‡   *SIGNET 8900 Multi-Parameter Controller Supplemental Manual*

1. Description

- This manual describes features for the +GF+ SIGNET 8900 Multi-Parameter Controller added in February 2004. Consult the manual supplied with the base unit for complete installation and operating instructions.
- Instruments manufactured prior to February 2004 must be returned to the factory for updating to add these features.
- The manufacture date of the 8900 is included in the serial number label on the top of the instrument as illustrated.
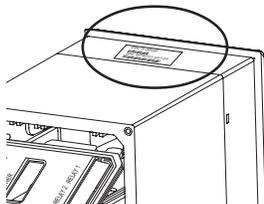
- The serial number (SN) includes the date the base unit was manufactured.

✗	**04**	**08**	**24**	**1980**
Disregard	**Year mfg**	**Month mfg**	**Day mfg**	**Sequential**

2. 4-20 mA Interface

The 8058 Signal Converter transforms any 4-20 mA signal into the digital format (S^3L) used by the 8900 and some ProcessPro Transmitters. There are two models available:

The 3-8058-1 is a single-channel converter in a wire-mount package.
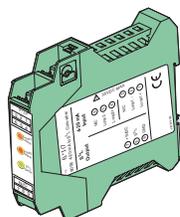
The 3-8058-2 is a two-channel converter in a standard DIN rail package.

2.1   8900 System Setup and Channel Settings for use with the 8058 Converter module

When the 8058 Converter is used with the 8900 Multi-Parameter Controller, the signal may be assigned as one of the standard CHANNEL TYPES listed in the System Setup Menu, or it may be configured as the channel type "Other (4-20)".

2.1.1   8058 as a Standard Channel Type

If the 8058 Converter input is assigned to one of the standard channel types (flow, pH, ORP, Conductivity, Pressure, Temperature, Level) all of the standard menus in the 8900 are used to program the channel.

2.1.2   8058 as Channel Type "Other (4-20)"

Special menu items appear in the Channel Settings menu when a channel is set to "Other".

Example: Program a 4-20 mA input to measure Turbidity.

1. Press the ENTER key for 2 seconds to jump to the menu directory. Press ENTER again to select the System Setup menu. Set one of the channels to Channel Type "Other".

2. Press the UP and DOWN keys together to exit the System Setup menu. Press the DOWN key to scroll to the Channel Settings menu and press the ENTER key to begin editing.

3. Navigate through the Channel Settings menu to set the label, abbreviation and units of measure.
- **Label:** The information here will appear as the full name of the channel. **Example: Turbidity***
  NOTE: If the last character in the label is "*", the label will be centered on the display.
- **Abbreviation:** Select a two-character abbreviation for the channel.   **Example: Tu**
- **Units:** Set the engineering unit for this measurement. **Example: NTU** (Nephelometric Turbidity Units)

4. Complete the remaining items to set the 4 mA and 20 mA endpoints, to set the decimal point and to select the averaging speed.
- Press the UP and DOWN keys together two times to exit back to View Mode and normal operation.
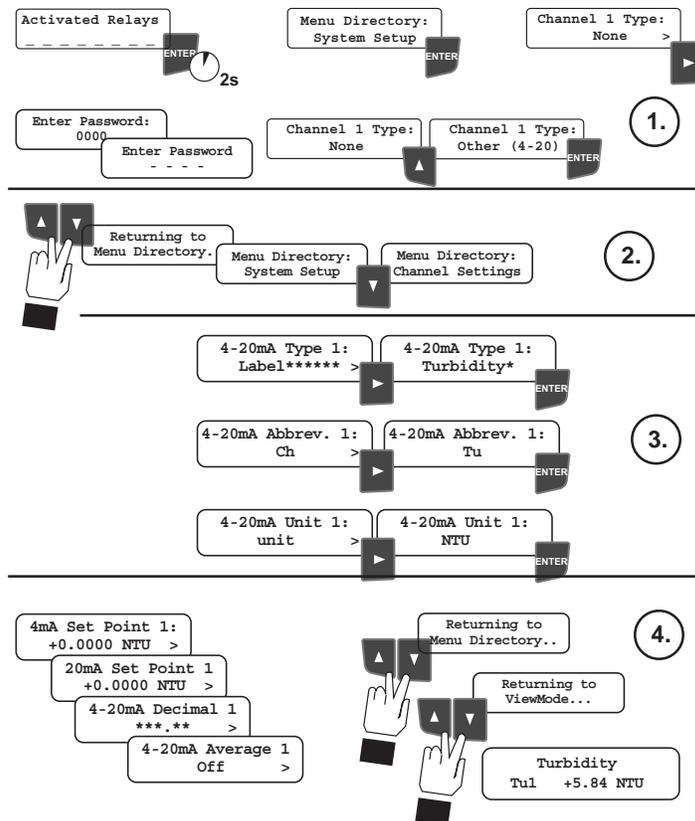
3. Input capability and S³L wiring configurations

The 8900 can be configured with Input/Output modules that provide 2, 4 or 6 input signals. Ordering information for the 6-channel modules are listed here. See the main product manual for a complete list of modules.

Mfr. Part No.	Description
3-8900.401-9	Six inputs, no outputs
3-8900.401-10	Six inputs, two passive 4 to 20 mA outputs
3-8900.401-11	Six inputs, two active 4 to 20 mA outputs
3-8900.401-12	Six inputs, two 0 to 5/10 VDC outputs

3.1 Calculate maximum current requirement

- The maximum cable length of the digital (S³L) bus varies depending on the types of sensors connected and the size of the conductors in the cable. For best results, determine the maximum cable length for the system before routing cables.
- Excessive cable length may cause signal loss and/or intermittent performance. Use the chart to calculate the total current requirements of your set of sensors.
- Frequency input signals from flow sensors are not part of the digital bus, so they do not impact the cabling calculation. Follow the maximum cable specifications published in the flow sensor literature.

Maximum Current Consumption for S³L Devices			
S³L Device	Maximum current consumption	Number of Devices Used	Total Current Consumption
2350 Temperature Sensor	1 mA		
2450 Pressure Sensor	1 mA		
2750/2760 pH and ORP Sensors	3 mA		
2850 Conductivity Sensor	2 mA		
8058 Current-to-S³L Module	3 mA		
8059 External Relay Module *	1 mA		
Total Current Consumption			

* The 8059 S³L communication link is powered by the 8900 and consumes 1 mA maximum. The 8059 External Relay Module requires a separate power source for to operate the relays.

3.2 Determine the maximum cable length

- Find the column on the chart that is closest to the total current. If necessary, use the next higher value to avoid problems.
- Cables available from Signet are 22 AWG, and have a capacitance of approximately 35 pf/ft.
- Larger conductors facilitate longer cable runs.

Maximum total cable length from S³L Devices to 8900

Wire Size	Total Current Consumption of S³L Devices					
	1 mA	2 mA	4 mA	10 mA	20 mA	40 mA
24 AWG	1800 ft	900 ft	450 ft	180 ft	90 ft	40 ft
22 AWG	2850 ft	1420 ft	710 ft	280 ft	140 ft	70 ft
20 AWG		2290 ft	1140 ft	450 ft	220 ft	110 ft
18 AWG			1810 ft	720 ft	360 ft	180 ft
16 AWG			2840 ft	1130 ft	560 ft	280 ft
14 AWG				1850 ft	920 ft	460 ft
12 AWG				2940 ft	1470 ft	730 ft

Cable capacitance <15 pf/ft

Cable capacitance <30 pf/ft

Cable capacitance <50 pf/ft (practically all cables)
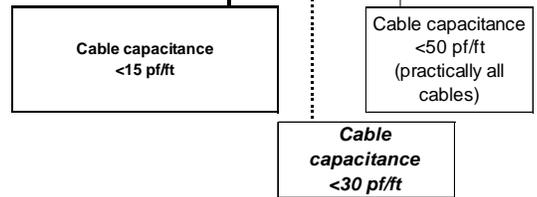
3.3 Example:

- The total current requirement for the S³L bus in the example is 10 mA.
- The conductors in the cable being used are 22 AWG.
- The chart shows a maximum of 280 ft. for 22 AWG cable @ 10 mA.
- If longer cable is required, the wire size must be increased. By substituting 20 AWG conductors, the cable length can be increased to 450 ft.

Maximum Current Consumption for S³L Devices			
S3L Device	Number of	Number of Devices Used	Total Current Consumption
2350 Temperature Sensor	1 mA	1	1
2450 Pressure Sensor	1 mA	2	2
2750/2760 pH and ORP Sensors	3 mA	1	3
2850 Conductivity Sensor	2 mA		
8058 Current-to-S³L Module	3 mA	1	3
8059 External Relay Module *	1 mA	1	1
Total Current Consumption			10

* The 8059 S³L communication link is powered by the 8900 and consumes 1 mA maximum. The 8059 External Relay Module requires a separate power source to operate the relays.

3.4 Planning the S³L Cable routing

After the maximum cable length is known, plan the cable routing scheme to complete the installation. The diagrams here illustrate some of the options for connecting the S³L sensors to the 8900. Use any combination of these to plan the most efficient route for the sensor cables. Do not exceed the maximum length specifications.

How to wire S³L sensors:
1. Tie all red wires together
2. Tie all white wires together
3. Tie all black wires together.
4. Tie cable shield to white GND wire at one end only for added protection from noise interference.
• Some installations may require connecting the cable shield to Earth ground to overcome noise interference.

3.4.1   "Multi-Drop" Wiring Pattern
Six digital (S³L) sensors and a Relay Module in a "Multi-Drop" pattern. The wires from each sensor are spliced to a common set of wires from the 8900.

NOTE: If a flow sensor is connected to terminals 1-2-3, only five digital sensors can be used. The 8900 has only six input channels available.

(The 8059 Relay module uses the S³L bus, but does not occupy an input channel.)
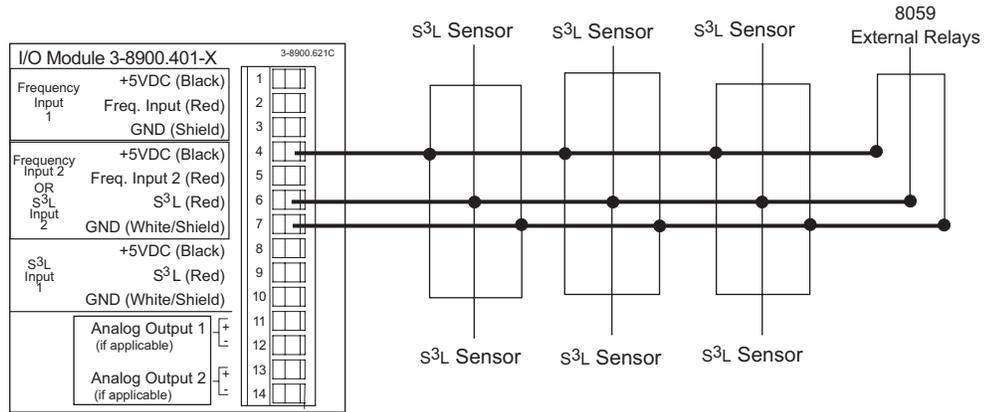
3.4.2   "Daisy-Chain" Wiring Pattern
Six digital (S³L) sensors and a Relay Module in a "Daisy-Chain" pattern. The wires from one sensor are spliced to the matching wire of the next sensor.

NOTE: If a flow sensor is connected to terminals 1-2-3 or to terminals 4-5-7, then one of the digital sensors must be removed. The 8900 has only six input channels available.
(The 8059 Relay module uses the S³L bus, but does not occupy an input channel.)
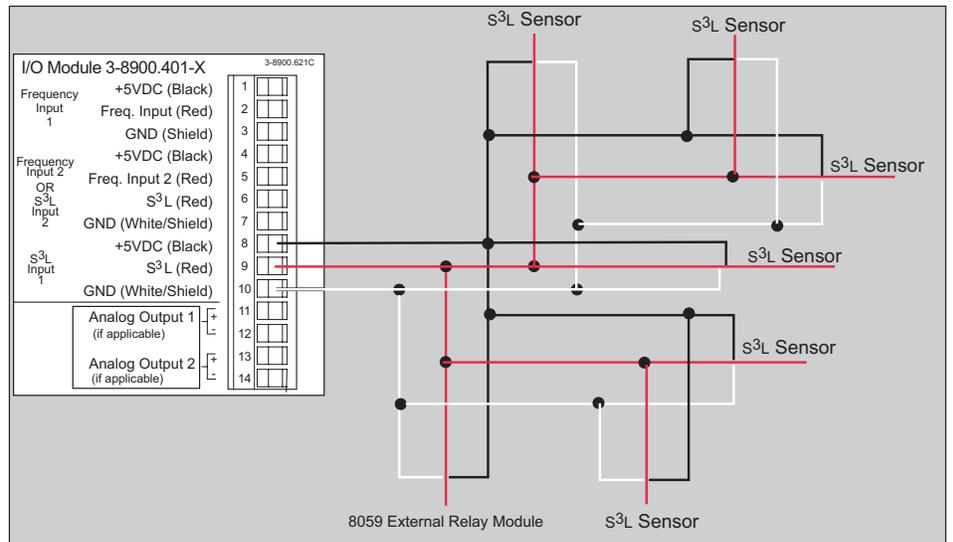
3.4.3   Frequency Input

• The 8900 accepts one or two frequency inputs from flow sensors. Each flow sensor will occupy one channel.

• The frequency input connected to terminals 1-2-3 will be identified in the 8900 menu as Freq. In 1.

• The frequency input connected to terminals 4-5-7 will be identified in the 8900 menu as Freq. In 2.

---
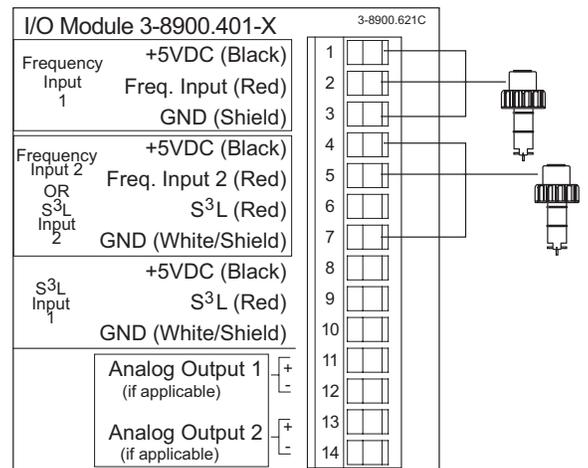
4. Automated System Setup

Basic system setup functions are automated in the 8900.
Channel Type selections in the System Setup menu must be completed to effectively enable the automatic functions.
After installation and wiring is completed, follow the steps below.
NOTE: Automatic Sensor Recognition occurs each time the 8900 is powered on. See the following page for additional information.

4.1 System Setup: Channel Type
Example: Set Channel 1 to operate as a Flow Channel:
1. Start from normal Operation. (In a new unit, the View display depends on the type of I/O module.).
2. Hold the ENTER key for 2 seconds. When the display shows "Menu Directory-System Setup", release, then press ENTER again.
3. Press the RIGHT key, then enter the password.
4. The channel type will be flashing "None". Press the DOWN key three times to scroll to "Flow".
5. The display will show two warning messages, then ask if you are sure you want to make the change.
    Press the RIGHT key to change the flashing response to "Yes", then press the ENTER key to finalize the change.
6. The display will show "Saving" for a few seconds, then return to the root menu.
    Press the DOWN key to scroll to the next channel type setting, then repeat the procedure steps 4 and 5.
7. If all settings in this menu are complete, press the UP and DOWN keys together again to return to the Menu Directory.
8. Press the UP and DOWN keys together once more to return to the View mode and normal operation.
    The display will now show the information from the sensor assigned to Channel 1.

1.

```
    Activated Relays
    _ _ _ _ _ _ _ _
```

2.

ENTER 2s →
```
Menu Directory:
  System Setup
```
ENTER →
```
Channel 1 Type:
   None      >
```

3.

►
```
Enter Password:
     000
```
```
Enter Password
    - - - -
```
```
Channel 1 Type:
     None
```

4.

▼
```
Channel 1 Type:
    Level
```
▼
```
Channel 1 Type:
  Conductivity
```
▼
```
Channel 1 Type:
    Flow
```

5.

ENTER
```
Channel Data
Will be RESET!
```
```
Check Relay And
Output Sources
```
```
Are You Sure?
   No    Yes
```
► ENTER

6.

```
Are You Sure?
   Saving
```
```
Channel 1 Type:
   Flow      >
```
▼
```
Channel 2 Type:
   None      >
```
OR

7.

▲ ▼
```
Returning to
Menu Directory..
```
```
Menu Directory:
  System Setup
```

8.

▲ ▼
```
Returning to
ViewMode
```
```
       Flow
F1   34.01   GPM
```

4.2 Automatic Sensor Recognition:

- S³L sensors are detected at every power up, and placed on a list that identifies each by type and serial number.
  When new S³L sensors are detected, the 8900 displays **"Found New S³L Devices"** , then **"Loading...Please wait".**
  When completed, the display shows how many sensors are connected, and if a Relay Module is detected.

```
6 Sensor(s) and
1 Ext Relay(s)
```

Manual override option: The **"Load S³L Devices"** function in the System Setup menu is available as a troubleshooting tool, to verify that all sensors are detected on the S³L bus. It is not required for normal operation.

4.3 Automatic Channel Assignment:

After a channel type is assigned (section 4.1), the 8900 compares the new sensor identification list with each channel type and assigns a sensor to each channel, following a specific heirarchy:

1. All Channels: Native sensors (sensors of the same measurement type as the channel type) will be assigned first.
   If multiple sensors of the same type are listed, the lowest serial number will be assigned first.
   Frequency inputs are considered the native type for flow channels.
2. Flow Channels: S³L type flow sensor will be assigned if no frequency input is detected.
   Level Channels: If no level sensors are listed, a pressure sensor will be assigned to the level channel.
3. All Channels: 4-20 mA sensors (from 8058 Signal Converter) will be assigned only if no native sensors are listed.
   If no compatible sensors are listed for a channel, or if all compatible sensors are already assigned, then no automatic channel assignment will be made.

   Manual override option: Use the **"Channel ID"** function to reassign sensors.
- The Channel ID menu will only list sensors that match the channel type being assigned.
- Removing a sensor from the wiring bus does NOT erase a channel assignment. The display will show "CHK SENSOR" for that channel until a sensor is manually reassigned.

4.4 Automatic Display Configurations

- A new display will be automatically configured for each channel (only where one of the six configurable displays has both lines set to "None".)
- Conductivity, Level and pH channels are allotted two-line displays to view both primary and secondary measurements. All other channel types are assigned a single-line display.
- Standard displays for each channel type are illustrated below.

Manual override option: Configurable VIEW displays can be modified with the **""Screen--Line--"** functions in System Setup menu.

---

pH Channel
The default pH display shows the primary pH measurement on line 1 and the secondary temperature measurement on line 2.

```
pH1        8.6 pH
T1        29.7 °C
```

Flow Channel
The default Flow display shows the full name of the measurement type on line 1 and the measurement value on line 2.

```
        Flow
F2     123.45 GPM
```

Conductivity Channel
The default Conductivity display shows the primary Conductivity measurement on line 1 and the secondary temperature measurement on line 2.

```
C3     17.54 µS/cm
T3        24.3 °C
```

Pressure Channel
The default Pressure display shows the full name of the measurement type on line 1 and the measurement value on line 2.

```
       Pressure
P4        35.9 psi
```

Temperature Channel
The default Temperature display shows the full name of the measurement type on line 1 and the measurement value on line 2.

```
      Temperature
T5        29.7 °C
```

Level Channel
The default Level display shows the primary Level measurement on line 1 and the secondary Volume measurement on line 2.

```
L4        12.58 ft
V4       987.65 ft3
```

ORP Channel
The default ORP display shows the full name of the measurement type on line 1 and the measurement value on line 2.

```
        ORP
ORP6       128 mV
```

Other (4-20) Channel
The default Other (4-20) display shows "Label" on line 1 and the measurement value on line 2.
NOTE: The channel label (Label), abbreviation (Ch) and unit of measure (Unit) settings must be customized for this type of channel. See section 2.1.2 "Channel Type Other (4-20)"

```
        Label
Ch1    12.34 Unit
```

---

5. Multiple Relay Sources and Advanced Relay Mode

When a Relay Source is set to "MULTIPLE" and the Relay Mode is set to "Advanced", the relay can be activated by up to three different conditions. ADVANCED mode presents four Boolean logic formulae called "Relay Operators." Each Operator can be programmed with up to three different conditions. The relay will only be activated when the complete formula is satisfied.

5.1 Boolean Relay Logic Options

(a I b I c) means
"Activate this relay when either a OR b OR c is true."

```
Relay 1 Operator
  ( a | b | c ) >
```

```
Relay 1 Operator:
  ( a & b & c ) >
```

(a & b & c) means
"Activate this relay only when a AND b AND c are all true."

(a I (b & c)) means
"Activate this relay if a is true OR if b AND c are both true."

```
Relay 1 Operator:
 ( a |(b & c) ) >
```

```
Relay 1 Operator:
 ( a &(b | c) ) >
```

(a & (b I c)) means
"Activate this relay only if a is true AND either b or c are also true."

5.2 Program a Relay for Advanced Operation

1. Starting from normal operation (View mode), Press and hold the ENTER key for 2 seconds to jump to the Menu Directory. Press the DOWN key three times to scroll to the RELAY menu then press ENTER key.

```
         Flow
 F1    123.45    GPM
```

ENTER **2s**

```
 Menu Directory:
   System Setup
```
```
   Menu Directory:
       Relay
```
ENTER
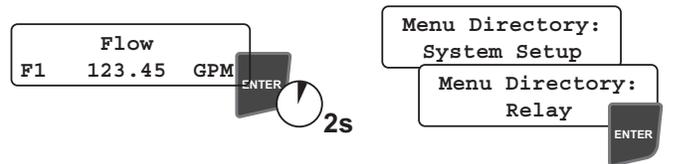
2. Use the keypad to navigate through the Relay menu. Set the relay Source to "Multiple" and set the Relay mode to "Advanced."

```
 Relay A Source:
    None     >
```
```
   Relay A Source:
      Multiple
```
```
 Relay A Mode:
    Off        >
```
```
   Relay A Mode:
      Advanced
```
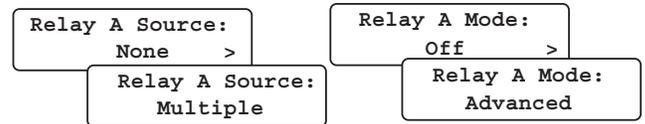
3. Select one of the four "Relay Operator" options.

```
 Relay A Operator
  ( a | b | c ) >
```
```
   Relay A Operator:
    ( a & b & c ) >
```
```
     Relay A Operator:
      ( a |(b & c) ) >
```
```
       Relay A Operator:
        ( a &(b | c) ) >
```
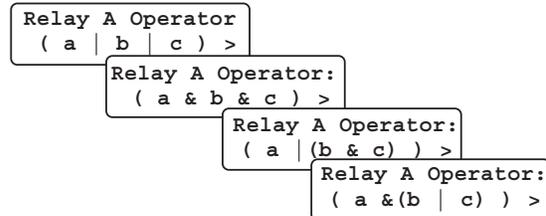
4. Set up to three sources for the Relay, assign each source a Mode (High, Low or Off) then set a Setpoint, Hysteresis and finally a delay time if applicable.

```
 Relay A Source1:
    Flow F1      >
```
```
   Relay A Mode 1:
      Low       >
```
```
     Relay A Setpnt1:
       +0.00 GPM     >
```
```
       Relay A Hys 1:
         +0.00 GPM     >
```
```
         Relay A Delay:
           0.0 secs  >
```
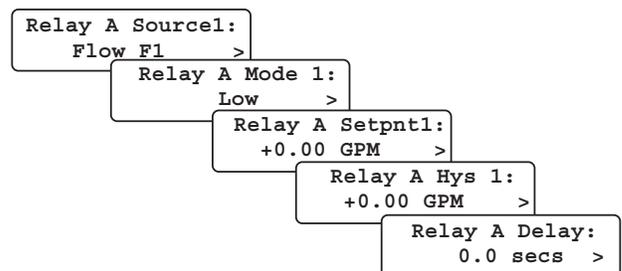
5. When all relay parameters are set, press the UP and DOWN keys together to exit from the Relay menu back to the Menu Directory, then press the same keys again to exit from the Menu Directory back to normal operation.

```
   Returning to
 Menu Directory
```
```
    Menu Directory:
        Relay
```
```
   Returning to
    ViewMode
```
```
         Flow
 F1    123.45    GPM
```
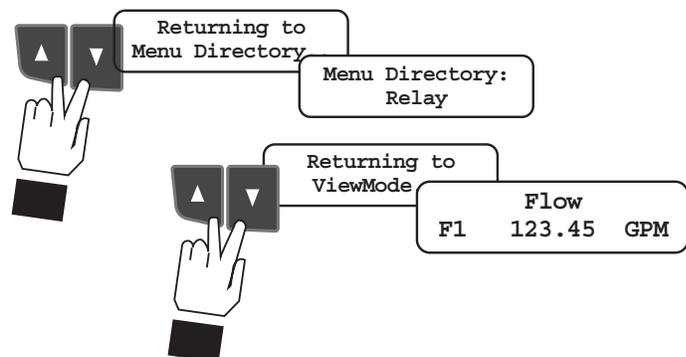
• In Advanced Relay mode, if any one of the relay sources has a "CHK SENSOR" indication, the logic condition will be set to FALSE.

6.   Multiple Language menus:

The 8900 can be configured to display in English, French, German, Italian, Portuguese or Spanish.

- When the display Language is changed in the Options Menu, the Decimal Separator will automatically be changed.
  English and Spanish will be set to use a Decimal point: 12.34 LPM
  All other languages will be set to use a comma: 12,34 LPM

To change the display language, starting from the standard View Display and normal operation:

1. Press the ENTER key for two seconds to jump to the Menu Directory, scroll to the Options Menu and press the ENTER key again.

```
       Flow
F1    123.45   GPM
```
ENTER 2s

```
Menu Directory:
   System Setup
```
```
Menu Directory:
    Options
```
ENTER
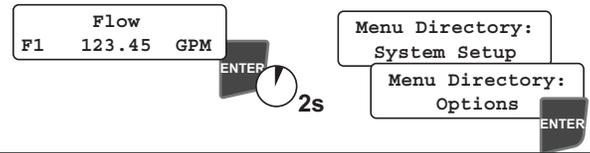
2. Use the keypad to navigate to the Choose Language display, select the new language and press the ENTER key to save the selection. (The Choose Language" display is illustrated in all six available languages.)
- All of the displays will change to the new language as soon as the selection is saved.
- Text that is set by the user will not be changed. This includes any text in the Memo display, and the customized fields in "OTHER (4-20)" channels. (labels, abbreviations and Unit settings.)

```
Choose Language:
    English     >
```
```
Scelga La Lingua
    Italiano    >
```
```
Sprachauswahl:
    Deutsch    >
```
```
Choisir Language:
    Francais    >
```
```
Escoja Lenguage:
    Espanol     >
```
```
Escolher Lingua:
    Portugues    >
```

▲ ▼
```
Returning to
Menu Directory
```
```
Menu Directory:
    Options
```
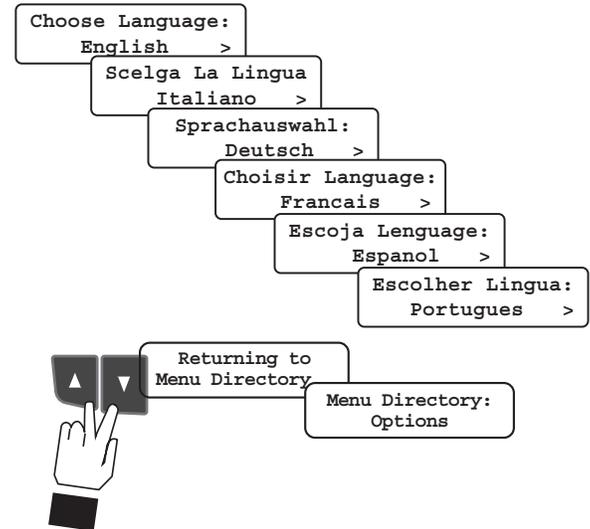
3. Press the UP and DOWN keys together to exit from the Options menu back to the Menu Directory, then press the same keys again to exit from the Menu Directory back to normal operation.
- The display will reflect the new language selection. The illustration at right shows a standard Flow Channel display in all six languages available in the 8900.

▲ ▼
```
Returning to
ViewMode
```
```
       Flow
F1    123.45   GPM
```
```
      Portata
Q1    123,45    GPM
```
```
     DurchFluss
Q1     123,45    LPM
```
```
        Débit
D1     123,45     LPM
```
```
      Caudal
Q1    123.45    GPM
```
```
      Vazao
Vz1   123,45   GPM
```
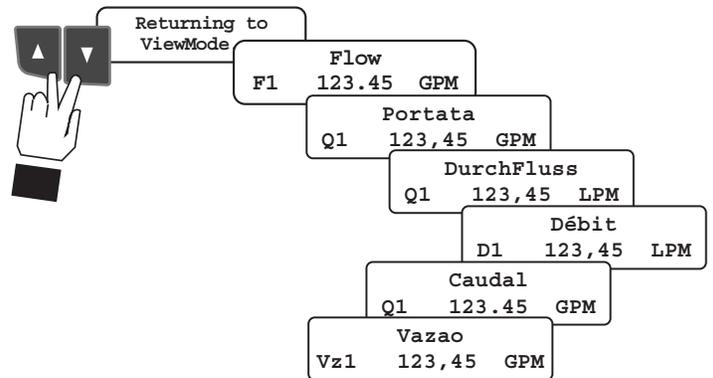
6.1   To restore a language if you cannot read the display:

- **a.** Press and hold the ENTER key for two seconds.
- **b.** Press the UP key one time.
- **c.** Press the ENTER key.
- **d.** Press the UP key two times.
- **e.** Press the RIGHT key.
- **f.** Enter the Password.
- **g.** Press the UP and DOWN keys until the correct language is displayed.
- **h.** Press the ENTER key.
- **i.** Press the UP and DOWN keys together to exit from the Options Menu
- **j.** Press the UP and DOWN keys again to exit from the Menu Directory back to the View Mode and normal operation.

7. Ordering Information

Mfr. Part No.	Code	Description
Base Unit, required; choose one		
3-8900	159 000 868	Base unit with back-lit LCD
3-8900-VF	159 000 869	Base unit with vacuum fluorescent display
I/O Module, required; choose one		
3-8900.401-1	159 000 870	Two inputs, no outputs
3-8900.401-2	159 000 871	Two inputs, two passive 4 to 20mA outputs
3-8900.401-3	159 000 872	Two inputs, two active 4 to 20mA outputs
3-8900.401-4	159 000 873	Two inputs, two 0 to 5/10 VDC outputs
3-8900.401-5	159 000 874	Four inputs, no outputs
3-8900.401-6	159 000 875	Four inputs, two passive 4 to 20mA outputs
3-8900.401-7	159 000 876	Four inputs, two active 4 to 20mA outputs
3-8900.401-8	159 000 877	Four inputs, two 0 to 5/10 VDC outputs
3-8900.401-9	159 000 968	Six inputs, no outputs
3-8900.401-10	159 000 969	Six inputs, two passive 4 to 20 mA outputs
3-8900.401-11	159 000 970	Six inputs, two active 4 to 20 mA outputs
3-8900.401-12	159 000 971	Six inputs, two 0 to 5/10 VDC outputs
Power Module, required; choose one		
3-8900.402-1	159 000 878	85 to 264 VAC power
3-8900.402-2	159 000 879	12 to 24 VDC power
Relay Module, optional; choose zero, one or two		
3-8900.403-1	159 000 880	Two dry-contact relays
3-8900.403-2	159 000 881	Two solid-state relays
External Relay Module, optional; choose zero or one		
3-8059-2	159 000 770	Two external dry-contact relays
3-8059-2AC	159 000 771	Two external dry-contact relays w ith power supply
3-8059-4	159 000 772	Four external dry-contact relays
3-8059-4AC	159 000 773	Four external dry-contact relays with power supply
Additional Outputs, optional; choose zero or one		
3-8900.405-1	159 000 883	Two passive 4 to 20mA outputs
3-8900.405-2	159 000 884	Two active 4 to 20mA outputs
3-8900.405-3	159 000 885	Two 0 to 5/10 VDC outputs
3-8900.404-1	159 000 882	RS232 communication module

Accessories

Mfr. Part No.	Code	Description
3-8050-1	159 000 753	Universal Mount Junction Box
3-8050-1CR	159 000 889	Universal Mount Junction Box w/Ranges (for use with 2850)
3-8050-2	159 000 754	Universal Mount Junction Box w/EasyCal (for use with 2750)
3-8050-2CR	159 000 802	Universal Mount Junction Box w/EasyCal (for use with 2850)
3-8050.392	159 000 640	Panel adapter, 1/2 DIN to 1/4 DIN
3-8050.395	159 000 186	Splashproof rear cover
3-8050.396	159 000 617	RC Filter kit (for relay use, 2 pieces)
3-8052-1	159 000 755	3/4 in. NPT Mount Junction Box
3-8052-1CR	159 000 890	3/4 in. NPT Mount Junction Box w/Ranges (for use with 2850)
3-8052-2	159 000 756	3/4 in. NPT Mount Junction Box w/EasyCal (for use with 2750)
3-8052-2CR	159 000 803	3/4 in. NPT Mount Junction Box w/EasyCal (for use with 2850)
3-0000.596-1	159 000 892	1/4 DIN wall mount bracket, 6.5 in. (use if no rear cover is installed)
3-0000.596-2	159 000 893	1/4 DIN wall mount bracket, 9 in. (use if rear cover is installed)
3-5000.399	198 840 224	Panel adapter, 5 x 5 in. to 1/4 DIN
3-5000.598	198 840 225	Shelf/Pipe mount bracket
3-8900.390	159 000 891	DB-9 crossover cable (for clone mode)
3-9000.392	159 000 368	Liquid tight connector kit, (3 pieces)
3-9000.392-1	159 000 839	Liquid tight connector kit, NPT (1 piece)
3-9000.392-2	159 000 841	Liquid tight connector kit, PG13.5 (1 piece)

Spare Parts

Mfr. Part No.	Code	Description
3-8900.614	159 000 902	14-terminal plug (for I/O Module)
3-8900.604	159 000 903	4-terminal plug (for Power Module)
3-8900.606	159 000 905	6-terminal plug (for Dry-contact Relays)
3-8900.602	159 000 904	2-terminal plug, 2 ea. (for SSR & Outputs 3 & 4)
3-8900.391	159 000 918	Rear Panel w/ Captive Screws
3-8900.561	159 000 919	Front Face Panel Gasket