



FUEL SENTRY TANK GAUGE AND LEAK DETECTION SYSTEM

Model TG-EL-D4B-xx-0-0

The **TG-EL-D4B Tank Gauge/Fuel Management System with Leak Detection System** monitors one or two tanks. The **D4B** tracks fuel deliveries and daily/weekly fuel consumption. It is a powerful accounting tool. The leak-detection system is designed for use with double wall tanks, vaulted tanks, single wall tanks with spill basins, and double wall piping. The **TG-EL-D4B** is designed for use with all fuel oils (No. 2 – No. 6), diesel, kerosene, jet fuel, and most other petroleum products.

Features include:

- Easy-to-read bar-graph touchscreen display
- Printer option with automatic report printing
- Automatic delivery report and data logging
- Daily/weekly usage report and data logging
- Daily HD-A2-C automatic leak sensor testing
- Overfill alarm
- Idle tank theft alarm
- Eight Intrinsically Safe (I.S.) sensor inputs
- RS485 and Ethernet Modbus
- Fully field-configurable
- JC_Edit PC based configuration via USB



4-20 mA Xmtrs or switch sensors:

- TG-EL-WF-x-C 4-20 mA wire float level sensor
- TG-EL-HLT-x-C 4-20 mA head level sensor
- Most other 4-20 mA level, head, bubbler, ultrasonic, or magnetostrictive level sensors
- HD-A2-C 4-20 mA discriminating leak sensor
- RBS or PS-LDS float leak switch
- Most other contact closure leak sensors

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SAFETY



WARNING

This product is intended for use in Commercial and Industrial installations,
it is NOT intended for Residential use.

This product is intended to be used by Trained Operators.

Installation, start-up, and troubleshooting is intended to be done by
Experienced Technicians familiar with Industrial Safety Codes
and installing devices in Hazardous Locations.



DANGER

Failure to comply with Control drawing 190789, and the instruction manuals of all Intrinsically Safe sensors connected to the TG-EL-D4B, voids the Intrinsically Safe design and **creates an explosion risk in the hazardous area.**

NOTE:

Do NOT begin to install or wire the TG-EL-D4B or the sensors unless the
TG-EL-D4B I/O Channel Configuration Worksheet has been completed and
all of the Intrinsic Safety wiring and physical installation notes have been read.



DANGER

Electric Shock Hazard

Multiple power sources may be present.

Disconnect all electric power sources, local and remote, before servicing



Specifications

Inputs (15 total)

Analog:	(8) 4-20 mA or contact closure Each channel field-configured
Intrinsically Safe:	Class 1, Zone 0, Group CD $V_{oc} = 29.9$, $I_{sc} = 99.5\text{mA}$, $P_o = 0.75\text{W}$
Resolution:	0.007%
Accuracy:	0.1%
Discrete:	(2) 120 VAC, 13 mA (5) 24 VDC, sinking, internal pull-up

Outputs (14 total)

Analog:	(2) 4-20mA, 16 bit 650 ohms max, volume or depth
Relays:	(4) SPST NO, 3A pilot, 120Vac (2) SPDT, 10A 250Vac
Discrete:	(6) 24 Vdc, 200mA, Sinking Requires external power supply

Instrument

Input power:	120 VAC +/-15%, 50/60 Hz, 26 VA
Enclosure:	Nema 12 Faceplate
Bezel:	3 7/8 w x 8 h x 1 d
Rear Case:	3 1/2 w x 7 9/16 h x 4 7/8 d
Panel Cutout:	3.61 w x 7.65 h
Ambient temp.:	32° to 131° F (0-55° C)
Display:	Color Touch Screen

Communications

USB:	JC_TG_Edit config & Firmware Flashing
RS485:	Isolated, 4.8 - 57.6k baud, Modbus RTU
Ethernet:	10/100 Mb/s, Modbus/TCP

Printer

Input power:	120 VAC +/-15%, 50/60 Hz, 20 VA
Size:	4.6"H x 4"W x 2.8"D
Enclosure:	Nema 1
Ambient temp.:	32° to 122° F
Paper:	2.25" W, thermal, 30 columns

Ordering Information

Tank gauge	TG-EL-D4B - - - - 0
No enclosure, no printer	00
Wall-mount enclosure, no printer	E0
Wall-mount enclosure, with printer	EP
RS485 Modbus	0

Magnetostrictive Level Sensor.....**TG-EL-MSxx**
Single Float, (1) 4-20mA

Magnetostrictive Level Sensor.....**TG-EL-MSxx-D420**
Dual Floats, Fluid and Water levels, (2) 4-20mA

Wire float level sensor, 4-20 mA
(See TG-EL-WF for dimensional information.)
7-ft. max. depth.....**TG-EL-WF-7-C**
12-ft. max. depth.....**TG-EL-WF-12-C**

Submersible head level sensor, 4-20 mA
7-ft. max. depth, #2 oil and diesel.....**TG-EL-HLT-7-C**
15-ft. max. depth, #2 oil and diesel.....**TG-EL-HLT-15-C**

Leak sensor, dry/water/oil, 4-20mA
25-ft. sensor**HD-A2-C**
8-ft. sensor**HD-A2-C-8**

Sensor guard for HD-A2-C for sumps, vault floors,
bright areas**HD-HSG**

Leak sensor, float actuated, day tank, double wall pipe.....**RBS**

Leak sensor, pump set leak float switch**PS-LDS**

Two-wire direct burial cable**92612**
(For use with TG-EL-WF-x-C, RBS, HLS.)

Four-wire vented direct burial cable**26000**
(For use with TG-EL-HLT-x-C.)

Fil-A-Larm Station (120 V).....**A-AV-xD3-SS**

Printer for panel mounting.....**TG-EL-D4x-PRINTER**
(Shipped loose for TG-EL-D4B-00-x-0 or TG-EL-D4B-E0-x-0.)

Windows configuration software (not required).....**JC_TG_Edit**

Features

The TG-EL-D4B can monitor tank volume (gallons or liters) and tank leak detectors for one or two tanks via 8 Intrinsically Safe inputs.

Fully field-configurable: The TG-EL-D4B can be completely configured in the field from its touchscreen menus. A laptop with JC_TG_Edit software can also be used to configure the D4B via the USB port.

Gallons (or liters) volume calculation based on:

- a) One of five standard tank shapes with user-entered tank dimensions (inches or centimeters), or
- b) A user-entered volume-vs.-depth stick chart (up to 51 points), typically from tank mfg. stick chart data.

The D4B can print a stick chart for either dimension-based or manual stick chart-based calculations.

Delivery detection and Data Logging: The TG-EL-D4B automatically detects a delivery and stores the delivered volume in a time/date-stamped data-logger nonvolatile memory. The most recent 50 Deliveries are saved.

The printer can be configured to automatically print a time/date-stamped "Volume Delivered" report after each delivery that can be used to verify the invoice before payment. The complete delivery history can also be viewed from the TG-EL-D4B screen, or read via USB into JC_TG_Edit.

Usage monitoring and Data Logging: Every day at midnight, the TG-EL-D4B computes the usage for the previous day based on: tank volume at the previous midnight, the sum of all deliveries during the day, and the tank volume at the current midnight. Usage less than (0.1% of Full Tank volume) or (Idle Tank Volume Change Theft SP) is considered to be 0 usage for the day. This prevents nuisance usage due to fluid thermal expansion/contraction.

The resulting daily usage is date-stamped and stored in the data-logger nonvolatile memory. Every Sunday at midnight, the previous seven days are added together and stored as the weekly usage. The oldest data are overwritten by newer data. Usage data can be printed, viewed via the touchscreen menus, or read by Modbus.

For a single-tank system, the D4B stores the last 70 days and the last 52 weeks usage for the tank.

For a dual-tank system, the D4B stores 70 total usage records, so typically 35 days and 26 weeks for each tank.

On Demand HD-A2-C Leak Detector Test: The user, or an inspector, can initiate an HD-A2-C test from the display menu. If the printer option is installed a time/date stamped pass/fail history can be printed for up to the last 70 entries.

Daily Automatic HD-A2-C Leak Detector Testing and Data Logging: Every Day at midnight, all HD-A2-C Leak Detectors are automatically tested. If any Fail, the Manual Reset Leak Alarm is activated. The last 70 pass/fail results for each HD-A2-C, and the channel(s) that failed is stored in the data logger.

Flexible, multipurpose Intrinsically Safe (I.S.) inputs: Each of the eight I.S. input channels can be connected to either a two-wire 4-20 mA transmitter or a contact closure. A wide variety of ullage, depth, head, discriminating leak, leak switch, fill alarm level switch, fill alarm silence PB switches and sensors can be field-configured from the TG-EL-D4B menus to be connected to any one of the eight I.S. input channels.

Selection of a standard Preferred Utilities sensor also configures the 4-20mA engineering units. Other I.S. 4-20 mA transmitters can also be used with manually entered 4-20mA engineering units.

RS485 and Ethernet Modbus: The current depths, volumes, alarms, and statuses can be read via Modbus. The previous day delivery and usage data can be read via Modbus. See the table at the end of the manual for Modbus addresses.

Custom Names: The touchscreen allows the user to enter a 12 character Name for each of the 15 Inputs. Each Tank also has a user entered Name. These Custom Names appear on all Operator screens, Alarms, and Alarm History screens. However, the Configuration/Setup menus used during installation the TG-EL-D4B refer to "Tank A" and "Tank B".

Alarms & Status's:

The TG-EL-D4B can be configured to generate a wide variety of alarms. Alarms are time and date-stamped and then stored in the data-logger nonvolatile memory. The alarm history can be printed, viewed on the touchscreen, or read into JC_TG_Edit PC software. The TG-EL-D4B stores the last 50 alarms and events.

Over Fill alarms (FILALM $\bar{x}$ and OFIL-LK C): Typically an outdoor bell and light (FA-AV-xD3, or equal) are installed near the tank fill pipe to warn the driver to stop filling the tank before it overfills.

For each tank, any, or all, of these signals/sensors can affect the outdoor bell:

Level Sensor HI Volume Setpoint (HI SP)	TG-EL-WF, TG-EL-HLT, or other 4-20mA level sensor
Level Sensor HIHI Volume Setpoint (HIHI SP)	TG-EL-WF, TG-EL-HLT, or other 4-20mA level sensor
Tank high level float switch (FILALM LS)	HLS, PLS, or other float switch
Vent Pipe float switch (VENT LS)	RBS, or other float switch
Leak Sensor (LK HD-A2, LK CONTAC)	HD-A2-C, RBS, HLS, PS-LDS, or other

The **FILALM $\bar{x}$** output rings the outdoor bell when: HIHI SP is exceeded, or FILALM LS or VENT LS is active.

The **OFIL-LK C** output rings the outdoor bell when: HI SP or HIHI SP is exceeded, or FILALM LS, VENT LS, or any Leak Sensor (HD-A2-C or LK CONTAC) is active for either tank.

The outdoor FilAlarm bell can be silenced by the driver if an outdoor pushbutton is wired to an FILALM AS input, or it will automatically silence after 60 seconds (adj. 10-120 sec.). Before filling the tank, the driver can test the fill alarm by pressing and holding the outdoor alarm silence button for more than five seconds.

The FilAlarm output (bell) will re-activate every time any of the related signals activates.

FILALM $\bar{x}$ output example: Volume > HIHI SP, bell sounds, bell silences (Driver or Auto Silence), tank keeps filling, FILALM LS tank level switch activates, bell sounds, bell silences, tank keeps filling, VENT LS vent pipe switch activates, bell sounds. The OFIL-LK output responds similarly, but for more sensors.

The Outdoor light is typically activated by the HIHI $\bar{x}$ ST output, which energizes if Volume > HIHI SP, FILALM LS, or VENT LS is active.

For dual-tank systems, individual (or common) lights, bells, alarm silence buttons and/or bells can be used, provided enough outputs are available.

Overfill Alarms do not trigger the D4B local alarm beeper or ALARM COM output, and are not recorded in the Alarm History. However, HI and HIHI Volume alarms are data logged.

Theft alarm: Thefts are monitored in two ways: idle tank volume change and high usage rate.

Idle tank: An idle tank will trigger a theft alarm if the volume drops an adjustable amount below the volume saved at the time the tank became idle. This mode requires a contact closure input that indicates when the tank is idle. This could be a manual valve auxiliary switch, a pump starter auxiliary switch, a flow switch, a diesel generator "not running" contact, or other means.

High usage: The D4B monitors the tank volume every few minutes and calculates a short-term usage rate. If this rate is higher than a user-adjustable theft rate, a theft alarm will be triggered. This strategy assumes that the normal peak flow rate is known and that the theft is caused by a high flow rate removal of oil by a pump.

Other Alarm and status functions: In addition to the fill alarm, theft alarm, and leak alarms discussed above, each tank has four volume-based alarm functions, four volume-based status functions, and two volume-based control functions.

Alarm and status functions are very similar. Status functions do not trigger the alarm outputs.

Almost all alarms reset/silence automatically when the condition clears. A Leak alarm will stay in alarm until the the Leak signal returns to normal and is then Reset by the Operator. The Low-Low level alarm can be configured as either manual reset or auto reset. The ALARM COM output can be silenced either from the Alarm Silence button, or from a COMMON AS input from an external pushbutton.

There are four user-adjustable volume setpoints for each Tank (total of eight), and one alarm delay seconds parameter:
HIGH-HIGH, HIGH, LOW, LOW-LOW

Each setpoint is used by both an alarm function and a status function, and sometimes by other functions.

The setpoint name describes the logic, examples:

HIGH-HIGH setpoint: If the volume is higher than the HIGH-HIGH setpoint for more than the alarm delay seconds, outputs configured as either HIHI $\times$ AL or HIHI $\times$ ST are triggered.

LOW setpoint: If the volume is lower than the LOW setpoint, LO $\times$ AL and LO $\times$ ST outputs are triggered.

Other setpoint uses:

The HIGH-HIGH setpoint triggers the Fill Alarm function described above.

FILL function: If volume < LOW setpoint, FILL turns ON. If volume > HIGH setpoint, FILL turns OFF.
If both conditions are true, FILL turns OFF.

DRAIN function: If volume > HIGH setpoint, DRAIN turns ON. If volume < LOW setpoint, DRAIN turns OFF.
If both conditions are true, DRAIN turns ON.

Note: If the HIGH ALARM setpoint is set less than or equal to the LOW ALARM setpoint, the FILL function will always be inactive and the DRAIN function will always be active to avoid overfill conditions.

Any Alarm or Status can energize any output. The user configures each output to respond to the desired Alarm or Status. Multiple outputs can be configured to respond to the same Alarm or Status. See the ROUT/DOUT CONFIG menu.

Printer:

The TG-EL-D4B-EP-0-0 includes a printer and is pre-mounted in a wall mount enclosure.

The TG-EL-00-0-0 and TG-EL-E0-0-0 does not include a printer. The TG-EL-D4A-PRINTER can be purchased separately, mounted in a user provided enclosure.

The following printed reports are provided:

Short report includes for each tank: current depth and volume; previous day's usage; last delivery and the most recent HD-A2 test result; and the last 10 alarms.

Long report includes everything on the short report, plus: the 10 latest deliveries for each tank, the last 8 daily consumptions for each tank, and the last 5 weekly consumptions for each tank.

Stick Chart report shows the volume at various depth intervals, one tank per report (maximum of 50 evenly spaced depths, plus the full volume and depth).

Any of the above reports can be printed at any time by the operator via the touchscreen PRINT button if the printer option is enabled.

In addition, reports can be configured to automatically print based on the following events:

Every Midnight:	Disable, Short Report, Long Report
Every Sunday Midnight:	Disable, Long Report
After Any Alarm:	Disable, Short Report
After a Delivery:	Disable, Long Report
End of Month HD-A2 Test History	Disabled, Enabled

If the printer is not installed, all data logged data can also be extracted with the JC_TG_Edit Windows PC App for viewing and saved in a .csv format for easy integration into a spreadsheet.

Operation

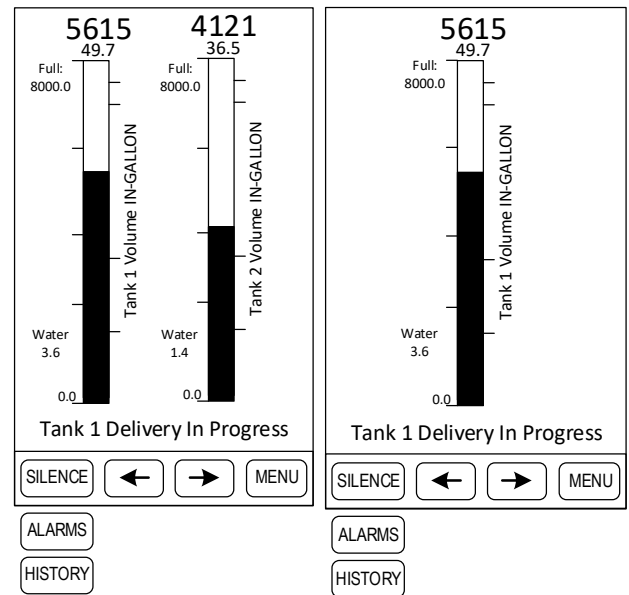
The main screen displays the tank volume and fluid depth (gallons and inches, or liters and centimeters). With volume being displayed above the depth measurement.

There are three **Home** screens: Tank A only, Tank B only, Tank A & B.

If the TG-EL-D4B is configured to monitor 2 tanks, press the right or left arrow button to change main screens.

Tick marks on right hand side of the bargraph indicate level alarm setpoints.

If a dual float level xmtr is installed the water depth in the bottom of the tank is displayed to the left of the bargraph.



When an alarm occurs, the bargraph(s) will blink, and the **Silence** button will blink. Depending on how the D4B is configured in the field, an alarm can cause an external alarm bell or horn to activate.

Press the **Silence** button to stop the blinking and silence the external bell/horn.

After Silencing, if any Alarms are still active, the **Alarms** button appears. Press the **Alarms** button to display the Active Alarms screen.

The **Reset** button appears if any alarms require a Manual Reset. **Reset** will only reset an alarm if it has Cleared (ie returned to normal).

Press **History** to display the History screen.

The History screen displays the Time/Date of the most recent 50 Alarms and Events.

Touch the Up or Down arrow to advance to the next page of History. Touch Date to enter a time/date in order to jump to the nearest History record.

The Hide Events and Show Events removes or displays Events.

The History memory is retained when powered down. The History can be extracted via the USB port using the free JC_TG_Edit Windows App.

Active Alarms			History		
Tank 2 High High Alarm			CH2 Leak Alarm		
4608 Gallons ALARM	02:23:59		CLEAR	02:45:51	
	12/15			12/15	
Tank 2 High Alarm			CH2 Leak Alarm		
3991 Gallons ALARM	02:23:48		ALARM	02:45:51	
	12/15			12/15	
Tank 1 Low Low Alarm			CH2 Leak Alarm		
2431 Gallons RESET REQ'd	02:22:57		CLEAR	02:45:46	
	12/15			12/15	
Tank 1 Low Alarm			Tank 1 Low Low Alarm		
2860 Gallons ALARM	02:22:36		3683 Gallons CLEAR	02:41:26	
	12/15			12/15	
CH2 Leak Alarm			Tank 2 High Alarm		
RESET REQ'd	02:19:06		4293 Gallons CLEAR	02:41:25	
	12/15			12/15	
			Tank 2 High High Alarm		
			4609 Gallons CLEAR	02:41:21	
				12/15	
History			Alarms		
Reset			Hide Events		
Home			Back		
Silence			Home		
Alarms			Show Events		
Menu					

History, HD-A2 leak test, and setting the clock:

The main menu is used to display these features.

See the complete menu layout in the next section for other features and information.

Menu operation:

From the operator home screens, press MENU.

This will bring up the Main Menu options.

History: Daily usage, weekly usage, deliveries, and alarms

From the main screen:

Press MENU.

TANK MAIN MENU appears.

Press Usage/Deliv. History

HISTORY submenu appears.

Daily Usage, Weekly Usage, and Delivery Histories can be selected.

A specific data can be entered and searched in any of the history screens.

Power outages can affect usage data:

Daily and weekly usage data are calculated at midnight. Power outage scenarios include:

After power is restored: Usage is calculated from when power came back ON until the next midnight.

Power off at midnight: Usage is not calculated, and 0 is recorded in all "missed" days upon power up.

Power off Sunday midnight: Weekly usage is not calculated.

	▲	▼	Date
Delivery History			
Tank 1			
1/26	08:17:07	1306	
Tank 2			
1/23	13:22:13	2803	
Tank 1			
1/23	13:22:45	1311	
Tank 1			
1/14	17:39:16	5109	
Tank 1			
12/30	17:38:02	1985	
Tank 2			
12/23	00:15:19	1604	
Alarms	Back	Home	

	▲	▼	Date
Daily Usage History			
Tank 2			
12/22	1218		
Tank 1			
12/22	2725		
Tank 2			
12/21	471		
Tank 1			
12/21	757		
Tank 2			
12/20	0		
Tank 1			
12/20	0		
Alarms	Back	Home	

TEST HD-A2 (leak sensors):

The TG-EL-D4B tests all installed HD-A2 leak sensors that are not in alarm every midnight. Selecting the TEST HD-A2s item in the main menu starts an HD-A2 test sequence and allows the user to witness the test.

Setting the clock time and date:

If the power is off for more than 10 days, or when the Daylight Saving Time shift occurs, the user will have to manually adjust the time, date, and day of week for the clock.

From the main menu, select Utilities > Set Clock. Time is set in 24-hour format.

Use the Utilities Menu to access the touch calibration and cleaning screens, as well as the screen settings.

CAUTION: Changing the date can cause the data-logger usage memory to be erased in some circumstances. It will not affect any of the TG-EL-D4B configuration parameters.

Password:

The TG-EL-D4B has an optional password system. Passwords are disabled when the TG-EL-D4B is shipped. To enable a password press "Change Tech Password" on the Password Menu Screen. This allows the user to enter the desired password. Valid passwords are numeric only and can be anything between -32768 to +32768. Once a password is set, the user must be logged in to change the password again. Setting the password to 9999 disables the password system on the controller.

When the password system is activated and the D4B is logged out:

Reports can be printed.

The main display tank can be selected.

Alarms can be silenced.

All submenus and menu items can be displayed.

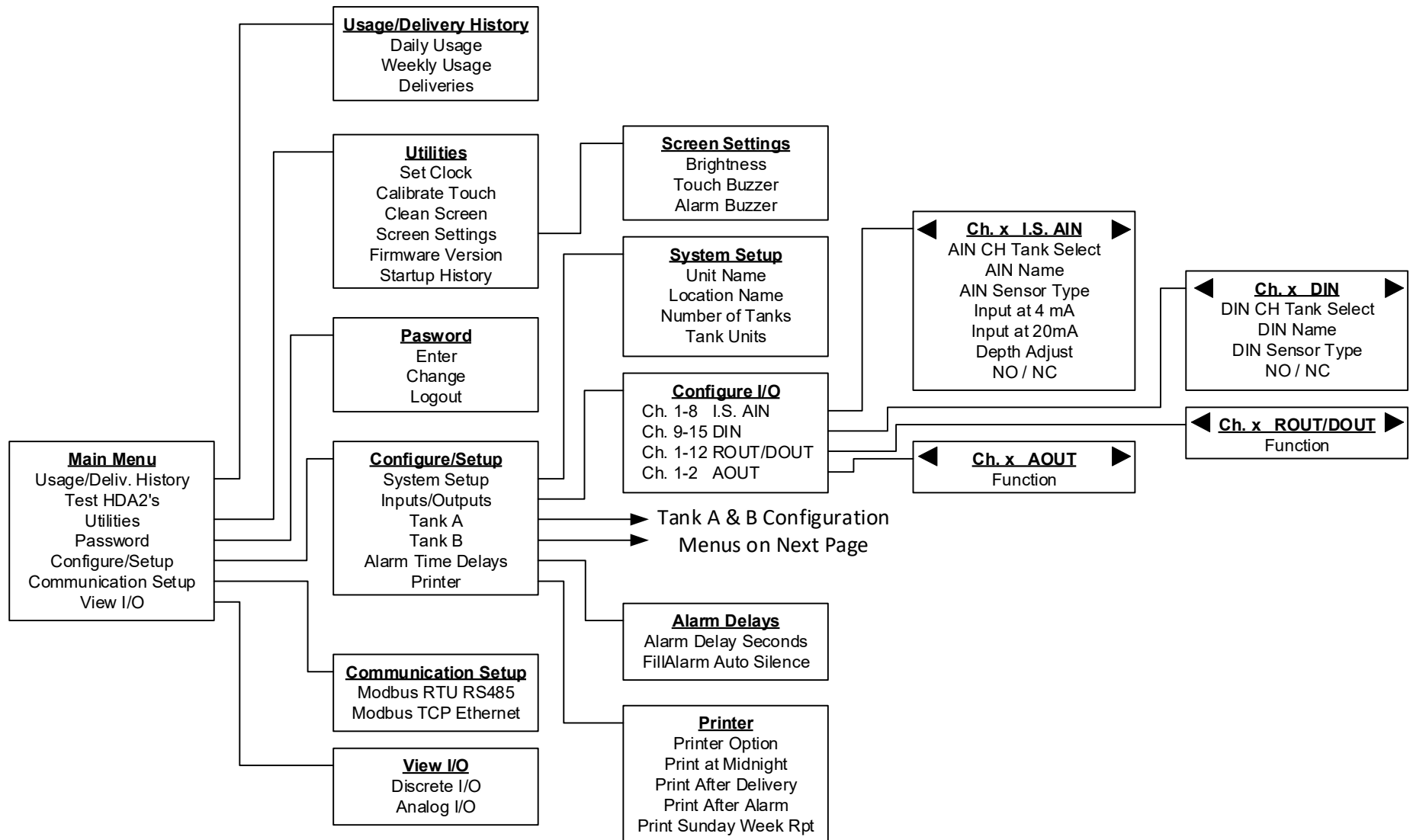
The clock can be set.

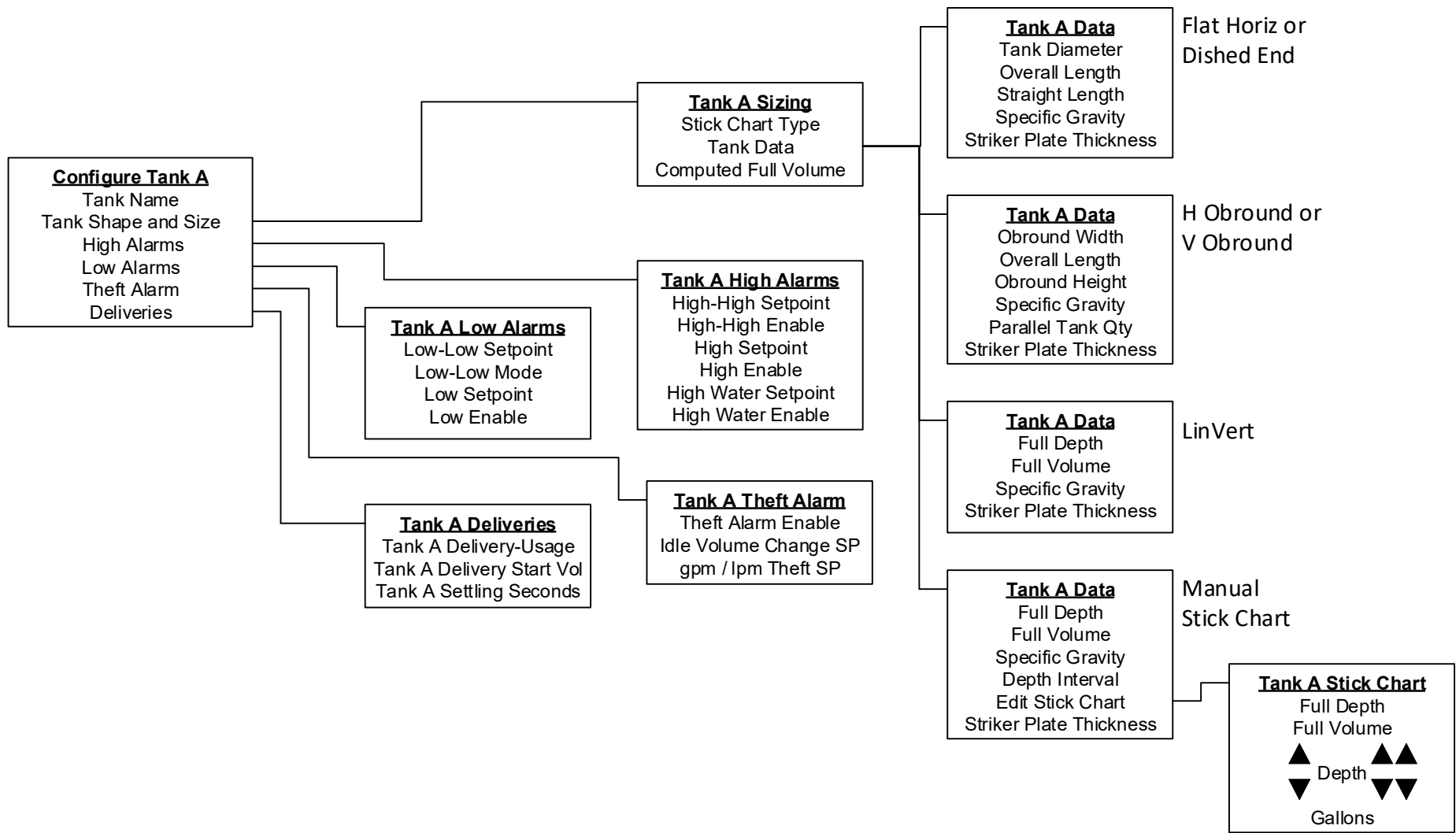
An HD-A2 test can be started.

No other items can be changed within the menu system.

When a password is entered, it automatically logs out after one hour.

Menu Layout





I/O Configuration Worksheet

For each input channel, the user must enter: sensor name, sensor type, the tank the sensor is associated with, the sensor option, and possibly the sensor calibration data. Functions must be assigned to the 4-20 outputs and the output outputs. Read all feature descriptions before completing.

The table and notes below detail the allowable configuration settings and the restrictions for each sensor type.

Allowable INPUT CONFIG settings for each SENSOR TYPE:

SENSOR TYPE	Description	Allowed qty. per tank	Allowed tanks	Allowed INPUT CHANNELS	Contact NO / NC	Default 20 mA Cal.	Default 4 mA Cal.
LVL WF7	Level sensor, 7 ft., TG-EL-WF-7-C	note 1	A,B	IS AIN 1-8		84.0 ullage	0.0
LVL WF12	Level sensor, 12 ft., TG-EL-WF-12-C	note 1	A,B	IS AIN 1-8		144.0 ullage	0.0
LVL UL18	Level sensor, 18 ft., TG-EL-ULT-18-C	note 1	A,B	IS AIN 1-8		216.0 ullage	0.0
LVL OTHER	Level sensor, other 4-20 mA	note 1	A,B	IS AIN 1-8		100.0 depth	0.0
HEAD HL7	Head level sensor, 7 ft.,TG-EL-HLT-7-C	note 1	A,B	IS AIN 1-8		80.0" of water	n/a
HEAD HL15	Head level sensor, 15 ft.,TG-EL-HLT-15-C	note 1	A,B	IS AIN 1-8		160.0" of water	n/a
HEADOTHER	Head level sensor, other 4-20 mA	note 1	A,B	IS AIN 1-8		100.0" of water	n/a
LK HD-A2	Leak sensor, HD-A2-C, dry/oil/water discriminating	8	A,B,C	IS AIN 1-8		n/a	n/a
LK CONTAC	Leak sensor, switch contact	8	A,B,C	IS AIN 1-8	N.C. or N.O.	n/a	n/a
FILALM LS	Tank Overfill alarm high-high level switch	1	A,B	IS AIN 1-8	N.C. or N.O.	n/a	n/a
VENT LS	Vent Pipe Overfill alarm high-high level switch	1	A,B	IS AIN 1-8	N.C. or N.O.	n/a	n/a
FILALM AS	Fill alarm remote alarm silence	1	A,B,C	IS AIN 1-8	N.C. or N.O.	n/a	n/a
WATER LVL	Water Level Sensor	1	A, B	IS AIN 1-8		100.0	0.0
LOW LS	Low Level Switch	8	A, B	IS AIN 1-8	N.C. or N.O.	n/a	n/a
GENALM	General Alarm	8	A, B, C	IS AIN 1-8	N.C. or N.O.	n/a	n/a
FILALM AS	Fill alarm remote alarm silence	1, note 1	A,B,C	xx DIN 1-5	N.C. or N.O.	n/a	n/a
IDLE TANK	Idle tank theft alarm enable	1	A,B	xx DIN 1-5	N.C. or N.O.	n/a	n/a
COMMON AS	Common alarm, alarm silence contact	note 1	C	xx DIN 1-5	N.C. or N.O.	n/a	n/a
LK CONTAC	Leak sensor, switch contact	5	A,B,C	xx DIN 1-5	N.C. or N.O.	n/a	n/a
GENALM	General Alarm	5	A,B,C	xx DIN 1-5	N.C. or N.O.	n/a	n/a

Notes: 1) Allowed qty. per tank:

FILALM AS: Either one per tank or one common, but not all three.

COMMON AS: Only one per system.

2) Allowed tanks: A = Tank A; B = Tank B; C = common area or piping (not related to a specific tank).

3) Contact input SENSOR OPTION:

N.C.: Normally closed contact. Contact opens when sensor activates.

N.O.: Normally open contact. Contact closes when sensor activates.

Intrinsically Safe Analog Inputs (IS AIN)

Ch.	Terminals			4-20 or Contact	Sensor Description / Location	Tank	Sensor Type	Contact NO / NC	Calibration	
	+24 V	Signal	Shield						20 mA	4 mA
1	53	55	51							
2	54	56	52							
3	57	59	51							
4	58	60	52							
5	61	63	69							
6	62	64	70							
7	65	67	69							
8	66	68	70							

Discrete (On/Off) Inputs (AC DIN and DC DIN)

Ch.	Terminals			Sensor Description / Location	Tank	Sensor Type	Contact NO / NC
	Signal	DC Gnd	Voltage				
9	44	43	24 Vdc				
10	46	43	24 Vdc				
11	71	78	24 Vdc				
12	73	78	24 Vdc				
13	75	78	24 Vdc				
14	7		120 Vac				
15	8		120 Vac				

4-20 mA Outputs AOUT Configuration:

Ch.	Terminals		Function
	+	-	
1	40	39	
2	42	41	

Relay Outputs ROUT Configuration:

Ch.	Terminals			Function
	NO	C	NC	
1	1	2	3	
2	4	5	6	
3	9	13		
4	10	13		
5	11	13		
6	12	13		

Discrete Outputs DOUT Configuration:

Ch.	Terminals		Function
	DOUT	DC Gnd	
7	48	43	
8	50	43	
9	77	86	
10	79	86	
11	81	86	
12	83	86	

4-20 mA Output Functions: X = A or B (Tank A or Tank B)

DISABLED Not used

TX VOLTank X volume

20 mA = full volume

TX LVLTank X level (fluid depth)

20 mA = tank diameter/full height/full depth

Relay and Discrete Output Functions: or C Common to Both Tanks)

Name:	Tank	Description:	Reset:
ALARM COM		Common alarm, with alarm local or remote alarm silence	Auto
LEAK COM		Combined Tank A or B or common-area leak alarm	Manual
LEAK <u>X</u>	A,B	Tank <u>X</u> leak alarm	Manual
LEAK OTHR		Common-area leak alarm	Manual
FILLALM <u>X</u>	A,B,C	OverFill alarm, Tank <u>X</u> (HIHI SP or FILALM LS or VENT LS	Auto
THEFT <u>X</u>	A,B	Tank <u>X</u> theft alarm	Manual
HIHI <u>X</u> AL	A,B	Tank <u>X</u> high-high-volume alarm	Auto
HI <u>X</u> AL	A,B	Tank <u>X</u> high-volume alarm	Auto
LO <u>X</u> AL	A,B,C	Tank <u>X</u> low-volume alarm	Auto
LOLO <u>X</u> AL	A,B,C	Tank <u>X</u> low-low-volume alarm	Auto or Manual
HIHI <u>X</u> ST	A,B	Tank <u>X</u> high-high-volume status.	Auto
HI <u>X</u> ST	A,B	Tank <u>X</u> high-volume status.	Auto
LO <u>X</u> ST	A,B	Tank <u>X</u> low-volume status	Auto
LOLO <u>X</u> ST	A,B	Tank <u>X</u> low-low-volume status	Auto
FILL <u>X</u>	A,B	Tank <u>X</u> fill valve/pump Activates when volume drops below "Low" setpoint Deactivates when volume rises above "High" setpoint	Auto
DRAIN <u>X</u>	A,B	Tank <u>X</u> drain valve/pump Activates when volume rises above "High" setpoint Deactivates when volume drops below "Low" setpoint	Auto
OFIL-LK C	C	Combined FILLALM or HI SP or any Leak Alarm	Auto

Physical Installation

WARNING

Failure to comply with Control drawing 190789, and the instruction manuals of all Intrinsically Safe sensors connected to the TG-EL-D4B, voids the Intrinsically Safe design and **creates an explosion risk in the hazardous area.**

TG-EL-D4B-00-x-x is designed for flush mounting in an enclosure.
TG-EL-D4B-Ex-x-x is pre-mounted in an enclosure.

The TG-EL-D4B should be mounted in a non-hazardous, indoor, NEMA 12 location that is free from excessive vibration. It is rated for continuous operation over the 32° F-122° F (0° C-50° C) range.

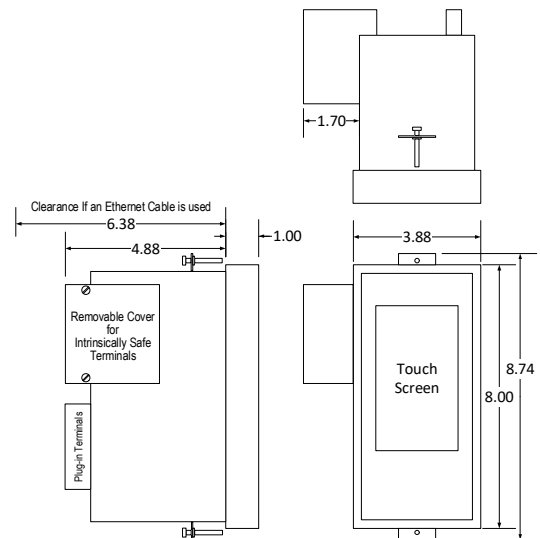
The optional printer is rated NEMA 1 and should not be exposed to mists or sprays.

Read all of the Intrinsic Safety (I.S.) requirements on drawing 190789 and in the Wiring section before mounting the TG-EL-D4B.

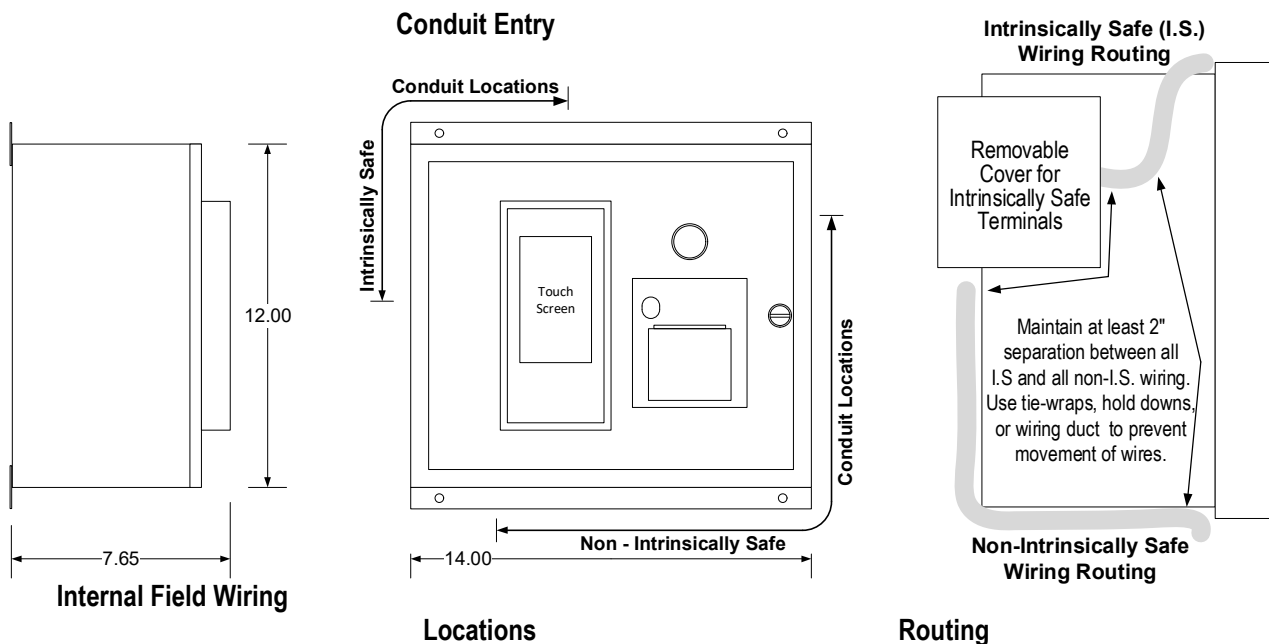
The Intrinsically Safe wiring must remain physically separated from all other non-Intrinsically Safe wiring by means of conduit, raceways, partitions, or tie-downs.

Tie-downs are acceptable if a 2" minimum separation is permanently maintained. The I.S.-vs.-non-I.S. separation must be maintained both inside the panel that the TG-EL-D4B is mounted in and outside the panel, all the way to the tank sensors.

See the sketches below for conduit entry locations and internal wire routing paths that will maintain the 2" minimum separation between I.S. and Non-I.S. wiring.



TG-EL-D4B-EP-x-x Dimensions



Wiring

NOTE:

Do NOT begin to wire the TG-EL-D4B or the sensors unless the **TG-EL-D4B I/O Channel Configuration Worksheet** has been completed and all of the Intrinsic Safety wiring and physical installation notes have been read.

WARNING

Failure to comply with Control drawing 190789, and the instruction manuals of all Intrinsically Safe sensors connected to the TG-EL-D4B, voids the Intrinsically Safe design and **creates an explosion risk in the hazardous area.**

Intrinsically Safe wiring notes:

What is "Intrinsic Safety"? "Intrinsically Safe" (I.S.) means that when the TG-EL-D4B-xx-x-x tank gauge and compatible sensors are properly installed, the sensors and the field wiring in the hazardous area will be incapable of releasing sufficient energy to cause ignition of a Group C or D hazardous atmosphere.

The installation must comply with the requirements of the TG-EL-D4B Control Drawing 190789 (next page) and all requirements on the control drawings of all associated apparatus in the hazardous location that is wired to the TG-EL-D4B terminals 21, 22, 51 through 70.

The Intrinsically Safe wiring must remain physically separated from all other non-Intrinsically Safe wiring by means of conduit, raceways, partitions, or tie-downs. Tie-downs are acceptable if a 2" minimum separation is permanently maintained.

The ground wires connected to terminals 21 and 22 are an essential part of the Intrinsic Safety design of the TG-EL-D4B. Two separate, independent, I.S. ground wires must be run from terminals 21 and 22 back to the grounding point of the AC power-supply system with less than a 1-ohm resistance. This wiring can NOT be electrically combined with any other AC ground wiring. Splices are not recommended. Follow all NEC and CSA codes for installation and marking of Intrinsically Safe wiring and grounding.

The capacitance and inductance of the field wiring cable affects the Intrinsically Safe design as noted on Control Drawing 190789. Preferred p/n 92612 and 26000 cables are rated at less than 0.00005 uF/ft. and 0.0002 mH/ft.

1000-ft. cable runs, or less, of either 92612 or 26000 cable satisfies drawing 190789 I.S. capacitance and inductance requirements when wired from any TG-EL-D4B-xx-x I.S. input channel to any of the following: TG-EL-WF-7-C, TG-EL-WF-12-C, TG-EL-HLT-7-C, TG-EL-HLT-15-C, TG-EL-ULT-18-C, HD-A2-C, or any simple switch.

"Simple switches" are inherently Intrinsically Safe and do not require UL, FM, CSA, or other approvals to be used in a hazardous location when connected to an Intrinsically Safe associated apparatus (the TG-EL-D4B).

A "simple switch" is a mechanically actuated electrical contact that does not have any other electrical components (especially no added capacitance and no added inductance). A simple switch does not store or discharge any electrical energy. All electrical energy is provided by, and limited by, the I.S. design of the TG-EL-D4B.

Non-Intrinsically Safe wiring notes:

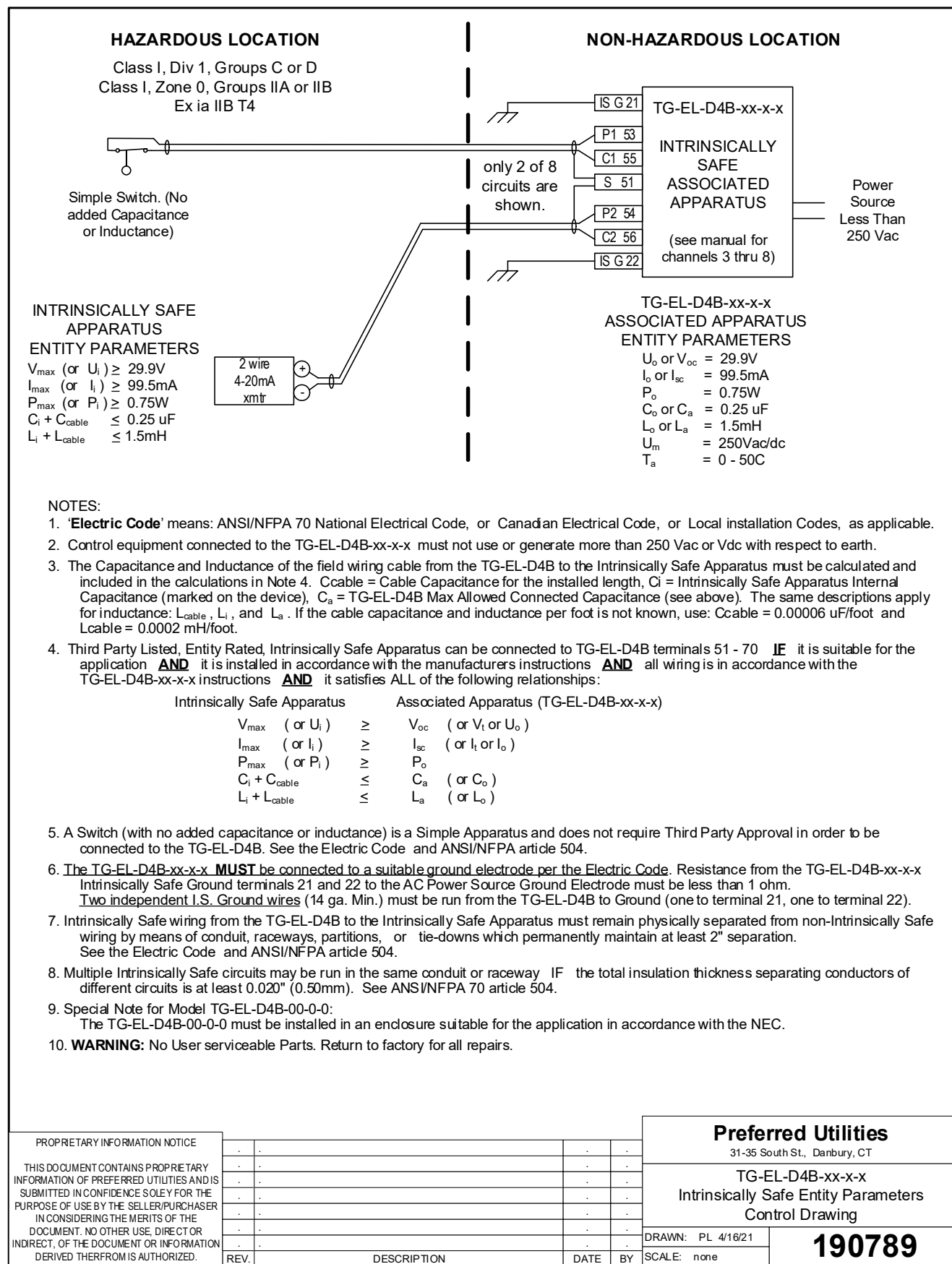
Do not run low-voltage DC wiring bundled with, or in the same conduit as, AC wiring.

Ground DC shielded cables only where shown.

Insulate exposed shields to prevent connections to ground.

WARNING

Connecting Non-Intrinsically Safe devices to any Intrinsically Safe terminal voids the Intrinsically Safe design and **creates an explosion risk in the hazardous area**



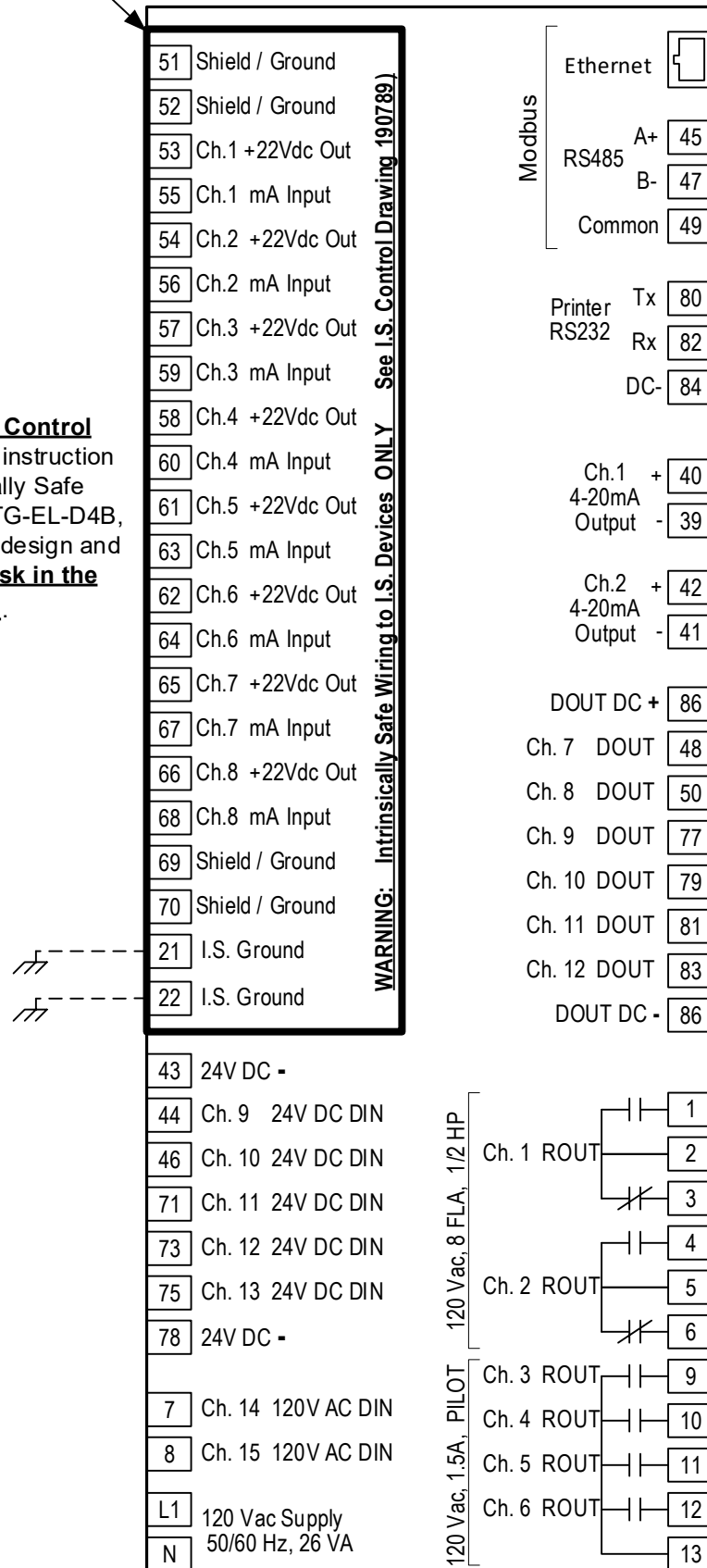
Note: This drawing is part of the Intrinsic Safety Design and Approval. Do not implement any changes without the approval of the Preferred Eng Mgr and the Approval Agency.

TG-EL-D4B-xx-x-0 Field Wiring Terminals

(This is NOT the physical terminal arrangement)

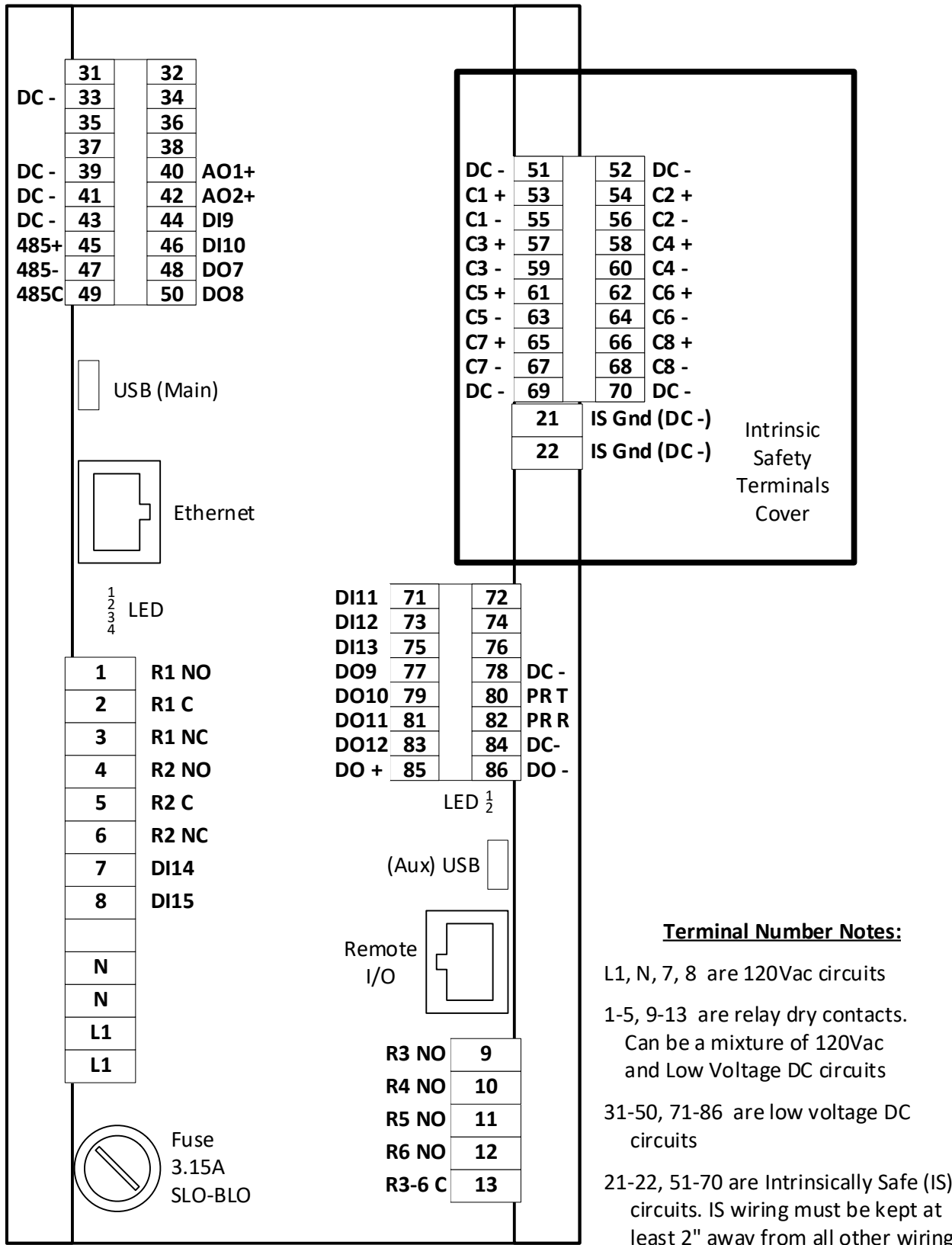
Terminals 21, 22, 51-70
are under the I.S. cover

WARNING
Failure to comply with Control drawing 190789, and the instruction manuals of all Intrinsically Safe sensors connected to the TG-EL-D4B, voids the Intrinsically Safe design and **creates an explosion risk in the hazardous area**.



TG-EL-D4B-00-0-0
Field Wiring Terminal Block Arrangement (Rear View)

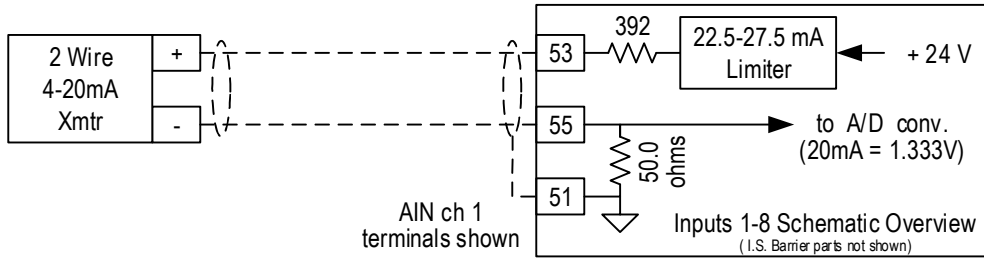
See the worksheets on pages 12 - 13 for I/O channel terminal numbers



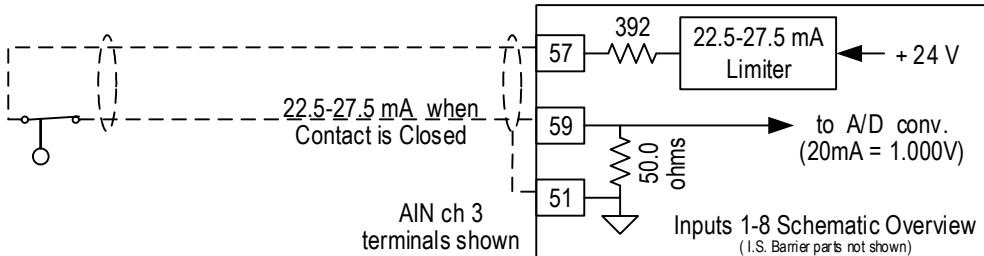
The following partial schematics are included as an aid to troubleshooting.

AIN ch. 1-8: 4-20mA Xmtr Intrinsically Safe

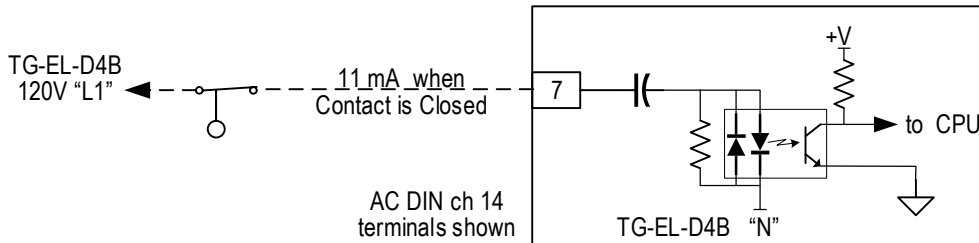
Total Loop Ohms = Field Wiring Ohms + 442 Internal Ohms



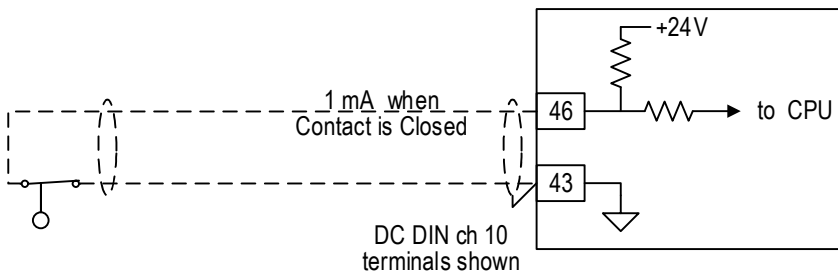
AIN ch. 1-8: Contact Closure Sensor Intrinsically Safe



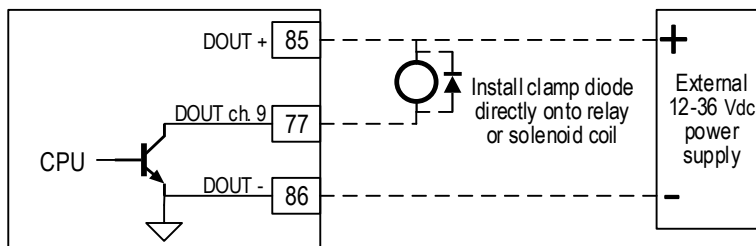
AC DIN ch. 14-15: Contact Closure Sensor Non-Intrinsically Safe



DC DIN ch. 9-13: Sinking Contact Closure Input Non-Intrinsically Safe



DC DOUT ch. 7-12: Sinking Outputs Non-Intrinsically Safe



Terminals 85 & 85 are common to all DOUT channels

Level Sensor Type Setup & "Stick Depth"

The TG-EL-D4B accommodates three different methods to determine the fluid depth: ullage, depth, and head. This section discusses each method, the calibration data, and "depth adjust."

The SENSOR TYPE determines the measurement type and default calibration.

SENSOR TYPE	Description	Measurement Type	Default 20 mA Cal.	Default 4 mA Cal.	CM-LITER 20 mA Cal.
LVL WF7	Level sensor, 7 ft., TG-EL-WF-7-C	Ullage	84.0 ullage	0.0	213.4
LVL WF12	Level sensor, 12 ft., TG-EL-WF-12-C	Ullage	144.0 ullage	0.0	365.8
LVL UL18	Level sensor, 18 ft., TG-EL-UL-18-C	Ullage	216.0 ullage	0.0	548.7
LVL OTHER	Level sensor, other 4-20 mA	Depth	100.0 depth	0.0	254.0
HEAD HL7	Head level sensor, 7 ft., TG-EL-HLT-7-C	Head	80.0" of water	n/a	203.2 cm WC
HEAD HL15	Head level sensor, 15 ft., TG-EL-HLT-15-C	Head	160.0" of water	n/a	406.4 cm WC
HEADOTHER	Head level sensor, other 4-20 mA	Head	100.0" of water	n/a	254.0 cm WC

When the SENSOR TYPE is changed, the calibration is changed automatically to the above defaults.

The default calibration data for sensors LVL OTHER, HEADOTHER, and LVL UL18 must be changed by the user to reflect the calibration of the sensor being used.

The calibration data for SENSOR TYPES: LVL WF7, LVL WF12, HEAD HL7, and HEAD HL15 should not be changed and must be set to the above default values.

The default units are: IN-GALLON (inches-gallons). Units can be changed to CM-LITER (centimeters-liters) via the UNITS selection in CONFIGURE MENU. If CM-LITER units are used, the 20 mA calibration must be changed manually to the equivalent cm values in the table above via the INPUT X SENSOR CONFIG menu.

Fluid depth methods

Ullage is the distance from the top of the tank down to the top of the fluid.

$$\text{Actual depth} = (\text{tank full height} - \text{ullage}) + \text{depth adj.}$$

Depth is the distance from the top of the fluid down to the bottom of the tank.

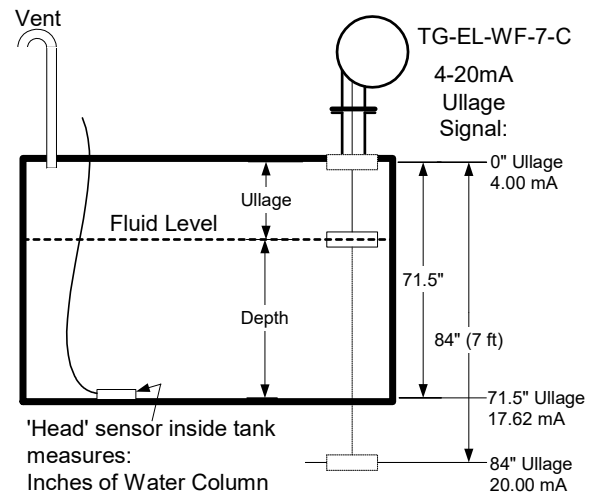
$$\text{Actual depth} = \text{xmtr depth} + \text{depth adj.}$$

Head is the pressure at the bottom of the tank caused by the weight of the fluid above it. Head sensors measure this pressure in "Inches of Water Column" or in "Centimeters of Water Column" units.

$$\text{Actual depth} = (\text{"WC"} \times \text{Specific Gravity}) + \text{Depth Adj.}$$

The specific gravity is entered via the TANK x SIZING menu.

(continued on next page)



Fluid depth methods (continued)

Depth Adjust is provided to correct deviations caused by mounting height errors, sensor body sizes, ... etc.

Examples:

The TG-EL-HLT-7-C sensor body is 1" diameter. When it lies on the bottom of the tank, the pressure port is 0.5" above the bottom of the tank. Set Depth Adjust to +0.5" to compensate.

If the TG-EL-WF-7-C tank mounting flange is the incorrect height, or if the float is in the wrong position on the wire, the Depth Adjust setting can be used to correct these errors.

"Stick depth" is the depth displayed on the face of the TG-EL-D4B and in the VIEW I/O troubleshooting screen.

Stick depth = (actual depth – striker plate thickness)

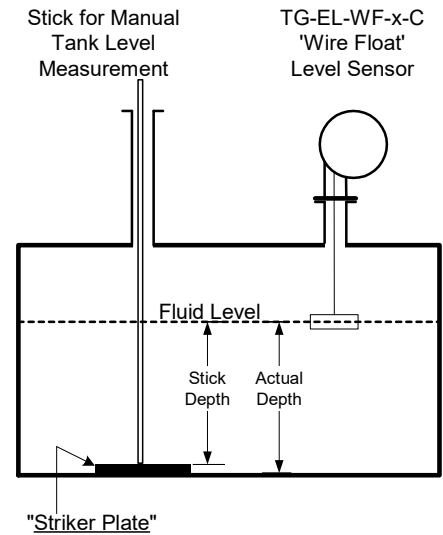
The fluid depth measured with a stick ("stick depth") is typically less than the actual fluid depth because of the thickness of a "striker plate" at the bottom of the tank.

Striker plates are installed by tank manufacturers to prevent damage caused by repeatedly dropping the stick into the tank and are typically 5/16" thick (0.31"). See tank mfg. drawing for actual thickness.

Most tank mfg. "stick charts" show fluid volume versus stick depth. Therefore, the TG-EL-D4B displays the "stick depth" to the user.

The default striker plate thickness = 0.3". It is adjusted in the TANK x SIZING MENU. Setting the thickness to 0.0" makes the D4B display actual depth. Striker plate thickness must be manually changed to the equivalent centimeters (0.8 cm is 5/16") if the units are changed to CM-LITER.

For maximum accuracy, "actual depth" is used in the D4B internal volume calculations for the of standard tank shapes and LIN/VERT. However, "striker depth" is used internally for STIKCHRT volume calculations.



Configuring Input Names, Main Menu > Configure/Setup > Inputs/Outputs > Ch. 1-8 I.S. AIN > AIN Ch x Name

Input Channels 1-15 can be configured with a unique name for each channel. Channel names can be up to 12 characters long (including spaces) and will carry over into alarm annunciation and history. If the input is configured as a leak sensor, the alarm annunciation and history will automatically append Leak Alarm to the input name. For example: if a leak sensor input channel is named "Tank 1 Sump", the alarm will appear as "Tank 1 Sump Leak Alarm"; if a leak sensor input channel is named "Tank 1 Leak", the alarm will appear as "Tank 1 Leak Leak Alarm".

Configuring Tank Name, Main Menu > Configure/Setup > Tank x > Tank x Name

The D4B can be configured to monitor up to 2 tanks. In the configuration menus, these will always be identified as Tank A and Tank B. The tanks can be given a unique name of up to 12 characters (including spaces). This name will be displayed on the home operator screens and in the alarm annunciation and history.

Tank Dimensions and Stick Chart Types

The **STICK CHART TYPE** that is selected determines how the TG-EL-D4B calculates the tank volume (gallons or liters) based on the fluid depth. Stick chart type choices include:

FLAT HORZ (horizontal cylinder with flat ends): Volume is calculated based on: actual depth, the dimensions entered and the tank shape. The user does not enter stick chart volume versus depth data points.

DISH HORZ (horizontal cylinder with dished ends): Volume is calculated based on: actual depth, the dimensions entered and the tank shape. The user does not enter stick chart volume versus depth data points.

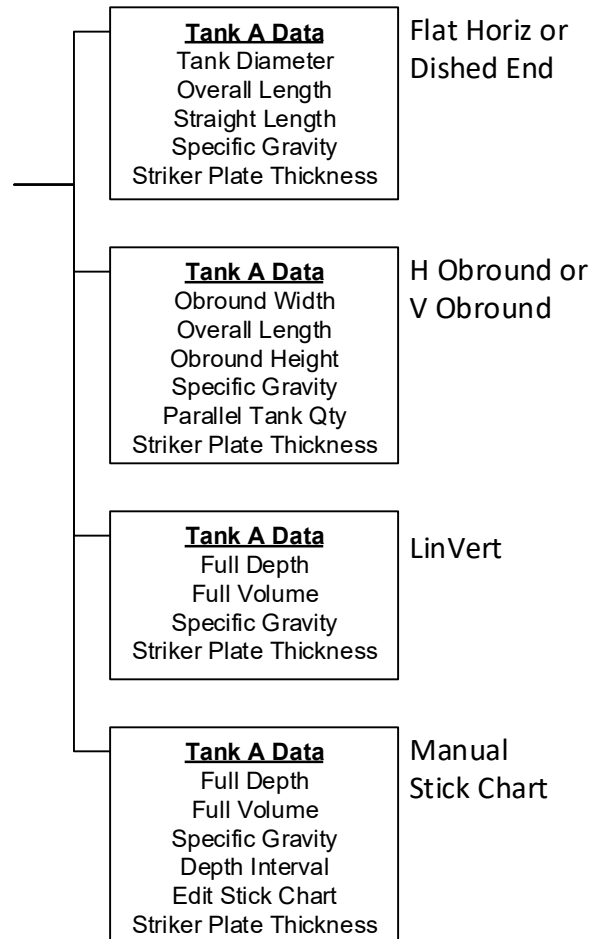
V OBOUND (vertical "obround" tank): Volume is calculated based on: actual depth, the dimensions entered and the tank shape. The user does not enter stick chart volume versus depth data points. Multiple tanks can be headered together with equalizing piping; simply enter the number of tanks headered together.

H OBOUND (horizontal 'obround' tank): Volume is calculated based on: actual depth, the dimensions entered and the tank shape. The user does not enter stick chart volume versus depth data points. Multiple tanks can be headered together with equalizing piping; simply enter the number of tanks headered together.

LIN/VERT (linear tank with straight, vertical walls and flat bottom): The horizontal cross-section shape and dimensions must be the same from bottom to top. Cross sections can be circular, square, rectangular, hexagonal, ... etc. Tank volume is directly proportional to actual depth. Based on the tank shape, the user must know and enter the tank FULL VOLUME at the tank FULL HEIGHT and must enter the tank FULL HEIGHT. The D4B does not calculate the full volume. It must be obtained from the tank manufacturer.

STIK CHRT (stick chart-based): The D4B has a user-entered table with up to 50 volumes corresponding to equally spaced stick depths (user-entered DEPTH INTERVAL sets the spacing). The user must also enter the tank FULL VOLUME and the tank FULL HEIGHT. Typically, this information is from the tank mfg. stick chart document.

The D4B linearly interpolates the volume for depths in between the volumes entered and thus is somewhat less accurate than the other five stick chart types. Fewer than 50 points in the table are used when the DEPTH INTERVAL is increased. Example: 96.5" full height, 2.0" interval, 47 points used (empty and full don't use table points).



Tank Dimensions and Stick Chart Types *(continued)*

For each STICK CHART TYPE shown below, enter the inside dimensions for that shape into the TG-EL-D4B.

If only the outside dimensions are known:

$$\text{Inside dimension} = \text{outside dimension} - [(2 \times \text{wall thickness}) + \text{any double-wall interstitial spacing}]$$

If tank dimensions are not available, or if the tank shape is not shown below, the tank's volume versus depth stick chart data from the tank manufacturer must be entered (see STIK CHRT below).

		<u>Side View</u>	<u>End View</u>	<u>Tank A</u>	<u>Tank B</u>								
		FLAT HORZ Flat End Horizontal Cylinder (Double Wall Tank shown)	Inside Diameter (Height)	Inside Diameter Overall Inside Length	<table border="1"> <tr><td></td><td></td></tr> <tr><td></td><td></td></tr> </table>								
		DISH HORZ Dished End Horizontal Cylinder (Elliptical or Spherical Ends)	Inside Diameter (Height)	Inside Diameter Overall Inside Length Straight Length	<table border="1"> <tr><td></td><td></td></tr> <tr><td></td><td></td></tr> <tr><td></td><td></td></tr> </table>								
		VOBROUND Vertical Obround	Inside Width	Overall Inside Length Overall Inside Width Overall Inside Height Number of Tanks in Parallel	<table border="1"> <tr><td></td><td></td></tr> <tr><td></td><td></td></tr> <tr><td></td><td></td></tr> <tr><td></td><td></td></tr> </table>								
		HOBROUND Horizontal Obround	Inside Width	Overall Inside Length Overall Inside Width Overall Inside Height Number of Tanks in Parallel	<table border="1"> <tr><td></td><td></td></tr> <tr><td></td><td></td></tr> <tr><td></td><td></td></tr> <tr><td></td><td></td></tr> </table>								
LINVERT Linear Vertical (Vertical Cylinder with Flat Bottom)	LINVERT Linear Vertical Any shape with Vertical Walls and Flat Bottom	Full Height	Need to know Volume <u>at</u> Full Height	Full Inside Depth Full Volume	<table border="1"> <tr><td></td><td></td></tr> <tr><td></td><td></td></tr> </table>								

Tank Dimensions and Stick Chart Types (continued)

Head sensor specific gravity: If a HEAD HL7, HEAD HL15, or HEADOTHER sensor type is configured for this tank, then the specific gravity of the fluid must be entered in the TANK X DATA screens.

Some specific gravities:

Fluid	Typical	Range
No. 1 fuel oil or kerosene	0.82	0.806 – 0.825
No. 2 fuel oil or diesel	0.876	0.825 – 0.887
No. 6 fuel oil	1.014	0.950 – 1.050

Note: No. 6 fuel doesn't really have a "typical" value; it varies substantially based on the point of origin.

If the displayed depth does not appear to be correct, verify the specific gravity, sensor 20 mA cal, depth adj., and striker-plate thickness entries, and check to make sure the sensor is at the bottom of the tank

Delivery Detection Setup

The TG-EL-D4B calculates the delivery volume by:

Delivered volume = delivery "stop" volume – "initial" volume

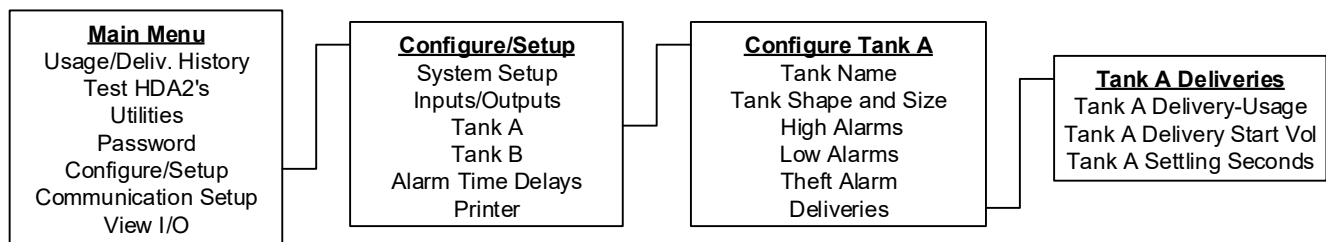
While waiting for a delivery, the D4B monitors tank volume and saves the lowest volume as the "initial" volume. To prevent false delivery detection, The D4B will declare only that a delivery is "in progress" if the volume has increased more than the user-adjusted START DELIVERY: VOLUME INCREASE value.

The VOLUME INCREASE value should be set high enough to prevent false delivery detection due to fluid thermal expansion, but lower than the smallest delivery volume anticipated. The default value is 100 gallons.

The delivery is considered completed when the volume has not increased for SETTLING SECONDS (user-adjustable). This time delay should be long enough to allow the driver to drain the hose into the tank after stopping the delivery. The default time is 60 seconds.

NOTE: If the fuel from the tank is being burned/used while the delivery is in progress, the TG-EL-D4B will report a smaller delivery volume than actual delivery volume.

NOTE: Cycling power to the D4B during a delivery will cause an incorrect entry in the delivery history.



Theft Alarm Setup

Theft alarms are triggered either by an idle tank volume decrease or a short-term high-usage rate. Only one method is activated at a time.

TANK X THEFT ALARM ENABLE must be set to "Enabled" to activate the theft alarm feature.

If an IDLE TANK switch input is installed: When the IDLE TANK input changes from "Active" to "Idle," the D4B saves the tank volume. It will trigger a theft alarm if the volume decreases more than the user-entered IDLE TANK VOL CHG THEFT SP TANK X gallons (or liters).

When the IDLE TANK input indicates the tank is active (or if this sensor is not installed), the D4B monitors the tank volume every few minutes and calculates a short-term usage rate (gpm or lpm). If the short-term rate is higher than the user-entered GPM/LPM FLOW RATE THEFT SP TANK X, the D4B will trigger a theft alarm.

This value must be set higher than the peak tank usage rate to prevent false alarms.

Alarms and Status Functions Setup

See the "Features" section for an overview of D4B alarm and status functions.

See the "I/O Configuration Worksheet" section for a listing of all alarms and statuses that can drive an output.

Setpoints are based on volume (not level).

Each setpoint is used in multiple functions. Example: HIGH-HIGH TANK A is used by: HIGH-HIGH ALARM TANK A, FILLALM, and HIHI A STATUS.

The high and low setpoints are also used by the FILL X and DRAIN X status functions.

There is a single ALARM DELAY SECONDS setting for all eight alarms (high-high, high, low, and low-low).

There is a single FILLALM AUTO SILENCE SECONDS setting for both tanks.

Alarms trigger the common alarm, blink the bar graph, and add an alarm history entry.

The high-high, high, low, and low-low alarm functions must be enabled/disabled via the ALARM CONFIG menu.

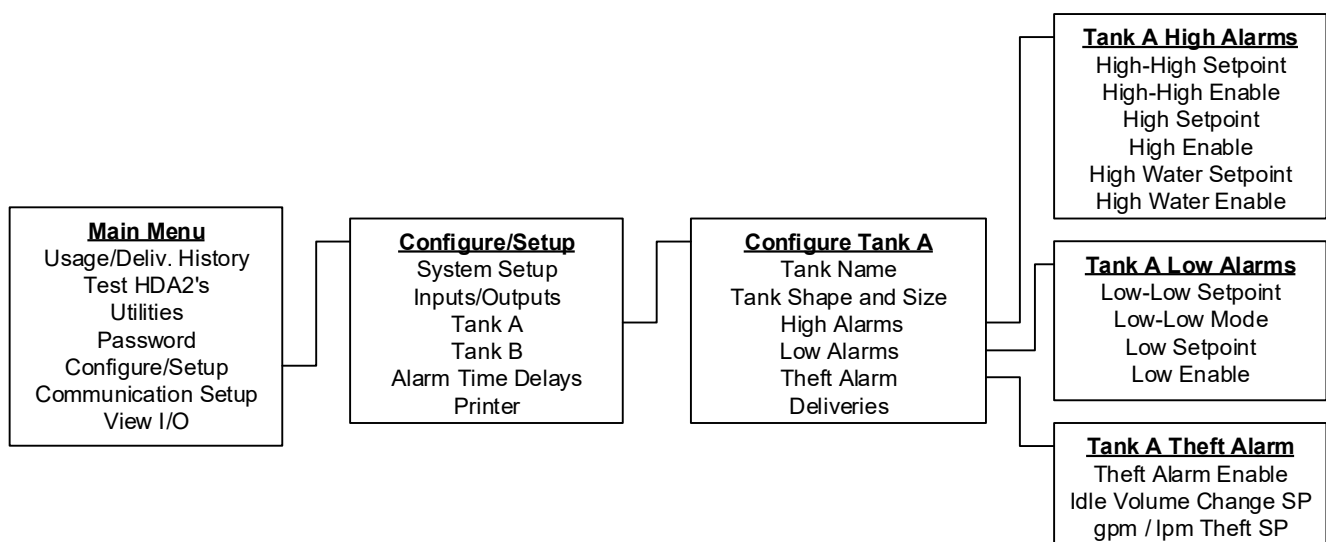
The low-low alarm ALARM CONFIG setting has three choices: DISABLED, AUTORESET, or MAN RESET.

Status functions do NOT: trigger the common alarm, blink the bar graph, or add an alarm history entry.

Status functions do not have time delays.

Status functions are always active and cannot be disabled.

FILALM is a status function; it is not an "alarm" function.



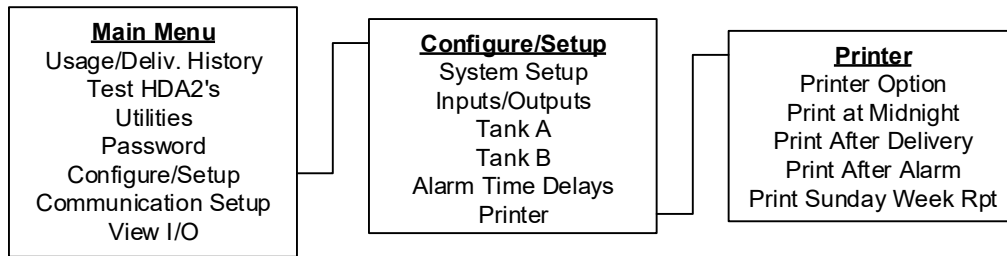
Printer

See the "Features" section for the description of the short and long Reports. Reports print 8-10 seconds after pressing the button on the main screen.

The PRINTER SETUP menu determines when the printer should automatically print, and which report. The choices are:

When	Report options
At midnight	NO, SHORT RPT, or LONG RPT
After a delivery	NO or SHORT RPT
After any alarm	NO or SHORT RPT
Sunday Weekly	NO or LONG RPT

The LOCATION NAME prints on the reports. It helps to identify the building/location where the report was generated.



Troubleshooting & VIEW I/O

Main menu item VIEW I/O displays the current values for all inputs and outputs.

Input channels 1-8 display the input channel name, function, current mA, terminal numbers and current input state. This allows you to verify electrical operation as well as configuration setup for each input. If an input is setup to be Normally Open or Normally Closed, that will be indicated after the channel function. The tank assignment is indicated before the channel function. A=Tank A, B =Tank B, C=Common.

Note: Level sensor inputs display the resulting "stick depth" based on the following:

WF/UL ullage: stick depth = tank full height – xmtr ullage + depth adj. – striker

Depth xmtr: stick depth = xmtr depth + depth adj. – striker

Head xmtr: stick depth = ("WC x sp. gravity) + depth adj. – striker

AIN Channel 1-8 HD-A2 leak sensor displayed values:

Display	Condition	Signal levels
SHORT	Field wiring shorted	≥ 21.5 mA
TEST	HD-A2 power-up test	18.5 to 21.5 mA
DRY	Dry	15.5 to 18.5 mA
WATER	Water detected	12.5 to 15.5 mA
OIL	Oil detected	1.5 to 12.5 mA
OPEN	Field wiring open	< 1.5 mA

AIN Channel 1-8 contact closure sensor displayed values:

Display	Condition	Signal mA
Open	contact open	< 8 mA
Closed	contact closed	> 8 mA

Examine Analog I/O ►		
Ch.		
1) 11.53	Tank 1 Level	44.8
T53,55	A.LVLOTHER	
2) 4.81	Tank 1 Water	2.2
T54,56	A.LVLWATER	
3) 0.00	T1 Contain. Open	
T57,59	A.LKCONTAC.NO	
4) 15.90	T1 Sump Leak Dry	
T58,60	A.LKHDA2	
1) 15.59	Tank 2 Level	63.2
T61,63	B.LVLOTHER	
2) 5.12	Tank 2 Water	2.8
T62,64	B.LVLWATER	
3) 0.00	T2 Contain. Open	
T65,67	B.LKCONTAC.NO	
4) 15.78	T2 Sump Leak Dry	
T66,68	B.LKHDA2	
Alarm Active		
Silence Back Home		

Alarms

History

The Discrete I/O Examine screens consists of a screen for: DIN Ch. 9-15, ROUT Ch. 1-6, and DOUT Ch. 7-12.

These screens display the I/O function, terminal number, and current status.

Examine Discrete I/O	
Relay Outputs	
Ch. Cmd	Function
1) On T1,2,3 LOAlarmA	
2) OFF T4,5,6 LOAlarmB	
3) OFF T9,13 HIHISStatusA	
4) OFF T10,13 HIHISStatusB	
5) ON T11,13 LeakTankA	
6) OFF T12,13 LeakTankB	
Alarm Active	
Silence	Back Home

Alarms

History

Password

The TG-EL-D4B has an optional password system. Passwords are disabled when the TG-EL-D4B is shipped.

To activate the Password system, go to: Main Menu >> Password >> Change Tech Password

Enter the new numeric password between +/- 32768. Setting the password as 9999 disables the password system. Keep a copy of the new password in a secure location.

When the password system is activated and the D4B is logged out:

- Reports can be printed.
- The main display tank can be selected.
- Alarms can be silenced.
- All submenus and menu items can be displayed.
- The clock can be set.
- An HD-A2 test can be started.
- No other items can be changed within the menu system.

When a password is entered, it automatically logs out after one hour.

If the new password is lost or forgotten, contact your sales representative or Preferred Utilities Fuel Oil Systems Technical Support to obtain a one-day temporary password. You must be near the TG-EL-D4B and provide various pieces of data from the menu displays when requesting a temporary password.

Modbus

RS485: Baud: 4800, 9600, 19200, 38400, 57600 Parity: Odd, Even, None Stop Bits: 1, 2
Ethernet: 10/100 Mb/s
Protocol: RTU, TCP/IP
Address: 1-247
Register Formats: 16 bit Signed Integer
32 bit Floating Point (register below = High bytes (exponent), register+1 = Low bytes (mantissa))
Modbus Commands: 01 Read Coils, 03 Read Registers, 05 Write Single Coil, 06 Write Single Register,
16 Write Multiple Registers (2 registers max)
Max Poll Size: 120 coils or registers (except Code 16)

TG-EL-D4B Fuel Sentry Tank Gauge Modbus Data Registers

40500	RO	UINT16	Tank A Current Volume
40501	RO	UINT16	Tank A Volume Multiplier
40502	RO	FLOAT	Tank A Current Distance
40504	RO	UINT16	Tank A Volume at Midnight
40505	RO	UINT16	Tank B Current Volume
40506	RO	UINT16	Tank B Volume Multiplier
40507	RO	FLOAT	Tank B Current Distance
40509	RO	UINT16	Tank B Volume at Midnight
40510	RO	UINT32	Tank A Current Alarms
40512	RO	UINT32	Tank B Current Alarms
40514	RO	UINT32	Common Alarms

Alarm/Status bits: Register 40510 (Tank A) & Register 40512 (Tank B)

Bit	Description
0	Sp. Gravity Alarm
1	Delivery Vs. Flow Alarm
2	Delivery in Progress
3	LS Short Open Alarm
4	High-High Level Status
5	High Water Alarm

Alarm/Status bits: Register 40511 (Tank A) & Register 40513 (Tank B)

Bit	Description
0	High-High Alarm
1	High Alarm
2	Low Alarm
3	Low-Low Alarm
4	Theft Alarm
5	Leak Alarm
6	Overfill Alarm
7	Lk HD-A2 Test Alarm
8	High-High Status
9	High Status
10	Low Status
11	Low-Low Status
12	Fill Status
13	Drain Status
14	Fill-Alarm Status
15	Primary vs Secondary Level Alarm

Alarm/Status bits: Register 40515

Bit	Description
0	Common Leak Alarm
1	Common HDA2 Test Alarm
2	Common Stop Solenoid Valve
3	Common Overfill and Leak

Modbus Coils:

113	RO	Tank A Low Level Switch Alarm
114	RO	Tank B Low Level Switch Alarm

TG-EL-D4B Fuel Sentry Tank Gauge Configuration Record

Main Menu > Configure/Setup > Inputs/Outputs > Ch. 1-8 I.S. AIN

see pages: 12-13, 20, 23

	Tank	Sensor Type	Sensor Options	Depth Adjust	4mA Cal	20mA Cal
Input 1						
Input 2						
Input 3						
Input 4						
Input 5						
Input 6						
Input 7						
Input 8						

↑ Disabled, Tank A, Tank B, Common
 ↑ LVL WF7, LVL WF12, LVL UL18, LVL OTHER, HEAD HL7, HEAD HL15, HEADOTHER, LK HD-A2, LK CONTAC, FILALM LS, FILALM AS, VENT LS, LVL WATER, LOW LS
 ↑ N.C., N.O.

Main Menu > Configure/Setup > Inputs/Outputs > Ch. 9-15 DIN

see pages: 12-13

	Tank	Sensor Type	Sensor Options
Input 9			
Input 10			
Input 11			
Input 12			
Input 13			
Input 14			
Input 15			

↑ Disabled, Tank A, Tank B, Common
 ↑ FILALM AS, IDLE TANK, COMMON AS, LK CONTACT
 ↑ N.C., N.O.

Main Menu > Configure/Setup > Inputs/Outputs > Ch. 1-12 ROUT/DOUT

see pages: 12-13, 25

ROUT 1	
ROUT 2	
ROUT 3	
ROUT 4	
ROUT5	
ROUT 6	
DOUT 7	
DOUT 8	
DOUT 9	
DOUT 10	
DOUT 11	
DOUT 12	

ALARM COM, LEAK COM, LEAK x,
 LEAK OTHR, OVERFILx, THEFT x,
 HIHI x AL, HI x AL, LO x AL, LOLO x AL,
 HIHI x ST, HI X ST, LO x ST,
 LOLO x ST, FILL x, DRAIN x, OFIL-LK 1

Main Menu > Configure/Setup > Inputs/Outputs > Ch. 1-2 AOUT

see pages: 12-13

AOUT 1		TA VOL, TA LVL, TB VOL, TB LVL
AOUT 2		TA VOL, TA LVL, TB VOL, TB LVL

Main Menu > Configure/Setup > Tank A > Tank A Shape/Size

see pages: 22-23

Stick Chart Type		FLAT HORZ, DISH HORZ, H OBOURD, V OBOURD, LIN/VERT, STIK CHRT
Computed Full Volume		

Main Menu > Configure/Setup > Tank A > Tank A Shape/Size > Tank A Data

see pages: 22-24

Stick Striker Plate Thickness	
Tank Dimensions	see page 23
Specific Gravity	

Main Menu > Configure/Setup > Tank A > High Alarms

see pages: 5, 6, 25

Tank A High-High SP		(also FillAlarm Setpoint, typically 95% full)
Tank A High-High Alarm Enable		DISABLED, ENABLED
Tank A High SP		
Tank A High Alarm Enable		DISABLED, ENABLED
Tank A High Water SP		

Main Menu > Configure/Setup > Tank A > Low Alarms

see pages: 5, 6, 25

Tank A Low SP		
Tank A Low Alarm Enable		DISABLED, ENABLED
Tank A Low-Low SP		
Tank A Low-Low Alarm Enable		DISABLED, AUTO-RESET, MAN RESET

Main Menu > Configure/Setup > Tank A > Theft Alarm

see pages: 5, 6, 25

Tank A Theft Alarm Enable		DISABLED, ENABLED
Tank A Idle Volume Change SP		
Tank A gpm/lpm Theft SP		

Main Menu > Configure/Setup > Tank A > Deliveries

see pages: 4, 24

Tank A Start Delivery: Volume Increase		
Tank A Stop Delivery: Settling Seconds		
Tank A Delivery-Usage Enable		DISABLED, ENABLED

Main Menu > Configure/Setup > Tank B > Tank B Shape/Size

see pages: 22-23

Stick Chart Type

Computed Full Volume

FLAT HORZ, DISH HORZ, H OBOUND, V OBOUND,
LIN/VERT, STIK CHRT

Main Menu > Configure/Setup > Tank B > Tank B Shape/Size > Tank B Data

see pages: 22-24

Stick Striker Plate Thickness

Tank Dimensions

Specific Gravity

see page 23

Main Menu > Configure/Setup > Tank B > High Alarms

see pages: 5, 6, 25

Tank B High-High SP

Tank B High-High Alarm Enable

Tank B High SP

Tank B High Alarm Enable

Tank B High Water SP

(also FillAlarm Setpoint, typically 95% full)

DISABLED, ENABLED

DISABLED, ENABLED

Main Menu > Configure/Setup > Tank B > Low Alarms

see pages: 5, 6, 25

Tank B Low SP

Tank B Low Alarm Enable

Tank B Low-Low SP

Tank B Low-Low Alarm Enable

DISABLED, ENABLED

DISABLED, ENABLED

Main Menu > Configure/Setup > Tank B > Theft Alarm

see pages 5, 6, 25

Tank B Theft Alarm Enable

Tank B Idle Volume Change SP

Tank B gpm/lpm Theft SP

DISABLED, ENABLED

Main Menu > Configure/Setup > Tank B > Deliveries

see pages: 4, 24

Tank B Start Delivery: Volume Increase

Tank B Stop Delivery: Settling Seconds

Tank B Delivery-Usage Enable

DISABLED, ENABLED

Main Menu > Configure/Setup > Alarm Time Delays

Alarm Delay Seconds

FillAlarm Auto Silence

Main Menu > Configure/Setup > Printer

see pages: 26

Location Name		
Print At Midnight		NO, SHORT RPT, LONG RPT
Print After Delivery		NO, SHORT RPT
Print After Any Alarm		NO, SHORT RPT
Print Sunday Weekly Report		NO, LONG RPT

Main Menu > Communications > RS485

see pages: 29

Baud		4800, 9600, 19200, 38400, 57600
Parity		NONE, ODD, EVEN
Stop Bits		1, 2
Address		1-245

Main Menu > Communications > Ethernet

IPv4 Address	
IPv4 mask	
IPv4 Gateway	

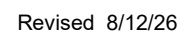
Manual Revisions:

4/21/21 TG-TL-D4B-xx-0-0 Rough Draft for I.S. Approval Submittal

Valid Pages: 2, 3, 16-19

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See the worksheets on pages 12 - 13 for I/O channel terminal numbers

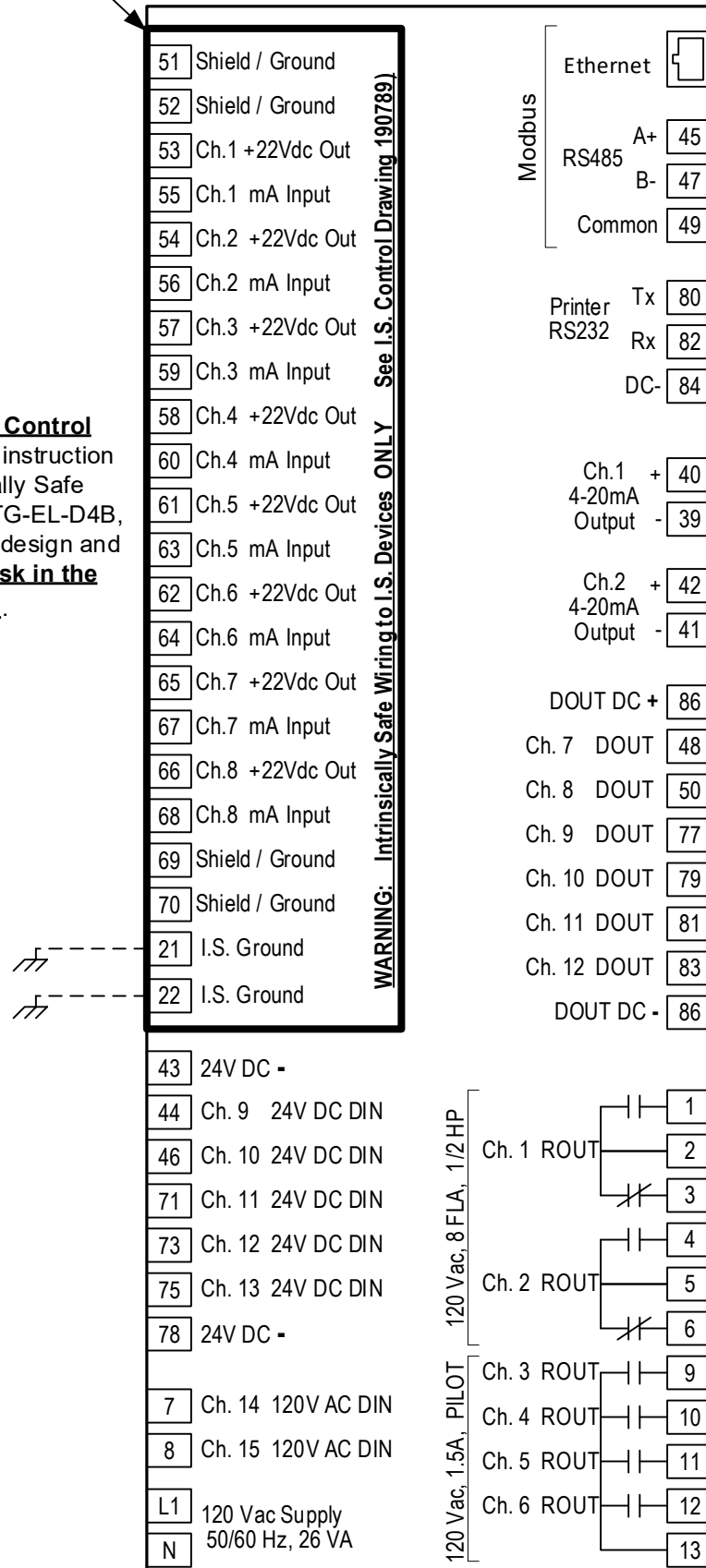


TG-EL-D4B-xx-x-0 Field Wiring Terminals

(This is NOT the physical terminal arrangement)

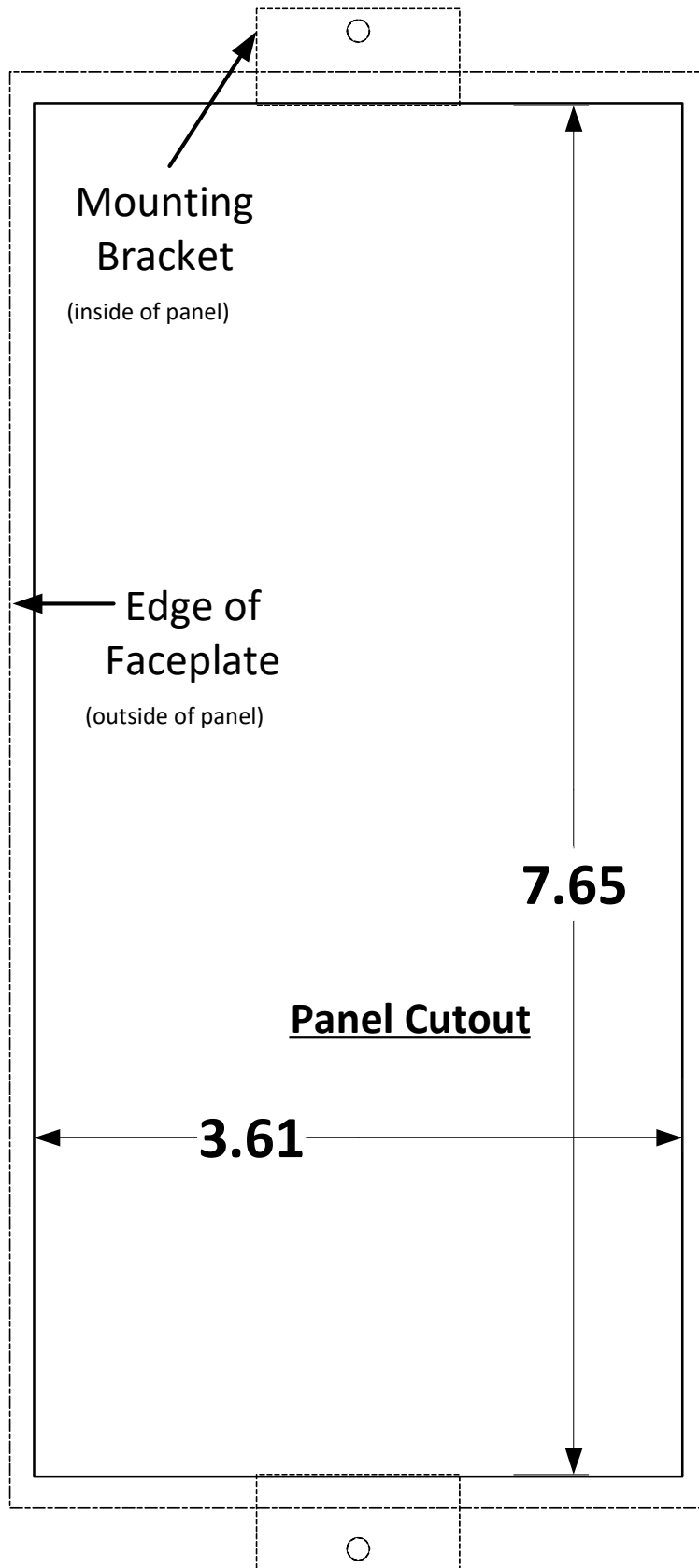
Terminals 21, 22, 51-70
are under the I.S. cover

WARNING
Failure to comply with Control
drawing 190789, and the instruction
manuals of all Intrinsically Safe
sensors connected to the TG-EL-D4B,
voids the Intrinsically Safe design and
creates an explosion risk in the
hazardous area.



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Panel Cutout Template



Preferred Utilities Mfg. Corp

31-35 South St.
Danbury, CT 06810

Phone: 203-743-6741
Fax: 203-798-7313

info@preferred-mfg.com
www.preferredutilities.com