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Protocol Manual, Coaxitron Family March 26, 1997



PROTOCOL MANUAL FOR

COAXITRON

EXTENDED COAXITRON

32 BIT COAXITRON

“D” (DIGITAL COAXITRON)

March 26, 1997

6 8
Word 7..... 8

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LEGAL NOTICES

NOTICE OF DISCLAIMER

Pelco makes no claims, expressed or implied, regarding the usefulness of this protocol, its implementation, or its correctness. Any use of this protocol is the sole responsibility of the agency implementing the protocol. The contents of this document and the function of the protocol are subject to change without notice.

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The contents of this document are considered to be the property of Pelco. Users of this protocol agree to use the protocol only in the interests of Pelco. Any use of this protocol to Pelco's detriment is prohibited.

Those receiving this protocol cannot redistribute the protocol without the expressed written consent of Pelco.

QUESTIONS

Questions regarding this protocol, its implementation, use, and distribution should be addressed to:

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WHAT THIS MANUAL COVERS

This manual covers the two versions of the Coaxitron (see below) protocol and a 422/485 version of the protocol. The two versions of Coaxitron are divided up between the 15 bit (fixed speed only) version and the 32 bit (variable speed) version. The 422/485 version adds some framing for transmission over an asynchronous medium and is explained in the section marked "Digital Coaxitron".

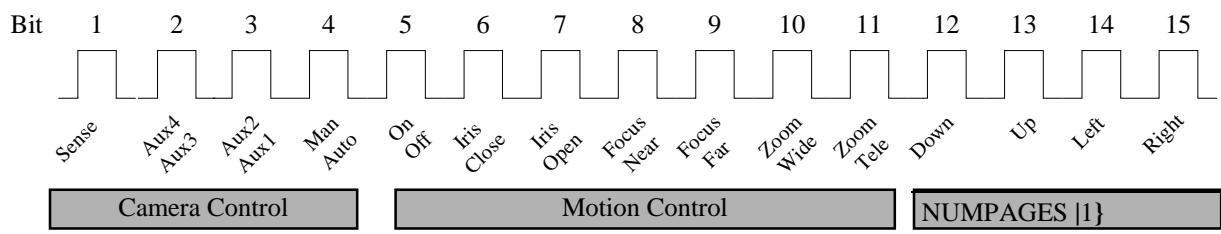
This manual covers the protocols used to speak to Coaxitron series equipment and with Pelco's "D" version receivers.

Coaxitron is Pelco's name for a method of sending control signaling from a controller to a pan and tilt, receiver driver, or camera and lens on the video signal (also known as "up the coax" or "UTC錯誤! 找不到參照來源。"). This document will present the protocol from a historical perspective because the current state of the protocol is most easily understood from an evolutionary viewpoint.

ORIGINS (15 BIT COAXITRON)

Coaxitron is a pulse width modulated (PWM) signal that is inserted into the unused video lines (the vertical blanking interval). A 2µs pulse represents a one (1) and a 1 µs pulse represents a zero (0).

Coaxitron originated as a fifteen (15) bit protocol to control basic functions of a remote device. The data is transmitted during line eighteen (18) of the vertical blanking interval of a video signal. The transmitted bits of one Coaxitron field are:



The "sense" bit determines the functions of the next three bits in the message. If the sense bit is on, then the next three bits reflect the state of Aux4, Aux2, and the manual scan mode. If the sense bit is off, the next three bits reflect the state of Aux3, Aux1, and the auto scan mode.

You can, for example, control the state of the autoscan by setting (turn it on) or clearing (turn it off) bit 4 with the sense bit off. If the sense bit is off and bit 4 is on, autoscan is enabled. If the sense bit is off and bit 4 is off, autoscan is disabled.

With this protocol, it's easy to see that we can send multiple control actions in the same message. That is, for example, you can move left and up at the same time you're opening the iris and zooming in.

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FIRST EXPANSION (EXTENDED 15 BIT COAXITRON)

Following this implementation, a feature was added that allowed the remote device to remember a position. This position is called a preset and contains information regarding the pan, tilt, zoom, focus, and iris positions. Since this information is stored (remembered) by the remote device, the protocol had to be expanded to allow the user to tell the remote to: remember a position, recall a position, recall a series of positions (preset scan), and clear a remembered position.

To do this, a series of Coaxitron fields were transmitted and the information about the preset and the command were transmitted serially within the Coaxitron field. The bits used for this were Man/Auto (or scan bit) and the Aux4/Aux3 bit.

The scan bit is used to “clock” the information through the system. The bit is set high to indicate a field where the data bit (the Aux bit) is valid, and is set low in the next field to provide framing. This bit will alternate between high (read) and low (clear) for each field of 24 video fields allowing the transmission of 12 bits of data (every other field).

The Aux4/Aux3 bit is used to transmit the command (4 bits) and the data (8 bits) as follows:

	Command				Data							
Bits	1	2	3	4	5	6	7	8	9	10	11	12

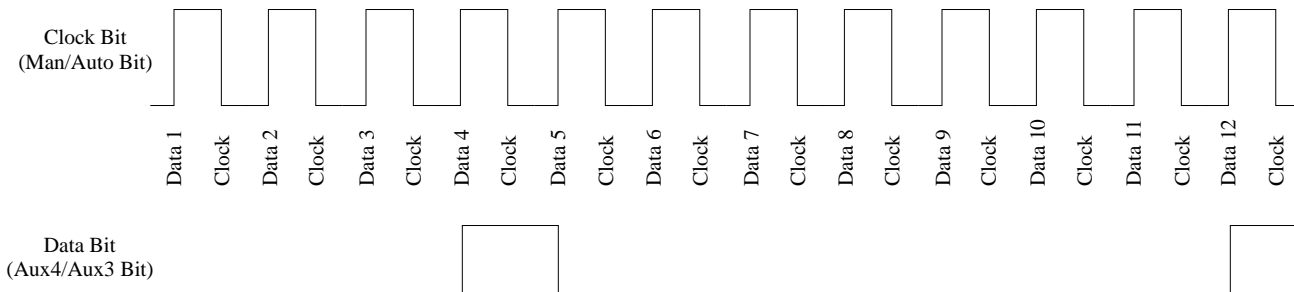
The meaning of the command bits are:

Command	Meaning	Data Represents
0000	Set Preset	Preset Number
0001	Go To Preset	Preset Number
0010	Preset Scan	Dwell Time
0011	Preset Clear	

So, for example, the command to set preset 1 would consist of 12, 0 bits. It will take 24 video fields to send the command with valid command and data bits being present during every other video field (when the clock bit (AKA scan bit) is high).

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The following diagram shows the timing of a message to go to preset 2. Please note that, while the diagram shows data in the Aux4/Aux3 bit at all times, valid data is not guaranteed to be present when the clock bit (scan bit) is low.



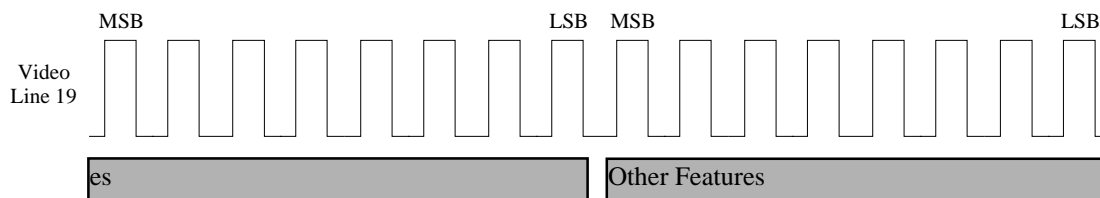
In this example, data bits 4 and 12 are “on”. This gives us the pattern for the go to preset 2 command, 000100000001.

Note that the data bit is held high through the clock cycle. Technically this should not be necessary but this process should be followed to ensure compatibility with future revisions of the Coaxitron product line.

In addition to the stream shown above, a preamble is sent to ensure the correct state of the video, and receiver. The preamble consists of two stop commands sent back to back (\$0000, \$0000). This helps to ensure that the video signal is on and that the receiver is in condition to receive the command.

SECOND EXPANSION (32 BIT COAXITRON)

A second expansion of Coaxitron abilities took place with the introduction of variable speed receiver/drivers. The protocol had to be expanded to include speed information in a real time environment. To do this, an extra data line was added. Line 19 of the video holds speed information (line 18 is implemented as shown in the 15 bit format shown above).



The speed settings are in the range \$00 to \$3F and \$FF for turbo (high speed) operation.

An extended command set was established that uses more of the protocol’s capabilities. For the purposes of this documentation, the Coaxitron signal can be divided up into four, eight-bit bytes. These bytes are frequently referred to as bytes 3 through 6 (see “Digital Coaxitron” below).

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EXTENDED COMMAND SET

In addition to “real” Coaxitron, there is a digital version of the protocol that is used with systems supporting a separately wired data channel. This protocol is seven bytes long and is constructed as follows:

Cmd 1	Cmd 2	Data 1	Data 2
-------	-------	--------	--------

The extended command set to support presets and auxiliaries includes the following commands:

Cmd 1 is not used and must be \$00.

Cmd 2 is:

Command	Bits								Hex
	7	6	5	4	3	2	1	0	
Set Preset	0	0	0	0	0	0	1	1	\$03
Go To Preset	0	0	0	0	0	1	1	1	\$07
Set Aux	0	0	0	0	1	0	0	1	\$09
Clear Aux	0	0	0	0	1	0	1	1	\$0B
Program Aux	0	0	0	0	1	1	0	1	\$0D

Data 1 is not used and must be \$00.

Data 2 contains either the preset number (1-32) or the auxiliary number (1-8).

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DIGITAL COAXITRON

An extension that allows us to use the same basic protocol contents over a normal asynchronous port (232, 422, 485) is available and is commonly called the “D” protocol.

The “D” protocol has some added overhead to improve the reliability of transmissions. The format for a message is:

Word 1	Word 2	Word 3	Word 4	Word 5	Word 6	Word 7
Synch Byte	Address	Command 1	Command 2	Data 1	Data 2	Check Sum

All values below are shown in hexadecimal (base 16).

The synchronization byte is always \$FF.

The address is the logical address of the receiver/driver being controlled.

Command 1 and 2 are as follows:
are as follows:

	Bit 7	Bit 6	Bit 5	Bit 4	Bit 3	Bit 2	Bit 1	Bit 0
Command 1	Sense	Reserved	Reserved	Auto / Manual Scan	Camera On / Off	Iris Close	Iris Open	Focus Near
Command 2	Focus Far	Zoom Wide	Zoom Tele	Down	Up	Left	Right	Always 0

The sense bit (command 1 bit 7) indicates the meaning of bits 4 and 3. If the sense bit is on and bits 4 and 3 are on the command will enable autoscan and turn the camera on. If the sense bit is off and bits 4 and 3 are on the command will enable manual scan and turn the camera off. Of course, if either bit 4 or bit 3 are off then no action will be taken for those features.

The reserved bits (6 and 5) should be set to 0.

Word 5 contains the pan speed. Pan speed is in the range \$00 (stop) to \$3F (high speed) and \$FF for “turbo” speed. Turbo speed is the maximum speed the device can obtain and is considered separately because it is not generally a smooth step from high speed to turbo. That is, going from one speed to the next usually looks smooth and will provide for smooth motion with the exception of going into and out of turbo speed.

Word 6 contains the tilt speed. Tilt speed is in the range \$00 (stop) to \$3F (maximum speed).

Word 7 is the check sum. The check sum is the sum of bytes (excluding the synchronization byte) modulo 256.

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In addition to the "PTZ" commands shown above, there are control commands that allow you access to the more advanced features of some equipment.

The response to one of these commands is four bytes long. The first byte is the synchronization character (FF), the second byte is the receiver address, the third byte contains the alarm information and the fourth byte is the check sum.

Command	Word 3	Word 4	Word 5	Word 6
Set Preset	00	03	00	01 to 20
Clear Preset	00	05	00	01 to 20
Go To Preset	00	07	00	01 to 20
Flip (180° about)	00	07	00	21
Go To Zero Pan	00	07	00	22
Set Auxiliary	00	09	00	01 to 08
Clear Auxiliary	00	0B	00	01 to 08
Remote Reset	00	0F	00	00
Set Zone Start	00	11	00	01 to 08
Set Zone End	00	13	00	01 to 08
Write Char. To Screen	00	15	X Position 00 to 28	ASCII Value
Clear Screen	00	17	00	00
Alarm Acknowledge	00	19	00	Alarm No.
Zone Scan On	00	1B	00	00
Zone Scan Off	00	1D	00	00
Set Pattern Start	00	1F	00	00
Set Pattern Stop	00	21	00	00
Run Pattern	00	23	00	00
Set Zoom Speed	00	25	00	00 to 03
Set Focus Speed	00	27	00	00 to 03

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Example messages (all message values are in hexadecimal):

Message to send	Message
Receiver 1, Camera on	FF, 01, 88, 00, 00, 00, 89
Receiver 1, Camera off	FF, 01, 08, 00, 00, 00, 09
Receiver 2, Left 1/2 speed	FF, 02, 00, 04, 00, 20, 26
Receiver 2, Stop	FF, 02, 00, 00, 00, 00, 02
Receiver 10, Camera on, Focus far, Left, turbo speed	FF, 0A, 88, 90, 00, 40, 62

Note: the check sum calculation for the last message looks like this:

```

0A      00001010
88      10001000
Subtotal 10010010  92
90      10010000
Subtotal 00100010  22  (modulo 256 allows the high bit to roll off)
00      00000000
Subtotal 00100010  22
40      01000000
        01100010  62  Final check sum value

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