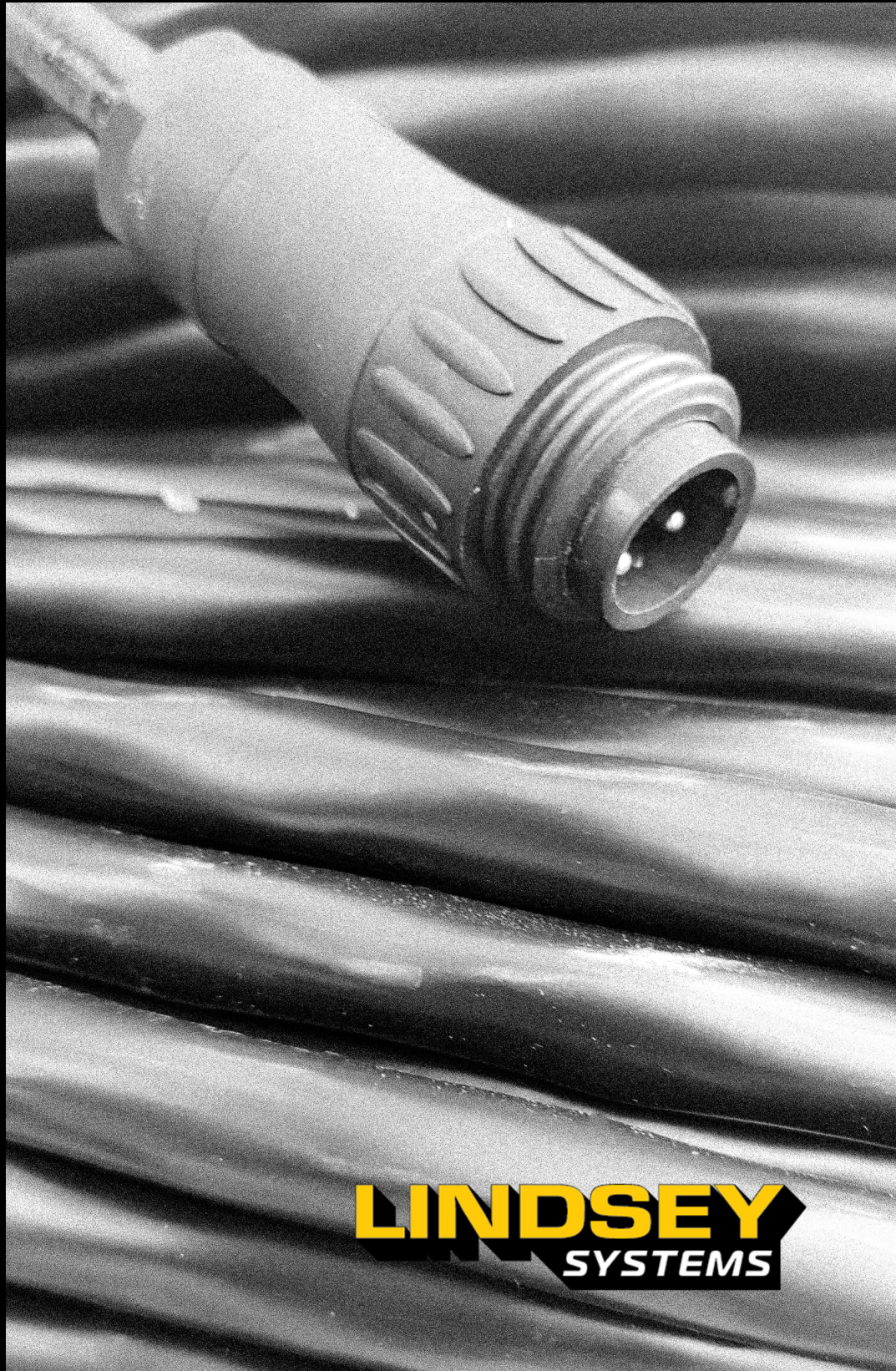


# Lindsey Cables

## Sensor Cable Assemblies

*for Lindsey Overhead & Underground Sensors*



**LINDSEY**  
SYSTEMS

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## **Lindsey Sensor Cables and Cable Assemblies**

*This catalog is designed to be used in conjunction with the Lindsey Sensors catalog which describes all of the sensor products referred to in this publication.*

Maintaining the performance and accuracy of Lindsey Systems' medium voltages sensors requires the use of cable systems which do not degrade their performance. The sensor design and calibration process includes the impedance characteristics of the cables with which they will be shipped. The use of Lindsey cables ensures that your sensor system will perform as expected. Lindsey Systems product offering is broad, ranging from single-phase cables to prefabricated cable assemblies combining the outputs of up to seven sensors.

### **Features Common to All Lindsey Cables**

- Controlled impedance across the sensor's operating temperature range
- Segregated and shielded signals to eliminate crosstalk, ensuring low noise
- Optimized cable construction minimizes parasitic capacitance, reducing signal loss and phase shift

### **Features of Multi-Phase Cables and Junction Boxes**

- IP67 rated by either over-molded or potted designs
- Individually twisted/shielded cable for each sensor
- Single-point ground design for the cable shielding

### **Custom Cables**

If your requirements are not met by any cable or cable assembly in this catalog, contact Lindsey Systems for a quote on a custom cable assembly.

## Single-Phase Cables

*Use: Installation of any overhead or underground Lindsey sensor where a separate, single-phase, cable will be used for each sensor.*

Single-phase cables can be used with voltage-only, current-only, or combined current and voltage sensors.

### Cable Termination Options

#### Pigtail Cable End

Provides ease of connection to terminal blocks.



#### Bayonet Connector

A metal bayonet-style water-proof connector that “snaps” when closed, eliminating risk of over-and under-tightening. Sealed from the environment, it remains waterproof even if the connectors are left exposed to the elements.



#### Amphenol Connector

A plastic, threaded, water-proof connector for single-phase applications.



#### ITT Cannon Connector

A metal, threaded, water-proof connector for single-phase applications.



## Single Phase Cables

Part Number										
Sensor End		Current Only					Cable End			
Connector	# Pins		Voltage Only	Voltage & Current	Length in ft.	Pigtail	ITT Cannon	Amphenol	Bayonet	Example with 10' Cable
ITT Cannon	2	9610			/XX		N/A	N/A	N/A	9610/10
ITT Cannon	4		9614		/XX		N/A	N/A	N/A	9614/10
ITT Cannon	4			9612	/XX		N/A	N/A	N/A	9612/10
Amphenol	4	9-587A			/XX		N/A	N/A	N/A	9-587A/10
Amphenol	7		9614A		/XX		N/A	N/A	N/A	9614A/10
Amphenol	4		9-587P		/XX		N/A	N/A	N/A	9-587P/10
Amphenol	4			9-587	/XX		N/A	N/A	N/A	9-587/10
Amphenol	7			9612A	/XX		N/A	N/A	N/A	9612A/10
Bayonet*	4	9620		9620	/XX/		R-21622	9-587	N/A	9620/10 (pigtail)
Bayonet*	4		9620P		/XX/		R-21622	9-587	N/A	9620P/10 (pigtail)
Bayonet*	4	9-789	9-789	9-789	/XX/	N/A	N/A	N/A	9-793	9-789/10/9-793

\*Any cables with bayonet connectors are also available with Gold Line High Accuracy conductors. Add /HA to the end of any catalog number to specify high accuracy cables. For example, 9620/40 cable in a high accuracy version would be part number 9620/40/HA.

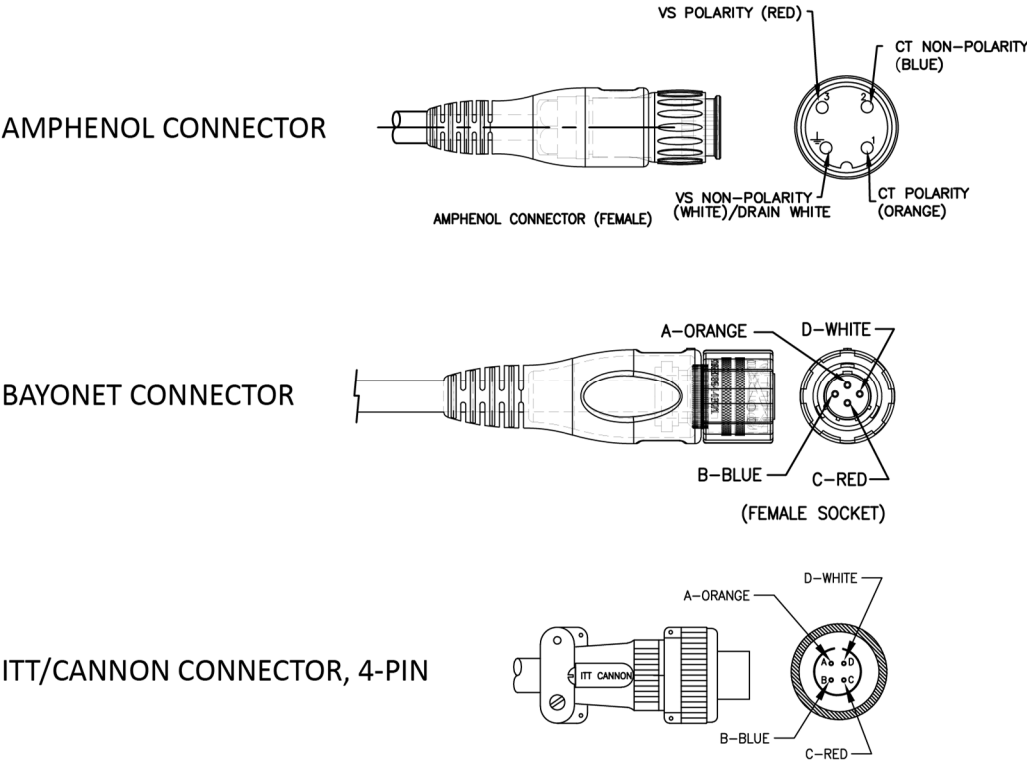


Pigtail Wire Identification for Single-phase cables with Sensor-end  
ITT Cannon or Amphenol Connectors

Wire Identification

	Bare 16 Gage	Bare 22 Gage	Black	Red	White	Orange	Blue
Current only 4-pin	Cable Shield/Drain					Current +	Current -
Current only 2-pin	Cable Shield/Drain		Current +	Current -			
Voltage only	Cable Shield/Drain			Voltage +	Voltage -		
Voltage & Current	Cable Shield/Drain	Voltage Shield/Drain		Voltage +	Voltage -	Current +	Current -
<b>Note:</b>							
Voltage + means voltage polarity				Current + means current polarity			
Voltage - means voltage non-polarity				Current - means current non-polarity			

Cable-End Pinout for Single-phase Cables with Sensor-end Bayonet Connectors



## Cable for Overhead Capacitor Bank or 3-Phase Monitoring Applications

*Use: Overhead installations of MultiCore-style GEN2 or Polysil Sensors fitted with bayonet-style connectors, with or without provisions for a separate neutral sensor.*

These cables use a unique junction-tube design to provide a compact, waterproof option to interface with Lindsey sensors using bayonet-style connectors. This would include any Lindsey GEN2 type sensor, or any Lindsey Polysil type sensor with the “B” connector type specified in the part number. See Column “I” of the Ordering Table on pp 14-15 of the Lindsey Sensor catalog, publication number 09B-003.

### About 3-to-1 and 4-to-1 Junction-Tube Connectors

- Prevents moisture ingress within the cable using a potted waterproof design
- Provides simple 3-phase sensor-to-control connections for pole mounted capacitor banks or line monitor installations
- Attaches directly to wood poles or capacitor bank frames
- Optional flexible conduit option provides cable protection leading to the control
- 4-to-1 cables allow for direct connection of a part number 9525C/5 connectorized neutral current sensor



Figure 1: 3-to-1 Junction-Tube cable assembly with 10' of flexible conduit protection above the control connector

### 3-to-1 and 4-to-1 Junction-Tube Cables Ordering Table

#### Part Number Sequence: A/B/C/D/E

A		B	C		D		E
Cable Style		Cable Length	Connector Pin		Mounting Preference		Flexible Conduit <i>(optional)</i>
3 Prong	9620	XX	8 Pin	R-22978	1	Wood pole	FCB, where B=length in feet
4 Prong	9620-4	(length in feet)	14 Pin	R-22102	2	Metal rack	

Example:

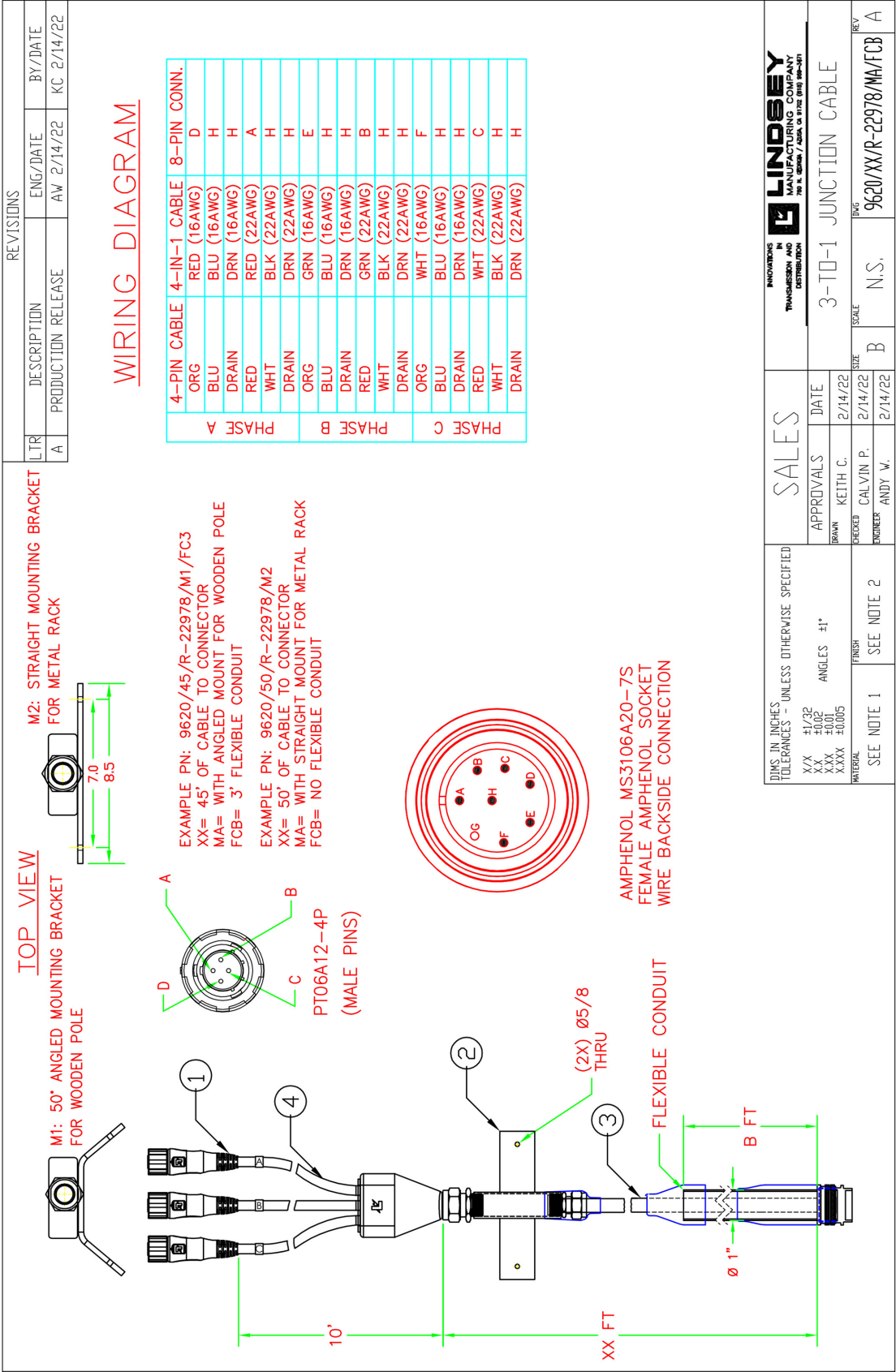


9620-4	40	R-22102	M1	FC5
--------	----	---------	----	-----

**Order Example:**

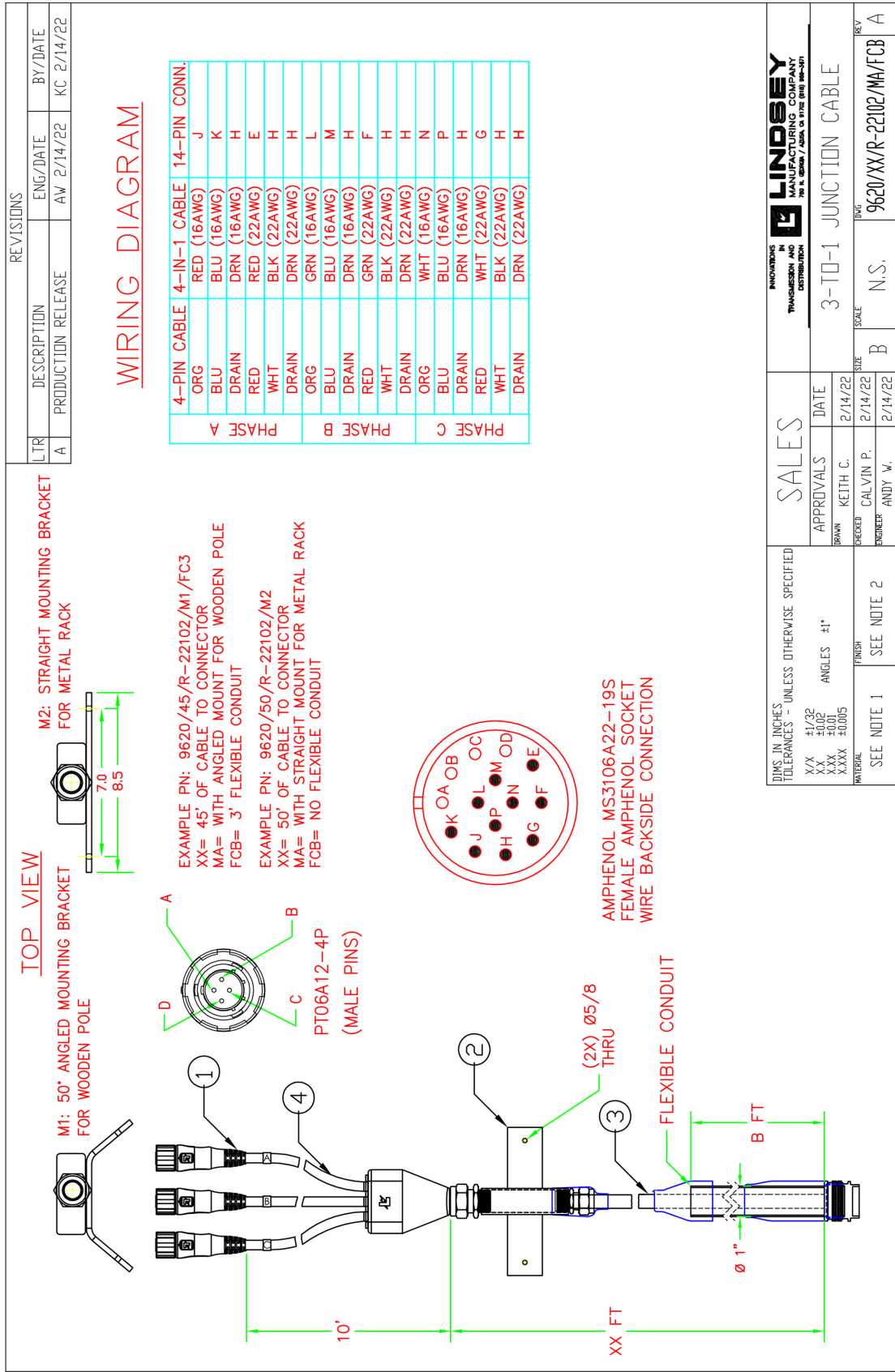
**9620-4 / 40 / R-22102 / M1 / FC5** is a 4 prong cable, 40 feet in length, with a 14 pin connector, for mounting on a wood pole, with 5 feet of flexible conduit.

3-to-1 8-pin Junction-Tube Drawing

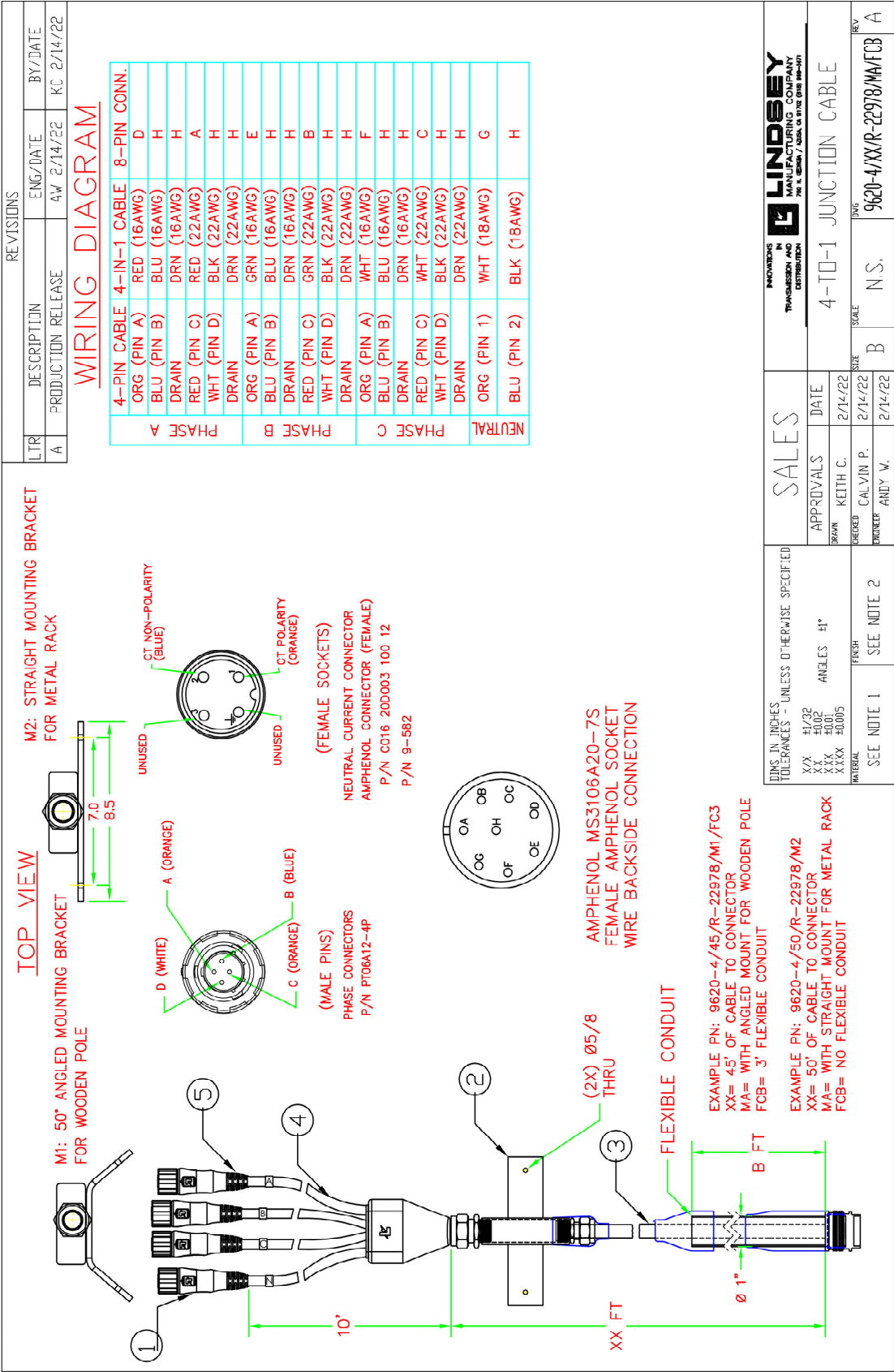




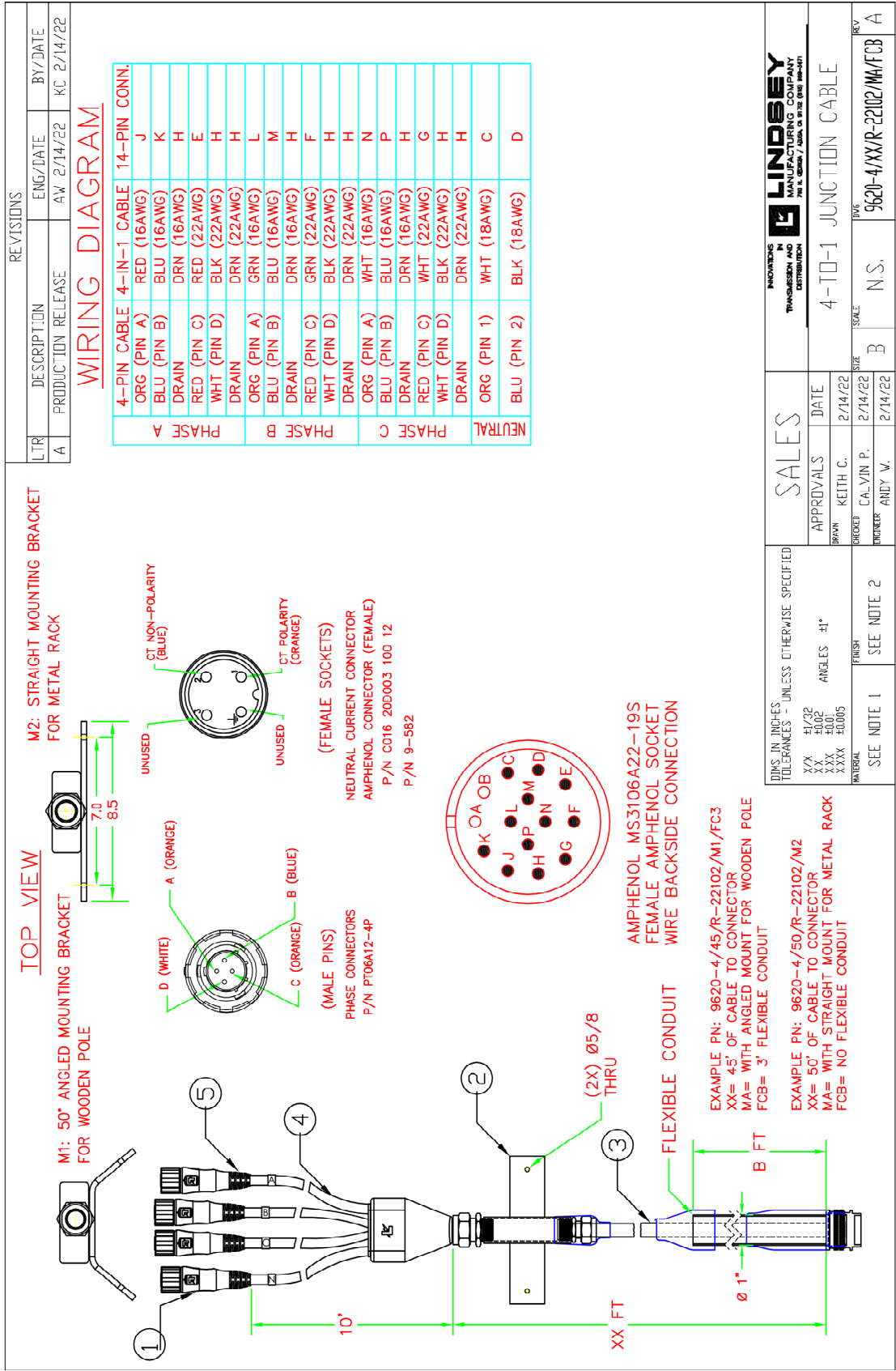
## 3-to-1 14-pin Junction-Tube Drawing



4-to-1 8-pin Junction-Tube Drawing



4-to-1 14-pin Junction-Tube Drawing





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## **Cable for Recloser Voltage Sensor Application**

*Use: Overhead installations of Style SVMl voltage sensors mounted on or in conjunction with overhead distribution reclosers, switches, or other equipment.*

Type SVMl sensors are commonly used with reclosers or switches where high accuracy voltage sensing on one or both sides of the device is desired. Both 3-to-1 and 6-to-1 cables feature waterproof cast-in or fully encapsulated junction box designs. The last 10 feet of down cable leading to the control-end connector on the 6-to-1 cable is encased in flexible conduit, providing protection of the control cable.

These cables are designed for use with SVMl sensors using cast-in bayonet connectors, designated by SVMl sensors incorporating the “/Bayonet” suffix to the part number.

(See Column “D” of the SVMl Ordering Table on p. 17 of the Lindsey Sensor catalog, publication 09B-003.)

### **About 3-to-1 and 6-to-1 SVMl Junction Boxes**

- Prevents moisture ingress within the cable using a potted or fully encapsulated waterproof design
- Provides simple 3-phase or double 3-phase sensor-to-control connections for pole mounted distribution reclosers or line switches
- Attaches directly to recloser or switch mounting frames

## 3-to-1 SVMJ Junction Boxes Ordering Table

### Part Number Sequence: A-B/C/D/E

A	B	C	D	
Junction Box Style	Cable Length (to sensors from junction box)	Down Cable Length	Control Connector Style	
93JB-9620P	X = length in feet	YY = length in feet	9-793	4-pin Bayonet
			R-22102	14-pin Amphenol*
			R-21622	Size 14S 4-pin Cannon
			R-26695	Size 22 4-pin Cannon
			(Blank)	Pigtail

Example:



93JB-9620P	-5	/40	/9-793
------------	----	-----	--------

#### Order Example:

**93JB-9620P-5/40/9-793** is a 3-to-1 SVMJ junction box with a 5-foot cable for connection to each sensor and a 40-foot down cable terminating in a 4-pin bayonet-style connector.

## 6-to-1 SVMJ Junction Boxes Ordering Table

### Part Number Sequence: A/B/C

A	B	C	
Junction Box Style	Down Cable Length	Control Connector Style	
93JB6M	YY = length in feet	R-22102	14-pin Amphenol*



Example:

93JB6M	/40	/R-22102
--------	-----	----------

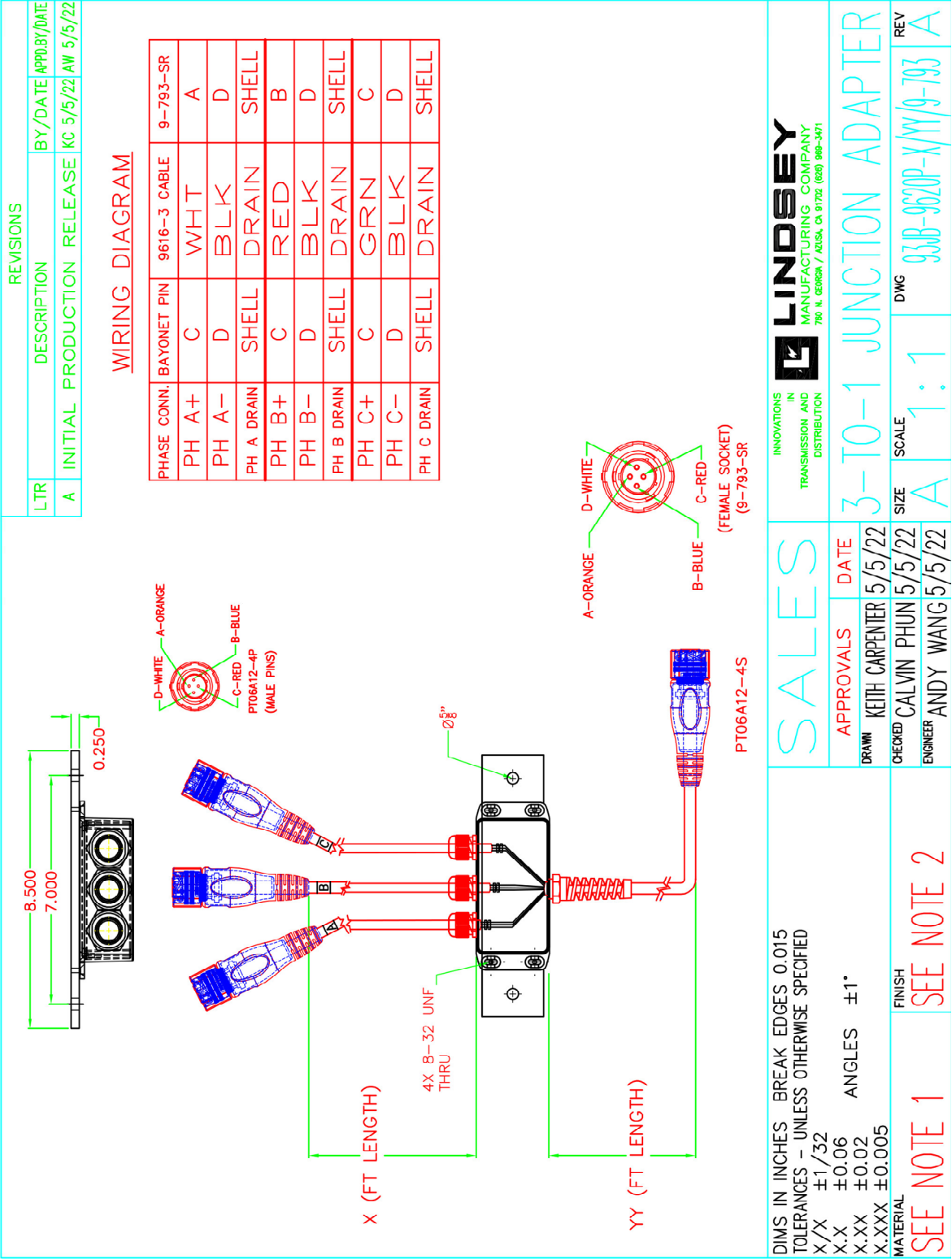
#### Order Example:

**93JB6M/40/R-22102** is a 6-to-1 SVMJ junction box with a 40-foot down cable terminating in a 14-pin Amphenol connector.

\*This type of connector is commonly used with SEL-651R recloser control.



3-to-1 4-pin Bayonet Drawing



## 3-to-1 4-pin Cannon Drawing

**REVISIONS**

LTR	DESCRIPTION	BY/DATE	APPD BY/DATE
A	INITIAL PRODUCTION RELEASE	KC 5/5/22 AW 5/5/22	

**WIRING DIAGRAM**

PHASE CONN.	BAYONET PIN	9616-3 CABLE	R-26695 PIN
PH A+	C	WHT	A
PH A-	D	BLK	D
PH A DRAIN	SHELL	DRAIN	SHELL
PH B+	C	RED	B
PH B-	D	BLK	D
PH B DRAIN	SHELL	DRAIN	SHELL
PH C+	C	GRN	C
PH C-	D	BLK	D
PH C DRAIN	SHELL	DRAIN	SHELL

**SALES**

APPROVALS	DATE
DRAWN KETH CARPENTER	5/5/22
CHECKED CALVIN PHUN	5/5/22
ENGINEER ANDY WANG	5/5/22

**3-T0-1 JUNCTION ADAPTER**

**LINDSEY MANUFACTURING COMPANY**  
760 N. GEORGIA / ALISA, CA 91702 (626) 999-3471

**INNOVATIONS IN TRANSMISSION AND DISTRIBUTION**

**REV**  
93JB-9620P-X/V/R-26695  
A

**DWG**  
SCALE  
1:1

**SIZE**  
A

**DIMS IN INCHES BREAK EDGES 0.015 TOLERANCES - UNLESS OTHERWISE SPECIFIED**

X/X	±1/32
X.X	±0.06
X.XX	±0.02
X.XXX	±0.005

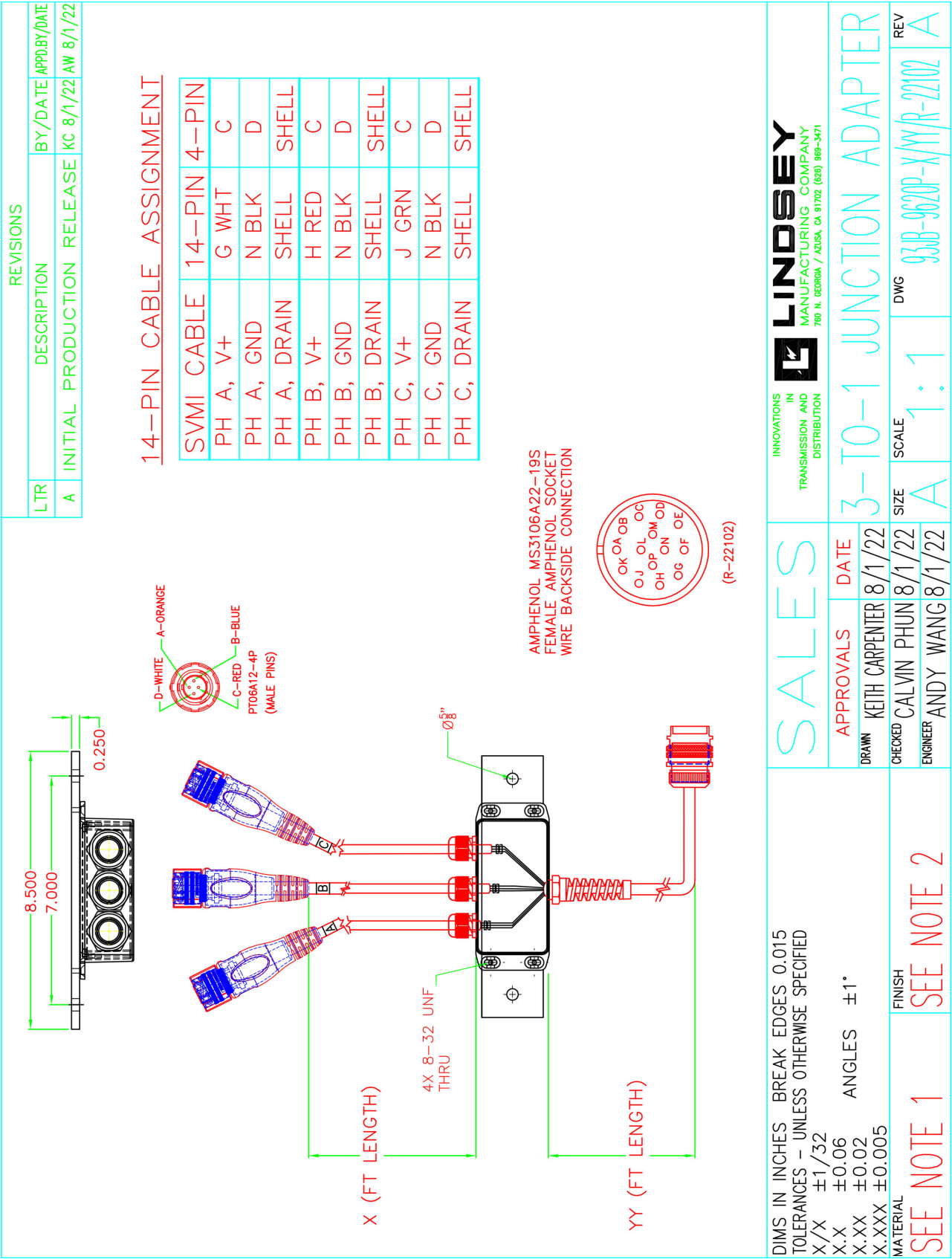
**MATERIAL**

**FINISH**

**SEE NOTE 1**

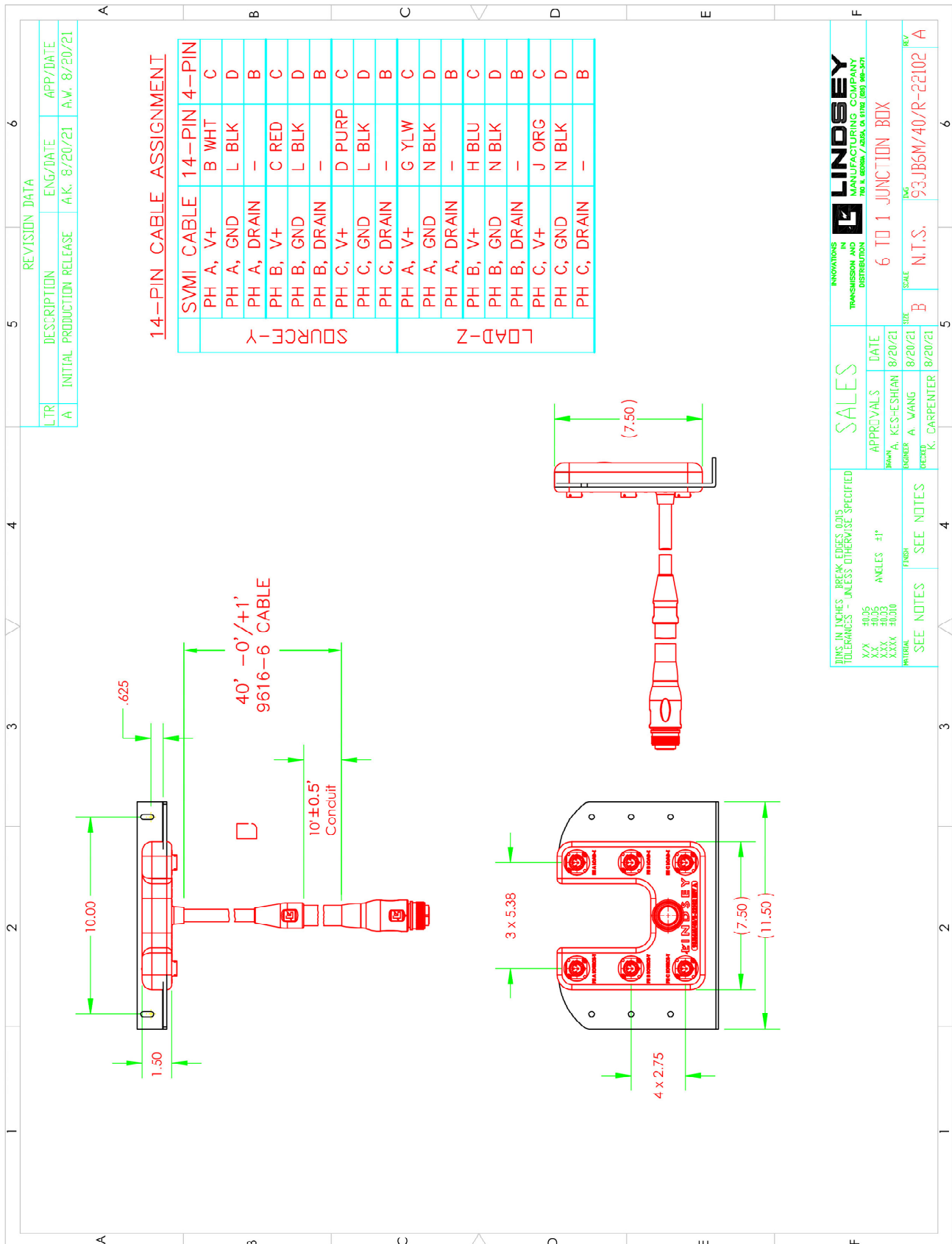
**SEE NOTE 2**

3-to-1 14-pin Drawing





## 17



## **Cables for Underground or Pad-Mount Voltage-only Sensor Applications**

*Use: Installation of Lindsey ElbowSense™ voltage sensors in underground or pad-mounted equipment, or Lindsey type VMI standoff insulator voltage sensors in pad-mount or metal-clad equipment.*

Three-phase voltage sensing is commonly used in underground, pad-mount, and metal-clad equipment as part of control, relaying, or metering applications. Lindsey's ElbowSense voltage sensors are available in familiar cable componentry, including load-break elbow, tee-body, and voltage plug configurations.

Lindsey type VMI voltage sensing standoff bushings are used in both metal-clad and pad-mount equipment.

### **About 3-to-1 Underground Voltage Sensor Junction Boxes**

- Style 93JB-9-587P junction boxes have three cables for connection to ElbowSense sensors fitted with Amphenol 4-pin female plastic connectors. The combined control end cable may be fitted with a variety of connectors. This junction box style is waterproof.
- Style 93JB junction boxes are intended for used with ElbowSense or VMI sensors with cast-in cables terminated with bayonet style connects. The combined control end cable may be fitted with a variety of connectors. This junction box style is submersible to 10 feet.
- Both junction box styles may be attached directly to interior surfaces of pad-mount or metal-clad equipment.

# UNDERGROUND : Voltage Only

## Connectorized ElbowSense™ Voltage Only Sensor 3-to-1 Junction Boxes Ordering Table

*For Interconnection of ElbowSense Sensors fitted with Connectors*

### Part Number Sequence: A-B/C/D

A	B	C	D	
Junction Box Style	Cable Length (to sensors from junction box)	Down Cable Length	Control Connector Style	
93JB-9-587P	X (length in feet)	YY (length in feet)	9-582	4-pin Amphenol
			R-26695*	Size 22 4-pin Cannon
			R-21622	Size 14S 4-pin Cannon
			(Blank)	Pigtail

Example:



93JB-9-587P-	3/	20/	R-26695
--------------	----	-----	---------

**Order Example:**

**93JB-9-587P - 3 / 20 / R-26695** is a 3-to-1 underground voltage sensor junction box with a 3-foot cable for connection to each sensor and a 20-feet down cable terminating in a size 22 4-pin bayonet-style connector.

## ElbowSense or VMI Voltage Only Sensor 3-to-1 Junction Boxes Ordering Table

*For Interconnection of ElbowSense or VMI Sensors fitted with Cast-in Cables (submersible ready)*

### Part Number Sequence: A/B/C

A	B	C	
Junction Box Style	Down Cable Length	Control Connector Style	
93JB	XX (length in feet)	9-582	4-pin Amphenol
		R-26695*	Size 22 4-pin Cannon
		R-21622	Size14S 4-pin Cannon
		(Blank)	Pigtail

Example:



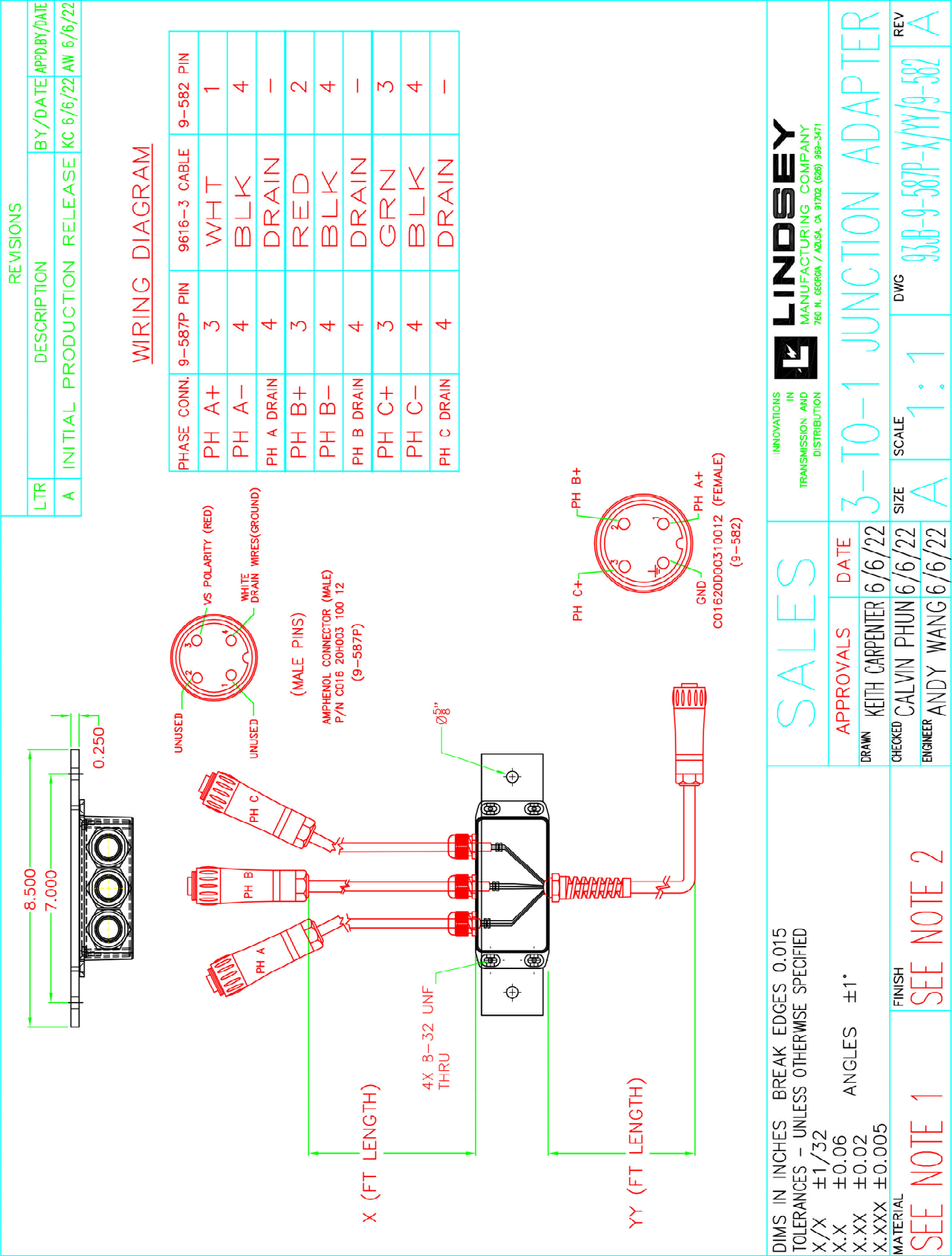
93JB	/ 20
------	------

**Order Example:**

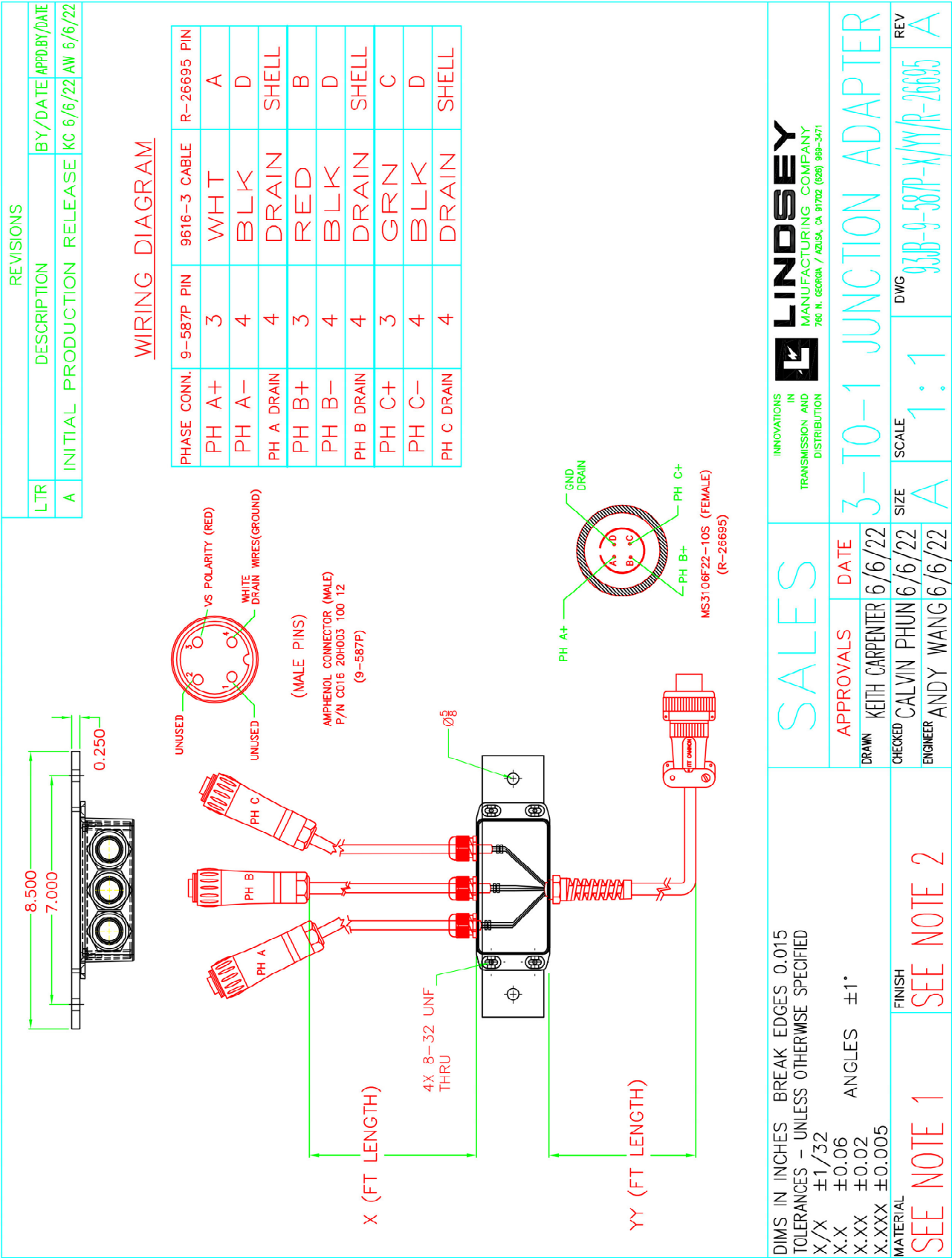
**93JB/20** is a 3-to-1 submersible ready underground voltage sensor junction box with a 20-feet down cable with pigtail cable ends.

\*This type of connector is commonly used with Eaton/Cooper controls.

3-to-1 Amphenol

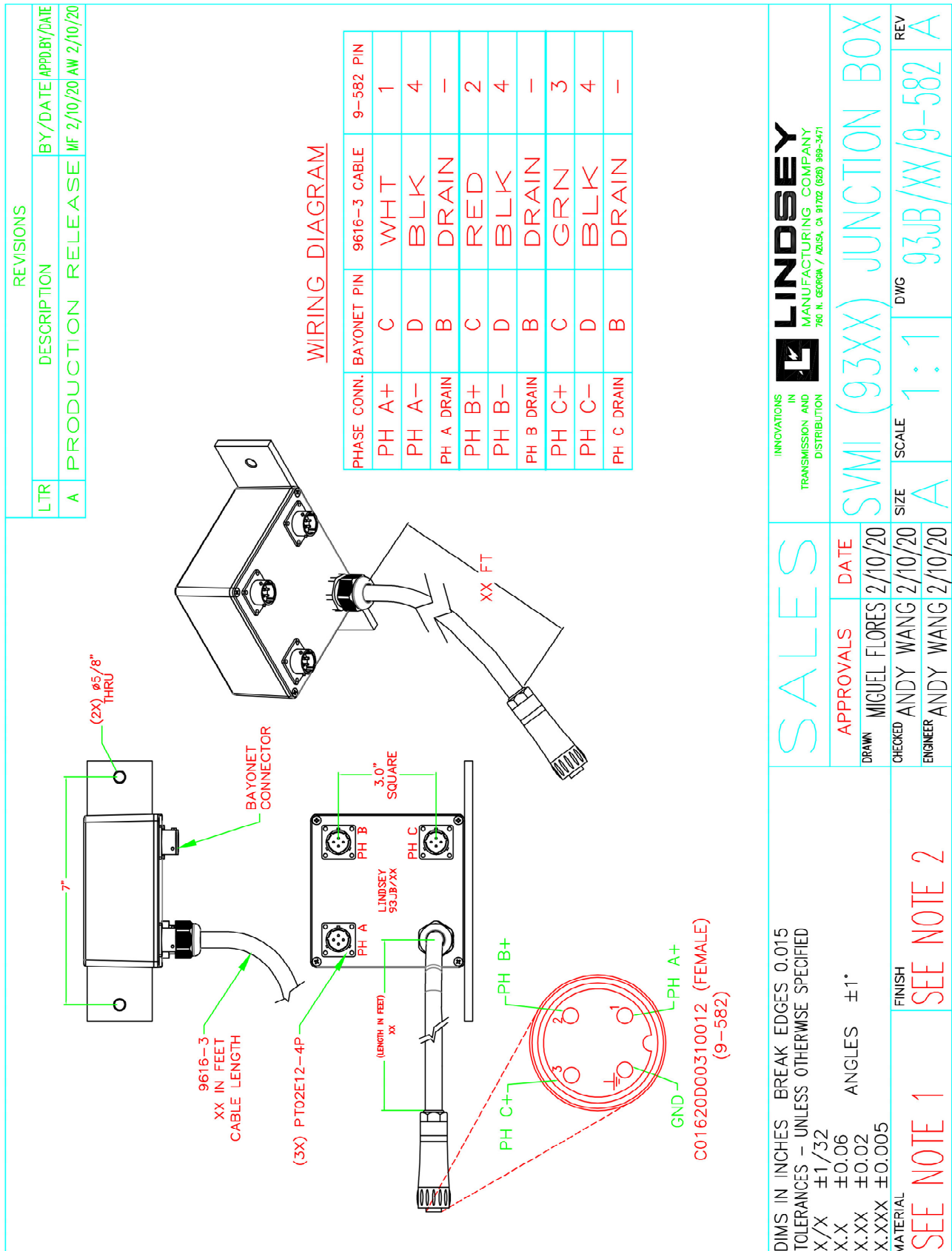


3-to-1 Size 22 Cannon\*

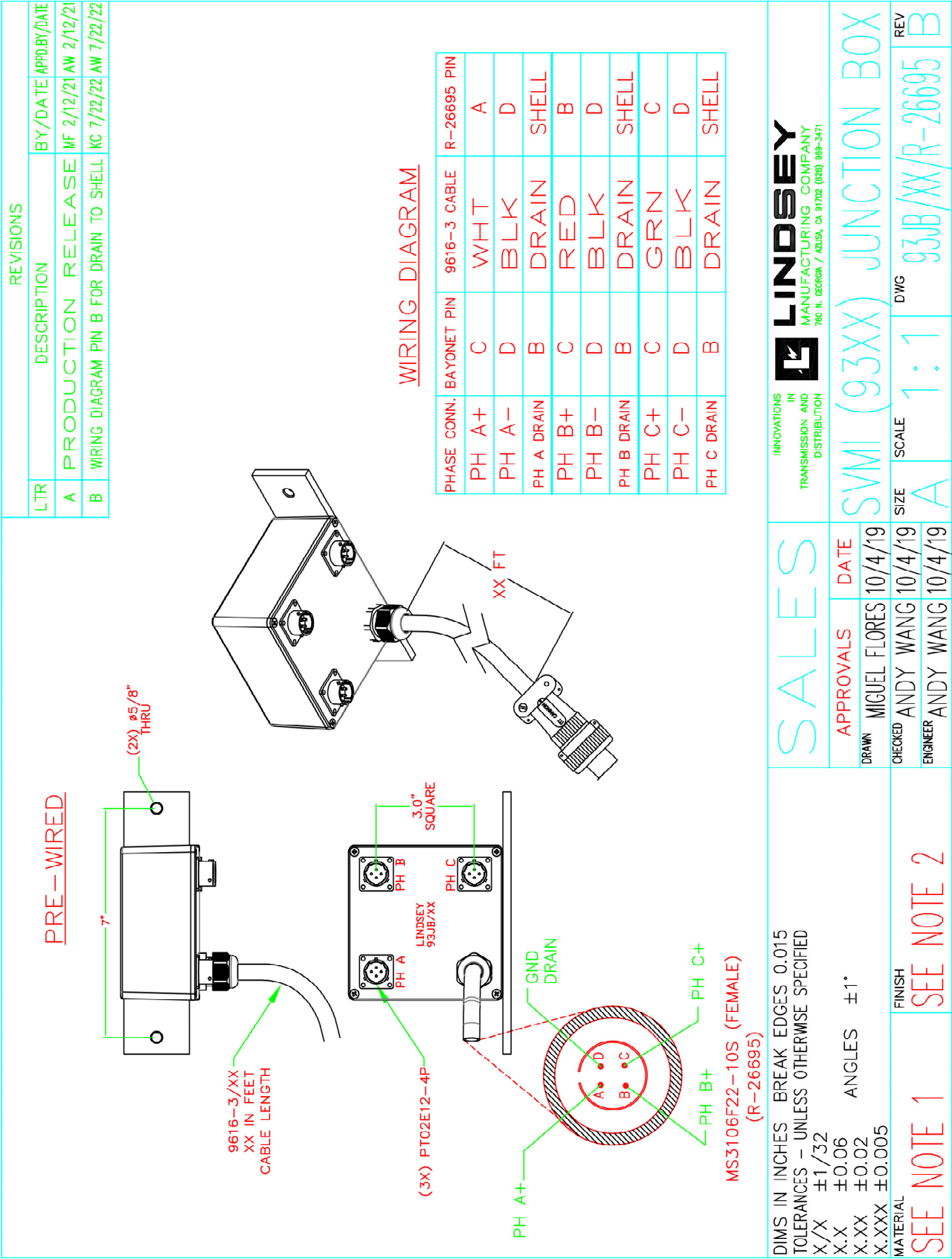




## 3-to-1 Padmount Standoff Amphenol



3-to-1 Padmount Standoff Cannon Size 22\*



\*Note: Size 145 Cannon shares the same wiring diagram.

## Voltage Ratio Fine Tuning Trim Board

*Use: For balancing the per phase Voltage ratio of low ratio Lindsey Voltage Sensors when used with certain relays.*

For precision voltage sensing applications, there may be a need to fine tune the ratio of each of the three phase voltage sensors for use with relays or controls that do not allow for individual phase ratio settings. This is most commonly required when using low voltage ratio sensors with certain relays.

For specific application recommendations, please consult the factory.

### About the Voltage Trim Board

- The trim board provides for the adjustment of individual low-ratio voltage sensors (i.e., 60:1, 120:1, and 166:1) when connecting to a relay or control where the input impedance of the device is not the same from phase to phase due to the variations in the impedance of the transformer at the input stage. These devices typically have relatively low input impedance values. If left uncompensated, the combined sensor/relay accuracy can be off by 15-20% even though the sensor accuracy is held within +/-0.5%.

Examples of such relays are Schweitzer Engineering Laboratories Models SEL-351, SEL-451, and SEL-487E, and Basler Electric Model BE1-IPS100.

- The trim board also provides for adjustment of 25kV, 35kV, and 46kV low ratio voltage sensors when used with very long (>100 feet) cables.
- Precision wire-wound potentiometers are supplied for each phase to allow for voltage ratio adjustment to achieve combined sensor/relay/cable accuracy to be +/- 0.5% or better.
- Conformal coating on both sides of the PCB provides environmental protection.
- Four corner mounting holes are provided for simple installation in control cabinets using standard stand-off spacers.

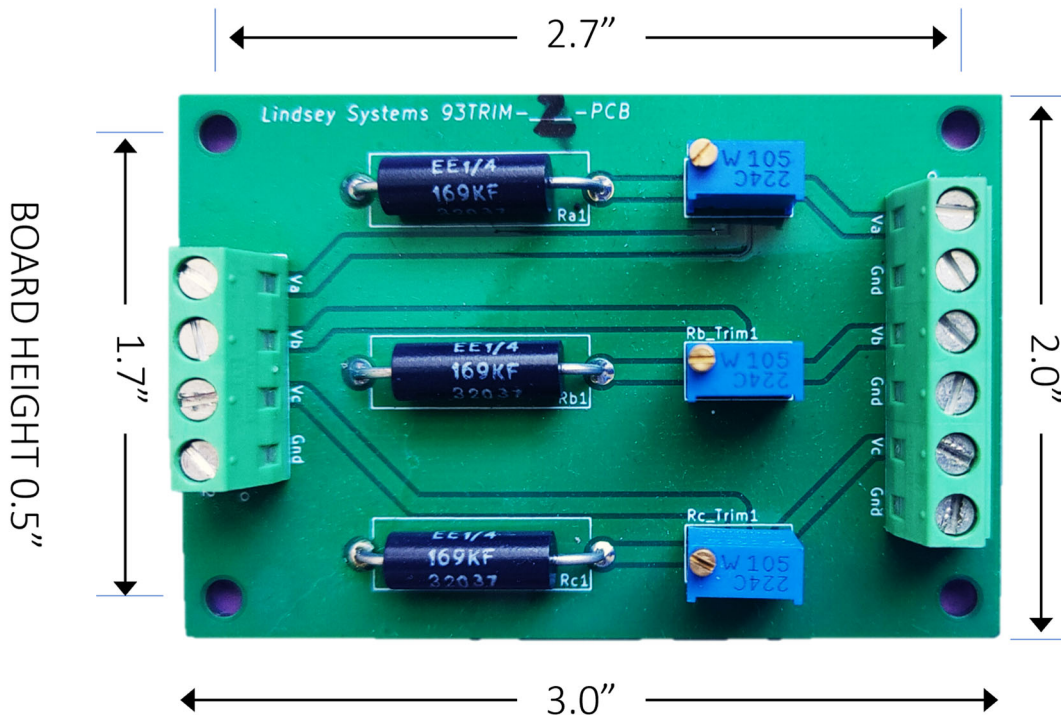
A quantity of four each of #6-32x1/2 screws and ¼" Nylon spacers is provided with each board.

**NOTE:** The board is not intended to be used free-standing and should be installed in a cabinet.

## Voltage Ratio Tuning Board Ordering Table

*For balancing the Voltage ratio of low ratio Lindsey Voltage Sensors on an individual phase basis when used with certain relays*

Part Number	Description
93TRIM-1	For use with 25kV, 35kV, or 46kV low ratio voltage sensors with cable length greater than 100 feet (30m).
93TRIM-2	General purpose for use with 15kV voltage sensors.
93TRIM-3	For use with 35kV low ratio sensor and cable lengths of 60 feet or less.
93TRIM-4	For use with 35kV voltage sensors and model SEL-751 relays or other relays with an input impedance $\geq 2\text{MOHM}$ .



# Cables for Underground or Pad-Mount ElbowSense™ Current-Only Sensor Applications

Use: Installation of Lindsey ElbowSense Split-core or Ring-Style Current sensors in underground, pad-mount, or metal-clad equipment.

These 600V insulation class sensors are intended for use with insulated medium voltage cables.

## About 3-to-1 Underground Current Sensor Junction Boxes

- Junction boxes for Ring-style current sensors have three cables for connection to the sensor’s cast-in Amphenol 4-pin plastic connectors. The single control end cable may be fitted with a variety of Amphenol connectors. This junction box style is waterproof.
- Junction boxes for Split-core current sensors are intended for use with Split-core sensors ordered with cast-in cables. The cables from these sensors are terminated in 2-pin Canon connectors which mate with the connectors installed in the junction box. This junction box style is waterproof.
- Both junction box styles may be attached directly to interior surfaces of pad-mount or metal-clad equipment.

## Connectorized ElbowSense™ Current Only Sensor 3-to-1 Junction Boxes Ordering Table

Part Number Sequence: A-B/C/D

A		B	C	D	
Junction Box Style		Cable Length (to sensors from junction box)	Down Cable Length	Control Connector Style	
93JB-9-587A -	For Ring-style sensors	X (length in feet)	YY (length in feet)	R-22978	8-pin Connector
93JB-9610	For Split-Core sensors			R-22102	14-pin Connector

Example:

↓

93JB-9-587A -

3 /

20 /

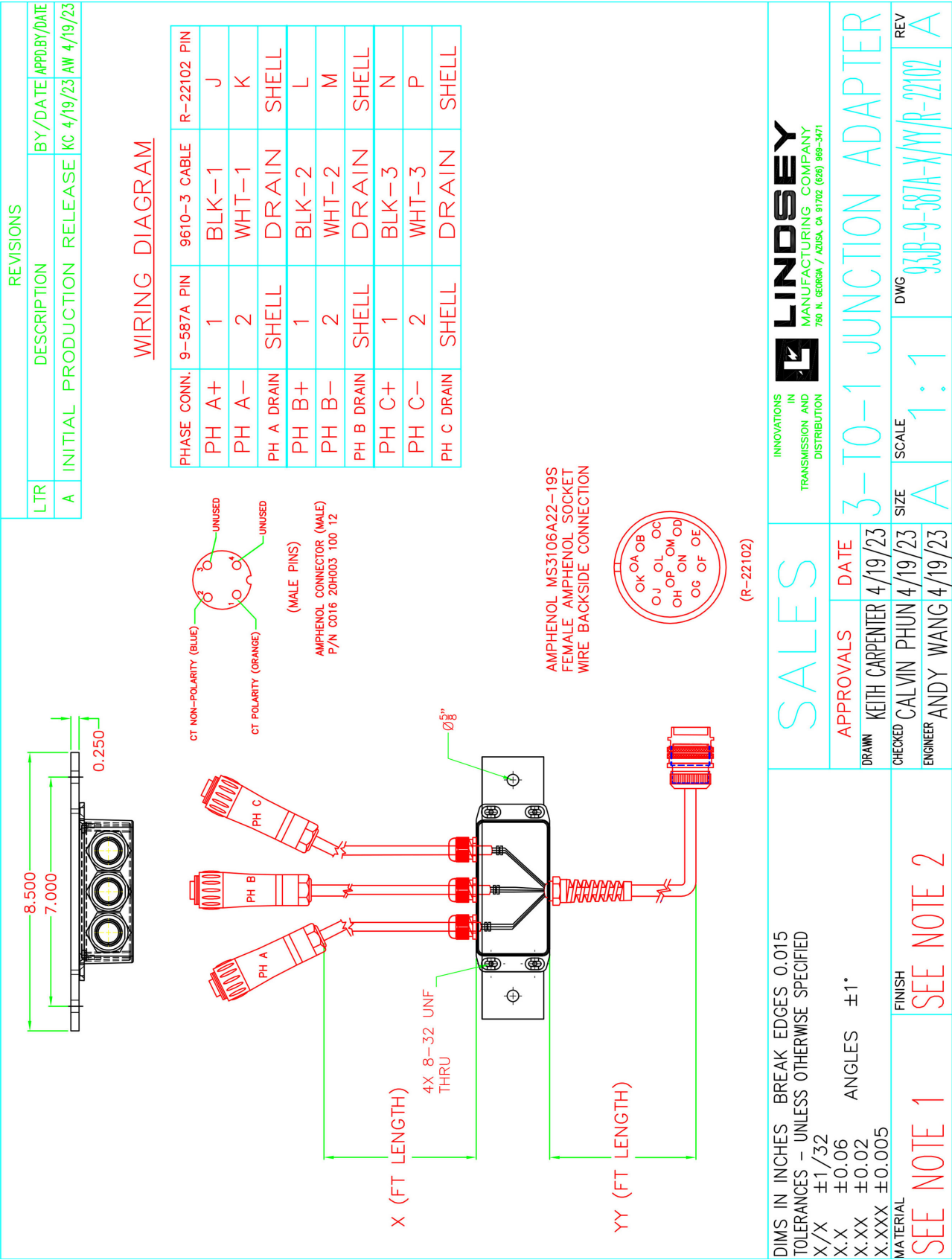
R-22102

### Order Example:

93JB-9-587A - 3 / 20 / R-22102 is a 3-to-1 underground junction box for ring-style current sensors, with a 3-foot cable for connection to each sensor and a 20-feet down cable terminating in a size 14-pin connector.

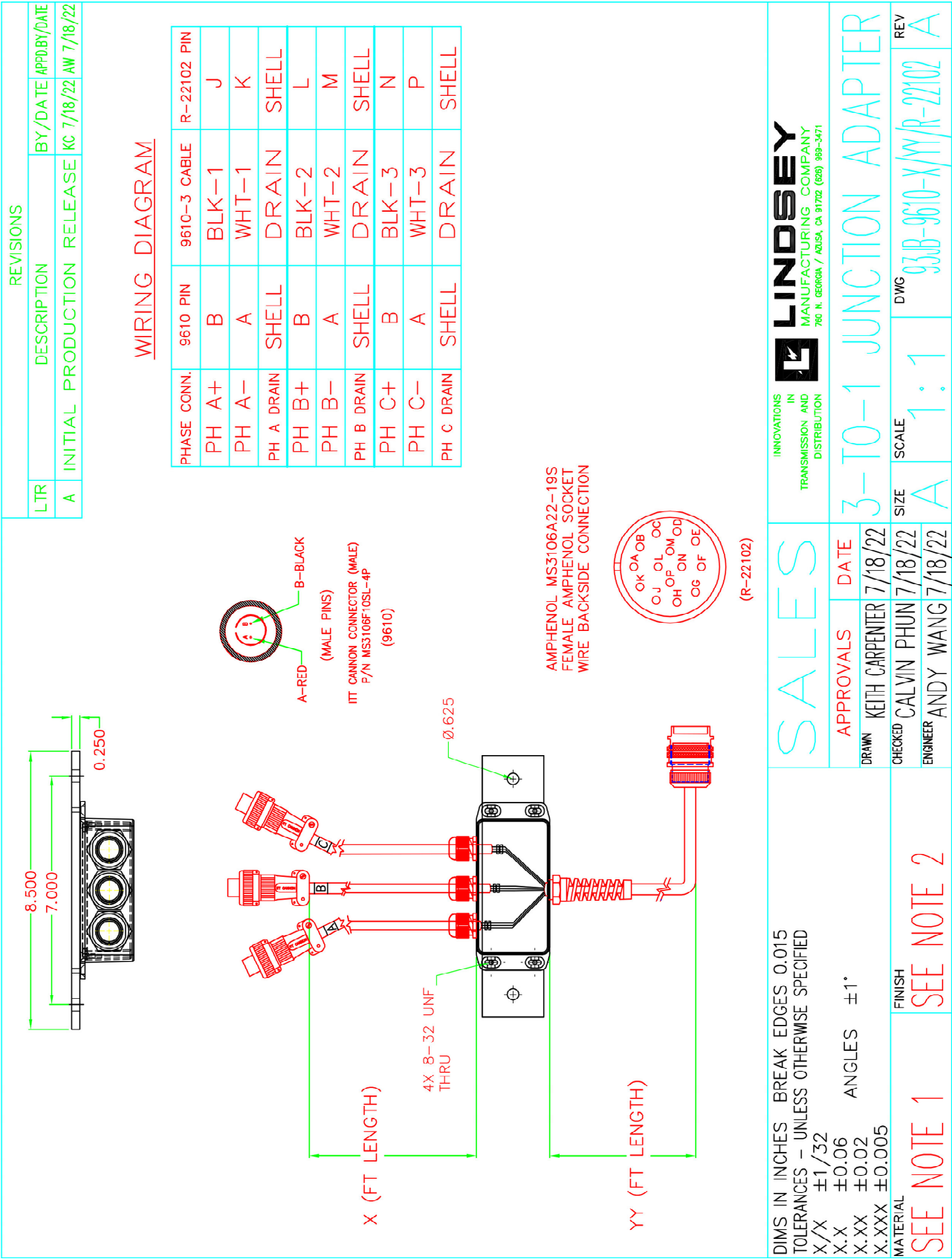


Current Ring Junction Box 22-pin



UNDERGROUND: Current Only (continued)

Split-Core Junction Box 22-pin



## Junction Box for Pad-mount Capacitor Bank or 3-Phase Monitoring Applications

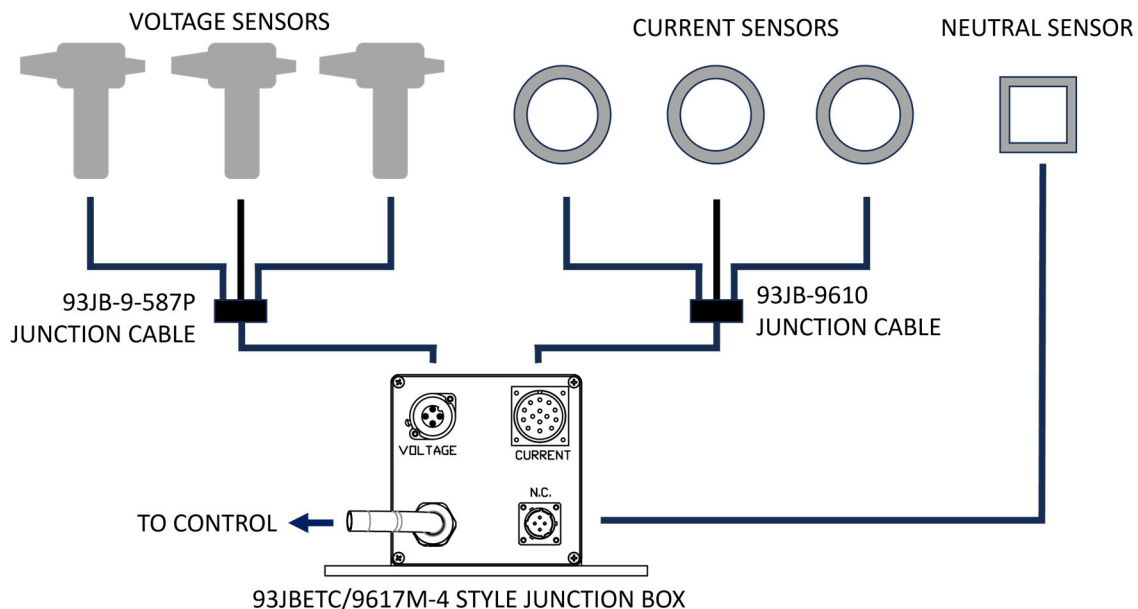
*Use: Installation of Lindsey ElbowSense™ or Type VMI voltage sensors and Ring-style or Split-core current sensors in pad-mount equipment, with or without provisions for a separate neutral current sensor.*

Pad-mount capacitor banks or three-phase metering applications require the connection of three voltage and three current signals, with an optional neutral current signal for capacitor bank applications.

This junction box combines a 3-to-1 voltage sensor cable and a 3-to-1 current sensor cable, along with an optional neutral current sensor cable, to one cable for connection to a control.

### About Combined Voltage and Current Junction Box

- Accepts connection from a style 93JB-9-587P 3-to-1 voltage sensor cable.
- Accepts connection from a style 93JB-9610 3-to-1 current sensor cable.
- Accepts connection from a Lindsey PN 9525FE neutral current sensor cable.
- Combines all 7 signals into one cable fitted with a 14-pin connector for connection to a control.
- Style 93JB junction boxes are intended for used with ElbowSense or VMI sensors with cast-in cables terminated with bayonet style connects.
- This junction box style is submersible to 10 feet.
- The waterproof junction box may be attached directly to interior surfaces of pad-mount or metal-clad equipment.





Junction Box for Pad-mount Capacitor Bank or 3-Phase Monitoring Applications Ordering Table

Part Number Sequence: A/ B/C

A		B	C	
Junction Box Style		Control Cable Length	Control Connector Style	
93JBETG/9617M-4		YY (length in feet)	R-22102	14-pin Connector

Example:



93JBETG/9617M-4 /		20 /	R-22102	
-------------------	--	------	---------	--

Order Example:

93JBETG / 9617M-4 /20 / R-22102 is a voltage sensor cable and current sensor cable junction box with a 20-foot cable terminating in a 14-pin connector.

# UNDERGROUND: Capacitor Bank

## Underground Capacitor Bank Junction Box

**PRE-WIRED**

REVISIONS			
LTR	DESCRIPTION	BY/DATE	APP'D BY/DATE
A	UPDATES TO WIRE DIAGRAM	KC 7/12/22	AW 7/12/22

PIN ASSIGNMENT			
14-PIN to SEL-734B	PIN	VOLTAGE	NEUTRAL CURRENT
+H	A	4-PIN	4-PIN
-N	B	14-PIN	14-PIN
Vn+	C		
Vn-	D		
VA	E	1 (RED)	
VB	F	2 (GRN)	
VC	G	3 (WHT)	
VG	H	6 (BLK/DRAWS)	
IA*	J	J (RED)	
IA	K	K (BLU)	
IB*	L	L (GRN)	
IB	M	M (BLU)	
IC*	N	N (WHT)	
IC	P	P (WHT)	
		DRAINS TO SHELL	

DIMS IN INCHES BREAK EDGES 0.015  
TOLERANCES - UNLESS OTHERWISE SPECIFIED  
X/X ±1/32  
X.X ±0.06  
X.XX ±0.02  
X.XXX ±0.005

MATERIAL  
**SEE NOTE 1**

FINISH  
**SEE NOTE 2**

**SALES**

APPROVALS  
DRAWN KEITH CARPENTER 7/12/22  
CHECKED CALVIN PHUN 7/12/22  
ENGINEER ANDY WANG 7/12/22

DATE 7/12/22

SCALE 1:1

SIZE A

DWG 93102ETG/9617M-4/XX/R-22102

REV A

AMPHENOL MS3106A22-19S  
FEMALE AMPHENOL SOCKET  
WIRE BACKSIDE CONNECTION

OK OA OB OC  
OJ OL OM OD  
OH ON OE  
OG OF





## About Lindsey Systems

Lindsey Systems is recognized globally as an innovator in the electric power industry. As a supplier of systems, products, and product solutions for the transmission and distribution of electricity, Lindsey enables utilities to meet the challenges of the modern-day electrical grid.

With over 75 years of experience and a reputation as a thought leader in the industry, Lindsey Systems' products are known around the world for reliability and performance.

Lindsey is ISO-9001, ISO-14001 and CSA W47.2 Certified.

For more information, visit [www.Lindsey-USA.com](http://www.Lindsey-USA.com).

*Thoughtful Solutions in Medium Voltage Sensors*

Lindsey Manufacturing Co., dba Lindsey Systems  
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