FINCH 5332

Level Monitor

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titan logix corp.

At Titan Logix Corp., we endeavour to design equipment that is simple to use and reliable in its operation, with the aim of satisfying our customers' needs.

Titan Logix Corp. fields of experience include:

- Level and Flow Measurement
- Transport Instruments
- Burner and Combustion
- Communication and Control System Integration and
- Drilling Fluid Monitoring

We have been designing and manufacturing electronic equipment since 1980. Titan Logix Corp. unites four companies – each a leader in different segments of the oil and gas industry:

- Titan Technologies
- Nagy Burner Control (NBC)
- Sherrex Systems
- Alberta Industrial Technologies (AIT)

Titan Logix Corp. sells and markets worldwide through subsidiaries, distributors, and representatives. Through continuous improvement, we are striving to provide our customers with first-rate sales information, engineering assistance, and after-sales support.

For more details on our products and services, please contact us and we will provide you with a listing of the offices or representatives near you.

TDR Level Products

WARRANTY STATEMENT

WARRANTY: Titan Logix Corp. warrants equipment of its own manufacture to be free of defects in materials and workmanship for a period of: see below. Titan Logix Corp.'s sole obligation hereunder shall be expressly limited to exchange or repair free of charge, F.O.B. Edmonton, Alberta, Canada, of such defective equipment (alternatively, Titan Logix Corp. will, at its option, refund the purchase price). Titan Logix Corp.'s obligation under this warranty is limited to the above and does not apply to exchange or repairs as the result of improper installation, misuse, maladjustment, abnormal operating conditions, or lack of routine maintenance. Nor does the warranty include the furnishing of service for maintenance or problems arising from the foregoing causes. No claims for labor, installation, removal, transportation or other expense will be recognized. Notwithstanding any stipulation of the purchaser to the contrary, all other obligations, representations, warranties or conditions of merchantability, quality or fitness are hereby excluded and Titan Logix Corp. shall not be liable for any loss, costs or damages, of any kind whatsoever, whether consequential, indirect, special or otherwise, arising out of or in connection with the equipment or any defect therein, even if caused by the negligence of Titan Logix Corp., its employees or agents. The provisions hereof relating to the warranty and limitations of liability shall continue to be enforceable between the parties notwithstanding termination of the written agreement for any reason including fundamental breach. Equipment not of Titan Logix Corp. manufacture will carry the vendor's or manufacturer's standard warranty.

The TD80 Level Transmitter mechanical portion in the tank and its enclosure used in transportation applications are warranted against defects for one (1) year from the date of installation with the exception of failure due to corrosion of the wetted parts exposed to the customer's tank contents. It is the responsibility of the customer to assure chemical compatibility with the wetted parts (coming in contact with tank liquids or gases). Titan Pacific Resources Ltd. will provide a list of the probe wetted materials. Probe failure from corrosion is not covered by this warranty. The FINCH 5332 Display and all electronics supplied by Titan Logix Corp. are warranted for a two (2) year period. The FINCH 5332E external display is warranted for two (2) years if protected from road hazards. The warranty is valid only if the probe is installed in accordance with the instruction manual provided, the truck has baffles and the probe is inserted into a Titan Logix Corp. approved stationary cone (see instruction manual) at the bottom of the tank to limit probe travel. The warranty is not valid if the gauge is damaged by foreign objects such as ice or if the probe is mounted in the inlet stream.

Table of Contents

Introduction

About This Manual

This instruction manual provides information specific to the Titan Logix Corp. Finch 5332/5332E Level Monitor. Other peripheral equipment should be supplied with its own instruction manual and that manual should be referred to for proper operation of the peripheral equipment.

It is essential that this manual be read and understood for proper installation and operation of your Finch 5332 Level Monitor.

This manual includes:

INTRODUCTION:	Briefly describes the key features of the Finch 5332 Level Monitor.
INSTALLATION:	Detailed description of mounting and wiring of external equipment.
OPERATION:	Describes the startup sequence, calibration, and operation of the Finch 5332 Level Monitor.
TROUBLESHOOTING:	Describes several quick problem solving techniques.
SPECIFICATIONS:	Describes the physical and operational characteristics.
TECHNICAL REFERENCE:	Describes the communication protocol used between the Finch Display and the transmitter head.

About the Finch 5332 Level Monitor

The TD80 system is designed for use in fluid measurement applications. The Finch 5332 Level Monitor receives information from the TD80 Level Transmitter and displays it in an easy to read form. The Finch is available in two forms, the Finch 5332 is a compact internal display while the Finch 5332E is a larger external display with a NEMA 4X enclosure. Both units operate in the same manner and will be referred to in this manual as the Finch Display. Clarification will only be made when the two units differ.

Please refer to the INSTALLATION section of this manual for directions on how to connect and set up the Finch Display.

Main Features

Enclosure:	**5332** Compact flame retardant ABS
	5332E NEMA 4x flame retardant fiberglass
Input/Output:	SVbus level information input with optional remote alarm acknowledge and PTO switch control. Four digit LED level display output with three alarm relays, horn circuit OK LED, and SVbus communications LED.
Reliability:	Built using industrial specified components to ensure long life and reliability even in harsh conditions.
Programming:	The Finch Display has two user programmable parameters. The Decimal point location is set through the use of jumpers inside the unit's case, and the level at which the fill / fall alarm is set is programmed through the two face plate buttons. Strapping tables, High High (HH) alarm, and Fail alarm levels are programmed directly into the level transmitter.

Installation

Installation should only be performed by qualified personnel, and in accordance with local governing regulations.

Environmental

Choose a mounting location suited to the Finch Display enclosure.

The ideal Finch 5332 mounting location is where the:

1. Display sheltered from the weather.
2. Display is out of direct sunlight.
3. Display is easily visible, and within reach of the operator.
4. Ambient temperature is always within -40ºC to +65ºC (-40ºF to +149ºF).
5. Wiring is easily accessible.

Avoid mounting locations where the Finch 5332 is:

- Exposed to the elements.
- In direct sunlight.
- Close to high voltage/current runs, contactors, SCR control devices, or frequency inverters.

The ideal Finch 5332E mounting location is where the:

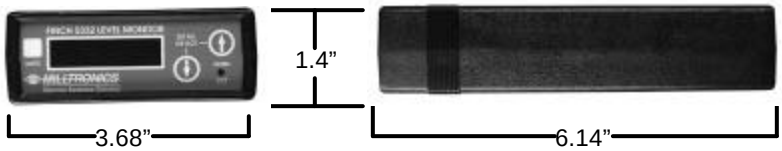
1. Display is out of direct sunlight.
2. Display is easily visible, and within reach of the operator.
3. Ambient temperature is always within -40ºC to +65ºC (-40ºF to +149ºF).
4. Wiring is easily accessible.
5. Display is shielded from wheel spray and stones. (If being used for transport applications)

Avoid mounting locations where the Finch 5332E is:

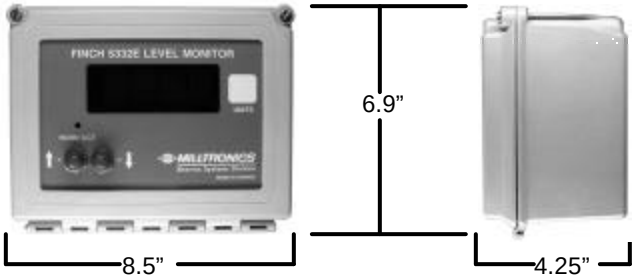
- In direct sunlight.
- Close to high voltage/current runs, contactors, SCR control devices, or frequency inverters.

Outline

Finch 5332



Finch 5332E

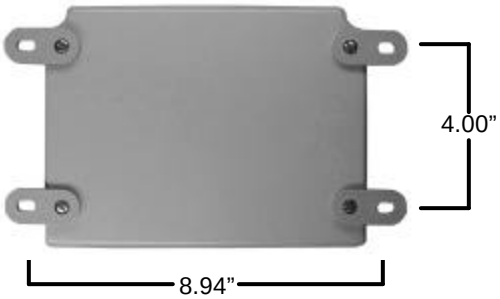


Mounting

The Finch 5332 internal display has been designed to mount using a user fabricated bracket or velcro tape.

The Finch 5332E external display mounts through the use of mounting feet and 10-32 bolts.

Finch 5332E Mounting Dimensions

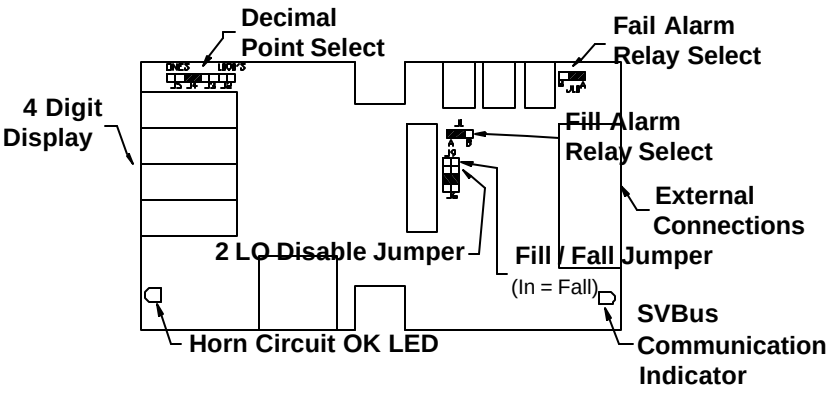


Interconnection

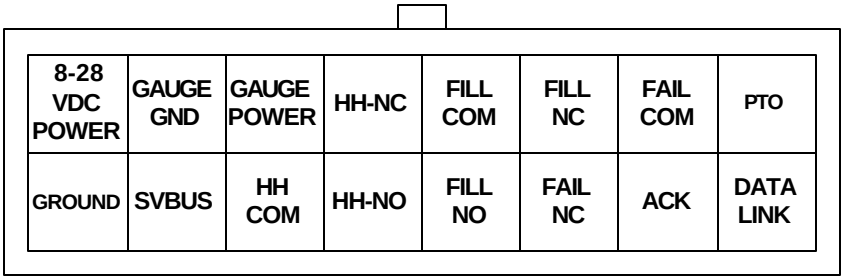
Perform all wiring in accordance with local governing regulations.

Please refer to the diagrams below for the location of the configuration jumpers and the I/O terminals on the Finch Display.

Finch 5332 Internal Display

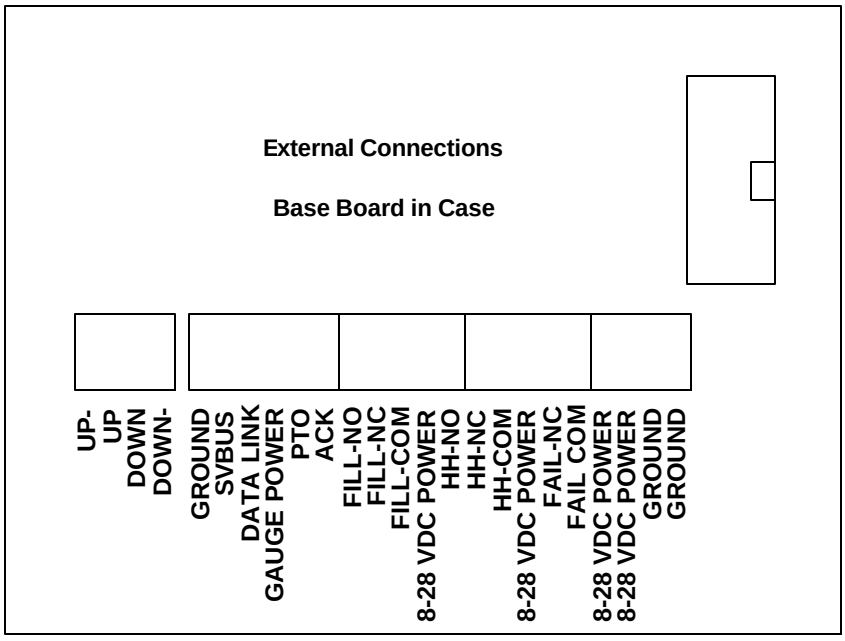


External Connections



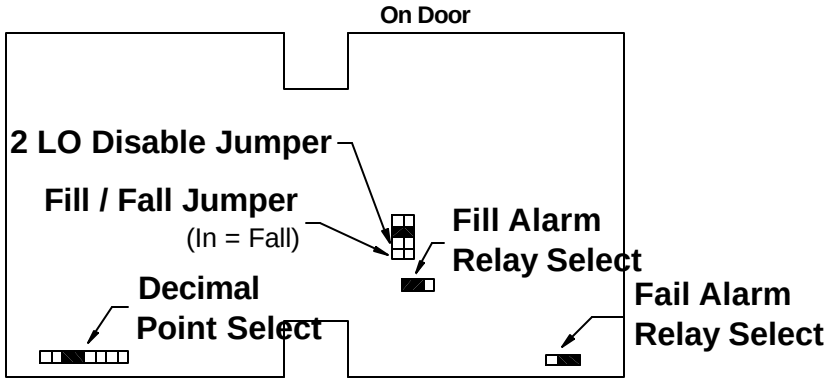
8-28 VDC POWER	GAUGE GND	GAUGE POWER	HH-NC	FILL COM	FILL NC	FAIL COM	PTO
GROUND	SVBUS	HH COM	HH-NO	FILL NO	FAIL NC	ACK	DATA LINK

Finch 5332E External Display



Display Board

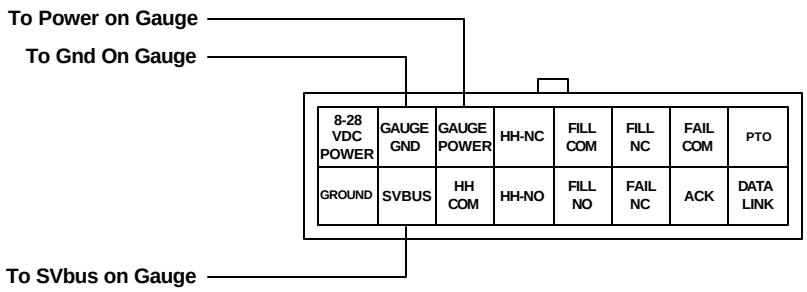
On Door



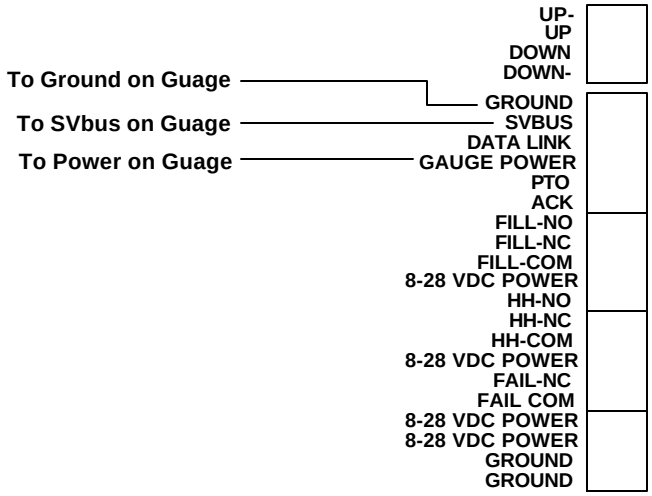
Transmitter Power and SVbus

Power for the TD80 Level Transmitter is provided through the Finch Display and the level is transmitted to the display through the SVbus.

Finch 5332



Finch 5332E

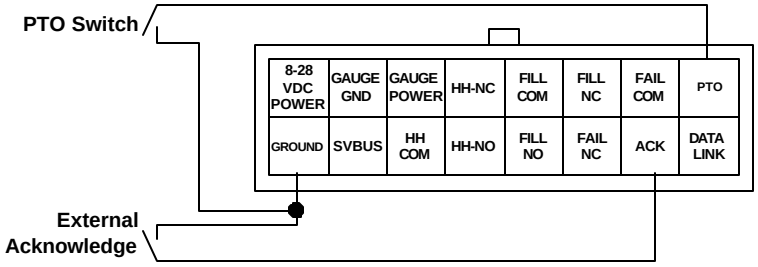


PTO and External Acknowledge

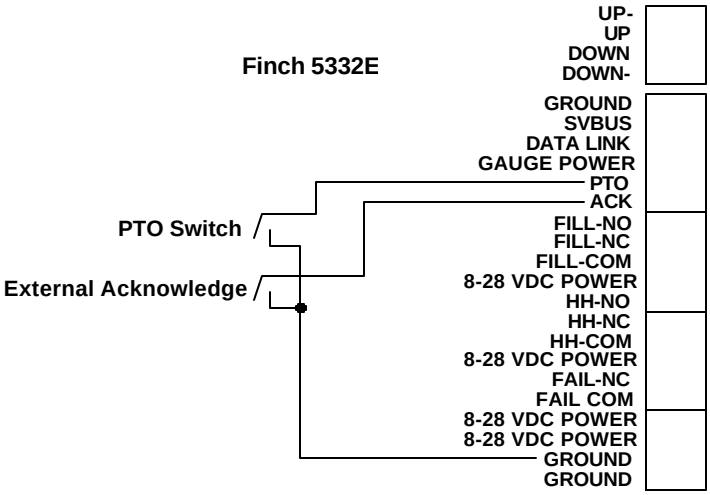
The PTO is used for setting the Finch Display to Monitor Mode. In Monitor Mode the Finch will display and act on all alarms sent by the level transmitter. To set the display to Monitor Mode the PTO needs to be shorted to ground through a PTO switch. If the unit is being used for a stationary system where power consumption is not a large concern the PTO may be jumpered directly to ground to keep the unit in Monitor Mode at all times.

The external acknowledge is used to acknowledge alarms without having to use the buttons on the Finch Display.

Finch 5332



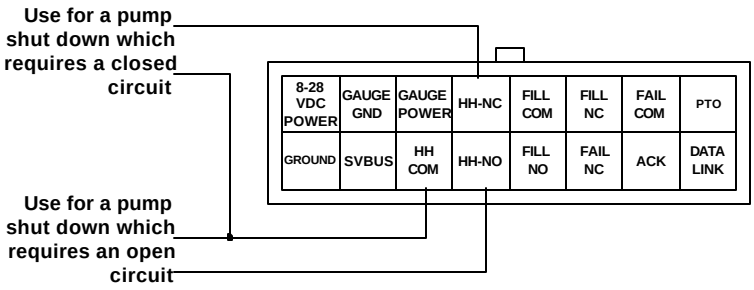
Finch 5332E



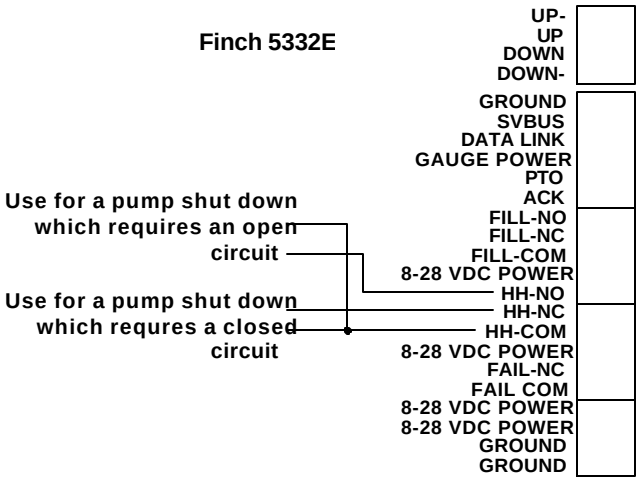
High High Alarm Relay Output

The High High Alarm (HH) level is set in the strapping table which is loaded into the level transmitter. This level indicates a point 8" from the top of the tank. This point is important because the probe and transmitter begin to lose their linear accuracy at this point. This alarm is intended for use as a pump shutdown output to prevent the tank from being overfilled. This relay is normally on and in an alarm state it will turn off. For example: if the pump requires an open circuit to shut down the normally open contact should be used, the contact will be closed when not in an alarm state and will open in an alarm state. This alarm is set up this way for fail safe operation (if the display loses power it will automatically shut down the pump).

Finch 5332

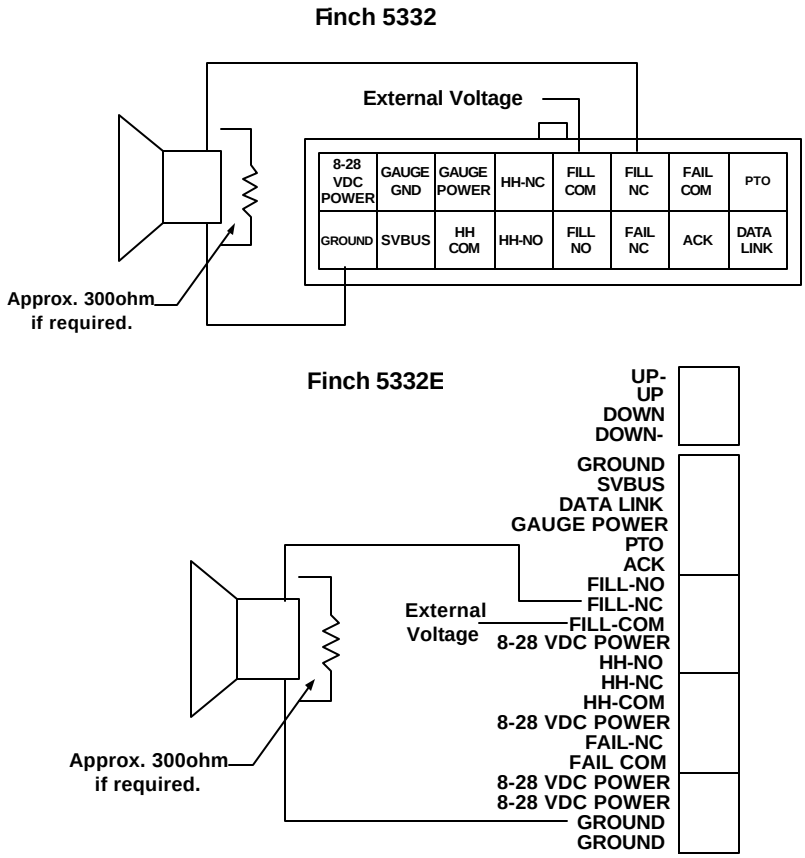


Finch 5332E



Fill Alarm Relay Output

The Fill alarm is a user set level intended to let the operator know when the level in the tank reaches a desired point. It is recommended that a horn or visible indicator be used on this output. The relay is factory set for fail safe operation (normally on, off in alarm state) but this can be changed by moving the Fill Alarm Relay Select Jumper (J1) to the other position. The Horn Circuit OK LED on the front of the display is connected to a circuit which constantly monitors the output. As long as this sensing circuit is seeing a proper path on the output the LED will be on (if using the NC contact, for the NO contact the LED will be off when the circuit is correct). If the horn is too sensitive (makes peeping noises etc.) a resistor may need to be placed across the horn, this resistor should be approximately 300 ohms.



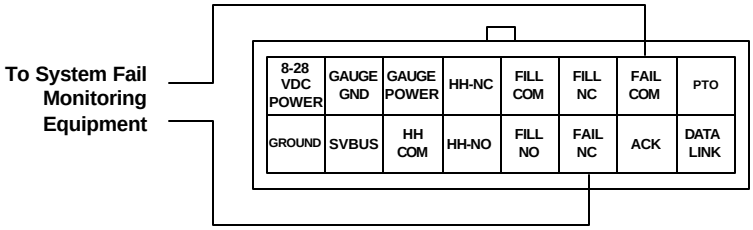
Fail Alarm Relay Output

The Fail Alarm is used to inform the operator when an error state exists in the system, a spill alarm has been set, or communications between the level transmitter and display has been interrupted (see Troubleshooting and Alarms sections for more information). This relay is a dry contact and can be set by the operator to either normally open or normally closed. It is factory set to normally open but may be changed by moving the Fail Alarm Relay Select Jumper (J10) to the other position. This relay is designed for fail safe operation (on when not in an alarm state, off when alarming). This relay is recommended for use in spill protection applications as a

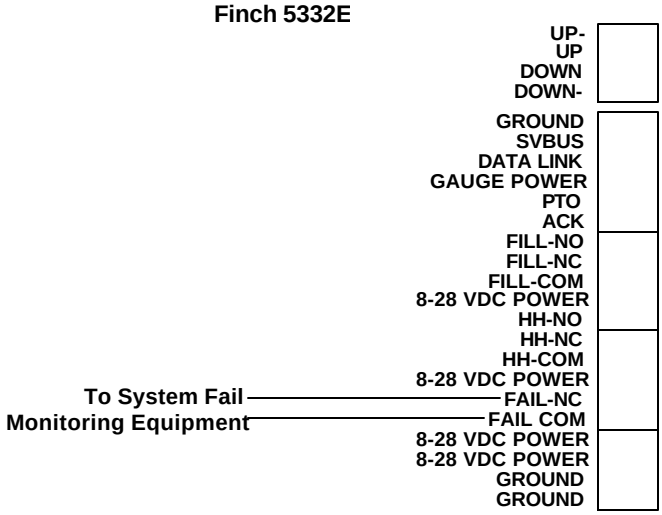
system fail relay and should be connected to a warning device which can alert the operator that an error state is present.

Note: This relay is not designed to take the place of proper process supervision when filling the tank.

Finch 5332



Finch 5332E



Power Input

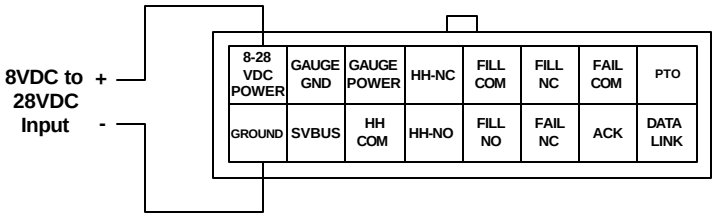
! IMPORTANT !

Before applying power to the Finch Display ensure the supply is set to a voltage the unit can accept, otherwise damage to the Finch Display and Level Transmitter is very likely.

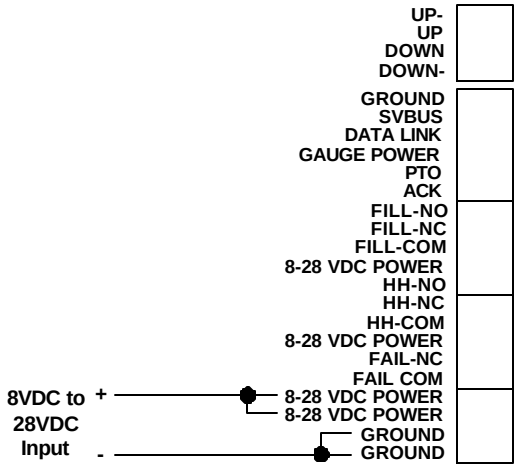
Before applying power to the Finch Display for the first time, ensure any related alarm/control equipment is disabled until satisfactory system operation and performance is verified.

The Finch Display is designed to operate from 8 to 28VDC. For transport applications it is recommended that the unit be powered from the vehicle's accessory power.

Finch 5332E



Finch 5332E



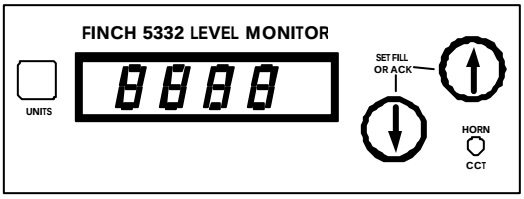
Operation

This section of the manual describes the start up sequence, calibration sequence, and the different modes of operation for the Finch Display. Both the 5332 and the 5332E behave exactly the same. For illustration purposes this manual will show the Finch 5332 but everything in this section applies to the Finch 5332E as well.

The Finch Display constantly receives level information from a level transmitter which is attached to the probe in the tank. The level transmitter contains a strapping table which allows it to convert the measurements it takes into useable units. The data which is sent to the Finch Display does not contain the decimal point information for the level. This is set by the installer through the use of the Decimal Point Select jumper (this requires that the case be opened). The level transmitter also contains the information for the HH Alarm and the Spill Alarm levels. The Finch Display contains the information for the Fill Alarm. This allows the display to be changed without losing any information about the tank itself.

Start Up

When power is applied to the Finch Display the level transmitter is powered as well. The level transmitter will run through a 12 second self diagnostic and test to ensure the information it transmits correct. During the transmitter's diagnostic cycle the Finch Display will run its own self diagnostic. During the diagnostic the Finch Display will show the current software revision number followed by a display test consisting of all four digits showing the values from 0 to 9 and A to F. At the same time as the display test, the unit will test the Fill and Fail relays. The unit will wait 2 seconds, pulse the Fill relay for 1 second, wait for 2 seconds, and pulse the Fail relay for 1 second.



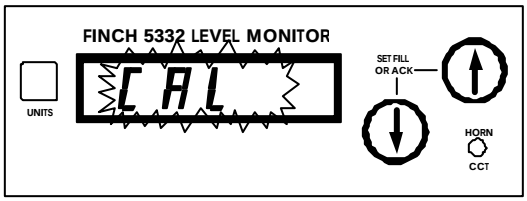
The operator may force the unit into calibration mode (see Calibration section for more information) by pressing either of the front panel buttons while turning the power on. If no button press is registered the unit will enter its normal mode of operation (either Monitor Mode or Off Mode Depending on PTO condition).

Note: If the display diagnostic is completed before the transmitter diagnostic the unit may display four dashes (----) for a few seconds while the transmitter diagnostic completes.

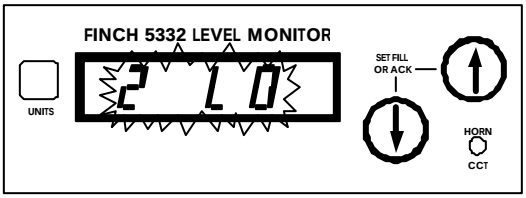
Calibration

In order to perform a calibration on the system a known amount of fluid must be in the tank. This level must be greater than 6 inches or the system will be unable to read the level accurately enough to perform the calibration.

During Start Up the operator may press either of the buttons on the front of the display to enter calibration mode. Upon completion of the self diagnostic cycle the unit will flash CAL for a few second to indicate that it has entered calibration mode.



The unit then reads the level of liquid in the tank and, if the system can read accurately, the current measurement will be displayed. All alarms in the transmitter are cleared at this time. If there is not enough fluid in the tank the display will flash 2 LO. More fluid will need to be added to the tank. Ensure that an accurately known level is in the tank or the calibration will be invalid.

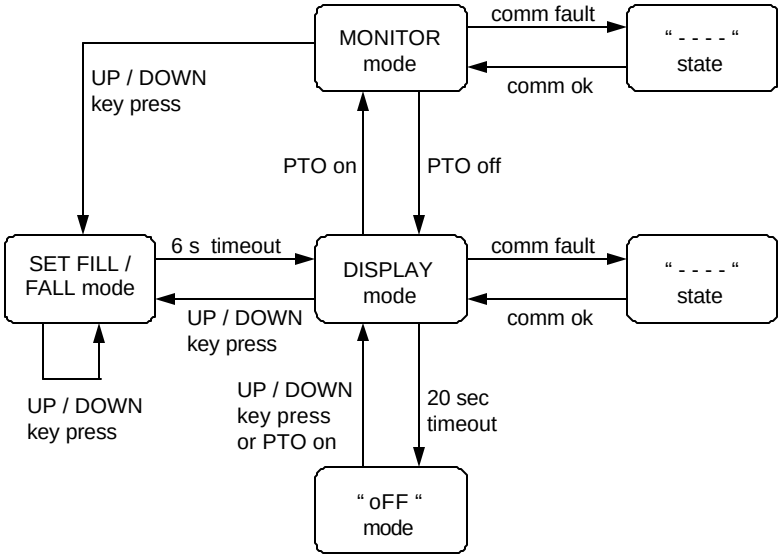


Once a level appears on the display the calibration can be adjusted by pressing the up or down buttons until the display is showing an accurate level. This adjusts the strapping table offset in the transmitter. The transmitter also ensures that the level value at the highest point will not exceed the HH Alarm level. If this point is reached the unit will not allow the operator to continue adjusting in that direction. If this condition is reached the strapping table will need to be adjusted. Please contact your distributor for the adjustment.

Once the display is reading as accurately as possible the unit may be turned off and restarted for normal operation.

Modes of Operation

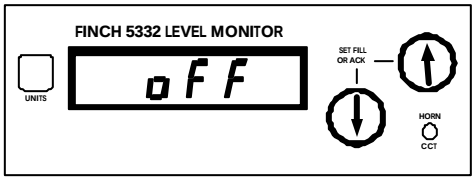
The following diagram illustrates the relationships between the various modes of operation after the start up sequence and calibration are complete.



After the Start Up sequence is complete the Finch Display will enter either Monitor Mode or Off Mode. If the PTO is on the display will go directly into Monitor Mode and will display the current level and act on any alarms. If the PTO is off the unit will go directly into Off Mode. See the mode descriptions below for more information on the various modes.

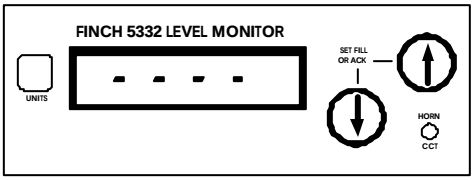
Off Mode

This mode is a sleep mode for the Finch Display. The display does not display the level or act on any alarms. The display shows oFF. To exit Off mode the operator needs to press either button on the face plate to enter Display Mode or turn on the PTO to enter Monitor Mode.

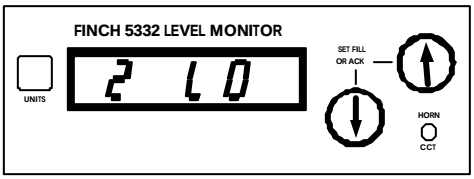


Display Mode

In this mode the Finch display will show the current tank level as well as any errors received from the level transmitter. The unit will remain in Display Mode for 30 seconds before it returns to Off Mode. If the Finch Display does not receive any information from the transmitter for 6 seconds the unit will display four dashes (----) to indicate a communications error.



If the tank level has dropped below 6” the unit will show 2 LO to indicate that the system cannot measure the level accurately. Should the unit have a Spill Alarm set it will display Spill to indicate this. From Display Mode the operator can enter Monitor Mode by turning the PTO on, Set Fill Mode by pressing either button on the face plate, or Off Mode by doing nothing and letting the unit time out.



Monitor Mode

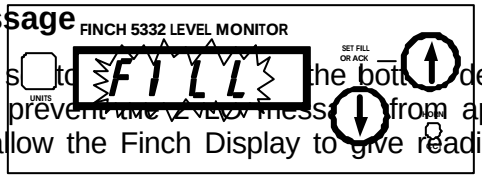
In this mode the Finch Display shows the current level, any error messages, and any alarm information sent by the level transmitter. The unit will act on any alarms it receives. To enter Monitor Mode the PTO must be on. From Monitor Mode the operator can enter either Display Mode by turning off the PTO, or Set Fill / Fall Mode by pressing either button.

As with Display Mode the Finch Display will show the current level and if the level falls below 6" the unit will display 2 LO. If the display does not receive any information from the transmitter for 6 seconds the display will show four dashes (----) and set the Fail Alarm. The Fail Alarm will also be set if the Finch Display receives an error message or a Spill Alarm. The Fill / Fall Alarm and the HH Alarm are also active in this mode and will activate if the conditions are reached. For more information on the alarms please see the Alarms section of this manual.

Set Fill / Fall Mode

Set Fill / Fall Mode can be reached from either Display Mode or Monitor Mode by pressing either of the buttons on the face plate. If the Fill / Fall Jumper is out the display will blink FILL, if the Fill / Fall Jumper is in the display will blink FALL. After a few seconds the display will show the current Fill or Fall setting. The current setting can then be adjusted up or down by pressing the appropriate button on the face plate. Each button press changes the level by one unit while holding the button down will change the level by tens of units. The fill level is prevented from exceeding the HH Level through software. After 5 seconds of inactivity the Finch Display will revert to either Display Mode or Monitor Mode depending of the state of the PTO.

Disabling the 2 LO Message



The Finch display can be set to read below the bottom dead band by installing the 2 LO Disable Jumper. This will prevent the 2 LO message from appearing on the display, When installed this jumper will allow the Finch Display to give readings all the way to the shorting block.

Note: It is not recommended that the unit be operated in this state. The readings below the bottom dead band are being measured in the non-linear portion of the probe. These readings can not be counted on for accuracy.

Alarms

When the Finch Display is in Monitor Mode the unit will respond to the various alarm states which may occur. There are four alarm states associated with three relays. The Spill and HH Alarms are controlled by the level transmitter only, the Fail alarm is controlled by the level transmitter primarily but may be set by the display if communications are lost, and the Fill / Fall Alarm is controlled by the Finch Display only. All alarm levels have a built in hysteresis to prevent false tripping during the load procedure. The Finch Display has a built in alarm log which will record each occurrence of a HH or Spill alarm. The Fill / Fall and Fail alarms are designed for fail safe operation, this means that should the Finch Display lose power the Fill and Fail relays will both go into their alarm states.

Note: The Finch Display will not allow the user to switch operating modes until all alarms have been acknowledged.

Fill / Fall Alarm

The Fill / Fall Alarm level is an operator entered value for use in filling or draining the tank to a predetermined level. This alarm is associated with the Fill Alarm Relay. The Fill Alarm Relay is a powered relay intended for use with a horn or visible indicator. When the fill / fall level is reached the alarm is set and the relay is activated. The Fill / Fall Alarm will persist until it is acknowledged. To acknowledge the alarm the operator needs to press one of the buttons on the front of the display or the External Acknowledge button (if installed).

High High Alarm

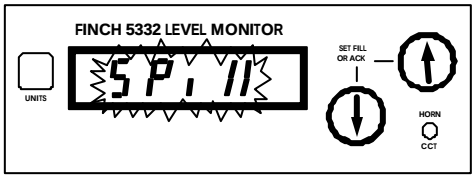
The High High Alarm (HH) level is set in the strapping table in the transmitter. This level is always set to 8" below the top of the tank, this is where the probe and transmitter begin to lose their linear accuracy. This alarm is associated with the HH Alarm relay, this relay is intended to be used as a pump shut down. When the HH Alarm trips the HH Alarm relay is activated, the display will begin flashing, alternating between the current level and HH, and the occurrence of the alarm is recorded in the alarm log. To acknowledge this alarm the operator must either press the External Acknowledge button (if installed) or press the buttons on the front in the following order: *up - up - down - up*. If the Fill / Fall Alarm and the High High Alarm are both set at the same time they can both be acknowledged at the same time by pressing the External Acknowledge button.

Fail Alarm

The Fail Alarm lets the operator know when a system error has occurred. This alarm is associated with the Fail Alarm relay. This alarm will activate the relay if an error message is received from the level transmitter, the Finch Display does not receive any communications for 6 seconds, or a Spill Alarm is set. This alarm is self resetting, when the cause of the alarm is gone so is the alarm. For example if the unit does not receive any communications for 6 seconds the alarm will be set, but if a communication is received 1 second later the alarm will reset itself. No acknowledgment is required for this alarm, nor is this alarm recorded in the alarm log.

Spill Alarm

The level for the Spill Alarm is set in the transmitter software. This level is set to approximately 6” from the top of the tank. This alarm has no relay associated directly with it but it is counted as a system error and therefore sets the Fail Alarm. When the Spill Alarm level is reached the display will flash Spill, set the Spill bit in the Transmitter, and record the alarm in the alarm log.



The only way to reset the Spill alarm is to either pump out fluid until the level is below the HH Alarm level, or to put the unit into Calibration Mode. If the Finch Display and level transmitter are not powered while the fluid is pumped out the Spill Alarm will *not* be reset.

Error Messages

The level transmitter is constantly performing error checking routines on the system. Any errors which are detected are coded and sent to the Finch Display which displays them in the form of E_xx (where xx is the two digit error code). These errors can assist in diagnosing any problems which may occur in the use of the system. The error codes, their meanings, and possible solutions are as follows:

Error	Meaning	Possible Solution
E_00	Can't autorange (Could not measure level)	Ensure the probe is not bowed or bent in any way. Move the probe to a location where there is less turbulence, or use a stilling well around the probe. Possible transmitter internal error.
E_01	Too many samples rejected. (Too much turbulence)	Move the probe to a location with less turbulence. Try using a stilling well around the probe.
E_02	Wrap around on Timer 1.	Internal transmitter error.
E_04	Timer 1 count is too large.	Internal transmitter error.
E_10	Time out between captures.	Internal transmitter error.
E_20	No fiducial detected.	Internal transmitter error Possible faulty probe Possible turbulence in the tank. If the problem persists, try using a stilling well around the probe.
E_40	Watchdog reset.	Internal transmitter error. If problem persists, contact your distributor.
E_80	HH Alarm level set too close to Spill Alarm level	Contact your distributor for adjustment to the strapping table.
E_81	Alarms set, No strapping table. *Transmitter is not suitable for use.*	Contact your distributor for programming of the strapping table.
E_83 or E_84	An error was detected in the strapping table during operation.	Restart the system. If the problem persists, contact your distributor.

Error codes 01, 02, 04, 10, 20, and 40 can be combined if there is more the one error at a time, for example E_26 would be E_02 + E_04 + E20. E_80 to E_84 will not be combined with any other error.

Troubleshooting

Problem	Possible Solution
Horn Circuit OK LED is not on.	1. Check that the horn is wired properly. 2. Replace the fuse for the horn 3. Replace the horn
Horn Circuit OK LED is blinking. Or Faint beeping coming from horn.	1. Check that the horn is wired properly. 2. Check for loose wires. 3. Place a 150ohm to 500ohm resistor across the horn 4. Replace the horn with a less sensitive one.
Display does not turn on.	1. Check that the input power fuse is not blown. 2. Check that the power is wired correctly. 3. Check for loose wires.
Only the decimal point appears on the display.	1. The display is faulty, replace it.
Display shows only ”- - - -“	1. Communications between the level transmitter and the display have been interrupted. 2. Check the wiring between the display and transmitter. 3. Possibly a faulty level transmitter
Display registers highest level point all the time, even when empty.	1. Tank has been over filled, pump out excess fluid immediately. 2. Reset the Spill bit in the transmitter. (see Spill Alarm section of this manual)
Large offset or error.	1. Unit may be faulty or strapping table is incorrect, contact your distributor.
Display shows “2 LO” during calibration	1. Power down the system, add more fluid to the tank. 2. Recalibrate. (see Calibration section of this manual)
Display show “SPill”	1. Tank has been over filled, pump out excess fluid immediately. 2. Reset the Spill bit in the transmitter. (see Spill Alarm section of this manual)

Specifications

Finch 5332/5332E Level Monitor

Application:	For use with Titan Logix Corp. TDR Level Transmitters
Power:	8 to 28VDC 1A max. current limited
Ambient Temperature:	-40ºC to +65ºC (-40ºF to +149ºF)
Humidity:	5% to 95% non-condensing
Inputs:	Up and Down buttons on front of case, external connections for PTO and External Acknowledge, SVbus for level information
Outputs:	Alarm relay contacts, CSA, UL rated to 2A at 30VDC
Alarm Hysteresis:	
HH Alarm:	3.5% of Strapping Table Probe Length
Fill / Fall Alarm:	3% of Strapping Table Probe Length
Communications:	SVbus (see Technical reference for details)
Accuracy:	1 digit, 1/9999 counts (depending on strapping table resolution)
Program Memory:	Program memory stored in OTP EPROM, parameters and event log stored in Non-Volatile EEPROM
Enclosure:	
5332:	Hammond 1598RABK flame retardant ABS instrument enclosure
5332E:	Hoffman A-864CHSCFGW NEMA 4X flame retardant fiberglass
Approvals:	FCC Part 15 Class A CSA, NRTL/C Special Inspection on 5332E only
Recommended Parts:	
PTO Switch:	HOBBS 76046 60 N (actual pressure value and contact rating may vary by application)
Fill Level Buzzer:	Back-A-Larm Model 230 97dB(A) 12VDC, Made by Preco Inc.

Technical Reference

Communications

The TDR level monitoring systems use the Titan Pacific Resources Ltd. proprietary SVbus communications. The Svbus is an open drain communications bus which can communicate up to 45m with unshielded cable and up to 500m using shielded, twisted pair cable with both ends terminated using100-170 ohm termination resistors between the SVbus and Svpower.

Protocol

Each data field of the SVbus message contains one or more bytes of ASCII binary code. Each byte contains 1 start bit, 8 data bits, 1 stop bit, and no parity. The data transmission rate is 1200 bits per second. The length of the data fields, “r” frames, is fixed at 10 bytes.

Data Field Descriptions

'r' Frame

Level Packet used to transmit level from the transmitter to the Finch Display:

Byte	Example	Description
0	'r'	Lower case r for reply to a READ command (which was not sent by the Finch Display since the transmitter sends data automatically). This is for compatibility with older systems.
1	0x01	A constant value of 0x01 which is the gauge number (in hex format).
2	0x0B	Register number where the transmitted value was read from (in hex format).
3,4		2 binary digits of the result (max. number is 9999), MSB first
5	0x40	One byte of 8 binary bits coding alarm relay settings and various flags: (lsb) bit 0 HH Relay bit 1 Fail Relay bit 2,3,4,5 Spare bit 6 First 6" indicator bit 7 Overfill indicator
6,7		Strapped HH level, 2 bytes of binary data of the result sent MSB first. This will be used be the Finch Display as the upper limit when verifying operators setting for Fill point (in binary format).
8	0x2A	MSB of 16 bit checksum of this data packet, binary.
9	0xDC	LSB of 16 bit checksum of this data packet, binary. Checksum is calculated on all data as 2's compliment of the actual sum (0-sum).

'L' Frame

Calibration command data packet sent by Finch Display to level transmitter during Calibration Mode:

Byte	Example	Description
0	'L'	Upper case L for reply to a CAL command.
1	0x01	A constant value of 0x01 which is gauge number (in hex format).
2	0x0B	Register number (OFFSET_LSB) where the transmitted value has to be added to (in hex format).
3,4		2 binary bytes of data (0, -1, or 1) MS byte first.
5,6,7		3 dummy bytes of 0x00 to fill the frame
8	'0'	MSB of 16 bit checksum of this data packet, binary
9	'C'	LSB of 16 bit checksum of this data packet, binary. Checksum is calculated on all data as 2's compliment of the actual sum (0 - sum).

‘l’ Frame

Calibration command data packet send by the level transmitter to Finch Display during Calibration as a reply to 'L' frame:

Byte	Example	Description
0	‘l’	Lower case 'l' for reply to a CAL ‘L’ command (which initially was not issued by Finch Display since the level transmitter gauge sends data automatically)
1	0x01	A constant value of 0x01 which is gauge number (in hex format).
2	0x0B	Register number where the transmitted value was read from (in hex format).
3,4		2 bytes binary data of the result (max. number is 2^16-1) send MSB first.
5	0x40	One byte of 8 binary bits coding alarm relay settings and various flags: (lsb) bit 0 HH Relay bit 1 Fail Relay bit 2,3,4,5 Spare bit 6 First 6” indicator bit 7 Overfill indicator
6,7		Strapped HH level, 2 bytes of hex data of the result send MSB first.
8	‘0’	MSB of 16 bit checksum of this data packet, hex.
9	‘C’	LSB of 16 bit checksum of this data packet, hex. Checksum is calculated on all data as 2’s compliment of the actual sum (0 - sum).

Notes