

CX9500/CX9504 Receivers
Coaxitron® System

Installation/Operation Manual

C505M-B (4/97)

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REVISION HISTORY

Manual #	Date	Comments
C505M	6/93	Original version
C505M-A	4/95	Updated to latest format and incorporated ECO's 94-507, 95-001 and 95-002.
C505M-B	4/97	Updated to new format. Removed proprietary information. Updated connector assembly instructions and illustrations. Revised Figure 3.

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1.0 GENERAL

1.1 IMPORTANT SAFEGUARDS AND WARNINGS

Prior to installation and use of this product, the following WARNINGS should be observed.

1. Installation and servicing should only be done by Qualified Service Personnel and conform to all Local codes.
2. Unless the unit is specifically marked as a NEMA Type 3, 3R, 3S, 4, 4X, 6 or 6P enclosure, it is designed for Indoor use only and it must not be installed where exposed to rain and moisture.
4. Only use replacement parts recommended by Pelco.
5. After replacement/repair of this unit's electrical components, conduct a resistance measurement between line and exposed parts to verify the exposed parts have not been connected to line circuitry.

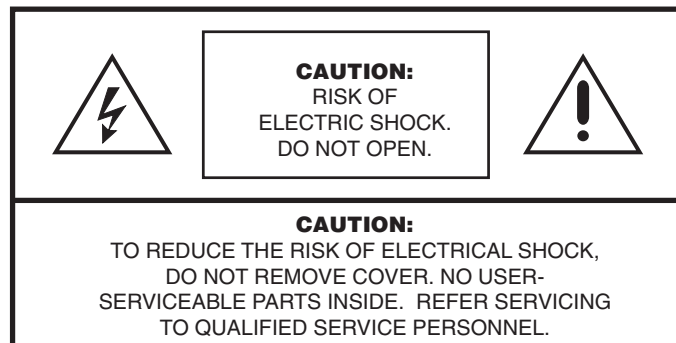
The product may bear the following marks:



This symbol indicates that dangerous voltage constituting a risk of electric shock is present within this unit.



This symbol indicates that there are important operating and maintenance instructions in the literature accompanying this unit.



Please thoroughly familiarize yourself with the information in this manual prior to installation and operation.

2.0 DESCRIPTION

The Coaxitron® System 9500 receivers are available in two control formats and work with all Coaxitron controls. The control formats are as follows:

1. CX9500 Coaxitron control
2. CX9504 RS-485 4-wire control

Standard features for all receivers include:

- Full PTZ (Pan/tilt and Zoom) Coaxitron control
- 8 programmable auxiliary functions
- Adjustable lens voltages
- 24 VAC, 120 VAC and 230 VAC camera voltages
- Indoor/outdoor model; integrated mount versions available for Legacy® series pan/tilts
- 24, 120, 230 VAC input voltages
- Self-test diagnostics built into firmware
- Composite sync generation in the absence of camera video
- Auto/Random scan

These models each support several options such as:

- 32 Presets with no labels
- Universal AC fixed speed power supply
- Variable Speed DC power supply
- Coaxitron or RS-485 control

NOTE: *Any feature and/or option listed must be supported by the controller being used for the corresponding receiver function or option to work properly.*

2.1 MODELS

The last number of the base model number designates the control type: Coaxitron (CX9500) is the most elementary and the last is the 4-wire RS-485 (CX9504).

The suffix will be RX for indoor/outdoor enclosure.

The remainder of the model number is in the form of extensions that designate any optional feature. These features are:

- PP 32 presets senses
- VS Variable speed

3.0 INSTALLATION

3.1 SELECTING THE CORRECT RECEIVER FOR YOUR APPLICATION

Successful installation must include proper application planning. The trade-offs and application hints that should be considered for each receiver type are discussed in the following subsections.

3.1.1 The CX9500 Coaxitron VIS Control System

A typical application is given in Figure 1.

Operating distance for the Vertical Interval Signaling (VIS) system is probably the most crucial installation parameter. For a VIS control system, the maximum loss allowed across the coax is 6 dB at 1 MHz. The actual distance for a system without line amplifiers can be calculated by the following formula.

Distance = 6 dB / Loss of the coax cable and any splices.

Where the "Loss of the coax cable" is obtained from the cable manufacturer's data sheets. The splice loss can vary, but a good splice can be assumed to add about 0.5 dB loss to the cable.

Terminations for the video must be supplied at the controller end of the coax. The correct termination is 75 ohms. If multiple components such as a VCR or monitors are on the coax line, the piece of equipment at the extreme end should supply the only termination.

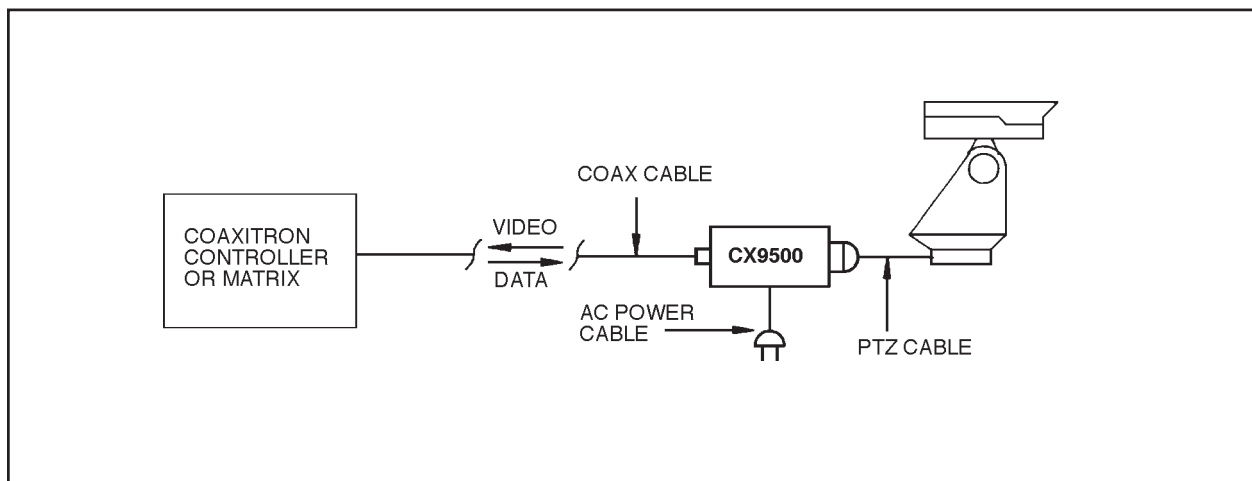


Figure 1. Typical Coaxitron Application

3.1.2 The CX9504 4-Wire RS-485 Control System

This system is used in applications where multiple receivers will listen to a single control channel, but duplex operation is desired. The RS-485 system presents several unique installation requirements. These requirements are shown in Figure 2 and are discussed below.

Excessive stub lengths are not acceptable since they produce reflections that cause message errors. This means that a "star" or "Y" topology is not acceptable.

The extreme ends of the cable must have 120 ohm termination resistors to minimize reflections.

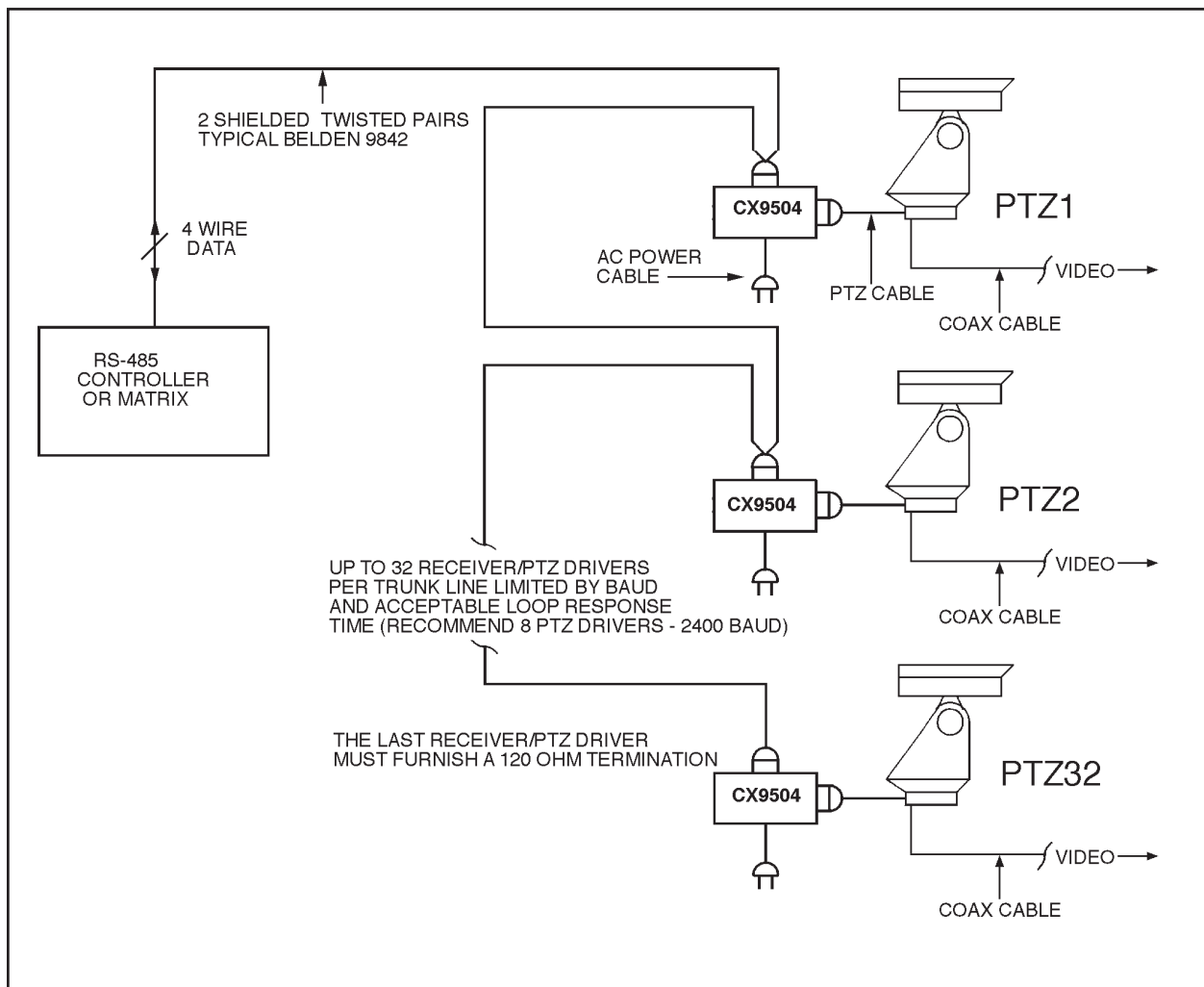


Figure 2. Typical RS-485 Control Applications

3.2 CONNECTING THE RECEIVER

Connecting the receiver involves mating the correct connector assembly to the appropriate receiver connector (J6 or J7) on the Coaxitron unit. See Figure 3.

Receiver connector locations are listed as follows:

- BNC-1** Video input from camera
- BNC-2** Video output and Coaxitron input
- J6 Standard function P/T cable connection
- J7 Optional functions cable connection
- F-1 Fuse holder
- AC Input power cable
- **Used in CX9500 only

The connector assemblies provided to you need to be assembled according to the instructions in section 3.2.1. When assembling either connector, follow the wiring call-outs listed in Table A for pin placement for the connector being wired (J6 or J7).

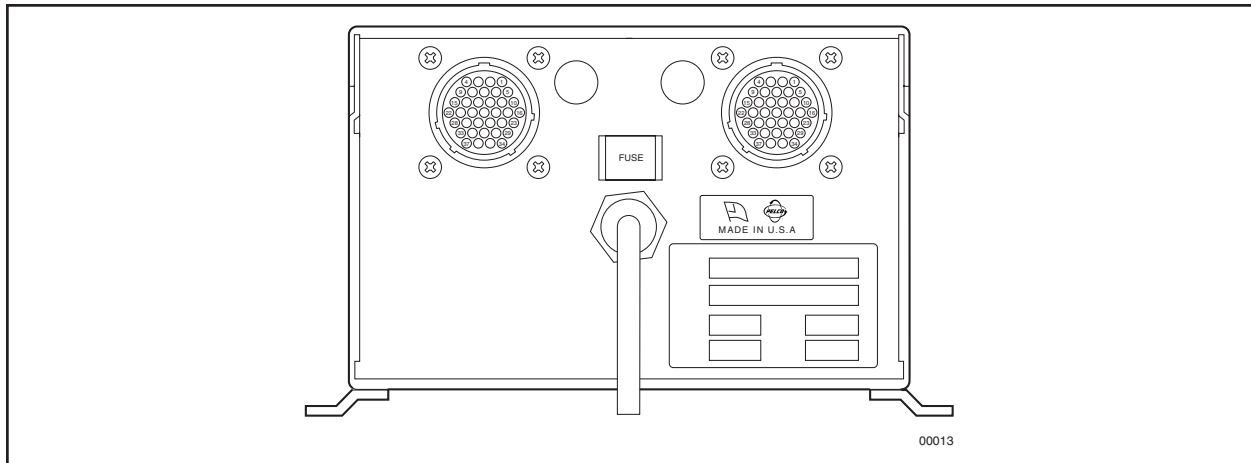


Figure 3. Receiver Connector Locations

Table A. CPC 37-PIN Connector Pinouts

Option Connector (J7)				PTZ Connector (J6)			
Pin#	Function	Pin#	Function	Pin#	Function	Pin#	Function
1	Not Used	20	Not Used	1	Pan/ Tilt Motor Common	20	Not Used
2	Not Used	21	Aux 3 TTL Output	2	Auto Iris Supply	21	Not Used
3	Not Used	22	Aux 4 TTL Output	3	Left	22	Not Used
4	Ground	23	Aux 5 TTL Output	4	Video Ground	23	Not Used
5	VAC	24	Aux 6 TTL Output	5	Down	24	Not Used
6	Not Used	25	Aux 7 TTL Output	6	Up	25	Aux 1 TTL Output
7	Gen Lock Core Input	26	Aux 8 TTL Output	7	Right	26	Aux 2 TTL Output
8	Not Used	27	Not Used	8	Chassis Ground	27	Video Core
9	AC Common	28	Not Used	9	Camera Supply High	28	Preset Ref. Ground
10	Reserved	29	Not Used	10	Iris	29	Preset Ref. Supply
11	Reserved	30	Not Used	11	Focus	30	Gen Lock Core Out
12	Reserved	31	Not Used	12	Zoom	31	Not Used
13	Reserved	32	Reserved	13	Lens Common	32	Not Used
14	Not Used	33	Not Used	14	Camera Supply Low	33	Pan B Pot Feedback
15	Reserved	34	TXD+	15	Enclosure AC High	34	Focus Pot Feedback
16	Reserved	35	RXD+	16	Enclosure AC Low	35	Zoom Pot Feedback
17	Reserved	36	RXD-	17	Not Used	36	Tilt Pot Feedback
18	Reserved	37	TXD-	18	Not Used	37	Pan A Pot Feedback
19	Not Used			19	Not Used		

3.2.1 Connector Assembly

NOTE: *Contacts cannot be removed from the connector without the use of the appropriate AMP extraction tool (ZT305183) which is available from Pelco.*

If you did not order a pre-assembled connector, assemble the connector parts according to the instructions below. Detail B, below, reflects the pin arrangement specific to CX9500/CX9504 Receivers. Refer to Figure 4 during assembly. For best results use an AMP style crimper when making the wire to pin connection.

The instructions that follow apply to all AMP style connectors regardless of pin size or pin number.

1. Slide the connector clamp assembly over the conductor cable. If the diameter of the conductor cable is such that the rubber boot will slide over it easily, then slide the rubber boot onto the conductor cable at this time. If not, discard the rubber boot.
2. Prepare the wires from the conductor cable as follows:
 - a. Strip at least 1" from the cable jacket to expose the wires. You may need to strip more from the cable jacket if you have more wires.
 - b. Strip 1/8" from each wire.
 - c. Using an AMP style crimper, crimp the wires and their insulation to the connector pins. Refer to Detail A in Figure 4.
3. Slide the connector pins into the appropriate holes in the connector body until they snap into place. The connector holes are numbered for your convenience.
4. Push the connector clamp assembly (with boot, if used) toward the connector body. Screw the clamp assembly onto the connector body, being careful not to disturb the wires.
5. To complete the assembly, attach the appropriate clamp with the screws provided and tighten.

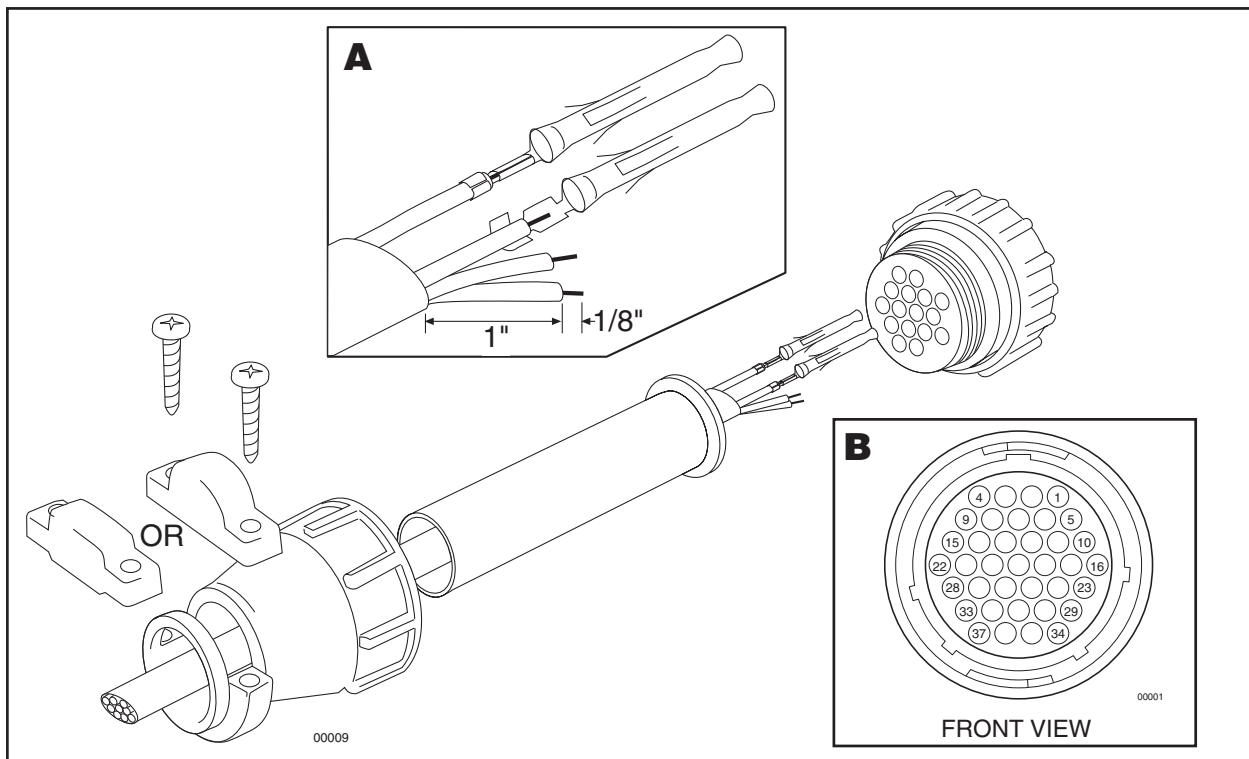


Figure 4. Connector Assembly

4.0 OPERATION

Upon applying power, the receiver will perform its self-test functions. These diagnostics determine the receiver, pan and tilt, lens and camera configuration by exercising each. The results are reported by text superimposed on the video if the text generator is preset (ZS versions). All versions are designed to allow the simultaneous operation of the PTZ commands. This feature is described in detail in the firmware section (Section 6.0). Other features are automatic composite sync generation in the event of camera video failure.

CX9500 Receiver

The CX9500 Coaxitron receiver operation is similar to the Coaxitron System 2000. Vertical Interval Signaling (VIS) is used to talk to and from the receiver. The actual signal is a Pulse Width Modulated (PWM) 15 or 32 pulse train of 0.5 to 1.5 volts amplitude, where a 2 μ s pulse is considered a Coaxitron one (1), and a 1 μ s pulse is considered a Coaxitron zero (0). Line 10 is reserved for alarm reporting and acknowledgment from the receiver by an 8-bit Coaxitron signal. Line 18 is reserved for Coaxitron commands to the receiver in the form of 16-bit Coaxitron signals. Line 19 is reserved for Coaxitron data to the receiver in the form of 16-bit Coaxitron commands. Compatibility with the older System 2000 controllers is maintained by allowing a 15-bit Coaxitron signal in lines 15 through 19. Once a valid signal is received, it is processed by the receiver as described in the firmware section (Section 6.0) of this manual.

CX9504 Receiver

Four-wire RS-485 operation allows for applications that require the receiver to be interfaced to single control and response channels in a daisy-chained fashion. The protocol is given in the firmware section (Section 6.0) of this manual. The drivers follow the RS-485 specification and are tri-stated to "high Z" when not transmitting. This allows several receivers to be wired together in a daisy-chained fashion on a single control channel. There is no channel contention avoidance built into the receiver. When it hears a valid command for its address, it immediately responds. Contention avoidance must be accounted for at the controller.

"PP" Option

This option allows 32 complete preset senses to be programmed and recalled as described in the firmware section. It should be noted that the protocol for this operation is not compatible with the older (Coaxitron Matrix) 7500 style preset protocol.

"VS" Option

This option provides the control for 12 VDC brushed motors to be driven in a variable speed fashion.

5.0 CX9500 RECEIVER BOARD DESCRIPTIONS

The CX9500 Receiver contains three boards: the Mother Board, the Option Board, and the Power Supply Board. Gaining access to the board slot locations can be seen in Figure 5. As part of any operational set-up, the Option and Power Supply Boards must be pulled and configured. This will be discussed shortly; first, a brief description of the function of each of the boards is given on the following pages.

5.1 MOTHER BOARD

The motherboard is the heart of the system. It contains the Microprocessor Circuits, Video Amplifier Circuits, Sync Generation and Sync Separation circuits and the Coaxitron Transceiver Circuits.

The Microprocessor Circuit handles all system functions via software interrupts and communicates with the rest of the circuitry (externally and on the Motherboard itself) via three functional buss groupings. The first group, the Address/Data buss, facilitates processor access of external program memory and external data memory. The second group, the Serial Data buss, among other functions, provides the path by which the non-volatile EPROMs which contain preset information are accessed on the Options Board. All data latches and Coaxitron transceiver communications occur through the third grouping, the External B and C-Data Busses, respectively.

The Video Amplifier and processing circuits add VIS and text bit patterns onto the camera video or, alternately, removes video from the incoming VIS.

The Sync Generation Circuit, in the presence of a good video signal, separates and locks the generated sync to the camera. In the absence of a good video signal, the free running sync from the generator is inserted in place of that from the camera.

The Sync Separation circuit separates the incoming sync from the video information and provides the system signal that interrupts the processor every vertical interval.

The Coaxitron Transceiver Circuits facilitate the storage, error checking and timing needed to transfer data. The transmitter can send the data to either the coax or the camera, depending on application. The receiver obtains its input from the last stage of the video section. The receiver amplifies, counts and then gates these data pulses into temporary Dual Port Ram (DPRAM) storage locations.

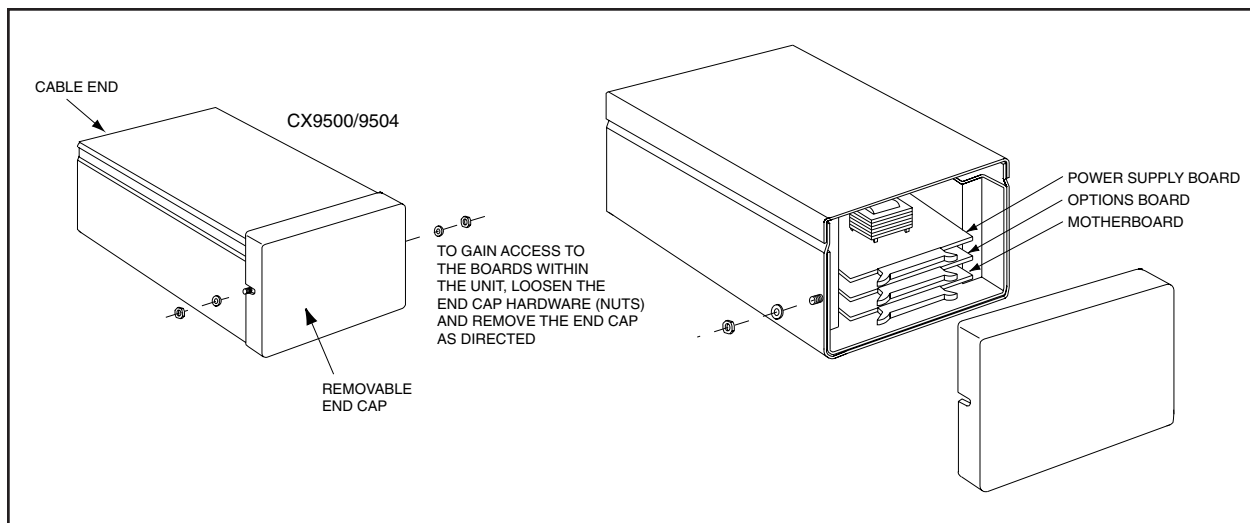


Figure 5. Receiver Board Locations

5.2 OPTION BOARD

This board contains all the circuitry required for all options. The components will be loaded or not loaded according to the model being built. Preset circuits are loaded for preset (PP). Receiver Address circuits are loaded for the 9504 versions of the receiver. The RS-485 drivers are only loaded for the 9504 version. The address switch sets the receiver address on power-up, and any change of address requires a hard reset. Switch settings are binary encoded. Figure 6 shows how these address settings are derived. If you are running simple coaxitron, you only have one address to worry about; if you're running RS485 multiple control applications, then each Receiver Option Board must be set for a different address. Implement Receiver addressing, using Figure 6 as a guide.

5.3 UNIVERSAL AC POWER SUPPLY

NOTE: *Prior to operation, both the fuse and strapping configurations must be installed. Use Figure 8 and Table II to configure.*

This board was designed to power all of Pelco's fixed speed pan and tilts that use synchronous AC motors. This board supplies the power for all the other boards. It listens to the processor and drives the PTZ accordingly. Each section is described in the following subsections.

5.3.1 Transformer and Power Supply Circuits

The transformer and power supply circuit supply the different voltages required by the remainder of the circuitry. The transformer is capable of stepping down the input voltage to required levels to supply the P/T, camera, and an accessory output. The total power drawn from the transformer from these windings must not exceed 50 watts. Step-up operation in which the supply voltage is less than the PT or camera voltage is not recommended. Table B lists the strapping configurations and fuse values needed for the recommended input/output voltages.

5.3.2 Logic and Latch Circuits

The logic and latch circuits listen to the mother board and control driver outputs for the PTZ.

5.3.3 Pan and Tilt Drive Circuit

The pan/tilt drive circuit for this version is simply four (4) solid-state relays which are energized by the latch circuit. The pan relays are monitored for the presence of current. This is used to detect limit stops when auto/random scan is used.

5.3.4 Lens Power Supply Circuit

The lens power supply circuit consists of dual power op amp circuits that provide up to +12 VDC for the lens outputs when engaged.

5.4 VARIABLE SPEED POWER SUPPLY

NOTE: *Prior to operation, both the fuse and strapping configurations must be installed. Use Figure 9 and Table III to configure.*

This board was designed to power all of Pelco's 12 VDC variable speed pan and tilts. This board also supplies the power for all the other boards. It also listens to the processor circuit and drives the PTZ accordingly. The descriptions for the lens power supply circuit and the logic and latch circuits is the same as that previously described in the AC power supply section. The remaining sections are described below.

5.4.1 Power Supply and Camera Transformer Circuit

Power supply and camera transformer circuit provide the operating voltages for the remainder of the receiver. The power supply is a switch mode power supply. It is supplied with 120 to 230 VAC and provides +12, -12, and +5 VDC. The switch mode power supply is capable of 40 watts continuous and 45 watts surge power. The camera transformer is capable of either 120 or 230 VAC input and 24 VAC output. Table C lists the strapping configurations needed for the recommended input/output voltages.

5.4.2 Motor Driver Circuits

The Motor Driver circuits listen to the latch circuitry and provide a pulse width modulated +12 volt output to the P/T motors.

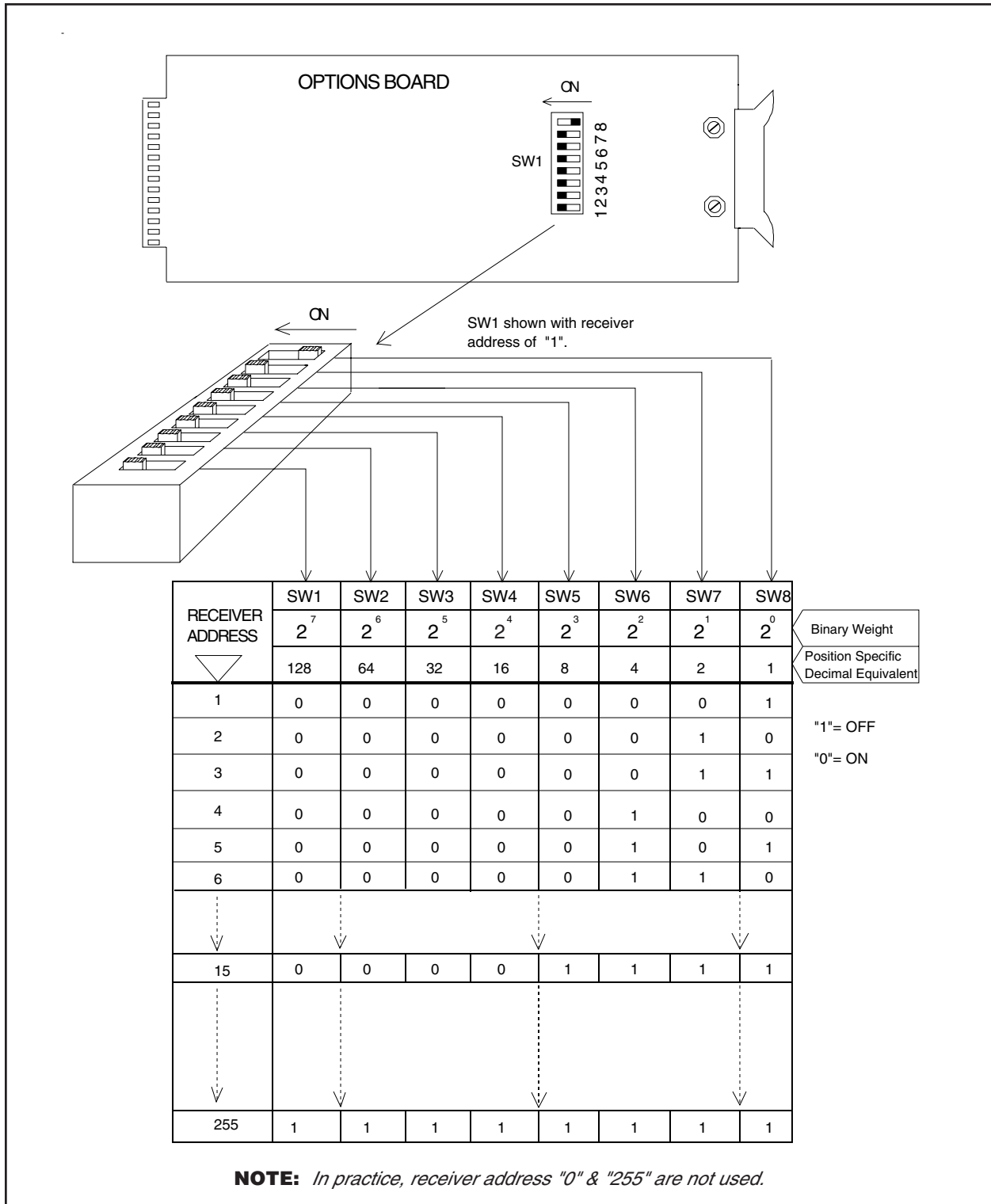


Figure 6. Options Board Address Settings

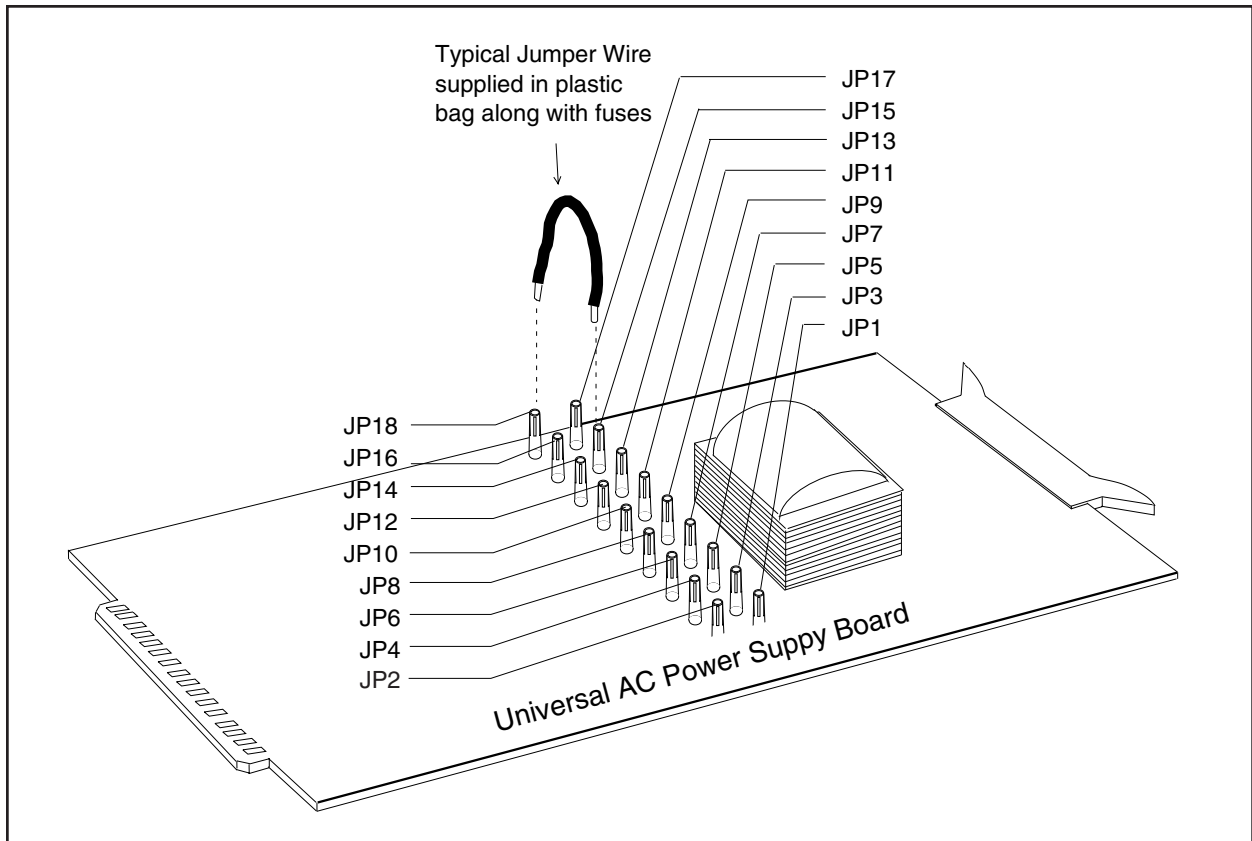


Figure 7. Universal Power Supply Board

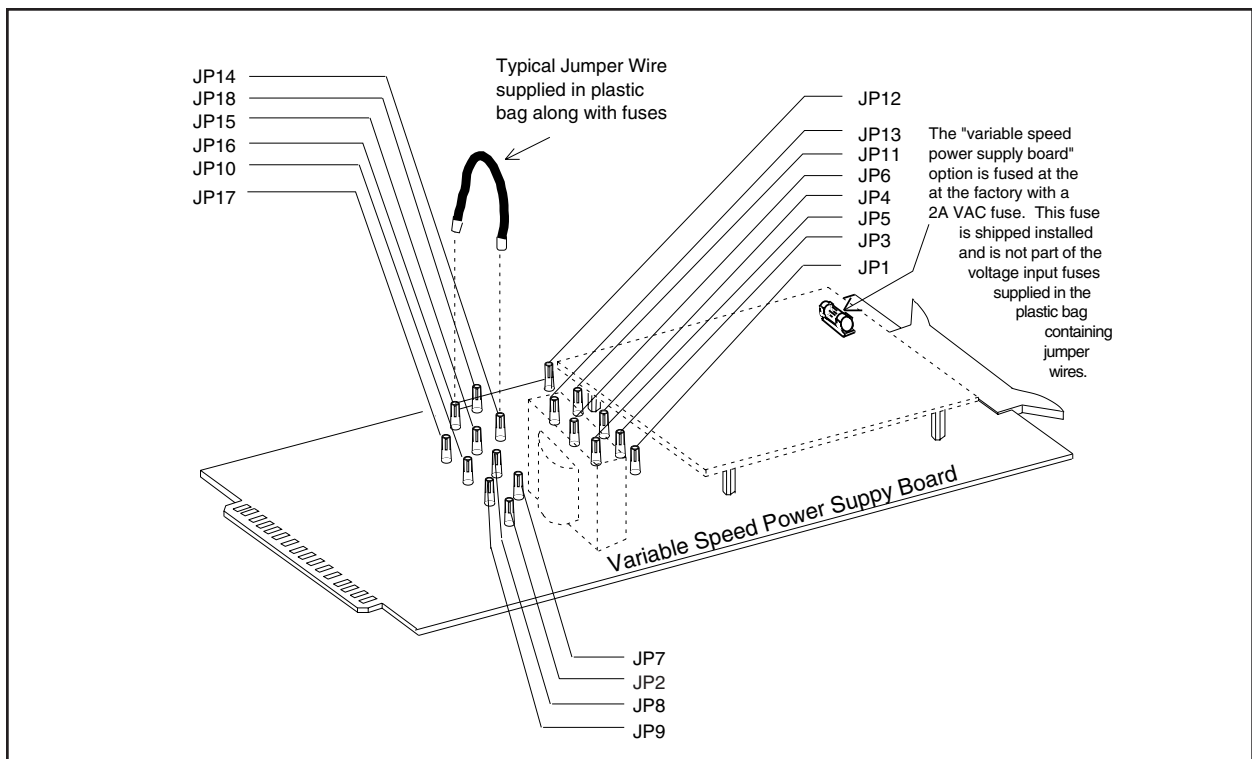


Figure 8. Variable Speed Power Supply Board

Table B. Strapping Configurations for Universal AC Power Supply

WARNING: The AC line voltage used to power the receiver/driver is the same voltage that is fed through the pan/tilt into the enclosure as "enclosure power", which also supplies the heaters and blower where applicable. This voltage is not selectable.

	INPUT VOLTAGE		
	24 VAC	120 VAC	230 VAC
* Not a recommended configuration.			
Fuse	2 AMP	1 AMP	1/2 AMP
Transformer Primary	JP2-JP15 JP6-JP11	JP2-JP1 JP4-JP3 JP6-JP5 JP8-JP7	JP2-JP1 JP3-JP5 JP8-JP7
Pan/Tilt			
24 VAC	JP13-JP16 JP9-JP12	JP15-JP16 JP11-JP12	JP15-JP16 JP11-JP12
120 VAC	*	JP17-JP16 JP11-JP12	JP17-JP16 JP11-JP12
230 VAC	*	*	JP4-JP16 JP6-JP12
Camera Voltage			
24 VAC	JP4-JP14 JP8-JP10	JP13-JP14 JP9-JP10	JP13-JP14 JP9-JP10
120 VAC	*	JP18-JP14 JP9-JP10	JP18-JP14 JP9-JP10
230 VAC	*	*	JP4-JP14 JP6-JP10

Table C. Variable Speed Power Supply and Camera Transformer Strapping Configurations

	INPUT VOLTAGE	
	120 VAC	230 VAC
* Not a recommended configuration.		
Fuse	1AMP	1/2AMP
Transformer Primary	JP2 - JP7 JP9 - JP15 JP10 - JP8 JP17 - JP16	JP2 - JP7 JP8 - JP15 JP17 - JP16
Camera Voltage		
24 VAC	JP3 - JP4 JP12 - JP13	JP3 - JP4 JP12 - JP13
120 VAC	JP1 - JP4 JP11 - JP13	*
230 VAC	*	JP1 - JP4 JP11 - JP13

6.0 FIRMWARE DESCRIPTIONS

6.1 BAUD RATES

The hardware architecture between the controller and receiver is an RS-485 circuit designated the “control channel”. The baud rate is currently set to 2400 baud. The information is processed by the receiver every 16 ms. Higher baud rates are possible by increasing the ring buffer size, but the information processing rate is set at 60 Hz.

6.2 PROGRAMMED AUX FUNCTIONS

Eight auxiliary outputs, depending on receiver optioning, are available to allow control of other peripheral devices. The operation of these functions are controlled by the receivers associated controller. The auxiliary functions may be programmed for latching or momentary operation. In latching mode, the output goes into an active mode after receiving a set command from the controller and is deactivated after reception of a clear command. In the momentary mode, the set command activates the output for a fixed duration of time (16ms) and the clear command is not used.

7.0 SPECIFICATIONS

ELECTRICAL

Input Voltage (50/60 Hz):

Standard	
Version	24, 120, 230 VAC
VS Version	120, 230 VAC

Power Consumption (excluding PTZ):

Standard	
Version	6 watts
VS version	6 watts

P/T Output Voltages:

Standard	
Version	24, 120, 230 VAC
VS Version	12 VDC PWM at 15 KHz

P/T Output Currents:

Standard	
Version	1.5 amps per motor
VS version	3 amps per motor

P/T Output Power:

Standard	
Version	50 watts
VS version	35 watts

Camera Output Voltages:

All Versions	24, 120, 230 VAC
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Lens Output Voltages:

All Versions	0 to 12 VDC
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Control Method:

CX9500	Coaxitron VIS
CX9504	4-wire RS-485

Standard Baud Rates:

CX9500	1 MHz
CX9504	2400 baud

Command Error Rates:

Duplex	0%
Simplex	0.02%

Input Video Level:

All versions	0.5 to 1.5 V p-p
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Input Video Format:

Standard	NTSC, RS-170
Optional	PAL

Video Bandwidth:

All versions	10 MHz
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Operating Distances:

Coaxitron	
Version	2,000 ft (610 m) on RG-11
RS-485 Version	4,000 ft (1,219 m) on 24 Awg-TP

NOTE: All standard baud rates from 600 to 19.2K are available on an optional basis. Please consult the factory.

NOTE: Operating distances given here are calculated, and based on typical performance. The actual calculations are explained in the Installation section of this manual, and should be done for each application prior to installation.

MECHANICAL

Connectors:	
P/T	37-pin CPC
Options	37-pin CPC
Video	2 BNCs
Power	3-wire #18 Awg
Fuse	2 AG, 1/2 amp

GENERAL

Ambient Operating Temperature: -4° to 140° F (-20° to 60° C)
Dimensions: See Figure 9.

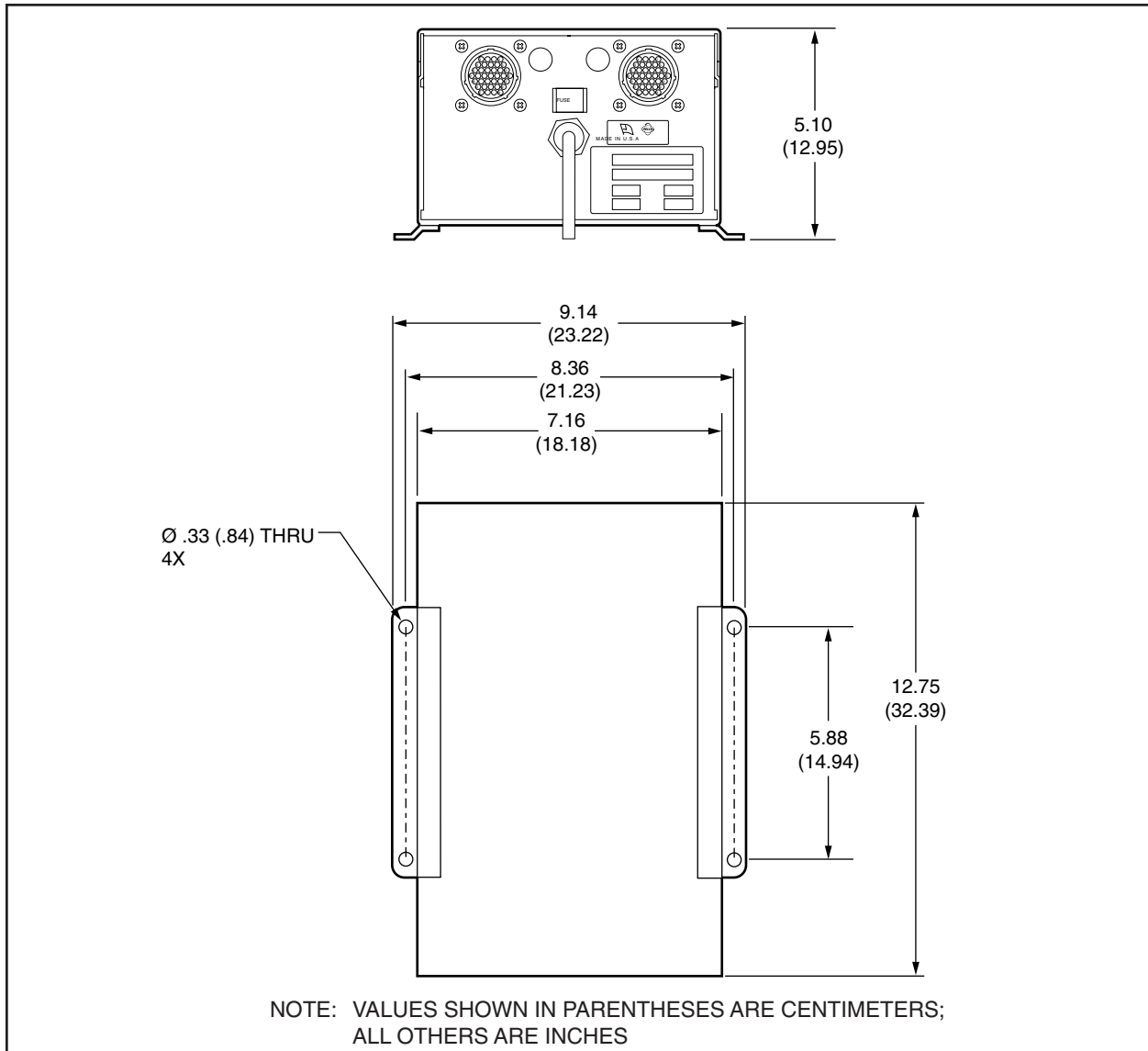


Figure 9. CM9500 Series Receiver/Driver Dimension Drawing

8.0 WARRANTY AND RETURN INFORMATION

WARRANTY

Pelco will repair or replace, without charge, any merchandise proved defective in material or workmanship for a period of one year after the date of shipment.

Exceptions to this warranty are as noted below:

- Five years on FT/FR8000 Series fiber optic products.
- Three years on Genex® Series products (multiplexers, server, and keyboard).
- Three years on Camclosure® and fixed camera models, except the CC3701H-2, CC3701H-2X, CC3751H-2, CC3651H-2X, MC3651H-2, and MC3651H-2X camera models, which have a five-year warranty.
- Two years on standard motorized or fixed focal length lenses.
- Two years on Legacy®, CM6700/CM6800/CM9700 Series matrix, and DF5/DF8 Series fixed dome products.
- Two years on Spectra®, Esprit®, ExSite™, and PS20 scanners, including when used in continuous motion applications.
- Two years on Esprit® and WW5700 Series window wiper (excluding wiper blades).
- Eighteen months on DX Series digital video recorders, NVR300 Series network video recorders, and Endura™ Series distributed network-based video products.
- One year (except video heads) on video cassette recorders (VCRs). Video heads will be covered for a period of six months.
- Six months on all pan and tilts, scanners or preset lenses used in continuous motion applications (that is, preset scan, tour and auto scan modes).

Pelco will warrant all replacement parts and repairs for 90 days from the date of Pelco shipment. All goods requiring warranty repair shall be sent freight prepaid to Pelco, Clovis, California. Repairs made necessary by reason of misuse, alteration, normal wear, or accident are not covered under this warranty.

Pelco assumes no risk and shall be subject to no liability for damages or loss resulting from the specific use or application made of the Products. Pelco's liability for any claim, whether based on breach of contract, negligence, infringement of any rights of any party or product liability, relating to the Products shall not exceed the price paid by the Dealer to Pelco for such Products. In no event will Pelco be liable for any special, incidental or consequential damages (including loss of use, loss of profit and claims of third parties) however caused, whether by the negligence of Pelco or otherwise.

The above warranty provides the Dealer with specific legal rights. The Dealer may also have additional rights, which are subject to variation from state to state.

If a warranty repair is required, the Dealer must contact Pelco at (800) 289-9100 or (559) 292-1981 to obtain a Repair Authorization number (RA), and provide the following information:

1. Model and serial number
2. Date of shipment, P.O. number, Sales Order number, or Pelco invoice number
3. Details of the defect or problem

If there is a dispute regarding the warranty of a product which does not fall under the warranty conditions stated above, please include a written explanation with the product when returned.

Method of return shipment shall be the same or equal to the method by which the item was received by Pelco.

RETURNS

In order to expedite parts returned to the factory for repair or credit, please call the factory at (800) 289-9100 or (559) 292-1981 to obtain an authorization number (CA number if returned for credit, and RA number if returned for repair).

All merchandise returned for credit may be subject to a 20% restocking and refurbishing charge. Goods returned for repair or credit should be clearly identified with the assigned CA or RA number and freight should be prepaid. Ship to the appropriate address below.

If you are located within the continental U.S., Alaska, Hawaii or Puerto Rico, send goods to:

Service Department
Pelco
3500 Pelco Way
Clovis, CA 93612-5699

If you are located outside the continental U.S., Alaska, Hawaii or Puerto Rico and are instructed to return goods to the USA, you may do one of the following:

If the goods are to be sent by a COURIER SERVICE, send the goods to:

Pelco
3500 Pelco Way
Clovis, CA 93612-5699 USA

If the goods are to be sent by a FREIGHT FORWARDER, send the goods to:

Pelco c/o Expeditors
473 Eccles Avenue
South San Francisco, CA 94080 USA
Phone: 650-737-1700
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