LIQUID SOLIDS CONTROL

INSTRUCTION MANUAL

MODEL 614 X1 & X2
PROCESS REFRACTOMETER

LIQUID SOLIDS CONTROL, INC.
P.O. Box 259, Upton, MA. USA 01568 **TEL: (508) 529 - 3377**

LSC Model 614 X

PROCESS REFRACTOMETER

MODEL 614 X1 & MODEL 614 X2

INSTRUCTION MANUAL

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LIQUID SOLIDS CONTROL, INC.
P.O. Box 259
Upton, MA 01568 U.S.A.
TEL: (508)-529-7773
FAX: (508)-529-6591
Email: usa@liquidsolidscontrol.com

LIQUID SOLIDS CONTROL
DIVISION OF LIQUID SOLIDS CONTROL, INC.
5723 Old West Saanich Road
Victoria, BC V9E 2H2, Canada
TEL: (250)-474-2243
FAX: (250)-474-3339
Email: canada@liquidsolidscontrol.com

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1. INTRODUCTION

This Manual is designed to give operations and maintenance personal a complete understanding of the LSC "Model 614 X1" and the "Model 614 X2". The Model 614 X1 is a single measurement, where the X2 has the ability for two independent measurements. The Model 614's, are Multi Range Micro Processor based Refractometers that measure the concentration of dissolved solids calculated from the Refractive Index. Using "Critical Angle of Refraction" as the measurement principle, Refractive Index of the product is converted to the appropriate units and displayed. The display is a continuous real time measurement. The LSC Model 614 also provides an RS - 232 output, along with a standard 0 - 10 VDC output, an isolated 4 -20 mA output and a 0 - 10 VDC temperature output. The LSC Model 614 In - Line Refractometer consists of Processor, Sensing Head, and an optional, Intrinsic Safety Barrier.

1.1 PROCESSOR

Figure 1
Model 614

1.1.1a 614 X1 PROCESSOR

The Model 614 X1 has seven (7) sub-assemblies. A Microprocessor Board, Power Supply Card, Interconnecting Card, Refractometer Card, Vacuum Florescent Display, 3 1/2 ” Floppy Drive, and a Touch Pad. Components are all integral to the stainless steel Nema 4 enclosure, which allows you to locate the unit in damp and dusty environments. (See figure 2, Component orientation for the physical layout of the floppy drive and electronic cards mounted in the enclosure, the touch pad is mounted to the door of the enclosure for easy access.)

Figure 2
Components of the 614 X1 Processor

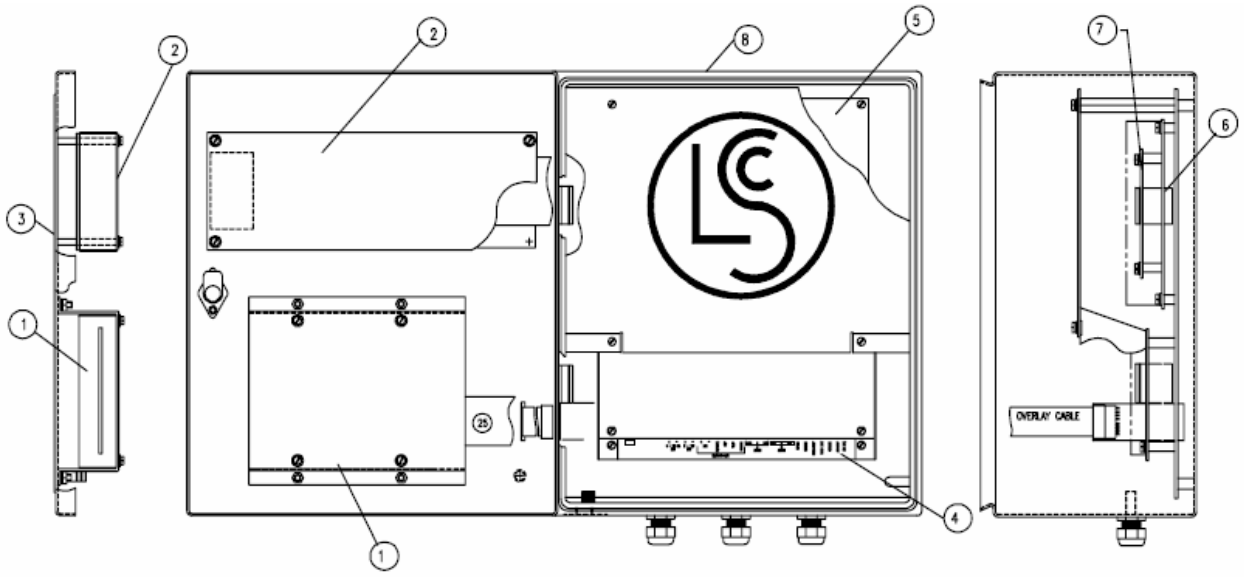


Table 1
Components of the 614 X1 Processor

1	3 1/2” 1.44 M Floppy drive	5	Power Supply Board
2	Vacuum Florescent Display	6	LSC Board (PC – 1) Refractometer Card
3	Overlay Touch Pad (See Figure 6 Page 5)	7	CPU Card
4	Interconnection Board (PC – 2)	8	Nema 4X SS Enclosure

1.1.1b 614 X2 PROCESSOR

The Model 614 X2 has Nine (9) sub-assemblies. A Microprocessor Board, Power Supply Card, Two (2) Interconnecting Card, Two (2) Refractometer Cards, Vacuum Florescent Display, 3 1/2" Floppy Drive, and a Touch Pad. Components are all integral to the stainless steel Nema 4 enclosure, which allows you to locate the unit in damp and dusty environments (See figure 3, Component orientation for the physical layout of the floppy drive and electronic cards mounted in the enclosure, the touch pad is mounted to the door of the enclosure for easy access).

Figure 3
Components of the 614 X2 Processor

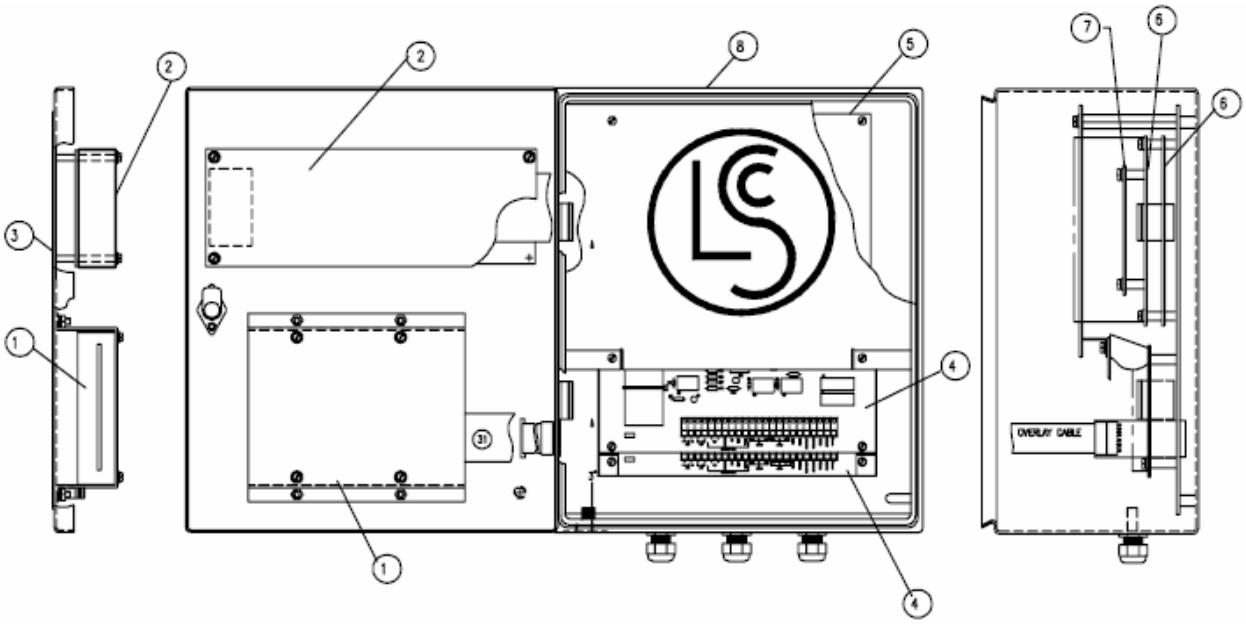


Table 2
Components of the 614 X2 Processor

1	3 1/2" 1.44 M Floppy drive	5	Power Supply Board
2	Vacuum Florescent Display	6	(2) LSC Board (PC – 1) Refractometer Card
3	Overlay Touch Pad (See Figure 6 page 5)	7	CPU Card
4	(2) Interconnection Board (PC – 2)	8	Nema 4X SS Enclosure

1.1.2 VACUUM FLUORESCENT DISPLAY

The vacuum display is 1 ¾" x 6 ¾" and is visible on the front of the Nema 4X SS enclosure. The display gives an immediate readout of the process. Using the Touch Pad located below the display will allow the operator to scroll through various screens, giving the operator easy access to the Model 614 X1 or 614 X2 and it's functions. The default or operate screen is shown below in "Figure 4 and Figure 5" for the 614 X1 and 614 X2 respectively. When powering the system up, the display remains blank for approximately 10 seconds while the system reboots.

Figure 4
Operate Display 614 X1

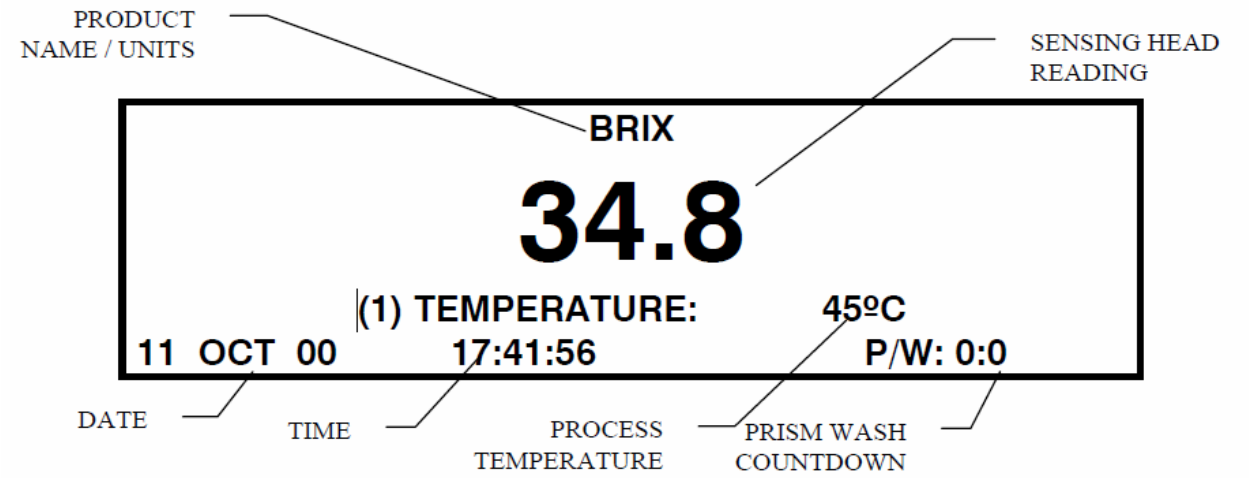
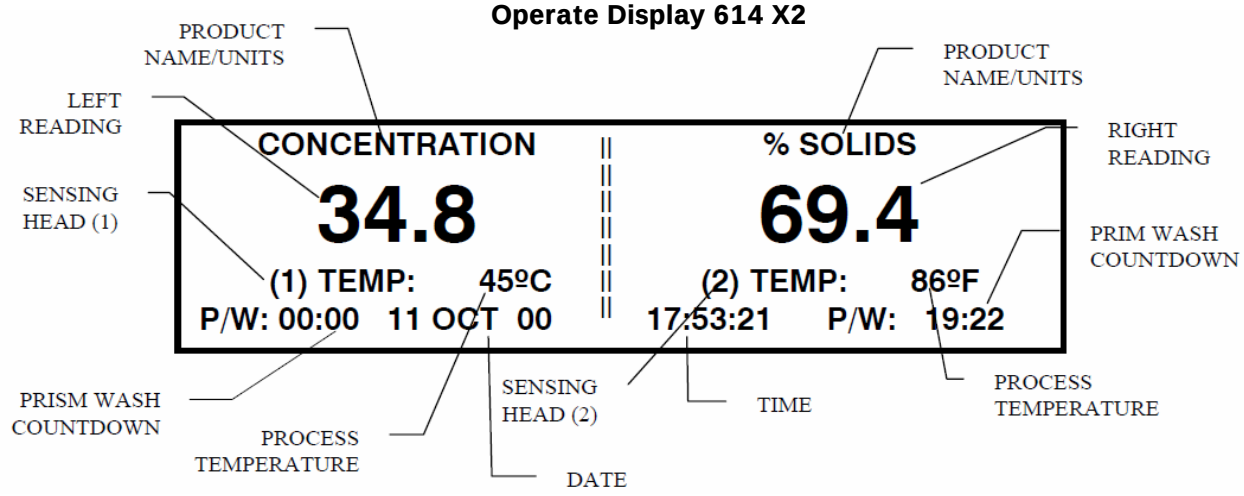


Figure 5
Operate Display 614 X2



1.1.3 FLOPPY DRIVE

3 1/2" 1.44M Floppy drive is located on the door, inside the Nema 4X SS enclosure. This drive allows for easy loading and downloading of files. These files can then be sent to your local LSC rep for analysis, where with the aid of e-mail, solutions to problems can be resolved. (Item #1 Figure 2 and Figure 3.)

1.1.4 CPU BOARD

This board has an 8-megabyte, solid-state hard disk. The CPU has a "self-test" function. This function insures the reliability of the processor. During this test, the field sensor is isolated from the circuit. (See Section 4.10.4 to run a "self-test"). If for any reason the system is shut down or rebooted, there is a 20 second time delay while the unit reboots. During this time, the 614 has no functioning capabilities. There is also a battery mounted on the chassis to insure that the time and date functions are maintained during a power loss. (See Item # 3 Figure 2 and Figure 3 for the location of the CPU Card).

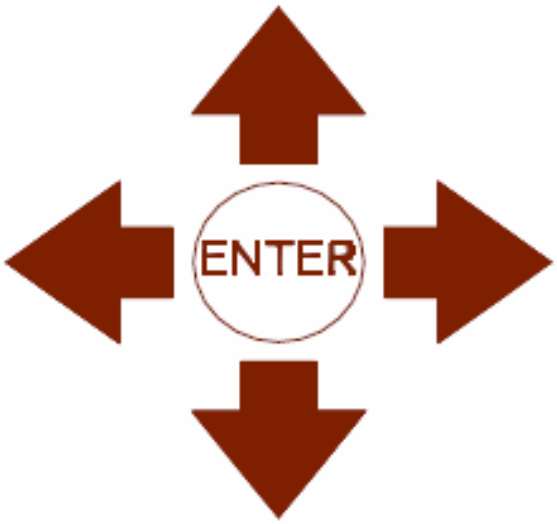
1.1.5 POWER SUPPLY BOARD

The Power Supply Board converts the 120 / 220 VAC to ± 15 VDC and ± 5 VDC. In case of a power surge there is a 10 Amp fuse located on the board. (See Item #5 Figure 2 and Figure 3 for card location).

1.1.6 TOUCH PAD OVERLAY

The touch pad is an integral part of the overlay and is located on the door of the 614, it allows the user to scroll through a variety of different screens and set various parameters. The up and down arrows allow you to scroll through the menus. Once on the desired menu item, ENTER will choose that selection. The left and right arrows will allow adjustable parameters to be adjusted, ENTER will set your parameters. (See Figure 6 below Overlay Layout.)

Figure 6
Touch Pad Overlay



1.1.7 INTERCONNECTION BOARD

All wiring from the Sensing Head and the input power are terminated to this card. All outputs are also terminated to this card, these outputs include; the 4 - 20 mA, RS 232, A and B alarms, 0 - 10 VDC, 0 – 10 VDC Temperature Output and the Prism Wash signal. See section 2.5 for the termination and a description of the inputs and outputs on the interconnection card. Figure 7 below shows the components of the interconnection card and Figure 19 shows the terminations. The LSC Model 614 X2 has two interconnection cards. One card is mounted on top of the other. (See Figure 20 for the layout of the two cards and the wiring of these two interconnecting cards)

Figure 7 : Interconnection Card

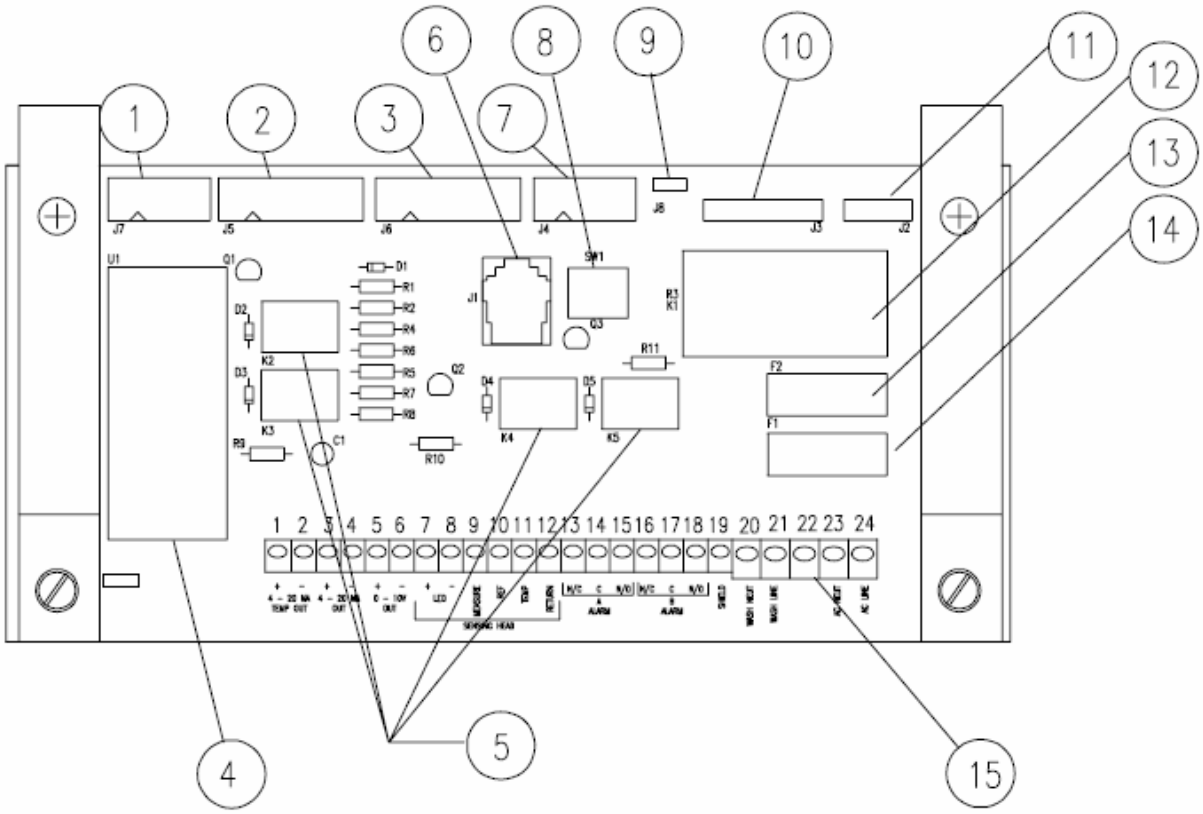


Table 3 : Interconnection Card

1	Connection PC2 J7 TO CPU J5	9	Batter Connection (J8)
2	Connection PC2 J5 TO LSC Board J3	10	5 and 15VDC Source from Power Supply (J3)
3	Connection PC2 J6 TO LSC Board J2	11	120 or 240 VAC to Power Supply Card (J2)
4	V/I Converter	12	Prism Wash Relay
5	5 VDC Alarm Relays	13	1 Amp Slow Blow Fuse for Prism Wash
6	RS 232 Connection / Diagnostic Port	14	1 Amp Slow Blow Fuse for Power to Unit
7	Connection PC2 J4 TO CPU J3	15	Terminal Connection (TB2) See Figure 20
8	Rest Button (White)		

1.2 THE SENSING HEAD

The Sensing Head is the portion of the Refractometer that is in direct contact with the process and performs the actual Critical Angle Measurement. The measurement is achieved by the refraction of light at the interface between the Sapphire Prism and the process. (See Figure 8, Principle of Operation Below). There are two types of sensing heads: the in-line and the insertion probe style.

1.2.1 SENSING HEAD COMPONENTS

There are two types of 614 Sensing Heads, the Standard In-line Head and the Insertion Probe. These heads consist of four major components: Detector, Infra-red Light Source, Temperature Sensor and a Sapphire Prism. The operations of these components are listed below and the assemblies are shown in Figure 9 "Standard In Line Sensing Head Assembly" and Figure 10 "Insertion Probe Assembly".

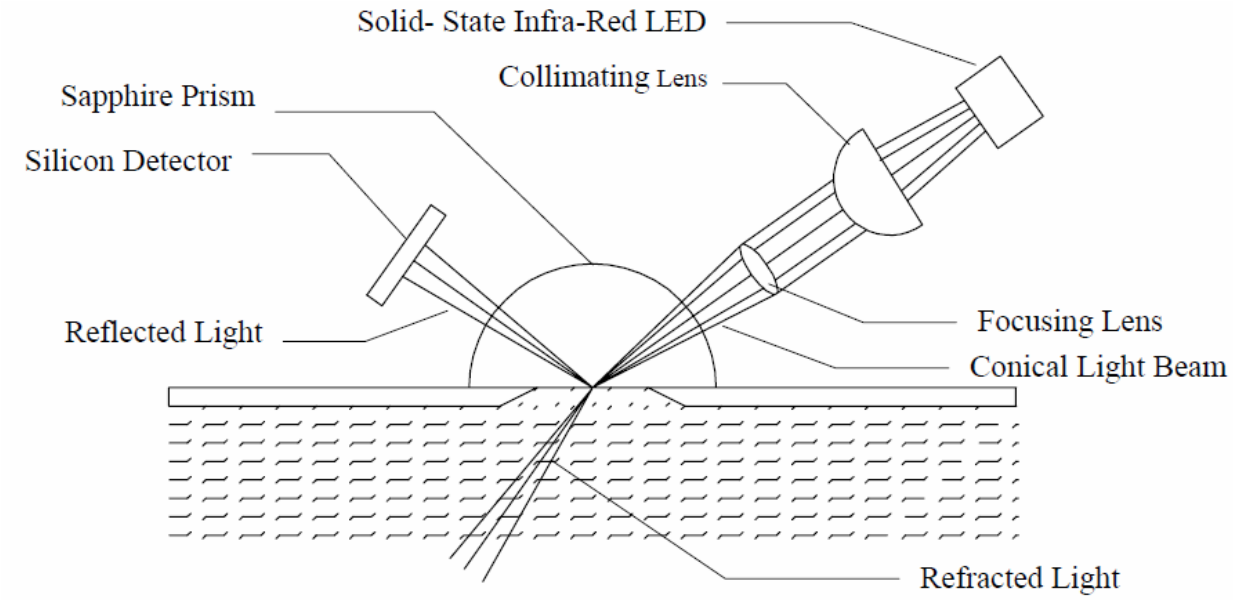
Detector: The Detector is made up of two silicon photocells, a measure cell and a reference cell. The reference cell measures the intensity of the light from the source and the 614 compensates for any fluctuations of intensity over time. The measure cell, measures the amount light reflected onto the cell.

Infra-red Light Source: The Infra-red Light Source "LED" emits a light beam through a collimating lens and a focusing lens, before it is reflected off the interface between the prism and the process. The light that is reflected is the light that hits the liquid interface at an angle below the "Critical Angle". The rest of the light is absorbed or refracted into the process. It is the reflected light that is measured by the detector.

Temperature Sensor: Monitors the change in temperature of the process. As temperatures increases or decreases, the voltage across the sensor increases or decreases, (0.01 VDC per °C).

Sapphire Prism: The Sapphire Prism is mounted in direct contact with the process. The wetting of the prism face provides the physical properties necessary for the "critical angle measurement". At the interface, light is reflected and refracted off the process at different angles depending on the dissolved solids level of the process.

Figure 8
Principle of Operations



1.2.2 IN-LINE SENSING HEAD

The 614 In-Line Sensing Head is mounted on a process fluid line and can be installed on the following:

- o Pipe Section
- o Flow Thru Block
- o Valve Body

Each of these options will be discussed in more detail in Section 2.1.

IN-LINE SENSING HEAD

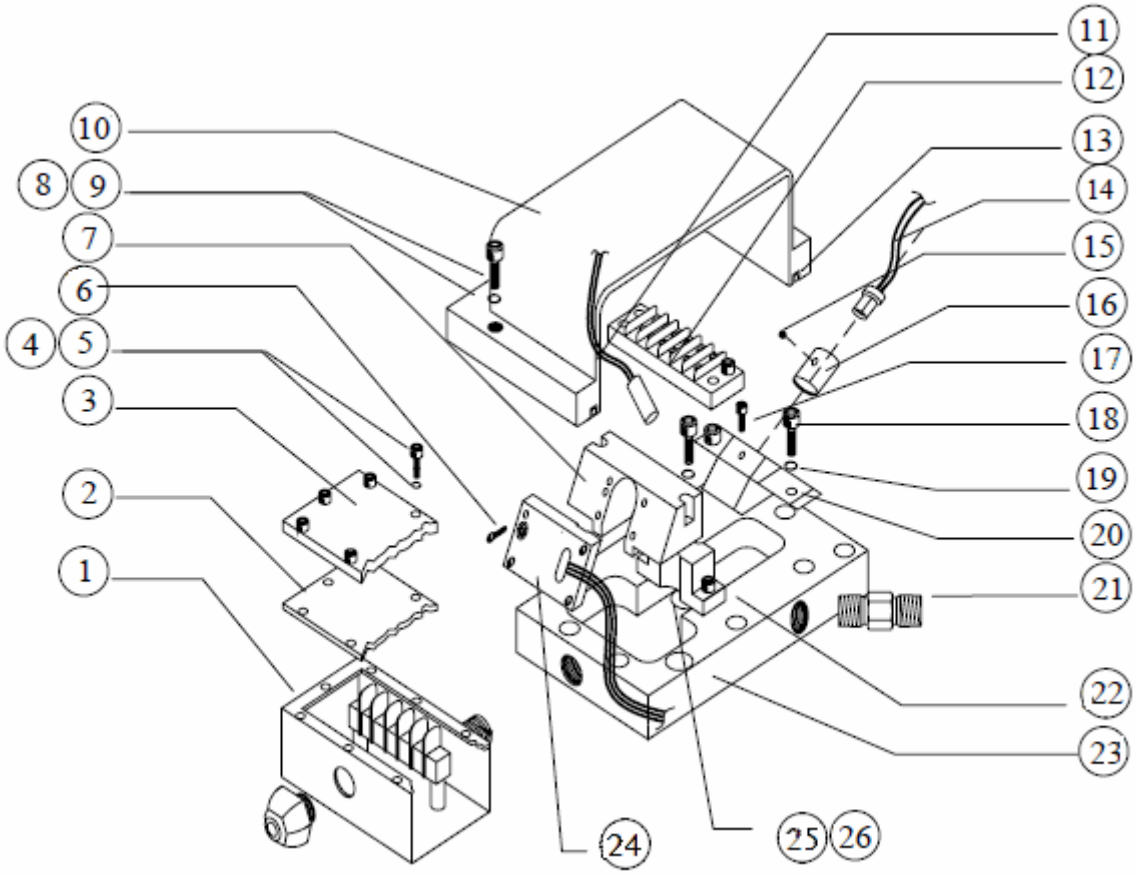


Figure 9
In-Line Sensing Head

Table 4
In-Line Sensing Head Parts List

ITEM	LSC PART #	DESCRIPTION	QTY
1	725305	T - BOX ASSY. COMPLETE WITH 725010, 725009	1
2	725010	GASKET, T – BOX	1
3	725009	COVER, T – BOX	1
4	106206	SCREW SH / CS # 6 - 32 x 3/8”	8
5	106830	WASHER LOCK # 6 HC	8
6	102202	SCREW SH / CS # 2 - 56 x 1/8”	1
7	725005	HOLDER, DETECTOR	1
8	125214	SCREW SH / CS # ¼” x 20 x 7/8”	7
9	125830	WASHER LOCK ¼” HC	7
10	725000	SENSING HEAD COVER PLATE	1
11	614300	TEMPERATURE SENSOR	1
12	170044	TERMINAL STRIP	1
13	640066	O - RING SENSING HEAD COVER	1
14	725308	INFRA-RED LED (LIGHT SOURCE)	1
15	104305	SET SCREW 4 x 40 x 3/32”	1
16	725309	COLLIMATING LENS HOLDER	1
17	104206	SCREW SH / CS # 4 - 40 x 3/8”	1
18	106206	SCREW SH / CS # 6 - 32 x 3/8”	2
19	106830	WASHER LOCK # 6 HC	2
20	725301	LAMP CASE ASSY.	1
21	106820	CHECK VALVE (STANDARD IS 40 PSI)	1
22	829052	PRISM HOLD DOWN BLOCK ASSY. (SEE FIGURE 26)	1
23	614010	BASE PLATE WITH PRISM WASH	1
24	725307	DETECTOR ASSY	1
25	829098	PRISM GASKET	1
26	610100	PRISM (SAPPHIRE)	1

1.2.3 INSERTION-PROBE SENSING HEAD

The Insertion Probe is used for installation in tanks or vessels where dissolved solids must be measured in the vessel rather than the pipeline. The probe style sensing head can also be mounted on a large pipeline.

INSERTION PROBE SENSING HEAD

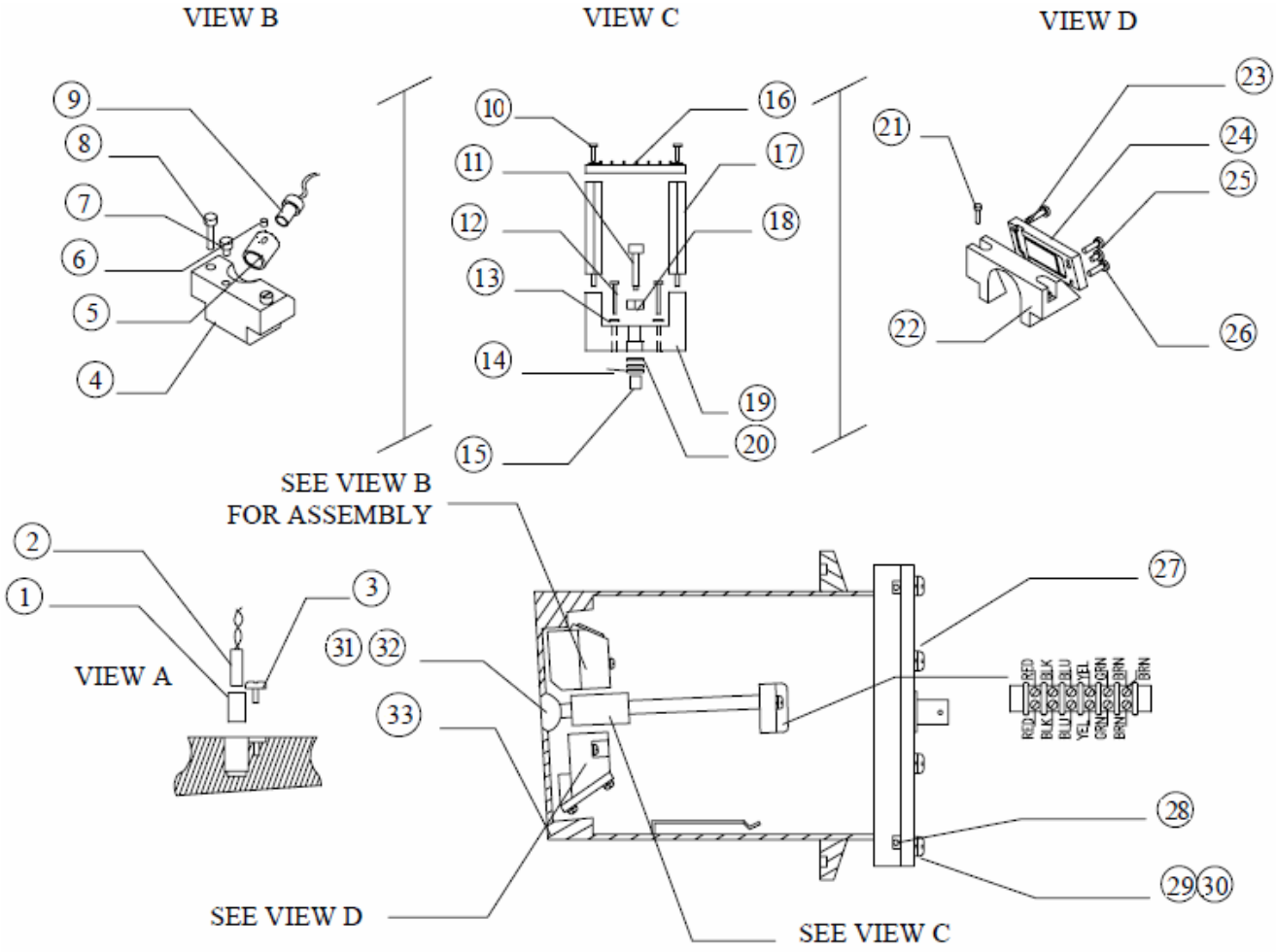


Figure 10
Insertion Probe Sensing Head

Table 5 Insertion Probe Spare Parts List

ITEM	PART #	DESCRIPTION	QTY
1	725059	TEMPERATURE SENSOR HOLDER	1
2	614300	TEMPERATURE SENSOR	1
3	106006	SCREW # 6 x 32 x 3/8” PH	1
4	725100	LIGHT SOURCE HOLDER	1
5	725309	COLLIMATING LENS HOLDER	1
6	104305	SCREW #4-40 x 3/32” SET	1
7	104210	SCREW #4-40 x ¼” SH/CS	1
8	106010	SCREW #6-32 x 5/8” PH	2
9	725308	INFRA-RED LED (LIGHT SOURCE)	1
10	104206	SCREW #4-40 x 3/8” SH/CS	2
11	829050	SCREW HOLD DOWN	1
12	106012	SCREW #6 - 32 x ¾” PH	2
13	106820	WASHER #6 LOCK6	6
14	106840	WASHER #6 BELLEVILLE	2
15	829051	PAD HOLD DOWN	1
16	170044	TERMINAL STRIP	1
17	139210	SPACER #4 - 40 x 2-5/8”	2
18	110852	NUT #10 x 32	1
19	725099	BRACKET, HOLD DOWN	1
20	104810	WASHER FLAT # 10	1
21	106010	SCREW #6 - 32 x 5/8” PH	4
22	725101	DETECTOR HOLD DOWN INSERTION PROBE	1
23	102820	WASHER LOCK # 2	4
24	725307	DETECTOR HOLDER ASSEMBLY	1
25	102006	SCREW #2 - 56 x 3/8” PH	4
26	102202	SCREW #2 - 56 x 1/8” SH/CS	1
27	725438	COVER ASSEMBLY INSERTION PROBE	1
28	640068	O - RING SENSING HEAD COVER, INSERTION PROBE	1
29	108008	SCREW # 8 - 32 x ½” PH	6
30	108820	WASHER LOCK # 8	6
31	610105	PRISM SAPPHIRE PROBE	1
32	725108	PRISM GASKET, INSERTION PROBE	1
33	725336	WELDMENT, INSERTION PROBE, PLAIN	1

1.3 SPECIFICATIONS

The LSC Specifications for the Model 614 are listed below in Table 6.

Table 6
LSC Model 614 Technical Specifications

Input Power Requirements	85 to 260 VAC, 50/60 Hz, < 25 Watts		
Refractive Index Range % Solids or BRIX Range	1.3000 – 1.6000 0 – 100		
Span (Calibration)		Minimum	Maximum
	RI	0.0015	0.2000
	BRIX	1.0	85.0
	SOLIDS*	1%	100%
	*May vary with some process materials or applications.		
Accuracy	± 0.5% of selected span range		
Repeatability and Sensitivity	1 count on DPM read out		
Speed and Response	500 milli-seconds		
Process Temperature Range	-25° – 150° C		
Temperature Compensation	Automatic (Can be calculated for any range)		
Process Line Pressure	Up to 1000 PSIG (68 bar)		
Interconnecting Cable Length	1,625 feet maximum (500 meters)		
Process Measurement Outputs	Standard and included Isolated 4 – 20mA DC, (20 V compliance) Isolated 0 – 10 VDC		
Process Temperature Output	0 – 10 VDC		
Diagnostic Port	RS 232		
Alarm Set Points	HI / LO or OUT OF SPEC / SYSTEM Relays normally energized or normally not energized HI / LO set points are fully adjustable		
Prism Wash	Automatic " Settable "		
Wetted Material	316L Stainless, Duplex 2205, Alloy 20, Hast Alloy C, Teflons, Other materials available upon request		
Prism	Industrial Grade Sapphire		
Processor Enclosure	Stainless Steel Nema 4X		
Electronic Enclosure Ambient Temp.	Up to 45^0 C		

Note: Due to the on going research and development and product improvement, all specifications are subject to change.

2. INSTALLATION

Before starting the installation, verify that all components ordered for the applications are available and the correct type such as:

- Mounting hardware
- Sensing Head / Prism Wash
- Electronics / enclosure
- Interconnecting Cable
- Installation Drawings

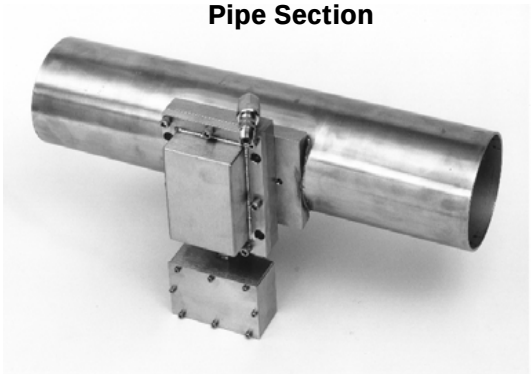
2.1 IN-LINE INSTALLATION

There are a variety of different in-line installations depending on the application. Be sure that the pipe spool you ordered suits your application. Below are examples of different types of pipe spools and their applications. In - line installations can be mounted vertically or horizontally. In vertical pipeline applications, the recommended fluid flow direction is upward. In horizontal pipelines, the sensing head must be mounted on the side of the pipeline as shown in Figure 11, and Figure 14.

2.1.1 PIPE SECTION MOUNTING

The In-Line Model 614 Sensing Head with pipe section mounting is illustrated in Figure 11. This type of mounting is used in most on line applications, generally in pipe lines 3" - 18" in diameter. Pipe sections can be ordered for specific applications. Our standard face to face dimension is 18" and weld in as shown. Bell reducers or a smaller line size is required if the flow rate in the pipe is insufficient for a good operation of the refractometer. Mounting flanges when needed are also available.

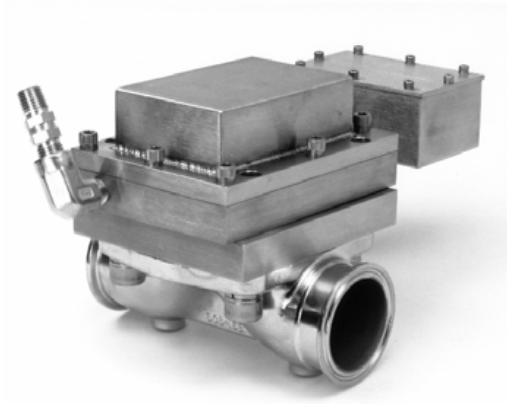
Figure 11
Pipe Section



2.1.2 VALVE BODY MOUNTING

A valve body mounting with prism wash is illustrated in Figure 12. This type of mounting hardware is well suited to pipelines from 2" - 4" diameter, in sanitary and non-sanitary applications. Valve bodies are typically flange mounted or have tri - clamp connections.

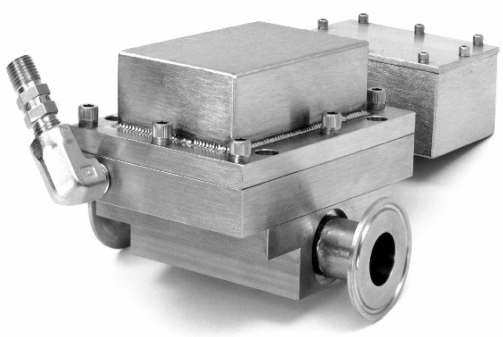
Figure 12
Valve Body



2.1.3 FLOW THRU BLOCK MOUNTING

The Flow Thru Block mounting illustrated in Figure 13 are often used in by-pass loops and other small pipe-line applications, from ¼" - 3" diameter. The Flow-Thru-Block mount is available with NPT threaded connections, Industrial Flanges, sanitary Tri - Clamp connections, and a variety of other connections to suit specialized applications. Typically the flow-thru blocks are 12" face to face but can be custom made to customer's requirements. Prism wash can be local to the sensing head or mounted to the Flow-Thru-Block depending on the application.

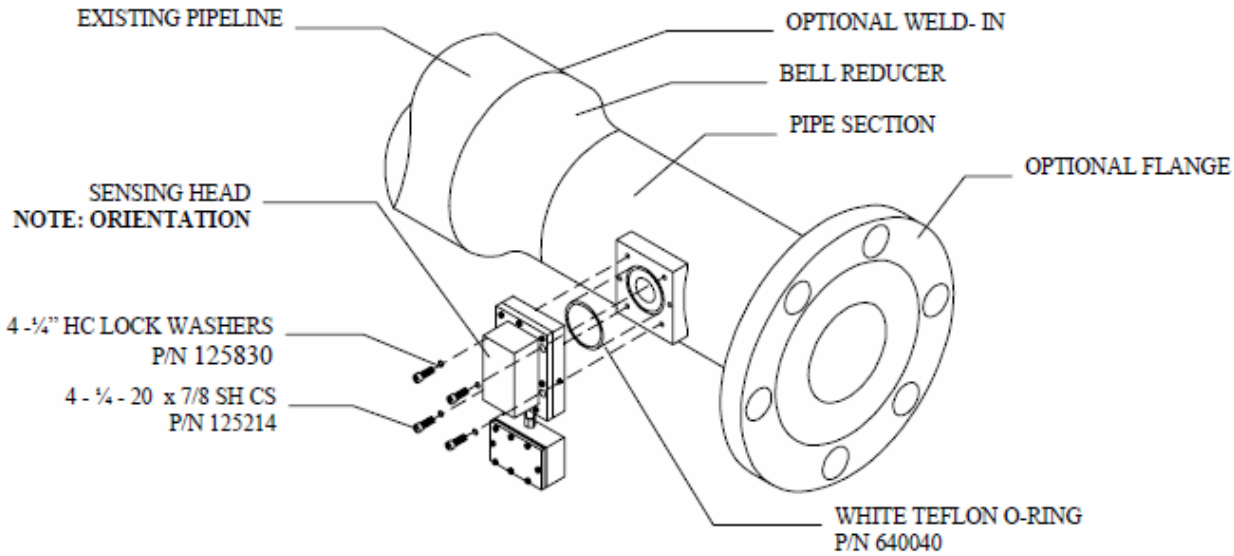
Figure 13
Flow-Thru-Block



2.1.4 STANDARD SENSING HEAD MOUNTING

Standard on-line Sensing Heads are mounted to Pipe Sections, Valve Bodies and Flow Thru Blocks. There are three types of standard Sensing Heads: with and without prism wash and, and a Thru Probe Sensing Head. Prism wash is only required if the process being measured has a tendency to coat the prism. Thru Probe Sensing Heads are required when temperature swings are fast and dramatic. The Sensing Head is mounted to the Pipe Section with 4 - ¼ - 20 x 7/8" socket head cap screws, with 1/4" high collar lock washers. A white Teflon O-Ring is placed between the Sensing Head and the pipe spool. (See Figure 14 below)

Figure 14
Sensing Head Mounting



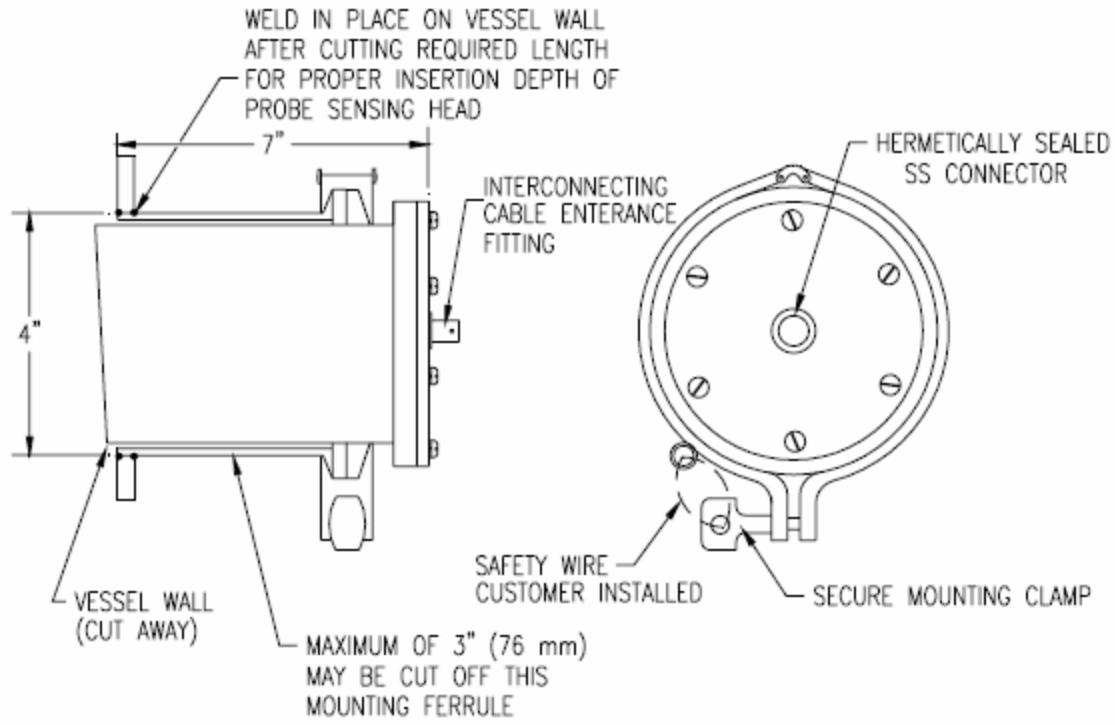
2.2 INSERTION PROBE MOUNTING

Figure 15
Insertion Probe

The Insertion Probe style sensing head, illustrated in Figure 15, is installed by preparing a 4" diameter cut out in vessels, tanks, or large pipelines. Weld the mounting ferrule (supplied by LSC) in place, and mount the probe to the ferrule. The Insertion probe can be supplied with either sanitary prism wash or industrial prism wash.

Note: The end face of the Insertion Probe is manufactured at an angle. After installing the Insertion Probe, but before fully securing the mounting clamp, rotate the Insertion Probe to a position that maximizes the product impingement on the sensing window "prism face" (See Figure 16 below).

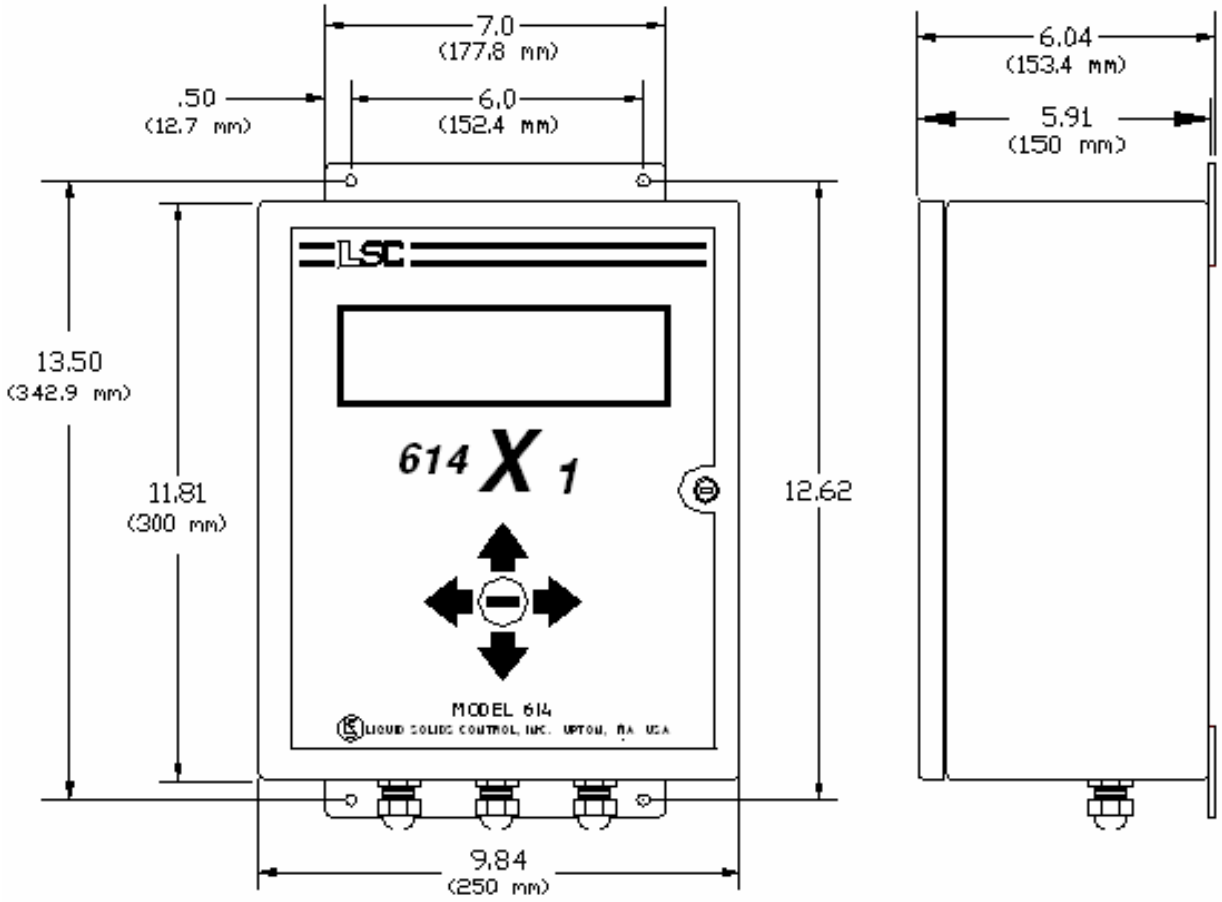
Figure 16
Insertion Probe Installation



2.3 INSTALLING ENCLOSURE

The enclosure is Nema 4X SS type. This allows the processor to be mounted in damp and dusty environments. The processor can be located up to 1625 ft. (500 m) from the Sensing Head. Ideal locations would be in a control room or a rack room where environmental conditions are monitored. Both the LSC Model 614 X1 and X2 has been designed to give you a convenient mounting option. Mounting dimensions for are shown in Figure 17. The depth of the Nema 4X SS processor is 6".

Figure 17
Mounting



2.4 PRISM WASH INSTALLATION

Prism wash is optional and only required if the process being measured has a tendency to coat. A typical prism wash installation is illustrated below in Figure 18. The appropriate wash medium with an adequate pressure is attached to the fitting provided. The frequency and the duration of the wash are set using the touch pad. See Sections 4.7.2, 4.7.3 and 4.7.4 to set the prism wash.

2.4.1 PRISM WASH REQUIREMENTS

The wash medium pressure must be sufficient to overcome the process line pressure, the check valve cracking pressure and provide at least 30 to 45 psi actual washing pressure. This total required pressure is calculated using the formula below.

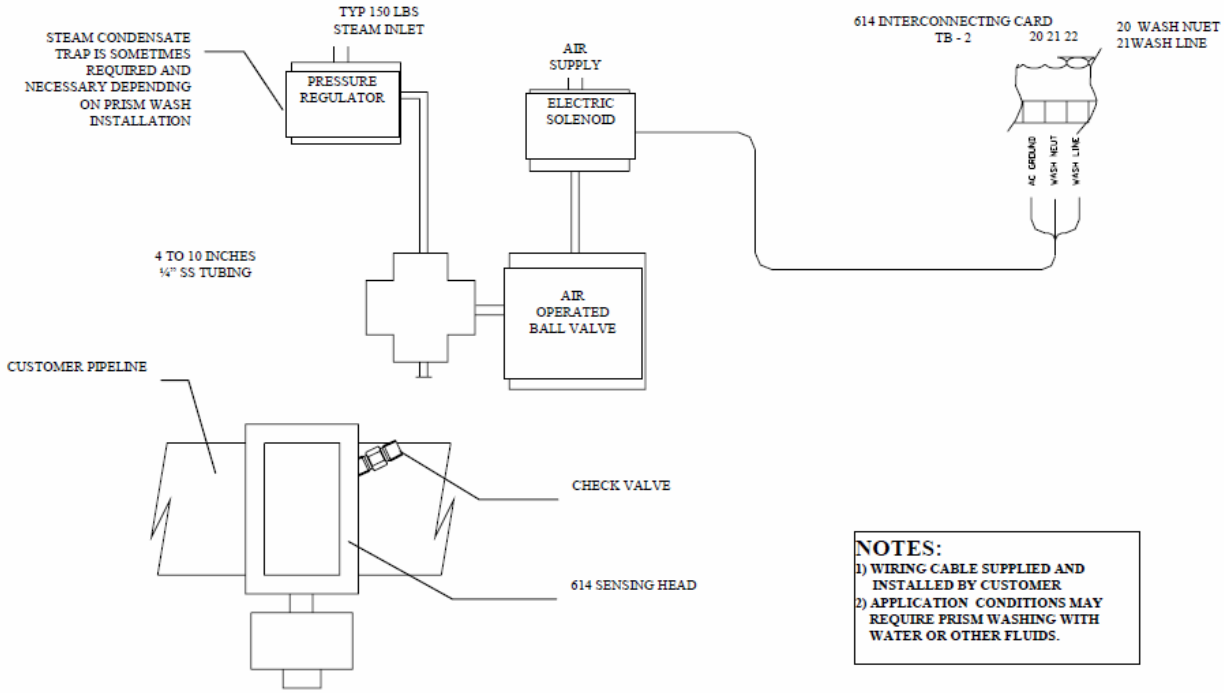
REQUIRED PRESSURE (PSI)	=	PROCESS LINE PRESSURE (PSI)	+	CHECK VALVE CRACKING PRESSURE (PSI)	+	30-45 (PSI)

LSC provides two types of actuators with systems that require prism wash, an air to open / air to close actuator and an air to open / spring to close actuator.

The air to open / spring to close actuator requires air pressure between 75 to 125 psi. P/N 190302
The air to open / air to close requires air pressure of 35 to 125 psi. P/N 190305
(See Figure 18 below for a Prism Wash System Schematic and Wiring Diagram).

Note: See Section 4.7.2 to set the WASH CYCLE PERIOD, section 4.7.3 to set the WASH CYCLE LENGTH and section 4.7.4 to set the HOLD CYCLE LENGTH.

Figure 18 : Prism Wash System Schematic and Wiring Diagram



2.5 CONNECTING THE ELECTRONICS

Each system has been factory tested and manufactured to accommodate plant site requirements. Check the data sheet for your unit at the beginning of this manual. If specifications are not to your requirements, contact LSC immediately. Wiring from the Sensing Head and all signal outputs are connected to TB2 of the Interconnection Card. See (Figure 7 Item 15), for the location of the terminal strip TB2. Terminations of the connections are shown below in figure 19 and 20.

614 X1

Figure 19
614 X1 Termination

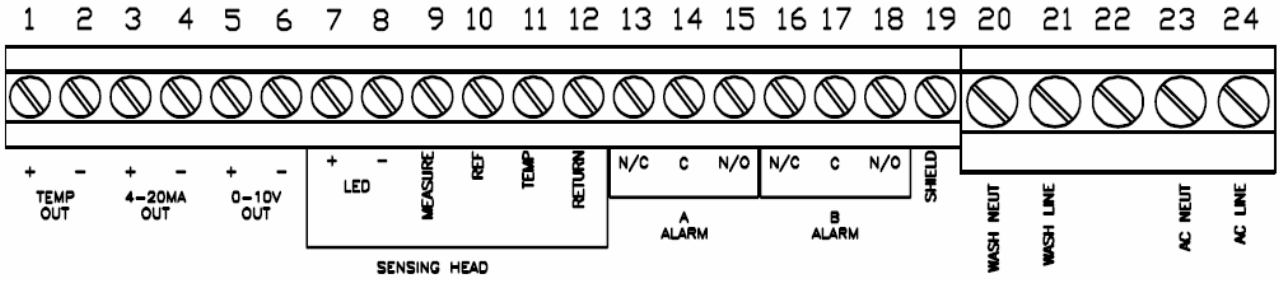


Table 7 : Interconnection Card Wiring 614 X1

1	0 - 10 VDC Temperature Output	13	"A" Alarm Close Contact
2	Ground for Temperature Output	14	"A" Alarm Common
3	4 - 20 mA DC Output (Isolated)	15	"A" Alarm Open Contact
4	Ground for the 4 - 20 mA Output	16	"B" Alarm Close Contact
5	0 - 10 VDC Output	17	"B" Alarm Common
6	Ground for 0 - 10 VDC Output	18	"B" Alarm Open Contact
7	Lamp Voltage DC (Red)	19	Shield
8	Lamp Ground (Black)	20	Prism Wash AC Neutral
9	Measure Detector (White)	21	Prism Wash Line
10	Referance Detector (Black)	22	
11	Temperature Probe (Green)	23	AC Neutral
12	Signal Return (Black)	24	AC Line

614 X2

The connections for the 614 X2 are similar to the X1 and are illustrated below in (Figure 20, Table 8) below. The lower card as shown, representing the Left Sensing Head and is wired as specified in (Figure 19, Table 7) on the last page. The upper card represents the Right Sensing Head and is terminated as shown below.
Note: "Do Not" connect the power to the upper card. One power source is all that is required.

Figure 20
614 X2 Termination

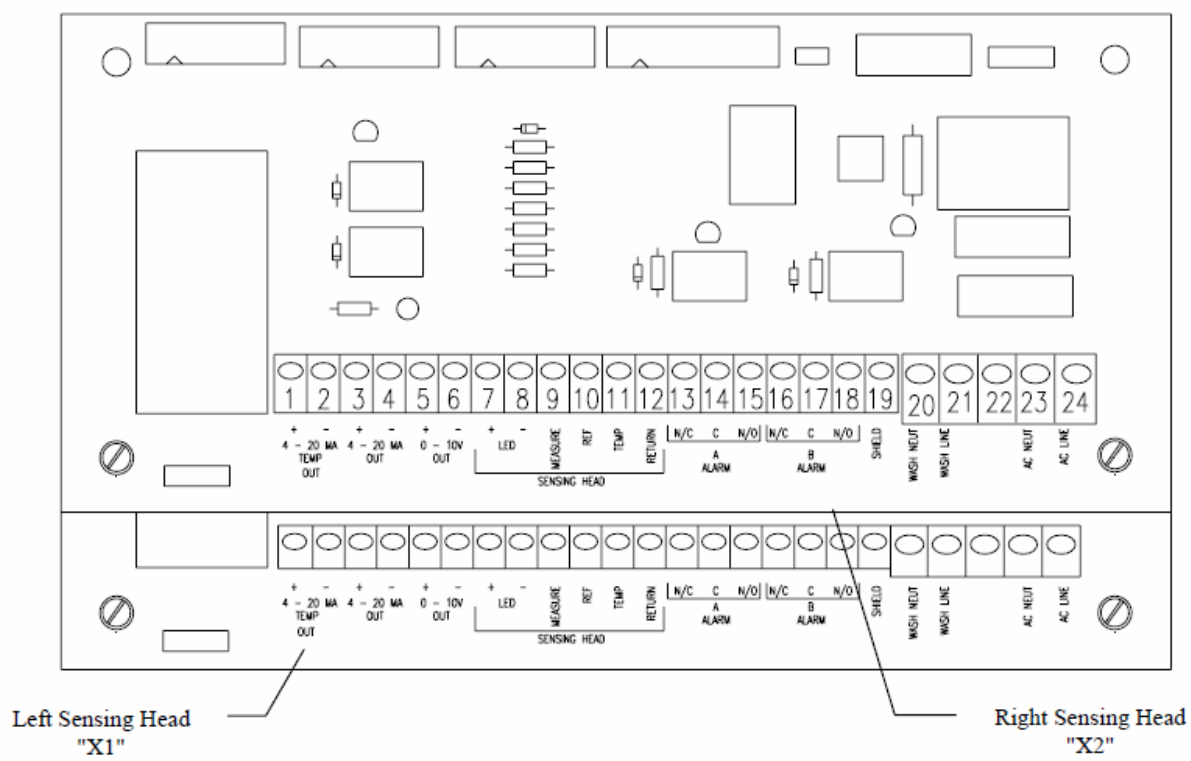


Table 8
Interconnection Card Wiring 614 X2

1	0-10 VDC Temperature Output	13	"A" Alarm Close Contact
2	Ground for Temperature Output	14	"A" Alarm Common
3	4 – 20 mA DC Output (Isolated)	15	"A" Alarm Open Contact
4	Ground for the 4 – 20 mA Output	16	"B" Alarm Close Contact
5	0 – 10 VDC Output	17	"B" Alarm Common
6	Ground for 0 – 10 VDC Output	18	"B" Alarm Open Contact
7	Lamp Voltage DC (Red)	19	Shield
8	Lamp Ground (Black)	20	Prism Was AC Neutral
9	Measure Detector (White)	21	Prism Was Line
10	Reference Detector (Black)	22	
11	Temperature Probe (Green)	23	**DO NOT USE**
12	Signal Return (Black)	24	**DO NOT USE**

2.5.1 CONNECTING MAIN POWER

Note: Please check with the local electrical codes before installation. A circuit breaker on the power supply is necessary for all installations.

The Model 614 "X" operates on an input power range from 85 VAC to 130 VAC or 210 VAC to 260 VAC, without adjustment. Three-cable strain reliefs have been provided to allow easy installation.

Before connecting the power supply, make sure that the power supply circuit breaker is OFF. Connect the main POWER "HOT" supply wire to terminal TB2 – 24 (AC LINE), POWER "NEUTRAL" to terminal TB2 – 23 (AC NEUT), on the Interconnecting Card PC – 2 (See Figure 19 and 20). Terminate the Ground to the Ground Stud, located on the inside of the Nema 4 enclosure.

Note: When connecting power to the 614 X2 only one power source is required. Only apply power to the bottom interconnection Card.

2.5.2 CONNECTING THE ALARMS

There are two alarm contacts "A" and "B". The relays for these alarms are two (5) VDC relays. The alarms can be wired to either NO (Normally Open) or NC (Normally Closed) contacts. See Figure 19 and 20, Items (13 - 18), for the location of the alarm contact terminations on TB2. The customer supplies the wiring for this connection.

2.5.3 CONNECTING THE TEMPERATURE (0 - 10 VDC)

The (0 - 10) VDC output is terminated to terminal 1 and 2 on TB-2 of the PC -2 Interconnection Board. The voltage output is a linear function, where "0 VDC" represents the low end temperature range set and "10 VDC" represents the high end temperature range set. See section 4.7.11 for setting these Temperature Ranges. The customer supplies the wiring for this connection.

2.5.4 CONNECTING THE (4 - 20 mA)

The 4 - 20 mA output is an isolated signal. 4 mA represent the low-end calibration and 20 Ma representing the high-end calibration set point. See section 4.7.6 to adjust unit's min and max. Connect the mA output to TB2 on the Interconnection Board PC-2 at positions 3 and 4 where terminal 4 is the ground. The maximum load for this current signal is 1 K Ω. See Figure 19 and 20 for the location of the wiring connection for the 4 - 20 mA. The customer supplies the wiring for this connection.

2.5.5 CONNECTING THE (0 - 10 VDC)

The 0 - 10 VDC output is connected to TB2 on the Interconnection Board PC-2 at positions 5 and 6, where position 6 is the ground. For locating the 0 - 10 VDC outputs see Figure 19 and 20. 0 VDC represents the low end calibration and 10 VDC represent the high end calibration set point. The customer supplies the wiring for this connection.

2.5.6 CONNECTING THE PRISM WASH SIGNAL

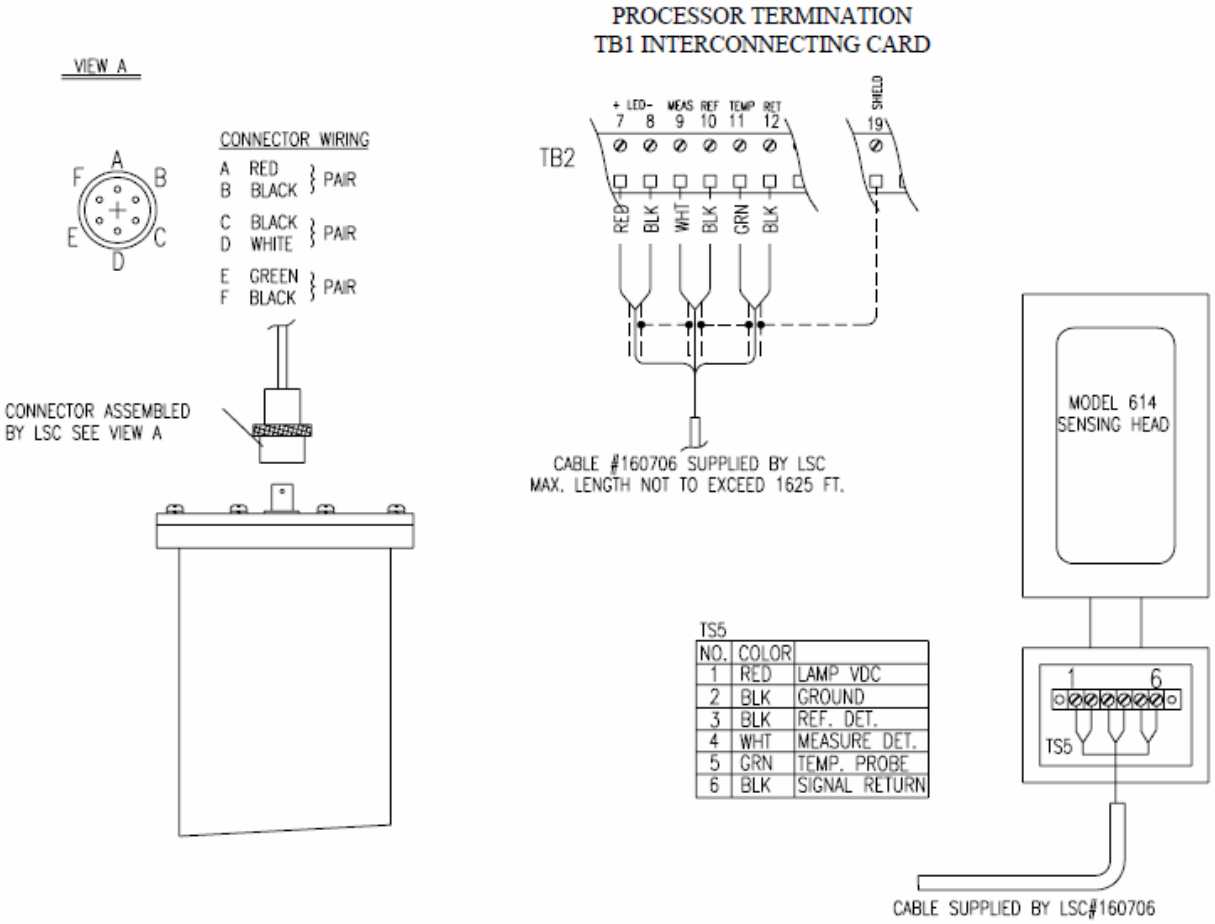
The AC signal to initiate the wash is connected to TB2, terminals 20 and 21. See Figure 18 and 19 on page 18. This output matches the input power connected in section 2.5.1. Like all electrical installations, a qualified electrician should perform wiring to the prism wash solenoid. **Note:** see sections (4.7.2, 4.7.3, and 4.7.4) for setting the timing sequences for the wash signal. The customer supplies the wiring for this connection.

2.5.7 CONNECTING THE SENSING HEADS

The cable used for connecting the sensor to the processor is supplied by LSC. The insertion Probe has a quick connector for positive connection to the sensing head. The In-Line Sensing Head is terminated with screw style crimp lugs inside the T-Box. When installing the cable, allow enough extra cable so the instrument technician can place the Sensing Head in a location accessible for calibration. See Figure 21 below for connecting the cable to the processor.

Note: The interconnection cable consists of three individually shielded pairs. Each pair has a color and a black wire. Each black wire carries a different signal and performs a different function, therefore pay particular attention to location of each black wire, which can be distinguished by the colored wire to which they are paired. Wiring required for the sensing head can be purchased from your local LSC rep. Length of wire cannot exceed 1625 feet.

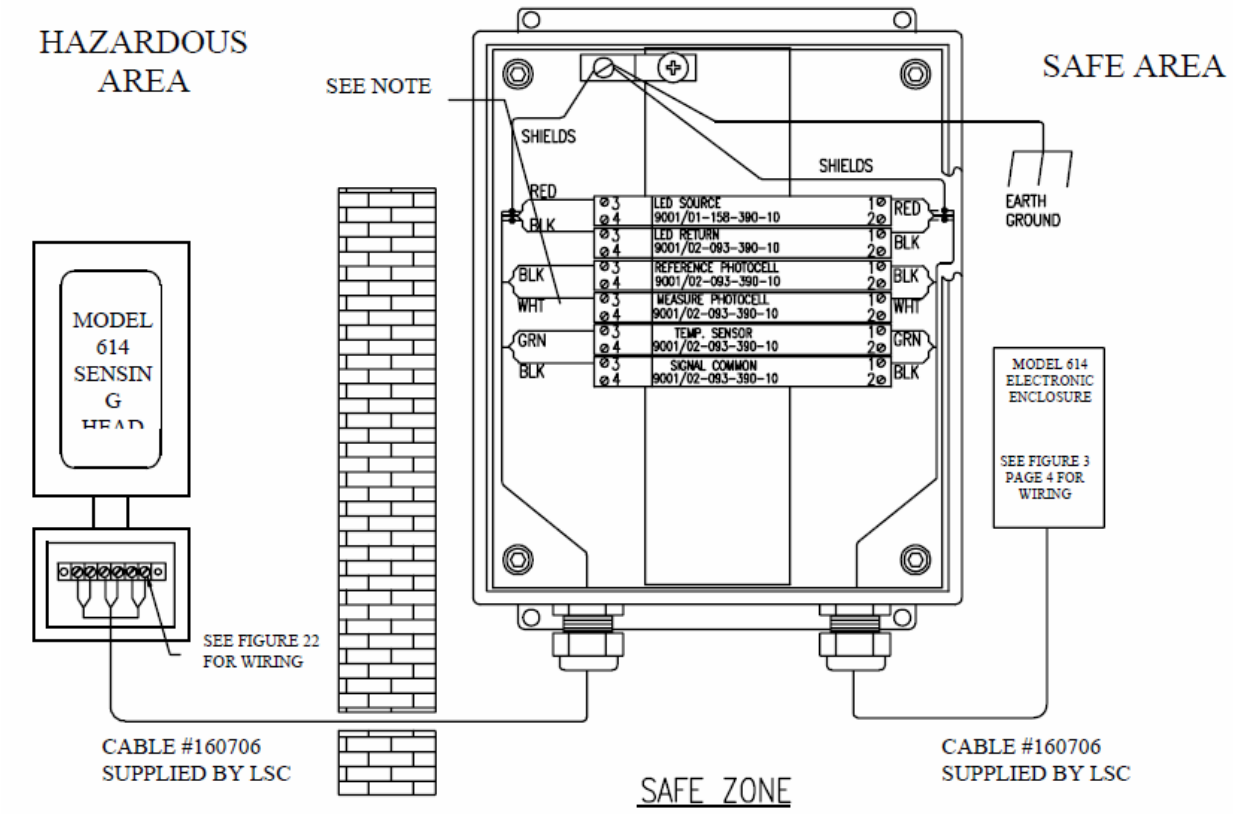
Figure 21
Wiring Installation of the Sensing Head



2.6 MOUNTING IN A HAZARDOUS AREA

In applications where there is a potential for explosion caused by a spark, LSC offers an intrinsic safety barrier. The Intrinsic Safety Barriers, and the 614 Processor, are installed away from the process in a safe area. It limits both the current and the voltage to the sensing head, such that it is impossible for it to generate a spark, "making it intrinsically safe. (See figure 22 below).

Figure 22
Intrinsic Safety Barrier Wiring Diagram



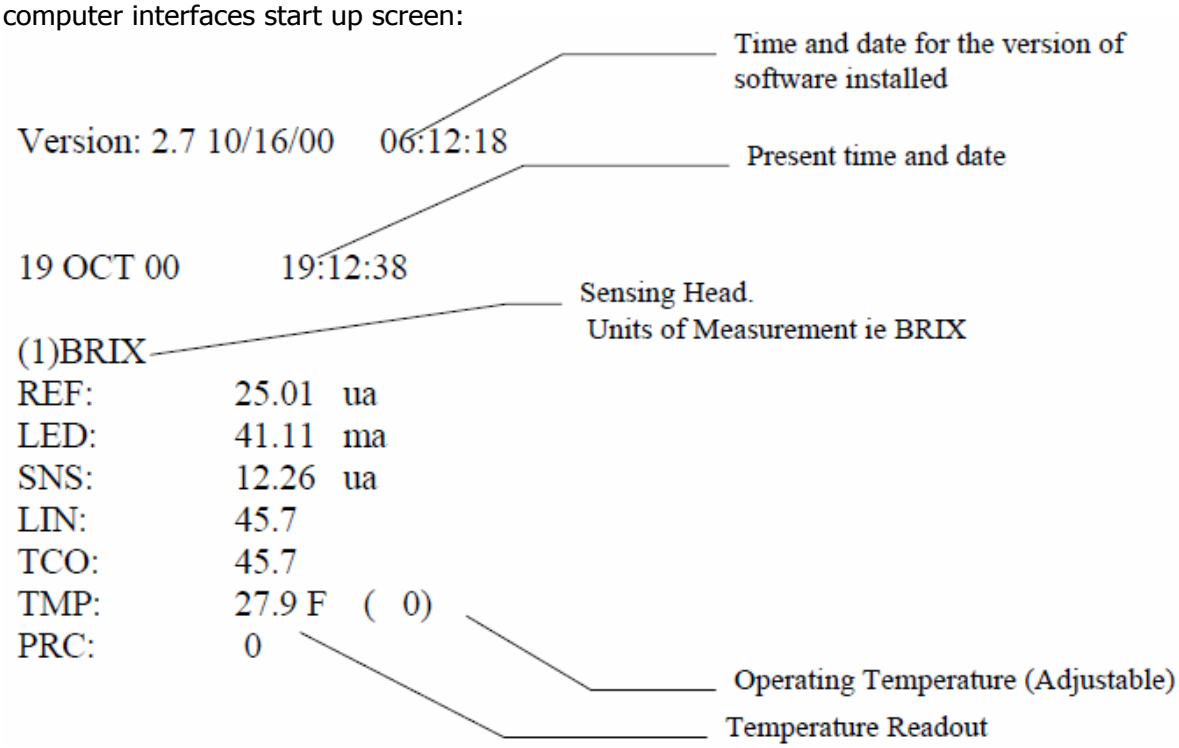
Note: SENSING HEAD CONNECTION TO BE MADE ON THE BLUE SIDE OF THE BARRIER.

2.7 COMPUTER CONNECTION

The LSC Model 614's have an RS - 232 output / diagnostics port, see item 6 figure 7 for the connection location on the Interconnecting Card. This output can be attached to a COM port on your computer. The communication protocol used is "Pro-Com" and the shareware program can be down loaded from the internet:

BAUD RATE: 19200
DATA BITS: 8
PARITY: NONE

Once a link is established, information about your process can be viewed. Below is an example of the computer interfaces start up screen:



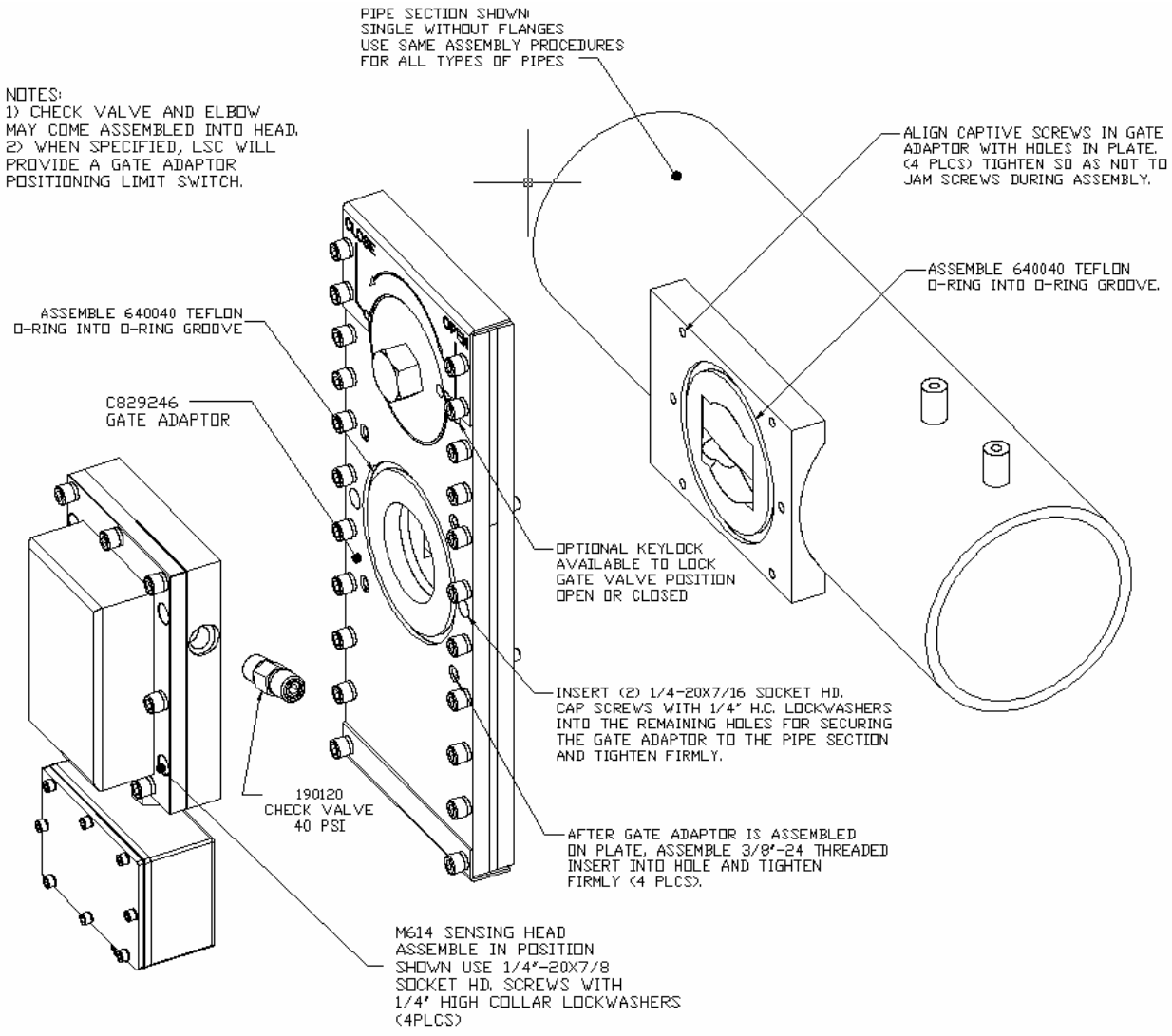
REF: Refers to the reference current in micro amps on the reference detector or cell. This reference is adjusted to 25 micro amps ever minute.
LED: Refers to the amount of current in milli amps driving the light source to maintain a constant micro amp reference. A "REFERENCE OUT OF ERROR MESSAGE" will be displayed on the main screen when the LED ma is greater than 100.
SNS: Refers to the micro amp current representing the reflected light. This reading is between (0 - 50) uA
LIN: Represents the read out before any temperature compensation. The read out is shown as the type of units set. The example above the read out is in BRIX. To set the units to a different unit of measurement see section 4.7.15, for changing the units.
TCO: Represent the read out after temperature compensation. This read out is the same value as the readout shown on the main display.
PRC: Selected Process. (0 - 6) settings.

Further information on the computer interface and the screens available for the 614, see section 4 "MENUS".

2.8 GATE ADAPTOR "ISOLATION VALVE"

The Gate Adaptor is installed on a pipe section between the Sensing Head to allow isolation of the Sensing Head from an Active Process Line. The Gate Adaptor is mounted to the pipe section by six ¼ - 20 bolts. A White Teflon O-Ring is placed between the pipe section and the Gate Adaptor before fastening down the Gate Adaptor. See section 6.2.3. For installation of the Gate Adaptor. The Gate Adaptor employs a complete slide gate that is moved by an eccentric cam. To open and close the gate, a 1" Hex. Nut is turned just under a half of a turn so that the indicating dot aligns with the "OPEN or "CLOSED" indicator. A ¼" long shank lock should be used to verify that the gate is fully open or fully closed by sliding the lock though the alignment lockout hole. See Figure 28 in section 6.2 for, part description and maintenance of the Gate Adaptor.

Figure 23 : Gate & Sensing Head Assembly

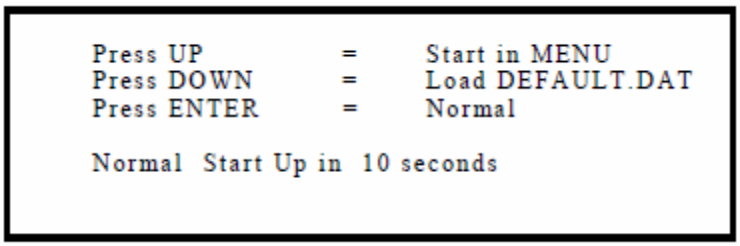


3. START UP

Before turning the power ON to the Model 614, re-check all the wiring per the prints provided with the system and the information given in the installation section of this manual.

3.1 TURN THE POWER ON

Turn the circuit breaker ON to the Model 614. Once the system is powered up, there is approximately a 20 second waiting period while the CPU starts (boots up), before there is any indication the unit is powered. After the 20-second time has elapsed, the screen states the version, and the date the software was written. The unit then gives you three options of choice:



START UP MENU

Press Up - Pressing the up arrow will allow you to choose from a list of files already loaded into the system.

Press Down - Pressing the down arrow will load the default process file "DEFAULT.DAT". This default file is a factory set file with generic values.

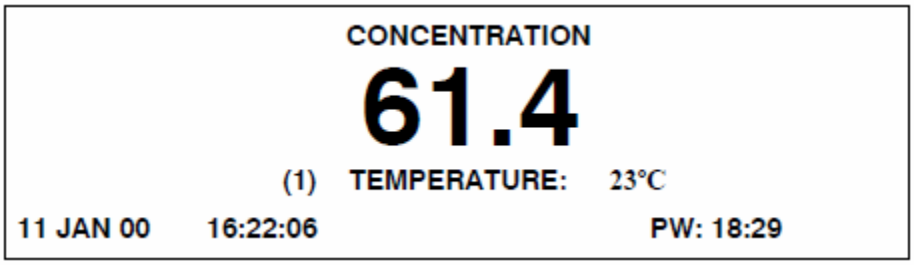
Press ENTER - Pressing ENTER will start the LAST.DAT file; this is the normal startup procedure. The LAST.DAT file is the file that the unit writes information to every time a parameter is changed, or whenever the unit is reset or shut down. It is the file containing all the information of the last file.

Note: If no action is taken the system will load, "start" the "LAST.DAT" file in 10 seconds. Pressing ENTER at any time before the 10-second time has elapsed will also start the LAST.DAT file. This is the recommended start up file. This file will be updated to the parameters set in the system, each time you CHANGE a setting, UPDATE LAST.DAT (save) or POWER DOWN the unit.

3.2 614 X1 START UP SEQUENCE

After making a selection, or the 10-second time has elapsed, the Model 614 X1 starts to initialize Head (1), setting the lamp current to 25 micro amps. Once the current is set, the display will look as shown below in Figure 24. "This is referred to as the OPERATE POSITION". If the unit does not start up in the "OPERATE POSITION" as shown below, reset the unit with the reset button located inside the Nema 4X SS enclosure. Item 8 Figure 7. It will take 20 seconds for the unit to re-boot. After 20 seconds, the above start up menu will be displayed. Press the DOWN arrow to select the DEFAULT.DAT file. The default file is set to LSC's default specifications. The parameters will now have to be set for your application. See section 4, "MENUS" to set your parameters. If the unit still does not start up in the OPERATE POSITION, then reset the unit and press the UP arrow to start at the MAIN MENU. Scroll through the process files and select the desired process file. Once at the operate menu, press the Enter Button to view the many available options. See section 4 for a description of the screens and their functions.

Figure 24
614 X1 Operate Position

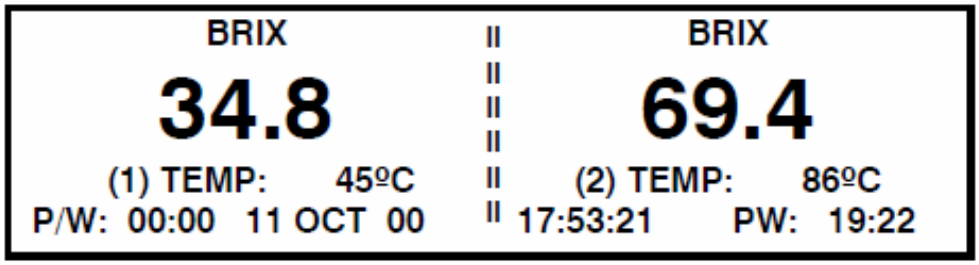


If you are unable to view the OPERATE POSITION shown above, call Liquid Solids Control for further assistance. See cover page for phone numbers.

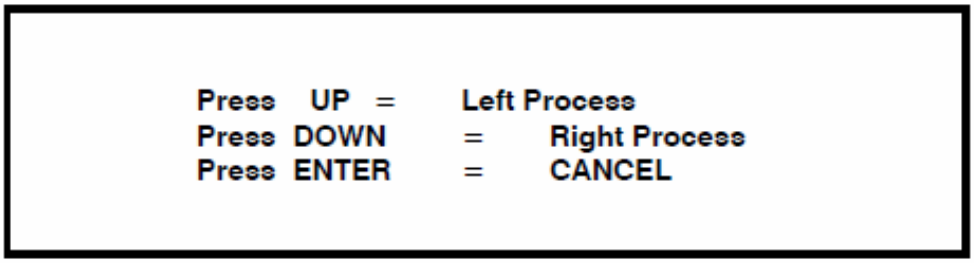
3.3 614 X2 START UP SEQUENCE

After making a selection, or the 10-second time has elapsed, the Model 614 X2 starts to initialize Head (1), setting the lamp current to 25 micro amps. Once the current is set, the unit starts to Initialize Head (2) setting the lamp current to 25 micro amps. The display will look as shown on the next page in Figure 25. "This is referred to as the, OPERATE POSITION" for the Dual 614, "614 X2". If the unit does not start up in the "OPERATE POSITION" as shown, reset the unit with the reset button located inside the Nema 4X SS enclosure, Item 8 Figure 7. It will take 20 seconds for the unit to re-boot. After 20 seconds, the above start up menu will be displayed. Press the DOWN arrow to select one of the DEFAULT.DAT files. The default files are set or programmed to LSC's default specifications. The parameters will now have to be set for your application. See section 4, "MENUS" to set your parameters. If the unit still does not start up in the OPERATE POSITION then reset the unit and press the UP arrow to start at the MAIN MENU. Scroll though the available process files and select the desired process file. **Note:** the sensing head operating with the file selected. It is possible to select either sensing head. The bracketed number i.e. (1) or (2) in front of the temperature measurement is the head selected. To switch sensing heads see section 4.10.9.

Figure 25
"614 X2 Operate Position"



Once at the main menu, pressing the ENTER button will allow you to view the process files. Pressing the UP arrow will allow you to view the Left Process and the Right arrow to view the right process. Press ENTER to cancel and return to the OPERATE MENU. See Section 4 of the manual to view the description of the many features the 614 X2 has to offer. Once the left or right button is pressed the screens viewed represent only the left or right process. Not both processes.



4. MENUS

There are a multitude of menus and sub menus available by pressing ENTER at the operating position. Move the highlighted bar through the menus by pressing the up or down arrow. Pressing ENTER allows you to select a highlighted menu. Below is a list of the menus and sub menus available. The explanation of all menus and their functions are explained in the following pages. In the descriptions of the menus the following symbols are used to help you scroll through the screens to the correct location:

"⬇" - "Press the down arrow on the touch pad once"
"⬇X7" - "Press the down arrow on the touch pad seven times"

614 X2

Note: 614 X2 Users must select the right or left process file after pressing ENTER to view the Appropriate left or right process. See section 3.3 "START UP SEQUENCE 614 X2".

CANCEL MAIN MENU - RETURN TO OPERATE
ZERO OFFSET
RUN WASH CYCLE
DISPLAY SYSTEM VARIABLES
CLEAR ALARM CONDITION
ENTER ADJUST MENU
- CANCEL ADJUST MENU - RETURN TO MAIN
- LOAD A PROCESS FILE
- ADJUST WASH CYCLE PERIOD
- ADJUST WASH CYCLE LENGTH
- ADJUST HOLD CYCLE LENGTH
- ADJUST ALARM SETPOINTS
- * ADJUST UNITS MIN/MAX
- * ADJUST LINEARIZE TABLE
- * ADJUST DECIMEL DIGITS
- * ADJUST TEMP COMPENSATION
- * ADJUST OPERATING TEMPERATURE
- * ADJUST TEMPERATURE RANGE
- * ADJUST TEMPERATURE SCALE (C/F)
- * ADJUST DATE AND TIME
- * ADJUST HISTORY PERIOD
- * SELECT UNITS TEXT

ENTER FILE MENU
- CANCEL FILE MENU - RETURN TO MAIN
- DISPLAY DISK SPACE REMAINING
- * LOAD LAST.DAT PROCESS START UP FILE
- * WRITE LAST.DAT PROCESS START FILE
- * LOAD A NUMBERED PROCESS FILE
- * WRITE A NUMBERED PROCESS FILE
- * UPDATE PROCESS AND PROGRAM FILES
- OFFLOAD PROCESS FILES
- OFFLOAD HISTORY AND EVENT FILES
- * DELETE HISTORY FILE (S)
- * DELETE OLDEST HISTORY FILE
- DISPLAY EVENT FILE (S)
- * DELETE EVENT FILE (S)

ENTER PLOT MENU
- CANCEL PLOT MENU - RETURN TO MAIN
- ENABLE / DISABLE REAL - TIME PLOT
- TOGGLE REAL - TIME PLOT HEAD SELECTION

ENTER CAL/MAINTENANCE MENU

CANCEL CAL MENU - RETURN TO MAIN
* FIELD CALIBRATION
* SELECT ALARM MODE
* RUN SELF TESTS
* SET REMOTE OFFSET INCREMENT
* TOGGLE MAINTENANCE DISPLAY
DISPLAY TEMP COMP TABLE
* TOGGLE REMOTE ON/OFF
* TOGGLE SELECTED HEAD
* TOGGLE NUMBER OF HEADS
LANGUAGE SELECT
ISB CORRECTION
* EXIT TO DOS SYSTEM

* When entering these adjustable menus a warning will be prompted. (See warning example below). Press ENTER to make changes or an arrow key to return back to the main menu.
* Changes to these menus will affect the calibration of the unit and should only be adjusted by a qualified technician.

WARNING

USE THIS MENU ITEM WITH EXTREME CAUTION

ENTER To Continue Or OTHER To Cancel

NOTE: Hooking a personal computer to the RS 232 diagnostic Portp Item 6 Figure 7 will allow the menu to be viewed on a computer while scrolling through the menus. Changing parameters cannot be done directly using the RS 232 link. Parameters can only be changed by, editing the "PROCESS FILE" and loading it into the unit or by directly changing parameters with the touch pad on the unit. Programs commonly used to edit files are Windows WordPad and Notepad.

4.1 CANCEL MAIN MENU - RETURN TO OPERATE

Pressing ENTER will set the 614 back to the OPERATE screen.

4.2 SELECT A PROCESS

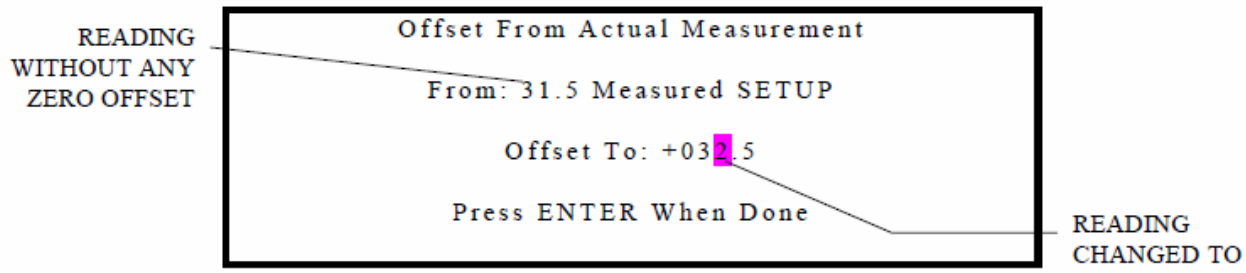
(Press "ENTER" MAIN MENU, Press "⬇" SELECT A PROCESS, Press "ENTER")

See description of menu Section 4.7.6.

4.3 ZERO OFFSET

(Press "ENTER" MAIN MENU, Press "⬇**X2**" ZERO OFFSET, Press "ENTER")

Setting the measurement to a desired readout: If the reading displayed is different from a proven off line measurement and the desire is to have the LSC read equal to the off line measurement, place the cursor on the digit by pressing the left or right arrow button on the touch pad. Increase or decrease the digit by pressing the up or down arrow respectively, until acquiring the desired setting. Adjusting the OFFSET will shift the whole calibration in the direction of that desired setting. This adjustment will change the 4 - 20 Ma output, the 0 - 10 VDC output and the displayed reading to the Offset value set. The below example shows the offset changed by 1.0 from 31.5 to 32.5. This adjustment is not used as a method of linearizing and does not change the slope of the calibration. It shifts the slope.



4.4 RUN WASH CYCLE

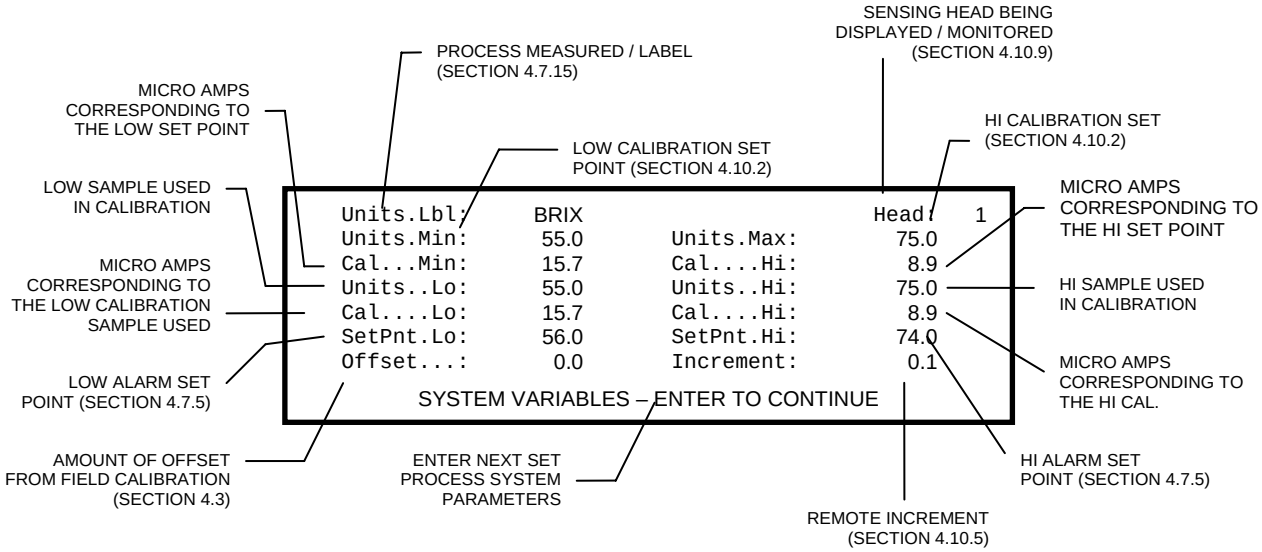
(Press "ENTER" MAIN MENU, Press "⬇**X3**" RUN WASH CYCLE, Press "ENTER")

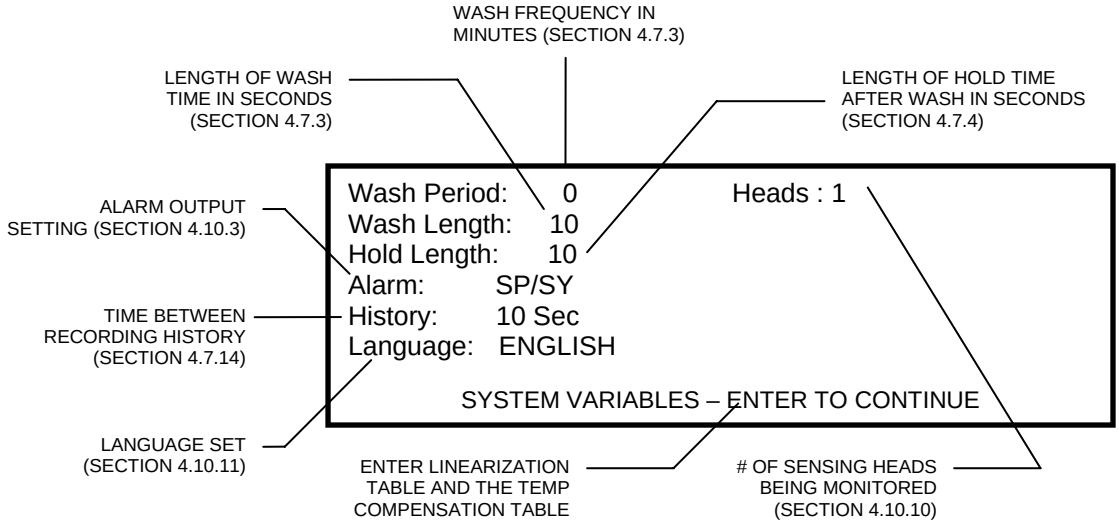
Pressing ENTER on the RUN WASH CYCLE will set the LSC 614 into a manual wash of the sensing head. During the wash time the MAIN MENU will display the wash and hold cycle. During the wash time the micro amps measured by the sensor is displayed. The micro amps displayed will increase during a wash; if the micro amps increase above the low calibration setting a successful wash is complete. The length of washing time and hold duration are determined by the parameters set in section 4.7.2 and 4.7.3.

4.5 DISPLAY SYSTEM VARIABLES

(Press "ENTER" MAIN MENU, Press "⬇**X4**" DISPLAY SYSTEM VARIABLES, Press "ENTER")

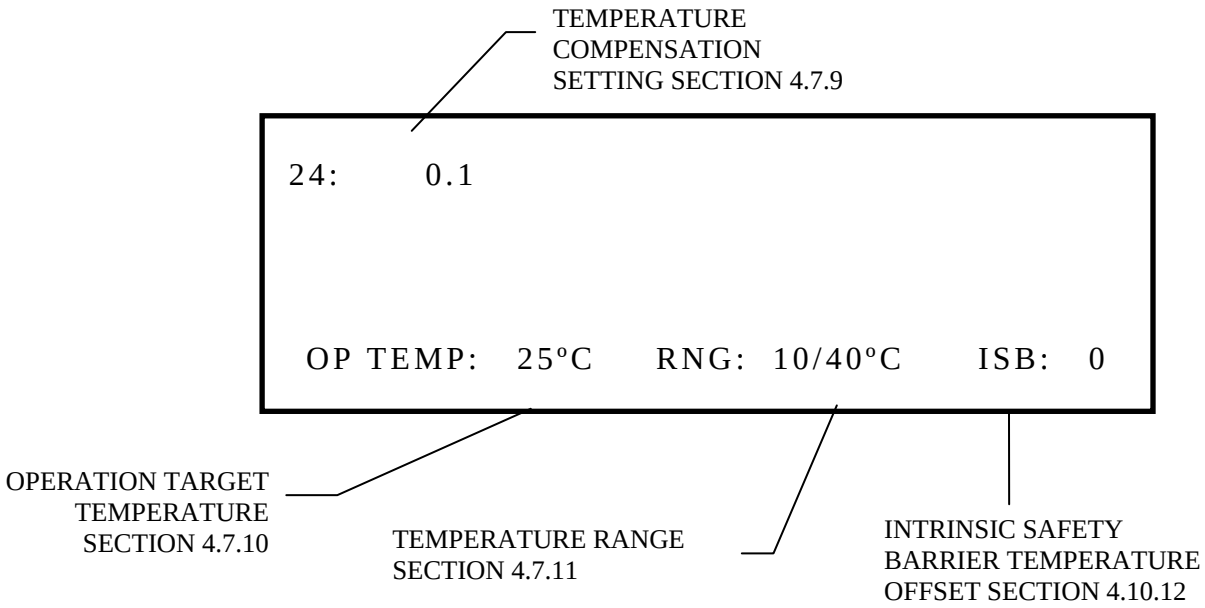
DISPLAY SYSTEM VARIABLES will display the process file parameters. Pressing ENTER again will continue listing the parameters shown in the DISPLAY SYSTEM VARIABLES. All the system variable screens are displayed below. Pressing ENTER again will show all the LINEARITY points programmed. If no points are programmed the menu will display the unit min and max calibration set points, [0.0: 0.0] [100.0: 100.0]. Refer to section 4.7.7 for programming points. ENTER again will show the TEMPERATURE COMPENSATION points programmed. See Section 4.7.9 or setting the TEMPERATURE COMPENSATION points. OPERATING TEMPERATURE and the TEMPERATURE RANGE are also displayed on the lower portion of this menu. See Section 4.7.10 to set the OPERATING TEMPERATURE, and Section 4.7.11 to set the TEMPERATURE RANGE.


SENSING HEAD BEING DISPLAYED / MONITORED (SECTION 4.10.9)
PROCESS MEASURED / LABEL (SECTION 4.7.15)
MICRO AMPS CORRESPONDING TO THE LOW SET POINT
HI CALIBRATION SET (SECTION 4.10.2)
LOW CALIBRATION SET POINT (SECTION 4.10.2)
LOW SAMPLE USED IN CALIBRATION
MICRO AMPS CORRESPONDING TO THE HI SET POINT
MICRO AMPS CORRESPONDING TO THE LOW CALIBRATION SAMPLE USED
HI SAMPLE USED IN CALIBRATION
LOW ALARM SET POINT (SECTION 4.7.5)
MICRO AMPS CORRESPONDING TO THE HI CAL.
AMOUNT OF OFFSET FROM FIELD CALIBRATION (SECTION 4.3)
ENTER NEXT SET PROCESS SYSTEM PARAMETERS
HI ALARM SET POINT (SECTION 4.7.5)
REMOTE INCREMENT (SECTION 4.10.5)
Units.Lbl: BRIX Head: 1
Units.Min: 55.0 Units.Max: 75.0
Cal...Min: 15.7 Cal....Hi: 8.9
Units..Lo: 55.0 Units..Hi: 75.0
Cal....Lo: 15.7 Cal....Hi: 8.9
SetPnt.Lo: 56.0 SetPnt.Hi: 74.0
Offset...: 0.0 Increment: 0.1
SYSTEM VARIABLES – ENTER TO CONTINUE


WASH FREQUENCY IN MINUTES (SECTION 4.7.3)
LENGTH OF WASH TIME IN SECONDS (SECTION 4.7.3)
LENGTH OF HOLD TIME AFTER WASH IN SECONDS (SECTION 4.7.4)
ALARM OUTPUT SETTING (SECTION 4.10.3)
TIME BETWEEN RECORDING HISTORY (SECTION 4.7.14)
LANGUAGE SET (SECTION 4.10.11)
ENTER LINEARIZATION TABLE AND THE TEMP COMPENSATION TABLE
OF SENSING HEADS BEING MONITORED (SECTION 4.10.10)
Wash Period: 0
Wash Length: 10
Hold Length: 10
Alarm: SP/SY
History: 10 Sec
Language: ENGLISH
Heads : 1
SYSTEM VARIABLES – ENTER TO CONTINUE

The linearity points are listed in the table below. The table can hold 25 points. To enter and set points in a Linearization Table See Section 4.7.7

The Temperature Compensation Points are listed in the table below. To enter a Temperature Compensation Value See Section 4.7.9.



4.6 CLEAR ALARM CONDITION (Press "ENTER" MAIN MENU, Press ""**⬇X5**" CLEAR ALARM CONDITIONS, Press "ENTER")

Pressing ENTER at this position will clear system alarms. This will not acknowledge LO, HI or SPEC/SYSTEM alarms. The system alarms that will be acknowledged is a Prism Wash Failure.

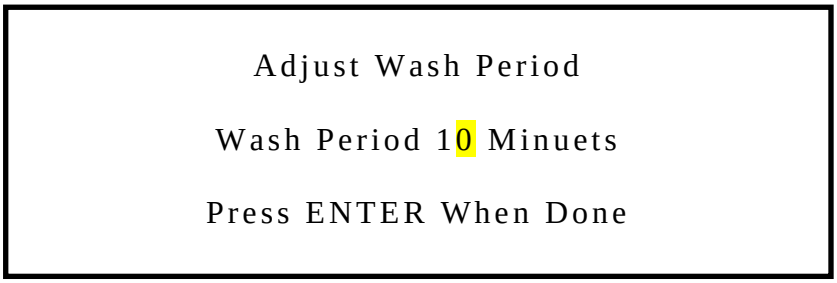
4.7 ENTER ADJUST MENU (Press "ENTER" MAIN MENU, Press "**⬇X6**" ENTER ADJUST MENU: Press "ENTER") Press ENTER to view all settable parameters.

4.7.1 CANCEL ADJUST MENU - RETURN TO MAIN

Pressing ENTER will return back to the previous menu. "MAIN MENU"

4.7.2 ADJUST WASH CYCLE PERIOD (Press "ENTER": MAIN MENU, Press "⬇**X6**" ENTER ADJUST MENU: Press "ENTER", Press "⬇", ADJUST WASH CYCLE, Press ENTER)

Adjusting the WASH CYCLE PERIOD will set the time duration between automatic washes. "Cleaning the surface of the prism". Setting the time for a scheduled wash will start a wash count down. The count down for the next wash is displayed on the operate menu at the lower right corner. If prism wash is not desired, set the wash time to 00. See section 2.5.1 for wash requirements and installation. Place the cursor on the digit by pressing the left or right arrow button on the touch pad. Increase or decrease the digit by pressing the up or down arrow respectively, until acquiring the desired wash cycle period. Note: During a wash cycle there is no access to the menus.



4.7.3 ADJUST WASH CYCLE LENGTH (Press "ENTER": MAIN MENU, Press "⬇**X6**" ENTER ADJUST MENU: Press "ENTER", Press "⬇**X2**", ADJUST WASH CYCLE LENGTH, Press ENTER)

Adjusting the WASH CYCLE LENGTH will set the length, "duration" of the wash. When the unit is sending a signal to wash the prism, the operate menu will display the length of time remaining in the wash and the micro amps from the measure sensor. As the system washes, the micro amps displayed on the operate menu will **increase** above the low calibration micro amp set point. "This will be considered a successful wash". If the micro amp current does not **increase** above the set point, then a wash alarm will be displayed flashing on the left hand side of the measured read out. This wash alarm will only initiate after the system fails two consecutive attempts. The wash alarm can only be acknowledged by pressing the "Clear Alarm Conditions", See Section 4.6. See Section 4.4 to initiate a manual wash. To set the Wash Cycle Length, place the cursor on the digit by pressing the left or right arrow button on the touch pad. Increase or decrease the highlighted digit by pressing the up or down arrow respectively, until acquiring the desired wash length. The Wash Cycle Length can be set anywhere between 00 seconds (setting the unit for smart wash, see Smart Wash settings below) and 30 seconds.

SMART WASH: Setting the wash length to 00 will initiate SMART WASH. When the system is in the SMART WASH mode, the unit will start a 30 second wash at the WASH CYCLE PERIOD set. During this wash cycle, if the micro amp current **increases** above the low calibration micro amp setting, the wash cycle will stop. "Wash successful". If the wash is not successful the system will attempt another wash at half the time set in the (ADJUST WASH CYCLE PERIOD), section 4.7.2. If the wash fails this second wash cycle then an alarm will flash at the left hand side of the reading on the Operate Display. To clear the alarm condition you must press the "Clear Alarm Condition". See Section 4.6.

Adjust Wash Length

Wash Length 05 Seconds

Press ENTER When Done

4.7.4 ADJUST HOLD CYCLE LENGTH (Press "ENTER": MAIN MENU, Press "⬇**X6**" ENTER ADJUST MENU: Press "ENTER", Press "⬇**X3**", ADJUST HOLD CYCLE LENGTH, Press ENTER)

Adjusting the Hold Cycle Length will set the time the 4 - 20 mA output and the display readout will be held before going back to an actively displayed measurement. This hold period allows the **sensing head** and **prism** to return to operation temperature. The greater the change in temperature between the process and the wash medium the longer a hold period is required. The time setting for the Hold Cycle can be set between 01 second and 60 seconds. To set the Hold Cycle Setting place the cursor on the digit by pressing the left or right arrow button on the touch pad. Increase or decrease the digit by pressing the up or down arrow respectively, until acquiring the desired hold cycle length.

Adjust Hold Length

Hold Length 30 Seconds

Press ENTER When Done

4.7.5 ADJUST ALARM SETPOINTS (Press "ENTER": MAIN MENU, Press "⬇**X6**" ENTER ADJUST MENU: Press "ENTER", Press "⬇**X4**", ADJUST ALARM SETPOINT, Press ENTER)

Pressing ENTER will bring up the low alarm set point and ENTER again will display the high alarm set point. These two settings represent the Normally Open or Normally Closed alarm outputs. See figure 19 and 20, terminals 13 - 18 for the location of the alarm terminations. See also Section 2.5.2 for the alarm functions. Place the cursor on the digit by pressing the left or right arrow button on the touch pad. Increase or decrease the digit by pressing the up or down arrow respectively, until acquiring the desired Hi and Lo alarms. See section 4.10.3 to select a different alarm mode.

Adjust Alarm Setpoints

Lo Setpoint 030 .0 PERCENT

Press ENTER When Done

```
Adjust Alarm Setpoints

Hi Setpoint 050 .0 PERCENT

Press ENTER When Done
```

4.7.6 *ADJUST UNITS MIN/MAX (Press "ENTER": MAIN MENU, Press "⬇**X6**" ENTER ADJUST MENU: Press "ENTER", Press "⬇**X5**", ADJUST UNITS MIN/MAX, Press ENTER)

Pressing ENTER will bring up the Warning noted in section 4. Pressing ENTER again will allow the Minimum, and ENTER again the Maximum Units to be set. These Min and Max Units represent the range the display will read, and should also represent the values that the system is calibrated for. Place the cursor on the digit by pressing the left or right arrow button on the touch pad. Increase or decrease the digit by pressing the up or down arrow respectively, until acquiring the desired min and max settings. Pressing ENTER again will save these settings to the LAST.DAT file and return the display to the MAIN MENU.

```
Adjust Units Minimum and Maximum

Units Minimum  030 .0 PERCENT

Press ENTER When Done
```

```
Adjust Units Minimum and Maximum

Units Maximum  050 .0 PERCENT

Press ENTER When Done
```

4.7.7 *ADJUST LINEARIZATION TABLE (Press "ENTER": MAIN MENU, Press "⬇X6" ENTER ADJUST MENU: Press "ENTER", Press "⬇X6", ADJUST LINEARIZATION TABLE, Press ENTER)

The Model 614 has the ability to track and give accurate measurements of products with a non-linear Refractive Index. This is accomplished by adding a series of points in the "Adjust Linearization Table". There are a maximum of 25 points that can be programmed into the table. A linearization table is only required if the LSC measurement is out (due to a nonlinear process) at the mid-range but accurate at the high and low end calibration points. With a linearization table we are able to display a linear measurement of a non-linear product by simulating a linear line between the two points entered. Before entering the Linearization table, points to be entered are required. The first and last points are already entered; as they are points entered in the field calibration, see section 4.10.2 of the manual. Once field calibrated, additional points can be acquired by placing known samples, an "Actual Value" on the Sensing Head, as done for the field calibration, and recording the "Measured Value". These new values will represent the next set of points. If the "Measured Value", equals the 'Actual Value", then no linearization table is required. Below is an example of points that may be entered. Note the units entered are as per the units specified in section 4.7.15.

LINEARIZATION POINT	MEASURED VALUE	ACTUAL VALUE
1	000.0	000.0
2	004.2	005.0
3	008.8	010.0
4	013.8	015.0
5	019.2	020.0
6	025.0	025.0

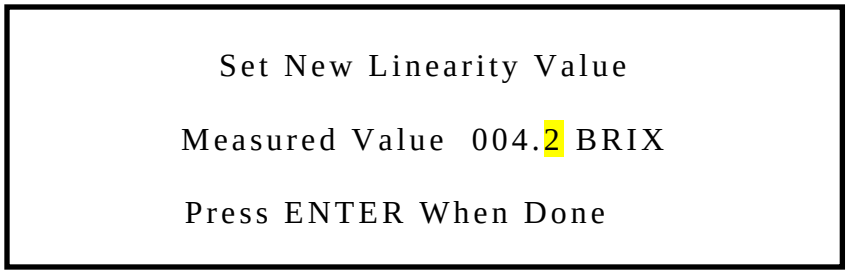
- ENTERING A POINT

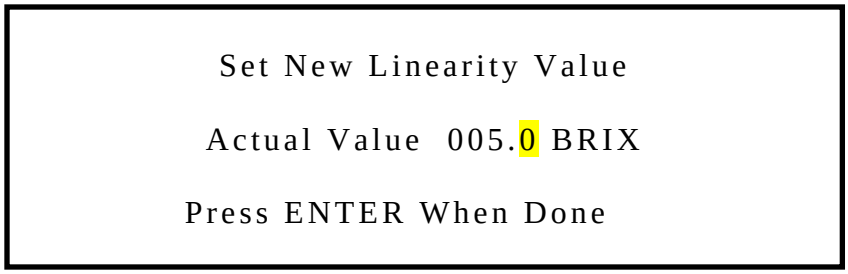
Pressing ENTER will bring up the Warning noted in section 4. Pressing ENTER again will allow the "Measured Value" to be set, and ENTER again the "Actual Value" to be set. These two values represent a linearized point. Place the cursor on the digit by pressing the left or right arrow button on the touch pad. Increase or decrease the digit by pressing the up or down arrow respectively, until acquiring the desired Measured Values and Actual Values.

Repeat the ENTERING A POINT procedure above to enter additional points.

- REMOVING A POINT

Before starting this procedure, record the Measured Value, which needs to be removed. Pressing ENTER will bring up the warning noted in section 4. Pressing ENTER again will allow the Measured Value to be set. Input the Measured Value that needs to be deleted and press ENTER. Next input an Actual Value equal to a Measured Value set. This will remove the point. Place the cursor on the digit by pressing the left or right arrow button on the touch pad. Increase or decrease the digit by pressing the up or down arrow respectively, until acquiring the desired Measured Values and Actual Values.



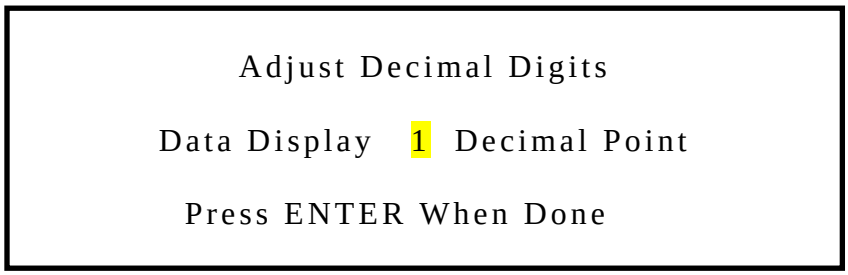


- VIEWING POINTS

These points, once entered, are all listed on the third screen of the DISPLAY SYSTEM VARIABLES menu. See Section 4.4. The points are all arranged in numerical order as per the Measured Value.

4.7.8 *ADJUST DECIMAL DIGITS (Press "ENTER": MAIN MENU, Press "⬇**X5**" ENTER ADJUST MENU: Press "ENTER", Press "⬇**X7**", ADJUST DECIMAL DIGITS, Press ENTER)

Pressing ENTER will bring up the Warning noted in section 4. Pressing ENTER again will allow the decimal place for the units to be set. The range of decimal places possible is 0 - 4. The up arrow will allow you to scroll continuously from 0 - 4. The down arrow will scroll continuously from 4 - 0. Press ENTER to accept the entry and return to the MAIN MENU.



4.7.9 *ADJUST TEMPERATURE COMPENSATION

(Press "ENTER": MAIN MENU, Press "⬇**X6**" ENTER ADJUST MENU: Press "ENTER", Press "⬇**X8**", ADJUST TEMPERATURE COMPENSATION, Press ENTER)

Before adjusting the TEMPERATURE COMPENSATION, you must set the TEMPERATURE RANGE (Section 4.7.11), and the OPERATING TEMPERATURE (Section 4.7.10)

As the temperature of the process changes, the refractive index, "RI" of that process also changes, while the **actual dissolved solids** remains constant. The amount that the RI changes, in reference to temperature, varies between processes and temperatures. This unit has the ability to program multiple compensation values to compensate for these variations in RI during temperature swings. Note: the unit will only compensate within the TEMPERATURE RANGE set in Section 4.7.11. Extensive research has been done by LSC in determining the amount of compensation required for a process at different operating temperatures. This compensation is called the TEMPERATURE COMPENSATION VALUE ADJUSTMENT or "TCVA", and is a function of the change in Refractive Index, and temperature. Below is a formula for calculating the TCVA, or call your local LSC representative. (See Section 8 for technical support).

TCVA = (% CALIBRATION SPAN) x (δ RI/ºC) / (RI SPAN) (δ = DELTA)

Pressing ENTER will bring up the Warning noted in section 4. Press ENTER again to set an Offset Temperature.

Set Temperature Compensation Value
Temperature 036
Press ENTER When Done

Pressing ENTER again will allow you to set the Temperature Offset Adjustment. The Temperature Offset Adjustment Value is the amount of change in reading due to the change in temperature. The Offset

Adjustment is equal to the Offset from Operating Temperature, multiplied by the TCVA Value.

Note: A positive and negative offset value need to be inputted. Below is an example of temperature settings. Pressing ENTER will return to the MAIN MENU.

Set Temperature Compensation Value
Adjustment +00.10 Solids
Press ENTER When Done

E.g. CALIBRATION 55% - 75%
TEMPERATURE RANGE = 20ºC - 40ºC
OPERATING TEMPERATURE = 35ºC
Set the TEMPERATURE to 36ºC
Set the TEMPERATURE COMPENSATION VALUE ADJUSTMENT = 0.1

In the above example, for every one degree C that the temperature varies from the OPERATING TEMPERATURE, the % readout will be compensated 0.1%.
For processes where the Δ RI/ºC is not linear, multiple points must be programmed in. Programmed points can be viewed in the DISPLAY TEMP COMP TABLE. (Section 4.10.7)

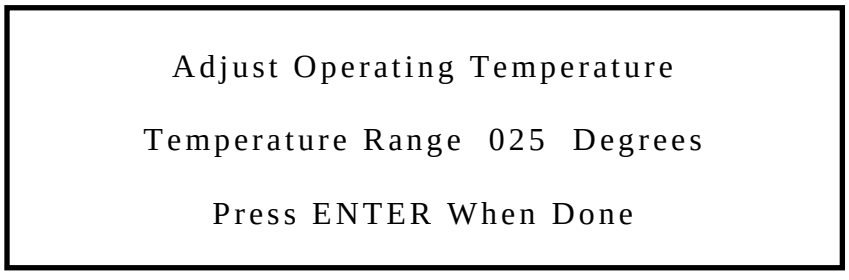
- REMOVING A POINT

The points set in the Temperature Compensation Table are listed in the DISPLAY SYSTEM VARIABLES fourth menu. See Section 4.5. Before starting this procedure, record the Temperature number / s displayed for the point you wish to remove and the Operating Temperature. Pressing ENTER at the Adjust Temperature Compensation Menu will bring up the warning noted in Section 4. Pressing Enter again will allow you to input the Offset from Operating Temperature number for the point you wish to remove. Pressing ENTER again will bring you to the Offset Adjustment menu. Pressing ENTER again, will set this value to 000.00, the default value. The Offset Temperature Compensation Value, which you recorded, has been removed. Check the forth menu of the DISPLAY SYSTEM VARIABLES to confirm that the point has been removed.

4.7.10 *ADJUST OPERATING TEMPERATURE

(Press "ENTER": MAIN MENU, Press "⬇**X6**" ENTER ADJUST MENU: Press "ENTER", Press "⬇**X9**", ADJUST OPERATING TEMPERATURE, Press ENTER)

Pressing ENTER will bring up the Warning noted in section 4. Press ENTER to set the OPERATING TEMPERATURE of the process. The OPERATING TEMPERATURE set must be the desired target process temperature. Place the cursor on the digit by pressing the left or right arrow button on the touch pad. Increase or decrease the digit by pressing the up or down arrow respectively, until acquiring the desired OPERATING TEMPERATURE setting. Press ENTER to accept the setting and return to the Main Menu.

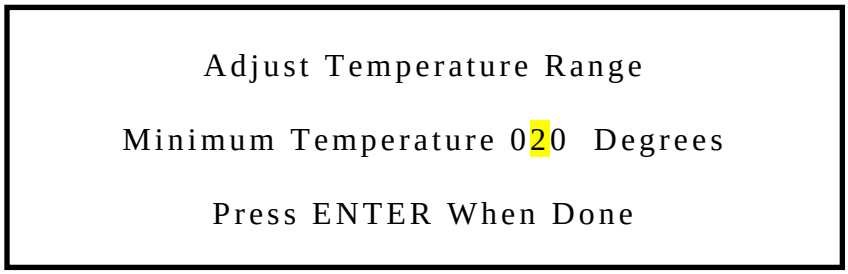


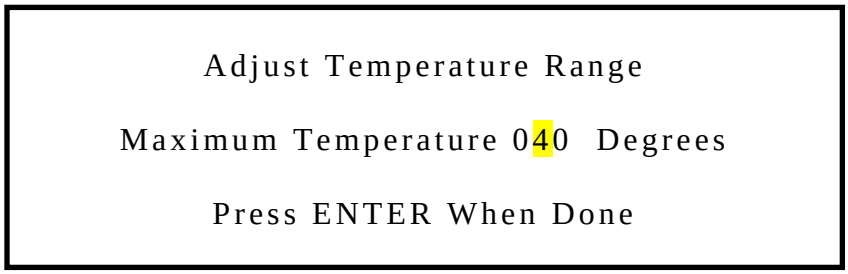
4.7.11 *ADJUST TEMPERATURE RANGE

(Press "ENTER": MAIN MENU, Press "⬇**X6**" ENTER ADJUST MENU: Press "ENTER", Press "⬇**X10**", ADJUST TEMPERATURE RANGE, Press ENTER)

Where the OPERATING TEMPERATURE is for the actual target temperature of the process, See Section 4.7.10, the TEMPERATURE RANGE is for the temperature that the process will be maintained at during normal operation.

Pressing ENTER will bring up the Warning noted in section 4. Press ENTER again to set the MINIMUM TEMPERATURE VALUE. This minimum value is the minimum normal operating temperature. Place the cursor on the digit by pressing the left or right arrow button on the touch pad. Increase or decrease the digit by pressing the up or down arrow respectively, until acquiring the desired MINIMUM OPERATING TEMPERATURE. Press ENTER again to set the MAXIMUM OPERATING TEMPERATURE of the process. Pressing ENTER again will accept these values and the display will return to the Main Menu. Once the TEMPERATURE RANGE has been set, if the temperature of the process is outside the set range, a flashing alarm message will be displayed on the left side of the OPERATE MENU. If the ALARM MODE is set at the OUT OF SPEC/SYSTEM screen, (See Section 4.10.3) an alarm contact will also be initiated when the process is outside the set range.





4.7.12 *ADJUST THE TEMPERATURE SCALE (C/F)

(Press "ENTER": MAIN MENU, Press "⬇**X6**" ENTER ADJUST MENU: Press "ENTER", Press "⬇**X11**", ADJUST THE TEMPERATURE SCALE (C/F), Press ENTER)

Pressing ENTER will bring up the Warning noted in section 4. Pressing ENTER again will bring up the menu to set the TEMPERATURE SCALE from Fahrenheit to Celsius. Pressing any arrow key at this menu will change the temperature scale, ENTER to accept the desired setting. Note: Changing the temperature scale will not adjust the other set temperature parameters. You must adjust all temperature parameters to reflect the scale selected.

Select Temperature Scale

Temperature Scale is Fahrenheit

Press ENTER When Done

4.7.13 *ADJUST DATE AND TIME (Press "ENTER": MAIN MENU, Press "⬇**X6**" ENTER ADJUST MENU: Press "ENTER", Press "⬇**X12**", ADJUST DATE AND TIME, Press ENTER)

Pressing ENTER will bring up the Warning noted in section 4. Pressing ENTER again will allow the YEAR to be set. Place the cursor on the digit by pressing the left or right arrow button on the touch pad. Increase or decrease the digit by pressing the up or down arrow respectively, until acquiring the desired date.

Adjust Year

YEAR: 99

Press ENTER To Continue

Pressing ENTER accepts the YEAR and enters the Adjust Month menu.

Adjust Month

MONTH: 04

Press ENTER To Continue

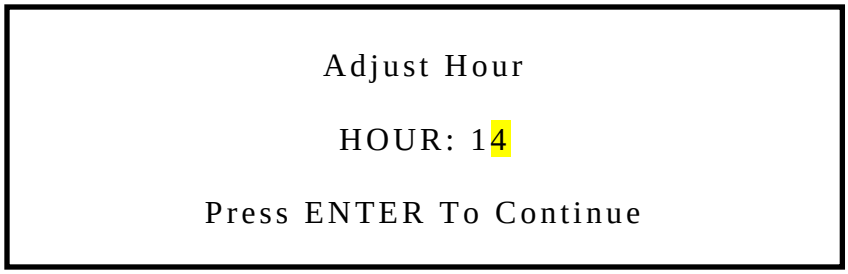
Pressing ENTER accepts the month and enters the Adjust Day menu. The unit acknowledges Leap Years and the day will not have to be adjusted in the event of a Leap Year.

Adjust Day

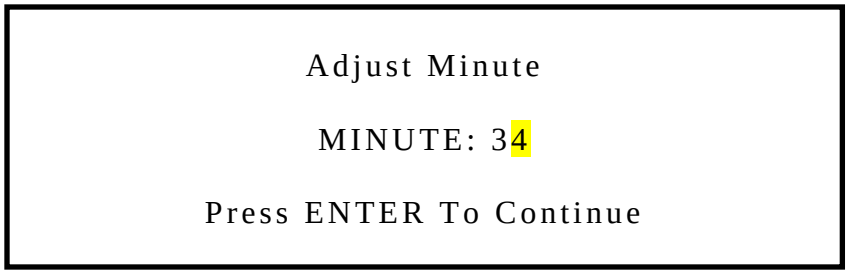
DAY: 26

Press ENTER To Continue

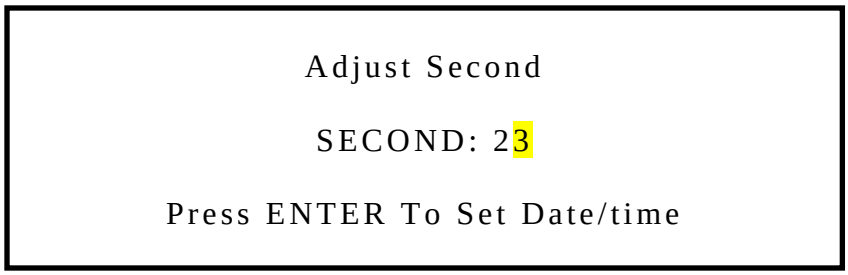
Pressing ENTER accepts the Day and enters the Adjust Hour menu. Use the 24 hour clock when adjusting the Hour. (1:00 PM = 13:00)



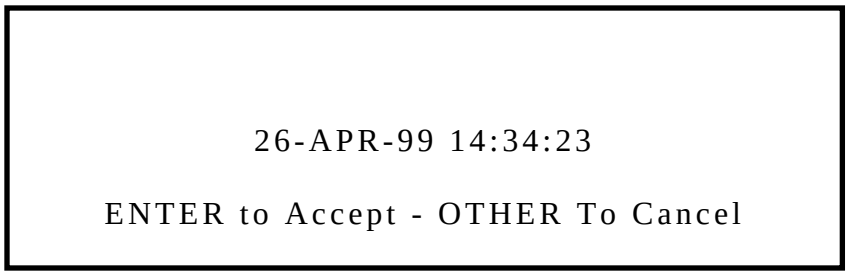
Pressing ENTER accepts the Hour and enters the Adjust Minute menu.



Pressing ENTER accepts the MINUTE and enters the Adjust Second menu.



Pressing ENTER accepts the SECONDS and enters the confirmation menu.



Pressing ENTER accepts the DATE AND TIME set or an arrow key will cancel set DATE AND TIME and return back to the MAIN MENU.

4.7.14 *ADJUST HISTORY PERIOD (Press "ENTER": MAIN MENU, Press "⬇X6" ENTER ADJUST MENU: Press "ENTER", Press "⬇X13", ADJUST HISTORY PERIOD, Press ENTER)

The time in seconds, set in the HISTORY PERIOD, is the frequency by which information is **updated** in the history file. This **history file** can then be **down loaded** (see section 4.8.9) and exported into a spreadsheet where the data can be analyzed and plotted. The default and recommended setting is 20 seconds. With the timing set at 20 seconds, the history file will log for approximately 90 days before delete the oldest file. A new file is started at the beginning of each day. If a more accurate file is required, a shorter HISTORY PERIOD is recommended. "NOTE"; if a shorter HISTORY PERIOD is set, the **memory** will fill up faster. Once the **C:** drive is full, less than 50 KB the oldest history file will be deleted, "**first in / first out**". Setting the History Period is also the frequency time used in the REAL TIME PLOT menu. See Section 4.9.2).

Pressing ENTER will bring up the Warning noted in section 4. Pressing ENTER again will allow the HISTORY PERIOD to be set. Place the cursor on the digit by pressing the left or right arrow button on the touch pad. Increase or decrease the digit by pressing the up or down arrow respectively, until acquiring the desired HISTORY PERIOD. The HISTORY PERIOD set can be viewed in the "DISPLAY SYSTEM VARIABLES" menu, second screen. (See Section 4.5)

```
Adjust History Update Period

Update Every 060 Seconds

Press ENTER When Done
```

4.7.15 *UNITS TEXT (Press "ENTER": MAIN MENU, Press "⬇X6" ENTER ADJUST MENU: Press "ENTER", Press "⬇X14", ADJUST HISTORY PERIOD, Press ENTER)

The UNITS TEXT selected is displayed at the top of the OPERATE MENU and describes the units of the process being measured. Below are the default units that can be selected. For selecting the units desired, pressing ENTER will bring up the Warning noted in section 4. Pressing ENTER again will bring up the menu to set the UNITS TEXT. Press the up or down arrow to the desired units and press ENTER. Units selected will now be displayed on the top of the OPERATE MENU. If the type of units required is not on the list, others may be added to the list by creating another file.

```
RETURN TO MAIN MENU
BRIX
CONCENTRATION
PERCENT_SOLIDS
REFRACTIVE_INDEX
PERCENT
BLANK
```

4.8 ENTER FILE MENU (Press "ENTER" MAIN MENU, Press "**⬇X7**" ENTER FILE MENU: Press "ENTER") Press ENTER to view the FILE MENU.

4.8.1 CANCEL FILE MENU (Press "ENTER": MAIN MENU, Press "**⬇X7**" ENTER FILE MENU: Press "ENTER", RETURN TO MAIN MENU)

Pressing Enter returns to the MAIN MENU.

4.8.2 DISPLAY DISK SPACE REMAINING (Press "ENTER": MAIN MENU, Press "**⬇X7**" ENTER FILE MENU: Press "ENTER", Press "**⬇X**", DISPLAY DISK SPACE REMAINING)

Pressing ENTER displays the DISK SPACE REMAINING. The first number is the DISK SPACE available on the **C drive** and the second number is the DISK SPACE remaining on the. Press Enter again to return to the MAIN MENU. The total disk space on the C drive is **6 Meg**.

4.8.3 *LOAD LAST.DAT PROCESS FILE (Press "ENTER" MAIN MENU, Press "**⬇X7**" ENTER FILE MENU: Press "ENTER", Press "**⬇X2**", LOAD LAST.DAT PROCESS FILE)

Pressing ENTER will bring up the Warning noted in section 4. Pressing ENTER again will load the LAST.DAT file. Loading the LAST.DAT file will install the latest system settings.

4.8.4 *WRITE LAST.DAT PROCESS FILE (Press "ENTER": MAIN MENU, Press "**⬇X7**" ENTER FILE MENU: Press "ENTER", Press "**⬇X3**", WRITE LAST.DAT PROCESS FILE)

Pressing ENTER will bring up the Warning noted in section 4. Pressing ENTER again will save the current parameters as the LAST.DAT file. The system also writes to the LAST.DAT File automatically any time an adjustable parameter is changed. Saving the current settings, as the Last.dat file will load these parameters when starting, or rebooting the system.

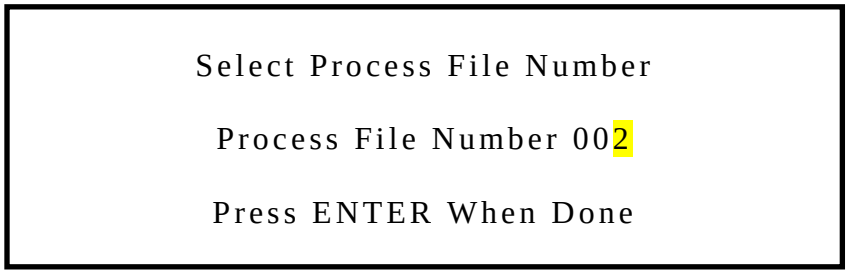
4.8.5*LOAD NUMBERED PROCESS FILE (Press "ENTER": MAIN MENU, Press "⬇**X7**" ENTER FILE MENU: Press "ENTER", Press "⬇**X4**", LOAD NUMBERED PROCESS FILE)

Pressing ENTER will bring up the Warning noted in section 4. Pressing ENTER again will display the NUMBERED PROCESS FILES available. Move the cursor up or down with the up or down arrow respectively, until you highlight the process file you desire and press ENTER. If you do not desire to change the file, highlight **Return to Main Menu** and press ENTER. There are 59 files that can be recalled from the display. To save a NUMBERED PROCESS FILE see section 4.8.6 and to save a NAMED PROCESS FILE see section 4.8.6.a

Note: DEFAULT.DAT- Generic file programmed by LSC
FACTORY.DAT- Factory set to the parameters specified by customer at time of purchase.
LAST.DAT- Last saved program file. The 614 writes all changes to this file.

4.8.6 WRITE NUMBERED PROCESS FILE (Press "ENTER": MAIN MENU, Press "⬇**X7**" ENTER FILE MENU: Press "ENTER", Press "⬇**X5**", WRITE NUMBERED.DAT PROCESS FILE, Press "ENTER")

A PROCESS FILE is a file that stores all the calibration and operation parameters that are programmed or set. These files can be programmed or set locally to the unit or on a computer and loaded into the unit via the floppy drive. Pressing ENTER allows you to select a number between and including (000 - 999). Place the cursor on the digit by pressing the left or right arrow button on the touch pad. Increase or decrease the digit by pressing the up or down arrow respectively, until acquiring the desired NUMBERED PROCESS FILE. If you select a number that already exists the original file will be erased and replaced with the new file. ENTER again stores the file with the number and a .DAT extension and returns the display to the MAIN MENU e.g. PROC_002.DAT.



4.8.6.a SAVING A PROCESS FILE EXTERNAL TO THE 614

Process files can also be written and saved external to the 614. The files are text format and can be given unique names of 8 characters with a DAT extension. Once the file has been made and saved to a disk it can be loaded into the 614 by following the procedure in section 4.8.7 UPDATE PROCESS AND PROGRAM FILES. Below is an example of a process file:

```
#
# PROCESS FILE CREATED 16-JUN-00 11:45:57 "Date file was saved"
#

NAME      =PROTOTYPE      -   "File Name"
UNITS     =BRIX           -   "Units of Measurement"
HEAD      = 02            -   "Number of Sensing Heads"
MUX       = 01            -   "Multiplexing Capability"
REMOTE    = 01            -   "Remote Capability"
UNITMIN   = 045.0         -   "Units Minimum"
UNITMAX   = 055.0         -   "Units Maximum"
CALMIN    = 028.1         -   "Micro amp reading corresponding to Units Minimum"
CALMAX    = 026.8         -   "Micro amp reading corresponding to Units Maximum"
UNITLOW   = 45.0          -   "Samples used for calibration Lo end"
UNITHI    = 055.8         -   "Samples used for calibration Hi end"
CALLO     = 028.1         -   "Calibrated Lo micro amp reading"
CALHI     = 026.8         -   "Calibrated Hi micro amp reading"
LOSET     = 044.5         -   "Lo Alarm Set Point"
HISET     = 055.5         -   "Hi Alarm Set Point"
OFFSET    = 000.0         -   "Amount in units of measurement reading is offset"
OFFADJ    = 000.1         -   "Remote offset in units of measurement"
ALARM     = 1             -   "Alarm Settings (HI/LO) or (SYSM/SPEC)
CYCLE     = 020           -   "Time between Washes in Minuets"
WASH      = 000           -   "Duration of Wash Time in Seconds"
HOLD      = 010           -   "Duration of Hold Time in Seconds"
TMPSCL    = F             -   "Temperature F Fahrenheit, C Celsius"
TMPMIN    = 120           -   "Minimum Operating Temperature"
TMPMAX    = 200           -   "Maximum Operating Temperature"
TMPOPR    = 135           -   "Operating Temperature"
TMPISB    = 000           -   "Intrinsic Safety Barrier Temperature Offset"
HIST      = 015           -   "Frequency of Recording History in Seconds"
DIGITS    = 1             -   "Amount of Numbers Right of the Decimal Point"
LANG      = ENGLISH       -   "Language"

TCOMP     = 125 0.400000  -   "Temperature Compensation Value 1st Point"
TCOMP     = 200 3.000000  -   "Temperature Compensation Value 2nd Point"
```

4.8.7 *UPDATE PROCESS AND PROGRAM FILES (Press "ENTER": MAIN MENU, Press "⬇**X7**" ENTER FILE MENU: Press "ENTER", Press "⬇**X6**", UPDATE PROGRAM AND PROCESS FILES, Press "ENTER")

As stated in section 4.8.6, Process files can be written off site, stored to a disk, and loaded into the 614 using the locally mounted **a: drive**. The off-site process files can be given names, opposed to numbers, as in section 4.8.6. In naming a file, use standard **DOS format** with a **.DAT** extension. Programming files are only written off - site for the Model 614, and are acquired from **Liquid Solids Control**. Programming files are the operating files for the 614. When updating these files, they must be in the **root directory** of the **a: drive,** or the 614 will not find the files. Place a 3.5" floppy disk into the **a: drive** of the 614 as instructed by the display and press ENTER. The display will read "CREATE ARCIVE DIRECTORY ON A:" then "ARCHIVE PROCESS FILES TO A:", and then "COPING PROGRAM FILES FROM A:". These are the commands visible on the display as the system updates the files. Notice that not only does this operation update the process and program files, it also copies all process and program files from the **c: drive** to the **a: drive** before updating. This copying of files to **the a: drive** before updating, is done in case any updated files have the same name, therefore overwriting the previous file. You now have a copy of the old files in the ARCIVE directory on the **a: drive**. The unit then returns to the MAIN MENU.

4.8.8 OFFLOAD PROCESS FILES (Press "ENTER": MAIN MENU, Press "⬇**X7**" ENTER FILE MENU: Press "ENTER", Press "⬇**X7**", OFFLOAD PROCESS FILES, Press "ENTER")

Off loading PROCESS FILES takes the files stored on the **C: drive**, and copies them to the **A: drive**. All files will be stored in a directory called "ARCHIVE", on the **A: drive**. The 614's processor creates this directory. Place the 3.5" floppy disk into the **A: drive** of the 614 as instructed by the display and press ENTER. The system will then "CREATE ARCHIVE DIRECTORY ON DRIVE A:" then "ARCHIVE PROCESS FILES TO DRIVE A:" These are the commands visible on the display as the system off loads the PROCESS FILES and returns to the MAIN MENU.

4.8.9 OFFLOAD HISTORY AND EVENT FILES

(Press "ENTER": MAIN MENU, Press "⬇**X7**" ENTER FILE MENU: Press "ENTER", Press "⬇**X8**", OFFLOAD HISTORY AND EVENT FILES, Press "ENTER")

Off loading the HISTORY AND EVENT FILES takes the history and event files stored on the C: drive, and copies them to the A: drive. During the downloading process the history and event files are zipped. This file is called "offload.zip". INSERT BLANK DISKETTE INTO FLOPPY DRIVE of the 614 as instructed by the display and press "ENTER". The system will then start to zip the files and copy offload.zip to the A: drive. This process may take several minutes. While the unit is zipping and coping the files the display will continue displaying, "INSERT BLANK DISKETTE INTO FLOPPY DRIVE". Once the operation is complete the display will return to the MAIN MENU.

This file can now be loaded into a computer and the file unzipped using pkunzip or WinZip for windows. After unzipping the **offload.zip** file, the history and event files can be viewed. These files will be called EVNT_###.TXT and HIST_###.TXT, where ### represents the day of the year the file started. These files are ASCII format. Open the files using programs that recognize TXT files or spreadsheet programs such as MS EXCEL. These files are comma delimited as shown below.

- **Viewing and analyzing a History file**. A history file is a series of data points record at a set time interval. (Set in section 4.7.14). The history format is as shown on the next page.

DATE, TIME, ADJ SENSE, TEMP, SENSE ua, REF ua, LED ma, LED Drive, [UNITS_MIN, UNITS_MAX]

08-OCT-99, 00:00:08, 44.7, 22.7, 28.6, 25.0, 49.8,2517, [0.0, 80.0]
08-OCT-99, 00:00:18, 44.7, 22.7, 28.6, 25.0, 49.9,2517
08-OCT-99, 00:00:28, 44.7, 22.7, 28.6, 25.0, 49.9,2517
08-OCT-99, 00:00:38, 44.7, 22.7, 28.6, 25.0, 49.9,2517
08-OCT-99, 00:00:48, 44.7, 22.7, 28.6, 25.0, 49.8,2517
08-OCT-99, 00:00:58, 44.7, 22.8, 28.6, 25.0, 49.9,2517
08-OCT-99, 00:01:08, 44.7, 22.8, 28.6, 25.0, 49.8,2517
08-OCT-99, 00:01:18, 44.7, 22.7, 28.6, 25.0, 49.9,2517
08-OCT-99, 00:01:28, 44.7, 22.8, 28.6, 25.0, 49.9,2517

DATE: Self-explanatory
TIME: Self-explanatory
ADJ SENSE: The output of the 614 in calibrated units after the temperature compensation
TEMP: Temperature
SENSE ua: Micro Amp reading from the measure detector.
REF ua: Micro amp reading of the reference detector.
LED ma: Measured LED drive in milli amps (current).
LED Drive: DAC output 0 - 4096 counts (12 bit)

UNITS_MIN: Minimum calibration range
UNITS_MAX: Maximum calibration range

• **Viewing and analyzing an event file** The event files, log time, date and a brief description of the event that occurred at that interval.

DATE, TIME, EVENT

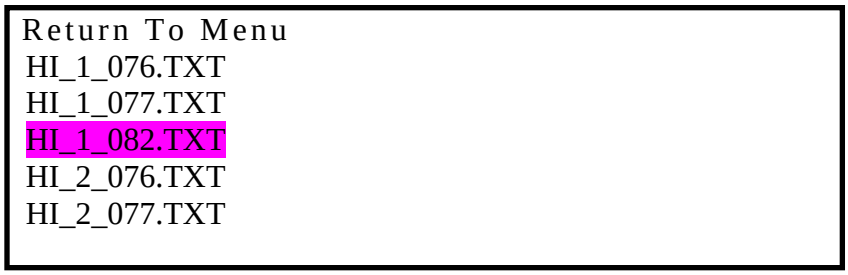
24-SEP-99, 004428 Program Startup
24-SEP-99, 004439 REF Initialize: LED Drive 2089 and 31.0ma Current
24-SEP-99, 004440 ALARM: LOW VALUE
24-SEP-99, 022529 Program Startup
24-SEP-99, 023427 Program Startup
24-SEP-99, 023428 ALARM: HI VALUE
24-SEP-99, 023445 ALARM: Clear High Alarm
24-SEP-99, 023446 ALARM: LOW VALUE

DATE: Self-explanatory
TIME: Self-explanatory
EVENT: Description of the Event that occurred

4.8.10 DELETE HISTORY FILE (S) (Press "ENTER": MAIN MENU, Press "⬇**X7**" ENTER FILE MENU: Press "ENTER", Press "⬇**X9**", DELETE HISTORY FILE (S))

Pressing ENTER will bring up the Warning noted in section 4. Pressing ENTER again will display the HISTORY FILES available. Move the cursor up or down with the up or down arrow respectively, until you highlight the HISTORY FILE you desire and press ENTER. If you do not desire to delete a file, highlight

Return To Main Menu and press ENTER. Each File is named according to the sensing head and the date the file started. The first 5 characters represent the sensing head; HI_1_ for head one and HI_2_ for head two. (If your unit is a 614 X1 then there will be no history files listed HI_2_). The next 3 numbered characters before the .TXT extension represent the starting date for the HISTORY FILE. E.g. 001 represents January 1st, and 365 representing December 31. On a leap year 366 representing December 31.

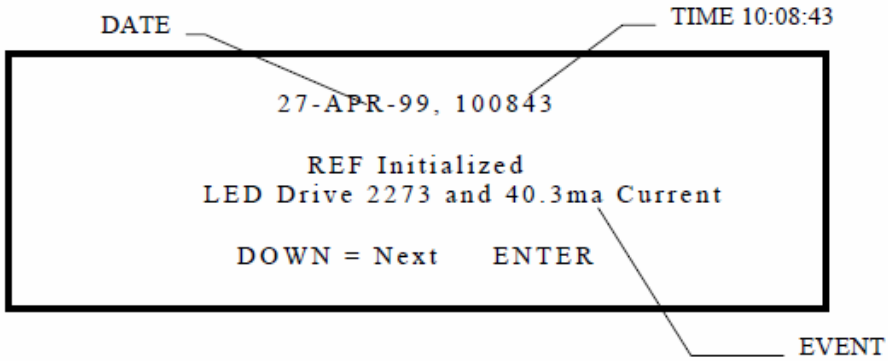


4.8.11 DELETE OLDEST HISTORY FILE (Press "ENTER": MAIN MENU, Press "⬇**X7**" ENTER FILE MENU: Press "ENTER", Press "⬇**X10**", DELETE OLDEST HISTORY FILE)

Pressing ENTER will bring up the Warning noted in section 4. Pressing ENTER again will delete the OLDEST HISTORY FILE, and return the display back to the MAIN MENU or press arrow key to cancel the operation and return you back to the MAIN MENU.

4.8.12 DISPLAY EVENT FILES (Press "ENTER": MAIN MENU, Press "⬇**X7**" ENTER FILE MENU: Press "ENTER", Press "⬇**X11**", DISPLAY EVENT FILE)

Pressing ENTER will list the event files that are saved in memory. Each File is named according to the sensing head and the date the file started. The first 5 characters represent the sensing head; EV_1_ for head one and EV_2_ for head two. (If your unit is a 614 X1 then there will be no history files listed EV_2_). The next 3 numbered characters before the .TXT extension represent the starting date for the HISTORY FILE. E.g. EV_1_116.TXT. "This event file for sensing head 1 started on the 116th day of the year." Scroll the cursor up and down using the up and down arrow on the touch pad to highlight the desired event file and press ENTER.

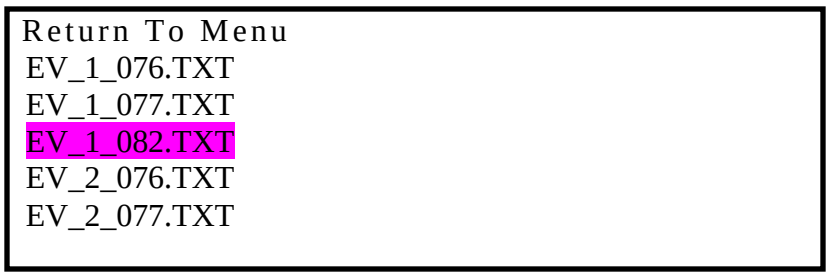


Press the DOWN arrow to view the next EVENT; the EVENTS are listed in chronological order. At the end of the file, pressing the DOWN arrow will return the display to the MAIN MENU. Pressing ENTER at any time while viewing the EVENTS will return the display to the MAIN MENU.

It is easier to follow the events by viewing the entire file at once. To list and view an entire file at once, follow the steps in Section 4.8.9 to off load the files and view them on a personal computer.

4.8.13 DELETE EVENT FILE (S) (Press "ENTER": MAIN MENU, Press "⬇**X7**" ENTER FILEMENU: Press "ENTER", Press "⬇**X12**", DELETE EVENT FILE (S)

Pressing ENTER will bring up the Warning noted in section 4. Pressing ENTER again will display the EVENT FILES available. Move the cursor up or down with the up or down arrow respectively, until you highlight the EVENT FILE you desire and press ENTER. If you do not desire to delete a file, highlight **Return To Main Menu** and press ENTER. Each File is named according to the sensing head and the date the file started. The first 5 characters represent the sensing head; EV_1_ for head one and EV_2_ for head two. (If your unit is a 614 X1 then there will be no history files listed EV_2_). The next 3 numbered characters before the .TXT extension represent the starting date for the EVENT FILE. E.g. 001 represents January 1st, and 365 representing December 31. On a leap year 366 representing December 31



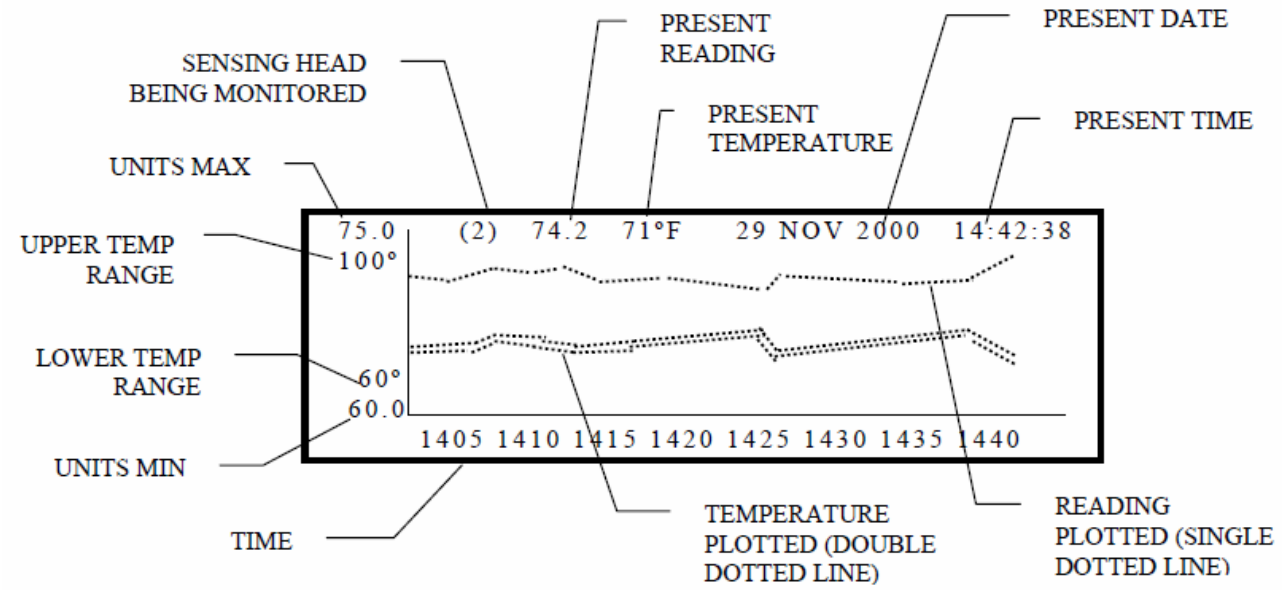
4.9 ENTER PLOT MENU (Press "ENTER" MAIN MENU, Press "⬇**X8**" ENTER PLOT MENU: Press "ENTER")

Press ENTER to view the plot options.

4.9.1 CANCEL PLOT MENU - RETURN TO MAIN (Press "ENTER": MAIN MENU, Press "⬇**X8**" ENTER PLOT MENU: Press "ENTER", RETURN TO MAIN MENU)

4.9.2 ENABLE/DISABLE REAL - TIME PLOT (Press "ENTER": MAIN MENU, Press "⬇X8" ENTER PLOT MENU: Press "ENTER", Press "⬇X1", ENABLE/DISABLE REAL - TIME PLOT)

Pressing ENTER Enables or Disables a real time plot. When enabling the Real time plot the main display represents a plot screen. The vertical plane or (y coordinate) represents the temperature range and the calibrated range. These two ranges are automatically set to the TEMPERATURE MIN and MAX settings and the UNITS MIN and MAX settings. The horizontal plane or (x coordinate) represents real time. Real time is directly related to the history period. To set the frequency of real time readings, set the history period to the desired frequency. See Section 4.7.14. To DISABLE the REAL - TIME plot (return the main display back to its normal OPERATE DISPLAY) repeat the same procedure above. Below is an example of a plot screen.



4.9.3 TOGGLE REAL-TIME PLOT HEAD SELECT (Press "ENTER": MAIN MENU Press "⬇X8" ENTER FILE MENU: Press "ENTER", Press "⬇X2", TOGGLE REAL - TIME PLOT HEAD SELECT)

Pressing ENTER toggles the main display from plotting, one sensing head to the other. The sensing head being monitored is identified in parentheses on the top left of the display. **Note**: An LSC Model 614 X1 only has one sensing head. Toggling the plot menu will display a blank graph, as this feature only function on a 614 X2, toggle back to the active head.

4.10 ENTER CAL / MAINTENANCE MENU (Press "ENTER": MAIN MENU, Press "⬇X9" ENTER CAL/MAINTENANCE MENU: Press "ENTER")

Press ENTER to view the calibration and maintenance menu.

4.10.1 CANCEL CAL MENU - RETURN TO MAIN (Press "ENTER": MAIN MENU, Press ""⬇X9" ENTER CAL/MAINTENANCE MENU: Press "ENTER", RETURN TO MAIN MENU)

Press ENTER will return back to the previous menu. "MAIN MENU"

4.10.2 *FIELD CALIBRATION (Press "ENTER": MAIN MENU, Press "⬇**X9**" ENTER CAL/MAINTENANCE MENU: Press "ENTER", Press ""⬇**X1**", FIELD CALIBRATION)

See Section 5 Calibration.

4.10.3 *SELECT ALARM MODE (Press "ENTER": MAIN MENU, Press "⬇**X9**" ENTER CAL/MAINTENANCE MENU: Press "ENTER", Press "⬇**X2**", SELECT ALARM MODE: Press "ENTER")

There are two alarm modes: HI/LO and OUT OF SPEC/SYSTEM. To switch between the two types of Alarms, press any Arrow button. Press ENTER to accept the ALARM MODE and return to the MAIN MENU.

- The HI/LO alarm parameters are set as per Section 4.7.5. The LO alarm can be either Normally Open or Normally Closed, and is terminated to the "A ALARM" output on the interconnecting card, Terminals 13 - 15. See Figure 19 and 20. The HI alarm can also be either Normally Open or Normally Closed, and is terminated to the "B ALARM" output on the interconnecting card, Terminals 16 - 18 Figure 19 and 20.

- OUT OF SPEC/SYSTEM alarm. The OUT OF SPEC ALARM is one alarm contact for both measurements, which are either too HIGH or too LOW. This OUT OF SPEC alarm can be either Normally Open or Normally Closed, and is terminated to the "A ALARM" output on the interconnecting card, Terminals 13 - 15. See Figure 19 and 20. A SYSTEM alarm will be set if there is a BAD WASH, FILE ERROR, or TEMPERATURE ERROR. A SYSTEM alarm can be either Normally Open or Normally Closed, and is terminated to the "B ALARM" output on the interconnecting card, Terminals 16 - 18. (See Figure 19 and 20).

Select Alarm Mode

OUT OF SPEC/SYSTEM

Press ENTER When Done

4.10.4 * RUN SELF TEST (Press "ENTER": MAIN MENU, Press "⬇**X9**" ENTER CAL/MAINTENANCE MENU: Press "ENTER", Press "⬇**X3**", RUN SELF TEST)

Pressing ENTER will bring up the Warning noted in Section 4. Pressing ENTER again will load the self-test function. Note while running the self-test, the **outputs** will represent the **test** and **not** the process being measured. This is a test of the processor and its functions, not a sensing head test. During the test, the system will simulate representative voltages and test their validity. Press ENTER to start a self-test or OTHER to cancel the test, (OTHER being any arrow button). Pressing an arrow key during the test will Initiate the LED Reference voltage on the Sensing Head and return the system to the Operation Menu, again monitoring the process.

```
SELFTEST FUNCTIONS
HEAD: 1
Self Test Ready


ENTER To Continue - OTHER to Exit
```

Press ENTER to start the self-test. The processor now checks the LED Drive. The acceptable values for the drive are between 1600 - 2200 counts.

```
SELFTEST FUNCTIONS
HEAD: 1
Test LED Drive

LED Drive: 30.0 ma @ 1692 counts
Values Between 1600 and 2200 are OK

ENTER To Continue - OTHER to Exit
```

Press ENTER again to check the DAC, "Digital Analog Converter" #3 and the DAC #4. There are a total of 10 voltage checks. Each voltage is checked as you press ENTER. During the check, the DAC out must equal what the ADC "Analog Digital Converter". Also, when testing 0, 1, 2, …10 volts, the 4 - 20ma output and the 0 - 10 VDC output represent the voltages being tested.

```
SELFTEST FUNCTIONS

Test DAC #3 and DAC #4

DAC #3 Out:  4.00 V - ADC Reads:  4.00 V
DAC #4 Out:  4.00 V - ADC Reads:  4.00 V

ENTER To Continue - OTHER to Exit
```

Press ENTER again to start a test on the Temperature Channel. The acceptable values for the temperature channel must be between 3.5 V and 4.6 V.

```
SELFTEST FUNCTIONS
HEAD: 1
Test Temperature Channel

Temperature Channel Reads:  4.04 V
Values between 3.5 V and 4.6 V are OK

ENTER To Continue - OTHER to Exit
```

Press ENTER again to test the Sensor Channel. During the test the unit simulates a 1 Volt Signal. The acceptable values for the Sensor Channel must be between 0.91 V and 1.09 V.

```
SELFTEST FUNCTIONS
HEAD: 1
Test Sensor Channel

SIG: 1.000 V - READ: 0.96 V
Values Between 0.91  and 1.09  are OK

ENTER To Continue - OTHER to Exit
```

Press ENTER again to test the Reference Channel. During the test the unit simulates a 1 Volt Signal. The acceptable values for the Reference Channel must be between 0.91 V and 1.09 V.

```
SELFTEST FUNCTIONS
HEAD: 1
Test Reference Channel

SIG: 1.000 V - READ: 1.02 V
Values Between 0.91  and 1.09  are OK

ENTER To Continue - OTHER to Exit
```

Press ENTER again to test the WASH and ALARM output. During the test, the prism wash output will be initiated and the Alarm outputs will change state. This test will remain on until ENTER is pressed again.

```
SELFTEST FUNCTIONS
HEAD: 1
Test Wash and Alarm Bits

WASH and ALARM BITS ARE ON

ENTER To Continue - OTHER to Exit
```

Press ENTER again completes the self-test. Pressing ENTER again initializes the Reference micro amp signal and the LED Drive milli-amp signal. . The display then returns to the OPERATION MENU.

```
SELFTEST FUNCTIONS
HEAD: 1
Self Test Complete

ENTER To Continue - OTHER to Exit
```

4.10.5 * SET REMOTE OFFSET INCREMENT (Press "ENTER": MAIN MENU, Press "⬇**X9**" ENTER CAL/MAINTENANCE MENU: Press "ENTER" Press "⬇**X4**" SET REMOTE OFFSET INCREMENT)

Please see Remote Controller Manual accompanying the controller.

4.10.6 * TOGGLE MAINTENANCE DISPLAY (Press "ENTER": MAIN MENU, Press "⬇**X9**" ENTER CAL/MAINTENANCE MENU: Press "ENTER", Press "⬇**X5**", TOGGLE MAINTENANCE DISPLAY)

Pressing ENTER will bring up the Warning noted in Section 4. Pressing ENTER again will switch OPERATE DISPLAY to a MAINTENANCE DISPLAY. The normal or default display is referred to as the OPERATE DISPLAY and is explained in Section 1.1.2. The MAINTENANCE DISPLAY shown below, displays the current related to the Detector Cells and LED.

Maintenance Display 614 X1

```
            28 NOV 00    21:54:34
(1)BRIX
REF:      25.01 ua
LED:      41.08 ma
SENSE:    11.98 ua
LIN:      26.9 BRIX
TCO:      26.6 BRIX
PRC:      0
```

Maintenance Display 614 X2

```
            28 NOV 00    21:54:34
(1)BRIX                   (2)BRIX
REF:      25.01 ua        REF:  25.01 ua
LED:      41.08 ma        LED:  45.72 ma
SNS:      11.98 ua        SNS:  41.26 ma
LIN:      26.9            LIN   11.4
TCO:      26.6            TCO   10.2
PRC:      0               PRC:  0
```

07 MAR 99 21:54:34	(Date and Time)
(1)BRIX (2)BRIX	(1) Refers to the sensing head i.e. 1. BRIX refers to the Units of measurement. The different units of measurements available are listed in the Units Menu Section 4.6.15.
REF: 25.01 ua	(micro amp current to the reference cell. This current should always be 25.00 ± 0.10 micro amps. This current is automatically adjusted every 60 seconds. If unit is unable to adjust current, a REFERENCE ERROR message will be displayed.)
LED: 41.08 ma	(milli amp current to the LED. Ideal current less than 85 milli amps
SNS: 11.98 ua	(milli amps to the measure cell.)
LIN: 26.9	(Non temperature compensated measurement)
TCO: 26.6	(temperature compensated measurement)
PRC : 0	(Process file Selected) Only available with external Switching Box.

4.10.7 *DISPLAY TEMP COMP TABLE (Press "ENTER": MAIN MENU, Press "⬇**X9**" ENTER CAL/MAINTENANCE MENU: Press "ENTER", Press "⬇**X6**", DISPLAY TEMP COMP TABLE)

Pressing ENTER will list all the TEMPERATURE COMPENSATION VALUES. Only those temperatures between your temperature range set in Section 4.7.11 will be listed. Setting the Temperature Compensation is accomplished in section 4.7.9. If all the values are not shown on the display, press ENTER to continue viewing the values. When all the values have been shown, the display will prompt you to press ENTER to return to the MAIN MENU.

70: -0.3	71:-0.3	72:-0.2
73: -0.1	74:-0.1	75: 0.0
76: 0.1	77: 0.1	78: 0.2
79: 0.3	80: 0.3	81: 0.4
82: 0.5	83: 0.5	84: 0.6
85: 0.7	86: 0.8	87: 0.8
88: 0.9	89: 0.9	90: 1.0

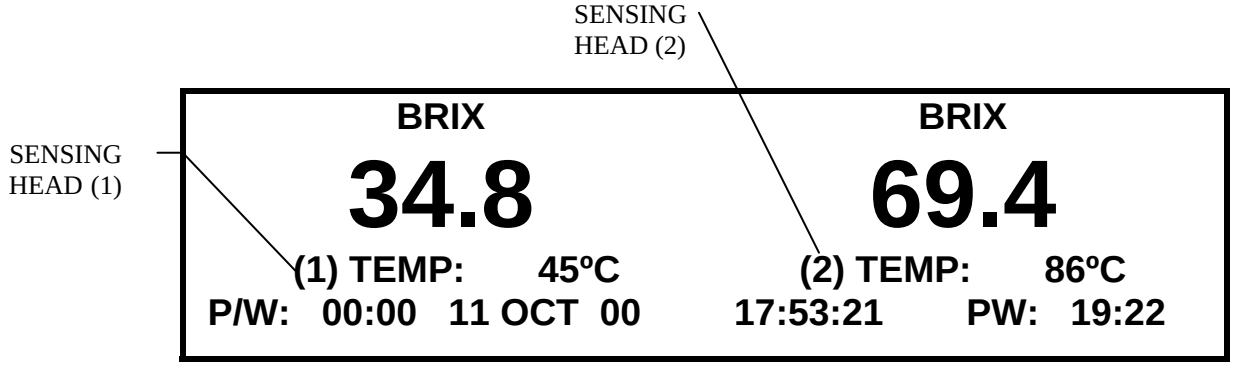
PRESS ENTER TO CONTINUE

4.10.8 * TOGGLE REMOTE ON/OFF (Press "ENTER": MAIN MENU, Press "⬇**X9**" ENTER CAL/MAINTENANCE MENU: Press "ENTER", Press "⬇**X7**", TOGGLE REMOTE ON/OFF)

Please see Remote Controller Manual accompanying the controller.

4.10.9 * TOGGLE SELECTED HEAD (Press "ENTER": MAIN MENU, Press "⬇**X9**" ENTER CAL/MAINTENANCE MENU: Press "ENTER", Press "⬇**X8**", TOGGLE SELECTED HEAD)

This feature only functions on the Model 614 X2. Pressing ENTER will change to the other Sensing Head. When Toggling the Selecting Sensing Head the process set up parameters do not change with the Sensing Head. Viewing the System Variables, and verifying the parameters of the process will assure the correct file is matched up with the appropriate Sensing Head. See Section 4.4. After pressing ENTER the unit initializes the reference cell to 25 micro amps before taking an active measurement and returns to the main menu as shown below. The Sensing Head being monitored is displayed as shown below. It is possible to have the same sensing head monitored on both sides of the display.



Pressing ENTER will list the TEMPERATURE COMPENSATION VALUES set in section 4.7.9

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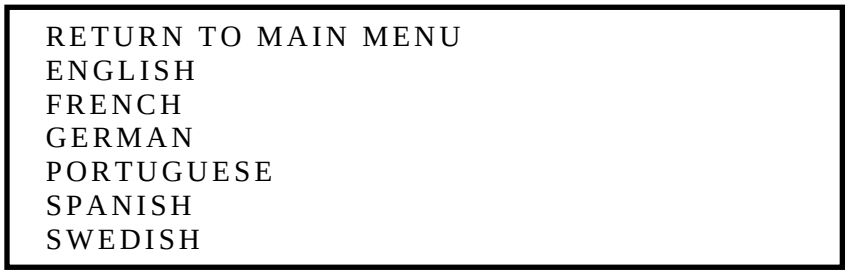
4.10.10 *TOGGLE NUMBER OF HEADS (Press "ENTER": MAIN MENU Press "⬇**X9**" ENTER CAL/MAINTENANCE MENU: Press "ENTER", Press "⬇**X9**", TOGGLE NUMBER OF HEADS)

This feature only functions on the Model 614 X2. If the Model 614 X2 is operating as a dual, pressing ENTER will change from monitoring two Sensing Heads to monitoring one. If the model 614 X2 is functioning, as a single, then pressing ENTER will initiate the other Sensing Head and the Model 614 X2 will now function as a Dual. Notice, as you Toggle Number of Heads, the Main Display will automatically adjust from single to dual and dual to single.

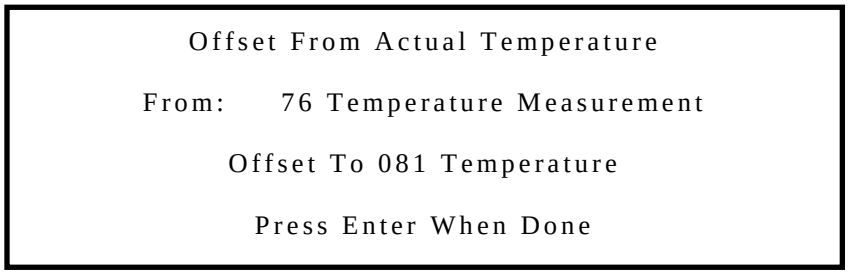
4.10.11 *LANGUAGE SELECT (Press "ENTER": MAIN MENU, Press "⬇**X9**" ENTER CAL/MAINTENANCE MENU: Press "ENTER", Press "⬇**X10**", LANGUAGE SELECT)

Pressing Enter will bring up the menu shown below. Scroll up or down using the up or down arrow key respectively on the touch pad to select the desired Language. Once the desired language is highlighted, press ENTER to accept the Language. Note: at the time of this manual, only English and Swedish are available. Pressing any of the other Language selections will default to English.



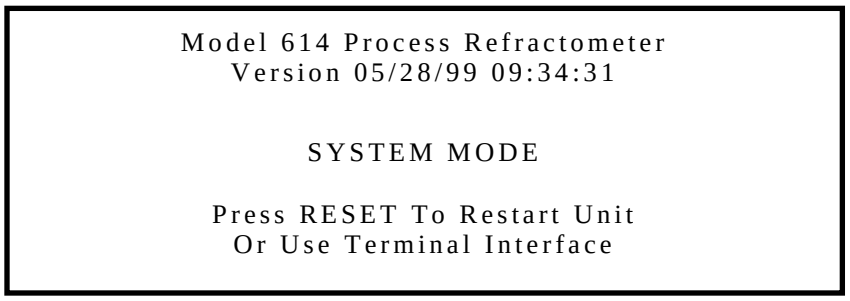
4.10.12 *ISB CONNECTION (Press "ENTER": MAIN MENU, Press "⬇**X9**" ENTER CAL/MAINTENANCE MENU: Press "ENTER", Press "⬇**X11**", ISB CONNECTION)

Due to the added resistance in the Isolation Barriers (ISB), the Temperature Reading displayed does not represent the actual temperature. To adjust for the variance in Temperature (Offset), press ENTER. Place the cursor on the digit by pressing the left or right arrow button on the touch pad. Increase or decrease the digit by pressing the up or down arrow respectively, until acquiring the desired actual temperature. Adjusting the OFFSET will display the temperature measurement correctly. The below example shows the temperature displayed being changed from 76 to 81.



4.10.13 *EXIT TO DOS SYSTEM (Press "ENTER": MAIN MENU, Press "⬇**X9**" ENTER CAL/MAINTENANCE MENU: Press "ENTER", Press "⬇**X12**", EXIT TO DOS SYSTEM)

In order to utilize this function, a computer must be connected to the processor by means of the RS 232 Diagnostic Port, "Item 6 Figure 7". Your computer must be running a program call ProCom. See Section 2.7 for computer interface communication settings. Pressing ENTER will initialize the C: prompt on the computer. **Note:** While the unit is in the DOS MODE, the Readings will not follow the process. The current output will output 4mA and the 0-10 VDC will output 0.0 VDC. To return the system to its operating status the unit must be reset.



Reset the system by pressing the **white square** reset button, Item 8, Figure 7, or type "lsc" at the C: prompt if you have a 614 X1 or type "lsc - 2" for a 614 X2 model at the C: prompt.

5. CALIBRATION

The following calibration procedure should be done annually to assure proper equipment operation and accuracy. Generally, calibration is only required when there is a discrepancy between the Model 614 reading and a reliable off line equivalent. It should also be performed if there is a detector or prism replacement, or a change in process liquid that does not already have a calibration in a process file. All LSC units are pre-calibrated at the factory to site specifications. These calibrated settings are saved to file called FACTORY.DAT, and are listed on the calibration data sheet at the beginning of the manuals received with the system. Loading this file will set the system back to the factory settings. It is not necessary to calibrate the system during initial startup, as the system has been factory calibrated. However, calibration of the system before startup will aid in familiarization and verify the factory settings.

Note: If calibrating to a different range, it will be necessary to use the appropriate upper and lower calibration samples. Call your local LSC representative for samples.

5.1 TOOLS REQUIRED

The following tools may be required to perform the calibration procedure:

- Wrench, 1" (Used for closing the Gate Adaptor "isolation valve" if installed)
- Wrench, Adjustable (Used to remove prism wash tubing if installed.)
- 3/16" Allen Wrench (Used to remove Sensing Head)
- Soft Paper Wipes (Used for cleaning the prism window)
- Opaque Cover (Used to cover sample when calibrating)
- Calibration samples: - one for the lower end (zero), and one for the higher end (span). The actual lower and higher end calibration samples are recommended but not necessary. The samples used for calibration have to represent the dissolved solids measurement of the process at operating temperature, not ambient temperature. These samples do not have to be the actual process liquid. When the actual process liquid is unstable or volatile, it is recommended that a stable, safe solution be used. Consult your LSC representative for suggestions on suitable calibration samples.

5.2 CHECKING SET POINTS

Below is a list of the parameter settings that must be checked before starting a calibration. When parameters are changed, the changes will be written to a file called LAST.DAT. If any changes have to be made to the file, be sure to save the file and record the number or name of the file. It is important to have a backup for your LAST.DAT file, (See section 4.7.6 to save a PROCESS FILE).

If no changes are made then your original file name is still a valid backup file.

ADJUST WASH CYCLE PERIOD	(SECTION 4.7.2)
ADJUST WASH CYCLE LENGTH	(SECTION 4.7.3)
ADJUST HOLD CYCLE LENGTH	(SECTION 4.7.4)
ADJUST ALARM SETPOINTS	(SECTION 4.7.5)
ADJUST UNITS MIN/MAX	(SECTION 4.7.6)
ADJUST LINEARIZED TABLE	(SECTION 4.7.7)
ADJUST DECIMAL DIGITS	(SECTION 4.7.8)
ADJUST TEMP COMPENSATION	(SECTION 4.7.9)
ADJUST OPERATING TEMPERATURE	(SECTION 4.7.10)
ADJUST TEMPERATURE RANGE	(SECTION 4.7.11)
ADJUST TEMPERATURE SCALE (C/F)	(SECTION 4.7.12)
ADJUST DATE AND TIME	(SECTION 4.7.13)
ADJUST HISTORY PERIOD	(SECTION 4.7.14)
SELECT UNITS TEXT	(SECTION 4.7.15)

5.3 CALIBRATION PROCEDURE

When doing a calibration for the first time, read through the complete procedure before starting.

1) Verify the settings in section 5.2 before proceeding.

2) Check the above set points to insure they are set to your calibration and process specifications.

3) If Prism Wash is installed, turn off the prism wash air and steam supplies.

4) Remove the sensing head from the process pipeline or vessel. If a Gate Adaptor is installed, completely close the gate. To verify the gate is fully closed check that the lock porthole is clear by sliding a lock, or pencil thought the porthole. (See figure 28 for the location of the lock porthole.) Once the gate is fully closed remove the Sensing Head. Otherwise, the process must be shut down and the liquid drained from the line before removing the Sensing Head.

5) For industrial applications with a prism wash nozzle mounted, remove the nozzle by removing the two mounting screws.

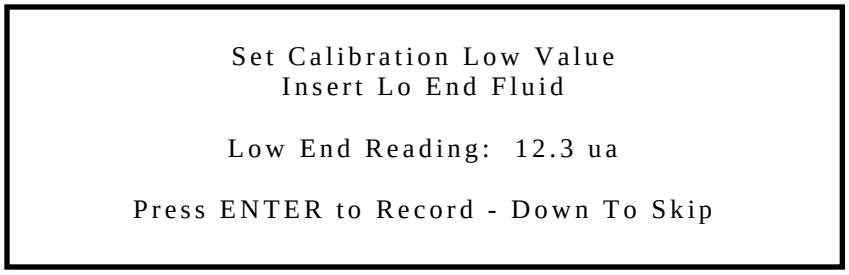
6) Clean the prism surface **well**. **Wait** for the sensing head to stabilize to ambient temperature. First washing the Sensing Head with warm water and then cool water may speed up cooling the Sensing Head down to ambient temperature. DO NOT cool a hot sensing head with cold water! A rapid temperature change may thermally shock damage the prism! It is important that the Sensing Head is at a stable ambient temperature before proceeding with the calibration.

7) Scroll thru the menu screen to * FIELD CALIBRATION (Press "ENTER": MAIN MENU, "⬇**X8**" ENTER CAL/MAINTENANCE MENU: Press "ENTER", Press"⬇**X1**", FIELD CALIBRATION)

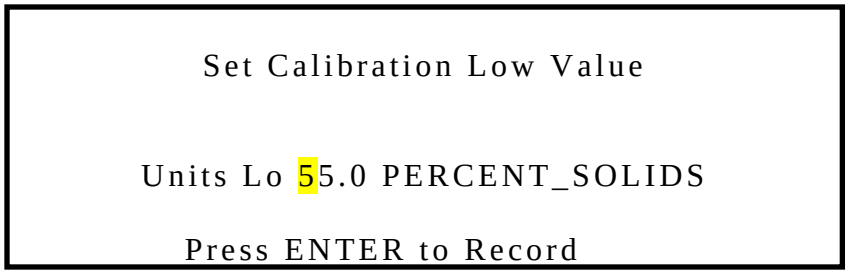
   Pressing ENTER will bring up the Warning noted in section 4. Pressing ENTER again will **prompt** to place the low end sample on the prism.

   614 X2 USERS Note: it is critical that you select the appropriate sensing head before starting calibration. To select the appropriate Sensing Head Press ENTER at the MAIN MENU and then press the Up or the DOWN arrow to select the Left or Right Sensing Head as directed on the display. When doing a calibration only one of the Sensing Heads can be calibrated at a time.

8) Apply 10 - 15 drops of low end or (zero) sample on the prism surface and cover with an opaque lid. It is best to use a low-end sample representing the low-end range point, but not necessary. Wait for the Low End micro Amp reading visible on the display to stabilize. (To skip the low-end calibration, place the high-end sample on the sensor and press the down arrow. Proceed the calibration at step 11).



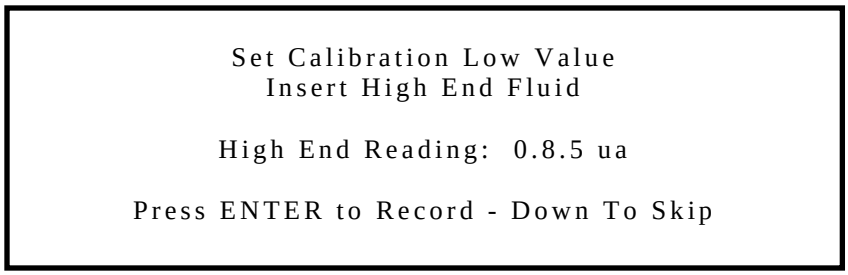
Once stable Pressing ENTER. This will record the Low End micro amp reading and allow you to set the value for the Low End sample used. Place the cursor on the digit by pressing the left or right arrow button on the touch pad. Increase or decrease the digit by pressing the up or down arrow respectively, until acquiring the desired setting for the Low End sample used.



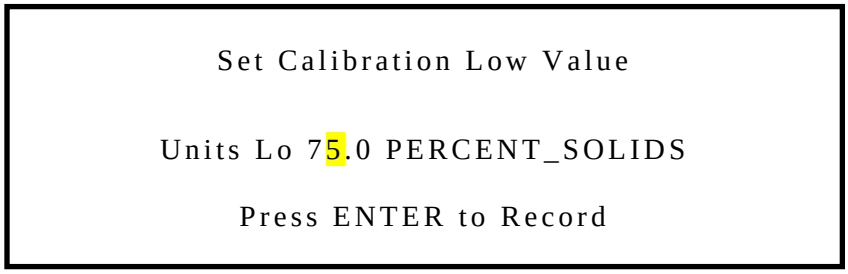
DO NOT Press ENTER to accept the Low End sample used until you have completed the next step.

9) Clean the prism **well** and apply 10 - 15 drops of High End or (span) sample on the prism surface and cover it with an opaque lid. It is best to use a High End sample representing the High End range, but not necessary.

10) Pressing ENTER will accept the low-end reading and initialize the Reference micro amp reading to 25 micro amps. Initializing the Reference micro amp reading could take 10 - 30 seconds. Wait for the High End micro Amp reading visible on the display to stabilize.



11) Once the high-end micro amp reading is stable, Pressing ENTER will record the High End micro amp reading and allow you to set the value for the High End sample used. Place the cursor on the digit by pressing the left or right arrow button on the touch pad. Increase or decrease the digit by pressing the up or down arrow, until acquiring the desired High End sample used.



Press ENTER to accept the value of the High End sample and restart the 614. Pressing the down arrow will skip the High End Calibration and restart the 614.

12) Reinstall the prism wash nozzle (if installed) and mount the Sensing Head to the pipeline or vessel. (Check the O-Ring gasket to verify that it will still provide an acceptable seal. If the seal is poor, replace the O-ring). Reconnect the Steam Supply (if removed).

13) Refill the pipe line or vessel with process fluid and / or Open the Gate Adaptor (if installed).

11) Turn the air and steam supplies on for the prism wash (if installed).

12) Wait for the head to stabilize at operating temperature.

13) Set the zero offset. (See section 4.2)

5.4 LINEARIZATION If your process is a non-linear process, then it requires points to be added in a linearization table. See section 4.7.7 to add points to the linearization table.

6.0 MAINTENANCE

This section is a recommended annual maintenance for the Sensing Heads and Gate Adaptor.

6.1 SENSING HEAD MAINTENANCE

Before removing the Sensing Head from the Process Line or Vessel make sure they are empty and open to atmospheric pressure. If prism wash is installed, turn off the Steam and Air Supply. If a Gate Adaptor is installed, completely close the gate. To verify the gate is fully closed check that the lock porthole is clear by sliding a lock, or pencil thought the porthole. (See figure 28 for the location of the lock porthole)

1) Cool the Sensing Head down to ambient temperature. DO NOT cool a hot sensing head with cold water as it may "thermally shock damage" the prism.

2) Check to see if the Prism is etched, pitted, foggy, or damaged visually. Inspect the prism gasket to insure it is not leaking. If Prism is damaged or leaking, See Section 6.1.1 for instructions on how to replace a prism.

3) Remove T-Box and Head Cover and check all termination's in the T-Box and on the terminal strip inside the Sensing Head. Check for loose connections, frayed wires and rust build up. If wires are loose tighten the connection. If there is any rust or fraying apparent on the connectors, replace and re-crimp the connections.

4 **In-line Sensing Head:** Remove the LED, Item 15 Figure 9 from the Collimating Lens Holder, Item16 Figure 9. Check the lenses in the Collimating Lens Holder and the Focusing Lens Holder, Item 21 Figure 9, that these lenses are clean. If they are not clean, a dry cotton swabs will clean the lenses. If this does not clean the lenses, use very little glass cleaner on the lenses. If cleaner is used, be sure no cleaner residue is left on the lens, wait for the lenses to completely dry before reassembling.

Insertion Probe: Remove the LED, Item 9 Figure 10 from the Collimating Lens Holder, Item 5 Figure 10. Check the lenses in the Collimating Lens Holder and the Focusing Lens Holder, Item 4 Figure 10, that these lenses are clean. If they are not clean a dry cotton swabs will clean the lenses. If this does not clean the lenses, use very little glass cleaner on the lenses. If cleaner is used, be sure no cleaner residue is left on the lens, wait for the lenses to completely dry before reassembling.

5) **In-line Sensing Head:** Check the Sensing Head Cover O-Ring to see if it has still retained its memory, Item 13 Figure 9. If it is flat or brittle replace it.

Insertion Probe: Check the Sensing Head Cover O-Ring to see if it has still retained its memory, Item 28 Figure 10. If it is flat or brittle replace it.

6) Visually inspect the two photocells on the detector. Check that they are firmly secured to the detector holder. If there is a problem with the detector, replace the detector and re-calibrate the system.

7) Firmly tighten all screws and Allen Bolts.

8) Replace Sensing Head Cover, and T-Box Cover.

9) If prism wash is installed, check that the prism wash port is clean. If not, clean the port by flushing water through the port. Inspect the Check Valve. The spring must have a solid, positive return for a good seal on the O-Ring. Check the O-ring and replace if damaged. Check the ball valve; be sure it does not leak. If there is a problem with the Ball Valve, replace the valve. Watch the Actuator and check that it fully returns to the open and closed positions, if it does not replace the Actuator.

6.1.1 PRISM REPLACEMENT

Replacement of the Prism is required if the Prism becomes etched, pitted, foggy, or damaged visually. The following procedure must also be followed if the Prism Gasket needs replacing because of a leaky seal. (See Figure 26 for an exploded view of the prism assembly).

1) Remove Sensing Head Cover and the T-Box. Remove all internal components, and clean the internal surface of the base plate and the prism seat.

2) Use a new Prism Gasket! DO NOT attempt to reuse the old gasket. Use New Belleville Washers.

3) Assemble the parts as shown in figure 26.

4) While the Sensing Head is still COLD, torque the Hold Down Screw to 25 inch-lbs.

5) Bake the assembly at 400ºF, 200ºC for 4 hours.

6) Upon completion of baking the assembly, and while the Sensing Head is still HOT, torque the Hold Down Screw to 35 inch-lbs.

7) With a sharp knife, remove any gasket material extruded over the prism surface on the underside of the base plate.

8) Tighten the Hold down Screw Lock Nut to prevent loosening of the Hold Down Screw.

9) Re-assemble the T-Box and all the Sensing Head components. Replace any components of the Sensing Head that may need changing. (Refer to figure 9 and 10 for layout drawing of the Sensing Heads)

10) Re-Calibrate the Sensing Head to the system. See Section 5.

Figure 26
Prism Assembly

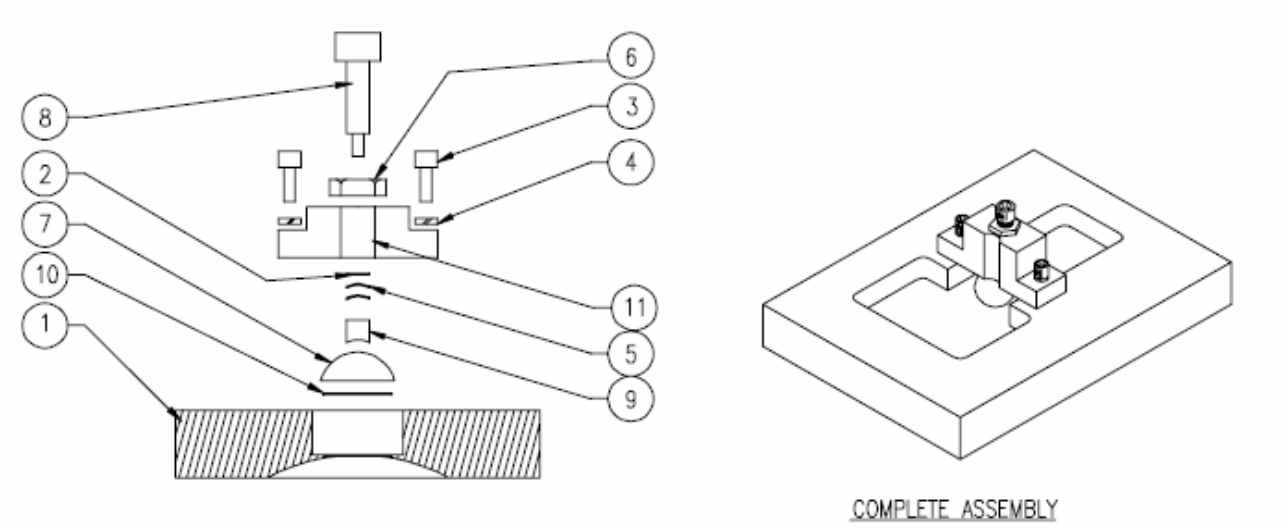
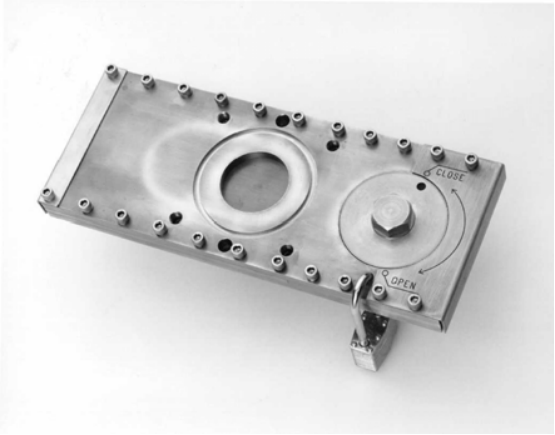


Table 9
Prism Assembly Parts

ITEM	LSC PART #	DESCRIPTION	QTY
1	X	BASEPLATE (Variety of materials available depending on application)	1
2	104810	#4 FLAT WASHER (LARGE PATTERN)	1
3	106207	SOCKET HEAD CAP SCREW #6 - 32 x 7/16	2
4	106830	#6 HIGH COLLAR LOCK WASHER	2
5	106840	BELLEVILLE SPRING #6 WASHER	2
6	125860	1/4”- 28 THIN JAM HEX NUT	1
7	610100	SAPPHIRE PRISM	1
8	829050	HOLD DOWN SCREW	1
9	829051	HOLD DOWN PAD	1
10	829098	TEFLON GASKET PRISM	1
11	829052	HOLD DOWN BLOCK	1

6.2 GATE ADAPTOR MAINTENANCE

Figure 27
Gate Adaptor



The Gate Adaptor employs a completely captive slide gate that is moved by an eccentric Cam. To OPEN and CLOSE the Gate a 1 inch hex nut is turned just under a half a turn so that the indicating dot aligns with the OPEN or CLOSE indicator. When the Gate is fully OPEN or fully CLOSED, a ¼" Long Shank Lock will slide thru the Lock locator porthole, reassuring the fully open or fully closed position of the Gate.

6.2.1 REMOVAL AND ANNUAL REBUILD OF GATE ADAPTORS

Before removing the Gate Adaptor from the Process Line, make sure the line is empty and that the line is open to atmospheric pressure.

1) Remove the Sensing Head from the Gate Adaptor by removing the four, ¼" Socket Head Cap Screws.

2) Remove the 4 threaded inserts from the sensing head mounting holes, allowing access to four of the six Gate Adaptor mounting bolts.

3) Unscrew the two center mounting bolts that hold the gate to the pipe section, and then remove the four corner bolts. Note that the four corner bolts are captive and must be unscrewed in successive increments to avoid jamming.

4) Dismantle the Gate Adaptor by removing the 22 socket head cap screws.

5) Remove O-rings and clean all parts. Also clean all foreign matter from the O-Ring grooves.

6) Inspect all parts for visual damage. Replace all O-Rings and repair or replace damaged parts.

7) File high spots around the Cam Oval on the Slide Plate and on the Bottom Plate with a fine metal file. Be sure to file the surfaces to re-attain their original dimensions so when re-assembly takes place; there is unrestricted movement of the Slide.

6.2.2 GATE RE-ASSEMBLY

1) Apply a thin layer of High-Temperature Teflon Grease, LSC part no. 829487, to the internal surfaces of the Top and Bottom Plates including the O-Ring grooves, and the bottom side of the Cam (See Figure 28). This lubricant protects the O-Rings and moving parts during operation. Use of other lubricants could lead to leaking or eventual seizing.

2) For ease of assembly, place the bottom plate on a pair of riser blocks at least ½" thick.

3) Place the four 3/4" captive gate mounting bolts, with High Collar Lock Washers into the counter bored holes in the Bottom Plate.

4) Press the O-Rings (LSC#'s 640065 & 640023) into the appropriate grooves of the top and bottom plates and smooth any excess grease.

5) Position the Slide on the Bottom Plate; aligning the Oval Hole over the C-shaped cutout in the Bottom Plate while ensuring the slide is also in the Gate Open Position.

6) Place the greased Cam Actuator assembly onto the Slide with the Small Bearing in the Oval Hole.

7) Place the Side Rails on the Bottom Plate. Note: when placing the Small Side Rails on the Bottom Plate, the holes are offset to one side of the side rail. Place these small side rails with the offset holes closest to the Slide Plate.

8) Situate the Top Plate onto the arranged assembly, guiding the Cam Actuator into the opening of the Top Plate.

9) Install the 16 (7/8") Socket head cap screws, complete with lock washers and anti-seize compound, into the correct holes. Leave the 1" long screws and the end plates out for now.

10) Tighten the screws in succession starting with the center and alternate progressively to the ends. NOTE: Before fully tightening, cycle the gate a few times to make sure nothing is seizing.

11) Slowly cycle the actuator (using a 1" box end wrench) to evenly distribute the excess grease at least 6 times while removing any excess grease that comes out. NOTE: When cycling the gate, it must go all the way to the closed position before returning to the open position. This will ensure that the O-Rings are seated properly in the O-Ring grooves.

12) Position the End Cover Plates and tighten them using the six (1") screws complete with lock washers and anti-seize compound. Make sure all screws are tight.

6.2.3 INSTALLING THE GATE ADAPTOR

1) Before mounting the Gate Adaptor to the pipe, make sure the pipe mounting plate surface and O-Ring groove are clean.

2) Install a new O-Ring (LSC# 640040) into the pipe mounting plate O-Ring groove.

3) Position Gate Adaptor on the pipe and fasten with the four captive bolts. Note these bolts are captive and must be screwed successively to avoid jamming. (Be sure to use anti seize compound on the treads).

4) Install the two 7/16" bolts with their lock washers.

5) Screw the four threaded inserts into the four captive bolt holes. BE SURE EACH INSERT IS SCREWED BELOW THE SURFACE OF THE TOP PLATE, BOTTOMED AND TIGHT!

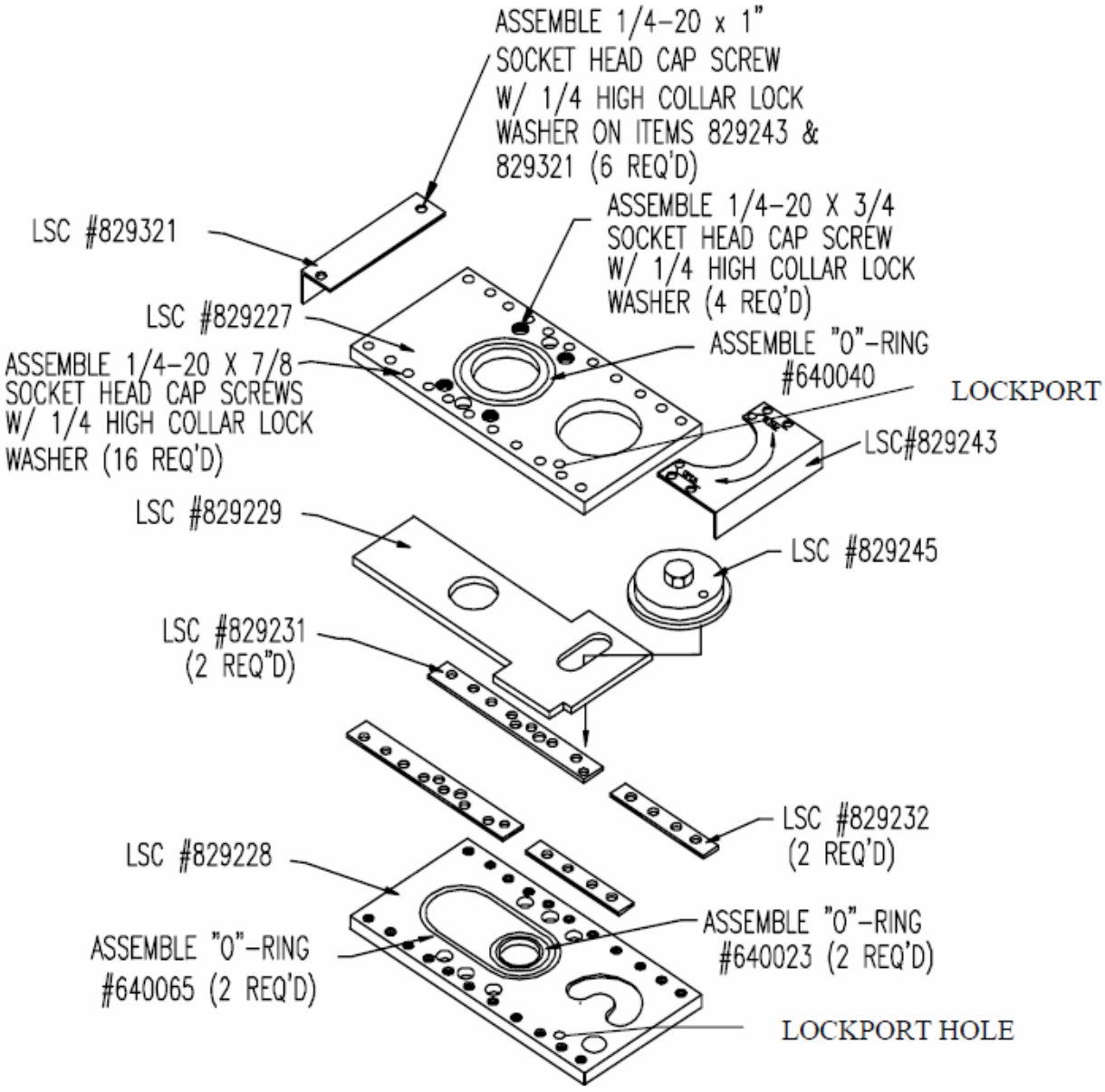
6) Seat a new Teflon O-Ring (P/N 640040) into the grove on the gate and install the Sensing Head, Steam Fittings and Gate Adaptor Limit Switch. (If removed)

7) Cycle the gate OPEN.

8) Turn on the steam and air supply to the prism wash system.

   NOTE: DUE TO THE CLOSE TOLERANCES IN ALL LOCATIONS WHERE SOCKET HEAD CAP SCREWS ARE USED, HIGH COLLAR LOCK WASHERS MUST BE USED.

Figure 28
Gate Assembly



7. SPARE PARTS

614903 : IN-LINE SENSING HEAD SPARE PARTS KIT

QTY	DESCRIPTION	PART #
4	SCREW, PH #2-56 X 3/8 LONG	102006
4	LOCK WASHER, # 2	102820
3	SCREW, SH/CS #6-32 X 3/8 LONG	106206
2	LOCK WASHER, # 6 HC	106830
7	SCREW, SH/CS 1/4-20 X 7/8 LONG	125214
7	LOCK WASHER, 1/4 HC	125830
1	PRISM SAPPHIRE	610100
1	TEMPERATURE SENSOR ASSEMBLY	614300
1	O-RING, 3-5/8 OD X 3-3/8 ID	640040
1	O-RING, 4-7/16 OD X 4-1/4 ID	640066
1	GASKET T – BOX	725010
1	DETECTOR HOLDER ASSEMBLY	725307
1	LIGHT SOURCE ASSEMBLY	725308
1	GASKET PRISM SEAL	829098

829254 : GATE ADAPTOR SPARE PARTS KIT

QTY	DESCRIPTION	PART #
1	CAM ASSEMBLY	829245
4	THREADED INSERTS	829233
2	O-RING (SMALL) TEFLON ENCAPSULATED	640023
2	O-RING (LARGE) TEFLON ENCAPSULATED	640065
2	O-RING (WHITE)	640040
1	STICK FREE LUBE	829487

614911 : GREEN LIQUOR PROBE HARDWARE KIT

QTY	DESCRIPTION	PART #
4	SCREW, PH #2-56 X 3/8 LG	102006
1	SCREW, PH #2-56 X 1/8 LG	102202
4	WASHER, LOCK # 2	102820
2	SCREW, SH/CS # 4-40 X 3/8 LG	104206
1	SCREW, SH/CS # 4-40 X 1/4 LG	104210
1	WASHER, FLAT # 4 LARGE PATTERN	104810
6	WASHER, FLAT # 4 SMALL PATTERN	104815
6	WASHER, LOCK # 4	104820
4	SCREW, PH # 6-32 X 5/8 LG	106010
2	SCREW, PH # 6-32 X 3/4 LG	106208
1	SCREW, PH # 6-32 X 3/8 LG	106206
6	WASHER, LOCK # 6	106820
2	WASHER, SPRING # 6, BELLEVILLE	106840
1	NUT, HEX THIN JAM 1/4-28 (18-8 SST)	125860
6	SCREW, M3 X 12 mm LG, PH (304 SST)	129552
10	WASHER, SPLIT LOCK M6(316 SST)	129553
2	SCREW, HEX HD CAP M6 X 25 mm (316L)	129566
8	SCREW, HEX HD CAP M6 X 22 mm (316L)	129568
6	TERM RING # 2	170430

614925 : GREEN LIQUOR PROBE SPARE PARTS KIT

QTY	DESCRIPTION	PART #
1	PRISM, SAPPHIRE PROBE	610105
1	TEMPERATURE SENSOR ASSEMBLY	614300
1	O-RING – EP 2” OD X 1 7/8” ID	640156
1	GLP O-RING – TEFLON, 4 1/4” OD X 4” ID	640167-T
1	GLP O-RING – TEFLON, 3” OD X 2 3/4“ ID	640168-T
1	GASKET, PRISM INSERTION PROBE	725108
1	DETECTOR HOLDER ASSEMBLY	725307
1	LIGHT SOURCE ASSEMBLY (LED)	725308
1	GREEN LIQUOR PROBE HARDWARE KIT	614911

614915 : INSERTION PROBE SENSING HEAD SPARE PARTS KIT

QTY	DESCRIPTION	PART #
4	SCREW, PH #2-56 X 3/8 LONG	102006
4	LOCK WASHER, # 2	102820
1	SCREW, PH #6-32 x 3/8 LONG	106006
2	SCREW, PH #6-32 x 5/8 LONG	106010
2	WASHER LOCK #6	106820
6	SCREW, PH #8-32 x 1/2 LONG	108008
6	WASHER LOCK #8	108820
1	PRISM SAPPHIRE - PROBE	610105
1	TEMPERATURE SENSOR ASSEMBLY	614300
1	O-RING 3-11/16 OD x 3-1/2 ID	640068
1	GASKET TRI CLAMP 4”	640105
1	GASKET PRISM INSERTION PROBE	725108
1	DETECTOR HOLDER ASSEMBLY	725307
1	LIGHT SOURCE ASSEMBLY	725308

614920-CPU : M614 AMPLIFIER SPARE PARTS KIT

QTY	DESCRIPTION	PART #
1	POWER SUPPLY	480400
1	FLOPPY DRIVE 3.5”	480450
1	DISPLAY VACUUM FLUORESCENT	480505
1	LSC BOARD PC – 1	614401
1	CPU BOARD	614815
1	CABLE, DC POWER	614463

614930 : 614 X1 TO X2 UPGRADE KIT

QTY	DESCRIPTION	PART #
4	STANDOFF – M/F 4-40 X .593 LG	139209
1	LSC BOARD, PC-1	614401
1	INTERCONNECTING BOARD, PC-2	614402
1	CABLE, PC-2 J6 TO LSC BD. J2	614460
1	CABLE, PC-2 J5 TO LSC BD. J3	614462
1	CABLE, AC POWER X2	614464-X2
1	GROUND STRAP, PCB TO GROUND STUD	614467

614933 : 725 TO 614 X1 UPGRADE KIT

QTY	DESCRIPTION	PART #
1	TEMPERATURE SENSOR ASSEMBLY	614300
1	M614N PROCESS REFRACTOMETER X1	614450-C
2	M614 INSTRUCTION MANUAL	614905
2	DRAWINGS, 1 SET (614501, 614600, 614303)	614910
1	O-RING 4 7/16” OD X 4 1/4” ID	640066
1	HOLDER, TEMP SENSOR, STANDARD	725059

614960 : 614 CPU CONVERSION KIT

QTY	DESCRIPTION	PART #
2	CABLE CLAMP, RIBBON	150150
1	CABLE, FLOPPY	614483
1	CABLE, RESET	614486
1	CABLE, DISPLAY	614487
1	CPU, NEW VERSION, X1 & X2	614815

8. TECHNICAL SUPPORT

If your questions are not answered by the information contained in this manual, contact one of our LSC locations listed below.

(Head Office)
LIQUID SOLIDS CONTROL, INC.
Upton, MA 01568
P.O. Box 259

Phone: (508) 529-3377
Fax: (508) 529-6591
Email: usa@liquidsolidscontrol.com

(Canadian Office)
LIQUID SOLIDS CONTROL
DIVISION OF LIQUID SOLIDS CONTROL, INC.

5723 Old West Saanich Road
Victoria, BC V9E 2H2, Canada

Phone: (250) 474-2243
Fax: (250) 474-3339
Email: canada@liquidsolidscontrol.com

REVISIONS:	DATE
1. Change in location of Canadian Office	2-27-2012
2. Update of prism baking instructions in section 6.1.1	2-27-2012
3. Added spare parts kits	2-27-2012
4. Changed mounting diagram (Figure 17)	2-27-2012
5. Updated gate rebuild instructions	5-4-2012