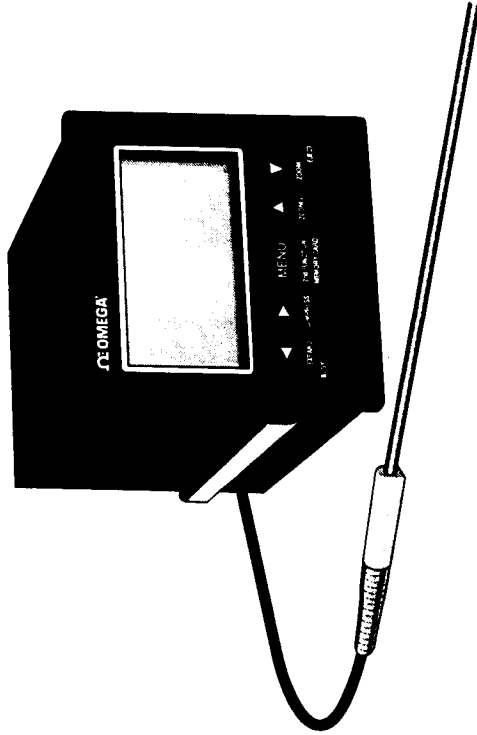


# RD820 Series

## Paperless Recording System



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Rev 1.3

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## 1.0 INTRODUCTION

The Solid State Paperless Recorder / Data Logger represents a technological breakthrough in the recorder industry. This instrument has all the capability of your regular paper recorder - variable chart speeds, the ability to review historic data, see trends and more, with a number of specific exceptions - *NO PAPER to jam, no ink to smudge and no pens to clog or break. The data is stored in a credit card sized memory card which can be easily transported.*

Of course it does all the regular functions a lot better, and the data can be transferred directly into reports, spreadsheets or analysis programs. Data can be examined and archived on any IBM PC compatible machine, and the data can be printed out in various formats as required.

Things are done a little differently in the Paperless recorder and there are a few new concepts that you need to become familiar with. There are more features and functions in this unit than you will probably use, it is recommended that you read this manual in its entirety before attempting to use the instrument.

The balance of this introduction will attempt to introduce some of the more unique features of the paperless recorder.

### 1.1 CHART SPEED TO SAMPLE SPEED

The major difference between paper and paperless is **SAMPLE SPEED** which is analogous to **CHART SPEED** in the paper recorder. There is an apparent chart speed, the rate at which the samples appear to move across the Graphics Display, but unlike paper recorders the display is made up of discrete data points, each of which is a distinct sample of the data being measured. The rate of movement across the screen is thus a direct function of the sample rate. The bottom line in deciding what sample rate to select is knowing how much data is enough. In a paper recorder, a chart speed of 1 inch per hour is fine for a process that does not vary very quickly, but would result in a thick blur if trying to record a 1Hz sine wave. Unlike a paper recorder, every point recorded by the paperless recorder is uniquely identifiable, no matter how dense it appears on the screen. It is always better to have too much data than to have too little, the only consideration is the amount of space used in the memory card.

To relate chart speed to sample rate we need to consider how we plan to reproduce the data. The graphic LCD display has a density of 70 pixels (data points) per inch, a typical dot matrix printer has 180 pixels per inch and a laser printer 300 pixels per inch. Thus to fill one inch of the display in one hour we need to sample at a rate of 70 samples per hour, a little over once per minute, however if this is now printed on a laser printer it will fill less than 1/3 of an inch. It is the amount and quality of the data that counts. There is another advantage that the paperless recorder has, it can sample internally at 100 samples per second (one every 0.01 seconds). These samples can be averaged or peaks or valleys can be detected and then this data can be stored at the chosen sample rate.

Trial and experience will yield the best sample speeds for the application. Start with a faster sampling rate than you think you will need; you can always slow it down in the future. As a rule of thumb, one sample every 10 seconds should give the equivalent information that 1 inch per hour of chart paper would.

### 1.2 REVIEWING AND SEARCHING DATA

One of the biggest features of this recorder is its ability to show historic data, trends and quickly search for specific data points. The data on the graphics screen can be rewound like a tape recorder, scrolling back in time, displaying past data on the screen while still recording data in real time.

The data can also be compressed on screen, showing a whole day or week's worth of recording on one screen, enabling trends or irregularities to be spotted easily. A data cursor can be moved around the screen to uniquely identify samples in both time and amplitude.

One of the most powerful and unique features is the ability to search past data for specific sets of user programmed parameters. The user can search for data greater than or equal to, or less than or equal to, a programmed value, or search for alarm point transgressions. The unit rapidly scans prerecorded data for the required search, then when found, positions the data cursor at the found point. The user can then view pre and post trigger information and uniquely identify it using the data cursor. Once data has been found the user can choose to exit the search or simply continue to find the next set of data that meets the search requirements.

Refer to the various sections in the manual for the specifics on searching and reviewing data.

### 1.3 ZOOMING AND CONDITIONING DATA

The recorder acquires data with greater resolution than can be displayed on the screen. The user has the ability to ZOOM in to amplify the data either 2 or 4 times, equivalent to using a magnifying glass on the display. These ZOOM windows can be scrolled up or down to cover the entire data spectrum. The vertical scale automatically adjusts to the zoom level and position to enable resolution of minor changes in input signal.

The recorder also acquires data at a rate faster than what may be displayed on the screen. The user can set the sampling rate from 100 samples per second down to 1 sample every 10 minutes. At any rate slower than 100 samples per second the recorder can be programmed to record the average, maximum or minimum values. Thus if a sample rate of 1 sample per minute is chosen, the recorder will still sample internally at 100 samples per second, computing the average, or looking for and remembering either the maximum (peak) value or minimum (valley) value, depending on the mode programmed, and then store this value when the minute is up. Unless required otherwise, it is recommended that the average value be used for recording, as this will tend to filter or smooth the data.

### 1.4 CUSTOMIZING

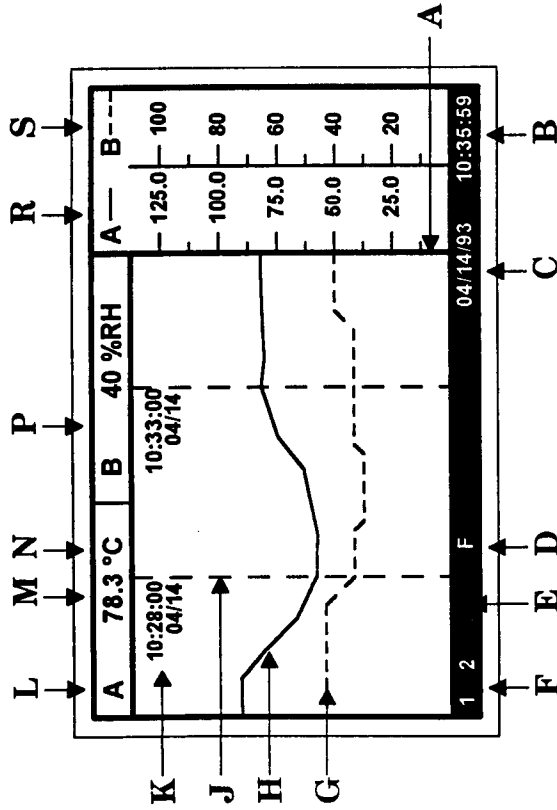
There are many operating features and parameters that the user can program. All settings are stored in nonvolatile memory and are recalled each time the unit is powered on. The display can be scaled to read in engineering units, and the trace can be labeled accordingly with up to three alphanumeric characters. Four alarms are fully user programmable and can be associated with either input channel, (in a dual channel unit). The Alarm levels can be set in the engineering units of the display, the sense of the alarm, the type and the deadband or hysteresis can be individually set for each alarm. Optional relay outputs can be assigned independently to each alarm. A reset delay feature is also available.

There are other features which may be programmed by the user including the time stamping mode, either real time or elapsed time, clock update rates, filenames, beeper operation etc. (Refer to Section 5)

### 1.5 TRIGGERING

The recorder has the ability to change sampling speeds and stop or start recording as a result of a triggered event. This event may be tied to any of the four internal alarms or optionally to an external signal. This enables the unit to monitor a process without recording, or to record at a slow speed to conserve card space, then, upon an external event or internal alarm condition, begin recording or change to a higher sample rate for the data of interest.

### 1.6 THE GRAPHICS LCD DISPLAY



The above diagram is a representation of the Graphics LCD (Liquid Crystal Display) of the dual channel recorder. The alpha characters around the border point to salient features of the display and are described below. Not shown are the MENUS which simply pop up over the display. The menus are in the form of those shown in Sections 4 and 5. The numbers in brackets below refer to the section that covers the topic in detail.

- A Right hand edge of the graphics area in which the traces are displayed. This is the point of the most recent data which is displayed in digital form at the top of the display (M and P). This data moves left with time - the most recent data is to the right and the oldest data is to the extreme left. New data appears against this margin and the oldest data disappears off the screen at the extreme left. The graphic cursor will start against this right edge. (Section 4.6)
- B The time shows the actual time of day (real time) or elapsed time from power up, depending on the setup mode. The time is displayed in 24 hour format with hours and minutes. Optionally seconds and hundredths of a second can be displayed. (Section 5.9.1)
- C The date shows the actual calendar date in months, days and years, or an accumulation of elapsed days since power up depending on the setup mode. The Date can be displayed in American or European formats. (Section 5.9.1)
- D One of the many status icons that appear to indicate the current status of the recorder display (Section 3.12).
- E Status line display area. Icons indicating the display status appear in this area per D above. (Section 3.12)
- F Alarm status of alarm channels 1 through 4. (Section 3.12 and 5.6)

- G Channel B trace. This is the graphic representation of time (horizontal) versus Amplitude (vertical). This line is shown dotted to distinguish it from Channel A trace. Not present in single channel units.
  - H Channel A trace. This is the graphic representation of time (horizontal) versus Amplitude (vertical). This line is shown solid to distinguish it from Channel B trace.
  - J Date / Time axis delimiter. Placed at equal increments along the Horizontal axes (Time) the lines mark the exact position of the Date / Time stamp alongside it (see next). These lines move with the trace at a speed dependent on the sampling speed. (Section 4.9)
  - K The Date / Time stamp identifies the Date and Time of the traces. May be in real time or elapsed time since start of file, depending on the setup mode. (Section 5.9.1). Moves with the delimiter - see J above.
  - L The Channel identifier for the digital display window. This window displays the absolute digital value of the instantaneous (last) reading for the channel, and is the sample against the right margin of the graphics display (A).
  - M The digital value of the most current sample for the input channel. This value is usually scaled to represent the input in engineering units. (Section 5.4)
  - N The label for the engineering units. May be three characters or less. (Section 5.4.3 and Appendix A)
  - P The digital display window for the B channel. Not present in single channel units. ( See L, M and N above)
  - R The vertical scale for the channel identified at the top, in this case, Channel A. The small piece of trace alongside the A identifies the trace on the graphic screen. This scale alters dynamically with the ZOOM function and UP and DOWN scrolling in the ZOOM mode. (Section 3.4) The units for the scale are shown in the digital display window as described above. Not present in single channel units.
  - S The vertical scale for the channel identified at the top, in this case, Channel B. The small piece of trace alongside the B identifies the trace on the graphic screen. This scale alters dynamically with the ZOOM function and UP and DOWN scrolling in the ZOOM mode. The units for the scale are shown in the digital display window as described above
- The graphics display area is that area containing the input traces, Date / Time delimiters and Date / Time stamp G, H, J and K. The Digital readout area comprises L, M, N and P. The Vertical Scale area is R and S. F, E and D is the status window and C and B is the Date / Time window.
- In single channel units the vertical scale area, window area R is not present, and the Graphics area right margin, A, moves to fill this space giving a larger graphics area with only a single trace. Digital readout area P blanks. The time/date windows may relocate to the top of the screen.
- On the front panel to the left of the memory card slot is a rectangular LED (Light Emitting Diode) marked **BUSY**. This light blinks on whenever data is written to or read from the card.



**DO NOT INSERT OR REMOVE THE MEMORY CARD WHILE THE BUSY LED IS ON!**

## 2.0 INSTALLATION AND SETUP

### 2.1 UNPACKING

Each unit is packed in a custom cardboard box. Check the box for the following contents - The paperless recorder, two locking bars, two 6-32 x 1/2" screws and this manual. There may also be an optional memory card and optional mains cable if these were ordered. Remove the instrument from the plastic bag and check for damage if any. Also check that the unit is as ordered. Immediately report any damage to the shipping agent. If you have any questions about the shipment, please call the Customer Service Department.

### 2.2 INSTALLATION

The unit is designed for panel mounting, although it can be used as a desktop recorder. To install, cut a hole in the panel 3.61 x 3.61 inches (91.7 x 91.7mm). The thickness of the panel is immaterial, but panels thicker than .125 inch will require that the locking bars be cut down.

Ensure that the locking bars are removed from the unit. Place the recorder into the hole in the panel from the front of the panel, inserting the rear of the recorder into the hole in the panel and pushing it home. From the rear of the unit insert the locking bars into the slots in the sides of the unit and slide them fully forward. Place the 6-32 x 1/2" screws into the rear of the slots and finger tighten. Using a screwdriver, tighten the screws until the recorder sits snug in the panel. **DO NOT OVER TIGHTEN THE SCREWS.** Note, thick panels will require that the locking bars be cut down accordingly; use a hacksaw.

### 2.3 CONNECTION

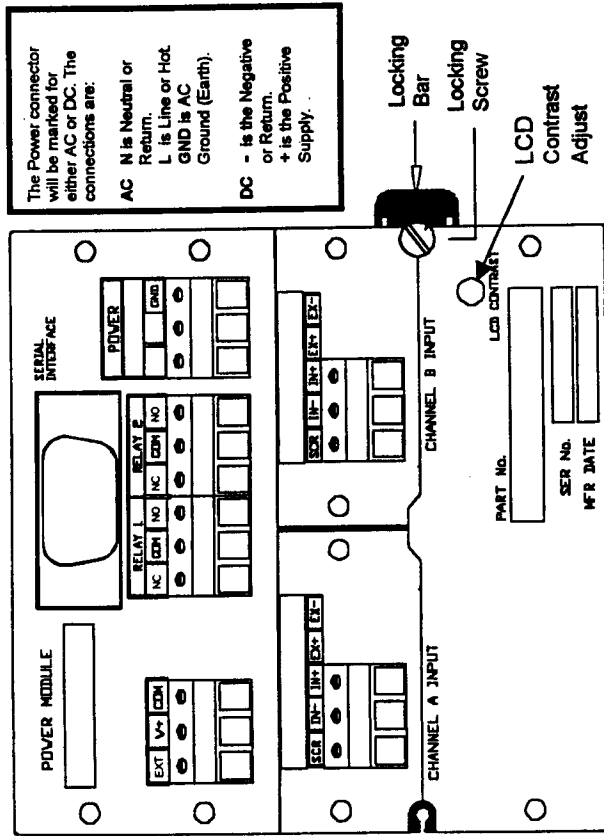


Fig 2.1 REAR PANEL - SHOWING CONNECTIONS

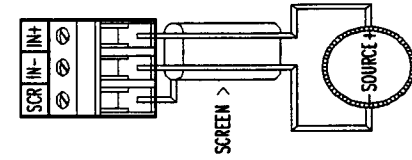
### 2.3.1 POWER CONNECTIONS

Before connecting any power or inputs to the unit, ensure that all signal wires and power cables are free of potential. Check the unit to ensure that the power and inputs are as expected, e.g. 115VAC or 230VAC power, 4-20mA inputs. You will require a small flat head screwdriver. Connect the power and signal wires accordingly, noting carefully all polarities. **Ensure that the unit is properly grounded**, either via the power cable, or directly from the ground point on the power connector to a suitable ground within the cabinet.

If the unit is installed in an electrically noisy environment it is necessary to use a line filter on the power lines. A recommended RFI power line filter is Corcom type 2VR1 or similar.

Identify the power connector on the rear panel in the top right corner. The power source required is clearly marked, either AC or DC with the specific voltage level. (Refer to Figure 2.1). Strip the insulation from the cables exposing about one half inch of the conductor. Twist any multi-strand conductors to form a solid end. Loosen the screws on the terminal block and insert the exposed conductor cable into the hole below the screws, between the metal tongues. Ensure that the insulation is flush with the terminal block. If it is too long, remove the cable, trim and reinsert. Tighten the screw to firmly hold the cable. Ensure the ground wire is connected and properly grounded at the other end.

### 2.3.2 INPUT SIGNAL CONNECTIONS



When connecting the signal wires keep polarities correct. Also if inputs are **not isolated** ensure there are no high common mode voltages and maintain ground integrity. The screw terminals are marked on the rear panel - typically there are two connections, a high or positive signal marked IN+, and a low or common signal marked IN-. The terminal marked SCR is the screen or shield (often the braided wire) and connects directly to the system ground and is used to shield the low level input signals from induced noise pick up. Special purpose inputs may have three or more connections, refer to any custom instructions shipped with the unit.

Connect the signal wires to the terminal block in the manner described above. Use wire of adequate gauge to carry the signal. Thermocouples should be connected with special thermocouple wire of the same type as the input, the terminal block is the reference junction. Connect any sheath or braid to the SCR input. RTD's have an additional wire, the current source which is connected to the terminal marked EX+ on the RTD input conditioning modules.

In dual channel **not isolated** input units, the signal common or IN-, of each channel, may be directly connected together internally as well as being connected to the system COMMON. This is the common shared by the entire unit (including the serial port if fitted). **USE CAUTION WHEN CONNECTING SIGNAL WIRES.** If in doubt use isolated input modules. The SCR terminal is not connected to the IN- or common input, but directly to the ground terminal of the power connector.

Connect signals of the correct type to the input modules. A Zero to 100mV input module may be damaged if you apply 100 Volts to it. A K type thermocouple will read incorrectly if connected to a J type input.

### 2.3.3 INSTALLING OR EXCHANGING INPUT MODULES

The input modules plug into the rear of the recorder and condition the input signals to the correct voltages as required by the unit. The unit automatically detects the presence and type of input module and configures itself accordingly. If only a single input module is present in a dual channel recorder, it will default to the single channel mode. Single channel only units cannot be upgraded to dual channel.

The plug in input modules are field installable and the user can change them at any time to alter the input requirements of the recorder. There are many different types of input module for conditioning millivolts and volts DC and AC, current input, various Thermocouple types, RTDs and so on. Both isolated and non isolated are available. Refer to Section 6.

### BEFORE REMOVING OR REPLACING THE INPUT MODULES, DISCONNECT THE UNIT FROM THE POWER SOURCE.

The input modules (Two in dual channel units, one in single channel units) plug into slots in the middle of the rear panel of the unit. The modules can plug into either side on dual channel units or the left hand side only of single channel units. They are held in place by a single securing screw which screws into a threaded hole on the outside wall of the cabinet. The center holes are not used.

It is necessary to *remove the locking bar retaining screw* in order to remove an input module. Also, ensure that the signal wires are safe and remove them from the terminal block on the input module before proceeding.

Remove the locking bar screw AND the securing screw as shown in Fig 2.2. above. Using a flat head screwdriver, gently pry the module out and withdraw it from the chassis.

Refer to any instructions provided with the module for any user options. Exchange or replace the module by placing the connector end of the circuit board into the slots on either side of the opening. Push the module in gently until the pins on the connector engage the socket internal to the unit. Push the module firmly home, so that the module rear panel is flush with the rear of the unit, and replace the securing screw. There are no adjustments to make, the recorder will detect the input module and automatically configure itself to the default settings. You may have to set the scaling and engineering units for personal preference using the setup menu.

Note : Looking at the rear of the unit, viewing the two input modules on a dual channel recorder, CHANNEL A is on the LEFT and CHANNEL B is on the RIGHT. Single channel units have only CHANNEL A fitted.

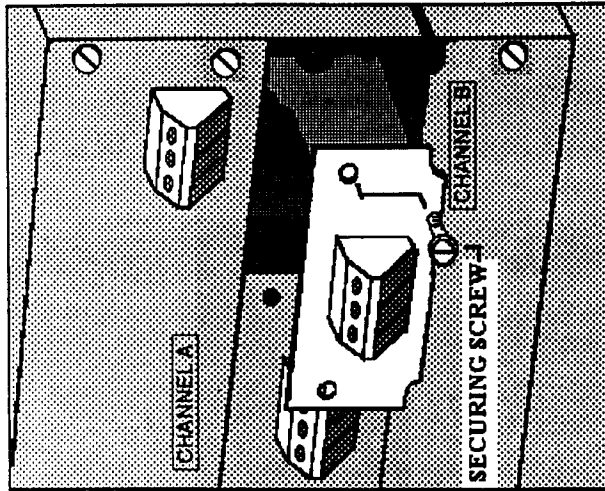


Fig 2.2 - Showing Rear Panel with Input Module partially removed.

### 2.3.4 RELAY OUTPUT CONNECTIONS

The relay output is an option and will be fitted only if specifically ordered.

Relay connections require special attention. The relay contacts are rated for AC or DC operation (Maximum recommended voltage - 30 Volts.) Each relay has a set of potential free change over contacts. There is the common contact, marked COM, a contact which switches between the other two contacts. Under normal conditions (no power) it is switched to the NORMALLY CLOSED contact and opens in alarm, the NORMALLY CLOSED contact is marked NC. The other contact is the NORMALLY OPEN contact and it makes connection with the common when the relay pulls in. It is marked NO. (Refer to Fig 2.1)

The relays may be used to switch any type of signal within the limits of the ratings, however some precautions must be taken.

If INDUCTIVE loads are to be switched it is imperative that some form of spike suppressor or snubber be used to limit the induced spike that WILL occur when switching such loads. These inductive spikes, if left unchecked, can affect the operation of the unit. The snubber may be a Resistor / Capacitor combination, a Varistor or Voltage dependent resistor, or a custom Transient Suppressor placed across the used set of contacts. Every used set of contacts should have adequate suppression.

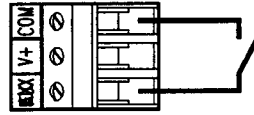
### 2.3.5 SERIAL OUTPUT CONNECTIONS

The serial output is an option and will be fitted only if specifically ordered. It is an RS232 serial bi-directional communication port which allows the user to program the recorder remotely, start or stop recording and download real time data.

Refer to the separate manual that is supplied with the serial interface option.

### 2.3.6 EXTERNAL TRIGGER

The external event trigger is an option and will be fitted only if specifically ordered. Connection is via a screw terminal connector on the rear panel. It is on the top left hand side and has three connections marked EXT, V+ and COM respectively from left to right.



The inputs to the external event trigger are via the EXT and COM connections. This input is TTL compatible, but may be used with a simple potential free contact closure as there is an internal bleed resistor, which may be disconnected. The COM connection is the COMMON for the external input, while the EXT is the EXTERNAL input for the high or signal input. If you are using a contact closure, simply wire this across the EXT and COM terminals.

The V+ terminal is a source of +5 volts DC which shares a common with the COM terminal. This voltage may be used to provide additional bleed voltage if required. Maximum current is 5mA DC.

The External Trigger may be used to stop or start recording using an external signal, or may be used to change the sampling speed. Thus the unit can be set to record only when a conveyor is running for example. The External Trigger may also be linked internally to the optional Relay Output. This could be used as a remote "record active" indicator. Refer to Section 5.3.

## 2.4 - INPUT SCALING

Often the input to the recorder is a standard process variable (e.g. voltage) rather than the actual units being measured, say pressure.

There are a number of custom conversions available in the unit to take care of special inputs such as thermocouples and RTDs which need special scaling and linearization. These are preset in the unit and require no modification. There is also the capability to customize any input variable that has a linear relationship to the measured variable. The relationship between the required variable and the input variable must satisfy the constraint

$$y = mx + c$$

where  $y$  is the value to be displayed and recorded,  $x$  is the input variable (typically volts or milliamps DC),  $m$  is the scale factor which defines the relationship between the input and the displayed variable and is a constant (linear relationship), and  $c$  is a constant offset variable that may be positive or negative.

This facility to scale the input is found in the ADVANCED SETUP menu and is available to each channel independently in dual channel units. Here the user can easily scale the input and set the displayed units using three alphanumeric characters.

The scaling is achieved in the unit in the CHANNEL SETUP option in the ADVANCED SETUP menu. First set the displayed LO VALUE which may be positive, negative or zero. Then set the displayed HI VALUE for the full scale input. The unit will then automatically compute the scale factor and offset.

Setting the engineering units is done in the same menu location using the UNITS LABEL option to set the three alphanumeric characters. Refer to the Section 5.4.3 and Appendix A.

Let us assume we have an input from a pressure transducer of 1 to 5 volts DC, corresponding to real world units of zero to 250 PSI (Pounds per Square Inch of pressure). Consider first the recorder is designed to accept a 1 to 5 volt input, in this case the offset of 1 volt is accounted for in hardware and the input span is 4 volts. The LO VALUE is set to "0" and the HI VALUE is set to "250". The engineering units are set to "PSI". The display will now show zero to 250 PSI for 1 to 5 Volts input.

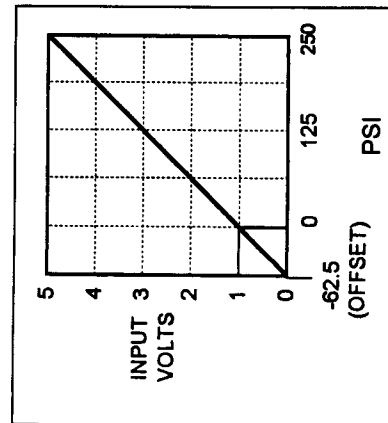


Fig 2.3

If the recorder has a zero to 5 volt input module and you have a 1 to 5 volt signal, it is necessary to account for the offset. Note that we have a reduced span of 80% of full scale (4/5) for our 0 to 250 PSI. Referring to the graph shown at left, it can be seen that the input span is actually 5 volts (0 to 5) while the signal span is 4 volts (1 to 5). The 1 volt difference has to be accounted for. For zero input (assuming we placed a zero on the input although the theoretical minimum is 1 volt) the actual value would be -62.5 PSI, this becomes the LO VALUE while 250 remains the HI VALUE. You can see from the graph that for 1 volt input the display will show 0 and for 5 volts input the display will show 250. The engineering units are set to "PSI".

## 2.5 ALARMS

The recorder has four programmable internal alarms with optional dual relay output. The alarms can be associated with either input channels, can be set as high or low, latching or non-latching with or without lockout capability. Each relay in the optional relay output module has a pair of potential free change over contacts (Form C - SPDT) that are accessible from the rear panel via screw terminal connections. The relays can be assigned to any, all or none of the alarms. Refer to section 5.6 and 5.7.

### 2.5.1 ALARM TYPES

A high alarm is active when the input is greater than or equal to the setpoint, a low alarm is active when the input is less than or equal to the setpoint. A latching alarm will remain set once activated and must be reset by the operator. Note that the alarm condition should be removed before resetting the alarm or the alarm will activate and latch again. A non-latching limit will set on alarm condition and automatically reset once the alarm condition is removed. A differential, known as hysteresis or deadband can be introduced so that once an alarm is set (at the setpoint), the input must go beyond the deadband before the alarm resets. This prevents the output relays from chattering in borderline conditions. The deadband is set in absolute units and adds to the setpoint in a low alarm, or subtracts from the setpoint in a high alarm. By way of example, if the setpoint is 100, and the hysteresis or deadband is set to 5, and the alarm is a high type, non latching, then the alarm will activate when the input exceeds 100 and will remain active until the input drops below 95 (100 minus 5). Alternatively the user can set a reset delay from 1 to 255 seconds. This delay must time out once an alarm condition has been removed before the alarm will reset.

Lockout prevents an alarm from activating until the setpoint has been traversed in the opposite sense, by the input. Again by way of example, if we were measuring pressure and had a low alarm set at 100, we may not wish the alarm to be active on start up, when the pressure may be low or zero. We really wish to monitor a low pressure situation once our target pressure has been reached, say 150. The lockout prevents the alarm activating at startup. The alarm remains deactivated until the input exceeds the setpoint. At this point the alarm arms and any time from this point on that the input drops below the setpoint, the alarm will activate as normal.

### 2.5.2 SETTING ALARMS

Setting and configuration is done in the Advanced Setup Menu.

The setpoints are set in the same units as the inputs, and may be different for each channel (in two channel units). When setting the actual setpoint value, the value may be incremented in steps other than what is expected (unit steps). This is due to the fact that the input is converted into a digital value with a finite resolution. It is not possible to set a setpoint value that cannot be resolved by the internal microprocessor. Select the closest value to the exact value you require, it will always be with 0.5%. The same applies when setting the deadband.

Note that when configuring the alarms, there is no correlation between inputs, alarms and relay outputs. These are user defined. Each alarm can be assigned to only one input channel.

When setting up each alarm channel the user should DISABLE the alarm so that parameters may be changed WITHOUT AFFECTING THE RELAYS assuming this option is fitted. This is done in the ALARMS menu by selecting the ENABLE option so that no ✓ appears to the left of this option. Once everything is set, select ENABLE once more to activate the alarm, indicated by the presence of the ✓. (Refer to Section 5.6)

When setting up alarms you may get unexpected results from the relay options if these are present and enabled. Ensure there is nothing connected to the relays that could result in an accident due to random closing of the relays during setup and always DISABLE the alarm as described above, make the changes and then re-enable the alarm.

## 2.6.3 CARD STORAGE CAPACITY

The following tables provide an approximate indication of the recording time available in a memory card. The actual times may vary depending on the number of files on each card, as each file has a header associated with it that uses up card space.

SAMPLE RATE VS. MEMORY CARD STORAGE TIME GUIDE		
EXAMPLE: 512 KBYTE MEMORY CARD		
SAMPLE RATE	SINGLE CHANNELS	TRIPLE CHANNELS
100/SEC	1 HR: 26 MIN	43 MIN
50/SEC	2 HR: 54 MIN	1 HR: 27 MIN
20/SEC	7 HR: 16 MIN	3 HR: 38 MIN
10/SEC	14 HR: 32 MIN	7 HR: 16 MIN
5/SEC	29 HR: 00 MIN	14 HR: 30 MIN
2/SEC	3 DAYS	1 1/2 DAYS
1 SEC	6 DAYS	3 DAYS
2 SEC	12 DAYS	6 DAYS
5 SEC	30 DAYS	15 DAYS
10 SEC	60 DAYS	30 DAYS
20 SEC	4 MONTHS	2 MONTHS
30 SEC	6 MONTHS	3 MONTHS
1 MIN	12 MONTHS	6 MONTHS
2 MIN	2 YEARS	1 YEAR
5 MIN	4 2/3 YEARS	2 1/3 YEARS
10 MIN	9 1/2 YEARS	4 3/4 YEARS

EXAMPLE: 128 K BYTE MEMORY CARD		
SAMPLE RATE	SINGLE CHANNELS	TRIPLE CHANNELS
100/SEC	21 MIN	10 MIN
50/SEC	42 MIN	21 MIN
20/SEC	1 HR: 50 MIN	55 MIN
10/SEC	3 HR: 45 MIN	1 HR: 50 MIN
5/SEC	7 HR: 30 MIN	3 HR: 45 MIN
2/SEC	18 HR: 24 MIN	9 HR: 12 MIN
1 SEC	1 1/2 DAYS	18 HR: 24 MIN
2 SEC	3 DAYS	1 1/2 DAYS
5 SEC	7 1/2 DAYS	3 DAYS
10 SEC	15 DAYS	7 1/2 DAYS
20 SEC	30 DAYS	15 DAYS
30 SEC	45 DAYS	22 1/2 DAYS
1 MIN	3 MONTHS	45 DAYS
2 MIN	6 MONTHS	3 MONTHS
5 MIN	1 1/4 YEARS	7 1/2 MONTHS
10 MIN	2 1/2 YEARS	1 1/4 YEARS

Note: For 256k and 1024k cards double the times of the 128k and 512k cards

The alarms can be used as search parameters and need not be assigned to relays, or the relay option may not be required. There are many different ways the alarms can be set up. All the alarms can be assigned to a single channel and may be of the same type giving for example a various degrees of high warning and ultimately a high shutdown indication. Also the relays may be assigned to any combination of alarms. This would allow a single relay output to indicate any alarm active. The combinations are endless.

## 2.5.3 ALARM INDICATION

There are three indications of alarm condition, two are standard in the unit, the third is an option - the relay outputs. The other two are visual and audible.

When an alarm is armed and functioning, it is indicated by a small "1", "2", "3" or "4" in reverse video on the bottom left hand side of the graphic display. These status indicators remain on as long as the alarm is enabled. If an alarm is triggered (in alarm condition), the status indicator will blink and the internal beeper will sound. The beeper can be permanently disabled from the Advanced Setup Menu - BEEPER - OFF.

The relays close on an alarm condition, assuming they have been set up correctly. The relays have change over contacts so they may be wired as fail safe by reversing the logic of the alarms.

## 2.6 - MEMORY CARDS

The memory cards used conform to the PCMCIA 2.0 standard. They are battery backed static RAM cards which can hold from approximately 128,000 samples (128k) to 1,000,000 (1024k) samples. The cards are keyed and can only go into the recorders with the arrow side up.

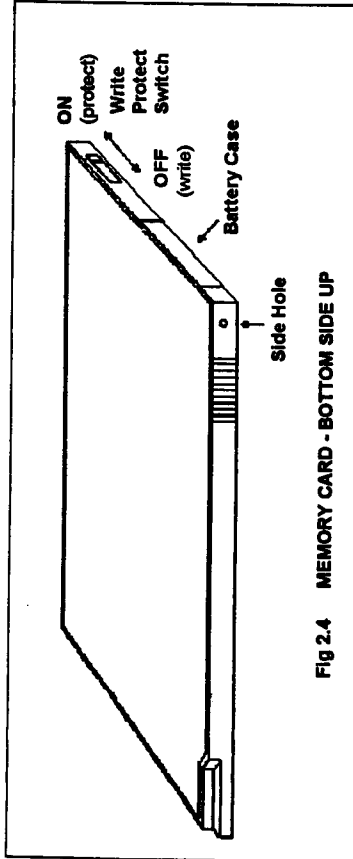


Fig 2.4 MEMORY CARD - BOTTOM SIDE UP

### 2.6.1 - WRITE PROTECTING THE DATA

When transporting or storing the Memory Cards the user can WRITE PROTECT the data in the card to prevent the data from being accidentally overwritten. There is a small write protect switch on the end of the card opposite the connector end. When the switch is away from the battery cover, closest to the outer edge, the data is write protected. The Recorder cannot write to a protected card and will indicate an error if the switch on the memory card is not in the OFF or write enabled mode.

### 2.6.2 - CARE OF THE DATA CARDS

Do not expose the cards to direct sunlight or extremes of temperature for any length of time. Do not expose to moisture. Do not bend or twist. Avoid high static discharge. Mail in suitable packaging to avoid postal damage. When transporting, use the anti-static bag provided.

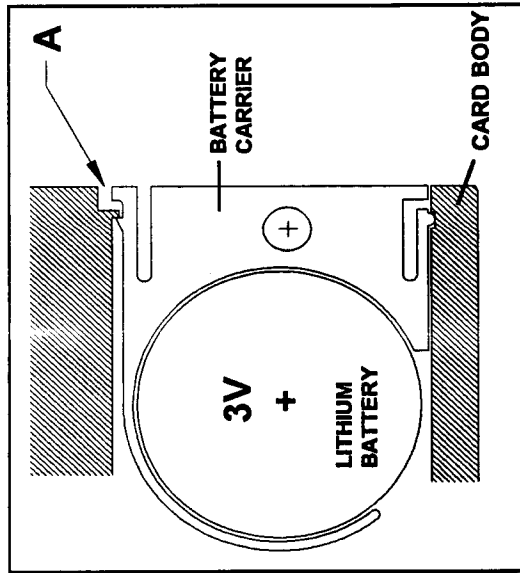


### 2.6.4 - BATTERY CARE

Not all cards have replaceable batteries, some have **internal rechargeable batteries** which cannot be replaced. These cards can maintain data for a minimum of four months with the card removed from the recorder or card reader. When plugged into a card reader or recorder, the batteries will automatically recharge. They require 48 hours to fully recharge a flat internal battery. Data from these cards should be archived on your personal computer hard drive or floppy drive for long term storage.

Those cards with removable batteries have a carrier which is visible along the rear edge of the card. The battery in the card is a 3 volt Lithium coin type, Part Number CR2025 and should maintain the data in the card for a minimum period of 5 years (at 20°C), with the exception of the 512k and 1024k cards which are rated to 2.5 years. Any change of temperature can affect battery life. The user should replace the battery periodically.

Note: REMOVING THE BATTERY WILL CAUSE LOSS OF DATA. Ensure all data on the card is backed up before changing the battery.



To replace the battery remove the battery carrier from the card by pushing a paper clip or small screwdriver under the slot marked "A", gently depress the latch and ease the carrier outwards. (see figure 2.5). Replace the battery with the same type - CR2025, observing the polarity which is marked on the battery carrier (+). Replace the carrier in the card. Note that the polarity is marked on the back of the memory cards.

Fig 2.5

### 2.7 - LCD CONTRAST ADJUST

The visibility of the Liquid Crystal Display (LCD) on the recorder is dependent on ambient lighting conditions, the back light and the viewing angle.

If the display is optimized for direct viewing (straight on) and it is installed so that the user looks up or down at an angle to the display, the display may appear very dim, or very dark. On the rear panel toward the lower right, is an adjustment potentiometer (refer to fig 2.1) which adjusts the viewing angle or contrast of the display. Insert a small screwdriver through the opening and adjust the display contrast for best conditions once installed in the panel.

### 3.0 BASIC OPERATING INSTRUCTIONS

The Basic mode of operation encompasses those functions that would be done on a routine basis and relate primarily to viewing and reviewing data, with some use of the menu system. The advanced mode, while technically still simple to operate, involves setting up the unit, and would typically be done once only.

#### 3.1 - BASIC MODE OF OPERATION

Basic operations are all done using the five buttons on the front panel and the first level menu.



The buttons have dual functions. The second function is activated by pressing and holding the MENU (2nd Function) button and then pressing any of the other buttons. The 2nd function of each button is denoted by the text under the arrow symbol. (EXPAND, COMPRESS, ZOOM + and ZOOM -).

The unit need not be recording to the memory card in order to manipulate data. The data available however is dependent on how long the unit has been operating, the sample rate and the buffer or memory card size.

#### 3.2 - VIEWING HISTORIC DATA

There are two different methods for viewing historic data. One is using the scroll buttons, the other is to use the View File menu option. Any data that is not currently visible on the screen is historic data.

To view past data by scrolling, the left and right arrow buttons (←) and (→), are used to scroll back (←) or scroll forward (→) through the recorded data. The arrows indicate the direction the graph will move. When scrolling back, data will be retrieved from the memory card if in the record mode (Start or Triggered) or from the internal buffer if not in the record mode, and is available as far back as the start of recording. An inverse will be displayed at the bottom of the screen when scrolling through the buffer memory or an inverse will be displayed if scrolling through the memory card.

When scrolling back, the data retrieved is in reverse chronological order, that is from the most recently recorded samples through to the start of the file. When scrolling forward, data is available up to real time. The time and date stamp on the screen indicates the relative time of the samples being viewed.

Viewing by scrolling is limited to the file (or files) created since recording was manually started via the RECO mode menu - START or TRIGGERED. Certain operations cause new files to be automatically created on the memory card (for example, changing sample rate while recording) but these are transparent to the viewer unless they are extremely short or are compressed smaller than the width of the graphics window. In this instance there will appear to be a blank space between files as the unit cannot display differing time bases on the same display. You can scroll across these file boundaries without problem. The system creates a

'bookmark' which it places at the last viewed position in a file. This 'bookmark' is used in the VIEW FILE mode.

To scroll the data, press either the right or left arrow (→←) button. Each press of the button will move the data one sample (pixel). If the button is held, the data will begin scrolling automatically. The data will continue to scroll until the MENU button is pressed or to the end of available data. Each press of the left or right arrow button while automatically scrolling, will increase the scroll speed, pressing the opposite arrow button will decrease the scroll speed until it stops and reverses direction.

☛ At any stage during the scrolling process, the screen can be restored to current or real time display by pressing the MENU button (once or twice depending on the scrolling mode).

### 3.3 - COMPRESSING AND EXPANDING DATA (TREND VIEWING)

In order to view data trends, it is necessary to pack more data onto the screen than is normally visible in real time. To compress the data, press and hold the MENU (2nd Function) key then press the COMPRESS (→) key. Each time this key is pressed, the amount of data on the screen will double up to a maximum of 32 times, equivalent to 5 sequential key presses. Once compressed, data can be reworded and fast forwarded as described above. The data can be expanded back after being compressed by pressing and holding the MENU key then pressing the EXPAND (←) button.

Note that compression displays peak values (both high and low). Thus even though data is compressed, all amplitude information is present on the display. At compressions of 16 times or greater, the redraw time of data on the screen slows down, due to the large amounts of data that must be manipulated.

☛ At any stage during the compression or expansion process, the screen can be restored to current or real time display by pressing the MENU button.

• When the data on screen is compressed, a  appears on the status line to indicate that the compress mode is active.

### 3.4 - ZOOMING DATA (AMPLIFICATION)

As a result of the small display area available, it is not always possible to see small changes in amplitude of the recorded signals even though the resolution of the internal converters can measure it. To overcome this problem you can ZOOM in on a portion of the graph and get increased resolution.


To ZOOM in and amplify the graph, press and hold the MENU key, press the ZOOM+ (↑) button then release both buttons. A pair of dotted cursors will appear showing the current zoom level. (The cursors will be along the upper and lower edges of the graph if not currently at some zoom level). Dotted cursors indicate the ZOOM Control Mode. To increase the zoom level (or zoom in) press and hold the MENU button and press the ZOOM+ (↑) button then release both buttons, the cursors will move together showing what the new zoom level will be. You can move the zoom cursors with the (↑) and (↓) buttons to place them about the area of interest. To actually do the ZOOM, press and release the MENU button. The area between the zoom cursors will now fill the entire screen. Note that the scale units change to reflect the increased zoom level. There are three zoom levels available, x1, x2 and x4.

To decrease the zoom level (or zoom out) press and hold the MENU key, press the ZOOM - (↓) button then release both buttons. The zoom cursors will move out, showing the new zoom area. To actually ZOOM out press and release the MENU button.

Note that when zoomed in at any zoom level, the (↑) and (↓) buttons will move the graph relative to the window, enabling viewing of any part of the graph within the zoom window. When in the Zoom Control Mode, (zoom cursors are visible) the (↑) and (↓) buttons move the cursors relative to the graph.

Once in a zoom level, all functions are operational on the zoomed display.

☛ To exit the zoom mode, zoom out as far as possible, until the zoom cursors appear at the edge of the screen, then press the MENU button so that they disappear.

• When in a zoom mode, the zoom level is indicated by a  on the status line. No indication indicates Real Time, X1.

### 3.5 - MENU MODE

At any time, pressing the MENU button will bring up a user menu. Note that the menu "pops up" over the graphics display, the unit continues to record and will not lose data. There is also a time out option that will return a menu display back to a graphic display after a period of inactivity. (Refer to Section 5.11.2).

☛ When the menu is active the Left Arrow (←) and Right Arrow (→) buttons act as ESCAPE keys to return to a previous level without activating any function.

The user moves about the menu using the Up Arrow (↑) and Down Arrow (↓) buttons. The current selection is always highlighted in reverse. To select a function, simply move to it with the (↑) and (↓) buttons then press the MENU button once. To go back a level without activating any function simply press the (←) or (→) button. Note that the menu has more options than can be displayed at once on the screen. When a selection gets to the top or bottom of the menu list, the list will scroll until the last entry is reached. Pressing and holding the (↑) and (↓) buttons will activate an Auto Repeat function and cause the highlight bar to scroll automatically.

The menu has two levels: the standard selection as shown when entering the Menu mode for the first time, and a second set of options accessed via the ADV. SETUP (ADVanced Setup) choice on the first menu. Access to the various levels can be controlled by a password, refer to section 4.12

When the menu is displayed it defaults to the EXIT selection. At this point, pressing the MENU button will return to the graphic display.

### 3.6 - RECORD MODE

To begin or end recording in the data card, select REC MODE by using the UP ARROW (↑) and DOWN ARROW (↓) buttons to highlight the selection and then press the MENU button. Three options appear in a sub window - STOP, START and TRIG'D. To exit at this stage without changing the current setting press either the LEFT or RIGHT ARROW button (←→), else make a selection with the UP ARROW and DOWN ARROW buttons then press the MENU button. Selecting any of the options causes a small window with the words DONE to appear, indicating that the selection has been executed, unless some error occurs, in which case the error message will be displayed. If you are using the alarms or external input to control the recording select TRIG'D for triggered operation. STOP and START will always stop or start a recording irrespective of the state of any of the record triggers. (Refer to Section 5.2 and 3.8 below)

Before selecting **START** or **TRIG'D** to begin a recording, ensure that a Memory Card is in place and that there is sufficient space available to contain your new data. (Refer to **STATUS** in section 4.4).

To return to the graphic screen press either the **LEFT** or **RIGHT ARROW** button. (←→)

### 3.7 - SAMPLE RATE

To adjust the sample rate, the rate at which data is recorded, select **SAMPLE RATE** from the menu using the (↑) and (↓) buttons to highlight the selection and then press the **MENU** button. You may have to scroll the Menu to display this selection. (Section 4.9)

When entering the **SAMPLE RATE** menu, the rate highlighted is the **current sampling rate**. To exit at this stage without changing the current setting press either the (←) or (→) button. In this manner the user can check the current sampling rate at any time without affecting the recording.

To change the sampling rate, use the **UP ARROW** and **DOWN ARROW** buttons (↑↓) to highlight the desired sample rate. The sample rates vary from a high of 100 S/sec (Samples per second) to the slowest 10 min/S (minutes per sample, sec/S is seconds per sample). Press the **MENU** button to make the selection. A small window with the words **DONE** will appear to indicate that the selection has been made, and the Sample Rate window will close.

To return to the graphic screen press either the **LEFT** or **RIGHT ARROW** buttons. (←→)

Changing the sample rate while recording will cause a new file to be automatically started. This file is chained to the file before it so that there is no apparent discontinuity as far as the user is concerned. See 3.2 above. The beginning of a file is the point at which the operator **STARTED** it from the **RECORD Mode** Menu. The end of the file is dynamic, but is terminated properly when the operator **STOPS** the recording from the **RECORD MODE** Menu. Any files automatically created by the unit form a linked chain of sub-files between the **START** and **STOP** points of the main file.

### 3.8 - EVENT TRIGGERING

The recorder has the ability to be triggered by certain events, generated internally or optionally, externally, which will enable it to automatically change sampling speed or begin or end a recording session. The trigger is any of the alarms, or an optional external input. The user can thus set the unit to record at a slow sample speed until some alarm condition is triggered, and then change to a higher sample rate to record the transient. Another example is the use of the external event trigger to start and stop recording, allowing the selective recording of specific events.

The event triggering is setup in the normal menu. The control of recording, stopping and starting is set in the **RECORD TRIGGER** menu option (Section 5.2), while the changing of sample speed is controlled via the **SAMPLE TRIGGER** menu option, where a second set of sample speeds will be presented for the triggered speed change (Section 5.1). This rate may be slower or faster than the regular rate depending on application.

The external event may be used in the same manner as the internal alarms for triggering a change of speed or record status. This is however an option and must be ordered if required. The external event trigger characteristics is set in the **ADVANCED** menu setup from the **EXT INPUT** menu option. Refer to section 5.3.

### 3.9 - CURSOR ID

The Cursor ID mode enables the user to accurately pinpoint the time and amplitude of any sample in the graphics window. To enable this function, select **CURSOR ID** from the menu by highlighting it with the (↑) and (↓) buttons and then press the **MENU** button.

The Menu will dissolve revealing the Graphics screen and a single data cursor against the right edge of the display area. The screen will be in the **HOLD** mode with a data window in the top right hand corner showing the time and date of the samples under the data cursor. The status line will show the highlighted **D** to indicate that the data in the Digital Display Window is that of the data under the cursor and not real time data.

Using the left and right arrow keys (←→) the user can move the data cursor to the point of interest. The data window will show the time and date of the sample and the digital readings at the top of the screen - A (and B in dual channel units) shows the absolute value. Note that at the extremities of the data, the cursor hits an end point then the data scrolls beneath it. This method can be used to accurately identify unique points on the graphics display, no matter how busy the traces appear.

Using the up and down arrow keys (↑↓) you can split off a second cursor to enter the difference mode. The left and right arrow keys will control the right hand cursor and the up and down keys will control the left hand cursor. The cursor window will display the time difference between samples under the cursors while the digital values at the top of the screen shows the difference in amplitude between the value at the left cursor and that at the right cursor. To return to the normal Cursor ID mode simply run one cursor into the other.

To return to normal (real time) mode, press the **MENU** key. Note that entering the cursor ID mode does not affect the real time acquisition of data.

### 3.10 - VIEWING FILES

The user can view data from files other than the one currently being recorded. The view file option allows the user to view previously recorded data on the data card, from the very first file through to the current data. To view the file on the memory card ensure that the card is firmly inserted into the recorder then select **VIEW FILE** from the **MENU**. This can be done while recording provided you follow the precautions listed below.

When viewing a file from a memory card other than the one currently being recorded AND the record mode is **ACTIVE**, the memory card containing the file you wish to view **MUST BE WRITE PROTECTED** before being inserted into the recorder. This will prevent the recorder from appending current data it is recording onto the memory card being viewed.

The status line will show a highlighted **F** to indicate that the data being viewed is from the memory card. All View, Compress, Search and Zoom functions work on the prerecorded file. Use the **LEFT** and **RIGHT** arrow keys (←→) to move through the files.

**DO NOT INSERT OR REMOVE MEMORY CARDS WHILE THE BUSY LED IS ON.**

### 3.11 SEARCHING FOR DATA

The user can search the current file, either the one being recorded or the one being viewed, for specific conditions. These conditions are set up in the SEARCH menu. Section 4.7 From the SEARCH menu select FIND WHAT... to define what it is you wish to search for. You can search for an Alarm event on any alarm, or for a user specified SEARCH Point.

The User Specified Search point is set in the SEARCH PT.. menu selection. Here the user specifies which channel is to be used for the search, Channel A or B, what the specific value to search for is, entered in the same engineering units as the selected channel, and finally the sense of the search, less than (or equal to) or greater than (or equal to).

Finally the search is initiated with the GO FIND! menu option.

The menu will dissolve and the data ID cursor will be placed on the graphics display and the time / date window will open. To commence a search *press and hold* the MENU (2nd Function) key and then press either the LEFT ARROW (←) or RIGHT ARROW (→) keys to search in the designated direction. Pressing the (←) button searches further into past data while pressing the (→) button searches into more recent data. Once data meeting the search criteria is found the cursor will attempt to center itself on the display over the found data point. If no matching data is found the message NO FIND is displayed. Change the search parameters and try again.

The cursor functions in the same manner as described in 3.9 above. The date and time of the found sample is displayed in the cursor window, and its value is shown in the digital display window. The user can probe pre and post "found" data with the cursor using the LEFT and RIGHT ARROW keys, or the next point can be searched for by pressing and holding the menu key then pressing the Left or Right arrow buttons as before.

To exit the search mode simply press the MENU button.

Once an event has been found, the next search point requires that the data go beyond a point where the search requirement goes *not true* then true again. In other words if we were searching data representing a sine wave, and our search requirement was for any data greater than the midpoint (amplitude) of the sine wave, effectively all data points above the midway line or center of the sine wave meet our search criteria. The sine wave is evaluated from left to right as this is how it was recorded, a point to the left occurred before the point to its right. Our first found point would be the first zero crossing of the sine wave in a negative to positive direction. The next point found will be the next zero crossing in the same negative to positive direction equal to one full period of the sine wave, not the next crossing point which is effectively going positive to negative, nor the next immediate point which also satisfies the search criterion, along with every point above the zero line. This is event hopping, a far more meaningful method of searching as very often adjacent points will meet the same search requirement and you could end up finding every adjacent sample, which could more effectively be scrolled through using the data cursor. Note that when searching backwards, the same points as above would be found although they would appear to be the wrong points going right to left, as if we evaluate the sine wave from right to left as opposed to left to right, negative to positive transitions appear to be opposite.

Search logic follows alarm logic. The graph is always evaluated from left to right on the display irrespective of the search direction.

Searches can be made backwards or forwards through the data. The time taken to find a data point is determined by the search requirement and the size of the file, which could effectively represent months worth of data. The search mode is a quick and easy way of checking the integrity of the process being monitored.

### 3.12 STATUS LINE INDICATORS



The bottom line of the graphics LCD display is used to indicate the status of the display and of the recorder itself. These status symbols consist of reverse video characters or letters that appear according to operations performed and are intended to prevent data on the display from being misinterpreted and to indicate the status of the alarms.

From left to right these symbols are as follows:



These status symbols indicate that the alarms are enabled. Any number of them may be present depending on how the alarms have been set up. If an alarm is enabled a solid block will be present. The number in the box is directly related to the alarm. If the alarm has exceeded the setpoint (i.e. is in an alarm condition) its symbol will be blinking.



This symbol indicates that the external input is enabled. If the external input is triggered this symbol will blink.



This symbol indicates that the display is in a ZOOM condition with an amplitude magnification other than one. The 2nd Function - ZOOM + or ZOOM - can be used to determine the zoom factor. To exit from the ZOOM mode it is necessary to Zoom to the minimum level and then press the MENU button.



This symbol indicates the display is in the COMPRESSED mode. The amount of compression can be determined from the time date stamps on the display. To exit from the Compressed Mode simply press the MENU button.



This symbol indicates the display is in the HOLD mode. The displayed data is no longer real time and will not be updated. The Hold mode is entered by pressing either the LEFT or RIGHT arrow buttons, entering the compressed mode or viewing any internally buffered data.



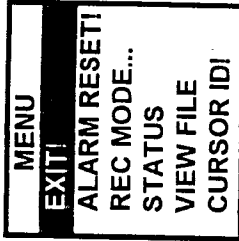
This symbol indicates the data on the display is from the MEMORY CARD and not currently recorded data. To view data from a file use the MENU selection option "VIEW FILE". Note that if currently recording, viewing a file does not disrupt the recording procedure provided that the file you are viewing is on the same memory card as the one you are recording on OR you do not exceed the buffer storage time on the recorder if you are using another memory card. Always write protect a memory card before viewing IF it is not the one currently being recorded.



This symbol indicates that the data cursor is active. (Refer to CURSOR ID and SEARCH modes). The data appearing in the Digital Display Window is at the cursor position.

#### 4.0 MENU SELECTIONS - STANDARD SELECTION

To enter the menu mode press and release the MENU button. To move through the menu use the up and down arrow keys (↑↓). Menu items will scroll as you near the bottom or top of the menu window. To select a menu item use the MENU button, to go back a step or exit use the left and right arrow buttons (←→). Any entry in the menu ending with a pair of dots .. has sub-menu options.



##### 4.1 - EXITI

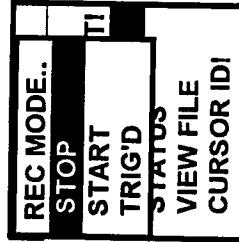
To exit from the menu select EXIT and press the MENU button. This is the default selection when entering the menu.

##### 4.2 - ALARM RESETI

Resets any alarm condition when selected. If the relay option is installed this will reset the relays. Works in "latching" and "lockout" modes.

To reset the alarms select ALARM RESET and press the MENU button. The alarms will be reset with no other indication on the screen. Note that if an alarm condition still exists the alarms will be set again after the next sample period.

##### 4.3 - REC MODE .. [RECORD MODE..]



Enables the user to STOP and START recording or arm the TRIGgered record mode.

To begin recording data to the memory card select RECORD MODE and then select START using the UP and DOWN arrow keys. Press the MENU key. The display will indicate DONE and the BUSY LED will flash periodically as data is stored to the card. The START record selection will begin recording regardless of the state of any of the record triggers (refer to section 5.2)

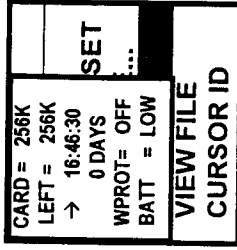
To stop recording select RECORD MODE then STOP. The display will indicate DONE. Note that the graphics display continues to display real time data irrespective of the record mode. The STOP record selection will override the triggered record mode and stop the recording irrespective of the status of any of the record triggers.

The TRIG'D (triggered) selection will arm the recorder and enable recording to be automatically started and stopped by the internal alarms or the external input, according to the settings in the RECord TRIGgger setup menu. Refer to Section 5.2 for Record Trigger setup.

ENSURE A GOOD DATA CARD IS IN PLACE AND USE STATUS TO CHECK CARD CONDITION BEFORE STARTING TO RECORD. THE UNIT WILL INDICATE ANY CARD ERRORS.

WHEN IN THE RECORD MODE YOU CANNOT ENTER THE ADVANCED SETUP MENU. YOU WILL GET AN "ACCESS DENIED" MESSAGE.

#### 4.4 - STATUS



Selecting STATUS brings up a status window which indicates the condition of the Data Card. This window will remain in place, even after exiting from the Menu mode. To remove the STATUS WINDOW, select STATUS from the MENU one more time. The STATUS WINDOW is continually updated and reflects the current condition of the card inserted into the Memory Card slot of the recorder.

Information in the STATUS WINDOW is as follows:

Line 1 - CARD = is the total memory capacity of the card currently inserted into the recorder in Kilobytes (K). One K is approximately 1000 bytes or samples.

Line 2 - LEFT = is the amount of memory remaining in the card that can be used for recording.

Line 3 & 4 The amount of time remaining in the card at the current sample rate in DAYS (Line 4), Hours, Minutes and Seconds. This time includes the internal buffer time. If the card is write protected, this time is the buffer time only.

Line 5 WPROT. Indicates if the Card is write protected. WRITE PROTECT SWITCH is on, YES, or off, OFF. If a card is write protected the CARD = and LEFT = will both show OK which is zero K (not Okay as in fine).

Line 6 BATT. Indicates the condition of the Battery in the MEMORY CARD. GOOD, LOW or BAD. If LOW or BAD, the battery should be replaced before recording or the data will not be retained.

#### 4.5 - VIEW FILE

Enables the viewing of existing files on the memory card.

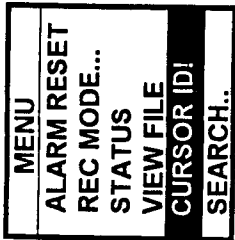
Selecting VIEW FILE will cause an **F** to show on the bottom Status Line indicating that the data currently being viewed has been retrieved from a File on the Memory Card and is not Real Time Data. All functions operate on this File Data in the normal way.

The view file option can be used to view all of the files on any memory card previously recorded, starting with the first file onwards, up to and including the current file. If the user has previously scrolled through files on the memory card, the entry point on view file will be the last place viewed. A 'bookmark' is left each time view file is used. When scrolling through files, the recorder will automatically jump from the end of one file to the beginning of the next. The user cannot however specify a specific file, but must scroll through from the start or current 'bookmark' position. Specific files can be viewed with the optional card reader and PC software.

Viewing a previously recorded file does not interfere with current recordings provided there is sufficient space on the card. Beware of removing a memory card that is currently being recorded, as this may create a discontinuity in recording. This can be avoided by turning the write protect feature on the card to "PROTECT" before inserting it. The original card must be returned before the internal buffer fills.

Refer to Section 3.10 before attempting to view a file.

#### 4.6 - CURSOR ID!



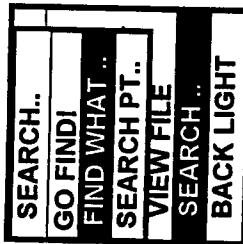
Enables the Cursor ID window on the display which uniquely identifies the Time and Date of the samples under the moveable cursor. Selecting CURSOR ID from the menu will automatically return you to the graphics display with the cursor ID window enabled in the top right hand corner of the display. The ID cursor is on the right of the display. This cursor can be moved with the left and right arrow keys (←→). The Cursor window shows the TIME and DATE of the samples, the top of the screen indicates the absolute digital values.

The cursor can be used to precisely identify samples on the Graphics screen. Use the LEFT and RIGHT ARROW keys (←→) to move the cursor. *The cursor identifies the value, time and date of the samples under it.* The display is in the hold mode during this function.

The cursor can be split into two using the up and down arrow keys (↑↓). This is the cursor difference mode. The cursor ID window will now show the time difference between the samples under the left and right cursors, while the digital values at the top of the screen are the magnitude differences between the samples. The cursors can be moved independently, the LEFT and RIGHT arrow keys moving the left hand cursor and the UP and DOWN arrow keys moving the right hand cursors. The cursors cannot cross one another. When the cursors meet the system reverts to the above Cursor ID mode.

To exit the cursor ID mode, press the MENU button once. Refer to section 3.8.

#### 4.7 - SEARCH..



Refer to Section 3.10 for Search Methods.

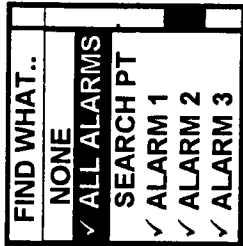
Select the SEARCH mode to find specific data occurrences in the historic (recorded) data file. Searches can be made from the current point forward or backward. The user can specify the search point or search for a number of preexisting conditions.

To begin a search select SEARCH from the menu. This brings up a sub-menu with three choices -

##### 4.7.1 GO FIND!

Find the next data point that satisfies the FIND WHAT condition. To begin a search, select GO FIND using the MENU key. This will bring up the Graphics display with the Cursor ID window and Cursor displayed. The screen is in the HOLD mode. To begin the search *press and hold* the MENU button then press either the LEFT or RIGHT ARROW keys to begin the search in the specified direction. The Unit will scan the data until it finds the first data that satisfies the search criteria and then stop, centering the cursor on the found data in the center of the screen if possible. The cursor ID Window shows the TIME and DATE of the sample and the top of the screen shows the digital value. Use just the LEFT and RIGHT arrow keys to move the cursor about the found point or press and hold the menu key, and press the LEFT or RIGHT ARROW key to find the next point. If the search criteria is not met the unit will indicate NO FIND.

#### 4.7.2 - FIND WHAT..



Specify what to look for. Selecting this item will bring up a second sub-menu which enables the user to specify the search data. Sub Menu choices are as follows:

NONE Will not find anything. Effectively clears all current selections.

ALL ALARMS Selects ALARMS 1 through 4. This is equivalent to selecting ALARM 1, then ALARM 2 and so on.

##### SEARCH PT

Search for the occurrence of the user specified SEARCH Point. ( Refer to SEARCH PT.. below)

##### ALARM 1

Search for the occurrence of an ALARM 1 condition in the specified direction. The Alarm condition must have previously been set up in the ADVANCED SETUP menu.

##### ALARM 2

Search for the occurrence of an ALARM 2 condition in the specified direction. The Alarm condition must have previously been set up in the ADVANCED SETUP menu.

##### ALARM 3

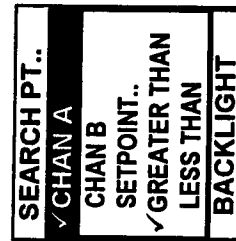
Search for the occurrence of an ALARM 3 condition in the specified direction. The Alarm condition must have previously been set up in the ADVANCED SETUP menu.

##### ALARM 4

Search for the occurrence of an ALARM 4 condition in the specified direction. The Alarm condition must have previously been set up in the ADVANCED SETUP menu.

The above selections are mutually inclusive, any combination of them may be selected as the search criteria.

#### 4.7.3 SEARCH PT..



User defined Search Point. The user can specify which channels to Search, the absolute search point and a greater than or less than condition to search for.

CHAN A Select to search Channel A. A ✓ appears alongside the item if it is selected.

CHAN B Select to search Channel B. A ✓ appears alongside the item if it is selected.

Note - The search can only be done on a single channel at a time, thus Channel A and Channel B selection are mutually exclusive. Selecting Channel A will automatically deselect Channel B. Use the MENU key to select the required Channel. If the recorder is set in the single channel mode, the search defaults to the active channel and the CHAN A and CHAN B options do not appear.

#### SETPOINT

Brings up a window to allow the actual search setpoint to be set using the UP Arrow and DOWN Arrow keys (↑↓). Use the MENU key to enter the selection. The units will default to those of the selected search channel. The search will be for a value less than or greater than this value as selected below.

SEARCH PT..	
✓ CHAN A	
CHA PSI	
SET 123.4	
✓ GREATER THAN	
LESS THAN	

#### GREATER THAN

Search for a value which is greater than (or equal to) the setpoint. A ✓ appears alongside the item if it is selected.

#### LESS THAN

Search for a value which is less (or equal to) than the setpoint. A ✓ appears alongside the item if it is selected.

The selection of GREATER THAN or LESS THAN is mutually exclusive. Selecting one will automatically deselect the other. It is not feasible to search for an exact match

#### 4.8 - BACK LIGHT

MENU	
CURSOR IDI	
SEARCH..	
BACK LIGHT	
SAMPLE RATE..	
PASSWORD..	
ADV. SETUP..	

Select BACK LIGHT to toggle the back light on or permanently off. The Back lighting consumes a fair amount of power and has a finite life span, so it is advisable to turn it off permanently if you are operating from batteries or are in a high ambient light environment. Each time BACK LIGHT is selected the state of the back lighting will change immediately. If it is off it will turn on, if it is on it will turn off.

When the back lighting is turned on, an automatic time-out function is enabled, where by after a finite period of time of inactivity, (set in the ADVANCED SETUP menu, DISPLAY - MENU TIMEOUT), the back lighting will turn off. Any action on the keypad will turn the back light back on. This is done to preserve the life of the Electroluminescent panel that provides the back lighting. It is possible to disable the timeout - refer to Section 5, DISPLAY - MENU TIMEOUT.

#### 4.9 - SAMPLE RATE..

SAMPLE RATE	
20	S/Sec
10	S/Sec
5	S/Sec
2	S/Sec
1	S/Sec
2	sec/S

Adjusts the rate at which samples are stored in the memory card. When selected the sample rate selection window opens with the current sample rate highlighted. Use the UP ARROW and DOWN ARROW keys (↑↓) to highlight the required sample rate. The values will scroll when the top or bottom of the window is reached. Select the new sample rate by pressing the MENU key. Sixteen sample rates are available from a high of 100 samples per sec (100 S/Sec) down to 1 sample every 10 minutes (10 min/S).

#### 4.10 - PASSWORD..

MENU	
CURSOR IDI	
SEARCH ENTER NEW	
BACK PASSWORD:	
SAMPLE RATE..	
PASSWORD	
ADV. SETUP..	

The PASSWORD option provides some level of protection from unauthorized users. Until a Password is entered, all menu options are available. Once a password has been set, this password must be entered to CHANGE any settings. The Advanced menu setup is Password protected, as is the speed change option and obviously the Change Password Menu. Most menu items in this section, which are the general operating features, are not protected as they do not involve changing settings.

The password consists of any combination of the four arrow buttons (←→↑↓). You could choose three ups and a down, or Up, Left, Right. While this is not a limitless choice it should provide a deterrent to anyone who should not be changing settings on the unit.

When entering the Password Change Menu for the first time, you will be requested to "ENTER NEW PASSWORD:". Of course if a Password has already been set, you will need to know the old password in order to change it. Press any combination of arrow keys, up to a maximum of four, to designate your password, then press the MENU key to record it. If you press more than four arrow keys - ONLY THE LAST FOUR will be recorded. You can have 0 (no password) 4 or more key presses.

Once entered, the unit will request you to "REPEAT..." the Password. Enter the Password a second time, exactly as you did before, and press the MENU key. If the two Passwords match you will get a "DONE" message to indicate the password has been set. If the two passwords did not match, you will get a "PASSWORD MISMATCH" error message and will have to try again.

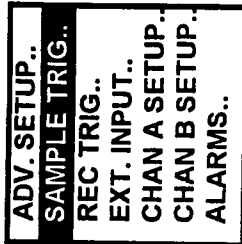
When a Password has been set, any attempt to access a feature which is protected will force the "ENTER CURRENT PASSWORD:" message to appear. Simply enter the four arrow button combination which is the Password, followed by the MENU key. If correct, you may proceed, otherwise an "ACCESS DENIED" message will be displayed. The message "ENTRY ERROR" indicates an incorrect number of keystrokes was entered and a second attempt may be made.

To remove a password, go to the password menu, Enter the CURRENT password, then when prompted for the NEW password, simply press the MENU key.

#### 4.11- ADV SETUP.. [ADVanced SETUP]

Select to go to Advanced Setup mode. Refer to next section.

## 5.0 MENU SELECTIONS - ADVANCED SETUP.

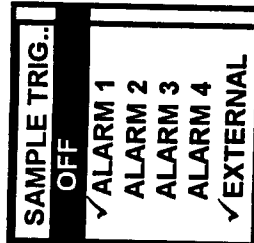


To get to the ADVANCED SETUP select this choice from the primary Menu, select ADV. SETUP and press the MENU button. This option may be password protected.

The ADVANCED SETUP enables the user to customize the recorder, set scale factors, display units, alarm setpoints etc. Most menu choices have multiple levels of sub-menus.

Note - you CANNOT ENTER THIS MENU if the unit is recording. Adjusting settings in ADVANCED SETUP can affect the operating modes of the unit in various ways. Read this manual completely before attempting any changes.

### 5.1 - SAMPLE TRIG.. [SAMPLE TRIGger]



The SAMPLE TRIGger option allows the user to change sampling speed based on an alarm event, internal or optionally, external. The Alarms are set up in the normal manner (refer to Section 5.6). As long as there is no alarm condition the unit will sample or record at the speed as set up in the SAMPLE RATE menu option (Section 4). In the event of an alarm, the unit will start sampling at a different speed as set up in this menu option. This allows a process to be sampled at slow speeds under normal conditions, and change to a faster sampling speed under alarm conditions.

The source of the trigger is selected in this menu option. The trigger source can be inhibited (OFF) so that no speed change takes place, or the speed change can be activated by ALARM1, ALARM 2, ALARM 3, ALARM 4 or the EXTERNAL event trigger if this option is fitted.

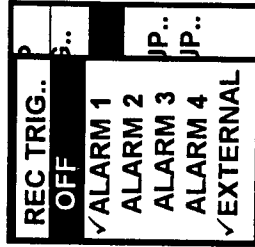
Select the trigger mode using the UP and DOWN arrow keys then press the MENU key to enter it. A ✓ appears next to each item that is active. You can set one or more items active by selecting them, and any one will trigger the speed change. Selecting OFF disables all items. The LEFT and RIGHT arrow keys will escape from this option. As you exit you will be presented with a sampling speed selection menu similar to that in Section 4.9. This is the triggered speed that the unit will change to when the alarm conditions are satisfied. Use the UP and DOWN arrow keys to highlight the desired sample rate then press the MENU key to select and exit.

It is important to consider the logic behind combinations of trigger sources.

For example, if you select the trigger source as both ALARM 1 and ALARM 2, the unit will change sampling speed if either alarm is active, but will not return to the original sampling rate until both are no longer active. The rate change will be affected by the properties of each alarm, thus if ALARM 1 is latching, it will have to be manually RESET before the unit will revert to the original sample speed. Similarly if ALARM 2 has a 100 second reset delay, sampling rate will not change back until this alarm is no longer active and the 100 second delay has timed out. Note that manually resetting the Alarms will also terminate any delays. This also applies to the External Input trigger if this option is fitted.

The Alarms should be set up with a reasonable amount of hysteresis or with reset delays to prevent spurious changes in sampling rates while recording. Note that each time the sample rate changes while recording, a file header is written to the memory card using data storage space.

## 5.2 - REC TRIG.. [RECORD TRIGger]



The Record Trigger enables the user to START or STOP a recording using alarm events or the external trigger if this option is fitted. The Alarms are set up in the normal manner (refer to Section 5.6). When an alarm trips, the recording begins, when the alarm resets, the recording stops unless the delay option is set or the alarm is latching.

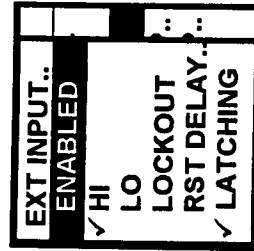
The Record Trigger may be disabled by selecting the OFF choice, or it may be started via ALARM 1, ALARM 2, ALARM 3, ALARM 4 or EXTERNAL or any combination of these.

Select the trigger mode using the UP and DOWN arrow keys then press the MENU key to enter it. A ✓ appears next to each item that is active. You can set one or more items active by selecting them and any one will trigger the recording. Selecting OFF disables all items. The LEFT and RIGHT arrow keys will escape from this option.

It is important to consider the logic behind combinations of trigger sources. Refer to the example given in 5.1 above as it applies equally to RECORD TRIGgering.

The Alarms should be set up with a reasonable amount of hysteresis or with reset delays to prevent spurious stops and starts to the recording. Note that each time a recording is started, a file header is written to the memory card.

## 5.3 - EXT. INPUT.. [EXTERNAL INPUT -OPTION]



The External Input Option allows the Recorder to be triggered by an external event. This External Trigger event can be used to stop or start a recording, change sampling speeds and activate the Relay outputs (Relay outputs are optional.) This menu item will appear whether or not the option hardware is installed.

The External Input option accepts a TTL compatible signal, or may be activated by a contact closure.

There are a number of settings for this Input as shown below. Select LATCHING using the UP and DOWN arrow keys to highlight it and then press the MENU key. Note that if this option is not fitted DO NOT ENABLE it.

ENABLED Enables the External Input Option if it is fitted. A ✓ will appear in front of the menu item if it is enabled. Pressing the MENU key toggles the enabled state on and off. If the Hardware option is not fitted do not enable it.

HI or LO Determines how the unit responds to the External Input Option. The HI and LO selections are mutually exclusive. Selecting one will cancel the other. If HI is selected the unit will respond to a High level on the external input, if LO is selected the unit will respond to a Low on the external input.

LOCKOUT Prevents the External Trigger from functioning until the existing true condition is reset and reactivated. For example, if a LO level is selected to trigger the unit, and the external event is currently low, as in the case of an underspeed alarm on a stopped motor, the external signal must first go high to arm the external trigger, analogous to the motor coming up to speed, and then go low to trigger the external event, as a true underspeed condition.



#### RST DELAY

The Reset Delay is a time delay that is activated once the external event is removed from the external input. The unit will not respond to this reset condition until *T* seconds later. If the delay *T* is zero, response will be immediate. *T* can be a maximum of 255 seconds. If during this reset delay the external event becomes True again, the delay is ignored and the unit reacts as though there never was a reset condition. For example assume the External input is used to stop and start recording, and the input level response condition is set HI, and *T*, the reset delay is set to 20 seconds. If the external signal is currently high, that is the unit is currently recording, then the external signal goes low, the unit will not stop recording for another 20 seconds. If during this 20 second period, the external signal goes high again the unit will continue recording as though there had been no reset condition. Each time the external event goes low, it restarts the 20 second delay. The Reset Delay is mutually exclusive with the LATCHING option. Selecting RST DELAY will automatically cancel LATCHING. A ✓ indicates that the option is enabled. If RST DELAY is enabled (pressing the MENU button) a window will pop up showing the current delay in seconds. Use the UP and DOWN arrows (↑↓) to set the required value, then press the MENU key to enter it. Note that a delay of 0 is equivalent to having no delay. The maximum delay is 255 seconds.

SECONDS
5

#### LATCHING

LATCHING means that once the external input is activated it will not reset until the user selects the ALARM RESET option and manually resets it once the external input is no longer active. This option is mutually exclusive with RST DELAY above. Selecting one automatically cancels the other. A ✓ indicates that the option is enabled.

The LEFT and RIGHT arrow keys exit from this menu selection.

#### 5.4 - CHAN A SETUP .. [CHANNEL A SETUP]

CHAN SETUP
LO VALUE ..
HI VALUE ..
CHAN ID ..
SAMPLING ..
INPUT TYPE ..
ALARM 2 ..

This is the default channel in single channel units. CHANNEL A SETUP is used to set the scale factor and units of the input to the recorder. In single channel units there is no "A" indication on the Channel Setup option.

Selecting CHAN A SETUP brings up a sub-menu. Each item in this sub-menu has a further menu associated with it. Select the desired option using the UP and DOWN arrow keys then press the MENU button. The LEFT or RIGHT arrow key will exit this menu.

#### 5.4.1 - LOW VALUE... [SCALING LOW VALUE]

CHAN SETUP
LO VALUE
HI V °F
UNI -150 FL..
SAMPLING..
INPUT TYPE..

Used to set the low value for scaling and offset of the input. This may be used to customize the readings to any engineering units - refer to the section on Setting Up. To set the low scale select LO VALUE from the menu. A Window will appear with the current value and the current channel ID (Engineering Units) showing. To change the current value use the UP ARROW and DOWN ARROW (↑↓) keys. Note that the value will increment or decrement accordingly. Negative values can be chosen by decrementing below zero. The decimal point can be moved using the RIGHT ARROW key (→). To accept the new value and exit press the MENU key. Certain input modules preset the Low value.

#### 5.4.2 - HI VALUE..

To set the full scale value select HI VALUE from the menu. A Window will appear with the current value and the current Engineering Units showing. To change the current value use the UP ARROW and DOWN ARROW (↑↓) keys. Note that the value will increment or decrement accordingly. Negative values can be chosen by decrementing below zero. The decimal point can be moved using the RIGHT ARROW key (→). To accept the new value and exit press the MENU key. Some input modules preset the full scale value.

#### 5.4.3 - CHAN ID..

CHAN ID..
UNITS LABEL ..
LINEPSI LE ..
CHAN ID ..
SAMPLING ..
INPUT TYPE..
ALARMS ..

CHANNEL Identification has a sub menu with two choices:

#### UNITS LABEL

UNITS LABEL is used to set a three character alphanumeric label to the channel for real world engineering unit identification. To change the units label, select UNITS LABEL from the CHAN A SETUP - CHAN ID.. menu in ADV. SETUP. A Window will appear with the current identifier showing with one of the characters highlighted.

To change the current value highlight the digit to change using the LEFT ARROW and RIGHT ARROW keys (←→). The highlighted digit is the one in reverse colors (white character on black background). To change the selected digit use the UP ARROW and DOWN ARROW (↑↓) keys. Note that the digit will cycle through a series of alphanumerics, both capital and small letters, numerics and some special characters. If less than three characters are required, select blanks (spaces) for the unused characters. To accept the current label press the MENU button.

A list of available characters in scrolling order, can be found in Appendix A.

#### LINE STYLE

LINE STYLE enables the user to assign a unique pattern to the displayed trace. The choices are SOLID, DOT, DASH and DOT-DASH. Use the UP ARROW and DOWN ARROW (↑↓) keys to select the line style then press the MENU button. The "DONE" message will appear. Use the LEFT ARROW or RIGHT ARROW key (←→) to exit.

#### 5.4.4 - SAMPLING

SAMPLING..
NONE
AVERAGE
PEAK
VALLEY
INPUT TYPE..
ALARMS ..

Sampling is a method whereby the unit takes more readings than it actually stores. The sampling or data acquisition rate is always at the maximum of 100 samples per second, whereas the actual rate at which data is stored in the Memory Card is determined by the Sampling Rate setup. (Refer to Section 4.9).

The number of additional samples taken is 100 per second divided by the actual Sample Rate. Thus at a sample rate of 1 per second there are 100 samples available, while at 1 sample every 10 minutes, there are 60,000 available. There are four ways that the unit can deal with the "excess" samples.

#### NONE

The additional samples are discarded and the unit stores only the reading taken at the standard sample rate. This is equivalent to storing all points at the user defined sample rate.

#### AVERAGE

All samples taken between the user defined sample rate are summed together then divided by the total number of samples. This is true

averaging. The number of samples in the average is a function of the user defined sample rate. This acts as a smoothing filter on noisy signals.

PEAK

The peak value measured during the sampling period is retained and stored at the user defined sampling rate. Each sample is compared with the previous to determine the peak or maximum reading.

VALLEY

As for peak, but the unit looks for valley or minimum readings.

Note - using PEAK or VALLEY sampling may give unexpectedly high or low results on the graphic display. Be aware of how you are recording.

#### 5.4.5 - INPUT TYPE

INPUT TYPE..	
J T/C °C	
J T/C °F	
OFF	
SAMPLING..	
INPUT TYPE..	
ALARMS ..	

Used to show the current default input type for this channel. If not a special input such as "J T/C" (J Type Thermocouple), this will indicate "ANALOG". For temperature inputs the display will show input types in both degrees Fahrenheit and Centigrade. To change from °C to °F or vice versa, use the UP ARROW or DOWN ARROW keys to highlight the input type, then press the MENU key. This will change the scaling and RESTORE THE DEFAULT SETTINGS for this channel. To exit without adjusting the settings press either the LEFT or RIGHT arrow buttons

To turn a channel OFF, select the OFF option and press the MENU key. In a dual channel recorder turning one channel off is equivalent to having a single channel recorder.

To restore the system defaults for the channel, select the desired setting and press the MENU button - CAUTION - You will lose any special scaling or engineering unit labels you may have programmed.

#### 5.5 - CHAN B SETUP [CHANNEL B SETUP]

Select CHAN B SETUP from the ADV SETUP menu. The functions and setup are as per CHAN A SETUP above. In single channel recorders there is no CHAN B setup.

#### 5.6 - ALARMS..

ALARMS..	P
ALARM 1..	RIG..
ALARM 2..	RIG..
ALARM 3..	..
ALARM 4..	JP..
ALARMS..	
RELAY 1 ..	

The ALARMS.. menu option allows the User to configure each of the four internal Alarms. Selecting ALARMS.. brings up a sub-menu showing each of the four alarms.

Note that there is no direct relationship between the Alarm channels and the input channels unless specifically set up by the user. Note also that if the relay output option is installed, there is no direct relationship between the relays and the alarms until specifically set by the user.

Select the ALARM you wish to set up using the UP and DOWN arrow keys then push the MENU key. The setup menu for that alarm will be presented.

#### 5.6.1 - ALARM 1..

ALARM 1..	
ENABLED	
SETPOINT..	
SETUP..	
DEADBAND..	
RST DELAY..	
LATCHING	

There are a number of options in the ALARM 1 menu. The menus for the other Alarms are the same as this one. Some of the options are simply toggled on or off. If the option is currently active a ✓ appears in front of the item. A number of items have additional menus associated with them, indicated by two periods at the end of the entry. Selecting these may enable the option and bring up the next menu, or simply just bring up the next menu. The selections are detailed below.

Note: When an alarm is enabled, a small block containing the alarm number appears on the extreme bottom left of the display (on the status line). If the alarm is triggered this block will be flashing. Disabling the alarm removes the block.

#### 5.6.1.1 ENABLED

Enables the Alarm so that it is active. If active, a ✓ appears in front of the word ENABLED. To disable the Alarm select ENABLE again. Pressing the Menu key toggles the current state of the Alarm. It is advisable to DISABLE the alarm while making adjustments to the settings.

#### 5.6.1.2 SETPOINT..

ALARM 1..	
ENABLED	
SETPOINT..	
SET 43.5	
DEADBAND..	
RST DELAY..	
LATCHING	

Select SETPOINT to adjust the actual value of the alarm setpoint. This is the value at which the alarm will activate. Once selected, a window appears showing the current setpoint in the units of the assigned channel. Change this value using the UP and DOWN arrow keys (↑↓) to increment or decrement the current value. Accept the new value by pressing the MENU button.

Note that when adjusting the setpoint the value will increment or decrement in predetermined steps based on the full scale value of the input and the fact that the analog to digital converter has a finite resolution. It may be necessary to accept a value closest to the actual value required.

#### 5.6.1.3 SETUP..

SETUP..	
CHAN A	
CHAN B	
HIGH	
LOW	
LOCKOUTY..	
LATCHING	

Used to define the Alarm type and assign it to a Channel.

To assign the Alarm to a Channel, select either CHAN A for Channel A or CHAN B for Channel B using the UP and DOWN arrow keys, then pressing the MENU key. The selected Channel is indicated by a ✓ in front of the selection. These two items are mutually exclusive. Selecting one cancels the other.

The Alarm must be defined as either a high alarm, tripping when the input value exceeds the setpoint, or a low alarm, tripping when the input value is below the setpoint. Select either HIGH or LOW using the UP and DOWN arrow keys then press the MENU key. HIGH and LOW selections are mutually exclusive. Selecting one cancels the other.

The Alarm can also be set to LOCKOUT. This only activates the alarm once the setpoint has been reached. For example, if the alarm is set as low and upon turning on the recorder, the input value is below the setpoint, the Alarm will not be enabled until the input goes above the setpoint. Thereafter, any time the input falls below the setpoint the alarm will trigger. Selecting LOCKOUT toggles the current setting. If currently active, indicated by a ✓ in front of the menu item, it will be disabled the next time it is selected.

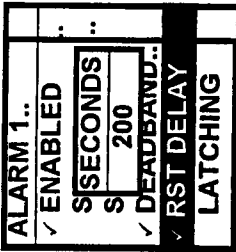
Press either the LEFT or RIGHT arrow keys to exit this menu.

#### 5.6.1.4 DEADBAND..

Selecting DEADBAND enables the user to adjust the DEADBAND or HYSTERESIS of the Alarm. This is only active in the NON LATCHING mode of operation and is useful to prevent output jitter.

Once selected, a window appears showing the current setpoint in the units of the assigned channel. Change this value using the UP and DOWN arrow keys (↑↓) to increment or decrement the current value. Accept the new value by pressing the MENU button. The DEADBAND is set in absolute units of Full Scale relative to the setpoint.

#### 5.6.1.5 RST DELAY (Reset Delay).



Reset Delay is an option that prevents an alarm from resetting for a fixed period of time (delay time) after the reset condition is satisfied. Refer to section 5.3 for a detailed explanation.

The Reset Delay is mutually exclusive with the LATCHING option. Selecting RST DELAY will automatically cancel LATCHING. A ✓ indicates that the option is enabled. If RST DELAY is enabled (pressing the MENU button) a window will pop up showing the current delay in seconds. Use the UP and DOWN arrows (↑↓) to set the required value, then press the MENU key to enter it. Note that a delay of 0 is equivalent to having no delay. The maximum delay is 255 seconds.

#### 5.6.1.6 LATCHING

LATCHING means that once the alarm is triggered it will not reset until the user selects the ALARM RESET option and manually resets it. This will affect any relays assigned to this alarm - the relays will close on an alarm condition and remain that way until the alarm condition is removed AND the ALARM RESET option is selected. If LATCHING is not enabled, the relays will close on an alarm condition but will automatically drop out when the alarm condition is removed, subject to any DEADBAND or RESET DELAY settings.

The LATCHING option is mutually exclusive with RST DELAY and DEADBAND above. Selecting LATCHING automatically cancels both DEADBAND and RST DELAY. Similarly selecting either DEADBAND or RST DELAY will cancel LATCHING. A ✓ indicates that the option is enabled. Use the UP and DOWN arrows and MENU key to select.

The LEFT or RIGHT arrow keys exit this menu option.

Note that it is possible to make adjustments to the Alarm while it is enabled. **THIS COULD RESULT IN ERRATIC BEHAVIOR OF THE OUTPUT RELAYS IF THIS OPTION IS INSTALLED. PROCEED WITH CAUTION.** It is advisable to always disable the alarm before adjusting any parameters, then, once setup, the alarm can be re-enabled.

#### 5.6.2 - ALARM 2..

The ALARM 2.. menu is used to set up the characteristics and setpoint of Alarm 2. Features and functions are the same as ALARM 1 above.

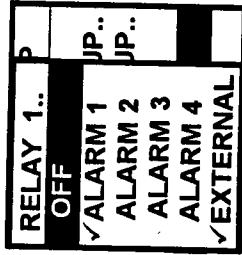
#### 5.6.3 - ALARM 3..

The ALARM 3.. menu is used to set up the characteristics and setpoint of Alarm 3. Features and functions are the same as ALARM 1 above.

#### 5.6.4 - ALARM 4..

The ALARM 4.. menu is used to set up the characteristics and setpoint of Alarm 4. Features and functions are the same as ALARM 1 above.

#### 5.7 - RELAY 1..



The RELAY 1 menu choice is only relevant if the relay option board is fitted. This sub menu associates the actual relay with any one of the four alarms, any combination of them, the EXTERNAL input or none (OFF). Use the UP ARROW and DOWN ARROW keys (↑↓) to highlight the correct selection then choose it with the MENU key. A ✓ will appear to the left of any item activated. Selections are mutually inclusive, that is, each item selected will trigger the relay.

The sub menu functions are as follows -

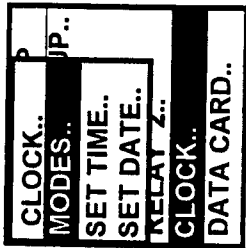
- OFF Relay 1 is inactive. This will automatically deselect all items below.
- ALARM 1 Relay 1 is associated with Alarm 1 and will react to Alarm 1 conditions as set. (Section 5.6.1)
- ALARM 2 Relay 1 is associated with Alarm 2 and will react to Alarm 2 conditions as set. (Section 5.6.2)
- ALARM 3 Relay 1 is associated with Alarm 3 and will react to Alarm 3 conditions as set. (Section 5.6.3)
- ALARM 4 Relay 1 is associated with Alarm 4 and will react to Alarm 4 conditions as set. (Section 5.6.4)
- EXTERNAL Relay 1 is associated with the EXTERNAL input and will react to the external input conditions as set. (Section 5.3)

#### 5.8 - RELAY 2 ..

The RELAY 2 menu choice is only relevant if the relay option board is fitted. This sub menu associates the actual relay with any one of the four alarms, any combination of them, the EXTERNAL input or none (OFF). A ✓ will appear to the left of any item activated. Selections are mutually inclusive, that is, each item selected will trigger the relay.

Refer to section 5.7 above

5.9 - CLOCK

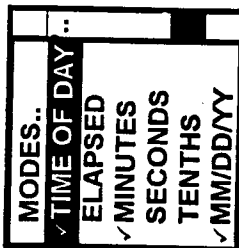


Used to set the Time and Date on the internal clock as well as the time display mode, refresh rates and date format.

Selecting CLOCK brings up the sub menu as shown. To set the time or date select SET TIME.. or SET DATE.. accordingly. To change the time or date modes select MODES..

5.9.1 - MODES..

MODES.. brings up a sub-menu with the following sets of choices. Use the UP ARROW and DOWN ARROW keys (↑↓) to highlight the correct selection then choose it with the MENU key.



TIME OF DAY and ELAPSED.

These relate to the way in which time is displayed on the graphics display. These choices are mutually exclusive, time display is either TIME OF DAY or ELAPSED. Selecting one cancels the other.

TIME OF DAY Time displayed on the display is Real Time of Day - absolute. If this mode is enabled a ✓ appears to the left of the option.

ELAPSED Time is elapsed time. When viewing a file this is the elapsed time from start of recording, or normally elapsed time from Power up or clock reset. If this mode is enabled a ✓ appears to the left of the option.

MINUTES, SECONDS and TENTHS

These refer to the TIME update rate, the rate at which the display clock is refreshed. These choices are mutually exclusive, selecting one disables the other two. If the mode is enabled a ✓ appears to the left of the option.

MINUTES The clock display is updated every minute. The displayed resolution is minutes and the time is in the form of HH:MM. (H is Hours, M is Minutes)

SECONDS The clock display is updated every second. The displayed resolution is seconds and the time is in the form HH:MM:SS (S is Seconds).

TENTHS The clock display is updated every 0.1 second (Tenth of a second). The displayed resolution is 100 milliseconds and the time is in the form HH:MM:SS.T (T is Tenths of a second).

MM/DD/YY and DD/MM/YY

These relate to the displayed Date format, either Month/Day/Year, the USA format, or Day/Month/Year, the European format. These choices are mutually exclusive, selecting one disables the other. If the mode is enabled a ✓ appears to the left of the option.

MM/DD/YY Date format is USA style - Month/Day/Year

DD/MM/YY

Date format is European style - Day/Month/Year. Use the Down arrow (↓) to scroll to this option.

The Left or RIGHT arrow keys exit from this menu.

5.9.2 - SET TIME

The SET TIME menu option allows the user to adjust the battery backed real time clock to the correct local time. Setting the time is different from most other options as it is button interactive, that is the front panel buttons are used to directly set the time rather than selecting MENU choices. Once set the clock will retain the new time and continue timing.

Select SET TIME from the CLOCK menu. This will cause a small window to open on the menu showing "SET TIME ". The current date and time is displayed in the lower right hand corner of the screen in the format as selected under MODES.. above.

Note time is displayed in the 24 Hour mode. For example 1:00pm is 13:00. When the time reaches 23:59 the next increment will alter the day.

After the time using the front panel buttons as follows:

DOWN ARROW Resets the time to ZERO.

UP ARROW Increments the time in minutes. When minutes reach 59 the hours will increment by one. To rapidly change the time, press and hold this key.

RIGHT ARROW Increment the time in hours. When hours reach 24 the days will increment by one.

MENU Set new (or current) time and exit.

LEFT ARROW No function.

If the ELAPSED TIME mode is selected, that is the clock that will be adjusted, not the real time clock. Altering elapsed time does not affect real time.

There is no decrement button for time. If you overshoot you will have to use the RESET key and set the time again.

5.9.3 - SET DATE

The SET DATE menu option allows the user to adjust the battery backed real time clock to the correct date. Setting the date is different from most other options as it is button interactive, that is the front panel buttons are used to directly set the date rather than selecting MENU choices.

Select SET DATE from the CLOCK menu. This will cause a small window to open over the menu and display "SET DATE". The current date and time is displayed in the lower right hand corner of the screen in the format as selected under MODES.. above.

Alter the date using the front panel buttons as follows.

UP ARROW Increment the DAYS one day at a time. The days will roll over and affect the months.

DOWN ARROW Decrement the DAYS one day at a time. The days will roll over and affect the months.

LEFT ARROW

Increment the DAYS 31 days at a time. The months will roll over and affect the year.

RIGHT ARROW

Decrement the DAYS 31 days at a time. The months will roll over and affect the year.

MENU

Set new (or current) date and exit.



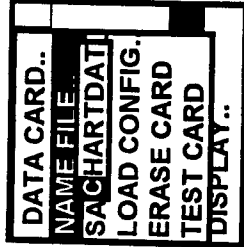
If the ELAPSED TIME mode is selected, then elapsed days will be incremented rather than the real date. The real date will not be affected when altering elapsed days.

### 6.10 - DATA CARD

There are a number of operations that can be performed on the data card currently plugged into the unit. Note that if the unit is in the RECORDING MODE none of the following can be executed. It is necessary to STOP recording in the RECORD MODE menu option. (From the MAIN MENU, select REC MODE then STOP.)

The DATA CARD.. menu has a number of options..

#### 6.10.1 - NAME FILE



By default all files saved into the memory card are named CHARTDAT. The user can however rename the files using the NAME FILE option.

Selecting the NAME FILE option brings up a window which displays the current file name, with the leading character in reverse video. Change the character using the UP ARROW and DOWN arrow keys (↑↓). Select the character to change using the LEFT ARROW and RIGHT ARROW keys (←→). Accept the new file name by pressing the MENU key. All characters may be used to name the file.

Note - once the file name has been changed, all subsequent files will acquire this name, differentiated only by a unique time and date stamp.

#### 6.10.2 - SAVE CONFIG

This option enables the user to save the system configuration onto the data card. This saves ALL current settings, user programmed scale factors, labels and alarms status. This configuration can be loaded back from the card using the LOAD CONFIG option below.

This feature enables the configuration for a recorder to be done remotely and then applied to a number of similar units by loading it into them.

Each memory card can contain only ONE configuration file. Any time a configuration file is saved to a memory card it overwrites any existing configuration file. To save the current system configuration to the data card select SAVE CONFIG and press the MENU key. The successful completion of the write operation will be indicated by the BUSY LED blinking as the card is written.

Note that if a configuration file already exists on the card the user will be prompted - OVERWRITE CONFIG FILE?. Select the UP ARROW button to save, any other button to exit.

### 6.10.3 - LOAD CONFIG

This option enables the user to load the configuration from the data card. The unit will be totally reconfigured according to the parameters of the new configuration file. (refer to SAVE CONFIG above). To load the configuration file from the card, select LOAD CONFIG and press the MENU key.

**CAUTION - LOADING THE CONFIG FILE WILL RESET THE RECORDER.**

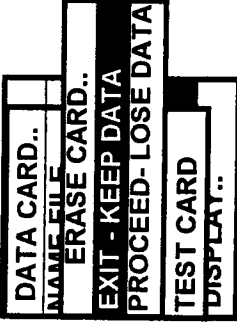
If no config file is found on the card the unit will indicate - NO FILE(S), and no change to the current configuration will be made.

### 6.10.4 - ERASE CARD

This option allows the user to ERASE ALL DATA from the data card currently plugged into the recorder and initialize it. Ensure that there is no data on the card that you need to preserve and that the write protect switch is in the off position.

**NOTE - ALL DATA ON THE CARD WILL BE LOST. PROCEED WITH CAUTION.**

Selecting the ERASE CARD option will bring up a sub-menu with two choices :



#### EXIT - KEEP DATA

This is a safety step and enables the user to exit without erasing the card. Use the RIGHT arrow key to exit.

#### PROCEED - LOSE DATA

Selecting this option WILL ERASE ALL DATA on the card. Once selected there is no turning back. The successful completion of the operation is indicated by "DONE" on the display.

### 6.10.5 - TEST CARD

Selecting the TEST CARD option will bring up a sub-menu with two choices :

#### EXIT - KEEP DATA

This is a safety step and enables the user to exit without testing the card. Use the RIGHT arrow key to exit.

#### PROCEED - LOSE DATA

Selecting this option will test the card and WILL ERASE ALL DATA. Once selected there is no turning back. The successful completion of the operation is indicated by "DONE" if the test passes or "TEST FAIL" if the test fails. The card is ERASED on completion of the test.

## 5.11 DISPLAY..

This option allows the user to customize the display. There are a number of sub-menu choices, each of which has its own menu. Use the UP ARROW and DOWN ARROW keys (↑↓) to highlight the correct selection then choose it with the MENU key.

<b>MATH FUNCT.:</b>
NONE
SUM (A + B) (G..)
DIFF (A - B)
DIFF (B - A) (T..)
<b>DRAW STYLE..:</b>
BEEPER

### 5.11.1 - MATH FUNCT.:

Selecting this option brings up a sub menu that enables the user to select a number of math functions as follows:

NONE No math function selected  
 SUM (A+B) Shows the sum of the two channels.  
 DIFF (A-B) Shows the difference of two channels  
 DIFF (B-A) Shows the difference of two channels.

This sum or difference value is displayed in the top right hand corner of the graphics display in place of the line identifiers. The sum adds the current value of Channel A to the current value of Channel B and displays the result in digital form. The value is preceded by a Σ. The difference subtracts Channel B from Channel A or Channel A from Channel B and displays the result in digital form. The value is preceded by a Δ

To select a math function, highlight the choice and press the MENU button. The unit will display "DONE" to indicate acceptance. To turn off the math function select "NONE".

Note In order for the DELTA display to be meaningful, both channels should have the same engineering units.

### 5.11.2 - WINDOW CONFIG..

WINDOW CONFIGuration enables you to adjust the graphics window layout. You can select which vertical scale to display along the right hand edge of the display or choose to select only a single trace (in dual trace units).

A & B Displays both vertical scales with the B scale to the right.  
 B & A Displays both vertical scales with the A scale to the right.  
 A ONLY Displays only the A channel vertical scale.  
 B ONLY Displays only the B channel vertical scale.

<b>TIME STAMP..:</b>
NONE
✓ TIME ONLY
TIME/DATE
✓ TOP
BOTTOM
MIDDLE

### 5.11.3 - TIME STAMP..

This menu option affects the time date stamping on the display. The user can adjust both the format and the position of the time date stamp. (see following page)

The format is adjusted using three mutually exclusive options. Selecting one of the three will cancel any other. The current option is indicated by a ✓ to the left of the selection.

NONE Removes the time date stamp.  
 TIME ONLY Time only will be displayed, no date.  
 TIME/DATE Both time and date will be displayed.

The position of the time/date stamp is adjusted using three mutually exclusive options. Selecting one of the three will cancel any other. The current option is indicated by a ✓ to the left of the selection.

TOP Places the time date stamp at the top of the graphic display.  
 BOTTOM Places the time date stamp at the bottom of the graphic display.  
 MIDDLE Places the time date stamp in the middle of the graphic display.

The positioning of the time date stamp depends on where there is the most activity on the graphic display. The position should be chosen to avoid this activity. The default position would be at the top of the graphics display.

### 5.11.4 - MENU TIME OUT

<b>MENU TIME OUT.:</b>
30 min
15 min
5 min
1 min
30 sec
<b>BEEPER</b>

The MENU TIME OUT option determines how long the menu will be displayed during periods of inactivity before the display automatically reverts back to the graphics display mode. It also selects the amount of time the backlight stays on before shutting off.

Use the UP and DOWN ARROW keys to select the time out period required and press the MENU key to select. The user will always have to escape from the MENU manually to return to the graphic display.

The MENU TIME OUT time also affects the display back lighting. When the menu times out, the back lighting shuts off. This is to preserve lamp life. Once the back light is off, touching any key on the display will turn it back on for the time out period. Do not use the MENU key unless you wish to display the menu.

The time out period commences from the last activity (button press).

### 5.11.5 - DRAW STYLE

The DRAW STYLE option determines how the lines are plotted on the display. There are two choices. Selecting either toggles the current setting. If the option is enabled it has a ✓ to the left of it.

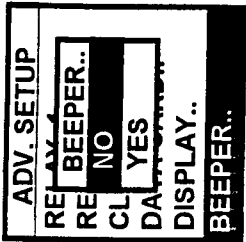
<b>DRAW STYLE..:</b>
✓ JOIN DOTS..
✓ DO END DOTS..
TIME STAMP..
MENU TIME OUT..
<b>DRAW STYLE..:</b>
BEEPER

### JOIN DOTS

This option toggles each time it is selected, effectively joining or unjoining dots. JOIN DOTS causes a line to be drawn between dot values printed on the display. If the dots are not joined the graph is plotted as a series of dots.

### DO END DOTS

This option is only valid in the joined dots graphic mode and determines whether the joining line between adjacent points is drawn to the following point or just before it. It simply affects appearance.



The BEEPER option allows the user to disable the internal beeper. The beeper is used to signal alarm, error or warning conditions.

To disable the beeper, select NO. To enable the beeper select YES. Press the MENU key to accept. The unit will show "DONE" and this sub menu will disappear.

## 6.0 SPECIFICATIONS

### GENERAL

1 or 2

**No. of Channels:**  
**Overall Accuracy:**  
**Time:**

0.5% of span, 8 bits resolution  
Internal battery backed clock tracks year, month, day, hours, minutes, seconds.

**Memory:**

Internal data buffer of 24k RAM, enables memory card to be removed without loss of data. Data storage direct to memory card. PCMCIA 2.0 Compatible. Available in 64K to 1024K bytes (equivalent to 1,000,000 readings @ 8 bits.) Unit automatically detects card size. Multiple files per memory card. User can select files from memory card for replay.

**Memory Card:**

**Non-Volatile Memory:**

All settings are stored in non-volatile memory. Unit remembers setup even if all power is removed.

**Triggered Speed:**

Alarm setpoint can be used to change sampling speed. Two individual sample speeds can be set, one for normal and one for alarm condition. For example, under normal conditions record slowly, on alarm increase recording speed for better definition of problem period.

**Triggered Record:**

Alarm setpoint can be used to start and stop recording. Monitor continually but only record when threshold exceeded.

**Dual Cursor Mode:**

Use to display delta time (time differences) between events.

### RECORDING

**Sample Rate:**

User selectable to 100 samples/sec. (10msec)

**Recording Method:**

User selectable - Averaging, Peak, Valley, All points.

**Recording Time:**

Up to 1,000,000 x recording interval (at 8 bits) Equivalent to 200+ hours at 1 sample/sec. (1 Mbyte Memory Card)

### DISPLAY

**Display Type:**

Twisted Nematic LCD Dot Matrix panel 180x60 pixels, Viewing area: 2.9" x 1.5" Backlighting standard. Graph Direction: right to left, Vertical Zoom Scroll

**Viewing Modes:**

Normal, Zoom, Compressed, SUM and Difference. Viewing Control: Real Time Data, Historic Data, Rewind, Forward, Search, Cursor Identification

**Customization:**

User can customize display by selecting line patterns, grid, time/date stamp, and layout

### INPUT

**Input Types:**

dc volts, dc MA, ac Volts, ac mA, RTD's, thermocouples by plug-in card selection.

**Input Display:**

4 digit (-999 to 9999) plus 3 characters for engineering units (e.g. RPM, PSI)

**Input Scaling:**

y = MX + C, linearization for TC and RTD

## ALARMS

### Alarm Types:

4 alarms standard, high or low, latching or non-latching, tied to internal buzzer or optional relay outputs. May be assigned to either Channel A or B, or both. May be used to trigger recording or sample rate change. Reset delay to 255 seconds.

## OUTPUT

### Relays:

Optional 2 user programmable alarms (high or low, latching or not). SPDT outputs rated at 3A.  
RS-232 option.

### Serial Port:

## MISCELLANEOUS

### Dimensions:

1/4 DIN panel mount 3.78" H x 3.78" W x 5.5" D (96 x 96 x 140 mm), extruded aluminum body

### Panel Cutout:

3.62" x 3.62" (91.6 x 91.6 mm). Mounting tabs supplied

### Operating Temp:

14 to 120°F (-10 to 50°C)

### Weight:

approx. 2.5 lbs (1.4 kg)

### Power Requirements:

115 Vac or 230 Vac 50/60 Hz (solder jumper to change), optional 12 Vdc to 24 Vdc

## ACCESSORIES

### Card Reader:

Allows data cards to be read into IBM PC<sup>®</sup> compatible computer. Supplied at no charge with card reader. Professional graphics package. Enables data to be archived on disk, displayed and analyzed on screen, exported to spreadsheets or word processors. Multiple graphs can be displayed on one screen. Output to printer. IBM PC<sup>®</sup> compatible DOS 3.1 or greater.

### Software:

Supplied at no charge with card reader. Professional graphics package. Enables data to be archived on disk, displayed and analyzed on screen, exported to spreadsheets or word processors. Multiple graphs can be displayed on one screen. Output to printer. IBM PC<sup>®</sup> compatible DOS 3.1 or greater.

## 7.0 ACCESSORIES

Model No.	Description
RD821	Paperless recorder, 1 channel
RD821R	Paperless recorder, with relays, 1 channel
RD822	Paperless recorder, 2 channels
RD822R	Paperless recorder, with relays, 2 channels

## Accessories

Model No.	Description
RD820-RS232	RS-232 module
RD820-SW	Software
RD820-CR	Memory card reader and software
RD820-MC64	Memory card, 64K
RD820-MC128	Memory card, 128K
RD820-MC256	Memory card, 256K
RD820-MC512	Memory card, 512K
RD820-MC1024	Memory card, 1024K

## (Input Modules - one required per channel)

Model No.	Description
RD820-ND0	Non-isolated, 0-100 mV dc
RD820-ND1	Non-isolated, 0-1 Vdc
RD820-ND2	Non-isolated, 0-5 Vdc
RD820-ND3	Non-isolated, 0-10 Vdc
RD820-ND4	Non-isolated, 0-100 Vdc
RD820-ID0	Isolated, 0-100 mV dc
RD820-ID1	Isolated, 0-1 Vdc
RD820-ID2	Isolated, 0-5 Vdc
RD820-ID3	Isolated, 0-10 Vdc
RD820-ID4	Isolated, 0-100 Vdc
RD820-N10	Non-isolated, 0-1 mA dc, 100 ohm Impedance
RD820-N11	Non-isolated, 0-100 mA dc, 1 ohm Impedance
RD820-N12	Non-isolated, 0-1000 mA dc, 0.1 ohm Impedance
RD820-I10	Isolated, 0-1 mA dc, 100 ohm Impedance
RD820-I11	Isolated, 0-100 mA dc, 1 ohm Impedance
RD820-I12	Isolated, 0-1000 mA dc, 0.1 ohm Impedance
RD820-NP0	Non-isolated, 1-5 V dc
RD820-NP1	Non-isolated, 4-20 mA dc, 1 ohm Impedance



Model No. (cont.)	Description (cont.)
RD820-IP0	Isolated, 1-5 V dc
RD820-IP1	Isolated, 4-20 mA dc, 250 ohm Impedance
RD820-IA1	Isolated, 0-1 V ac
RD820-IA5	Isolated, 0-600 V ac
RD820-IA7	Isolated, 0-1000 mA ac, 0.2 ohm, Impedance
RD820-NJ0	Non-Isolated, Type J, 0-480°C, 32-900°F
RD820-NJ1	Non-Isolated, Type J, -200 to 760°C, -300 to 1400°F
RD820-NK0	Non-Isolated, K, 0-720°C, 32-1320°F
RD820-NK1	Non-Isolated, K, -120 to 1080°C, -185 to 1975°F
RD820-NT0	Non-Isolated, T, -80 to 400°C, -110 to 750°F
RD820-NE1	Non-Isolated, E, 0-960°C, 32-1760°F
RD820-NR1	Non-Isolated, RTD, 0-400°C 32-750°F
RD820-IJ0	Isolated, Type J, 0-480°C, 32-900°F
RD820-IJ1	Isolated, Type J, -200 to 760°C, -300 to 1400°F
RD820-IK0	Isolated, Type K, 0-720°C, 32-1320°F
RD820-IK1	Isolated, Type K, -120 to 1080°C, -185 to 1975°F
RD820-IT0	Isolated, T, -80 to 400°C, -110 to 750°F
RD820-IE0	Isolated, Type E, 0-960°C, 32-1760°F
RD820-IR1	Isolated, RTD, 0-400°C, 32-750°F
RD820-NS2	Non-Isolated, hum.temp., 10-90% RH, 0-50°C, with probe

## APPENDIX A - UNITS LABEL CHARACTERS

The following is a list of the characters available (up to three may be used) in the UNITS LABEL setup for either channel A or B. The list is shown in the order in which they appear. The UP and DOWN arrows move through the list.

(space)	!	"	#	\$	%	&	'
(	)	*	+	,	-	.	/
0	1	2	3	4	5	6	7
8	9	:	;	<	=	>	?
@	A	B	C	D	E	F	G
H	I	J	K	L	M	N	O
P	Q	R	S	T	U	V	W
X	Y	Z	[	\	]	^	_
.	a	b	c	d	e	f	g
h	i	j	k	l	m	n	o
p	q	r	s	t	u	v	w
x	y	z	{		}	~	#
↑	↓	→	←	°	μ	Ω	

The left and right arrow keys select the character to edit.

## APPENDIX B - ERROR AND INFORMATION MESSAGES

The following messages appear on the Graphics screen as a result of the following: (suggested solutions appear in italics)

### ACCESS DENIED

An incorrect password was entered while attempting to gain access to a password protected function. Also when trying to get into Advanced Setup while in the recording mode. *Find someone who has the right password or stop recording.*

### CARD ABSENT

Failed attempt to read from (viewing) or write to (recording) a memory card which is not present. *Insert a card.*

### CHECK BATT

Memory card battery requires attention... Battery maybe low or flat. May appear any time a memory card is inserted, not directly related to any other activity. *Replace battery per section 2. Note - data will be lost when battery is removed.*

### CARD CORRUPT

Failed attempt to read or write a memory card due to file data corruption. *Erase card - data will be lost.*

### CARD WRITE PROT.

Failed attempt to write to or size check a memory card that is write protected, i.e. the write protect switch on the memory card is on. *Turn the write protect switch off or exchange the card.*

### CARD FULL

Failed attempt to write to a memory card which is filled to capacity. *Exchange card with a new one that has spare capacity.*

**DONE**

Appears on successful selection of menu item s. Also appears on completion of a card erase accompanied by a beep if the beeper is enabled.

**ENTER CURRENT PASSWORD:** You have attempted to access a password protected function and must enter the password to continue. *Enter current password.*

**ENTRY ERROR** An illegal number of keystrokes was entered while entering the password. *Try it again, only more slowly.*

**NO FILE(S)** Failed attempt to read a data file or configuration file due to the fact that no such file exists on the memory card. *Get the correct card.*

**NO FIND** Search facility fails to find a search item. *Change search parameters and try again.*

**NO MORE FILES** Failed attempt to read additional data files from the memory card due to the fact that no more exist on the card.

**AOR** **AQUISITION OVERRUN.** The internal buffer has filled up and data is still coming. May be seen with high sample rates when not recording. Also if the card is full and the buffer fills up. The unit will clear the buffer and overwrite the old data with new data. The length of time AOR remains on the screen is a function of the record rate.

**OVERWRITE CONFIG. FILE?** A config file already exists on the memory card. Writing to the card will overwrite this existing file. The unit is checking user intent. *Press the UP ARROW key to overwrite the existing file, any other key to exit*

**PASSWORD MISMATCH** This time password did not match last time password when setting up. *Try it again, only more slowly.*

**APPENDIX C - SERIAL INTERFACE OPTION**

The serial port RS232 is an option which is usually factory installed but may be fitted at a later date.

The mating connector is a standard DB-9 Female plug (not supplied).

The serial connection is direct to the host computer or PC RS-232 port (often referred to as COM 1 or COM 2). The cable length is not critical but should not exceed fifty feet (24m).

The connections shown below are for the DB-9 socket on the rear of the recorder with typical connections shown for an IBM™ PC or equivalent (Both 25 pin and 9 pin variations)

Recorder DB-9	Description	Host PC DB-9	Host PC DB-25
2	Transmit Data	2	3
3	Receive Data	3	2
5	Common	5	7
7	Clear to Send	7	4
8	Request to Send	8	5

The settings for serial communications is

Asynchronous, 9600 baud, 8 bits, 1 stop bit, no parity.

Flow control is the responsibility of the host PC. The recorder will not supply any data unless it is polled. The host must set the RTS line true (high) in order for the recorder to transmit data. The recorder may be used with optional software or serial communications may be incorporated into the users program. Refer to Technical Doc DC9303.

**APPENDIX D - MASTER RESET**

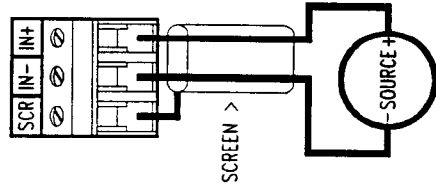
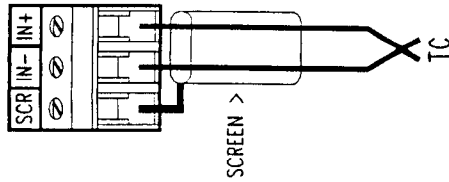
The master reset is used to restore all factory defaults to the unit. It is used in the unlikely event of the unit losing or corrupting the contents of its nonvolatile memory. All user configurations will be lost.

To reset the unit to the factory defaults, hold the two outer keypad buttons down simultaneously (The DOWN and LEFT arrows) while powering up the unit. Wait two to three seconds and then release.

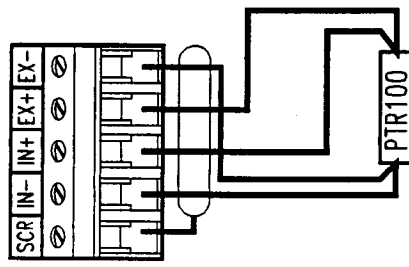
# APPENDIX E - INPUT MODULE CONNECTIONS

## THERMOCOUPLE MODULES

## AC and DC VOLTAGE or CURRENT

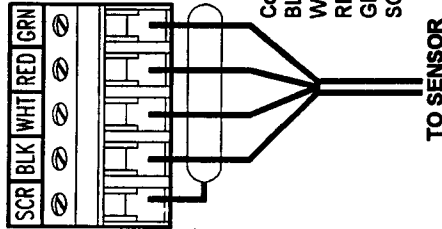


## RTD MODULES



Link IN+ and EX+ together at the terminal and use only IN-, not EX-, for two wire systems

## TEMPERATURE / HUMIDITY MODULE



Connect by Color:  
 BLK - Black  
 WHT - White  
 RED - Red  
 GRN - Green  
 SCR - Screen

TO SENSOR



## WARRANTY

OMEGA warrants this unit to be free of defects in materials and workmanship and to give satisfactory service for a period of **13 months** from date of purchase. OMEGA Warranty adds an additional one (1) month grace period to the normal **one (1) year product warranty** to cover handling and shipping malfunction. This ensures that our customers receive maximum coverage on each product. If the unit should issue an Authorized Return (AR) number immediately upon phone or written request. Upon examination by OMEGA, if the unit is found to be defective it will be repaired or replaced at no charge. However, this **WARRANTY is VOID** if the unit shows evidence of having been tampered with or shows evidence of being damaged as a result of excessive corrosion; or current, heat, moisture or vibration; improper specification; misapplication; misuse or other operating conditions outside of OMEGA's control. Components which wear or which are damaged by misuse are not warranted. These include contact points, fuses, and triacs.

**We are glad to offer suggestions on the use of our various products. Nevertheless OMEGA only warrants that the parts manufactured by it will be as specified and free of defects.**

**OMEGA MAKES NO OTHER WARRANTIES OR REPRESENTATIONS OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE AND ALL IMPLIED WARRANTIES INCLUDING ANY WARRANTY OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE ARE HEREBY DISCLAIMED.**

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Every precaution for accuracy has been taken in the preparation of this manual; however, OMEGA ENGINEERING, INC. neither assumes responsibility for any omissions or errors that may appear nor assumes liability for any damages that result from the use of the products in accordance with the information contained in the manual.

## RETURN REQUESTS / INQUIRIES

Direct all warranty and repair requests/inquiries to the OMEGA ENGINEERING Customer Service Department. Call toll free in the USA and Canada: 1-800-622-2378, FAX: 203-359-7811; International: 203-359-1660, FAX: 203-359-7807.

BEFORE RETURNING ANY PRODUCT(S) TO OMEGA, YOU MUST OBTAIN AN AUTHORIZED RETURN (AR) NUMBER FROM OUR CUSTOMER SERVICE DEPARTMENT (IN ORDER TO AVOID PROCESSING DELAYS). The assigned AR number should then be marked on the outside of the return package and on any correspondence.

FOR WARRANTY RETURNS, please have the following information available BEFORE contacting OMEGA:

1. P.O. number under which the product was PURCHASED.
2. Model and serial number of the product under warranty, and
3. Repair instructions and/or specific problems you are having with the product.

FOR NON-WARRANTY REPAIRS OR CALIBRATION, consult OMEGA for current repair/calibration charges. Have the following information available BEFORE contacting OMEGA:

1. Your P.O. number to cover the COST of the of the repair/calibration.
2. Model and serial number of product, and
3. Repair instructions and/or specific problems you are having with the product.

OMEGA's policy is to make running changes, not model changes, whenever an improvement is possible. That way our customers get the latest in technology and engineering.

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