MOORE INDUSTRIES®

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*Site-Programmable AC
Current & Voltage Alarms*

SPA
AC

*Site-Programmable AC
Current & Voltage Alarms*

SPA

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The SPA AC Input Alarm Trip

This is the users' manual for Moore Industries' family of SPA Site-Programmable AC Current and Voltage Alarms. The SPA monitors a process input or inputs and provides user-configurable, contact closure outputs whenever that input falls outside a user-set, high or low trip point. SPAs are typically used to activate a warning light, bell, or buzzer; or to initiate a system shutdown, thus acting as a simple, but highly reliable and effective means of safe-guarding a process.

The following guidelines are used in this manual:

WARNING - Hazardous procedure or condition that could injure the operator.

Caution - Hazardous procedure or condition that could damage or destroy the unit.

Note - Information that is helpful for a procedure, condition, or operation of the unit.

Programmable Inputs

The Programmable AC Current & Voltage unit, or SPA AC, handles either current or voltage inputs in any user set span in a 0-250VAC or 0-5AAC range.

Programmable Outputs

The SPA AC can be equipped with an analog output option to provide either a 1-5V or 0-20mA output. Analog output equipped units are set by the user to provide either current (switchable between source or sink modes), or voltage.

The source/sink setting for the optional analog output is controlled by DIP switches that are located behind an easy-to-remove access panel inside the unit's housing.

Programmable Input Failure Alarms

SPA alarm setup is quick, intuitive, and flexible. Most unit operating parameters can be viewed and/or set using push buttons and a series of simple, "plain English" menu prompts displayed on the integrated front panel LCD.

Failsafe or Non-failsafe alarm functioning and source/sink settings for the optional analog output are controlled by DIP switches that, together with a security jumper, are located behind an easy-to-use access panel inside the unit housing. Unit disassembly is unnecessary.

Universal Mounting

The SPA is housed in a "universal" DIN case that can be mounted on both 32mm G-type (EN50035) and 35mm Top Hat (EN50022) DIN-rail. The Installation section of this manual gives the dimensions of the housings for the various alarm configurations.

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Specifications

Performance	**Repeatability:** Trip point repeats within ±0.1% of input span	**Performance (continued)**	**Power Consumption:** 2-4W, nominal; 6W, maximum	**Ambient Conditions (continued)**	**Relative Humidity:** 0–95% non-condensing

Performance

Repeatability: Trip point repeats within ±0.1% of input span

Display Accuracy: ±1 digit; When scaling the display (in Custom Mode), high input-to-display span ratios decrease display accuracy

Input Accuracy: Current input, ±5.0mAac; Voltage input, ±0.25Vac (±0.1% of max. span)

Stability: ±0.1% of calibrated span, maximum, over 6 months

Deadband: 250V or 7.5A, maximum in Linear Mode; equivalent of maximum input range in user-set engineering units in Custom Mode

Response Time: 600 milliseconds (defined as time from step change on input to alarm state change when alarm is set to trip mid-point)

Alarm Trip Delay: Programmable from 0-60 seconds

Isolation: 1000Vrms between case, input, output (units with -AO option) and power, continuous, and will withstand a 1500Vac dielectric strength test for one minute without breakdown

Line Voltage Effect: ±0.005% of span for a 1% change in line voltage (ac or dc)

Performance (continued)

Power Consumption: 2-4W, nominal; 6W, maximum

Input Impedance: 160KΩ for voltage inputs; 0.002Ω for current inputs

Input Over-Range Protection: Current: 7.5A rms continuous, 10A rms for <1.0sec; Voltage: 264Vac

Performance with Analog Output (-AO Option)

WITH ANALOG OUTPUT

Output Accuracy: ±0.03% of output span (includes the combined effects of linearity, hysteresis, repeatability, and adjustment resolution)

Response Time: 250 msec maximum time for output to go from 10% to 90% for step change on input

Ripple (up to 120Hz): Current output, 10mV peak-to-peak max. when measured across a 250Ω resistor; Voltage output, 50mV peak-to-peak max.

Output Limiting: 117% of span max., 115% of span typical

Load Effect: ±0.01% of span from 0 to maximum load resistance on current output

Ambient Conditions

Operating Range: −25°C to +70°C (−13°F to +158°F)

Storage Range: −40°C to +85°C (−40°F to +185°F)

Ambient Temperature Effect: ±0.015% of output span per °C maximum;

Ambient Conditions (continued)

Relative Humidity: 0–95% non-condensing

RFI/EMI Protection: 10V/m, 20 to 1000MHz, as per SAMA 33.1 - ABC with 0.5% of span or less error

Digital Filter: 50 or 60Hz (user selectable)

Common Mode Rejection: 100dB @ 50/60Hz

Adjustments

Front panel push buttons control settings for zero, span, alarm trip points, high/low alarms, etc.; Easy access internal settings select current (source or sink) or voltage output, and failsafe or non-failsafe alarm functions; Internal jumper and menu password protect parameter settings

Indicators

LCD: 2x4 character, backlit, alphanumeric readout accurate to the nearest digit

Range: -9999 to 9999; Decimal point can be user-set when in Custom Mode

LED's: Dual-color TRIP light (one for each relay) shows green for non-alarm, red for alarm; READY light indicates normal operation, extinguishes in the event of any internal failure; INPUT light is always green

Weight 510 g (18 ounces)

Specifications and information subject to change without notice.

Internal Settings

The Failsafe/Non-failsafe relay and the password security functions are controlled by means of simple DIP switches and a single jumper inside the unit housing.

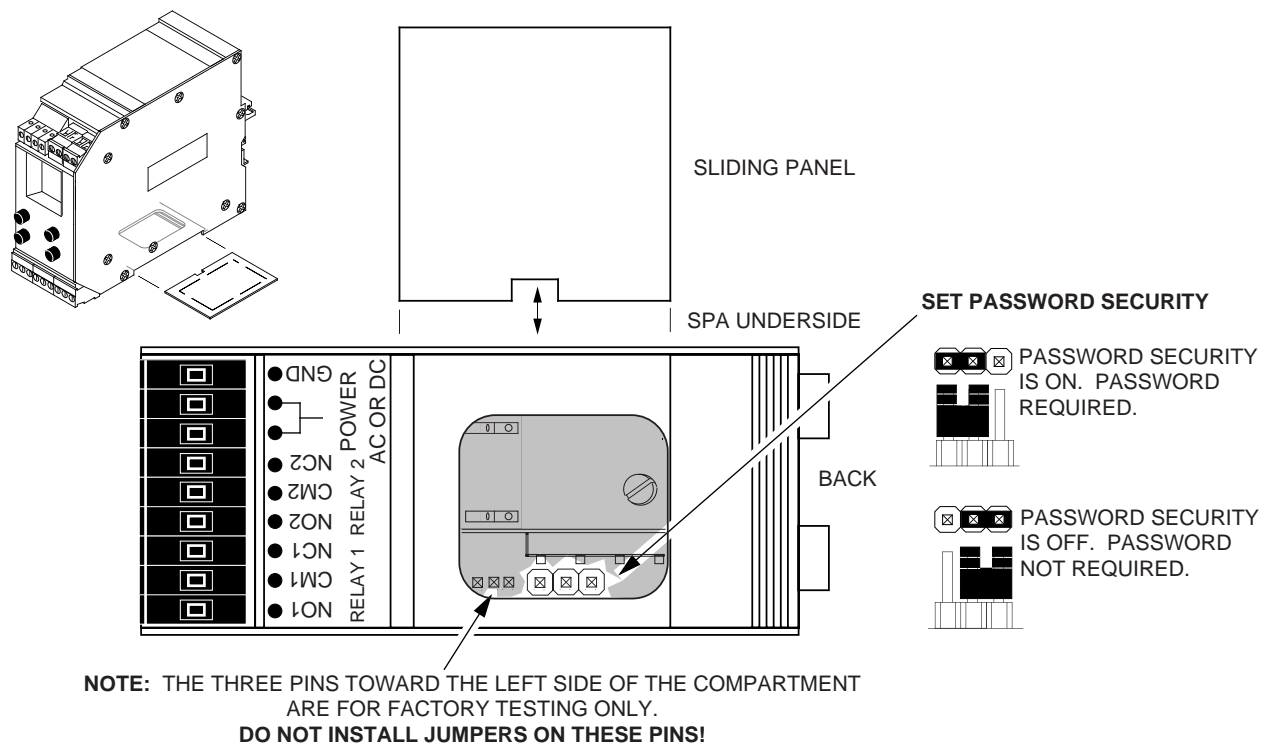If the unit is equipped with the –AO option, voltage and current sink/source selection is also inside.

The SPA housing is fitted with a sliding access door in its bottom panel. Figures 1, 2, and 3 show the panel and the location of each of the controls for setting:

• Password Security ON/OFF **(Figure 1)**

• Failsafe/Non-failsafe Alarm Function **(Figure 2)**

• Current Source/Sink or Voltage **(Figure 3)** **(Available in AO-equipped SPA only)**

NOTE:
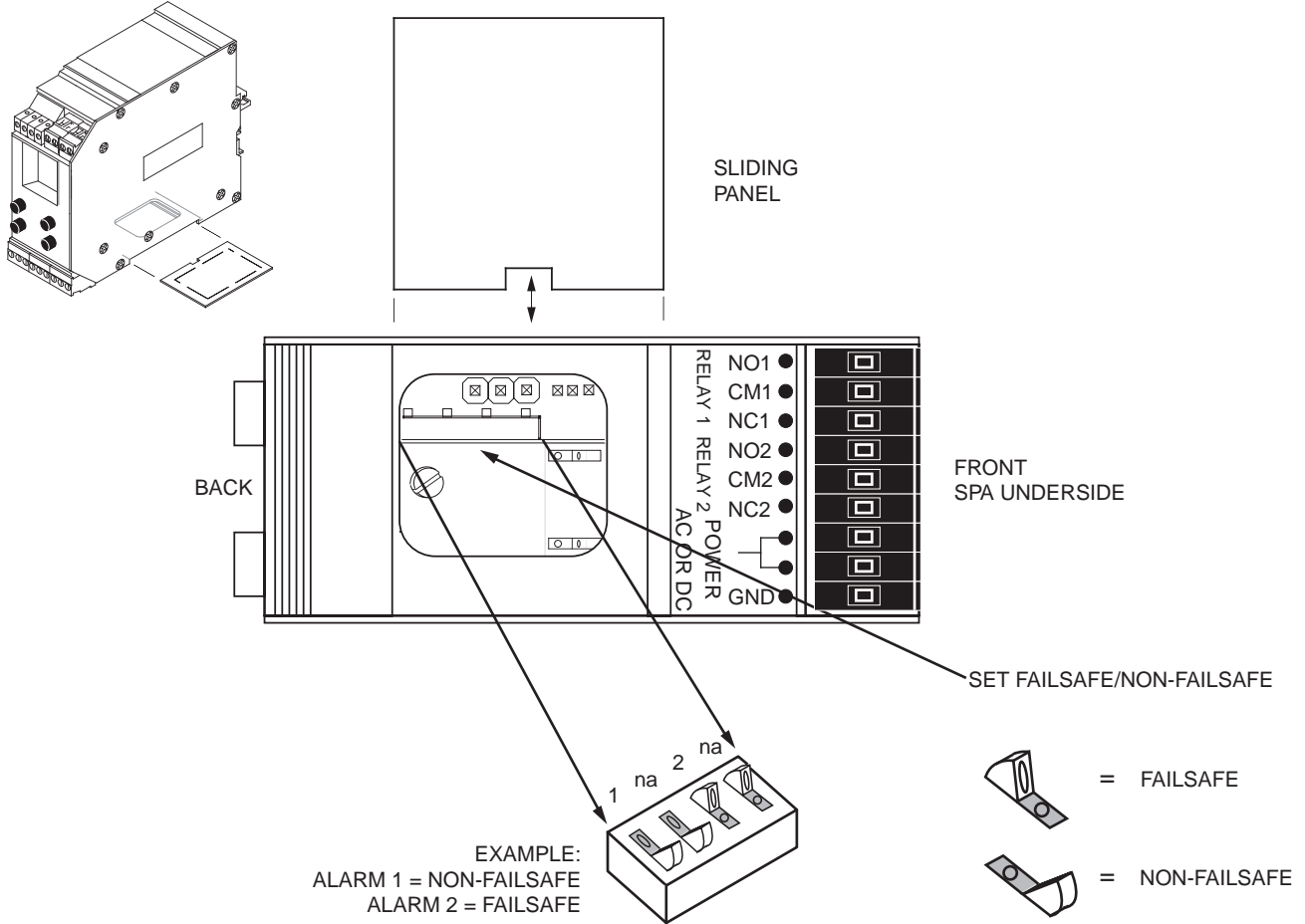*SPAs equipped with the –DPDT option make use of switches 1 and 2 only (see Figure 2).*

Figure 1. *Setting the Internal Jumper for Password Security ON or OFF*

SLIDING PANEL

SPA UNDERSIDE

BACK

SET PASSWORD SECURITY

PASSWORD SECURITY IS ON. PASSWORD REQUIRED.

PASSWORD SECURITY IS OFF. PASSWORD NOT REQUIRED.

NOTE: THE THREE PINS TOWARD THE LEFT SIDE OF THE COMPARTMENT ARE FOR FACTORY TESTING ONLY. **DO NOT INSTALL JUMPERS ON THESE PINS!**
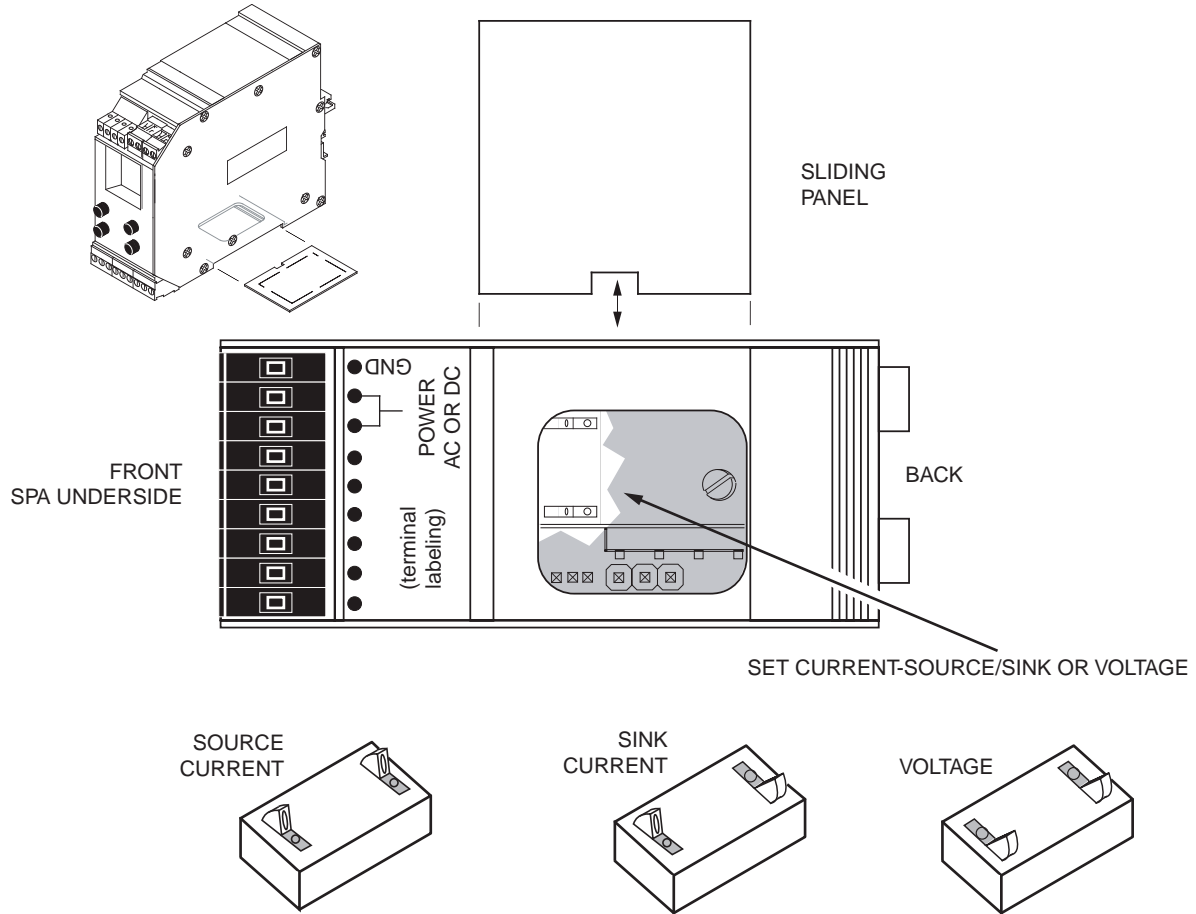
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Figure 2. *Setting the Internal DIP Switches for Failsafe or Non-Failsafe Alarm Function*

SLIDING
PANEL

BACK

RELAY 1 RELAY 2 POWER
AC OR DC

NO1
CM1
NC1
NO2
CM2
NC2

GND

FRONT
SPA UNDERSIDE

SET FAILSAFE/NON-FAILSAFE

na
1   na   2

EXAMPLE:
ALARM 1 = NON-FAILSAFE
ALARM 2 = FAILSAFE

= FAILSAFE

= NON-FAILSAFE

NOTE: THIS 4-POSITION SIP SWITCH MAY VARY IN LOCATION BASED ON THE TYPE OF SPA USED

Figure 3. *Setting the Internal DIP Switches for Current Source/Sink or Voltage (AO-equipped SPAs only)*

SLIDING
PANEL

FRONT
SPA UNDERSIDE

GND
POWER
AC OR DC
(terminal labeling)

BACK

SET CURRENT-SOURCE/SINK OR VOLTAGE

SOURCE
CURRENT

SINK
CURRENT

VOLTAGE

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Programming the SPA
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The SPA operating parameters are set, and the settings are stored in on-board, non-volatile EEPROM. There are four push buttons on the unit front panel; VIEW, SELECT, an UP arrow, and a DOWN arrow. Together with the prompting messages displayed on the LCD, these are used to access menus, and view/change the settings for:

• **Select Functional Setting (Linear Mode or Custom Mode) and, if selected, set Custom Mode Engineering units.**

• **Scale Input — Smart Scaling**

• **Apply Input — Bench Scaling**

• **Scale Display Readout**

• **Set Linearization Curve (Custom Mode only)**

• **Scale Analog Output (AO-equipped units only)**

• **Trim Actual Output (AO-equipped units only)**

• **Configure Alarm Functions (Trip points, etc.)**

• **Change/View Password**

• **Set the Start Timer (SW-equipped units only)**
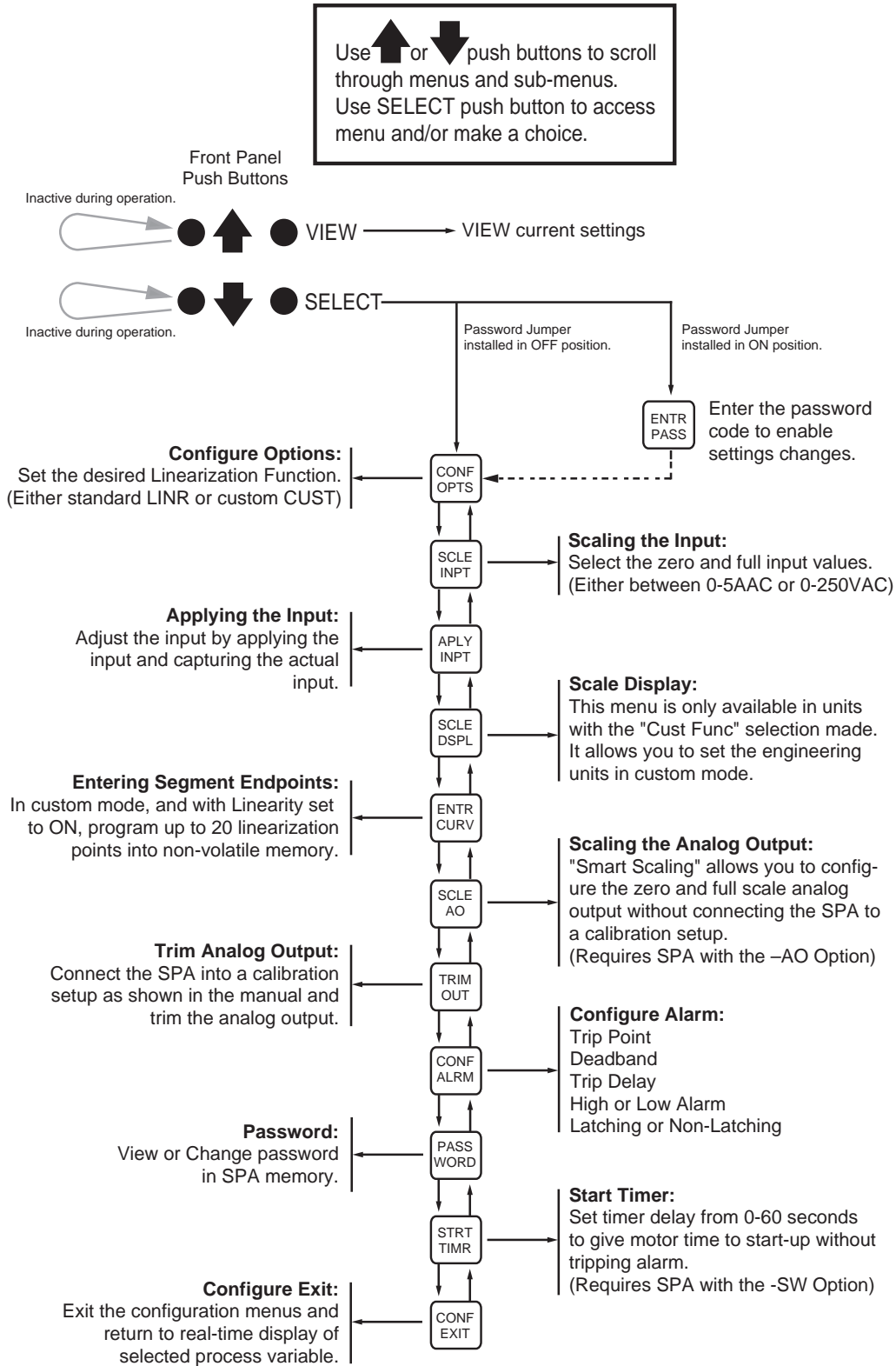
Main Menu: View Settings

Figure 4 gives an overview of the first level of menus used to configure the SPA.

On power-up, the AC-input SPA defaults to a display of the measured value. Pressing the VIEW button accesses a series of displays that show, in succession, the settings currently stored in unit memory.

Depending upon whether or not the Security Jumper has been installed (see Figure 1), SELECT will access either the first screen in the main configuration menu, "CONF OPTS", or the password code query screen, "ENTR PASS".

Once the Main Menu has been accessed, the up and down arrow buttons are used to move through all of the sub-menus in a loop. Pressing the SELECT button accesses the screen of the sub-menu currently shown on the LCD.

Figure 4. *The SPA ACIPRG & ACVPRG Main Menu*

Use ⬆ or ⬇ push buttons to scroll through menus and sub-menus. Use SELECT push button to access menu and/or make a choice.

Front Panel
Push Buttons

Inactive during operation.

● ⬆ ● VIEW ⟶ VIEW current settings

Inactive during operation.

● ⬇ ● SELECT

Password Jumper installed in OFF position.

Password Jumper installed in ON position.

ENTR PASS — Enter the password code to enable settings changes.

Configure Options:
Set the desired Linearization Function.
(Either standard LINR or custom CUST)

CONF OPTS

SCLE INPT — **Scaling the Input:**
Select the zero and full input values.
(Either between 0-5AAC or 0-250VAC)

Applying the Input:
Adjust the input by applying the input and capturing the actual input.

APLY INPT

SCLE DSPL — **Scale Display:**
This menu is only available in units with the "Cust Func" selection made. It allows you to set the engineering units in custom mode.

Entering Segment Endpoints:
In custom mode, and with Linearity set to ON, program up to 20 linearization points into non-volatile memory.

ENTR CURV

SCLE AO — **Scaling the Analog Output:**
"Smart Scaling" allows you to configure the zero and full scale analog output without connecting the SPA to a calibration setup.
(Requires SPA with the –AO Option)

Trim Analog Output:
Connect the SPA into a calibration setup as shown in the manual and trim the analog output.

TRIM OUT

CONF ALRM — **Configure Alarm:**
Trip Point
Deadband
Trip Delay
High or Low Alarm
Latching or Non-Latching

Password:
View or Change password in SPA memory.

PASS WORD

STRT TIMR — **Start Timer:**
Set timer delay from 0-60 seconds to give motor time to start-up without tripping alarm.
(Requires SPA with the -SW Option)

Configure Exit:
Exit the configuration menus and return to real-time display of selected process variable.

CONF EXIT

Main Menu: Password

This menu is bypassed if the Password Security Jumper is not installed (see Figure 1). If the jumper is installed, the menu comes up when SELECT is pressed from the display of the process variable input.

Main Menu: Configure Options

The Configure Options menu allows the user to choose between Linear and Custom modes of functioning.

Linear Function. In its Linear Mode (LINR), the SPA behaves much like a simple input meter. The display shows the input in either AAC or VAC, depending on the type of SPA. Its scaling is tied to any input scaling performed (set in another menu). If equipped with the –AO option, SPA output can be scaled independently with respect to the input.

Custom Function. The Custom Mode sets the unit up for *independent* programming of input scaling, display scaling, and, if equipped with the –AO option, output scaling. In Custom Mode, the user can select °C, °F, % of scale, Blank (for raw display); or a user-specified, 4-place engineering unit, set at the factory.

Also, if Custom Mode is selected, the user can select either linear or non-linear display scaling, which enables a user-programmed, 20-point linearization curve set in a separate menu.

NOTE:
The SPA's Linear Mode and its linearizing of the Custom Mode functioning are not the same.

Follow the instructions below to select the correct function. See Figure 5 for details.

1. SELECT the "CONF OPTS", then with "SET FUNC" showing on the LCD, use the arrow buttons to toggle between "CUST FUNC" and "LINR FUNC". Refer to the explanation above for information about each of the operating modes.

2. Press SELECT to choose the desired mode. If you selected "LINR FUNC", the LCD will prompt you to exit this menu; if you selected "CUST FUNC", continue to step 3 to set up the custom linearization curve.

3. Press SELECT to begin the process of setting the desired engineering units to be displayed during SPA operation. Select the appropriate engineering units with the SELECT button.

    This brings up a sub-menu that allows the user to choose between a linearized or non-linearized display of the selected, custom engineering units.

6. Use the arrow buttons to toggle linearization on or off, then press SELECT to go to "EXIT OPTS".

7. Press SELECT again (from "EXIT OPTS") to return to the Main Menu.

Figure 5. *The Configure Options Menu*
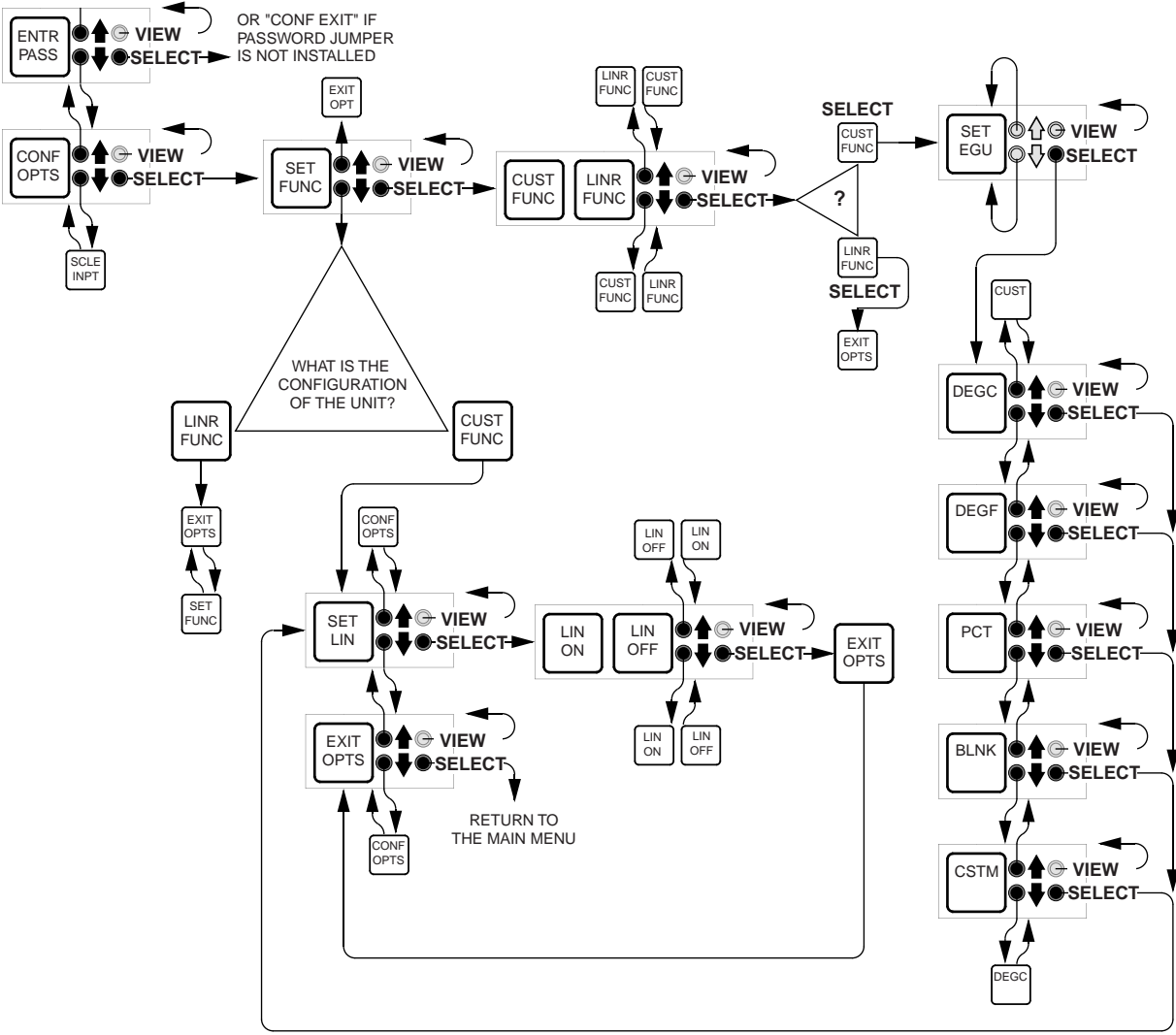
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Main Menu: Scaling Input "Smart Scaling"

This feature of the SPA allows users to set the zero and full scale values of the input from the intended application without having to connect the unit to any calibration equipment.

Once the Zero and Full values are set, the SPA automatically routes the user to the next appropriate menu; *Scale the Display*, for Custom Mode users; *Scale the Output*, for Linear Mode users (with AO-equipped SPAs); or *Configure Alarms*, for Linear Mode users whose units are not equipped with analog output.

Follow the directions below to scale the input.

1. SELECT the "SCLE INPT" menu.

2. SELECT the "SET ZERO" menu, and use the arrow buttons to set the display to show the known zero scale input from the intended application. Holding the button accelerates the display change. Press SELECT.

3. SELECT the "SET FULL" menu, and use the arrow buttons to set the display to show the known full scale input from the intended application. Holding the button accelerates the display change. Press SELECT.

4. Scroll to "EXIT SCLE", and press SELECT.

   If the SPA Custom Mode was selected in the Configure Options menu, the next menu shown will be Scale the Display, since in Custom Mode the input, display, and output (if present) are independent.

   If the SPA Linear Mode was selected in the Configure Options menu, the next menu shown will either be Scale Analog Output, for units equipped with an –AO option, or Configure Alarms.

Figure 6. *The Input Scaling Menu*

FROM THE MAIN MENU:

CONF OPT ● ↑ ↺ **VIEW** / ● ↓ ● **SELECT** → SET LINEAR OR CUSTOM ENGINEERING UNITS

SCLE INPT ● ↑ ↺ **VIEW** / ● ↓ ● **SELECT**

APLY INPT

EXIT SCLE

SET ZERO ● ↑ ↺ **VIEW** / ● ↓ ● **SELECT**

INCREMENT XXXX (ZERO)

DEPENDING ON TYPE OF SPA

XXXX A | XXXX V ● ↑ ↺ **VIEW** / ● ↓ ● **SELECT**

DECREMENT XXXX (ZERO)

SET FULL ● ↑ ↺ **VIEW** / ● ↓ ● **SELECT**

INCREMENT XXXX (FULL)

DEPENDING ON TYPE OF SPA

XXXX A | XXXX V ● ↑ ↺ **VIEW** / ● ↓ ● **SELECT**

DECREMENT XXXX (FULL)

EXIT SCLE ● ↑ ↺ **VIEW** / ● ↓ ● **SELECT**

SCLE INPT

WAS [CUST FUNC] SELECTED IN [CONF OPT] ?

EXIT INPUT SCALING AND RETURN TO MAIN MENU

YES

SCLE DSPL

NO

SCLE AO

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Main Menu: Applying Input "Bench Ranging"

With this method of calibrating input to the SPA, the SPA is hooked into a calibration setup and inputs are "captured" at their zero and full scale values.

Figure 7 shows the setup required for applying and capturing input scaling for the SPA. After the connections shown in the diagram have been made, apply appropriate power and allow 5 minutes for unit warm-up/stabilization.

Figure 8 shows the SPA menu used in this procedure. Follow the directions below to complete bench ranging.

1. SELECT the "APLY INPT" menu.

2. SELECT the "SAVE ZERO" menu, and vary the input to the zero level of the intended application. When the display shows the appropriate readout, press SELECT to capture the value in memory.

3. SELECT the "SAVE FULL" menu, and vary the input to the full level of the intended application. When the display shows the appropriate readout, press SELECT to capture the value in memory.

4. Use the arrow buttons to bring up the "EXIT INPT" display, and press SELECT to return to the Main Menu.

Figure 7. The SPA Bench Scaling Setup
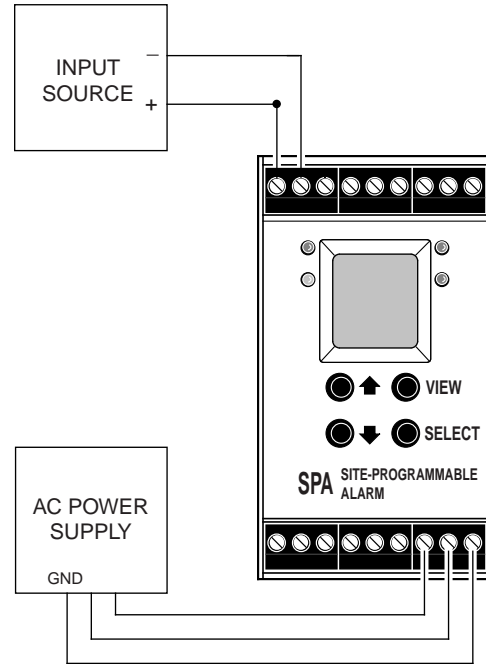
Figure 8. *The Applying Input Menu*
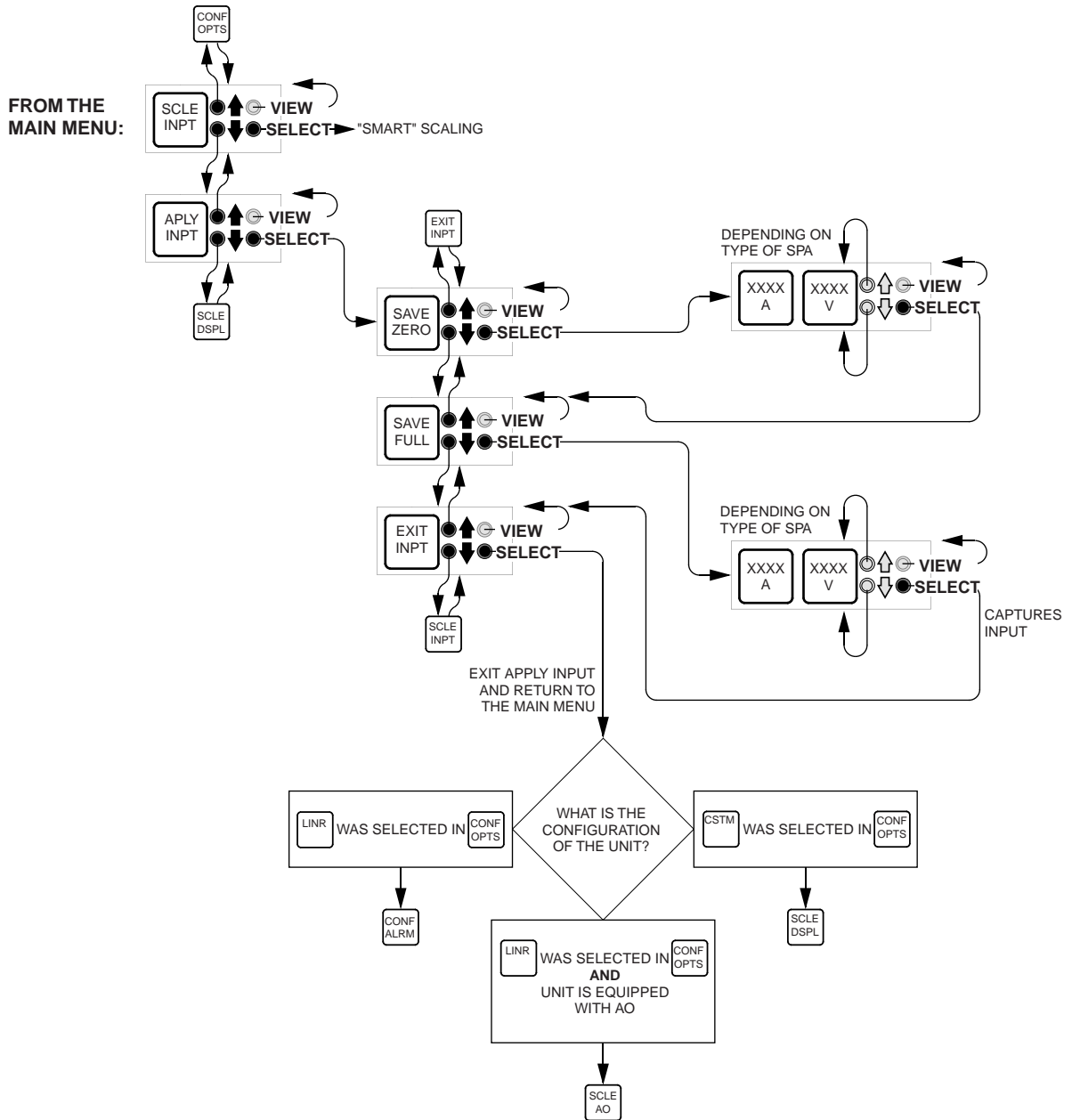
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Figure 9. *The Display Scaling Menu*
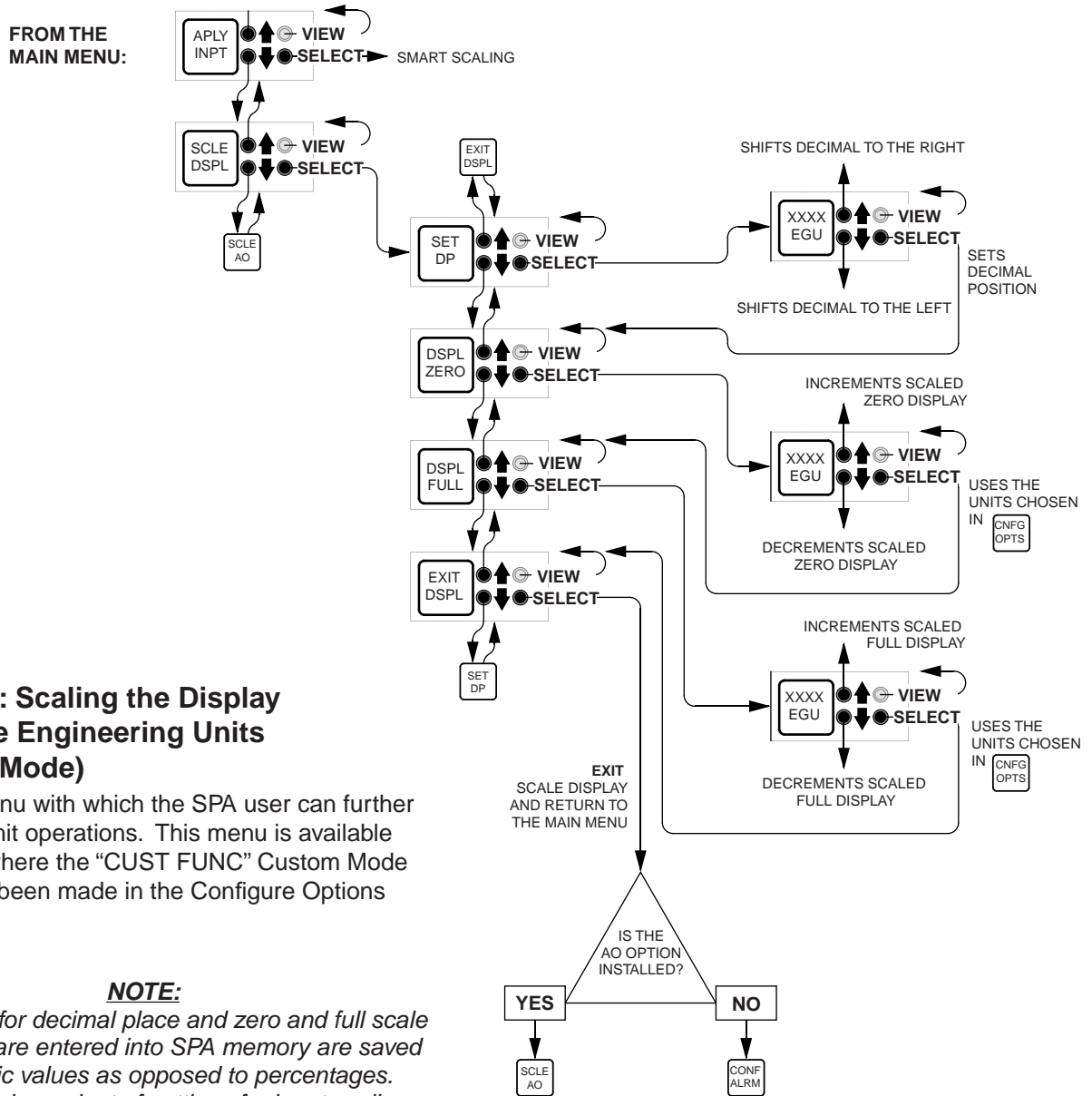
Main Menu: Scaling the Display (Setting the Engineering Units in Custom Mode)

This is the menu with which the SPA user can further "customize" unit operations. This menu is available only in units where the "CUST FUNC" Custom Mode selection has been made in the Configure Options menu, earlier.

NOTE:
The settings for decimal place and zero and full scale display that are entered into SPA memory are saved as numeric values as opposed to percentages. They are independent of settings for input scaling and trip points.

If changes are made to the Input Scaling or Trip Points (in the Configure Alarms menu), this menu must be accessed and the values changed appropriately in order to carry any scaling changes through to the display.

Use this menu to set the decimal point, the displayed zero, and the displayed full values.
Figure 9 shows the menu for this procedure.

NOTE: MAXIMUM DISPLAY RANGE* = $\dfrac{\text{INPUT RANGE}}{\text{INPUT ACCURACY}}$
(0.25V FOR VOLTAGE INPUTS
5mA FOR CURRENT INPUTS)

*DISPLAY FULL SETTING – DISPLAY ZERO SETTING

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Main Menu: Enter Curve (Entering Segment Endpoints in Custom Mode)

Using this menu the user can program up to 20 linearization points into non-volatile SPA memory. This capability works exclusively with the unit's Custom Mode to make the SPA display linear with respect to its scaled input. When enabled (in the "CONF OPTS" menu, discussed earlier), the SPA's Custom Mode sets the unit to display the *linearized* input value in the user-set engineering units.

As mentioned, the "ENTR CURV" menu is active only when the SPA's "CUST FUNC" selection has been made in the Configure Options menu.

IMPORTANT:
Input zero and full scale as well as display zero and full scale must be programmed prior to programming the linearization curve.

The procedure consists of defining the number of points that are to constitute the linearization curve, then specifying first the input, then its corresponding display value at each point.

The "rules" for entering points are:

- $Xz < Xn < Xn+1 < Xn+2 < ... < Xn+19 < Xf$
  Where Xz=Input zero, in this case, 0A;
  and Xf=Input full scale, in this case, 5A;
  Xn, Xn+1 through Xn+19 = Input curve

- $Yz < Yn < Yn+1 < Yn+2 < ... < Yn+19 < Yf$
  Where Yz=Display zero, in this case, 0%:
  and Yf=Display full scale, in this case, 100%;
  Yn, Yn+1 through Yn+19 = Display curve

NOTE:
*The endpoints of the curve must fall **within** a range defined by the zero and full scale values for both the input **and** the display. Figure 10 shows the menu.*

Figure 10. *The Enter Custom Curve (Custom Linearization) Menu*

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Main Menu: Analog Output Scaling (For SPA's with –AO option)

This menu is only applicable to those SPA's equipped with an analog output option. Scaling for the analog output of the SPA is stored as numerical values in unit memory. They are not stored as percentages of scale.

NOTE:
If either Input Scaling or Display Scaling is changed, any existing scaling operating on the analog output (if present) must also be changed.

Figure 11 shows the menu for this procedure.

Figure 11. *The Analog Output Menu*

NOTE: RE-RANGING THE UNIT NULLIFIES ANY OUTPUT TRIM. RE-TRIM AFTER ANY RE-RANGING.

Main Menu: Trim Analog Output

This procedure is only required on those SPAs equipped with the –AO option. Figure 12 shows the setup needed. Figure 13 shows the menu.

Connect the unit as shown, apply the appropriate power, and allow 5 minutes for stabilization/warm-up.

1. SELECT the "TRIM OUT" menu.

2. Use the arrow buttons to choose the level, zero or full scale, that is to be trimmed.

3. Press SELECT to begin the trim process. The display will begin to flash the "TRIM ZERO" or "TRIM FULL" screen, depending upon the option chosen in step 2.

4. While monitoring the reading on the meter, use the arrow buttons to adjust the output to the desired level. Use the meter in the setup to monitor the output as the output is adjusted.

5. When the output is set as desired, press SELECT. This sets the adjustment into SPA memory, and brings up either the next output level to be adjusted (repeat steps 3, 4, and 5), or "EXIT OUT" if both zero and full scale output have been adjusted.

Figure 12. *Connections for Trimming SPA Analog Output*
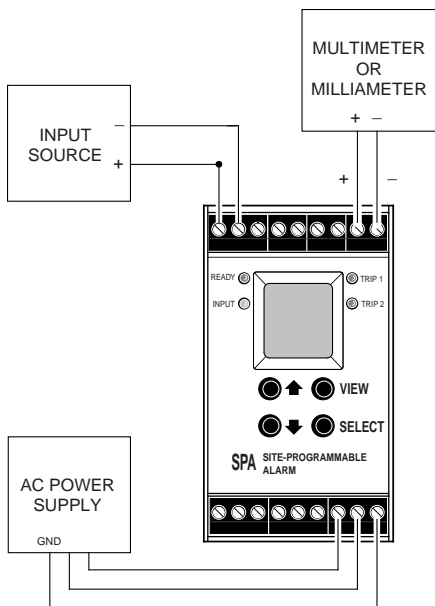
Figure 13. *The Trim Output Menu*
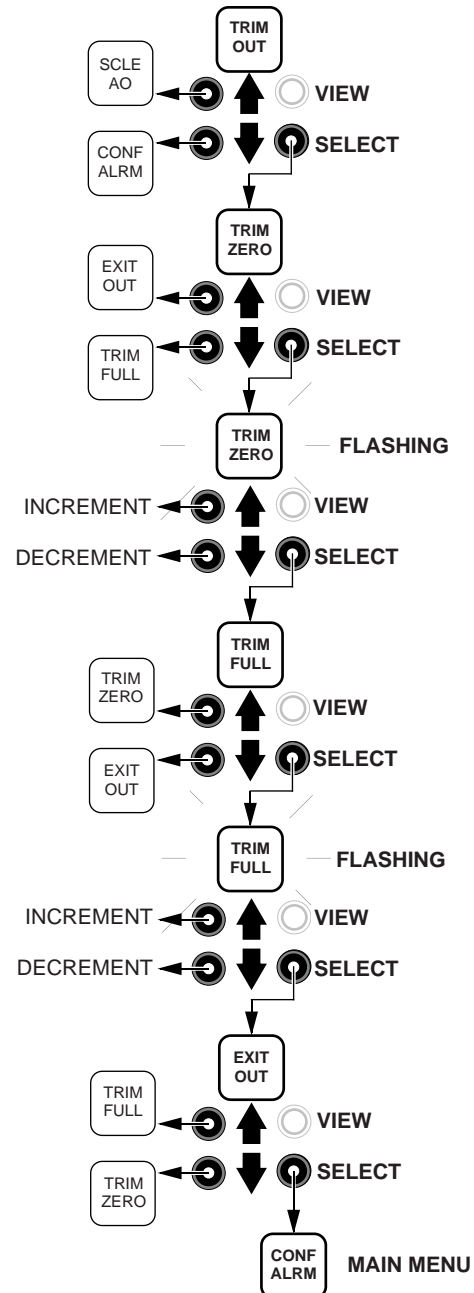
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Main Menu: Configure Alarm
The Configure Alarm menu sets the trip point(s), Deadband, Trip Delay, High or Low Alarm function, and Latching or Non-Latching operation.

After selecting the "CONF ALRM" menu, use the arrow buttons to scroll through the alarm operation parameters. Press SELECT to access the settings for the displayed parameter.

Trip Point(s)
There are two options for setting the trip points of the installed alarms,"ENTR TRIP" and "APLY TRIP".

In the "ENTR TRIP" menu, the user employs the Smart Ranging feature of the SPA, entering the desired trip point with the front panel push buttons.

In the "APLY TRIP" menu, the SPA must be set up with calibration equipment (see Figure 7, page 12).
The unit then "captures" its trip point from the input of an adjustable source. The process for this is similar to capturing the input: hookup the SPA into a calibration setup, set the SPA's menu appropriately, apply the amount of power that you would like the trip point set at, and press SELECT.

Other Configuration Options
Setting the deadband, delay, high/low trip, and latching or non-latching options is a simple matter of using the front-panel buttons to select the appropriate values.

Figure 14. *The Configure Alarm Menu*
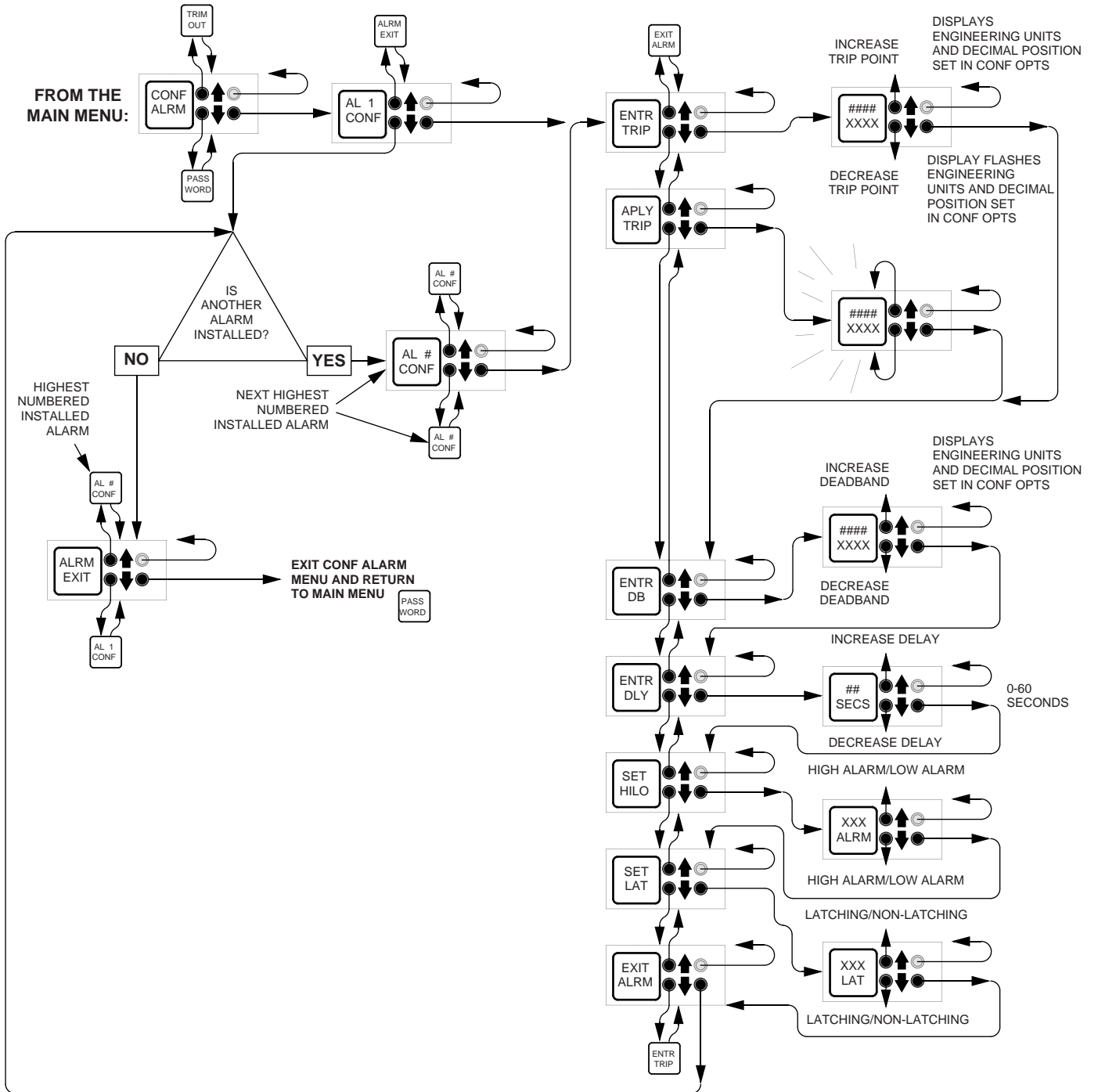
Main Menu: Change the Password Code

This menu is active when the Security Jumper is NOT installed, or when the jumper is installed and a correct password has been entered. When the jumper is installed, unless the correct password is entered, accessing this menu causes the "PASS LOCK" message to appear. Any attempt to make changes will be "locked out" (READ ONLY mode).

To change the password, select the proper menu and use the arrows to increase or decrease the number to the desired value. Figure 15 shows the menu.

NOTES:
The password can be any number between 00 AND 99.

When the security jumper (Figure 3) is NOT installed, pressing SELECT from "PASS WORD" *shows the current password setting.*

Figure 15. *The Change Password Menu*
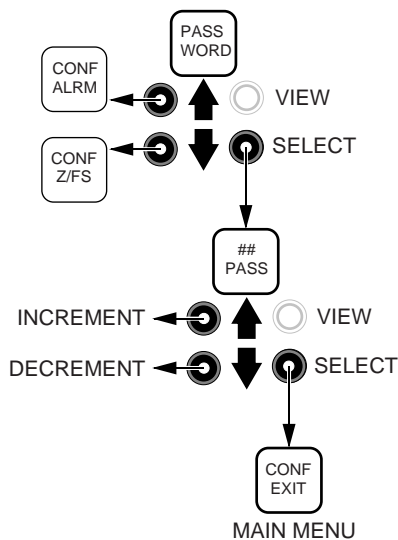
Main Menu: Set the Start Timer
(Only available on SPA with –SW option)

The Start Timer function causes the SPA to wait on startup for between 0 and 60 seconds before it checks if the motor is running. This prevents false alarms by providing the motor with enough time to startup and provide a stable input for the SPA.

The menu is displayed in Figure 16.

Figure 16. *The Start Motor Delay Timer Menu*
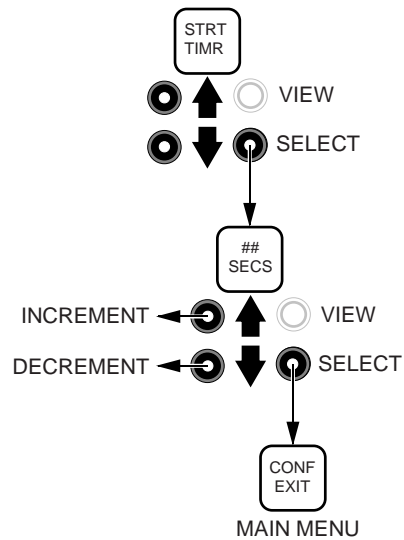
Installation

The SPA is housed in a universal DIN-style case. Its back panel is equipped with fittings that make it possible to mount the unit on both G-type and Top Hat rails. Figure 18 shows the unit dimensions.

Mounting

To mount the SPA on Top Hat DIN-rail, seat the upper extrusion on the unit back panel over the top lip of the rail and pivot downward until the housing locks into place. To mount the unit on G-type rail, seat the extrusion under the top lip of the rail and again, pivot downward.

When mounting SPAs in multiple unit scenario like a rack or cabinet, make sure to allow adequate vertical spacing for pivoting the units.

Connections

Figure 17 illustrates how to connect the SPA into your process. See the Terminal Designation table on the next page for more information.

Figure 17. *SPA Connection Diagram*
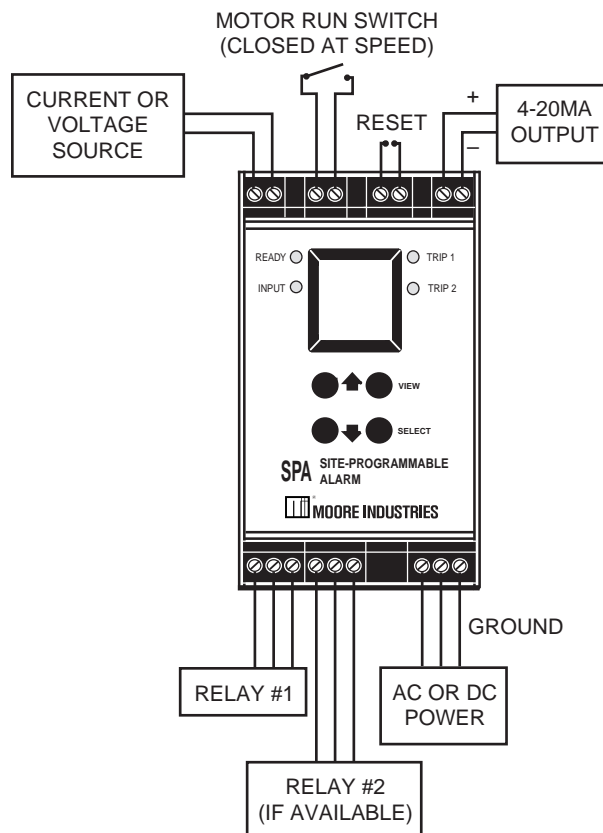
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Recommended Ground Wiring Practices

Moore Industries recommends the following ground wiring practices:

- Any Moore Industries product in a metal case or housing should be grounded.

- The protective earth conductor must be connected to a system safety earth ground before making other connections.

- All input signals to, and output signals from, Moore Industries' products should be wired using a shielded, twisted pair wiring technique. Shields should be connected to an earth or safety ground.

- For the best shielding, the shield should be run all the way from the signal source to the receiving device. (see Note below)

- The maximum length of unshielded input and output signal wiring should be 2 inches.

Note:
Some of Moore Industries' instruments can be classified as receivers (IPT[2], IPX[2], etc.) and some can be classified as transmitters (TRX, TRY, etc.) while some are both a receiver and a transmitter (SPA[2], HIM, etc). Hence, your shield ground connections should be appropriate for the type of signal line being shielded. The shield should be grounded at the receiver and not at the signal source.

Contact/Load Suppression
When the instrument relays are used to switch external relay coil, contactor, solenoid or some other inductive load, large voltage spikes may be created in nearby cable harnesses. When excessive, these voltage spikes can disrupt the operation of all nearby electronics including this product. Please follow the external relay manufacturer instructions for their recommended relay coil suppression kits. Inductive loads should have suppression devices installed on the relay right across the relay coil itself. Usually this is a simple diode for dc circuits. AC circuits routinely use an R-C snubber.

Operation
Once connected to sensors, annunciators (or other discrete devices), and appropriate power, the SPA begins to function according to its internal switch settings and the configuration stored in its non-volatile internal memory.

Configuration data, stored in memory, is monitored continuously. Changes can be made at any time. Any changes made to operating parameters controlled by choices made in the SPA menu system take effect immediately.

The settings of the internal DIP switches and security jumper may also be changed at any time. Changes to the security jumper setting, however, do not take effect until unit power is cycled off and on.

The settings for failsafe/non-failsafe and source/sink (see Figures 2 and 3, respectively), once made, take effect right away.

LEDs

There are at least three, and as many as four LEDs on the front panel of the SPA. Each is labeled, and provides a quick reference for input condition during normal unit operations.

- **READY** This LED shows green during normal operation. Green indicates that the SPA has run its startup diagnostic and that all internal circuitry is functioning properly. The LED goes out if internal errors occur.

- **INPUT** This LED shows green during normal operation. Green indicates that an input sensor or sensors has/have been connected, and that they are functioning properly. The LED turns red if there is a problem with the input.

- **TRIP #** These LEDs, one per installed relay, show green when the connected input is in a non-alarm condition relative to the trip point setting. A red LED indicates alarm.

NOTE:

The state of the SPA relays in alarm or non-alarm is determined by the failsafe/non-failsafe setting of the unit's internal DIP switches (see Figure 4, earlier in this manual). Do not confuse the state of the LED with the state of its associated relay.

Failsafe relays are ON (energized) when input is in a non-alarm condition (green LED), OFF (de-energized) in alarm (red LED).

Non-failsafe relays are ON (energized) when input is in an alarm condition (red LED), OFF (de-energized) in non-alarm (green LED).

This design scheme means that the LEDs associated with relays will always show red when the corresponding input is in an alarm condition, green in non-alarm.

Table 1. *SPA ACVPRG & ACIPRG Terminal Description*

Input	T1	T2	T3	T4	T5	T6	T7	T8	T9	T10	T11
0-5A	la	la	not present	RUN	RUN	not present	MR+	MR–	not present	+AO	–AO
0-250V	Va	Va									
Output/Power	B1	B2	B3	B4	B5	B6	B7	B8	B9	B10	B11
Single (1PRG)	NO	CM	NC				not present	not present	AC or DC Power	AC or DC Power	Ground
Dual (2PRG)	NO1	CM1	NC1	NO2	CM2	NC2					
Single –DPDT (1PRG with –DPDT Option)	NO1	CM1	NC1	NO2	CM2	NC2					
	↑ Relay #1 ↑			↑ Relay #2 ↑							

Key:
MR = Manual Reset
la = Current Input
NO# = Normally Open
CM# = Common
RUN = Motor Running
Va = Voltage Input
NC# = Normally Closed
AO = Analog Output

SPA
Site-Programmable AC
Current & Voltage Alarms

Manual Reset

There are two connections, labeled "MR +/-" on the SPA top terminal block. These terminals work in conjunction with the latching/non-latching alarm function.

When an SPA is configured with latching alarms (refer to the description of the "CONF ALRM" menu, earlier in this manual), an alarm condition will not "clear", that is, the relay will not change state, until the input returns to a non-alarm state **AND** these manual reset terminals are shorted.

Shorting the MR terminals "clears" all alarms.

Figure 18. *The Dimensions and Terminal Designations for the AC-input SPA*

SPA
Site-Programmable AC
Current & Voltage Alarms
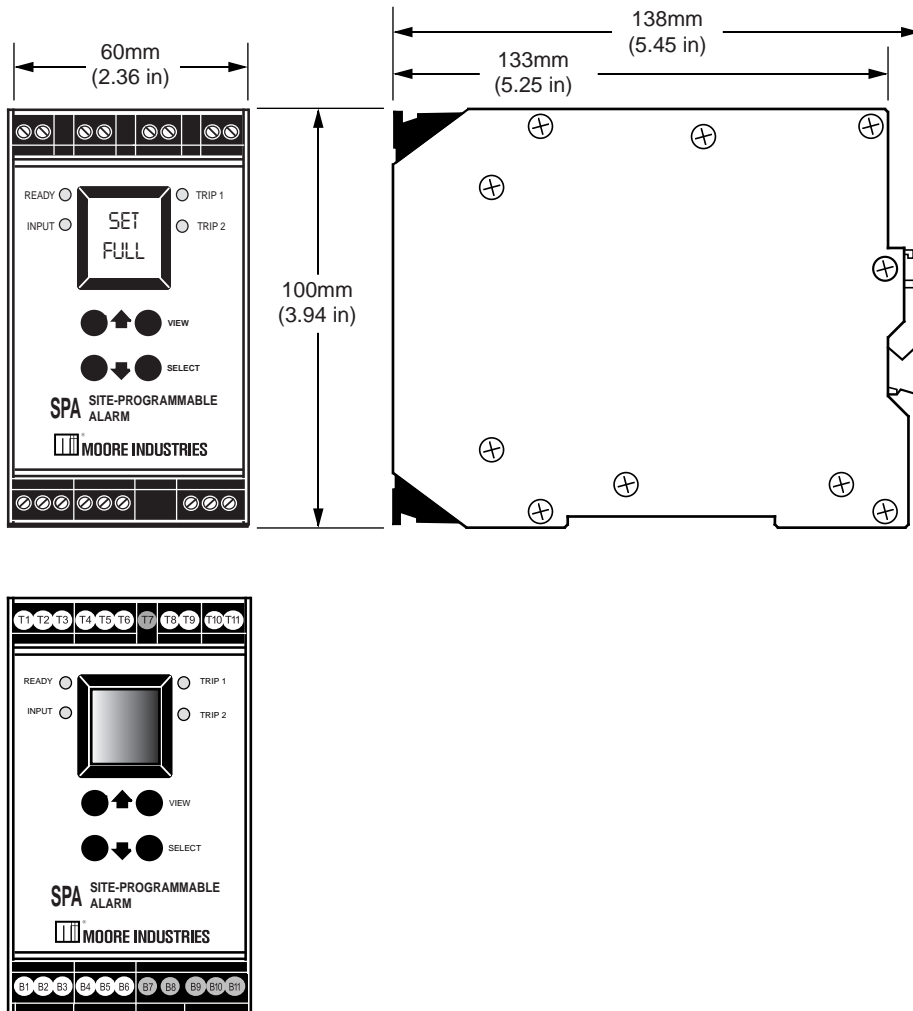
Error Codes

Every SPA is subjected to an exhaustive battery of operational checks and tests prior to its shipment. Occasionally, however, units can sustain damage getting from the factory to the user.

As a safeguard, the unit is equipped with a full set of internal diagnostics that check operation and configuration on power-up. If there are problems with the microprocessor, or with conflicting operating parameter settings, the LCD will show an error code upon unit start-up.

Table 2 lists the error codes.

For most of these problems, it will be necessary to return the offending SPA to the factory. A quick call to the nearest Moore Industries STAR Center will have a temporary replacement unit to you in as little as 24 hours, usually in even less time.

Customer Service

If service assistance is ever required for one of the SPAs in your application, refer to the back cover of this manual for the telephone numbers to Moore Industries STAR Center customer service department.

For fastest assistance, try to gather the unit's model number, serial number and the job and purchase order number under which it was shipped. This assists the factory representative in providing you with the answers you need as efficiently as possible.

Look for the model and serial numbers on a tag affixed to one of the housing side panels.

Table 2. SPA LCD Error Codes

EE FLT	EEPROM Error - The internal processor failed	Cycle power to the unit, and if the error occurs again, return the unit to the factory for service.
RAM ERR	RAM (memory) Error - The internal processor failed	
ROM ERR		
CAL ERR	Calibration Error - The factory-set calibration of the unit has failed to initialize.	
DATA ERR	Data Error - There are conflicts in the settings entered into unit memory. This can be caused by power loss or fluctuation during power-up.	Cycle power to the unit, then run through the configuration menus to ensure that the technician made the correct sensor selections for the range settings, etc.
PACT ERR	Memory Packet Failure - Internal memory failure	Cycle power to the unit, and if the error occurs again, return the unit to the factory for service.
CONF ERR	Data Error - There are conflicts in the settings entered into unit memory. This can be caused by power loss or fluctuation during power-up.	Cycle power to the unit, then run through the configuration menus to ensure that the technician made the correct sensor selections for the range settings, etc.

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GUIDELINES AND CERTIFICATIONS

Low Voltage Directive

When installing any Moore Industries product, always follow all local regulations and standards for grounding, shielding, and safety. The following grounding and wiring practices must be followed in order for the unit(s) to meet the requirements set fourth in the EMC directives EN50082-2 and EN55011.

Grounding

If the unit has a metal case it is to be grounded. (DIN rail mounted units should be mounted on a grounded rail).

Wiring

Twisted shielded wire should be used for all input and output signals. The shields are to be grounded at the units, to earth ground (safety ground). The un-shielded part of the in/output wires should be no longer than 2 inches.

CE Certification-related Guidelines

The following guidelines must be followed in order to comply with EN61010-1 (Low Voltage Directive). If these products are to be used in a non-CE environment, this directive may be disregarded.

WARNING:
If this unit is used in a manner not specified by Moore Industries, the protection provided by the equipment may be impaired.

Switches and Circuit Breakers

A switch or circuit breaker must be wired in series with the AC power conductors. The switch or circuit breaker used must be located within three meters of the unit.

WARNING:
Terminals on this unit may be connected to hazardous voltages. Before making ANY connections to this unit, ALL hazardous voltages must be de-energized.

The circuit breaker or switch will only remove power to the unit, hazardous voltages may still be connected to other terminals on the unit.

Installation Category

All of Moore Industries' terminals are rated CAT II, except those with the -RF option. These terminals are rated CAT I.

Equipment Ratings

The SPA does not generate hazardous voltages, rather, it accomodates AC inputs and generates a low voltage current output. Products connected to the SPA should be designed to receive these inputs.

Supply Wiring

All power connections should be made with the proper wire.

The end of each conductor should be stripped no more than 8mm. The end of the stripped wire should be tinned with solder, or inserted into a ferrule and crimped before being placed into a terminal block.

Conductors connected to screw-type connections should have a ring-lug or spade-lug crimped onto the wire end.

SPA AC (–SW Option) Supplement

Three minor modifications have been made to the SPA AC with –SW Option.

1. Firmware revision *2.03* is shown on the display during power-up.

2. The instrument has been modified to cause the Manual Reset (MR) to only reset when the signal is present for three seconds. Any signals less than three seconds in length are ignored.

3. The drawing in Figure 5, page 13 of the SPA AC Users' Manual, #224-770-00, version B, has been revised. The labels in the Engineering Unit menu have been changed from *DEGC* and *DEGF* to *AMPS* and *VOLT*. In addition, when the user selects *Custom Function* and *AMPS*, then the input scale is shown as *AMP* and the display scale, trip point, and deadband are all shown in *AMPS.* (When *Linear Function* is selected, all displays show the EGU as *AMP).* This allows the user to easily determine whether as SPA AC is in Custom or Linear Function mode.

Corrected Figure 5. *The Configure Options Menu*
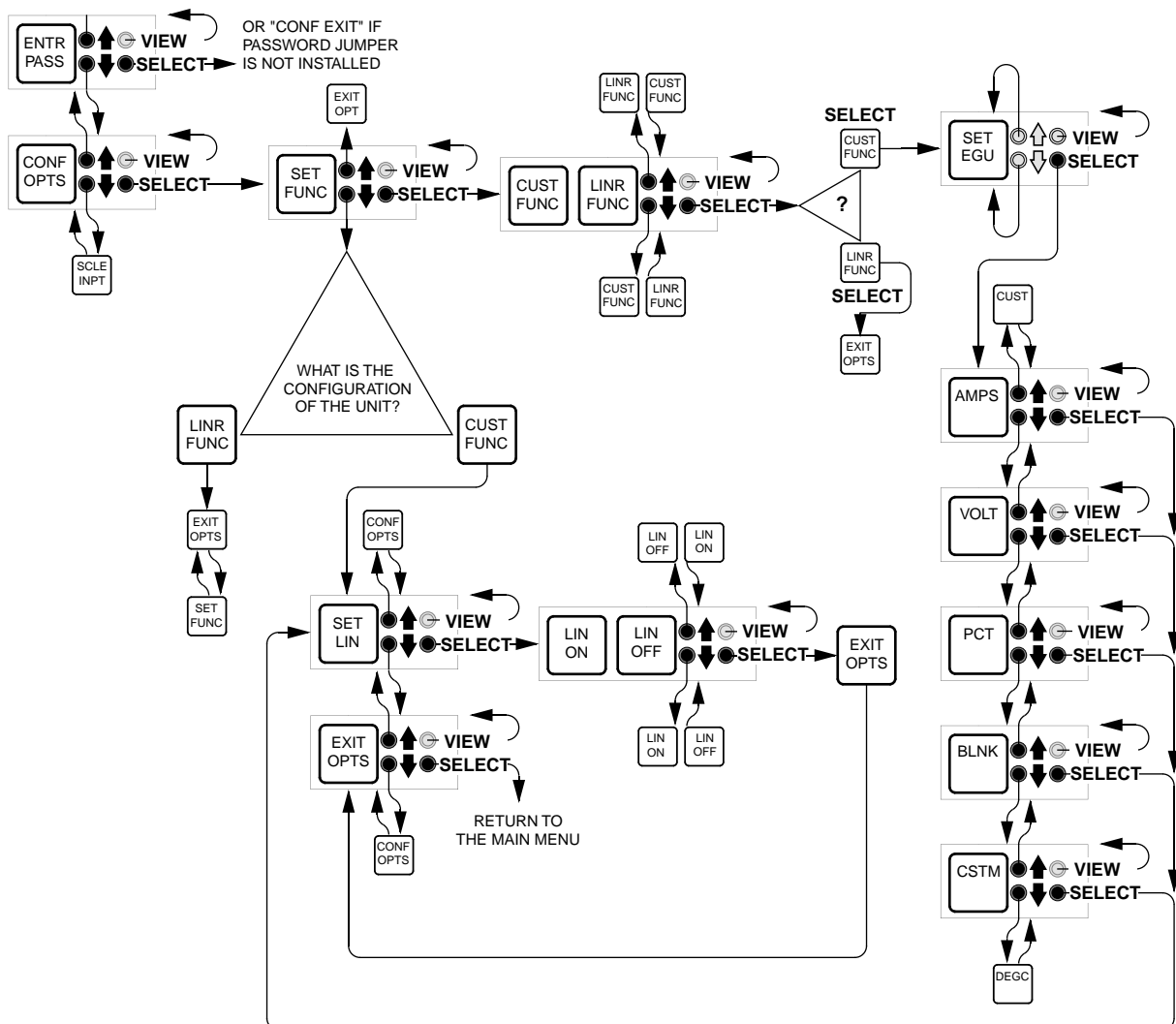
RETURN PROCEDURES

To return equipment to Moore Industries for repair, follow these four steps:

1. Call Moore Industries and request a Returned Material Authorization (RMA) number.

   ## Warranty Repair –
   If you are unsure if your unit is still under warranty, we can use the unit's serial number to verify the warranty status foryou over the phone. Be sure to include the RMA number on all documentation.

   ## Non-Warranty Repair –

   If your unit is out of warranty, be prepared to give us a Purchase Order number when you call. In most cases, we will be able to quote you the repair costs at that time. The repair price you are quoted will be a "Not To Exceed" price, which means that the actual repair costs may be less than the quote. Be sure to include the RMA number on all documentation.

2. Provide us with the following documentation:
   a) A note listing the symptoms that indicate the unit needs repair
   b) Complete shipping information for return of the equipment after repair
   c) The name and phone number of the person to contact if questions arise at the factory

3. Use sufficient packing material and carefully pack the equipment in a sturdy shipping container.

4. Ship the equipment to the Moore Industries location nearest you.

The returned equipment will be inspected and tested at the factory. A Moore Industries representative will contact the person designated on your documentation if more information is needed. The repaired equipment, or its replacement, will be returned to you in accordance with the shipping instructions furnished in your documentation.