

INSTRUCTION MANUAL
R.C. SYSTEMS CO. INC.
MODEL ST-80 SIX STREAM SEQUENCER
(REVISION 2.0)

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SECTION 1

1.0 GENERAL DESCRIPTION

The R. C. Systems Co. Inc. ST-80 Six Stream Sequencer allows time-sharing of a process analyzer between up to six sample streams. Three alarms per stream and a dedicated horn relay also make the ST-80 well suited for many critical monitoring applications. Monitored data may be input to the ST-80 by optional analog inputs or the standard Modbus® RTU *master* port. A Modbus RTU *slave* port is also standard for sending data to PC's, PLC's, and DCS's. Options such as analog I/O and discrete relays for each alarm are easily added to the addressable I²C bus.

5-amp resistive Form C relay outputs drive valves for multiplexing sample streams to the analyzer at an adjustable time rate. A high intensity 12-digit alphanumeric LED display indicates the selected stream and its value in engineering units. A 2-line by 16 character LCD display provides operator interface to *Set-Up* menus allowing configuration for a wide range of sequencing applications. All configuration data is retained in non-volatile memory during power interruptions. The LCD also indicates each stream's 16 character *Measurement Name* field when not being utilized for operator interface. This field displays user terminology descriptions for each stream. The ST-80 front panel is shown below in Figure 1.1.

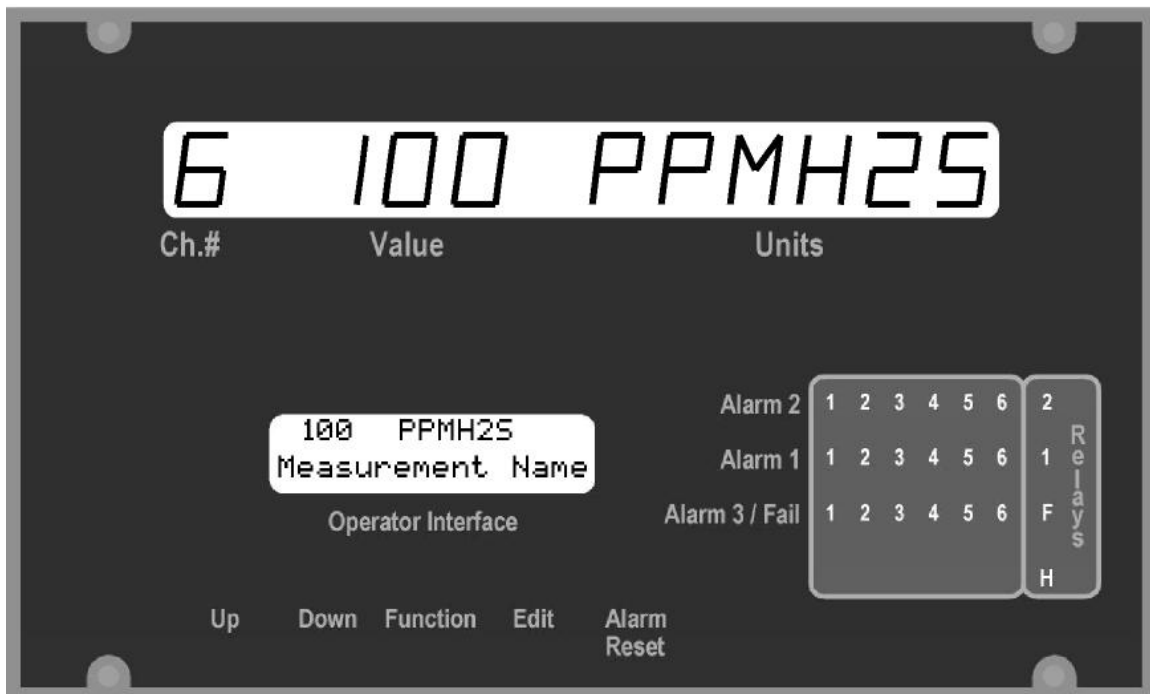


Figure1.1

1.1 SPECIFICATIONS:

1.1.1 POWER SUPPLY REQUIREMENTS

Standard ST-80 power requirements are 10-30VDC @ 3 watts, or 18VAC with installation of JP2, applied to terminals 9 & 11 of TB2 on the standard I/O PCB (see section 3.0). **WARNING! HIGH VOLTAGES SUCH AS 115VAC OR 220 VAC APPLIED TO THESE TERMINALS WILL CAUSE SEVERE DAMAGE!**

Optional features increase power consumption as described below:

- ? Discrete Relay PCB option; add 2 watts per PCB.
- ? Analog Input PCB option; add 1/2 watt.
- ? 4-20mA Output PCB option; add 1 watt.
- ? TB2 terminals 10 & 12 of the standard I/O PCB provide a maximum of 500mA fused output power for powering of auxiliary external devices such as relays, lamps or transmitters. Power consumed from these terminals should be considered when calculating system power consumption.

1.1.2 AMBIENT TEMPERATURE RANGE

-40 to 60 degrees C

1.1.3 HOUSINGS

- ? General purpose panel mount including hardware of 19" rack mounting.
 - ? *NEMA 4X wall mount in fiberglass enclosure.
 - ? *NEMA 7 wall mount suitable for DIV 1&2 Groups B,C,D
- *Includes non-intrusive magnetic keypad.

SECTION 2

2.0 BASIC OPERATION

ST-80 modes of operation are configured via the Operator Interface LCD display. After initial power up, *Normal* mode operation is in effect as the ST-80 sequences through active streams and the displays indicate values for the selected stream (see Figure 2a). *Normal* mode operation may be paused by initiating the *Manual* mode, allowing longer duration viewing of any stream (see Figure 2b). The *Manual* mode is entered by pressing the **UP/DOWN** keys simultaneously, then using the **UP or DOWN** keys to step to the desired stream. Each time a new stream is selected the PURGE timer resets and starts over (see section 2.3.3). A *Manual* mode timeout feature forces the ST-80 back into the *Normal* mode after a preset interval (see Section 2.3.4). A *Set-Up* mode is entered by pressing **FUNCTION**, scrolling to the desired menu tree using the **UP/DOWN** keys, and pressing **EDIT** (see Figure 2c). Exit the *Set-Up* mode by pressing **FUNCTION** again. Stream selection and system critical alarm event switching of relays and front panel alarm LED indicators are not affected by entering the *Set-Up* mode. An *AUTHORIZATION MENU* feature may be utilized to prevent malicious and accidental tampering with ST-80 parameters.



Figure 2a (*Normal*)



Figure 2b (*Manual*)

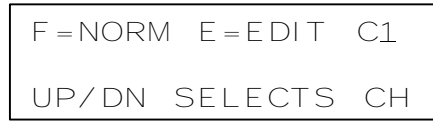


Figure 2b (*Set-Up*)

2.1 SYSTEM CONFIGURATION

Each ST-80 Sequencer requires configuration of *system* and *stream* variables upon initial installation. After power up, the controller will be in *Normal* mode. Configuration of system and stream variables requires entering the *Set-Up* mode by pressing **FUNCTION**, selecting the desired menu, then **EDIT**. A menu tree is provided for each of the 6 *streams* and another for *system* variables. From *Normal* mode press **FUNCTION**, select the tree to be entered by pressing the **UP** or **DOWN** buttons to scroll through C1, C2, C3, C4, C5, C6 SY and press **EDIT** to enter the desired tree.

2.1.1 CHANGING VARIABLES USING THE KEYPAD

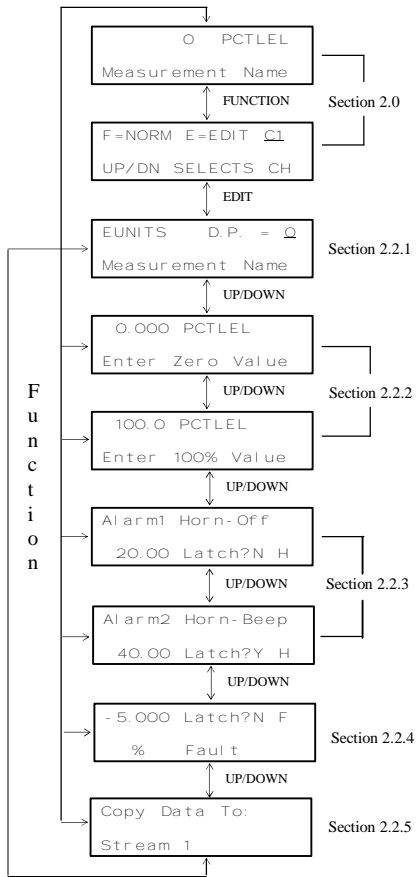
Each ST-80 menu contains one or more entries to be configured. Some are simple *YES/NO* or *ON/OFF* entries that are toggled by pressing the **EDIT** key. Others, such as the *Measurement Name* and *Engineering Units* fields, may have many different ASCII character possibilities. **EDIT** is used to modify variables within any menu. If the item has only limited entries, it toggles each time **EDIT** is pressed. If there are many possible entries, **EDIT** begins a flashing cursor over the item and **UP/DOWN** scrolls through each available entry. **FUNCTION** moves the flashing cursor to the next position within a field. **EDIT** discontinues the flashing cursor and loads that entry into non-volatile memory.

2.2 STREAM CONFIGURATION MENUS

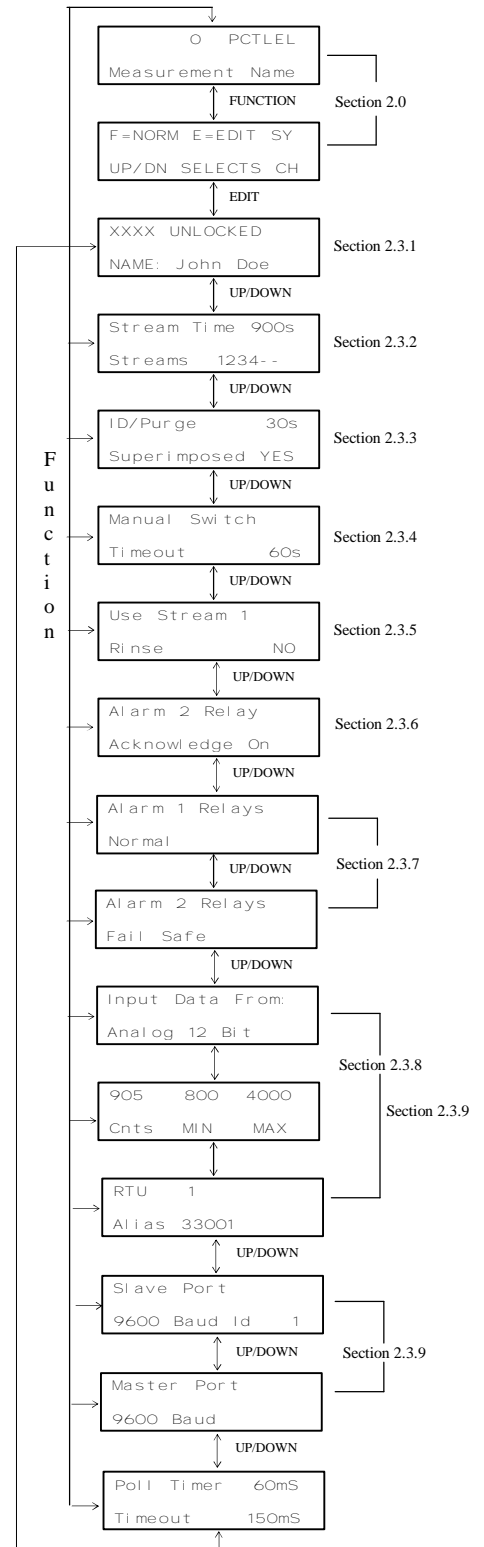
Figure 2.2 shows the menu tree for configuring all *stream* variables on the left side of the page. These only affect the specific stream that has been selected. The *system* menu tree is shown on the right side of the page and is described in section 2.3.

LCD OPERATOR INTERFACE MENU TREES

STREAM MENU TREE (See Section 2.2)



SYSTEM MENU TREE (See Section 2.3)



These menus used only if *Modbus* is selected in the *Input Data From:* menu.

Note: Arrows = Key Strokes

Figure 2.2

2.2.1 DECIMAL POINT RESOLUTION / ASCII FIELDS

The Figure 2.3 menu sets the 6 character *engineering unit* and 16 character *Measurement Name* ASCII fields. Only uppercase letters and numbers 0-9 may be displayed in the engineering unit field since it is difficult to display lowercase letters on the large alphanumeric LED readout. The *Measurement Name* field is displayed only on the LCD and supports upper and lowercase letters along with many other symbols.

Resolution of stream values is also configured in this menu by setting the number digits trailing the decimal point. Values are limited to a maximum of four digits and a polarity sign. ST-80 auto-ranging displays the highest resolution allowed by this decimal point entry. For example, if three decimal points are entered and the range is 0 to 100ppm, the reading will be **0.000** at 0ppm and **100.0** at 100ppm. However, this may be undesirable due to the high resolution at zero unless the analyzer's output is extremely stable. If decimal points are limited to one the 0ppm reading becomes **0.0** and the 100ppm reading remains **100.0**. Resolution may be limited further by setting decimal points to 0. In the above example, this causes 0ppm to display **0** and 100ppm to display **100**.



Figure 2.3

2.2.2 MEASUREMENT RANGE

The menus shown in Figure 2.4a & 2.4b allow configuration of the measurement range displayed on this stream. These menus normally match the range of the input signal's engineering units. For example, if a stream's input is 4-20mA from an analyzer monitoring 0 to 10ppm chlorine, then the zero value should equal 0.000 and the 100% value equal 10.00. The six ASCII engineering units previously entered are automatically displayed to the right of the value as a reminder. The entire 4 digits must appear in this entry so trailing 0's may appear here that are not displayed on the LED readout.



Figure 2.4a



Figure 2.4b

2.2.3 ALARM 1 / ALARM 2 / HORN RELAY SET-UP

The menu shown in Figure 2.5 allows configuration of ALARMS 1 & 2 and how each affect the horn relay. There are two each of the menus in Figure 2.5 affecting ALARM 1 identical to ALARM 2.

The **AlarmX Horn-XXXX** menu shown in Figure 2.5 may be set for **Beep**, **Off**, or **On**. **Beep** causes the horn relay to pulse ON/OFF each second when the alarm is active. **On** causes the horn relay to be continuous when the alarm is active. **Off** causes the alarm to have no effect upon the horn relay. Discrete LED indicators on the front panel indicate the status of each alarm and relay. Any *new* alarm event causes the associated LED to flash until **Alarm Reset** occurs causing an *acknowledged* steady on condition. Operators should recognize *new* alarms by a flashing LED. **Alarm Reset** also turns off the horn relay until another new alarm occurs. The bottom line of this menu determines the alarm's trip-point value, latching or non-latching, and high or low trip. The trip-point is entered in engineering units. After the **Latch?** icon, entering **Y** causes that alarm to require a manual **Alarm Reset** to clear. **Y** latches this alarm group's common relay, this stream's LED, and the optional discrete relay if so equipped. The far right character on the bottom line may be set to **H** for high trip alarms or **L** for low trip alarms determining if the alarm becomes active upon exceeding or falling below the trip-point.

```
Alarm1 Horn- Beep
20.00 Latch?N H
```

Figure 2.5

2.2.4 ALARM 3 / FAIL ALARM

The discrete stream alarms identified as Alarm 3/Fail may be configured either as a 3rd level alarm, or, as a Fail alarm providing notification that the input is out of range in the negative direction. This is controlled by the menu shown in Figure 2.6. It is important to understand that even though the discrete stream alarms may be set as Alarm 3 level alarms, the common relay for this group is always a Fail alarm. The out of range threshold for the stream is the most recent Fail trip point entered prior to changing the menu to alarm 3. The following example describes how to configure both the Fail and Alarm 3 trip points for a stream. If it is desired for the common Fail relay to trip as the input falls below negative 10% of full scale, and the discrete alarms trip as the input exceeds a level, the -10% Fail value must be entered first. Toggle the **A/F** character on the right side of the top line to **F** and enter -10.00% into the *value* entry. Next, toggle the **A/F** character back to **A** and enter the desired Alarm 3 trip level. The Fail value is retained in memory although it no longer appears on the menu.

```
- 10.00 Latch?N F
%      Fault
```

Figure 2.6

2.2.5 COPY DATA TO?

This menu simplifies the Set-Up procedure by allowing similar streams to be copied from one to another. For example, if all streams are identical except for the *Measurement Name* entry, stream 1 could be configured first and copied to streams 2 – 6. Only *Measurement Name* would then need to be configured on streams 2 – 6. Use **EDIT** to activate the cursor, then **UP/DN** to select the stream to copy to. Press **EDIT** once more to copy.

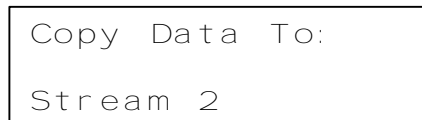


Figure 2.7

2.3 SYSTEM CONFIGURATION MENUS

Some items requiring configuration are not specific to each stream but affect the entire ST-80 system. These are located in the **SYSTEM** menu tree shown in Figure 2.2 on the right side of the page. System menus are accessed by pressing **FUNCTION**, then **DOWN** until the **SY** icon appears in the upper right of the LCD readout, then **EDIT**.

2.3.1 AUTHORIZATION MODE

The system menu in Figure 2.8 allows locking variables that might prevent critical alarm events if altered. *Viewing* menus is not denied but attempts to *edit* variables displays a brief *System Locked* message on the LCD.

Authorized individuals locking the system should first enter a name, phone # or some sort of contact information into the 10 digit field on the bottom line. To lock or unlock the system the correct 4 digit authorization number must be entered into the XXXX field. **UP** or **DOWN** then toggles the UNLOCKED message to LOCKED. It is important to record the 4 digit code since the factory must be consulted if lost.



Figure 2.8

2.3.2 ACTIVATING STREAMS / STREAM TIMER

The system menu in Figure 2.9 allows configuration of the amount of time per stream in seconds and provides the ability to deactivate streams. The stream timer entry on the top line of this menu sets how many seconds an active stream remains on. This may be from 1 – 999 seconds. The *Streams* entry on the bottom line determines what streams are active. A dash appears for inactive streams as exhibited in streams 5 & 6 below. Inactive streams are not sequenced or displayed and do not contribute to alarm events.

Scan Timer	10s
Streams	1234- -

Figure 2.9

2.3.3 STREAM ID / PURGE TIMER

The menu in Figure 2.10 allows setting of the Stream ID or Purge time period that occurs at the beginning of each new stream. The purge timer allows up to 999 seconds for the previous stream values to be purged from the analyzer before analog outputs or alarms are updated. If the ST-80 is equipped with an 8-channel analog output option (see Section 3.4), analog output # seven may either track the analyzer output, or it may have a constant mA value superimposed during the stream ID / Purge time period. The superimposed value is equal to 10% of full scale for stream 1, 20% for stream 2, 30% for stream 3 and so on. If the *Superimposed* option entry is NO then output seven tracks the analyzer output at all times.

ID/Purge	30s
Superimposed	YES

Figure 2.10

2.3.4 "MANUAL" SWITCH TIMEOUT

The *Manual* mode of operation described in Section 2.0 expires and returns to Normal mode after the time period entered in the menu shown in Figure 2.11. This prevents accidental halting of sequencing when the ST-80 is inadvertently left in the *Manual* mode. The maximum timeout is 9999 seconds.

Manual Switch	
Timeout	600s

Figure 2.11

2.3.5 STREAM 1 RINSE OPTION

The menu in Figure 2.12 allows activation of a special switching sequence where stream 1 is alternated with each of the other active streams. For example, if all six streams are active the sequence would be 1-2-1-3-1-4-1-5-1-6-1.

Use Stream 1	
Rinse	NO

Figure 2.12

2.3.6 ALARM 2 RELAY ACKNOWLEDGE

This Figure 2.13 menu allows the ALARM 2 common alarm relay to be acknowledged. This means that while an alarm 2 event exists, the relay may be deactivated by an **ALARM RESET**. This is useful for silencing audible devices while personnel work to correct the alarm condition.



Figure 2.13

2.3.7 FAIL SAFE / NORMAL ALARMS

These two menus allow ALARM 1 and ALARM 2 common **and** optional discrete relays to be configured for *fail safe* or *normal* operation. Fail safe means alarm conditions force the relay contacts to their power off, or shelf state. Therefore, if the ST-80 loses power the contacts will indicate the alarm condition rather than a safe condition. The common FAIL relay is always fail safe and is typically used to signal trouble conditions such as power or signal loss.



Figure 2.14a



Figure 2.14b

2.3.8 INPUT DATA FROM?

Each stream may be independently configured to accept input data from the Modbus RS-485 master port, or, from channel 1 of a 6-channel analog input card attached to the I²C bus (see Section 3.1). **EDIT** toggles the Figure 2.9a menu between several *Modbus* options and *Analog 12 Bit*. Within the Modbus option are additional choices to accommodate the binary resolution of the input data (8 bit, 10 bit, 12 bit etc.). With *Modbus* selected the menu shown in Figure 2.9b requests the RTU # and the Alias register # location of the data to be retrieved from the RTU. Alias register numbers define the location of the floating point variable representing the input value.

Analog 12 Bit should be selected when the stream's input comes from an analyzer or monitoring device with a calibrated output such as 4-20mA

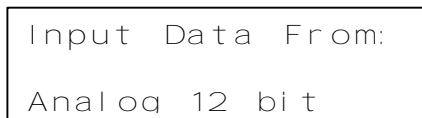


Figure 2.15a

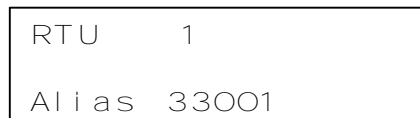


Figure 2.15b

2.3.9 RANGE OF A-D COUNTS

The menu in Figure 2.16 defines what range of A-D (analog to digital) counts will provide *Measurement Range* read out values entered previously in section 2.2.2. This menu entry is determined by the A/D converter resolution of the channel's input. For example, if the input is a 12 bit Modbus® device with zero at 800 counts and 100% at 4000 counts, then this menu's MIN should be set at 800 and MAX at 4000. If communicating with the ST-80's optional 12 bit Analog Input PCB configured for a 4-20mA input on its #1 input, the MIN should be 800 and the MAX 4000.

For questions what to enter in this menu, the variable on the left side of the top line displays actual raw A/D counts currently being read by the ST-80. This may be utilized to test the input signal for what counts are provided for zero and 100% if these values are unknown. Forcing the analyzer to read zero should provide the A/D counts value needed to make the ST-80 display also read zero. Likewise, forcing the analyzer to read 100% should provide the A/D counts value needed to make the ST-80 display also read 100%.

905	800	4000
Input	Min	Max

Figure 2.16

2.3.10 MASTER / SLAVE SERIAL PORT MENUS

The final two menus in the *system tree*, shown in Figures 2.17a & 2.17b, allow setting baud rates for the *master / slave* Modbus serial ports. The RTU address of the slave port is also entered here. This slave port may be used to transfer ST-80 data to a host device such as a PC, PLC or DCS. The slave port is addressable, allowing many ST-80 controllers to be connected to a single RS-485 cable. Section 5 of this manual provides important information describing how to interface to the ST-80's Modbus slave port

Slave Port
9600 Baud Id 1

Figure 2.17a

Master Port
9600 Baud

Figure 2.17b

SECTION 3

3.0 MAIN I/O INTERFACE PCB

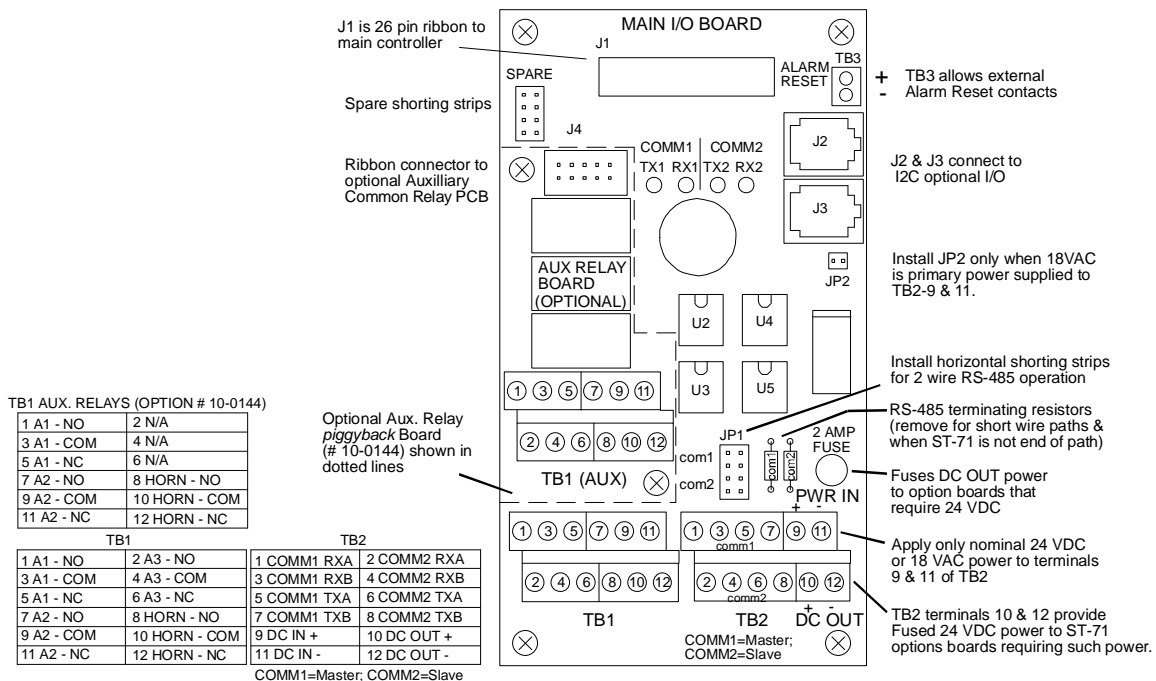
The most basic ST-80 Controller requires only the I/O PCB shown in Figure 3.1 for interfacing to field wiring. The ST-80 primary power supply is applied to terminals 9 & 11 of TB2. This may be from 10 – 30 VDC, or 18VAC by installing JP2. **WARNING! HIGH VOLTAGES SUCH AS 115VAC OR 220VAC APPLIED TO THESE TERMINALS WILL CAUSE SEVERE DAMAGE!** DC output terminals 10 & 12 on

TB2 provide up to 500mA of output power for powering remote devices such as lamps, transmitters etc.

This PCB includes both master and slave RS-485 Modbus ports, 5 amp form C relays for each common alarm event (A1, A2, FAIL/A3 & HORN), and power supply I/O terminals. JP1 allows the RS-485 ports to be configured for 2 or 4 wire operation. A 26 pin ribbon cable connects the I/O PCB to the main ST-80 CPU and Display nest assembly. Two I²C bus connectors allow addition of optional functions such as analog I/O and discrete alarm relays for each stream.

Horizontal jumpers installed in JP1 connect the RS-485 port's RX & TX lines, simplifying 2 wire daisy chains by providing additional terminals for incoming and outgoing cables. For example, installing the 2 COM 1 jumpers connects terminals 1 & 5 and 3 & 7 of TB2.

Optional Auxiliary Relays may be added to the I/O PCB via ribbon connector J4. These add another form C contact set to the common A1, A2 and HORN alarms. Auxiliary Relay contacts are available at the TB1 (AUX) terminals shown in Figure 3.1.



Main I/O PCB WITH COMMON RELAYS #10-0142

Figure 3.1

3.1 ANALOG INPUT PCB

The ST-80 typically receives analyzer values as a 4-20mA signal, thereby requiring the 10-0171 Analog Input PCB to convert 4-20mA to a 12 bit binary value. Even-though six channels are available on the 10-0171 Analog Input PCB, only channel one provides analyzer readings to the ST-80. The analyzer's 4-20mA output must be connected to the LO and HI terminals of channel one. The other 5 inputs have no affect upon ST-80

readouts or alarms but are available from the Modbus database as 12-bit A/D values. This is useful if additional analog values require monitoring by a Modbus master device. The EXC terminals and TB2 are not used in ST-80 applications.

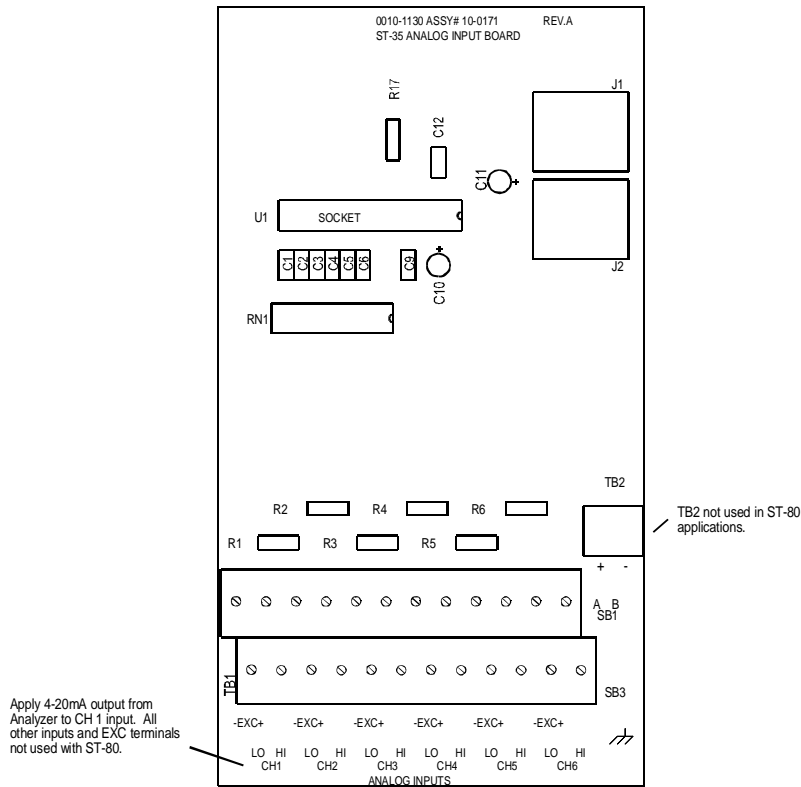


Figure 3.2

3.2 SAMPLE STREAM RELAYS FOR VALVE MANIFOLD

The ST-80 normally interfaces to a sample valve manifold that switches each of the six sample streams being applied to the analyzer. Solenoid or motorized ball valves are typically used to switch streams. The 10-0146/R relay board shown in Figure 3.3 provides 5 amp (resistive) form C dry contacts for switching these valves. JP1, JP2 and JP3 jumpers must be set for B, A, B positions in order for the relays to function properly. Only the relay associated with the ST-80's current channel is ever energized at one time.

Care must be taken to prevent injection of large amounts of RFI into the ST-80 and its wiring. Appropriate arc suppression devices such as MOV's and snubbers should be located across inductive loads. Wiring between these inductive loads and the relay contacts should be separated away from the system's analog wiring.

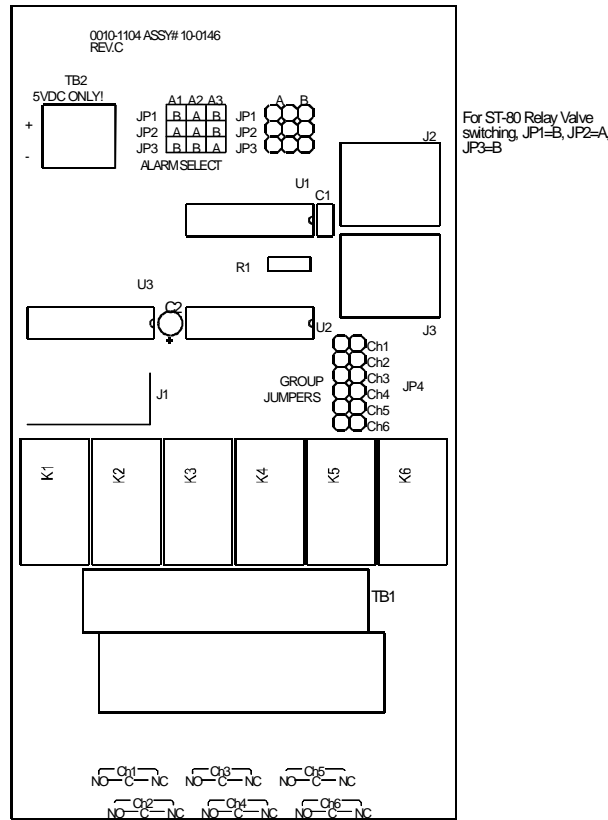


Figure 3.3

3.3 OPTIONAL DISCRETE ALARM RELAY PCB

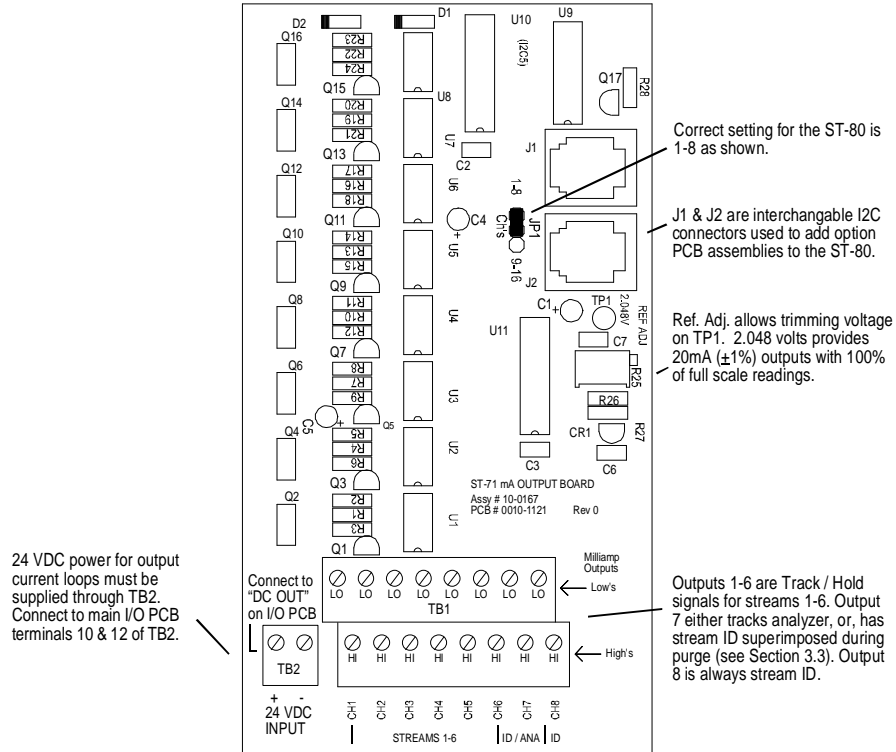
An optional 10-0146 *Discrete Relay PCB* adds six 5 amp form C relays per six stream alarm group. This option is almost identical to the 10-0146R PCB shown in Figure 3.3 above and depends upon correct jumper configuration to function as discrete alarm relays for ALARM 1, ALARM 2 or ALARM 3/FAIL. Alarm groups, or zones, may be created by connecting adjacent streams together using JP4 as shown. This creates an *OR* function with selected streams causing *any* alarm included in the zone to actuate *all* relays. If discrete relays are needed for each of the 18 alarm events, then 3 PCB's are required.

3.4 OPTIONAL 4-20mA ANALOG OUTPUT BOARD

An optional 10 bit 4-20mA analog output board, shown in Figure 3.4, may be connected to the I²C bus. Each stream's output will transmit 4mA for 0% readings and 20mA for 100% readings. Loop drive capability depends upon the level of the ST-80's primary DC power supply. With at least 20 volts DC primary power they are capable of driving 20mA through a 750 ohm load. Outputs are self powered and DC power should not be provided by the receiving device.

The board offers eight 4-20mA outputs with the first six representing each of the ST-80's six streams. These six outputs *track* while on the stream and not in a purge period. They

hold last value at all other times. Output seven's format depends upon the setting in the *Superimposed* menu described in section 2.3.3. With the menu set for **NO** this output always tracks the analyzer signal. With it set for **YES** it tracks the analyzer after the PURGE cycle but during purge it transmits a value based upon which stream the ST-80 is currently on. For example, stream 1's superimposed value is 10%(5.6mA), stream 2 = 20%(7.2mA), stream 3 = 30%(8.8mA) and so on. This superimposed stream ID signal allows monitoring of all six stream from a single 4-20mA signal. The eighth 4-20mA output always transmits the % of full scale signal proportional to the current stream irregardless of the purge period.

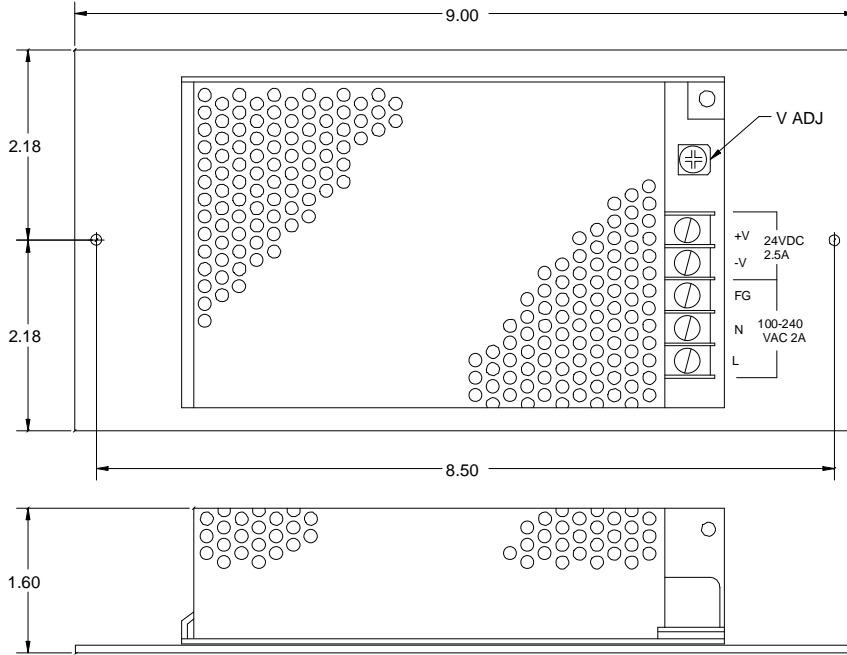


8 Channel 4-20mA Output Option #10-0167

Figure 3.4

3.5 OPTIONAL 24VDC 60 WATT POWER SUPPLY

The ST-80 Controller may be powered from 10-30VDC or 18VAC from a step down isolation transformer. However, many applications require 24VDC power to drive the monitors or transmitters providing inputs to the ST-80. A 60 watt AC / DC power supply may be included behind the ST-80 front panel for these applications. This supply has a universal 85VAC to 240VAC input range and requires no modification between 115VAC and 220VAC installations. When ordered from the factory, it is pre-wired to provide 24VDC primary power for the ST-80 controller as well as any transmitters or monitors that may be connected by the end user.



60 Watt 24 VDC Power Supply Option # 10-0153

SECTION 4

4.0 SYSTEM DIAGNOSTICS

The ST-80 restores configuration data from non-volatile memory each time power is applied. During this several second long procedure the LCD operator interface flashes messages stating firmware revision and what I²C options are connected. These messages are useful indications of the status of options such as discrete relays, analog outputs and others.

A *System Diagnostic Mode* may also be entered while power is applied. This mode offers menus, shown in Figure 4.1, for testing LED's, relays and analog I/O. To enter this mode press and hold the **EDIT** key while simultaneously pressing the **UP/DOWN** keys. A brief error code message appears. Immediately press and hold the **FUNCTION** key until a **DIAGNOSTIC MODE** message appears on the top line of the LCD readout. **UP/DOWN** keys are used to move through the various testing procedures. Pressing **ALARM/RESET** at any time will return the ST-80 to the normal monitoring mode. With no keys pressed for 5 minutes, the diagnostic mode times out and automatically returns to the normal mode.

LCD SYSTEM DIAGNOSTIC MODE MENU TREES

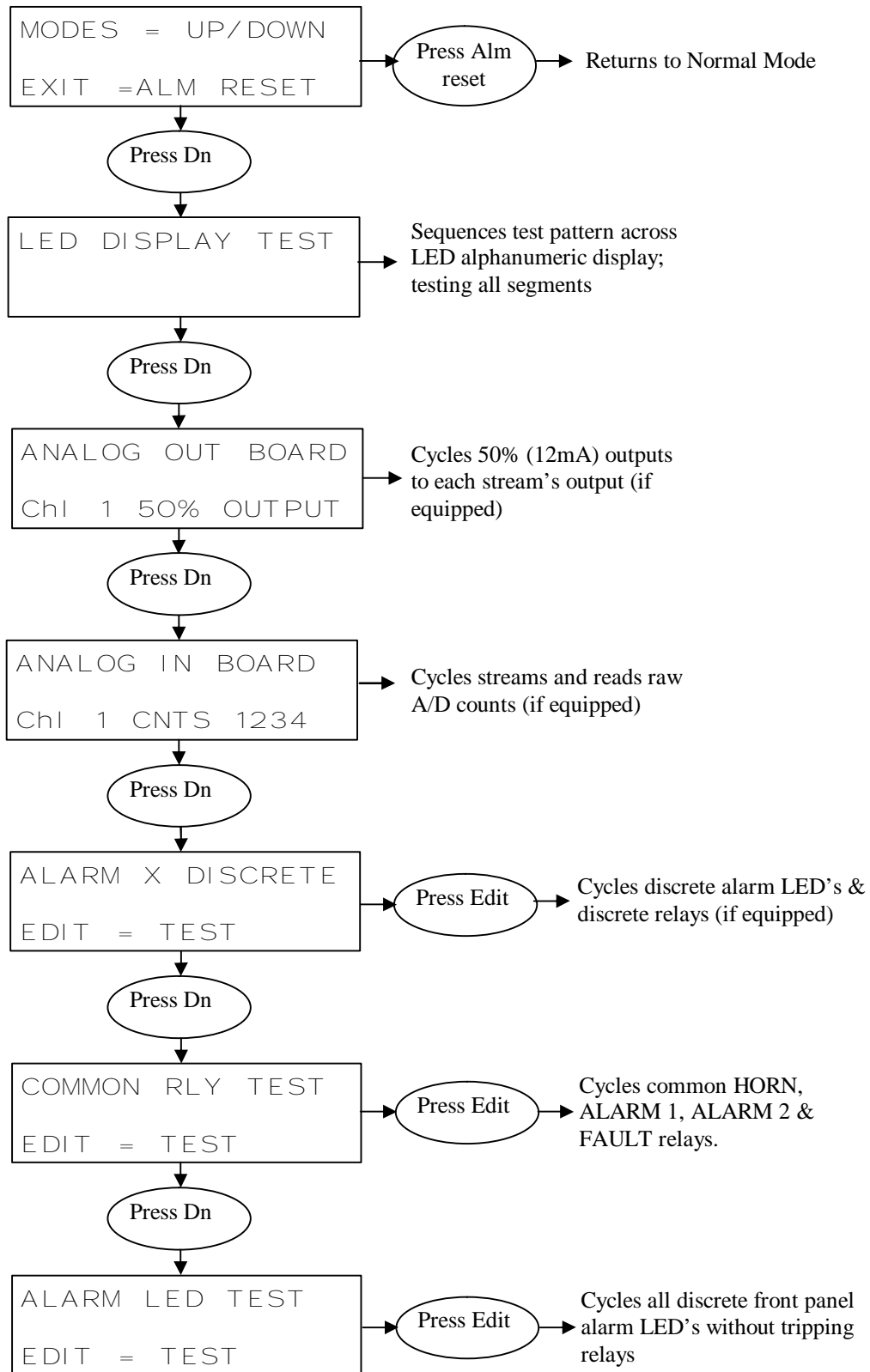


Figure 4.1

SECTION 5

5.0 MODBUS RS-485 PORTS

The ST-80 is equipped with a *slave* modbus RTU port. Port configurations are described in sections 2.2 and 2.3 of this manual. The following section defines register locations of data available when interrogating the ST-80 slave port.

5.1 MODBUS SLAVE REGISTER LOCATIONS

The following table describes the ST-80's modbus slave database. Any portion of this data may be read by a modbus master device such as a PC, PLC or DCS. Since the modbus port is RS-485, ST-80's may also be multi-dropped onto the same cable.

MemoryIntAsciiRW

Notes: ASCII which may be read 2 characters at a time or in strings using a multiple register read.

Description	Alias	R/FC	W/FC	Type
Stream 1 tag	40401-40408	3	na	Ascii 2 characters/reg
Stream 2 tag	40409-40416	3	na	Ascii 2 characters/reg
Stream 3 tag	40417-40424	3	na	Ascii 2 characters/reg
Stream 4 tag	40425-40432	3	na	Ascii 2 characters/reg
Stream 5 tag	40433-40440	3	na	Ascii 2 characters/reg
Stream 6 tag	40441-40448	3	na	Ascii 2 characters/reg
Stream 1 eunits	40449-40451	3	na	Ascii 2 characters/reg
Stream 2 eunits	40452-40454	3	na	Ascii 2 characters/reg
Stream 3 eunits	40455-40457	3	na	Ascii 2 characters/reg
Stream 4 eunits	40458-40460	3	na	Ascii 2 characters/reg
Stream 5 eunits	40461-40463	3	na	Ascii 2 characters/reg
Stream 6 eunits	40464-40466	3	na	Ascii 2 characters/reg
Stream 1 Ascii value	40467-40469	3	na	Ascii 2 characters/reg
Stream 2 Ascii value	40470-40472	3	na	Ascii 2 characters/reg
Stream 3 Ascii value	40473-40475	3	na	Ascii 2 characters/reg
Stream 4 Ascii value	40476-40478	3	na	Ascii 2 characters/reg
Stream 5 Ascii value	40479-40481	3	na	Ascii 2 characters/reg
Stream 6 Ascii value	40482-40484	3	na	Ascii 2 characters/reg

MB_FltPtMemRO

Memory Floating Point:

Notes: Returned as 15 bit 2s complement with +- 5% over/underrange applied.. Therefore this must be considered when scaling values to be displayed at the Workstation. The following equation may be used to determine a value for display.

$$\text{Display Value} = \frac{\text{MODBUS Value} [(\text{Span Value} - \text{Zero Value}) 1.1]}{32767} + \{ \text{Zero Value} - [(\text{Span Value} - \text{Zero Value}) .05] \}$$

Description	Alias	R/FC	W/FC	Type
Stream 1 float value	33001	4	na	2s comp 15 bit integer
Stream 2 float value	33002	4	na	2s comp 15 bit integer
Stream 3 float value	33003	4	na	2s comp 15 bit integer

Stream 4 float value	33004	4	na	2s comp 15 bit integer
Stream 5 float value	33005	4	na	2s comp 15 bit integer
Stream 6 float value	33006	4	na	2s comp 15 bit integer

MemoryIntRO

Notes: MAIN ST-80 a/d value = direct a/d counts. Alarm status words are bits packed into 16 bit integer where lsb = Stream 1 alarm status and msb = relay status. Purge Timer: 65535 = purge finished.

Description	Alias	R/FC	W/FC	Type
MAIN ST-80 12 bit a/d raw	31001	4	n/a	16 bit integer
Analog 2 12 bit a/d raw	31002	4	n/a	16 bit integer
Analog 3 12 bit a/d raw	31003	4	n/a	16 bit integer
Analog 4 12 bit a/d raw	31004	4	n/a	16 bit integer
Analog 5 12 bit a/d raw	31005	4	n/a	16 bit integer
Analog 6 12 bit a/d raw	31006	4	n/a	16 bit integer
alarm1 status	31007	4	n/a	16 bit packed status
alarm2 status	31008	4	n/a	16 bit packed status
alarm3 status	31009	4	n/a	16 bit packed status
Stream I/D	31010	4	n/a	16 bit packed status
Purge Timer	31011	4	n/a	16 bit packed status

MemoryIntRW

Notes: Integer representing current channel being displayed.

Description	Alias	R/FC	W/FC	Type
current Stream	30250	4	n/a	integer

CoilDbase

Notes: Set this coil to issue an alarm acknowledge via modbus.

Description	Alias	R/FC	W/FC	Type
remote alarm ack	2001	n/a	5	setable coil

MemoryDiscreteRO

Notes: May be read as single discrete or packed with multiple register read.

Description	Alias	R/FC	W/FC	Type
Stream 1 alarm1	12001	2	n/a	16bit packed integer
Stream 2 alarm1	12002	2	n/a	16bit packed integer
Stream 3 alarm1	12003	2	n/a	16bit packed integer
Stream 4 alarm1	12004	2	n/a	16bit packed integer
Stream 5 alarm1	12005	2	n/a	16bit packed integer
Stream 6 alarm1	12006	2	n/a	16bit packed integer
Stream 1 alarm2	12007	2	n/a	16bit packed integer
Stream 2 alarm2	12008	2	n/a	16bit packed integer
Stream 3 alarm2	12008	2	n/a	16bit packed integer
Stream 4 alarm2	12010	2	n/a	16bit packed integer
Stream 5 alarm2	12011	2	n/a	16bit packed integer
Stream 6 alarm2	12012	2	n/a	16bit packed integer
Stream 1 alarm3	12013	2	n/a	16bit packed integer
Stream 2 alarm3	12014	2	n/a	16bit packed integer
Stream 3 alarm3	12015	2	n/a	16bit packed integer

Stream 4 alarm3	12016	2	n/a	16bit packed integer
Stream 5 alarm3	12017	2	n/a	16bit packed integer
Stream 6 alarm3	12018	2	n/a	16bit packed integer

MbFltPtMemRW

Notes: Real value represents float value without the decimal point such as 123.4 is returned as 1234.
Decimal divisor is returned as 1, 10, 100, or 1000 for decimal position of 1, 2, 3, or 4, where 123.4 would return the value 10.

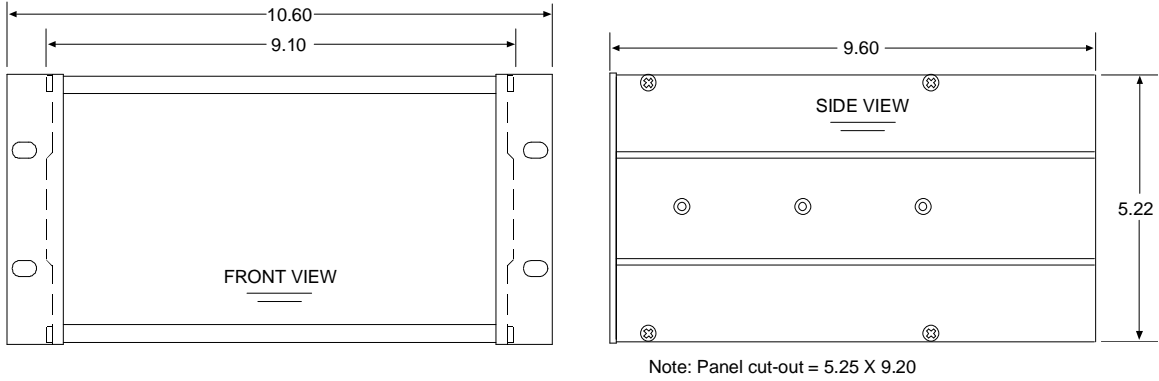
Description	Alias	R/FC	W/FC	Type
Stream 1 zero real	41001	3	n/a	real w/o decimal point
Stream 2 zero real	41002	3	n/a	real w/o decimal point
Stream 3 zero real	41003	3	n/a	real w/o decimal point
Stream 4 zero real	41004	3	n/a	real w/o decimal point
Stream 5 zero real	41005	3	n/a	real w/o decimal point
Stream 6 zero real	41006	3	n/a	real w/o decimal point
Stream 1 zero decimal	41007	3	n/a	decimal position divisor
Stream 2 zero decimal	41008	3	n/a	decimal position divisor
Stream 3 zero decimal	41009	3	n/a	decimal position divisor
Stream 4 zero decimal	41010	3	n/a	decimal position divisor
Stream 5 zero decimal	41011	3	n/a	decimal position divisor
Stream 6 zero decimal	41012	3	n/a	decimal position divisor
Stream 1 span real	41013	3	n/a	real w/o decimal point
Stream 2 span real	41014	3	n/a	real w/o decimal point
Stream 3 span real	41015	3	n/a	real w/o decimal point
Stream 4 span real	41016	3	n/a	real w/o decimal point
Stream 5 span real	41017	3	n/a	real w/o decimal point
Stream 6 span real	41018	3	n/a	real w/o decimal point
Stream 1 span decimal	41019	3	n/a	decimal position divisor
Stream 2 span decimal	41020	3	n/a	decimal position divisor
Stream 3 span decimal	41021	3	n/a	decimal position divisor
Stream 4 zero decimal	41022	3	n/a	decimal position divisor
Stream 5 zero decimal	41023	3	n/a	decimal position divisor
Stream 6 zero decimal	41024	3	n/a	decimal position divisor
Stream 1 alarm1 real	41025	3	n/a	real w/o decimal point
Stream 2 alarm1 real	41026	3	n/a	real w/o decimal point
Stream 3 alarm1 real	41027	3	n/a	real w/o decimal point
Stream 4 alarm1 real	41028	3	n/a	real w/o decimal point
Stream 5 alarm1 real	41029	3	n/a	real w/o decimal point
Stream 6 alarm1 real	41030	3	n/a	real w/o decimal point
Stream 1 alarm1 decimal	41031	3	n/a	decimal position divisor
Stream 2 alarm1 decimal	41032	3	n/a	decimal position divisor
Stream 3 alarm1 decimal	41033	3	n/a	decimal position divisor
Stream 4 alarm1 decimal	41034	3	n/a	decimal position divisor
Stream 5 alarm1 decimal	41035	3	n/a	decimal position divisor
Stream 6 alarm1 decimal	41036	3	n/a	decimal position divisor
Stream 1 alarm2 real	41037	3	n/a	real w/o decimal point
Stream 2 alarm2 real	41038	3	n/a	real w/o decimal point
Stream 3 alarm2 real	41039	3	n/a	real w/o decimal point
Stream 4 alarm2 real	41040	3	n/a	real w/o decimal point

Stream 5 alarm2 real	41041	3	n/a	real w/o decimal point
Stream 6 alarm2 real	41042	3	n/a	real w/o decimal point
Stream 1 alarm2 decimal	41043	3	n/a	decimal position divisor
Stream 2 alarm2 decimal	41044	3	n/a	decimal position divisor
Stream 3 alarm2 decimal	41045	3	n/a	decimal position divisor
Stream 4 alarm2 decimal	41046	3	n/a	decimal position divisor
Stream 5 alarm2 decimal	41047	3	n/a	decimal position divisor
Stream 6 alarm2 decimal	41048	3	n/a	decimal position divisor
Stream 1 alarm3 real	41049	3	n/a	real w/o decimal point
Stream 2 alarm3 real	41050	3	n/a	real w/o decimal point
Stream 3 alarm3 real	41051	3	n/a	real w/o decimal point
Stream 4 alarm3 real	41052	3	n/a	real w/o decimal point
Stream 5 alarm3 real	41053	3	n/a	real w/o decimal point
Stream 6 alarm3 real	41054	3	n/a	real w/o decimal point
Stream 1 alarm3 decimal	41055	3	n/a	decimal position divisor
Stream 2 alarm3 decimal	41056	3	n/a	decimal position divisor
Stream 3 alarm3 decimal	41057	3	n/a	decimal position divisor
Stream 4 alarm3 decimal	41058	3	n/a	decimal position divisor
Stream 5 alarm3 decimal	41059	3	n/a	decimal position divisor
Stream 6 alarm3 decimal	41060	3	n/a	decimal position divisor
Stream 1 fault real	41061	3	n/a	real w/o decimal point
Stream 2 fault real	41062	3	n/a	real w/o decimal point
Stream 3 fault real	41063	3	n/a	real w/o decimal point
Stream 4 fault real	41064	3	n/a	real w/o decimal point
Stream 5 fault real	41065	3	n/a	real w/o decimal point
Stream 6 fault real	41066	3	n/a	real w/o decimal point
Stream 1 fault decimal	41067	3	n/a	decimal position divisor
Stream 2 fault decimal	41068	3	n/a	decimal position divisor
Stream 3 fault decimal	41069	3	n/a	decimal position divisor
Stream 4 fault decimal	41070	3	n/a	decimal position divisor
Stream 5 fault decimal	41071	3	n/a	decimal position divisor
Stream 6 fault decimal	41072	3	n/a	decimal position divisor

SECTION 6

6.0 ST-80PM PANEL / RACK MOUNT ENCLOSURE

The ST-80PM shown in Figure 6.1 is a half width 19" rack enclosure. It is supplied with hardware that allows mounting in either a full width 19" rack style cabinet or it may be panel mounted in a rectangular cutout. Only two 6 channel I/O option PCB's such as analog input or discrete relays may be mounted directly to the back of the enclosure. Additional 6 channel I/O option PCB's must be located external from the assembly on another mounting plate. A 3 foot length of I²C cable is also supplied for this purpose.

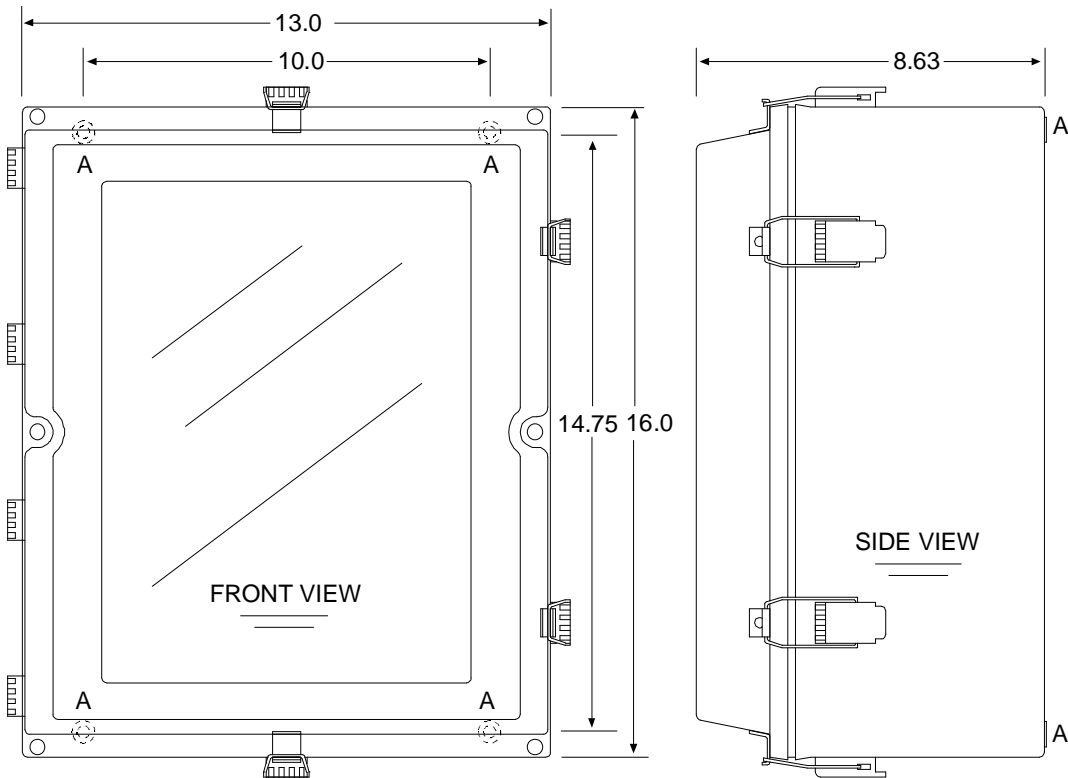


RACK / PANEL MOUNT
(19" RACK SPREADER PLATES &
PANEL MOUNT BEZEL NOT SHOWN)

Figure 6.1

6.1 ST-80N4 NEMA 4X WALL MOUNT ENCLOSURE

The ST-80N4 shown in Figure 6.2 is a fiberglass NEMA 4X wall mount enclosure. Seven 6 channel I/O option PCB's such as analog input or discrete relays may be mounted inside this enclosure.



NEMA 4X WALL MOUNT

Figure 6.2

6.2 ST-80XP NEMA 7 EXPLOSION-PROOF WALL MOUNT ENCLOSURE

The ST-80XP shown in Figure 6.3 is an aluminum NEMA 7 wall mount enclosure designed for mounting into potentially hazardous areas. Eleven 6 channel I/O option PCB's such as analog input or discrete relays may be mounted inside this enclosure.

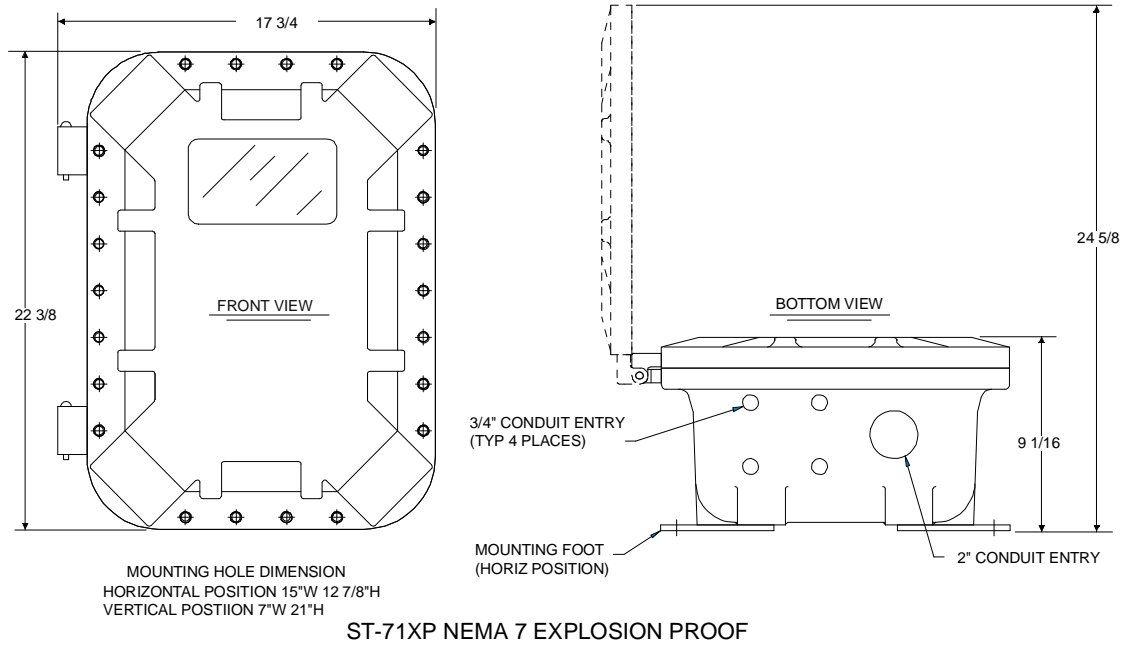


Figure 6.3