Robertshaw
INDUSTRIAL PRODUCTS DIVISION

LEVEL-TEL MODEL 158A

GENERAL DESCRIPTION

The Robertshaw Model 158A capacitance to current RF transmitter is designed for remote mounting from the sensing probe and is used for continuous level measurement and control. Housed in a weather-tight or explosion-proof enclosure, with or without local indication, the Model 158A may be mounted up to 150 feet from the sensing probe allowing convenient and accessible installation.

A true DC current output signal, unaffected by varying load resistance, is produced which is directly and linearly proportional to input capacitance change. All calibration adjustments for the system are within the transmitter enclosure and are completely independent and non-interacting resulting in a simple "one-shot" calibration method. Wide adjustment ranges for both zero and span are provided to insure satisfactory operation on virtually any measurement application.

Unique circuit design concepts are employed in the Model 158A to effectively "cancel-out" the capacitance inherent in the Triaxial cable used to couple the transmitter to the probe. This permits the use of long lengths of interconnecting cable without any degradation in performance of the system -- and without the need for compensating cables, padding capacitors, or other calibration "tricks." Extensive use of integrated circuit operational amplifiers and other state-of-the-art semiconductors are used in the Model 158A to achieve reliability and long-term stability.

A wide variety of standard sensing probes for use with the Model 158A are available from Robertshaw to satisfy virtually any level measurement application.

Probe, Cable and Conduit Outlet Box shown for illustration only. Must be ordered separately.

FEATURES AND BENEFITS

- **CSA Certified**
- **Independent and non-interacting adjustments- Simple initial calibration**
- **Remote mounting capability- Convenient installation location**
- **True Current Output Signals- Insensitive to load variations**
- **All solid-state circuitry- Long-term stability and reliability**

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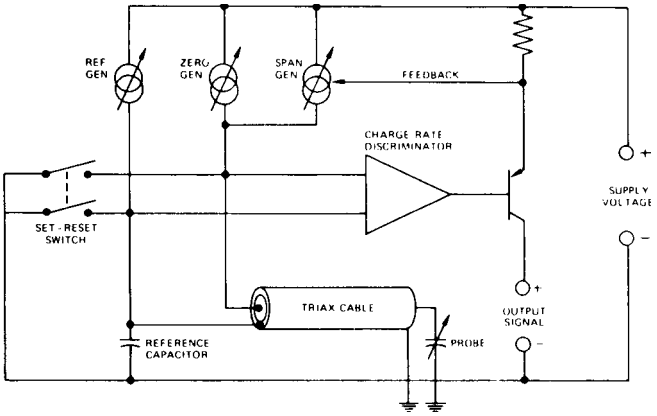
PRINCIPLE OF OPERATION

The Model 158A makes use of a unique circuit design concept developed by Robertshaw to provide a true DC current output signal as a function of input capacitance change. Referring to the block diagram, Figure 1, two freerunning sawtooth oscillators are utilized; one being used as a reference and consisting of a reference capacitor and reference current generator, the second being the zero generator and probe capacitor connected through the Triaixial cable. Both capacitors, reference and probe, charge up linearly until a pre set voltage is reached causing the "set-reset" solid-state switch to momentarily close "shorting" out both capacitors - thus starting the charging cycle once again and developing a "sawtooth" waveform across both capacitors.



Connected directly across both capacitors is the "charge rate discriminator" amplifier which produces a voltage output when the charging rate of the probe capacitor differs from that of the reference capacitor. When a change in probe capacitance occurs (due to a change in process level), the discriminator amplifier causes an output signal change, which, with voltage feedback, readjusts the probe charging rate through the span generator until the charging rates are again equal.

Since the sensing probe is remotely mounted from the Model 158A, any change in the connecting cable capacitance between the probe and the transmitter would normally affect the measurement accuracy. This error is eliminated, however, in the Model 158A by using a Triaxial cable with the inner shield of the cable connected to the reference capacitor. This causes the inner shield to be "driven" in phase with the center conductor of the cable, keeping the voltage difference near zero, thereby canceling out the effects of the inherent cable capacitance. This permits long lengths of cable to be used between the Model 158A and the sensing probe--without sacrifice of performance.

SPECIFICATIONS

ENVIRONMENTAL

Enclosure: See Dimensional Data

Intrinsic Safety: Models 158A-(A,B)(1,2)-(A,B,C,D)-1 have CSA certified intrinsically safe probe input circuit for Class I, Div. 1, Groups C & D; Class II, Div. 1, Groups E, F, G (requires safety barrier, wiring connections, and sensors per Robertshaw Dwg. #907GA518).

Storage ..... -55°F to +225°F (-48° C to 107° C)

Operating Temperature Limits ..... -40°F to 160°F (-40°C to +70°C)

Operating Vibration Limits ..... 2 g's, 10 to 200 Hz

Operating Humidity Limits ..... 95% RH @ 100°F

Mechanical Shock ..... 75 g's for 11 ms duration without permanent damage

PERFORMANCE

Supply Variation Effect ..... 0.5%/10% supply change

Temperature Coefficient ..... 1.0%/100°F ambient (including connecting cable) change, or 1 Pf/100°F whichever is greater

Load Resistance Effect ..... 0.25% from no load to full load

Output Signal Ripple ..... 0.2% PP maximum @ supply voltage frequency

Terminal Nonlinearity ..... 0.5% maximum for spans less than 1000 Pf, 1.0% maximum for spans greater than 1000 Pf

ELECTRICAL

Supply Voltage ..... 120 VAC ± 10%, 50/60 Hz

Optional ..... 26.5 VDC ± 10%

Optional ..... 240 VAC ± 10%, 50/60 Hz

Supply Power:

AC ..... 5 watts, 7 VA maximum

DC ..... 85 ma maximum

Output Signal ..... 4-20 ma into 0 to 650 ohms

Optional ..... 1-5 ma into 0 to 2500 ohms

Optional ..... 10-50 ma into 0 to 250 ohms

Optional ..... 0-10 ma into 0 to 1200 ohms

Input Signal (Capacitance):

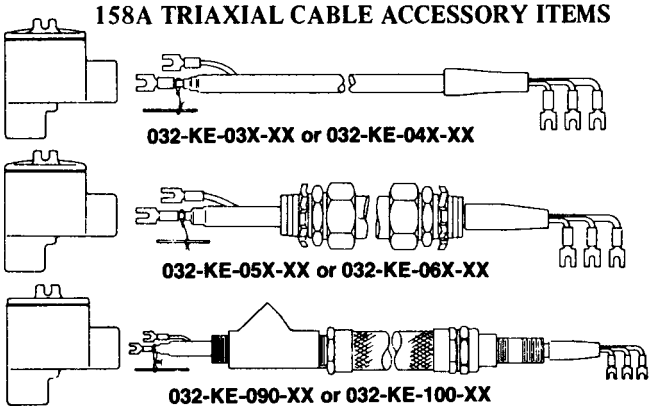
Terminal Adjustment ..... 0 to 1000 Pf

Span Adjustment ..... 10 to 2000 Pf

Maximum Zero Suppression ..... 10 times span

Connecting Cable Length ..... 150 feet maximum

158A TRIAXIAL CABLE ACCESSORY ITEMS

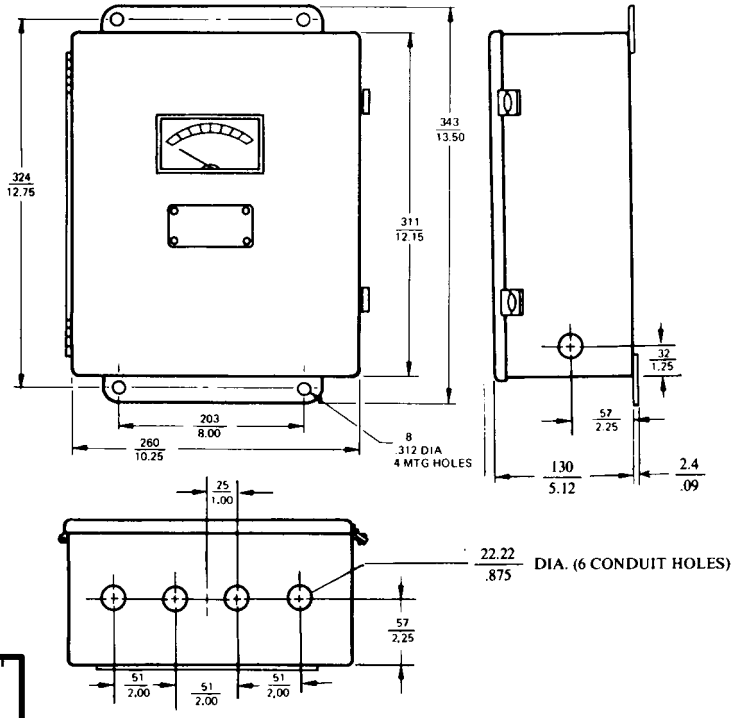


MODEL 158A – TRIAXIAL CABLE ACCESSORY ITEMS

Part No. 032-KE-	Description
03X-XX	GENERAL PURPOSE Triax Cable with terminations and probe connection conduit outlet box. (Recommended for use with customer supplied rigid or flexible conduit.) Maximum temperature 185°F. Specify length in feet for XXX in part number.
05X-XX	Same as above but with flexible conduit (protective armor). Specify length in feet for XXX in part number.
04X-XX	HIGH TEMP Triax (Teflon insulated) Cable with terminations and probe connection conduit outlet box. (Recommended for use with customer supplied rigid or flexible conduit.) Maximum temperature 350°F. Specify length in feet for XXX in part number.
06X-XX	Same as above but with flexible conduit (protective armor). Specify length in feet for XXX in part number.
090-XX	GENERAL PURPOSE Triax Cable with terminations in explosion proof flexible conduit with seal fitting & probe connection conduit outlet box. Max. temp. 185° F. Specify either-05 or -10 for XX in part number.
100-XX	Same as above except with High Temp (Teflon insulated) Triax. Max. Temp. 350°F. Specify either -05 or -10 for XX in part number.

CUSTOMER CONNECTIONS

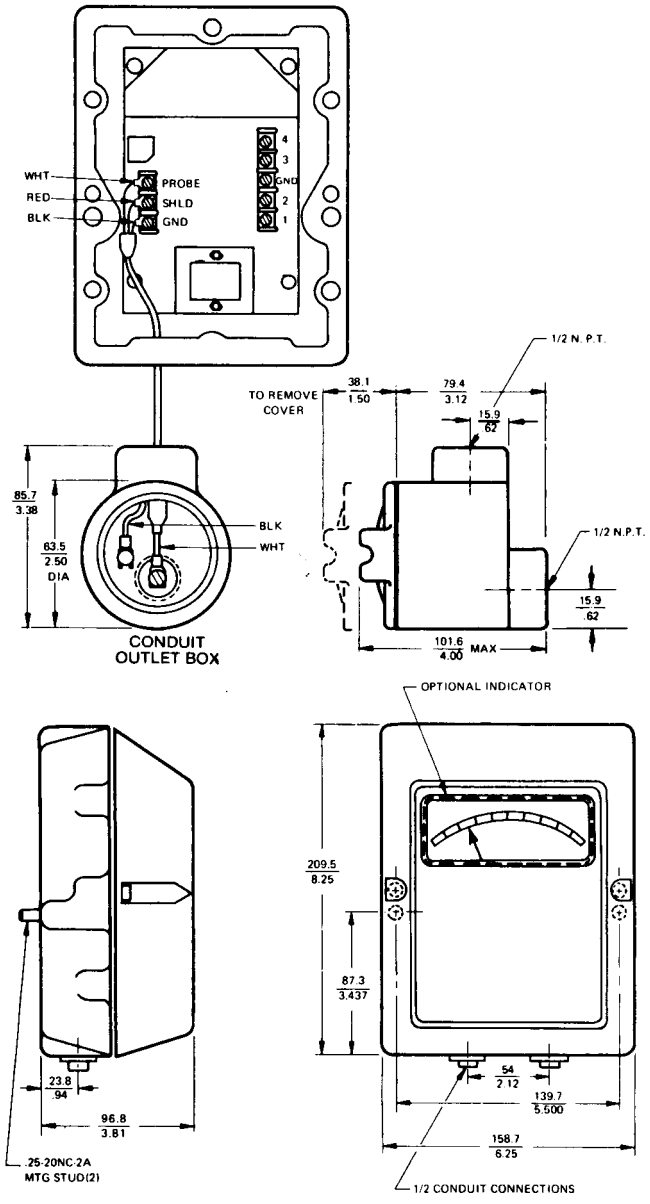
	TERMINAL	CONNECTION	
	G	CHASSIS GROUND	
TB7	1	(-) SUPPLY	
	2	(+) SEE RATING PLATE	
	3	(-)OUTPUT	
	4	(+)OUTPUT	
	5	NO CONNECTION	
	6	NO CONNECTION	
TB8	7	NO CONNECTION	
	8	NO CONNECTION	
	9	N. C.	DPDT
	10	COM.	5a
	11	N. O. OPTIONAL NO. 1	
	12	N. C. ALARM CONTACTS	
	13	COM.	
	14	N. O.	
TB9	15	NO CONNECTION	
	16	NO CONNECTION	
	17	N. C.	DPDT
	18	COM.	5a
	19	N. O. OPTIONAL NO. 2	
	20	N. C. ALARM CONTACTS	
	21	COM.	
	22	N. O.	



LARGE WEATHERTIGHT HOUSING

(MEETS CSA ENCLOSURE 3)

DIMENSION DATA

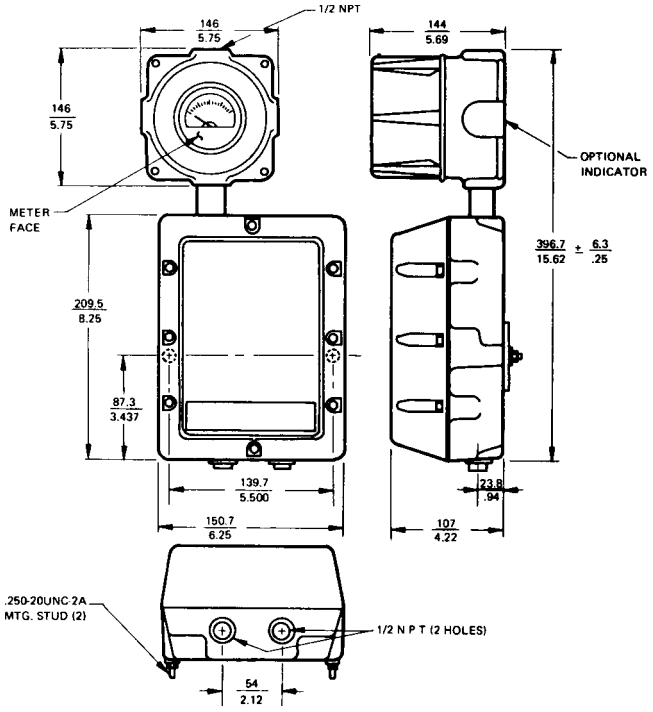


WEATHER TIGHT HOUSING

(MEETS CSA ENCLOSURE 5 & NEMA 4)

CUSTOMER CONNECTIONS

TERMINAL NUMBERS	CONNECTIONS
1	(-) SUPPLY VOLTAGE
2	(+)
GND	CHASSIS GROUND
3	(-) OUTPUT SIGNAL
4	(+)



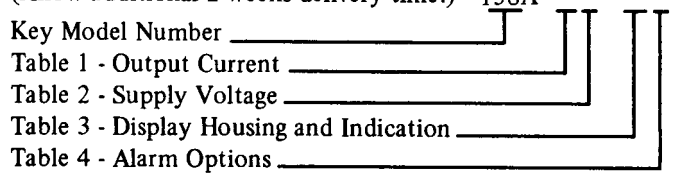
EXPLOSION PROOF HOUSING

CSA Certified Class I, Div. 1, Groups C & D;
Class II, Div. 1, Groups E, F, G

ORDERING INFORMATION

***STANDARD MODEL 158A – B 2 – B 1**

OPTIONAL MODELS
Select from tables.
(Allow additional 2 weeks delivery time.) 158A- – –



KEY MODEL NUMBER

Designation	Description
*158A	Capacitance to current transmitter system for remotely mounted probe assemblies. Control Unit is available as blind transmitter or with indication and optional alarms.

TABLE 1 – OUTPUT CURRENT

Designation	Description
A	1-5 ma DC
*B	4-20 ma DC
C	10-50 ma DC
D	0-10 ma DC

TABLE 2 – SUPPLY VOLTAGE

Designation	Description
1	26.5 VDC ±10%
*2	120 VAC ±10%, 50/60 Hz
3	240 VAC ±10%, 50/60 Hz

TABLE 3 – DISPLAY HOUSING & INDICATION

Designation	Description
A	Weathertight Housing without Indicator
*B	Weathertight Housing with Indicator
C	Explosion Proof Housing without Indicator
D	Explosion Proof Housing with Indicator
E	Large Weathertight Housing with Indicator to be used with optional alarms.

TABLE 4 – ALARM OPTIONS

Designation	Description
*1	None
† 2	Alarm Relay for High or Low Alarm †
† 3	Alarm Relays for High and Low Alarm †

† Only available with designation 'E' Table 3.
DPDT, 5 amp, 28 VDC, 120/240 VAC, non-inductive.

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