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Echotel® Model 341 & 344 Ultrasonic Non-Contact Transmitters For Level, Volume, or Open Channel Flow

Software version 2.0

Instruction Manual and Parts List

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MODEL IDENTIFICATION

Each Model 341/344 Ultrasonic Transmitter has a nameplate on which the model number of the unit is shown. Each model number is coded to identify the options in that specific unit. Listed below and to the right are the definitions of each digit of the model number. By referring to these charts, the installer can determine exactly which options the transmitter contains.

Electronics 34 ☐ - ☐ 4 4 2 - 10 ☐

FREQUENCY
1 - 50 kHz, used with 385 transducer
4 - 38 kHz, used with 384 transducer

INPUT POWER
0 - 120 VAC, 50/60 Hz
1 - 240 VAC, 50/60 Hz
2 - 24 VDC
3 - 120 VAC, with heater & thermostat
4 - 240 VAC, with heater & thermostat

(4) SPDT 10 AMP RELAYS

NEMA 4X NORYL HOUSING

16 CHARACTER ALPHANUMERIC DISPLAY

4-20 mA isolated and RS-232 OUTPUT

SPECIAL OPTIONS
0 - None
1 - Mechanical totalizer
2 - 31 day data logger (RS-232)
3 - Mechanical totalizer and 31 day data logger (RS-232)

MODEL IDENTIFICATION cont.

Transducer 384- ☐ K ☐ ☐ - ☐ ☐ ☐

PROCESS CONNECTION
2 – 1" NPT
5 - 2" NPT ①

KYNAR TRANSDUCER MATERIAL

TRANSDUCER HOUSING
0 - No housing, w/ 35' (10.7 m) of cable
1 - NEMA 4X/7/9, aluminum, ¾" NPT *
Y - NEMA 4X/7/9, 316 SS, ¾" NPT *
***Requires connecting cable. (See below)**

TRANSDUCER MOUNTING BRACKET
0 - No transducer mounting bracket
3 - Wall mount for 2" NPT
4 - Floor mount for 2" NPT

TRANSDUCER LENGTH
003 - 3" (76 mm) length
010 - 10" (254 mm) length

NOTE: If the Model 384 Transducer is to be mounted more than 35' (10.7 m) away from the Model 344 Electronics, a transducer housing and interconnecting cable are required.

① Process connection code 2 (1" NPT) cannot be ordered with transducer housing code 1 or Y.

Connecting Cable 037-3176- ☐ ☐ ☐

CABLE LENGTH IN FEET
500 Ft. (152 m) max.
Example: 10 feet = 037-3176-010

Cable to be Belden Type 8102. Consult factory before selecting an alternate.

Refer to page 2 for Transducer Model 385.

MODEL IDENTIFICATION

Transducer 385- ☐☐ ☐ ☐ - ☐☐☐

FREQUENCY
50 kHz, used with 341 electronics

CONNECTION/MATERIAL
1C - Kynar/CPVC with ¾" NPT*
5C - Kynar/CPVC with 2" NPT
1K - Kynar with ¾" NPT*
5K - Kynar with 2" NPT
1E - Stainless steel with ¾" NPT*
5E - Stainless steel with 2" NPT
*** WARNING: The ¾" NPT transducer with a transducer housing does not have a process connection. Refer to Transducer Illustrations on page 34.**

TRANSDUCER HOUSING
0 - No housing, with 20 Ft. (6 m) of cable
1 - NEMA 4X, aluminum, ¾" NPT*
Y - NEMA 4X, 316 SS, ¾" NPT*
***Requires connecting cable. (See right)**

TRANSDUCER MOUNTING BRACKET
0 - None
1 - Wall mount ¾" NPT
2 - Floor mount ¾" NPT
3 - Wall mount 2" NPT
4 - Floor mount 2" NPT

TRANSDUCER LENGTH
003 - 3" (76) length
006 - 6" (152) length
010 - 10" (254) length

Connecting Cable 037-3176-☐☐☐

CABLE LENGTH IN FEET
500 Ft. (152 m) max.
Example: 10 feet = 037-3176-010

Cable to be Belden Type 8102. Consult factory before selecting an alternate.

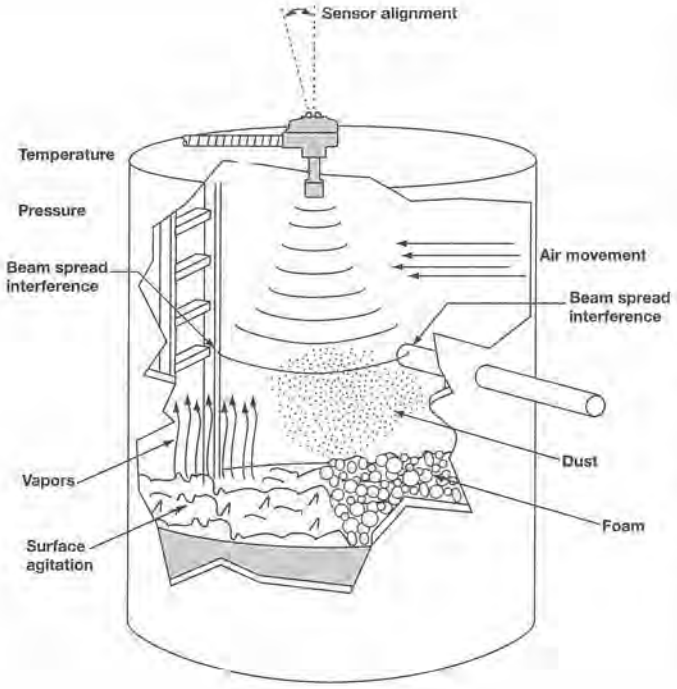
MEASUREMENT RANGE CALCULATIONS

Measurement range expectations

Ultrasonic non-contact devices are typically rated for a maximum range in ideal conditions. Experience has shown that maximum range must be reduced for certain factors. Although the maximum range rating is somewhat conservative, each application must be evaluated for specific conditions.

The operating parameters listed below can impact the maximum range of measurement:

- Surface agitation
- Vapors and steam
- Beam spread interference
- Transducer alignment
- Foam
- Dust
- Air movement
- Ambient temperature
- Pressure



How to calculate

To calculate the performance that a **particular** application will have, using the chart on page 4:

1. Select **one** condition from each of the operating parameters that best describes your application.
2. Enter the corresponding performance multiplier value in the application column.
3. Multiply all values together.
4. Multiply the result from step 3 by the maximum potential range (35' for the 344 and 25' for the 341); this yields a value that is the maximum allowable measurement range for this application.

Example:

The vessel is a closed-top tank, uninsulated, 26 feet tall.

Surface agitation:	Expect slight agitation from fill line. Performance multiplier 0.9.
Vapor and steam:	The maximum process temperature is +110° F; slight vapor is expected. Performance multiplier 0.9.
Beam interference:	No interference exists. Performance multiplier 1.0.
Transducer alignment:	The transducer will be perpendicular to the liquid surface. Performance multiplier 1.0
Foam:	None. Performance multiplier 1.0
Dust:	None. Performance multiplier 1.0
Air movement:	None. Performance multiplier 1.0
Ambient temp.:	+30 to +80° F. Performance multiplier 1.0
Pressure:	+40 PSIG. Performance multiplier 1.0

Will the Model 344 work for this application?

Calculation:

Multiplied values of all application columns:

0.9 x 0.9 x 1.0 x 1.0 x 1.0 x 1.0 x 1.0 x 1.0 x 1.0 x 35 feet (maximum) = **28.35 feet**

The calculation yields 28.35 feet as the new maximum range. Since the tank is 26 feet tall, this application will give satisfactory results.

NOTE: The performance multipliers provided are conservative estimates. Since these factors are subjective, the estimates have been designed to provide a very high confidence of system success. Contact the factory if there are any questions concerning the interpretation of any of these values.

MEASUREMENT RANGE CALCULATIONS

Operating Parameter	Condition	Performance Multiplier	Application
SURFACE AGITATION: Surface agitation or waves can degrade the performance. Moderate agitation results in only slight degradation of performance. The worst case is when the surface is a good reflector, but in the wrong direction. (See also transducer alignment.)	Smooth, glasslike surface	1.0	
	Slight agitation, choppiness	0.9	
	Heavy agitation	0.8	
	Slight vortex (6")	0.7	
VAPORS AND STEAM: Vapors in the air space, above the process, become apparent, and cause problems when the liquid process temperature is well above the temperature of the airspace. The greater the difference, the more expected vapor problems. The problems result from condensation or layering in the sound path, both of which attenuate the sound signal, degrading performance To avoid these problems, ensure that the vessel is insulated so that vapors are less likely to condense. If a vent is used, be sure that the vent, which is where condensation will form, is well away from the transducer.	No condensation	1.0	
	Little condensation	0.9	
	Much condensation/ foggy appearance	0.8	
BEAM SPREAD INTERFERENCE: It is strongly recommended that nothing be allowed within the transducer's beam, except the liquid which is being monitored. Often, the signal from the liquid will be strong, compared to the signal from other sources, such as ladder rungs, filling process material, support struts, etc. For that reason, some applications may provide satisfactory results, even with interference. Interference from agitator blades is only an intermittent interference that usually has little effect on performance. It is recommended there be no interference within the 6° half angle of the transducer beam. If interference is unavoidable, make the interference as far as possible from the transducer so that the real signal at the longest distance is stronger than the interference signal.	No interference	1.0	
	Agitator at speed less than 60 RPM	1.0	
	Agitator at speed greater than 60 RPM	consult factory	
	Interference outside 4°, far from transducer (in bottom third of range)	0.8	
	Interference outside 4°, near to transducer (in top third of range)	0.5	
TRANSDUCER ALIGNMENT: Optimum performance is obtained when the transducer is perfectly aligned. If the process is not perpendicular to the sound beam, the sound will not reflect properly back to the transducer. The effect is significant.	Beam perpendicular to liquid surface	1.0	
	Beam 4° off from perpendicular	0.5	
FOAM: Even small thicknesses of foam can attenuate the ultrasound and render the system inoperative. If possible, moving the transducer to an area in the tank where there is less foam will improve the performance. Thick, heavy-density foams can sometimes produce a reflection from the top of the foam. The multipliers shown at right are general guidelines. For further assistance consult the factory.	No foam	1.0	
	Light froth, less than 0.25" thick	0.8	
	Light foam, less than 0.5" thick	0.5	
	Light foam, more than 1" thick	0.1	
DUST: Dust attenuates the sound and results in poor performance. Even barely perceptible haze in the air can cause significant attenuation.	No dust	1.0	
	Haze, barely perceptible	0.7	
	Slight dust	0.4	
	Heavy dust	0.1	
AIR MOVEMENT: The movement of air, as possible in an open top vessel, can create a layer from which the sound will reflect. This will be most noticeable in applications where vapors or steam tend to form.	No air movement	1.0	
	Open vessel, but transducer below rim	0.8	
	Open air movement in sound path	0.7	
AMBIENT TEMPERATURE: The ambient temperature can have a significant effect on the sound and on the transducer's capability to transmit and receive sound. The most noticeable effect on the transducer is at the temperature extremes.	-20° F to +140° F (-29° C to +50° C)	1.0	
	-40° F to -20° F (-40° C to -29° C)	0.9	
	+140° F to +160° F (+50 to +70° C)	0.9	
PRESSURE: Sound requires air molecules to be able to travel. Sound will not travel in a vacuum. Likewise, higher pressures will allow the sound to continue without decay, which can cause problems with multiple echoes.	-10 to +50 PSIG (0.689 to +3.45 Bar)	1.0	
	Pressures outside above rating	Consult Factory	
Multiply all values together in the application column			
			X
Maximum Potential Range (35' for Model 344, 25' for Model 341)			**25' or 35'**
Maximum allowable measurement range for this application =			

INSTALLATION

CAUTION: *Please read the entire installation section carefully prior to starting installation.*

DESCRIPTION

Model 341/344 non-contact continuous transmitters perform level, volume, or open channel flow measurements of liquids and slurries. Non-contacting ultrasonic technology is used, which enables a wide variety of industrial and municipal applications to be reliably measured. The ultrasonic transducer may be mounted up to 500 feet (152 m) from the transmitter.

PRINCIPLE OF OPERATION

Pulses generated by the microprocessor-based electronics are transmitted through the analog processor to the ultrasonic transducer. The transducer directs an ultrasonic pulse to the surface level. The returning echo/signal is detected by the transducer. A microprocessor converts the signal into a digital representation of the level, flow or volume measurement. This representation is displayed in the unit of measurement selected by the user during the Configuration/Set-up process.

UNPACKING

Unpack the instrument carefully. Make sure all components have been removed from the packing material. Inspect all components for damage. Report any concealed damage to the carrier within 24 hours. Check the contents of the packing slip and report any discrepancies to the factory. Check the nameplate model number to be sure it agrees with the packing slip and purchase order. Check and record the serial number for future reference when ordering parts.

TRANSMITTER MOUNTING LOCATION

The transmitter enclosure should be securely fastened to an appropriate supporting structure, in a location that permits easy access for maintenance. Avoid locations that are exposed to direct sunlight, flooding, high levels of radiated electromagnetic interference, and excessive vibration or shock. If mounted in a location where there is intense, extreme, direct sunlight, a sun shade is recommended.

TRANSDUCER MOUNTING LOCATION

Model 384/385 transducers must be mounted directly over the material to be measured. This may be accomplished by flange or bracket mounting. Both floor and wall mount transducer brackets are available for use over open tanks or channels. Flange mounts are available for use with closed vessels.

Proper mounting and wiring of the ultrasonic transducer is of the utmost importance. Both the accuracy and the reliability of the Model 341/344 can be adversely affected if the transducer is mounted improperly.

NOTE: The 341/344 requires a "dead band" blanking distance between the transducer and the maximum level of material. The minimum dead band is 12 inches (305 mm) for Model 341 and 18 inches (460 mm) for Model 344. At temperatures above 140° F minimum, dead band is 18" for either model. Maximum dead band should be limited to approximately 10 feet (3 m) as this blanking distance is extended at the expense of the useful span over which the instrument operates.

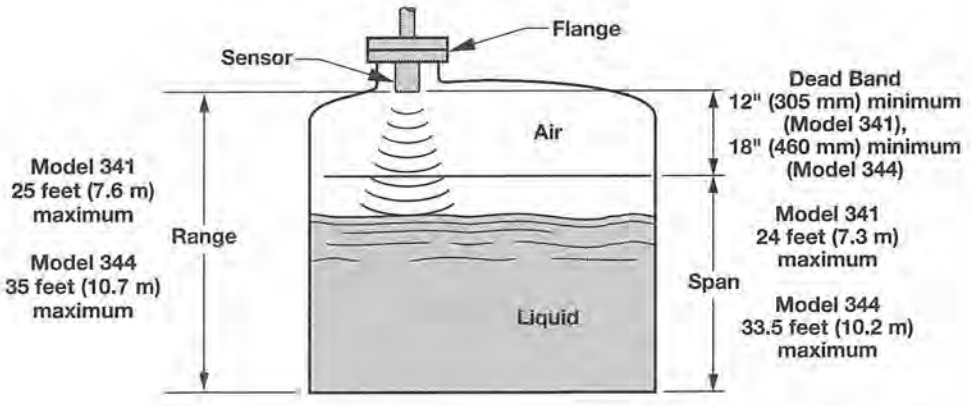


Figure 1
Transducer Mounting Location

INSTALLATION cont.

TRANSMITTER MOUNTING PROCEDURE

There are two predrilled holes in the enclosure for connecting 1/2" NEMA 4X conduit; one for power and one for transducer cable wiring. Refer to Figure 2.

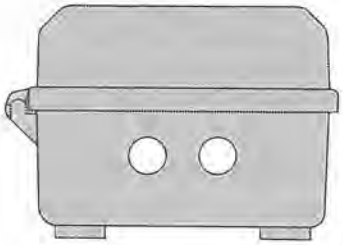


Figure 2
Electronics Mounting Holes

1. Open the door of the unit.
2. Drill holes in the enclosure as required for additional wiring. Be careful not to damage the printed circuit boards. Be sure that the PC boards are not damaged or contaminated when removing filings and/or debris from the housing.
3. Provide watertight seals for all wiring entrances in the enclosure to maintain the NEMA 4X rating.
4. Mount the enclosure to a wall or flat surface using the appropriate screws or bolts. The mounting tabs on the back of the enclosure can be rotated to the sides, or top and bottom to facilitate mounting. Refer to Figure 3.
5. Install conduit for power and control wiring. Be sure all connections to the enclosure maintain a NEMA 4X rating.
6. Close the transmitter door until it is time to wire the transmitter. Proceed to mount the transducer.

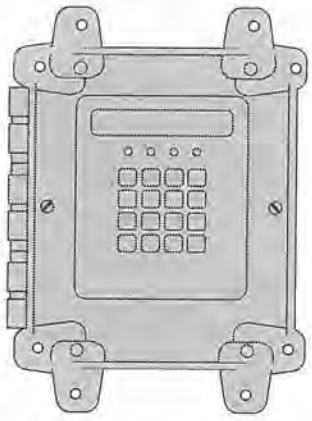


Figure 3
Electronics Mounting Tabs

GENERAL TRANSDUCER MOUNTING REQUIREMENTS

1. Whenever possible, locate the transducer to avoid obstructions between the transducer face and the surface of the level being tracked. Ultrasound radiates from the transducer with a beam spread of approximately twelve (12) degrees. Objects that extend into the sonic beam can produce echoes that mask the true level. The false target buffering feature allows for blanking out up to nine obstructions. Refer to page 25.

Sonic Beam Dispersion

Distance from Transducer Face	Beam Diameter	Minimum Offset From Tank Wall
2'	0.42'	2.52"
4'	0.84'	5.04"
6'	1.25'	7.5"
8'	1.67'	10.02"
10'	2.1'	12.6"
12'	2.5'	15"
14'	2.9'	17.4"
16'	3.3'	19.8"
18'	3.76'	22.56
20'	4.18'	25.08"
22'	4.6'	27.6"
24'	5.02'	30.12"
26'	5.44'	32.64"
28'	5.86'	35.16"
30'	6.28'	37.68"
32'	6.80'	40.8"
35'	7.44'	44.64"

2. Position the transducer so that the radiating surface or transducer face is exactly parallel to the measurement surface. This will provide the strongest return signals and enhance the reliability of the Model 341/344.
3. In applications where the material level may come into the dead band or where the full tank height will be used, the transducer must be mounted in a short, flanged pipe stub. The diameter of the stub should be at least 8 inches (203 mm) and its length should be limited to 11 inches (279 mm) from transducer face. Refer to Figure 4.

   NOTE: Transducer face should be mounted as close to the vessel ceiling as possible.

INSTALLATION cont.

GENERAL TRANSDUCER MOUNTING REQUIREMENTS cont.

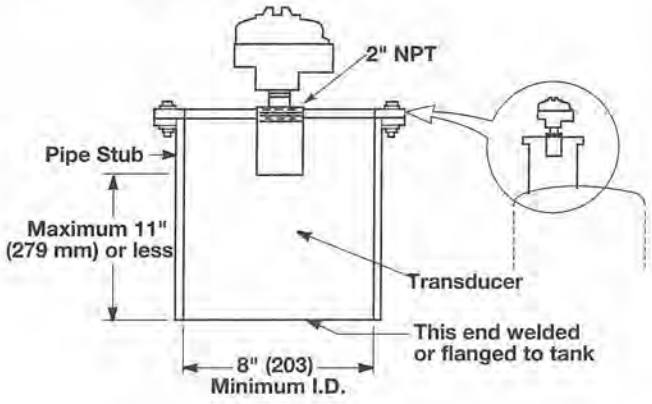


Figure 4
Transducer Mounting for Full Tanks

4. Avoid installing the transducer in tank top openings that exhaust heated air or vapors. The boundaries between the vapors and the outside air often represent acoustic impedance gradients that can cause troublesome sound reflections. In those installations, the transducer should be mounted well away from the opening inside the tank, or in a pipe stub as illustrated here. Refer to Figures 4 and 5.

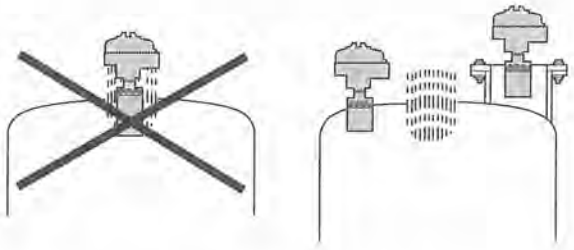


Figure 5
Transducer Mounting for Tanks With Exhaust

CAUTION: *Do* ***NOT*** *install transducers in the center of domed roof tanks. Locate transducers 1' to 3' off center to minimize false/multiple echoes being reflected off the domed roof.*

5. To prevent electromagnetic noise from disrupting the normal operation of the Model 341/344, it is recommended that each transducer cable be run in its own conduit, separated from other cables and wiring.
6. There are three Mounting Procedures discussed on pages 7 and 8. Locate the mounting procedure from the chart below and proceed to the appropriate instructions.

NPT	Mounting	Housing	Procedure	Page
¾" or 2"	bracket	without	A	7
¾" or 2"	bracket	with	B	8
¾", 1", or 2"	flange	without	C	8
¾" or 2"	flange	with	C	8

TRANSDUCER MOUNTING PROCEDURE A

¾" NPT or 2" NPT Transducer with Factory Supplied Mounting Bracket, Without Transducer Housing

NOTE: Be sure the transducer location meets the requirements discussed under "General Transducer Mounting Requirements" on pages 6 and 7.

1. Position the bracket such that the transducer mounting hole is positioned over the open tank or channel. Refer to Figure 6.

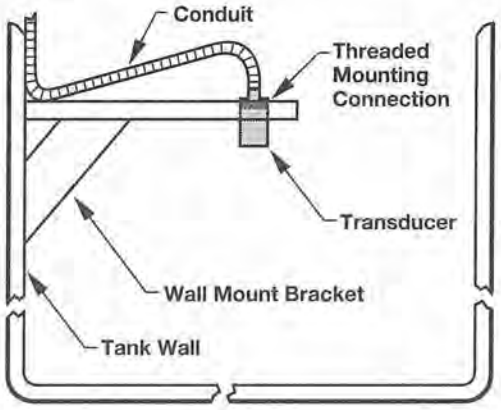


Figure 6

2. Secure the bracket to the wall, floor, or vessel as appropriate with four 3/8" screws. Refer to the mounting hole pattern as shown in the dimensional drawings on page 34.
3. Pull transducer cable through mounting bracket and screw transducer into fitting in mounting bracket.

CAUTION: HAND TIGHTEN ONLY. *Do* ***NOT*** *use a pipe wrench or other tools when tightening the transducer. Use teflon tape on thread for 316 stainless steel transducer. Avoid excessive twisting of the transducer cable.*

4. Providing conduit from the transducer to the transmitter enclosure, carefully pull the transducer cable through the conduit toward the transmitter enclosure. This cable will be connected in the "Transducer Wiring Without Transducer Housing" section on page 10.
5. Tighten the conduit to the nipple on the top of the transducer. Refer to Figure 7.

NOTE: In high humidity applications, it is recommended that the transducer wiring be completely immersed in an insulating compound where the conduit connects to the transducer. (3M #4441 Gella Re-enterable Encapsulating Compound or equivalent.)

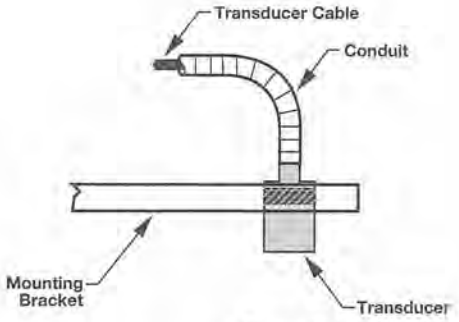


Figure 7

6. Proceed to the "Wiring" section on page 9.

TRANSDUCER MOUNTING PROCEDURE B

¾" NPT or 2" NPT Transducer with Factory Supplied Mounting Bracket and Transducer Housing

NOTE: Be sure the transducer location meets the requirements discussed under "General Transducer Mounting Requirements" on pages 6 and 7.

1. Position the bracket such that the transducer mounting hole is positioned over the open tank or channel. Refer to Figure 8.

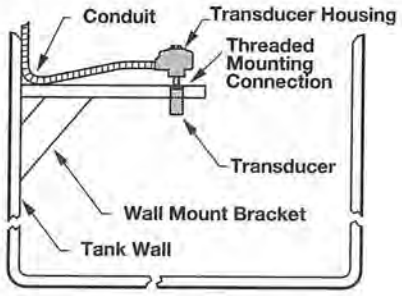


Figure 8

2. Secure the bracket to the wall, floor, or vessel as appropriate with four 3/8" screws. Refer to the mounting hole pattern as shown in the dimensional drawings on page 34.

3a. ¾" mounting — unscrew and remove the cover of the transducer housing. Remove the transducer cable from the terminal strip located within the transducer housing. Refer to Transducer Wiring on page 10. Carefully pull the transducer cable through the hole in the bracket and through the hole in the bottom of the transducer housing. Screw transducer into the mounting bracket and hand tighten.

3b. 2" mounting — screw 2" NPT bushing into the 2" NPT hole in bracket and hand tighten.

CAUTION: HAND TIGHTEN ONLY. *Do* ***NOT*** *use a pipe wrench or other tools when tightening the transducer. Use teflon tape on thread for 316 stainless steel transducer. Avoid excessive twisting of the transducer cable.*

4. Providing conduit from the transducer to the transmitter enclosure, carefully pull the transducer cable through the conduit toward the transmitter enclosure. Refer to Figure 9. This cable will be connected in the "Transducer Wiring With Transducer Housing" section on page 10.

5. Tighten the conduit at the connection on the transducer housing.

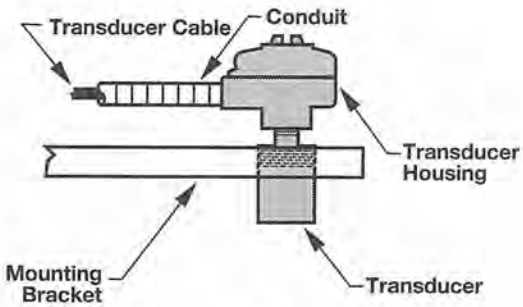


Figure 9

6. Proceed to the "Wiring" section on page 9.

TRANSDUCER MOUNTING PROCEDURE C

¾", 1", or 2" NPT Transducer with Flange, With or Without Transducer Housing

NOTE: Be sure the transducer location meets the requirements discussed under "General Transducer Mounting Requirements" on pages 6 and 7. In addition, be sure that the flange size corresponds to the transducer connection size. Consult Model Identification on pages 1-2 for available models.

1. Position transducer over the tank port. Bolt the transducer flange to the tank port flange. Refer to Figure 10.

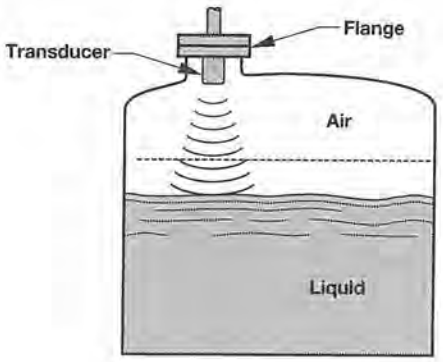


Figure 10

2. Screw bushing of transducer into flange.

CAUTION: HAND TIGHTEN ONLY. *Do* ***NOT*** *use a pipe wrench or other tools when tightening the transducer. Use teflon tape on thread for 316 stainless steel transducer. Avoid excessive twisting of the transducer cable.*

3. Install conduit from the nipple on transducer to the transmitter enclosure. For transducers with transducer housing, conduit is connected to the housing conduit connection.

NOTE: In high humidity applications, it is recommended that the transducer wiring be completely immersed in an insulating compound where the conduit connects to the transducer. (3M #4441 Gella Re-enterable Encapsulating Compound or equivalent.)

4. Carefully pull the connecting cable attached to the transducer through the conduit to the transmitter. Refer to Figure 11. This cable will be connected in the "Transducer Wiring" section on page 10.

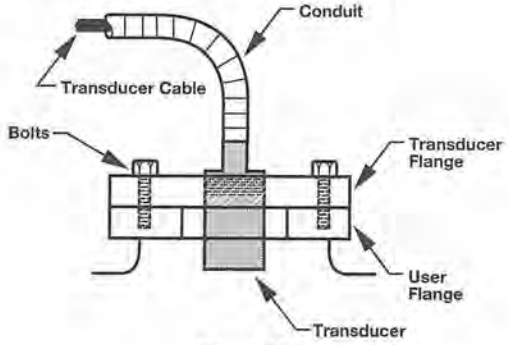


Figure 11

5. Proceed to the "Wiring" section on page 9.

ELECTROSTATIC DISCHARGE (ESD) HANDLING PROCEDURE

Magnetrol's electronic instruments are manufactured to the highest quality standards. These instruments utilize electronic components which may be damaged by static electricity present in most work environments. The following steps are recommended to reduce the risk of component failure due to electrostatic discharge:

1. Ship and store circuit boards in anti-static bags. If an anti-static bag is not available, wrap board in aluminum foil. Do not place boards on foam packing materials.
2. Use a grounding wrist strap when installing and removing circuit boards. A grounded workstation is also recommended.
3. Handle printed circuit boards only by the edges. Do not touch components or connector pins.
4. Ensure that all electrical connections are completely made and none are partial or floating. Ground all equipment to a good, earth ground.

WIRING

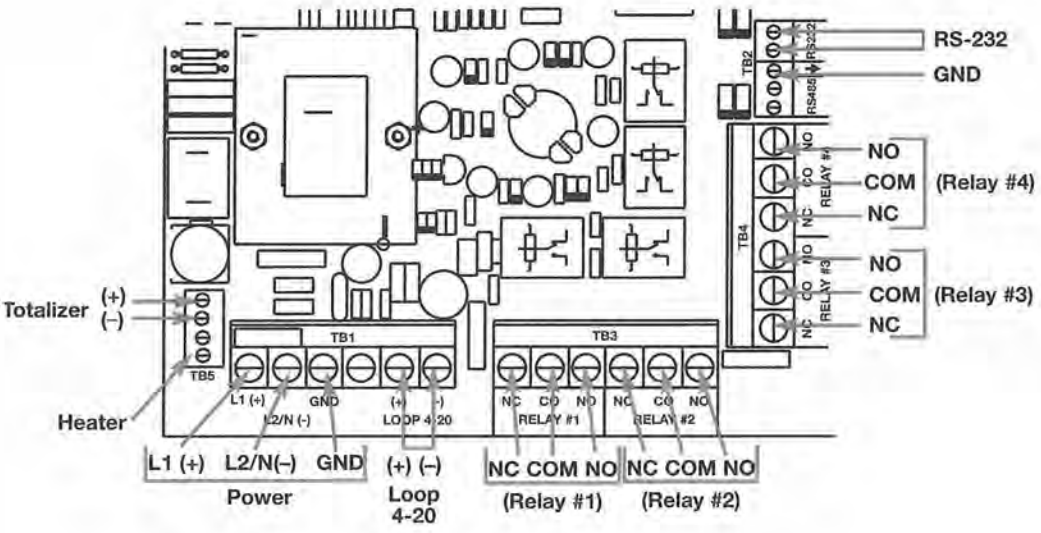


Figure 12
341/344 Motherboard (shown with daughter board removed)

NOTE: Models 341 and 344 have the same motherboard (P/N 030-3564-00X), but have unique daughter boards. The 341 uses a daughter board (P/N 030-3565-001) that drives the 50 kHz Model 385-XXXX-XXX transducer, and the 344 uses a daughter board (P/N 030-3573-001) that drives the 38 kHz Model 384-XXXX-XXX transducer.

NOTE: Do **NOT** attempt to operate this unit at voltages other than as ordered from the Model Identification as it will damage the unit.

***CAUTION:** This instrument is grounded through the grounding connector of terminal block TB1. The power input must include a ground wire connected to a good earth ground. Failure to ground the instrument may allow a shock hazard to exist!*

Wiring Colors By Country/Continent

	U.S.	Europe	U.K.
Line 1 (HI)	Black	Blue	Brown
Line 2 Neutral	White	Black	Blue
Ground	Green/Yellow	Green/Yellow	Green/Yellow

Table 1

TRANSMITTER POWER WIRING

1. Open the cover of the transmitter enclosure by loosening the six screws.
2. The PC board is marked for 120/240 VAC (L1, L2/N, GND) and 24 VDC (+,–) power connections. Ensure proper connections are made on the six position terminal block TB1. Refer to Figure 12. Spade lugs should be used. For optimum operator safety, observe the wiring colors listed in Table 1.
3. To prevent electromagnetic noise from disrupting the normal operation of the Model 341/344, the GROUND should be connected to a good earth ground with as short a length as possible of heavy wire or copper braid.
4. Proceed to the appropriate transducer wiring section.

WIRING cont.

TRANSDUCER WIRING

CAUTION: *Do not run transducer cable in the same conduit with power, signal, or other transducer cables.*

The transducer cable consists of two twisted pairs of wire wrapped with a shield. Each wire is labeled below for identification. Refer to Figure 13.

After running the transducer wiring through the conduit from the transducer to the transmitter, separate the wires into two groups;

Group 1 - Signal Wiring (Transducer)

Group 2 - Temperature Compensation Wiring (Temperature Transducer)

NOTE: It is imperative that Magnetrol cable part number 037-3176 (Belden Type 8102) be used. If connecting cable was not provided with unit, consult factory for specifications. Maximum total cable length is 500 feet (152 m). **AVOID SPLICING CABLE.**

If a 316 stainless steel transducer is used, connect the green ground wire to an earth ground, i.e. conduit, tank, etc.

If a junction box is used, connect earth ground to green terminal screw.

Without a Transducer Housing

Group 1

1. Connect the orange w/white stripe wire to the terminal marked (X1) at TB6.
2. Connect the shield wire to the middle terminal at TB6.
3. Connect the white w/orange stripe wire to the terminal marked (X2) at TB6.

Group 2

1. Connect the white w/blue stripe wire of the twisted pair to terminal labeled positive (+) at TB7.
2. Connect the blue w/white stripe wire of the twisted pair to terminal labeled negative (-) at TB7.
3. Proceed to the appropriate section for wiring options.

NOTE: Both groups of wire must be connected.

TRANSDUCER WIRING cont.

With a Transducer Housing

If transducer housing is provided, use the connecting cable ordered with the remote transducer housing. Connect the transducer cable per the Transducer Wiring instructions between the terminal block in the transducer housing to TB6 (Transducer) and TB7 (Temperature Transducer) in the transmitter. Be sure to connect wires to appropriate terminals per the instructions below. Refer to Figure 13.

Group 1

1. Connect the orange w/white stripe wire from the transducer housing terminal marked (X1) to the terminal marked (X1) at TB6 in the transmitter.
2. Connect the shield from the transducer housing terminal marked (shield) to the middle terminal at TB6 in the transmitter.
3. Connect the white w/orange stripe wire from the transducer housing terminal marked (X2) to the terminal marked (X2) at TB6 in the transmitter.

Group 2

1. Connect the white w/blue stripe wire of the twisted pair from the transducer housing terminal marked (+) to the terminal labeled positive (+) at TB7.
2. Connect the blue w/white stripe wire of the twisted pair from the transducer housing terminal marked (-) to the terminal labeled negative (-) at TB7.
3. Proceed to the appropriate section for wiring options.

NOTE: In high humidity applications, it is recommended that the transducer wiring within the remote housing be completely immersed in an insulating compound. (3M #4441 Gella Re-enterable Encapsulating Compound or equivalent.)

NOTE: The 50 kHz transducer Model 385-XXXX-XXX from the 341, and the 40 kHz transducer Model 384-XXXX-XXX from the 344 use the same Beldon Type 8102 cabling. They are also terminated at the same terminal blocks on their respective daughter board. This is shown in Figure 13 below.

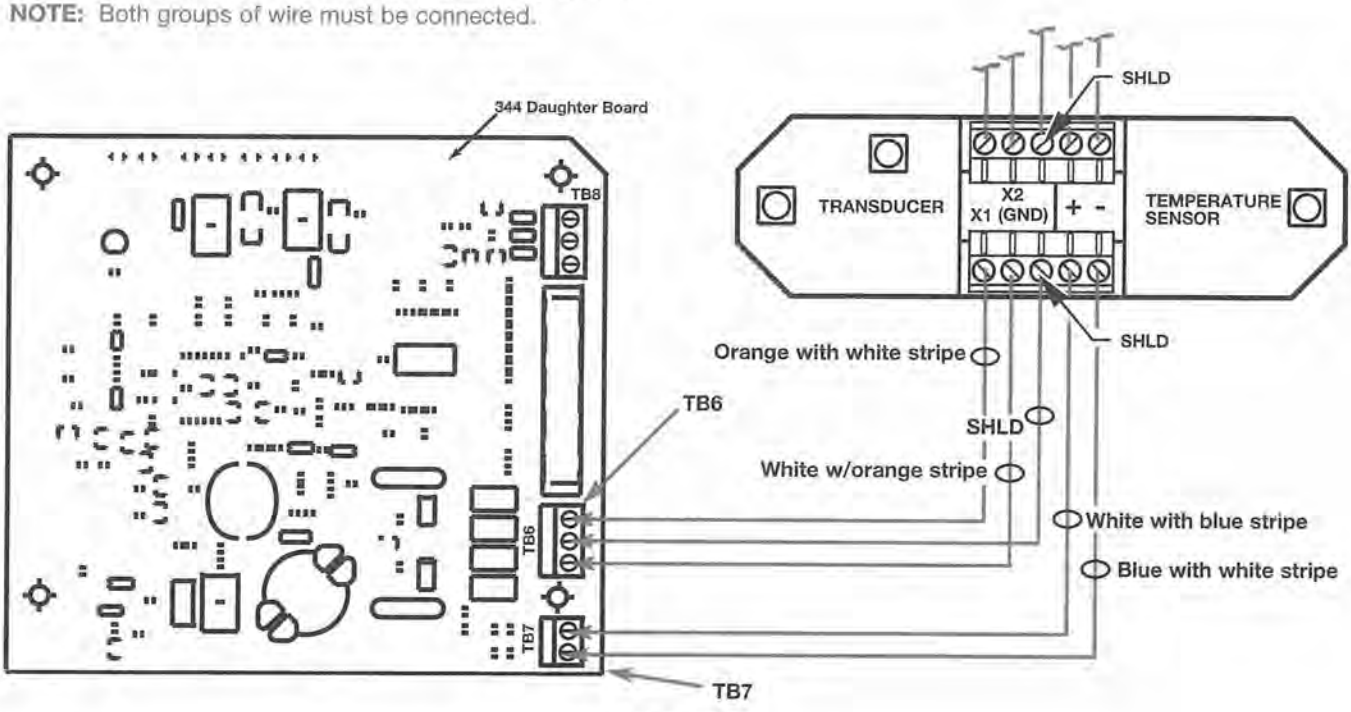


Figure 13

RELAY OUTPUT WIRING

The 341/344 unit is supplied with 4 relays that can operate as normal independent contact closures or used as dedicated relays as follows:

Relay 1 Normal

Relay 2 Normal/Lead/Lag Pump Alternation (with Relay 1)

Relay 3 Normal/Dedicated Fault

Relay 4 Normal/Sampler Contact

Relay connections are supplied on the motherboard as shown in Figure 12 and 14.

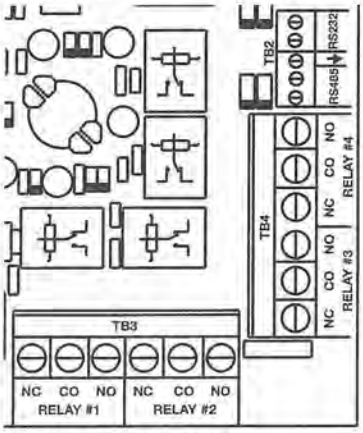


Figure 14

1. Connect two-wire leads to the desired relay connection, 1 through 4. Connect one wire to the terminal labeled (COM) and the other to the terminal for the desired contact function, (NC) for normally closed or (NO) for normally open. Repeat this step for each relay.
2. Refer to Relay Settings in the Configuration section on page 23 and 24 for information on configuring the relays.
3. Proceed to wire any remaining options the unit may have, as shown in the next two pages.

NOTE: If the device to be operated by the relay has an inductive load a separate power supply should be used for the electronics.

OUTPUT SIGNAL WIRING

4-20 mA DC Output cont.

4-20 mA DC output connections can be made at terminal block TB1, located inside the transmitter housing. Refer to Figure 15. The loop is optically isolated, has non-grounded outputs, and can drive a 1000 ohm load.

1. Connect the positive (+) shielded twisted pair wire from the load to terminal LOOP (+).
2. Connect the negative (-) shielded twisted pair wire from the load to terminal LOOP (-).

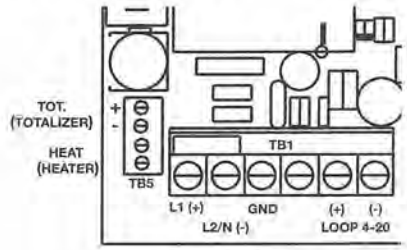


Figure 15

3. Proceed to the "Unit Configuration" section on page 12.

NOTE: The shield should be connected to an earth ground at only one location.

Transducer Synchronization

Transducer synchronization is a feature offered with the Model 344 unit only. It allows you to run the cabling from multiple Model 384 transducers in the same conduit. This prevents the possibility for cross talk to occur from one Model 344 to another. The synchronization scheme involves the use of one 344 unit operating as a master, and one or more other units operating as slaves.

Multiple Model 344 units should be wired together utilizing TB8 (Figure 16) on the daughter board as shown in Figure 17 below. The master unit synchronizes the ultrasonic signals such that all units transmit their ultrasonic signals at the same time. This eliminates the possibility of cross talk occurring. No calibration or configuration is necessary other than the wiring shown below.

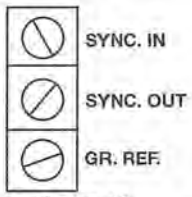


Figure 16
(344 Daughter Board)
Synchronization Terminal Block – TB8

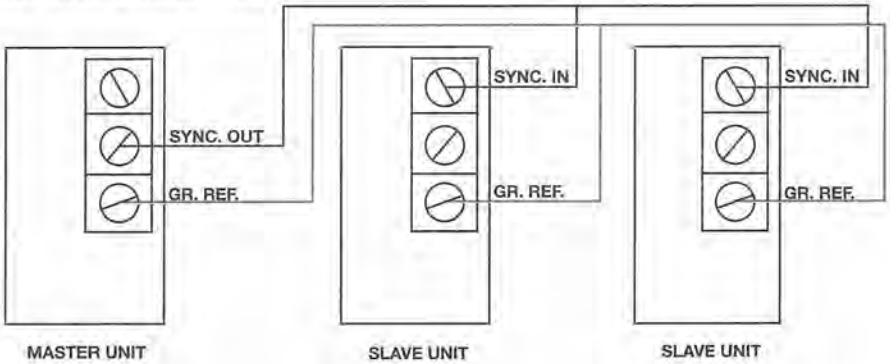


Figure 17
Synchronization Wiring Diagram

WIRING cont.

RS-232 Output

NOTE: The RS-232 output is only used for downloading information from the optional 31 day data logger.

RS-232 output connection is located at TB2 and labeled TX and RX. Refer to Figure 18.

This connection for the RS-232 is utilized for the hookup of a laptop computer. In the laptop mode, one can download stored data, if unit is equipped with data logging option.

The cable to connect the laptop computer to the Model 341/344 must be supplied by the user. Configure this cable as shown in Figure 18 below. Downloading instructions are in the Laptop Section on page 28.

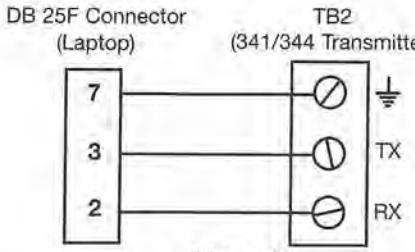


Figure 18

UNIT CONFIGURATION

GENERAL CONFIGURATION INSTRUCTIONS

The Model 341/344 ultrasonic non-contact continuous transmitter contains a microprocessor-based operator interface which allows for easy configuration of level, flow or volume applications. These features are built into the transmitter and are entered via a keypad located on the front of the unit.

This operator interface and the instructions for the Unit Configuration are broken down into six main groups of menus, as follows:

MEASURED VALUES	To view measured values
SYSTEM CONFIG	First time configuration (Essential programming information for measurements)
I/O CONFIG	Configure input/output functions
ADVANCED CONFIG	Additional values that affect the units performance
DIAGNOSTICS	Test functions
LAPTOP	Download data logging to Laptop computer. (With optional Data Logger only)

PASSWORDS

The Model 341/344 has two types of passwords that can be used to protect configuration parameters. They are as follows:

GENERAL PASSWORD - The General Password is used for the **System Config** and the **I/O Config** portion of the Menu Structure. Any time a change is made to parameters in these menus, ie. range, span, 4-20 mA, relays, etc., the Model 341/344 will prompt the operator to enter a password. This password can be any one to six character numeric combination that is easy for the operator to remember.

SUPERVISORY PASSWORD - The Supervisory Password is used for the **Advanced Config** portion of the Menu Structure. This password is used to protect values that can affect the performance and/or accuracy of the device.

NOTE: Although the Supervisory Password is normally used in the Advanced Config menu, this password can also be used in any portion of the menu. The Supervisory Password overrides the General Password.

UNIT CONFIGURATION cont.

PASSWORDS cont.

The Passwords can be changed at any time via the Advanced Config mode.

If an invalid password is entered, the display will read **Password Invalid**. By pressing the DEL key twice, the unit will continue to operate with the previous programmed parameters.

Password ☐☐☐☐

Sup Password ☐☐☐☐

CAUTION: *The Model 341/344 is shipped from the factory with the password set at* **0341.** *If the password is misplaced or forgotten, please consult the factory for assistance.*

OPERATOR KEYPAD

All Unit Configuration instructions in this manual will show the local transmitter display exactly as it will appear to the operator.

The operator interface to the 341/344 is via a keypad consisting of the following keys:

0 - 9	For numeric entry of parameters.
.	For decimal numeric entries.
DEL	To exit any programming area and return to a measurement mode.
ENT	For writing new parameter values into memory. Also used to exit the parameter entry mode, if pressed prior to entering numeric parameter values.
↑ ↓	To sequentially access other parameter procedures. In addition, parameters may be skipped over without affecting their stored values. The DOWN arrow will act as a backspace for correcting data entry errors.

All values for Parameter Entry procedures follow the transaction flow below:

FIRST LEVEL PROGRAMMING MENUS

Model 341/344

- **Measured Values**
- **System Configuration**
- **I/O Configuration**
- **Advanced Configuration**
- **Diagnostics**
- **Laptop**
- **>>>QUIT<<<**

UNIT CONFIGURATION cont.

341/344 QUICK START PROGRAM

This quick start up program will guide the user through the basic setup of the 341/344 and get the device performing a valid measurement. The basics covered in this section will be for a **Level Only** measurement and will guide the user through selecting the units of measure, range, span, 1 relay setting, and a 4-20 mA scaling.

After removing the 341/344 from the packing material, the front cover should be opened and wiring of the power, relays, 4-20 mA, and the transducer should be made at this point. Once wiring is finished, close the front cover and fasten the six screws to keep the NEMA 4X rating intact.

Apply power to the unit. The 341/344 has a default range setting of 144 inches programmed into the software. If the transducer is installed in the application and the distance from the transducer face is further away than 144 inches, the display will read **"Loss of Echo"**. The range setting will have to be adjusted at this point in order to clear the loss of echo error.

You are now ready to begin configuring the unit.

After applying power, press the ENT key and the display will read **Measured Values.** Press the DOWN arrow key once to read **System Config** and press ENT. Level units will display on the screen. Press ENT at this point and then use UP or DOWN arrow keys to make your **Units Of Measure** selection. Once a selection has been made, press ENT and the display will indicate the next segment in the setup, **Mode Setup.** Remember that if your selection is different from the previous selection, the display will ask for a password. At any point in the Quick Start, if **PASSWORD?** is displayed key in 0341, press enter. With **Mode Setup** on the display, press ENT to display **Level Only.** For this quick start program, a guided setup through Level only will be discussed. If volume and level or flow and level are desired, use the UP or DOWN arrow keys to make the selection and then press ENT. The display will then read **Range Setting.** Press ENT and then use the UP or DOWN arrow keys to toggle between manual or auto set. Range setting is the measured distance from the transducer face to the lowest point of measurement or zero. The user has the option of selecting the auto ranging mode which will automatically provide the user with a range distance. The level or zero point should be absolutely at the lowest point in the application for this auto set mode. The preferred method for range setting is the manual set scheme. The user will key in the display using the numbered keys the measured distance from the transducer face to the zero point. Once this value is keyed in, press ENT and the **Span Setting** will be displayed. The Span Setting is the distance from the lowest point or zero to the maximum anticipated distance that the level will rise in the tank, without entering the dead band of the transducer. Typically, span is the difference between the Range (low level or zero) and the desired maximum level usually with the 12 or 18 inch dead band. With **Span Setting** displayed, press ENT and **Manual Set** will display. The user can toggle between manual and auto like the range setting scheme. In the auto mode, be certain that the level is at its absolute maximum in the tank otherwise loss of echo may occur. Once the selection has been made for the span value, press ENT. The display will read **Previous Menu,** press ENT to display **System Config** and then proceed to the next menu by pressing the DOWN arrow key once to display **I/O Config.** This is the menu that allows the user to program the relays, scaling the 4-20 mA output, and the communications port setup.

341/344 QUICK START PROGRAM cont.

For this quick start scheme, we will guide the user through one relay setup in the level only mode and scaling the 4-20 mA output.

With **I/O Config** displayed, press ENT and the display will read **Relay Settings**. Press ENT here to display **Relay #___.** For this quick start scheme, press the #1 key to indicate relay #1. Press ENT at this point and the display will read **Relay 1 Disabled.** The user can toggle with the UP or DOWN arrow keys to disable or enable the relay. Select **Enable** and press the ENT key. The 341/344 will prompt you to key in the **Turn On Level** and next the **Turn Off Level**, for the relay. The 341/344 will prompt you to key in the **Turn On Delay** and next the **Turn Off Delay**. Key in value from 1 - 120 seconds and press ENT. The display will read **Fail-safe:OFF.**

Fail-safe sets the state of the relay when a measurement error occurs. Measurement errors are defined as any error specific to the transducer (loss of echo, ringdown, or transducer failure).

For relays with fail-safe set to ON, relay will be energized. OFF, the relay will be de-energized. With fail-safe at HOLD, relay will remain in the state that was prior to the fault.

NOTE: With loss of power, all relays regardless of fail-safe setting, will de-energize.

Use the UP or DOWN arrows to toggle your selection of **Off, On** or **Hold.** Press ENT. The display may prompt the user for a password entry. Press ENT and the display will read **Relay Settings** again.

You are now ready to program the 4-20 mA setting.

Press the DOWN arrow key from **Relay Settings** and display will read **4-20 mA Settings.** Press ENT and the display will read **4:_0 in.** This is the 4 mA point at which the 341/344 will drive a 4 mA signal to an external device. This can be any value within the span value area. Key in a value at this point and press ENT. If the desired 4 mA value is zero (0), then key in the number zero. The next displayed information will ask for the **20:__in.** Key in a value now and press ENT. The display will then read **Fail-safe:4 mA.**

4-20 fail-safe sets the output current to a defined value when a measurement error occurs. With fail-safe set to 4 mA, the current will drive to 4 mA. The other settings are the same from that point.

Use the UP or DOWN arrows to toggle the selection of **4 mA, 20 mA, 22 mA,** or **Hold.** Press ENT for your selection, key in the password, and then press ENT again.

The basic configuration is now complete. The other menus for additional configuration can be performed by going through the menu prompt format. The instruction manual also provides excellent information to get the user through the entire configuration.

UNIT CONFIGURATION cont.

NOTE: Prior to programming, it is suggested that the installation is reviewed and all data such as range/reference distance, span, desired units and relay set points are written down to aid in the programming. Refer to Figures 19 and 20 on page 16.

COMPLETE MENU STRUCTURE

Model 341/344

Measured Values

- Volume (Volume mode only)
- Flow (Flow mode only)
- Totalizer (Flow mode only)
- Level
- Distance
- Loop
- Calculation
- Temperature
- View Data Log
- Previous Menu

System Configuration

- Level Units
- Mode Setup
  - Level Only
    - Range Setting
    - Span Setting
    - Previous Menu
  - Volume & Level
    - Vessel Type
    - Volume Units
    - Range Setting
    - Maximum Volume
    - Span Setting
    - Previous Menu
  - Flow & Level
    - Flow Element
    - Flow Units
    - Reference Distance
    - Maximum Flow
    - Maximum Head
    - Low Flow Cutoff
    - Previous Menu

I/O Configuration

- Relay Settings
- 4-20 mA Settings
- Totalizer (Flow mode only)
- Comm Port Setup
- Previous Menu

Advanced Configuration

- Temperature
- Calibrate
- Gain Limit
- Dampening
- False Targets
- Set Clock
- Enter Tag
- Default Display
- Calculation
- Change Password
- Change Sup Password
- Previous Menu

Diagnostics

- Test Relays
- Test 4-20 mA Loop
- Signal Strength
- View Version #
- Extended Errors
- Previous Menu

Laptop

- STRT ____
- END ____

>>>QUIT<<<

Measured Values Menu

This menu is used to view present values being measured in the Model 341/344. The menu layout is shown below.

Model 341/344

Measured Values

- Volume (Volume mode only)
- Flow (Flow mode only)
- Totalizer (Flow mode only)
- Level
  - Present measurement
- Distance
  - Present measurement
- Loop
  - Present measurement
- Calculation
  - Present measurement
- Temperature
  - Present measurement
- View Data Log*
- Previous Menu

Please refer to the above menu layout for the configuration instructions below.

*View Data Log

The optional data logger allows for storage of up to 31 days of the following measurement data.

Level Mode

Minimum and maximum level and time of occurrence each day. For level measurement only refer to the instructions at right.

Volume and Level

Minimum and maximum volume and time of occurrence each day. For volume and level only proceed to page 17.

Flow and Level

Minimum and maximum flow and time of occurrence each day and total flow for that day. For flow and level only proceed to page 20.

If you do not wish to view the measured values at this time, press DEL once if in a main menu mode or twice if in a value read mode from anywhere in the display and the unit will return to the default display, or press ENT at **Previous Menu** display, and the unit will return to **Measured Values**.

From the Default Display, press ENT to view the *Measured Values* menu. **Measured Values** and the UP/DOWN arrows will be displayed.

To view the Measured Values - Press ENT at the **Measured Values** display. **Level** will be displayed if level mode has been selected. (**Volume** will be displayed if volume mode has been selected. **Flow** will be displayed if flow mode has been selected).

To view the Present Measurement: Press ENT. After reviewing, press ENT to return to **Level, Volume** (Volume Mode Only) or **Flow** (Flow Mode Only).

To scroll down to the next Measured Value: Press the DOWN arrow. Pressing the UP arrow scrolls up the menu. Press ENT at any measured value that you wish to review.

System Config Menu - *Level Measurement*

This menu is used to configure the main control parameters of the Model 341/344. This is also used for first time configuration of the unit.

It is important to note that once in the *System Config* menu, you may scroll through the selections by using the UP or DOWN arrow. Once the desired selection is displayed, press ENT. The unit is capable of being configured in three different modes of operation.

- **Level Only**
- **Volume & Level**
- **Flow & Level**

The menu layout for **Level Measurement** is shown below.

Model 341/344

System Config - Level Measurement

- **Level Units**
- **Mode Setup**
- **Range Setting**
- **Span Setting**
- **Previous Menu**

Level Units

- **Inches**
- **Feet**
- **Centimeters**
- **Meters**

Please refer to the above menu layout for the configuration instructions below.

From the Default Display, press ENT to display **Measured Values**. Press the DOWN arrow to display **System Config**.

Press ENT once again to enter System Config and to display **Level Units**. Press ENT to display the present units of measure. Use the UP or DOWN arrow to scroll through units of measurement. When the desired selection is displayed, press ENT to lock in value. **Password?** will be displayed if the selection has been changed and your chosen password must be entered at this time. Press ENT to acknowledge an accepted password and the unit will display the next menu item - **Mode Setup**.

Refer to page 12 on selection of a General or Supervisory Password. The factory default password is **0341.** To change this password use the Advanced Config menu. Refer to page 27 for instruction.

Mode Set Up

- **Level Only**
- **Volume & Level**
- **Flow & Level**

With **Mode Set Up** on the display, press ENT to display the present mode. Scroll using the UP or DOWN arrows until the desired mode is displayed. Press ENT when **Level Only** is displayed. If the mode selection has changed, a warning will appear:

***** WARNING*** This mode change WILL erase ALL settings! Confirm change by pressing <9>.**

If the change is acknowledged after pressing <9> **Password?** will then be displayed. The password must be entered at this time. Press ENT to acknowledge the accepted password and the unit will display the next menu item - **Range Setting.**

UNIT CONFIGURATION cont.

System Config Menu cont.

Level Only

Range Setting

- **Manual Set**
- **Auto Set**

With **Range Setting** on the display, press ENT to display **Manual Set.** Use the UP or DOWN arrow to toggle between **Manual Set** and **Auto Set.**

The **Range Setting** is the entered distance from the transducer face to the minimum level to be measured (zero point). Refer to Figure 19. The operator is given the choice of **Manual Set** or **Auto Set**.

Manual Set: The measured distance from the face of the transducer and the minimum level (zero point) must be accurately measured and entered at this point.

Auto Set: This is an automatic ranging measurement. The actual low point will be measured between the transducer face and the zero point. The **Auto Set** mode requires that the transducer be installed and the fluid level in the vessel be at the lowest span point (zero).

NOTE: When using **Auto Set** first enter **Manual Set** and enter a value greater than the expected value in the auto mode.

When the desired type of range setting is displayed, press ENT to enable entry or display the range values.

Enter or display the range values and press ENT. **Password?** will be displayed and your chosen password must be entered at this time. Press ENT to acknowledge the accepted password and the unit will display the next menu item - **Span Setting**.

System Config Menu cont.

Level Only

Span Setting

- **Manual Set**
- **Auto Set**

With **Span Setting** on the display, press ENT to display **Manual Set.** Use the UP or DOWN arrow to toggle between **Manual Set** and **Auto Set.**

The **Span Setting** is the difference between the Range (low level or zero) and the desired maximum level. Refer to Figure 19. Maximum Span is the range value less the dead band, 12" or 18" (305 or 460 mm). The operator is given the choice of **Manual Set** or **Auto Set.**

Manual Set: The maximum level in the vessel must be measured or anticipated and entered at this time.

Auto Set: The 341/344 will actually measure the distance between the transducer face and maximum level anticipated.

NOTE: The Manual Set mode for the Span Setting is the preferred method of specifying this parameter.

When the desired span setting is displayed, press ENT to enable entry or display of the span values.

Enter or display the span values and press ENT. **Password?** will be displayed if the selection has been changed and your chosen password must be entered at this time. Press ENT to acknowledge the accepted password and the unit will display **Previous Menu**. Press ENT to return to the *System Configuration* menu.

***CAUTION:** If the actual level falls below the maximum range of the unit, the fail-safe selection must be set up so that the desired output is transmitted. When the level falls below the programmed range, the display will show **Loss of Echo.** If this condition occurs, the fail-safe actions will take place.*

***WARNING:** If level exceeds the programmed span, false display or output/control errors will occur. Transducer should be installed and unit programmed to assure that this level cannot occur.*

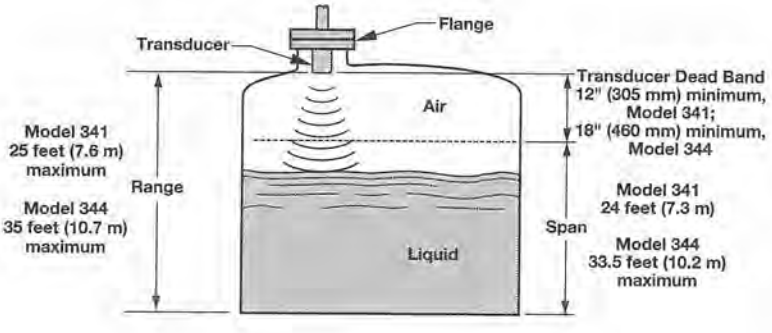


Figure 19

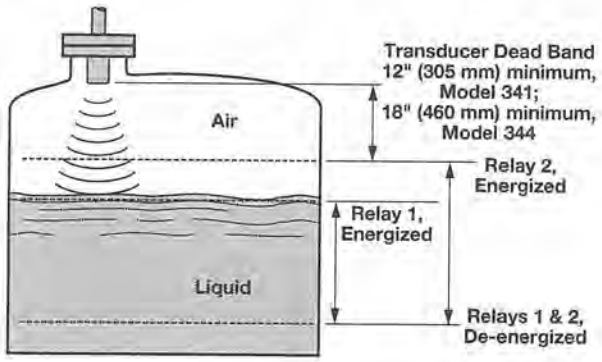


Figure 20

UNIT CONFIGURATION cont.

System Config Menu cont.

Volume and Level Measurement

This menu is used to configure the main control parameters of the Model 341/344 for the Volume and Level Measurement. This is also used for first time configuration of the unit.

It is important to note that once in the *System Config* menu, you may scroll through the selections by using the UP or DOWN arrow. Once the desired selection is displayed, press ENT. The unit is capable of being configured in three different modes of operation.

- **Level Only**
- **Volume & Level**
- **Flow & Level**

The menu layout for **Volume and Level Measurement** is shown below.

Model 341/344

Measured Values

System Config - Volume and Level Measurement

- **Level Units**
- **Mode Setup**
- **Vessel Type**
- **Volume Units**
- **Range Setting**
- **Maximum Volume**
- **Span Setting**
- **Previous Menu**

Level Units

- **Inches**
- **Feet**
- **Centimeters**
- **Meters**

Please refer to the above menu layout for the configuration instructions below.

From the Default Display, press ENT to display **Measured Values**. Press the DOWN arrow to display **System Config**.

Press ENT once again to enter System Config and to display **Level Units**. Press ENT to display the present units of measure. Use the UP or DOWN arrow to scroll through units of measurement. When the desired selection is displayed, press ENT to lock in value. **Password?** will be displayed if the selection has been changed and your chosen password must be entered at this time. Press ENT to acknowledge an accepted password and the unit will display the next menu item - **Mode Setup**.

Refer to page 12 on selection of a General or Supervisory Password. The factory default password is **0341.** To change this password use the Advanced Config menu. Refer to page 27 for instruction.

System Config Menu cont.

Mode Set Up

- **Level Only**
- **Volume & Level**
- **Flow & Level**

With **Mode Set Up** on the display, press ENT to display the selected mode. Scroll using the UP or DOWN arrows until the desired mode is displayed. Press ENT on display of **Volume & Level**. If the mode selection is changed, a warning will appear:

***** WARNING*** This mode change WILL erase ALL settings! Confirm change by pressing <9>.**

Password? will be displayed and your chosen password must be entered at this time. Press ENT to acknowledge the accepted password and the unit will display the next menu item - **Vessel Type**.

UNIT CONFIGURATION cont.

System Config Menu cont.

Volume and Level

Vessel Type

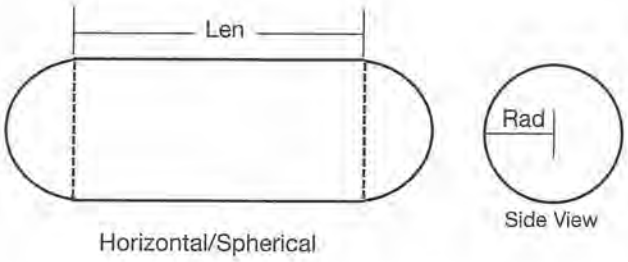
- **Horiz/Flat**
- **Horiz/Elip**
- **Horiz/Sphere**
- **Verti/Flat**
- **Verti/Conical**
- **Spherical**
- **Custom Table — Refer to pages 18 and 20**

With **Vessel Type** displayed, press ENT to display the present selection. Use the UP or DOWN arrow to scroll through the **Vessel Type** selections. When the desired vessel is displayed, press ENT.

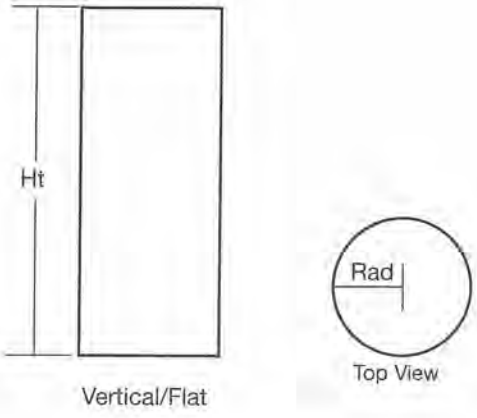
Enter the values needed to define the vessel parameters (ie. length, height, radius, end radius, cone, etc.), and press ENT. Refer to detailed vessel drawings.

NOTE: For Horiz/Elip tanks, when END is displayed, enter the value for one end of vessel only.

Password? will be displayed and your chosen password must be entered at this time. Press ENT to acknowledge the accepted password and the unit will display the next menu item - **Volume Units** refer to page 19.

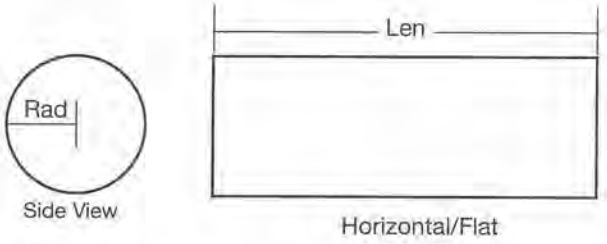


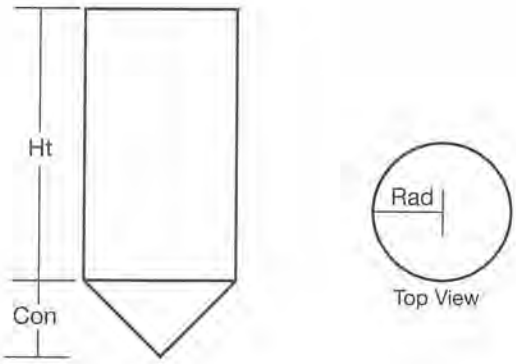
Horizontal/Spherical



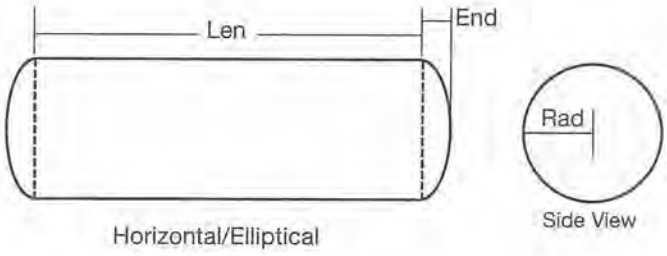
Vertical/Flat

Vessel Drawings

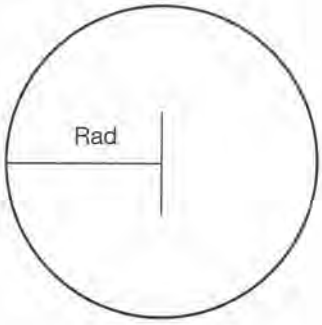




Vertical/Conical



Horizontal/Elliptical



Spherical

System Config Menu cont.

Custom Table Entry

If a custom table is selected, Press ENT and **Table Name** will be displayed. Press ENT and the present name will appear on the display. Press the 2nd key to start the left value/letter scrolling. If a faster scrolling speed is desired, press 2nd again. Make the selection by pressing ENT to lock in the first letter/value designation of the Table name. Use the UP or DOWN arrow to single step to the desired characters. Press ENT once again to proceed to the next character. For the balance of the table name perform the same steps as stated above. When completed, press ENT and the display will read **Max. Table Span**.

Enter the maximum span in units of measure selected in the level mode under **System Configuration** and press ENT. **Max. Table Value** will then be displayed.

Enter the maximum value (units selected under next step corresponding to 100% of table value) in the customer conversion/strapping table and press ENT. **Table Units** will be displayed.

Press ENT to choose Table Units. Enter characters via 2nd key in desired units. Press ENT and display reads **ENTER TABLE PTS**. Press ENT again to read **00%:** . Begin entering percent of volume for each % of height displayed in 2% steps. Table is complete after all 51 points are entered. After entering the points in the table, **Previous Menu** is displayed. Press ENT to continue to **Volume Units.** Press DOWN arrow to display Range Setting.

NOTE: If a custom table has been selected the unit will not allow access to Volume Units Menu. Display will read **Operation Denied**.

Password? will be displayed and your chosen password must be entered at this time. Press ENT to acknowledge the accepted password and the unit will display the next menu item - **Volume Units.**

Volume Units

Volume Units
- **Cubic Feet**
- **Gallons**
- **Million Gallons**
- **Cubic Meters**
- **Liters**
- **Million Liters**
- **Petroleum Barrel**

With **Volume Units** displayed, press ENT to display the selected units. Scroll to the desired **Volume Units** and press ENT.

Password? will be displayed if the selection has been changed and your chosen password must be entered at this time. Press ENT to acknowledge an accepted password and the unit will display the next menu item - **Range Setting**.

Refer to page 12 on selection of a General or Supervisory Password.

System Config Menu cont.

Volume and Level

Range Setting
- **Manual Set**
- **Auto Set**

With **Range Setting** displayed, press ENT to display **Manual Set.** Use the UP or DOWN arrow to toggle between **Manual Set** and **Auto Set.** Refer to page 16 for explanation of **Range** as well as **Manual Set** and **Auto Set** modes. When the desired type of range setting is displayed, press ENT to enable entry of the range values.

Enter or display the range values and press ENT. **Password?** will be displayed and your chosen password must be entered at this time. Press ENT to acknowledge the accepted password and the unit will display the next menu item - **Max Volume**.

Max Volume and **Span Setting** interact with each other. Only one of these two parameters should be entered. The other parameter is available for review by the user.

Volume and Level

Max Volume

With **Max Volume** displayed, press ENT to display the current value, **Max___cuft.** If the maximum vessel volume is known, enter the value and press ENT.

Password? will be displayed and your chosen password must be entered at this time. Press ENT to acknowledge the accepted password and the unit will display the next menu item - **Span Setting**.

NOTE: Make sure that the volume entered does not include dead band. Maximum volume occurs at the maximum span of liquid. The Model 341/344 will use **Max. Volume** to calculate the **Span Setting**.

Volume and Level

Span Setting
- **Manual Set**
- **Auto Set**

With **Span Setting** displayed, press ENT to display **Manual Set.** Use the UP or DOWN arrow to toggle between **Manual Set** and **Auto Set.** Refer to page 16 for explanation of **Span** as well as **Manual Set** and **Auto Set** modes. When the desired type of span setting is displayed, press ENT to enable entry of the span values.

Enter the span values and press ENT. **Password?** will be displayed and your chosen password must be entered at this time. Press ENT to acknowledge the accepted password and the unit will display the next menu item - **Previous Menu**.

Press ENT to return to the *System Configuration* menu.

UNIT CONFIGURATION cont.

System Config Menu cont. - *Flow and Level Measurement*

This menu is used to configure the main control parameters of the Model 341/344 for Flow and Level Measurements. This is also used for first time configuration of the unit.

It is important to note that once in the *System Config* menu, you may scroll through the selections by using the UP or DOWN arrow. Once the desired selection is displayed, press ENT. The unit is capable of being configured in three different modes of operation.

- **Level Only**
- **Volume & Level**
- **Flow & Level**

The menu layout for **Flow and Level Measurement** is shown below.

Model 341/344

Measured Values

System Config - Flow and Level Measurement

- **Level Units**
- **Mode Setup**
- **Flow Element**
- **Flow Units**
- **Reference Distance**
- **Maximum Flow**
- **Maximum Head**
- **Low Flow Cutoff**
- **Previous Menu**

Level Units

- Inches
- Feet
- Centimeters
- Meters

Please refer to the above menu layout for the configuration instructions below.

From the Default Display, press ENT to display **Measured Values.** Press the DOWN arrow to display **System Config.**

Press ENT once again to enter System Config and to display **Level Units.** Press ENT to display the present units of measure. Use the UP or DOWN arrow to scroll through units of measurement. When the desired selection is displayed, press ENT to lock in value. **Password?** will be displayed if the selection has been changed and your chosen password must be entered at this time. Press ENT to acknowledge an accepted password and the unit will display the next menu item - **Mode Setup.**

Refer to page 12 on selection of a General or Supervisory Password. The factory default password is **0341.** To change this password use the Advanced Config menu. Refer to page 27 for instruction.

System Config Menu cont.

Mode Set Up

- **Level Only**
- **Volume & Level**
- **Flow & Level**

With **Mode Set Up** displayed, press ENT to display the selected mode. Scroll using the UP or DOWN arrows until the desired mode is displayed. Press ENT. If the mode selection is changed, a warning will appear:

***** WARNING*** This mode change WILL erase ALL settings! Confirm change by pressing <9>.**

Password? will be displayed and your chosen password must be entered at this time. Press ENT to acknowledge the accepted password and the unit will display the next menu item - **Flow Element.**

Flow and Level

Flow Element

V-notch	22.5°
	30°
	45°
	60°
	90°
	120°
Parshall	1"
	2"
	3"
	6"
	9"
	12"
	18"
	24"
	36"
	48"
	60"
	72"
	96"
	120"
	144"

UNIT CONFIGURATION cont.

System Config Menu cont.

Flow and Level

Flow Element cont.

- **Rectangular/End Contractions**
- **Rectangular**
- **Cipoletti**
- **Palmer Bowlus** 4", 6", 8", 10", 12", 15", 18", 21", 24", 27", 30"
- **H-Flume** 6", 9", 12", 18", 24", 30", 36", 54"
- **I-Flume** I 12 Z, I 30 Z, I 40 Z, I 50 Z, I 60 Z, I 80 Z, I 10 H, I 13 H, I 16 H
- **Custom Table**

From the **Flow and Level** display, press ENT to display **Flow Element**. Press ENT to display the selection. Use the UP or DOWN arrow to scroll through the **Flow Element** selections. When the desired flow element is displayed, press ENT.

If the flow element is changed, **Password?** will be displayed and your chosen password must be entered at this time. Press ENT to acknowledge the accepted password and the unit will display the next menu item - **Flow Units**. Refer to page 22.

NOTE: If the Rectangular/End Contractions, Rectangular or Cipoletti is selected, the unit will prompt the user for the width of the flow element.

System Config Menu cont.

Custom Table Entry

If the flow element for your application is not in the menu, select the custom table to configure a 51-point strapping table. Press ENT on display of **Custom Table. Table Name** will be displayed. Press ENT and input the table name via 2nd key (Refer to page 19 for volume custom table configuration). Press ENT and read **Max. Table Span.** Press ENT and key in maximum span level. Press ENT once again and read **Max Table Value** and press ENT. Key in desired Max. table value (usually equal to the 100% value) and press ENT. **Table Units** will appear. Key in any appropriate units and press ENT and unit will display the current timebase. Use UP or DOWN arrow to choose **Timebase Seconds, Timebase Minutes, Timebase Hour or Timebase Day**. This operation will enable Totalizer to function properly. **Tbl Total Units** will appear on display. This is the units being used for your totalized flow. Key in appropriate units. Press ENT to display **Enter Table PTS**. Press ENT again to read **00%:** Begin entering percent of volume for each % of height displayed in 2% steps. Table is complete after all 51 points are entered. After entering the points in the table, **Previous Menu** is displayed. Press ENT to continue to **Flow Units.** Press DOWN arrow to display **Reference Distance**.

Attempt to access **Flow Units** menu selection when using a custom table is not allowed. Display will read **Operation Denied**.

UNIT CONFIGURATION cont.

System Config Menu cont.

Flow Units

- **Cubic Feet/Sec**
- **Cubic Feet/Min**
- **Cubic Feet /Hr**
- **Gallons/Min**
- **Gallons/Hr**
- **Million Gals/Day**
- **Cubic Meters/Sec**
- **Cubic Meters/Min**
- **Cubic Meters/Hr**
- **Liters/Min**
- **Liters/Hr**
- **MegaLiters/Day**

With **Flow Units** displayed, press ENT to display the selections. Use the UP or DOWN arrow to scroll through the **Flow Units**. When the desired flow unit is displayed, press ENT.

If the flow unit is changed, **Password?** will be displayed and your chosen password must be entered at this time. Press ENT to acknowledge the accepted password and the unit will display the next menu item - **Reference Distance**.

NOTE: If a custom table has been selected the unit will not allow access to **Flow Units** menu.

Flow and Level

Reference Distance (Range)

- **Manual Set**
- **Auto Set**

With **Reference Distance** displayed, press ENT to display **Manual Set.** Use the UP or DOWN arrow to toggle between **Manual Set** and **Auto Set.** Refer to page 16 for explanation of **Range** as well as **Manual Set** or **Auto Set.** When the desired reference distance setting is displayed, press ENT to enable entry of the values.

Enter the values and press ENT. **Password?** will be displayed and your chosen password must be entered at this time. Press ENT to acknowledge the accepted password and the unit will display the next menu item - **Maximum Flow.**

System Config Menu cont.

Maximum Head and **Maximum Flow** will interact with each other. Only one of these two parameters should be entered. The other parameter is available for review by the user.

Flow and Level

Maximum Flow

With **Maximum Flow** displayed, press ENT to display the current value, **Max** ___. If a maximum flow rate is known, based on the flow element selected, enter this value, and press ENT.

Password? will be displayed and your chosen password must be entered at this time. Press ENT to acknowledge the accepted password and the unit will display the next menu item - **Maximum Head.**

The Model 341/344 will use the **Maximum Flow** to calculate the **Maximum Head Value.**

Flow and Level

Maximum Head

- **Manual Set**
- **Auto Set**

With **Maximum Head** displayed, press ENT to display **Manual Set. Maximum Head** is the maximum anticipated level of the liquid in the flow element. Use the UP or DOWN arrow to toggle between **Manual Set** and **Auto Set.** When the desired reference maximum head setting is displayed, press ENT to enable entry of the values.

Enter the values and press ENT. **Password?** will be displayed and your chosen password must be entered at this time. Press ENT to acknowledge the accepted password and the unit will display the next menu item - **Low Flow Cutoff.**

NOTE: **Manual Set** is the recommended method of configuration.

Flow and Level

Low Flow Cutoff

- **Cut** __

With **Low Flow Cutoff** displayed, press ENT to display **Cut.**

Low Flow Cutoff is the low level cutoff value expressed in (x.x) which is the chosen units of level. This will force a zero flow value when the level is at or below this **Low Cutoff Value**. Enter the value and press ENT. **Password?** will be displayed and your chosen password must be entered at this time. Press ENT to acknowledge the accepted password and the unit will display the next menu item - **Previous Menu**.

I/O Config Menu

This menu is used to configure relay settings, output, totalization, and communications parameters of the Model 341/344.

All relays can be configured for normal mode of action. (ie. pump control, high or low alarm). However the unit can be configured for dedicated relays as follows:

Relay 1 Normal

Relay 2 Normal/Lead/Lag Pump Alternation (with Relay 1)

Relay 3 Normal/Dedicated Fault

Relay 4 Normal/Sampler Contact

Model 341/344

Measured Values

System Config

I/O Config

- **Relay Settings**
- **4-20 mA Settings**
- **Totalizer (Flow Mode Only)**
- **CommPort Set up**
- **Previous Menu**

Relay Settings

- **Disabled**
- **Enabled**
  - **SetPoint** **LEVEL**
    - **VOLUME (Volume Mode Only)**
    - **FLOW (Flow Mode Only)**
      - **ON Setpoint**
      - **OFF Setpoint**
        - **ON Delay**
        - **OFF Delay**
        - **Fail-safe OFF**
        - **Fail-safe ON**
        - **Fail-safe Hold**

Please refer to the above menu layout for the configuration instructions below.

From the Default Display, press ENT to display **Measured Values**.Press the DOWN arrow to display **System Config**. Press the DOWN arrow once again to display **I/O Config.**

Press ENT to enter I/O Config and to display **Relay Settings**. Press ENT once again to display **Relay #**. Enter the relay number to be configured and press ENT. The operating status of the relay will be displayed. Use the UP or DOWN arrow to toggle between **Disabled** and **Enabled**. With **Enabled** displayed press ENT.

I/O Config Menu cont.

On will be displayed. Enter the **On** setpoint value for that relay and press ENT. Enter the value at which the relay setpoint should turn off at the **Off** display. Press ENT. If the 341/344 is in the flow or volume modes, the unit will prompt the user to set the relays in a level mode, volume or flow mode.

If the **On** and **Off** setpoint values entered are identical, the display will read **On>=Setpoint.** Use the UP or DOWN arrow to toggle between greater than or equal to and less than setpoint. Press ENT to display **On Delay**. This is the number of seconds before activating or deactivating the relay contact closure. This delay is adjustable from 1 to 120 seconds. Press ENT after the value is entered. Follow the same procedure for the **Off Delay**. Press ENT and **Fail-safe:Off**, **On**, or **Hold** will be displayed.

NOTE: With loss of power, all relays regardless of fail-safe setting, will de-energize.

This is the state the relay will assume if a fault is detected or echo loss occurs. **OFF** means the relay is de-energized. **On** means the relay is energized and **Hold** means the relay is left in the state the relay was in when the fault occurred. Use the UP or DOWN arrow to scroll through selections. Press ENT and **Relay Settings** will be displayed.

Relay #2

If LEAD/LAG is selected for Relay 2, Relays 1 and 2 will alternate as described in the following paragraph.

Lead/Lag Pump Control

Lead/Lag pump control provides for an exchange of the role or function of the two pumps in order to provide for even wear on both pumps, therefore increasing pump life. The relay action is identical to the Auto Empty Mode or the Auto Fill Mode, however, following each pump shutdown, the lead/lad role of each pump is exchanged. When using Lead/Lag Pump Control, set points cannot be identical; they must operate in the same direction. Refer to Figure 21.

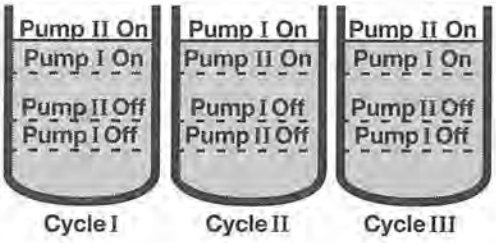


Figure 21

UNIT CONFIGURATION cont.

I/O Config Menu cont.

If fault is selected for Relay 3, press ENT and **T'ducer** will be displayed. User should select the faults to "Enable" the ones that control Relay 3. Select between Enable and Disable for the displayed Fault by using the UP or DOWN arrow. Press ENT to continue to next item.

Relay #3

- **Normal**
- **Fault**
  - * **T'ducer**
    The unit was not able to detect a transducer connected or was not able to determine the transducer's frequency.
  - * **No Echo**
    The unit is not able to detect a return signal from the transducer.
  - * **Ringdown**
    The transducer is ringing long enough to ring into the span of the unit.
  - * **Loop Flt**
    The calculated value for the loop output is less than 4 mA or greater than 20 mA. The loop output will be in its fail-safe mode.
  - * **Temp.**
    The signal from the temperature transducer in the transducer is out of range. Either a short or open lead detected.
  - * **Params**
    This error is not supported at this time and will not be generated.
  - * **System**
    This error is generated when there is an error writing configured values to non volatile memory.
  - * **Fault Action**
    - **Energize**
    - **De-Energize**

* For further information on Faults, refer to Troubleshooting Section on pages 29-32.

With **Fault Action** in the display, press ENT. Choose the operation of Relay 3 on the faults; **Energize** or **De-Energize.** With **Previous Menu** on the display, press ENT.

I/O Config Menu cont.

If Sampler is selected for Relay 4, enter a volume or time for a contact closure to be pulsed to an external sampling device.

Relay #4

- **Normal**
- **Sampler**
  - **Sample By Time****
  - **Sample By Flow**

**This parameter is only allowed with the Data Logging option.

Relay #4 provides the user with two choices, normal relay action or a relay contact closure to an external sampler. With the display reading Relay # ____, press the number 4 at this time corresponding to Relay #4 and press ENT. Select sampler for the relay mode by using the UP or DOWN arrow keys. Press ENT. Using the UP or DOWN arrow keys, toggle between the selection of **Sample by Time** or **Sample by Flow.** If **Sampling by Time** is chosen, the display will read **Interval 0000.** Enter a value in minutes as to the contact closure time. If **Sample by Flow** is chosen, the unit will prompt the user to enter a value in the flow units selected for the relay contact closure rate. This is a momentary contact closure. Example: If 1000 gal. is entered, Relay #4 will will energize once for every 1000 gallons.

Password? will be displayed if any of the selections have been changed and your chosen password must be entered at this time. Press ENT to acknowledge an accepted password and the unit will display the current menu item - **Relay Settings**.

Refer to page 12 on selection of a General or Supervisory Password.

Press the DOWN arrow to proceed to **4-20 mA Settings**.

UNIT CONFIGURATION cont.

I/O Config Menu cont.

4-20 mA Settings

- **4:**
- **20:**
- **Fail-safe: 4 mA**
- **20 mA**
- **22 mA**
- **Hold**

With **4-20 mA Settings** displayed, press ENT to display **Setpoint Level, Setpoint Flow** or **Setpoint Volume,** depending on the mode that the unit is in. If level only is selected as the mode of operation, the display will read **4:**___ and **20:** ___. In addition, if the Volume or Flow modes are selected, the 4 and 20 points can be entered as volume or flow units. Press ENT and **4: 0** is displayed. Enter the value desired for 4 mA and press ENT. **20:0** will be displayed. Enter the value desired for the 20 mA and press ENT.

Loop Fail-Safe Settings

The Echotel 341/344 has a unique ability to calibrate its analog output anywhere inside its "system span" (refer to page 16 for **Span Setting**). The analog (4-20 mA) signal can cover the entire "system span" or just a small portion of it. If the actual level should move beyond the limits of the 4-20 mA span, the analog output will *hold the last value* being generated at the moment the unit went out of range.

NOTE: Relay *fail-safe* settings are totally independent of the analog 4-20 mA *fail-safe* settings.

The analog output will assume predetermined values under certain conditions. The conditions or events that will cause the unit to go into the fail-safe mode include *echo loss, transducer failure* or *ringdown error.* The fail-safe output values may be set as: 4 mA, 20 mA, 22 mA, or HOLD (last value). The 22 mA value is provided for use as an unmistakable indication of a fault condition. The factory default setting for this feature will be **HOLD**.

To change the fail-safe setting, press the UP/DOWN arrows and scroll through the four possible values. When the desired value is displayed press ENT to select it. The unit will prompt you for a password before accepting the change. Enter the appropriate password (factory default is **0341**) and press ENT. The display will then return to the menu selection **4-20 mA Settings.**

I/O Config Menu cont.

Totalizer (Flow Mode Only)

- **Hardware**
- **Tot** ___
- **Software**
- **Tot** ___

The selected display units will determine the totalizer units, i.e. if chosen units are gallons and multiplier is 100, every 100 gallons the totalizer will advance once. Hardware totalizer is seven digits; software totalizer is six digits.

This is the weight of each count of flow increment shown on the mechanical totalizer. With **Totalizer** displayed, press ENT to display **Hardware.** Press ENT and **Tot 0** is displayed. Enter the value at which each digit changes based on the chosen units of flow and press ENT. The unit will display **Software.** Press ENT and **Tot 0** will be displayed. Enter the value desired at which the software totalizer changes each increment and press ENT.

Password? will be displayed and your chosen password must be entered at this time. Press ENT to acknowledge the accepted password and the unit will display **Totalizer.** Use the DOWN arrow to scroll to display **Comm Port Set Up.**

NOTE: The hardware/software totalizing multiplier should be chosen so that at maximum value, the advance rate should not exceed once per minute.

NOTE: If power to the unit is removed, Software Totalizer will reset to zero.

Comm Port Set Up

- **Laptop Rate**
- **MagNet Rate**
- **MagNet Addr**
- **Previous Menu**

With **Comm Port Set Up** displayed, press ENT to display **Laptop Rate.** Use the UP/DOWN arrow to scroll to the desired rate for RS-232 communications and press ENT.

NOTE: The baud rate selected must match the baud rate setting from the communications program of the laptop being used in the downloading scheme..

The unit will display **MagNet Rate 300.** Use the UP/DOWN arrow to scroll to the desired rate for RS-485 communications. Press ENT at the desired rate and **MagNet Address** will be displayed. Enter the number assigned to the unit in the field at which the MagNet software is to use as the address location and press ENT.

Password? will be displayed and your chosen password must be entered at this time. Press ENT to acknowledge the accepted password and the unit will display **Comm Port Set Up**. Use the DOWN arrow to scroll to **Previous Menu** and press ENT. Press the DOWN arrow to scroll to the next menu section - **Advanced Config.**

UNIT CONFIGURATION cont.

Advanced Config

This menu is used to calibrate non-control parameters of the Model 341/344. Each menu item will prompt for **Sup Pswd?** as a protection against unauthorized changes.

Model 341/344

Measured Values
System Config
I/O Config
Advanced Config

- **Temperature ***
- **Calibrate***
- **Gain Limit***
- **Dampening***
- **False Targets**
- **Set Clock**
- **Enter Tag**
- **Default Display**
- **Calculation**
- **Change Password**
- **Change Sup Pass**
- **Previous Menu**

* **Warning:** These values are factory set and should not be changed without consulting the factory.

Temperature

This displays the present temperature sensed inside the transducer in degrees F. (C if metric units of level are chosen)

If the transducer is changed or the value seems to be in error, enter the correct value and press ENT.

Sup Password? will be displayed and your chosen password must be entered at this time. Press ENT to acknowledge the password.

Calibrate

This displays the measured distance in the present units of level.

If the process is other than air and/or a known distance is available, enter the correct value and press ENT. This feature allows the instrument to be used with inert gas blankets where the speed of sound differs significantly from atmospheric pressure.

NOTE: If calibrate mode is not properly used, this may cause false level readings. Consult factory for reset procedures.

Sup Password? will be displayed and your chosen password must be entered at this time. Press ENT to acknowledge the password.

Advanced Config cont.

Gain Limit

This displays the value of Maximum gain that the unit will use. This value is from 1-32 and the unit steps up in single gain increments until a suitable signal is received. Limiting the Max Gain to a lower value helps to limit noise problems.

Enter any value between 1 and 32. **Sup Password?** will be displayed and your chosen password must be entered at this time. Press ENT to acknowledge the password.

The Model 341/344 adapts its gain to suit the conditions of the application. There are 32 gain steps. The higher the number, the higher gain/drive required to detect an acceptable signal.

Dampening

This displays the value dampening. This factor is a smoothing or averaging factor for the Model 341/344 outputs and the higher the number the more smoothing to rapid changes. The value may be between 1 and 16.

Enter any value between 1 and 16. **Sup Password?** will be displayed and your chosen password must be entered at this time. Press ENT to acknowledge the password.

The dampening factor is a smoothing or averaging term. The 341/344 averages echo values over a number of previous measurement cycles. The dampening factor tells the unit the number of cycles over which the unit should perform this average. Thus, the higher the dampening factor, the more averaging and the slower it reacts to a step change in level.

False Targets

The false target rejection feature allows for semi-automatic programming as follows. The tank must be empty or below any false targets that will be rejected. The 341/344 will proceed to find the first target which provides a detectable echo. The display will prompt the user, to identify each echo as either a false target or the true distance to the process material. If the echo results from a false target, press ENT. The 341/344 will store gain and distance parameters about each target that will allow it to discern true levels from false target echoes.

The 341/344 will suppress this target and increase gain until the next target is obtained. This procedure can be repeated until all false targets have been acknowledged.

After the true distance is displayed, press DEL.

The 341/344 will prompt "Press ENT" to save all new false targets. Press ENT to continue. **Sup Pswd?** will be displayed and your chosen password must be entered at this time. Press ENT to acknowledge the password.

Entering this menu again will restart the false target selection and clear the old targets.

* **Warning:** Make sure that all false targets are cleared or deleted from the software. Press DEL upon the display saying **Tar 0:__in.** Press ENT and input **Supervisory Password** code.

Advanced Config cont.

Set Clock

This allows for setting or changing of the date and time. This is only available with the Data Logging option. Unit prompts for:

Month?
Date?
Year?
Hour? (24 hour format)
Minute?

After entering these values, the unit prompts ENT to set and then asks for the password.

Enter Tag

This menu shows the present Tag - **Magnetrol.**

If desired, this tag can be changed by using the UP or DOWN arrows to scan through characters and press ENT to use the character at that location in the Tag. Pressing the 2nd key will start scrolling of the available characters. When close to the desired character, press ENT and use arrows to reach desired character.

Default Display

This menu allows the operator to select the items to be displayed during normal operation.The following items may be toggled **Enabled/Disabled** using the UP and DOWN arrow:

Level

Vol/Flow (Only when Volume or Flow mode is chosen)

Loop

Tag (Magnetrol)

Clock

Calc.

Totl.

The last menu item is **Previous Menu.** If any change was made in the default display, ENT at this point will cause the unit to prompt for the **Sup Pswd.**

Advanced Config cont.

Calculation

Press ENT to display **Existing Text Is.** Press ENT again to display **Text:** ___ . Enter Text by using UP or DOWN arrow keys and press ENT at each entry. Display will then read **Mult:.** This is the multiplier used to show up in calculation. This value is multiplied by your level, flow or volume reading.

NOTE: The calculation is only for display purposes. It does not affect the control relays or loop current output.

Change Password

Allows for a change of password. Requires the **Sup Pswd.**

Change Sup Password

Allows for a change of **Sup Pswd.** Requires the **Sup Pswd.**

Previous Menu

Returns to the previous menu, **Advanced Config.**

Press DOWN arrow to proceed to **Diagnostics.**

UNIT CONFIGURATION cont.

Diagnostics Menu

This menu is used to provide the user with testing the functionality and providing useful information for troubleshooting of the unit.

Model 341/344

Measured Values
System Config
I/O Config
Advanced Config
Diagnostics
- **Test Relays**
- **Test 4-20 Loop**
- **Signal Strength**
- **View Version#**
- **Extended Errors**
- **Previous Menu**

Test Relays

This menu allows the operator to cycle individual control relays on or off.

Test 4-20 mA Loop

By entering different values into the system the actual loop current output can be adjusted to test dependent devices and /or control loops.

Signal Strength

This menu provides the user with a gain value from 1 to 32 (1=low gain/sensitivity, 32=high gain/sensitivity) and a percent received signal strength from 0 to 100%. The 341/344's processor controls the signal strength at 60-70%. This is a variable gain circuit which self-adjusts for an optimum signal return.

View Version

This is the version number of the software in the 341/344.

Extended Errors

This information may be requested during troubleshooting of the unit.

Press ENT with **Previous Menu** displayed, and return to **Diagnostics** mode. Press the DOWN arrow to display **LapTop.**

LapTop Menu

This menu is used to enter the start and end day range for downloading of stored data log for the Model 341/344 with optional data logging feature.

Model 341/344

Measured Values
System Config
I/O Config
Advanced Config
Diagnostics
Laptop
- **STRT**
- **END**

With **LapTop** displayed, press ENT to display **Strt** ___ . Enter the number of the day (the most recent day) to begin downloading. The present day is always day 1. Data up to 31 days prior to the current day can be downloaded. Press ENT and **End** will appear. Enter the ending day. Press ENT and **Processing...** will be displayed. If the laptop is connected for RS-232 and the baud rate is compatible as set in the I/O Config, the unit will begin to download the start /end day range.

NOTE: This is an updating 31 day format. It will download the minimum, maximum (at times of occurrence), and total flow data for selected days. When the transmission of data is complete, the display will return to **Laptop.**

Refer to page 12 for wiring information.

Any P.C. communication program may be used to capture this data. Start the communications program. Set up as 8 bit, 9600 Baud, 1 stop bit. Select download file (usually page DOWN key), select ASCII file type. Refer to your communications program documentation if needed.

TROUBLESHOOTING

The Troubleshooting section offers five steps in diagnosing problems with the Model 341/344:

Step 1: Application Checklist – review fundamental application parameters
Step 2: Installation Checklist – review typical installation problems
Step 3: Troubleshooting Table – explains diagnostic error conditions shown on the LCD display and some typical electronic problems.
Step 4: Troubleshooting Flowchart – step-by-step procedure
Step 5: Contact factory.

APPLICATION CHECKLIST

Check for the following application sensitivities before proceeding to the next section:

VAPORS _____
INVISIBLE (may alter speed of sound) _____
VISIBLE (may cause false reflections or attenuation) _____
FOAM _____
SURFACE AGITATION _____
ANGLE OF REPOSE _____
TEMPERATURE _____
PRESSURE _____
OBSTRUCTIONS _____

If any of the above sensitivities are present, consult the factory for recommendations.

INSTALLATION CHECKLIST

CABLE

1. _____ Was Belden 8102 used? If not, improper operation may occur.
2. _____ Is transducer wiring run in a dedicated conduit?
3. _____ Is shield connected at both ends?

TRANSDUCER

1. _____ Check transducer alignment (vertical)
2. _____ Is transducer mounted hand tight? Over tightening may cause ringing, some installations may require use of a "shock" absorber.
3. _____ Minimum nozzle diameter 8 inches.
4. _____ Maximum nozzle height 11 inches.
5. _____ Check beam path for obstructions, including tank wall. Refer to page 6 for Sonic Beam Dispersion chart.
6. _____ Check transducer housing for moisture.
7. _____ What is the distance from the transducer face to current level?

PROCESS

1. What is the temperature?
   a. At transmitter _____
   b. At transducer _____
2. What is the media being measured? _____

PROCESS cont.

3. _____ Does the tank have a mixing blade? Could it be providing false level readings or creating a vortex resulting in echo loss.
4. _____ Is there an angle of repose? (Solids)

NOTE: Refer to Measurement Range Calculations on pages 3 and 4 if any of the points in the PROCESS section have been checked.

TRANSMITTER

Enter the specified menu and obtain the following information before consulting the factory.

MEASURED VALUES MENU
LEVEL _____
DISTANCE _____

SYSTEM CONFIGURATION
RANGE _____
SPAN _____

ADVANCED CONFIGURATION
TEMPERATURE _____

DIAGNOSTICS MENU
GAIN _____
SIGNAL STRENGTH _____%

1. Is transmitter indoors or out? _____
2. What is the transmitter serial number? _____

TROUBLESHOOTING cont.

TROUBLESHOOTING TABLE

These are troubleshooting displays which may appear on the Model 341/344.

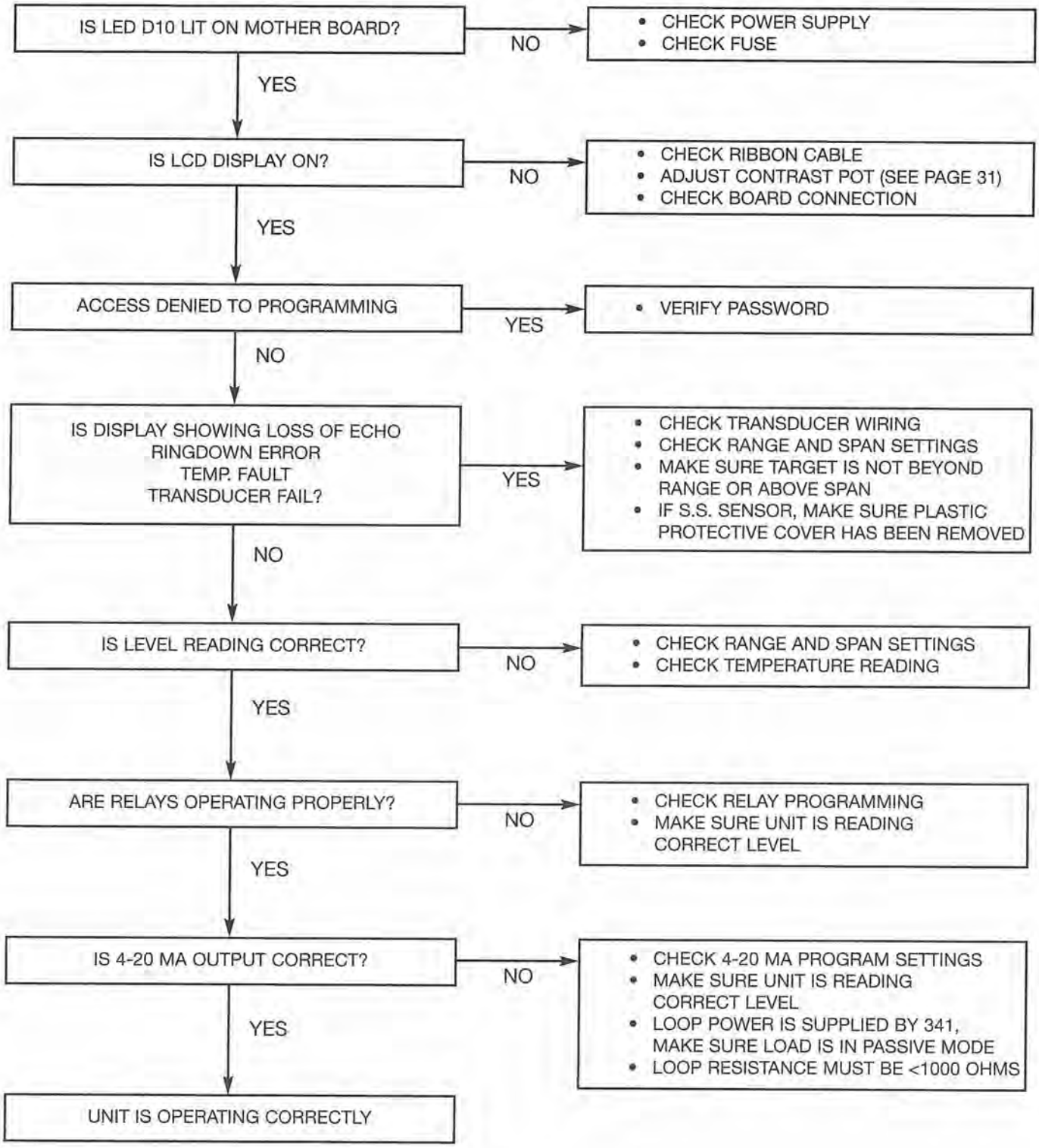
Display	Cause	Solution
COMM PARAM FAIL	The configuration parameters for the communications port are corrupt.	Press ENT to continue. This loads default values for the communication parameters. The communication parameters should be checked to refer to that they match your configuration.
MAIN PARAM FAIL	The main parameters which store range/reference and span/headroom are corrupt.	Press ENT to continue. This will load default values for the main parameters. All of the items in the System Config menu need to be verified.
STRAP TABLE FAIL	There is an error in the custom strapping table entry.	Press ENT to continue; the table is cleared. If a custom table is not being used, then this error can be ignored. If you are using a custom table, the table has to be re-entered.
RLY1 PARAM FAIL	The parameters for Relay 1 are corrupt.	Press ENT to continue. The relay is disabled and the settings are set to default values. Reconfigure the relay from the I/O Config menu.
RLY2 PARAM FAIL	The parameters for Relay 2 are corrupt.	Press ENT to continue. The relay is disabled and the settings are set to default values. Reconfigure the relay from the I/O Config menu.
RLY3 PARAM FAIL	The parameters for Relay 3 are corrupt.	Press ENT to continue. The relay is disabled and the settings are set to default values. Reconfigure the relay from the I/O Config menu.
RLY4 PARAM FAIL	The parameters for Relay 4 are corrupt.	Press ENT to continue. The relay is disabled and the settings are set to default values. Reconfigure the relay from the I/O Config menu.
LOOP PARAM FAIL	The 4–20 mA loop parameters are corrupt.	Press ENT to continue. The loop is disabled and the settings are set to default values. Reconfigure the relay from the I/O Config menu.
CALC PARAM FAIL	The calculation parameters are corrupt.	Press ENT to continue. New values need to be entered for the calculation. This is done from the Calibration menu.
PASSWORD LOST	The passwords are corrupt.	Press ENT to continue. Enter new passwords from the Calibration menu.
DATA LOG LOST	The data log is corrupt.	Press ENT to continue. The data log is cleared.
P.O.S.T. FAILED	Power on self test failed. Microprocessor internal register was not set correctly on power up. The software will attempt to set the register to the proper value	Turn unit off and apply power again. If the error disappears, it was able to set the register to the proper value and will function properly.
TRANSDUCER FAIL	The unit was not able to detect a transducer connected or was not able to determine the transducer's frequency.	Ensure that the transducer is connected properly to the unit. Try replacing the transducer. Return the unit for repair.
LOSS OF ECHO	The unit is not able to detect a return signal from the transducer.	Ensure that the level to be detected is within the range and span of the unit. Check the application for foam, obstructions, or heavy vapors.
RINGDOWN ERROR	The transducer is ringing long enough to ring into the span of the unit.	Try decreasing the span to increase the dead band (range minus span) of the unit. Try replacing the transducer because the current transducer may have a problem that causes it to ring an extra long time.
TEMPERATURE FAULT	The signal from the temperature sensor in the transducer is out of range. Either a short or open lead detected.	Check to see that the sensor wires are connected properly. Ensure that the sensor wires are not shorted or open.
OPERATION DENIED	The current operation is not allowed because the proper password was not entered.	Retry the proper password.
"OUT OF RANGE"	The value that was entered was not in an acceptable range.	Re-enter a value within the proper limits.
CANNOT BE EQUAL	The value for the 4 mA point and the 20 mA point cannot be equal.	Choose the values that are not the same and re-enter.
INVALID LEAD/LAG	Setting relay 1 and 2 for lead/lag is not allowed.	Check that both relays are enable and that the set points are proper for lead/lag operation.
PASSWORD INVALID	The password entered is not valid.	Retry the previous operation and enter the proper password.

TROUBLESHOOTING cont.

Display	Cause	Solution
NO CLOCK PRESENT	The real time clock was not found on the board. No data logging or time sampling is allowed.	If you need the real time functions, contact the factory to see if your unit was ordered with the data logging option.
LOOP > 20 mA	The calculated value for the loop output is greater than 20 mA. The loop output will be in its fail-safe mode.	If the level is within a normal operating range, adjust the loop parameters to allow proper tracking of the level. If the level is out of the normal 4-20 mA range then correct the problem with the level.
LOOP < 4 mA	The calculated value for the loop output is less than 4 mA. The loop output will be in its fail-safe mode.	If the level is within a normal operating range, adjust the loop parameters to allow proper tracking of the level. If the level is out of the normal 4-20 mA range then correct the problem with the level.
DISPLAY IS TOO DIM OR TOO LIGHT		Turn R2 (contrast adjustment), clockwise to darken the display or counterclockwise to lighten the display, until the desired contrast is obtained.

TROUBLESHOOTING cont.

TROUBLESHOOTING FLOWCHART



CONTACT FACTORY

If it becomes necessary to contact the factory for technical assistance, please have all of the information gathered in Steps 1-4 readily available. This will help us in resolving your problem.

ELECTRICAL SPECIFICATIONS

Description		Specification
Supply Voltage		120 VAC +10%/-15%, 50-60 Hz 240 VAC +10%/-15%, 50-60 Hz 24 VDC, +/- 20%
Power Consumption		12 watts (without heater option) 65 watts (with optional heater on)
Transducer Frequency		38 kHz
Range	38 kHz	35 feet (10.7 m) from transducer face
	50 kHz	25 feet (7.6 m) from transducer face
Span	38 kHz	33.5 feet (10.2 m) from transducer face
	50 kHz	24 feet (7.3 m) from transducer face
Dead Band	38 kHz	18 inches (460 mm) minimum -40° F to +160° F (-40° C to +70° C)
	50 kHz	12 inches (305 mm) minimum -20° F to +140° F (-29° C to +60° C)
Output Signal		4-20 mA isolated, RS-232
Relays (4)		10 Amp resistive, SPDT
Display		Sixteen (16) character alphanumeric LCD
Keypad		Sixteen (16) button integral to front panel
Fail-safe		User selectable for analog and relay outputs

Description	Specification
Response Time	2 seconds typical
Accuracy	± 0.25% of calibrated span
Ambient Temperature (Electronics)	Without heater & thermostat -4° F to +160° F (-20° C to +70° C) With heater & thermostat -40° F to +160° F (-40° C to +70° C)
Ambient Temperature (38 kHz Transducer)	-40° F to +160° F operational (-40° C to +70° C) non-operational to +250° F (121° C)
Ambient Temperature (50 kHz Transducer)	-20° F to +200° F operational* (-29° C to +93° C) non-operational to +250° F (121° C)
Temperature Compensation	Automatic over range of transducer operating temperature
Operating Pressure	–10 to +50 PSIG (–0.689 to +3.45 Bar)
Beam Angle	Conical 12° (typical)
Humidity 95%	Non-condensing (electronics)

* Maximum range is reduced at temperature extremes for 50 kHz. Refer to the measurement range calculations on pages 3 and 4.

AGENCY APPROVALS

MODEL 341 FM AGENCY APPROVALS

Model	Approval
341-X442-10X	Indoors and outdoors NEMA Type 4X and IP 65
385-XXXX-XXX	Indoors and outdoors NEMA Type 4X and IP 65
385-XEXX-006 and 385-XEXX-010	Hazardous environments Class I, Div. 1, Groups B, C, & D Class II, Div. 1, Groups E, F, & G Class III
385-XEXX-003	Hazardous environments Class I, Div. 1, Groups A, B, C, & D Class II, Div. 1, Groups E, F, & G Class III

MODEL 341 CSA AGENCY APPROVALS

Model	Approval
341-X442-10X	Indoors and outdoors NEMA Type 4X and IP 65
341-0442-10X, 341-1442-10X, 341-2442-10X,	Hazardous environments Class I, Div. 2, Groups A, B, C, & D Class II, Div. 2, Groups E, F, & G Class III
385-XXXX-XXX	Indoors and outdoors NEMA Type 4X and IP 65
	Hazardous environments Class I, Div. 2, Groups A, B, C, & D Class II, Div. 2, Groups E, F, & G Class III
385-XE1X-0XX and 385-XEYX-0XX	Hazardous environments Class I, Div. 1, Groups C, & D Class II, Div. 1, Groups E, F, & G Class III
385-XE0X-0XX	Hazardous environments Class I, Div. 1, Groups A, B, C, & D Class II, Div. 1, Groups E, F, & G Class III

MODEL 344 FM AGENCY APPROVALS

Model	Approval
344-X442-10X ①	Indoors and outdoors NEMA Type 4X and IP 65
384-XKXX-0XX	Indoors and outdoors NEMA Type 4X and IP 65
	Hazardous environments Class I, Div. 1, Groups B, C, & D Class II, Div. 1, Groups E, F, & G Class III

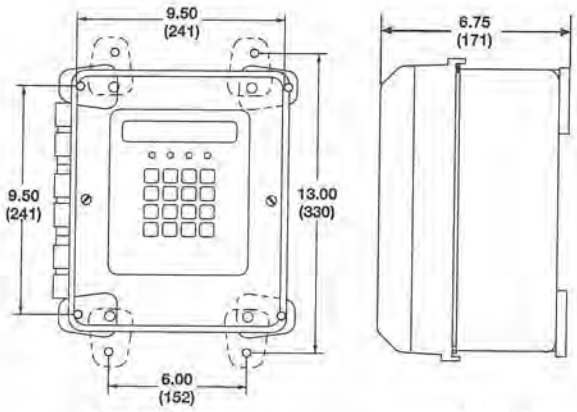
① Model 344 Transmitter agency approvals pending

MODEL 344 CSA AGENCY APPROVALS

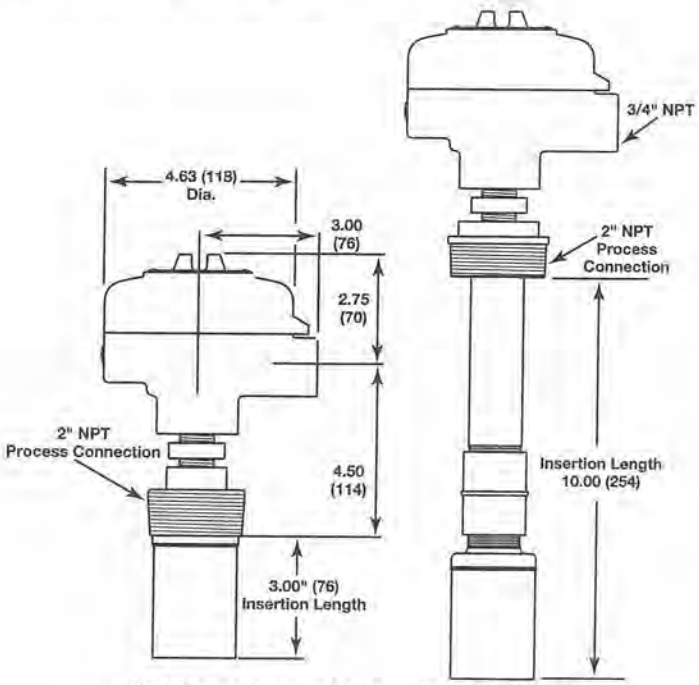
Model	Approval
344-X442-10X ②	Non-hazardous environment Type 4X enclosure
344-0442-10X, 344-1442-10X, 344-2442-10X, ②	Hazardous environments Class I, Div. 2, Groups A, B, C, & D Class II, Div. 2, Groups E, F, & G Class III
384-XKXX-0XX	Non-hazardous environment Type 4X enclosure
384-XK0X-0XX	Hazardous environment Indoors and outdoors Type 4X enclosure and IP 65 Class I, Div. 1, Groups B, C, & D Class II, Div. 1, Groups E, F, & G Class III
384-XK1X-0XX 384-XKYX-0XX	Hazardous environment Indoors and outdoors Type 4X enclosure and IP 65 Class I, Div. 1, Groups C, & D Class II, Div. 1, Groups E, F, & G Class III

② Model 344 Transmitter agency approvals pending

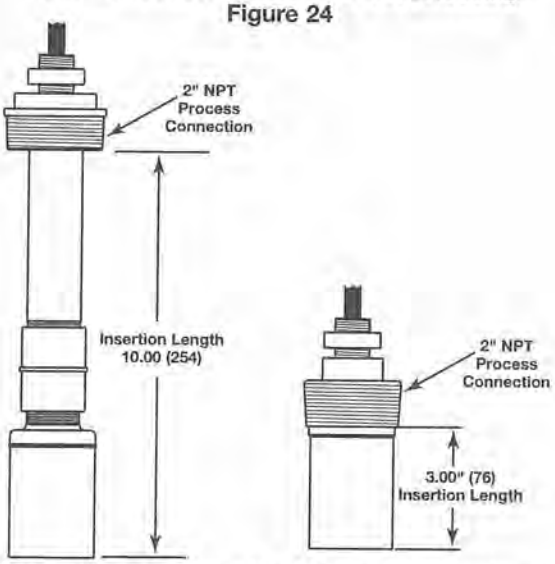
DIMENSIONAL SPECIFICATIONS



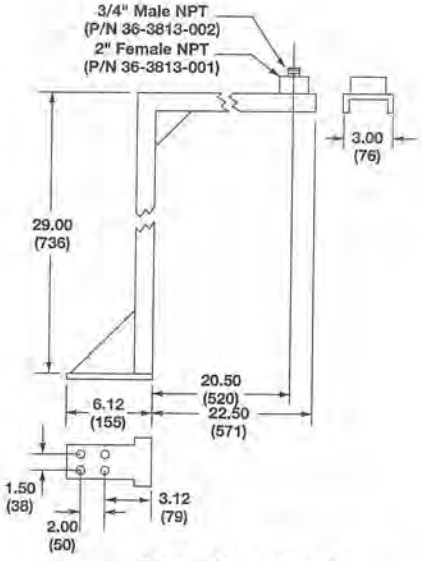
341/344 Transmitter
Figure 22



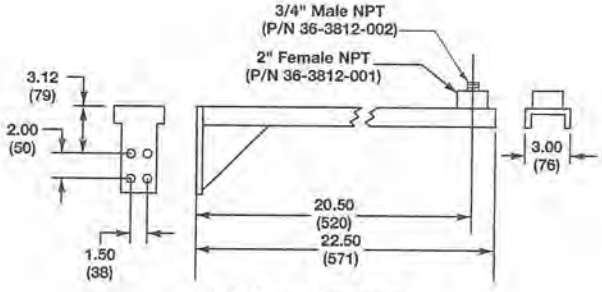
384 Transducer with 2" NPT with Housing
Figure 24



384 Transducer with 2" NPT without Housing
Figure 25

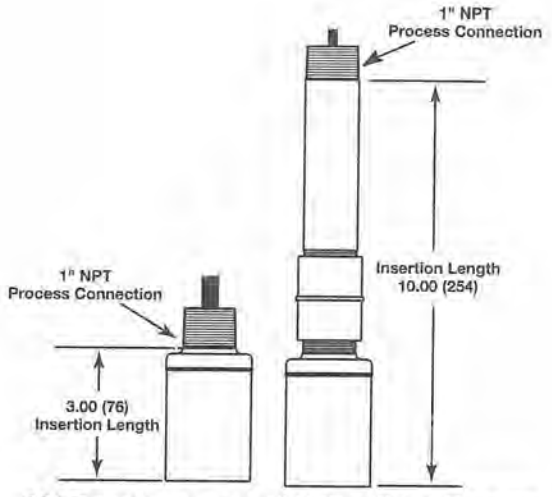


Floor Mount Bracket



Wall Mount Bracket

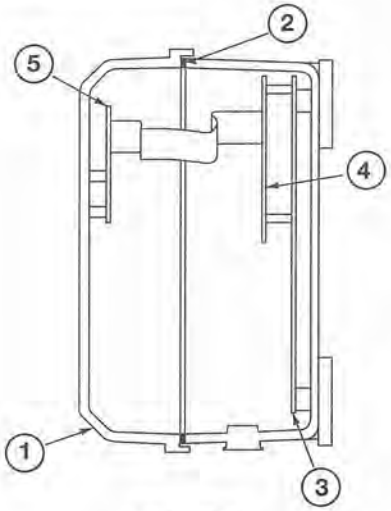
Optional Mounting Brackets
Figure 23



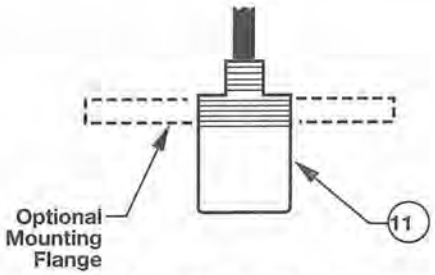
384 Transducer with 1" NPT without Housing
Figure 26

REPLACEMENT PARTS

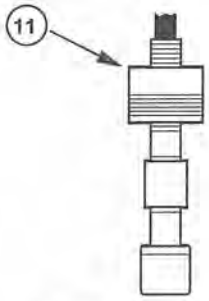
Item	Description		Model 341	Model 344
1	NEMA 4X enclosure, LCD display, keypad with hardware		089-5210-001	
2	Enclosure gasket		012-1606-001	
3	Main P.C. board	120 VAC	030-3564-001	
		120 VAC with data logger	030-3564-007	
		240 VAC	030-3564-002	
		240 VAC with data logger	030-3564-008	
		24 VDC	030-3564-003	
		24 VDC with data logger	030-3564-009	
4	Daughter P.C. board		030-3565-001	030-3573-001
5	Display P.C. board		030-3539-001	
6	Transducer housing base	NEMA 4X, aluminum	004-9104-001	
		NEMA 4X, stainless steel	004-9140-001	
7	Transducer housing cover	NEMA 4X, aluminum	004-9105-001	
		NEMA 4X, stainless steel	004-9142-001	
8	O-ring		012-2101-345	
9	Transducer P.C. board		030-3515-001	
10	Bracket		005-6634-001	
11	Transducer		Refer to transducer model identification on page 1	
	Transducer mount bracket	Wall mount, ¾" male NPT	036-3812-002	
		Wall mount, 2" female NPT	036-3812-001	
		Floor mount, ¾" male NPT	036-3813-002	
		Floor mount, 2" female NPT	036-3813-001	



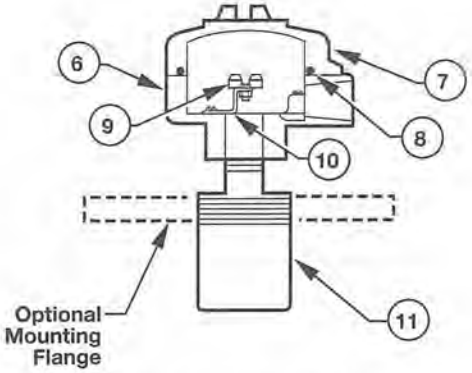
Transmitter
Figure 27



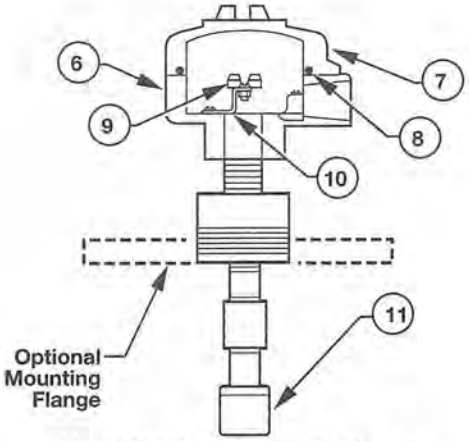
Model 384 Transducer without housing
Figure 28



Model 385 Transducer without housing
Figure 29



Model 384 Transducer with Housing
Figure 30



Model 385 Transducer with Housing
Figure 31

IMPORTANT

PRODUCT WARRANTY

All Magnetrol/STI electronic level and flow controls are warranted free of defects in materials or workmanship for one full year from the date of original factory shipment.

If returned within the warranty period; and, upon factory inspection of the control, the cause of the claim is determined to be covered under the warranty; then, Magnetrol/STI will repair or replace the control at no cost to the purchaser (or owner) other than transportation.

Magnetrol/STI shall not be liable for misapplication, labor claims, direct or consequential damage or expense arising from the installation or use of equipment. There are no other warranties expressed or implied, except special written warranties covering some Magnetrol/STI products.

QUALITY ASSURANCE

The quality assurance system in place at Magnetrol/STI guarantees the highest level of quality throughout the company. Magnetrol/STI is committed to providing full customer satisfaction both in quality products and quality service.

Magnetrol's quality assurance system is registered to ISO 9001 and Z299.1 affirming its commitment to known international quality standards providing the strongest assurance of product/service quality available.

ASSURED QUALITY & SERVICE COST LESS

SERVICE POLICY

Owners of Magnetrol/STI controls may request the return of a control or any part of a control for complete rebuilding or replacement. They will be rebuilt or replaced promptly. Controls returned under our service policy must be returned by Prepaid transportation. Magnetrol/STI will repair or replace the control at no cost to the purchaser (or owner) other than transportation if:

1. Returned within the warranty period; and
2. The factory inspection finds the cause of the claim to be covered under the warranty.

If the trouble is the result of conditions beyond our control; or, is NOT covered by the warranty, there will be charges for labor and the parts required to rebuild or replace the equipment.

In some cases it may be expedient to ship replacement parts; or, in extreme cases a complete new control, to replace the original equipment before it is returned. If this is desired, notify the factory of both the model and serial numbers of the control to be replaced. In such cases, credit for the materials returned will be determined on the basis of the applicability of our warranty.

No claims for misapplication, labor, direct or consequential damage will be allowed.

LOW VOLTAGE DIRECTIVE

For use in Category II installations. If equipment is used in a manner not specified by manufacturer, protection provided by equipment may be impaired.

RETURN MATERIAL PROCEDURE

So that we may efficiently process any materials that are returned, it is essential that a "Return Material Authorization" (RMA) number be obtained from the factory, prior to the material's return. This is available through Magnetrol/STI's local representative or by contacting the factory. Please supply the following information:

1. Company Name
2. Description of Material
3. Serial Number
4. Reason for Return
5. Application

Any unit that was used in a process must be properly cleaned in accordance with OSHA standards, before it is returned to the factory.

A Material Safety Data Sheet (MSDS) must accompany material that was used in any media.

All shipments returned to the factory must be by prepaid transportation.

All replacements will be shipped F.O.B. factory.

NOTE: See Electrostatic Discharge Handling Procedure on page 9.

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(Software version 2.0)
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SUPERSEDES: April 1997