

Model
FL-3A
Fluoroprobe[®]

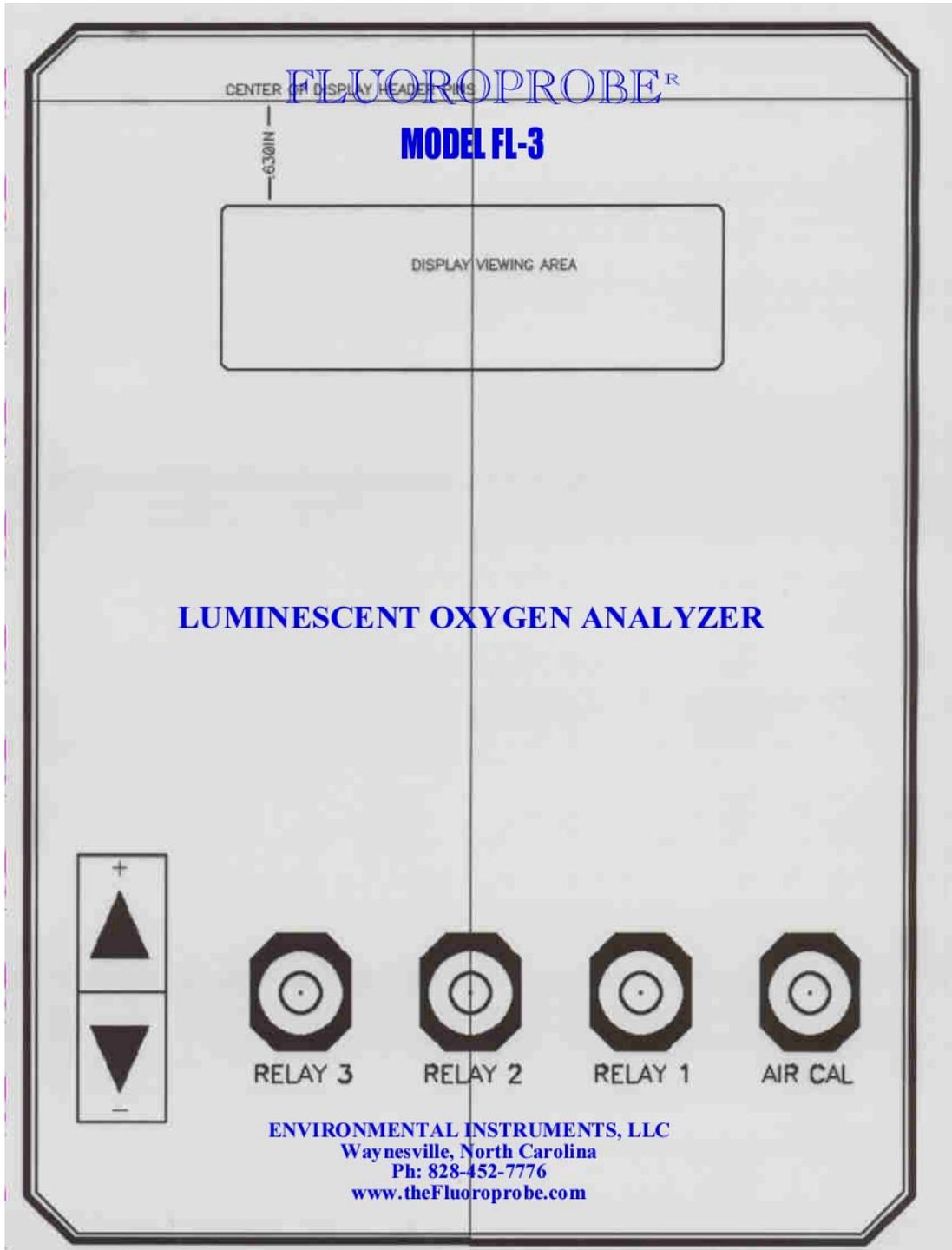
ENVIRONMENTAL INSTRUMENTS, LLC

144 Industrial Park Drive ▶ Suite A-3 ▶ Waynesville, NC 28723 ▶ Phone: 828-452-7776 ▶ www.thefluoroprobe.com

“Changing the way the world measures oxygen”

O&M MANUAL

Front Panel Layout:



Product Description

FL-3 Fluoroprobe is a luminescent optical oxygen analyzer based upon US patent #5,030,420. Consult the patent for specific information. Users of this product can expect years of use providing that the environment it operates in is compatible with silicone rubber. We reserve the right to make this determination before the purchase and installation. Please consult sales/engineering for any questions.

Installation Location

The FL-3 keypad is engineered for outside UV exposure and the elements. Environmental Instruments spared no expense on this item. However, It is prudent to avoid direct sunlight on the front panel by proper location or a protective hood. The FL-3 unit is available in a fiberglass window enclosure and clear cover with the PVC enclosure to place the keypad behind or a windowed front panel. These are available as a priced option. Consult sales/engineering for information.

Installation and Startup

Power up the unit only after complying with all codes and regulations that are applicable. Only individuals with certified training and experience should attempt installation.

When power is applied the unit will display a screen which shows company and software revisions for 1-2 seconds. The screen will then change and remain in the main screen mode. The main screen will display elevation temperature and D.O. Our goal is to ship every unit to the individual user with the elevation already entered for their location. If, however the elevation is not correct please refer to the keypad operation section of this manual to change the elevation.

If the elevation is correct, then the unit is ready to be placed in service. Each unit is supplied pre-calibrated and calibration should not be required to put the unit into operation. We recommend that you do not calibrate the unit without first discussing with you local representative. If calibration is required, refer to key pad operation section of this manual on how to air calibrate.

We strongly recommend using a pipe installation system for aeration basin tanks or SBR's etc. See probe installation instructions for details. Experience has shown this is a superior and inexpensive system. We recommend staying away from highly mechanical or complicated articulated (multiple joint) type probe installations. They will collect hair, string and other debris and are expensive.

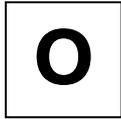
NOTHING BEATS THE PIPE!

In Summary:

1. Install unit and power up the unit.
2. Change elevation if necessary (Refer to keypad operation).
3. If elevation is changed, air calibration must be done.
4. Place probe in service.
5. Refer to relay wiring information if relays inside the controller are used.
6. Refer to 4-20 mA setup information if 4-20 mA output is to be connected.

Key Pad Operations

AIR CALIBRATE



The unit must be displaying the main screen before air calibration can be attempted. See screen section if there is a question that the main screen is not being shown.

1. Make sure the elevation is the present elevation. If the elevation needs to be changed, please refer to keypad operation section of this manual and change. Do not attempt air calibration until correct elevation is entered.
2. Wipe off sensor if probe has been in service.
3. Place probe in a dark environment.

NOTE: If the preferred pipe installation method is used to install the probe, simply pull the probe out until you see the end of the probe. Wipe off the sensor and leave the probe in the end of the pipe with the sensor approximately 10-12 inches down into the pipe.

WARNING: Please make sure the pipe has vent holes drilled in the pipe every 2 feet or so above the water level. Gases in the pipe will cause a low oxygen reading during calibration if this is not done. The pipe must be vented to fresh air.

4. With the probe in a dark place, push and hold the air calibration key until the display changes to the air Calibration screen. You will know when you are in the air calibration screen when you see the text below.

Air Cal Min to go: 5

Release the key. The minutes to go will count down from 5 to 0 in 1 minute increments. When 5 minutes has expired, the unit will return to the main screen showing D. O. – temperature and elevation.

Elevation
Temperature
D.O

Please note that during air calibration you should observe that the elevation is the correct elevation. If it is not, push the air calibration key and hold for 10-12 seconds to exit back to the main screen. Refer to the keypad operations to change the elevation.

During Air calibration there is a sensor diagnostic being performed on the sensor. This diagnostic is displayed as follows

Sensor = ____._ %

During the calibration this diagnostic text should increase until it displays 90-105%. An example is shown below.

Sensor = 95.0%

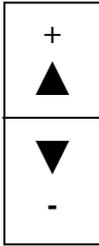
If during the 5 minutes the diagnostic stays at 0%, or less than 90%, please check that the probe has been plugged into the circuit board inside the controller.

WARNING: When the controller cover is open, there are high voltages present. Only properly trained and qualified individuals should attempt this.

If the probe is connected and the problem persists, please contact your sales/engineer support or Environmental Instruments.

If at any time, due to power failure or if the air calibration is exited before the 5 minutes has expired, the unit will not be calibrated. It is imperative that the unit be left to come out automatically in this screen in order to air calibrate the unit or to accept any elevation changes that have been made.

ELEVATION SET



NOTE: When elevation is changed, the unit must be air calibrated to accept changes. Refer to the air calibration section in the keypad section for details.

To set the elevation, the unit must be in the main screen. The main screen is the only screen, which displays the company name, elevation, temperature, and D.O. in ppm.

While in the main screen, push at the same time both the  and the  keys. They must be pushed at the same time and held for approximately 2 seconds. If the screen does not change, release the keys and try again. The unit will display the following when in the elevation screen.

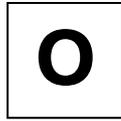
Elevation =

When the elevation screen is displayed, release the keys. Use the  or  key to make the changes. Please note that the elevation changes in 50 foot jumps. When the elevation is set as close as can be done, release the key being used and push the  and  keys at the same time until the main screen appears.

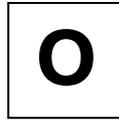
NOTE: When the elevation is changed, the unit must be air calibrated to accept the changes. Refer to air calibrate in the keypad operations for details. After air calibration is done, the unit can be placed in operation.

Inputs & Outputs

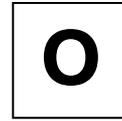
RELAYS:



Relay 3



Relay 2



Relay 1

To access relay 1 or relay 2, press the appropriate key for approximately 2 seconds. Release the key when the screen changes to display:

Relay 1 or 2
Relay opens= __. __ppm
Relay closes= __. __ppm

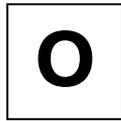
Use the  or  key to make changes. The changes are in 0.25 ppm increments.

Please note that the  will change the “Relay opens __. __ppm” only.

Please note that the  will change the “Relay closes __. __ppm” only.

Keep pressing the  or  key until the desired value is obtained.

The settings will go to 20.00 and start over again at 00.00 if the setting is lower than desired. The same holds true for the closes __. __ ppm except that the settings go to 00.00 and start over again at 20.00. When changes have been made, press the relay key being changed until the unit goes back to the main screen.

RELAY 3:**Relay 3**

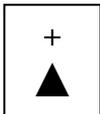
Relay 3 has two functions and does both of them when the key pad is pushed for approximately 2 seconds.

These functions are:

1. Display the “AIR Blast” screen where timing adjustments are made
2. Test the air blast clean system, if the system has been installed and connected to Relay 3.

The Automatic Cleaning cycle time is adjusted on the Air Blast screen. Press and hold the R3 button until the screen displays “Air Blast”. Use the “UP” and “DOWN” arrow keys to adjust the desired interval between cleaning cycles. Press R3 to exit the “Jet Clean” screen. The time value will be retained, the unit will then test the air blast system, obtain an oxygen reading and go back to the main screen.

To test the Cleaning System press and hold R3 until the “Jet Clean” screen is displayed. Press R3 again and the unit will operate the cleaning system and return to the main screen and resume normal operation.



The + and – keypads are used to make relay set point changes and elevation changes. If the unit is not in the appropriate screen for elevation or relays, the settings for elevation and relays will not be changed.



These two keypads when used together will also access the “Elevation” screen.

When if either one of the + or- keypad is pushed the unit will update a reading of oxygen and return to the main screen with no changes.

ZERO CALIBRATION:

Under normal circumstances zero calibration is not required. However, the FL-3 does have an internal zero calibration function but this should only be used in factory controlled conditions. If you consider that a zero calibration may be required then contact your local representative for further instructions.

4-20 mA OUTPUT SETUP

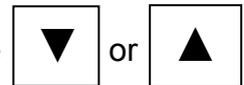
Every unit shipped has the 4-20mA output signal pre-calibrated. This is usually for 4.00 mA @ 0.00ppm and 20.00 mA at 10.00 ppm.

The system provides an active 4-20mA output and will operate up to 550ohms. To wire the 4-20 mA output to a data system, refer to the “FL-3 Wiring Input/Output” diagram for location of terminals and polarity information.

The FL-3A has a function to assist the calibration of the 20mA output signal. Press the “Relay 2” and “Air Cal” buttons simultaneously and hold these two buttons until the screen shows the following display (note that the processor will not let you enter this function while the display indicates the unit is “READING PROBE”):

Span Adjust
 4ma = 0 mg/l (FIXED)
 20ma = 10.0 mg/l

The mg/l value can be adjusted up or down by using the Keep pressing the



keys until the desired value is reached.

Once the new measuring range is selected, the “Relay 2” and “Air Cal” buttons must be pressed simultaneously to return to the main screen. If the configuration screen is not left in the manner the changes that were made will not be saved and the configuration will return to the default settings.

Your local representative will gladly assist any user in setting up the 4-20mA calibration if problems should arise. If possible, please work through your sales/engineering contact for this service.

RELAY WIRING

The relays are single pole, change over micro-switch contacts (SPDT) rated up to 2 Amps and 250 Vac.

For wiring to the relays, refer to the “FL-3 Wiring Input/Output” diagram for location of terminals and their function.

FL-3 FLUOROPROBE SPECIFICATIONS

Sensor Design:

Measurement Principle	Fluorescent (Patented)
Tip Thickness	0.005" (0.127mm)
Tip Material	Silicone Rubber
Body Material	PVC with Epoxy encapsulant
Cable	Polyurethane
Length	9" (230mm) Nominal
Diameter	1.25" (32mm) Nominal
Optics	400nm Excitation, 610nm Emission
Internal Power	+/- 12 Vdc, +/- 5 Vdc
Output Signal	AC Modulated

Application Data:

Power Supply:	240 Vac, 50Hz, < 25W (standard) 12 & 24 Vdc, on order.
Temperature Limits:	
Instrument	-30°C to +50°C
Sensor	0°C to +50°C
Operation Range	0 _{ppm} to Supersaturation in Aqueous Solutions.
Accuracy:	1% over 0 to 10ppm Range in Aqueous Solutions.
Repeatability:	0.5% of Range.
Response Time*:	30 sec (90%) in Aqueous Solutions. 7 sec (90%) in Gaseous Phases.

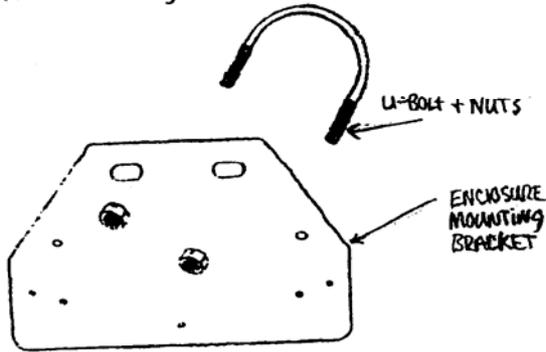
*Note: The response time is based on 0.3 m/s flow across sensor. The response time will decrease with increased flow rate. However, flow is not required for the measurement.

Sensor Lifetime:	Estimated 10+ years for conventional aeration applications. Based solely upon the application environment and the effect on Silicone Rubber. 5 year Sensor warranty on standard applications.
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Features:

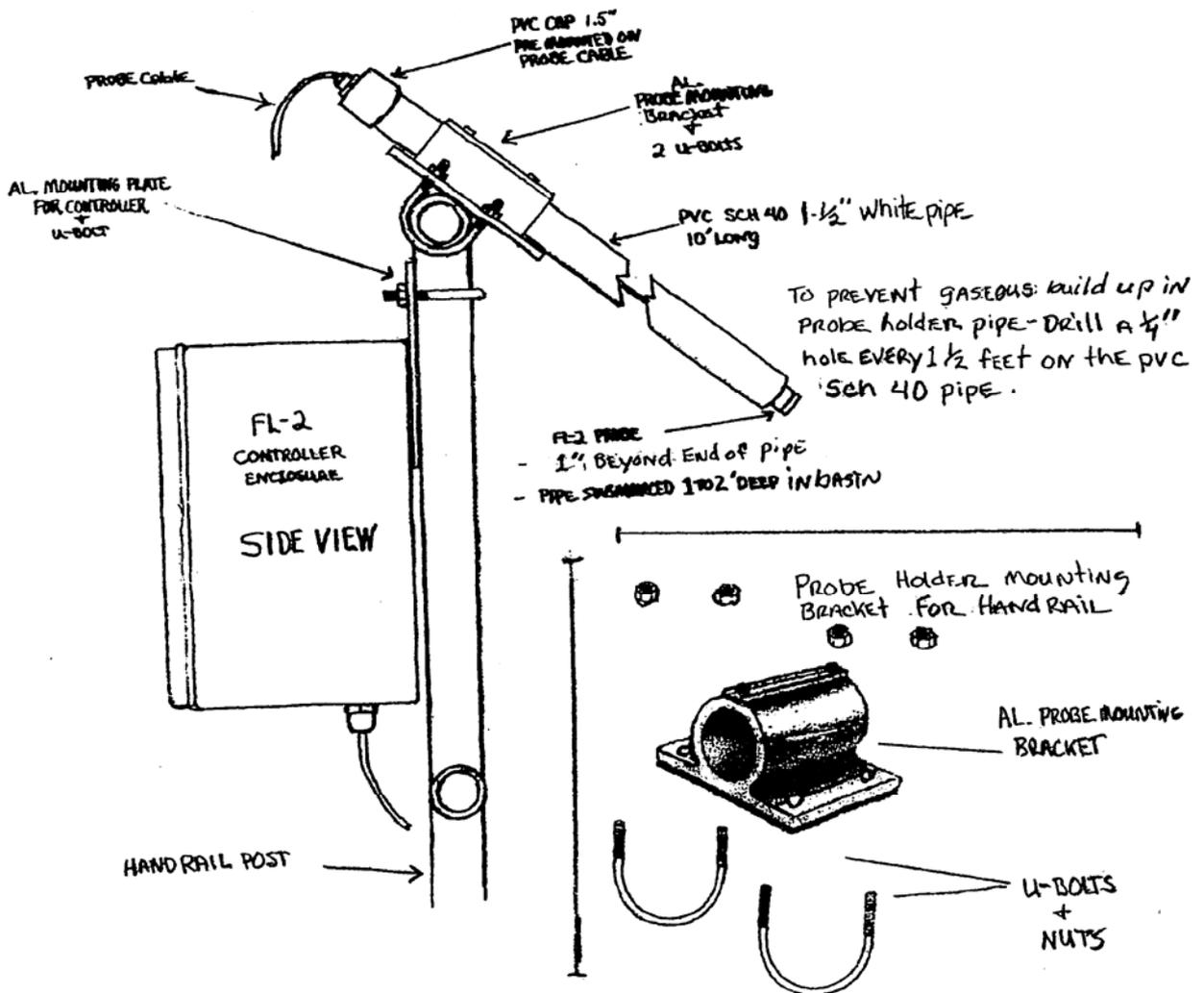
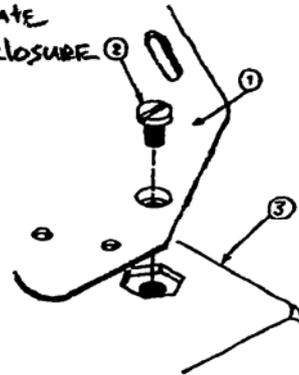
Analogue Output Signal	1x 4-20mA, 550 Ω max.
Digital Outputs	2x Relay, 2A max.
Display	3 Lines: DO, Temperature and Elevation
Automated Air Calibration Routine	Yes
Temperature Compensation	Yes
Ambient Excitation Compensation	Yes
Instrument Measurement	Steady State, Amplitude/Lifetime

AL. Mounting Bracket Hardware



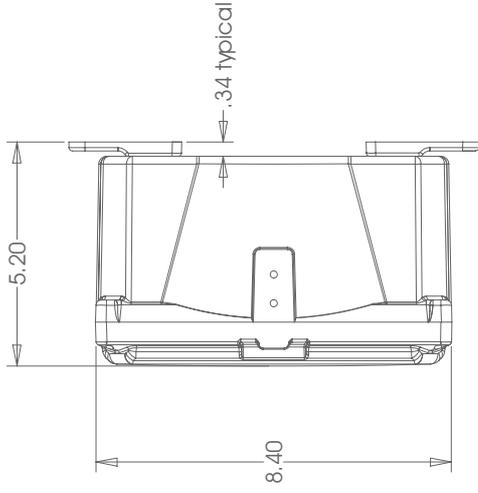
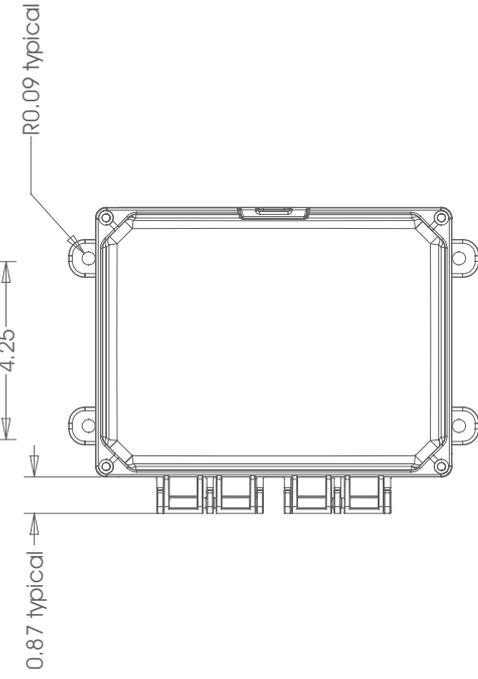
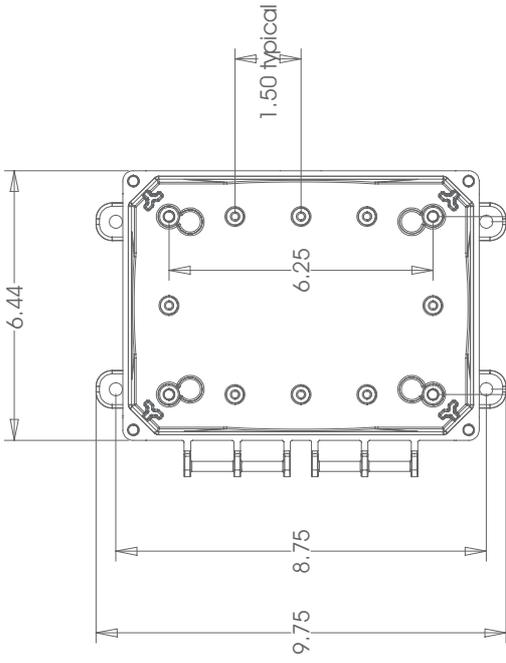
- ① ENCLOSURE MOUNTING BRACKET FOR HANDRAIL POST
- ② SCREWS INSIDE ENCLOSURE IN PLASTIC BAGGIE
- ③ BACK VIEW OF ENCLOSURE.

SCREW AL PLATE TO TOP OF ENCLOSURE BACK SIDE.



Installation Arrangement

Note: Only install on hand rails where local regulations permit this. If local regulations do not permit installation of items on a hand rail then use the knee rail or separately installed pipe to meet the local regulation requirements.

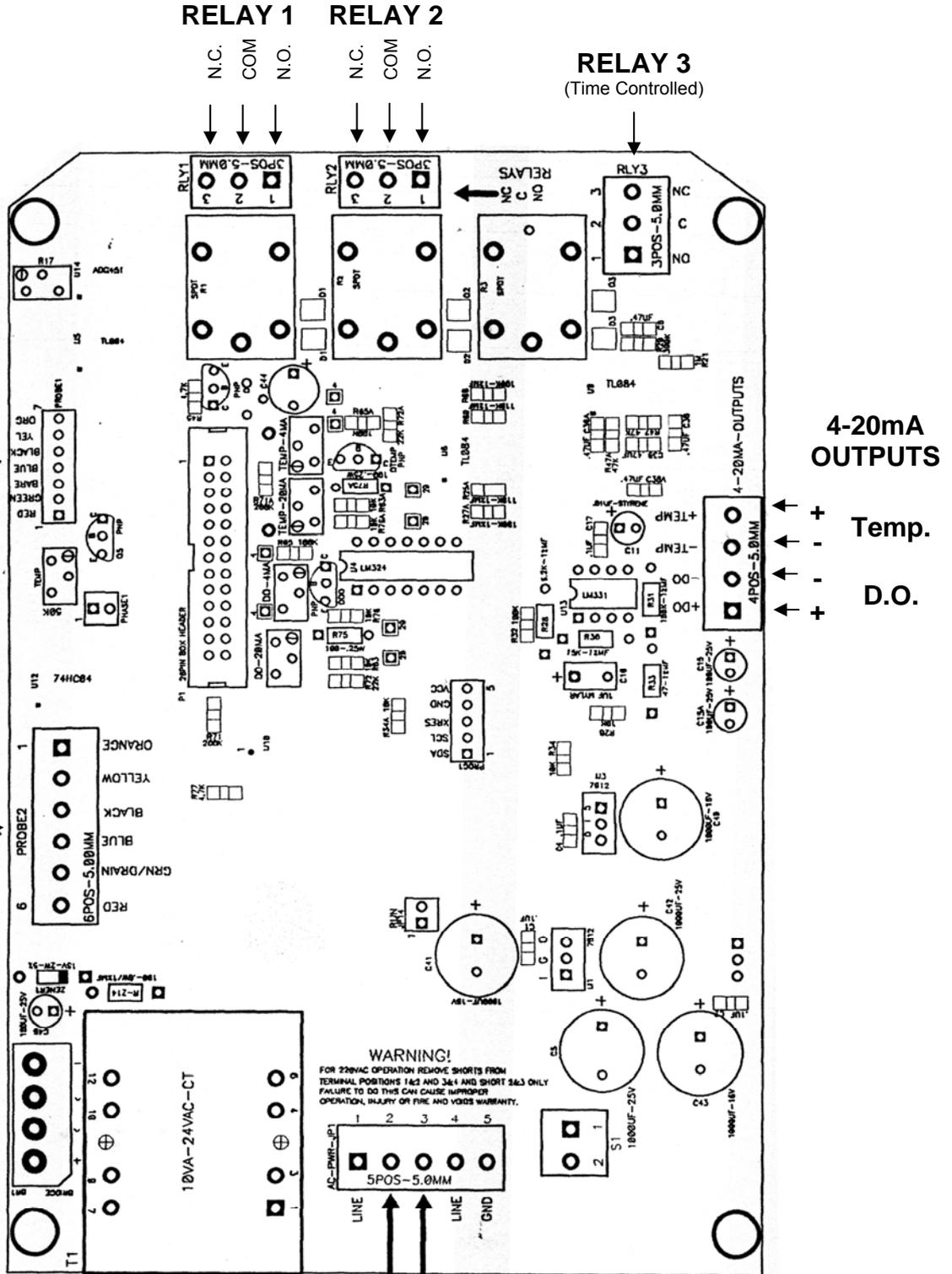


- Notes:
1. Backpanel width = 4.88, Backpanel height = 6.75
 2. Internal height without Backpanel = 4.75
 3. Internal height with Backpanel = 4.25
 4. All dimensions are in inches

Company	Integra Enclosures, Inc.	Product	10000
Address	8100 E. Grand Ave. Aurora, CO 80012	Part No.	10000
City	Aurora, CO	Rev.	10000
State	CO	Date	12/2003
Country	USA	Drawn By	10000
Customer	10000	Checked By	10000
Project	10000	Released By	10000
Scale	1:1	Drawn Date	10000

FL-3A WIRING INPUT/OUTPUT

WARNING: --Changing OEM connections to probe will void warranty.
Probe Inputs



D.C. INPUT

LINE NEU GND

A.C. INPUT

WARNING:

For 240 Vac Operation, remove shorts from terminal positions 1&2 and 3&4 and short 2&3 only. Failure to do this can cause improper operation, injury or fire and voids warranty.

CALIBRATION TABLES

Table I shows the amount of oxygen in mg/l that is dissolved in air saturated fresh water at sea level (760 mmHg atmospheric pressure) as temperature varies from 0° to 50°C.

Table I: Solubility of Oxygen in Fresh Water

Temp °C	Solubility mg/L								
0	14.62	11	11.03	22	8.74	33	7.18	44	6.02
1	14.22	12	10.78	23	8.58	34	7.07	45	5.93
2	13.83	13	10.54	24	8.42	35	6.95	46	5.84
3	13.46	14	10.31	25	8.26	36	6.84	47	5.74
4	13.11	15	10.08	26	8.11	37	6.73	48	5.65
5	12.77	16	9.87	27	7.97	38	6.62	49	5.56
6	12.45	17	9.67	28	7.83	39	6.52	50	5.47
7	12.14	18	9.47	29	7.69	40	6.41		
8	11.84	19	9.28	30	7.56	41	6.31		
9	11.56	20	9.09	31	7.43	42	6.21		
10	11.29	21	8.92	32	7.31	43	6.12		

Derived from 17th Edition, *Standard Methods for the Examination of Water and Wastewater*.

Table II shows the correction factor that should be used to compensate for the effects of variation in atmospheric pressure or altitude. Find true atmospheric pressure in the left hand column and read across to the right hand column to determine the correction factor. (Note that "true" atmospheric pressure is as read on a barometer. Weather Bureau reporting of atmospheric pressure is corrected to sea level.) If atmospheric pressure is unknown, the local altitude may be substituted. Select the altitude in the center column and read across to the right hand column for the correction factor.

Table II: Altitude Correction Factors

Pressure In			Altitude in		Correction Factor (%)	Pressure In			Altitude in		Correction Factor (%)
inches Hg	mm Hg	kPa	Feet	Meters		inches Hg	mm Hg	kPa	Feet	Meters	
30.23	768	102.3	-276	-84	101	24.53	623	83.1	5391	1643	82
29.92	760	101.3	0	0	100	23.94	608	81.1	6047	1843	80
29.33	745	99.3	558	170	98	23.35	593	79.0	6717	2047	78
28.74	730	97.3	1126	343	96	22.76	578	77.0	7401	2256	76
28.11	714	95.2	1703	519	94	22.13	562	75.0	8100	2469	74
27.52	699	93.2	2290	698	92	21.54	547	73.0	8815	2687	72
26.93	684	91.2	2887	880	90	20.94	532	70.9	9545	2909	70
26.34	669	89.2	3496	1066	88	20.35	517	68.9	10293	3137	68
25.75	654	87.1	4115	1254	86	19.76	502	66.9	11058	3371	66
25.12	638	85.1	4747	1447	84						

The temperature/solubility relationship of oxygen in sea water is not the same as that in fresh water. Oxygen solubility in sea water is shown in Table III.

Table III: Solubility of Oxygen in Sea Water
(Chloride concentration 20,000 mg/L)

Temp °C	Solubility mg/L								
0	11.41	7	9.59	14	8.24	21	7.20	28	6.38
1	11.11	8	9.37	15	8.07	22	7.07	29	6.28
2	10.83	9	9.16	16	7.91	23	6.95	30	6.18
3	10.56	10	8.96	17	7.78	24	6.83		
4	10.30	11	8.77	18	7.61	25	6.71		
5	10.05	12	8.58	19	7.47	26	6.60		
6	9.82	13	8.41	20	7.33	27	6.49		

Derived from 15th Edition, *Standard Methods for the Examination of Water and Wastewater*.

ENVIRONMENTAL INSTRUMENTS, LLC Warranty Policy
Model FL-3 Fluoroprobe

Environmental Instruments warrants this product to the original purchaser against any defects that are due to faulty material or workmanship for a period of one year from date of shipment. Sensor is warranted for 5 years.

In the event that a defect is discovered during the warranty period, Environmental Instruments agrees that, at its option, it will repair or replace the defective product or refund the purchase price, excluding original shipping and handling charges. Any product repaired or replaced under this warranty will be warranted only for the remainder of the original product warranty period.

This warranty does not apply to consumable products such as chemical reagents; or consumable components of a product. Contact Environmental Instruments or your distributor to initiate warranty support. Products may not be returned without authorization from Environmental Instruments.

Limitations

This warranty does not cover:

- Damage caused by acts of God, natural disaster, labor unrest, acts of war (declared or undeclared), terrorism, civil strife or acts of any governmental jurisdiction
- Damage caused by misuse, neglect, accident or improper application or installation
- Damage caused by any repair or attempted repair not authorized by Environmental Instruments
- Any product not used in accordance with the instructions furnished by Environmental Instruments
- Freight charges to return merchandise to Environmental Instruments
- Freight charges on expedited or express shipment of warranted parts or product
- Travel fees associated with on-site warranty repair

This warranty contains the sole express warranty made by Environmental Instruments in connection with this product. All implied warranties, including without limitation, the warranties of merchantability and fitness for a particular purpose, are expressly disclaimed.

Some states within the United States do not allow the disclaimer of implied warranties and if this is true in your state the above limitation may not apply to you. This warranty gives you specific rights, and you may also have other rights that vary from state to state.

This warranty constitutes the final, complete, and exclusive statement of warranty terms and no person is authorized to make any other warranties or representations on behalf of Environmental Instruments.

Limitation of Remedies

The remedies of repair, replacement or refund of purchase price as stated above are the exclusive remedies for the breach of this warranty. On the basis of strict liability or under any other legal theory, in no event shall Environmental Instruments be liable for any incidental or consequential damages of any kind for breach of warranty or negligence.