position of Digital input Links shown on Top edge of Digital I/O Board

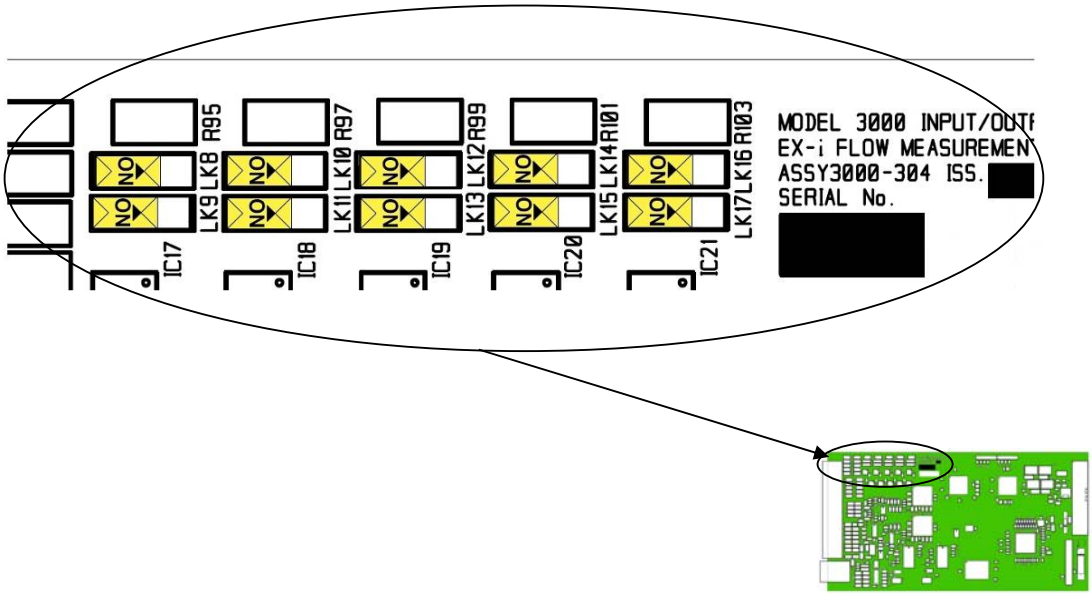


Figure 24 Digital I/O Board Digital Input Link Setting

Link No.	Function	Factory setting	Notes
8	Digital Input 1 Resistor bypass	OFF	See Figure 20
9	Digital Input 1 $0V_{24}$ Connection	OFF	See Figure 20
10	Digital Input 2 Resistor bypass	OFF	See Figure 20
11	Digital Input 2 $0V_{24}$ Connection	OFF	See Figure 20
12	Digital Input 3 Resistor bypass	OFF	See Figure 20
13	Digital Input 3 $0V_{24}$ Connection	OFF	See Figure 20
14	Digital Input 4 Resistor bypass	OFF	See Figure 20
15	Digital Input 4 $0V_{24}$ Connection	OFF	See Figure 20
16	Digital Input 5 Resistor bypass	OFF	See Figure 20
17	Digital Input 5 $0V_{24}$ Connection	OFF	See Figure 20

5.2.1.2 HART Loop Settings

Position of HART Loop Links shown on Left hand edge of Digital I/O Board

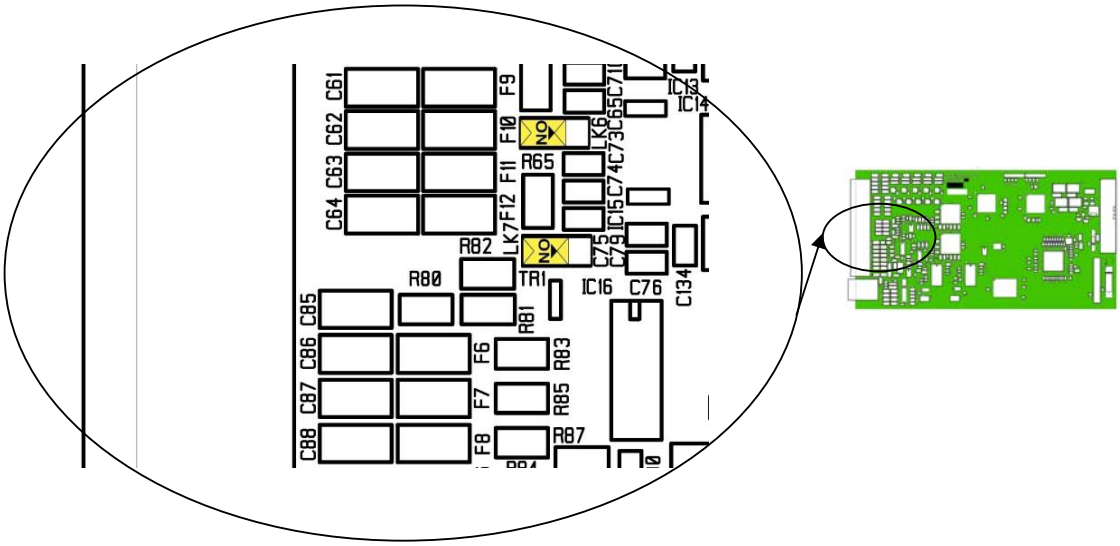


Figure 25 Digital I/O Board HART Loop Link Settings

Link No.	Function	Factory setting	Notes
6	HART Loop 1 $0V_{24}$ Connection	ON	
7	HART Loop 2 $0V_{24}$ Connection	ON	

5.2.1.3 RS485 Settings

Position of RS485 Termination Network Links shown on Left hand edge of Digital I/O Board

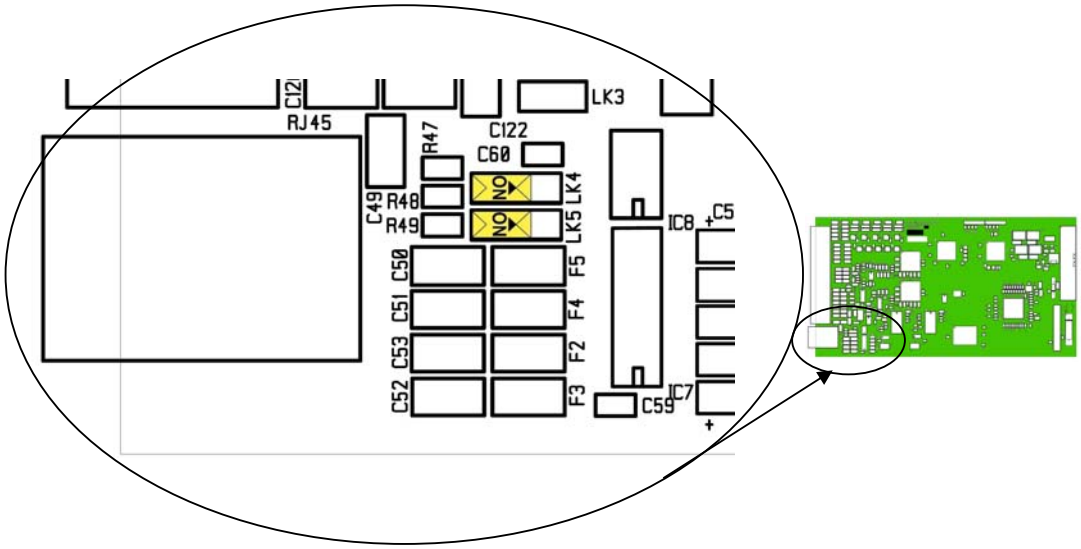


Figure 26 Digital I/O Board RS485 Termination Link Setting

Link No.	Function	Factory setting	Notes
4	RS485 Termination Network Connection	OFF	See Figure 23
5	RS485 Termination Network Connection	OFF	See Figure 23

5.2.2 Digital Input/ Output Board 2 Settings

The following sections contain details of the User controls and settings for the Digital Input Output Board 2.

5.2.2.1 Digital Input Settings

Position of Digital input Links shown on Top edge of Digital I/O Board2

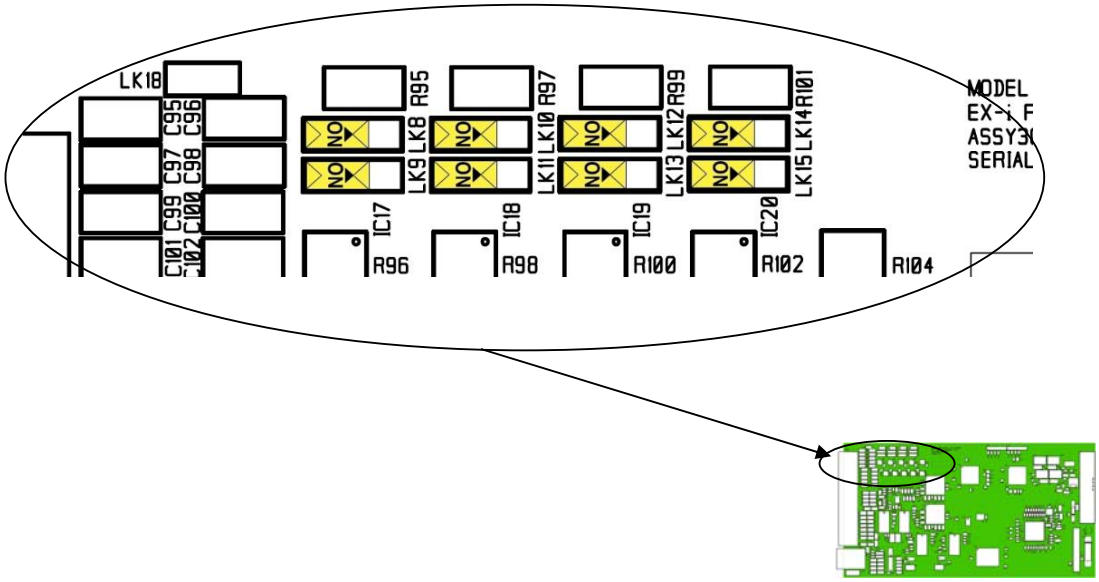


Figure 27 Digital I/O Board 2 Digital Input Link Setting

Link No.	Function	Factory setting	Notes
8	Digital Input 1 Resistor bypass	OFF	See Figure 20
9	Digital Input 1 $0V_{24}$ Connection	OFF	See Figure 20
10	Digital Input 2 Resistor bypass	OFF	See Figure 20
11	Digital Input 2 $0V_{24}$ Connection	OFF	See Figure 20
12	Digital Input 3 Resistor bypass	OFF	See Figure 20
13	Digital Input 3 $0V_{24}$ Connection	OFF	See Figure 20
14	Digital Input 4 Resistor bypass	OFF	See Figure 20
15	Digital Input 4 $0V_{24}$ Connection	OFF	See Figure 20

5.2.2.2 HART Loop Settings

Position of HART Loop Links shown on Left hand edge of Digital I/O Board 2

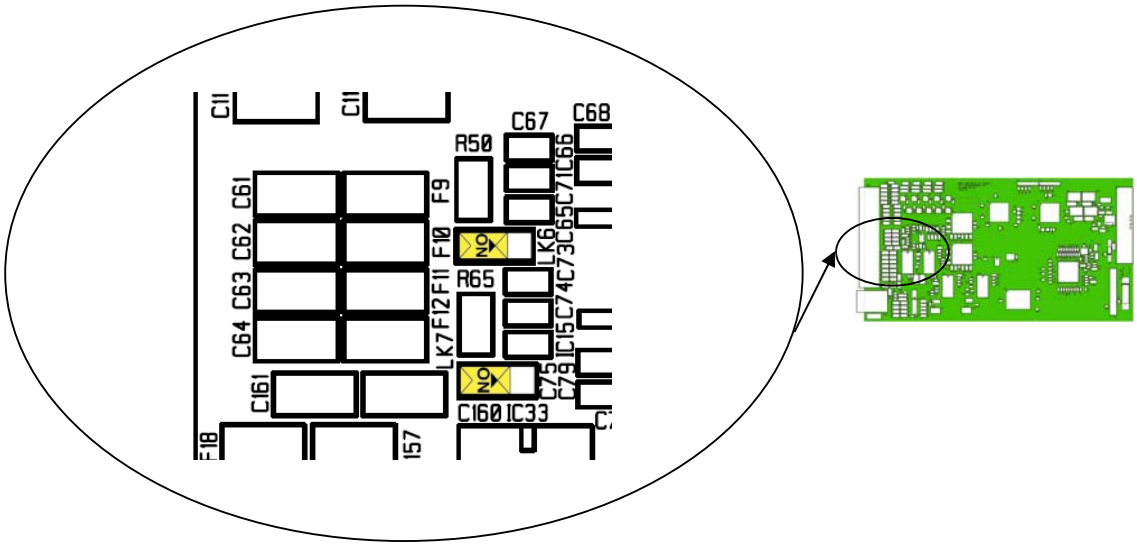


Figure 28 Digital I/O Board 2 HART Loop Link Settings

Link No.	Function	Factory setting	Notes
6	HART Loop 1 $0V_{24}$ Connection	ON	
7	HART Loop 2 $0V_{24}$ Connection	ON	

5.2.2.3 RS485 Settings

Position of RS485 Termination Network Links shown on Left hand edge of Digital I/O Board 2

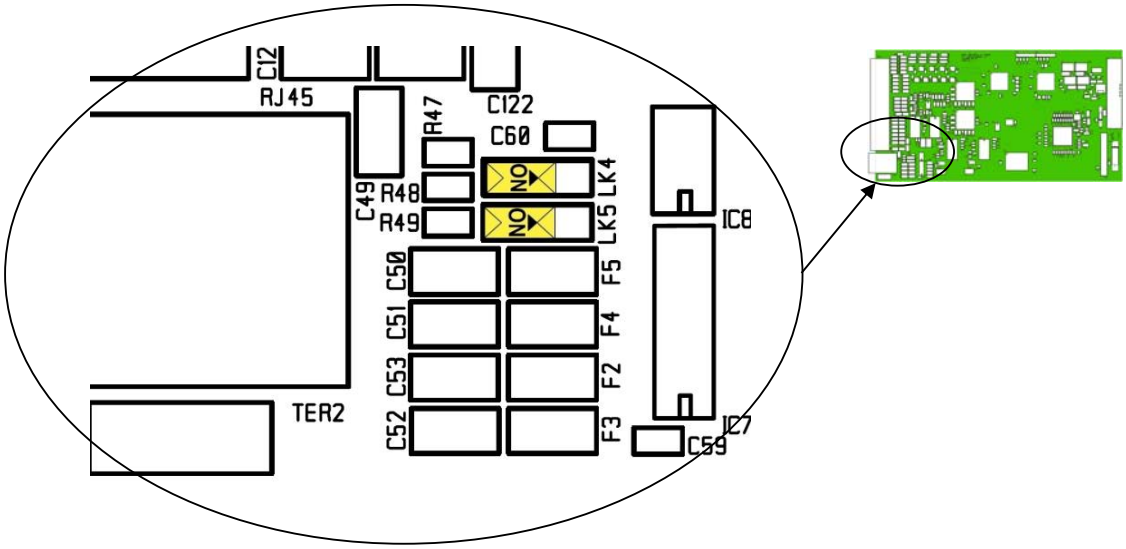


Figure 29 Digital I/O Board 2 RS485 Termination Link Setting

Link No.	Function	Factory setting	Notes
4	RS485 Termination Network Connection	OFF	See Figure 23
5	RS485 Termination Network Connection	OFF	See Figure 23

5.2.3 Analogue Input/ Output Board Settings

5.2.3.1 Digital Input Settings

Position of Digital input Links shown on Top edge of Analogue I/O Board

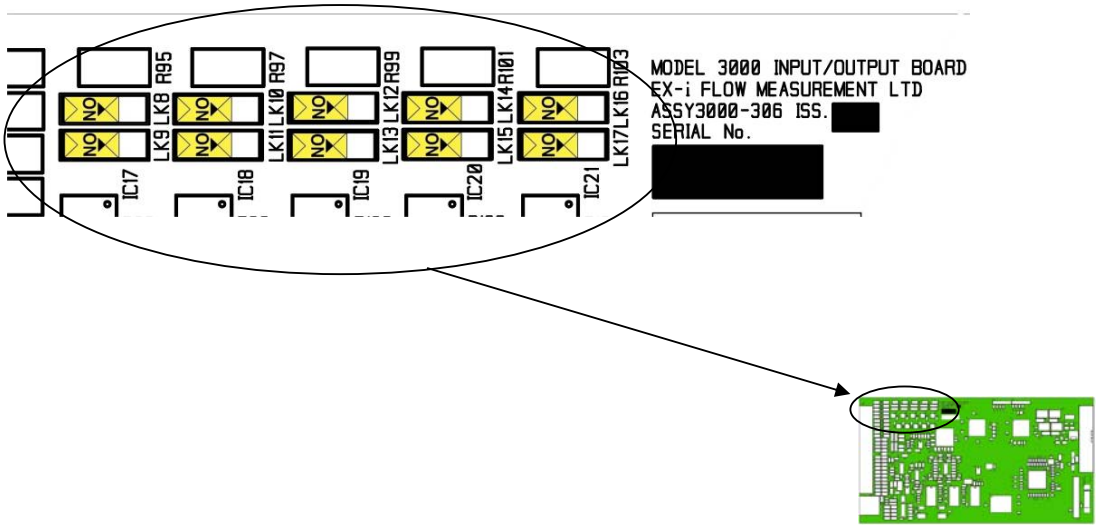


Figure 30 Analogue I/O Board Digital Input Link Settings

Link No.	Function	Factory setting	Notes
8	Digital Input 1 Resistor bypass	OFF	See Figure 20
9	Digital Input 1 $0V_{24}$ Connection	OFF	See Figure 20
10	Digital Input 2 Resistor bypass	OFF	See Figure 20
11	Digital Input 2 $0V_{24}$ Connection	OFF	See Figure 20
12	Digital Input 3 Resistor bypass	OFF	See Figure 20
13	Digital Input 3 $0V_{24}$ Connection	OFF	See Figure 20
14	Digital Input 4 Resistor bypass	OFF	See Figure 20
15	Digital Input 4 $0V_{24}$ Connection	OFF	See Figure 20
16	Digital Input 5 Resistor bypass	OFF	See Figure 20
17	Digital Input 5 $0V_{24}$ Connection	OFF	See Figure 20

5.2.3.2 HART Loop and I/O Function Settings

Position of HART Loop and I/O function Links shown on Left hand edge of the Analogue I/O Board

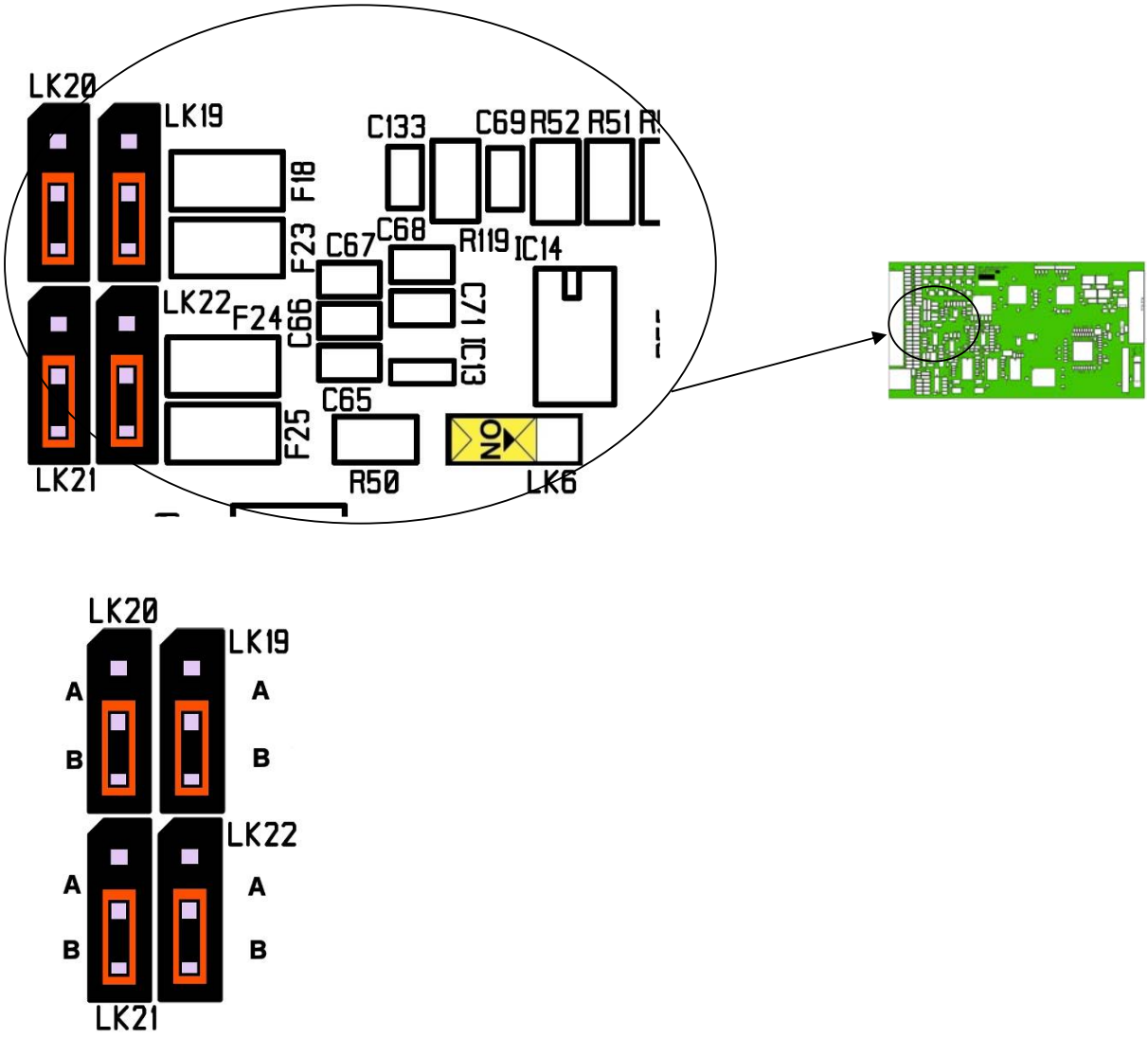


Figure 31 Analogue I/O board HART Loop and I/O Function Link Settings

Link No.	Function		Factory setting	Notes
6	HART Loop 1 $0V_{24}$ Connection		ON	
19	Digital Output 4 Position A Fit	Analogue Input 4 Position B Fit	B	
20	Digital Output 4 Position A Fit	Analogue Input 4 Position B Fit	B	
21	Digital Output 5 Position A Fit	Analogue Output 3 Position B Fit	B	
22	Digital Output 5 Position A Fit	Analogue Output 3 Position B Fit	B	

5.2.3.3 RS485 Settings

Position of RS485 Termination Network Links shown on Left hand edge of Analogue I/O Board

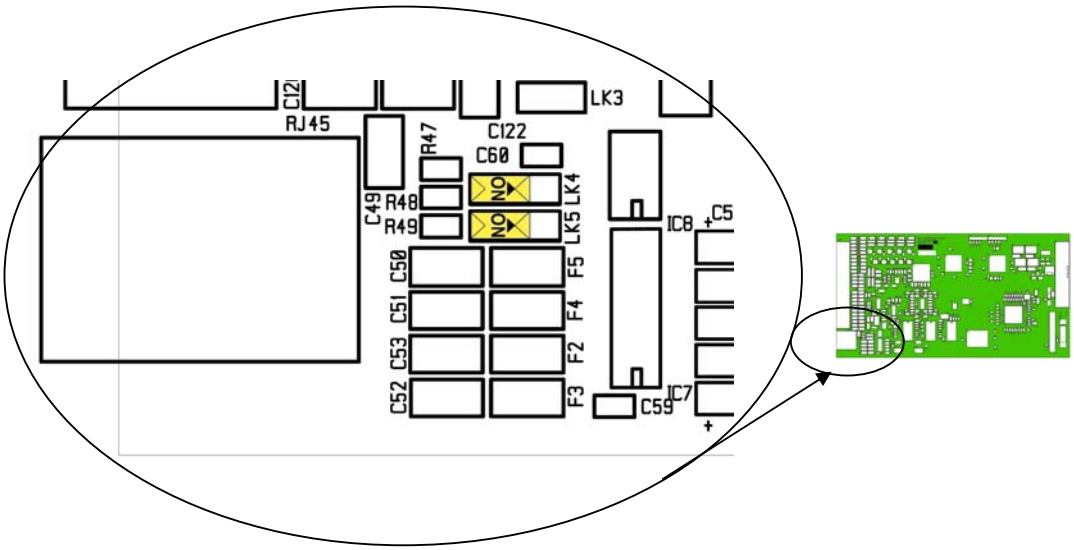


Figure 32 Analogue I/O Board RS485 Termination Link Setting

Link No.	Function	Factory setting	Notes
4	RS485 Termination Network Connection	OFF	See Figure 23
5	RS485 Termination Network Connection	OFF	See Figure 23

5.2.4 Switch Input/ Output Board Settings

The following sections contain details of the User controls and settings for the Switch Input Output Board.

5.2.4.1 Digital Input Settings

Position of Digital input Links shown on Top edge of Switch I/O Board

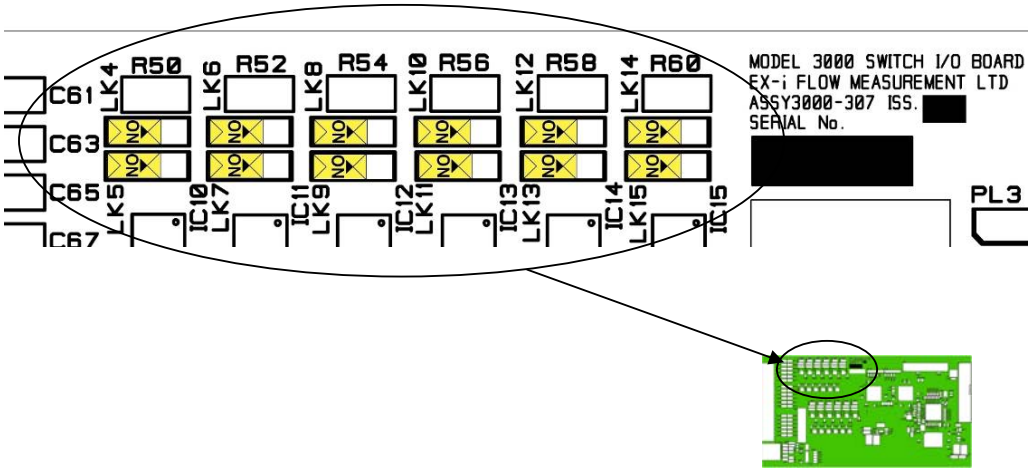


Figure 33 Switch I/O Board Digital Input Link Setting

Link No.	Function	Factory setting	Notes
4	Digital Input 1 Resistor bypass	OFF	See Figure 20
5	Digital Input 1 $0V_{24}$ Connection	OFF	See Figure 20
6	Digital Input 2 Resistor bypass	OFF	See Figure 20
7	Digital Input 2 $0V_{24}$ Connection	OFF	See Figure 20
8	Digital Input 3 Resistor bypass	OFF	See Figure 20
9	Digital Input 3 $0V_{24}$ Connection	OFF	See Figure 20
10	Digital Input 4 Resistor bypass	OFF	See Figure 20
11	Digital Input 4 $0V_{24}$ Connection	OFF	See Figure 20
12	Digital Input 5 Resistor bypass	OFF	See Figure 20
13	Digital Input 5 $0V_{24}$ Connection	OFF	See Figure 20
14	Digital Input 6 Resistor bypass	OFF	See Figure 20
15	Digital Input 6 $0V_{24}$ Connection	OFF	See Figure 20

5.2.4.2 Digital Input / Outputs (When set as Inputs) Settings

Position of Digital input Links shown in the centre of Switch I/O Board

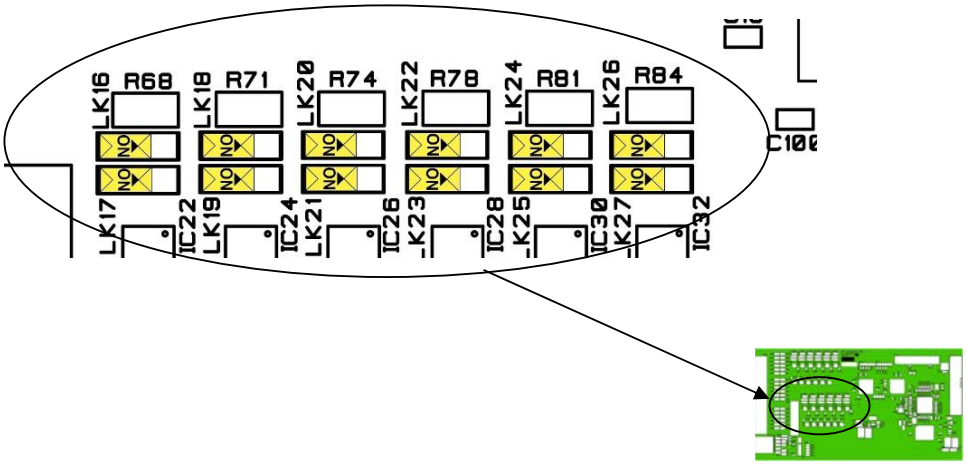


Figure 34 Switch I/O Board Digital Input Link Setting

Link No.	Function	Factory setting	Notes
16	Digital I/O 1 Resistor bypass	OFF	See Figure 20
17	Digital I/O 1 $0V_{24}$ Connection	OFF	See Figure 20
18	Digital I/O 2 Resistor bypass	OFF	See Figure 20
19	Digital I/O 2 $0V_{24}$ Connection	OFF	See Figure 20
20	Digital I/O 3 Resistor bypass	OFF	See Figure 20
21	Digital I/O 3 $0V_{24}$ Connection	OFF	See Figure 20
22	Digital I/O 4 Resistor bypass	OFF	See Figure 20
23	Digital I/O 4 $0V_{24}$ Connection	OFF	See Figure 20
24	Digital I/O 5 Resistor bypass	OFF	See Figure 20
25	Digital I/O 5 $0V_{24}$ Connection	OFF	See Figure 20
26	Digital I/O 6 Resistor bypass	OFF	See Figure 20
27	Digital I/O 6 $0V_{24}$ Connection	OFF	See Figure 20

5.2.4.3 RS485 Settings

Position of RS485 Termination Network Links shown on the Left hand edge of the Switch I/O Board

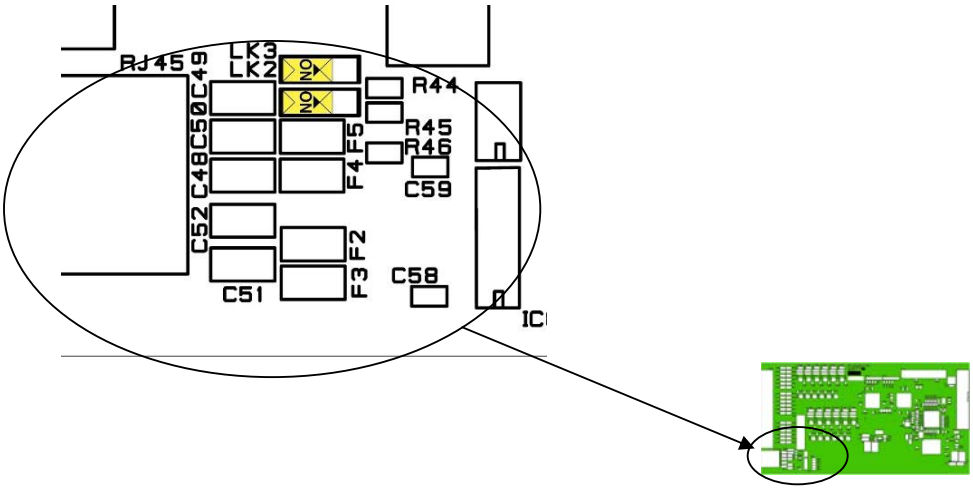


Figure 35 Switch I/O Board RS485 Termination Link Setting

Link No.	Function	Factory setting	Notes
3	RS485 Termination Network Connection	OFF	See Figure 23
2	RS485 Termination Network Connection	OFF	See Figure 23

5.2.4.4 Digital Input / Outputs Settings

Position of Digital Input / Output Links shown in the centre of the Switch I/O Board

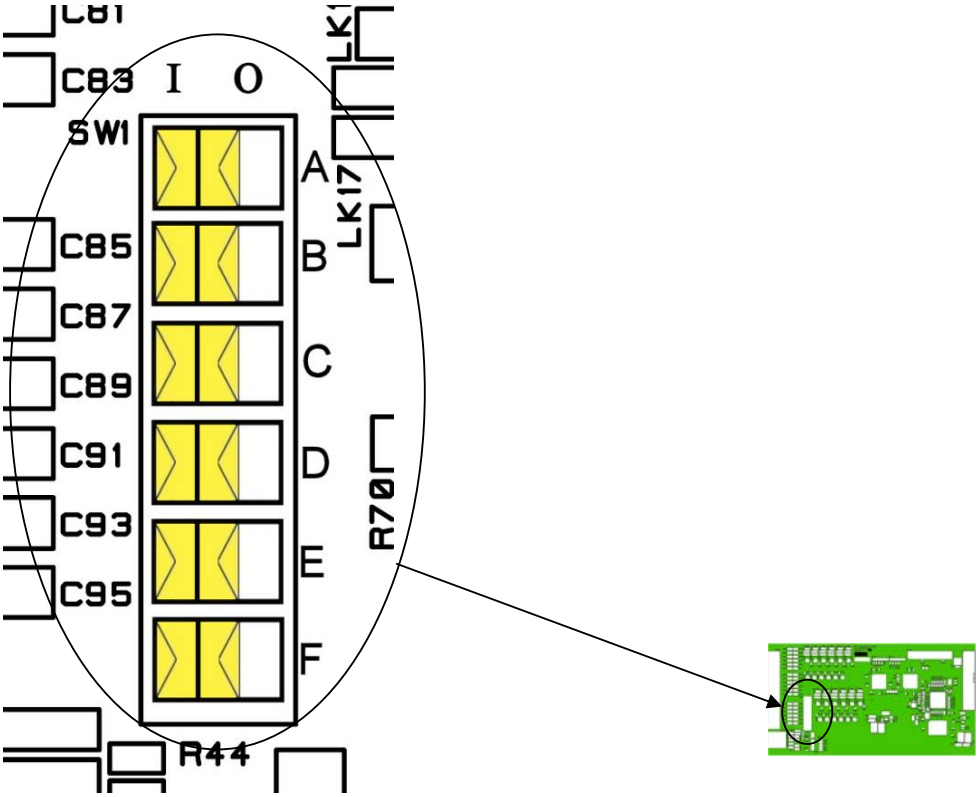


Figure 36 Switch I/O Board Digital Input / Output Link Setting

Link No.	Function		Factory setting	Notes
	I	O		
SW1-A	Digital I/O 1 Input	Digital I/O 1 Output	Input	
SW1-B	Digital I/O 2 Input	Digital I/O 2 Output	Input	
SW1-C	Digital I/O 3 Input	Digital I/O 3 Output	Input	
SW1-D	Digital I/O 4 Input	Digital I/O 4 Output	Input	
SW1-E	Digital I/O 5 Input	Digital I/O 5 Output	Input	
SW1-F	Digital I/O 6 Input	Digital I/O 6 Output	Input	

5.2.5 Communication Board Settings

Position of RS485 Termination Network Links shown on Left hand edge of Communication Board

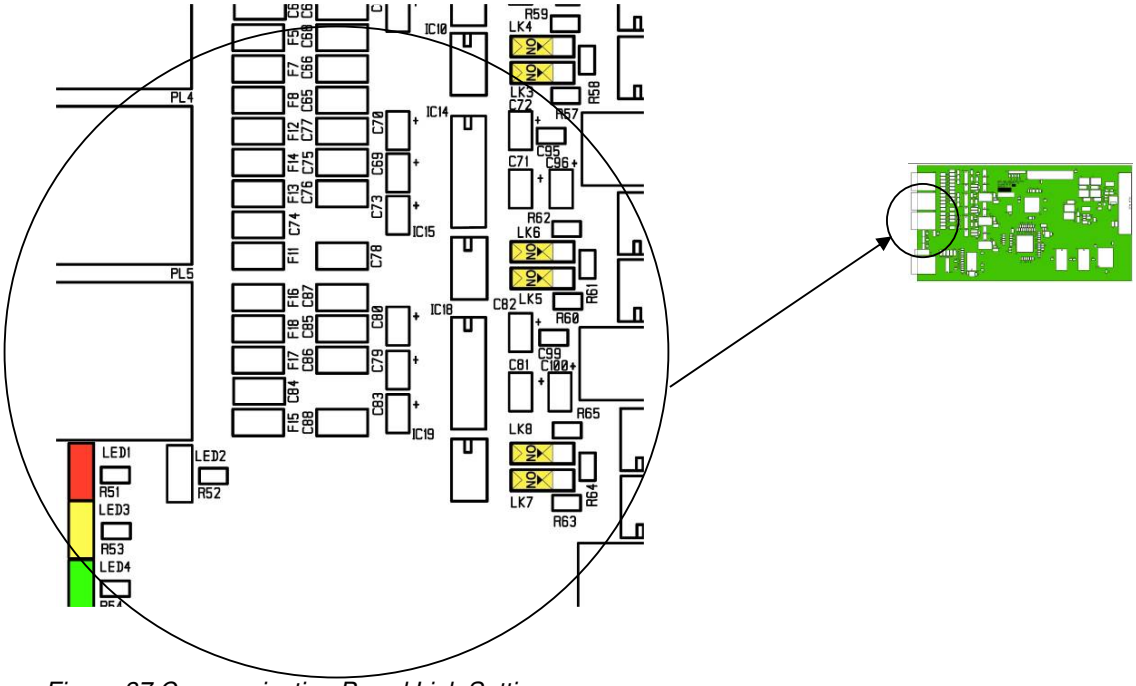


Figure 37 Communication Board Link Setting

Link No.	Function	Factory setting	Notes
3	RS485 Termination Network Connection Port 1	OFF	See Figure 23
4	RS485 Termination Network Connection Port 1	OFF	See Figure 23
5	RS485 Termination Network Connection Port 2	OFF	See Figure 23
6	RS485 Termination Network Connection Port 2	OFF	See Figure 23
7	RS485 Termination Network Connection Port 3	OFF	See Figure 23
8	RS485 Termination Network Connection Port 3	OFF	See Figure 23

LED No.	Function	Notes
1	RED Network Collision	Normally OFF
2	Not Fitted No function	
3	YELLOW 100M Network	Normally ON for 100M
4	GREEN Network Activity	Normally Flash

5.2.6 Dual Ethernet Communication Board Settings

Position of RS485 Termination Network Links shown on Left hand edge of Communication Board

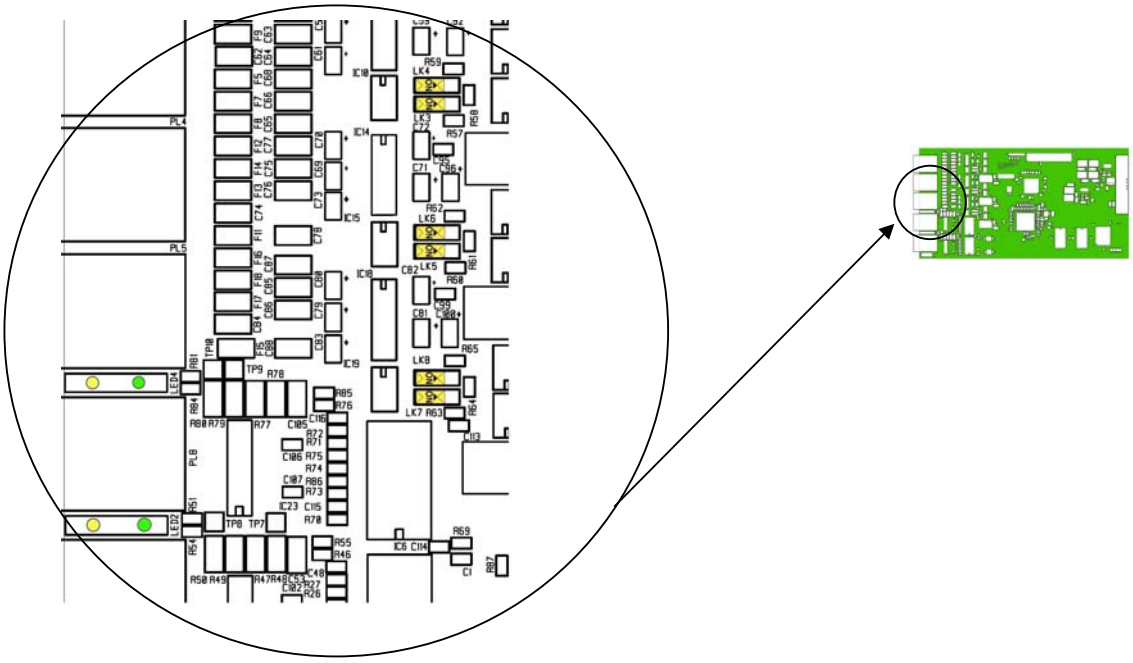


Figure 38 Dual Ethernet Communication Board Link Setting

Link No.	Function	Factory setting	Notes
3	RS485 Termination Network Connection Port 1	OFF	See Figure 23
4	RS485 Termination Network Connection Port 1	OFF	See Figure 23
5	RS485 Termination Network Connection Port 2	OFF	See Figure 23
6	RS485 Termination Network Connection Port 2	OFF	See Figure 23
7	RS485 Termination Network Connection Port 3	OFF	See Figure 23
8	RS485 Termination Network Connection Port 3	OFF	See Figure 23

LED No.	Function	Notes
4	YELLOW 100M Network Ethernet Port 1	Normally ON for 100M
4	GREEN Network Activity Ethernet Port 1	Normally Flash
2	YELLOW 100M Network Ethernet Port 2	Normally ON for 100M
2	GREEN Network Activity Ethernet Port 2	Normally Flash

5.2.7 Auxiliary Board Settings

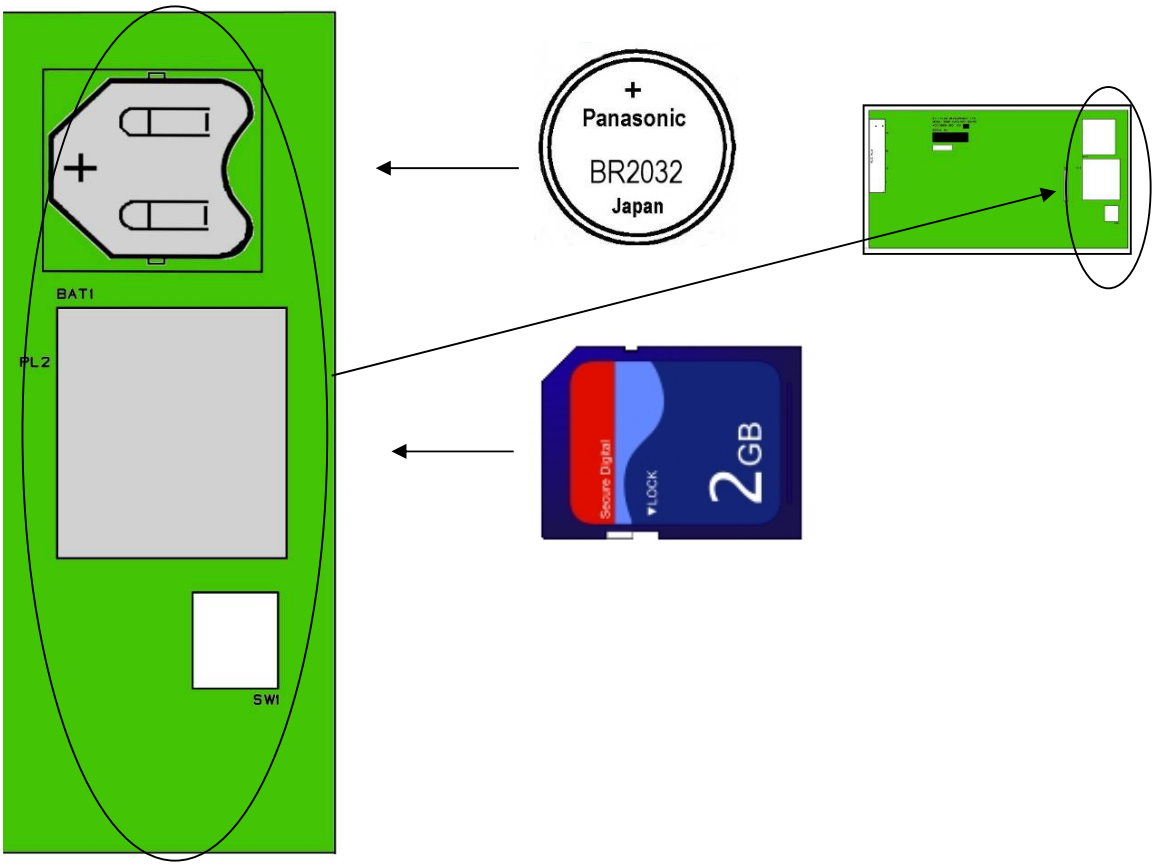


Figure 39 Auxiliary Board Components

Figure 39 shows the position of the Auxiliary Board user replaceable parts:

Time and date & Memory Replaceable Battery refer to paragraphs 4.1.3 and 4.1.4

Optional SD memory card

5.2.8 PSU Board Settings

Details of position of PSU Board Fuses

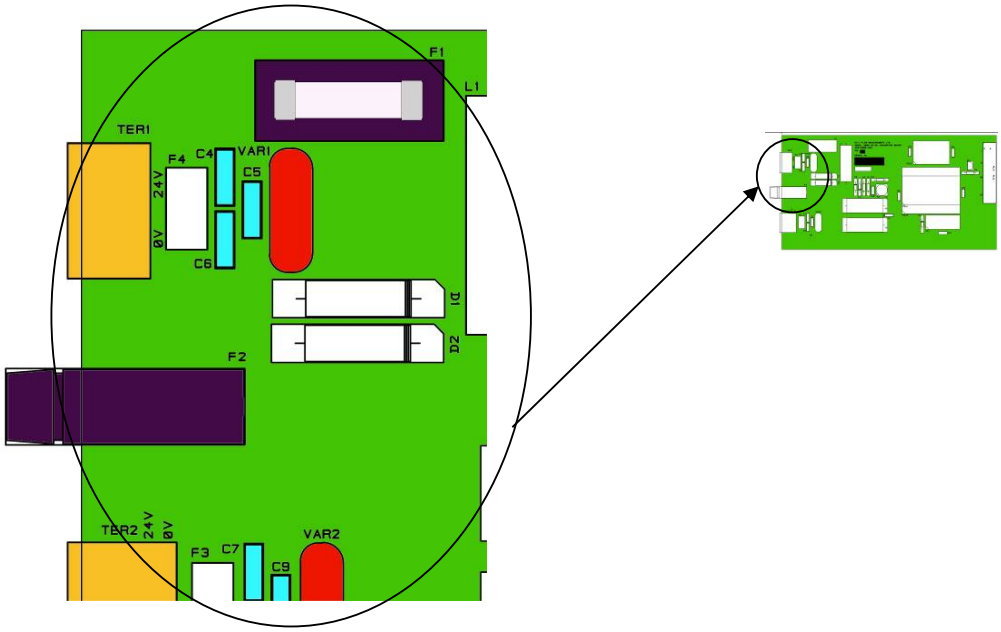


Figure 40 PSU Board Components

Fuse No.	Function	Fuse Type	Notes
1	Unit Main Fuse	Refer para 4.1.2	
2	External +24V Fuse (User equipment)	Refer para 4.1.1	

5.2.9 Rear Panel

Removal of the Rear Panel
To remove the rear panel, remove all cables and plug in connectors from the sockets on the rear of the SFC3000.
Undo the 4 cross screws as indicated in Figure 41 below.
Carefully pull the rear panel away from the chassis.
Re-fitting is the reverse of this procedure.
When refitting care should be taken to ensure that all terminals, switches and connectors protrude through the rear panel and are not trapped behind it before tightening the fixing screws.

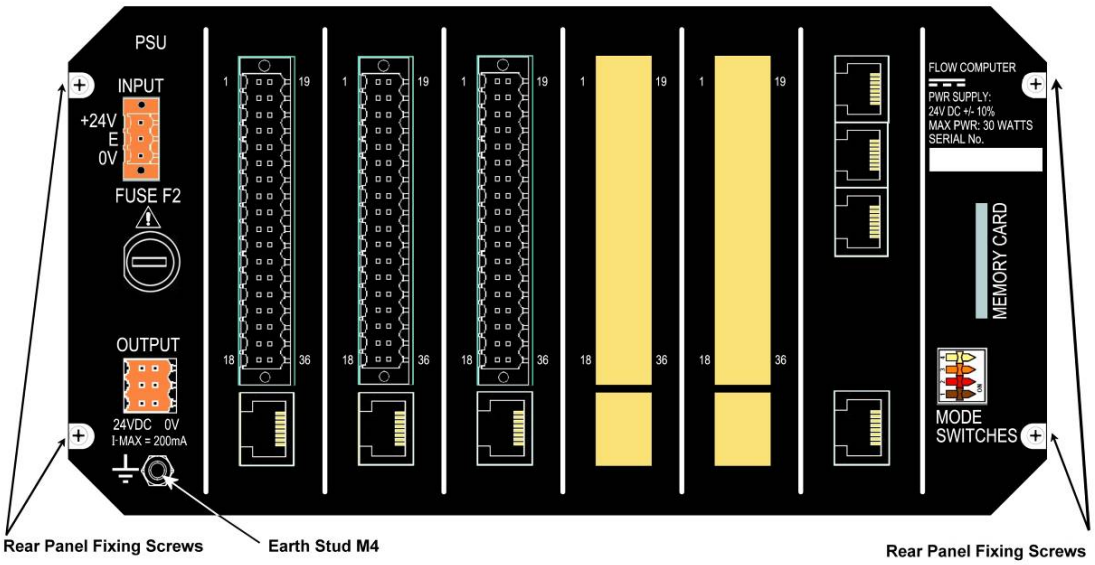


Figure 41 Rear Panel View

6.0 Technical Data

6.1 General

Environmental	Intended for Indoor use only	Optional IP20
	Maximum Altitude	2000 meters
	Operating Temperature	0 to 50 °C
	Storage Temperature	-25 to 70 °C
	Maximum Relative Humidity	80% non-condensing
	Pollution Degree	2
Dimensions	Height	130 mm
	Width	210 mm
	Depth	240 mm
Weight	All slots occupied	2.5 kg
	1 I/P Board and 1 comms Board	2.0 kg
Packed Weight	All slots occupied	3.1 kg
	1 I/P Board and 1 comms Board	2.6 kg
Packaging	Type	Cardboard, Foam Internal
	Dimensions	340 × 330 × 230 mm
External Connections	Input /Output Type	Mating part Weidemuller 36 Way Part No. 1748640000 Tension Clamp type Suitable Wire Size 0.2 – 1.0 mm^2
	Serial Communication RS232/RS485	RJ45 8C8P
	Network	RJ45 8C8P
	Power Input	Mating part Weidemuller 3 Way Part No. 1606650000 Screw Terminal type Suitable Wire Size 0.2 – 1.5 mm^2
	Power Output	Mating part Weidemuller 6 Way Part No. 1727560000 Tension Clamp type Suitable Wire Size 0.2 – 1.0 mm^2
	Front Panel USB	Standard B USB connector
Internal Battery	Type	BR/CR 2032 Refer paragraph 4.1.3
	Voltage	Nominal 3V
	Capacity	200/220mAh
Memory Card	Type Standard SD	Standard SD
	Capacity	Up to 2 G Byte

6.2 Inputs

Pulse	Type	Isolated Opto coupler Input
	Frequency Range	DC to 5KHz
	Maximum Input Current	25mA
	Maximum Input Voltage	+24V DC
	LK8, 10, 12 OFF	
	Maximum Input Voltage	+1.2V
	LK8, 10, 12 ON	
Switch	Type	Isolated Opto coupler Input
	Minimum closure time	1 second
	Maximum Input Current	25mA
	Maximum Input Voltage	+24V DC
	LK14, 16 OFF	
	Maximum Input Voltage	+1.2V
	LK14, 16 ON	
Analogue	Type	Current Input
	Input range	4 to 20 mA
	Input resistance	100 Ω
Analogue	Type	4 wire Direct PRT
	Nominal Input Range	-20 C to +100 °C
	PRT type	100 Ω @ 0 °C
	Energising current	1mA
Analogue	Type	HART current Loop
	Maximum No. transmitters/ loop	3
	Maximum Loop Current	12mA
	Input Resistance	510 Ω

6.3 Outputs

Pulse	Type	Open collector Darlington Transistor
	Maximum applied Voltage	+30V dc
	Maximum Load current	20mA dc
	Maximum Power in output Transistor	100mW
	Frequency Ranges	50, 25, 10, 5, 2 Hz at 50% Duty Cycle
	Output Invert	On or Off
Prover corrected Bus	Pulse Output 1 Only	Digital and Analogue IO Board Only
Switch	Type	Open collector Darlington Transistor
	Maximum applied Voltage	+30V dc
	Maximum Load current	20mA dc
	Maximum Power in output Transistor	100mW
	Output Invert	On or Off
Analogue	Type	Current source loop
	Current ranges	4 to 20 mA or 0-20mA
	Maximum Loop Resistance	750Ω
	Maximum Output current	26mA

6.4 Communication

I/O Board Communication

Serial Communication	Physical Layer	RS232 or RS485
	Max Baud Rate	38400 Baud
	Handshake	None
	Isolation	None

Comms and Network Board

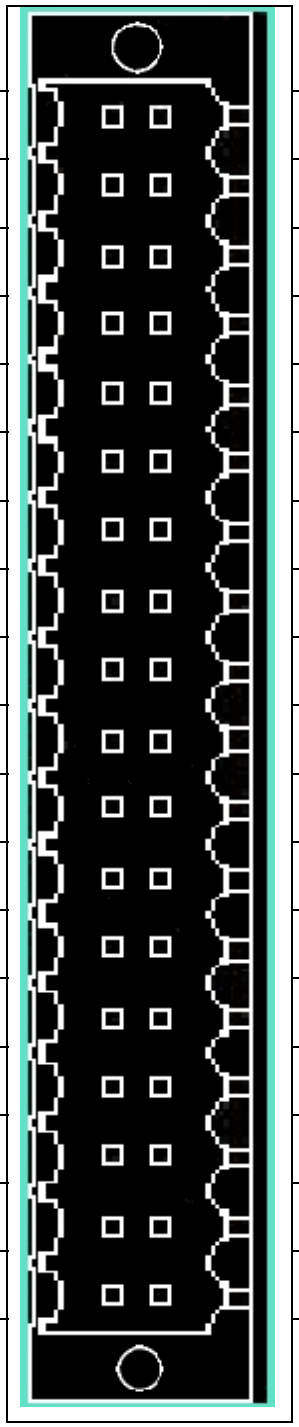
Serial Communication	Physical Layer	RS232 or RS485
	Max Baud Rate	38400 baud
	Handshake	RTS/CTS on Port PL3 None on Port PL4 or PL5
	Isolation	Galvanically isolated
Network communication	Ethernet	IEEE 802.3
	Speed	10/100

6.5 Power Supply

Power Input	Voltage Range	+24VDC +/- 10%
	Power Consumption	
Power Consumption	All slots occupied	30W at Input voltage +24V nominal
	1 I/P Board and 1 comms Board	8.5W
Fuse	F1 Internal	3.15A 20mm Refer paragraph 4.1.2
	F2 External Rear Panel	1.6A 20mm Refer paragraph 4.1.1
Power Output	Rear Aux Connector	+24V DC nominal at I max = 200mA

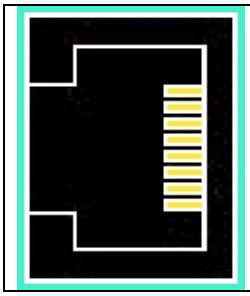
Appendix 1TERMINAL CONNECTIONS

Digital I/O Board Terminal Connections



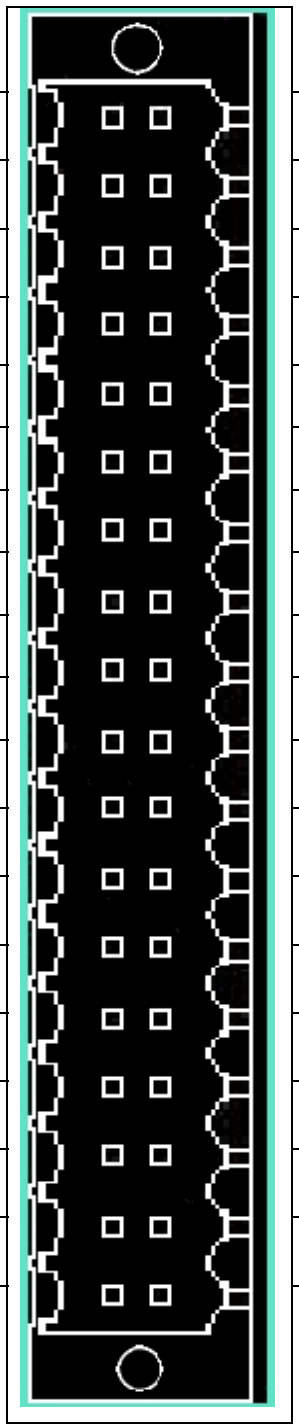
1	D I/P 1 +	D I/P 1 -	19
2	D I/P 2 +	D I/P 2 -	20
3	D I/P 3 +	D I/P 3 -	21
4	D I/P 4 +	D I/P 4 -	22
5	D I/P 5 +	D I/P 5 -	23
6	D O/P 1 +	D O/P 1 -	24
7	D O/P 2 +	D O/P 2 -	25
8	D O/P 3 +	D O/P 3 -	26
9	D O/P 4 +	D O/P 4 -	27
10	D O/P 5 +	D O/P 5 -	28
11	Not Used	Not Used	29
12	HART 1 +	HART 1 -	30
13	HART 2 +	HART 2 -	31
14	PRT C	PRT A	32
15	PRT B	PRT D	33
16	AN O/P 1 +	AN O/P 1 -	34
17	AN O/P 2 +	AN O/P 2 -	35
18	Not Used	Not Used	36

Digital I/O Board Comms Connector pins



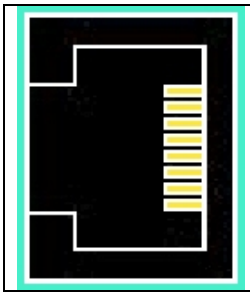
	RS 232 / RS 485	Direction
1	RS 485 A	
2	RS 485 B	
3	0V	
4	0V	
5	RS 232 Rx	3000 ◄ Source
6	RS 232 Tx	3000 ► Source
7	Not Used	
8	Not Used	

Digital I/O Board 2 Terminal Connections



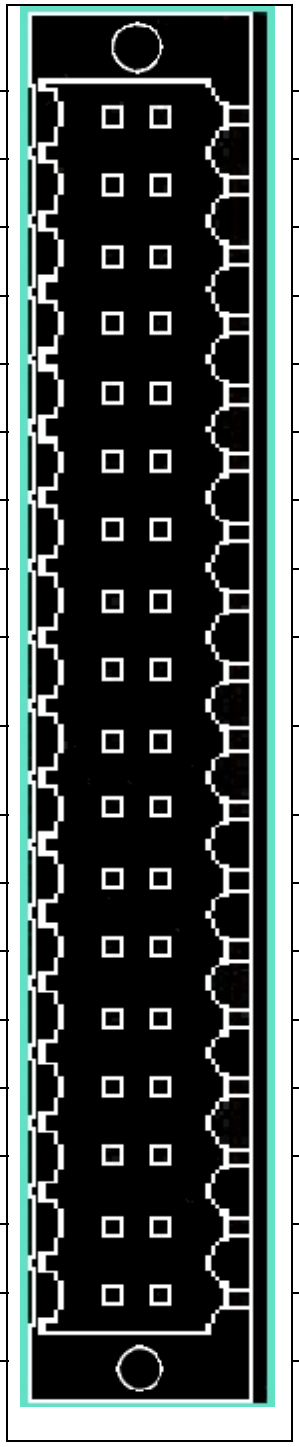
1	D I/P 1 +	D I/P 1 -	19	
2	D I/P 2 +	D I/P 2 -	20	
3	D I/P 3 +	D I/P 3 -	21	
4	D I/P 4 +	D I/P 4 -	22	
5	D O/P 6 +	D O/P 6 -	23	Common negative connection all D O/P
6	D O/P 1 +	D O/P 1 -	24	Common negative connection all D O/P
7	D O/P 2 +	D O/P 2 -	25	Common negative connection all D O/P
8	D O/P 3 +	D O/P 3 -	26	Common negative connection all D O/P
9	D O/P 4 +	D O/P 4 -	27	Common negative connection all D O/P
10	D O/P 5 +	D O/P 5 -	28	Common negative connection all D O/P
11	Not Used	Not Used	29	
12	HART 1 +	HART 1 -	30	
13	HART 2 +	HART 2 -	31	
14	AN O/P 3 +	AN O/P 3 -	32	
15	AN O/P 4 +	AN O/P 4 -	33	
16	AN O/P 1 +	AN O/P 1 -	34	
17	AN O/P 2 +	AN O/P 2 -	35	
18	Not Used	Not Used	36	

Digital I/O Board 2 Comms Connector pins



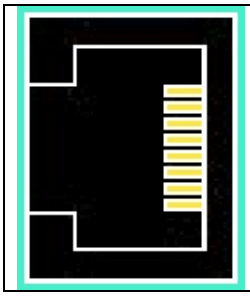
	RS 232 / RS 485	Direction
1	RS 485 A	
2	RS 485 B	
3	0V	
4	0V	
5	RS 232 Rx	3000 ◄ Source
6	RS 232 Tx	3000 ► Source
7	Not Used	
8	Not Used	

Analogue I/O Board Terminal Connections



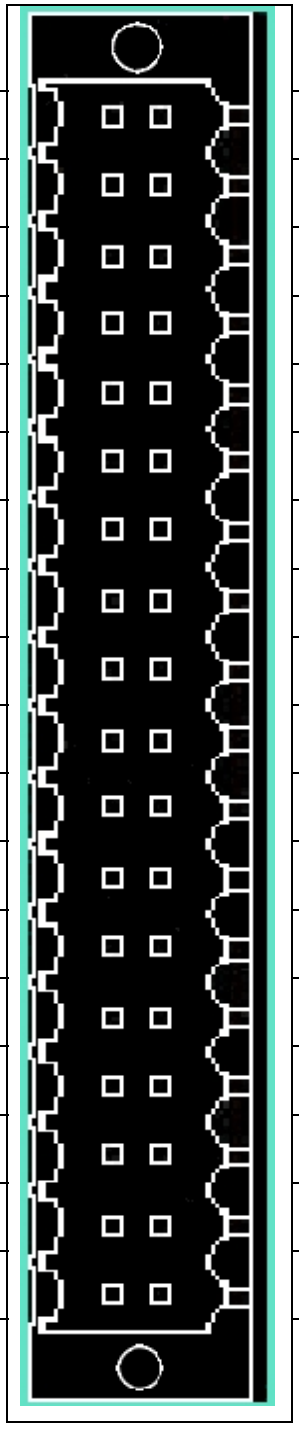
1	D I/P 1 +	D I/P 1 -	19	
2	D I/P 2 +	D I/P 2 -	20	
3	D I/P 3 +	D I/P 3 -	21	
4	D I/P 4 +	D I/P 4 -	22	
5	D I/P 5 +	D I/P 5 -	23	
6	D O/P 1 +	D O/P 1 -	24	
7	D O/P 2 +	D O/P 2 -	25	
8	D O/P 3 +	D O/P 3 -	26	
9	D O/P 4 + or A I/P 4 +	D O/P 4 – or A I/P 4 -	27	See 5.2.3.2 LK 19, 20
10	D O/P 5 + or AN O/P 3 +	D O/P 5 – or AN O/P 3 -	28	See 5.2.3.2 LK 21, 22
11	A I/P 2 +	A I/P 2 -	29	
12	HART 1 +	HART 1 -	30	
13	A I/P 1 +	A I/P 1 -	31	
14	PRT C	PRT A	32	
15	PRT B	PRT D	33	
16	AN O/P 1 +	AN O/P 1 -	34	
17	AN O/P 2 +	AN O/P 2 -	35	
18	A I/P 3 +	A I/P 3 -	36	

Analogue I/O Board Comms Connector pins

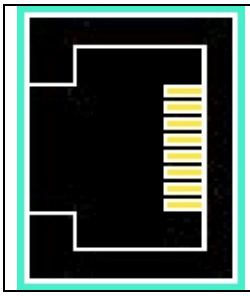


	RS 232 / RS 485	Direction
1	RS 485 A	
2	RS 485 B	
3	0V	
4	0V	
5	RS 232 Rx	3000 ◄ Source
6	RS 232 Tx	3000 ► Source
7	Not Used	
8	Not Used	

Switch I/O Board Terminal Connections

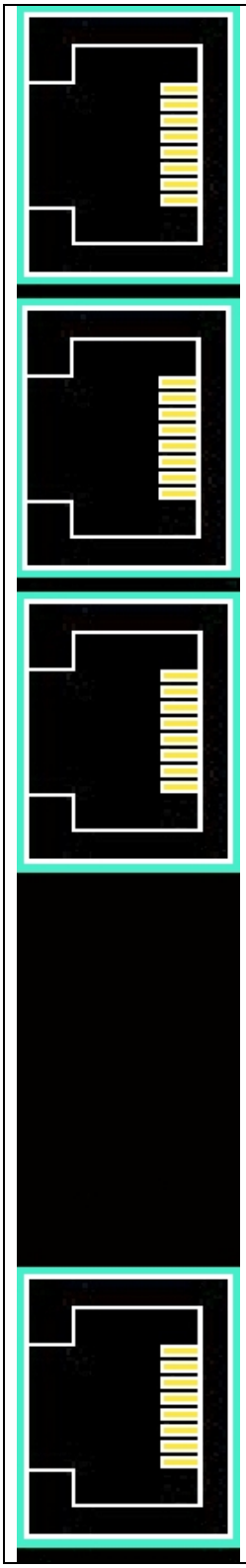
1	D I/P 1 +		D I/P 1 -	19
2	D I/P 2 +		D I/P 2 -	20
3	D I/P 3 +		D I/P 3 -	21
4	D I/P 4 +		D I/P 4 -	22
5	D I/P 5 +		D I/P 5 -	23
6	D I/P 6 +		D I/P 6 -	24
7	D O/P 1 +		D O/P 1 -	25
8	D O/P 2 +		D O/P 2 -	26
9	D O/P 3 +		D O/P 3 -	27
10	D O/P 4 +		D O/P 4 -	28
11	D O/P 5 +		D O/P 5 -	29
12	D O/P 6 +		D O/P 6 -	30
13	D I/O 1 +		D I/O 1 -	31
14	D I/O 2 +		D I/O 2 -	32
15	D I/O 3 +		D I/O 3 -	33
16	D I/O 4 +		D I/O 4 -	34
17	D I/O 5 +		D I/O 5 -	35
18	D I/O 6 +		D I/O 6 -	36

Switch I/O Board Comms Connector pins



	RS 232 / RS 485	Direction
1	RS 485 A	
2	RS 485 B	
3	0V	
4	0V	
5	RS 232 Rx	3000 ◄ Source
6	RS 232 Tx	3000 ► Source
7	Not Used	
8	Not Used	

Network communication card pin connections



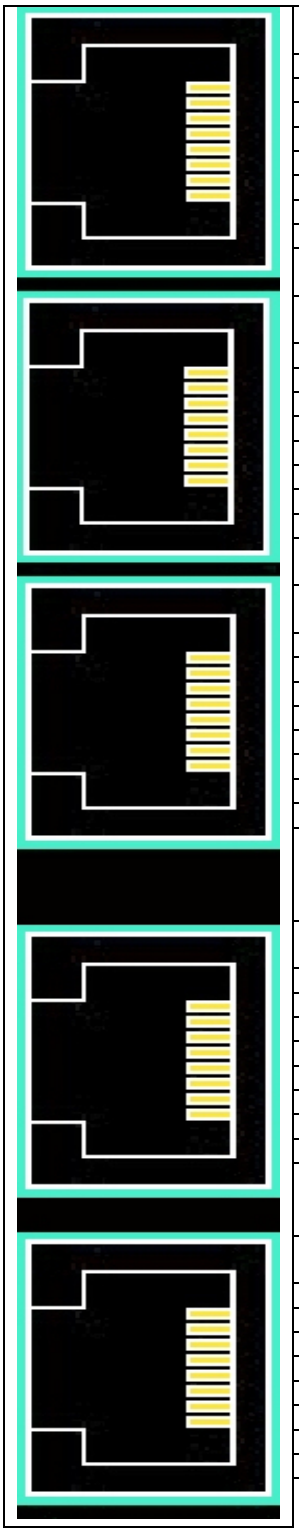
PL 3	RS 232 with handshaking / RS485	Direction
1	RS 485 A	
2	RS 485 B	
3	0V	
4	0V	
5	RS 232 Rx	3000 ◄ Source
6	RS 232 Tx	3000 ► Source
7	RS 232 /CTS	3000 ◄ Source
8	RS 232 /RTS	3000 ► Source

PL 4	RS 232 / RS485	Direction
1	RS 485 A	
2	RS 485 B	
3	0V	
4	0V	
5	RS 232 Rx	3000 ◄ Source
6	RS 232 Tx	3000 ► Source
7	Not Used	
8	Not Used	

PL 5	RS 232 / RS 485	Direction
1	RS 485 A	
2	RS 485 B	
3	0V	
4	0V	
5	RS 232 Rx	3000 ◄ Source
6	RS 232 Tx	3000 ► Source
7	Not Used	
8	Not Used	

PL2	Network 10 / 100	
1	Tx +	
2	Tx -	
3	Rx +	
4		
5		
6	Rx -	
7		
8		

Dual Ethernet Network communication card pin connections



PL 3	RS 232 with handshaking / RS485	Direction
1	RS 485 A	
2	RS 485 B	
3	0V	
4	0V	
5	RS 232 Rx	3000 ◄ Source
6	RS 232 Tx	3000 ► Source
7	RS 232 /CTS	3000 ◄ Source
8	RS 232 /RTS	3000 ► Source

PL 4	RS 232 / RS485	Direction
1	RS 485 A	
2	RS 485 B	
3	0V	
4	0V	
5	RS 232 Rx	3000 ◄ Source
6	RS 232 Tx	3000 ► Source
7	Not Used	
8	Not Used	

PL 5	RS 232 / RS 485	Direction
1	RS 485 A	
2	RS 485 B	
3	0V	
4	0V	
5	RS 232 Rx	3000 ◄ Source
6	RS 232 Tx	3000 ► Source
7	Not Used	
8	Not Used	

PL8	Network 10 / 100 Port 1	
1	Tx +	
2	Tx -	
3	Rx +	
4		
5		
6	Rx -	
7		
8		

PL2	Network 10 / 100 Port 2	
1	Tx +	
2	Tx -	
3	Rx +	
4		
5		
6	Rx -	
7		
8		

Power Supply Terminals

POWER SUPPLY INPUT CONNECTOR TER 1		
Terminal No.	FUNCTION	
1	+24V DC	+24V DC positive power supply Terminal
2	E	Earth connection terminal
3	0V	Power Supply 0V terminal

AUXILIARY POWER SUPPLY OUTPUT CONNECTOR TER 2		
Terminal No.	FUNCTION	
1	+24V DC	+24V DC Auxiliary output supply I max = 200mA
2	+24V DC	+24V DC Auxiliary output supply I max = 200mA
3	+24V DC	+24V DC Auxiliary output supply I max = 200mA
4	0V	0V Auxiliary output supply
5	0V	0V Auxiliary output supply
6	0V	0V Auxiliary output supply

CHASSIS EARTH SCREW TERMINAL		
		Earth Stud terminal M4