REFLEX/SCANFLEX

PROGRAMMABLE LEVEL CONTROLLER

INSTRUCTION MANUAL

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REFLEX/SCANFLEX

PROGRAMMABLE LEVEL CONTROL SYSTEM

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INTRODUCTION

The REFLEX/SCANFLEX Programmable Level Controller is capable of monitoring the level of liquids, powders and solids in vessels up to 50 metres deep, depending on the type of material they contain.

The instrument is programmed by the user, who can select either;

Single point monitoring (REFLEX mode) for one transducer or
Multipoint monitoring (SCANFLEX mode) for up to 10 transducers.

The REFLEX/SCANFLEX will operate with either short range transducer of the RXV15 family or long range transducer of the RXM19 family.

The principle of operation of the REFLEX/SCANFLEX system is to use ultrasonic pulses which are transmitted directly, or via a Multiplexor, to the transducer mounted at each measurement point. Echoes are reflected off the surface of the material being monitored, back to the transducer.

The time period between transmission and reception of the echo is directly proportional to the distance between the transducer and the surface being monitored. A microcontroller computes this time period for all echoes received and analyses them to determine which is the correct reflection from the material surface. It uses this data as the basis for giving control outputs and displays in usable engineering units.

REFLEX/SCANFLEX is capable of the following functions:

Level Measurement
Volume Measurement
Distance Measurement

When used as a REFLEX single point instrument the controller is connected directly to the transducer.

When used as a SCANFLEX in its multipoint mode the controller is connected to the transducers via a Multiplexor. Additionally, relay and analogue output modules can be added to the system and individually programmed for each point.

INSTALLATION

REFLEX - AS A SINGLE POINT INSTRUMENT

Transceiver Mounting

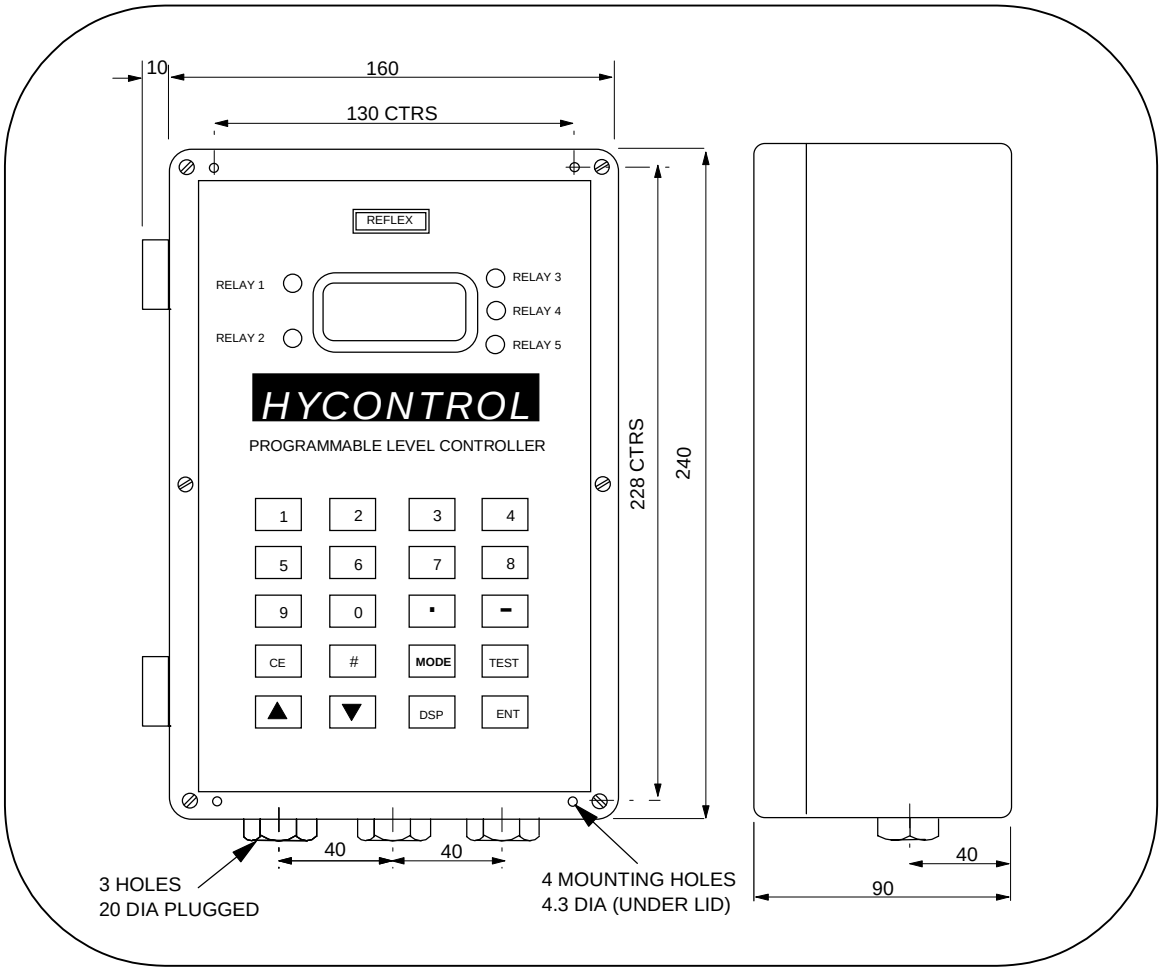
Undo the 6 quarter turn screws on the front panel and open the hinged door to expose the mounting holes.

Mount the unit on a flat surface and secure it via the 4 mounting holes moulded in the enclosure. DO NOT use excessive force when tightening the fixings and avoid any distortion of the enclosure.

Ensure that the mounting surface is not subject to vibration and is not in close proximity to high voltage cables, contactors or drive controls. The unit should not be mounted in a confined space where temperatures may exceed the normal working temperature. If the unit is mounted outside it must be protected from direct sunlight or severe weather conditions.

Remove the required number of hexagon blanking plugs from the bottom of the enclosure and replace them with appropriate conduit hubs or cable glands to maintain the I.P. rating.

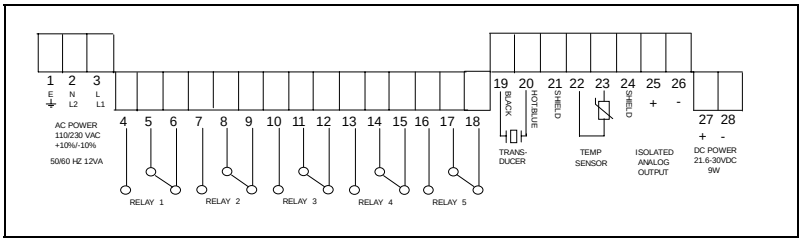
Figure 1:



Electrical Connections - Single Point Applications

The instrument has two-part screw terminals. It can be powered from either an AC or DC supply.

Figure 2:



AC power supply - connected:- Earth to terminal 1
Neutral to terminal 2
Live to terminal 3

The instrument will automatically accept either 110V or 230V AC ±10%, 50Hz or 60Hz, 12VA. A time lag fuse T160mA is fitted.

DC power supply - connected :- Positive +ve to terminal 27
Negative -ve to terminal 28

The instrument will accept 24V DC + 25%, - 10%. 9W.
A time lag fuse T315mA is fitted.

5 SPDT Relays - rated 8A/250V AC/30V DC resistive, with gold plated contacts for lower power switching, are connected to terminals 4 to 18, for controlling external alarms, contactors, pumps etc..

Transducer RXV15 Series - is connected:- Black to terminal 19
See Page 50 Blue to terminal 20
Screen to terminal 21

Transducer RXT15 Series - is connected:- Screen to terminal 19
See Page 50 Blue to terminal 20
Black to terminal 22

Transducer RXM19 - is connected:- Core to terminal 20
See Page 51 Screen to terminal 19

Transducer RXM19ER - is connected:- Core to terminal 20
See Page 52 Screen to terminal 19

Analogue Output - is connected :- Screen to terminal 24
(Isolated on AC units only) Positive +ve to terminal 25
Negative -ve to terminal 26.

Separate Temperature Sensor - connected with a shielded twisted pair and connected:-

(Screen to terminal 21
Must enable Pr.37 (Core* to terminal 22* Polarity of cores is
(Core* to terminal 23 unimportant

Communications RS485 & RS232 - Contact Hycontrol for separate document.

INSTALLATION

REFLEX - AS A MULTIPOINT INSTRUMENT

System Configuration

The REFLEX controller can be used as the heart of a SCANFLEX System which will monitor and control the level in 2 to 10 separate vessels. The transducer for each vessel is connected to the controller via a 10 point Multiplexor SM-10. A full description of the Multiplexor and PCB layout is shown on Page 58 to 61.

The Controller will output an analogue signal proportional to level or distance for each point as it is scanned, but if a continuous mA signal is required for each point then an Analogue Output Module SA-10, must be connected. A full description of the Analogue Output Card and PCB layout is shown on Page 65 to 67

When used in the multipoint Scanflex mode the 5 relays in the Controller are pre-assigned as Group Alarms and show the following:-

Relay 1 Indicates that Relay 1, on one of the points being monitored, has operated.
Relay 2 Indicates that Relay 2, on one of the points being monitored, has operated.
Relay 3 Indicates a loss of echo on one of the transducers.
Relay 4 Indicates that there is a fault in the communications with a module.
Relay 5 Indicates that the instrument is in Programme Mode.

To provide two separate alarm or control relays for each point a Relay Module SR-10 must be connected.

A second Relay Module can be added, to provide 2 more alarms or relays for each point. A full description of the Relay Module and PCB layout is shown on Pages 62 to 64.

Scanflex Configuration General

The modular approach to the design of the SCANFLEX system allows a choice of different system configurations to be built. The individual modules required to build each system can be mounted remote from each other. The controller is linked to the Multiplexor with RG62AU cable and communication between the Controller and all modules is via a single RS485 cable. Suitable cables include Belden 8451, Alpha 2461 or equivalents.

A little care in the selection of the location for the individual modules can considerably reduce the cost of cabling.

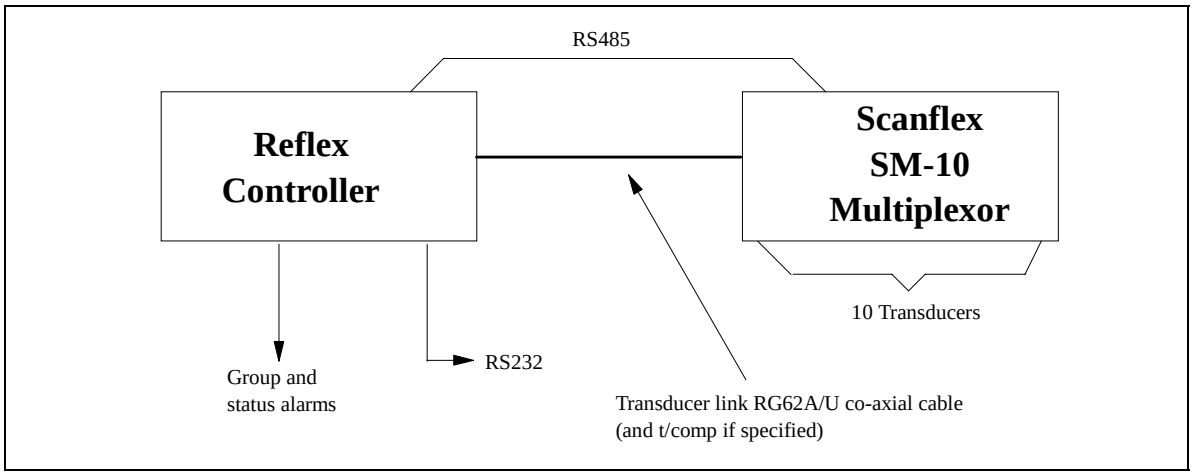
i.e. The Multiplexor Module should be close to the transducer.
The Analogue Module should be close to where the outputs are required.
The Relay Module should be close to the alarms or controls it operates.

The maximum distance between the Controller, through the Multiplexor, to each individual transducer, should not exceed 300m.

The Relay and Analogue Modules can be up to 2000m from the Controller, or greater if repeater modules are used on the RS485 communications.

Below are detailed a number of typical configurations:-

Configuration 1 - Minimum System



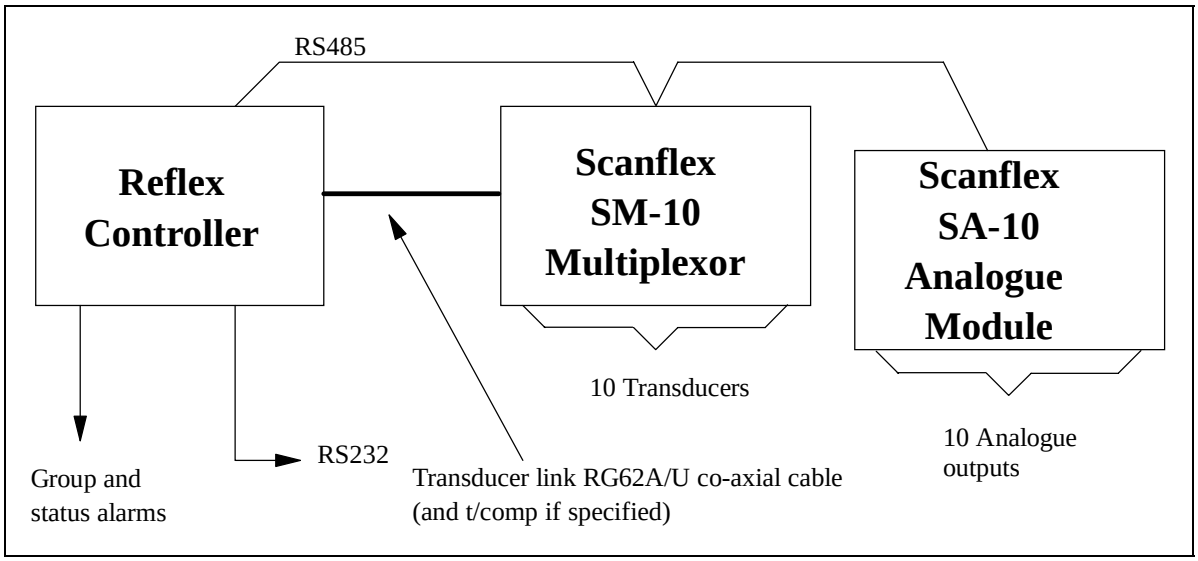
Minimum system to provide:-

A display of measurement for up to 10 points and 5 group alarms which are designated as shown on Page 4.

An analogue output is available from the controller but it varies as the instrument scans each point.

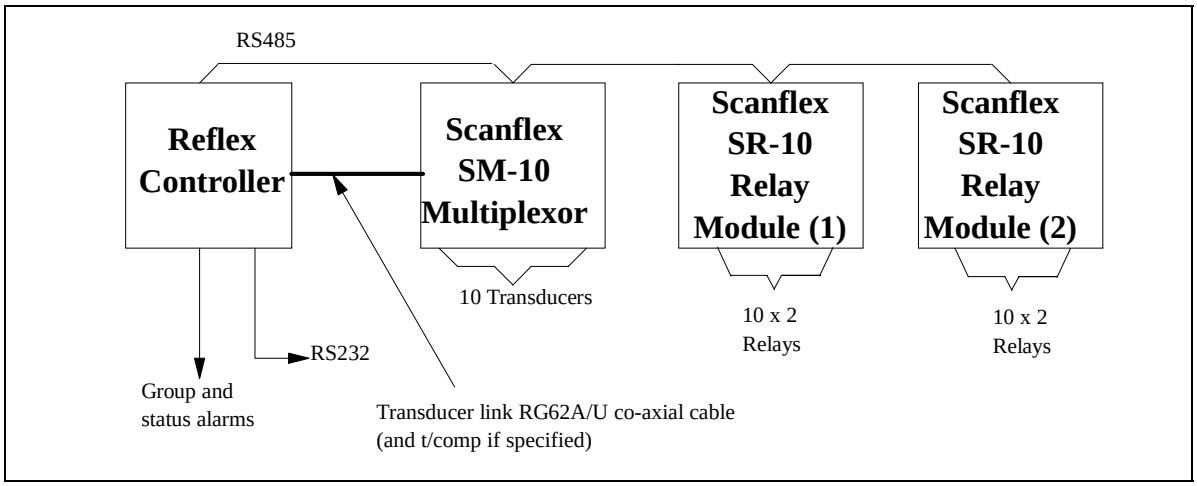
The RS232 output enables a local computer or PLC to obtain data from all measurement points.

Configuration 2 - With Analogue Output - Module SA-10



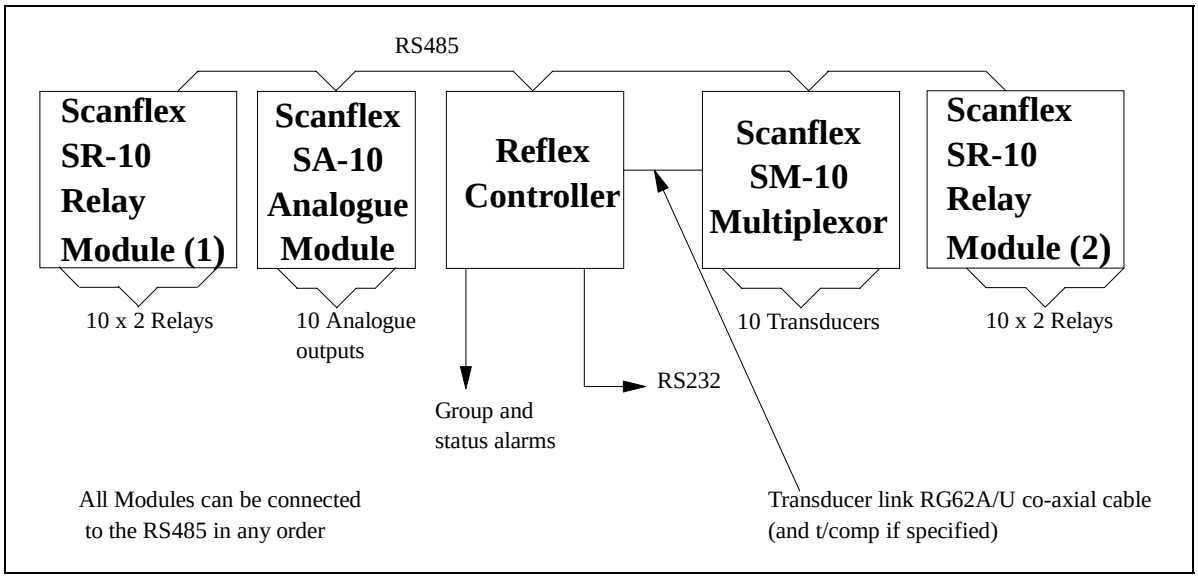
In addition to the functions provided by Configuration 1, the analogue module provides a continuous analogue output for each measurement point.

Configuration 3 - With 2 or 4 Relays Per Point - Module SR-10



In addition to the functionality of Configuration 1 the Relay Module provides two alarm relays for each measurement point. A second Relay Module can be added to either increase the number of relays per point to 4 or duplicate the relay settings of the first (SR-10) module. Dependent on how LK4 or LK5 are set. (See Pages 62 and 63 for details).

Configuration 4 - With both Analogue and Relay Outputs



Configuration 4 shows maximum outputs available per point i.e. 1 analogue and 4 relays.

This configuration provides all the discrete outputs that can be programmed for each measurement point. Two Relay Modules provide 4 independently programmable relay switch points for each transducer.

If required additional Analogue and/or Relay Modules can be added to duplicate the same signals in different locations or control rooms. Up to 14 Modules can be connected, although the total system configuration **must not exceed 15 modules** including the one Multiplexor.

INSTRUMENT MOUNTING

To install the REFLEX/SCANFLEX Controller and the associated Scanflex SM-10 Multiplexor, SA-10 Analogue Module, and SR-10 Relay Module, if required, follow the guidelines below.

Reflex/Scanflex Controller See Fig. 1

To install this follow the instructions for mounting the Reflex transceiver as shown on Page 2.

Modules SM-10, SA-10 and SR-10

These are all supplied in identical enclosures as shown on Page 59. Before mounting them drill the enclosure and fit appropriate conduit hubs or cable glands.

Undo the 6 quarter turn screws on the front panel and remove it to expose the mounting holes.

Mount the unit on a flat surface and secure it via the 4 mounting holes moulded in the enclosure. DO NOT use excessive force when tightening the fixings and avoid any distortion of the enclosure.

Ensure that the mounting surface is not subject to vibration and is not in close proximity to high voltage cables, contactors or drive controls. The unit should not be mounted in a confined space where temperatures may exceed the normal working temperature. If the unit is mounted outside it must be protected from direct sunlight or severe weather conditions.

Scanflex Multiplexor SM-10

One of these modules must be fitted in all multipoint systems.

For economy of cabling put the Multiplexor as near the transducers as possible.

See Page 9 for ELECTRICAL CONNECTIONS.

Scanflex Analogue Module SA-10

This is an optional requirement.

The Analogue Module should be located close to where the analogue outputs are to be used or displayed in order to reduce the wiring to a minimum.

See Page 10 for ELECTRICAL CONNECTIONS.

Scanflex Relay Module SR-10

This is an optional requirement.

The Relay Module should be located close to where the controls or alarms are located. If relays are required to activate both controls and alarms, but they are located in different areas, then a Relay Module should be mounted separately in each location as this will significantly simplify and reduce cabling costs.

See Page 10 for ELECTRICAL CONNECTIONS.

Electrical Connections - MultiPoint System

Controller - Electrical Connections

The Reflex Controller is common to all systems. It has two-part screw terminals. It can be powered from either an AC or DC supply, but the Multiplexor, Analogue and Relay Modules must be powered from 110/230V AC.

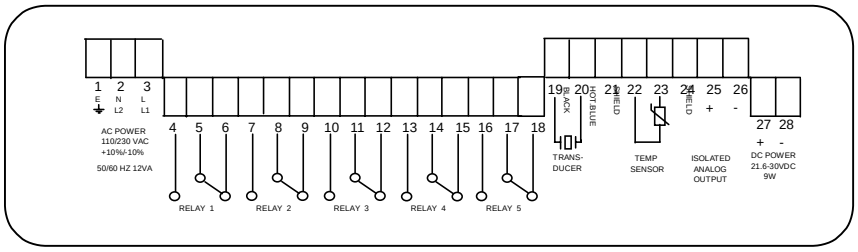


Fig 3.Terminal Layout - Bottom PCB

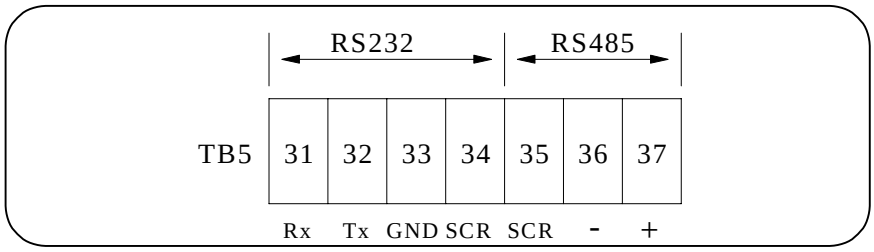


Fig 4.Communications terminals on top PCB.

AC power supply - connected:-	Earth	to terminal 1
	Neutral	to terminal 2
	Live	to terminal 3

The instrument will automatically accept either 110V or 230V AC ±10%, 50Hz or 60Hz, 12VA. A time lag fuse T160mA is fitted.

DC power supply - connected :-	Positive +ve	to terminal 27
	Negative -ve	to terminal 28

The instrument will accept 24V DC + 25%, - 10%. 9W.
A time lag fuse T315mA is fitted.

5 SPDT Relays - rated 8A/250V AC/30V DC resistive, with gold plated contacts for lower power switching, are connected to terminals 4 to 18, for controlling external group alarms for pre-determined conditions as detailed on Page 4.

Co-axial Cable Connection to Multiplexor SM-10 - is connected:-

Core	to terminal 20
Screen	to terminal 19

This cable should be separated from power cables and preferably installed in its own earthed steel conduit.

Analogue Output - is connected :-

Screen	to terminal 24*
Positive +ve	to terminal 25*
Negative -ve	to terminal 26*

* Gives an indication of only one point at time. For continuous analogue output an Analogue Output Module SA-10 is required.

Separate Temperature Compensation - when compensation is provided by a separate temperature sensor on each point then the controller should be connected to the Multiplexor SM-10 with a shielded twisted pair and connected:-

Screen	to terminal 21)		terminal Shld)	On
Core*	to terminal 22)	On Controller	terminal +)	Multiplexor
Core*	to terminal 23)		terminal -)	

* The polarity of the cores is unimportant.

Communications between Scanflex Modules Via RS485

The Controller is connected to the Multiplexor Module, Analogue Module and Relay Module using 2 core screened cable. TB5 terminals 35 to 37, on the Controller top PCB are connected to the matching SHLD, -ve and +ve terminals on TB1 on the Multiplexor and then looped on to TB1 on the Analogue and/or Relay Modules used in the system. For location of terminals see Pages 8, 60, 63 and 66.

Communications to external PC or PLC via RS232

Communications from the Controller via RS232 to Hycontrol's vision system or to the user's external devices, is via 3 core screened cable connected to terminals 31 to 34 on TB5.

MULTIPLEXOR MODULE SM-10 - ELECTRICAL CONNECTIONS See Page 60

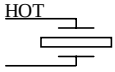
Communication - From the Controller terminals 35-37 to the Multiplexor is via a 2 core screened cable connected to TB1. Use Belden 8451 or equivalent cable.

Power Supply - Selectable 110V or 230V AC +10/-15%, 50Hz or 60Hz, 12VA is connected to TB4. Voltage selector SW4 must be set to the correct voltage.

Transducer link to Controller Co-axial cable RG62AU must be used. Connect to TB3 TRANS
Core to HOT
Screen to SCR

Transducer connection to Multiplexor - Up to 10 transducers can be connected to one Multiplexor. If fewer than 10 transducers are connected and called up in the programme they must be connected to Points 1 to 'n' in sequence. NO GAPS MUST BE LEFT IN THE RANGE PROGRAMMED. (e.g. 6 transducers must be connected to Points 1 to Point 6).

RXV15 Transducer	Blue to HOT Black & Screen to SCR
RXM19 Transducer	Core to HOT Screen to SCR
RXM19ER Transducer	Core to HOT Screen to SCR



ANALOGUE MODULE SA-10 - ELECTRICAL CONNECTIONS See Page 66

Communication - From Controller or other module via a 2 core screened cable connected to TB1. Refer to Page 9.

Power Supply - Selectable 110V or 230V AC +10%/-15%, 50Hz or 60Hz, 12VA is connected to TB4. Voltage selector SW4 must be set to the correct voltage.

Analogue Outputs - Are connected to the +ve -ve and shield terminals of TB2 for each point starting at Point 1 and leaving no gaps in the programmed range.

RELAY MODULE SR-10 - ELECTRICAL CONNECTIONS See Page 63

Communication - From Controller or other module via a 2 core screened cable connected to TB1. Refer to Page 9.

Power Supply - Selectable 110V or 230V AC +10/-15%, 50Hz or 60Hz, 12VA is connected to TB4. Voltage selector SW4 must be set to the correct voltage.

Relay Outputs - One Relay Module provides two relays for each point. If 4 relays are required for a point then two Relay Modules must be used.

Relays are connected at TB2 for each point starting at Point 1 and leaving no gaps in the programmed ranged

MODULE IDENTIFICATION INSTRUCTIONS

Each Module (other than the Controller) must have an individual address number. This is set on Switch (SW1) which is located on the upper left hand side of each Module.

The switch (SW1) on the Multiplexor must always be set to 1, with other Modules numbered sequentially with no gaps in the sequence.

The total number of Modules connected to the Controller must be entered in Pr.51

NB - No two Module switches should be set to the same position.

Transducer Installation

The positioning of the transducer and the mounting method used is important and varies with the type of transducer, the application and the material, being monitored.

On liquid measurement applications it is important to ensure that the transducer is perpendicular to the liquid surface and the circumstances shown on Page 49 should be avoided. The transducer beam angle is 10 to 12^0 included.

Transducers should be mounted in the isolation kits provided and for solids applications where levels may not be flat due to the effects of fill or draw off points, then an aiming kit as shown on Pages 53 or 54 should be used.

Transducers wired to the Multiplexor (SM-10) must to be connected to Point 1 first then sequentially and without gaps. See Page 60 for terminal connections.

Each transducer is supplied with a length of integral cable, which can be extended up to 300 metres using a suitable junction box, and RG62A/U co-axial cable. The 300m is the maximum distance from the Controller to the transducer via the Multiplexor. **Transducer cable should be separated from power cables and preferably installed in its own earthed steel conduit.**

Transducer cables and temperature compensation cables can be run together.

For installation of the RXV15 series transducer in hazardous locations refer to the appropriate National Standard.

SEE APPENDIX (1) FOR TRANSDUCER PERFORMANCE, POSITIONING AND PHYSICAL RECOMMENDATIONS FOR STANDPIPE INSTALLATIONS.

Temperature Sensor See Page 55

If temperature compensation is required the sensor should be mounted where it will monitor temperature changes of the air between the transducer and the material. This is usually adjacent to the transducer, but should not be in direct sunlight.

The sensor is connected to the Multiplexor at TB2 using a 2 core screened cable connected to -ve, +ve and SHLD for each point. The Multiplexor terminal TB3 connections SHLD, + and -, are connected to Controller terminals 21 to 23 using the same type of cable. The total cable run from sensor to Controller via the Multiplexor should not exceed 300m. The cable can be run together with the transducer cable in the same conduit.
For installation of sensor type RTS-2B in hazardous locations refer to the appropriate National Standard.

PRE-START GUIDE

Pre-Start Check List

1. Check that each module enclosure is mounted securely in accordance with Pages 2 or 7.

2. Check that the wiring is in accordance with Page 3 for a single point instrument or Pages 8-10 for a multipoint instrument.

3. Provide a power supply for the Controller and each Module in a multipoint system. Remember that the Controller can have 110/230V AC or 24V DC supply but the Scanflex Modules must have 110 or 230V AC and this must be selected, on the module.

4. Check that each module has its individual system address number by setting the selector switch (SW1) on each module to its correct position. See Page 10.

5. Check that the data link to each module is as shown in Configuration wiring diagrams, Pages 5 & 6 and the RS485 connections are as indicated on Pages 9 and 10

6. Check the RG62AU cable link from terminals 19 and 20 on the Controller to TB 3 on the Multiplexor.

7. Check the temperature sensor link (if required) from terminals 21 to 23 on the Controller to TB 3 on the Multiplexor.

8. Check that any Relay or Analogue Modules are correctly wired. See Page 10.

YOU ARE NOW READY TO SWITCH ON

9. Check that the neon light in the Reflex Controller is flashing. The instrument will be in the normal RUN mode.
At switch-on the instrument will show either:-

HYCONTROL REFLEX HYCONTROL

In single point mode Pr.1 = 1
(Under factory default programme)

or

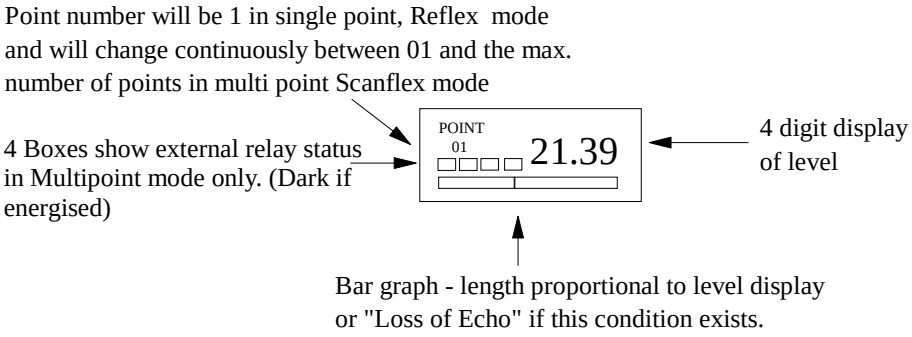
HYCONTROL SCANFLEX HYCONTROL

In multipoint mode Pr.1 = 2 to 10
(If pre-programmed)

The above display will remain for 1 minute maximum and then go into its normal RUN mode.

10. In the 'run' mode three different display layouts are available.

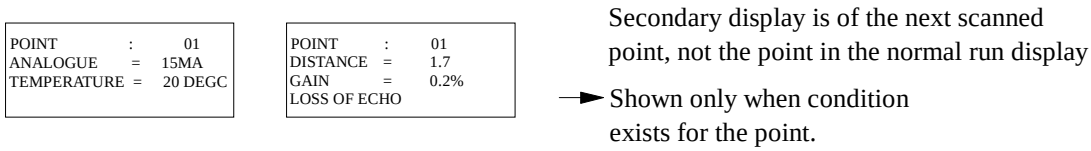
10a. <u>Normal 'RUN' Mode</u>



10b. <u>Display of Secondary Functions</u>

When "TEST" is pressed the display shows gain, distance and loss of echo status for that point. When "DSP" is pressed it shows mA Output and Temperature for that point.

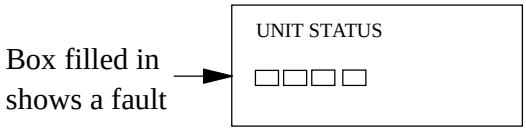
Press "DSP" Press "TEST" Press CE to return to RUN



10c. <u>Status check for Scanflex Modules</u>

This is available only if the instrument is configured as a multipoint system and a Multiplexor and other modules are being used.

When "#" is pressed in RUN mode the display of a Scanflex will show the status and the number of modules connected to the Controller as defined by Pr.51.



If a box is filled in it indicates a fault in communication. Consult Page 44

If the above displays do not appear then re-set to factory defaults as instructed on Page 16 and check the entry at Pr.51

11. On Scanflex application also check that the green comms light on the Multiplexor is flashing and the red status light is scanning from point 1 to point 10 or however many points are selected.

THE SYSTEM IS NOW READY TO BE PROGRAMMED

PROGRAMMING

REFLEX/SCANFLEX system needs to be programmed by the operator to produce the required measurements and control. To do this the keypad on the Controller is used to access parameters and enter values in each one to determine the controls required.

Principle of Programming

The REFLEX/SCANFLEX has two modes:-

a) RUN (Normal operating)

b) PROG (Programming)

In the 'RUN' mode, the instrument monitors the target, displaying values, and setting outputs as programmed by the operator. If Scanflex multipoint operation (Pr.1 = 2 to 10) has been selected then in "RUN" mode the instrument will automatically scan each point and update the display in numerical sequence.

In the 'PROG' mode the operator uses the keypad in conjunction with the display to adjust the settings for each point and to test that the unit is programmed correctly.

Security Code

The REFLEX/SCANFLEX program includes security code protection. Any operator who knows the entry sequence can display the value of a parameter, but any attempt to enter a new value or perform a test will result in the security code being requested.

The security code is requested by the prompt 'CODE'. If the code is not entered correctly, then this prompt is re-displayed.

Once the code has been input correctly, it will not be required again whilst the system remains in the 'PROG' mode.

The factory set value is 9753, but a new "customers" security code comprising 4 numerical digits, can be entered via Pr.96 providing the operator is in program mode. The range of acceptable values is 1000 to 9999. If an invalid code is entered the instrument will default to a code number 1000.

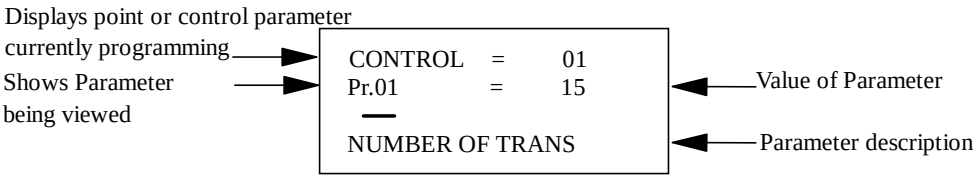
The code number is scrambled immediately on entry and therefore cannot be read by an unauthorised person.

If you forget your own new code number contact Hycontrol advising the scrambled code number displayed at Pr.96

To Enter Programme Mode and View Data

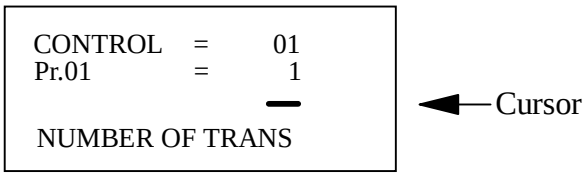
Press Mode **Display shows** **-PROG**

Press 1



Parameters which effect all Points are called CONTROL. Parameters which may have a different value for each individual Point are called POINT.

Press DSP



Pressing DSP toggles the cursor between Pr. No. and Value. Position the cursor under whichever you want to change.

To Select and View any other Parameter

Either press the '▲' key or '▼' key until you come to the parameter required or put the cursor under the Pr. No. (Press DSP to move cursor) and key in the new number required.

To Change the Value in a Parameter

Select the parameter which you wish to change. Put the cursor under the value presently in that parameter and key in the new value required.

Press ENT **Display shows** **-** **CODE**

Key in 9753

Press ENT Display will show the new value.

If you remain in PROG mode other parameters can now be changed without the need to re-enter the code.

i.e. Select the next Pr. No. to be changed.
Press DSP - to move cursor to the value.
Key in the new value required.
Press Ent. - Display will show new value

To Change Point No. in Multipoint Mode (i.e. Pr.1 is 2 or greater)

Select any parameter, which is a POINT parameter (not CONTROL) and press # key. POINT No. will increase progressively until the maximum selected by Pr.01 and then return to POINT 01.

Note that you will stay on the Point No. selected until you return to RUN mode, or press the # key to change the Point No.

Return System to "RUN" Mode

When all parameters have been set to their required value press MODE and the instrument will return to "RUN" i.e. normal running. (The unit will automatically return to RUN mode if a key is not pressed within 6 mins).

USE THE KEYPAD AND WATCH THE DISPLAY UNTIL YOU FEEL COMFORTABLE WITH ALL KEY PRESSES AND DISPLAYS.

We recommend that you now reset the system to its factory defaults as shown below, before you begin programming the system for your application.

System Reset to Factory Defaults

1. Press MODE to display 'PROG'.
2. Press 1 to display programme sequence.
3. Change Pr. number to display Pr.99.
4. Press DSP to move cursor under '===='
5. Press 'CE' then 'ENT'.
6. Press 9753 when 'CODE' displayed. (Or your own new code number).
7. Press 'ENT'.
8. Display will show 'PRES' and 'TRES' and return to programme display.
9. Press DSP to move cursor under Pr.99
10. You can now begin programming by changing Pr.99 to the first parameter you wish to change.

All parameters are now returned to their original factory default values as specified in this manual.

i.e.RXM19 family and single point Reflex mode.

Before starting to programme your application we recommend that you list all parameter numbers/values which you intend to change from their factory defaults.

For Reflex single point use Page 71.

For Scanflex multipoint use Page 72.

Manual Scanning

When used as a multipoint scanner this facility has been included mainly for commissioning and fault finding purposes. It allows the system in the "RUN" mode to continually stay on one point whilst checks are carried out. The normal scanning process is stopped.

When manual scan is in operation the system fault relay (Relay 4 on the Controller) will be in alarm mode and the corresponding LED will be on.

Manual scan is enabled by programming Pr.53 = 1 and then re-entering "RUN" mode.

To select a specific point to be monitored press the relevant key 1-9 or 0, these correspond to measuring points 1-10. To de-select manual scan set Pr.53 to 0 or power down then up again.

NOTE:

1. When in manual scan, press "TEST" to display the gain value.
To return to normal display press the "CE" (Clear entry) key.

2. Module system status check does not operate during manual scan.

3. The unit will not automatically return to normal run mode. Reset Pr.53 to 0.

Keypad Definitions

The keypad consists of 20 keys which are used to programme the Controller. Some of these keys also have secondary functions enabling the operator to view the results being obtained by the instrument during its normal 'RUN' cycle.

Primary Key Functions

0 - 9 Numerical Values

w Decimal Point

— Negative value (also used to slow down simulation)

CE Clear Entry (also used to leave test functions Pr.75 to Pr.78.)

In normal 'RUN' mode it displays unit status and in 'PROG' mode it advances point number. (also speeds up simulation Pr.78)

MODE Alternates between 'RUN' and 'PROG' mode.

TEST In 'RUN' it displays gain and distance or shows LOE status.

'▲' Increase parameter number (also control of simulation direction).

'▼' Decrease parameter number (also control of simulation direction)

DSP Moves the cursor on the display between Pr. No. and its value. (Changes can be made only to the data underlined by the cursor.)

ENT Enter a new value or initiate a system test under Pr.75 to Pr.78

Active Secondary Key Functions

During normal 'RUN' mode it is possible for an operator to obtain the data defined as secondary function without interrupting normal operation, by pressing the appropriate key, i.e.

Key 1	Relay 1. Hours energised and number of starts.
Key 2	Relay 2. Hours energised and number of starts.
Key 3	Relay 3. Hours energised and number of starts.
Key 4	Relay 4. Hours energised and number of starts.
Key 5	Relay 5. Hours energised and number of starts.
Test	In 'PROG' it scrolls through parameter list and control simulation.
DSP	Displays point, mA output and temperature

To cancel secondary display press "CE"

Display Description

REFLEX/SCANFLEX	On power-up REFLEX indicates that the instrument is programmed on single point and SCANFLEX indicates that the instrument is programmed as multipoint.
PROG	Precedes entry to programme mode.
RUN	Precedes return to run mode.
Pr.XX	Parameter number, 2 digits
CODE	Requests the entry of the security code.
====	No value
FULL	Numerical overflow
-FUL	Negative numerical overflow
PRES	Indicates a parameter reset
TRES	Indicates a totaliser reset
TEST	System performing a requested test
GAIN	Precedes display of gain value being used.

Programming Sequence

The programming of REFLEX/SCANFLEX is controlled by the parameters listed later in this section.

The parameters are divided into the following distinct groups.

Pr's 01 - 07	Determine the number of points to be monitored, the type of transducer used on each point, the function of the instrument and the maximum and minimum distances and units.
Pr's 08 - 29	Configure the designation of the relays for each point being measured and sets their operation points and failsafe modes.
Pr's 30 - 34	Configure the analogue output for all points.
Pr's 37 - 39	Enables and reads the output of temperature compensation sensors if fitted.
Pr's 40 - 44	Programmes each point for volume conversion.
Pr's 49 - 53	Configures the Scanner for a multipoint application.
Pr's 62 & 63	Serial communications.
Pr's 65 - 69	Echo detection and processing.
Pr's 70 - 97	Miscellaneous and test parameter
Pr 99	System reset
Note:	Use Pr.50 to copy data from one point to other points.

PARAMETER INDEX

REFLEX/SCANFLEX

Note: All other parameters are unused and should not be changed.

PARAMETER DEFINITIONS

The parameters define all the options that are available to the operator of a REFELX/SCANFLEX. It may be easier to read these in conjunction with the application examples on Page 34 to 36.

Basic Set-up

NOTE:- (D=) factory default entry for that parameter.

Pr.1 Single or MultiPoint (D=1)

Enter 1 - Single point control
2 to 10 Multipoint control. This entry defines the number of points to be monitored

NOTE: Changing the entry in Pr.1 will cause all parameters to default to factory resets.

Pr.2 Transducer Type (Defined for each point) (D=1)

Enter 1 - Long range - RXM19/RXM19ER
2 - Short range - RXV15 Series

NOTE: Changing the entry in Pr.2 will automatically reset the default entries in Pr.4 to Pr.6, and all other POINT parameters will default to factory resets. CONTROL parameters will not be changed.

For transducer specification see Page 48

Pr.3 Application/Units (Defined for each point) (D=2)

Enter 1 - Level Measurement - Feet
2 - Level Measurement - Metres
3 - Distance Measurement - Feet
4 - Distance Measurement - Metres

To display in percent of span set Pr.40 to 1.

The system will be set to work in the specified units but the display can be made to display a percentage, a converted value or a volume (Pr.40).

NOTE: Any subsequent change of units in Pr.3 (i.e. Pr.3 = 1-4) will reset parameters Pr.4 to Pr.7 to new units and all other parameters will default to factory resets.

Pr.4 Empty Distance (Defined for each point) (D=30)

The distance from the transducer to the furthest point away, usually the bottom of the vessel. Enter the distance in the units selected in Pr.3.

Note that this is not exactly at the transducer face.

Pr.5 Operational Span (Defined for each point) (D=30)

The distance between the furthest and nearest points over which measurement is required. Enter the distance in the units selected in Pr.3.

Pr.6 Blocking or Blanking Zone (Defined for each point) (D=1.00)

The distance in front of the transducer, within which the material should not enter, and within which no return echoes will be processed. It is important to ensure that the material being measured does not enter this zone.

Enter in the units selected in Pr.3.

DO NOT REDUCE THE FACTORY SET VALUE WITHOUT REFERENCE TO HYCONTROL.

Pr.7 Rate of Change (Defined for each point) (D=1.00)

This value should be as small as possible but greater than the maximum rate of change of level. **Do not** change this value unless you know that the rate of change is greater than 1.0m/min.

If it is necessary to change the value, enter the new value in units per minute selected in Pr.3. The suggested range of values is 0.1 to 10 metres/min or the equivalent.

Relays

In single point application the 5 relays in the Reflex Controller can be assigned to various functions depending on the application, as shown below:

Hysteresis is fully adjustable, so for most functions it is necessary to enter both "set" and "reset" values.

The relay state under normal operating conditions is defined as:-

(e) = normally energised. De-energise when "set" value is reached.

(d) = normally de-energised. Energise when "set" value is reached.

"Failsafe" functions are detailed in Pr.23 - 27.

The relays can be programmed to give both high and low alarm or control levels.

e.g.	High alarm	Set:	2.0m	Low Alarm	Reset:	0.5m
		Reset	1.8m		Set	0.2m

The system will automatically configure itself as high or low alarm depending on which of the set and reset entries has the higher value.

Note that on distance measurement only (Pr.3 = 3 or 4), the highest value is furthest from the transducer.

Defaults are 0 for relay designations 8, 11, 14, 17 and 20.
Defaults are 0.00 for relay settings 9 & 10, 12 & 13, 15 & 16, 18 & 19, and 21 & 22.

Controller Relays in Multipoint System (Pr.1 = 2 to 10)-Group Alarms

When the Reflex instrument is used as a Scanflex Controller the 5 relays in the Controller are pre assigned as group alarms to show the following:-

Relay 1 - Is energised to indicate that Relay 1 on the Relay Module for any point has operated. (Normally de-energised)

Relay 2 - Is energised to indicate that Relay 2 on the Relay Module for any point has operated. (Normally de-energised)

Relay 3 - Indicates loss of echo on any point. (Normally energised)

Relay 4 - Indicates a fault in any communication module. (Normally energised) Also indicates manual scanning mode has been initiated or loss of power to any module or the Controller.

Relay 5 - Indicates the instrument is in the programme mode. (Normally de-energised)

Point Relays in a Multipoint Systems

In addition to the above, one or two Scanflex Relay Modules SR-10 may be linked to the system. Each Module has two relays per point. The designation of these relays is common for all points and the designation is selected using Pr.8 to designate relay 1 on all points. Pr.11 to do the same for relay 2 on all points and Pr.14 and Pr.17 for relay 3 and 4 if they are fitted. All the options listed for Pr.8 are available for multipoint applications except option 8 "RUN-PROG". This is covered by a group alarm.

Relay Definitions

Pr.8 Relay 1 Designation Common to all points on Scanflex

Single Point Reflex	**Multipoint Scanflex**
0 = Off (default)	0 = Off (default)
1 = Level alarm (ne)	
2 = Level control (nd)	2 = Level control (nd)
6 = Temperature alarm (ne)	
7 = Loss of echo (ne)	No other options
8 = Run/Prog (ne)	are available.

Pr.9 Relay 1 Set Defined for each point

For level or distance enter values in units selected in Pr.3
For volume (Pr.43) enter in displayed units.
For temperature enter values in degrees C. (Valid only if probe fitted)
For loss of echo or Run/Prog, no set/reset entries are required.

Pr.10 Relay 1 Reset Defined for each point

Options are the same as Pr.9.

Pr.11 Relay 2 Designation Common to all points.

Options are the same as Pr.8

Pr.12 Relay 2 Set Defined for each point

Options are the same as Pr.9

Pr.13 Relay 2 Reset Defined for each point

Options are the same as Pr.9

Note: Pr.14 - Pr.19 In multipoint systems a second Relay Module SR-10 would be required if more than 2 relays are required per point.

Pr.14 Relay 3 Designation Common to all points.

Options are the same as Pr.8

Pr.15 Relay 3 Set Defined for each point

Options are the same as Pr.9

Pr.16 Relay 3 Reset Defined for each point

Options are the same as Pr.9

Pr.17 Relay 4 Designation Common to all points.

Options are the same as Pr.8

Pr.18 Relay 4 Set Defined for each point

Options are the same as Pr.9

Pr.19 Relay 4 Reset Defined for each point

Options are the same as Pr.9

Pr.20 Relay 5 Designation Programmable only on single point instruments.

Options are the same as Pr.8

Pr.21 Relay 5 Set Programmable only on single point instruments.

Options are the same as Pr.9

Pr.22 Relay 5 Reset Programmable only on single point instruments.

Options are the same as Pr.9

FAILSAFE

On loss of power to the Controller all Controller relays de-energise but any relays on a Relay Module will hold state.

On loss of power to a Relay Module, all the relays on it will de-energise.

On loss of echo (e.g. damaged transducer) the "fail-safe" position of each relay can be designated as below.

Pr.23 Relay 1 Failsafe Common to all points(D=3)
1 = energise
2 = de-energise
3 = hold state(default)

Pr.24 Relay 2 Failsafe Common to all points
Options the same as Pr.23

Pr.25 Relay 3 Failsafe Common to all points
Options the same as Pr.23

Pr.26 Relay 4 Failsafe Common to all points
Options the same as Pr.23

Pr.27 Relay 5 Failsafe Used only on single point systems.
Options the same as Pr.23

Note: On Multipoint systems

Relays 1 and 2 are provided by the first Relay Module (if fitted) and Relays 3 and 4 by the second Relay Module if fitted.

The fail-safe designation of each relay number must be the same for all points.

An indication of Loss of Echo at any point is available at Relay 3 on the Controller.

Pr.28 Analogue and Display Failsafe (Common to all points) (D=3)
Enter 1 - Low
2 - High
3 - Hold Value

Pr.29 Failsafe Time Delay (Common to all points) (D=600)

Enter value (in seconds) of the time allowed before the unit goes to selected fail-safe positions.
Minimum value is 30 seconds.

Analogue

Pr.30 Analogue Output (Common to all points) (D=1)

The analogue output will be related to span (Pr.5). On single point applications see also Pr.32 and Pr.33

Enter 1 - 4-20mA
2 - 20-4mA
3 - 0-20mA
4 - 20-0mA
5 - 4-20mA) > will over-range 0-24mA if normal span
6 - 0-20mA) (Pr.5) is exceeded

NOTE: Refer to Pr.34 for output test.

Pr.32 Analogue Datum (Used only on single point systems) (D=0.00)

If an analogue output is required with a zero different from the measurement zero (Pr.4) then an offset defined as a percentage of the measurement span/volume etc., can be entered here.

Pr.33 Analogue Span (Top level) (Used only on single point systems) (D=100)

If an analogue output is required with a span different to that defined for the measurement (Pr.5) then an alternative value for the top limit of span, defined as a percentage of the measurement span/volume etc., can be entered here.

Pr.34 Analogue Output Test (Applies to the point selected) (D=0.00)

This parameter can be used to examine the last analogue output value set up by the instrument. Also any value in the analogue output range can be entered for loading to the current output, and can be measured at the output terminals, to test the external analogue circuitry.

Temperature Compensation

Pr.37 Temperature Sensor Enable (Define for each point) (D=1)

1 = No sensor attached
2 = Sensor attached

Pr.38 Compensating Temperature (Define for each point) (D=20°C)

If no sensor is fitted the vessel temperature may be entered here.

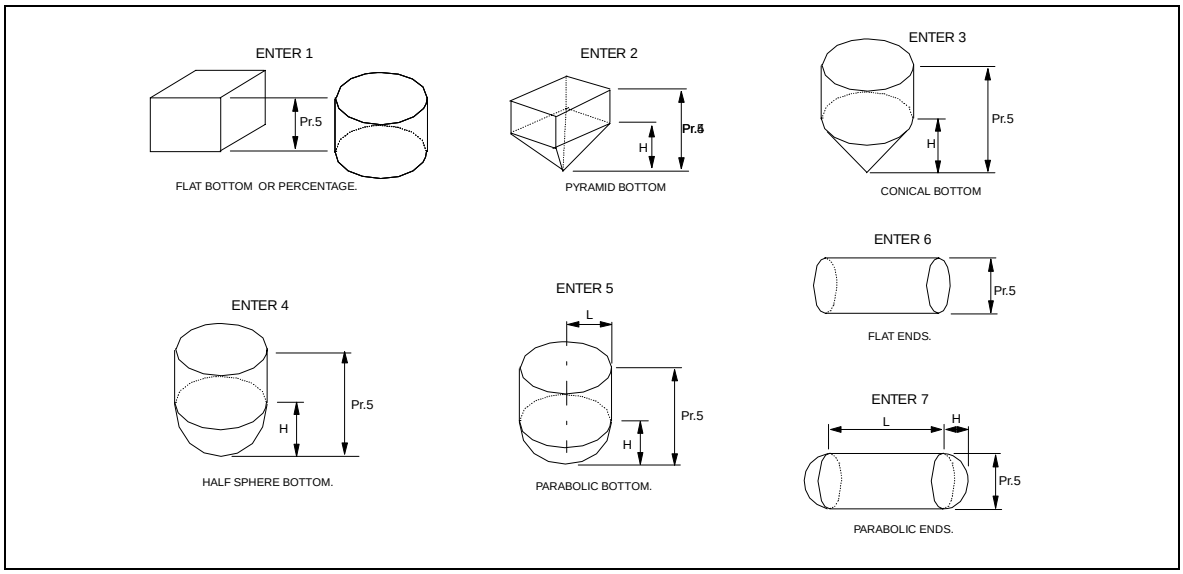
Pr.39 Temperature Sensor Test (Applies to the point selected) (D=0.00)

Displays the sensor resistance in K Ohms. Typically 9.5 at 20°C.
If value shows '0.00' after switching 'Off' and 'On' then either no sensor is connected, or there is a short circuit or open circuit in the system.

Volume Conversion

Pr.40 **Vessel Shape** (Define for each point) (D=0)

'0'	=	no volume conversion
1	=	flat bottomed vessel and percentage of span
2 - 7	=	standard shapes as shown below
8	=	vessel linearisation (see Pr.44)



Pr.41 **Vessel Dimension H** (Define for each point) (D=0.00)

Enter H where indicated above in units selected at Pr.3.

Pr.42 **Vessel Dimension L** (Define for each point) (D=0.00)

Enter L where indicated above in units selected at Pr.3

Pr. 43 **Display Conversion** (Define for each point) (D=1.00)

If Pr.40 entry is between 1 - 8 then enter - full scale display ÷ 100
e.g. if 100% = 2000 litres and display is required in litres then
set Pr.43 to (2000 ÷ 100) = 20.

To display in any unit enter any value from '0.001' to '9999'

NOTE: Display cannot be more than 4 digits. If full scale is 20,000 litres, then display in thousands of litres by dividing 20 by 100 = 0.2.

Pr.44 **Linearisation** (Applicable only to single point systems) (D= '====')

This function allows non-standard vessels to be characterised. For full details please refer to Appendix 3, Pages 68 to 70.

Multipoint Scanner Configuration

These parameters are relevant only if Pr.1 = 2 to 10

Pr.49 Point Data Reset (Applicable only to point selected) (D= '====')

The values of all POINT parameters which are particular to the point selected will be returned to their factory default values.
Position cursor under '====='.
Press 'CE' to clear '====' and then press 'ENT'
CONTROL parameters, which are designated for all points, will not be changed.

Pr.50 Point Data Copy (D=0)

This parameter allows the programme entered for one point to be copied to other points, as follows:-

a) Total Data Copy

On point 1 select Pr.50 = "0", position cursor under '0' and press 'ENT'. All points as defined by Pr.1 will then have the same programme copied to them.

b) Partial Data Copy

To be used for instance where points 1 & 2 are different but points 3 onwards are identical. On point 3 select Pr.50 = "0", position cursor under '0' and press 'ENT', then point 3 to number of points defined by Pr.1 will all have the same programme copied to them.

c) Individual Data Copy

This will copy all programme data from one individual point to another. eg. To copy the data from point 4 to point 8, select point 4 and then select Pr.50 and enter 8 into it, Points 4 and 8 will then have the same data.

Pr.51 Number of Modules (D=1)

(Minimum 1, Maximum 15)

This parameter defines the total number of extra modules (SM-10, SR-10 and SA-10) which are connected to the Scanflex Controller. (See Module identification instructions Page 10)

Do not include the Reflex Controller in the total.

Pr.52 Maximum Time On One Point (D=15)

The maximum time the Scanflex Controller will remain on one point attempting to achieve a valid echo. Adjustable from 10 to 100 seconds.

Pr.53 Manual Scanning (D=0)

0 = Automatic Scanning
1 = Manual Scanning

This facility has been included mainly for commissioning and fault finding purposes. It allows the system to continually stay on one point whilst checks are carried out. The normal scanning process is stopped when manual scan is in operation. The system fault relay (Relay 4 on the Controller) will be in alarm mode and the corresponding LED will be on.

Manual scan is enabled by Pr.53 = 1 and then re-entering 'RUN' mode.

To select a specific point to be monitored press keys 1-9 or 0. These correspond to measuring points 1-10. To de-select manual scan set Pr.53 = 0 or power down then up again.

NOTE:

When in manual scan, the gain display if called for by pressing the "TEST" key, is continuous. To return to level display press "CE" key.

Module System Status Check does not operate during manual scan.

WHEN IN MANUAL SCAN ONLY THE POINT YOU ARE ON IS BEING MONITORED, ALL OTHER POINTS OF MEASUREMENT WILL RESET, ALONG WITH ANY ALARMS THAT ARE ON THOSE POINTS. THE SYSTEM WILL NOT CONTROL THE OTHER POINTS UNTIL IT RETURNS TO RUN MODE.

Serial Communications (Refer to Hycontrol for separate leaflet)

The serial communication ports are configured for 9600 baud rate, 8 bit data, 1 stop bit and even parity. The customers system must be configured to suit this.

Pr.62 Serial Communication Enable (Channel 1 - RS232) (D=1)

Channel 1 (RS232) 1 = Commissioning System (default)
2 = Polled data transfer

The data which is transferred is: Level or Distance or Percentage for each point
Temperature for each point
Alarm status for each point
Group alarm status for scanner applications
Rate of change of level for single point applications.

Channel 2 (RS485) Is permanently enabled for polled data transfer but for scanner applications this channel is used to communicate with the external modules SM-10, SA-10 and is not available to communicate with the customers internal devices.

Pr.63 Station Number (D=0)

For polled data transfer, the unit must to have a unique station number assigned to it in the range 1-31.

Echo Detection

Pr.65 Maximum Gain (Define for each point) (D=100.0)

The gain can be limited to a percentage of the maximum available.

Pr.66 Gain Restriction (Define for each point) (D=2)

1 = No gain restriction)
2 = Partial gain restriction) Consult Hycontrol before changing from the default value.
3 = Full gain restriction)

Pr.68 Echo Processing Algorithm (Define for each point) (D=1)

The system has two echo extraction techniques, which are capable of determining the "true" echo for the majority of applications where an echo is present.

Enter 1 = For solids applications. This technique looks for the highest level within the transducer view.
Enter 2 = For liquids. This technique positions a narrow 'window' around the target it is tracking to enable it to ignore spurious noise.

Pr.69 Echo Velocity (Define for each point)
(D=344.1 i.e. speed of sound in air at 20°C)

If operating through any medium other than air, enter the velocity of sound through that medium in metres per second.

Miscellaneous

Pr.70 Parameter Display (D=0)

The system will display continually the value of:

Gain	-	by entering 47
Temperature	-	by entering 38
Analogue output	-	by entering 34.

It can be used only for commissioning as it will be lost on power down.

Pr.71 Correction Value (Define for each point) (D=0.00)

Both negative and positive values can be input. This value must be entered in the units selected at Pr.3.

This parameter has two uses:

1. It can be used to correct minor reading errors on the display
2. It can be used to prevent loss-of-echo when the target can go further away from the transducer than the empty distance. Add the extra depth to Pr.4 and enter minus the extra depth at Pr.71 in the units selected at Pr.3

Pr.72 Decimal Display (D=2)

0 = No decimal places allowed.
1 = Up to 1 decimal place.
2 = Up to 2 decimal places.
3 = Up to 3 decimal places.

Pr. 73 Software Revision Number

Displays the revision number of the software, e.g. RE.XX

Pr.74 Reset Counter (D=0)

This count value gives the number of times that the system has been powered down or reset since the last time the counter was zeroed. It is useful for checking if the power supply is erratic.

Test Parameters

Pr.75 Digital Outputs (Applies to the point selected) (D=0)

To aid commissioning and the testing of external wiring, it is possible to define the status of all five relays when in 'PROG' mode.

Press 'DSP' then:-
Enter 0 - To de-energise all relays
ADD 1 - To energise relay 1
ADD 2 - To energise relay 2
ADD 4 - To energise relay 3
ADD 8 - To energise relay 4
ADD 16 - To energise relay 5 - Applicable only to single point applications

e.g. To energise relays 2 and 5 enter '18'

The defined relay state will be maintained until over-written or until 'PROG' mode times out (6 minutes). The time period can be extended by pressing a key during this period to reset the time-out counter.

Pr.76 Hardware Test This tests only the relays in the Controller

Press 'DSP' then 'ENT' to test LED's and relays. The LCD shows 'TEST' and the LED's will switch on/off in sequence. Press 'CE' to end test, or let it time out.

This test will not check the relays on the Relay Module of a multipoint system.

CAUTION: DO NOT USE THIS TEST WHEN CONNECTED TO PUMPS OR RELAYS. USING THIS PARAMETER WILL OPERATE ALL RELAYS AND MIGHT START PUMPS, ALARMS ETC.

Pr.77 Transmitter Test (Applies to the point selected)

Press 'DSP' then 'ENT', the transmitter should pulse continuously, (made visible by the neon).

Also useful to ascertain if a transducer is correctly connected, as it will 'click' repeatedly. Press 'CE' to end.

Pr.78 Simulation (Applies to the point selected)

Put the cursor under the '====' and press 'ENT' to simulate the operation of the instrument as set up between blanking and empty distance. The display will show the level, volume or converted value as required, for the point configured, along with the bargraph. Press CE to end simulation.

It will set all LED's/relays and the current output as programmed. Therefore, care must be taken if the instrument is wired into other instruments or controls. The displayed value, on which all relays are operated, is that which is set by the operator.

The initial speed of the simulation is that set into Rate of Change (Pr.7) this can be increased by a factor of 2 by pressing the '#' key and the key can be pressed 6 times (x64). To reduce the speed press the '-' key, the speed cannot be reduced below that defined by Rate of Change, Pr.7.

The direction of the simulation can be changed by using the '▲' and '▼' keys, which one has to be pressed depends on the set up. The simulation can be stopped and re-started using the 'TEST' key. Press 'CE' to end.

Pr.80 Filter One Non-adjustable filter setting.

Pr.81 Filter Two Non-adjustable filter setting.

Number Store

Pr.95 Serial Number (Viewable only)

This parameter displays the serial number of the Reflex unit.

Pr.96 Security Code Store (D=15.02)

A new security code can be entered at this parameter, but after entry it is scrambled. Refer to Hycontrol if you forget your security code and quote the number displayed here.

Resets

Pr.97 Relay Hours/Starts Totaliser Reset (D= '====')

The totalisers are cleared by entering:

Pr.97 and 'DSP'	to show '===='
Press CE	to clear the screen
Press Enter	to request 'COdE'
Enter 9753 *****	
Press Enter	to show 'TRES' followed by '===='

The relay hours/starts will now read 0

Pr.99 Return to Factory Default

Press	'MODE'	to display 'PROG'
	'1'	immediately to display 'Pr.01' or previous Pr. number.
	'99'	to display Pr.99
	'DSP'	to move cursor under '===='
	'CE'	to clear the display
	'ENT'	to display 'COdE' requesting the security code* (see note)
	'9753'&'ENT'	to display 'PRES' followed by 'TRES', and then to display 'Pr.99.

The new programme can now be entered.

REMEMBER:- FACTORY DEFAULT IS SINGLE POINT REFLEX MODE WITH RXM19 TRANSDUCER FAMILY.

NOTE * Enter your own security code number if you have changed it from factory setting of 9753.

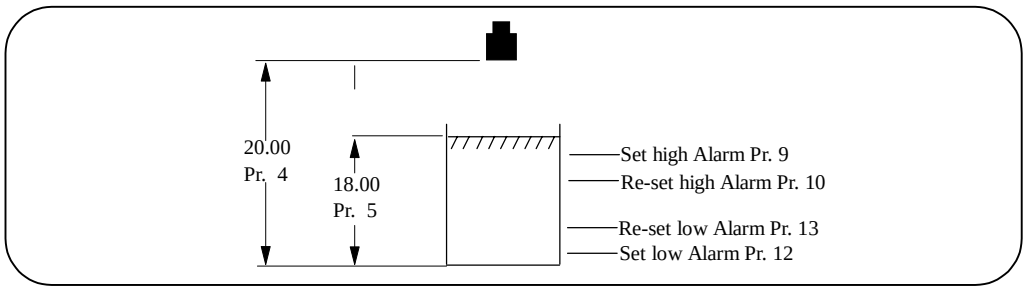
PROGRAM APPLICATION EXAMPLES

EXAMPLE 1

Reflex as a Single Point Level Instrument

Application. To measure and display in metres the level of a liquid in a tank and to provide a high alarm and analogue output.

Maximum tank depth	-	20 metres
Maximum usable span	-	18 metre
Alarm if level rises above	-	17.0 metres and reset at 16.75 metres
Alarm if level falls below	-	2.0 metres and reset at 2.24 metres
Alarm	-	If loss of echo for more than 1 minute
Relay failsafe mode	-	Hold state on Loss of Echo
Analogue failsafe mode	-	Hold last value



Pr. 1 = 1	Single point system.
Pr. 2 = 1	RXM19 long range transducer
Pr. 3 = 2	Level measurement unit in metres
Pr. 4 = 20	Empty distance 20 metres
Pr. 5 = 18	Span 18 metres above empty level
Pr. 6 = 1.0	Blanking zone into which level must not rise
Pr. 7 = 1.0	Maximum Rate of Change (Metres/Min)
Pr. 8 = 1	Relay 1 designated as level alarm, therefore normally energised (High level)
Pr. 9 = 17	Relay 1 set point. Relay de-energises
Pr.10 = 16.75	Relay 1 re-set. Relay re-energises
Pr.11 = 1	Relay 2 designated as level alarm therefore normally energised (Low level)
Pr.12 = 2.0	Relay 2 set point. Relay de-energises
Pr.13 = 2.25	Relay 2 re-set. Relay re-energises
Pr.14 = 7	Relay 3 designated as Loss of Echo
Pr.23 = 3	Relay 1 failsafe hold
Pr.24 = 3	Relay 2 failsafe hold
Pr.28 = 3	Analogue and display failsafe-hold
Pr.29 = 60	Failsafe time delay 60 seconds
Pr.30 = 1	Analogue output 4-20mA
Pr.68 = 2	Echo processing algorithm for liquids

EXAMPLE 2

Reflex as a Single Point Level Instrument with Volume Conversion

Application is identical to Example 1 but tank contents when 18 metres deep is 8000 tons and a temperature compensation probe is fitted.

Programme exactly as Example 1 with the following additions:-

Pr.37 = 2	Temperature sensor enable
Pr.40 = 1	Flat bottomed vessel and percentage of span
Pr.43 = 80	Display conversion = full capacity ÷ 100
Pr.72 = 0	No decimal places.

EXAMPLE 3

Reflex as a Multipoint Scanner

Application is the same as Example 1 but with seven 7 identical tanks to be monitored.

The system must include a Reflex Controller, a Multiplexor SM-10, an Analogue Module SA-10 and a Relay Module SR-10.

After entering programme mode ensure that the display is showing 'POINT 01' before detail programming starts.

Pr. 1 = 7	Multipoint application with 7 transducers
Pr. 2 = 1	RXM19 long range transducer
Pr. 3 = 2	Level measurement in metres for POINT 01
Pr. 4 = 20	Empty distance 20 metres for POINT 01
Pr. 5 = 18	Span 18 metres above empty level for POINT 01
Pr. 6 = 1.0	Blanking zone into which level must not rise for POINT 01
Pt. 7 = 10	Rate of Change for POINT 01
Pr. 8 = 1	This will designate Relay 1 on the SR-10 as level alarm for all Points.
Pr. 9 = 17	Relay 1 set point for POINT 01
Pr.10 = 16.75	Relay 1 re-set for POINT 01
Pr.11 = 1	This will designated Relay 2 on the SR-10 as level alarm for all Points.
Pr.12 = 2.0	Relay 2 set point for POINT 01
Pr.13 = 2.25	Relay 2 re-set for POINT 01
Pr.23 = 3	Designates that Relay 1 will failsafe Hold on all Points
Pr.24 = 3	Designates that Relay 2 will failsafe Hold on all Points
Pr.28 = 3	Designates that on all Points the Analogue Output will hold last value on any Point which loses echo.
Pr.29 = 60	Designates that the LOE group alarm, Relay 3 in the Controller, will operate after 60 seconds.
Pr.30 = 1	Designates that the Analogue Output for all Points will be 4-20ma
Pr.51 = 3	Defines that there are 3 modules attached to the Controller i.e. SM-10, SA-10 and SR-10.

Pr.52 = 15		Determines the maximum time the Controller can dwell on any individual Point.
Pr.68 = 2		Echo processing algorithm for liquids as POINT 01

This completes the programming for POINT 01 and has set all the "Control" parameters which must be the same for each point i.e. in this example Pr.8, 11, 23, 24, 28, 29, 30, 51 and 52.

There are now two ways to programme the remaining 6 points:-

1) Since in this example all points are identical you could go to Pr.50 and enter "0" which will copy the same data to all remaining 6 points.

or

2) If any of the data is different for a point you can press the "#" key and change from point 1 to point 2 etc and then re-enter data for all the parameters relevant to point 02 etc.

NOTE Parameters which can be individually set for each point are typically shown as follows:-

```
POINT      =    01
Pr.04      =    20
                ▬

EMPTY DISTANCE
```

Parameters which are common to all points are call CONTROL and are typically shown as follows:-

```
CONTROL    =    01
Pr.08      =     1
                ▬

RELAY ONE DESIG
```

FAULT FINDING & COMMISSIONING

INDEX

SINGLE POINT REFLEX

FAULT FINDING & COMMISSIONING GUIDE

Before investigating a system fault, ensure that the pre-start check on Pages 12 & 13 has been done. We recommend that you list all your application programme parameters before proceeding.

A) The display is blank, l.e.d.'s are unlit, neon not firing:-

1. Ensure that power is being supplied to the unit and that wiring is correct - refer to Page 3.
2. Check fuses F5 (AC) or F6 (DC).
3. Check that the supply is within specified limits - refer to Page 3.

B) The fuse blows continually:-

1. Power-down and fit a new fuse - refer to Page 3.
Disconnect all cabling from the unit except power, if the fuse does not blow, there is a fault in the external wiring.
2. Check that the supply is within specified limits - refer to page 3.
3. Check for metal debris under the bottom PCB.

C) The system power-up but display is blank:-

1. Power-down and check that the main eprom is fitted correctly at U7 on the top PCB.

D) The display shows 'LOSS OF ECHO'

1. Check transducer type selection at Pr.2.
2. Check transducer wiring and connections to the instrument - refer to Page 3 and 50-52. Note the different connections for the temperature compensated transducer (RXT15 Series).
3. Check whether the neon adjacent to terminal 22 is flashing.
If it is, proceed to 4.
If not, then:-

a) Disconnect the transducer: If the neon now flashes there is a short circuit in the cabling. If it does not flash, the transmission fuse may have blown. Check F1 and F2 T80mA fuses on the bottom PCB.
b) If the unit still shows 'LOSS OF ECHO', check that you can hear the transducer clicking when close to the ear.
c) If you have extended the transducer cable, disconnect and remove the transducer and connect it direct to the Reflex. If the unit now operates, re-check the extension cabling connections and routing, avoiding power cables. Re-install the transducer and check its aiming.
d) If the transducer does not click, proceed to 6.

4. Is the target within the empty distance specified at Pr.4? This is particularly important if the temperature varies and no compensation is applied.

5. Is the vessel empty, with a conical parabolic or spherical bottom? If the transducer is not central the transmission pulse may be reflected from the the sloping sides and not back to the transducer. Under these conditions the display will show 'LOSS OF ECHO' but the failsafe designation will operate until product returns and the system will automatically recover and track the level. If the transducer cannot be mounted centrally, the problem may be overcome by the installation of a 'target' plate.

6. Connect a known good transducer. If this operates, check the gain value by pressing the 'TEST' key. The percentage displayed ranges from 0-100, the lower the figure the better the signal strength. If the gain is 50-100, check the surface on liquid applications for foam or floating debris, which may cause poor echoes.

7. Check that the ST6 eprom is seated correctly at U6 on the bottom PCB.

E) <u>The keypad fails to operate:-</u>

1. Check the alignment of the plug with the top PCB connectors.

2. Check that the key press sequence is valid, refer to Programming Section.

3. Power-down and wait 5 secs. Power-up and press 'MODE'. This should result in 'PROG' being displayed. It is now advisable to reset the unit - refer to Page 16.

F) <u>Analogue output is unstable:-</u>

1. Connect test meter in series with your external wiring.
Can fault be seen on test meter? If yes, then use Pr.34 to enter a stable value into the current loop. Suitable values range from 4 to 20. If output is still unstable disconnect external wiring and connect meter across terminals 25 and 26 and repeat Pr.34 test. If still unstable, contact Hycontrol. If stable, check wiring and meters etc.

G) <u>Analogue has no output:-</u>

1. Check programme value at Pr.30 - Value 1-6

2. Insert test meter in series with the output. Under Pr.34 enter a fixed output. If still no output, then connect test meter directly across terminals 25 and 26, repeat test under Pr.34. If no value is read at terminals 25 to 26 contact Hycontrol.

H) <u>Analogue output is less than 20 at maximum display reading:-</u>

1. The load attached to the output may be too high. To check this disconnect all the external wiring and see if it now reads 20. The output is capable of driving 20mA into 750 Ohms.

I) Analogue output does not correspond to application:-

1. Check that the correct options (Pr.30 to Pr.33) have been selected.
2. Check that the correct span (Pr.5) has been input, this is the value over which the analogue will be spanned unless a separate entry has been made at Pr.32 or Pr.33.

J) Display stays high:-

***** This is usually caused by return echoes from close-in obstructions.

1. Check for obstructions. If the transducer is mounted in a standpipe, check for rough edges at connection with the vessel, refer to Page 47.
2. If there are no close-in obstructions ensure that the isolation kit (Pages 50-52) is fitted on the transducer and the transducer is mounted correctly. The isolation kit should enable the transducer to move slightly, it should not be solid. (Not applicable if the transducer has an integral flange).
3. May be caused by rate of change, Pr.7 being too small.
4. Check the entry at Pr.6. This should not be less than the factory default value.

K) Display is lower than expected:-

1. Check that Pr.4 and 5 are correct for the application.
2. It can be caused when the level rises into the blanking zone (Pr.6). The system may lock-up on a multiple echo and track this value when the level falls. The correct reading can be re-established by pressure 'MODE-1-MODE' but to effect a permanent cure, the transducer should be raised to prevent the level encroaching into blanking.
3. It can also be caused by poor surface quality. On liquid applications this may be foam or turbulence and on solids, a very irregular surface.
4. The level may be moving at a faster rate than that programmed in Pr.7. The rate of change value should be increased to match the true rate.

L) Display changes in steps:-

Increase rate of change at Pr.7 to match the true rate.

M) Display is inaccurate:-

1. Check the empty distance at Pr.4.
2. Check the vessel dimensions and any volume conversion factor used at Pr.43.
3. Temperature compensation may be required.
4. The presence of vapours will affect accuracy. If they are constant over the range, the speed of sound can be adjusted at Pr.69.
5. Check that the echo processing routine at Pr.68 is correct for the application.

N) Temperature compensation error:-

1. The position of the transducer/temperature sensor is important, to prevent heating by sunlight and convection currents. Also, the sensor should be in a free-air vented position if possible, to avoid hot-spots.
2. Check that the sensor is enabled at Pr.37.
3. Check the resistance of the sensor when disconnected against the value displayed at Pr.39 when connected. If using RXT series transducer (integral temperature compensation), check resistance across black core and screen when disconnected.

Note: The sensor compensates only for temperature variance; it is not expected to accurately measure the actual temperature.

O) Relays not switching:-

1. Check the programmed relay designations and settings at Pr.8-Pr.22. Functions can be tested under simulation at Pr.78.
2. Test the relays at Pr.75 or Pr.76.
3. Check contact continuity at the terminals.

Warning:

We recommend disconnection of external controls, alarms etc. before performing the above tests.

P) The PCB hums loudly:-

1. Check the transformer mounting screws for tightness on the bottom PCB.

MULTIPOINT REFLEX

FAULT FINDING & COMMISSIONING GUIDE

Before investigating a system fault, ensure that the pre-start check on Pages 12 and 13 has been done. We recommend that you list all your application programme parameters before proceeding.

CONTROLLER

A) The display is blank, l.e.d.'s are unlit, neon not firing:-

1. Ensure that power is being supplied to the unit and that wiring is correct - refer to Page 3.
2. Check fuses F5 (AC) or F6 (DC).
3. Check that the supply is within specified limits - refer to Page 3.

B) The fuse blows continually:-

1. Power-down and fit a new fuse - refer to Page 3. Disconnect all cabling from the unit, except power, if the fuse does not blow, there is a fault in the external wiring.
2. Check that the supply is within specified limits - refer to Page 3.
3. Check for metal debris under the bottom PCB.

C) The system powers-up but display is blank:-

1. Power-down and check that the main eprom is fitted correctly at U7 on the top PCB.

D) The keypad fails to operate:-

1. Check the ribbon plug to PCB connection for alignment.
2. Check that your key-press sequence is valid, refer to Programming Section.
3. Power-down, wait 5 secs. then power-up. Press 'MODE', this should result in 'PROG' being displayed. It is now advisable to reset the unit - refer to Page 6.

E) Relay 1 l.e.d. on:-

Used to indicate that no.1 relay on the Relay Module on any point of measurement is energised: - **This is not a system fault.**

F) Relay 2 l.e.d. on:-

Used to indicate that no.2 relay on the Relay Module on any point of measurement is energised: - **This is not a system fault.**

G) Relay 3 l.e.d. on:-

Used to indicate 'LOSS OF ECHO' on any or all points of measurement. Also indicated by 'LOSS OF ECHO' being displayed on the Controller display, replacing the bar graph.

'LOSS OF ECHO' on all points:-

1. Check that the Multiplexor Unit is powered up.
2. If the neon by terminal 22 on the Controller does not flash disconnect the transducer cable at the Controller. If the neon now flashes this indicates a short circuit in the link between the Controller and the Multiplexor. If the neon does not light with the above transducer link disconnected check fuses F1 and F2 on the bottom PCB.
3. If the neon does light, check that the green 'comms' l.e.d. on the Multiplexor unit is flashing. If not check the RS485 link (refer to Page 9). Also check that the unit selector SW1 is not set to zero, as this will prevent the connection of a transducer (refer to page 10).
4. If the neon does light, connect a known good transducer to the Controller and check the operation of the unit at various distances. If it does not work correctly the Controller is faulty.
5. Check the RG62AU connection between Controller terminals 19 and 20 and TB3 on the Multiplexor.
6. Check on the Controller that the ST6 eprom is seated correctly at U6 on the bottom PCB.

'LOSS OF ECHO' on one point:-

1. Select Manual Scan at Pr.53 and the faulty point.
2. If the Controller neon does not flash whilst the Multiplexor is on the measurement point, disconnect the transducer from the Multiplexor. If the neon now flashes there is a short circuit in the cabling between the Multiplexor and the transducer.
3. If the neon does flash, connect a known good transducer on to the Multiplexor for the measurement point, and check for correct operation. If the point remains in 'LOSS OF ECHO' check that the relay on the Multiplexor for the point is operating correctly, the adjacent red l.e.d. should be lit.
4. If the good transducer works, re-connect the original transducer and programme the Controller for transmitter test (Pr.77) for that point. Check if the transducer is 'clicking', if not there may be an open circuit in the cable or the transducer is faulty.
5. Check that empty distance at Pr.4 is correct and that the target is within range.

'LOSS OF ECHO' at short distances from the transducer:-

1. 'LOSS OF ECHO' at short ranges can be caused by poor quality return echoes. Check the surface conditions for foam, turbulence etc. If these conditions exist, contact Hycontrol.
2. Change Pr.66 from 2 to 1. This should give adequate gain to clear the 'LOSS OF ECHO'.

3. Check that all transducer extension cables are RG62AU.

4. Check the condition of the transducer face, the aiming, the cable length and quality and the correct terminations of the extension cable screen. All of these can cause higher gains to be used.

'LOSS OF ECHO' at long distances from the transducer:-

1. 'LOSS OF ECHO' at long distances is usually due to insufficient gain available to recover the echo. Check that Pr.65 is set to 100 (maximum gain). At ranges approaching the maximum specification, poor surface conditions may prevent the system recovering the echo at all.

2. Poor aiming of the transducer or the quality of the installation may be causing the system to be unable to identify a true level. Transducer aiming can be checked by putting the instrument into manual scan (Pr.53) for the relevant point, and pressing 'TEST' key on the Controller. Carefully move the transducer until you obtain the correct level reading with the lowest gain number possible.

3. Check that the value of the empty distance (Pr.4) is sufficient to include the bottom of the vessel. This is especially important if temperature variations are experienced and no compensation is applied. The check this set Pr.4 to a greater value and see if the system recovers. If it does, re-calculate Pr.4 allowing for temperature variations which are 0.17% of measured distance per deg.C change in temperature.

'LOSS OF ECHO' when empty on a vessel with conical, parabolic or spherical bottom:-

1. This is a common problem that occurs if the transducer cannot be mounted over the centre of the vessel, above the lowest point. When the vessel becomes empty, the pulse from the transducer hits the sloping edge of the bottom section and the signal is not reflected back to the transducer. Except by the use of a target plate, this is difficult to solve. It is better to ensure that the transducer is mounted centrally.

H) Relay 4 l.e.d. on:-

1. The system may be in Manual Scan Mode (Pr.53=1).
Check for a message on the display.

2. Possible power failure on one or more of the system modules.
Check the power supplies and voltage selection (SW4) on each module.

3. Possible communications fault between the Controller and the modules.
Check the external system modules status by pressing '#' key. The number of boxes displayed is defined by Pr.51 (max. 15), modules 1-8 on the top line, 9-15 on the bottom line. An empty distance box indicates that module is OK. A blocked-in box indicates a faulty module. To update the box display after Making corrections, press '#' key. Check the RS485 link and module address details - refers to Pages 9 and 10. Check that the green l.e.d. is flashing on all modules.

I) Relay 5 l.e.d. on:-

Used to indicate that the Controller is in programme mode:- **This is not a system**

fault.

MULTIPLEXOR MODULE SM-10

Faults on this module will normally be indicated on the Controller display.

Refer to G) & H) above.

A) Red power l.e.d. is not on:-

1. Check that your power supply is correct for the voltage selected at SW4

B) Green comms l.e.d. is not flashing:-

1. Communications fault - refer to H)3 above.

RELAY MODULE SR-10

A) Red power l.e.d. is not on:-

1. Check that your power supply is correct for the voltage selected at SW4. Note that a unit set for 230Vac but supplied 110Vac will power-up but the Relays will not switch.

B) Greens comms l.e.d. is not flashing:-

1. Communications faults - refer to H)3 above.

C) Relays will not switch:-

1. Check for communications and power faults as A) and B) above.
2. Use the 'TEST' button as detailed on Page 62.
3. Use the simulation test (Pr.78) to check that the relays operate as programmed for the application. If faulty, check the relay programme parameters Pr.8 - 22 to ensure that all the necessary data is entered.

ANALOGUE MODULE SA-10

A) Red power l.e.d. is not on:-

1. Check that your power supply is correct for the voltage selected at SW4.

B) Green comms l.e.d. is not flashing:-

1. Communications fault - refer to H)3 above.

C) Output not varying:-

1. Use the 'TEST' button as detailed on Page 65.

D) No output:-

1. Disconnect the external wiring and check outputs with a meter. The expected output is displayed at Pr.34 for each point of measurement. If OK, the fault is external; if not OK, the module is faulty.

E) Maximum output less than 20mA:-

1. The external load may be too high. Specification is 750 Ohms at 20mA.

F) The output does not match the application:-

1. Check that the correct span is programmed at Pr.5 and that the correct option has been selected at Pr.30.

G) Output is unstable:-

1. It should be as stable as the display, from which it is calculated. To test, disconnect external wiring and check with a meter.

OPERATIONAL FAULTS

A) Display stays high:-

1. Check for obstructions close-in to the transducer.
2. If standpipe-mounted, refer to Page 47.
3. Ensure that the isolation kit is fitted to the transducer, refer to Pages 50-52. (Not applicable if the transducer has an integral flange).
4. Check that the rate of change (Pr.7) is high enough for the application.
5. Check the entry at Pr.6. This should not be less than the factory default.

B) Display is lower than expected:-

1. Check that Pr.4 & 5 are correct for the application.
2. It can be caused when the level rises into the blanking zone (Pr.6). The system may lock-up on a multiple echo and track this when the level falls. The correct reading can be re-established by pressing 'MODE-1-MODE' but to effect a permanent cure, the transducer should be raised to prevent the level encroaching into blanking.
3. It can also be caused by poor surface quality. On liquid applications this may be foam or turbulence and on solids, a very irregular surface.
4. The level may be moving at a faster rate than that programmed in Pr.7. The rate of change value should be increased to match the true rate.

C) Display changes in steps:-

1. Increase rate of change at Pr.7 to match the true rate.

D) Display is inaccurate:-

1. Check the empty distance at Pr.4.
2. Check the vessel dimensions and any volume conversion factor used at Pr.43.
3. Temperature compensation may be required.
4. The presence of vapours will affect accuracy. If they are constant over the range, the speed of sound can be adjusted at Pr.69.
5. Check that the echo processing routine at Pr.68 is correct for the application.

TEMPERATURE COMPENSATION ERRORS

A) No temperature indicated on display:-

1. Check that Pr.37=2 for every point using compensation.
2. Check the RS485 and t/comp cable links between Controller and Multiplexor; refer to Pages 5 & 6.
3. Check the wiring to the temperature sensor or to the temperature compensated transducer (RXT Series) as appropriate.
4. Check the resistance of the sensor when disconnected against its value displayed at Pr.39 when connected, typically 9.5K at 20C. If using RXT transducer check resistance across black core and screen when disconnected.

B) Temperature reading is inaccurate:-

1. Check the sensor position. It should not be in direct sunlight nor where it may be affected by convection currents.
   Note that the sensor compensates for temperature variations, it is not expected to give an accurate measurement of actual temperature.

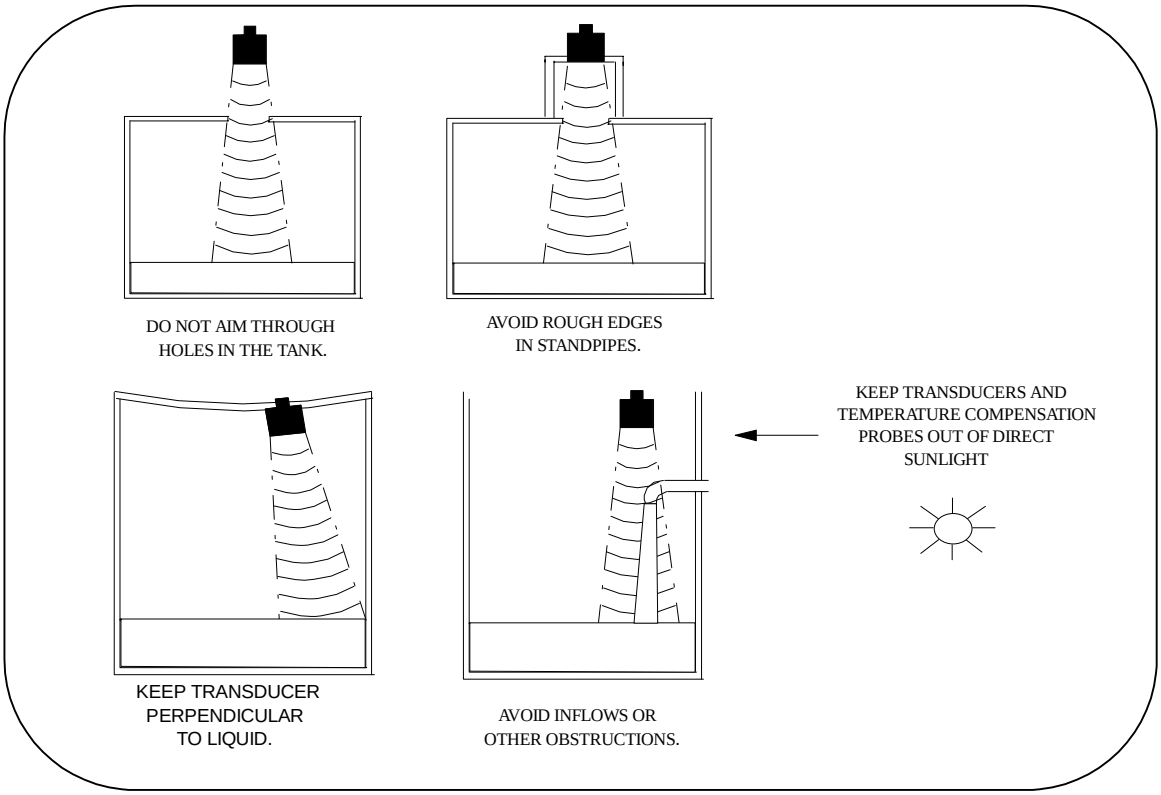
TRANSDUCER SPECIFICATION

MODEL	BODY MTRL	FACE MTRL	FREQ KHz	BEAM ANGLE INC	MAX. RANGE LIQS	MAX RANGE SOLIDS	TEMP DEG C *	HAZ. AREA	PROTEC -TION	WEIGHT KG	MNTG	PAGE NO.
RXV15 RXT15	Xenoy	Urethane	41.5	10	15m	6m	-40 to +90	EExmIIT6	IP68	2.0	M20	**50**
RXV15T	Xenoy	PTFE	41.5	10	13m	-	-40 to +90	EExmIIT6	IP68	3.0	Flange	**50**
RXV15P	Xenoy	Poly-ethy lene	41.5	10	20m	15m	-40 to +90	EExmIIT6	IP68	2.0	M20	**50**
RXM19	Poly-propy-lene	Poly-ethy lene	19	10	30m	25m	-20 to +60	No	IP68	2.8	M20	**51**
RXM19ER	Poly-ethy-lene	Poly-ethy-lene	17	5	50m	35m	-20 to +60	No	IP68	4.8	M20	**52**

*** The RXV15 Series is Certified EExmIIT6 (Zone 1 and 2) for -20 to + 60ºC.**

POINTS TO BE AVOIDED WHEN INSTALLING TRANSDUCERS.

Figure 1.



Standpipe Installations

In many applications access to a vessel must be made via a standpipe. However, it is necessary to observe some basic rules when fitting transducers into standpipes.

BLANKING: Parameter 6 should always be set at least 150mm longer than the length of the standpipe.

STANDPIPE DIMENSIONS: should be in accordance with the following table

Minimum bore of Standpipe	Maximum length of Standpipe
3" (75mm)	300mm
4" (100mm)	300mm
6" (150mm)	400mm
8" (200mm)	600mm
12" (300mm)	600mm

e.g. Using a 4" flanged transducer would require the standpipe length to be no more than 300mm and Pr.6 set at 450mm minimum.

The inside of the pipe and joint with vessel top must be clean and free of any obstructions, seams or welds.

Transducer Mounting

An isolation kit is provided with each transducer to minimise any ringing transmitted through the mounting structure.

The transducer must be mounted perpendicular to any liquid surface being monitored, but on solids use the aiming kit and point towards the draw off position. Ideally, at least 0.5 metres above the full point.

The transducer has a 10° inclusive conical beam angle at 3dB and must be mounted with a clear unobstructed sight of the material to be measured over the complete measurement range.

The transducer is provided with integral cable which can be extended up to 300 metres using a suitable junction box and RG62AU cable. The temperature compensated version of the RXV15 (which is called RXT15) transducer requires an additional single core screen extension as shown below.

Transducer cables and temperature compensation cables can be run together but should be separated from power cables by at least 150mm and preferably installed in their own earthed steel conduit.

Figure 2. **Dimensions of RXV15 and RXT15 Series**

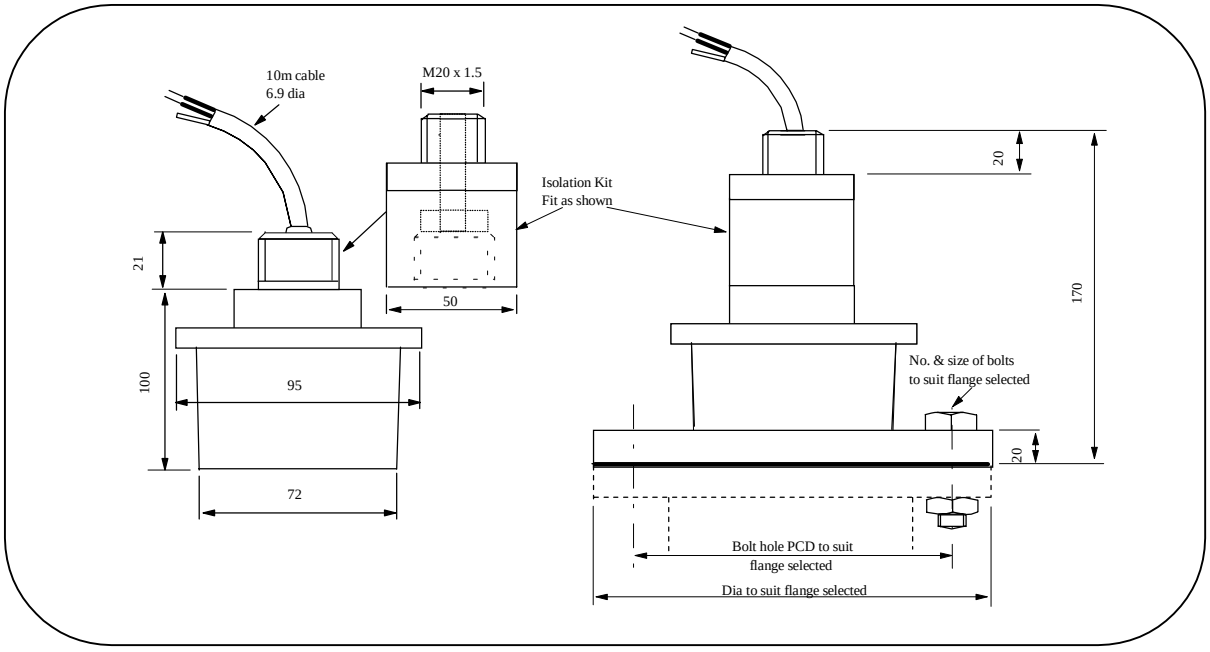


Figure 3.

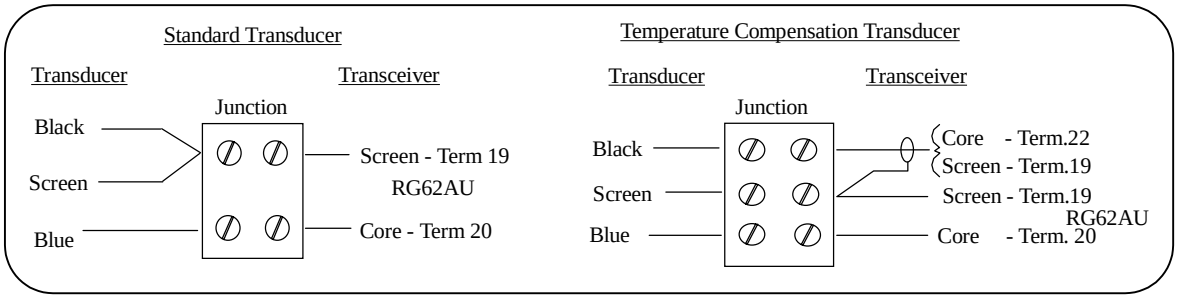


Figure 4.

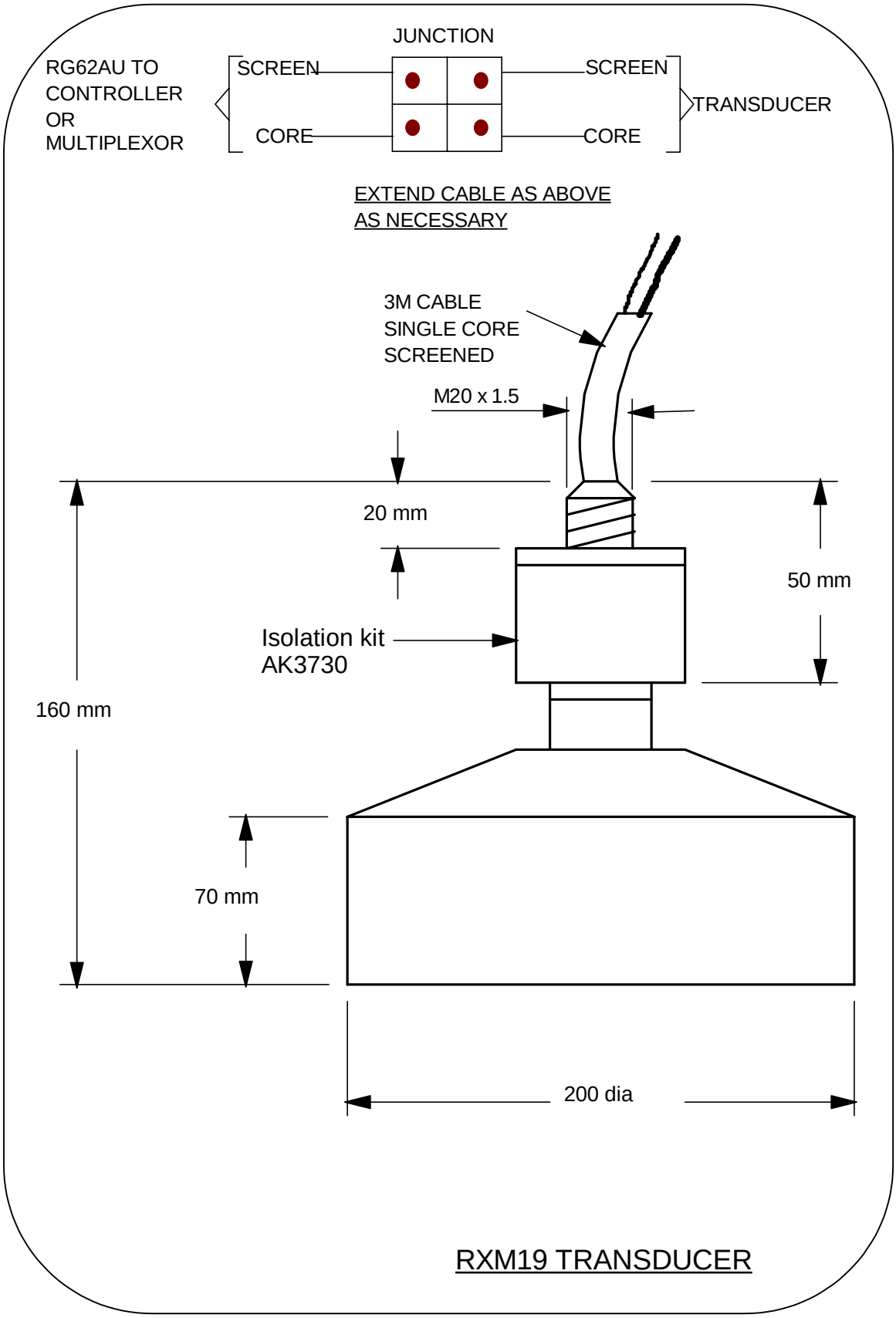

JUNCTION
RG62AU TO CONTROLLER OR MULTIPLEXOR
SCREEN
CORE
SCREEN
CORE
TRANSDUCER
EXTEND CABLE AS ABOVE AS NECESSARY
3M CABLE SINGLE CORE SCREENED
M20 x 1.5
20 mm
50 mm
Isolation kit AK3730
160 mm
70 mm
200 dia
RXM19 TRANSDUCER

Figure 5.

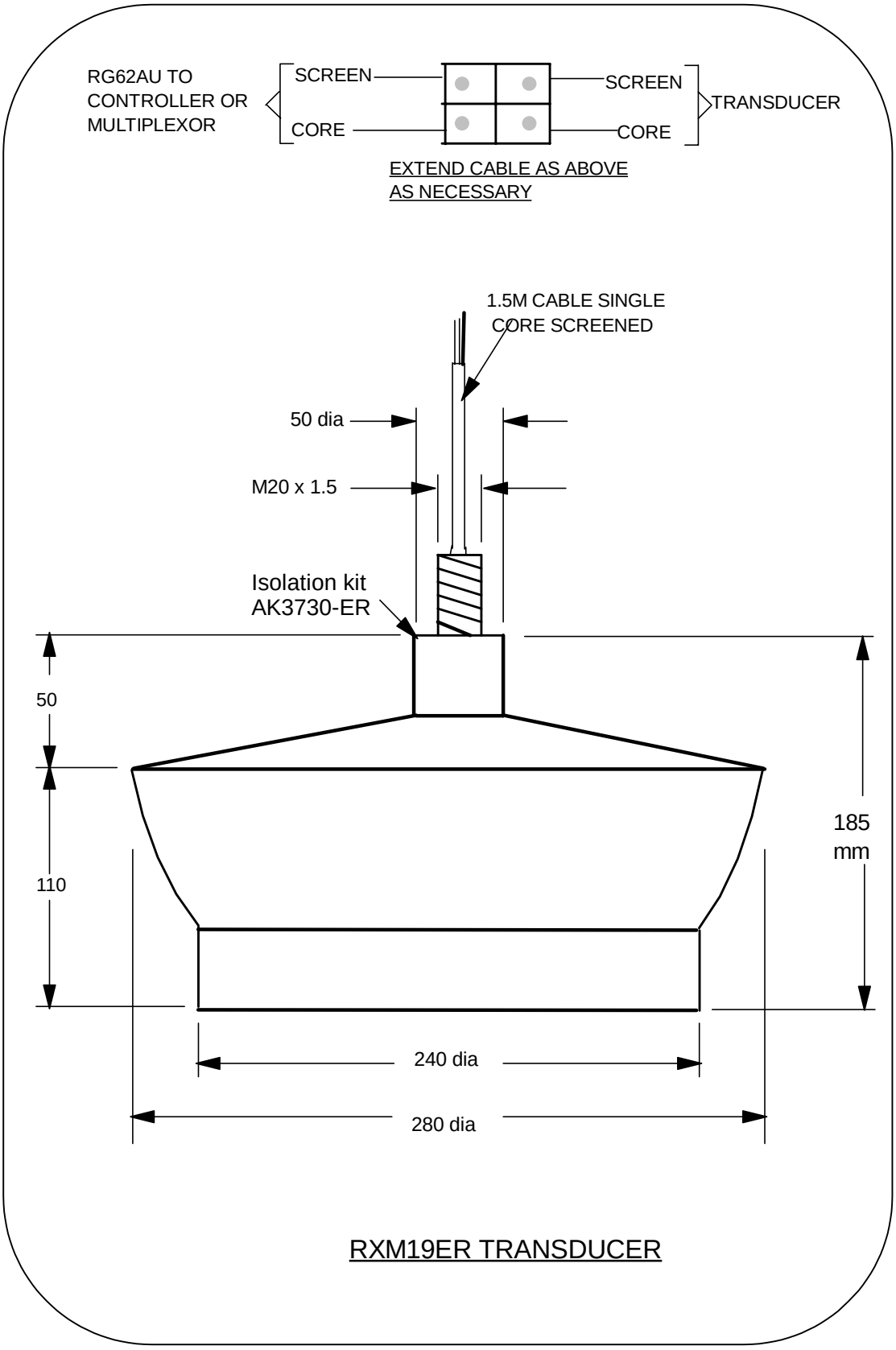
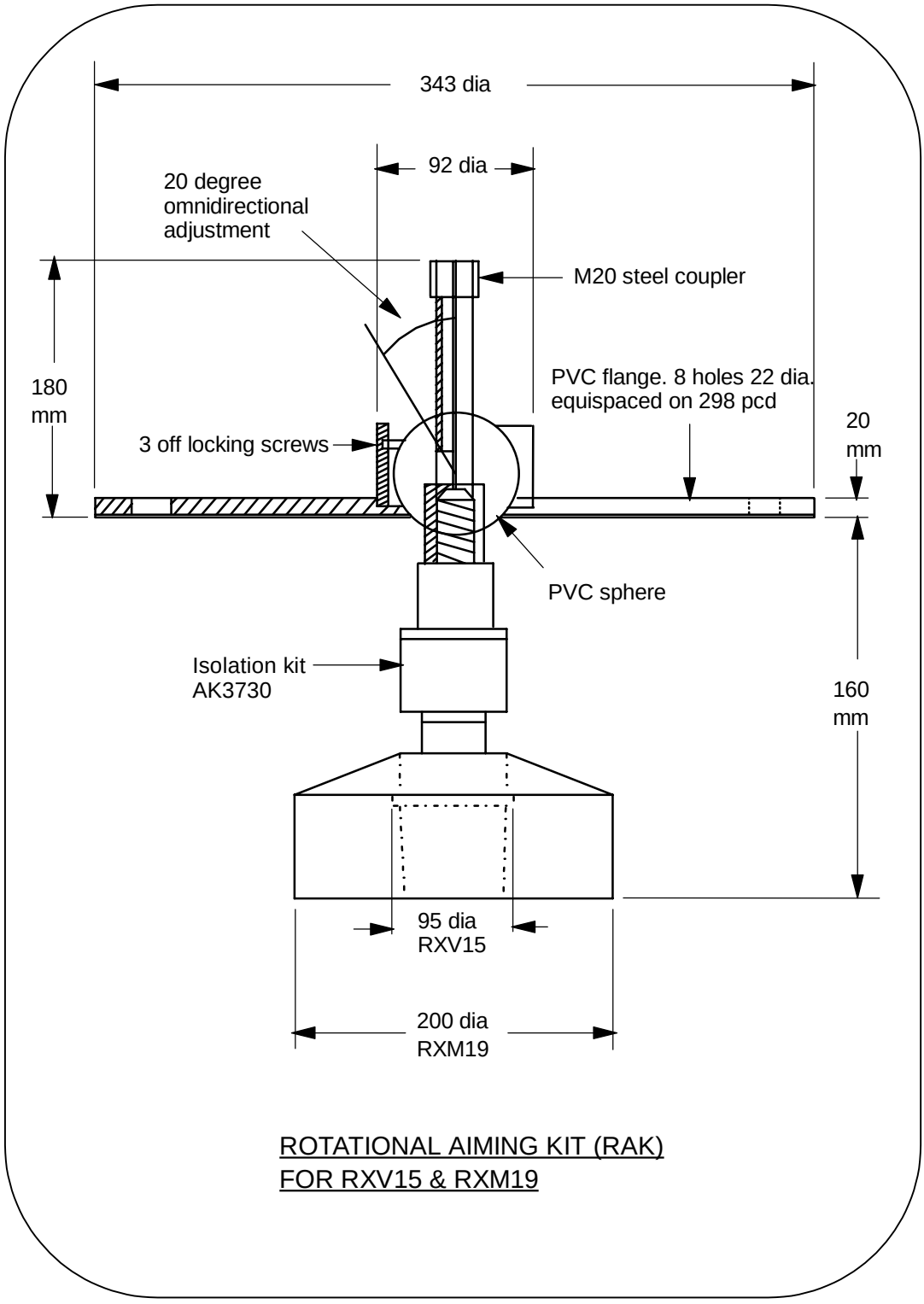
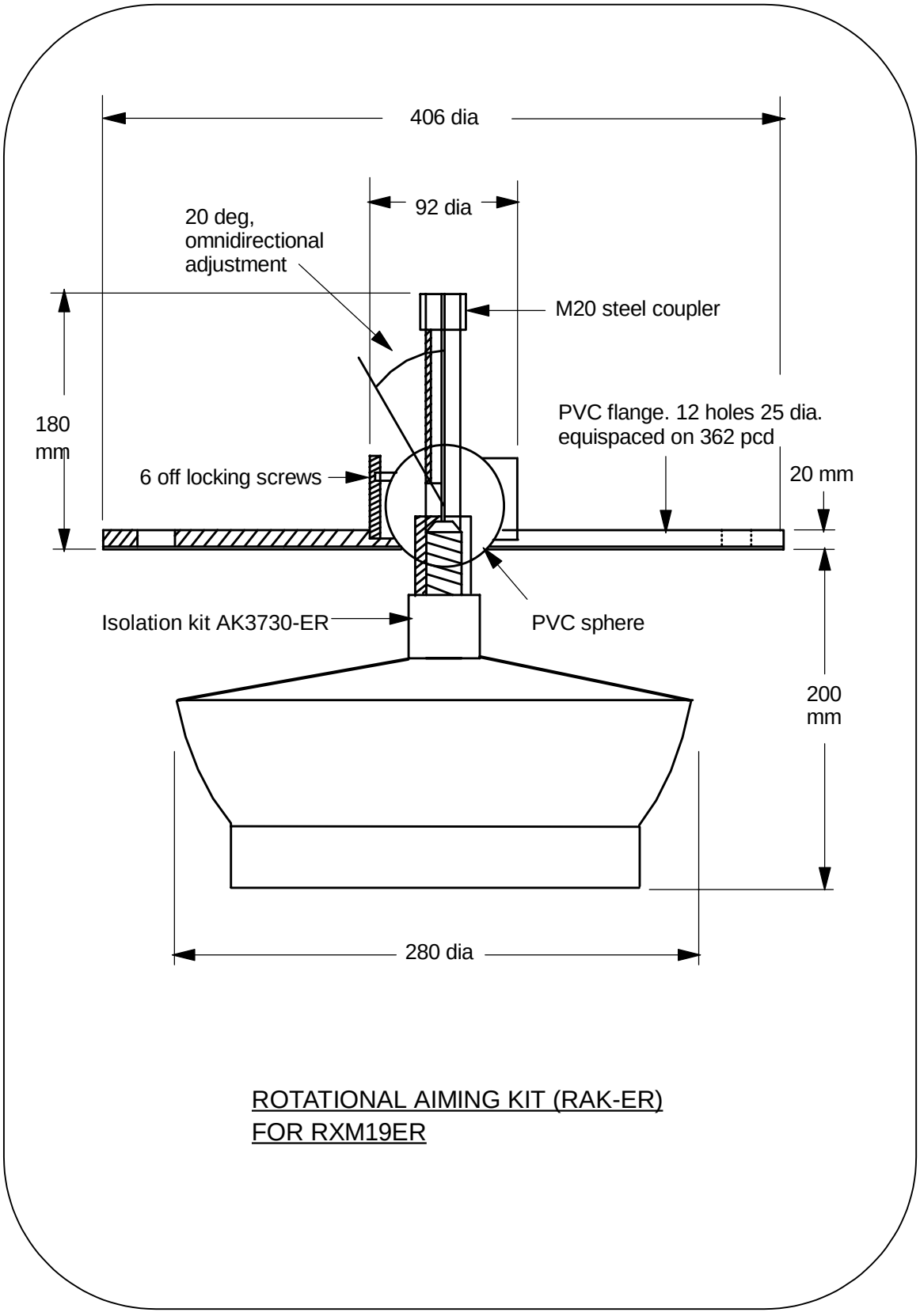

RG62AU TO
CONTROLLER OR
MULTIPLEXOR
SCREEN
CORE
SCREEN
CORE
TRANSDUCER
EXTEND CABLE AS ABOVE
AS NECESSARY
1.5M CABLE SINGLE
CORE SCREENED
50 dia
M20 x 1.5
Isolation kit
AK3730-ER
50
110
185
mm
240 dia
280 dia
RXM19ER TRANSDUCER

Figure 6.



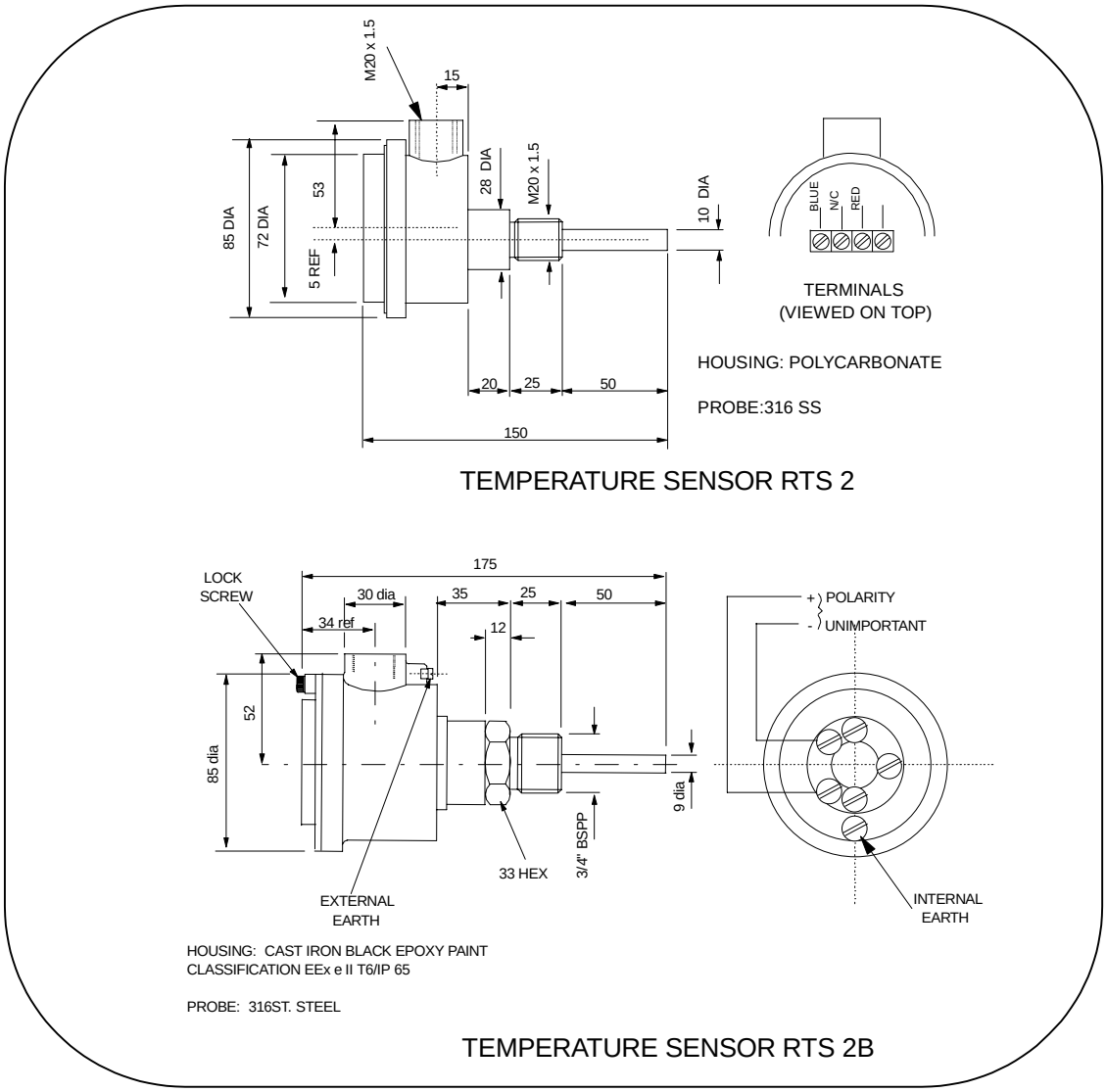
ROTATIONAL AIMING KIT (RAK)
FOR RXV15 & RXM19

Figure 7.



ROTATIONAL AIMING KIT (RAK-ER)
FOR RXM19ER

Figure 8



TEMPERATURE SENSOR SPECIFICATION

In applications where high accuracy is needed with varying temperatures, a temperature sensor will be required; the error without this will be 0.17% of reading, per degree centigrade change but is reduced to 0.017% of reading with sensor fitted.

Three sensors are available:-

a)	Integral	-	With RXV15 family transducers as standard.
b)	RTS-2	-	General purpose IP65 Polycarbonate enclosure and stainless steel probe.
c)	RTS-2B	-	Cast iron IP65 enclosure and stainless steel probe. Certified to EExeIIT6 for Zones 1 & 2

These sensors should not be used for process temperature measurement or control.

REFLEX/SCANFLEX MODULE DESCRIPTION AND SPECIFICATIONS

REFLEX/SCANFLEX CONTROLLER DESCRIPTION

The Reflex/Scanflex Controller is a stand-alone single point level instrument or can form the heart of a scanner system. It configures the system, takes all the measurement and controls the setting of all outputs.

It consists of a single main board fitted with an intelligent display board in a standard Polycarbonate enclosure. All data to configure and test the Controller and the system is input via the membrane keypad.

The display board has its own microprocessor which allows it to generate various displays on the graphics LCD module without slowing down the main processor.

The Controller is fitted with relays which can be individually programmed in the Reflex mode but are used to provide group status alarm in the Scanflex mode. Their alarm state is shown by red LED's on the display.

The analogue output on the Controller gives an output that corresponds to the latest value sent to the analogue module. In Scanflex mode it therefore gives an output which changes as the Controller scans around the measurement points.

The Controller is fitted with two serial communications ports. The RS232 is available to the customer for connection to a local computer to obtain data on the displayed value, temperature and alarms for each point on the system. To use this the customer will need to request the Communications Polled Data Transfer Leaflet.

The RS485 port is also available to transmit data to the customers computer in Reflex mode, but is used to communicate with the Multiplexor, Relay and Analogue Modules in the Scanflex mode.

The module is fitted with two part screw terminal connectors.

RFLFLEX CONTROLLER SPECIFICATION

Enclosure	:	IP65 and NEMA 4X polycarbonate, hinged lid.
Dimensions	:	240H x 160W x 90Dmm
Weight	:	1.75Kg
Power Supply	:	110/230V AC +/- 10% selected automatically. 50/60Hz, 12VA. 24V DC +20% -10%, 9Watt separate terminals.
Fuse Rating	:	F5 T160mA for ac supply F6 T315mA for 24V dc supply F1 & F2 T80ma
Range	:	Up to 50m (depending on transducer)
Accuracy	:	+/- 0.25% of measured distance from the transducer at constant temperature of 20^{o}C.
Ambient Temperature	:	-40^{o}C to +70^{o}C
Calibration	:	Integral keypad with security code
Resolution	:	2mm or 0.1% of range , whichever is greater
Outputs : Analogue	:	4-20mA into 750 ohms. 16 bit. Short circuit protected and opto-isolated on ac powered units. Non isolated on 24V dc units. Maximum allowable degradation of signal 2% under extremes of transient and constant conducted immunity test to EN50082
Relays	:	5 multi-function SPDT relays rated 8A/230Vac/30Vdc resistive, with gold contact.
Serial	:	Channel 1 RS232. Available to customer Channel 2 RS485. Used by system in multipoint mode.
Indication	:	Graphics LCD module (120 x 32 dot) 5 red LED's to indicate relay status
Failsafe	:	High, Low, Hold
Failsafe Time received	:	Adjustable. Specified as time since last valid echo on a point.
Rate of Change	:	Fully adjustable (Pr.7) (0.1 to 4m/min)
Blanking transducer	:	Fully adjustable (Pr.6) min 0.3m depending on
Optional Temperature Sensor	:	Reduces ambient temperature errors from 0.17%/deg C of measured distance to 0.01%/deg C
Terminals	:	2 part screw terminals.

SCANFLEX MULTIPLEXOR SM-10
DESCRIPTION

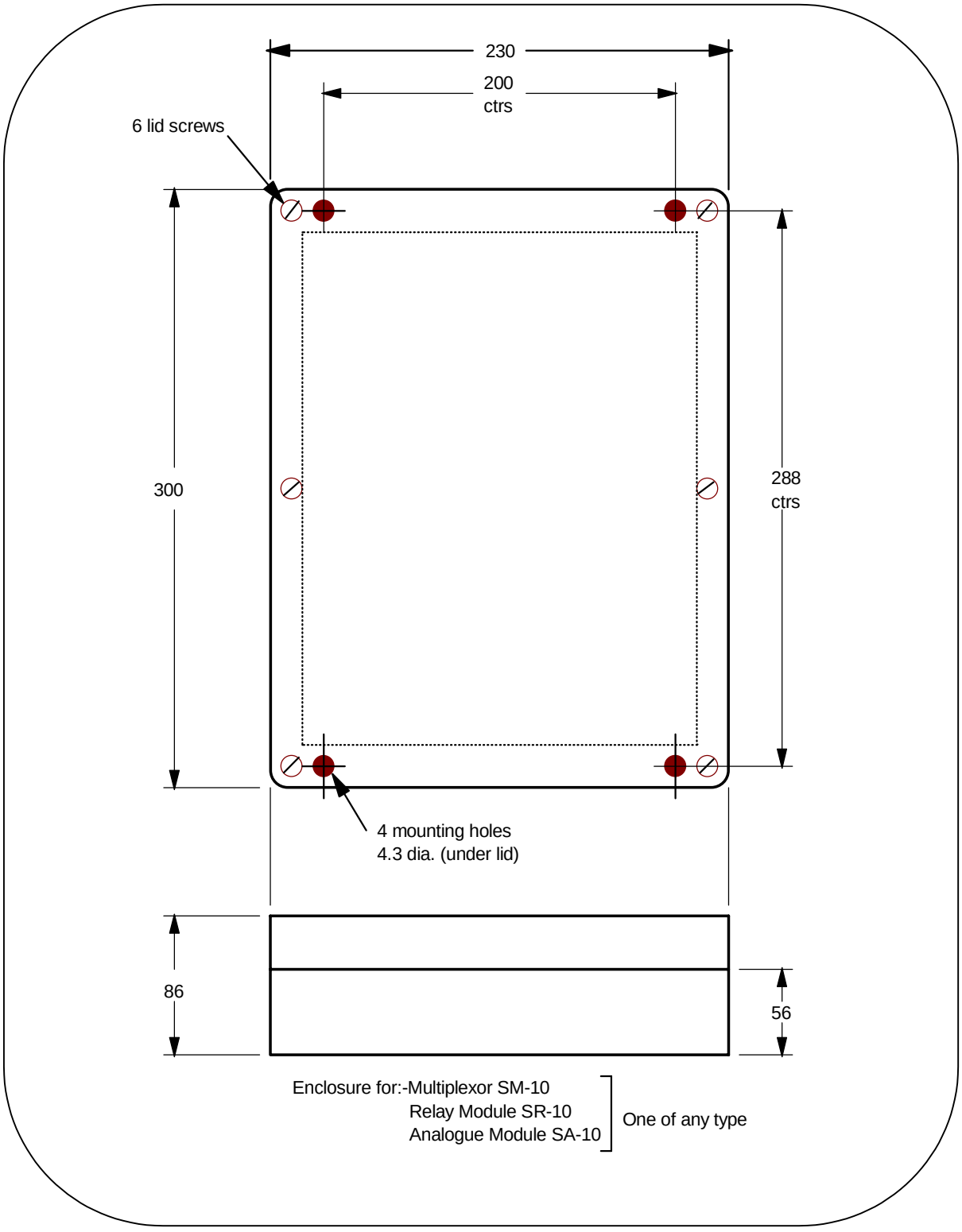
The Scanflex Multiplexor is mounted in an IP65 polycarbonate enclosure with a clear lid. (See Page 59)

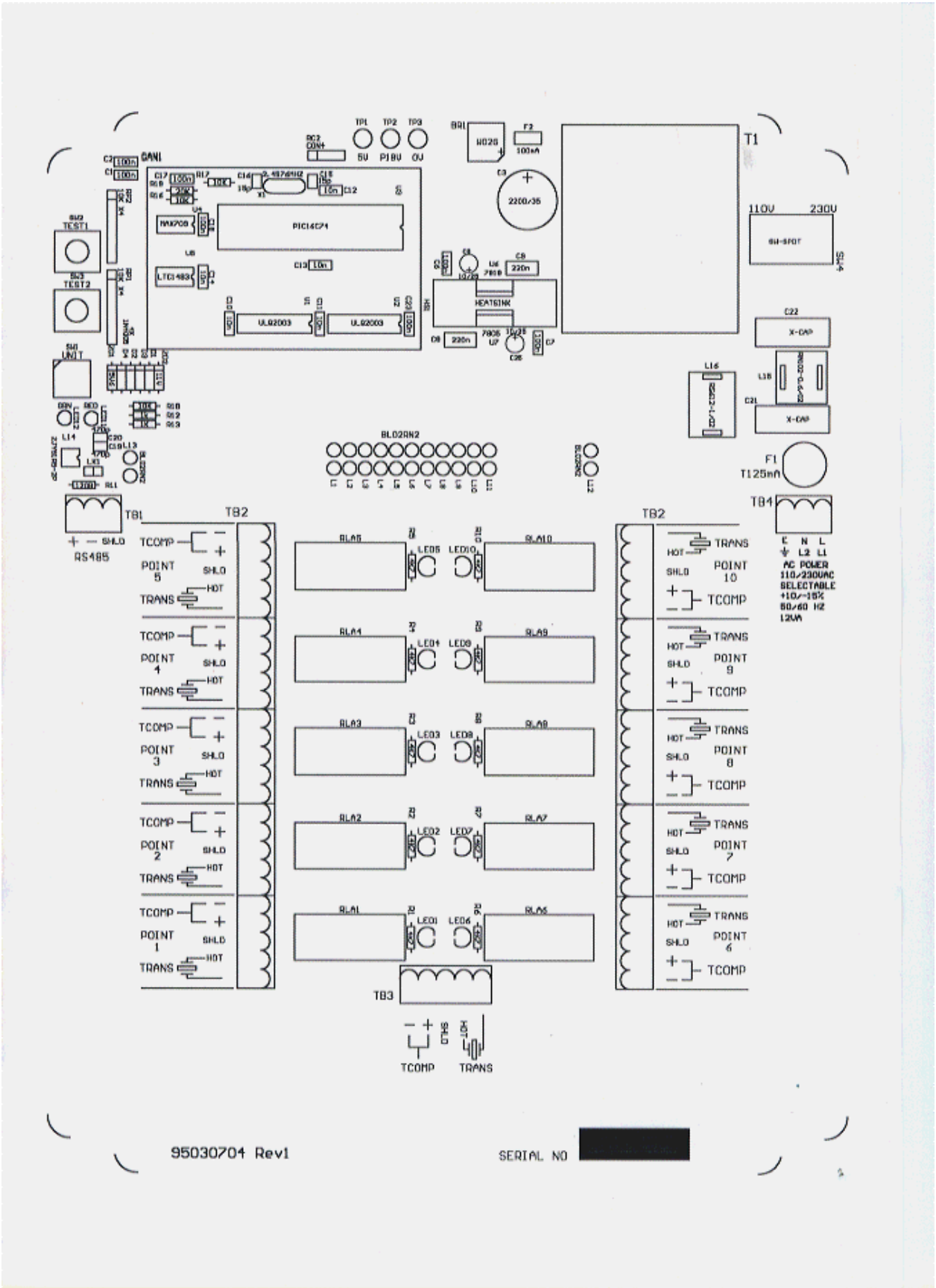
The Multiplexor controls the setting of a relay to select the transducer (and temperature sensor) for the required measurement point. The transducer currently connected to the controller is identified by an illuminated red l.e.d. adjacent to the energised relay.

The module is fitted with an RS485 serial port for communications with the controller. The controller transmits data every half second when in the measurement mode. When a valid message is received, the green 'comms' l.e.d. will flash.

The selector switch (SW1) marked 'UNIT' is used to select the number that uniquely identifies the module to the controller. For the Multiplexor, settings must always be 1. If the switch is set to zero the module can be tested using the momentary switches SW2 and SW3. By pressing 'TEST 1' (SW2) the relays are energised rapidly in sequence, while 'TEST 2' (SW3) is pressed to energise the next relay in the sequence. To exit from the test condition move the selector switch (SW1) away from zero.

The module is fitted with two part screw terminal connectors for ease of wiring, with separate connectors for each point. A full description of the connections is shown on Page 60.


230
200
ctrs
6 lid screws
300
288
ctrs
4 mounting holes
4.3 dia. (under lid)
86
56
Enclosure for:-Multiplexor SM-10
Relay Module SR-10
Analogue Module SA-10
One of any type


TP1 TP2 TP3
5V P18V 0V
T1
110V 230V
PIC14C71
HEATSINK
X-CAP
F1
T125mA
TB1
TB2
TB3
TB4
RS485
TCOMP
POINT
SHLD
HOT
TRANS
AC POWER
110/230VAC
SELECTABLE
+10/-15%
50/60 HZ
12VA
95030704 Rev1
SERIAL NO

SCANFLEX MULTIPLEXOR SM-10
SPECIFICATION

Enclosure	:	IP65 Polycarbonate
Dimensions	:	330H x 230W x 85D (mm)
Weight	:	1.75Kg
Power Supply	:	110/230V a.c. selectable 50/60Hz 12VA
Supply Variation	:	+10% -15%
Fuse Rating	:	250mA slow-blow
Ambient Temperature	:	-40^{o}C to +70^{o}C
Relay	:	10 off DPST, rated to switch the transducer and temperature probe signals.
Indication	:	1 off red l.e.d. to indicate power on
		10 off red l.e.d's to indicate energisation state of relays
		1 off green l.e.d. to indicate communications with controller
Switches	:	1 off module number selector
		2 off relay test
Connections	:	Two part screw terminal connectors

SCANFLEX RELAY MODULE SR-10
DESCRIPTION

The Scanflex Relay Module is mounted in an IP65 polycarbonate enclosure with a clear lid. (See Page 59)

The Module controls the settings of 2 relays for each point of measurement, a total of 20. The energisation state of each relay is shown by an adjacent red l.e.d., an energised relay illuminates the l.e.d.

The module is fitted with an RS485 serial port for communications with the controller. When a valid message is received, the green 'comms' l.e.d. will flash. The link (LK1) located by terminal TB1 connects a line termination resistor into the communications circuitry. It is fitted only when the Relay Module is the last Module in the system configuration.

The selector switch (SW1) marked 'UNIT' is used to select the number that uniquely identifies the module to the controller. For the Relay Module settings 1-15 can be used. Each Module on the system must have a different setting number. If the switch is set to zero the module can be tested using the momentary switches SW2 and SW3. By pressing 'TEST 1' (SW3) the relays are energised rapidly in sequence, while 'TEST 2' (SW3) is pressed to energise the next relay in sequence. To exit from the test condition move the selector switch (SW1) away from zero to its correct position.

The module is fitted with two part screw terminals connectors for ease of wiring, with separate connectors for each point. A full description of the connectors is shown on Page 63.

As the Controller can set 4 alarms per point (when 2 Relay Modules are used) relays are programmed thus:-

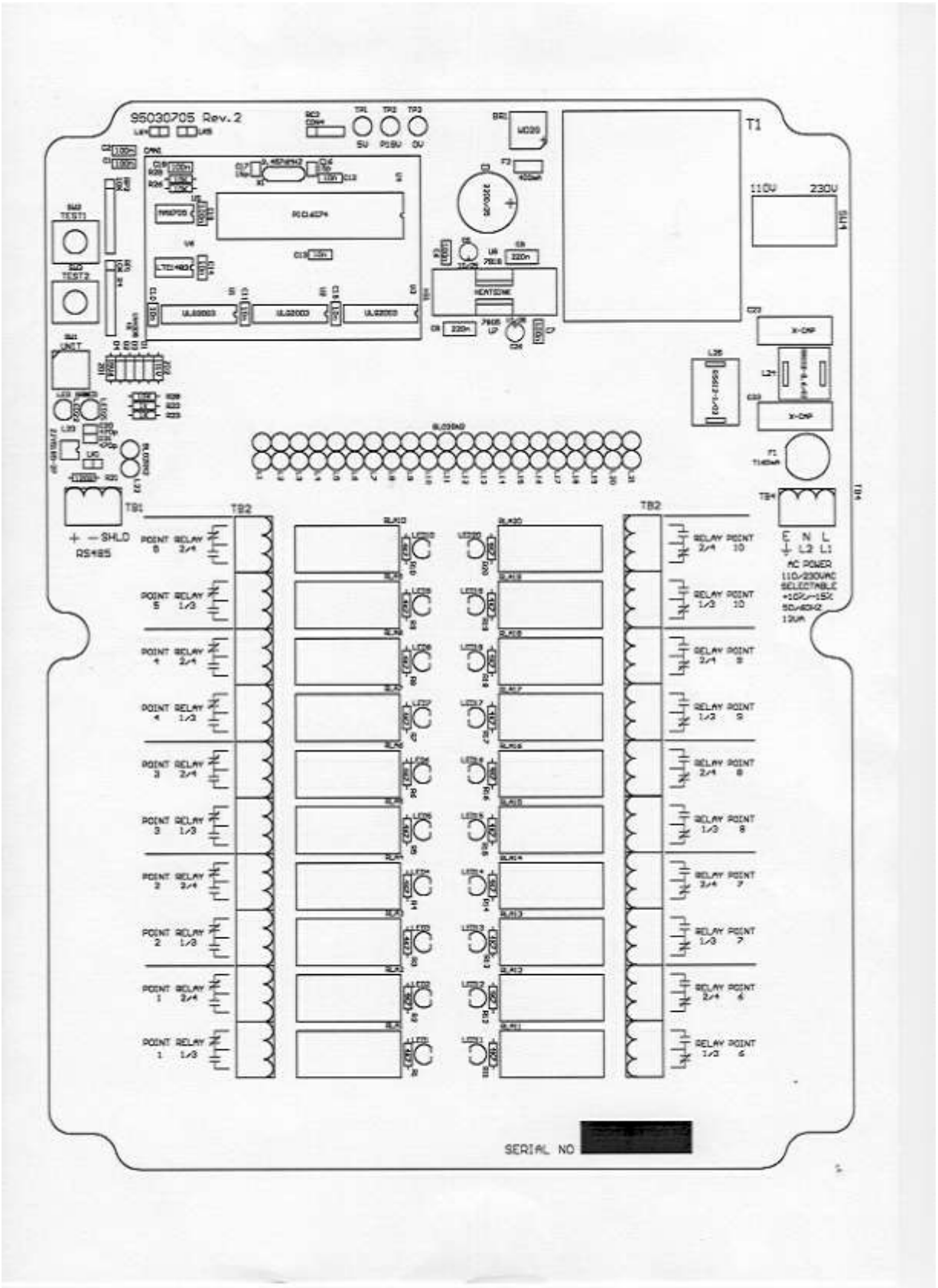
1st Relay Module

Fit link at LK5 (top left of board) to define relays as 1 & 2. Programme via Pr.08 to Pr.13 for settings and Pr.23 and 24 for fail-safe.

2nd Relay Module

Fit link at LK4 (to left of board) to define relays as 3 & 4. Programme via Pr.14 to Pr.19 for settings and Pr.25 and 26 for fail-safe.

Note: On the Relay Module pcb the relays have dual identification i.e. 1/3 or 2/4, to accommodate the above selections.


95030705 Rev.2
T1
110V
230V
TB1
TB2
TB3
TB4
+ – SHLD
RS485
AC POWER
110/230VAC
SELECTABLE
SERIAL NO

SCANFLEX RELAY MODULE SR-10
SPECIFICATION

Enclosure	:	IP65 Polycarbonate
Dimensions	:	300H x 230W x 85D (mm)
Weight	:	1.75Kg
Power Supply	:	110/230V a.c. selectable, 50/60Hz 12VA
Supply Variation	:	+10% -15%
Fuse Rating	:	250mA slow-blow
Ambient Temperature	:	-40^{o}C to +70^{o}C
Relay	:	20 off SPDT, rated 8A/230Vac/30Vdc
Indication	:	1 off red l.e.d. to indicate power on
		20 off red l.e.d. to indicate relay status
Switches	:	1 off module number selector
		2 off relay test
Connections	:	Two part screw terminal connectors

SCANFLEX ANALOGUE MODULE SA-10
DESCRIPTION

The Scanflex Analogue Module is mounted in an IP65 polycarbonate enclosure with a clear lid. (See Page 59)

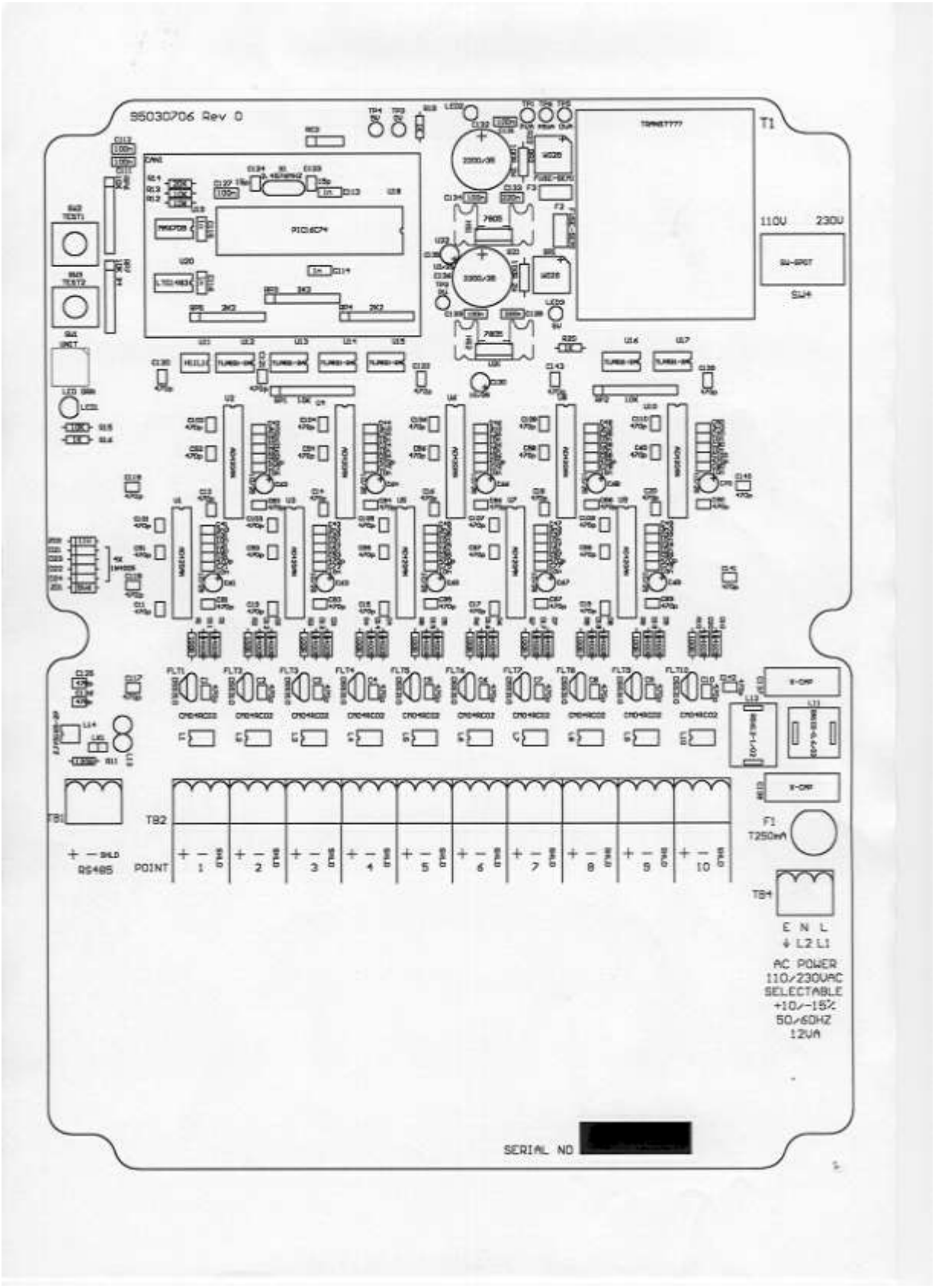
The Module controls the setting of an analogue output for each point of measurement. The current output has 12-bit resolution and gives 4-20mA into 750 ohms.

The module is fitted with an RS485 serial port for communications with the controller. When a valid message is received, the green 'comms' l.e.d. will flash. The link (LK1) by TB1 connects a line termination resistor into the communications circuitry. It is used only when the Module is that last one on the system configuration

The selector switch (SW1) marked 'UNIT' is used to select the number that uniquely identifies the module to the controller. For the analogue module settings 2-15 can be used. Each Module on the system must have a different setting number. if the switch is set to zero the module can be tested using the momentary switches SW2 and SW3. By pressing 'TEST 1' (SW2) all of the analogue channels will be set to a value of approximately 20mA. To exist from the test condition move the selector switch (SW1) away from zero to its correct position.

When the Module is initialised, the analogue outputs will be at a value of 2.8mA to signify no valid reading, until data is transmitted for that point.

The Module is fitted with two part screw terminal connectors for ease of wiring, with separate connectors for each point. A full description of the connection is shown on Page 66.


95030706 Rev 0
T1
110V
230V
PIC16C74
TB1
TB2
RS485
POINT
F1
T250mA
TB4
E N L
AC POWER
110/230VAC
SELECTABLE
+10/-15%
50/60HZ
12VA
SERIAL NO

SCANFLEX ANALOGUE MODULE SA-10
SPECIFICATION

Enclosure	:	IP65 Polycarbonate
Dimensions	:	300H x 230W x 85D (mm)
Weight	:	1.75Kg
Power Supply	:	110/230V a.c. selectable 50/60Hz 12VA
Supply Variation	:	+10% -15%
Fuse Rating	:	250mA slow-blow
Ambient Temperature	:	-40^{o}C to +70^{o}C
Analogue Outputs	:	10 off 4-20mA into 750 ohms, short circuit protected. Group opto-isolated. (All have common -ve and shield)
Indication	:	2 off red l.e.d.'s to indicate power on.
		1 off green l.e.d. to indicate communications with Controller.
Switches	:	1 off module number selector
		2 off mA test
Connections	:	Two part screw terminal connectors

LINEARISATION OF VESSELS

This feature is available only in Reflex single point mode

This feature allows volume conversion to be applied on irregular shaped vessels providing that level/volume relationships are known.

The system allows the entry of a volume profile at up to 16 points of level to be entered into memory, that is then used to produce the required volume values when in 'RUN' mode. The required profile is stored in parameter 44.

Before proceeding it is useful to write down a table of the point numbers and 'A'/'B' values to facilitate programming.

The facility is enabled by Pr.40 = 8. The profile is stored as percentage of level, against percentage of the total volume. See example on Page 69.

PROCEDURE

The procedure uses a 16 point curve to map the profile, but all 16 points do not have to be used.

% Level is designated "A"
% Volume is designated "B"

The profile data is input into Pr.44 which, when accessed, [Pr.44, 'DSP', 'ENT'] will display 'A1', which means the data pointer is at value 1 on 'A' data. The values displayed can be changed as required.

Pr.44 - Keyboard Controls

#	-	Toggles the display between data blocks 'A' and 'b'
'▲'	-}	Increases and decreases through the 16 point numbers, when either the point
	-}	number
'▼'	-}	or its value is displayed.
CE	-	Clears the display when inputting a new value.
DSP	-	Toggles the display between the block and point number and the value.
ENT	-	Enters a new value.
TEST	-	Exits Pr.44 and returns the operator to the normal programme.
0-9	-	The number keys and decimal point are used to input new values. Increasing or decreasing through the 16 point numbers can be done only by using the '▲' and '▼' keys.

Pr.44 - Inputting Values

When a new value is to be entered, first display the old value and then input the new and press 'ENT', the system will display the value it has stored in memory. The values input have to be in a specific form.

1. - Level - Designated 'A'
   - These values must be entered as a whole number.

   i.e. 11 will be accepted as 11
   22.3 will be accepted as 223.

The allowable range of values is 0-250%, any unused data values must be set to 255.

PARAMETER RESET: LOADS 255 TO ALL DATA VALUES.

2. - Volume - designated 'B'
   - These values are expected to contain one decimal place, therefore, it is not necessary to input the decimal place, but the procedure will display it.
   i.e. 10 will be accepted as 1.0
   95 will be accepted as 9.5

The allowable range of values is 0-500%.

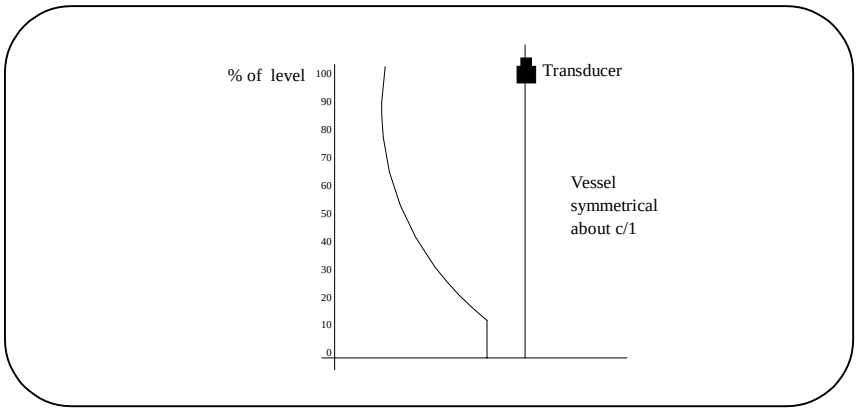
PARAMETER RESET: LOADS 0 TO ALL DATA VALUES.

NOTE:
1. As time is required to enter all the data, the standard keypad time-outs are suspended.
2. We recommend that the required values are written in tabular form, as shown before programming commences. Then enter all Block A values, before entering all Block B values.

Example: Vessel Mapping

Use Example 2 on Page 35, but substitute a special shape vessel.

Assume the data in the table below has been given for the vessel. Enter it into the Reflex in the following Manner.



Required Values

Point Number	'A' % Level	'A' Key in Values	'B' % Volume	'B' Key in Values
1	0	0	0.0	0
2	10	10	3.3	33
3	20	20	16.1	161
4	30	30	27.3	273
5	40	40	37.5	375
6	50	50	48.5	485
7	60	60	59.5	595
8	70	70	70.5	705
9	80	80	80.0	800
10	90	90	89.5	895
11	100	100	100.0	1000
12	110	110	Not Used	Not Used
13	255	255	Not Used	Not Used
14	255	255	Not Used	Not Used
15	255	255	Not Used	Not Used
16	255	255	Not Used	Not Used

NOTE:
1. Points 13 to 16 not used - leave at factory default value.
2. 'A' values must be whole numbers, no decimals allowed.
3. 'B' values must be entered as the 'key-in' value, the decimal will be automatically allocated.

Now continue programming the instrument as follows:

Programme the instrument exactly as Example 2 on Page 35, except:

Change Pr.40	from 1 to 8, which denotes vessel linearisation
Go to Pr.44	and proceed as follows:
Press Pr.44	to display Pr.44:
Press 'DSP'	
Press 'ENT'	to show 'A1' and the value held in 'A1' (default = 255) Key in the value 'O' from Table 1 and press 'ENT' to show .0 again.
Press '▲'	to show 'A2' and the value held in '2' (default = 255) Key in the value 10 from Table 1 and press 'ENT' Continue for all points which you need to use (up to 'A16)' Any points not used must be left at the default of 255
Press '▼'	several times to return to 'A1'
Press #	to show 'B1' and the value held in 'B1' (default = .0) Key in the value '0' from Table 1 and press 'ENT' to show .0 again.
Press '▲'	to show 'B2' and the value held in 'B2' (default = .0) Key in the value '33' from Table 1 (accepted as 3.3) Continue for all points which you need to use (up to B16) Any points not used must be left at the default of .0
Press 'TEST'	then 'DSP' to move the cursor under Pr.44
	Leave the linearisation part of the programme by displaying any other parameter, or go into 'RUN' mode.

Appendix 4

REFLEX PARAMETER SETTINGS

Pr	Description	Factory Default	User	Eng
Basic Set-up				
1	Single or Multi Point	1		
2	Transducer Type	1		
3	Application/Units	2		
4	Empty Distance	30.00		
5	Operational Span	30.00		
6	Blanking Distance	1.00		
7	Rate of Change	1.00		
Relays				
8	Relay 1 Designation	0		
9	Relay 1 Set	0.00		
10	Relay 1 Reset	0.00		
11	Relay 2 Designation	0		
12	Relay 2 Set	0.00		
13	Relay 2 Reset	0.00		
14	Relay 3 Designation	0		
15	Relay 3 Set	0.00		
16	Relay 3 Reset	0.00		
17	Relay 4 Designation	0		
18	Relay 4 Set	0.00		
19	Relay 4 Reset	0.00		
20	Relay 5 Designation	0		
21	Relay 5 Set	0.00		
22	Relay 5 Reset	0.00		
Failsafe				
23	Failsafe R1	3		
24	Failsafe R2	3		
25	Failsafe R3	3		
26	Failsafe R4	3		
27	Failsafe R5	3		
28	Failsafe Analogue	3		
29	Failsafe Time Delay	600		
Analogue				
30	Analogue Output	1		
32	Analogue Datum	0.00		
33	Analogue Span	100.0		
34	Analogue Test	0		
Temperature				
37	Probe Enable	1		
38	Temp. Compensation	20°C		
39	Probe Test	0.00		
Volume Conversion				
40	Vessel Shape	0		
41	Dimension H	0.00		
42	Dimension L	0.00		
43	Display Conversion	1		
44	Volume Linearisation	'====='		

Pr	Description	Factory Default	User	Eng
Scanner Control				
49	Point Data Reset	'===='		
50	Point Data Copy Over	0		
51	Number of Modules	1		
52	Max. Time Per Point	15		
53	Manual Scan Select	0		
Communications				
62	Serial Comms. Enable	1		
63	Station Number	0		
Echo Detection				
65	Maximum Gain	80.0		
66	Gain Restriction	2		
68	Echo Selection	1		
69	Echo Velocity	344.1		
Miscellaneous				
70	Parameter Display	0		
71	Correction Value	0.00		
72	Decimal Point	2		
73	Software Revision No.	S/WARE		
74	Reset Counter	0		
Test Parameters				
75	Digitial Output Set	0		
76	Hardware Test	'===='		
77	Transmitter Test	'===='		
78	Simulation	'===='		
Filter Settings				
80	Filter One			
81	Filter Two			
Number Store				
95	Serial Number Store	Ser.No		
96	Security Code Store	15.02		
Resets				
97	Relay Totaliser Reset	'===='		
99	Total System Reset	'===='		

SCANFLEX PARAMETER SETTINGS

POINT 1		
Pr.	**Fact.**	**Ent.**
1	1	
2	1	
3	2	
4	30.00	
5	30.00	
6	1.00	
7	1.00	
9	0.00	
10	0.00	
12	0.00	
13	0.00	
15	0.00	
16	0.00	
18	0.00	
19	0.00	
21	0.00	
22	0.00	
34	0.00	
37	1	
38	20ºC	
39	0.00	
40	0	
41	0.00	
42	0.00	
43	1.00	
65	80.0	
66	2	
68	1	
69	344.1	
71	0.00	

POINT 2	
Pr.	**Ent.**
1	
2	
3	
4	
5	
6	
7	
9	
10	
12	
13	
15	
16	
18	
19	
21	
22	
34	
37	
38	
39	
40	
41	
42	
43	
65	
66	
68	
69	
71	

POINT 3	
Pr.	**Ent.**
1	
2	
3	
4	
5	
6	
7	
9	
10	
12	
13	
15	
16	
18	
19	
21	
22	
34	
37	
38	
39	
40	
41	
42	
43	
65	
66	
68	
69	
71	

POINT 4	
Pr.	**Ent.**
1	
2	
3	
4	
5	
6	
7	
9	
10	
12	
13	
15	
16	
18	
19	
21	
22	
34	
37	
38	
39	
40	
41	
42	
43	
65	
66	
68	
69	
71	

POINT 5	
Pr.	**Ent.**
1	
2	
3	
4	
5	
6	
7	
9	
10	
12	
13	
15	
16	
18	
19	
21	
22	
34	
37	
38	
39	
40	
41	
42	
43	
65	
66	
68	
69	
71	

POINT 6	
Pr.	**Ent.**
1	
2	
3	
4	
5	
6	
7	
9	
10	
12	
13	
15	
16	
18	
19	
21	
22	
34	
37	
38	
39	
40	
41	
42	
43	
65	
66	
68	
69	
71	

POINT 7	
Pr.	**Ent.**
1	
2	
3	
4	
5	
6	
7	
9	
10	
12	
13	
15	
16	
18	
19	
21	
22	
34	
37	
38	
39	
40	
41	
42	
43	
65	
66	
68	
69	
71	

POINT 8	
Pr.	**Ent.**
1	
2	
3	
4	
5	
6	
7	
9	
10	
12	
13	
15	
16	
18	
19	
21	
22	
34	
37	
38	
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40	
41	
42	
43	
65	
66	
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69	
71	

POINT 9	
Pr.	**Ent.**
1	
2	
3	
4	
5	
6	
7	
9	
10	
12	
13	
15	
16	
18	
19	
21	
22	
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37	
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40	
41	
42	
43	
65	
66	
68	
69	
71	

POINT 10	
Pr.	**Ent.**
1	
2	
3	
4	
5	
6	
7	
9	
10	
12	
13	
15	
16	
18	
19	
21	
22	
34	
37	
38	
39	
40	
41	
42	
43	
65	
66	
68	
69	
71	

ALL POINTS		
Pr.	**Fact.**	**Ent.**
8	0	
11	0	
14	0	
17	0	
20	0	
23	3	
24	3	
25	3	
26	3	
27	3	
28	3	
29	600	
30	1	
32	0.00	
33	100	
50	0	
51	1	
52	15	
53	0	
62	1	
63	0	
70	0	
72	2	
73	S/Ware	
74	0	
75	H/Test	
76	H/Test	
77	T/Test	
78	SIM	
95	SerNo	
96	15!02	