IDEX
IDEX CORPORATION

Class 1

ISO 9001 CERTIFIED

607 NW 27th Ave
Ocala, FL 34475
Phone: (352) 629-5020 or 800-533-3569
Fax: (352)-629-2902

SUITABLE FOR EXTERNAL DISTRIBUTION

OPERATION MANUAL

Intelli-Tank Level 40

ITL 40

Class1 IDEX CORPORATION 607 NW 27th Ave Ocala, FL 34475 Ph: 352-629-5020 or 1-800-533-3569 Fax : 352-629-2902 or 1-800-520-3473	SUITABLE FOR EXTERNAL DISTRIBUTION **OPERATION MANUAL**		**PAGE**	2 of 27
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1. Revision Log

Rev	Date	Approved	Changes
1.00	9-24-2008	AGK	Initial requirements
1.10	4-19-2012		Added details for the AutoFill output
1.20	5-01-2015	GMC	Changed part number of Transducer
1.30	6-12-2019	MH	Added passwords to turn on/off start-up text scroll

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2. System Overview

2.1. Scope

The Intelli-Tank Level 40 (ITL40) is designed to display a liquid's volume to an eighth of a tank level accuracy through 180-degree viewable ultra-bright LEDs. An Intelli-Tank Level 40 set as a MASTER uses a 0-5 PSI (0-34.47 kPa, 0-0.3447 bar) pressure sensor to obtain tank level information and then relays that information along the communication line(s) (1-Wire or CAN) to ITL40's set as REMOTES. Multiple REMOTE units can be linked to the MASTER tank level.

2.2. Part numbers

		Standard	with auto fill	
Tank Level Gauge	C1 – p/n	118404-01	123340-01	– **Red LEDs**
	p/n	118404-02	123340-02	– **Amber LEDs**
	p/n	118404-03	123340-03	– **Yellow LEDs**
	p/n	118404-04	123340-04	– **Green LEDs**
	p/n	118404-05	123340-05	– **Blue LEDs**
	p/n	118404-06	123340-06	– **2 Red, 2 Yellow, 2 Blue, 2 Green rows of LEDs**

Labels	C1 – p/n	117691	– water (blue)
	p/n	117692	– foam (red)
	p/n	117693	– foam (green)

Pressure Sensor   C1 – p/n 200-00093 – 0 to 5 PSI (0 to 34.47 kPa, 0 to 0.3447 bar) gage

Adapter bushing   C1 – p/n 102219 – ¾ to ¼ NPT

Installation Harness	C1 – p/n	118485-10	– Master display, 10 feet
	p/n	118485-20	– Master display, 20 feet
	p/n	118485-30	– Master display, 30 feet
	p/n	118485-40	– Master display, 40 feet
	p/n	118695	– Remote display

Terminating resistor (CAN)   C1 – p/n DT06-3S-P006

"Y" connector (CAN)   C1 – p/n DT04-3P-P007

Operation Manual   C1 – p/n 118253

One Page Manual   C1 – p/n 118252

2.3. Modes of Operation

Master   When the ITL40 display is calibrated with a proper pressure signal it automatically becomes a MASTER display and will send tank level information along the communication line(s) (either 1-wire or CAN) to all other REMOTE displays.

Remote   ITL40 displays are initially shipped as REMOTE displays. A REMOTE display only requires power, ground and communications line(s) (either 1-wire or CAN). The REMOTE display mimics the MASTER display's LEDs by reading the appropriate information on the communication line(s).

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3. Operation

3.1. LED indications

The ITL40 display uses 8 rows of LEDs to show the unit status, tank level indication (section 3.1.2), and error indications (section 3.1.3).

3.1.1. Initial power ON indications

When the ITL40 is first powered up the display will…
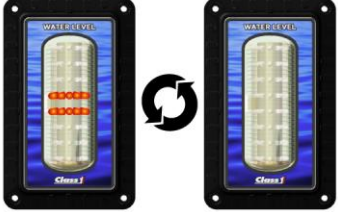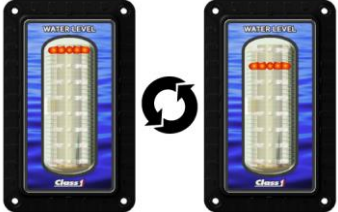
1. Turn ON all of the LEDs then immediately cycle OFF each LED starting at the top row.
2. Display the custom scroll greeting (default is "CLASS 1", but can be custom configured – section 3.8).
3. The LEDs will show the tank level indication (section 3.1.2) or error indication (section 3.1.3).
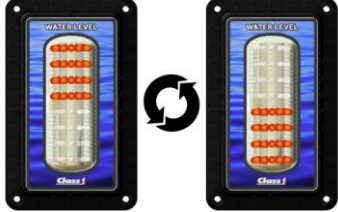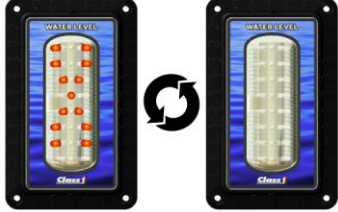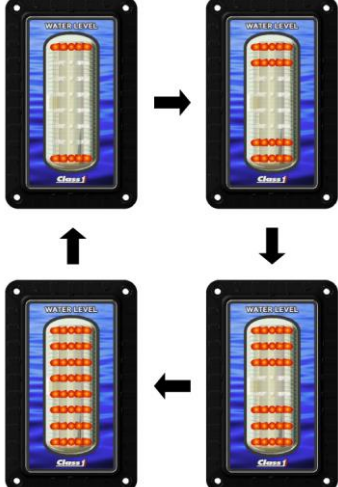
3.1.2. Level indications

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3.1.3. Error indications

Condition	Visual	Condition	Visual
Invalid calibration		"NO DATA" REMOTE is not receiving data from MASTER	
Incomplete calibration		Password Error [1]	
EEPROM error		Unit type error [2] The display is not configured as a MASTER or REMOTE	
Sensor signal voltage above 4.8V			
Sensor signal voltage below 0.4V			

[1] "X" flashed four times.
[2] Indicates that the unit type has erroneously changed. The two valid unit types are REMOTE and MASTER.

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3.2. Magnetic switches

The ITL40 has two magnetic switches (left and right). The switches are activated by touching a magnet to either side of the display in the areas shown in picture below. The label has a small "o" to indicate the location of the magnetic switch.

For best results the magnet should be positioned over the desired switch approximately 2 inches from the front of the display, pushed directly to the front of the display, and then pulled back to the start position (do not using a swiping motion).
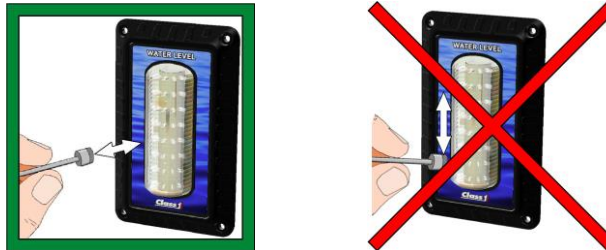
The LEDs on the display will indicate which switch was activated for approximately half a second and then the display will go blank (LEFT = left two columns of LEDs, RIGHT = right two columns of LEDs).

LEFT (L) indication   *RIGHT (R) indication*

The maximum time between magnetic switch activations is two seconds. If longer than two seconds have passed between activations the unit will resume normal operation and the password attempted will be cleared.

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3.3. Calibration

The ITL40 display can be calibrated five different ways: 1-point (quick calibration), 2-point (level calibration) empty then full, 2-point (level calibration) full then empty, 5-point and 9-point (volume calibration).

To enter calibration mode use a magnet and activate the magnetic switches in the order of the appropriate password.
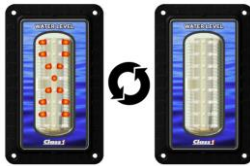
Entering an invalid password will initiate a "password error" pattern on the display ("X" flashed four times). The unit will then resume its normal operation and the user can attempt to re-enter the password.

Calibrate the unit by entering the desired point calibration password –

1 point	**RLLR LRRL** (see section 3.3.1)
2 point (empty then full)	**RLLR LLRL** (see section 3.3.2)
2 point (full then empty)	**RLLR LRRR** (see section 3.3.3)
5 point (start at empty)	**RLLR LRLR** (see section 3.3.4)
9 point (start at empty)	**RLLR RLLR** (see section 3.3.5)

During calibration, the process can be cancelled at any time by activating the **LEFT** magnetic switch. This will allow the display to exit without showing an "incomplete calibration error" (section 3.1.3) on the next power cycle.

3.3.1. 1 Point Calibration

1 point calibration only calibrates the full point. The empty calibration is always set to 0.55V (approximately 1.5 inches of liquid).
1. Make certain that the tank is FULL.
2. Enter the password **RLLR LRRL**. The display will respond by showing the number "1". The display will then start normal operation with the new calibration by displaying FULL (all LEDs on).

3.3.2. 2 Point Calibration (empty then full)

1. Enter the password **RLLR LLRL**. The display will respond by showing the number "2". The display will then begin scrolling the text "SET EMPTY" across the display.
2. Make certain that the tank is EMPTY and then activate the **RIGHT** switch to store that point. The display will flash the top two LED rows and then begin scrolling the text "SET FULL".
3. Fill the tank and then activate the **RIGHT** switch. The display will respond by flashing the top two LED rows and then start normal operation with the new calibration by displaying FULL (all LEDs on).

3.3.3. 2 Point Calibration (full then empty)

1. Enter the password **RLLR LRRR**. The display will respond by showing the number "2". The display will then begin scrolling the text "SET FULL" across the display.
2. Make certain that the tank is FULL and then activate the **RIGHT** switch to store that point. The display will flash the top two LED rows and then begin scrolling the text "SET EMPTY".
3. Drain the tank and then activate the **RIGHT** switch. The display will respond by flashing the top two LED rows and then start normal operation with the new calibration by displaying EMPTY (cascading LEDs).

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3.3.4. 5 Point Calibration

1. Enter the password **RLLR LRLR**. The display will respond by showing the number "5". The display will then begin scrolling the text "SET EMPTY".
2. Make certain that the tank is EMPTY and then activate the **RIGHT** switch to store that point. The display will flash the top two LED rows and then begin scrolling the text "SET 1/4".
3. Fill the tank to the one-quarter tank point and then activate the **RIGHT** switch. The display will flash the top two LED rows and then begin scrolling the text "SET 1/2".
4. Fill the tank to the one-half tank point and then activate the **RIGHT** switch. The display will flash the top two LED rows and then begin scrolling the text "SET 3/4".
5. Fill the tank to the three-quarter tank point and then activate the **RIGHT** switch. The display will flash the top two LED rows and then begin scrolling the text "SET FULL".
6. Fill the tank to the full point and then activate the **RIGHT** switch. The display will respond by flashing the top two LED rows and then start normal operation with the new calibration by displaying FULL (all LEDs on).

3.3.5. 9 Point Calibration

1. Enter the password **RLLR RLLR**. The display will respond by showing the number "9". The display will then begin scrolling the text "SET EMPTY".
2. Make certain that the tank is EMPTY and then activate the **RIGHT** switch to store that point. The display will flash the top two LED rows and then begin scrolling the text "SET 1/8".
3. Fill the tank to the one-eighth point and then activate the **RIGHT** switch. The display will flash the top two LED rows and then begin scrolling the text "SET 1/4".
4. Fill the tank to the one-quarter point and then activate the **RIGHT** switch. The display will flash the top two LED rows and then begin scrolling the text "SET 3/8".
5. Fill the tank to the three-eighths point and then activate the **RIGHT** switch. The display will flash the top two LED rows and then begin scrolling the text "SET 1/2".
6. Fill the tank to the one-half point and then activate the **RIGHT** switch. The display will flash the top two LED rows and then begin scrolling the text "SET 5/8".
7. Fill the tank to the five-eighths point and then activate the **RIGHT** switch. The display will flash the top two LED rows and then begin scrolling the text "SET 3/4".
8. Fill the tank to the three-quarter point and then activate the **RIGHT** switch. The display will flash the top two LED rows and then begin scrolling the text "SET 7/8".
9. Fill the tank to the seven-eighths point and then activate the **RIGHT** switch. The display will flash the top two LED rows and then begin scrolling the text "SET FULL".
10. Fill the tank to the full point and then activate the **RIGHT** switch. The display will respond by flashing the top two LED rows and then start normal operation with the new calibration by displaying FULL (all LEDs on).

3.3.6. Calibration retention

Calibration data is saved in non-volatile memory (EEPROM) and the display does not need power to retain calibration data.

3.3.7. Invalid calibration

Calibration automatically makes the ITL40 a MASTER display if the calibration is valid. An invalid calibration is determined when any calibrated point is not at a higher level than the previous calibrated point, or if the sensor voltage falls outside of the valid minimum (0.4V) or maximum (4.8V) range.

An invalid calibration is acknowledged by flashing "X" four times and then scrolling the text "CHECK SENSOR VOLTS" followed by a continuous scroll of the voltage detected on the sensor's signal (pin 6).

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3.3.8. <u>Calibration incomplete</u>

If the calibration is not completed the display will continually flash the "incomplete calibration" error (section 3.1.3), during all subsequent power cycles. This indicates that a calibration was attempted but never completed. Recalibrate the display completely to remove this error condition.

3.4. **Self test**

The ITL40 can check its hardware for proper operation by entering the password **RLLR LLRR.**
The display will turn all the LEDs ON and then cycle each LED OFF individually starting with the top LED. All LEDs will come on and begin flashing between full bright and the calibrated dim level for 5 seconds. The display will then scroll text indicating the self test condition.

<u>Memory test</u>

"MEM-PASS"	Memory (EEPROM) is good.
"MEM-FAIL"	Memory (EEPROM) failure detected.

<u>Sensor signal test (MASTER unit only)</u>

"SIG-PASS"	Sensor signal voltage within tolerance (0.4 volts to 4.8 volts).
"SIG-FAIL"	Sensor signal voltage out of tolerance (0.4 volts to 4.8 volts).

<u>Communication wire test</u>

'WIRE-PASS"	Data communication lines good.
"WIRE-FAIL"	Data communication lines shorted or open.

If the self test password is used on a MASTER display all REMOTE displays will also perform their self test.

3.5. **Setting the dim LED level**

The display can be dimmed by applying system power to pin 4 (Dim Display input). The ITL40 has 9 levels of brightness available (9 = brightest, 1 = dimmest, default value is 3).
To select the dim level of the display use the magnetic switches to enter the password **RLLR LLLR.**
All of the LEDs will be illuminated during the set-up. Touch a magnet against the **RIGHT** switch and the display will dim to the next level and show the dim value number (9 through 1). Release the magnet and again touch it against the **RIGHT** switch again to drop to the next dim level. Once the dim level is at the dimmest setting (1) the next touch of the magnet will cycle to the highest dim level (9).
When the dim level is at the desired point activate the **LEFT** switch to save and exit.

3.6. **Show software version, device settings, and errors**

The ITL40 can display its setting by entering the password **RRRR RRRR.**
The display will scroll the software version, unit type, communication method, and then display any errors.
<u>Software version</u>

"Vx.x"	Where x.x equals the numeric software version. For example, V1.0.

<u>Unit type</u>

"MASTER"	The unit is set as a MASTER.
"REMOTE"	The unit is set as a remote.
"CAL INCOMPLETE"	A calibration was started but never completed.
"UNKNOWN"	The unit type cannot be determined – ERROR.

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Communication method

"1-WIRE"	Using 1-wire communication method.
"CAN"	Using CAN communication method.

CAN device address (if communication method = CAN)

"ADDR=1"	The unit 's CAN address is 1 (0xCB).
"ADDR=2"	The unit 's CAN address is 2 (0xCC).
"ADDR=3"	The unit 's CAN address is 3 (0xCD).
"ADDR=4"	The unit 's CAN address is 4 (0xCE).
"ADDR=PCM"	The unit 's CAN address is Pump Control Module (0xCA).

Error indications

"NO ERRORS"	No errors detected.
"MEM-ERROR"	Memory error detected.
"CAL-ERROR"	Validation of calibration problem detected.
"NO-COMM"	Not receiving communication from MASTER display.
"SIG-HIGH"	Sensor signal voltage too high (greater than 4.8V).
"SIG-LOW"	Sensor signal voltage too low (less than 0.4V).
"CAL NOT FINISHED"	Calibration was started but not completed.
"TYPE-BAD"	Unit type cannot be determined (not MASTER, REMOTE, or CAL INCOMPLETE).

3.7. Configure the communication method

A MASTER display can communicate to other displays that are configured as remotes via CAN or 1-wire.
The 1-wire communication method is the default method and will work with ITL40 and ITL displays.
The CAN communication method is new for the ITL40 displays and is a more robust communication method. This method requires two wires (CAN high, CAN low) and approved J1939 CAN wiring and connectors. There should be two (2) 120 ohm terminating resistors located at the ends of the CAN bus (see section 6.3.5).

3.7.1. Configuring a display as a Master with 1-wire communications

Enter the password **LRLL LLLR** to set the communication method to 1-wire. If the display was not previously a MASTER display, calibrate the display (see section 3.3).

3.7.2. Configuring a display as a Remote with 1-wire communications

Enter the password **LRLL LLLR** to set the communication method to 1-wire. If the display is a MASTER display, enter the password **LRLR LRLR** to turn the display into a REMOTE.

3.7.3. Configuring a display as a Master with CAN communications

Enter the password **LRLL LLRL** to set the communication method to CAN. If the display was not previously a MASTER display, calibrate the display (see section 3.3).
Choose the CAN identification address to use (either address 1, 2, 3, 4, or PCM) and enter the appropriate password to set the address (**LRRR LLLL** address 1, **LRRR LLLR** address 2, **LRRR LRRR** address 3, **LRRR RLLR** address 4, **LRRR LRLR** address PCM). All REMOTE displays that are to mimic this Master display must have their addresses matching the MASTER's.

3.7.4. Configuring a display as a Remote with CAN communications

Choose the CAN identification address to use (either address 1, 2, 3, 4, or PCM) and enter the appropriate password to set the address (**LRRR LLRL** address 1, **LRRR LLRR** address 2, **LRRR LRRL** address 3,

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LRRR RLLL address 4). All REMOTE displays that are to mimic the MASTER display must have their addresses matching the MASTER's.

The display can also be configured to mimic a Class 1 Pump Sensor Module (p/n 111097) by entering the password for the desired tank (**LRRR LRLL** PCM tank 1, **LRRR RLRL** PCM tank 2, **LRRR RLRR** PCM tank 3).

3.8. Configure a custom message scroll

The ITL40 scrolls a custom message during start-up. The default scroll text is "Class 1" but the text can be custom configured to a desired message (maximum of 21 characters allowed).

List of available characters.

A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U	V
W	X	Y	Z	**SP**	0	1	2	3	4	5	6	7	8	9	+	-	/	=	?	.	

Enter the password **LLLL LRLR** and the display will show the first available character - "A".

Use the LEFT and RIGHT magnetic switches to enter the desired text.

- The LEFT magnetic switch changes the character. Each LEFT switch activation moves forward or backward through the available characters. Wait two seconds between switch activations and the direction reverses.
- The RIGHT magnetic switch saves the displayed character to memory.

There are three methods of exiting…

- Save two SPACE characters in a row.
- Configure the maximum number of characters (21).
- Turn OFF power to the ITL40.

The custom message scroll can also be configured through a CAN message. Contact Class 1 for details.

3.9. Use the display reference mark

The level the ITL40 shows may be difficult to distinguish at a distance for some viewers. The ITL40 can be configured with a reference mark at the top of the display (single LED ON) which will help quickly determine level.

- Enter the password **LLRR RRRR** to turn the reference mark ON.

- Enter the password **LLRR LLLL** to turn the reference mark OFF.
  The default for the reference mark is OFF.

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3.10. Slosh dampening feature

Some applications (off-road vehicles, etc) may submit the tank to conditions of extreme movement which causes the fluid to slosh producing significant fluctuation in the displayed tank level.
The ITL40 can counteract these conditions by averaging the rhythmic changes (sloshing) detected by the pressure sensor creating a more consistent displayed tank level.

Example with the slosh dampening feature DISABLED (default).
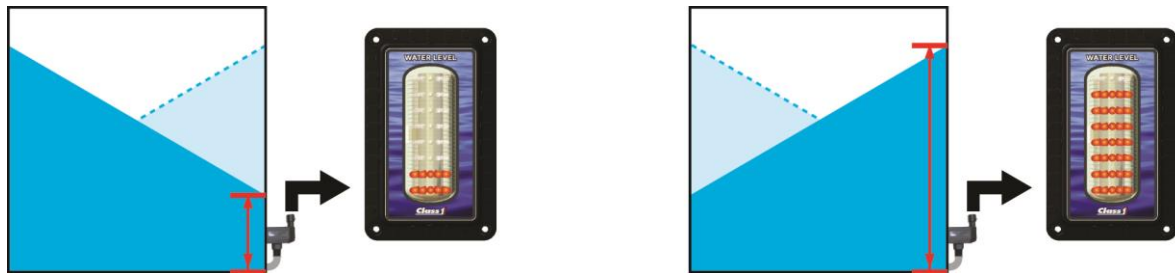
Example with the slosh dampening feature ENABLED.
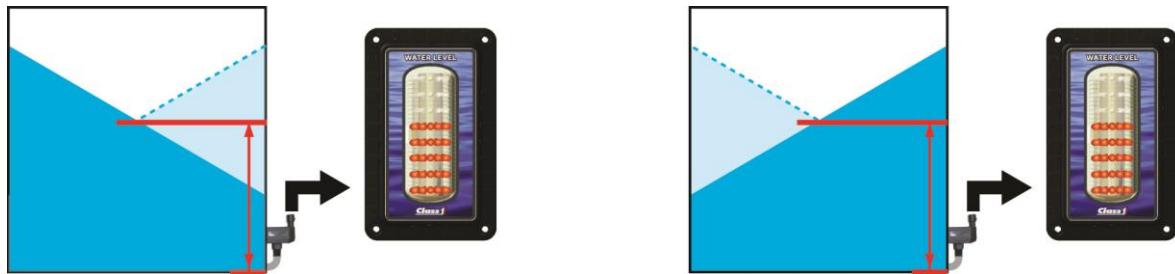
- Enable the slosh dampening feature by entering the password **LRRL LRRL.**
  The display will scroll "SLOSH ON" to indicate that the feature has been enabled.

- Disable the slosh dampening feature by entering the password **LRRL LRRR.**
  The display will scroll "SLOSH OFF" to indicate that the feature has been disabled.

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3.11. AutoFill

The ITL-40 has a .250 Amp ground output driver that can be custom configured to turn on and off based on tank levels. The feature will disable and shut off the output if the ITL-40 is in a sensor error condition once the error condition has been resolved the output will continue to operate. (Note only available on 123340-XX units)

3.11.1. <u>Enabling the AutoFill output</u>

Enable the AutoFill feature by entering the password **LRRL RLLL**.
The display will scroll "FILL ON" to indicate that the feature has been enabled.

3.11.2. <u>Disabling the AutoFill output</u>

Disable the AutoFill feature by entering the password **LRRL RLLR**.
The display will scroll "FILL OFF" to indicate that the feature has been disabled.

3.11.3. <u>Setting the AutoFill turn on level</u>

The turn on level can be customized from Empty to 7/8 of a tank by entering a password (Section 4). Example if you want the AutoFill output to turn on when the tank level falls to 1/4 of a tank or below you would enter the following password **RRRL LLRL**. Once the password has been entered the display will briefly display 1/4 of a tank to indicate the level has been set.

3.11.4. <u>Setting the AutoFill turn off level</u>

The turn off level can be customized from Full to 1/8 of a tank by entering a password (Section 4). Example if you want the AutoFill output to turn off when the tank level rises to 3/4 of a tank or below you would enter the following password **RRRR LLRL**. Once the password has been entered the display will briefly display 3/4 of a tank to indicate the level has been set.

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4. Password list

RLLR LRRL	**1 point calibration (section 3.3.1)**
RLLR LLRL	**2 point calibration, empty then full (section 3.3.2)**
RLLR LRRR	**2 point calibration, full then empty (section 3.3.4)**
RLLR LRLR	**5 point calibration (section 3.3.4)**
RLLR RLLR	**9 point calibration (section 3.3.5)**
RLLR LLRR	**Self test (section 3.4)**
LRLR LRLR	**Configure display as Remote display (section 2.3)**
RLLR LLLR	**Configure dim level (section 3.5)**
LLRR LLRR	**Display voltage (section 7.2)**
LRLL LLLR	**Configure for 1-wire communications (section 3.7)**
LRLL LLRL	**Configure for CAN communications (section 3.7)**
LRRR LLLL	**Configure as Master display with CAN address 1 (section 3.7.3)**
LRRR LLLR	**Configure as Master display with CAN address 2 (section 3.7.3)**
LRRR LRRR	**Configure as Master display with CAN address 3 (section 3.7.3)**
LRRR RLLR	**Configure as Master display with CAN address 4 (section 3.7.3)**
LRRR LRLR	**Configure as Master display with CAN address PCM (section 3.7.3)**
LRRR LLRL	**Configure as Remote display with CAN address 1 (section 3.7.4)**
LRRR LLRR	**Configure as Remote display with CAN address 2 (section 3.7.4)**
LRRR LRRL	**Configure as Remote display with CAN address 3 (section 3.7.4)**
LRRR RLLL	**Configure as Remote display with CAN address 4 (section 3.7.4)**
LRRR LRLL	**Configure as Remote display for use with Pump Sensor Module, Tank 1 (section 3.7.4)**
LRRR RLRL	**Configure as Remote display for use with Pump Sensor Module, Tank 2 (section 3.7.4)**
LRRR RLRR	**Configure as Remote display for use with Pump Sensor Module, Tank 3 (section 3.7.4)**
LRRL LRRL	**Slosh dampening feature enabled (section 3.10)**
LRRL LRRR	**Slosh dampening feature disabled (section 3.10)**
LLRR LLLL	**Reference mark turned OFF (section 3.9)**
LLRR RRRR	**Reference mark turned ON (section 3.9)**
LLRR LRRL	**Load defaults (remote, 1-wire, dim level 3, "CLASS 1" scroll, slosh dampening OFF)**
LLLL LRLR	**Configure custom start-up text scroll (section 3.8)**
LLLL LRRL	**Turn off start-up text scroll**
LLLL LRRR	**Turn on start-up text scroll (default)**

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4. Password list continued

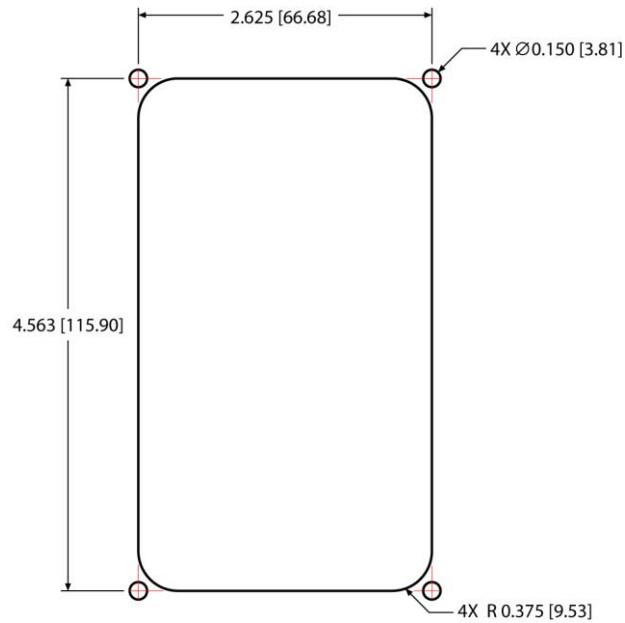**LRRL RLLL**   **AutoFill Feature enabled (section 3.8)**

LLLL RLLR   **AutoFill Feature Disabled (section 3.8)**

RRRL LLLL   **Configure AutoFill turn on for Empty (section 3.8)**

RRRL LLLR   **Configure AutoFill turn on for 1/8 Tank (section 3.8)**

RRRL LLRL   **Configure AutoFill turn on for 1/4 Tank (section 3.8)**

RRRL LLRR   **Configure AutoFill turn on for 3/8 Tank (section 3.8)**

RRRL LRLL   **Configure AutoFill turn on for 1/2 Tank (section 3.8)**

RRRL LRLR   **Configure AutoFill turn on for 5/8 Tank (section 3.8)**

RRRL LRRL   **Configure AutoFill turn on for 3/4 Tank (section 3.8)**

RRRL LRRR   **Configure AutoFill turn on for 7/8 Tank (section 3.8)**

RRRR LLLL   **Configure AutoFill turn off for Full (section 3.8)**

RRRR LLLR   **Configure AutoFill turn off for 7/8 Tank (section 3.8)**

RRRR LLRL   **Configure AutoFill turn off for 3/4 Tank (section 3.8)**

RRRR LLRR   **Configure AutoFill turn off for 5/8 Tank (section 3.8)**

RRRR LRLL   **Configure AutoFill turn off for 1/2 Tank (section 3.8)**

RRRR LRLR   **Configure AutoFill turn off for 3/8 Tank (section 3.8)**

RRRR LRRL   **Configure AutoFill turn off for 1/4 Tank (section 3.8)**

RRRR LRRR   **Configure AutoFill turn off for 1/8 Tank (section 3.8)**

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5. Installation

5.1. Cutout dimensions

The display requires a cutout as shown. The display is water tight and may be mounted in any location on the operator's panel.

Unit of scale: inches [millimeters]

5.2. Outer bezel dimensions

Unit of scale: inches [millimeters]

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5.3. Label orientation

Before mounting the display and adhering the label insure that the display is situated correctly (TOP is UP). Refer to the drawing for orientation.

ARROWS and text "TOP" indicate the top of the display

p/n 117691   p/n 117692   p/n 117693
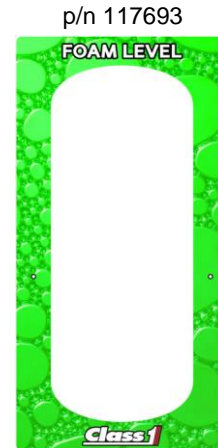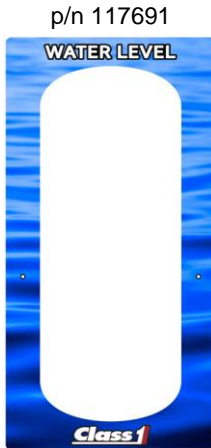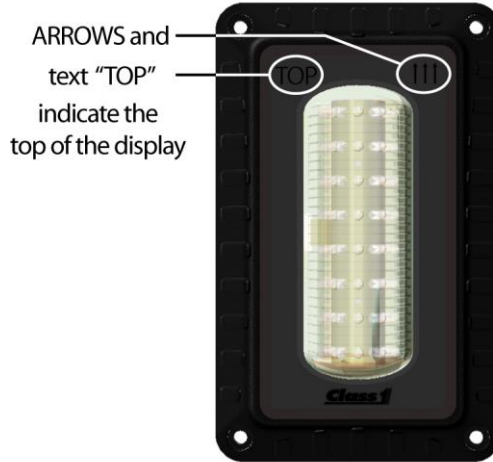
5.4. Pressure sensor

The pressure sensor (p/n 102162) is threaded for ¼" NPT and must be mounted vertically as depicted to insure an accurate reading.

FLUID TANK

PRESSURE SENSOR (p/n 102162) 1/4 NPT

ADAPTER 3/4 NPT to 1/4 NPT (p/n 102219)

90° ELBOW (OEM) 3/4 NPT
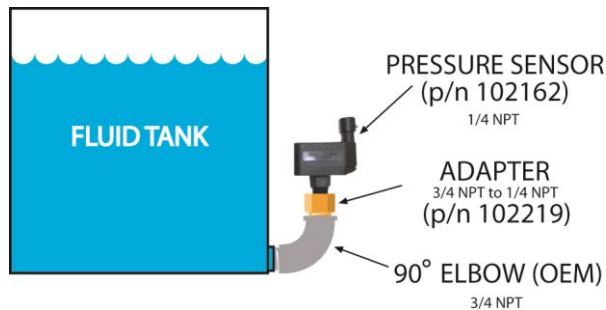
5.4.1. Approved fluids

The pressure sensor has been tested and approved for water and Class A and B foams.

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6. Wiring

6.1. ITL40 connector

The ITL40 has one connector and the following definitions apply:

Mating connector: Deutsch DT06-12SB BLACK
Mating sockets: Deutsch 0462-201-16141
Wedge lock: W12S   Recommended wire gage: 16-18 AWG

PIN	CIRCUIT	DESCRIPTION	
1	SUPPLY (+)	(INPUT) – battery voltage	(+9VDC…+32VDC)
2	CAN HIGH	(DATA) – SAE J1939 CAN 2.0B, 250Kbits/s	
3	CAN SHIELD	(DATA) – SAE J1939 CAN 2.0B, 250Kbits /s	
4	DIM DISPLAY	(INPUT) – Dim display input	(positive polarity)
5	Sensor REF	(OUTPUT) – pressure sensor supply	(+5VDC)
6	Sensor SIGNAL	(INPUT) – pressure sensor signal	(+0.5VDC to +4.5VDC)
7	Sensor GND	(OUTPUT) – pressure sensor ground	
8	AUX Output	(OUTPUT) – ground .250 Amps (Auto Fill Version only)	
9	1-WIRE SIG	(DATA) – Class 1proprietary communication	
10	GROUND	(OUTPUT) – common ground	
11	CAN LOW	(DATA) – SAE J1939 CAN 2.0B, 250Kbits /s	
12	SUPPLY (-)	(INPUT) – battery ground	

6.2. Pressure sensor connector

The pressure sensor has one connector and the following definitions apply:

Mating connector: Packard Metri-Pack 150 series, 12047909
Mating sockets: Packard Metri-Pack 150 series, 12103881
**   Recommended wire gage: 18-20 AWG**

| PIN	CIRCUIT	DESCRIPTION	
A	SUPPLY (+)	(INPUT) – pressure sensor supply	(+5VDC)
B	SUPPLY (-)	(INPUT) – pressure sensor ground	
C	Signal	(OUTPUT) – pressure sensor signal	(+0.5VDC to +4.5VDC)

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6.3. Communication wiring examples

The ITL40 display can be set up to use the 1-wire or CAN communication methods. The simplest system would be comprised of a single ITL40 MASTER display.

6.3.1. 1-wire method, 1 MASTER and 2 REMOTES
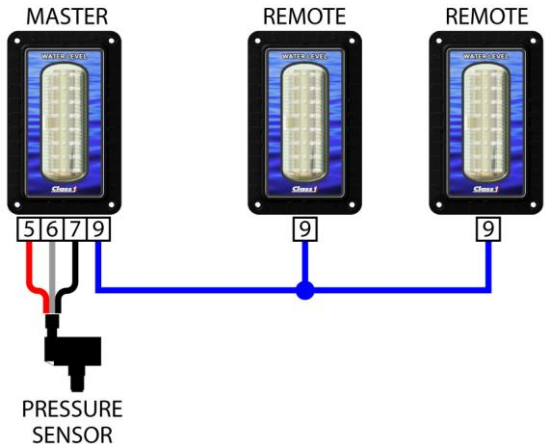
System configured with 1-wire communication method.   Make certain that the ground for each display is tied to a common point or the REMOTE displays will not receive communication data from the MASTER display.
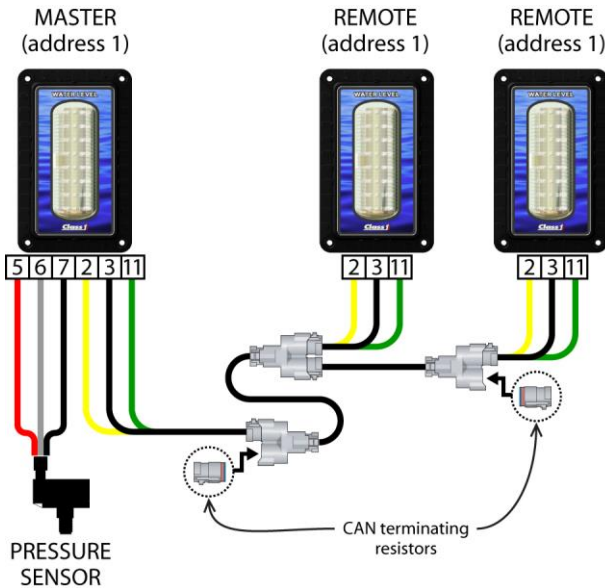
6.3.2. 1-wire method, 2 MASTERS and 2 REMOTES
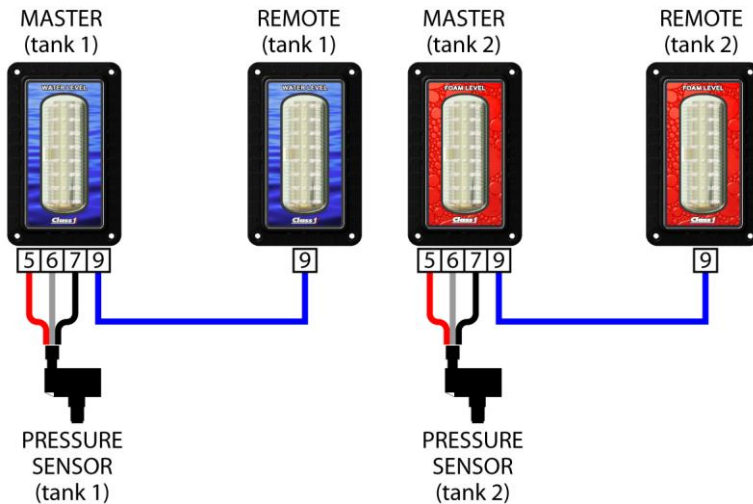
System configured with 1-wire communication method.   Make certain that the two MASTER 1-wire data lines are not connected and that the ground for each display is tied to a common point or the REMOTE displays will not receive communication data from their associated MASTER display.

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6.3.3.   CAN method, 1 MASTER and 2 REMOTES

System configured with CAN communication method.   This example shows one MASTER display (configured with address 1) communicating with 2 REMOTE displays (configured with address 1).

Two CAN terminating resistors (p/n DT06-3S-P006) are required in the system (one at each end of the CAN bus).

6.3.4.   CAN method, 2 MASTERS and 2 REMOTES
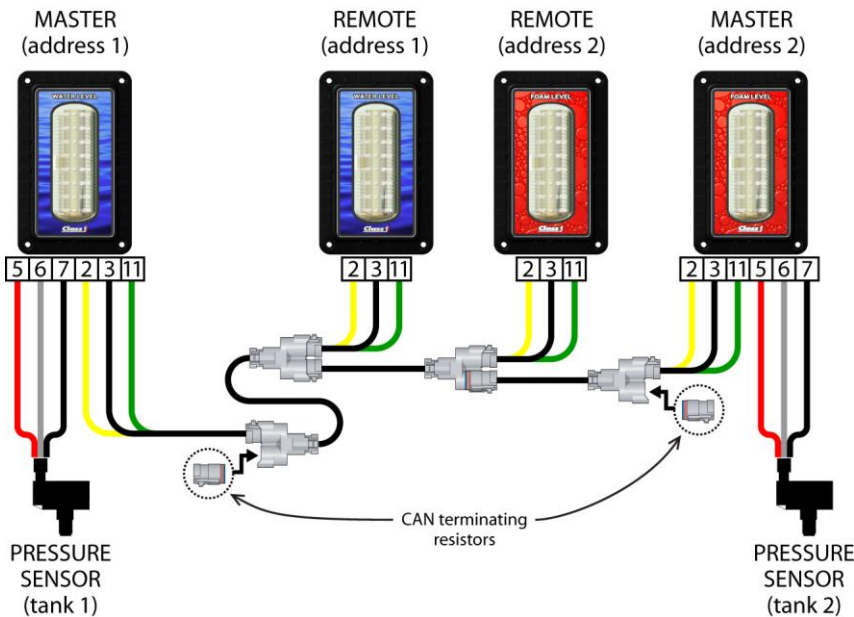
System configured with CAN communication method.   This example shows two MASTER displays (configured with address 1 and address 2) communicating with 2 REMOTE displays (configured with address 1 and address 2). REMOTE display address 1 only follows the indications of MASTER display address 1, and REMOTE display address 2 only follows the indications of MASTER display address 2.

Two CAN terminating resistors (p/n DT06-3S-P006) are required in the system (one at each end of the CAN bus).
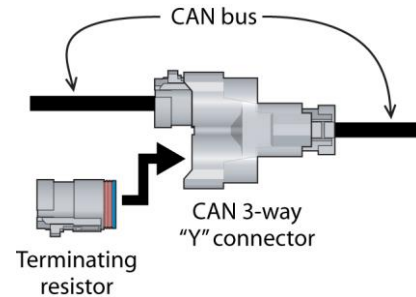
6.3.5. Terminating resistor requirement (CAN communication)

Two terminating resistors (120 Ohm) are required on the CAN bus for proper operation (one at each end of the CAN bus). Only two terminating resistors are allowed on a CAN bus.

Terminating resistor   p/n DT06-3S-P006

CAN 3-way "Y" connector   p/n DT04-3P-P007

6.4. Communication compatibility with Class 1 products

The ITL40 display is compatible with other Class 1 CAN and 1-wire products.

6.4.1. 1-wire compatibility

An ITL40 display configured with 1-wire communication is compatible with…

- 4 light remote driver module (p/n 106877)
- Pump input sensor module (p/n 111097)
- Mini remote driver module (p/n 112648)
- Mini remote dash gauge (p/n 112649)
- 4 and 5 light ITL displays (p/n 106299, 106296, 108858, 108859, 113739, 114378, 114005, 114379)

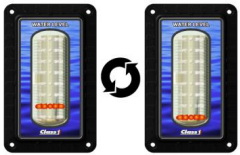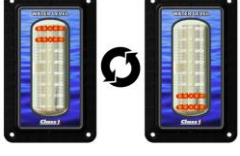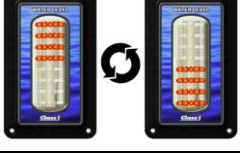### 6.4.2. CAN compatibility

An ITL40 display configured with CAN communications is compatible with…

- Command Master (p/n 111084, 111085, 111086)
- Pump input sensor module (p/n 111097)
- 4 and 5 light ITL displays (p/n 113739, 114378, 114005, 114379)

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7.   Troubleshooting

7.1.   Evaluation table

Condition	Visual	Evaluate
Bottom two LEDs rows alternate flashing. Signal voltage too low (less than 0.4 V).		Check sensor wiring. Ensure +5V at pin A, ground at pin B and at least 0.4V at pin C (Signal). Use password **LLRR LLRR** to view sensor voltage on display.
Top two LED rows alternate flashing. Signal voltage too high (greater than 4.8V).		Check sensor wiring. Ensure +5V at pin A, ground at pin B and no more than 4.8V at pin C (Signal). Use password **LLRR LLRR** to view sensor voltage on display.
Middle two LED rows alternate flashing. Memory error.		Perform self test **RLLR LLRR**. If it shows "MEM-FAIL" replace display, otherwise recalibrate or reset as REMOTE.
Outer two LED rows alternate flashing. Invalid calibration.		Try to recalibrate. If condition remains, check if the sensor signal voltage (pin C) changes as tank level increases. If it doesn't, replace sensor. If it does, verify depth of tank. It may be impossible to calibrate a tank with a depth of less than 6 inches.
Bottom four and Upper four LEDs rows alternate flashing. Not receiving data.		The display is configured as a REMOTE. Recalibrate if a MASTER is required. If the display is supposed to be a REMOTE check communication data lines for continuity.
No LEDS on.		Check power (Pin 1) and ground (Pin 12) connection.
Master Tank level unit does not change when actual tank level is changing.	No picture	Check sensor wiring. Ensure sensor signal voltage (Pin C) is varying. If it does, check for same signal changes at Pin 6 of tank level connector (if it is not the same - repair wiring). If signal is good at both locations try re-calibrating.
Remote Tank level unit does not follow Master display.	No picture	Perform self test. If self test is good, verify communication data lines for continuity. Insure 1-wire data line is not routed near noisy power or RF sources.

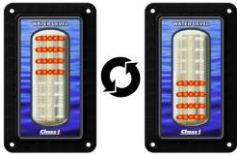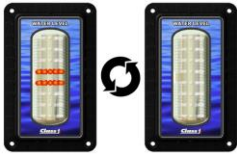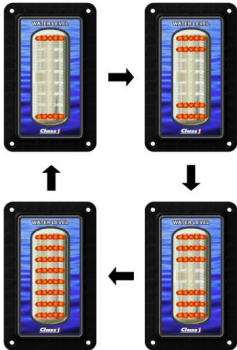|			SUITABLE FOR EXTERNAL DISTRIBUTION		PAGE	25 of 27

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Condition	Visual	Evaluate
No passwords are accepted.		If the display flashes "X" four times after entering a password, insure the display is installed right side up. During power-up the display should turn on all LEDs and then cycle them OFF starting with the top row, then the display should scroll the custom greeting from right to left. Check that the left and right magnetic switches are recognized by activating each switch and verifying that the associated LEDs illuminate.
The bottom four LED rows are on and occasionally they go out and the top four LED rows flash and then return to the bottom four LED rows on (or vice-versa). (REMOTE).		Check for large noise spikes on the 1-wire data line. Insure that the display's ground potential is the same as the MASTER's. Insure that the data line is not chaffed and making contact with other electrical wires.
The points calibrated seemed to have changed.	No picture	Check the pressure sensor for problems. Recalibrate the display and take a voltage reading from the sensor (pin 6 on the display's connector) at each calibration point. When the calibration points again look wrong check the voltages at those points and determine if they are the same as the voltage reading taken during calibration – if they are not then replace the sensor.
Unit will not dim display.	No picture	Insure the Dim input voltage on Pin 4 is at least 9V. Recalibrate dim setting (**RLLR LLLR**). If display does not dim LEDs while in the dim configure mode, replace display.
The middle two LED rows are flashing together.		A calibration was started on the display but not completed correctly. Set the display to a REMOTE display (**LRLR LRLR**) or calibrate it as a MASTER (follow calibration steps exactly).
LEDs cycle ON toward the center continuously.		The display has had a unit type memory error. Attempt to set the display back to REMOTE or MASTER as required. Replace the display if this error cannot be corrected.

7.2. Using the display to verify pressure sensor signal voltage

The display can show the voltage level that it detects on the pressure sensor signal line by entering the password **LLRR LLRR**.
The display will then scroll the text "VOLTS" and then continue to scroll the voltage detected at pin 6.

The display will continue showing the voltage until either of the magnetic switches is activated.

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8.   Glossary

1-wire   Proprietary communication method that uses only one wire for data transfer.

C1   Class 1

CAN   Controller Area Network. SAE J1939 communication method.

EEPROM   Electrically Erasable Programmable Read-Only Memory. The memory of the tank level display, used to store the display information (tank level points, display type, dim value, etc).

ESD   ElectroStatic Discharge.

Foam A   Class "A" type foam used when fighting fires where the cooling effect of water is of prime importance in extinguishing (wood, paper, etc.)

Foam B   Class "B" type foam used when fighting fires involving flammable liquids where blanketing or smothering effect of water is of prime importance in extinguishing (gasoline, etc.)

IP   Ingress Protection (IP 67, etc).

ITL   Intelli-Tank Level. Class 1's 4 and 5 light tank level display.

ITL40   Intelli-Tank Level 40. The tank level display.

LED   Light Emitting Diode. The lights on the display used to show tank level and information.

MASTER   Master display. The tank level display wired to the sensor. This display transmits data to other remote displays.

NPT   Normal Pipe Taper. Pipe thread specification.

OEM   Original Equipment Manufacturer.

PCM   Pump Control Module. Class 1 module p/n 111097.

P/N   part number

PSI   Pounds per Square Inch. Pressure measurement.

REMOTE   Remote display. A tank level display that receives data from the master unit. The remote display will only display what the master display commands.

SAE   Society of Automotive Engineers.

Sensor   The pressure sensor.

System voltage The normal power level used by the system or vehicle. This voltage level will normally come from the vehicle's battery and charging system (vehicle ignition, vehicle power, etc.)

TBD   To Be Developed.

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9. Technical details

9.1. Technical details

Product category	ITL40 (Intelli-Tank Level 40)
Voltage range	+9VDC…+32VDC
Power consumption	
@13.8VDC (25ºC)	100 mA
@27.6VDC (25ºC)	52 mA
Operational temperature range	-40ºC…+85ºC
Environmental range	IP 67
CAN specification	SAE J1939 proprietary, 250 Kbits/second
1-Wire specification	Class 1 proprietary, 425 bits/second
Output	Protected .250 Amp Ground output
Protection	Internal thermal fuse
	Reverse voltage protection (pins 1 and 12 of connector)
	CAN buses protected to 24V
	ESD voltage protected to SAE J1113 specification for heavy duty trucks
	Transient voltage protected to SAE J1113 specification for heavy duty trucks
Dimensions (W x H x D) in inches [mm]	3.185 [80.90] x 5.125 [130.17] x 2.150 [54.61]
Weight in ounces [grams]	7.9 [223.96]

9.2. WEEE (Waste of Electrical and Electronic Equipment) directive

This symbol [crossed-out wheeled bin WEEE Annex IV] indicates separate collection of waste electrical and electronic equipment in the European Union countries.
Please do not throw the equipment into the domestic refuse.
Each individual European Union member state has implemented the WEEE regulations into national law in slightly different ways. Please follow your national law when you want to dispose of any electrical or electronic products.

More details can be obtained from your national WEEE recycling agency.

9.3. CE statement

This device complies with the European Regulations for Electromagnetic Compatibility (EMC) of the European Union and it is equipped with the CE mark. This unit must be used in accordance with the details specified within this manual.

Class1
Unit of IDEX Corporation
607 NW 27th Avenue
Ocala, FL 34475 U.S.A
Phone: 1.800.533.3569 • 352.629.5020
Fax: 1.800.520.3473 • 352.629.2902
www.class1.com

Class1 IDEX CORPORATION 607 NW 27th Ave Ocala, FL 34475 Ph: 352-629-5020 or 1-800-533-3569 Fax : 352-629-2902 or 1-800-520-3473	SUITABLE FOR EXTERNAL DISTRIBUTION **OPERATION MANUAL**			PAGE	28 of 27
				DATE	6/12/2019
	PRODUCT GROUP	ITL40	P/N	118404-XX	REV	1.30
	PRODUCT	Intelli-Tank Level 40			BY	AMS

10. 板料信息声明 (RoHS 声明) – Declaration Information Sheet (RoHS Declaration)

10.1. 产品中有毒和有害的物质或成份的名称和含量 – (NAMES AND CONTENTS OF THE TOXIC AND HAZARDOUS SUBSTANCES OR ELEMENTS IN THE PRODUCTS)

Class1 is committed to comply with the Management Methods on Control of Pollution from Electronic Information Products of China (China RoHS). The RoHS Directive restricts substances including lead (Pb), mercury (Hg), Cadmium (Cd), hexavalent chromium (CrVI) and certain halogenated flame retardants such as polybrominated biphenyls (PBB) and polybrominated diphenyl ethers (PBDE) in electrical and electronic equipment.

零件名称 Parts	有毒和有害的物质或成份 TOXIC AND HAZARDOUS SUBSTANCES OR ELEMENTS					
	铅 (Pb)	汞 (Hg)	六价铬 (CrVI)	多溴联苯 (PBBs)	多溴二苯醚 (PBDEs)	镉 (Cd)
基准 Base	O	O	O	O	O	O
盒子 Box	O	O	O	O	O	O
镀层 Coating	O	O	O	O	O	O
面板 Faceplate	O	O	O	O	O	O
标签 Label	O	O	O	O	O	O
透镜 Lens	O	O	O	O	O	O
印制电路 PCB	X	O	O	O	O	O
元器件 Components	X	O	O	O	O	O
连接器 Connector	O	O	O	O	O	O
密封垫 Gasket	O	O	O	O	O	O
螺钉 Screw	O	O	O	O	O	O

○ ：表示该有毒有害物质在该部件所有均质材料中的含量均在SJ/T 11363-2006标准规定的限量要求以下。

○ : Indicates that this hazardous substance contained in all homogeneous materials of this part is below the limit requirement in SJ/T 11363-2006.

✕ ：表示该有毒有害物质至少在该部件的某一均质材料中的含量超出SJ/T 11363-2006标准规定的限量要求。

✕ : Indicates that this hazardous substance contained in at least one of the homogeneous materials of this part is above the limit requirement in SJ/T 11363-2006.

除非另外特别的标注,此标志为针对所涉及产品的环保使用期限标志.此环保使用期限只适用于产品在产品手册中所规定的条件下工作.

The Environment-Friendly Use Period (EFUP) for all enclosed products and their parts are per the symbol shown here, unless otherwise marked. The Environment-Friendly Use Period is valid only when the product is operated under the conditions defined in the product manual.