4103/4100G

100 mm chart recorders

Options Manual

invensys
EUROTHERM

OPTIONS MANUAL

ALPHABETIC LIST OF OPTIONS

INSTALLATION CATEGORY AND POLLUTION DEGREE

This product has been designed to conform to BS EN61010 installation category II and pollution degree 2. These are defined as follows:

INSTALLATION CATEGORY II
The rated impulse voltage for equipment on nominal 230V ac mains is 2500V.

POLLUTION DEGREE 2
Normally, only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation shall be expected.

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* not graphics units

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1 RELAY OUTPUTS

1.1 INTRODUCTION

The relay output option comes in three versions, each of which uses a 1/2-width circuit board. The three versions are as follows:

1. 3-relay with change-over contacts (i.e. common, normally closed and normally open). In alarm or power off conditions, the common and normally closed contacts are closed.
2. 4-relay with normally open contacts (i.e. common and normally open contacts only). In alarm or power off conditions, the common and normally open contacts are open.
3. 4-relay with normally closed contacts (i.e. common and normally closed contacts only). In alarm or power off conditions, the common and normally closed contacts are closed.

1.1.1 Configuration

Alarm types, thresholds etc. are set up as described in the Channel Configuration section of the Installation and operation manual. Each relevant Process Variable can operate one or more relays using jobs.

JOBS

A single job 'Drive relay N of card N' (whilst active/inactive) is added to the job list shown in Section 4.1 of the installation and operation manual.

1.1.2 Relay specification

The relay specification for ac resistive loads is given below. Derate with reactive or inductive loads in accordance with figure 1.1.2a, in which:

F1 = Actually measured on representative samples
F2 = Typical values (according to experience)
Contact life = Resistive contact life x Reduction factor.

Number of relays per board	
Changeover board:	Three
Common - Normally closed board:	Four
Common - Normally open board:	Four
Estimated life	30,000,000 operations
Maximum ac contact voltage	250V ac*
Maximum ac contact current	2 Amps
Maximum ac switching power	500VA
Maximum dc voltage/current/switching power	See figure 1.1.2b
Safety isolation (dc to 65Hz; BS EN61010)	Installation category II, Pollution degree 2 (see page 1 for definitions).
Relay to relay:	300V RMS or dc (double insulation)*
Relay to ground:	300V RMS or dc (basic insulation)*

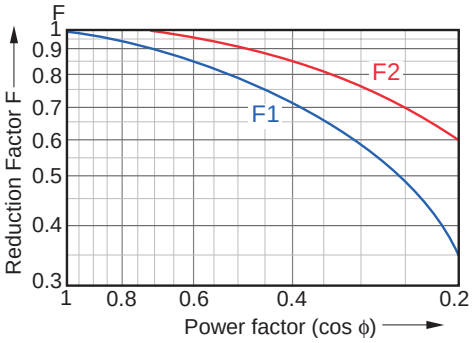


Figure 1.1.2a Derating curves

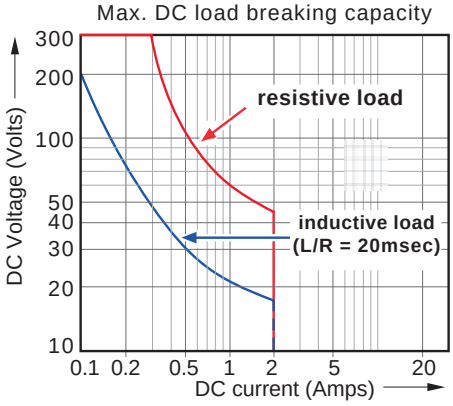


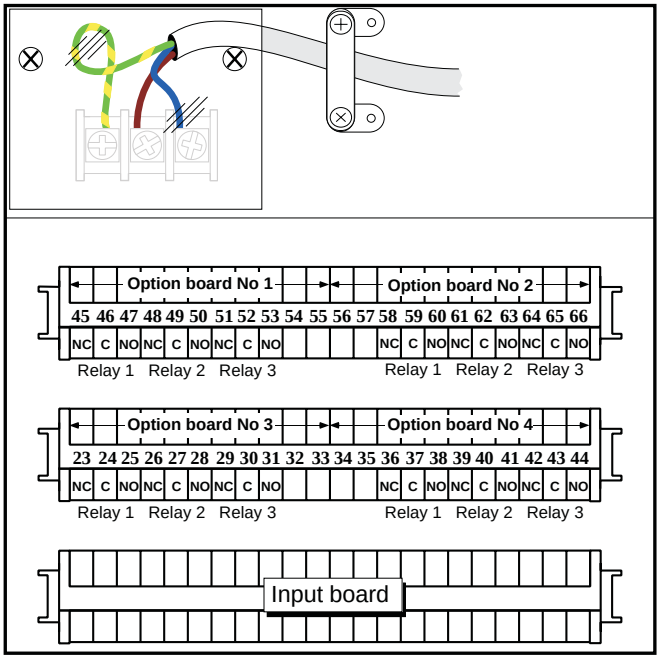
Figure 1.1.2b DC curves

* Caution
See Section 14 if the
Enhanced Immunity option is fitted.

1.2 RELAY WIRING

The following diagrams show user terminations for the different versions of the relay output board. Where other options are fitted, they are always fitted 'after' relay boards (i.e. relay boards always have the lowest option board numbers).

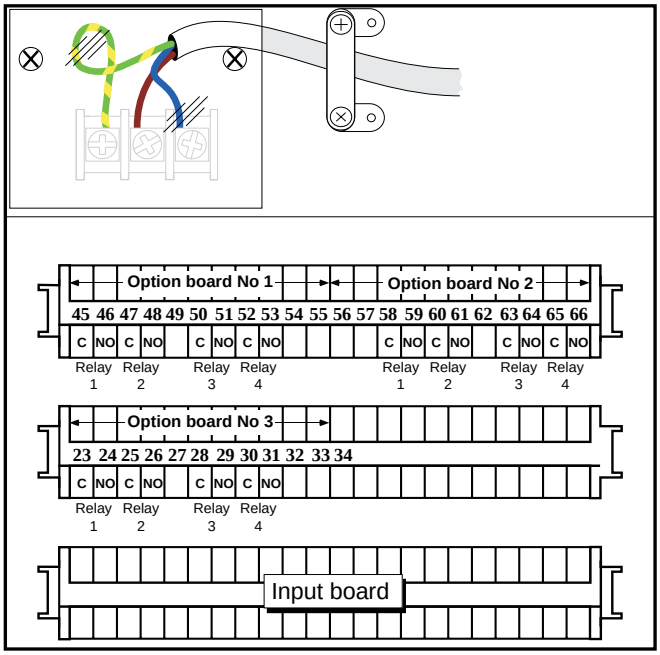
1.2.1 Three change-over relays board



Pin	Function
23 (45)	RELAY 1 NORMALLY CLOSED
24 (46)	RELAY 1COMMON
25 (47)	RELAY 1 NORMALLY OPEN
26 (48)	RELAY 2 NORMALLY CLOSED
27 (49)	RELAY 2 COMMON
28 (50)	RELAY 2 NORMALLY OPEN
29 (51)	RELAY 3 NORMALLY CLOSED
30 (52)	RELAY 3 COMMON
31 (53)	RELAY 3 NORMALLY OPEN
32 (54)	
33 (55)	
34 (56)	
35 (57)	
36 (58)	RELAY 1 NORMALLY CLOSED
37 (59)	RELAY 1 COMMON
38 (60)	RELAY 1 NORMALLY OPEN
39 (61)	RELAY 2 NORMALLY CLOSED
40 (62)	RELAY 2 COMMON
41 (63)	RELAY 2 NORMALLY OPEN
42 (64)	RELAY 3 NORMALLY CLOSED
43 (65)	RELAY 3 COMMON
44 (66)	RELAY 3 NORMALLY OPEN

Figure 1.2.1 Change-over relay option wiring

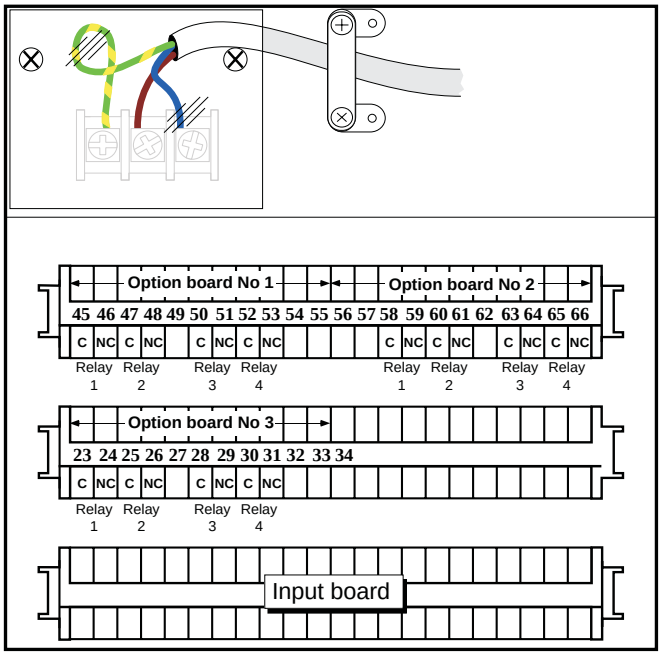
1.2.2 Four Normally–Open relays board



Pin	Function
23 (45)	RELAY 1 COMMON
24 (46)	RELAY 1 NORMALLY OPEN
25 (47)	RELAY 2 COMMON
26 (48)	RELAY 2 NORMALLY OPEN
27 (49)	
28 (50)	RELAY 3 COMMON
29 (51)	RELAY 3 NORMALLY OPEN
30 (52)	RELAY 4 COMMON
31 (53)	RELAY 4 NORMALLY OPEN
54	
55	
56	
57	
58	RELAY 1 COMMON
59	RELAY 1 NORMALLY OPEN
60	RELAY 2 COMMON
61	RELAY 2 NORMALLY OPEN
62	
63	RELAY 3 COMMON
64	RELAY 3 NORMALLY OPEN
65	RELAY 4 COMMON
66	RELAY 4 NORMALLY OPEN

Figure 1.2.2 Normally open relay option wiring

1.2.3 Four Normally–Closed relays board



Pin	Function
23 (45)	RELAY 1 COMMON
24 (46)	RELAY 1 NORMALLY CLOSED
25 (47)	RELAY 2 COMMON
26 (48)	RELAY 2 NORMALLY CLOSED
27 (49)	
28 (50)	RELAY 3 COMMON
29 (51)	RELAY 3 NORMALLY CLOSED
30 (52)	RELAY 4 COMMON
31 (53)	RELAY 4 NORMALLY CLOSED
54	
55	
56	
57	
58	RELAY 1 COMMON
59	RELAY 1 NORMALLY CLOSED
60	RELAY 2 COMMON
61	RELAY 2 NORMALLY CLOSED
62	
63	RELAY 3 COMMON
64	RELAY 3 NORMALLY CLOSED
65	RELAY 4 COMMON
66	RELAY 4 NORMALLY CLOSED

Figure 1.2.3 Normally closed relay option wiring

2 ANALOGUE OUTPUT (RETRANSMISSION)

2.1 INTRODUCTION

The analogue output option provides retransmission of input channels, where a configurable proportion of a selected input channel's span is linearly mapped onto a configurable output range. The type of output (Volts or mA) and the proportion of input span mapped, can be set up using the configuration pages described in section 2.3 below.

CAUTION
For recorders fitted with analogue outputs.
During recorder initialisation, analogue output terminal voltages can lie anywhere between -1V and +15V inclusive. It should be ensured by the user that any equipment connected to the recorder's analogue outputs cannot be damaged by such voltages.

2.2 SPECIFICATION

Analogue (retransmission) outputs

Output ranges (user configurable)

	Voltage:	0 to 10 V (Source 5 mA max.)
	Current:	0 to 20mA (max. load resistance: 1kΩ)
Update rate	Continuous-trace recorders:	8 Hz.
	Multi-point recorders:	2 Hz.
Step response (10% to 90%)		250msec
Linearity		0.024% of hardware range
Performance		See table below
Safety solation (dc to 65Hz; BS EN61010)		Installation category II; Pollution degree 2 (see page 1 for definitions)
	Channel to channel:	300V RMS or dc*
	Channel to ground:	300V RMS or dc*

* Caution
See Section 14 if the
Enhanced Immunity option is fitted.

Performance in instrument at 20 deg. C		
Range	Accuracy	Temperature drift
0 to 10 V	0.1% of range	±0.12mV +0.022% of reading per deg. C
0 to 20mA	0.1% of range	± 1 µA +0.03% of reading per deg. C

2.3 WIRING

Wiring details for the retransmission outputs depend on what other options are fitted. The four possible variants are shown in figure 2.3

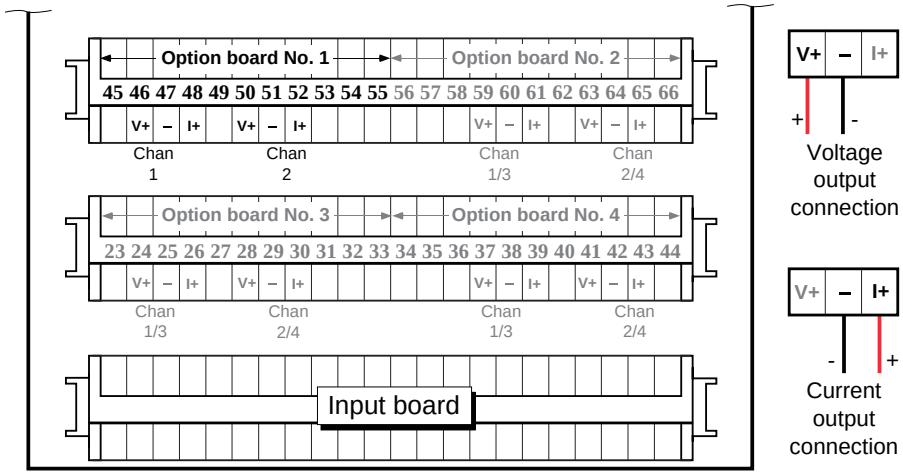


Figure 2.3 Retransmission option wiring

2.4 CONFIGURATION PAGES

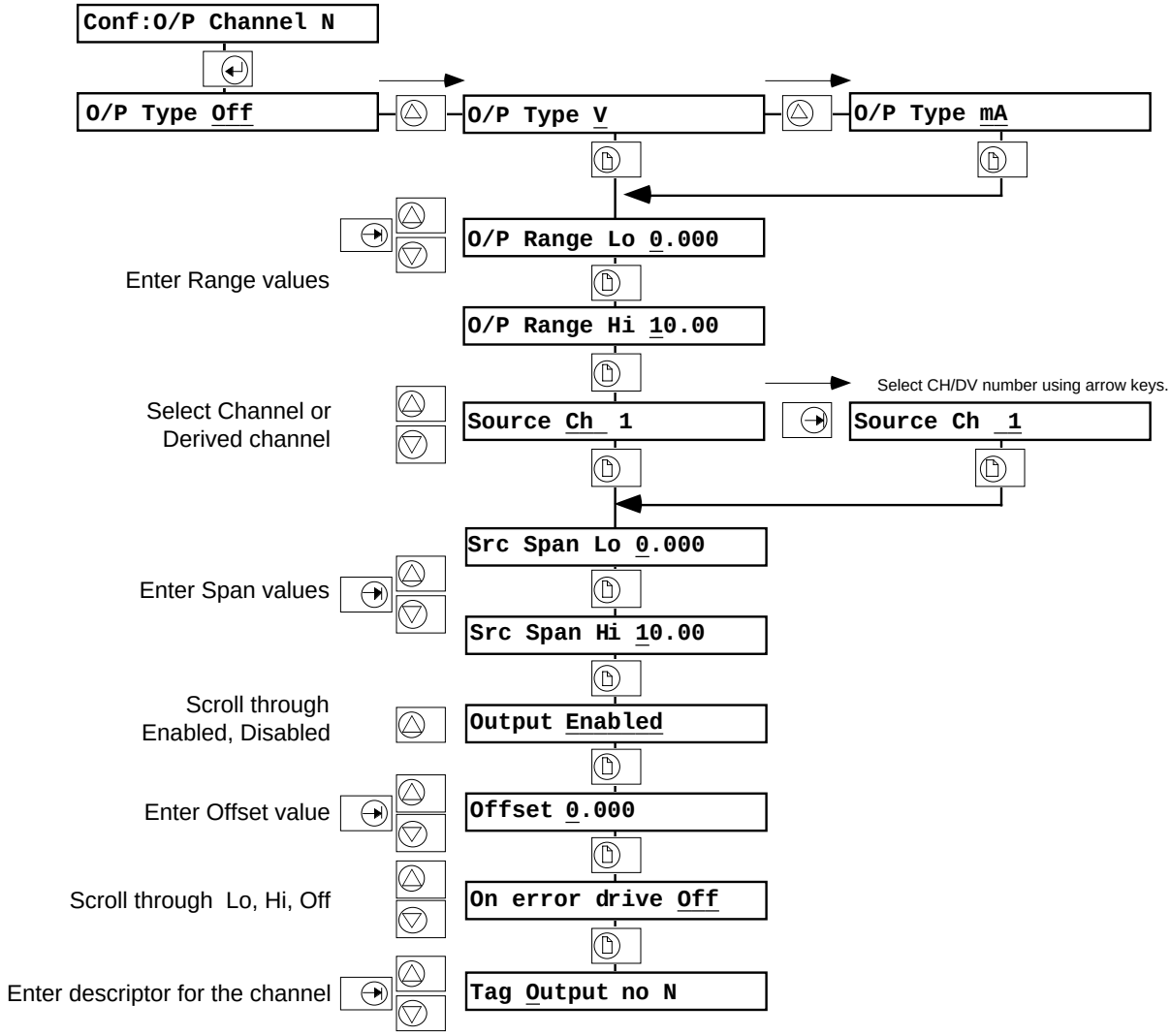


Figure 2.4 Retransmission configuration pages

Figure 2.4 shows the configuration pages for the analogue output option.

O/P Type	Allows V or mA to be selected as the output type. When 'Off', the channel output goes to 0mA at I+ and – terminals and to approximately -1V across the V+ and – terminals
O/P Range Lo/Hi	Allows the voltage or current that is to appear at the output terminals when the source signal is at Span Lo/Hi (See below) to be set.
Source Ch	Allows 'Ch' (measuring channel) or 'DV' (derived channel) to be selected as input source type. When source type is as required, use the cursor key to move to the numeric field and use the arrow keys to scroll through the available channels/DVs
Source Span Lo/Hi	Allows the value of the source channel/DV which is to give the minimum/maximum value of the output signal (O/P Range Lo/Hi) to be set.
Output Enabled	Allows the output channel to be switched off, without its configuration being lost.
Offset	Allows a fixed value to be added to the source channel's value, before conversion to the output range.
On error drive	Allows Off, high or low to be selected as an error output (e.g. if the input source is missing). 'Off' causes the output to be set to its Off state as defined in O/P type above. 'High' or 'low' cause the output to drive to approximately 15% above span or below 'zero' respectively.
Tag	Allows a 14-character descriptor to be applied to the selected channel.

2.5 OUTPUT ADJUST

This feature allows the relationship output signal to be adjusted to compensate for errors in the monitoring system. The adjustment can be applied or removed at will.

The technique used is:

1. The recorder outputs a known value (10%* of output span) at the analogue output terminals.
2. The user takes the resulting value as indicated by his/her monitoring equipment and enters it into the recorder.
3. The recorder outputs a second value (90%* of output span).
4. The user takes the resulting value as indicated by his/her monitoring equipment and enters it into the recorder.

The recorder then calculates a linear gain and offset correction to be applied to the output.

*These are default values and can be adjusted by the user.

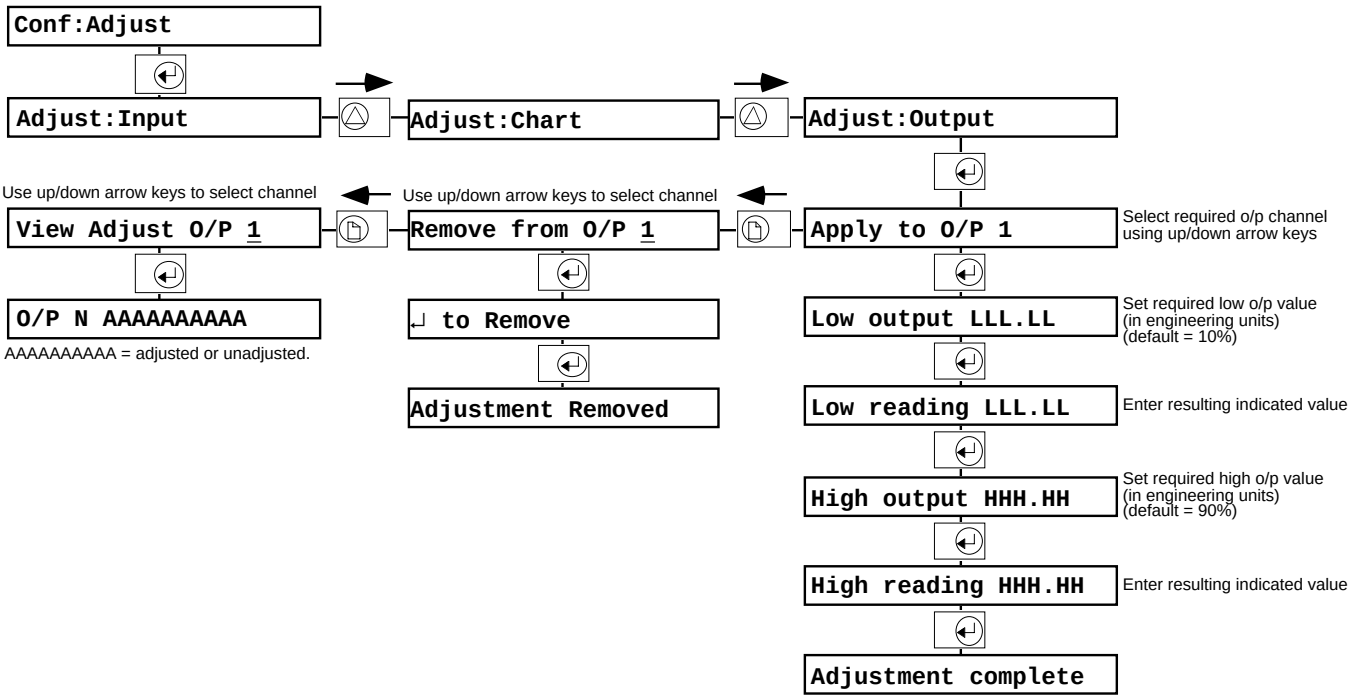


Figure 2.5 Output Adjust menu pages

'Remove' allows the adjustment to be removed from a selected channel.

'View' allows the user to determine whether any particular o/p channel is currently adjusted or not.

3 MATHS PACK

3.1 INTRODUCTION

The maths pack option provides 16 'derived' channels (DV1 to DV16), in addition to the measuring channels. (For graphics units, there are 24 derived channels: DV1 to DV24.)

The option comes in two levels: level 1 which provides basic arithmetic functions, and level 2 which provides advanced functions such as averaging, relative humidity calculations, mass flow etc. The functions are listed in table 3.1 below.

Level 1 functions	Level 2 functions (additional to level 1 functions)	
Off	Square root	DV group continuous maximum
Constant	Channel average	Third order polynomial
Copy	DV Group average	Relative humidity
Add	Rolling average	F value
Subtract	e^x	Linear mass flow
Multiply	$\log_n$	Square root mass flow
Divide	10^x	Zirconia probe
Modulus	$\log_{10}$	Switch
	Rate of change	High select
	Sample and hold	Low select
	Channel minimum	Stopwatch
	DV group latching minimum	Time stamp
	DV group continuous	O_2 Correction
	MinimumChannel maximum	Percentile
	DV group latching maximum	

Table 3.1 Maths functions

3.1.1 Groups

Derived channels can be added to the log and display groups described in the Group configuration section of the Installation and Operation manual. The operator can edit these groups to contain only those items which are to be logged or which are to appear at the display.

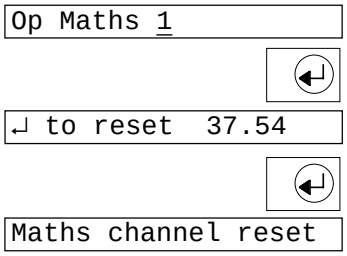
The Level 2 maths pack option adds a further group, called the DV group, which can contain only derived and measuring channels (i.e. not totalisers or counters). The group is used to assemble channels which are to be part of group averaging, or group max/min functions.

3.1.2 Jobs

The following jobs are added to the list given in the Installation and Operation Manual:
Reset channel NN
Reset all DVs
Switch to B on NN
Disable channel NN
Disable all DVs
Trigger Ch NN

3.1.3 Operator pages

If operator access allows it, the operator can reset any of the resettable functions in level 2 from this menu. The reset page displays the current value of the channel to be reset.

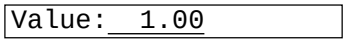


3.2 EQUATIONS

3.2.1 Level 1 equations

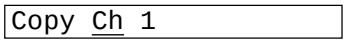
CONSTANT

Allows the entry of a constant to be used in other equations



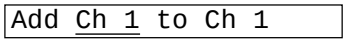
COPY

Normally used to import totaliser/counter values so they can be traced on the chart and/or, so that arithmetic functions can be carried out on them.



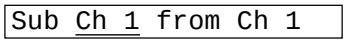
ADD

Allows one input or derived channel to be added to another.



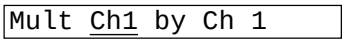
SUBTRACT

Allows one input or derived channel to be subtracted from another



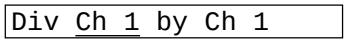
MULTIPLY

Allows one input or derived channel to be multiplied by another.



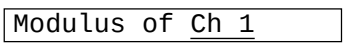
DIVIDE

Allows one input or derived channel to be divided by another



MODULUS

Takes the value of a channel, ignoring sign (i.e. always positive)



3.2.2 Level 2 equations

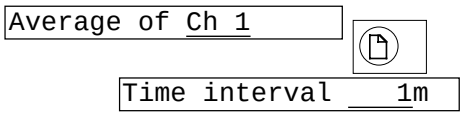
SQUARE ROOT

Takes the square root of the value of a channel. Produces a system error if signal value goes negative.

Square root of Ch 1

CHANNEL AVAERAGE

Provides the average value of an input or derived channel over a configurable time interval, then repeats



GROUP AVERAGE

Provides the current average value of all the channels in the DV group i.e.

(DVa + DVb + -------+ DVc)/R

where R is the total number of DVs in the group.

The function may be globally reset..

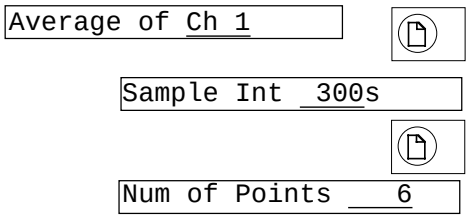
DV Group average

ROLLING AVERAGE

Takes the average value of a channel sampled a specified number of times each at a specified time period

For example, as shown, it may continuously take the average of the last 6 readings, where the readings are taken every five minutes. I.E. the first reading is discarded when the seventh one is taken and so on.

The function may be globally reset.



E TO THE POWER

Raises e to the power of the value of the specified channel.

e To Power of Ch 1

NATURAL LOG

Takes the Naperian log of the value of the specified input or derived channel.

Natural log of Ch 1

10 TO THE POWER

Raises 10 to the power of the value of the specified input or derived channel.

10 to Power of Ch 1

LOG BASE 10

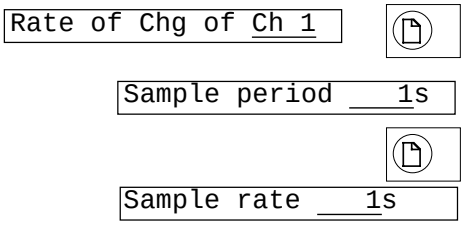
Takes base 10 log of the specified input or derived channel's value.

Log base 10 of Ch 1

3.2.2 LEVEL 2 EQUATIONS (Cont.)

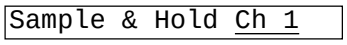
RATE OF CHANGE

Calculates the rate at which the selected channel's value changes over a specified time period, with a specified number of measurements being taken during that time period.



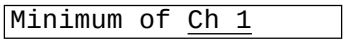
SAMPLE AND HOLD

When triggered, outputs the value of the specified channel's value, until reset.



CHANNEL MINIMUM

Saves the lowest value that the specified channel has reached since initiation or last reset.

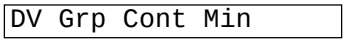


DV GROUP LATCH MIN

Outputs the lowest value reached by any derived channel in the DV group since initiation or last reset.

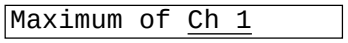
DV GROUP CONT MIN

Outputs the current value of whichever channel in the DV group has the lowest value.



CHANNEL MAXIMUM

Outputs the highest value that the specified channel has reached since initiation or last reset.

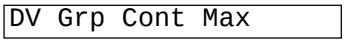


DV GROUP LATCH MAX

Outputs the highest value reached by any derived channel in the DV group since initiation or last reset.

DV GROUP CONT MAX

Outputs the current value of whichever channel in the DV group has the highest value.

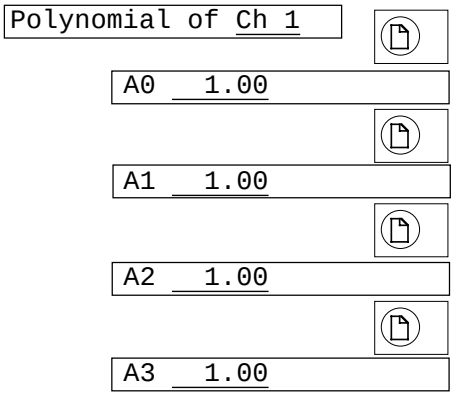


THIRD ORDER POLYNOMIAL

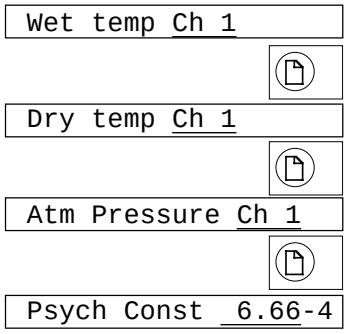
Provides a third order polynomial curve fit:

$$A0 + A1x + A2x^2 + A3x^3$$

where A0 to A3 are constants and x is the specified channel's value.



3.2.2 LEVEL 2 EQUATIONS (Cont.)



RELATIVE HUMIDITY

To determine the percentage relative humidity using wet and dry temperature readings ˚C and atmospheric pressure (Abs) inputs. Standard temperature and pressure are defined as 1.01325 Bar at sea level at 288.15K (15˚C). Pressure varies with height, as indicated in table 3.3.2a.

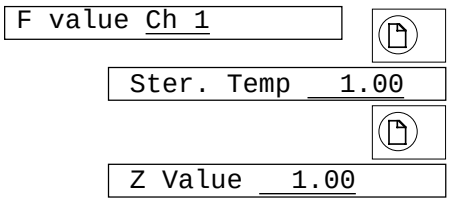
The numeric part (6.66) of the default psychrometric constant can be changed by the user, but the exponent (-4) is fixed.

Geometric height (Metres)	Pressure (Bar)
-250	1.04365
0	1.01325
+250	0.983576
500	0.954612
750	0.926346
1000	0.898762
1500	0.845596
2000	0.795014

Table 3.2.2a
Pressure / variation with height

FVALUE

To calculate the equivalent time at Sterilizing Temperature (for temperatures below, at and above Sterilizing Temperature) both in dry (F_H) and steam (F_O) sterilizing environments, using the following equation:



$$Fval_t = Fval_{t-1} + T \times 10^{\frac{ma_t - target\ temp}{Z}}$$

Where $Fval_t$ = F value at time t (minutes)
$Fval_{t-1}$ = F value last iteration
T = Internal recorder iteration rate (minutes)
ma_t = Value of temperature measuring channel
Target temp = 121.1˚C for F_O; 170˚C for F_H
Z = Temperature interval representing a factor-of-10 reduction in killing efficiency
= 10˚C for F_O; = 20˚C for F_H

MASS FLOW LINEAR

Note: the overall accuracy of a flow measurement installation depends on a number of factors outside the control of the recorder manufacturer. For this reason, the manufacturer takes no responsibility for the accuracy of results obtained by using the mass flow equations implemented in the maths pack.
It is not recommended that the recorder be used for custody transfer.

The equation solved is: $$Qm_t = \frac{K}{Rg \times Z} \times \frac{Flow_t \times AbsP_t}{Temp}$$

where: Qm_t = mass flow at time t, in kg/sec.
$Flow_t$ = measured value from the flow meter at time t
$AbsP_t$ = absolute pressure of the fluid at time t
Temp = absolute temperature of the fluid in Kelvins
K = scaling factor (see below)
Rg = specific gas constant in J/(kg-K) (see below)
Z = compressibility factor (see below)

3.2.2 LEVEL 2 EQUATIONS (Cont.)

For the recorder user, this becomes: $Mass\ flow = \frac{md \times ma_t \times mb_t}{mc_t}$

where: mat = the value, at time t, of the channel measuring the flow meter output
mbt = the value, at time t, of the channel measuring the absolute pressure of the fluid
mct = the value, at time t, of the channel measuring the fluid temperature in Kelvins
md = a constant, derived from the equation:

$$Const = \frac{K}{Rg \times Z}$$

where: K = a scaling factor (see below)
Rg = specific gas constant in J/(kg-K) (see below)
Z = compressibility factor (see below)

SCALING FACTOR K

This is derived from the equation:

$$K = \frac{S}{ma_{max}}$$

where: S = The full scale output from the flow meter
ma_{max} = the full scale input of the channel which is reading the flow meter output

SPECIFIC GAS CONSTANT (Rg)

The specific gas constant values are available from published tables.

For convenience, the Rg values for a number of common gases are given in table 3.2.2b

Gas	RG (J/kg-K)
Air	287.1
Ammonia	488.2
Carbon dioxide	188.9
Carbon monoxide	296.8
Ethylene	296.4
Hydrogen	4116.0
Methane	518.4
Nitrogen	296.8
Oxygen	259.8
Propane	188.5
Steam	461.4

Table 3.2.2b Common gas constants

COMPRESSIBILITY FACTOR (Z-FACTOR)

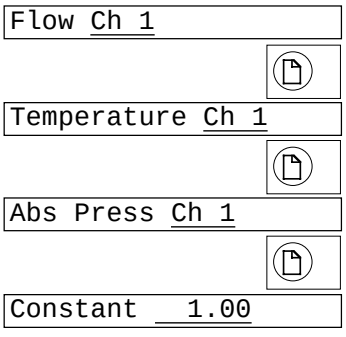
The compressibility factor is a density-related measure of how far a particular gas deviates from a 'perfect' gas under any set of temperature and pressure conditions, and is given by the equation below. Alternatively, the Z-factor can be established experimentally.

$$Z = \frac{P}{T} \times \frac{1}{\rho}$$

Where: Z = Compressibility factor
P = Absolute pressure of the gas
T = Absolute temperature of the gas
ρ = Gas density at pressure P and temperature T (from published tables)

CONFIGURATION PAGES

Enter the flow rate, absolute temperature and the absolute pressure channels and the constant



3.2.2 LEVEL 2 EQUATIONS (Cont.)

MASS FLOW SQUARE ROOT

Note: the overall accuracy of a flow measurement installation depends on a number of factors outside the control of the recorder manufacturer. For this reason, the manufacturer takes no responsibility for the accuracy of results obtained by using the mass flow equations implemented in the maths pack.

It is not recommended that the recorder be used for custody transfer.

The equation solved is: $$Qm_t = \sqrt{\frac{K^2}{Rg \times Z}} \times \sqrt{\frac{DeltaP_t \times AbsP_t}{Temp_t}}$$

where: Qm_t = mass flow at time t, in kg/sec.
$DeltaP_t$ = measured value of the differential pressure across the orifice plate at time t, in kPa.
$AbsP_t$ = absolute pressure of the fluid, at upstream tapping, at time t, in kPa(A)
Temp = absolute temperature of the fluid in Kelvins
K = scaling factor (see below)
Rg = specific gas constant in J/(kg-K) (see below)
Z = compressibility factor (see below)

For the recorder user, this becomes: $$Mass\ flow = \sqrt{\frac{md \times ma_t \times mb_t}{mc_t}}$$

where: ma_t = the value, at time t, of the channel measuring the differential pressure.
mb_t = the value, at time t, of the channel measuring the absolute pressure of the fluid.
mc_t = the value, at time t, of the channel measuring the fluid temperature in Kelvins.

md = a constant, derived from the equation: $$Const = \frac{K^2}{Rg \times Z}$$

where: K = a scaling factor (see below)
Rg = specific gas constant in J/(kg-K) (see linear mass flow above)
Z = compressibility factor (see linear mass flow above)

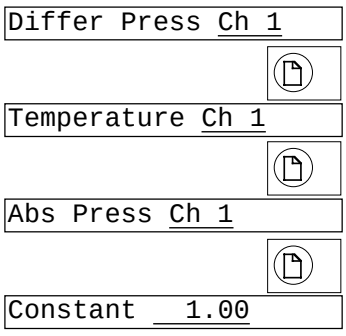
SCALING FACTOR K

This is derived from the equation: $$K = \frac{S}{\sqrt{ma_{max}}}$$

where: S = The full scale output from the flow meter
ma_{max} = the full scale input of the channel which is reading the flow meter output

CONFIGURATION PAGES

Enter the differential pressure, absolute temperature and the absolute pressure channels and the constant



3.2.2 LEVEL 2 EQUATIONS (Cont.)

ZIRCONIA PROBES

A zirconia (oxygen) probe consists of two platinum electrodes bonded to a pellet or cylinder of zirconia. At elevated temperatures, such a probe develops an emf across it which is proportional to probe temperature and to the log of partial pressure of oxygen difference between its two ends.

OXYGEN CONCENTRATION MEASUREMENT

In order to measure oxygen concentrations, one end of the probe is inserted into the atmosphere to be measured, whilst the other is subjected to a reference atmosphere. For most applications, air provides a suitable reference (reference input = 20.95% for air).

The temperature of the probe is usually measured using a type K or a type R thermocouple. The temperature effect on the thermocouple is such that for successful operation with the recorder, the probe temperature must be greater than 973K (700˚C).

The probe output obeys a law, described by the Nernst oxygen equation:

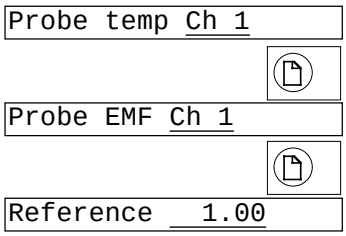
$$E = T \times \log \frac{P1}{P2} \text{ or, rewritten: } P2 = \frac{P1}{10^{\frac{E}{0.0496 \times T}}}$$

where, P2 = Partial pressure of oxygen in the sampled gas (%)
P1 = Partial pressure of oxygen in the reference atmosphere (%) (20.95% for air)
E = Electromotive force across the probe in mV
T = Probe temperature in Kelvins

In order to obtain a useful result, it is necessary to scale the inputs and outputs correctly. The channel measuring the probe voltage will normally need a scale of 0 to 100 mV. The temperature measuring channel will probably be scaled at 273 to 1800K, whilst the output scaling would typically be 0 to 5 % for boiler flues, and 0 to 20% in kilns.

CONFIGURATION PAGES

Enter channel numbers for Probe temperature, Probe emf and reference % measurements.



3.2.2 LEVEL 2 EQUATIONS (Cont.)

ZIRCONIA PROBES (Cont.)

OXYGEN POTENTIAL MEASUREMENT

The oxygen potential of an atmosphere is a measure of its ability to oxidise or reduce. For any element, a value of oxygen potential (free energy of formation) is known. Above this value, the material will oxidise, below it, no oxidation will occur.

Oxygen potential is given by the equation

$$Op = 0.00457 \times T \times \log Op'$$

where, Op = Required oxygen potential (kilocalories)
T = Probe temperature (Kelvin)
Op′ = Partial pressure of oxygen in the reference atmosphere in atmospheres

It can be shown that, because oxygen potential of air is essentially constant over the range 870 to 1450 Kelvins, the probe output is proportional to the oxygen potential of an atmosphere according to:

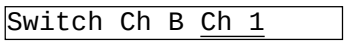
$E = (10.84 \times T) + 40$ mV between 870 to 1450 K.

Thus it is possible to measure oxygen potential directly from a zirconia probe, using a standard input channel of the recorder, scaled in units of oxygen potential.

A typical input range would be 40 to 1124 mV, with a scale of 0 to -100 kilocalories. Such scaling would be appropriate over the temperature range 873 to 1473 K (600 to 1200 ˚C).

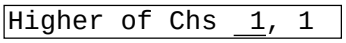
SWITCH

This function copies one of two input or derived channels' values according to the state of its 'Select channel B for NN' job. I.E. if the relevant switch is active, copy the value of source channel B, else copy the value of source channel A.



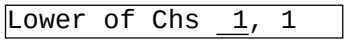
HIGH SELECT

This function has two input/derived channels, and copies whichever has the higher value.



LOW SELECT

This function has two input/derived channels, and copies whichever has the higher value.



STOPWATCH

The stopwatch starts counting as soon as the function is configured. The stopwatch can be disabled by a maths pack 'job, (disable channel NN) and can also be reset to zero (Reset channel NN). The value is normally displayed as a number of 1/4 seconds, but if one of the date/time formats described in section 3.3 is selected, the value is displayed as -----, but when logged to the chart, it will appear in the specified format in a line of its own.

3.2.2 LEVEL 2 EQUATIONS (Cont.)

TIME STAMP

When triggered by a maths pack job (Trigger channel NN) becoming active, the time stamp reads the current time and date from the system clock and holds it. The time or the date can be displayed according to the configured value format.

Note: The display format selected affects only the value displayed, not the internal value of the channel. This internal value is a number of 1/4 seconds elapsed either since enabled (stopwatch) or since the 1st January 1988 (Time stamp). This allows time stamp functions to be processed in the maths pack. For example, two channels, each with a time stamp as its value can be subtracted from one another to give the time between the stamps, and this can be displayed as elapsed time if so configured in the Value Format page.

OXYGEN (O_2) CORRECTION

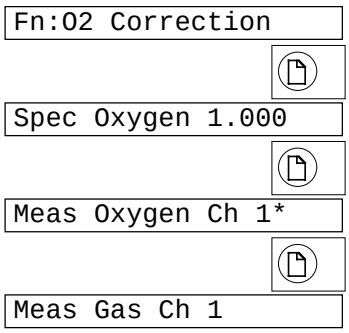
This function carries out O_2 correction of gas measurements for use in Continuous Emissions Monitoring applications. The equation calculated is:

$$\frac{20.9\% - SpecO_2}{20.9\% - MeasO_2} \times Meas.gas$$

where,

SpecO$_2$ = specified oxygen entered as a constant 5-digit value (prescribed for the particular process).
Meas.O$_2$ = measured oxygen, entered as a channel number (gas analyser input)*
Meas.gas = the measured gas, entered as a channel number (gas analyser input)

CONFIGURATION PAGES



* APPLICATION NOTE

Some Authorities allow Oxygen correction to be made ONLY if the Measured Oxygen value is above a limit specified by such Authorities.

For the oxygen correction function to conform with this requirement it is necessary to 'Filter' the Measured Oxygen value using a High Select function, with 'Measured Oxygen' and the Specified Limit constant as its inputs. The output from this function (derived channel number) is then used as the 'Measured oxygen' value.

3.2.2 LEVEL 2 EQUATIONS (Cont.)

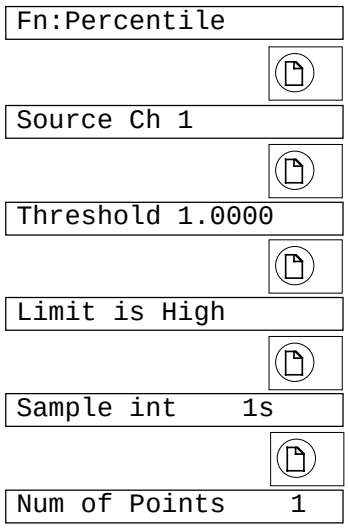
PERCENTILE

This function looks at a specifiable number of samples (points), and calculates the percentage of these samples which are:

a. equal to or below a threshold value if the limit is defined as 'high' OR
b. equal to or above a threshold value if the limit is defined as ' low'.

The sample interval can also be specified.

Once the specified number of samples has been reached, the oldest is discarded and the percentage re-calculated.



Scroll through 'high' and 'low'

Use minimum number of points you can, to save memory space.

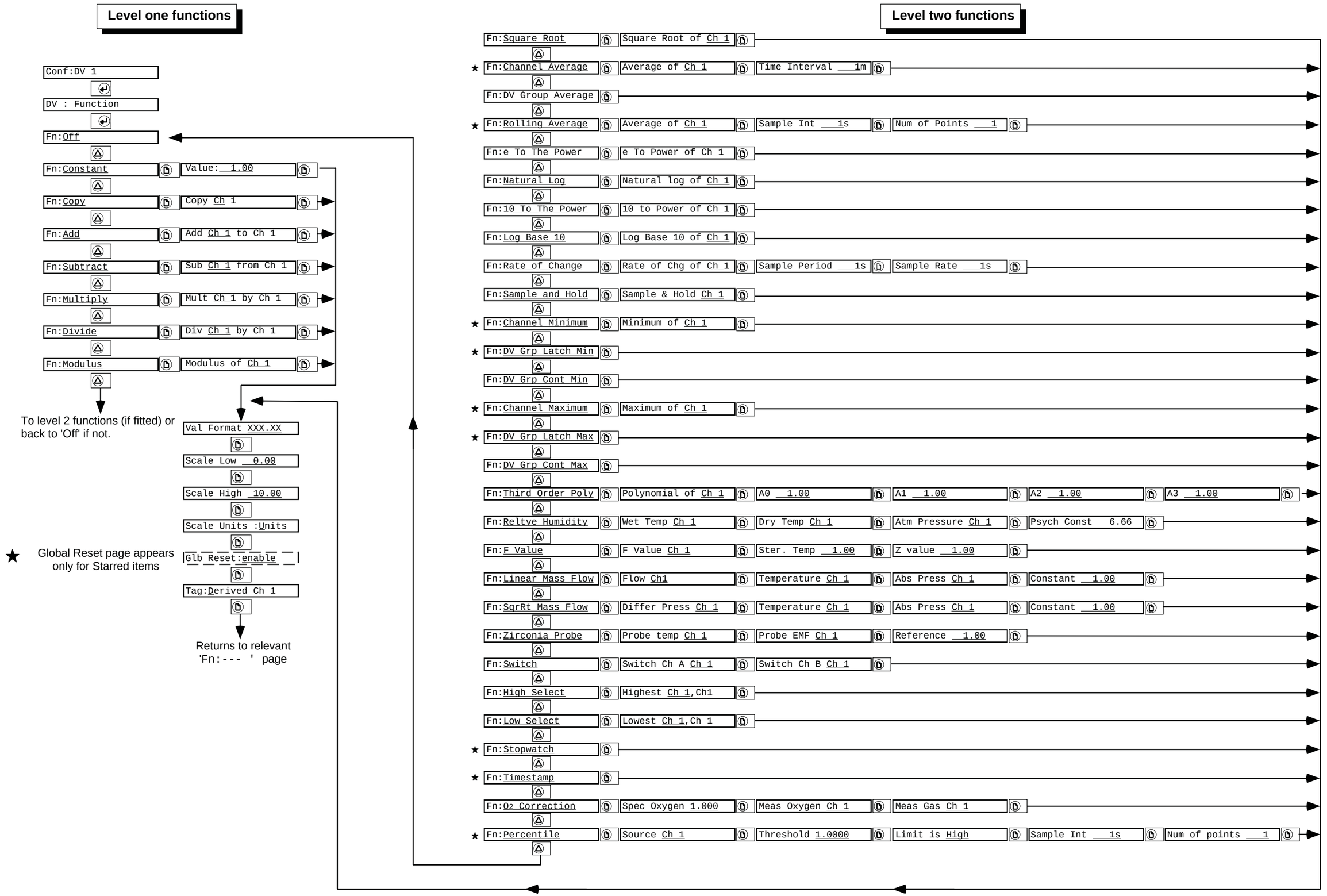


Figure 3.3 Maths pack configuration menu structure

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3.3 CONFIGURATION

Figure 3.3 is an overview of the maths pack configuration pages. The configuration technique for derived channels is similar to that described for measuring channels in the Installation and Operation manual. Input and derived channels share the following parameters:

Channel units	Five character user definable string	Span	A and B
Trace	On, off	Tag	14-character tag
Line thickening	On, off (Not graphics units)	Alarms	Type, threshold, jobs
Colour	Selectable from those available	Value format	Five digits with configurable decimal point

MATHS PACK UNIQUE PARAMETERS

GROUP RESET ENABLE
Allows resettable functions to be made susceptible to group reset.

VALUE FORMATS

Five digits with configurable decimal point position.
Scientific - see 'Scientific Format' below.
Time as HH:MM:SS (Time part of time stamp function)
Date as DD/MM/YY or MM/DD/YY (Date part of Time Stamp function). Date format is defined as a part of instrument configuration.
Elapsed time as HH:MM:SS. If the period is 100 hours or more, the format changes to HHHHH:MM

Note: If a DV is configured with one of the above Date, Time or Elapsed formats, it will be displayed as -----, but will be logged on a separate line in the chosen format.

SCIENTIFIC FORMAT
For graphics units only, an additional value format 'Scient' is selectable for the scale, alarm and Constant configuration of maths functions. This format causes a value of 2,300,000 to appear as, for example 2.30E06, where 2.30 is called the mantissa and 06 is the exponent. The number of decimal places in the mantissa, and the form of the exponent depend on what the item is and where it is displayed as shown in the table below, which uses a value of 1,234,567 as an example.

Constraints
1. The maximum value for the exponent is 36 (positive or negative).
2. Scale and range spans cannot be greater than 10^{10}*. For example, low to high scale values may be 1.2 E-05 to 1.2 E05 respectively, but not 1.2 E-05 to 1.2 E06. Any attempt to enter a scale or range of values greater than 10^{10} results in an 'Invalid configuration' message appearing, and the non-acceptance of the new value.

ITEM	FORMAT
DV Configuration	
Scale	-1.2345E06
Alarm threshold	-1.2345E06
Span	-1.2345E06
Display	
Bargraph	-1.23+06
Trace scale	-1.23+06
Numeric	-1.23+06
Faceplate	-1.23+06
Memory card	-1.234E06
Embedded messages	-1.2+06

Table 3.3 Scientific formats

* 10^{10} = E10 = 10,000,000,000

4 TOTALISERS, COUNTERS AND TIMERS

4.1 INTRODUCTION

The Totaliser, Counter, Timer (TCT) option supplies up to six each of 8-digit totalisers, 8-digit counters and timers.

4.2 TOTALISERS

4.2.1 Source types

Each totaliser can have one of two source types:

1. The totaliser can integrate a given input or derived channel's value providing this value is above a low cut-off point; below a high cut-off point and within the channel's range.
2. If the 'Event input' option is fitted, each totaliser can count pulses (max 6 Hz) by counting edges and dividing by two.

4.2.2 Alarms

An alarm threshold can be set up for each totaliser, and each threshold can have up to two jobs associated with it. A 'limit' setting defines whether the job list is to be initiated when the totaliser value lies above (high) or below (low) the threshold value. Up to two jobs can be initiated by the alarm.

4.2.3 Display

The Display Group (described in the Installation and Operation Manual) is initially empty. With the TCT option, totalisers can be included in the display group with identifiers t1 to t6. It is up to the user to include totalisers in the group as required.

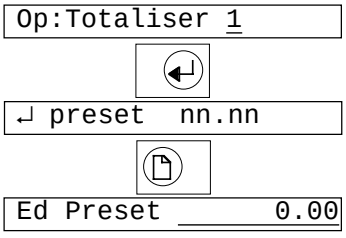
The value and units of each totaliser in the Display Group are displayed, in turn, in the 20-character text area*. (The decimal point position is set up in the 'Value Format' configuration page.) Operation of the page key displays the totaliser tag and units instead.

4.2.4 Tracing on the chart* (maths pack level 1 required)

To trace the value of a totaliser on the chart, it must be imported into a derived channel (using the 'Copy' function), and the derived channel then traced.

4.2.5 Operator pages

If operator access is allowed, the operator can preset individual totalisers, and can edit the preset value.



* Not graphics units

4.2.6 Totaliser configuration

Configuration is carried out using the normal techniques described in the Installation and Operation manual. Figure 4.2.6 below, shows the configuration pages.

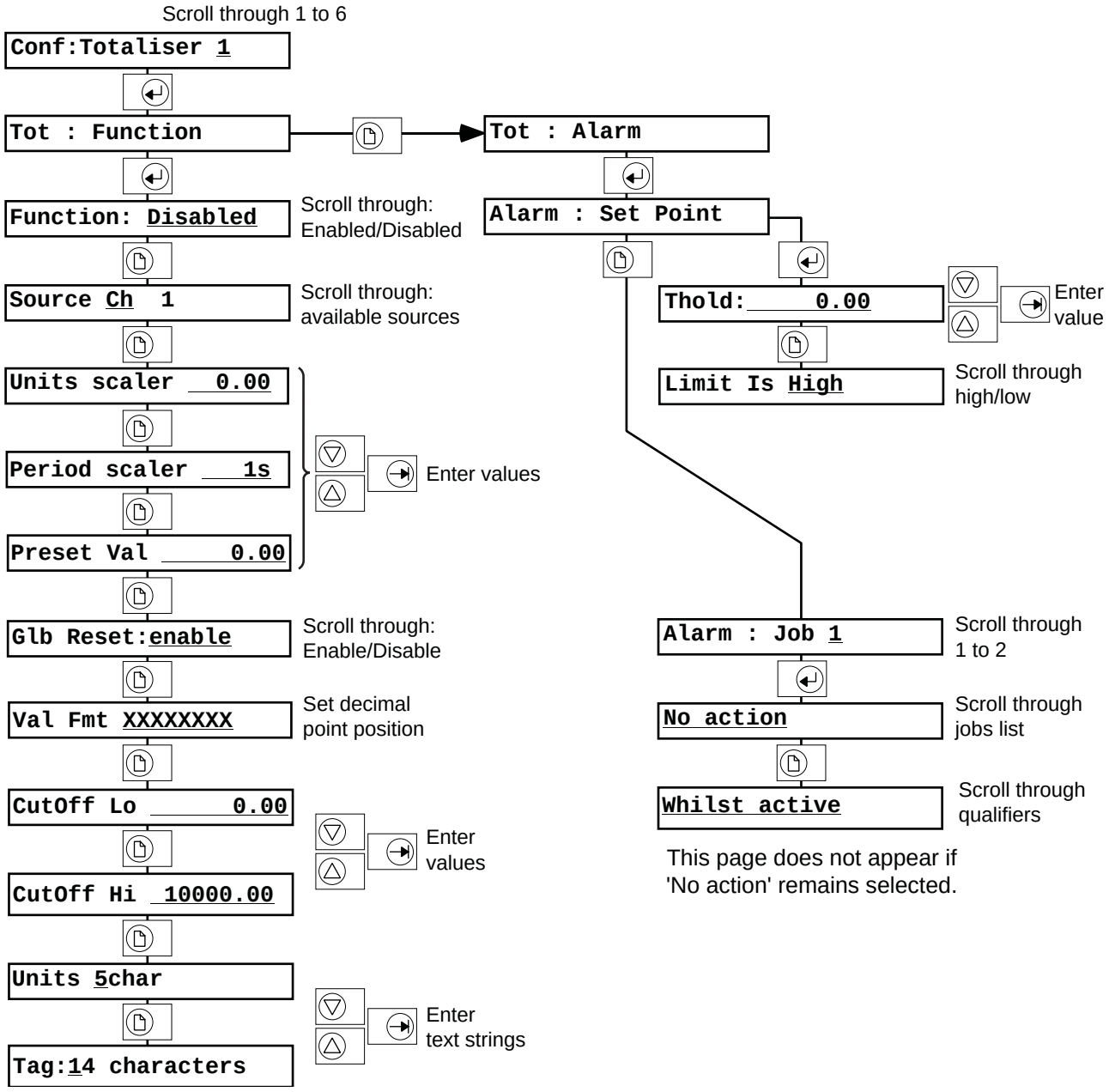


Figure 4.2.6 Totaliser configuration

4.2.6 TOTALISER CONFIGURATION (Cont.)

Source	Allows input channels, derived channels and event inputs to be selected as totaliser sources
Units scaler	Allows the counting scale and direction to be selected. For example, if the input to a storage tank is litres/sec and the totaliser value is to be litres x 10^3 (i.e. thousands of litres), then the units scaler would be set to 1000. If the flow were out of the tank, the units scale would be -1000.
Period scaler	Changes the time units of the input to seconds, as required by the recorder. For example, if the input is in litres/hour, then the period scaler would have to be the number of seconds in an hour (3600).
Preset value	Allows the entry of an eight-digit number from which the totaliser will count. Totalisers can be set to their preset values, either individually or as a group, by job action or individually by the operator, if access permission is granted. See also 'Glb Preset Disable' immediately below.
Glb Reset	Allows each totaliser to be configured to be susceptible to global reset (Enable) or not (Disable).
Val format	Allows the decimal point position to be specified using the up and/or down arrow keys.
Cut Off Lo(Hi)	Allows cut-off values to be entered, below (above) which the totalising function will be disabled.
Units	Allows a 5-character text string to be entered to describe the totaliser units
Tag	Allows a 14-character descriptive text string to be entered

ALARM PAGES

Threshold	Allows a value to be entered to act as an alarm trigger.
Limit	Defines whether the alarm triggers when the totaliser value is ≥ the threshold (absolute high alarm) (limit = high) or ≤ the threshold (absolute low alarm) (limit = low)
Jobs	The following jobs are added to the scroll list given in the Installation and Operation Manual: Preset Tot N Preset all Tots Disable all Tots

4.3 COUNTERS

4.3.1 Introduction

The TCT option supplies up to six, eight-digit counters which are controlled from other recorder functions through job lists. The following jobs are added to the list given in section 4.1 of the Installation and Operation Manual. They can all be triggered when the source goes active, goes inactive or on alarm acknowledgment,' as configured:

1. Increment Counter N
2. Decrement Counter N
3. Preset counter N
4. Preset all counters
5. Disable all counters

Each counter can be configured with a threshold value to enable it to trigger up to two jobs itself. A 'limit' input allows a job list to be initiated either when the counter value ≥ the threshold (limit high) or when it is ≤ the threshold (limit low).

4.3.2 Tracing on the chart* (maths pack level 1 required)

To trace the value of a counter on the chart, it must be imported into a derived channel (using the 'Copy' function), and the derived channel then traced.

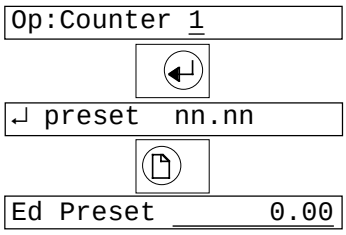
4.3.3 Display

The Display Group (described in the Installation and Operation Manual) is initially empty. With the TCT option, counters can be included in the display group with identifiers c1 to c6. It is up to the user to include counters in the group as required.

The value and units of each counter in the Display Group are displayed, in turn, in the 20-character text area*. (The decimal point position is set up in the 'Value Format' configuration page). Operation of the page key displays the counter tag and units instead.

4.3.4 Operator pages

If operator access is allowed, the operator can preset individual counters, and can edit the preset value. Initiation of preset can also be carried out by job action on individual channels or on all channels simultaneously.



* Not graphics units

4.3.5 Configuration

Configuration is carried out using the normal techniques described in the Installation and Operation Manual. Figure 4.3.5, shows the configuration pages.

Preset	Eight digit value of preset, entered using the up and down arrows. The preset value is loaded into the counter by job or by operator action.
Units	Allows a 5-character units string to be entered using the up/down arrows and cursor key.
Glb preset	Allows each counter to be defied as being susceptible to global reset (enable) or not (disable).
Tag	Allows a 14-character descriptive tag to be entered for each counter.

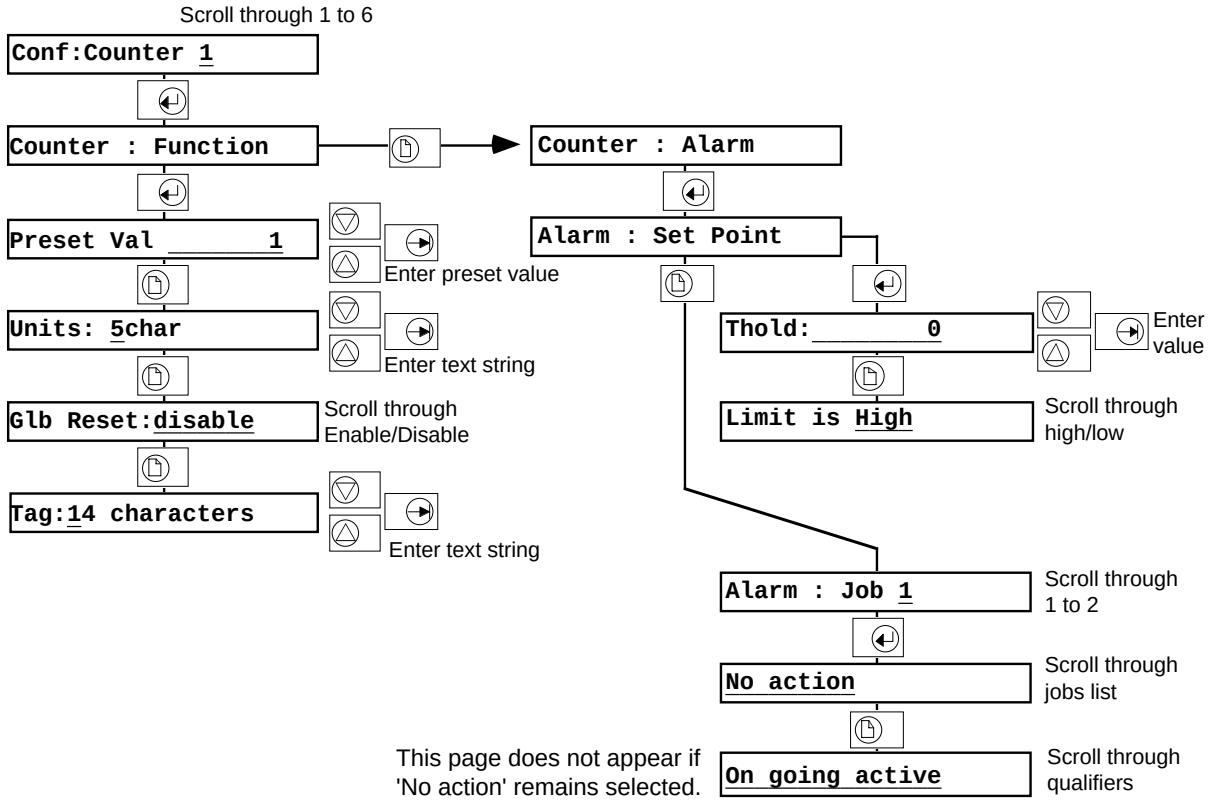


Figure 4.3.5 Counter configuration

ALARM PAGES

Threshold	Allows a value to be entered to act as an alarm trigger.
Limit	Defines whether the alarm triggers when the counter value is ≥ the threshold (absolute high alarm) (limit = high) or ≤ the threshold (absolute low alarm) (limit = low)

4.4 TIMERS

4.4.1 Introduction

The TCT option supplies six timers, each of which can be configured to start at a specific time and date relative to the real-time clock in the recorder. Once initiated, the timer will run for a configurable time period (duration) and repeat at a configurable rate. Alternatively, the timer can be initiated by a job, and it will then repeat at the configured repetition rate. Once initiated, the timer will re-start every repeat period until it is disabled.

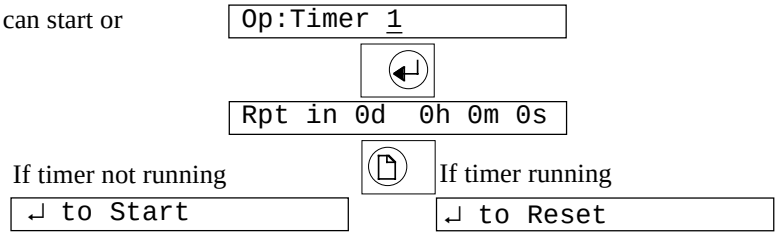
Each timer can have up to two jobs associated with it, and these jobs remain active for the duration of the timer Duration Period.

The TCT option adds the following jobs to the list given in the Installation and Operation Manual:

Start specified timer
Reset specified timer

4.4.2 Operator pages

If access permission is granted, the operator can start or reset a timer



4.4.3 Configuration

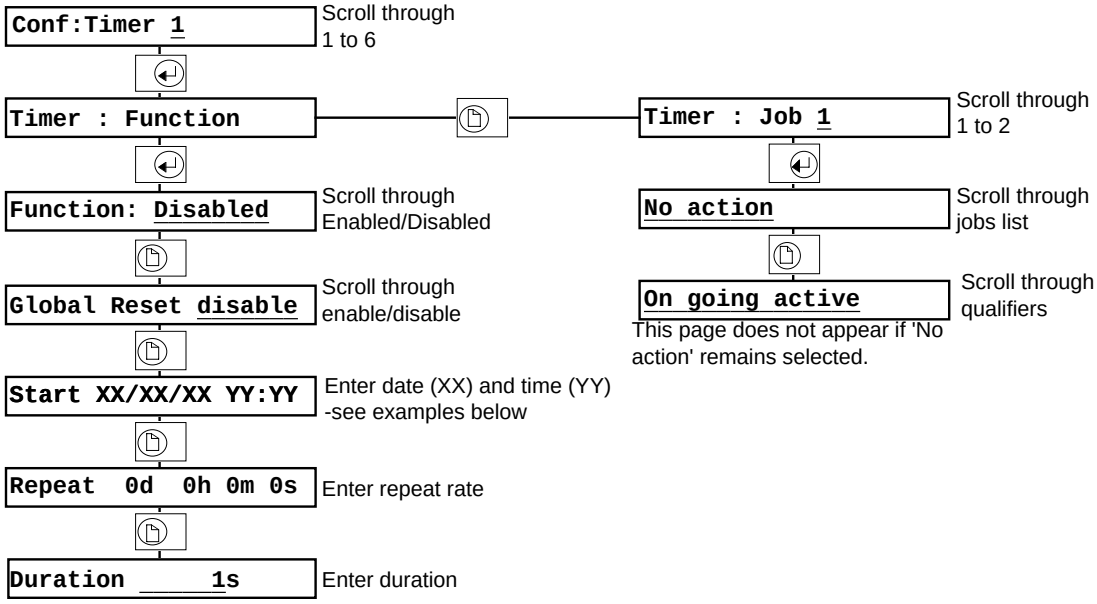


Figure 4.4.3 Timer configuration pages

4.4.3 TIMER CONFIGURATION (Cont.)

Function	Allows the timer to be switched on or off
Global reset	Allows each timer to be configured to be susceptible to global reset (enable) or not (disable)
Start	Allows a date and time to be entered for the timer to start. If an entry is left as XX, the timer will operate at the next smallest time unit. If all entries are left as XX, the timer can be started only by job or by operator action
Repeat	Allows a repeat period to be entered. If entries are left as zeros, the timer does not repeat.
Duration	Allows a duration period to be entered for the timer

JOBS PAGES

Allows up to two jobs to be entered for the timer to trigger.

4.4.4 Timer examples

1. To start a timer at mid-day on the 1st of each month:

```
Start XX/01/XX 12:00
```

2. To start a timer every hour, on the 1/2 hour, starting at 12:30 on 31st December:

```
Start 31/12/XX 12:30
```

```
Repeat  0d  1h 0m 0s
```

5 EVENT INPUTS

5.1 INTRODUCTION

The Event input option offers six isolated event input circuits on a half-width board. The event inputs can be used as discrete inputs, or four of them can be encoded to provide a further 16 inputs. Inputs can either be switch closures or voltage levels.

The section 'Internal Events' in the Installation and Operation Manual, describes the use of events, and how they can be ANDed and ORed together to perform logic functions if required. Job lists can be triggered by any event, either 'internal' or as a result of external events wired to the event input board. The event source list has the following added to that shown in the installation and Operation Manual:

Event input N (N = 1 to 6)
Evt Input val NN (NN = 00 to 15) (See section 5.4 'Encoded inputs' below)

With non-graphics units, it also possible to control chart speed by applying a negative going pulse input across terminals CS (+) and CSC (-). A pulse rate of 200 pps. causes the chart to drive at the selected chart speed See section 5.5 below for full details.

5.1.1 Safety isolation specification

Safety Isolation (dc to 65 Hz: BS EN61010)	Installation category II; Pollution degree 2 (see page 1 for definitions)
Event input to event input:	0V
Event input to ground:	100V* RMS or dc (double insulation)
Event input to chart drive input:	100V RMS or dc (double insulation)
Chart drive input to ground:	100V RMS or dc (double insulation)

* Caution
See Section 14 if the
Enhanced Immunity option is fitted.

5.2 SIGNAL WIRING TERMINATION

Although only one event input board may be fitted to a recorder, it can be fitted in any of the four option slots. Figure 5.2 therefore gives termination details for each of the four slots.

Note: The 'C' terminal is isolated from recorder 0 Volts

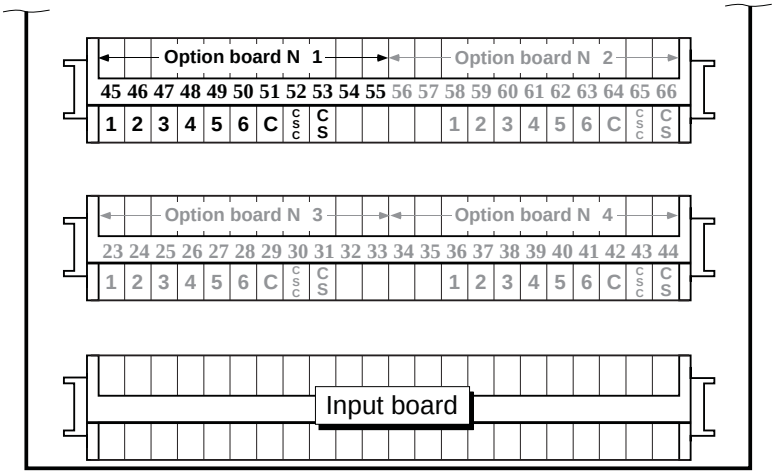


Figure 5.2 Event input option termination

5.3 DISCRETE INPUT WIRING

Figure 5.4 shows wiring details for the six discrete event inputs.

When using voltage inputs, the min/max values are as follows;

Maximum low level voltage	= 0.8V
Minimum low level voltage	= - 30V
Minimum high level voltage	= 2V
Maximum high level voltage	= 30V
Maximum input frequency	= 1Hz
Current sink requirements (Voltage inputs)	= 10mA

Note: The 'C' Terminal is isolated from recorder 0V

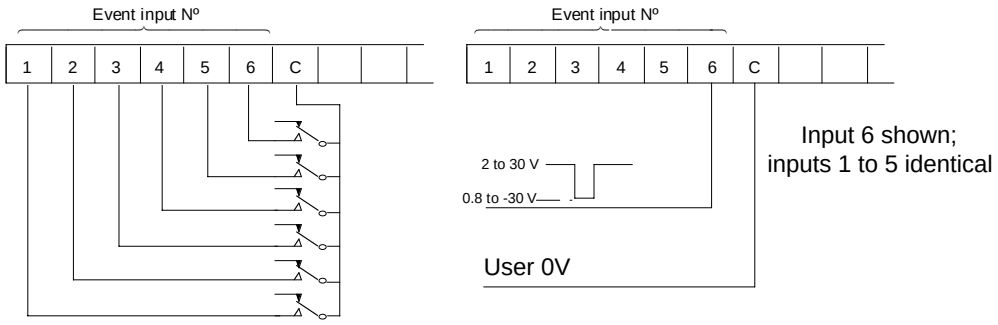


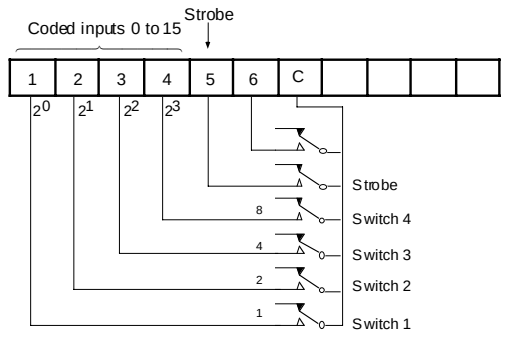
Figure 5.3 Event input wiring (discrete inputs)

5.4 ENCODED INPUTS

A binary coded 4-bit input can be applied to inputs 1 to 4, either by switch inputs as shown, or as voltage levels. The information is loaded into the board by a contact closure or negative-going 'strobe' input applied to input 5. This adds a further 16 events, whose names are Evt Input val 00 to 15 when used as inputs to internal events (and thus as job triggers if required). See figure 5.4 for wiring details, and Figure 5.2 for terminal numbers for the inputs.

When using voltage levels, the max/min values are as shown for discrete inputs above, with the additional information that the strobe input must be held low (contacts closed) for ≥ 62.5msec.

Note: The 'C' terminal is isolated from recorder 0V



Encoded event Nº	Switch 1	Switch 2	Switch 3	Switch 4
0	Open	Open	Open	Open
1	Closed	Open	Open	Open
2	Open	Closed	Open	Open
3	Closed	Closed	Open	Open
4	Open	Open	Closed	Open
5	Closed	Open	Closed	Open
6	Open	Closed	Closed	Open
7	Closed	Closed	Closed	Open
8	Open	Open	Open	Closed
9	Closed	Open	Open	Closed
10	Open	Closed	Open	Closed
11	Closed	Closed	Open	Closed
12	Open	Open	Closed	Closed
13	Closed	Open	Closed	Closed
14	Open	Closed	Closed	Closed
15	Closed	Closed	Closed	Closed

Figure 5.4 Event input wiring (encoded contact closure inputs)

5.5 CHART DRIVE INPUTS

Note: Not applicable to graphics units.

With chart drive source configured to 'External' (see section 5.6), a negative going pulse stream applied across the CS (+'ve) and CSC (-ve) terminals causes the chart to drive. The amount the chart moves depends on the selected chart speed; 200 pulses per second (pps) causes the chart to drive at the selected chart speed, 100pps causes the chart to drive at half the selected chart speed and so on. 0V is applied to stop the chart drive.

Note: The CSC terminal is isolated from recorder 0V

Figure 5.5 shows wiring for chart drive inputs, whilst table 5.5 gives a specification for the required pulses.

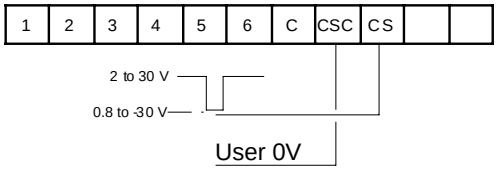


Figure 5.5 Pulse chart drive connections

Chart speed	=	Selected chart speed at 200 pulses per second (pps)
Maximum pulse rate	=	220 pps
Duty cycle	=	20% to 80%
Maximum low level voltage	=	0.8V
Minimum low level voltage	=	- 30V
Minimum high level voltage	=	2V
Maximum high level voltage	=	30V
Response time	=	2 secs (input frequency change to chart speed change)

Table 5.5 Pulse-drive specifications

5.6 CONFIGURATION PAGES

Note: Not applicable to graphics units

As shown in figure 5.6, an extra page is appended to the standard chart menu to allow 'Internal' or 'External' to be selected as chart drive source.

With 'Internal' selected, the recorder's internal crystal is used as a synchronization source for chart drive.

With 'External' selected, the chart is incremented by a pulse stream or contact closure as described in section 5.5 above.

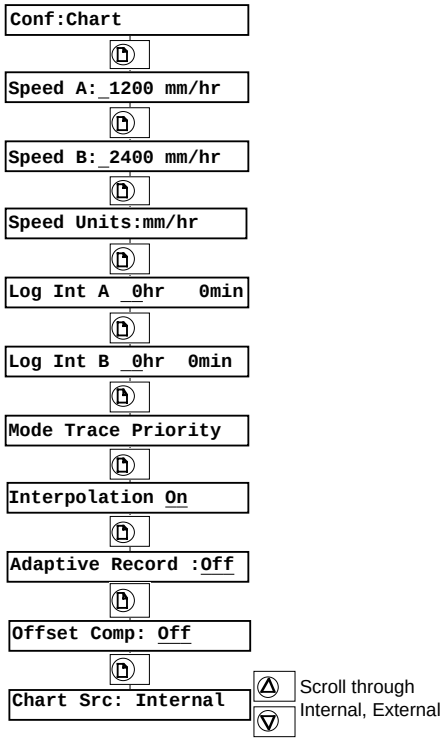


Figure 5.6 Chart configuration pages

6 CUSTOM LINEARISATION TABLE

6.1 INTRODUCTION

This option allows the user to enter a linearisation function of up to 32 points, which can then be used instead of the standard linearisations supplied with the recorder ('User' added to Lin Type list in Channel Range configuration).

The curve must be monotonic (i.e it may have only one y value for each x value entered) and the x inputs must increase in value as they are entered. The points do not have to be equally spaced, so if the curve varies in gradient, more points can be entered round any 'knees', leaving the recorder to interpolate in areas where the gradient is more constant.

The curve is entered as pairs of points, one representing the input value which will be applied to the recorder (X), the other the output value (Y) which is to appear on the chart.

6.2 CONFIGURATION PAGES

The following set up shows how to enter a $y = x^3$ output function using inputs of -5 to +5.

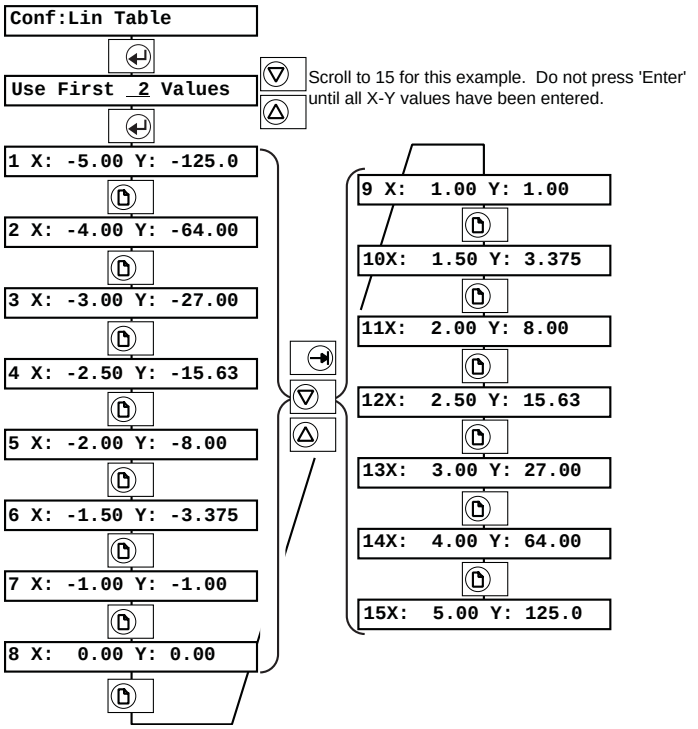


Figure 6.2a
Linearisation table configuration pages

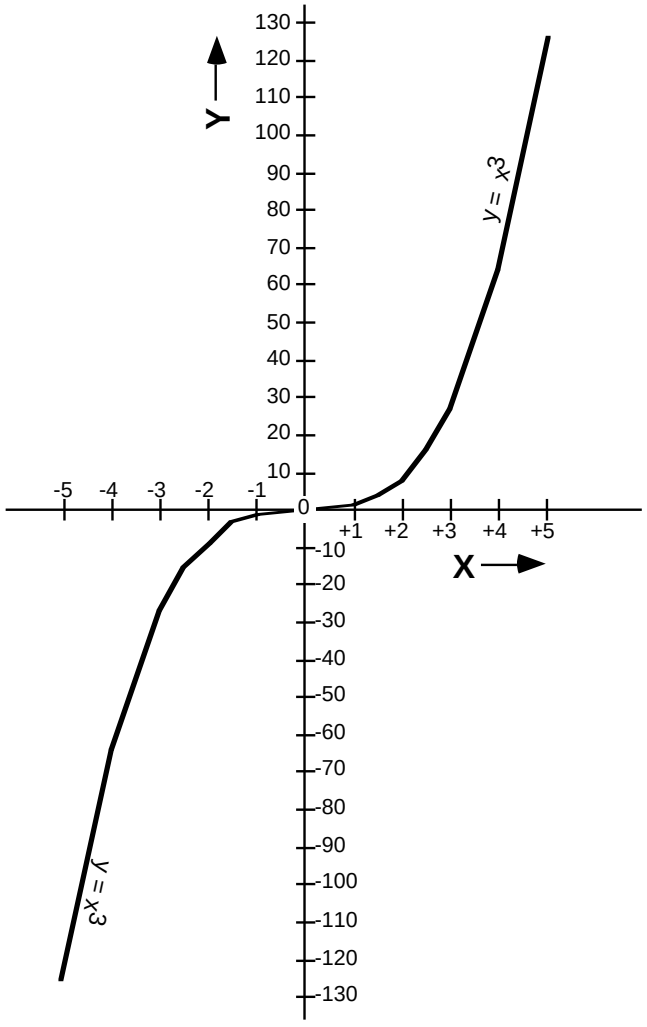


Figure 6.2b $y = x^3$ function

7 SERIAL COMMUNICATIONS

7.1 INTRODUCTION

This option provides the means for establishing a serial communications link between the recorder and a host computer (using the Gould Modicon MODBUS protocol), or terminal emulator or Modem. The Host computer can be wired using either RS232 or RS485, as can terminal emulators but modems will work only with RS232. This section deals with the establishment of a serial communications link between the recorder and a host computer; section 11 describes modem/terminal emulator working.

7.1.1 Safety isolation specification

Safety isolation (dc to 65Hz; BS EN61010) Installation category II; Pollution category 2 (see page 1 for definitions)
Terminals to ground: 100 V* RMS or dc (basic insulation)

7.2 WIRING

* Caution
See Section 14 if the
Enhanced Immunity option is fitted.

7.2.1 Pinout

Only one communications board may be fitted to the recorder, and it should be fitted in slot 2 or slot 4. Figure 7.2.1 gives termination details for both slots and shows RS232 and RS485 terminations. RS232/RS485 working is selected by the placing of links on the option board, as shown in section 7.6.

Notes:
1. The 5V output is capable of sourcing 5mA max. and is supplied for biassing purposes only
2. The Signal ground (0V) must be earthed at one point (only) in the link.
3. The option board can be located at slot two or slot four, and can be wired for RS232 or RS485 in either slot.
4. The recorder supports 4-wire RS485 only, i.e. with separate transmit and receive connections. Two-wire operation is not supported

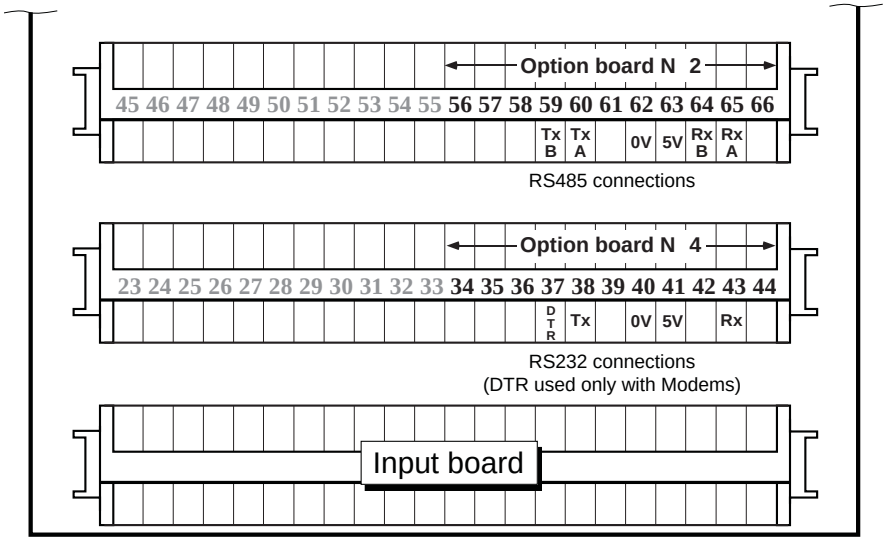


Figure 7.2.1 Communications option pinout

7.2.2 Termination and Biasing (not applicable to RS232)

If the communications line is left open-ended, the end of the cable acts as a reflector, returning what can appear to be 'true' data signals back down the line. A receiver cannot distinguish between 'true' and reflected data, with the result that the 'true' data is corrupted.

In order to avoid this, a termination resistor is fitted across the line at the final instrument. If the value of this resistor is equal to the characteristic impedance of the cable (120 Ohms in this case), then the line appears to be of infinite length and no reflections occur. Such a value however, does not give the best signal-to-noise ratio, so a compromise value (220 Ohms) is chosen to give the optimum performance in reducing unwanted reflections and in improving the signal-to-noise ratio.

The recorder communications port is terminated as shown in figure 7.2.2a, below. In a single point-to-point application, it may be necessary to terminate the instrument with a 220Ω resistor. In multi-drop systems, only the final unit should be terminated in this way, otherwise the transmitted signal levels may be reduced to an unacceptable level.

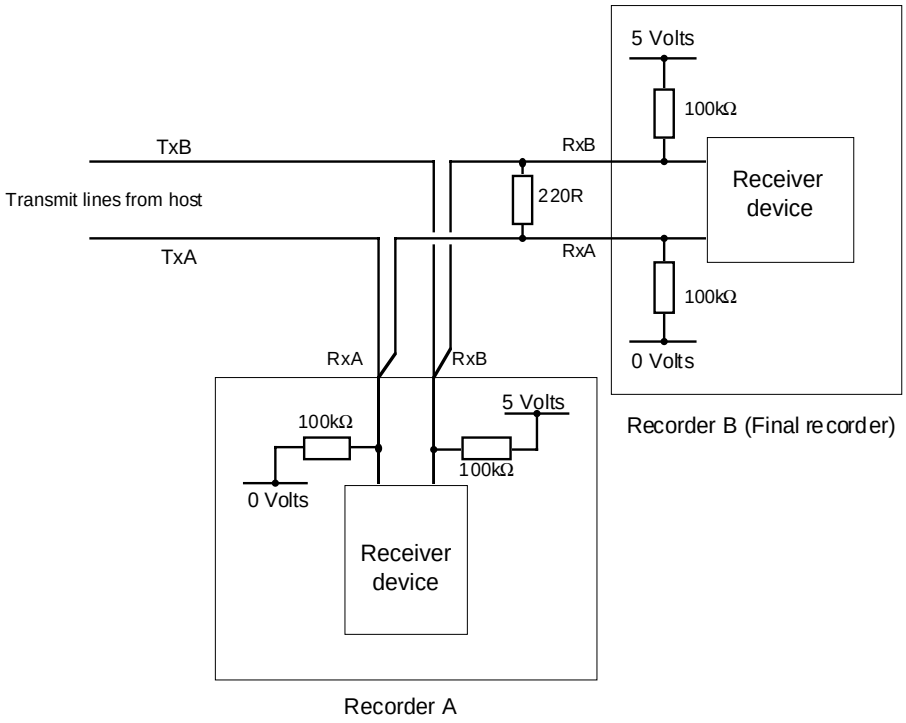


Figure 7.2.2a System termination and biasing

HOST COMPUTER

When not communicating, the instrument outputs go to a high-impedance state to allow multi-drop connection. This will cause a problem if the host computer is not fitted with biasing resistors to pull these essentially open circuit lines to their idle states as defined for the RS422/RS485 standards. To overcome such problems, external biasing resistors can be fitted as shown in figure 7.2.2b (a) below.

With long cable runs it may also be necessary to terminate the transmission line. Figure 7.2.2b (b) shows how this may be done using external biasing resistors. Such a circuit is for use where the host receiver does not have its own internal biasing arrangements. Where the host does have its own internal biasing, the fitting of a 220Ω resistor across the receive inputs (figure 7.2.2b (c)) will terminate the line correctly.

7.2.2 TERMINATION AND BIASING (Cont.)

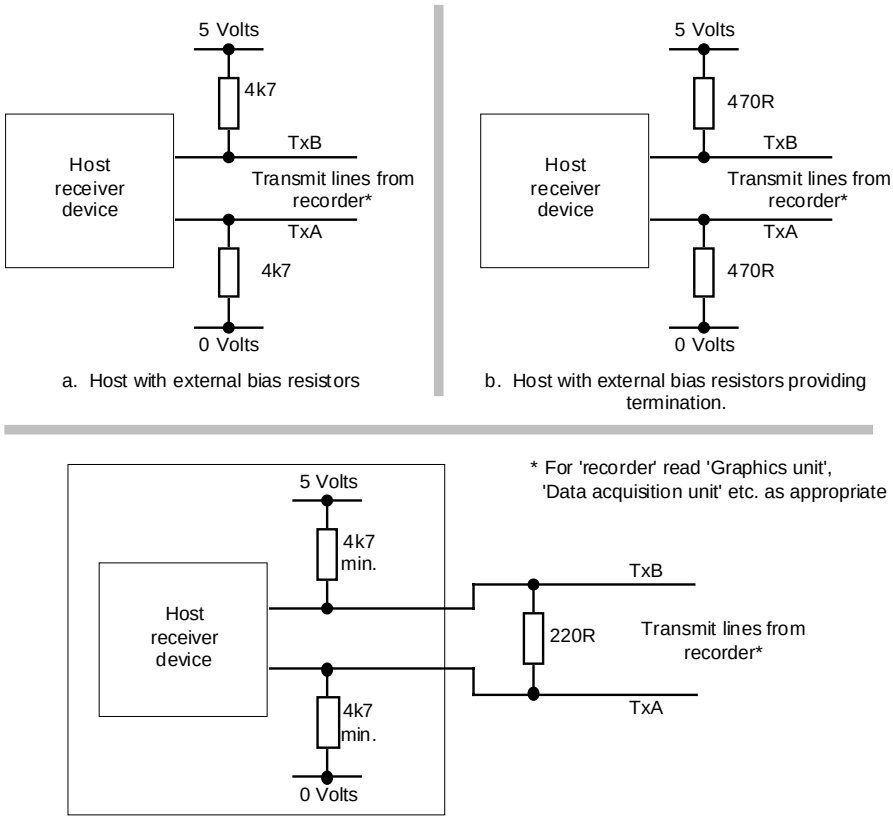


Figure 7.2.2b Host computer termination and biasing

7.3 CONFIGURATION PAGES

The configuration pages (figure 7.3) allow the Baud Rate, Parity, Nº of stop bits and the instrument address to be set up for a Modbus link, or 'Remote Operation to be selected instead if the Modem option is fitted (see section 11).

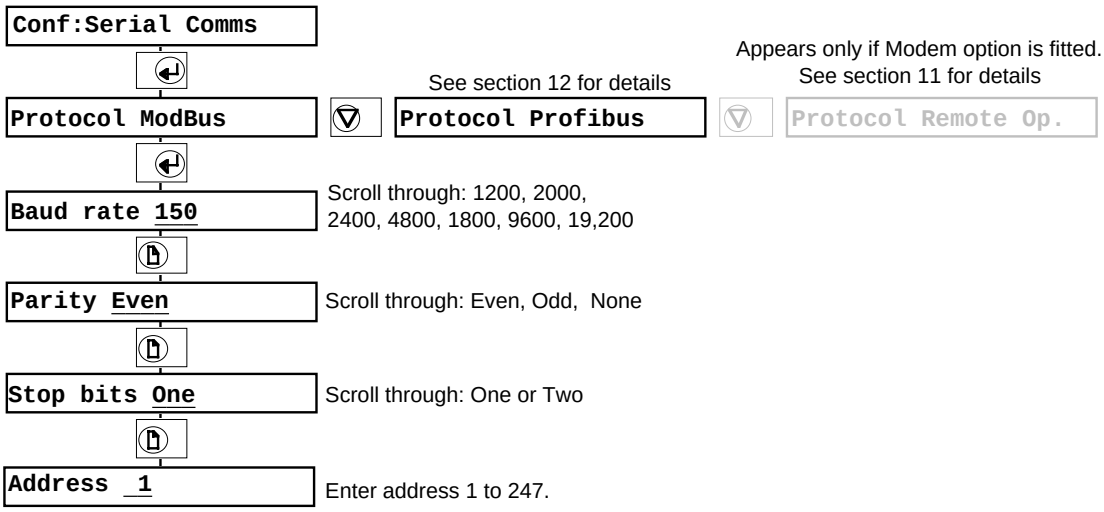


Figure 7.3 Configuration pages

7.4 GOULD MODICON MODBUS PROTOCOL

7.4.1 Introduction

When connected to a host computer the recorder acts as a slave Modbus device. The unit address (1 to 247) being set up as a part of the recorder's communications configuration. Only a limited number of function codes have been implemented (ref. Modbus protocol manual) and these are listed in section 7.4.4

7.4.2 Channel addressing

The channel 1 address listed in table 7.4.3 is the base address at which channel 1 may be accessed.

Note: Addressing starts at zero, whilst channel numbers start at 1

Example: to read a digital input at channel 23, the required address passed with the code 01 would be 22

If an alarm is set for an input or derived channel, the associated alarm parameters can be read using code 03

Example: To read the set point of absolute alarm 1 on channel 8, the required address passed with code 03 should be 1257 (1250 = channel 1; 1251 = channel 2 etc.).

The interpretation of alarm parameters (A1 to A4 and SP1 to SP4 in table 7.4.4) depends on alarm type as follows:

ALARM TYPE	PARAMETER	DEFINITION
Absolute	A1 to A4	Not used
Absolute	SP1 to SP4	Setpoint values
Deviation	A1 to A4	Deviation Values
Deviation	SP1 to SP4	Setpoint values
Rate	A1 to A4	Rate value
Rate	SP1 to SP4	Period value (secs)
Digital	A1 to A4	Not used
Digital	SP1 to SP4	0000 = Open; FFFF = Closed

Table 7.4.2 Alarm parameter definition

Note: Any request to read a nonexistent setpoint value will result in the value 0000 being returned. This should not be taken to mean that the setpoint is at 0.000

7.4.3 Reading analogue inputs

The values read are in the range 0000 to FFFF. To obtain the scaled relative value, the following calculation must be carried out where the analogue input is in hex:

$$\text{Scaled value} = \left(\frac{\text{High range - Low range}}{\text{FFFF}} \; x \; \text{Analogue input} \right) + \text{low range}$$

In the event of a hardware error or under-range value, the value is forced to scale zero. Should the analogue value be over range, the scaled value is forced to scale high.

7.4.4 Function codes

CODE	FUNCTION	RECORDER ACTION	CHANNEL 1 ADDRESS (DECIMAL)
01	Read coil status	Digital input state (true = >0.5)	0
02	Digital read input status	Digital input state (true = < 0.5)	0
		Input alarm 1 status	250
		Input alarm 2 status	500
		Input alarm 3 status	750
		Input alarm 4 status	1000
		Derived alarm 1 status	1250
		Derived alarm 2 status	1500
		Derived alarm 3 status	1750
		Derived alarm 4 status	2000
03	Read holding register	Analogue input value	0
		Analogue input A1 (Table 7.4.2)	250
		Analogue input A2 (Table 7.4.2)	500
		Analogue input A3 (Table 7.4.2)	750
		Analogue input A4 (Table 7.4.2)	1000
		Analogue input SP1 (Table 7.4.2)	1250
		Analogue input SP2 (Table 7.4.2)	1500
		Analogue input SP3 (Table 7.4.2)	1750
		Analogue input SP4 (Table 7.4.2)	2000
		Derived channel A1 (Table 7.4.2)	2250
		Reserved (always returns 0000)	2500
		Derived channel A2 (Table 7.4.2)	2750
		Reserved (always returns 0000)	3000
		Derived channel A3 (Table 7.4.2)	3250
		Reserved (always returns 0000)	3500
		Derived channel A4 (Table 7.4.2)	3750
		Reserved (always returns 0000)	4000
		Derived channel SP1 (Table 7.4.2)	4250
		Reserved (always returns 0000)	4500
		Derived channel SP2 (Table 7.4.2)	4750
		Reserved (always returns 0000)	5000
		Derived channel SP3 (Table 7.4.2)	5250
		Reserved (always returns 0000)	5500
		Derived channel SP4 (Table 7.4.2)	5750
		Reserved (always returns 0000)	6000
		Input channel status (read only) (flags - see code 04)	6250
		Derived channel status (read only) (flags - see code 04)	6500
		Instrument status (read only) (flags - see code 07)	6750
		Print mode	7000
		0 = Trace priority	
		1 = Text priority	
		2 = Text only	
		Analogue input value (scaled 16-bit)	8000
		Derived channel value (scaled 16-bit)	8012
		Year/Month	8036
		Bits 15 to 4 = Year (e.g. 2000 = 0111 1101 0000)	
		Bits 3 to 0 = Month (e.g. Nov = 1011)	
		E.G. November 2000 = 0111110100001011	

Table 7.4.4 Modbus implementation channel addresses (Sheet 1: codes 01 to 03 (part))

7.4.4 FUNCTION CODES (Cont.)

CODE	FUNCTION	RECORDER ACTION	CHANNEL 1 ADDRESS
03	Holding register (Cont.)	Date and hours	8037
		Bits 15 to 8 = Day number (e.g. 25th = 0001 1001) Bits 7 to 0 = Hours (e.g. 1 pm = 0000 1101) E.G. 1pm on the 25th = 0001100100001101	
		Minutes and seconds	8038
		Bits 15 to 8 = minutes (e.g. 39 = 0010 0111) Bits 7 to 0 = seconds (e.g. 15 = 0000 1111) E.G. 39 minutes, 15 seconds = 0010011100001111	
		Status flags	8039

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	0	0	0	0	SE	Data modification counter							

SE = Recorder system error flag. Set if any recorder system error is active.
Data modification (DM) counter. Set to zero at switch-on. If any of the 9000 series of registers is modified, the recorder increments this counter.

Alarm and status flags (analogue inputs) 8040

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
0	0	0	0	A1	A2	A3	A4	0	0	OF	RE	HE	UR	OR	CO

A1 to A4 = Alarm 1 flag to alarm 4 flag (1 = alarm)
OF = Overflow
RE = Ranging error or no data
HE = Hardware error
UR = Under range
OR = Over range
CO = Channel off

Alarm and status flags (Derived channels) 8052
(As for 8040 above)

Analogue input value (32-bit floating point) 8076
Value is held in two contiguous registers, where the even register (e.g. 8076) contains bits 31 to 16, and the following register (8077 in this example) contains bits 15 to 0. Register 8076 + 2(n-1) is the most significant register for input 'n'.

Derived channel value (32-bit floating point) 8100
Value is held in two contiguous registers, where the even register (e.g. 8100) contains bits 31 to 16, and the following register (8101 in this example) contains bits 15 to 0. Register 8100 + 2(n-1) is the most significant register for channel 'n'.

Table 7.4.4 Modbus implementation channel addresses (Sheet 2: Code 03 continued)

7.4.4 FUNCTION CODES (Cont.)

CODE	FUNCTION	RECORDER ACTION	CHANNEL 1 ADDRESS
03	Holding register (Cont.)	Number of PVs and DVs in the recorder	9000

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Number of Derived Channels								Number of Analogue inputs							

Instrument tag - characters 1 and 2 9001
Instrument tag - characters 3 and 4 9002
Instrument tag - characters 5 and 6 9003
Instrument tag - characters 7 and 8 9004
Instrument tag - characters 9 and 10 9005
Instrument tag - characters 11 and 12 9006
Instrument tag - characters 13 and 14 9007
Instrument tag - characters 15 and 16 9008

Instrument tag is sent in groups of two 8-bit ASCII characters, with odd numbered characters in the most significant byte.

15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0
Odd character (e.g. first)								Next character (e.g. second)							

Analogue input scale zero (32-bit floating point) 9009

Value is held in two contiguous registers, where the odd register (e.g. 9009) contains bits 31 to 16, and the following register (9010 in this example) contains bits 15 to 0. Register 9009 + 2(n-1) is the most significant register for input 'n'.

Derived channel scale zero (32-bit floating point) 9033

Value is held in two contiguous registers, where the odd register (e.g. 9033) contains bits 31 to 16, and the following register (9034 in this example) contains bits 15 to 0. Register 9033 + 2(n-1) is the most significant register for channel 'n'.

Analogue input full scale (32-bit floating point) 9081

Value is held in two contiguous registers, where the odd register (e.g. 9081) contains bits 31 to 16, and the following register (9082 in this example) contains bits 15 to 0. Register 9081 + 2(n-1) is the most significant register for input 'n'.

Derived channel scale zero (32-bit floating point) 9105

Value is held in two contiguous registers, where the odd register (e.g. 9105) contains bits 31 to 16, and the following register (9105 in this example) contains bits 15 to 0. Register 9105 + 2(n-1) is the most significant register for channel 'n'.

Analogue input Tag (Descriptor) 9153

The tag is held in 7 contiguous registers, each of which contains two ASCII characters. For example, register 9153 contains characters 1 and 2 of input 1's tag; 9154 contains characters 3 and 4 and so on, until 9159 which contains characters 13 and 14. Register 9160 contains characters 1 and 2 of input 2's tag and so on. Register 9153 + 7(n-1) contains characters 1 and 2 for input 'n'.

Table 7.4.4 Modbus implementation channel addresses (Sheet 3: Code 03 continued)

7.4.4 FUNCTION CODES (Cont.)

CODE	FUNCTION	RECORDER ACTION	CHANNEL 1 ADDRESS
03	Holding register (Cont.)	Derived channel Tag (descriptor)	9237
		The derived channel tag is held in 7 contiguous registers, each of which contains two ASCII characters. For example, register 9237 contains characters 1 and 2 of channel 1's tag; 9238 contains characters 3 and 4, and so on, until 9243 which contains characters 13 and 14. Register 9244 contains characters 1 and 2 of channel 2's tag and so on. Register 9237 + 7(n-1) contains characters 1 and 2 for channel 'n'.	
		Analogue input Engineering Units	9405
		The engineering units string is held in 3 contiguous registers, The first of which contains characters 1 and 2; the second contains characters 3 and 4, and the third contains character 5. For example, register 9405 contains characters 1 and 2 for input 1; register 9406 contains characters 3 and 4 and register 9407 contains character 5. Register 9408 contains characters 1 and 2 for input 2 and so on. Register 9405 + 3(n-1) contains characters 1 and 2 for input 'n'.	
		Derived channel Engineering Units	9441
		The engineering units string is held in 3 contiguous registers, The first of which contains characters 1 and 2; the second contains characters 3 and 4, and the third contains character 5. For example, register 9441 contains characters 1 and 2 for derived channel 1; register 9442 contains characters 3 and 4 and register 9443 contains character 5. Register 9444 contains characters 1 and 2 for derived channel 2 and so on. Register 9441 + 3(n-1) contains characters 1 and 2 for channel 'n'.	

Table 7.4.4 Modbus implementation channel addresses (Sheet 4: Code 03 concluded)

Note: 8000 series registers are intended for continuous polling, and are read-only. 9000 series registers typically are polled only on initialisation and are also read-only. Registers 8000 to 9512 are used only with graphics recorders.

7.4.4 FUNCTION CODES (Cont.)

CODE	FUNCTION	RECORDER ACTION	CHANNEL 1 ADDRESS
04	Read input register	Analogue input value	0
		Input channel status	250
		No bits set: Channel OK Bit 0 set: Channel off Bit 1 set: Over range Bit 2 set: Under range Bit 3 set: Hardware error / bad PV Bit 4 set: Ranging error / no data Bit 5 set: Overflow Bits 6 to 15: Always 0.	
		Derived channel value	500
		Reserved (returns 0000)	750
		Derived channel status	1000
		(Bits 0 to 15 as for Input channel status above)	
		Instrument status (flags - code 7)	1250
05	Force single coil	Sets digital input state for comms channel 0 = 0.000; 1 = 1.000	0
06	Preset single register	Preset holding register (Presets values for comms channels only)	As code 03
07	Read exception status	Read instrument status Bit 0 set: System error Bit 1 set: Writing system failure Bits 2 to 7 Always 0	
08	Loopback test	Diagnostic code 0 (Echoes message as sent)	
15	Force multiple coil	Sets digital input code for comms channels in address range. 0 = 0.000; 1 = 1.000	0
16	Preset multiple registers	Preset holding register for each channel in address range. (Presets values for comms channels only)	As code 03
16	Print text string	In addition to the above code 16. Data quantity is the total number of characters in the text string (including colour commands) divided by two (must have an even number of characters. The text string must consist of no more than 42 characters and may contain no more than 10 colour commands of the form !n, where n is a numeric character from 1 to 6 as shown in the table below. Text is printed in black unless otherwise commanded The '!' character may not be used as a text character. MSB is printed first.	7250

n	Colour
1	Red
2	Brown
3	Green
4	Violet
5	Blue
6	Black

Continuous trace recorders (with annotation option fitted) print in black only. '!n' commands are ignored.

Table 7.4.4 Modbus implementation channel addresses (Sheet 4)

7.4.4 FUNCTION CODES (Cont.)

CODE	FUNCTION	RECORDER ACTION	CHANNEL 1 ADDRESS
65	Enter XMODEM mode	Holds 1 byte of data specifying which mode to enter 0 = standby; 1 = Receiver; 2 = Sender	
66	Report XMODEM error	Returns 1 byte of data as follows: 0: Transfer OK - no errors 1: Restore failed completely File was incompatible or comms failed to transfer the file, Original configuration unchanged. 2: Restore failed on data. Some records ignored, but transfer mostly successful. 3: Restore failed on transfer Some config. transferred before failure. New configuration undefined 16: Save had no reply from comms and timed out 32: Save failed before transfer completed	
		EXCEPTION RESPONSES	
01	Illegal function	Unsupported or illegal Modbus function 0	
02	Illegal data address	Data address out of range for instrument config .....0 Attempt to preset input value of non comms channel Invalid configuration data	
03	Illegal data	Data value out of range for function	
06	Illegal busy	Configuration transfer in progress via another port so unable to action function	

Table 7.4.4 Modbus implementation channel addresses (Sheet 5)

7.5 XMODEM TRANSFER

XMODEM transfers take place between a host computer and a single instrument to save or restore configuration.

The transfer procedure is as follows

1. Place any other instruments on the communications link into standby mode.
2. Set the required recorder to sender or receiver mode as appropriate.
3. Send or receive file at host.
4. 10 seconds after completion, host communications is restored to normal use.

Note: 10 seconds of inactivity on the communications link, at any point in the procedure, will cause the host communications to return to normal use for instruments in standby mode.

7.6 CHANGING BETWEEN RS232 AND RS422/485

CAUTION

This procedure involves the handling of circuit boards which are susceptible to damage caused by static electrical discharge. All relevant personnel should be aware of proper static handling procedures.

Changing between RS232 and RS422/485 is effected by changing the position of links LK1, LK2 and LK 3 on the communications option board, as follows:

7.6.1 Access to the communications board

1. Isolate the recorder from all hazardous voltages, both supply and signal.
2. For graphics recorders, continue at instruction 3. For non-graphics recorders, open the recorder door and remove the chart cassette and the pens/printhead. Undo the retaining screw (Figure 7.6.1a) and pull the chassis gently out of the case until the flexi cable connector at the rear of the writing system can be accessed. Continue at instruction 4.
3. For graphics recorders, lift the handle and pull the display unit forwards until it latches (figure 7.6.1b). Press the latch in and pull the chassis gently out of the case until the flexi cable connector at the rear of the writing system can be accessed.

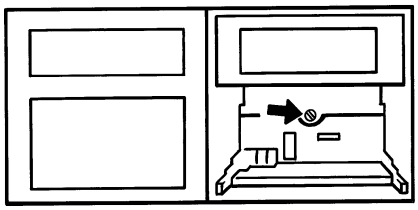


Figure 7.6.1a Securing screw location (non-graphics units)

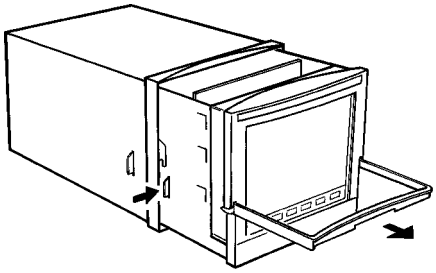


Figure 7.6.1b Graphics unit chassis removal

4. Remove the flexicable from its connector as shown in figure 7.6.1c. (The connector consists of a fixed part attached to the circuit board, and a moving clamp. The clamp should be gently prised away from the fixed part, until the flexi cable can be removed easily.)

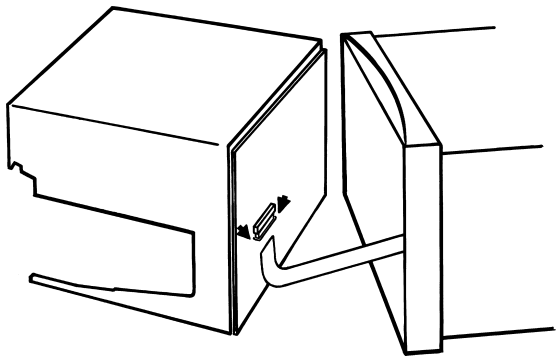


Figure 7.6.1c Flexi-cable removal (Non-graphics model shown; graphics units similar)

5. Remove the chassis and lay it carefully in a static-safe environment.
6. The option boards are now accessible from the front of the case, as shown below.

7.6.1 ACCESS TO THE COMMUNICATIONS BOARD (Cont.)

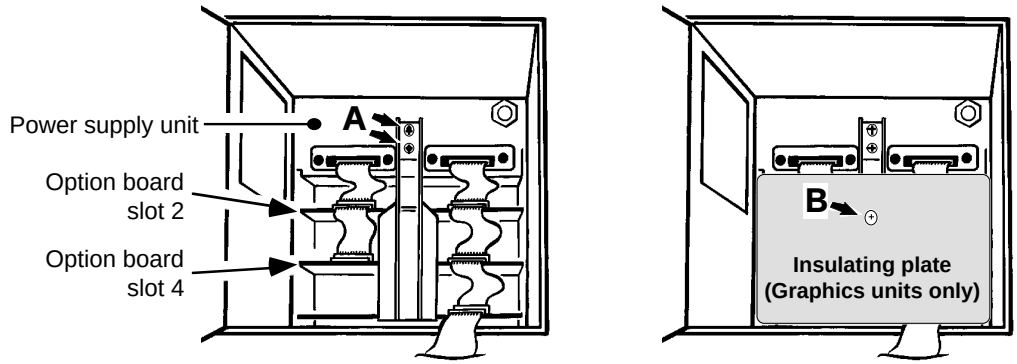


Figure 7.6.1d Option board locations

7. The communications board is located either in slot 2 or slot 4, and can be gently pulled out, once the board retainer has been removed and the relevant ribbon cable connector(s) removed. The board retainer is removed by undoing its two securing screws (A in the figure above). For graphics units, an insulating sheet has to be removed first (screw B above). Once the board has been removed, it should be placed on a static safe surface.

7.6.2 Link locations

The link locations are as shown in figure 7.6.2 below.

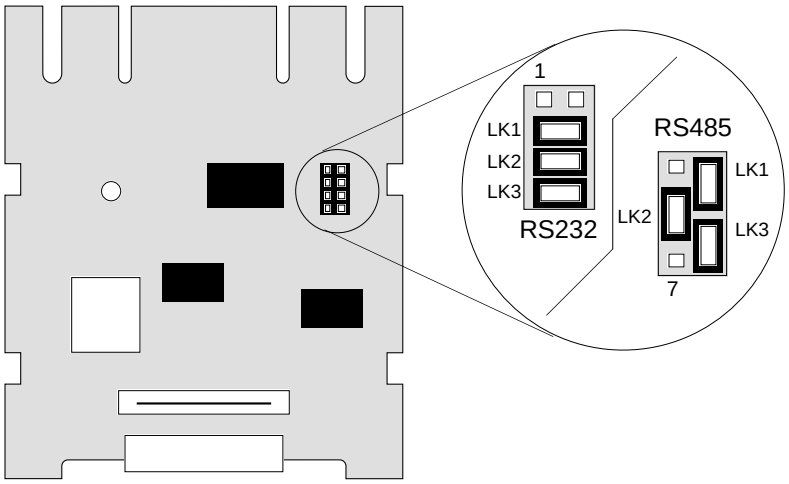


Figure 7.6.2 Link locations for RS232 / RS485

7.6.3 Re-assembly

Once the links have been set appropriately, return the circuit board to its slot, and remake the ribbon cable connector(s). Re-fit the board retainer and insulating sheet (graphics units only).

Re-connect the flexi-cable at the rear of the chassis, ensuring that the cable is fitted securely. Return the chassis to the case and, for non-graphics recorders, return the chart cassette and pens/printhead to the chassis.

Wire the communications link as shown in figure 7.2.1.

8 MEMORY CARD

8.1 INTRODUCTION

Notes:
1. This section does not apply to graphics units. Please refer to Section 6 (Mass Storage) of the Installation and operation manual supplied with the graphics unit.
2. Most memory card functions are not accessible to the operator until they have been enabled in the Operator Access' configuration as described in section 8.5.

The memory card is a static RAM with battery back-up. The battery, located within the card, maintains the data for a period which is dependent on card type. The instructions supplied with the card give details of storage periods and battery changing.

Files are stored in DOS format, and the card is PCMCIA version 2 compatible. Configuration software, available from the manufacturer, to run on a PC, can be used in conjunction with the card (and a suitable reader) to create or modify configurations for subsequent down loading to the recorder.

Memory card functions are all available both from the configuration menu and from the operator menu (unless access permission has been denied - see section 8.5). The major functions of the Memory Card options are:

Save and restore option:	Configuration save and restore
ASCII log option:	As above Save and Restore option but with ASCII Data logging.
Compressed log option:	As ASCII log but with PACKED data format.

Reformatting software is available to convert PACKED format data logs to ASCII format thus allowing manipulation of the data in PCs.

8.2 MEMORY CARD INSERTION

As shown in figure 8.2, the memory card is inserted into a slot located at the top of the recorder, behind the display module. To insert the card, open the recorder door, open the display (hinged at its left edge) and, noting the instructions on the card as to its correct orientation, push the card fully into the slot.

To remove the card, operate the push-button card ejector immediately to the right of the card slot.

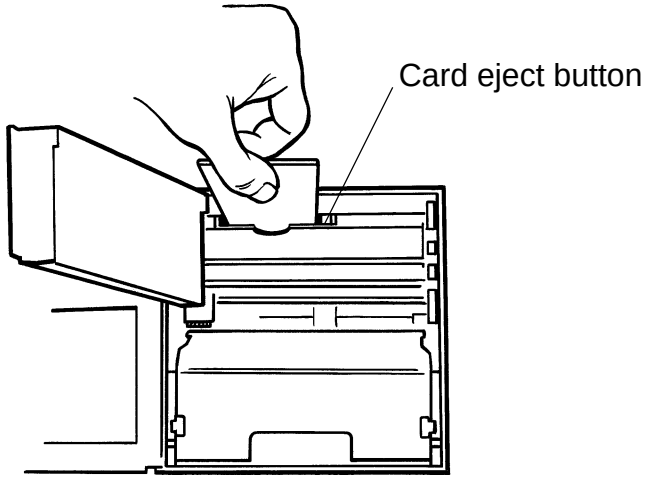


Figure 8.2 Memory card insertion

8 MEMORY CARD (Cont.)

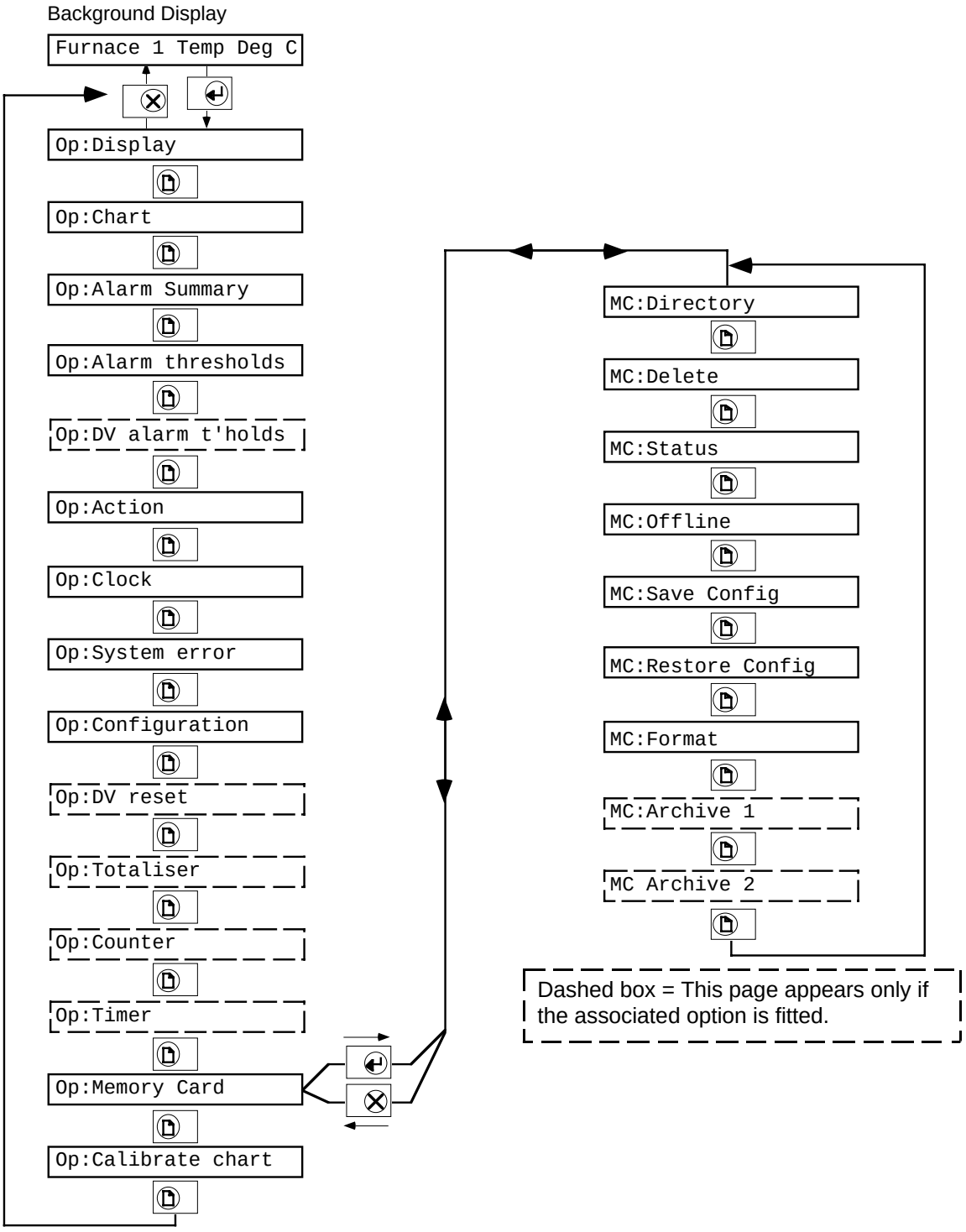


Figure 8 Memory card operator menu structure

8.2.1 Card formatting

Before the memory card can be used for the first time, it must be formatted, by operating the 'Enter' key in the '↵ to FORMAT' display page as shown in figure 8.2.2 below.

Note: All existing data on the card will be deleted.

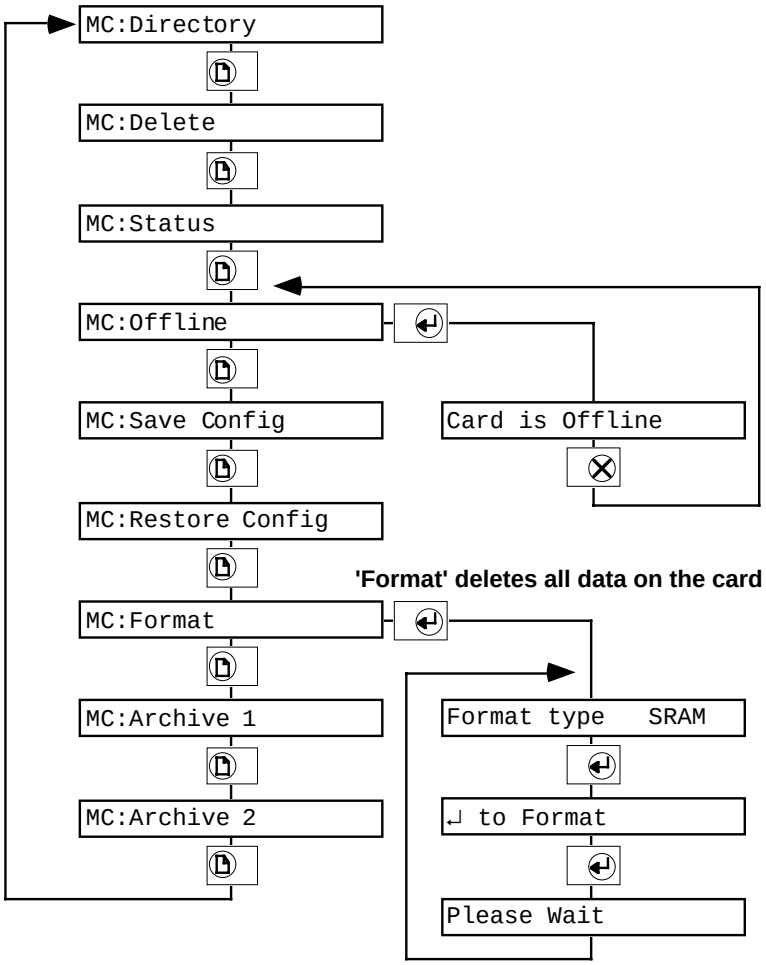


Figure 8.2.2 Card format and off-line menus

8.2.2 Changing cards

In order to ensure that no corruption of card data takes place whilst changing cards, it is recommended that access to the memory card be inhibited whilst card removal / insertion is carried out. This is done by setting the card off-line by operating the 'Enter key' in the MC:Offline page. See figure 8.2.2 above

The card comes back on line as soon as the operator quits the menu.

8.3 CONFIGURATION SAVE AND RESTORE

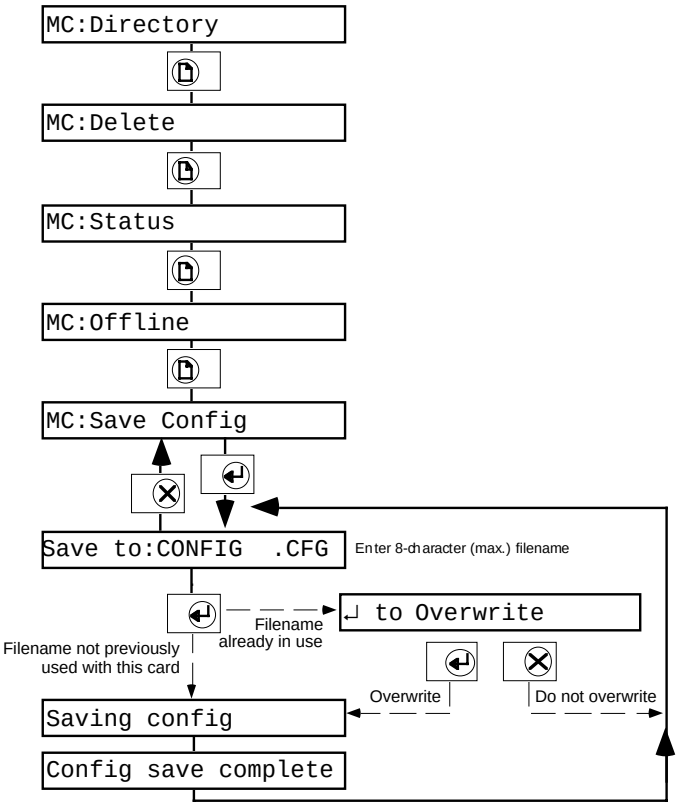
8.3.1 Save

Operation of the 'Enter' key from the Save Config page, calls a Filename page which allows the entry of an 8-character (max) string as the Configuration's title.

Once the file name has been entered, a further operation of the 'Enter' key causes the configuration to be written to the memory card.

Should the filename already exist, an overwrite confirmation is requested. 'Enter' confirms overwrite, or Cancel returns to the filename page.

See section 8.7 for details of file names (Only DOS format file names allowed)



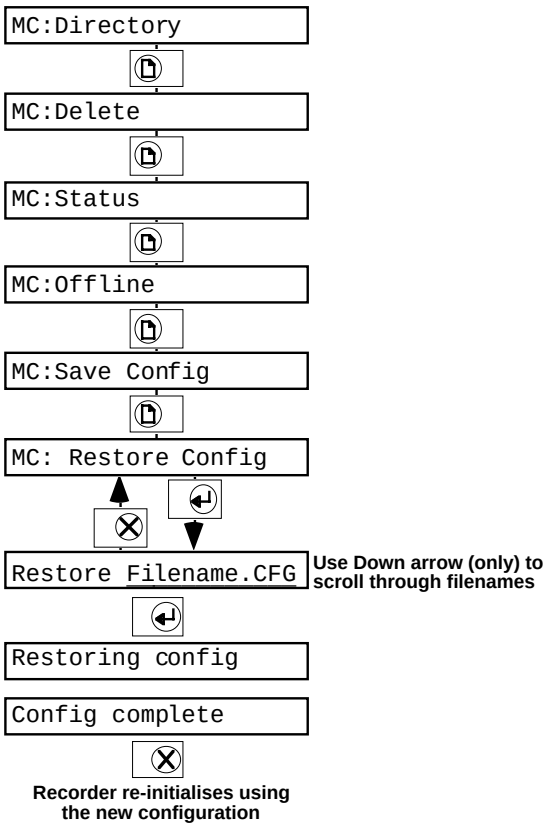
8.3.2 Restore

Operation of the 'Enter key from the Restore Config page, calls the filename page. This allows the names of all the files held on the card to be scrolled through using the down arrow key. Configuration files can be identified as they have .CFG as their extension

Once the required file name is displayed, a further operation of the 'Enter' key causes the configuration to be read from the memory card.

Whilst the configuration is being read from the memory card, the message 'Restoring config.' is displayed.

Once the configuration read is complete, operation of the Clear (X) key causes the recorder to re-initialise and return to background display.



8.4 DATA LOGGING (ARCHIVE)

Logging to file can be initiated by job, through operator action or, for log group 2, automatically at one of two configurable periods (archive intervals A and B). Under normal circumstances, interval A is used, interval B being selected by Job action. More details can be found in section 4.1 of the Installation and Operation Manual supplied with the recorder.

When archiving automatically, log group 2 is sent to the file defined in Archive 2 configuration.

The content of logs 1 and 2 are set up in Group Configuration as described in Section 4.6 of the Installation and Operation Manual.

According to which of the archiving options is fitted, data can be logged in ASCII format (both options) or in PACKED format which is a compressed format for high density data archiving. Reformatting Software for running on a PC, is available from the manufacturer to allow conversion of the compressed data into ASCII comma-delimited format, suitable for direct use with PC spreadsheet or word processing packages.

Note: See section 8.7 for details of permissible file names / types.

The Archiving operator pages (figure 8.4) allow only the initiation of the log. Entry of file names, archive interval, data type etc., is carried out using the configuration menus (figure 8.4.1).

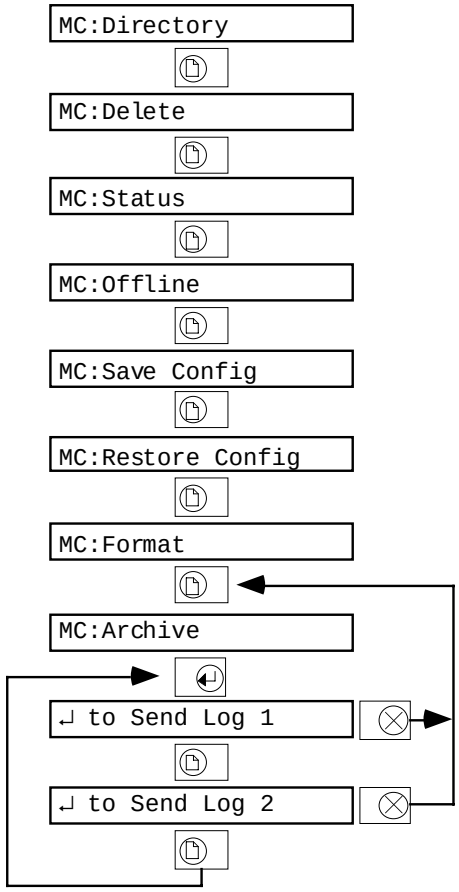


Figure 8.4 Operator Log initiation

8.4.1 Archive configuration

File containing two input channels (2 and 3) including tags (TempVes1 and PressVes1) and units (˚C and bar respectively), with DD/MM/YY,HH:MM:SS date format. Column headers (Channel tags) included:

```
“XXXXA”, ,”2","3"
“DD/MM/YY”,”HH:MM:SS”,”˚C”,”Bar”
“Log”,,”TempVes1","PresVes1"
29/02/96,12:15:06,28.93,0.989
29/02/96,12:16:04,28.71,0.963
```

(Where XXXXA is the recorder model number)

File containing two input channels (1 and 3) NOT including tags or units, with DD/MM/YY,HH:MM:SS date format. Column headers (Channel tags) included:

```
“XXXXA”, ,”1","2"
,,
“Log”,,
29/02/96,12:15:06,28.93,0.989
29/02/96,12:15:06,28.71,0.963
```

(Where XXXXA is the recorder model number)

Table 8.4.1 Examples of ASCII format files

8.4.1 ARCHIVE CONFIGURATION (Cont.)

With reference to figure 8.4.1 below, and table 8.4.1 above, the following configuration steps are possible:

File type	ASCII	Produces comma delimited columns of data. File name extension is .ASC (See table 8.4.1 above for examples)
	PACKED	Proprietary format. Data is stored in a compressed manner which requires a reformatting tool to extract data from it. File name extension is .PKD
File name type	Text	Fixed file name - see section 8.7.1.
	Hourly	New file opened hourly - see section 8.7.2.
	Daily	New file opened daily - see section 8.7.3.
	Counter	File name takes counter value - see section 8.7.4.
Include column titles	Yes/No	For ASCII files only. If YES, comma delimited column titles are sent depending on the 'Channel tag' and 'Instrument tag' fields in the Log Format Configuration described in the Installation and Operation Manual supplied with the recorder.
Date format (ASCII)	DD/MM/YY,HH:MM:SS	First two columns used to specify time and date of archive. (DD/MM/YY might be MM/DD/YY according to the date format selected in Clock configuration.)
	Spreadsheet	Single, floating-point number. The integer part is the number of days since 31st Dec 1899, the decimal part is the proportion of the day since midnight. For example, Noon on the 1st Jan 1900 would be represented by a value of 1.5, whilst a value of 34121.25 would represent the 6 am on the 1st June 1993.
	Integer	Compresses time and date as YYMMDDHHMMSS, so that 6 am on the 1st June 1993 would be represented as 930601060000.
Compression ratio	Normal	For PACKED data only, compresses the data, but provides an exact copy.
	High	For PACKED data only, compresses the data more than NORMAL. Input channel values are saved to 0.02% accuracy, Totalisers, counters and derived channels are saved to 0.000004% of display accuracy (4 parts in 10^8)

JOBS

If an archiving option is fitted, the following jobs are added to the list given in section 4.1.5 of the Installation and Operation manual:

Log 1 to archive 1
Log 2 to archive 2
Archive interval B
Message (Msg) N to archive 1
Message (Msg) N to archive 2

All the above can be initiated 'On going active', 'On going inactive' or 'On acknowledge'

8.4.1 ARCHIVE CONFIGURATION (Cont.)

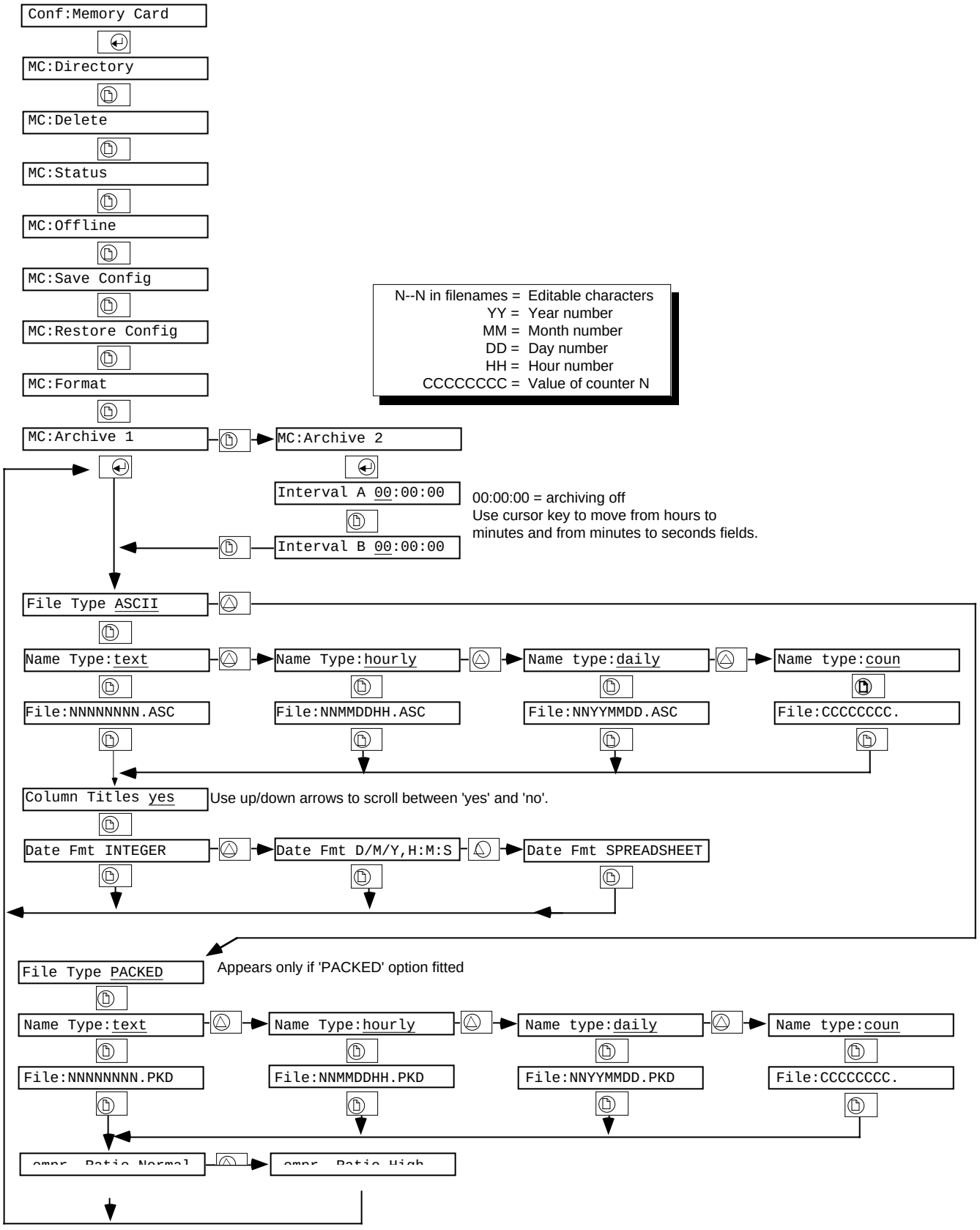


Figure 8.4.1 Archiving configuration menus

8.4.2 Archive interval

In 'Archive 2' configuration page, use the cursor and numeric entry keys to enter the required archive intervals A and B for automatic logging of log 2 group . An entry of 00:00:00 causes the automatic triggering to be inhibited. Automatic archiving is carried out at interval A except when interval B is selected by job action.

If a ‘round figure’ value (e.g. 10 mins, 20 mins) is entered, the recorder will start its automatic archiving at the next whole 10-minutes.

8.5 OPERATOR ACCESS

For the sake of security, each of the memory card functions can be added to or removed from the operator pages using the OPERATOR ACCESS part of the recorder configuration. Refer to the Operator Access description in the Configuration section of the Installation and Operation manual for further details. If all functions are removed, MCARD does not appear in the Operator Menu.

The up/down arrow keys are used to toggle the permissions between ‘yes’ and ‘no’.

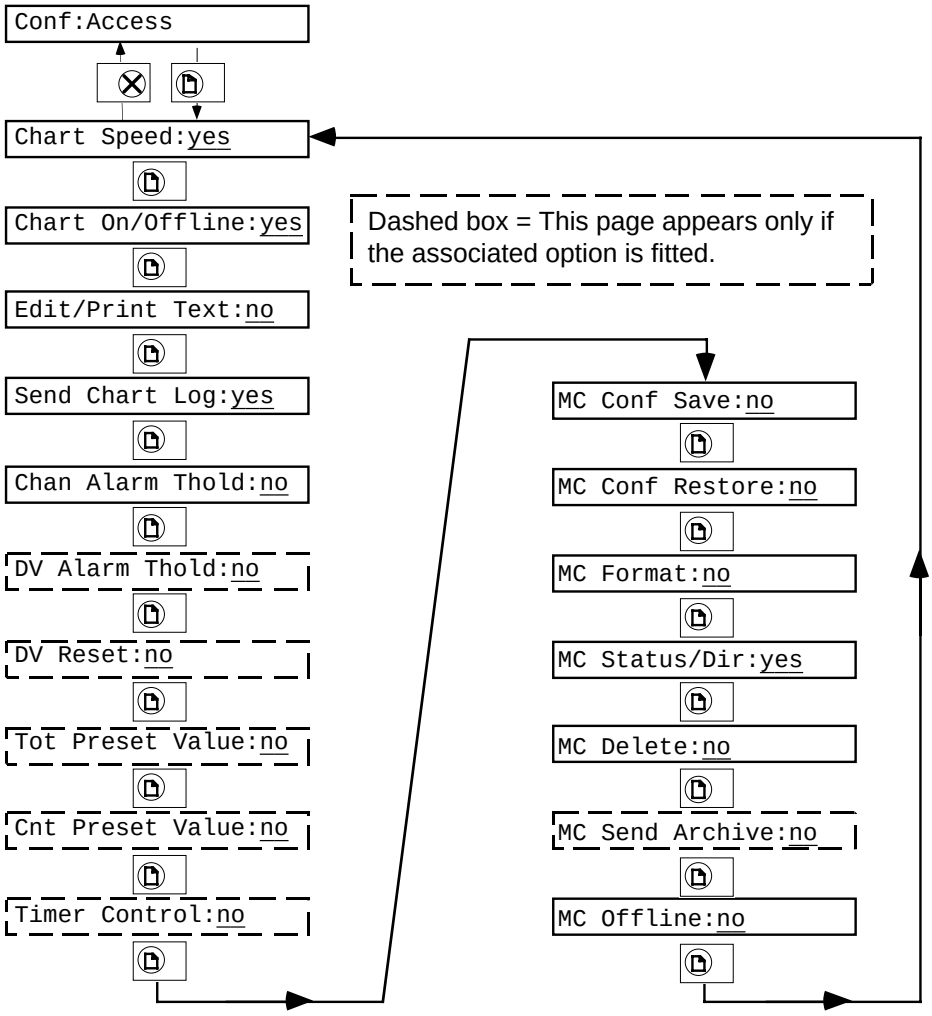


Figure 8.5 Operator permissions

8.6 MEMORY CARD GENERAL FUNCTIONS

8.6.1 Directory

The display shows the name of the oldest file on the card, together with its size in Bytes. As shown in figure 8.6.1, the down arrow key allows the user to scroll through the file names held in the card memory. For each filename on display, operation of the Page key calls a further display page which shows the time and date of the file's creation.

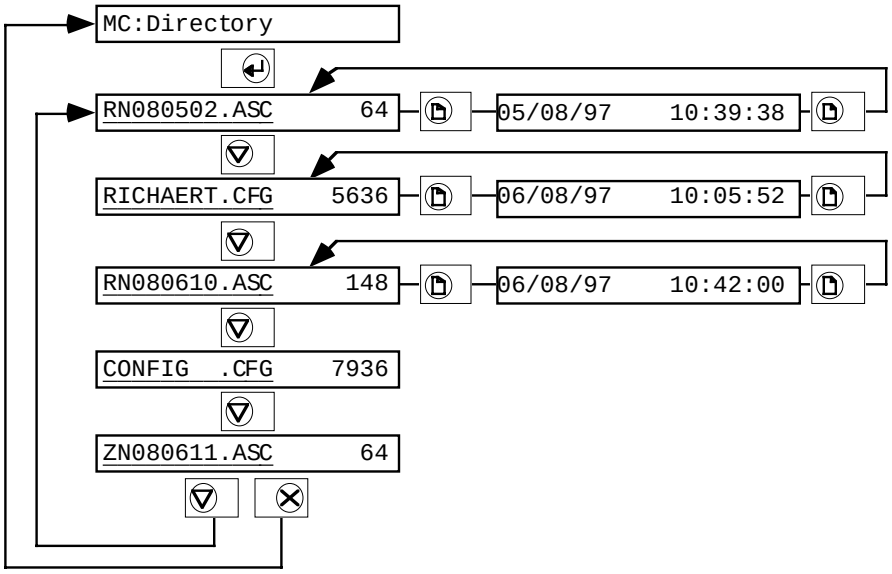


Figure 8.6.1 Directory function display pages

8.6.2 Delete

As shown in figure 8.6.2, the display shows the name of the oldest file on the card, together with a '↵ to erase' statement. The down arrow key allows the user to scroll through the file names held in the card memory. For each filename on display, operation of the 'Enter' key calls a further display page which asks for confirmation of erasure. A further operation of the 'Enter' key removes the file from the directory.

Operation of the Page key from any of the filename pages, allows the file size, and data and time of creation to be viewed as shown in the figure.

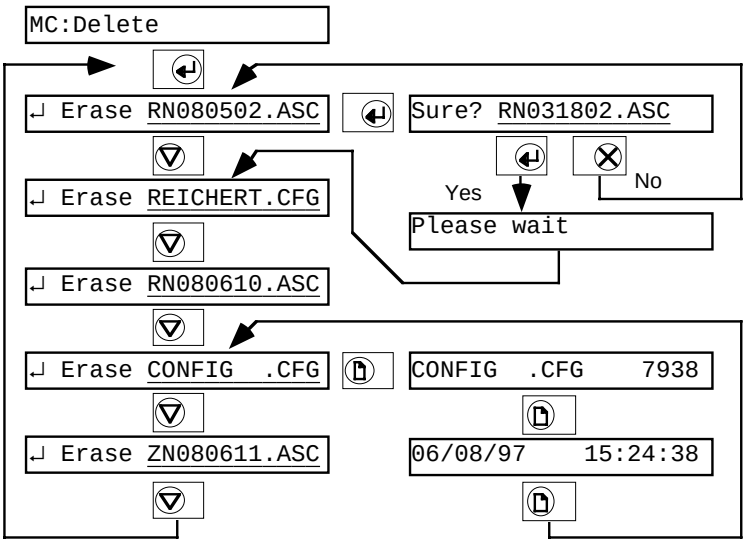


Figure 8.6.2 Delete function display pages

8.6.3 Card status

This display tells the user how much memory is currently used (11kB in the example) out of the card's total memory (128kB in the example).

Operation of the page key calls a display which shows whether the card is write protected or not.

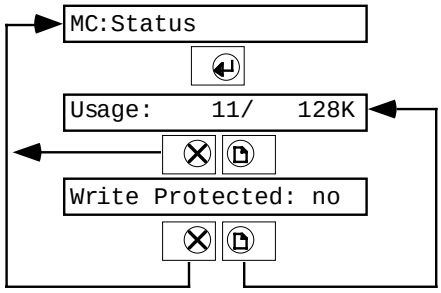


Figure 8.6.3 Status display pages

Note: A newly formatted card uses some space for format data,

8.6.4 Automatic file deletion

Should the card become full whist chart copy or data logging / archiving activities are being carried out, the oldest data logging / archiving file on the card is deleted. (The oldest file will be deleted whether or not it is of the same type as the one being written.) **Existing configuration files (.CFG) are not deleted.**

Should the card become full whist a Configuration Save is being attempted the Save will be aborted and the message 'Err:Card full' will be displayed until cleared by the 'Clear' (X) key.

8.7 FILE NAMES

As shown in figure 8.7 for 'Archive 1', the following types of file name may be used when archiving data.

1. Text
2. Daily (Uses the recorder's real-time clock)
3. Hourly (Uses the recorder's real-time clock)
4. Counter value.

The file names consist of up to eight characters, followed by a three-character non-editable extension.

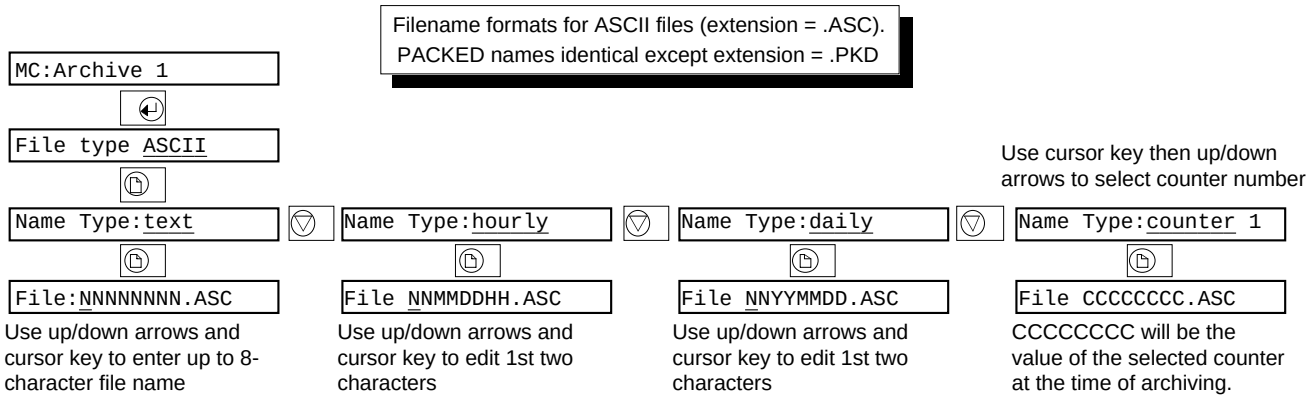


Figure 8.7 Filename selection

8.7.1 Text file names

With 'Filename type' selected as 'Text', the NN—NN field can be freely edited with alphanumeric characters as follows:

A to Z, a to z, 0 to 9 à ê è ô ù # $ % & ( ) - _ ! ^ '{ } ~ â ë ï î ì ò û ÿ á í ó ú

The use of any other character will result in a fleeting 'Invalid config' message.

8.7.2 Hourly file names

With 'Name Type' scrolled to 'Hourly', only the first two characters (NN) can be edited. The remainder of the file name will be the time and date on which the copy was initiated. Thus if an ASCII log were started some time between nine and ten a.m. on the 3rd of August, then the file name would be NN080309.ASC.

8.7.3 Daily file names

Daily filenames are similar to hourly filenames except that they contain the date rather than the time at which the file is opened Only the first two characters (NN) can be edited; the remainder of the file name will be the date on which the file was initiated. Thus if an ASCII log were initiated some time on the 3rd of August 1993, then the file name would be NN930803.ASC.

8.7.4 Counter file names

With 'Filename type' scrolled to 'Counter', none of the filename characters can be edited; the file name being the value of counter N. This allows, for example, a separate chart copy to be made for individual batches, if counter N is set up to hold the batch number. Should the counter be incremented during data transfer, the file will be closed at an appropriate point, and a new file opened with the counter's new value for a file name.

8.7.5 File name extensions

All logging file names have extensions ASC or PKD according as they are ASCII or PACKED format (See section 8.4).

If an ASCII archive is attempted to a file which already exists, then the extension is 'incremented' from ASC to AS1. If AS1 also exists, the extension will be incremented to AS2, AS3 — A10 — 100, and so on (up to 999), until an unused file name is found. PKD extensions are treated in exactly the same way.

Configuration file names (.CFG extensions) are different in that if an attempt is made to create a configuration file which already exists, a warning message appears asking for overwrite permission, and if this is given, the existing file will be overwritten and lost.

8.8 OTHER INFORMATION

8.8.1 Event sources

The following event sources (depending on which option is fitted) are added to the recorder:

1. Mem Card Bat Low
2. Mem Card Full
3. M Card Near Full
4. MCC Overdrive (Archiving buffer full)

These can be used to initiate recorder jobs as described in the Installation and Operation Manual.

8.8.2 System errors

The following possible system errors are added to the recorder:

1. Memory card battery low
2. Memory card battery flat
3. MCC Overdrive error (Archiving buffer full) (Archiving options only)

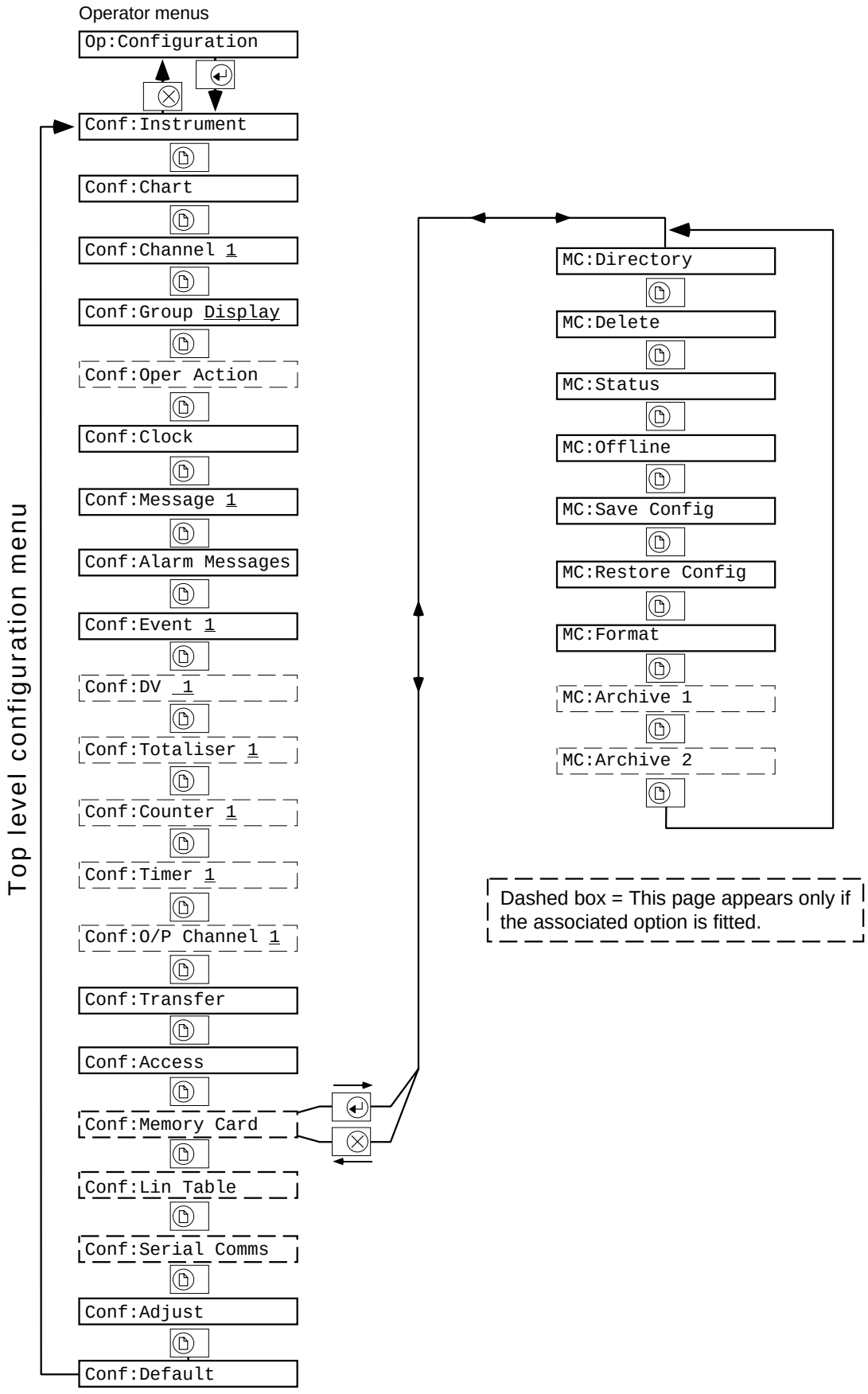
Any of these will cause a message to be sent to the display and an entry to be placed in the system error list (see the Installation and Operation Manual).

8.8.3 Error messages

In the event of an error occurring during card use, a message will appear for a few seconds. The following error messages are possible, if all memory card options are fitted:

Directory empty	Card reader fault
Card write protected	Card read failure
Card changed	Card write failure
Card not formatted	Bad filename
Card not fitted	Card data corrupted
File write protected	Card full
File read protected	MCC overdrive

8.9 MEMORY CARD CONFIGURATION MENU OVERVIEW



9 TRANSMITTER POWER SUPPLY OPTION

9.1 INTRODUCTION

This option supplies one or two sets of three isolated 25 Volt outputs. Each output is intended to supply power to a remote transmitter in order to run a 0 to 20 mA or a 4 to 20 mA current loop.

Physically, each unit consists of a circuit board and associated terminal block, located in the rear terminal cover. Electrically, the circuit boards contain a transformer with multiple secondary windings used to drive three simple regulators via individual rectifying/smoothing circuits. Outputs from the regulators are wired to terminal blocks for user connection.

Figure 9.1 shows an overall view of a transmitter power supply option fitted in the rear terminal cover.

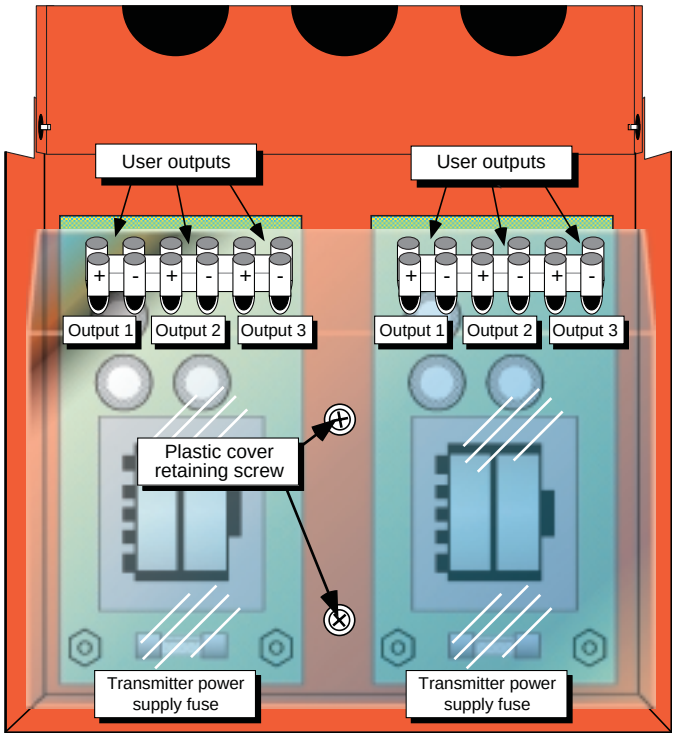


Figure 9.1 Transmitter power supply

9.1.1 Fuses

The required fuse value depends on the supply voltage, as shown in table 9.1.1 below. The fuse type is 20mm anti-surge, and one is located on each circuit board as shown in figure 9.1 above.

Supply Voltage	Fuse value	Fuse part Number
110/120	100 mA	CH050012
220/240	63 mA	CH050630

Table 9.1.1 Fuse values

9.1.2 Safety isolation specification

Safety isolation (dc to 65Hz; BS EN61010)	Installation category II; Pollution degree 2 (see page 1 for definitions)
Channel to channel:	100V RMS or dc (double insulation)
Channel to ground:	100V RMS or dc (basic insulation)

9.2 SIGNAL WIRING

The outputs are terminated at a terminal block as shown below.

In order to read input values successfully a resistor must be connected across V+ and V- of the input channel. This resistor should have a minimum specification of 1.4 Watt, ±1% and should be either 100Ω or 250Ω in value as required. Resistors of this kind are available from the manufacturer.

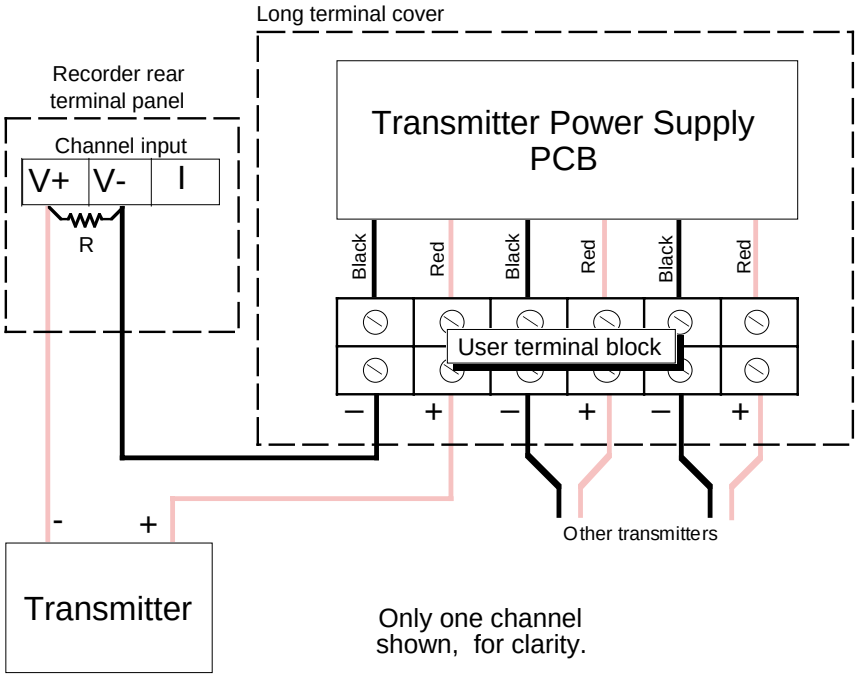


Figure 9.2 Transmitter power supply signal wiring

10 SEISMIC OPTION

10.1 100 MM CONTINUOUS-TRACE RECORDER

This option provides two extra case clamps for securing the recorder to the panel, and a securing device for the door catch to prevent the door from springing open during periods of high vibrational energy.

The product has been tested to IEEE344 - 1987 'IEEE recommended practice for Seismic Qualification of Class 1E equipment for Nuclear Power Generating Stations'.

10.1.1 Panel mounting

When mounting in the panel, all four mounting clips are used to secure the unit instead of the normal two. Clamp positions are given in Section 1.2.1 (Mechanical Installation) of the Installation and Operation Manual supplied with the recorder.

10.1.2 Door security

The door is fitted with a knurled knob, which is freely rotatable either clockwise or anti- (counter-) clockwise. The face of the knob has a narrow slot milled into it, to act as a position indicator. When this indicator is pointing vertically downwards, the door is firmly secured, and cannot be opened by pulling on it in the normal way. When the indicator is pointing upwards, the door can be opened in the normal way.

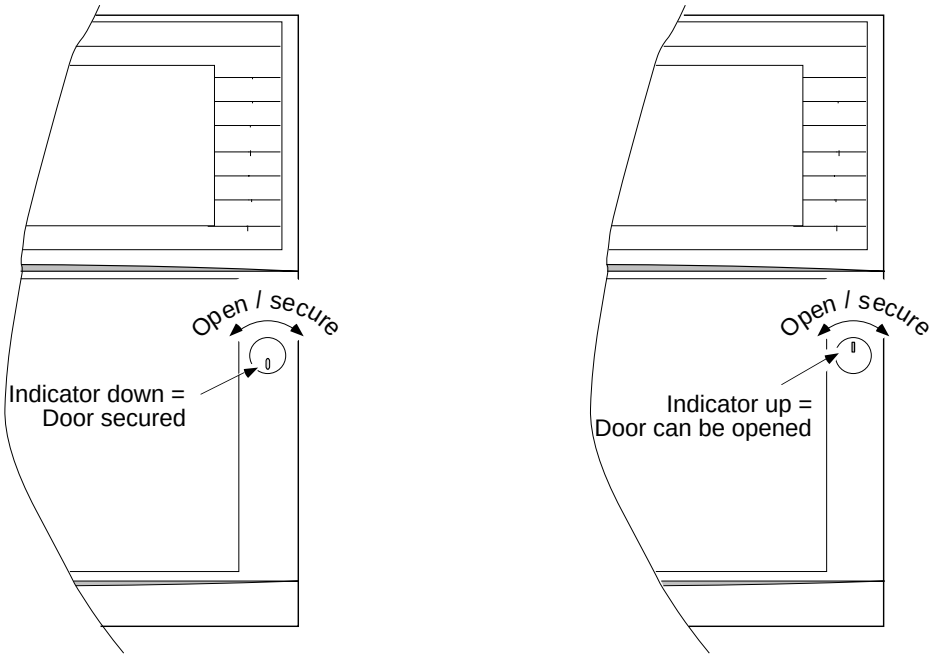


Figure 10.1.2 Door securing mechanism

10.2 GRAPHICS RECORDERS

This option provides two extra case clamps for securing the recorder to the panel, and securing devices for the disk access door and the recorder chassis to prevent damage during periods of high vibrational energy.

The product has been tested to IEEE344 - 1987 'IEEE recommended practice for Seismic Qualification of Class 1E equipment for Nuclear Power Generating Stations'.

10.2.1 Panel mounting

When mounting in the panel, all four mounting clips are used to secure the unit instead of the normal two. Clamp positions are given in Section 1.2.1 (Mechanical Installation) of the Installation and Operation Manual supplied with the recorder.

10.2.2 Disk access door security

The seismic version of the recorder is fitted with a lockable disk access door, the lock being located as shown in figure 10.2.3 below.

10.2.3 Door security

The seismic option is fitted with two hex-head M3.5 bolts. To remove these, a 6mm across-flats spanner (wrench) must be used. The locations of these bolts is shown in figure 10.2.3 below.

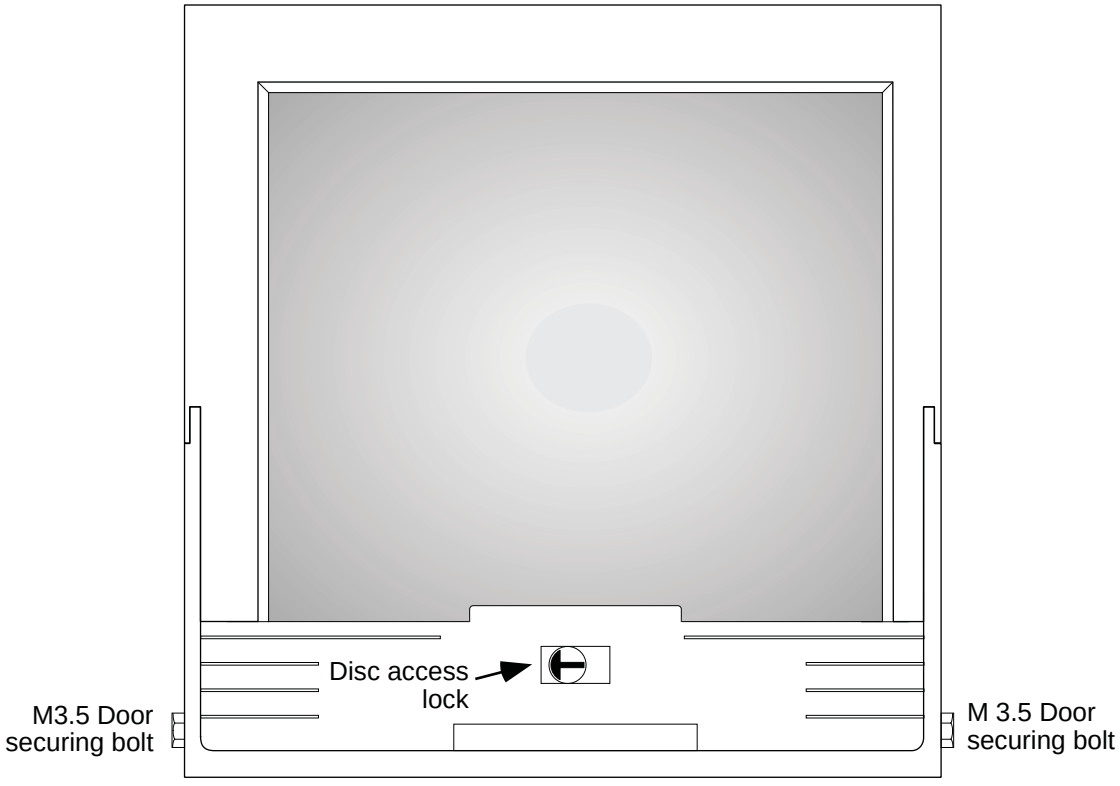


Figure 10.2.3 Securing device locations - graphics recorders

11 MODEM/DIRECT LINK OPTION

This option allows a user to carry out the operations listed below from a remote PC, either directly connected to the recorder, or over a normal telephone line, using Zmodem transfers via a pair of Modems, one connected to the PC, the other to the recorder. The recorder must be fitted with a disk drive/memory card option.

1. Retrieve archive and configuration files from the instrument's floppy disk or memory card.
2. Re-configure the instrument, using configuration files from another instrument, or created using PC configuration software available from the manufacturer.
3. Delete files from the recorder's memory card/disk drive

Notes:
1 MODBUS communications and Modem/Direct communications are mutually exclusive.
2 Only one recorder can be connected to the Modem.
3 Please refer to the documentation supplied with your computer and modem for details of how to set them up to communicate over a telephone line.
4. ®Hyperterminal is a trademark of Hilgraeve Inc.
5 ® Windows, Windows NT and the Windows logo are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

11.1 WIRING

Figure 11.1 shows the wiring for the two alternative locations which are available for the 'comms' option board (only one board can be fitted to any one instrument, either in slot two or in slot four).

The link with the modem must use the RS232 wiring standard, but the options board can be set up to use RS485 or RS232 according to the position of 3 links (jumpers) located on the options board. If you are in doubt as to whether your board is set to RS485 or RS232, refer to section 7.6 above for details of how to remove the board and check its link positions.

Notes:
1 The 5V output can supply max. 5mA and is to be used only for biasing.
2 The 0V terminal (which is isolated from recorder 0V/Earth) should be connected to the modem 0V, and also to safety earth at one point (only) in the serial link.

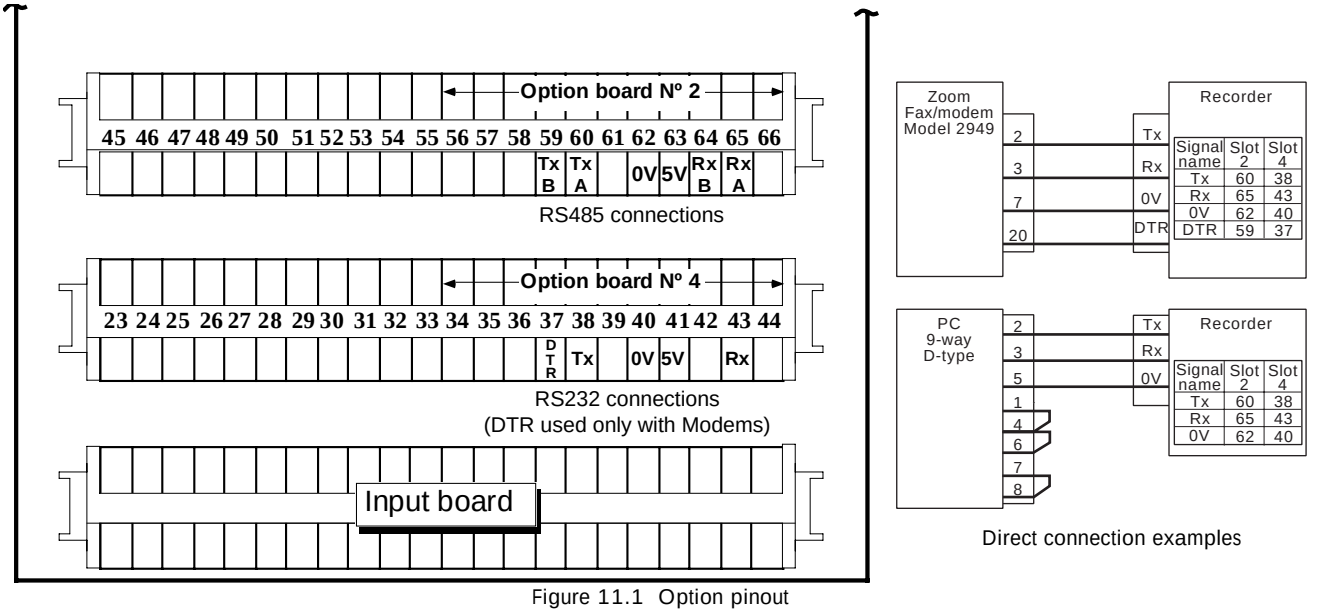


Figure 11.1 Option pinout

11.2 CONFIGURATION

11.2.1 Recorder configuration

The configuration of the recorder takes place in two areas: 'Serial Communications' and 'Remote Operation'. It should be noted in the figures below that 'Direct' is used with RS232/RS485 links between the recorder and a) the Windows review program (Section 11.2.2) or b) a terminal emulator.

SERIAL COMMUNICATIONS (ALSO SEE SECTION 7)

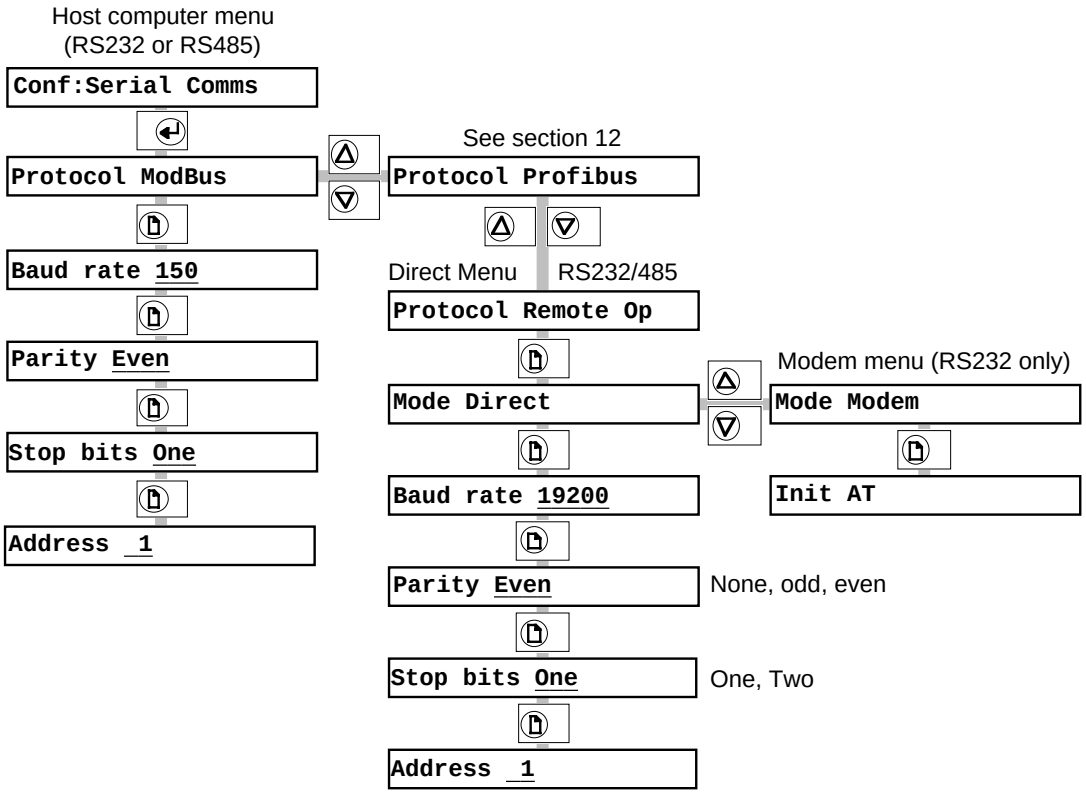


Figure 11.2.1a Serial comms - complete menu structure

MODBUS PARAMETERS

Baud rate, parity and Stop bits and instrument address are described in section 7.

DIRECT PARAMETERS

Baud rate, parity and stop bits must match those selected at the PC.

Address — This field is used only when using remote operation with the review Program. When multiple instruments are connected on an RS485 link, the addresses should be configured to be the same as those of the corresponding instruments within the review program.

Note: When configuring the 'Direct' parameters, a parity setting of 'none' must be used if 'Nº of stop bits' is set to '1'. Otherwise, the communications link will not operate correctly.

MODEM PARAMETERS

Init AT — This allows an initialisation string to be entered to allow extra commands to be sent to the modem connected to the recorder if connection difficulties are being experienced. Please refer to the documentation supplied with your PC / Modem for details.

11.2.1 RECORDER CONFIGURATION (Cont.)

REMOTE OP(ERATION)

Figure 11.2.1b shows the Remote Operation menu, which appears immediately after the Serial comms item in the top level menu.

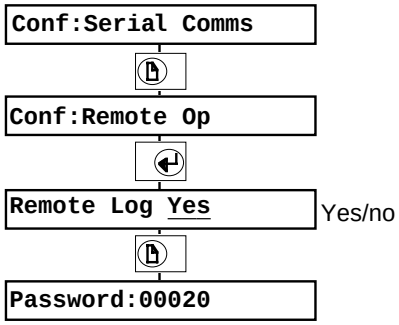


Figure 11.2.1b Remote Operation menu

PARAMETERS

Remote Log — When enabled, a log of remote operations, such as connection times, file transfers, re-configurations and so on, is stored on the recorder's disk as a file called 'REMOTE .LOG'. This can be transferred over the modem link in the normal way, as described in section 11.3 below.

Password — In addition to the normal configuration password (default = 00010) which allows access to all the Remote Operation parameters, a further password (default = 00020) can be entered here. Users who enter this password can access only those items in the table below whose 'permission' is 'yes'. Section 4 of the Installation and Operation manual supplied with the recorder describes how to change these permissions.

The items concerned are shown in table 11.1.2, along with their default (as despatched) permissions.

Function	Interpretation	Default permission
Rem Cnf Save	Read configuration file from recorder disk	no
Rem Cnf Restore	Send configuration file to recorder	no
Rem File Delete	Delete file from recorder disk	no
Rem File -> Inst	Send file to instrument	no
Inst File -> Rem	Receive file from instrument	yes
Rem arc Offline	Set recorder's archiving offline during file transfer	no

Table 11.1.2 Remote operation default operator permissions

11.2.2 Use with the Windows® Review Program

Remote operations can be driven using an 'explorer' type file interface in the Review program. This program can connect with one instrument over a MODEM link, or directly using RS232/RS485 standards, or it can communicate with multiple instruments using the RS485 standard. In such a case, the instruments are identified by the setting of an address in the recorder communications configuration, as shown in figure 11.2.1a. The Review program on-line documentation contains further details.

® Windows, Windows NT and the Windows logo are either registered trademarks or trademarks of Microsoft Corporation in the United States and/or other countries.

11.2.3 Terminal configuration

USE WITH MODEM LINK

Configuration of the terminal to suit the modem being used is outside the scope of this manual

DIRECT CONNECTION

When configuring the terminal emulator, the Baud Rate, Parity and Stop bits set must match those set at the recorder in the Serial Comms configuration. In addition XON/XOFF flow control must be enabled at the terminal; this is always enabled at the recorder and is not configurable.

11.3 OPERATION

The simulated screens below are based on Hyperterminal® , supplied with Windows® software. Other packages may look and behave differently. Refer to the documentation/help files supplied with your software package.

11.3.1 Dial-up page

Figure 11.3a is an attempt to show a typical modem dial-up screen, from which connection to the recorder can be made by mouse clicking on the 'Dial' button or by operation of the 'Enter' key on the keyboard, and then following any further instructions on the screen.

Calls can also be initiated from the keys and pull-down menus at the top of the page.

Note: The modem link is disconnected a) after five minutes of non-use, or b) if the recorder configuration menus are entered by a user at the recorder.

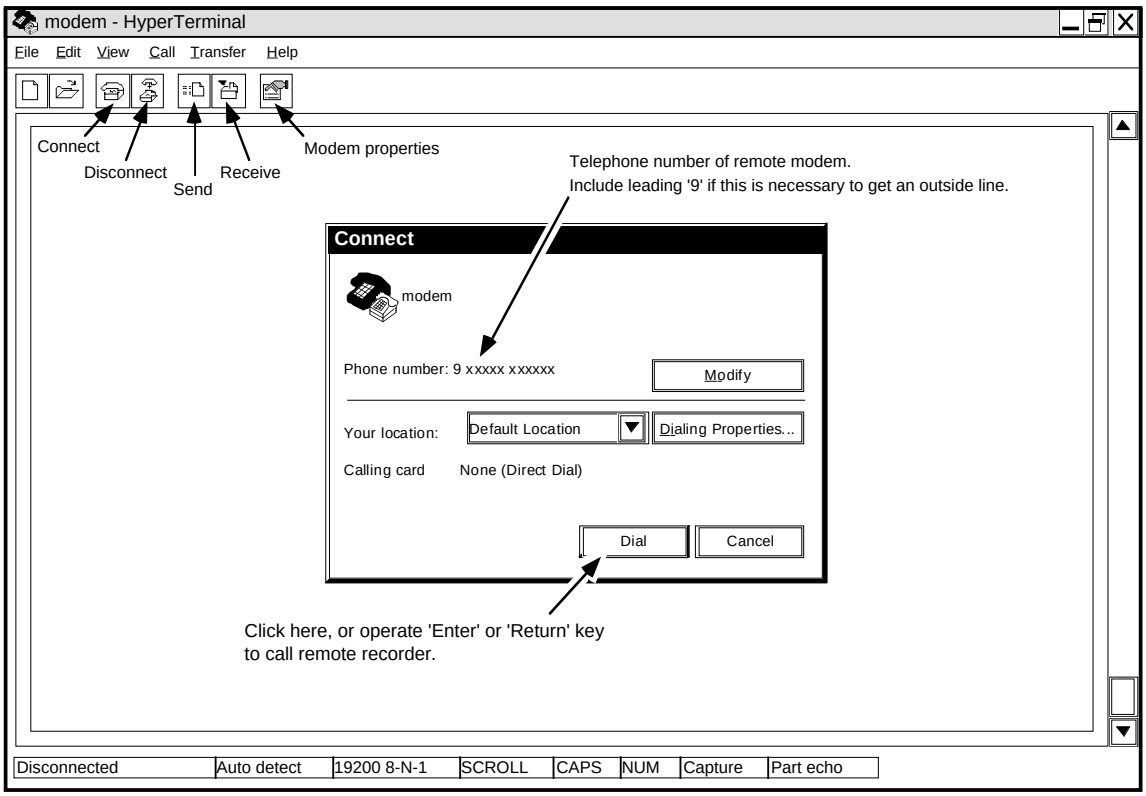


Figure 11.3.1 Typical modem dial-up page

®Hyperterminal is a trademark of Hilgraeve Inc.

11.3.2 Home page

Once the connection is established, a password is requested. Either of the configuration or Operator Access passwords may be used, but entry of the Operator access password may result in restricted operation depending on how the permissions have been configured.

Figure 11.3.2 shows the Home page which results from entering the configuration password.

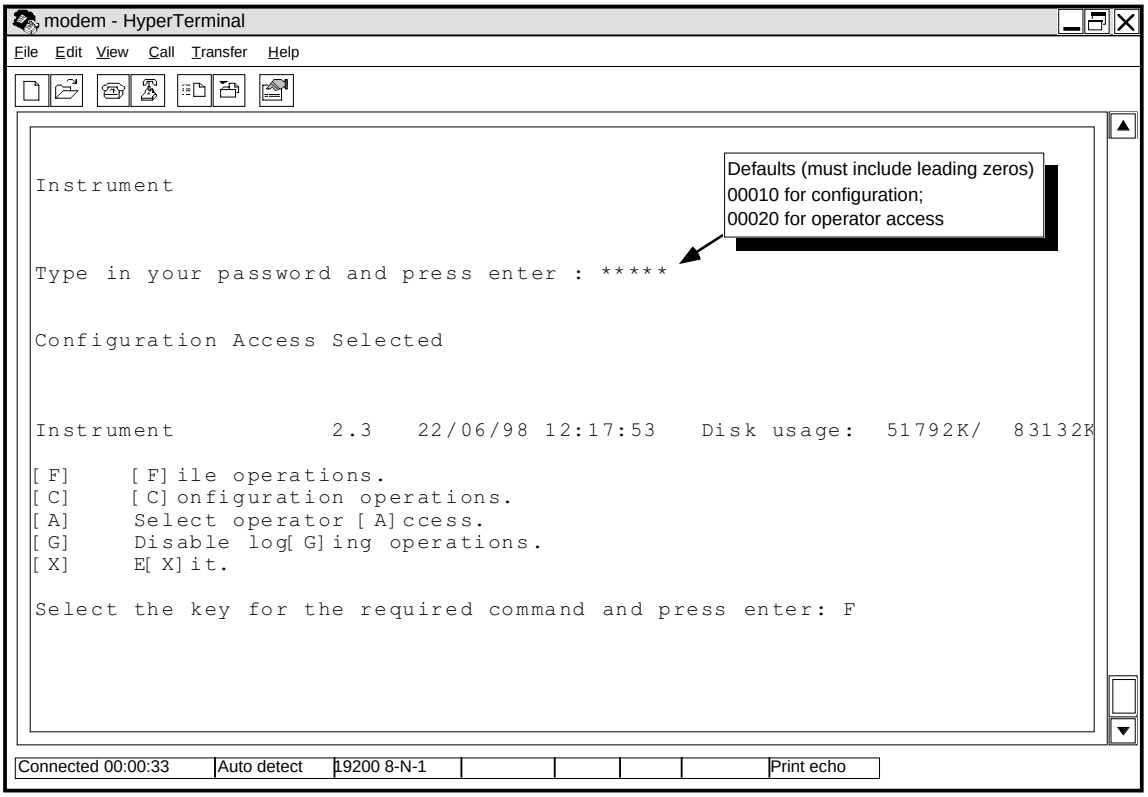


Figure 11.3.2 Home Page

HOME PAGE CONTENT

The page consists of a line giving instrument details, and a set of commands. The line giving instrument details is interpreted as follows:

```
Instrument                V.N       DD/MM/YY   HH:MM:SS    Disk usage:   nnnnnK/
```

Instrument	This is the 20-character (max) tag entered as a part of 'Instrument' configuration described in section 4.3 of the Installation and Operation manual supplied with the recorder.
V.N	The recorder's software version number.
DD/MM/YY	Recorder current date
HH:MM:SS	Recorder current time
Disk usage	Shows how many kB of the recorder's disk's capacity are used (nnnnn) out of the total number available (rrrrr)

11.3.2 HOME PAGE (Cont.)

The commands available to the user are as follows:

F File operations. Produces a list of files currently stored on the recorder disk, and allows transfer functions to take place (section 11.3.3).

C Configuration operations. Produces a list of non archive files, and allows the saving and restoring of the recorder's configuration to and from the disk. Once a configuration file has been sent to the disk, it can then be 'restored' to the recorder's data base, and become operational. During this 'restore' the recorder resets, and the comms link stops operating for the duration of the transfer.

A Select operator access. Allows Operator Access permissions to be edited.

G Disable logging operations. Sets Remote Operations Logging (section 11.2.1) off/on.

X Exit. Disconnects line.

11.3.3 File Operations Page

Figure 11.3.3 shows an imaginary file operations page, consisting like the home page, of an instrument line and a set of commands, but this time with the first eight files contained on the disk. The instrument line is as described for the Home page.

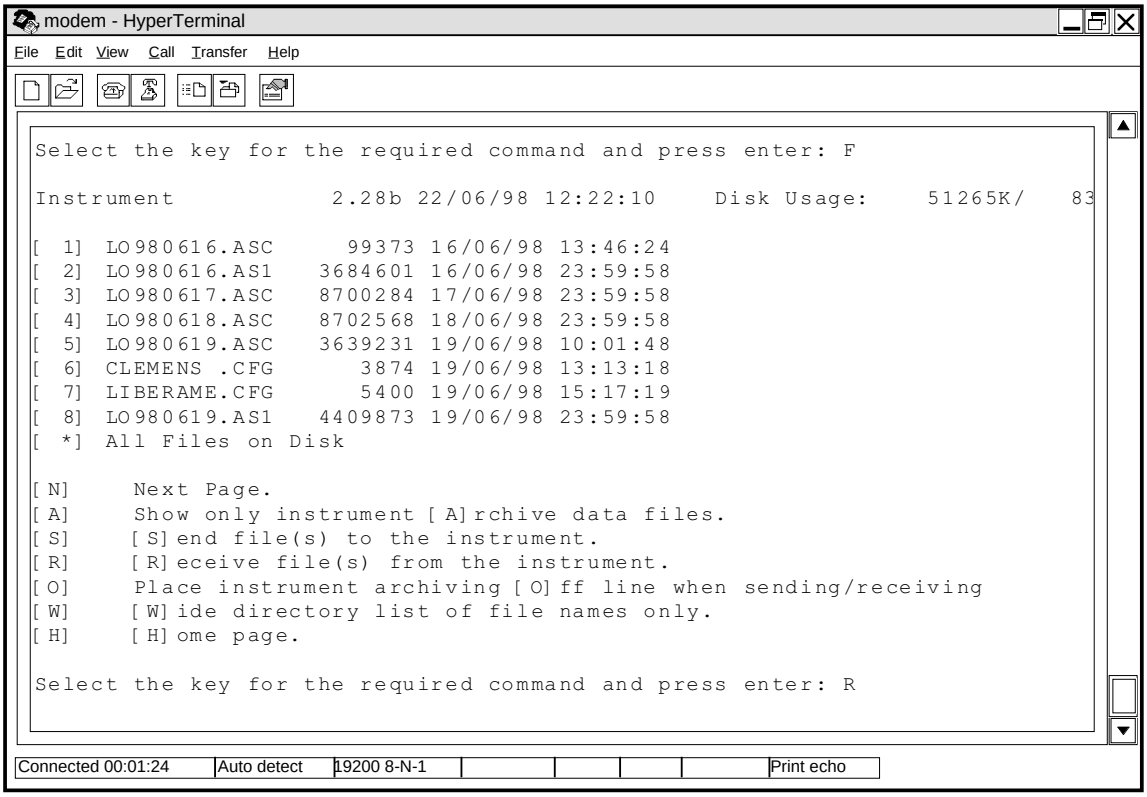


Figure 11.3.3a File operations page - file details display

FILE LIST

This consists of a list of the first (up to) eight files which are contained on the recorder's disk, each one accompanied by its size in Bytes, and the date and time of its creation (or latest modification). Further groups of eight files (if any) can be displayed using the Next page command (N). The file list can also be 'filtered' to exclude non-archive (e.g. configuration) files (A command), and can be displayed in an alternative (eight x three) matrix of file names, without size and date data (W command).

11.3.3 FILE OPERATIONS (Cont.)

COMMANDS

N Next Page. Calls the next eight or 24 file names to the screen.

F First Page. (Appears on the second or subsequent pages-full of file names), and returns to the first eight (24) filename display.

A Show only instrument archive files. Causes the list to exclude non-archive files.

A Show all file types. Appears when 'Show only instrument archive files' is selected. Causes the list to revert to displaying all types of file, instead of only archive files.

S Send file(s) to the instrument. Allows a file to be sent to the recorder disk. Such files may have been previously saved from this or another recorder, or created using the 'configuration software package' available from the manufacturer.

R Receive file(s) from instrument. Allows the receipt of one file, all archive files or all files from the recorder to a specifiable location in the PC. The required file number (left hand column of file list) or index is typed in (asterisk for all files) and the Enter key operated to initiate the process.

O Place instrument archiving off (on) line when sending/receiving. Allows the user to disable/enable archiving whilst sending or receiving files over the modem link.

W Wide directory list of file names only. Replaces the normal, maximum-of-eight list of files (with file sizes and date/time information) with a maximum-of-24 list of files (file names only). (See also 'L' below)

L Directory list containing all file details. Appears when the file is in 'Wide' display, and reverses the action of the 'W' command.

H Home. Causes a return to the Home page.

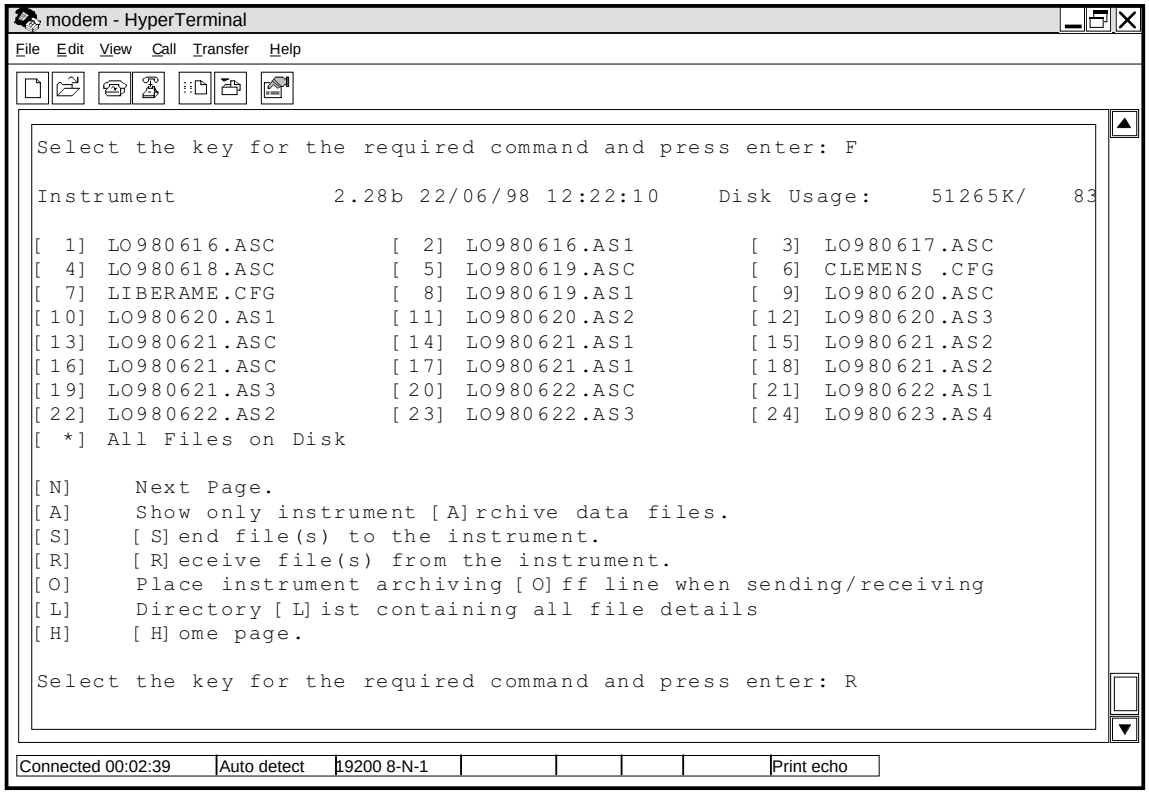


Figure 11.3.3b File operations page - file names only

11.3.3 FILE OPERATIONS (Cont.)

RECEIVING FILES

Typing the command R, and following the commands on the screen allows any of the files stored on the recorders disk to be transferred to any specified location in the computer. The actual transfer is initiated by clicking on the 'Receive' key of the 'Receive Files' page called from the Transfer pull down menu. Figures 11.3.3c and 11.3.3d below show the basic screens, and figure 11.3.3e shows the 'Receive files' page.

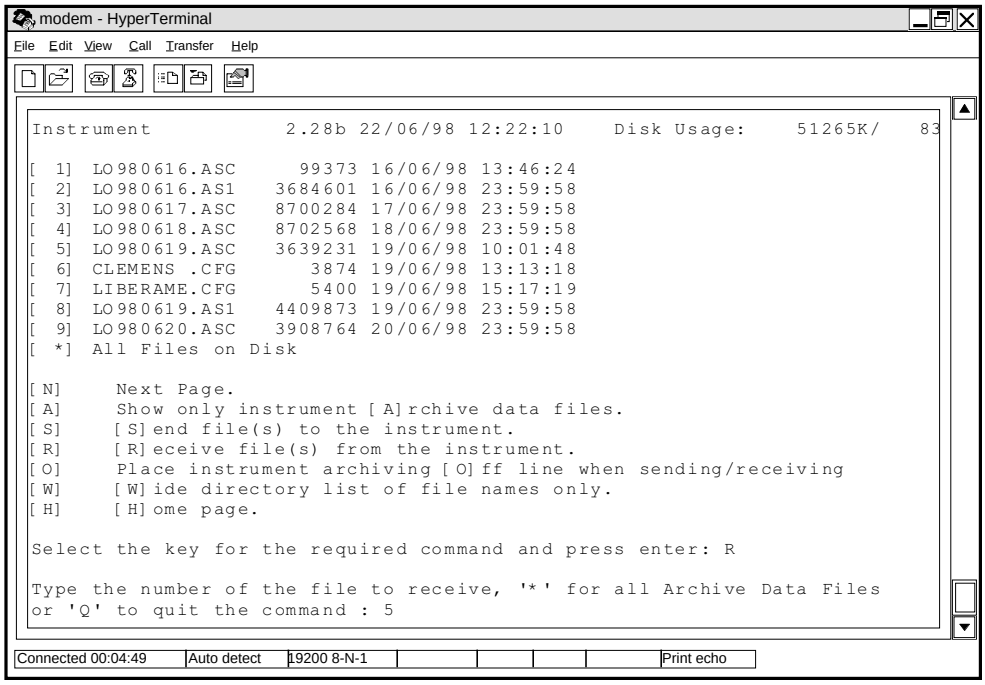


Figure 11.3.3c Receive files command screen (1)

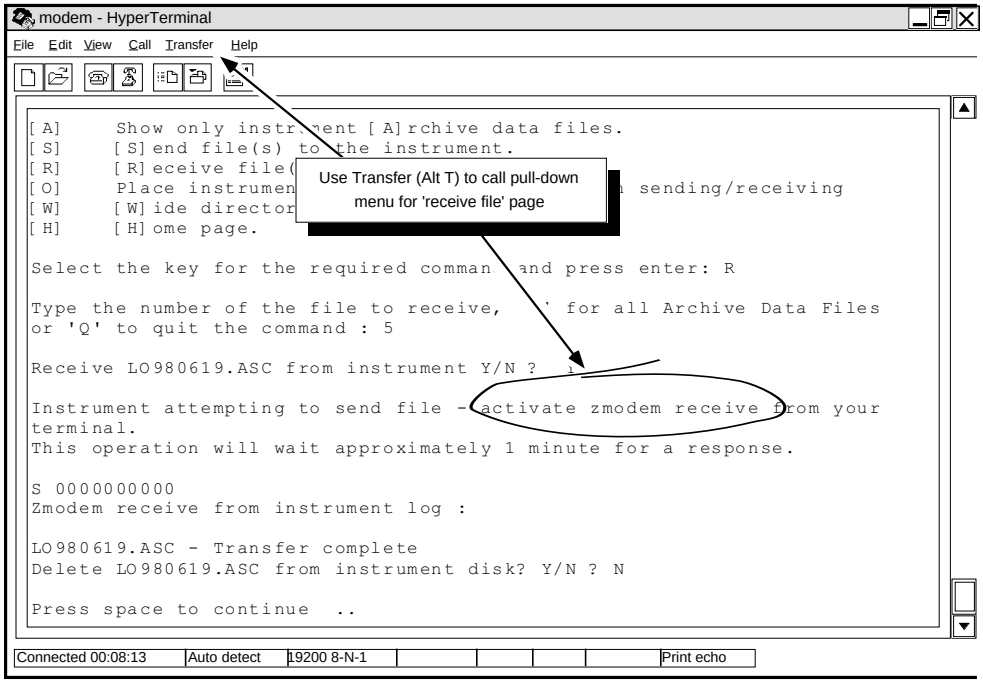


Figure 11.3.3d Receive files command screen (2)

11.3.3 FILE OPERATIONS (Cont.)

RECEIVING FILES (CONT.)

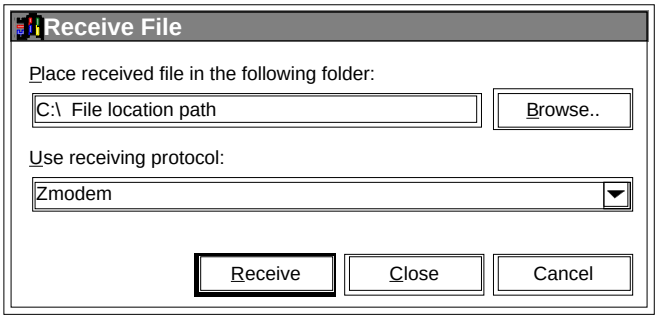


Figure 11.3.3e 'Receive Files' display

SENDING FILES

The procedure for sending files is similar to that for receiving files, the major difference being that you have to define the file which is to be sent by folder and filename, instead of just typing in a file (index) number.

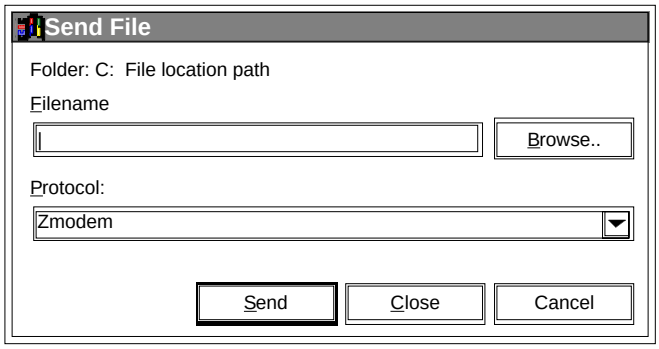


Figure 11.3.3f 'Send Files' display

11.4 DIRECT CONNECTION

Direct connection of a terminal emulator to the recorder is possible using the RS232 connections described above in section 11.1, remembering though, that the Serial Communications configuration must be set to DIRECT at the recorder. Communication is also possible using RS485, but an appropriate converter must then be used at the PC.

Operation in this mode is identical with Modem operation described above.

Notes:
1 Communications link parameters at the terminal must match those selected at the recorder.
2. XON/XOFF must be enabled at the terminal

11.5 ERROR MESSAGES

A 'Modem Failure' system error occurs when connection with the modem cannot be established, or if the modem cannot be configured successfully by the recorder. The error is self clearing.

11.6 APPLICATION NOTES

1. When configuring the 'Direct' communications parameters, a parity setting of 'none' must be used if 'No of stop bits' is set to '1'. Otherwise, the communications link will not operate correctly.

2. The local disk should not be removed during a remote operation session.

3. When receiving files whose filenames already exist, some applications will rename the files rather than over-write the existing file.

4. The 'Receive multiple files' option will work only on terminal packages which support 'auto download'.

5, The RS232 DTR line is used only with modems, not with direct connection.

6. Terminal emulation should be set to ANSI if text display problems occur. Occasionally, operation of the Enter or Return key to refresh the display will cure the problem.

7. To display non-English characters (e.g. å), when using Hyperterminal®, the font must be set to 'Terminal'.

8. If dial-in is unsuccessful after two attempts, it is recommended that a period of approximately five minutes is allowed to elapse before re-trying.

9 Ten rapid 'carriage returns' close the remote session.

10. Using the Hyperterminal ® SKIP option whilst receiving files, will cause a 'Seek not supported' error from the instrument.

11. If problems are encountered in establishing a connection, refer to the documentation received with the modem and PC. Ensure that the modem is connected to the correct PC comms port.

12. Crash recovery should not be enabled in the terminal application.

For graphics recorders:

1. If the archiving interval is less than 5 seconds, it is recommended that file transfers be carried out with archiving off (i.e. Off-line), since, otherwise, archive samples might be lost.

2. File transfer is not available with more than nine input channels.

11.7 APPROVED MODEMS

The following Modems (listed in alphabetical order) are approved by the recorder manufacturer for use with the Remote Operation (Modem) Option.
Hayes Accura 56k Speakerphone Modem (External).
US Robotics Sportster Flash 56k Modem (External).
Zoom 56k Fax Modem (External).
The use of other Modems is not recommended.

In rare cases (and only if the recorder configuration is complex), the maximum archive rate to the memory card is reduced to 2 seconds whilst file transfer over the Modem link is taking place.

12 PROFIBUS COMMS OPTION

12.1 INTRODUCTION

PROFIBUS DP is an industry standard open network used to interconnect instrumentation and control devices in, for example, a manufacturing or processing plant. It is often used to allow a central Programmable Logic Controller (PLC) or PC based control system to use external ‘slave’ devices for input/output (I/O) or specialised functions, thus reducing the processing load on the controlling unit so that its other functions can be carried out more efficiently using less memory.

The PROFIBUS network uses a high speed version of the RS485 standard, and permits transmission rates of up to 12M Baud between the host and up to 32 PROFIBUS ‘Stations’ otherwise called ‘nodes’ within a single section of network. The use of RS485 repeaters (each counted as a node) allows the maximum of 127 nodes (addresses 0 to 126) to be supported.

It is not within the scope of this document to describe the PROFIBUS standard in detail, nor does it discuss the recorder itself. Details of the recorder are to be found in the documentation supplied with it and more detailed information on the PROFIBUS can be found by reference to 'http//www.profibus.com’.

12.1.1 GSD Files

Figure 12.1.1 shows that for each instrument on the communications link, a Device Database File is constructed and loaded into the profibus configuration terminal. These files (called Gerätestammdaten or 'GSD' files) contain information, relating to the instrument’s parameters, which the PROFIBUS master (a PLC in the figure) needs in order to communicate with the device.

A number of ‘default’ GSD files, and editing software are included on the support disk, supplied with the option. More details are to be found in Section 12.5 below.

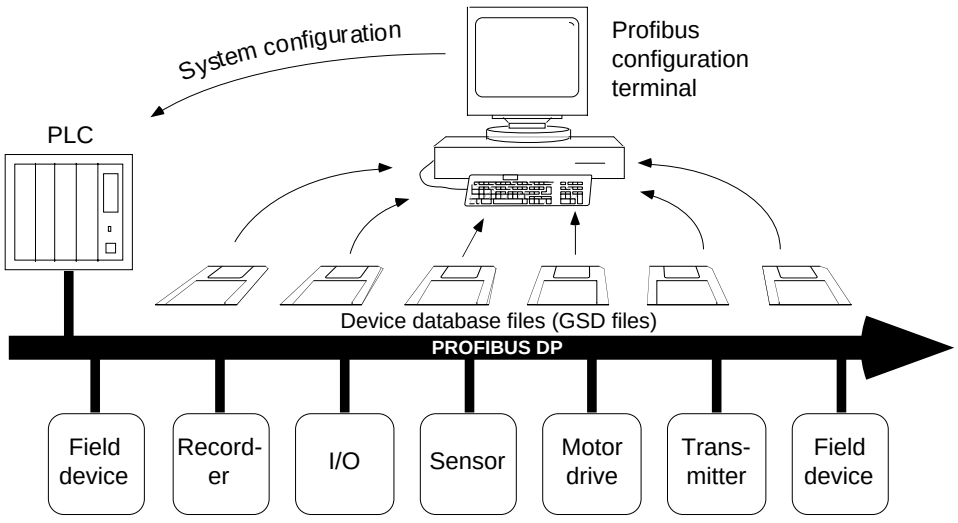


Figure 12.1.1 Typical PROFIBUS link using a PLC as master
(from section 3.3 of http: / / www.profibus.com)

12.2 INSTALLATION

PROFIBUS DP is provided by means of a 1/2 width option board, which can be fitted in option board slot 2 or 4.

12.2.1 Wiring

The wiring to the PROFIBUS option board is terminated as shown in figures 12.2.1a (pinout), and figure 12.2.1b (termination, biassing and shielding arrangement). Note that only one Profibus board can be fitted, and this may be fitted only at slot 2 or at slot 4.

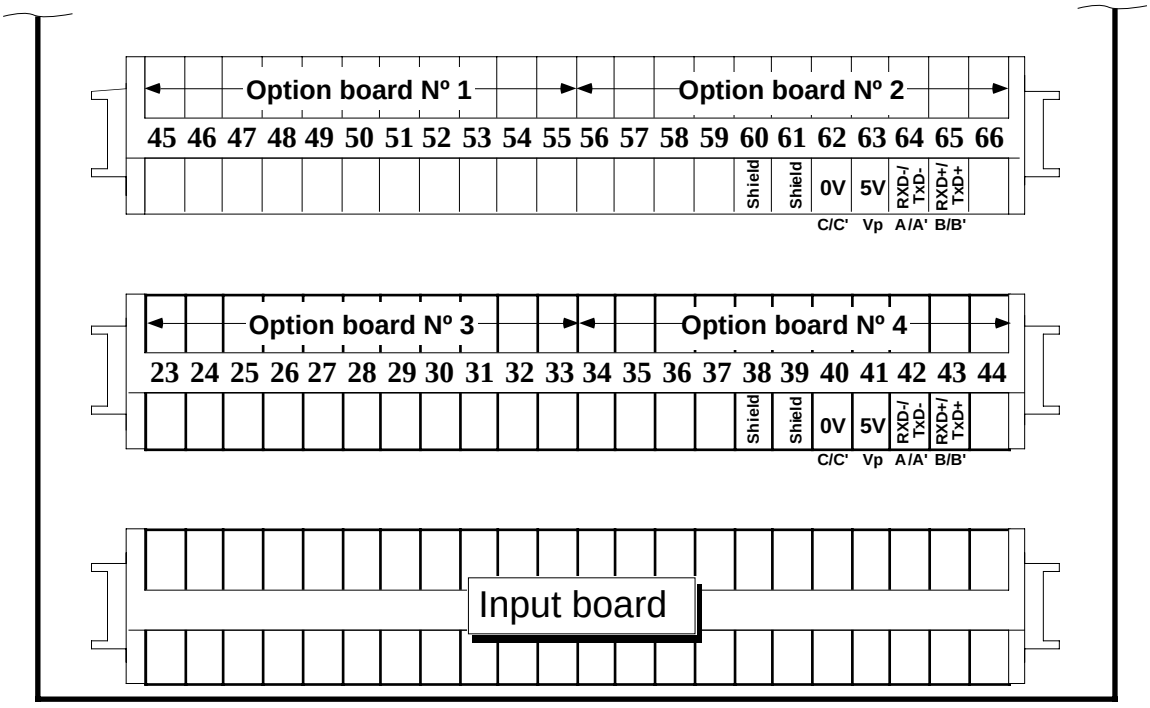


Figure 12.2.1a Communications Pinout

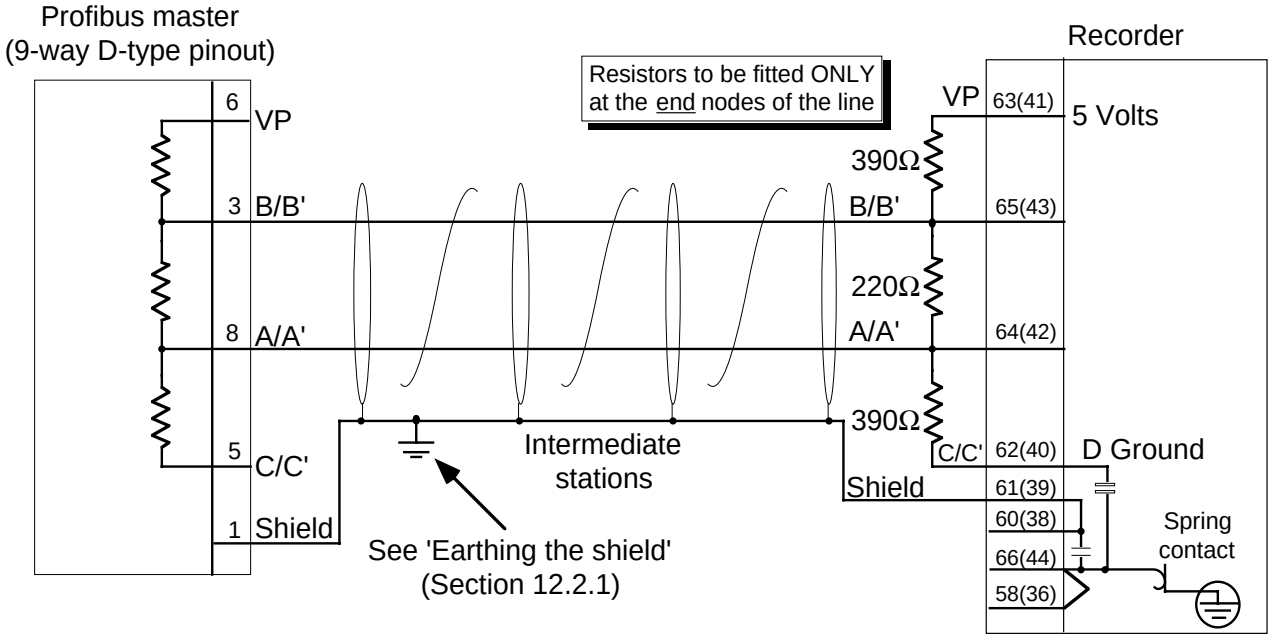


Figure 12.2.1b Communications wiring and termination

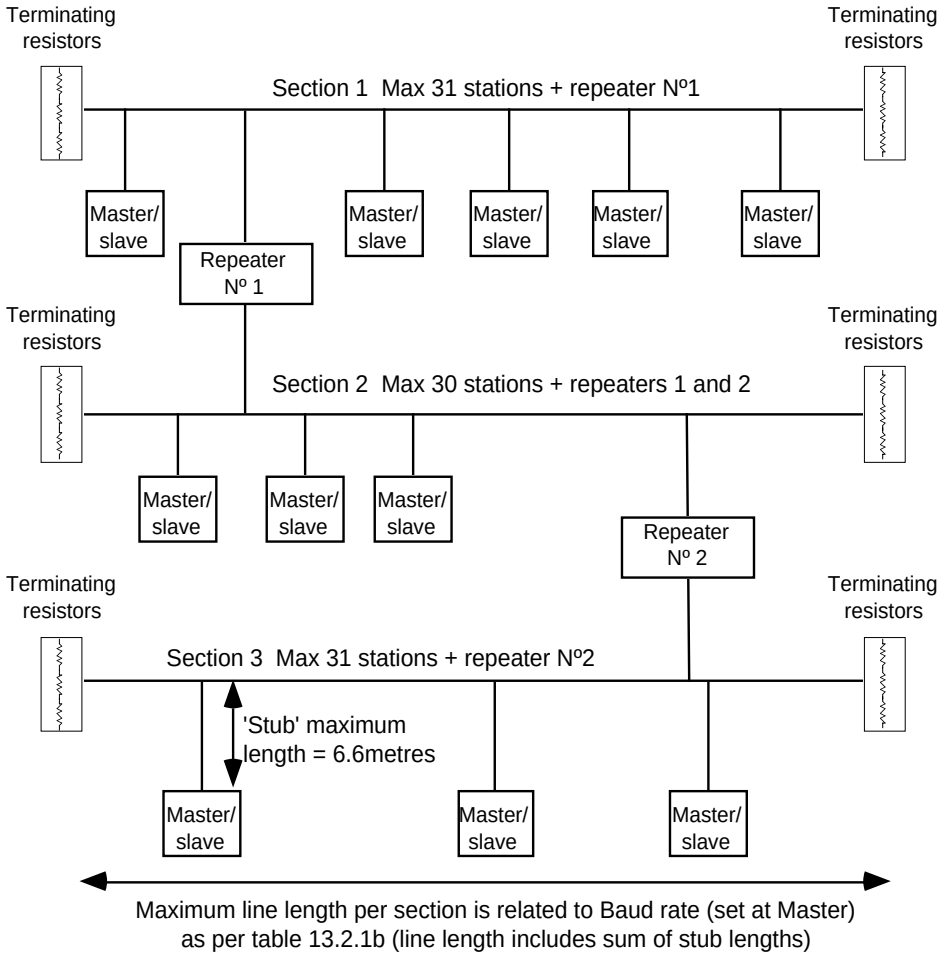
12.2.1 WIRING (Cont.)

EARTHING THE SHIELD

The PROFIBUS standard suggests that both ends of the transmission line be connected to safety earth. If such a course is followed, care must be taken to ensure that differences in local earth potential do not allow circulating currents to flow, as these can not only induce large common mode signals in the data lines, resulting in communications failure, but can also produce potentially dangerous heating in the cable. Where doubt exists, it is recommended that the shield be earthed at only one point in each section of the network.

NETWORK WIRING

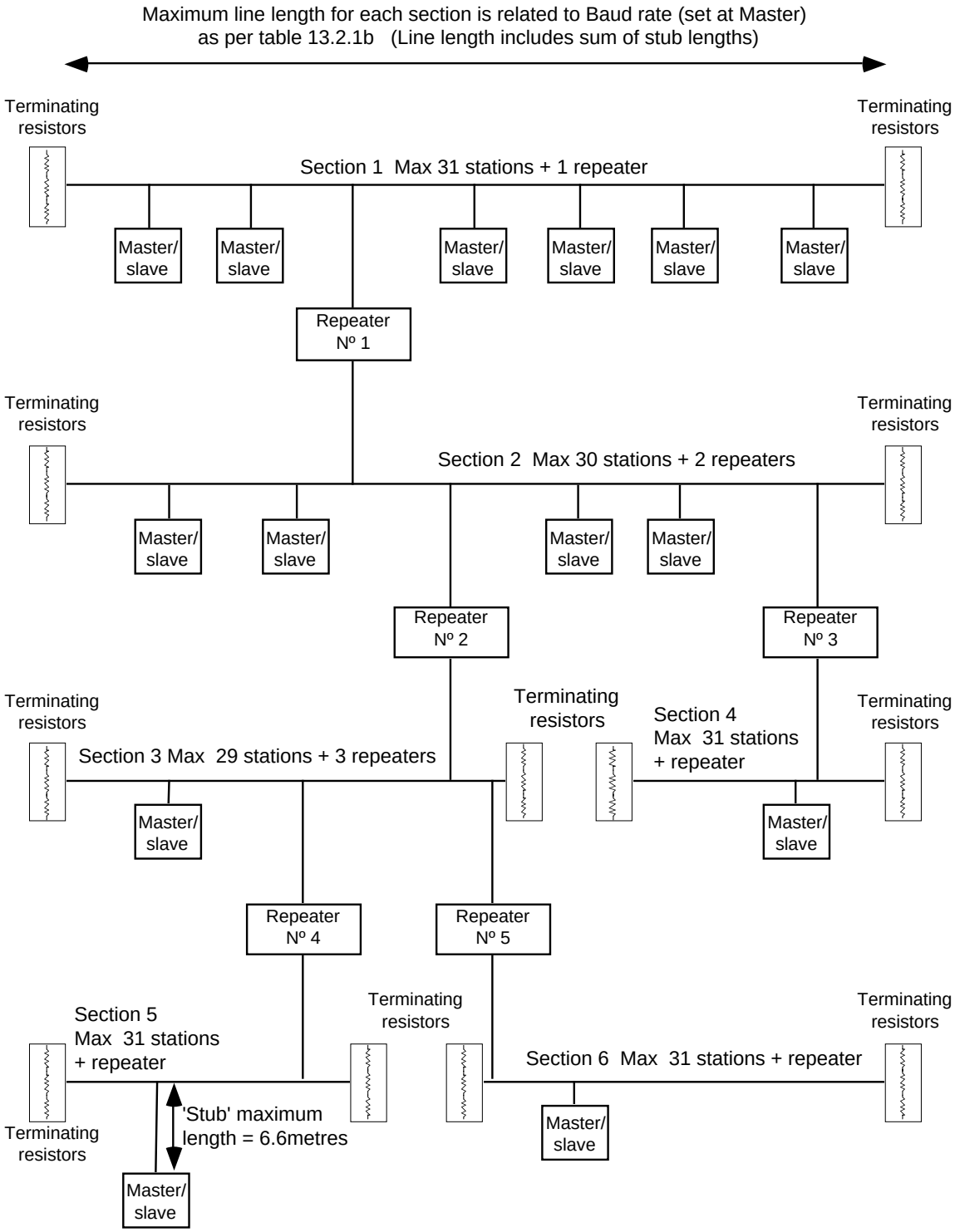
There are two distinct ways of wiring a network, known as 'Linear topology' and 'Tree topology'. In a linear network (figure 12.2.1c), the maximum number of repeaters is three, giving a total number of stations of 122. In theory the tree set-up (figure 12.2.1d) can have more stations, but the PROFIBUS protocol limits the number of stations (including repeaters) to 127 (addresses 0 to 126). It is up to the user to determine which is the most cost effective way of organising the layout.



Typical **linear** bus layout, with two repeaters and up to 92 nodes.
A maximum of three repeaters is allowed, bringing the maximum number of nodes to 122.

Figure 12.2.1c Typical linear bus layout

12.2.1 WIRING (Cont.)



Typical **tree** bus layout, with five repeaters and up to 183 station locations.
(Note: The maximum number of stations allowed by Profibus DP is 127)

Figure 12.2.1d Typical tree bus layout

NETWORK WIRING (Cont.)

CABLE TYPE

Table 12.2.1 below gives the specification for a suitable cable such as Beldon B3079A.

Impedance	135 to 165 ohms at 3 to 20 MHz
Resistance	<110 Ohms/km
Cable capacitance	<30 pF/metre
Core diameter	>0.34 mm2 (22 awg)
Cable type	Twisted pair, 1x1, 2x2 or 4x1 lines
Signal attenuation	9 dB max. over total length of line section
Shielding	Cu shielding braid, or shielding braid and shielding foil

Table 12.2.1a Cable specification

MAXIMUM BAUD RATE COMPARED WITH LINE LENGTH

The maximum transmission speed depends on the length of the cable run including 'stub' (distance from the bus to a station) lengths. Guaranteed minimum values are given below.

Line length/segment (metres)	100	200	400	1000	1200
Max Baud rate (kbit/sec) (kB)	12,000	1,500	500	187.5	93.75

Table 12.2.1b Maximum Baud rate versus line length

12.2.2 Node Address

Each node must be given a unique address, and this is done in communications configuration. The unit has an address of 1 set at the factory. This is within the address range of the PROFIBUS protocol (0 to 126), so if the unit is inadvertently inserted into the network without a new address having been set, the bus may be affected.

Note: After changing the Profibus address, the instrument should be powered off and on again, to allow correct initialisation to take place.

Figure 12.2.2 shows the communications configuration menu.

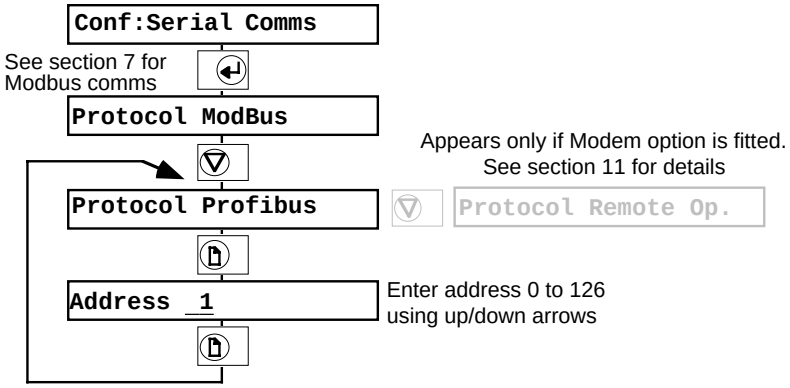


Figure 12.2.2 Configuration menus

12.2.3 Adding the unit to the network

Once the unit has been physically wired, and has had an address allocated, a GSD file must be imported into the network configuration software. A number of GSD files are provided on the PROFIBUS support disc, along with a software program called 'PROFCONF' which allows the user to edit these GSD files and/or to create new ones. See Section 12.5 for details.

The unit can now be added to the network, using the network configuration software, and I/O data areas can be assigned in the master unit, to represent it.

Once the network is defined, the configuration is written to the master, as described in the network configuration software documentation, and the network can be started. Values can now be assigned to PROFIBUS outputs and PROFIBUS inputs can be read as required.

12.2.4 Trouble-shooting

WARNING

Fault finding may affect the network and control system. Ensure that no damage to personnel or equipment can be caused by any fault finding activity.

NO COMMUNICATIONS

1. Check wiring, verifying the continuity of A and B connections to the master, and ensure that the correct terminals have been used. Figure 12.2.1a above, shows the terminations for this unit.
2. Check the node address, as described in section 12.2.2 above. Ensure the address is unique.
3. Verify that a PROFIBUS comms. module is fitted. This can be done by inspecting the label on the inside of the rear terminal cover for 'Profibus Comms' (not just 'Comms') in slot 2 or 4.
4. Ensure that the network has been correctly configured and that the configuration has been correctly downloaded to the master.
5. Verify that the GSD file being used is correct, by loading it into the GSD file configurator to check the format..
6. Ensure that the maximum line length of transmission line has not been exceeded for the Baud rate in use (Table 12.2.1b above).
7. Ensure that the final node on the transmission line (no matter what type of instrument it is) is terminated correctly using three resistors as shown in figure 12.2.1b above, and that only the first and final nodes are so terminated.

   Note: Some equipment has built-in pull up and pull down resistors which in some cases can be switched in and out of circuit. Such resistors must be removed or switched out of circuit for all but the instruments at each end of the line.

8. Replace any faulty item(s) and re-test.

DATA FORMAT OR PARAMETER DATA SEEMS INCORRECT

Verify that the GSD file is correct for the given application by loading it into the GSD file configurator program.

12.2.5 Diagnostic information

To be issued later

12.2.6 Global commands

Freeze and Sync from a PROFIBUS master have no effect

12.3. OPERATION

PROFIBUS DP performs a cyclical scan of the network devices, during which input and output data for each node is exchanged.

Values from each node (input data) are read by the master, which then runs its control program, and generates a set of values (output data) to be transmitted to the nodes. This process is called an 'I/O data exchange'. This process is repeated continuously, to give a cyclical I/O data exchange.

Examples of input data are:
a. A set of digital readings.
b. The measured temperature and alarm status from a PID controller.

Examples of output data are:
a. Derived variables (DVs)

The I/O data exchange can be repeated continuously, can be synchronised at given times, or can be repeated, asynchronously, at a pre-defined interval. Each node is normally assigned a group of PLC I/O registers, or a single function block, so that the controlling program can deal with each node's data as though the node is an internal device, without having to be concerned about timing problems. This mapping of node to register or function block is carried out during network configuration, which is usually carried out using a PC based program.

12.3.1 I/O data transfer limits.

The PROFIBUS DP standard allows up to 234 bytes of data to be transferred in each direction, during each I/O data exchange. Many PLC masters, however, are unable to support more than 32 bytes, and this has become a typical value. Input and output data lengths for a given node are variable, and it is possible to define nodes as read only, write only or read/write.

The I/O data mixture used by a given slave device is defined by what is called a 'GSD' file, which can be edited to change the mapping of node parameters to PROFIBUS inputs and outputs. This file is imported into the network configuration before the network is created.

12.3.2 Reading analogue inputs

The values read are in the range 0000 to FFFF. To obtain the scaled relative value, the following calculation must be carried out where the analogue input is in hex:

$$\text{Scaled value} = \left(\frac{\text{High range - Low range}}{\text{FFFF}} \; x \; \text{Analogue input} \right) + \text{low range}$$

In the event of a hardware error or under-range value, the value is forced to scale zero. Should the analogue value be over range, the scaled value is forced to scale high.

12.4 SPECIFICATION

This information is additional to, or replaces the relevant parts of the specification given in Part 1 of this manual. For cable specification and Baud rate versus cable length, see section 12.2.1

Safety isolation		
Isolation	(BS EN61010 dc to 65 Hz)	Installation category II, Pollution degree 2 (Note 1)
	Any terminal to safety earth:	50V dc or RMS (double isolation)

Vp and C/C' limitations (Note 2)	
Maximum current source/sink	30mA (5 Volts)

Notes:
1 Installation category II: The rated impulse voltage for equipment on nominal 230 Volts is 2500 V. Pollution category 2: Normally, only non-conductive pollution occurs. Occasionally, however, a temporary conductivity caused by condensation shall be expected.
2 Vp and C/C' may be used ONLY as pull up/down facilities for terminating networks as shown in section 2.1 above.

12.5 GSD FILES

12.5.1 The GSD Configurator

INTRODUCTION

The GSD file configuration software (PROFCONF) is supplied on the PROFIBUS support disc, and provides a simple means of setting up PROFIBUS input and output data frames. It is a 16-bit Windows application which will run on Windows 3.1, Windows 95 and Windows NT.

INSTALLATION

Place the PROFIBUS support disc in the disc drive, and run A:\SETUP.EXE from Program Manager or Windows Explorer. Follow the on-screen prompts.

OPERATION

The screen layout is as depicted in figure 12.5.1 below. Initially, if the mouse cursor is moved to an area and left there, a 'hint' box appears to explain what that area of screen does. (Hints can be disabled from the 'Help' menu when they are no longer needed.)

Put simply, the operation of the window is as follows:
1. Select instrument type from the icons at the left edge of the screen.
2. Add device parameters to the PROFIBUS Inputs or PROFIBUS Outputs area.
3. Use 'Save' in order to edit an existing GSD file or 'Save As' to create a new file.

12.5.1 THE GSD CONFIGURATOR (Cont.)

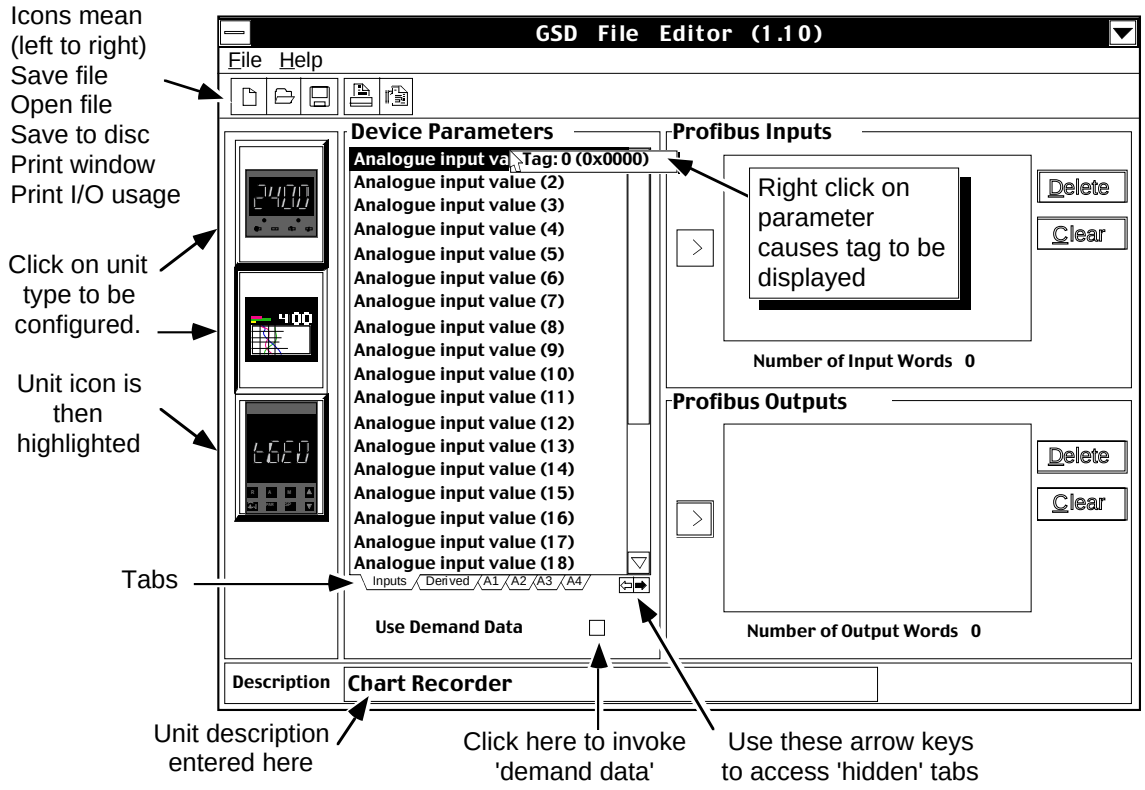


Figure 12.5.1 Typical GSD file window

EDITING THE I/O AREAS

This can be done by displaying the required parameter in the Device Parameter area, using the 'Tabs' at the bottom of the area if necessary, then either

a. Click-and-drag the required parameter to the PROFIBUS inputs or PROFIBUS Outputs areas as appropriate, or
b. Double-click on the parameter to move it to whichever of the Inputs or Outputs area is active (selected by clicking on the associated arrow key), or
c. Single click on the required parameter, then click on the Inputs or Outputs arrow key as required.

A parameter can be moved within the list, by click-dragging it within the area.

A parameter can be removed from the Inputs/Outputs list by

a. Clicking on the parameter to highlight it, then clicking the 'Delete' key to the right of the relevant area.
b. Pressing the right mouse button whilst the cursor is over the parameter name. Confirmation of the removal is requested by a pop-up box.

The entire list can be removed using the 'Clear' key.

A maximum of 117 words (input and/or output) including the requirements for demand data (Appendix B) is imposed by the configurator. When this limit is reached, parameters must be removed from lists before any further ones can be added. Because many PLCs cannot support more than 32 words of data at a time, it is recommended that 32 be treated as the limit.

The 'View I/O map' item in the File menu displays a summary of the I/O memory map for the current GSD file. This may be pasted to the clipboard for later use, and can be printed from the File menu.

12.5.1 THE GSD CONFIGURATOR (Cont.)

USING THE FILE

Before saving the file, it is recommended that a meaningful description in entered in the area at the bottom of the page. Finally, support for demand data can be enabled by clicking in the 'Use Demand Data' box. Demand data is discussed in section 12.7, below.

Once the Input/Output lists are as required, the file should be saved to disc. The file can now be imported into the PROFIBUS network configuration tool, and used as an application program.

> Note: Several different GSD files can be created for the same instrument, thus allowing the user to create a library of different applications.

EXAMPLE

This example shows how to set up a GSD file to allow gain scheduling using PID settings stored in a PLC.

Input data	Input channel
Output data	Derived channel

In such an application, the PLC monitors the Input channel (e.g. temperature), and when its value passes into a particular pre-set band, the PLC sets the control parameters from previously determined settings.

12.6 PARAMETER LISTS

The following device parameters are available at the GSD file editor for defining as Profibus Inputs or Outputs as described in 'Editing the I/O areas', above. The parameter headings are those of the 'tabs' (see fig 12.5.1)

> Note: More inputs/outputs appear on the screens than might be available on your unit. If, for example you have a six input instrument, you should use only analogue inputs 1 to 6 and so on.

INPUTS

Analogue input values 1 to 48 representing the values of input channels 1 to 48.

DERIVED

Derived channel values 1 to 48 representing the values of derived channels 1 to 48.

A1

Alarm 1 for analogue inputs 1 to 48. Function depends on alarm type - see table 12.6

A2(3)(4)

Alarms 2 (3)(4) for analogue inputs 1 to 48. Function depends on alarm type - see table 12.6

SP1

Setpoint 1 for analogue inputs 1 to 48. Function depends on alarm type - see table 12.6

SP2 (3)(4)

Setpoint 2 (3)(4) for analogue inputs 1 to 48. Function depends on alarm type - see table 12.6

Drvd A1

Alarm 1 for derived channels 1 to 48. Function depends on alarm type - see table 12.6

12.6 PARAMETER LISTS (Cont.)

Drvd A2 (3)(4)

Alarms 2 (3)(4) for derived channels 1 to 48. Function depends on alarm type - see table 12.6

Drvd SP1

Setpoint 1 for derived channels 1 to 48. Function depends on alarm type - see table 12.6

Drvd SP2 (3)(4)

Setpoint 2 (3)(4) for derived channels 1 to 48. Function depends on alarm type - see table 12.6

IP STATUS

Allows the status (e.g. off, over/under range etc.) of input channels 1 to 48 to be checked. Code 04 in table 12.8 gives details.

DIGITAL IP

Allows digital input status (i.e. on or off) to be determined for channels 1 to 24.

IP AL1 Stat

Allows alarm one status (i.e. whether the source is active or not active) to be determined for input channels 1 to 24. Hysteresis and dwell time are included in the calculation, but alarm action (e.g. latching, non-latching etc.) is not, so alarm acknowledge has no effect on the alarm status.

IP AL2 (3)(4) Stat

As above, but for alarms 2, 3 and 4 of input channels 1 to 48.

Drvd AL1 Stat to Drvd AL4 Stat

As for IP AL1 to IP AL4 above, but for derived channels instead of input channels

ALARM TYPE	PARAMETER	DEFINITION
Absolute	A1 to A4	Not used
Absolute	SP1 to SP4	Setpoint values
Deviation	A1 to A4	Deviation Values
Deviation	SP1 to SP4	Setpoint values
Rate	A1 to A4	Rate value
Rate	SP1 to SP4	Period value (secs)
Digital	A1 to A4	Not used
Digital	SP1 to SP4	0000 = Open; FFFF = Closed

Table 12.6 Alarm parameter definition

12.7 DEMAND DATA

12.7.1 Overview

The Demand data sub-protocol is supported via standard software in many PLCs. It can also be implemented in ladder logic. The protocol uses the first eight bytes in the request and response messages of the cyclic I/O data exchange described in section 12.3 of this manual, and is enabled by setting the first byte of the module configuration data to hex 73. Once enabled, it allows random read/write access to any parameter within the instrument.

Setting the value to hex 73 can be done by clicking the 'Use demand data' box in the GSD file configuration program (also supplied on the disc).

Demand data identifies parameters by 'tags', which are unique 16-bit numbers. The tag for any particular parameter can be determined by using the right mouse button when the cursor is over the relevant parameter in the 'Device Parameters' area of the configurator program, or by reference to the tables in Section 12.8

The first four words of the Output data are used to encode a 'request message'. The control program is responsible for writing values to this area to make requests.

Word 1				Word 2		Word 3		Word 4	
Byte 0		Byte 1		Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
15 14 13 12	11 10 9 8	7 6 5 4	3 2 1 0	15 14 13 12 11 10 9 8	7 6 5 4 3 2 1 0	15 14 13 12 11 10 9 8	7 6 5 4 3 2 1 0	15 14 13 12 11 10 9 8	7 6 5 4 3 2 1 0
Command	Zero	Function code tag		Tag		Reserved		Value or error code	

As can be seen from the figure above, Word 1 contains a command field (bits 12 to 15), and a function code tag to distinguish between different functions with identical Tags. Word 2 contains the 'Tag' of the required parameter (see section 12.8 for a full list). The various values for Word 1 are shown in the following table.

Word 1 bit																Interpretation
15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	0	
0	0	0	0	0	X	X	X	X	X	X	X	X	X	X	X	No command
0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	0	Function code 3 read request
0	0	1	1	0	0	0	0	0	0	0	0	0	0	0	1	Function code 4 read request
0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	0	Function code 1 read request
0	0	1	1	0	0	0	0	0	0	0	0	0	0	1	1	Function code 2 read request
0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	Function code 16 write request
0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	1	Function code 6 write request
0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	0	Function code 5 write request
0	1	0	0	0	0	0	0	0	0	0	0	0	0	1	1	Function code 15 write request

Bits 12 and 13 = 8192 + 4096 = 12288
Bit 14 = 16384

Thus it can be seen, that a read request requires a value of 12288, 12289, 12290 or 12291 according to the function code, whereas a write request requires a value of 16384 to 16387.

The first four words of Input data are used by the instrument as a 'response message' to return values and indicate the success or failure of the requested operation. In this case, the command field will be either 3 (bits 12 and 13 set) (read successful), 4 (bit 14 set) (write successful) or 7 (bits 12,13,14 set) (read/write unsuccessful). The Value field will contain the read/written value (if successful) or an error code (if unsuccessful). The command field has the value 0 when acknowledging 'No Command'.

Error codes are:

0 Invalid tag number.
1 Attempt to write to a read-only parameter.
2 Value is out of range.

12.7.2 Example

READING DERIVED CHANNEL (DV) 9

From table 12.8, we can see that 'read derived channel 1' is function code 04, Tag 500. (Thus DV9 is Tag 508)

CLEAR ANY PREVIOUS DEMAND DATA REQUESTS

This is done by setting tag and command data to 0 (zero), and waiting for the (identical) response message.

Word 1		Word 2		Word 3		Word 4	
Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
00000000	00000000	00000000	00000000	Anything		Anything	

READ THE VALUE OF DV9

This is done by setting the value of word 1 to 12289 (table above) and that of Word 2 to 508

Wait for the response message. If successful, the command area will have bits 12 and 13 set (= 12288), so a value of anything other than '12289' in word 1 indicates an error. Word four will have the DV value in it.

Word 1		Word 2		Word 3		Word 4	
Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
00110000	00000001	00000001	11111100	Anything		DV Value	

12289

If an error has occurred, the command area will have bits 12, 13 and 14 set (= 28672) so word 1 will have a total value of 28673, and word 4 will contain one of the error codes described above.

Word 1		Word 2		Word 3		Word 4	
Byte 0	Byte 1	Byte 2	Byte 3	Byte 4	Byte 5	Byte 6	Byte 7
01110000	00000001	00000001	11111100	Anything		Error code	

28673

12.8 PARAMETER TAGS

FUNCTION CODE	DESCRIPTION	RECORDER ACTION	CHANNEL 1 TAG (DECIMAL)
01	Read coil status	Digital input state (true = >0.5)	0
02	Digital read input status	Digital input state (true = < 0.5)	0
		Input alarm 1 status	250
		Input alarm 2 status	500
		Input alarm 3 status	750
		Input alarm 4 status	1000
		Derived alarm 1 status	1250
		Derived alarm 2 status	1500
		Derived alarm 3 status	1750
		Derived alarm 4 status	2000
03	Read holding register	Analogue input value	0
		Analogue input A1 (Table 12.6)	250
		Analogue input A2 (Table 12.6)	500
		Analogue input A3 (Table 12.6)	750
		Analogue input A4 (Table 12.6)	1000
		Analogue input SP1 (Table 12.6)	1250
		Analogue input SP2 (Table 12.6)	1500
		Analogue input SP3 (Table 12.6)	1750
		Analogue input SP4 (Table 12.6)	2000
		Derived channel A1 (Table 12.6)	2250
		Reserved (always returns 0000)	2500
		Derived channel A2 (Table 12.6)	2750
		Reserved (always returns 0000)	3000
		Derived channel A3 (Table 12.6)	3250
		Reserved (always returns 0000)	3500
		Derived channel A4 (Table 12.6)	3750
		Reserved (always returns 0000)	4000
		Derived channel SP1 (Table 12.6)	4250
		Reserved (always returns 0000)	4500
		Derived channel SP2 (Table 12.6)	4750
		Reserved (always returns 0000)	5000
		Derived channel SP3 (Table 12.6)	5250
		Reserved (always returns 0000)	5500
		Derived channel SP4 (Table 12.6)	5750
		Reserved (always returns 0000)	6000
		Input channel status (read only) (flags - see code 04)	6250
		Derived channel status (read only) (flags - see code 04)	6500
		Instrument status (read only) (flags - see code 04)	6750
		Print mode	7000
		0 = Trace priority	
		1 = Text priority	
		2 = Text only	

Table 12.8 Parameter tags (Sheet 1: Function codes 01 to 03)

Note: To access a channel N parameter, find the tag for channel 1 and add (N-1) to it.
E.G. to read the status of alarm 2 of Derived channel 13. From the table above, derived channel 1 alarm 2 status tag is 1500. From this we can calculate that the tag, for derived channel 13, is 1500 + 13 - 1 =1512.

12.8 PARAMETER TAGS (Cont.)

FUNCTION CODE	DESCRIPTION	RECORDER ACTION	CHANNEL 1 TAG (DECIMAL)
04	Read input register	Analogue input value	0
		Input channel status	250
		No bits set: Channel OK	
		Bit 0 set: Channel off	
		Bit 1 set: Over range	
		Bit 2 set: Under range	
		Bit 3 set: Hardware error / bad PV	
		Bit 4 set: Ranging error / no data	
		Bit 5 set: Overflow	
		Bits 6 to 15: Always 0.	
		Derived channel value	500
		Reserved (returns 0000)	750
		Derived channel status	1000
		(Bits 0 to 15 as for Input channel status above)	
		Instrument status	1250
		Bit 0 set: System error	
		Bit 1 set: Writing system failure (not graphics units)	
		Bits 2 to 7: Always zero	
05	Force single coil	Sets digital input state for comms channel	0
		0 = 0.000; 1 = 1.000	
06	Preset single register	Preset holding register	As code 03
		(Presets values for comms channels only)	
15	Force multiple coil	Sets digital input code for comms channels in	0
		address range.	
		0 = 0.000; 1 = 1.000	
16	Preset multiple registers	Preset holding register for each channel in address range.	As code 03
		(Presets values for comms channels only)	

Table 12.8 Parameter tags (Sheet 2)

Note: To access a channel N parameter, find the tag for channel 1 and add (N-1) to it.
E.G. to read the value of Derived channel 9: From the table above, derived channel 1 value tag is 500.
From this we can calculate that the tag for derived channel 9 is: 500 + 9 - 1 = 508

12.9 IMPORTING GSD FILES INTO COMMERCIAL PROFIBUS CONFIGURATION SOFTWARE

12.9.1 OVERVIEW

In order to configure PROFIBUS networks, GSD files (<name>.GSD) must be imported into the network configuration tool provided by the vendor of the PROFIBUS Master device. It is also often possible to include a supplementary bitmap file which provide an icon of the unit being configured for use on a graphical representation of the network.

Section 12.9.3 below, includes details of how to import GSD files into a number of different Vendors' Master software. These examples should give an indication of how GSD files can be imported into other suppliers' configuration tools.

12.9.2 Finding files on disk

GSD FILES AND BITMAPS

It is assumed that a GSD file has been created using the GSD file editor described in SECTION 12.5 above and that its location on hard or floppy disc drive is known.

Notes:

1. A set of standard GSD files and bitmaps are included on the PROFIBUS support disk supplied with this manual. These files are copied into the directory in which the program is installed, usually C:\EUROPROF. Unless action is taken to save GSD files elsewhere, all files created by the GSD File Editor will also be saved to this directory.
2. A GSD file contains a list of required parameters for a particular type of instrument - it does not contain the node address of any individual instrument. The node address is a part of each instruments own configuration (see section 12.2.2 above) and in the Master Configuration, that particular node address is associated with a particular GSD file. This means that, for example, all temperature controllers can use one GSD file containing parameters suited to temperature controllers, whilst all chart recorders use a different GSD file with a set of parameters related to recorder functions

MASTER CONFIGURATION SOFTWARE

In most cases, it will be necessary for the user to determine the location on the hard disk into which the Master Configuration Software has been installed. In the examples below, it is assumed that the default location defined by the installation program of the Master Software has been used. If it has been installed into a different directory or drive the user must modify the procedure accordingly.

COPYING FILES

It is usually necessary to copy files from one location on the hard disk drive to another, as a part of the process of importing GSD files. This can be done using Windows Explorer, File Manager or MSDOS copy programs. It may be easier to configure Windows 95 explorer to display file name extensions in order to locate the required files more easily (>GSD for GSD files, >BMP for bitmaps).

12.9.3 Configuration tool examples

SIEMENS: SINEC SETUP V1.02/COMLDP V1.01

This is a simple network configuration tool provided with Siemens PC master cards such as the CP5412A2. There is no graphical representation of the network, so no bitmap copying is required.

IMPORTING A GSD FILE

1. Select 'DP Configuration' from the 'Edit' menu of Sinec Setup. This runs the DP configuration program (COML DP).
2. Select 'New' from the 'File' menu, then, from the 'Extras' menu, select 'Update Catalogue (GSD)...' This causes a list of all the DP device names (Slave names) in the catalogue to be displayed.
3. Use the 'Import GSD' button.
4. Locate the required GSD file in the file dialogue box, and then to click 'OK' to import the selected GSD file. Once complete, click 'OK' again to finish.
5. Select the device and add it to the network using 'Catalogue Slave' from the 'Insert' menu. To remove a slave, use the 'Delete Entry' button.
6. Assign a node address by clicking on the node address field on the left hand side of the 'Slave List' and typing a new number in.

> Note: The program does not automatically load any changes made to the GSD file after it has been imported. If a GSD file is edited (e.g. to add or remove parameters) then the old file must be deleted using 'Update catalogue' and the new file imported.

SIEMENS: COM PROFIBUS V 3.1

The GSD files used by this program must be located in the GSD subdirectory of the installation directory C:\COMPB31. (This is the default directory which is an abbreviation of COM PROFIBUS version 3.1)

Files can be copied to this directory from the GSD Editor installation directory (default = C:\EUROPROF), or can be created there using the 'Save as' option of the editor and selecting the \COMPPB31\GSD sub-directory using the dialogue box. The GSD editor remembers that this is the last sub-directory used, and subsequent files will be loaded from and saved to it directly, unless told otherwise.

In addition to the GSD files, all bitmap (.bmp) files should be copied from the file editor or from the support disk to directory COMPB31\BITMAPS . These will provide a graphical representation of the instrument after configuration. This needs to be carried out only once.

When all the required files are in their correct directories, use of the 'Scan GSD files' option on the 'File' menu loads the files.

> Note: The 'Load GSD file' verifies that a GSD file is present and valid, but does not import it.

To create the network, use 'File', 'New' and add the devices as described in the program documentation. Devices are added by pressing the 'CONTROL' button, and their node addresses are assigned at this point.

> Note: The program does not automatically load any changes made to the GSD file after it has been imported. If a GSD file is edited (e.g. to add or remove parameters) then the old file must be deleted using 'Update catalogue' and the new file imported.

12.9.3 CONFIGURATION TOOL EXAMPLES (Cont.)

HILSCHER (SYNERGETIC) SYCON CONFIGURATOR V1 (16 Bit)

The GSD files used by this program must be located in the GSD subdirectory of the installation directory C:\PROFIBUS\SYCOMDP. (This is the default directory.)

Files can be copied to this directory from the GSD Editor installation directory (default = C:\EUROPROF), or can be created there using the 'Save as' option of the editor and selecting the \PROFIBUS\SYCOMDP sub-directory using the dialogue box. The GSD editor remembers that this is the last sub-directory used, and subsequent files will be loaded from and saved to it directly, unless told otherwise.

Bitmaps are not supported so there is no need to import them.

Use the 'Add device' option on the 'Device data base' menu to locate and import the GSD file. If you wish to use a number of different GSD files for the same device type, the program requires that you give a unique name to each device in the 'Description' field of the GSD file editor, so that it can differentiate between the devices on the database.

Note: The program does not automatically load any changes made to the GSD file after it has been imported. If a GSD file is edited (e.g. to add or remove parameters) then the old file must be deleted as follows:

a Use the 'Display' option on the 'Device data base' menu to display the device database, which is a list of the currently loaded GSD file types.
b Click on the required device name, and remove it by using the delete button.

The replacement file is loaded using the 'Add device' option on the 'Device data base' menu.

HILSCHER (SYNERGETIC) SYCON CONFIGURATOR V2.4 (32 Bit - Windows 95 and NT only)

The GSD files used by this program must be located in the FieldBus\PROFIBUS\GSD subdirectory of the installation directory C:\Program Files\Hilscher GmbH\SyCon. (This is the default directory.)

Files can be copied to this directory from the GSD Editor installation directory (default = C:\EUROPROF), or can be created there using the 'Save as' option of the editor and selecting the sub-directory using the dialogue box. It should be noted that some elements are abbreviated because the editor is a 16-bit application:
\PROGRA~1\HILSCH~1\GMBH\SYCON\FIELDBUS\GSD

The GSD editor remembers that this is the last subdirectory used, and subsequent files will be loaded from and saved to it directly, unless told otherwise.

In addition to the GSD files, all bitmap (.bmp) files should be copied from the file editor or from the support disk to the FieldBus\PROFIBUS\BMP sub-directory of the SyCon installation directory. These will provide a graphical representation of the instrument after configuration. This needs to be carried out only once.

SyCon scans (imports) all GSD files when it starts up, so you need only to add the devices to the network and assign node addresses as described in the SyCon documentation.

Because the program imports all GSD files at start up, it is necessary only to shut the program down and then re-start it to import any newly edited files.

12.9.3 CONFIGURATION TOOL EXAMPLES (Cont.)

SST (S&S Technologies) PROFIBUS CONFIGURATOR V0.14 BETA (32 Bit - Windows 95 and NT only)

The GSD files used by this program must be located in the PBX subdirectory of the installation directory C:\DLINK32\5136-PFB (this is the default directory.)

Files can be copied to this directory from the GSD Editor installation directory (default = C:\EUROPROF), or can be created there using the 'Save as' option of the editor and selecting the DLINK32\5136-PFB\PBX sub-directory using the dialogue box. The GSD editor remembers that this is the last sub-directory used, and subsequent files will be loaded from and saved to it directly, unless told otherwise.

Bitmaps are not supported so there is no need to import them.

The program scans (imports) all GSD files when it starts up, you need only to add the devices to the network and assign node addresses as described in the SyCon documentation

Because the program imports all GSD files at start up, it is necessary only to shut the program down and then re-start it to import any newly edited files.

SOFTING/ INTEGRATED CONTROL TECHNOLOGY PROFIBUS DP CONFIGURATOR (ProfiConf)

The importing of GSD files into this program is carried out as follows:

1. Use the '`Edit DDB path`' option in the 'Options' menu.
2. Use the '`Add`' button.
3. Use the dialogue box which is displayed to locate the directory containing your GSD files (C:\EUROPROF is the default name).
4. Exit the program and re-start it. (Once this has been done, any changes to GSD files are automatically imported when PROFIBUS starts up.)
5. Add the device to the network by clicking on its name in the '`Model Name`' window, and assigning a node address to it.

Bitmaps are not supported by this program.

13 IP65 RATING DOOR OPTION

This option consists of an enhanced door catch and extra seals to bring the recorder door up to IP65 rating.

The door is fitted with a knurled knob, which can be rotated through 90 degrees. The face of the knob has a narrow slot milled into it, to act as a position indicator. When this indicator is horizontal, the door is latched shut; when the indicator is pointing vertically upwards, the door is unlatched and can be opened in the normal way. Figure 13 shows the two positions for the knob.

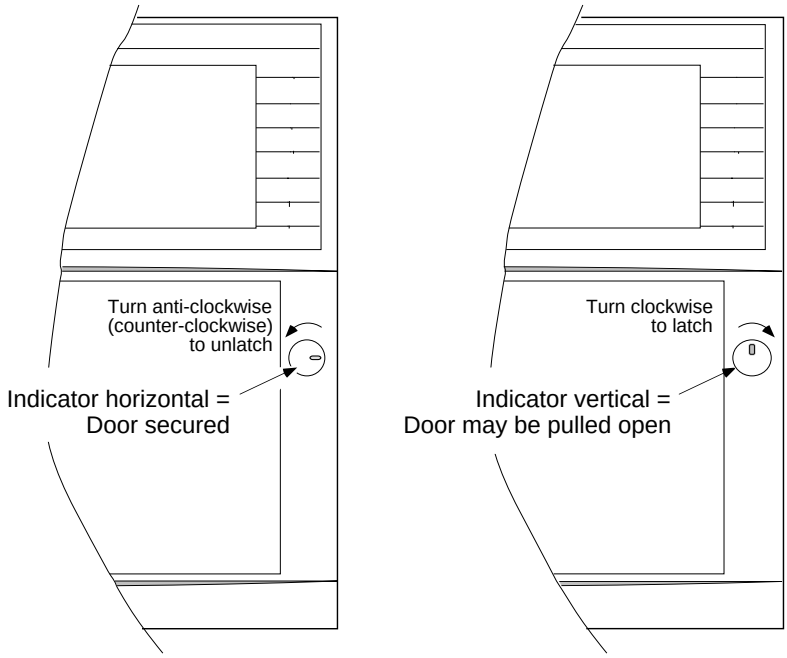


Figure 13 Door securing mechanism

14 ENHANCED IMMUNITY OPTION

For 100mm graphics recorders, this option provides an enhanced EMC performance compared with the standard version. The option is not available with Profibus Communications, the Transmitter Power Supply or the low supply voltage option. ALL signal inputs are limited to S.E.L.V. (i.e. 30V RMS or 42.2 V peak).

14.1 PHYSICAL

As shown in figure 14.1, the recorder is extended by 74mm to allow space for high performance filter components. The remaining dimensions and the clamping details remain unchanged from those given in figure 1.2.1 of the installation and operation manual.

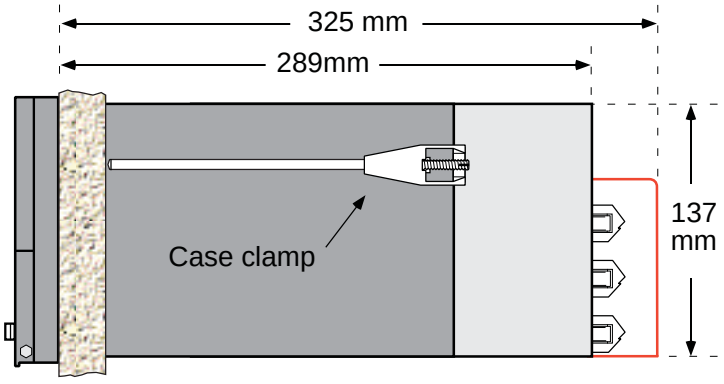
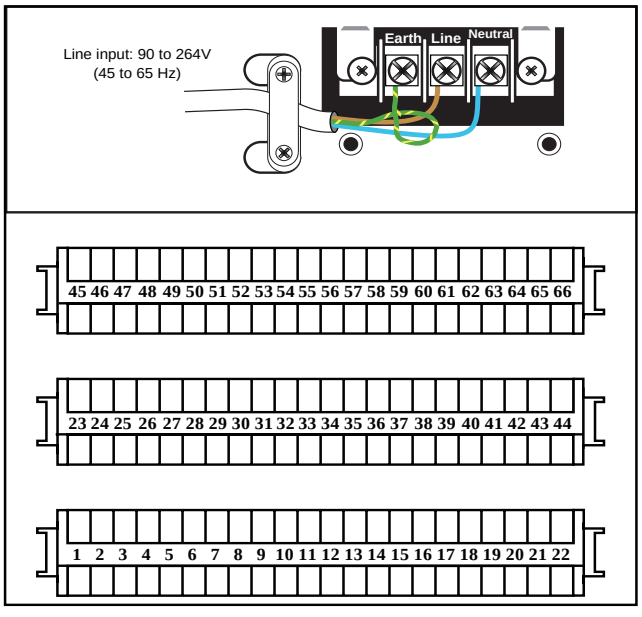


Figure 14.1 recorder length

14.2 WIRING

The input/output (i/o) and option board pinouts are identical with the standard graphics recorder. Supply voltage wiring is similar except that the terminal block is moved (figure 14.2) relative to its standard position.



See Installation and Operation Manual for I/O pinouts.
See relevant section of this manual for option board pinouts

Figure 14.2 Connector locations

14.3 SPECIFICATION

The recorder specification is as given in Annex A of the Installation and Operation Manual, with the exception of the following amendments.

A1 TECHNICAL SPECIFICATION (Recorder)

Physical

Depth behind bezel rear face	289 mm (no terminal cover); 325mm (with terminal cover)

Power requirements

low voltage option:	20 to 53V dc or peak ac (45 to 400Hz) (Not available with Enhanced Immunity Option)

Electromagnetic compatibility (EMC)

EMC Immunity	Bursts/fast transients:	IEC 61000-4-4	3kV
	Surge:	IEC 61000-4-5	3kV
	Conducted RF:	IEC 61000-4-6	7V RMS AM 50kHz to 400MHz; 6.3V RMS AM 30Hz to 50kHz
	Radiated RF:	IEC 61000-4-3	10V/m AM 10kHz to 1GHz
	Electrostatic discharge (ESD):	IEC 61000-4-2	± 15 kV (air discharge); ± 8 kV (contact discharge)

A2 TECHNICAL SPECIFICATION (input board)

General

Maximum common mode voltage	30V RMS (42,2V peak)
Safety isolation (dc to 65 Hz; BS EN61010)	Installation category II; pollution degree 2
Channel to channel:	30V RMS or 42.2V dc (double isolation)
Channel to common electronics:	30V RMS or 42.2V dc (double isolation)
Channel to ground:	30V RMS or 42.2V dc (basic isolation)
Dielectric strength	
Channel to channel:	50V
Channel to ground:	50V
Insulation resistance	>10 MΩ at 50 Volts
Overvoltage protection	40 Volts peak (120V with attenuator)

Option specifications, as given elsewhere in this (Options) manual are amended as follows:

1.1.2 RELAY SPECIFICATION

Maximum contact voltage	30V RMS or 42.2V dc
Safety isolation(dc to 65 Hz; BS EN61010)	Installation category II; pollution degree 2
Relay to relay:	30V RMS or 42.2V dc
Relay to ground:	30V RMS or 42.2V dc

2.2 ANALOGUE OUTPUT BOARD

Safety isolation(dc to 65 Hz; BS EN61010)	Installation category II; pollution degree 2
Channel to channel:	30V RMS or 42.2V dc
Channel to ground:	30V RMS or 42.2V dc

5.1.1 EVENT INPUTS

Safety isolation(dc to 65 Hz; BS EN61010)	Installation category II; pollution degree 2
Event input to ground:	30V RMS or 42.2V dc

7.1.1 Serial communications

Safety isolation(dc to 65 Hz; BS EN61010)	Installation category II; pollution degree 2
Terminals to ground:	30V RMS or 42.2V dc

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HA249874/16 (CN21536)