

Instruction Manual

**Whessoe Varec Model 1410
Averaging Selection Unit (ASU)**

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Safety Precaution Definitions

CAUTION

Damage to equipment may result if this precaution is disregarded.

WARNING

Direct injury to personnel or damage to equipment or data may result if this precaution is not followed.

Safety Precautions

CAUTION

Read and understand this instruction manual before installing, operating or performing maintenance on the Whessoe Varec Model 1410 Averaging Selection Unit (ASU). Follow all precautions and warnings noted herein when installing, operating or performing maintenance on this equipment.

WARNING

- The mechanical connections between the guide cables, the floats, the tape and the gaugehead provide a resistance to ground that is adequate for the safe electrical drain of electrostatic charges that may accumulate in the tank and the product. Worker activity and worker clothing may accumulate electrostatic charges on the body of a worker. Care should be used in flammable environments to avoid the hazard.
- Make certain grounding straps are fastened properly to the case of each unit. Ground connections via unit mounting clamps and bolts are not sufficient to ensure a proper ground.

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Section 1 – Introduction

Using This Manual

This manual is designed to assist the user with the installation, configuration, operation, maintenance, and troubleshooting of the Whessoe Varec Model 1410 Averaging Selection Unit (ASU) as follows:

Section 1 - Introduction

Contains an overview of this manual and an introduction.

Section 2 - Installation and Commissioning

Contains instructions for unpacking, mounting, wiring, and commissioning.

Section 3 - Theory of Operation

Contains information about system operation and mechanical details of the electrical assembly.

Section 4 - Maintenance and Calibration

Provides maintenance and calibration information.

Section 5 - Specifications and Spare Parts List

Provides specifications and a spare parts list.

Getting Acquainted with the Averaging Selection Unit (ASU)

The Whessoe Varec Model 1410 Averaging Selection Unit (ASU) is a solid state microprocessor based transmitter. When connected to a Whessoe Varec Model 9909 Averaging Temperature Bulb in conjunction with a Whessoe Varec Model 1900 Level Transmitter, the Model 1410 supplies tank temperature data based on the longest fully immersed element of the averaging temperature bulb.

The ASU communicates with the Whessoe Varec computer/receiver over the same four wires as the Model 1900 Level Transmitter.

Construction

The Model 1410 Averaging Selection Unit has an integral intrinsically safe barrier to conform with requirements of Intrinsic Safety Averaging Temperature Gauging. Refer to Figure 1-1 for an exploded view of the ASU.

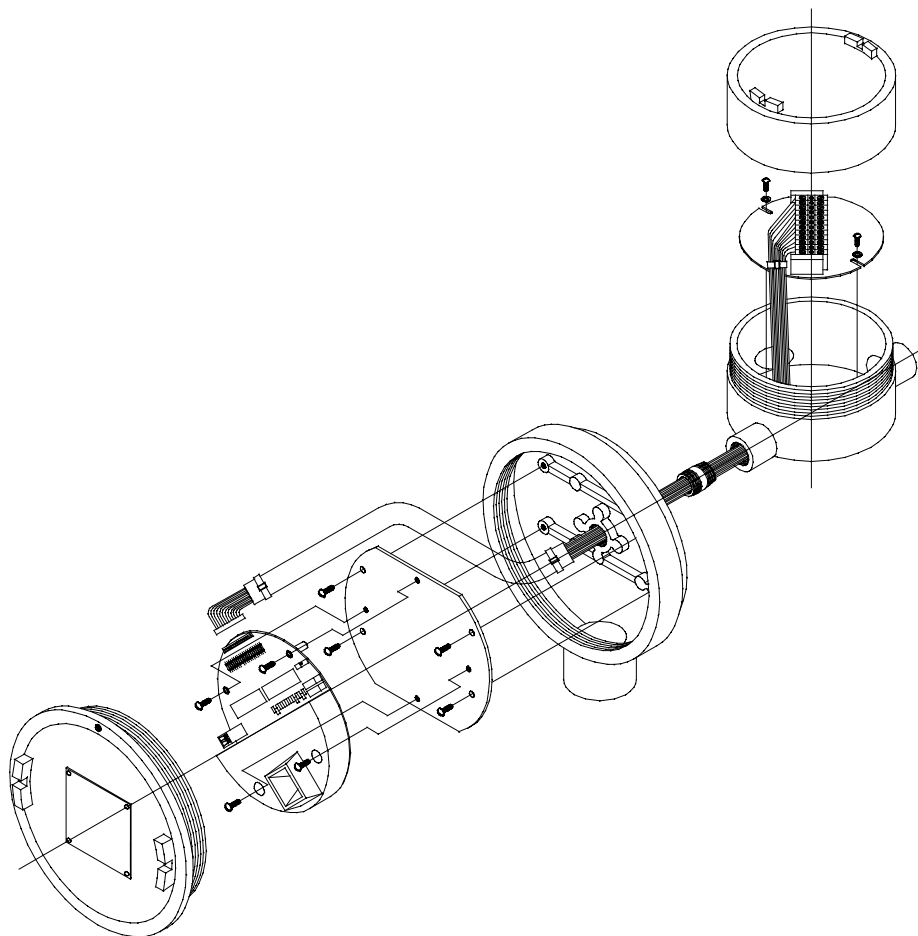


Figure 1-1 Model 1410 Exploded View

Section 2 – Installation and Commissioning

Overview

This section contains instructions for unpacking, mounting, and wiring the Whessoe Varec Model 1410 Averaging Selection Unit (ASU).

WARNING

To avoid electric shock and possible injury, do not perform any service procedures other than those specified in this manual. These installation instructions are for use by qualified service technicians.

Unpacking the ASU

Remove the ASU from the shipping container and inspect it for evidence of shipping or handling damage. Report any shipping damage to the carrier. Verify that the contents of the shipping container agrees with the packing list.

Storage Prior to Installation

If the ASU is to be stored prior to installation, it should be repackaged in its shipping container and stored in a *temperature and humidity controlled environment*.

Mounting the ASU

The Model 1410 Averaging Selection Unit mounts directly onto the Averaging Temperature Bulb. The installation of the averaging temperature bulb must be completed before the ASU is installed.

Orientation of the ASU should be to facilitate connection of the field wiring and service to the unit.

Wiring the ASU

Conduit Entries

It is recommended that seals be installed at conduit entries to prevent the entry of moisture.

Conductor Sizing

The installation standard of the wiring must conform to the area classification code and the current edition of the appropriate electrical codes.

The sizing of conductors between the Model 1900 Level Transmitter with the ASU and receiver is a function of the number of transmitters in a loop and the length of the conductors from the receiver to the furthest transmitters.

The loop resistance can be calculated using the following formulas where N is the number of Model 1900/ASUs in the system:

Model 1900 with Brush Encoder and ASU

$$R = 18000 / (40 \times N) + 100$$

Model 1900 with Optical Encoder and ASU

$$R = 18000 / (40 \times N) + 140$$

If the loop resistance of B+ and B- exceeds the calculated value of R, consult with Whessoe Varec about the use of a repeater or booster unit.

Loop resistance is measured by shorting B+ and B- at the transmitter and measuring the resistance of B+ and B- at the receiver.

Terminations

Terminations between the ASU and the averaging temperature bulb are by screw terminals. Refer to Table 2-1 for connection details and to Figure 2-1 for Model 1410 system wiring with the Model 1900 Level Transmitter.

Field wiring terminations are made on the ASU power supply board. Refer to Table 2-2 for details of connections.

Table 2-1 ASU to Temperature Bulb Connections

Bulb Range		Bulb Wiring Color	TB-2 Connection
0-5 ft	0-0.7 m	Brown	1
0-7 ft	0-2.1 m	Red	2
0-10 ft	0-3.0 m	Orange	3
0-14 ft	0-4.3 m	Yellow	4
0-20 ft	0-6.0 m	Green	5
0-26 ft	0-7.9 m	Blue	6
0-32 ft	0-9.7 m	Violet	7
0-40 ft	0-12 m	Gray	8
0-50 ft	0-15 m	White	9
Over 50 ft	Over 15 m	Pink	10
Common		Black	11
Return		White/Black or Black	12

Table 2-2 Field Wiring to ASU Connections

Signal Wire	TB-1 Connection
B-	1
B+	2
Mark	3
Space	4

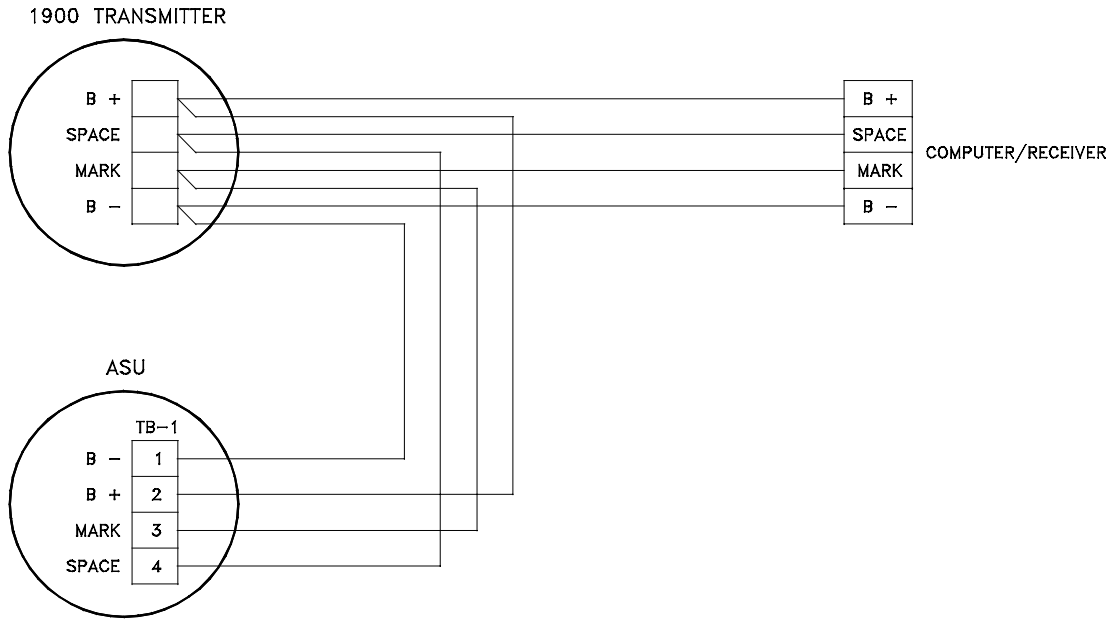


Figure 2-1 Model 1410 System Wiring/Model 1900 Transmitter

Commissioning

WARNING

Power must be OFF before the cover is removed.

The following steps are required to ensure satisfactory operation of the Model 1410 Averaging Selection Unit:

1. Set tank ID jumpers to match the settings of the associated Model 1900 Level Transmitter.

For a tank ID of 365, set the jumpers as follows:

Jumper	Position
1	ON
2	OFF
4	ON
8	OFF
10	OFF
20	ON
40	ON
80	OFF
100	ON
200	ON
400	OFF
800	OFF

2. The function jumpers in the associated Model 1900 Level Transmitter must be in the same position. Set appropriate function jumpers as follows:

Jumper Number	Jumper Position	Action
3	OFF	Copper RTD
	ON	Platinum RTD
5 (with 6 Off)	OFF	Degrees Centigrade
	ON	Degrees Fahrenheit
5 (with 6 On)	OFF	Computer/Receiver interprets first 18 bits of level message
	ON	Computer/Receiver interprets first 17 bits of level message
6	OFF	English Decoder
	ON	Metric Encoder

3. Ensure that the function jumpers in the Model 1900 Level Transmitter are set in accordance with the following to accommodate the Model 1410 ASU.

Jumper Number	Jumper Position
0	OFF
1	OFF
2	OFF
3	as required
4	OFF
5	as required
6	as required
7	as required

4. Carry out the temperature calibration procedure as outlined in Section 4 to ensure correct temperature indication at various tank liquid levels.
5. After a thorough check that all connections are correctly made and that all covers and plugs are installed, turn on power to the Model 1900 Level Transmitter and Model 1410 Averaging Selection Unit.

Note that tank level and temperature data is received and displayed correctly. If more than one combination of 1900/ASU transmitters are connected to the receiver, it is advisable to bring each combination of transmitters on line individually.

Section 3 – Operation

The Whessoe Varec Model 1410 Averaging Selection Unit (ASU) is an improved electronic design version of the obsolete Model 1400 ASU and is intended to be a direct “drop-in” replacement for the Model 1400.

There are no mechanical changes in the Model 1410 except that the external ASU barrier (infallible voltage clamp) has been eliminated. A block diagram of the Model 1410 ASU is provided in Figure 3-1.

System Operation

Communication between the ASU and the receiver is over the same four wires as the associated Model 1900 Level Transmitter. The ASU and Model 1900 work in conjunction with each other to transmit level and temperature data to the receiver in the same way as a Model 1900 Level Transmitter alone with a single point temperature bulb. This eliminates the need for additional wiring and special configuration.

As the receiver polls the transmitters in the field, the ASU monitors the bus for the address that matches its own preset address and that of the associated transmitter. When the address matches, the Model 1900 Level Transmitter transmits the first 39 bits of the reply message which contains the level information. It then shuts off and the ASU immediately transmits the remaining 17 bits which contain the temperature data and parity bit.

The temperature data and the element of the Averaging Temperature Bulb selected during this transmission was determined at the end of the previous poll. After the ASU completes transmission, it selects the proper temperature bulb element, based on the level just transmitted, measures the temperature of this element and stores the value for the next poll.

System Boards

The electronics package consists of a conformably coated circuit board with microprocessor and analog circuitry along with a potted module assembly that contains a second circuit board. Inside the potted module, the incoming signal voltages are isolated from the remaining circuitry by an infallible transformer and infallibly protected opto-couplers.

The three zener diodes that provide an infallible 6.2 V voltage clamp are provided with an access area and connector which allows them to be individually tested after they are potted. The access area is then potted after testing.

By infallible isolation of the power sources from the local circuitry, the requirement for a low resistance connection between this unit and the power source is eliminated.

Whesoe Varec Model 1410 Averaging Selection Unit

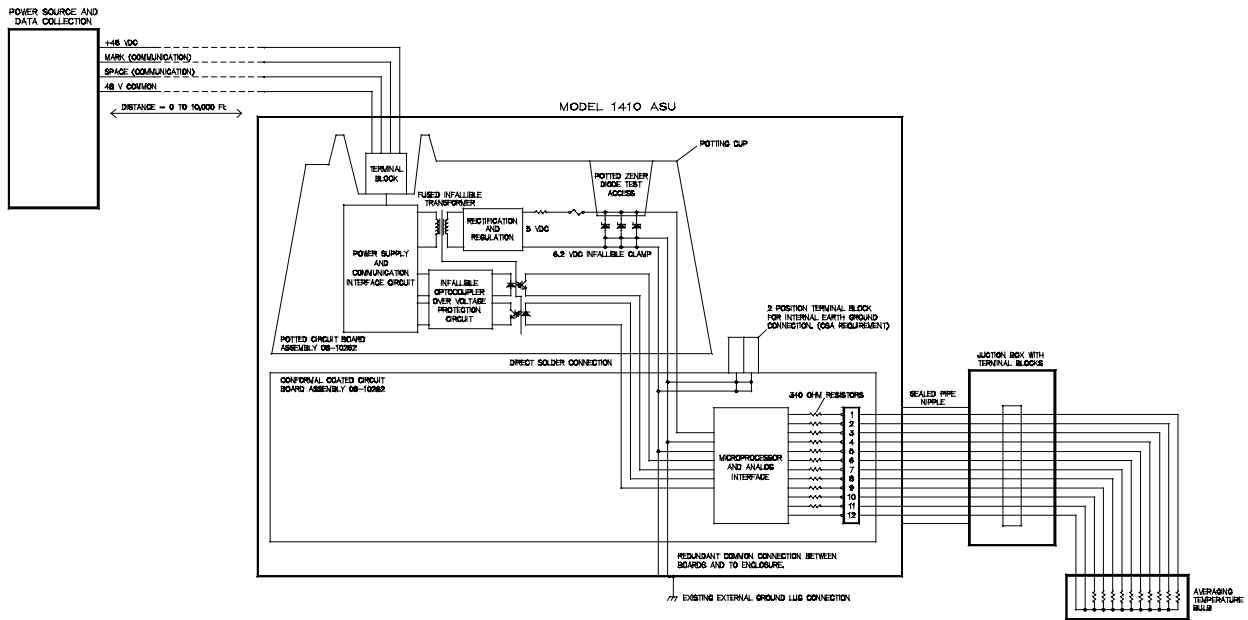


Figure 3-1 Model 1410 ASU Block Diagram

Mechanical Electronic Assembly

Figure 3-? shows the mechanical details of the Model 1410 electrical assembly.

The most significant feature of the design is the injection molded plastic potting cup that serves as a container for the potted circuit board during potting. It also provides an access cavity for testing potted zener diodes and a recessed mounting location for the field wiring terminal block.

Not shown on this drawing are five male connector headers that are soldered to the side of the potted board opposite the field terminal block. Connector J1 provides the electrical interconnect between the two boards while the other four connectors are for mechanical support.

After potting, the potted assembly is essentially a solid block with the pins of all five connectors protruding through the potting. Also after potting, the potted assembly is mounted on the other board as if it were a large component and soldered in place.

Connector J4 provides a connection between gas discharge tubes located on the potted board and the ground plane of the other board. This connection has to be broken during voltage isolation testing.

The electrical assembly is mounted to an aluminum plate located inside the enclosure by means of four nickel-plated brass threaded swage-on round support spacers. Refer to Figures 3-? and 3-? for component placement on both boards.

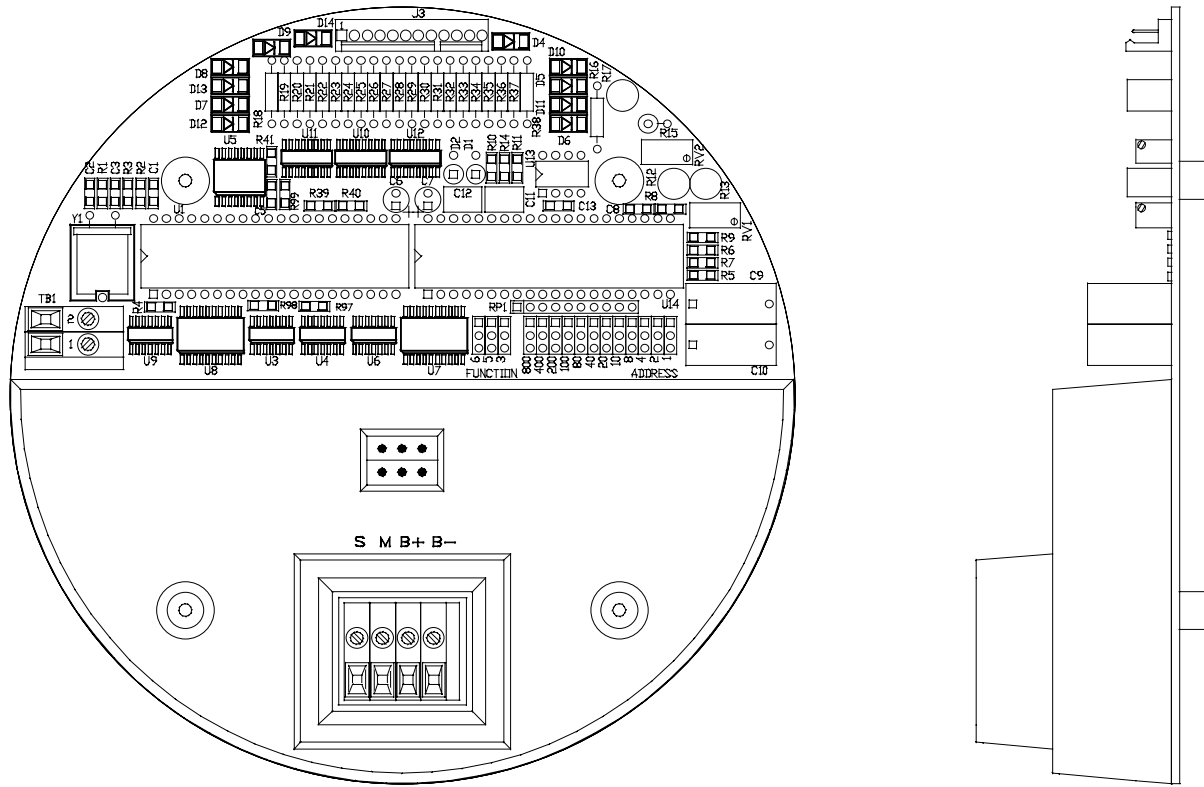


Figure 3-2 Model 1410 Electronics Board

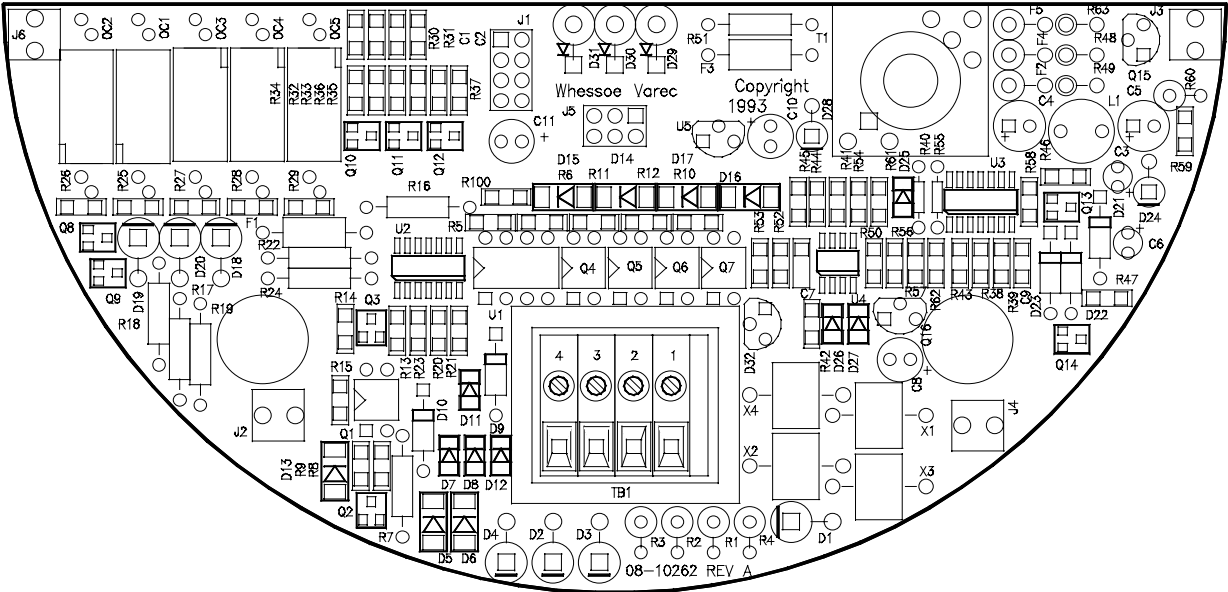


Figure 3-3 Model 1410 Potted Electronics Board

Section 4 – Maintenance and Calibration

Maintenance

The Whessoe Varec Model 1410 Averaging Selection Unit (ASU) is a solid state device designed and manufactured to provide accurate and reliable operation without a requirement for regularly scheduled maintenance.

WARNING

Power must be OFF before the cover is removed from the Model 1410, Model 1900 or the Intrinsically Safe barrier.

Calibration

To check or change the calibration for the Model 1410, perform the procedure for the appropriate type of temperature bulb being used.

- Copper RTD
- Platinum RTD

Temperature Calibration for Copper RTD

1. Set the function jumpers as shown.

Jumper Number	Jumper Position
0	No Change
1	No Change
2	No Change
3	OFF (see Note 1)
4	No Change
5	see Notes 1 and 2
6	see Notes 1 and 2
7	ON (see Note 1)

Note 1

Function Jumpers in the associated Model 1900 must be set in the same position.

Note 2

If Jumper 6 is ON, Jumper 5 can be ON or OFF.

If Jumper 6 is OFF, Jumper 5 must be OFF. This is necessary as copper RTDs are always calibrated in Centigrade.

2. In the associated Model 1900 loosen the coupling on the output shaft. On the metric model, loosen the set screw on the input gear of the adapter assembly. Set the encoder discs to a level of 2 feet, 6 inches (0.75 meters).

3. Disconnect the averaging temperature bulb in the junction box of the ASU and connect a decade resistance device to terminals 1 and 11, then jumper terminal 11 to terminal 12.
4. Set decade resistance to 119.38 ohms.
5. Check the receiver for a temperature reading of 75.0°C +/- 0.25°C and adjust VR1 as necessary.
6. Set decade resistance to 163.97 ohms.
7. Check the receiver for a temperature reading of 190.0°C +/- 0.25°C and adjust VR2 as necessary.
8. Set decade resistance to 55.4 ohms.
9. Check the receiver for a temperature reading of -90.0°C +/- 0.25°C.
10. If calibration accuracy of +/-0.25°C cannot be attained, the unit should be returned to Whessoe Varec for repair.
11. Check all three calibration points at the levels shown in Table 4-1 to verify the calibration of all channels on the ASU. This requires changing the encoder level setting in the Model 1900 and connecting the decade resistance device to different terminals in the ASU junction box.
12. If the above calibration figures are within +/- 0.25°C, calibration is complete. Disconnect the decade resistance device, reconnect the averaging temperature bulb, restore the function jumpers to their original locations if necessary and fit the cover.
13. Refer to the Model 1900 Instruction Manual for resetting the encoder and returning the unit to service.

Table 4-1 Model 1900 Encoder Settings for Temperature Calibration Check

Encoder Level Setting		Decade Resistance Device
English (feet)	Metric (meters)	Terminal
6	1.8	2
8.5	2.6	3
12	3.7	4
17	5.0	5
23	7.0	6
29	9.0	7
36	11.0	8
45	14.0	9
55	17.0	10

Temperature Calibration for Platinum RTD

1. Set the function jumpers as shown.

Jumper Number	Jumper Position
0	No Change
1	No Change
2	No Change
3	ON (see Note 1)
4	No Change
5	see Notes 1 and 2
6	see Notes 1 and 2
7	ON (see Note 1)

Note 1

Function Jumpers in the associated Model 1900 must be set in the same position.

Note 2

If Jumper 6 is ON, Jumper 5 can be ON or OFF.

If Jumper 6 is OFF, Jumper 5 must be OFF.

2. In the associated Model 1900 loosen the coupling on the output shaft. On the metric model, loosen the set screw on the input gear of the adapter assembly. Set the encoder discs to a level of 2 feet, 6 inches (0.75 meters).
3. Disconnect the averaging temperature bulb in the junction box of the ASU and connect a decade resistance device to terminals 1 and 11, then jumper terminal 11 to terminal 12.
4. Set decade resistance to 119.38 ohms.
5. Check the receiver for a temperature reading of $50.0^{\circ}\text{C} \pm 0.25^{\circ}\text{C}$ and adjust VR1 as necessary.
6. Set decade resistance to 175.43 ohms.
7. Check the receiver for a temperature reading of $198.9^{\circ}\text{C} \pm 0.25^{\circ}\text{C}$ and adjust VR2 as necessary.
8. Set decade resistance to 84.21 ohms.
9. Check the receiver for a temperature reading of $-40.0^{\circ}\text{C} \pm 0.25^{\circ}\text{C}$.
10. If calibration accuracy of $\pm 0.25^{\circ}\text{C}$ cannot be attained, the unit should be returned to Whessoe Varec for repair.
11. Check all three calibration points at the levels shown in Table 4-1 to verify the calibration of all channels on the ASU. This requires changing the encoder level setting in the Model 1900 and connecting the decade resistance device to different terminals in the ASU junction box.

12. If the above calibration figures are within $\pm 0.25^{\circ}\text{C}$, calibration is complete. Disconnect the decade resistance device, reconnect the averaging temperature bulb, restore the function jumpers to their original locations if necessary and fit the cover.
13. Refer to the Model 1900 Instruction Manual for resetting the encoder and returning the unit to service.

Section 5 - Specifications and Spare Parts Lists

Specifications and Physical Characteristics

The following specifications apply to the Whessoe Varec Model 1410 Averaging Selection Unit (ASU) assembly over the operating temperature range.

Temperature Ranges

with Copper Bulb	-125°C to +275°C or -190°F to +525°F
with Platinum Bulb	-45°C to +260°C or -50°F to +500°F
Number of Bulb Elements	Up to 10
Accuracy	0.5°F or 0.25°C
Repeatability	0.5°F or 0.25°C
Operating Temperature	-20 °C to +85 °C (Operating)
Operating Humidity Limits	-0 to 95% (Non-condensing)

Physical

Dimensions	203 mm (8") Diameter x 146 mm (5.75") High
Net Weight	4.5 kg (10 lb.)
Mounting	Directly onto Model 9909 Averaging Temperature Bulb
Connections	3/4-inch NPT
Terminations	Screw Terminal
Surge and Lightning Protection	Signal level meets ANSI/IEEC C62.41

Power Requirements

Voltage	48 VDC Nominal 55 VDC Maximum 30 VDC Minimum
Current	5 mA at 48V Passive 25 mA at 48V Active

Computer/Receiver Communication

Uses the same four wires as the Model 1900 Level Transmitter.

Approvals

CSA, FM and CENELEC Applications

Parts Lists

ASU Parts List

Item	Quantity	Description	Part Number
1	1	Housing	02-06084
2	1	Cover	02-06089
3	1	Nipple Assembly	06-07073
4	1	CPU/Power Supply Board	08-10270
5	1	Adapter Plate	02-06075
6	1	Cable Assembly	06-06076
7	1	Cap Screw	P31-1140
8	1	Ground Terminal	P102-03-004
9	1	"O" Ring	P109-15-024
10	2	3/4-inch NPT Pipe Plug	P030-04-800

Junction Box Parts List

Item	Quantity	Description	Part Number
1	1	Junction Box with Cover	02-02818
2	1	Mounting Plate	02-07072
3	4	6-32 x 3/8 Screw	P031-07-1639
4	2	#6 Lock Washer	P31-921
5	1	End Plate	P102-02-006
6	12	Terminal	P102-01-005
7	2	End Bracket	P102-02-005
8	1	Terminal Mounting Rail	02-07071

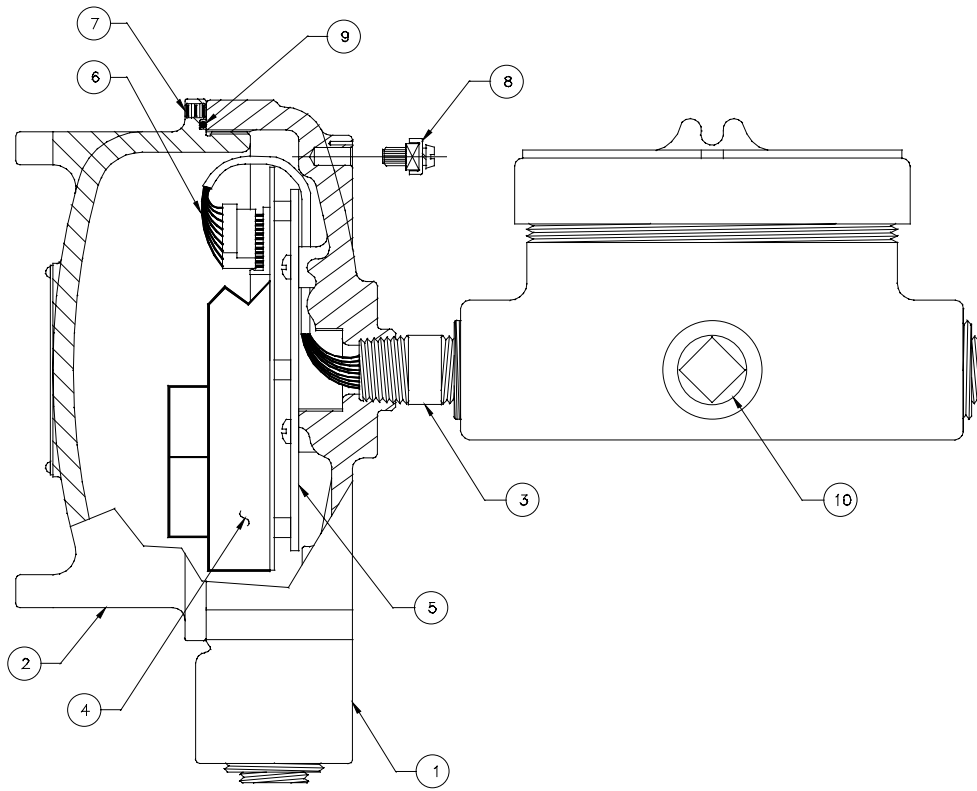


Figure 5-1 Model 1410 Parts Illustration

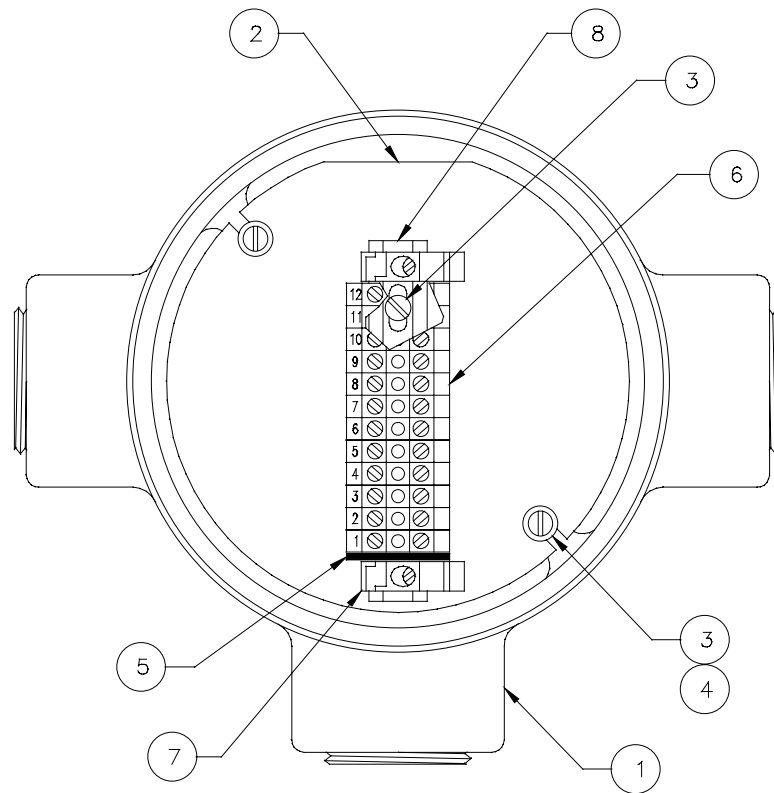


Figure 5-2 Model 1410 Averaging Bulb Connection Junction Box Terminals