LIQUID SOLIDS CONTROL

INSTRUCTION MANUAL

E - NET

PROCESS REFRACTOMETER

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

LSC E - NET

PROCESS REFRACTOMETER

INSTRUCTION MANUAL

MAY 4, 2012

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

Note: The appearance and contents of this manual were updated on May 4, 2012. The contents of the manual are consistent with previous editions except for the revisions found on the last page.

TABLE OF CONTENTS

Page

LIST OF FIGURES

Page

LIST OF TABLES

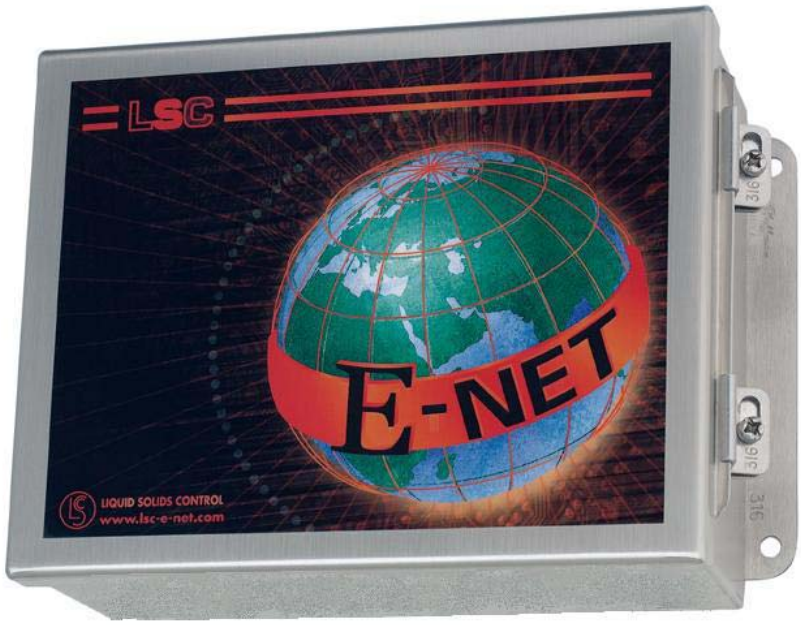
1. INTRODUCTION

This Manual is designed to give operations, personnel and maintenance a complete understanding of the LSC "E-NET" Process Refractometer. The E-Net is capable of multi Ranging and is unrestricted to the amount of calibration ranges. The E-NET measures 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 from any location within the plant's Network browsers. Any standard web browser (e.g. Netscape and Internet Explorer) works with the E-NET making it simple to point and click to change and or view the systems parameters, and functions. Each screen displayed has it's own description and help menus, accessible by clicking on "LSC Help Index", at the bottom right of the screen.

The E-NET uses the Linux operating system, taking advantage of Linux's multitasking abilities. Two programs are running continuously. The first controls the Sensing Head, taking measurements every second and stores the measured values into shared memory locations. The second program reads the measured values and creates a file accessible with a local browser. The browser window is updated every second and displays time, units measured; temperature, alarm and prism wash status.

The LSC E-NET On-Line Refractometer consists of a Processor, Sensing Head, and an optional, Intrinsic Safety Barrier, and Isolation Valve (Gate Adaptor).

Figure 1
E-NET



1.1 E-NET PROCESSOR

The E-NET has four (4) sub-assemblies. A Microprocessor Board, Power Supply Card, Interconnecting Card, and a Refractometer Card. 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 cards mounted in the enclosure.

Figure 2
Components of the E-NET Processor

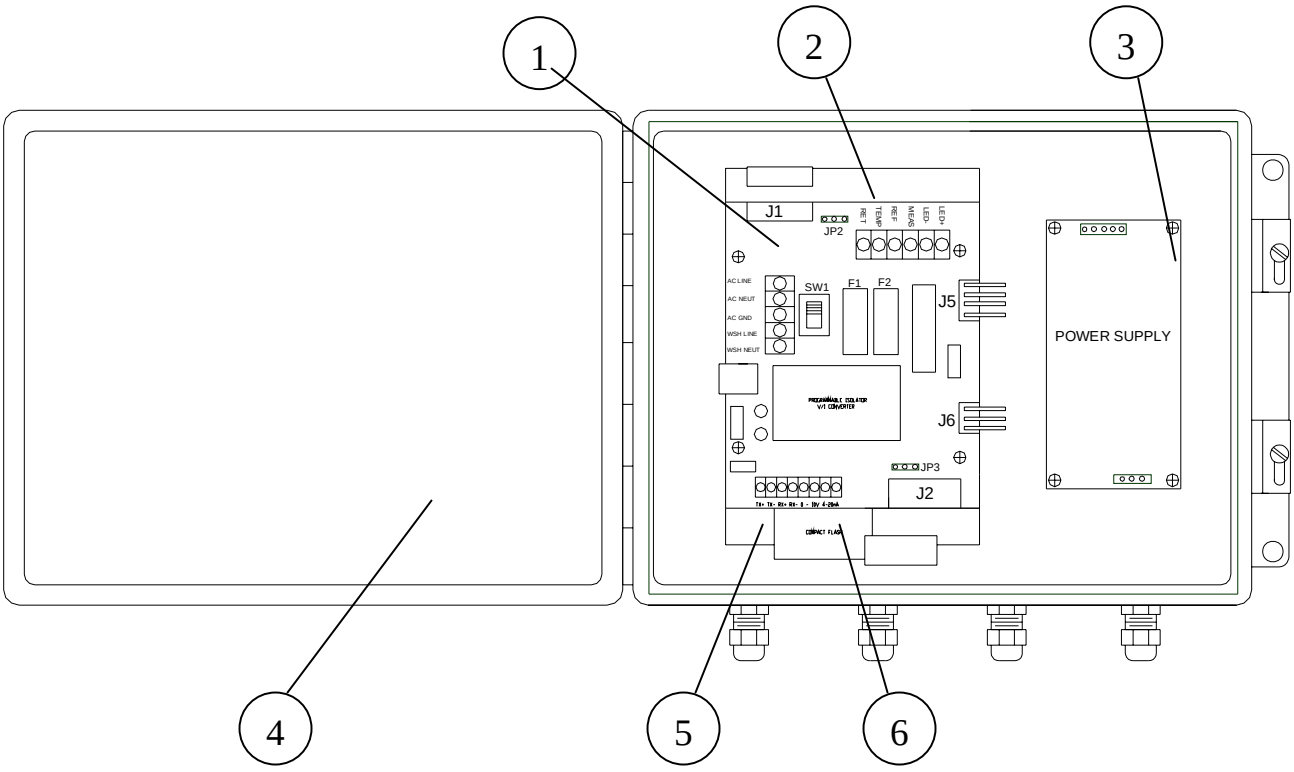


Table 1
Components of the E-NET Processor

1	Interconnection Board PC –5 (LSC P/N 614405)	4	Nema 4 Enclosure
2	Refractometer Board, PC – 1 (LSC P/N 614401)	5	CPU Board P/N 614805
3	Power Supply (LSC P/N 480410)	6	Flash Card Located on CPU Board

1.1.1 CPU BOARD

This board has a 64-megabyte compact flash card, solid-state hard disk. There is also a battery mounted on the chassis to insure that the time and date functions are maintained during a power loss.

1.1.2 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).

1.1.3 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; RJ-45, and the Prism Wash signal. See Figure 3 Below.

Figure 3
Interconnecting Card Layout

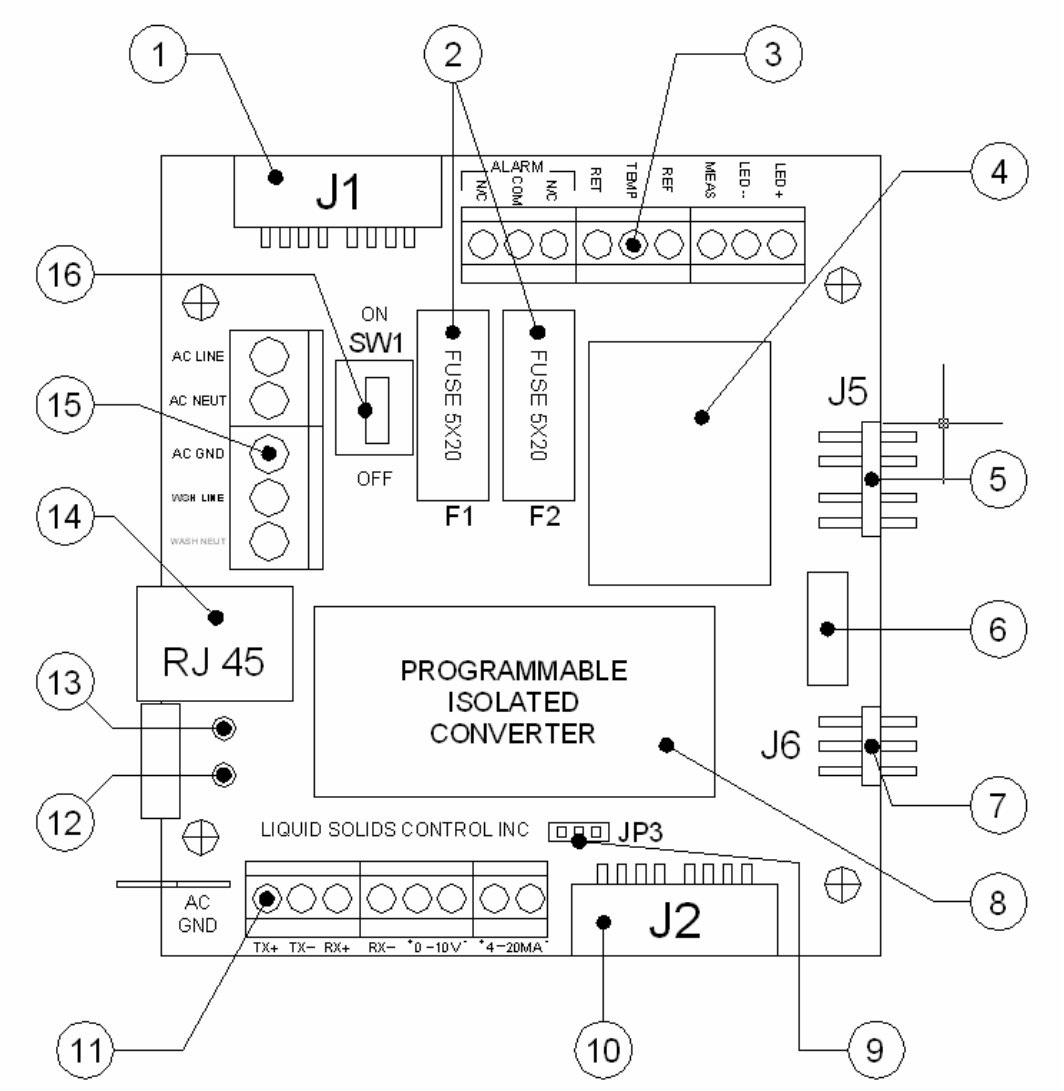


Table 2
Interconnecting Card Lay Out

1	Connection Enet PC-5 to 614 PC-1	9	Jumper
2	1 Amp Slow Blow Fuses	10	Connection Enet PC-5 to 614 PC-1
3	Sensing Head Termination	11	Network Connection, 4 – 20 mA Output, 0 – 10 VAC Output
4	Prism Wash Relay	12	Network Activity Indicator (Green)
5	Connection Power Supply to PC-5 ± 5 VDC, ± 15 VDC	13	Network Link Indicator (Red)
6	Resistor	14	RJ-45 Port for Ethernet Connection
7	120 VAC PC-5 to Power Supply Card	15	120 VAC Connection and Prism Wash Output
8	4 – 20 mA VI Converter	16	On / Off Switch

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 4, "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 7 "Standard In-Line Sensing Head Assembly" and Figure 11 "Insertion Probe Assembly".

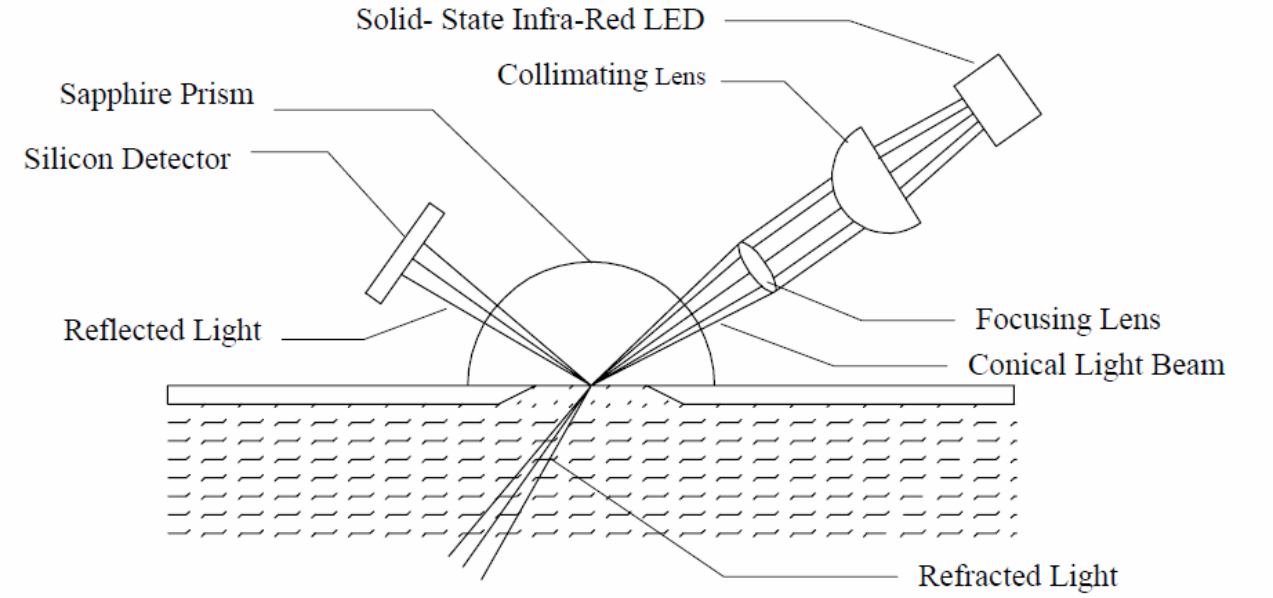
Detector: The Detector is made up of two silicon photocells, a measure cell and a reference cell. The reference cell measures the intensity of the light from the source and the 614 compensates for any fluctuations of intensity over time. The measure cell, measures the amount light reflected onto the 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 4
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:

- Pipe Section
- Flow Thru Block
- Valve Body

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

Figure 5 : In-Line Sensing Head

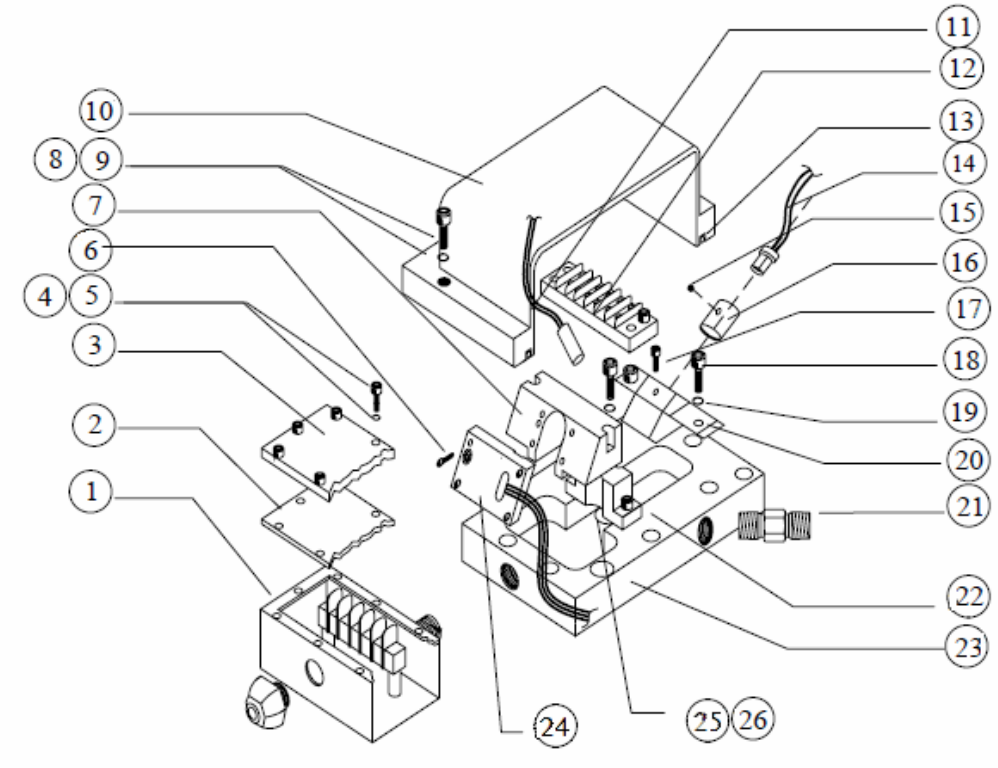


Table 3 : In-Line Sensing Head Parts List

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	725094	HOLDER, DETECTOR BLUE	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 27)	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 6
Insertion Probe Sensing Head

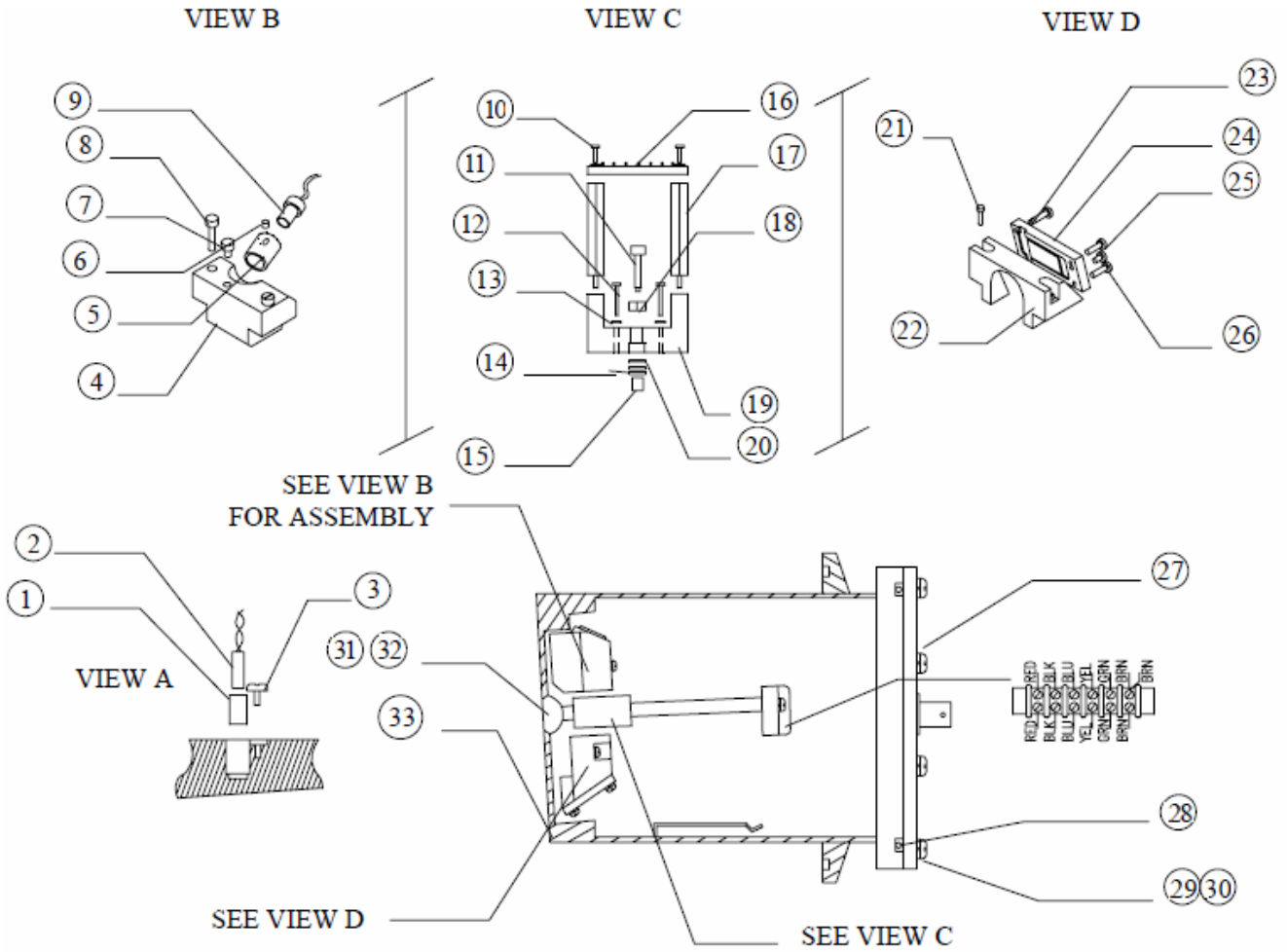


Table 4
Insertion Probe Spare Parts List

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 E-NET are listed below in Table 5.

Table 5
LSC E-NET 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 0.00015 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 ± 0.0% With Internal Computer Correction
Speed of Response No Damping	330 milliseconds
Process Temperature Range	-25º - 150ºC
Temperature Compensation	Automatic - Electronic
Process Line Pressure	Up to 1000 PSIG (68 bar)
Interconnecting Cable Length	1625 feet maximum (500 m)
Process Measurement Output	Ethernet and 0 – 10 VDC Optional 4 - 20, mA DC
Communication / Diagnostic Port	RJ – 45 Port
Prism Wash	Automatic " Settable"
Wetted Material	316L Stainless Steel, Alloy 20, Hastalloy C, Teflon's "Other Materials upon request"
Prism	Industrial Grade Sapphire
Processor Enclosure	Nema 4 X

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

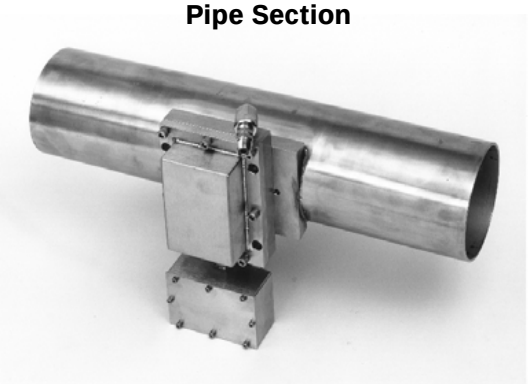
2.1 IN-LINE INSTALLATION

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 7, and Figure 10.

2.1.1 PIPE SECTION MOUNTING

The In-Line Model 614 Sensing Head with pipe section mounting is illustrated in Figure 7. 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.

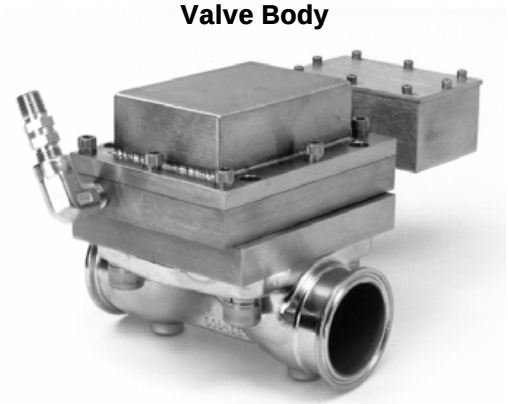
Figure 7
Pipe Section



2.1.2 VALVE BODY MOUNTING

A valve body mounting with prism wash is illustrated in Figure 8. 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 8
Valve Body



2.1.3 FLOW THRU BLOCK MOUNTING

The Flow Thru Block mounting illustrated in Figure 9 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.

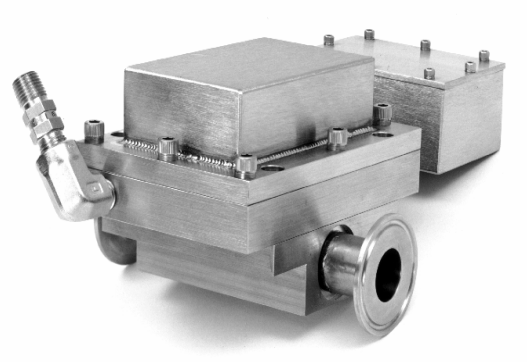
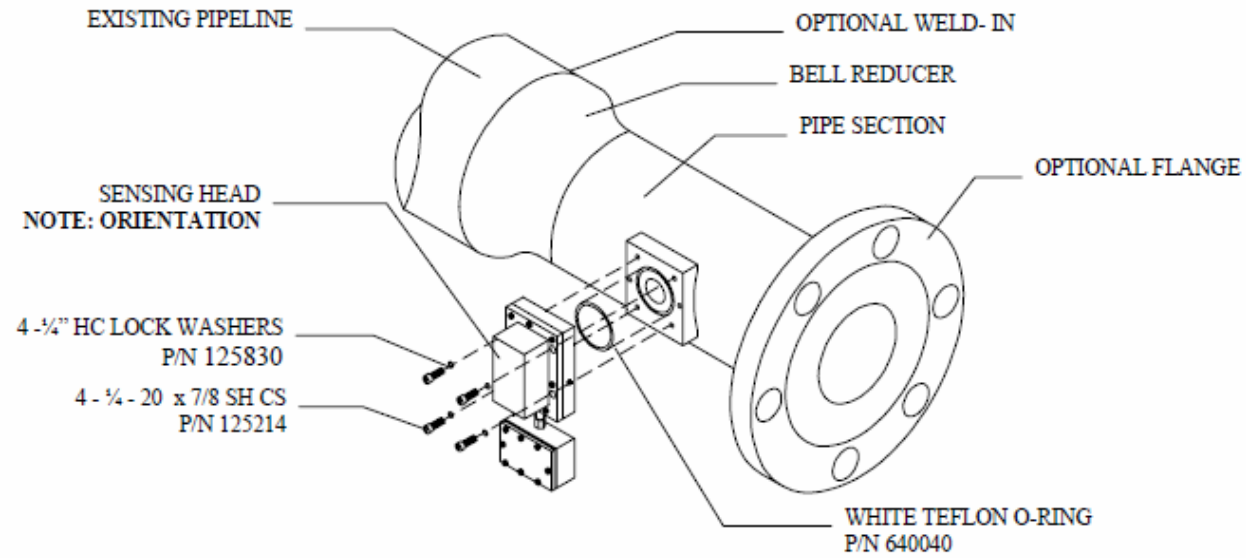


Figure 9
Flow-Thru-Block

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 10 below).

Figure 10
Sensing Head Mounting



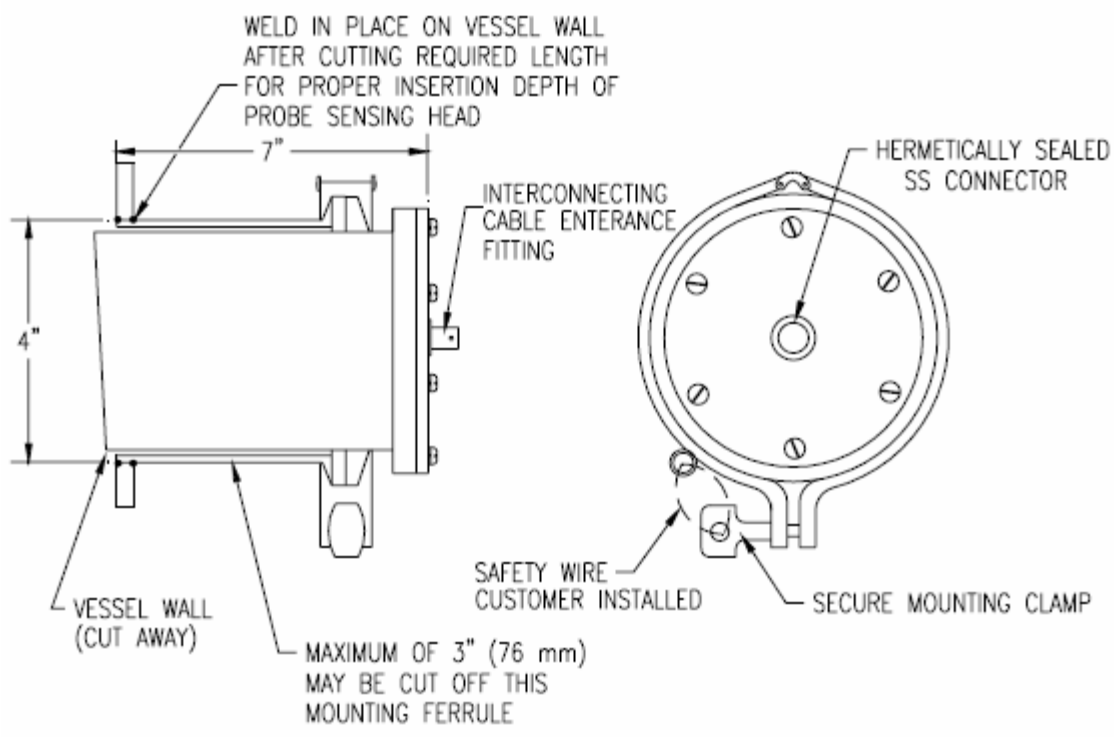
2.2 INSERTION PROBE MOUNTING

The Insertion Probe style sensing head, illustrated in Figure 11, 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 12 below).

Figure 11
Insertion Probe

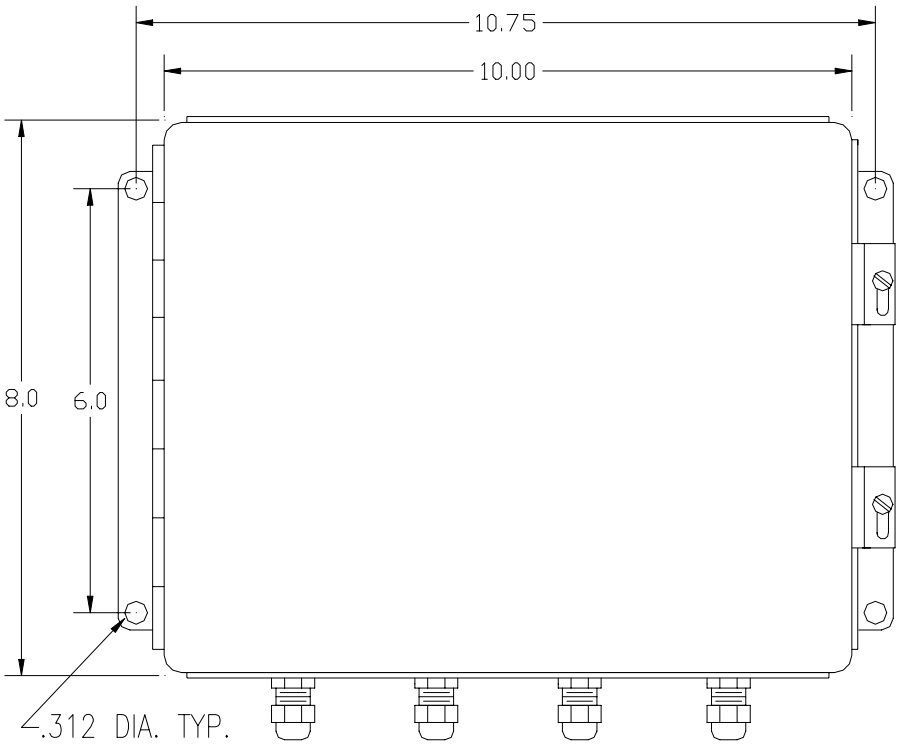
Figure 12
Insertion Probe Installation



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. Mounting dimensions of the unit are shown below in Figure 13. The depth of the Nema 4X SS processor is 4 1/2".

Figure 13
Mounting the Enclosure



2.4 PRISM WASH INSTALLATION

Prism wash is optional and only required if the process being measured has a tendency to coat the prism. A typical prism wash installation is illustrated below in Figure 14. 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 Ethernet connection.

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.

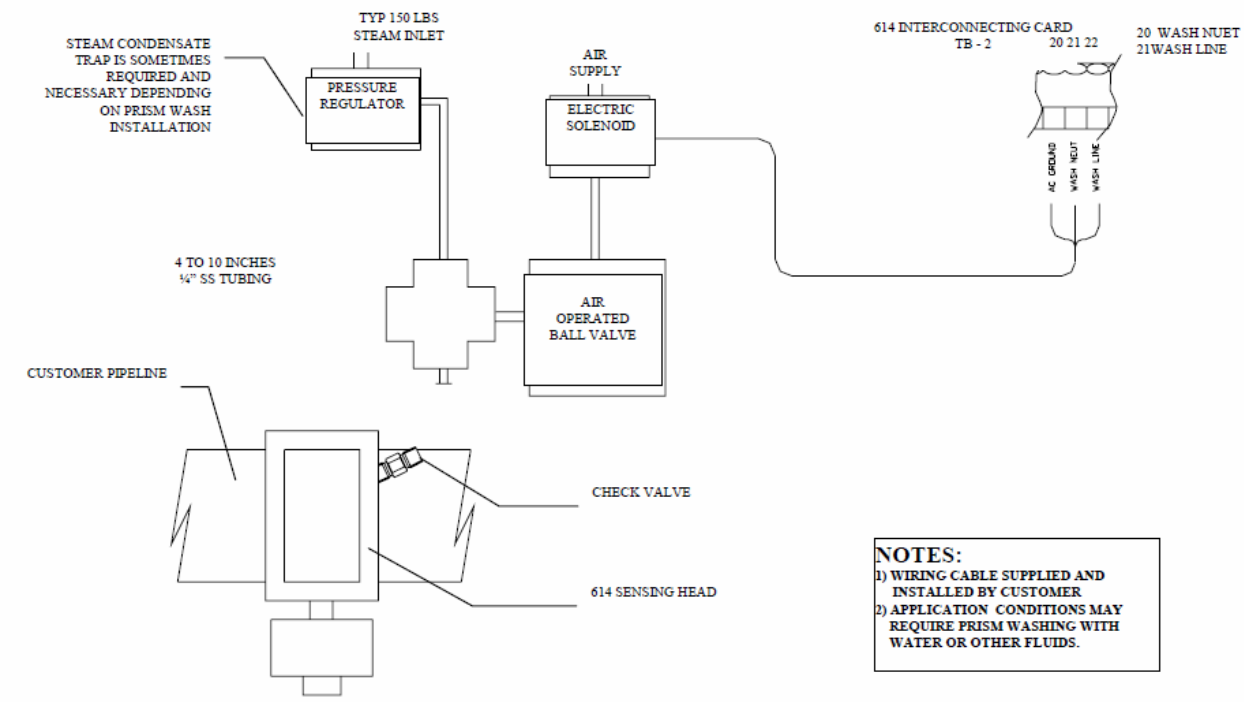
REQUIRED PRESSURE (PSI)	=	PROCESS LINE PRESSURE (PSI)	+	CHECK VALVE CRACKING PRESSURE (PSI)	+	30-45 (PSI)

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 14 below for a Prism Wash System Schematic and Wiring Diagram).

Note: Prism wash timing is done through your local browser. See section 3 (Start Up) to access the browser.

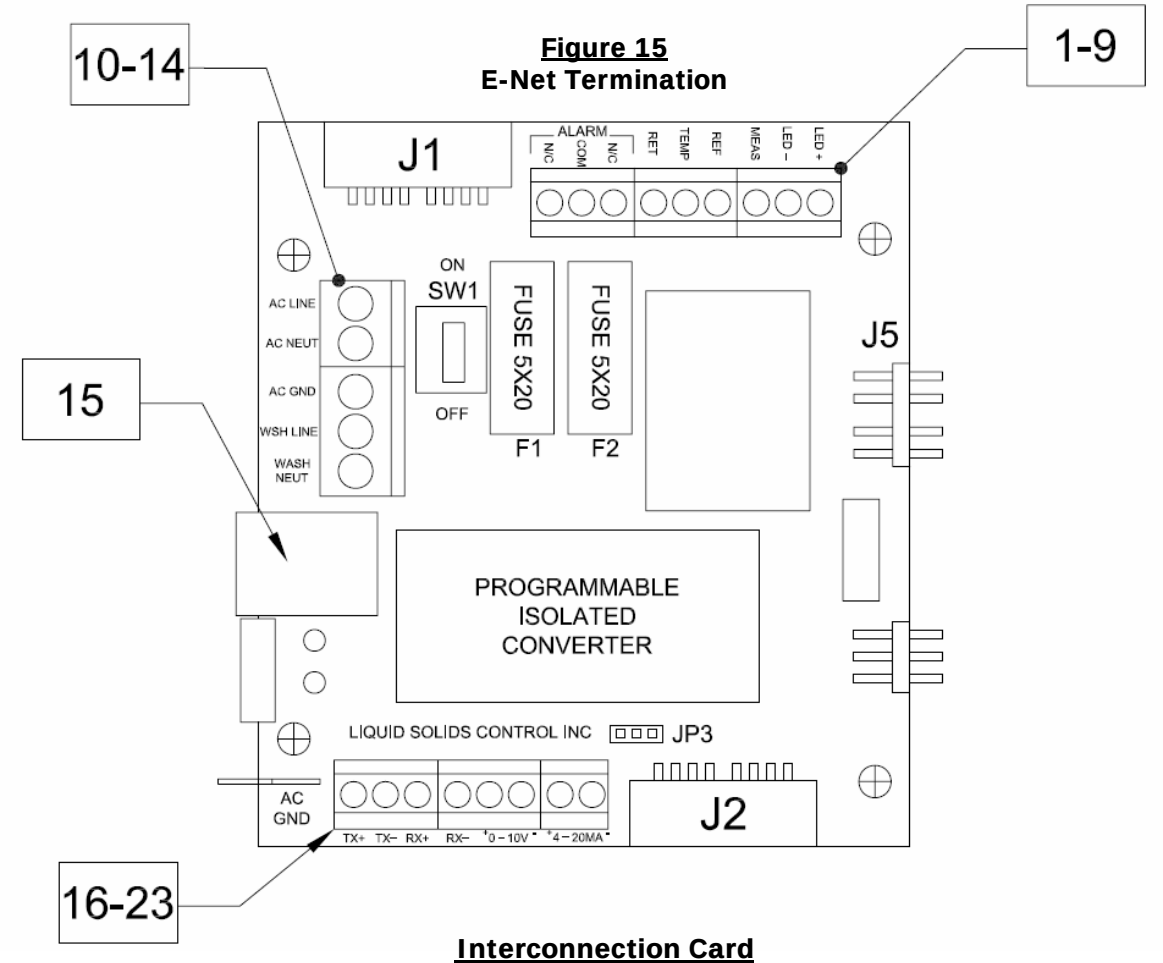
Figure 14
Prism Wash System Schematic and Wiring Diagram



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 the Interconnection Card. See (Figure 2 Item 1), for the location of the interconnection card. Terminations of the connections are shown below in figure 15.

Figure 15
E-Net Termination



Interconnection Card

1	LED+ Lamp Voltage DC (Red)	12	AC Ground
2	LED- Lamp Ground (Black)	13	Prism Wash Line
3	MEAS Measure Detector (White)	14	Prism Wash AC Neutral
4	REF Reference Detector (Black)	15	Ethernet Port (RJ 45 Connection)
5	TEMP Temperature Probe (Green)	16	Ethernet TX + (Green/White)
6	RET Temperature Probe (Black)	17	Ethernet TX - (Green)
7	ALARM (N/C)	18	Ethernet RX+ (Orange/White)
8	ALARM (COM)	19	Ethernet RX - (Orange)
9	ALARM (N/C)	20	0 - 10 VDC Output
10	AC Line	21	Ground for 0 - 10 VDC Output
11	AC Neutral	22	4 – 20 mA Output
		23	Ground for the 4 – 20 mA Output

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 E-Net 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 (AC LINE), POWER "NEUTRAL" (AC NEUT), and the Ground to (AC GND), terminals 10, 11, and 12 respectively in figure 15 above.

2.5.2 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 highend calibration set point. Setting the units' min and max are done through your local browser. Connect the mA output to the Interconnection Board (Figure 15 positions 22 and 23) where terminal 22 is the ground and 22 is the positive Ma output. The maximum load for this current signal is 1 K Ω. See Figure 15 for the location of the wiring connection for the 4 - 20 mA. The customer supplies the wiring for this connection.

2.5.3 CONNECTING THE (0 - 10 VDC)

The 0 - 10 VDC output is connected to designations 20 and 21, where position 21 is the ground and 20 is the positive DC Voltage. For locating the 0 - 10 VDC outputs see Figure 3 item 11. 0 VDC measurements represent the low-end calibration and 10 VDC measurements represent the high-end calibration set point. The customer supplies the wiring for this connection.

2.5.4 CONNECTING THE PRISM WASH SIGNAL

The AC signal to initiate the wash is connected to the interconnection card. (Figure 15 terminals 10 & 11) 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: Prism wash timing and set up is done through your local browser. See section 3.2 (Start Up) to access the browser. The customer supplies the wiring for this connection.

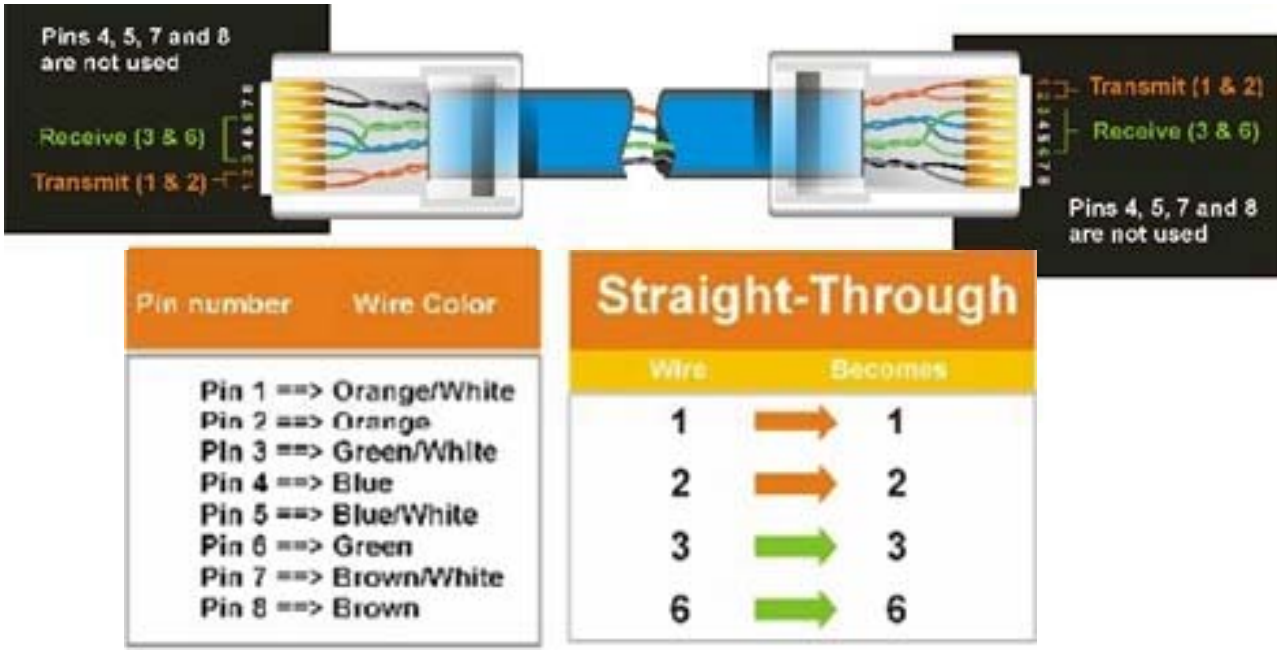
2.6 ETHERNET CONNECTION

The LSC E-NET unit can be connected to a customer's Ethernet through common cat 5-type cable. The physical connection can be made by RJ 45 connector (item 14 Figure 3) or on the terminal strip as shown in figure 3 (item 11)**.** The E-NET when shipped from the factory is set up with a fixed IP address. That address can be found printed on the flash card (Item 4 figure 2). The standard IP address is 192.168.0.10 unless specified differently by the customer.

There are different **grades**, or **categories**, of twisted-pair cabling. **Category 5** is the most reliable and widely compatible, and is highly recommended. It runs easily with 10Mbps networks, and is required for Fast Ethernet. You can buy Category 5 cabling that is pre-made, or you can cut & crimp your own. Category 5 cables can be purchased or crimped as either **straight through or crossed**. A Category 5 cable has 8 thin, color-coded wires. Ethernet networks for communication use only wires 1, 2, 3, and 6. Although only four wires are used, if the cable has 8 wires, all the wires have to be connected in both jacks.

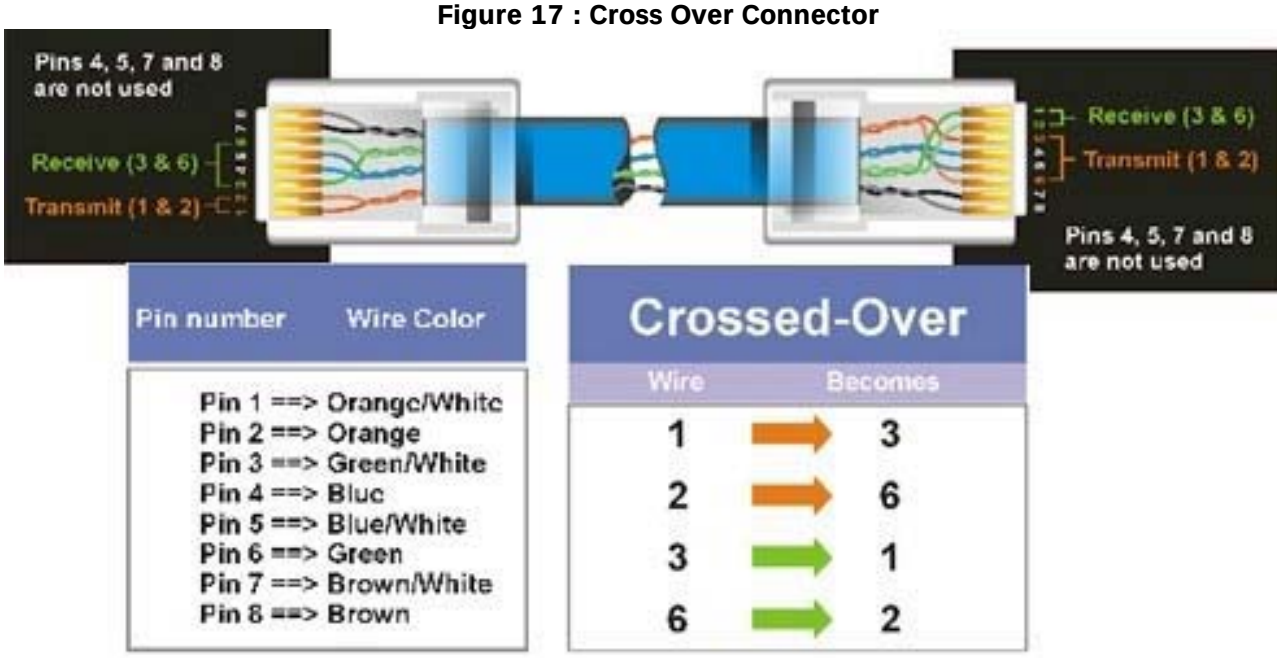
Straight-through cable is used for connecting the E-NET to a hub. In a **straight-through cable**, wires 1, 2, 3, and 6 at one end of the cable are also wires 1, 2, 3, and 6 at the other end.

Figure 16 : Straight Through Connector



Crossed cables are used for connecting E-NET directly to a Computer. In a **crossed cable**, the order of the wires changes from one end to the other: wire 1 becomes 3 and 2 becomes 6.

Figure 17 : Cross Over Connector



To figure out which wire is wire number 1, hold the cable so that the end of the plastic RJ-45 tip (the part that goes into a wall jack first) is facing away from you. Flip the clip so that the copper side faces up (the springy plastic clip will now be parallel to the floor). When looking down on the coppers, wire 1 will be on the far left.

The most common connection would be to a hub, using a straight through cat5 cable. Alternatively, the ENET system can be connected directly to a single computer using a **cross over** cat5 cable. Using this method, you will need to set up your computer's IP address manually. Following the examples below to manually set up or change your computers IP addresses.

2.6.1 IP SETUP FOR MS WINDOWS 98 WITH FIXED IP

- Go to "Control Panel" and double click on "Network"
- Highlight "TCP/IP" for your adaptor and click on "Properties"
- Select the "IP Address" tab.
- Check the "Specify an IP address"
- Enter 192, 168, 0, and then any number in the range of 2 – 254.
  DO NOT; use any numbers that have already been assigned to other computers.
- Enter 255,255,255, 0 for the "subnet mask".
- You will need to reboot your computer for the new settings to take effect.

2.6.2 IP SETUP FOR MS WINDOWS 2000 WITH FIXED IP

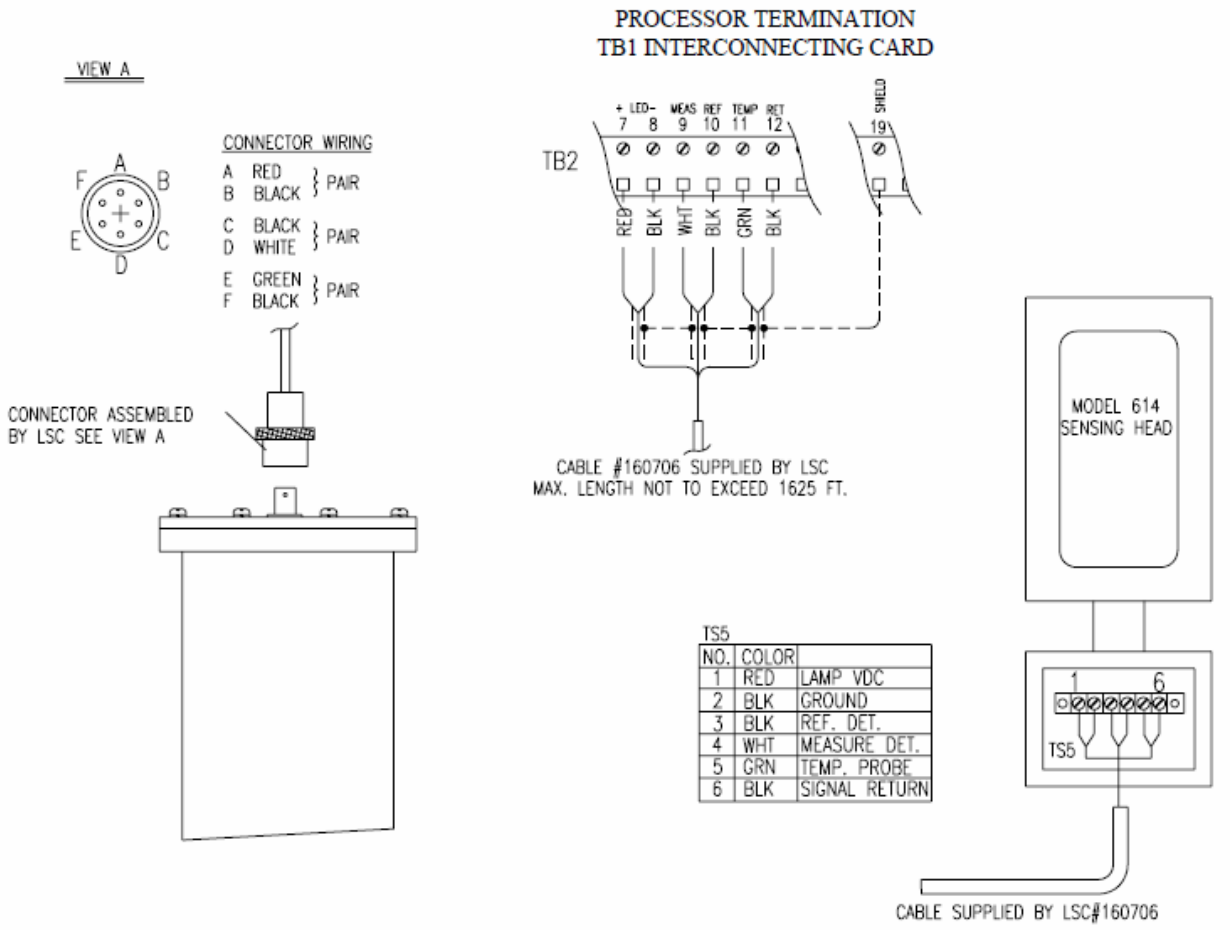
- Go to the "settings", "Network and Dialup connections" from your start menu.
- Select properties for your "Local Area Connection"
- Click on properties.
- Click on properties for "Internet Protocol (TCP/IP)"
- Check the "Use the following IP address"
- Enter 192, 168, 0, and then any number in the range of 2 – 254.
  DO NOT; use any numbers that have already been assigned to other computers.
- Enter 255 , 255 , 255 , 0 for the "subnet mask".
- Enter your default gateway. Typically 192 , 168 , 0 , 1.
- DNS servers are not needed for the E-Net connection.

2.7 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 18 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. Cable required for the sensing head can be purchased from your local LSC rep. Length of wire cannot exceed 1625 feet.

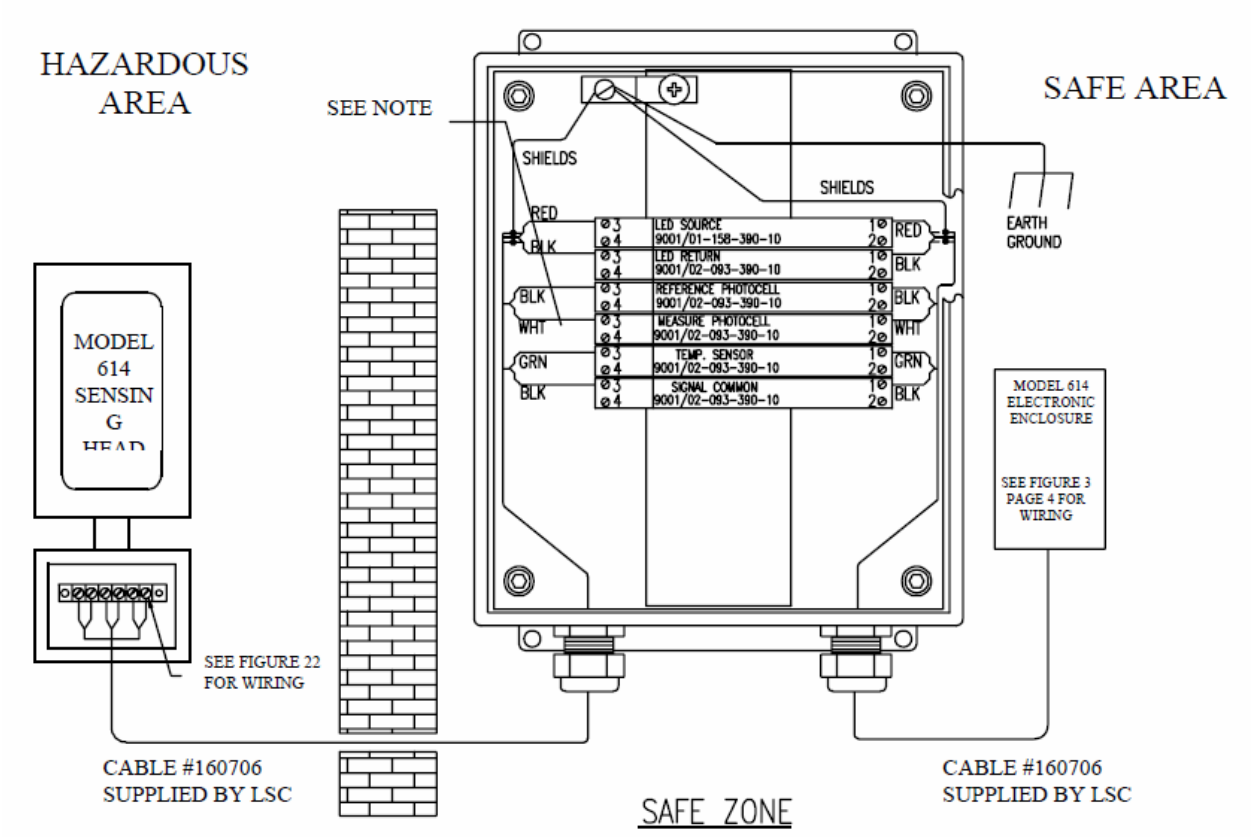
Figure 18
Wiring Installation of the Sensing Head



2.8 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 E – NET 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 19 below)

Figure 19
Intrinsic Safety Barrier Wiring Diagram

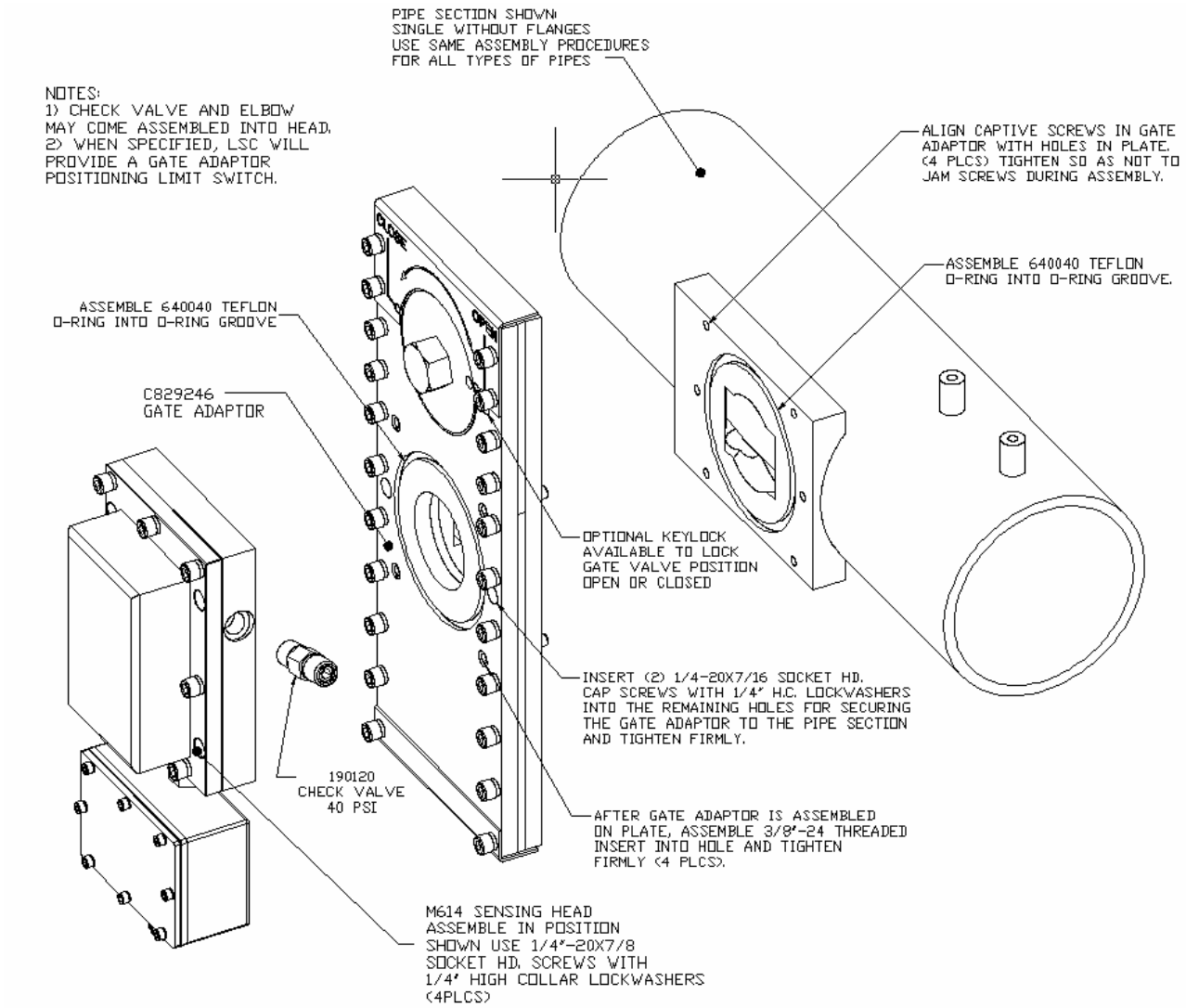


Note: SENSING HEAD CONNECTION TO BE MADE ON THE BLUE SIDE OF THE BARRIER.

2.9 GATE ADAPTOR "ISOLATION VALVE"

The Gate Adaptor is installed on a pipe section between the Sensing Head and the pipeline 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 5.2.3. 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 20. See section 5.2 for, part description and maintenance of the Gate Adaptor.

Figure 20
Gate & Sensing Head Assembly



3. START UP

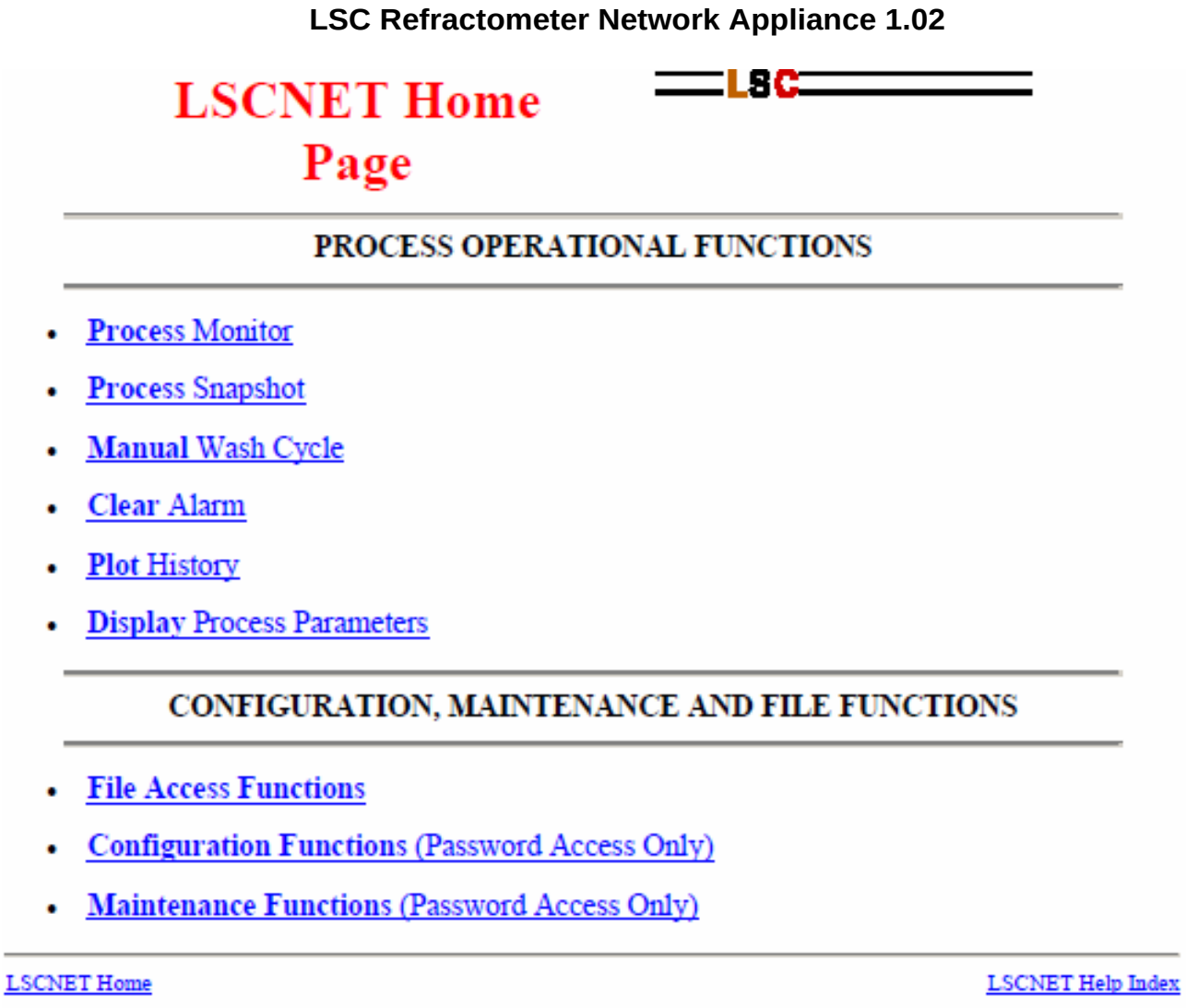
Before turning the power ON re-check all the wiring per the prints provided with the system and the information given in the installation section of this manual.

3.1 TURN THE POWER ON

Turn the circuit breaker on to the E-NET. Once the system is powered up there is approximately a 20 second waiting period while the CPU starts. There is a green light on the CPU Card that indicates that power is turned on and two lights on the interconnection card (Figure 3: items 12 and 13) Item 12 represents a Network link that is on when there is a connection to the Ethernet (This light is green). Item 13 an Activity indicator & it is illuminated (RED) when there is activity between the E-NET system and the Internal Ethernet.

3.2 ACCESSING THE E-NET http://192.168.0.10

From your local browser, (Explorer, Netscape) type in the address of your E-NET System, the address for the E-Net can be found printed on the flash card mounted on the CPU (Figure 2 Item 5). Such as; **http://192.168.0.10**. This example is our standard address. If a preferred address has not been received from the customer. After pressing ENTER or GO on the browser the HOME PAGE of the E-NET will be displayed.

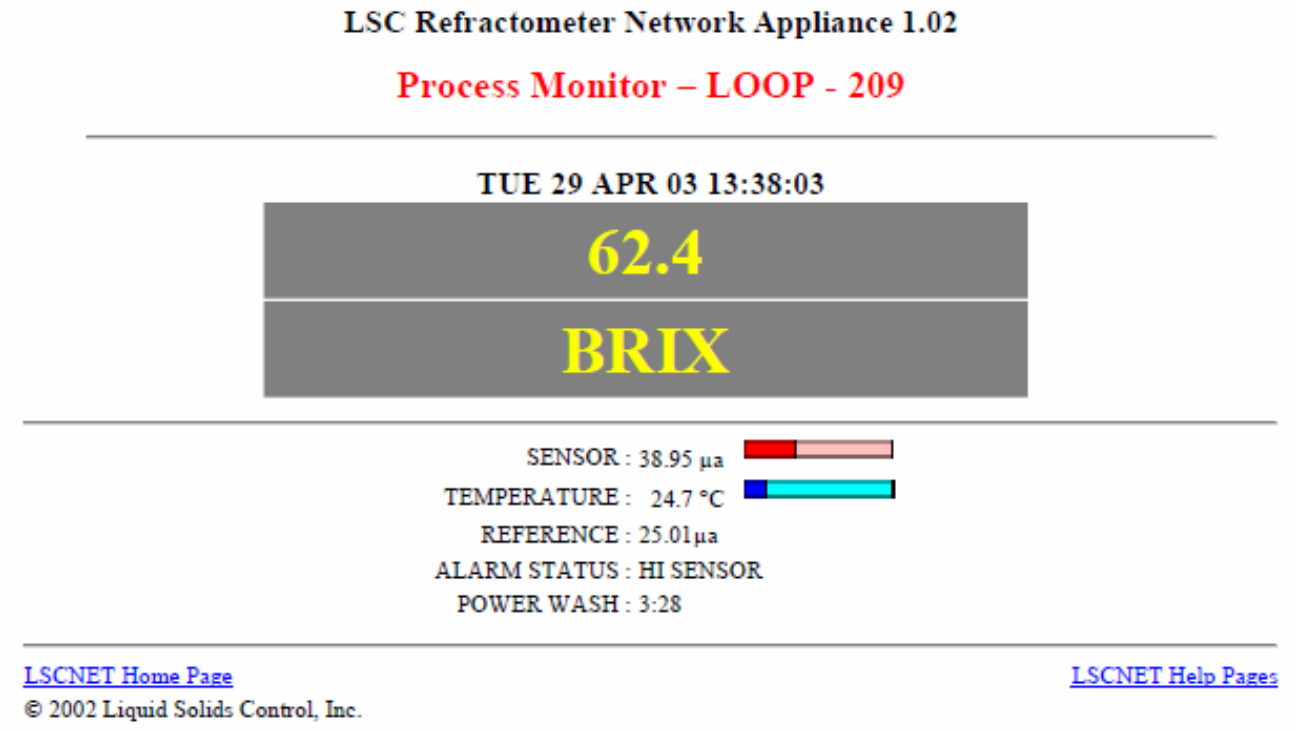


NOTE: If unable to connect with the home page make sure your computer has the correct IP Address set correctly. To set up an IP address on your computer manually, see section (2.5.5). "Setting fixed IP Addresses".

From the HOME PAGE a link to all Process Operational functions and features is available. At the lower right hand corner of each display is a direct link to the help page. From the help page there is a direct link to explain all E-NET features. Use this feature to help explaining menus and parameters not discussed in this manual.

3.3 PROCESS MEASURMENT

FROM THE home page click on PROCESS MONITOR to view the on-line process measurement from a local computer. Your process measurement will be displayed as shown below.



3.4 VERIFYING SYSTEM PARAMETERS

Check parameters to insure your E-NET has been programmed to your plant site specifications by clicking on Display Process Parameters, when at the HOME PAGE. Below is an example of a process file. To the right of each parameter is a description of each of the parameter. To change a system parameter, click on Configuration Functions (Password Access Only) at the E-NET HOME PAGE. NOTICE, a password is required to change process and system parameters. See Section 3.4 Changing Password. At the lower right hand corner of each display is a direct link to the help page for further explanation.

LSC Refractometer Network Appliance 1.02

Parameter List

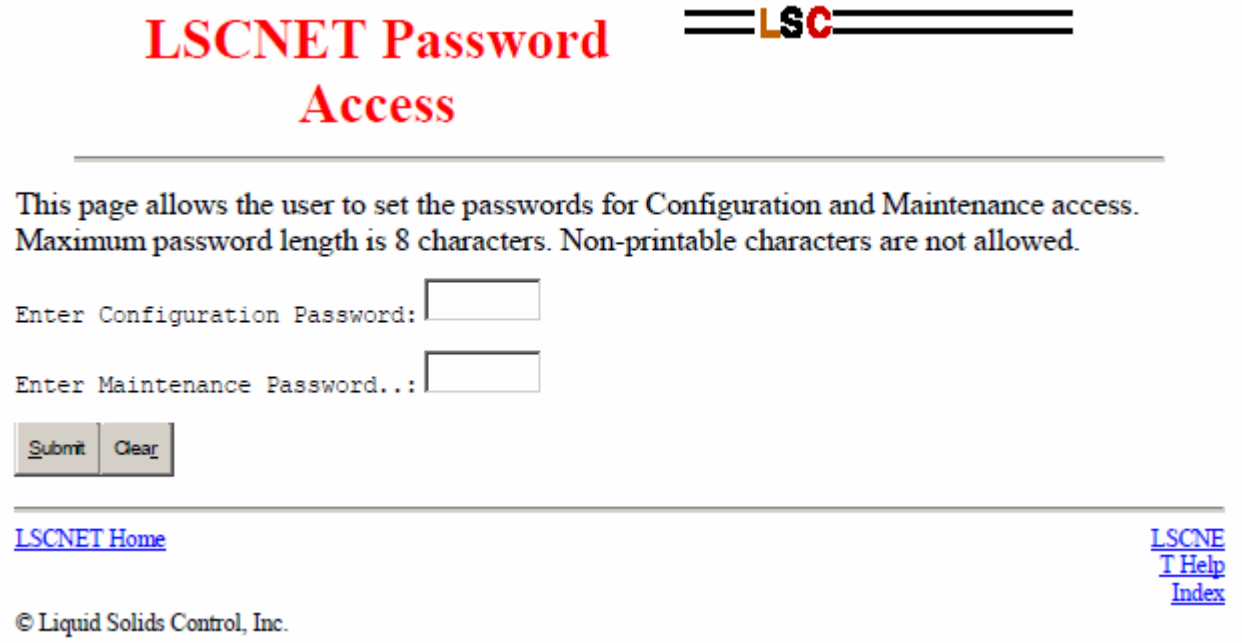
```
Process.Name..: SAMPLE_PROCESS   Refractometer Process Name
Ref Current...:  25.0 µa         Ref Sensor Operating Current
Cal Min.......:  59.8 µa         Expanded µa Scale Minimum Value
Cal Max.......:   3.6 µa         Expanded µa Scale Maximum Value
Cal Lo........:  33.6 µa         Calibration Low End Value µa
Cal Hi........:  16.6 µa         Calibration High End Value µa
Units.........: REFRACTIVE_INDEX Units Name
Units Min.....: 1.2000           Units Minimum
Units Max.....: 1.5000           Units Maximum
Units Lo......: 1.3400           Calibration Units Low End
Units Hi......: 1.4300           Calibration Units High End
SetPnt Lo.....: 1.1850           Low Alarm Setpoint
SetPnt Hi.....: 1.5150           High Alarm Setpoint
Offset........: 0.0000           Sensor Value Offset
Increment.....: 0.1000           Offset Increment
Linearity (01): 1.2000:1.2000    Linearity Measured:Actual
Linearity (02): 1.5000:1.5000
Coarse Zero...:  0.00 Volts      Preamplifier Input Bias
Op Temperature:  20°C            Operating Temperature
  Range......: 16 - 24°C         Operating Temperature Range
  ISB........:   0               Safety Barrier Correction
Temp Comp.....:  15:0.00500      Temperature:Compensation
Temp Comp.....:  18:0.01000
Temp Comp.....:  22:0.02000
Temp Comp.....:  25:0.01000
Wash Period...:   0 Minutes      Wash Cycle Period
Wash Length...:  10 Seconds      Wash Length (0 = Smart Wash)
Hold Length...:   5 Seconds      Hold Length
History Period:  15 Seconds      History Entry Write Period
```

3.5 CHANGING PASSWORDS

Systems are shipped with the password LSC programmed in, unless the customer specified a different password. If a different password is specified then it will be documented on the Calibration Data sheet in the front of this manual.

You must have a connection to the E-net system in order to change the passwords. To set the network passwords for the E-net system, you need to type in the existing IP address into your browser eg. http://192.168.0.10/password.html. Password Access display is displayed as shown below. Enter the new password for the configuration and the maintenance menus and click on Submit.

LSC Refractometer Network Appliance 1.02



3.6 CHANGING YOUR IP ADDRESSES

You must have a connection to the E-net system in order to change the parameters. To set the network parameters for the E-net system, you need to type in the existing IP address into your browser. Ex: http://192.168.0.10/network.html
You should see the following screen. **BE VERY CAREFUL HERE**. You render the system inaccessible through the Ethernet system.

LSC Refractometer Network Appliance 1.02

The system would need to be restarted for the new setting to be active. To restart the system, turn off the power by using the On / Off Switch. (Item 17 Figure 3)

3.7 CHANGING TIME AND DATE

Changing the Time and Date has to be done from the DOS Command Prompt. To get to the DOS Prompt in Windows Open Command Prompt. At the DOS Prompt type:

Tenet [ENET ADDRESS] E.g. telnet 192.168.0.10

Follow the below e.g. to set Time and Date. Note the login name, and passwords are both lsc.
lscnet login: lsc

Password: Linux 2.2.13.

Last login: Fri Jun 27 12:51:23 +0000 2003 on pts/0 from 192.168.0.6.
lscnet:/lscnet% su
Password:
lscnet:~# setclock
LSCNET Hardware and System Clock Set

Enter 2 Digit Year.....? 03
Enter Month.....? 06
Enter Day.....? 26
Enter Hour.....? 12
Enter Minute.....? 29
Enter Second.....? 02

Press Enter To Set/Synchronize

Once Enter is pressed the Time and Date is set on the E-Net unit.

/sbin/hwclock --set --date="06/26/03 12:29:02"
/bin/date 0626122903.02
Thu Jun 26 12:29:02 /etc/localtime 2003
lscnet:~#

4. 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 E-Net reading and a reliable off line equivalent. A calibration should also be performed if there is a detector or prism replacement, or if there is a change in process liquid. However if a process file already exists no calibration is required. (To load a process file, go to the Configuration Functions from the main screen). All LSC units are pre-calibrated at the factory to site specifications. This calibrated file is called FACTORY and is found in the Configuration File Menu Options. 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.

4.1 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.

4.2 CHECKING SET POINTS

Verify your system settings before calibrating. (See Section 3.3). If a parameter needs to be adjusted double click on the appropriate parameter in the Configuration Function Menu. Once the desired parameter is entered pressing Submit below the setting will change it and write the changes to a file called lscnet.cfg.

4.3 CALIBRATION PROCEDURE

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

1) Verify the settings in Display Process Parameters to assure all settings are correct.

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.

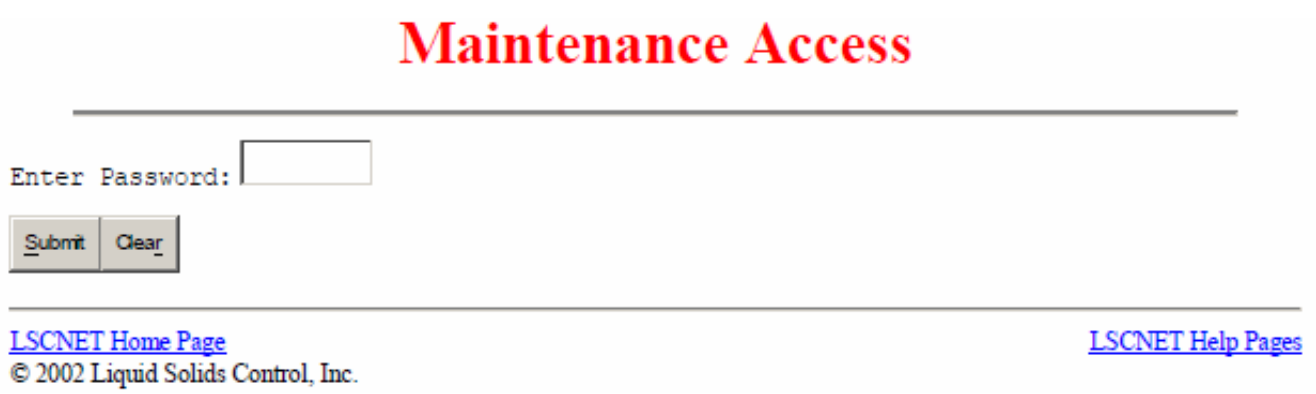
4) Remove the sensing head from the process pipeline or vessel. If a Gate Adaptor is installed, completely close the gate. To verify the gate is fully closed check that the lock porthole is clear by sliding a lock, or pencil thought the porthole. (See figure 20 for the location of the lock porthole.) 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!**

7) From the Browser on your computer enter the IP Address of your ENET System. i.e. 192.168.0.10. The E-Net home page is now displayed. From the Home Page, double click on the Maintenance Function at the bottom of the page. The "Maintenance Access" screen will be on the display where you then have to type in your password and double click on Submit to enter the password. Systems are sent from the factory with a password "lsc". Once inside the maintenance menu, double click on Calibrate Head. The Menus will now prompt you through the calibration.

LSC Refractometer Network Appliance 1.02

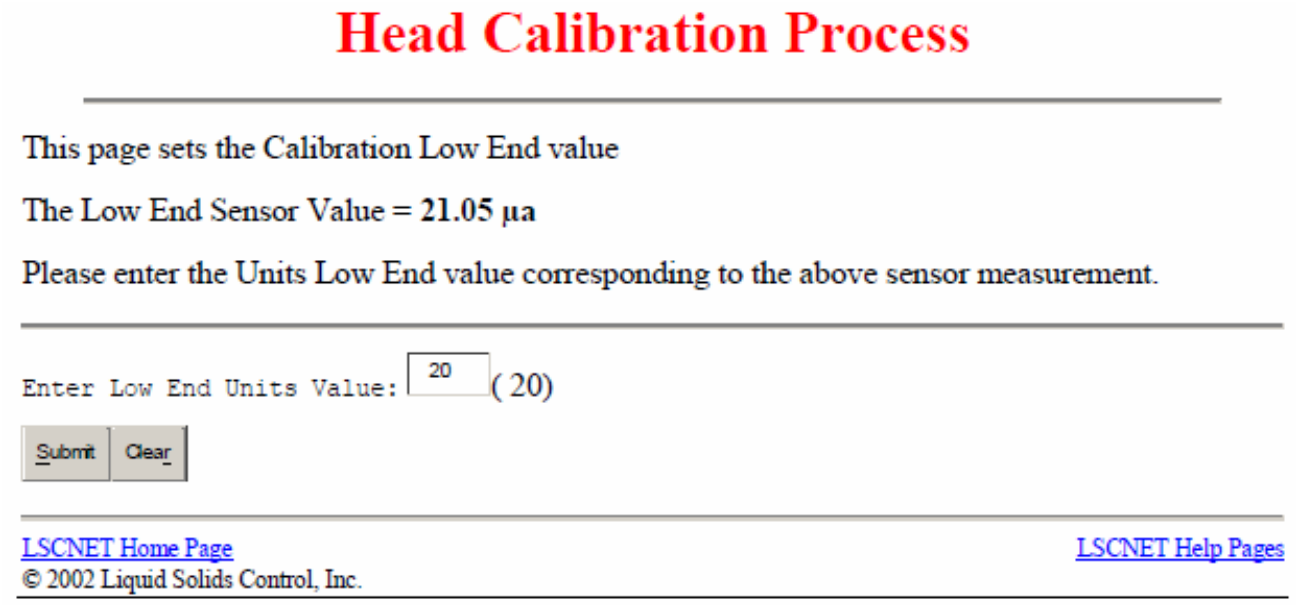


8) Apply 10 - 15 drops of low end or (zero) sample on the prism surface and cover with something opaque, this eliminates exterior light from entering the prism. It is best to use a low-end sample representing the low-end range point, but not necessary. After putting the sample on the sensing head, press Continue.

LSC Refractometer Network Appliance 1.02

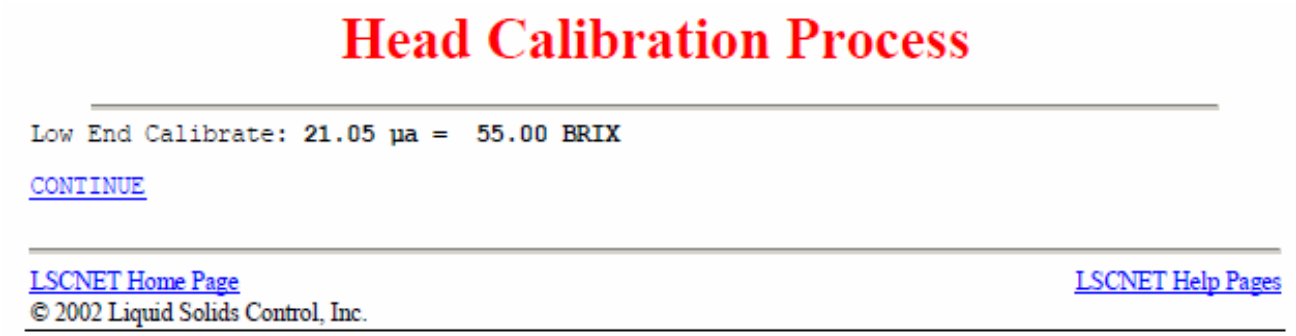
9) Enter the value of the low end sample used to do the low end calibration, then press Submit.

LSC Refractometer Network Appliance 1.02



10) Assure the low end calibration, and then press "CONTINUE", this will accept the low-end calibration. Pressing BACK on your browser at any time during the calibration will permit you to back up to the previous menu if a mistake has been made.

LSC Refractometer Network Appliance 1.02

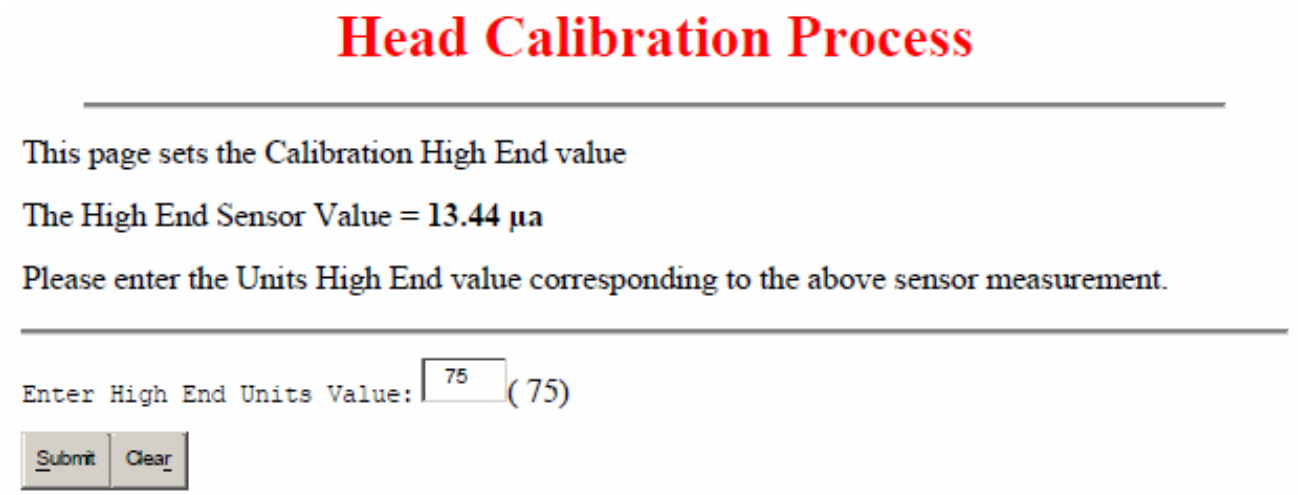


11) Clean the prism well. Apply one drop of the high end sample on the prism surface and wipe clean again, (this assures that any residue that may be on the surface of the prism is the high end sample being used). Apply 10 - 15 drops of High End or (span) sample on the prism surface and cover it with an opaque lid as done in step 8, Press "**CONTINUE"**. It is best to use a High End sample representing the High End range, but not necessary.

LSC Refractometer Network Appliance 1.01

12) Enter the value of the high-end sample used to do the high-end calibration then press Submit.

LSC Refractometer Network Appliance 1.02



13) The E-Net system is now calibrated and gives the option to save this calibration as a new process file or overwrite the "**lscnet.cfg"** file. **NOTE: When saving a file do not use wild characters or a space between names. I.e. (/, \.*, @, &)**

14) Reinstall the prism wash nozzle (if required) and mount the Sensing Head to the pipeline on 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).

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

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

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

18) Setting the Zero Offset. 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, an offset is required. To set an offset, double click on "Configure Operating Parameters", from the LSCNet Home Page. Next double click on "Zero Offset". Type into the Entry field, the desired reading. Notice the unit displays the actual measurement to the right of the entry box. Pressing "Submit" accepts the Value typed in and displays the True / Off Set Readings.

Adjusting the Zero Offset will shift the whole calibration in the direction of that desired setting. The 4 - 20 mA output will also correspond to the offset typed in. 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 LINEARIZATION

The LSC E-Net 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 "Linearity Table". There are a maximum of 25 points that can be programmed into the table. A Linearity Table is only required if the LSC measurement is out (due to a non linear process) at the mid range but accurate at the high and low end calibration points. With a Linearity 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 Linearity Table, points to be entered are required. The first and last points are already entered, as they are points entered in the field calibration. 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 Linearity Table is required. Below is an example of points that may be entered.

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

LSC Refractometer Network Appliance 1.02

Linearity Table Values

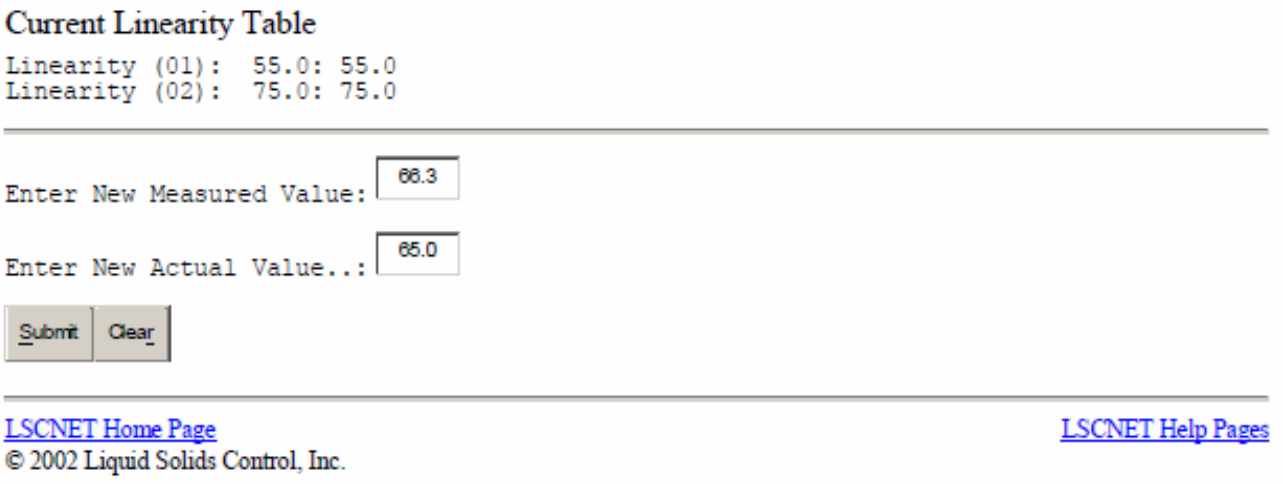
This page allows the user to add/replace/delete values in the linearity table.

To **ADD** a value, enter a new measured value and its corresponding actual value

To **REPLACE** a value, enter the measured value with a new actual value

To **DELETE** a value, enter the measured value with an identical actual value

For more detailed information concerning the linearity table use the **HELP** function.



These points, once entered, are all listed in the Display Process Parameters Page.

5. MAINTENANCE

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

5.1 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 23 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 5.1.1 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 5 from the Collimating Lens Holder, Item 16 Figure 5. Check the lenses in the Collimating Lens Holder and the Focusing Lens Holder, Item 20 Figure 5, 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 6 from the Collimating Lens Holder, Item 5 Figure 6. Check the lenses in the Collimating Lens Holder and the Focusing Lens Holder, Item 4 Figure 6, 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 5. 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 6. 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.

5.1.1 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 21 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 21.

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) After it has cooled remove any gasket material that had extruded over the prism surface on the underside of the base plate with a sharp knife.

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.

10) Re-Calibrate the Sensing Head to the system. See Section 4.

Figure 21
Prism Assembly

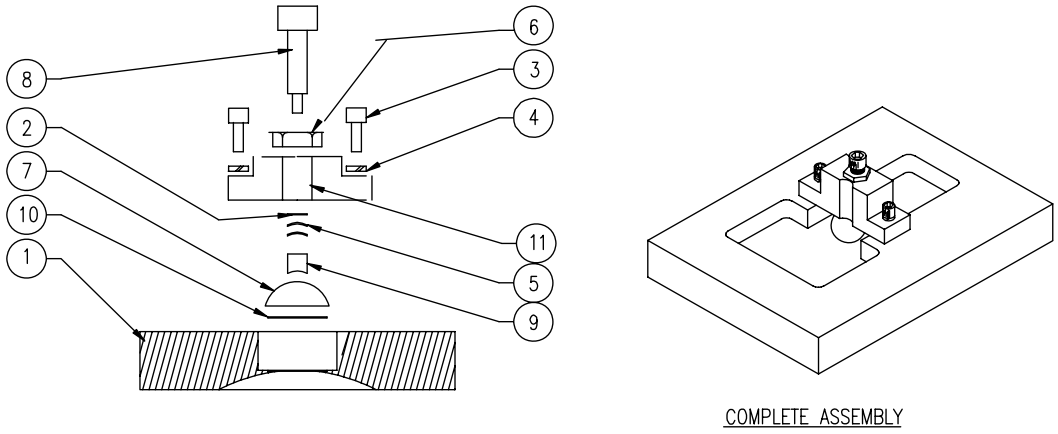


Table 7
Prism Assembly Parts

ITEM	LSC PART #	DESCRIPTION	QTY
1	X	BASE PLATE (there are many different base plates depending on your 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

5.2 GATE ADAPTOR MAINTENANCE

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.

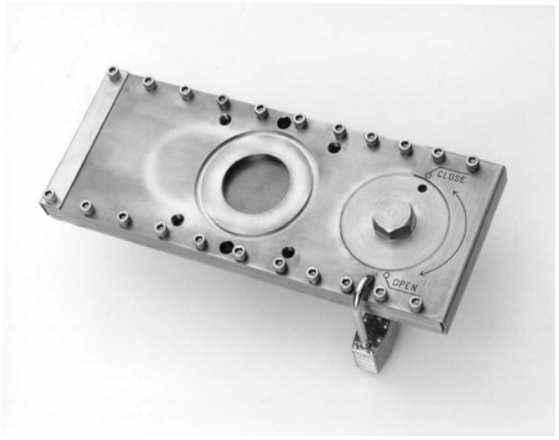


Figure 22
Gate Adaptor

5.2.1 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.

5.2.2 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 23). 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.

5.2.3 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!

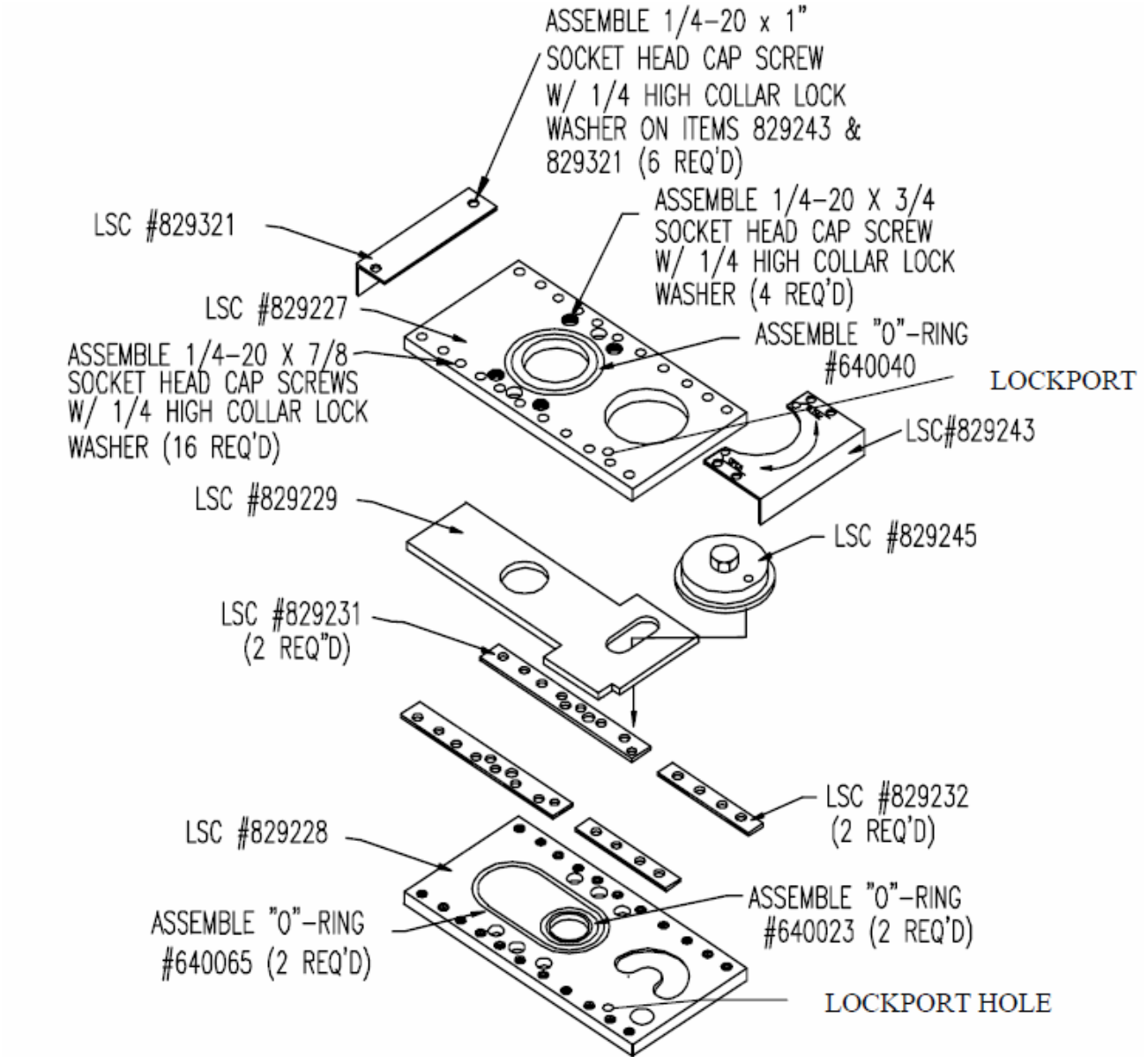
6) Seat a new Teflon O-Ring (P/N 640040) into the grove on the gate and install the Sensing Head, Steam Fittings and Gate Adaptor Limit Switch. (If removed)

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 23
Gate Assembly



6. 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

614410-C : E-NET SPARE ELECTRONICS KIT

QTY	DESCRIPTION	PART #
1	POWER SUPPLY	480410
1	LSC BOARD PC – 1	614401
1	INTERCONNECTING BOARD ASSY. PC-5	614405
1	CPU BOARD, E-NET UNIT W/ FLASH CARD	614805

7. TECHNICAL SUPPORT

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

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

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 5.1.1	2-27-2012
3. Added spare parts kits	2-27-2012
4. Updated gate rebuild	5-4-2012
5. Interconnection card layout (Figure 3)	5-4-2012
6. Interconnection card Terminations (Figure 15)	5-4-2012