Miscellaneous information about the Sensormatic RS422 Translator

Hardware Information

22 March 2002

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[1] `$Header: d:/sears/RCS/txbshard.tex,v 1.6 2002-01-21 16:00:23-08 Hamilton Exp Hamilton $`

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Note

A change bar will be used where any changes have been made since the last version of this set of miscellaneous information was printed.

As is common, those pages with changed page numbers and references to those numbers, (this includes the Table of Contents and the Index) do not qualify for a change bar. Neither will there be a change bar on this page.

A summary of the changes will also be listed here.

Date	Notes
None	

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1 AD1996R Information

The AD1996R is a one rack unit high CPU unit used to control various American Dynamics pieces of equipment. The actual CPU part is similar to the one normally located in the AD2050 matrix. However the software is different and it has a limited set of capabilities.

1.1 Communications Protocol

The AD1996R[3] receives command data from an AD2078, or similar, keyboard. The commands generated by the keyboard are similar to those used in Pelco's ASCII protocol. One of the biggest areas of difference is that in Pelco' ASCII protocol, all commands end with a lower case "`a`", while in the American Dynamics version the trailing character identifies the keyboard number per port. Each port may have up to four keyboards "port expanded" into it and the AD1996R has ten keyboard ports. Thus a trailing suffix of "`a`" may indicate keyboard #1, 5, 9, 13, 17, 21, 25, 29, 33 or 37. (Note that each keyboard ID is four greater than the proceeding keyboard ID.)

Quoting from page A-10 of the AD1996 manual:

"*The ten 1996R CPU control ports use asynchronous, full duplex, RS-232 protocol. As shipped, all ports are set for operation at 1200 baud with 8 data bits, 1 stop bit, and no parity. The 1996R ports are programmed for type of use, baud rate, and communication parameters, via the on-screen Ports Menu (page 4-20). For computer control of the 1996R, the port must be set for "KEYBOARD" Port Use via this menu.*

ASCII code is used for all system control commands to these ports. The ASCII codes used to control the 1996R are printable ASCII characters; these are shown in the table to the right [following in this version, ed]. Lower case ASCII letters `a` *through* `d` *are used as command terminators; these are shown in the table to the lower right [first table following in this version, ed]. The terminator codes identify the source of the command; that is, which keyboard is connected to a 1981 Port Expander (four keyboards may be connected via a Port Expander).*

The software XON/XOFF handshake codes. Control Q (DC1 or HEX 11) and Control S (DC3 or HEX 13), are supported. Other ASCII control codes such as LF (HEX 0A) are ignored.

To request 2050 Switching System actions from a computer, the computer must send the same characters that would be sent from a keyboard for the desired actions. For example:

> *To call camera 25 to the current monitor, send the following command sequence: 25, Camera, Terminator*
>
> *(ASCII codes:* `25#a`*) or (HEX codes:* `32 35 23 61`*).*
>
> *To call preset scene 3 from that camera, send the following command sequence: 3, Call Shot, Terminator*
>
> *(ASCII codes:* `3\a`*) or (HEX codes:* `33 5C 61`*).*

[2] `$Header: d:/sears/RCS/ad1996r.inc,v 1.6 2001-11-28 11:50:38-08 Hamilton Exp Hamilton $`

[3] This information has been extracted from the American Dynamics Installation and Operating Instructions for the Model 1996R, MegaPower II, Central Processing Unit, 1997. Publication number 8000-1788-01 Rev A, July, 1999.

To request continuous system actions, such as pan, tilt, zoom, or focus, repeat the command codes for that action, followed by a terminator, for as long as the action is desired. The command code sequence should be repeated approximately 15 times per second. For example:

> *To pan the camera to the right, repeat the following control commands, 15 times per second, until the desired camera position is reached: "Pan Right, "Pan Right", etc.*
>
> *(ASCII codes:* `R a R a` *etc.) or*
>
> *(HEX codes:* `52 61 52 61` *etc.)*
>
> *To focus the lens on a closer object, repeat the following control commands, 15 times per second, until the desired focal length is attained: "Focus Near", Focus Near", etc.*
>
> *(ASCII codes:* `N a N a` *etc.) or*
>
> *(HEX codes:* `4E 61 4E 61` *etc.)*

1996R setup programming commands are not provided via these codes. The optional software package 2050SW13 is available for external setup programming from a PC.

Contact American Dynamics Applications Department for a more detailed Applications note on ASCII remote control."

Command Terminators	
a	Keyboard 1
b	Keyboard 2
c	Keyboard 3
d	Keyboard 4

Table 1. Keyboard Terminating Bytes

By name		By command	
Command Name	Code	Command Name	Code
Ack	_	Zero	0
Alarm new	E	One	1
Alarm old	G	Two	2
Alarm clear	I	Three	3
Aux on	A	Four	4
Aux off	B	Five	5
Call shot	\	Six	6
Camera	#	Seven	7

Continued on the next page.

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By name		By command	
Command Name	Code	Command Name	Code
Camera arm	(	Eight	8
Camera hold	H	Nine	9
Camera disarm	)	Aux on	A
Focus far	F	Aux off	B
Focus near	N	Iris close	C
Iris close	C	Tilt down	D
Iris open	O	Alarm new	E
Lens tele	T	Focus far	F
Lens wide	W	Alarm old	G
Lockout camera	K	Camera hold	H
Monitor	M	Alarm clear	I
Monitor arm	[	No lockout	J
Monitor disarm	]	Lockout camera	K
Next camera	+	Pan left	L
No lockout	J	Monitor	M
Pan left	L	Focus near	N
Pan right	R	Iris open	O
Program	P	Program	P
Run seq	S	Pan right	R
Salvo	$	Run seq	S
Set shot	^	Lens tele	T
Tilt down	D	Tilt up	U
Tilt up	U	Lens wide	W
Zero	0	Next camera	+
One	1	Call shot	\
Two	2	Camera arm	(
Three	3	Camera disarm	)
Four	4	Monitor arm	[
Five	5	Monitor disarm	]
Six	6	Camera	#
Seven	7	Salvo	$
Eight	8	Set shot	^
Nine	9	Ack	_
F1	%	F1	%
F2	`	F2	`

Continued on the next page.

Continued from the previous page.			
By name		By command	
Command Name	Code	Command Name	Code

1.2 Interfacing to an AD1996R

Interfacing to an AD1996R may be done using RS232 voltage levels at 1200 baud, 8 data bits, 1 stop bit and no parity. The communications characters are described in the preceding section. In this section we will discuss pin assignments for the RJ45 connector on the rear of the AD1996R.

If a cable is made as per the table in Section 1.2.1, page 11, then a "straight" RS232 cable may be used to directly connect an AD1995R to a PC. When the AD1996R is connected this way, commands may be sent to it by using HyperTerminal and selecting the `Send Text File` option under the `Transfer` menu item. The configuration information used was:

```
Connect using:    Direct to Com1
Bits per second:  1200
Data bits:        8
Parity:           None
Stop bits:        1
Flow control:     None
```

Table 2. HyperTerminal Configuration

The format of the file to send **must** start out with a command to select a monitor and then a command to select a camera. If these selections are not made the AD1996R will ignore all following commands. This is a command string to send these two commands, it should be noted that carriage return, or any other line terminator is not needed. "`1Ma1#a`" (This selects Monitor 1, Camera 1).

A typical command to pan the camera to the right, stop and then tilt it up and down would consist of:

`6Ra6Ra6Ra6Ra6Ra6Ra3Ua3Ua3Ua3Ua3Ua3Da3Da3Da3Da`

It should be noted that to keep the camera moving, a command must be repeated as long as the camera should be moving. Thus for a long move to the right, would require a whole bunch of "`6Ra`"'s. Note that the number in front of the movement commands, tells the AD1996R how fast to move the camera. `0` is the slowest and `7`, or nothing (remember that a blank is not the same as a nothing), is the fastest speed. Only a single numeric digit is allowed. (For an idea of the various speed available, see the "Sensormatic Protocols" document.)

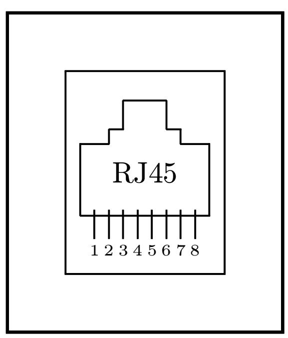
1.2.1 Model 2083/02, Code Translator RS232 pinouts

It is unclear, but this may be a "universal" pinout for American Dynamics type RJ45 connectors.

RJ45 pins 1 and 8 are reserved for power to an AD2078 keyboard. NC indicates "No Connection".

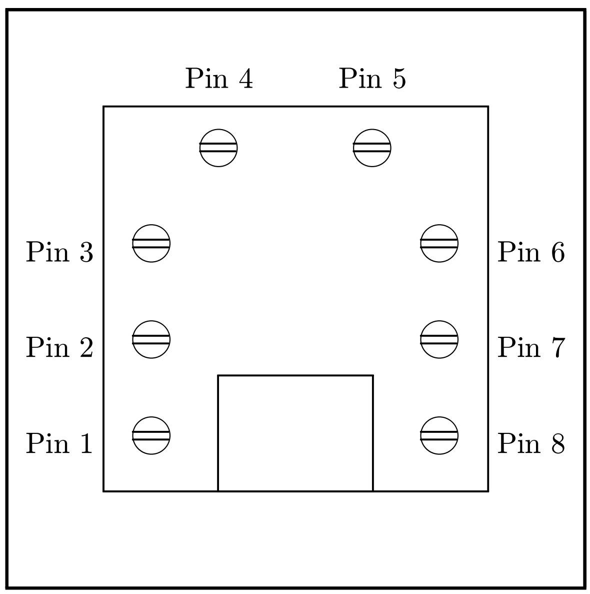
RJ45 Pin	Color	Use		
		RS232	RS422	DB9
1	WH	NC	NC	—
2	BR	Shield	Shield	5
3	YE	NC	T-	—
4	GR	Receive Data	R+	2
5	RE	Transmit Data	T+	3
6	BK	NC	R-	—
7	OR	Ground	Ground	1
8	BL	NC	NC	—

Table 3. Pinout for American Dynamics type RJ45 connectors.



$RCSfile: ad1996r.inc,v $

Figure 1. Female RJ45 connector



$RCSfile: ad1996r.inc,v $

Figure 2. RJ45 Terminal block

2 AD2150D16-5 Information

The AD2150D16-5 is a two high rack unit used to control/switch various American Dynamics pieces of equipment. The IO interfaces are similar to the AD1995R with the additional advantage of being able to switch 16 camera inputs to any of 5 monitors and it is able to generate Manchester code dome control information directly. It also has a built in ability for fixed speed control of domes and will accept variable speed commands from an AD2078 keyboard.

Most of this section is extracted from the documentation for the AD1996R CPU and should be close. The interconnect information comes from what "the line" uses when testing TXB-AB/-TXB-AD translators.

2.1 Communications Protocol

The AD1996R[5] receives command data from an AD2078, or similar, keyboard. The commands generated by the keyboard are similar to those used in Pelco's ASCII protocol. One of the biggest areas of difference is that in Pelco' ASCII protocol, all commands end with a lower case "`a`", while in the American Dynamics version the trailing character identifies the keyboard number per port. Each port may have up to four keyboards "port expanded" into it and the AD1996R/AD2150[6] has ten keyboard ports. Thus a trailing suffix of "`a`" may indicate keyboard #1, 5, 9, 13, 17, 21, 25, 29, 33 or 37. (Note that each keyboard ID is four greater than the proceeding keyboard ID.)

Quoting from page A-10 of the AD1996 manual:

"The ten 1996R CPU control ports use asynchronous, full duplex, RS-232 protocol. As shipped, all ports are set for operation at 1200 baud with 8 data bits, 1 stop bit, and no parity. The 1996R ports are programmed for type of use, baud rate, and communication parameters, via the on-screen Ports Menu (page 4-20). For computer control of the 1996R/AD2150, the port must be set for "KEYBOARD" Port Use via this menu.

ASCII code is used for all system control commands to these ports. The ASCII codes used to control the 1996R/AD2150 are printable ASCII characters; these are shown in the table to the right [following in this version, ed]. Lower case ASCII letters `a` *through* `d` *are used as command terminators; these are shown in the table to the lower right [first table following in this version, ed]. The terminator codes identify the source of the command; that is, which keyboard is connected to a 1981 Port Expander (four keyboards may be connected via a Port Expander).*

The software XON/XOFF handshake codes. Control Q (DC1 or HEX 11) and Control S (DC3 or HEX 13), are supported. Other ASCII control codes such as LF (HEX 0A) are ignored.

To request 2050 Switching System actions from a computer, the computer must send the same characters that would be sent from a keyboard for the desired actions. For example:

> *To call camera 25 to the current monitor, send the following command sequence: 25, Camera, Terminator*

[4] `$Header: d:/sears/RCS/ad2150.inc,v 1.5 2001-12-12 15:04:36-08 Hamilton Exp Hamilton $`

[5] This information has been extracted from the American Dynamics Installation and Operating Instructions for the Model 1996R, MegaPower II, Central Processing Unit, 1997. Publication number 8000-1788-01 Rev A, July, 1999.

[6] The AD2150 has only three keyboard ports.

(ASCII codes: `25#a`*) or (HEX codes:* `32 35 23 61`*).*

To call preset scene 3 from that camera, send the following command sequence: 3, Call Shot, Terminator

(ASCII codes: `3\a`*) or (HEX codes:* `33 5C 61`*).*

To request continuous system actions, such as pan, tilt, zoom, or focus, repeat the command codes for that action, followed by a terminator, for as long as the action is desired. The command code sequence should be repeated approximately 15 times per second. For example:

To pan the camera to the right, repeat the following control commands, 15 times per second, until the desired camera position is reached: "Pan Right, "Pan Right", etc.

(ASCII codes: `R a R a` *etc.) or*

(HEX codes: `52 61 52 61` *etc.)*

To focus the lens on a closer object, repeat the following control commands, 15 times per second, until the desired focal length is attained: "Focus Near", Focus Near", etc.

(ASCII codes: `N a N a` *etc.) or*

(HEX codes: `4E 61 4E 61` *etc.)*

1996R/AD2150 setup programming commands are not provided via these codes.

Contact American Dynamics Applications Department for a more detailed Applications note on ASCII remote control."

Command Terminators	
a	Keyboard 1
b	Keyboard 2
c	Keyboard 3
d	Keyboard 4 (Note that the 2150 only has three inputs.)

Table 4. Keyboard Terminating Bytes

By name		By command	
Command Name	Code	Command Name	Code
Ack	_	Zero	0
Alarm new	E	One	1
Alarm old	G	Two	2

Continued on the next page.

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By name		By command	
Command Name	Code	Command Name	Code
Alarm clear	I	Three	3
Aux on	A	Four	4
Aux off	B	Five	5
Call shot	\	Six	6
Camera	#	Seven	7
Camera arm	(	Eight	8
Camera hold	H	Nine	9
Camera disarm	)	Aux on	A
Focus far	F	Aux off	B
Focus near	N	Iris close	C
Iris close	C	Tilt down	D
Iris open	O	Alarm new	E
Lens tele	T	Focus far	F
Lens wide	W	Alarm old	G
Lockout camera	K	Camera hold	H
Monitor	M	Alarm clear	I
Monitor arm	[	No lockout	J
Monitor disarm	]	Lockout camera	K
Next camera	+	Pan left	L
No lockout	J	Monitor	M
Pan left	L	Focus near	N
Pan right	R	Iris open	O
Program	P	Program	P
Run seq	S	Pan right	R
Salvo	$	Run seq	S
Set shot	^	Lens tele	T
Tilt down	D	Tilt up	U
Tilt up	U	Lens wide	W
Zero	0	Next camera	+
One	1	Call shot	\
Two	2	Camera arm	(
Three	3	Camera disarm	)
Four	4	Monitor arm	[
Five	5	Monitor disarm	]
Six	6	Camera	#

Continued on the next page.

Continued from the previous page.			
By name		By command	
Command Name	Code	Command Name	Code
Seven	7	Salvo	$
Eight	8	Set shot	^
Nine	9	Ack	_
F1	%	F1	%
F2	`	F2	`

2.2 Interfacing to an AD1996R

Keyboard interfacing to an AD1996R (and probably to the AD2150) may be done using RS232 voltage levels at 1200 baud, 8 data bits, 1 stop bit and no parity. The communications characters are described in the preceding section. In this section we will discuss pin assignments for the RJ45 connector on the rear of the AD1996R/AD2150.

If a cable is made as per the table in Section 2.2.1, page 17, then a "straight" RS232 cable may be used to directly connect an AD1995R/AD2150 to a PC. When the AD1996R/AD2150 is connected this way, commands may be sent to it by using HyperTerminal and selecting the `Send Text File` option under the `Transfer` menu item. The configuration information used was:

```
Connect using:    Direct to Com1
Bits per second:  1200
Data bits:        8
Parity:           None
Stop bits:        1
Flow control:     None
```

Table 5. HyperTerminal Configuration

The format of the file to send **must** start out with a command to select a monitor and then a command to select a camera. If these selections are not made the AD1996R/AD2150 will ignore all following commands. This is a command string to send these two commands, it should be noted that carriage return, or any other line terminator is not needed. "`1Ma1#a`" (This selects Monitor 1, Camera 1).

A typical command to pan the camera to the right, stop and then tilt it up and down would consist of:

`6Ra6Ra6Ra6Ra6Ra6Ra3Ua3Ua3Ua3Ua3Ua3Da3Da3Da3Da`

It should be noted that to keep the camera moving, a command must be repeated as long as the camera should be moving. Thus for a long move to the right, would require a whole bunch of "`6Ra`"'s. Note that the number in front of the movement commands, tells the AD1996R/AD2150 how fast to move the camera. `0` is the slowest and `7`, or nothing (remember that a blank is not the same as a nothing), is the fastest speed. Only a single numeric digit is allowed. (For an idea of the various speed available, see the "Sensormatic Protocols" document.)

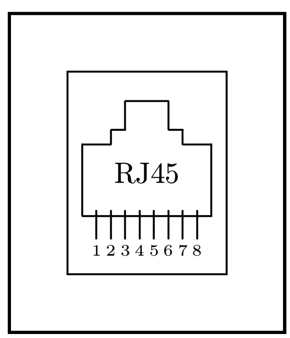
2.2.1 Model 2083/02, Code Translator RS232 pinouts

It is unclear, but this may be a "universal" pinout for American Dynamics type RJ45 connectors.

RJ45	Color	Use		
Pin		RS232	RS422	DB9
1	WH	NC	NC	—
2	BR	Shield	Shield	5
3	YE	NC	T-	—
4	GR	Receive Data	R+	2
5	RE	Transmit Data	T+	3
6	BK	NC	R-	—
7	OR	Ground	Ground	1
8	BL	NC	NC	—

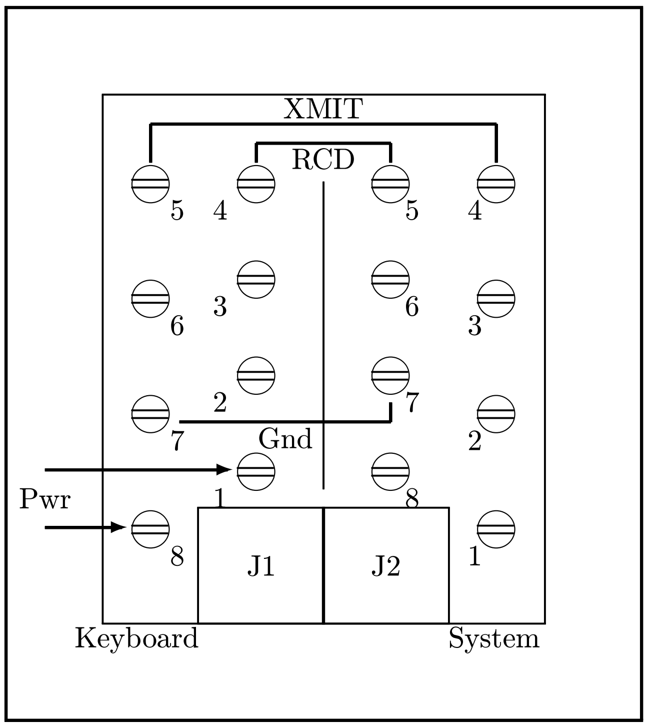
Table 6. Pinout for American Dynamics type RJ45 connectors.

RJ45 pins 1 and 8 are reserved for power to an AD2078 keyboard. NC indicates "No Connection".



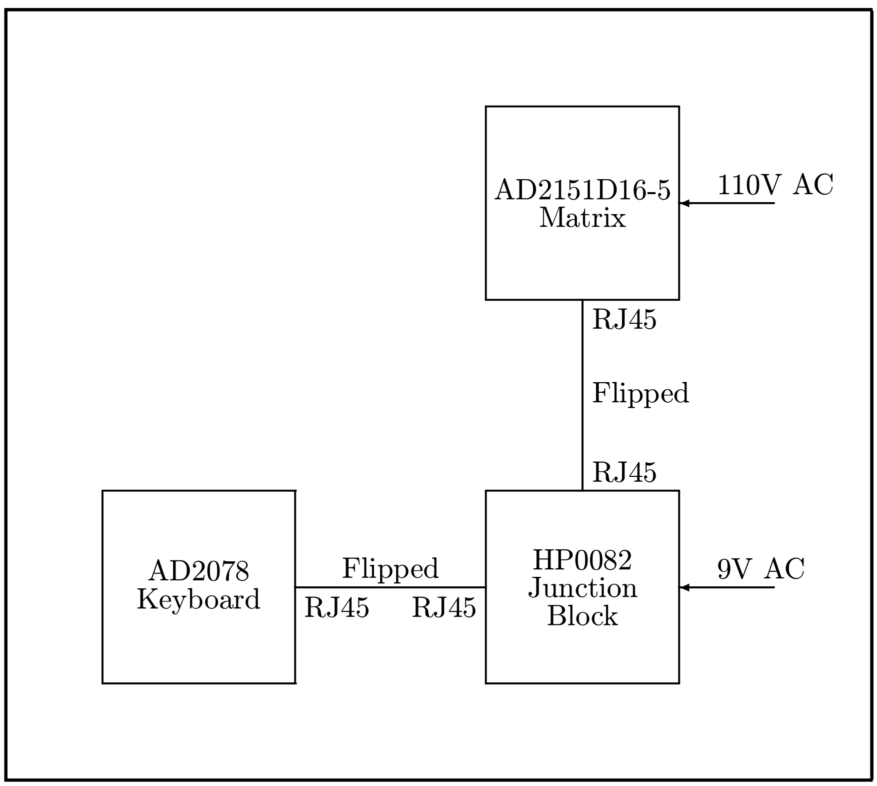
$RCSfile: ad2150.inc,v $

Figure 3. Female RJ45 connector



$RCSfile: ad2150.inc,v $

Figure 4. RJ45 Terminal block HP0082



$RCSfile: ad2150.inc,v $

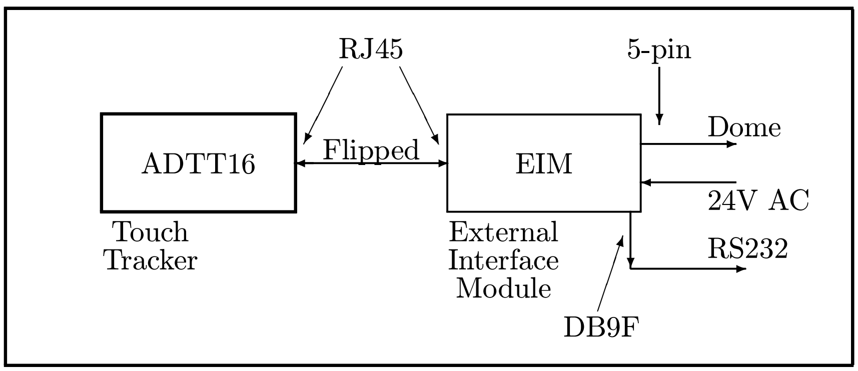
Figure 5. Connecting an AD2078 keyboard to an AD2151 matrix

3 American Dynamics, ADTT16 TouchTracker

There are a total of, at least, three similar versions of the TouchTracker series of keyboards. The ADTT16 (Figure 7, page 22) appears to be a stand alone unit. The ADTTE (Figure 8, page 23) appears to be used with the AD168 matrix/controler, and the unnamed version (Figure 29, page 75) is used with the VM96 matrix/controller.

The name for the ADTT16 type of keyboard may be derived from: **A**merican **D**ynamics **T**ouch **T**racker **16**. This unit appears to be a stand alone keyboard similar to a Pelco KBD300. (Although it does have additional capabilities.)

The name for the ADTTE type of keyboard may be derived from: **A**merican **D**ynamics **T**ouch **T**racker **E**nhanced. This unit appears to be a keyboard similar to a Pelco KBD4000. (Although it does have additional capabilities.)



$RCSfile: adtt16.inc,v $

Figure 6. Connecting an ADTT16 to a dome

J1	Use
2	Transmit Data
5	Ground

Table 7. RS232 connections to an EIM

[7] $Header: d:/sears/RCS/adtt16.inc,v 1.5 2002-02-28 12:57:15-08 Hamilton Exp Hamilton $

[8] $Header: d:/sears/RCS/adtt16l.inc,v 1.2 2002-02-13 07:53:49-08 Hamilton Exp Hamilton $

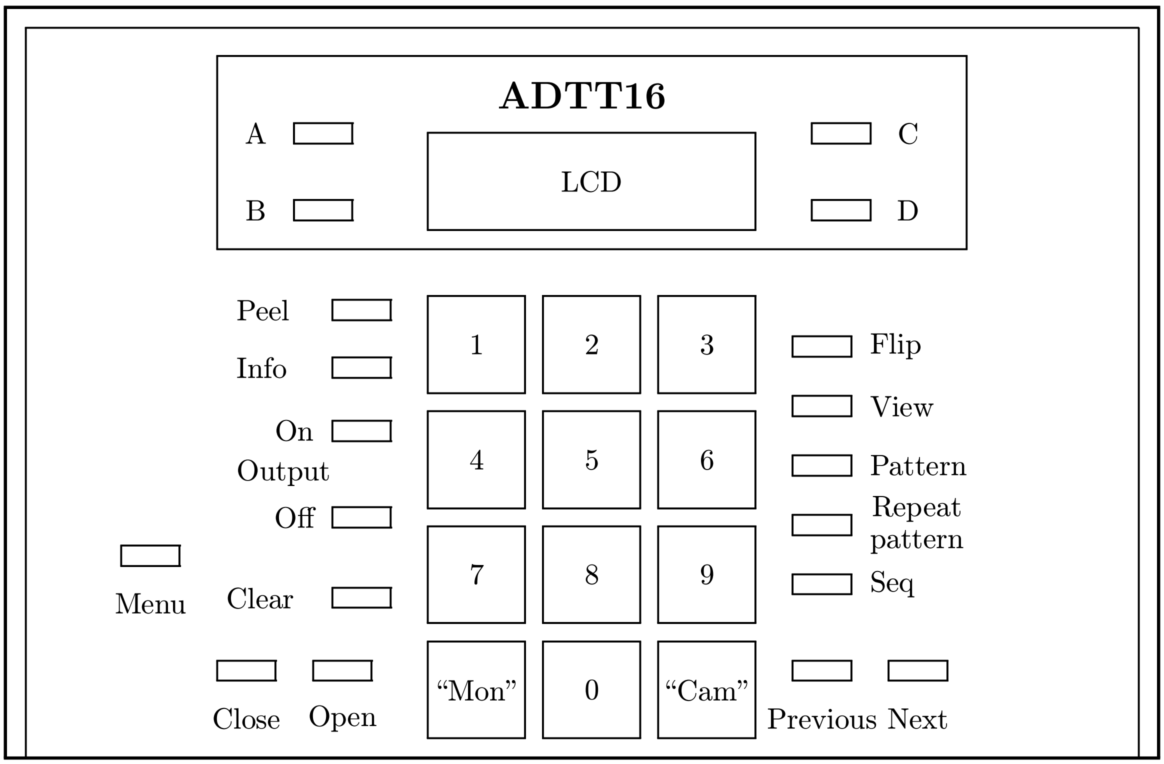
[9] $Header: d:/sears/RCS/adtte.inc,v 1.2 2002-02-13 07:53:49-08 Hamilton Exp Hamilton $

J3	Use
1	SensorNet A
2	24V AC in
3	Ground
4	24V AC in
5	SensorNet B

Table 8. SensorNet and power connections to an EIM

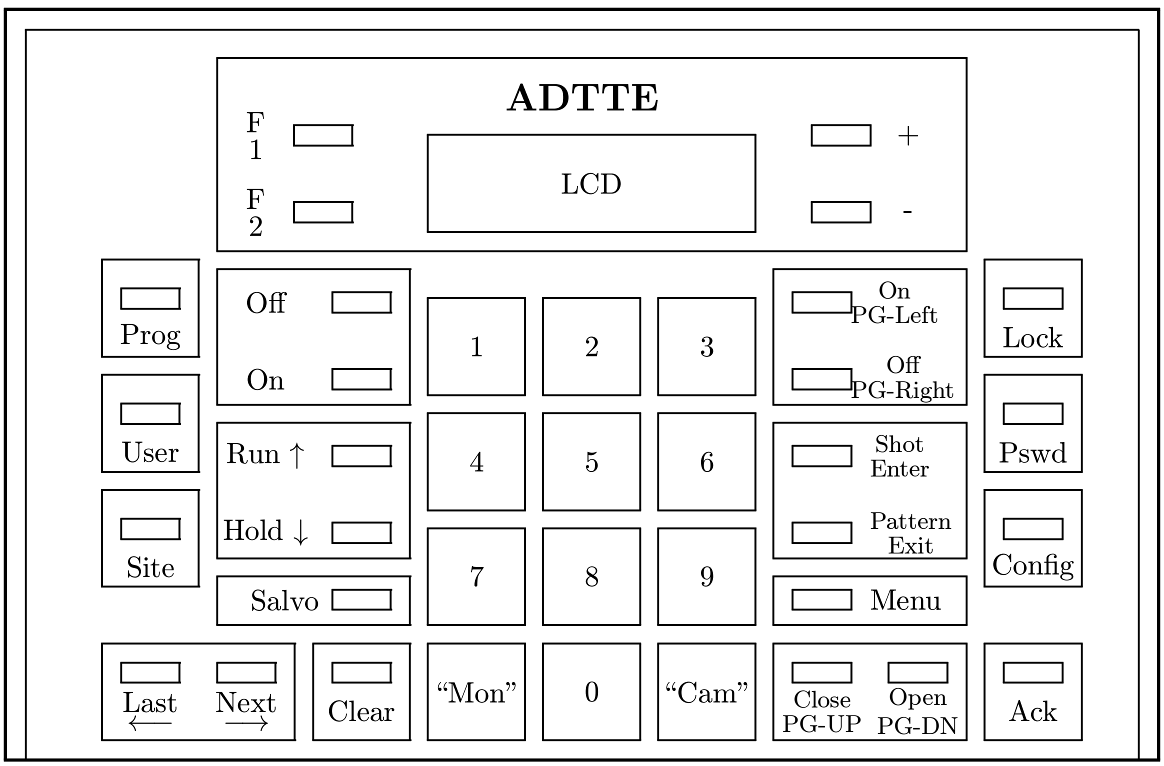
SpeedDome			DeltaDome		
P3	1	SensorNet A	P7	1	24V AC power
P3	2	SensorNet B	P7	1	Ground
P3	3	24V AC power	P7	1	24V AC power
P3	4	Ground	P1	5	SensorNet A
P3	5	24V AC power	P1	6	SensorNet B
E2	1-2	SNET	Auto sense		
E3	1-2	SNET	Auto sense		

Table 9: Connecting SensorNet and power to a UniCard equiped SpeedDome connector and an UltraDome/DeltaDome



$RCSfile: adtt16l.inc,v $

Figure 7. ADTT16 type TouchTracker layout



$RCSfile: adtte.inc,v $

Figure 8. ADTTE layout

4 Cable Connections

Various cable connections for use with the AD/Sensormatic system. Every time I look at an AD/Sensormatic system another set of connections turns up. To date I have discovered the following:

4.1 RS422 wiring

Protocol	Unknown, might be described in 8000-2694-01
Baud rate	4800
Character length	8
Parity	None
Start bits	One
Stop bits	One
Data Format	NRZ
Directional	Two way, either end may originate a message.
Daisy Chaining	Yes, limit 10? items.

Table 10. Protocol Format

RS422		
Pin	Color	Function
1	Brown	Data Out - (Lo)
2	Yellow	Data Out + (Hi)
3	Black	AC in
4	Red	Ground
5	White	AC in
6	Green	Data In - (Lo)
7	Orange	Data In + (Hi)
From 8000-0817-01 Rev D		
Hi's and Lo's From 8000-1686-01 Rev A		

Table 11. RS422 Wiring

[10] `$Header: d:/sears/RCS/connect.inc,v 1.8 2002-01-02 11:47:57-08 Hamilton Exp Hamilton $`

```
Sensormatic Mini-Dome? Jones plug
  +---------+      +---------+
  |  |   |  |      |  8   7  |
  |  |   |  |      |  6   5  |
  | --- --- |      |  4   3  |
  | --- --- |      |  2   1  |
  +---------+      +---------+
 Pin Orientation    Pin numbers
 from rear of a female connector
 Whitcomm part number S-308-CCT-P
```

4.2 SensorNet wiring

Protocol	Unknown
Baud rate	Unknown
Character length	8?
Parity	Unknown
Start bits	One?
Stop bits	Unknown
Data Format	Unknown
Directional	One way, from head end only.
Daisy Chaining	Unknown, but probable

Table 12. Protocol Format

SensorNet		
Pin	Color	Function
1	Orange	Data -
2	Yellow	Data +
3	Black	AC in
4	Red	Ground
5	White	AC in
6	—	Not Used
7	—	Not Used
From 8000-0817-01 Rev D		

Table 13. SensorNet Wiring

4.3 AD2078 Keyboard

Protocol	Unknown
Baud rate	**1200**, 2400, 4800, 9600
RS232/RS422/RS485	Selected with internal DIP switch.
Character length	8?
Parity	Unknown
Start bits	One?
Stop bits	Unknown
Data Format	Unknown
Directional	Unknown
Daisy Chaining	Unknown
Defaults are in **bold.**	

Table 14. Protocol Format

AD2078 Keyboard RJ45	
Pin	Function
1	Transformer Power In
2	Shield/Ground
3	RS422 T-
4	RS232 RCD, RS422 R+
5	RS232 XMIT, RS422 T+
6	RS422 R-
7	Ground
8	Transformer Power In
From OP2078F, November, 1996	

Table 15. AD2078 Wiring

4.4 Monitoring communications in my office

AD2051 Matrix to UltraDome V				
AD2083/2	UltraDome V		PV130 #1	PV130 #2
T+	Orange	In +	Red, RD(B)	—
T-	Black-White	In -	Blue, RD(A)	—
R+	Yellow	Out +	—	Yellow, RD(B)
R-	Brown	Out -	—	Orange, RD(A)

Table 16. Office monitoring of data #1

AD2051 Matrix to SpeedDome					
AD2083/02	SpeedDome	Oscilloscope		PV130 #1	PV130 #2
T+	White-Brown	Light Blue	In +	Red, RD(B)	—
T-	Brown-White	Orange	In -	Blue, RD(A)	—
R+	Blue-White	Dark Blue	Out +	—	Yellow, RD(B)
R-	White-Blue	Brown	Out -	—	Orange, RD(A)

Table 17. Office monitoring of data #2

Wiring to old Sensormatic Dome					
Jones Pin	Color	Use	AD2083/02	PV130 #1	PV130 #2
1	Brown	Data Out -	R-	—	Orange, RD(A)
2	Yellow	Data Out +	R+	—	Yellow, RD(B)
3	Black-White	24 VAC power			
4	Blue	Pwr center tap (?)			
5	Black-White	24 VAC power			
6	Blue	Data In -	T-	Blue, RD(A)	—
7	Orange	Data In +	T+	Red, RD(B)	—

Table 18. Office monitoring of data #3

4.5 References

ID	Document
8000-0817-01 Rev D	Installation instructions included with dome #5.
8000-1686-01 Rev A	SpeedDome LT, Camera Dome, Installation and Service manual.
8000-2694-01 Rev O	RS422/RS485 Communications Protocols
OP2078F	Model AD2078, System Keyboard, Installation and Operating Instructions.

Table 19. References used

4.6 Connections used after 1AUG01

AD2083/02		SpeedDome	DB-9	Spectra	PV-130
1,7	T+	7	5	Rx+	Bl-RD(B)
2,8	Gnd				
3,9	T-	6	9	Rx-	Bl-RD(A)
4,10	R+	2	1	Tx+	Re-RD(B)
5,11	Gnd				
6,12	R-	1	6	Tx-	Re-RD(A)
—	Open	4	2,3,4, 7,8	—	
—	26VAC	3,5	—	—	

Table 20. Final office monitoring/wiring used

- A,- = Negative polarity
- B,+ = Positive polarity
- Bl = Blue
- Gnd = Shield ground
- R,Rx,RD = Receive Data
- Re = Red
- T,Tx = Transmit Data

5 Available types of Sensormatic domes

Currently on hand Sensormatic/American Dynamics domes consist of:

5.1 Sensormatic Dome #1

This is a working single circuit board type of color camera dome that does not display any configuration information on power up.

Manufacturer	Sensormatic
Model #	SpeedDome 2000 Outdoor
Reg M/N	SU SD
Part of	0100-0760-05
Rev.	A0
Serial #	1507495
Mfd.	4QTR95
Bar Code	*1507495*
Paper Label	RAS586LS
2^{nd} Paper Label	RAS586LS REV. C SC 04/28/99 T.33

Table 21. Identifying marks on Dome #1

It has three EPROMs:

U4	0701-0081 U4 VER 0.316
U8	0701-0077 U8 VER 03.12
U50	3133-0013-01 U50 VER 1.00

Table 22. EPROM information from Dome #1

Dome response to SSOFTWAREVERSION (0xC9):

```
0-06 0-C9 0-31
```

[11] $Header: d:/sears/RCS/dometype.inc,v 1.14 2001-12-12 14:08:06-08 Hamilton Exp Hamilton $

```
1-06 1-C9 1-06 1-07 1-01 1-00 1-81 1-03 1-16 1-89
```

Dome response to SGETDOMETYPE (`0x94`): `0xF8`

5.2 Sensormatic Dome #2

This is a semi-working (positioning works, camera displays vertical colored bars) double circuit board type of color camera dome. When powered up there is no display of configuration information.

Manufacturer	Sensormatic
Model #	RA486LP
Part #	01RA486LP
Rev.	D0
Serial #	555790
Mfd.	2QTR92
Bar Code	None

Table 23. Identifying marks on Dome #2

Data from the EPROM label:

```
0701-0006-0620
CHECKSUM 800E
U 10 S/W VER 6.2
```

Reading the EPROM chip with an EPROM reader, the following information was obtained:

```
Copyright Sensormatic Electronics Corporation - 1993
All rights Reserved
SpeedDome Designer Lawrence R. Mills
```

By peeling the label back some we found the following:

Chip Type:	NM27C512Q
Chip Speed:	200 ns
Chip date code:	G9336

Table 24. EPROM information from Dome #2

Or that the EPROM was probably made the 36th week (or August) of 1993.
Dome response to SSOFTWAREVERSION (0xC9):

```
0-06 0-C9 0-31
1-06 1-C9 1-06 1-07 1-01 1-00 1-06 1-06 1-20 1-F7
```

Dome response to SGETDOMETYPE (0x94): 0xE5

5.3 Sensormatic Dome #3

This is a non-functioning double circuit board type of ??? (color or B&W) camera dome.

Manufacturer	Sensormatic
Model #	RA485LP
Part of	0100-0197-01
Rev #	M0
Serial #	749172
Mfd	3QTR93
Bar Code	*749172*

Table 25. Identifying marks on Dome #3

Data from the EPROM label:

```
0701-0006-0610
CHECKSUM F8F0
U 10  S/W VER 6.1
```

When the chip was read on the EPROM reader it was found to say:

```
Copyright Sensormatic Electronics Corporation - 1993
All rights Reserved
SpeedDome Designer Lawrence R. Mills
```

Peeling the label back a little bit revealed the EPROM's date code was:

Chip Type:	NM27C512Q
Chip Speed:	200 ns
Chip date code:	B9324

Table 26. EPROM information from Dome #3

Or that the EPROM was probably made the 24th week (or June) of 1993.

5.4 Sensormatic Dome #4

This is a new model American Dynamics Ultra Dome type of color dome. When powered up it displays: "BOOT VER 0103 MAIN VER 0303" and "22X OPTICAL ZOOM" in double high characters. In normal height characters there are the results of passing (or otherwise, ours always passes) the "COMM. LOOPBACK", "CAMERA LOOPBACK" and "MOTOR CIRCUIT" tests.

Manufacturer	American Dynamics
Reg Id	UP SDU
P/N	0100 2283-25
Rev	B1
S/N	4867379
Bar Code	000525-0925
EPROM	0701-2507-0303 U-4 CS=C27A

Table 27. Identifying marks on Dome #4

Dome response to SSOFTWAREVERSION (0xC9):

```
0-06 0-C9 0-31
1-06 1-C9 1-06 1-07 1-01 1-25 1-07 1-03 1-03 1-F1
```

Dome response to SGETDOMETYPE (0x94): 0xF5

5.5 Sensormatic Dome #5

This is working "new" single circuit board type of B+W camera dome. This dome does not display any configuration information when it is initially powered up.

Manufacturer	Sensormatic
Model #	SpeedDome 2000 Outdoor
Reg M/N	SU SDO
Rev	B0
Part of	0100-761-03
Mfd	4QTR97
Serial #	2380062
Bar Code	*2380062*

Table 28. Identifying marks on Dome #5

It has three EPROMs:

U4	0701-0081 U4 VER 0316
U8	0701-0077 U8 VER 03.12
U50	3133-0013-01 U50 VER 1.00

Table 29. EPROM information from Dome #5

Dome response to SSOFTWAREVERSION (0xC9):

```
0-06 0-C9 0-31
1-06 1-C9 1-06 1-07 1-01 1-00 1-81 1-03 1-16 1-89
```

Dome response to SGETDOMETYPE (0x94): 0xF8

5.6 Sensormatic Dome #6

This is a new model American Dynamics Ultra Dome type of color dome. When powered up it displays: "BOOT VER 0103 MAIN VER 0306" and "22X OPTICAL ZOOM" in double high characters. In normal height characters there are the results of passing (or otherwise, ours always passes) the "COMM. LOOPBACK", "CAMERA LOOPBACK" and "MOTOR CIRCUIT" tests.

Manufacturer	American Dynamics
Reg Id	UP SDU
P/N	0100 2283-21
Rev	C0
S/N	4466459
Bar Code	010718-0593
EPROM	0701-2507-0306 U-4 CS=FA82

Table 30. Identifying marks on Dome #6

Dome response to SSOFTWAREVERSION (0xC9):

```
0-06 0-C9 0-31
1-06 1-C9 1-06 1-07 1-01 1-00 1-81 1-03 1-16 1-8A
```

Dome response to SGETDOMETYPE (0x94): 0xF8

5.7 Sensormatic Dome #SF1 "MiniDome"

This is an older Sensormatic Dome which obtained from Sears Fresno. It is a non-working specimen that has the following written on it.

Serial #	126938
	Anti Theft Alarm 441X

Table 31. Identifying marks on Dome #SF1

Hand written on the side, with a ball point pen(?), there is a note that says: "Good Camera Slow 2 RPM."

5.8 Sensormatic Dome #SF2 "MiniDome"

This non-working older Sensormatic Dome was obtained from Sears Fresno.
"Tested by Sensormatic 8.8.90 Rev C"

Mfg Date	4QTR84
Serial #	136315
Model #	RA410
Paper Label	RA410 Rev E
	RC 4/10/92 T06

Table 32. Identifying marks on Dome #SF2

5.9 Sensormatic Dome #SF3 "MiniDome"

This non-working older Sensormatic Dome was obtained from Sears Fresno.

Mfg Date	0684
Serial #	128404
Model #	RA511
	Anti Theft Alarm 441X

Table 33. Identifying marks on Dome #SF3

6 Typical oscilloscope pictures from Sears Fresno

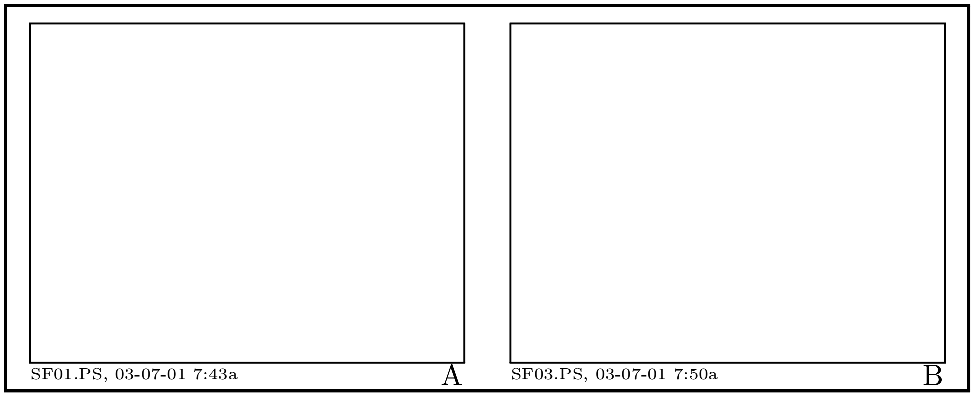


Figure 9. Fresno Sears store, Typical data.

Trace	Use
1	Data out with no dome connected.
A	Typical command data.
B	Typical double command data.

[12] `$Header: d:/sears/RCS/faq-pict.inc,v 1.3 2001-11-30 15:12:01-08 Hamilton Exp Hamilton $`

SF10.PS, 03-07-01 9:02a A

SF11.PS, 03-07-01 9:02a B

Figure 10. Fresno Sears store, Typical triple command.

Trace	Use
1	Data out with no dome connected. Original captured image had to be hand edited to remove the “DCL” trash. Its original capture time was: 03-07-01 8:02a.
A	Typical triple command with timing between commands 1 and 2.
B	Typical triple command with timing between commands 2 and 3.

7 Final TXB-S422 Testing Configuration

Final ("in house/programmer" level) testing of the TXB-S422 consisted of having four domes connected in a star configuration to a single port of an AD2093/06 Code Translator. Two of these domes were Spectra IIs, one was a SpeedDome (dome #5) and the other was an UltraDome (dome #4). Although the physical connections were those of a "star" the method accurately simulated a "daisy-chain" configuration. (The configuration is shown in Figure 11, page 42.)

Testing consisted of:

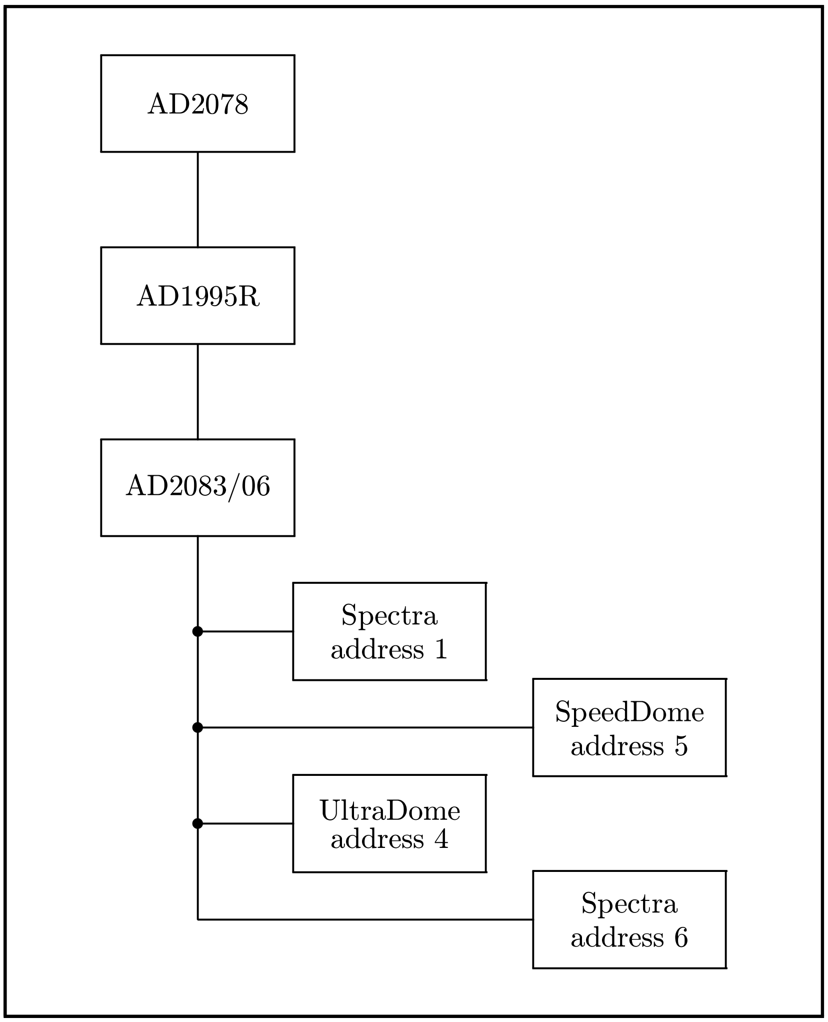
1. Powering all items up and down in as an random order, and as long as I could stand it, as I could come up with. And doing this as long as I could stand it.
2. Randomly selecting domes and sending various motion commands to them and having them move. This was done as long as I could stand it.
3. Setting and selecting presets and having the various domes goto them. I did this one as long as I could stand it.

There were no observed problems. Some known problems with the Spectra were noted and I have sent out an e-mail about these.

Items not tested

1. There has been no testing done with an Esprit due to a general lack of interest and I don't have one. In the past the Esprit has worked correctly when it has a translator board installed.
2. There has been no testing done with a Spectra III as they are new and not yet available for compatibility testing.

[13] `$Header: d:/sears/RCS/fintest.inc,v 1.3 2001-11-30 15:12:02-08 Hamilton Exp Hamilton $`



$RCSfile: fintest.inc,v $

Figure 11. TXB-S422's final testing configuration

8 Sensormatic RS422 signals from an AD2083/02A

The next few oscilloscope pictures show the message data generated by an AD2083/02A. This unit is normally used to interface AD matrices with Sensormatic equipment. According to Dennis Dodrill, this equipment generates data that is identical to that used by the Sensormatic RS422 domes that the TXB-S422 will be attempting to emulate. In March, I was able to connect to the Sensormatic RC58 system at Fresno Sears. The data there is different in that all messages are sent three times and that I have not detected any usage of variable speed commands.

There was some unexpected "noise" detected in the data. This set of pictures, Figure 8, page 43 shows some information about a command as viewed using the input circuitry of a prototype TXB-LG. This noise was not observed at Fresno Sears and appears to be caused by incorrectly connecting up with the AD2083.

A212.PS, 02-21-01 3:04p A

A213.PS, 02-21-01 3:05p B

Figure 12. Timing of data portion of protocol from an AD2083/02A

Trace	Contents
1	Open, i.e. not used
2	Data line from AD-2050 matrix
3	AD-2083/02 $T+$,$T-$ signal line.
4	AD-2083/02 $R+$,$R-$ signal line.

[14]`$Header: d:/sears/RCS/inputsig.inc,v 1.5 2001-11-30 15:12:02-08 Hamilton Exp Hamilton $`

9 RC58 type of Sensormatic controller

There appear to be three closely related controllers that make up different models of Sensormatic's SensorVision™ line of video management systems.

The RC58 controller[16] may have the largest number of cameras attached to it (58). The RC20 and RC32 controllers probably have about the same capabilities. The differences relate to the maximum number of domes that are supported.

The protocol is probably similar with the major difference being with polling that wrap occurs at either dome number 20 or 32.

1. All commands are sent three times.
2. Polling recycles from `0x3A` (58_{10}) to `0x01` (1_{10}) with no skipped addresses.
3. Blue cable (upper) has the controller's outputs.
4. Blue wiring is Red, Black.
5. Red wiring is Green, White.
6. Most connectors are flipped. (Port 4 red is not flipped.)
7. There are no variable speed commands.

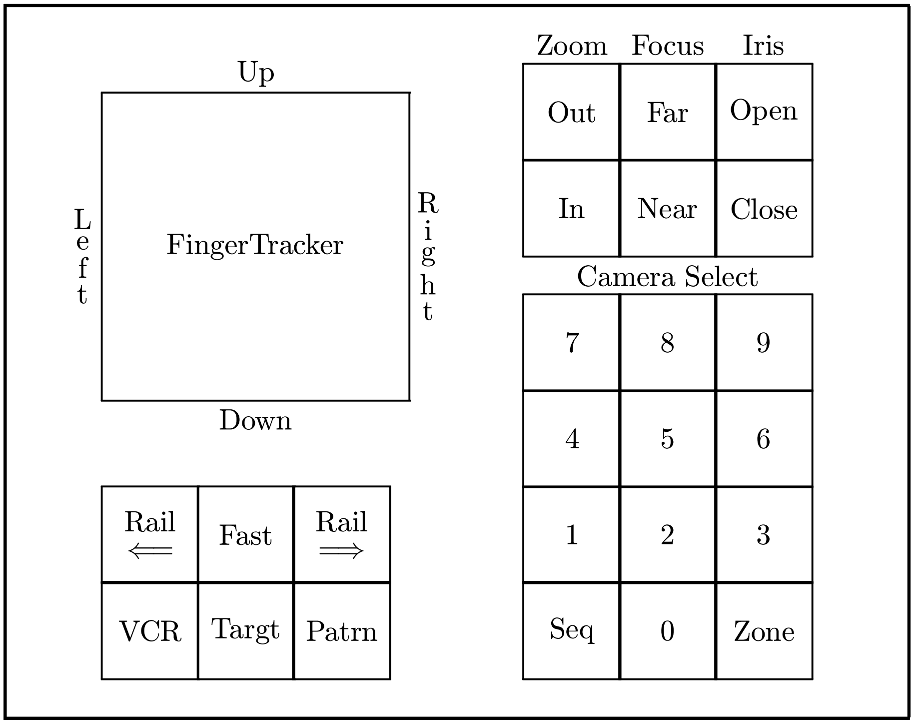
Note

In the above table I have mentioned "Blue" and "Red" to indicate various cables. I have marked the equipment at Sears Fresno with these colors to aid me in investigating the protocol. The actual equipment does not have these colors on it. The colors were chosen because I happened to have two rolls of colored electrician's tape in those colors and BREAKOUT color codes its display with red and blue. Having every thing consistent makes it more likely that I will avoid serious mistakes.

9.1 FingerTracker

Control of an RC58 class controller is normally done using a FingerTracker type control keyboard and an alphanumeric keyboard. A layout of these types of control keyboards are shown in Figure 13, page 45 and Figure 14, page 45.

[15]`$Header: d:/sears/RCS/rc58.inc,v 1.5 2002-02-28 12:57:31-08 Hamilton Exp Hamilton $`
[16]Installed at Sears Fresno.
[17]`$Header: d:/sears/RCS/ft.inc,v 1.4 2002-02-13 07:53:55-08 Hamilton Exp Hamilton $`
[18]`$Header: d:/sears/RCS/an.inc,v 1.3 2002-02-13 07:53:50-08 Hamilton Exp Hamilton $`



$RCSfile: ft.inc,v $

Figure 13. VM1 type Control Keypad

Over ride	1	2	3	4	5	6	7	8	9	0	Reset
Selc	Q	W	E	R	T	Y	U	I	O	P	Del
List	A	S	D	F	G	H	J	K	L	Enter	Insrt
Quit	Start	Z	X	C	V	B	N	M	·	⇑	⇓
Menu	Set	Low Prty	F1	F2	Space	Space	F3	Lock Pan	Track	⟸	⟹

$RCSfile: an.inc,v $

Figure 14. VM1 type Alphanumeric Keyboard

10 Serial data monitoring RC20, RC32 and RC58 type controllers

These three controllers are physically very similar. The primary difference is the number of cameras that each will control. The RC20 controls 20 cameras, the RC32 controls 32 and the RC58 controls 58. (What a surprise!) It appears that all three of these are grouped together and called "SensorVision" by Sensormatic. There is a chance that other systems, such as VM-1 etc., may be made by grouping several components together. When this happens, the controller (matrix) component may be one of these controllers. This would explain some of the confusion as to what any given system consists of. For example: the VM-96 uses a RC216 as its controller. I haven't been able to find any clear indications as to what the controllers are in the VM-1, VM-16 or VM-32 systems.

In examining the two different versions that are available, I have discovered that at least two protocols are in use with them. **Protocol I** is the same as that used by Sears Fresno and closely follows the protocol used at Sears Clovis. We got a RC32 in that had been previously installed in Sears Nanuet New York. The Nanuet unit shows a different incompatible protocol which I have been calling **Protocol II**.

We have been able to determine most of what **Protocol I** does and have been able to build a translator for use with it. This translator is called a **TXB-S422**. For **Protocol II** nothing is known nor is there a translator that supports it. (It is convenient that the various SpeedDomes and the UltraDome that I have been able to test, work with **Protocol I** but not **Protocol II**.)

Item	Value
Baud	4800
Interface	RS-422

Table 34. Communications parameters

[19] `$Header: d:/sears/RCS/rcxxmon.inc,v 1.5 2001-11-30 15:12:05-08 Hamilton Exp Hamilton $`

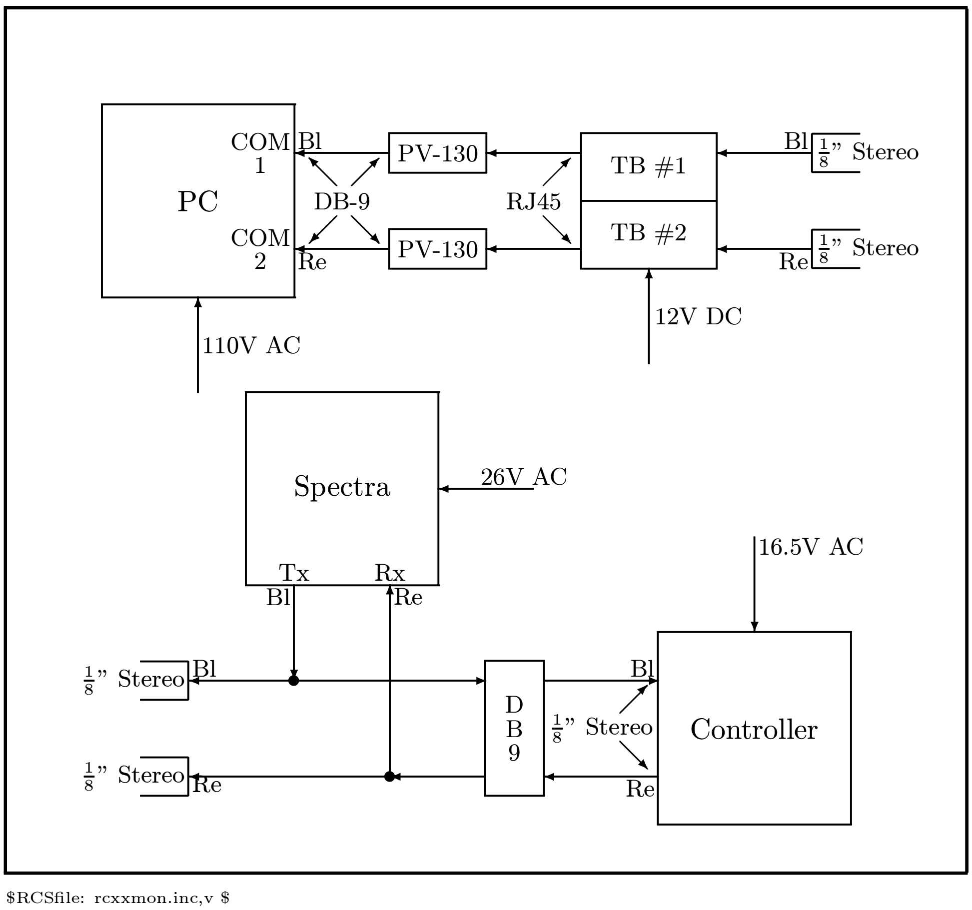
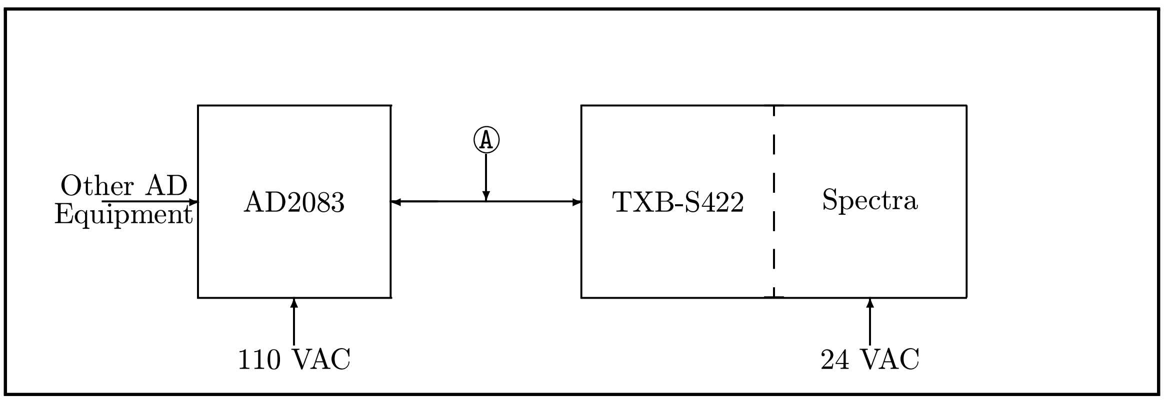


Figure 15. Connection diagram for monitoring an RC20, RC32 or RC58 type controller

11 Interfacing to an AD1996R — AD2083/02 translator

A Spectra with a TXB-S422 installed in it may be connected to an AD2083/02 (a code translator for an American Dynamics matrix system). This is done by connecting a cable from the T +/-, R +/- connectors.

Spectra		Direction	AD2083/02
P_4	CONTROL		IN/OUT
4	RX —	From Translator	T +
3	RX +	From Translator	T —
	—	Shield	S
2	TX —	To Translator	R +
1	TX +	To Translator	R —



$RCSfile: testcnfg.inc,v $

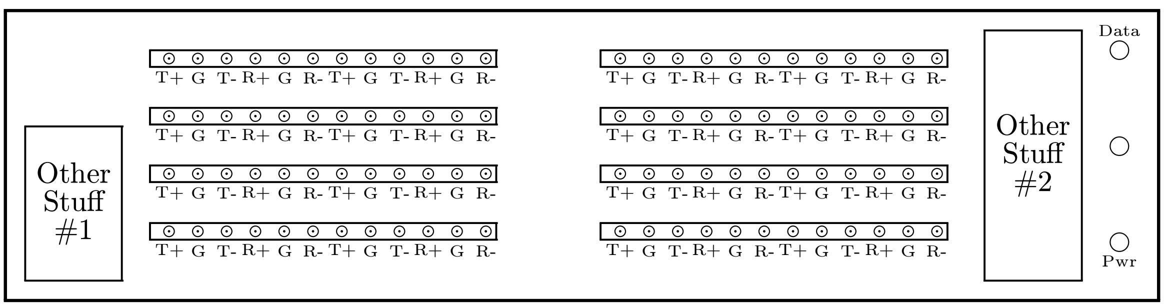
Figure 16. Connection diagram for a Spectra and an AD2083/02

[20] `$Header: d:/sears/RCS/testcnfg.inc,v 1.7 2001-12-17 16:25:57-08 Hamilton Exp Hamilton $`

11.1 Using an AD2083/02

The AD2083/02 Data Translator is used to convert American Dynamics "Data Line" information into RS422 messages to control domes, etc. The rear panel is shown in Figure 17, page 49.

Spectra		Direction		AD2083/02
P_4	CONTROL		DB-9	IN/OUT
4	RX +	From Translator	5	T +
3	RX —	From Translator	9	T —
	—	Shield		S
2	TX —	To Translator	1	R +
1	TX +	To Translator	6	R —

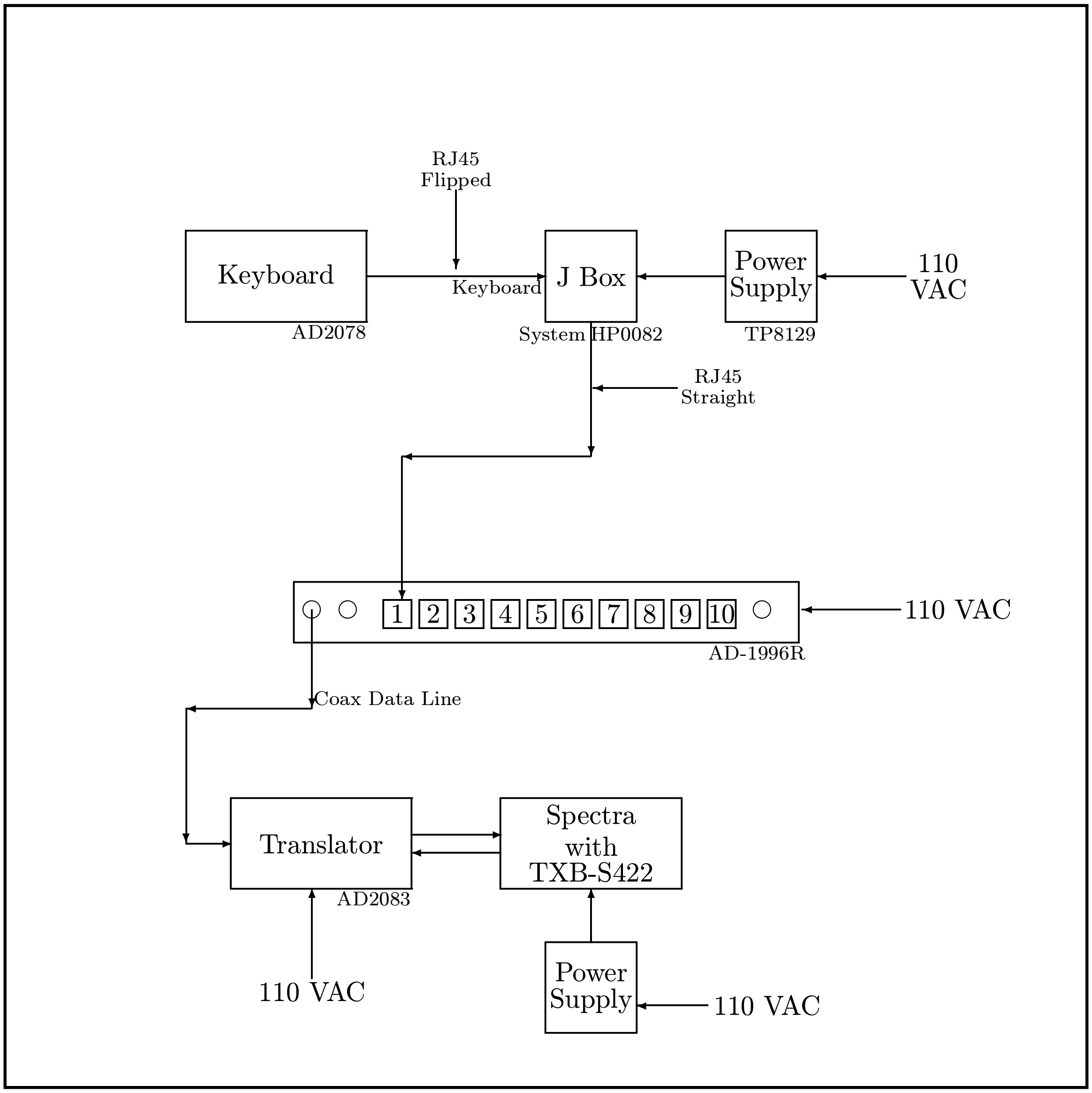


$RCSfile: testcnfg.inc,v $

Figure 17. AD2083/02 Rear Panel

Other stuff			
#1		#2	
1	Power LED	2	RJ-45 comm in/out jacks
1	Alarm LED	1	12 pin IO connector
1	Code LED	2	BNC code connectors
	—	1	Power cord

[21] `$Header: d:/sears/RCS/testcnfg.inc,v 1.7 2001-12-17 16:25:57-08 Hamilton Exp Hamilton $`

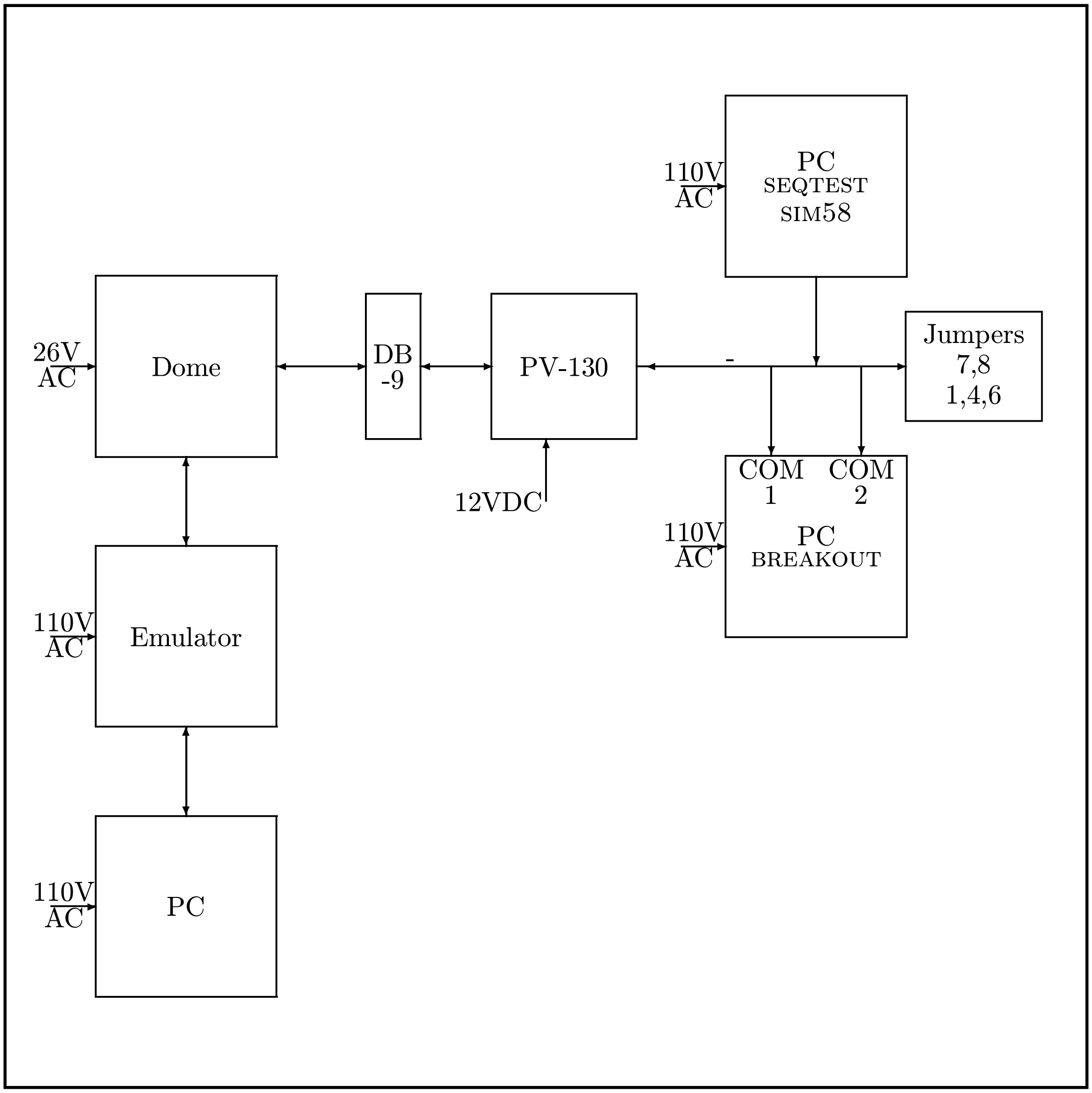


$RCSfile: testcnfg.inc,v $

Figure 18. Setup configuration for an AD switch

11.2 Testing with a PC sending commands

Testing with using a PC to send commands requires some software on the "commanding PC". Two programs have been written for this purpose. One of them SIM58.BAS is a simple and crude command sending program what takes control from a keyboard and sends motion commands to a dome. The other, SEQTEST.BAS, is used to send every command possible from 0 through 255_{10} to a dome. When these types of testing is being done it is a good idea to have an additional PC connected in the system to monitor the protocol. I usually use BREAKOUT, but other data line monitoring software is available.



$RCSfile: tc.inc,v $

Figure 19. General Testing Configuration

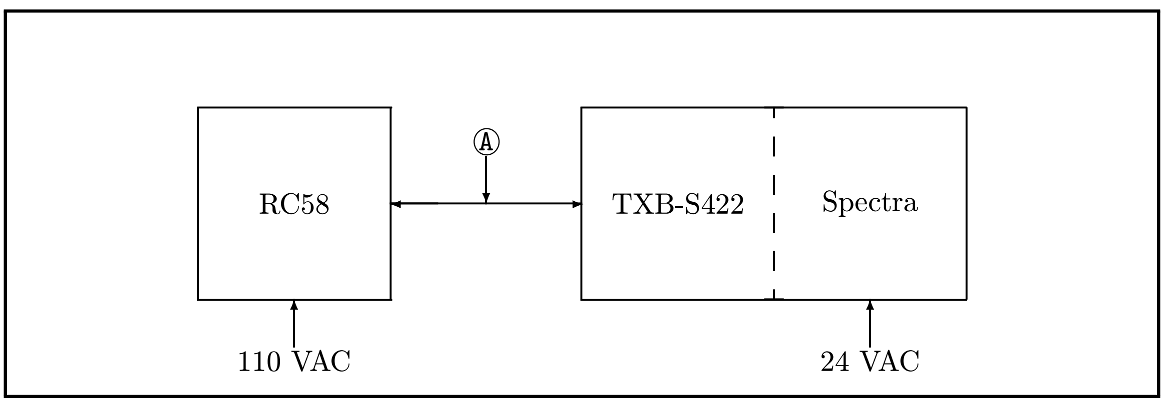
12 Interfacing a Spectra

12.1 To an RC58 controller

A Spectra with a TXB-S422 installed in it may be connected to an RC58 (the controller of a SensorVision™ Programmable Video Management System). This is done by connecting a cable from the IN/OUT J-BOX connectors. To do this make the following connections at point Ⓐ in Figure 20, page 53:

Spectra		Direction	RC58
P_4	CONTROL		IN/OUT
4	RX —	From Controller	Tip
3	RX +	From Controller	Ring
	—	Shield	Sleeve
2	TX —	To Controller	Tip
1	TX +	To Controller	Ring

The RC58 will not recognize the presence of the Spectra until the Spectra (with a TXB-S422 installed) has been powered up (or power cycled). Even then it is important to note that the Spectra is only "partially" installed. This means that the dome will receive and process commands from the controller, but that the controller does not have a completely "normal conversation" with the Spectra.



$RCSfile: txbs422.inc,v $

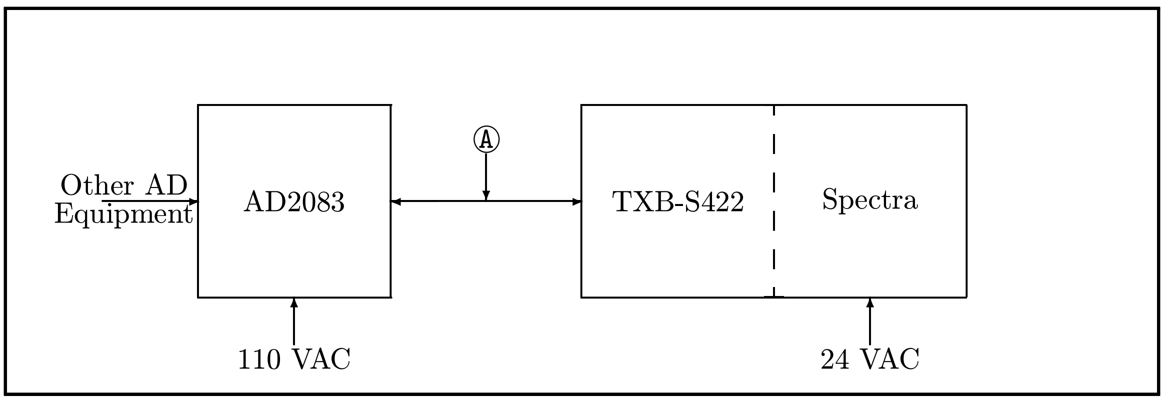
Figure 20. Connection diagram for a Spectra and an RC58

[22] `$Header: d:/sears/RCS/txbs422.inc,v 1.7 2001-11-30 14:25:08-08 Hamilton Exp Hamilton $`

12.2 To an AD2083/02 translator

A Spectra with a TXB-S422 installed in it may be connected to an AD2083/02 (a code translator for an American Dynamics matrix system). This is done by connecting a cable from the T +/-, R +/- connectors. To do this make the following connections at point Ⓐ in Figure 21, page 54:

Spectra		Direction	AD2083/02
P_4	CONTROL		IN/OUT
4	RX —	From Translator	T +
3	RX +	From Translator	T —
	—	Shield	S
2	TX —	To Translator	R +
1	TX +	To Translator	R —



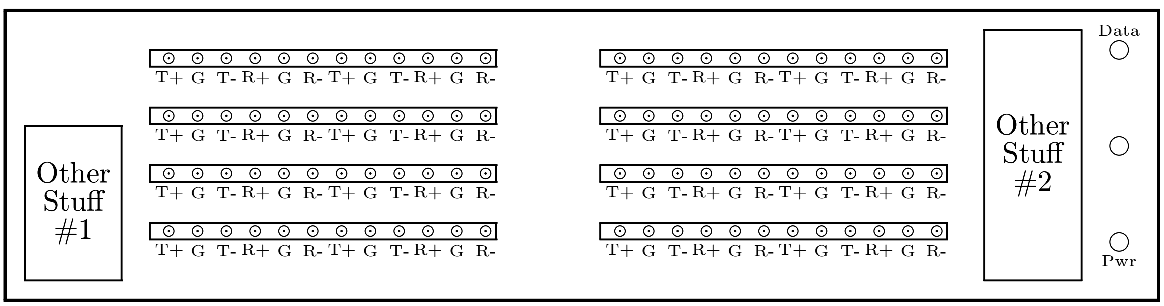
$RCSfile: txbs422.inc,v $

Figure 21. Connection diagram for a Spectra and an AD2083/02

12.3 Using an AD2083/02

The AD2083/02 Data Translator is used to convert American Dynamics "Data Line" information into RS422 messages to control domes, etc. The rear panel is shown in Figure 22, page 55.

Spectra		Direction		AD2083/02
P_4	CONTROL		DB-9	IN/OUT
4	RX +	From Translator	5	T +
3	RX —	From Translator	9	T —
	—	Shield		S
2	TX —	To Translator	1	R +
1	TX +	To Translator	6	R —

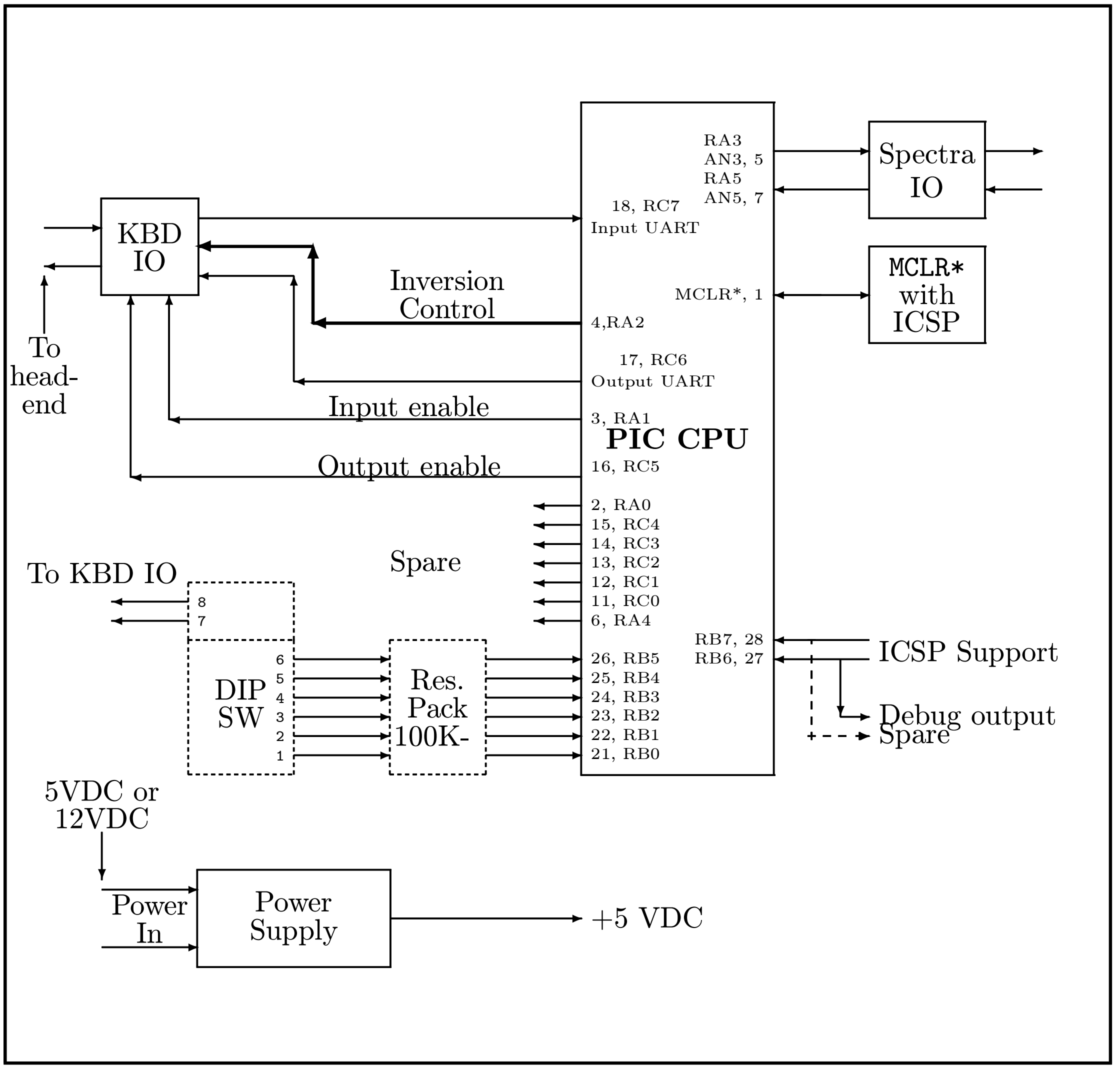


$RCSfile: txbs422.inc,v $

Figure 22. AD2083/02 Rear Panel

Other stuff			
#1		#2	
1	Power LED	2	RJ-45 comm in/out jacks
1	Alarm LED	1	12 pin IO connector
1	Code LED	2	BNC code connectors
	—	1	Power cord

13 Hardware description



$RCSfile: txbshard.inc,v $

Figure 23. Hardware design for the TXB-S422 unit

[23]$Header: d:/sears/RCS/txbshard.inc,v 1.11 2002-02-06 15:57:30-08 Hamilton Exp Hamilton $

13.1 PIC CPU IO pin usage

PIC 16C73C (or 16C63C), IO port usage			
Bit	RAx	RBx	RCx
0	2, Spare	21, SW-1	11, Spare
1	3, Input data enable	22, SW-2	12, Spare
2	4, Inversion Control	23, SW-3	13, Spare
3	5, Spectra Serial Out	24, SW-4	14, Spare
4	6, Spare	25, SW-5	15, Spare
5	7, Spectra Serial In	26, SW-6	16, Output data enable
6	N/A	27, ICSP Support/Debug Output	17, HE Output UART
7	N/A	28, ICSP Support/Spare	18, HE Input UART
Note that in this table, references are: Pin #,Use			

Table 35. CPU IO pin usage

13.2 Connector pin assignments

There is one 16 pin interface connector on the TXB-S422 translator. The connector is designed to be plugged into the accessory jack of either a Spectra or Esprit.

There is an additional 5 pin connector which is used to support In Circuit Serial Programming (ICSP) of the PIC CPU chip.

The shorting plug that is normally installed in J2 connects the following pins together: 3-4, 5-6, 7-8, 9-10, 11-12, 13-14. And leaves the following pins open: 1, 2, 15, 16.

J2 Spectra/Esprit connection	
Pin	Use
1	+5 VDC, From an Esprit, open with a Spectra
2	+12 VDC, From a Spectra, open with an Esprit
3	Ground
4	Open on a Spectra, unknown on an Esprit
5	RXD+, To Spectra
6	RX+, From host
7	RXD-, To Spectra
8	RX-, From host
9	TXD+, From Spectra
10	TX-, To host
11	TXD-, From Spectra
12	TX-, To host
13	Video in, jumpered to pin 14 on the TXB-S422
14	Video out, jumpered to pin 13 on the TXB-S422
15	Ground
16	Open on a Spectra, unknown on an Esprit

Table 36. Connector pin assignments

13.3 Pin assignments on the PIC CPU chip

RA0, RA1, RA2, RA3 and RA5 are usable as A/D converter inputs on 16C7x (x = 2, 3 or 4) type chips.

RA4 has an open collector type of output.

13.4 Switch bit assignments for SW

SW	Use
1	LSB of RC216 speed control
2	MSB of RC216 speed control
3	SpeedDome/UltraDome line seizing control.
4	Extended address bit 3, or spare
5	Enable decoding of address 64
6	Enable debug mode
7	Terminate controller input communications
8	Terminate controller output communications

The two switch positions that control communications termination are shipped from the factory in the “on” position. To remove termination of the communications lines, change the sub-switches to the “off” position. The state of these two sub-switches may not be monitored by the CPU chip.

Pin	Name	Name	Use
1	MCLR*	N/A	Master Clear and ICSP
2	RA0	spare2	Spare
3	RA1	ENABLEINPUTS	Input data enable, for head end communications
4	RA2	INVERTIO	Input inversion control
5	RA3	SPECTRAOUT	Serial data out to Spectra
6	RA4	spare6	Spare
7	RA5	SPECTRAIN	Serial data in from Spectra
8	Vss	N/A	+5 VDC
9	OSC1	N/A	Crystal oscillator, 11.0952 MHz
10	OSC2	N/A	Crystal oscillator, 11.0952 MHz
11	RC0	spare11	Spare
12	RC1	spare12	Spare
13	RC2	spare13	Spare
14	RC3	spare14	Spare
15	RC4	spare15	Spare
16	RC5	ENABLEOUTPUTS	Output data enable, for head end communications
17	RC6	UARTOUT	Serial data from UART Out
18	RC7	UARTIN	Serial data to UART In
19	Vss	N/A	+5 VDC
20	Vdd	N/A	Gnd
21	RB0	ADDRESS0	SW-1
	INT	N/A	(Interrupts are not used.)
22	RB1	ADDRESS1	SW-2
23	RB2	ADDRESS2	SW-3
24	RB3	ADDRESS3	SW-4
25	RB4	PERMIT64	SW-5, Allows the TXB-S422 to use address 64.
26	RB5	DEBUGMODEON	SW-6, Permits debug output mode to be entered.
27	RB6	DATAOUT	Spare, debug data output and used for ICSP
28	RB7	spare28	Spare and used for ICSP

Table 37. Pin assignments on the PIC CPU chip

14 VM1 (RC32) information

Pelco recently, 31JUL01, received an RC32, or VM1, matrix system. The system consists of a card cage which will switch 32 camera inputs to either, or both, of two monitors. In addition to the card cage we also received an "AlphaNumeric Keyboard" (ANK) and nothing else.

When powered up, it starts to poll the domes about the time that the "`DOME CONFIGURATION IN PROGRESS`" message is displayed (see Figure 26, page 67). However there seems to be a temperature(?) related power up problem in that if this is the first time today that power is applied, it takes several minuets before the keyboard starts to work. After the keyboard once starts to work, then it continues to do so.

14.1 Identifying marks

On the card cage there is the following information:

SensorVision	
Model No	RC32CG
Part Of	0100 0084001
Serial No	730983
Input	16.5 V 1.75A
Rev	H0
Mfd	3QTR93

Table 38. RC32/VM1 Identifying Information

14.2 Software (firmware) version

Examining the "Master Software Assembly" card shows that this has either RF002 or RF003 software installed which is at software revision M. (There is a QA stamp on the software version label that makes it difficult to determine the exact software version model.)

EPROMs (NMC27C64Q 200) are revision part number 0701-2810-0001 Rev M for $U3 \rightarrow U7$.

Software features: (When powered up the RC32 indicates that it is running software rev "M", dated 1997, type RF002.)

14.3 Dome connections

Connections to domes is made with three, or four, cables.

1. A single RG-59, or equivalent, cable for video.

[24] `$Header: d:/sears/RCS/vm1.inc,v 1.7 2001-11-30 15:12:08-08 Hamilton Exp Hamilton $`

2. Using a "$\frac{1}{8}$ inch stereo" (mini stereo phone jack) connector a data line goes to the domes using RS422 voltage levels on a 22 AWG wire.
3. Using a "$\frac{1}{8}$ inch stereo" (mini stereo phone jack) connector a data line comes from the domes using RS422 voltage levels on a 22 AWG wire.
4. Additionally the domes require 24 V AC center tapped power.

14.4 Printed circuit card information

PC Cards in the card cage use the following color code system:

White Communications VCR, quantity = 1, position = 1

PCB part number = 0301-0093-02.

J2 = 1-4 on, 3-4 off

Have schematics? No

Red PSB, Power Supply Board, quantity = 1, position = 2

PCB part number = 0301-0092-01.

"No jumpers"

Have schematics? No

Blue Console CPU board, quantity = 1, position = 3

PCB part number = 0333-0006-01.

LNK1 $1 \rightarrow 6, 8 =$ off, $7 =$ on.

LNK2 $1 \rightarrow 6, 8 =$ off, $7 =$ on.

S1 = left, is a momentary switch.

Have schematics? Yes

Orange Remote Input Board, quantity = 1, position = 4

PCB part number = 0333-0007-01.

SW1 $A \rightarrow F =$ off

Have schematics? Yes

Black Software and backed up CMOS memory, quantity = 1, position = 5

PCB part number = 0315-0002-01.

U6 = R off, off, P = on, on.

U7 = R off, off, P = on, on.

BATT = on.

Have schematics? Yes

Green VIB, Video Interface Board, quantity = 2, position = 6, 7

PCB part number = 0301-0060-01 position 6.

J1-J2 = off

E1-E2, E4-E5 = on

E2-E3, E5-E6 = off

P1 in 1 $\rightarrow$ 4.

P2 = USA = on, EUR = off

Have schematics? No

PCB part number = 0301-0060-01 position 7.

J1-J2 = off

E1-E2, E4-E5 = on

E2-E3, E5-E6 = off

P1 in 5 $\rightarrow$ 8.

P2 = USA = on, EUR = off

Have schematics? No

Yellow VSB, Video Switcher Board, quantity = 2, position = 8, 9

PCB part number = 0301-0061-01 position 8.

P1 1-2 = on, 3-4 = off

SW1 1 = on, 2 $\rightarrow$ 6 = off.

Have schematics? No

PCB part number = 0301-0061-01 position 9.

P1 1-2 = on, 3-4 = off

SW1 2 = on, $1, 3 \rightarrow 6$ = off.

Have schematics? No

14.5 Keyboard IO assignments

Keyboard Pin assignments: (A straight through male-female cable was used and it worked.)

RF002
Alarm Clock
Dome Alarm
Name Camera
Password
Program Dome
Sequential Switching
System Status
Time/Date
Zone Stage

Table 39. RC32/VM1 Software Configuration

DB-9F Pin	Use/Name
1	+5V
2	`KBDDAT`
3	`KBDCLR*/KBDINT*`
4	`KBDCLK*/KBDACK*`
5	Ground
6	—
7	—
8	—
9	—

Table 40. RC32/VM1 Keyboard Pin assignments

14.6 Typical display screens

```
123456789 123456789 123456789 123456789 12
2
3
4
5
6
7
8
9
10
11
12
13
14
15
16
17
18
19
20
21
22
23
123456789 123456789 123456789 123456789 12
```

Figure 24. Monitor screen size on an RC32

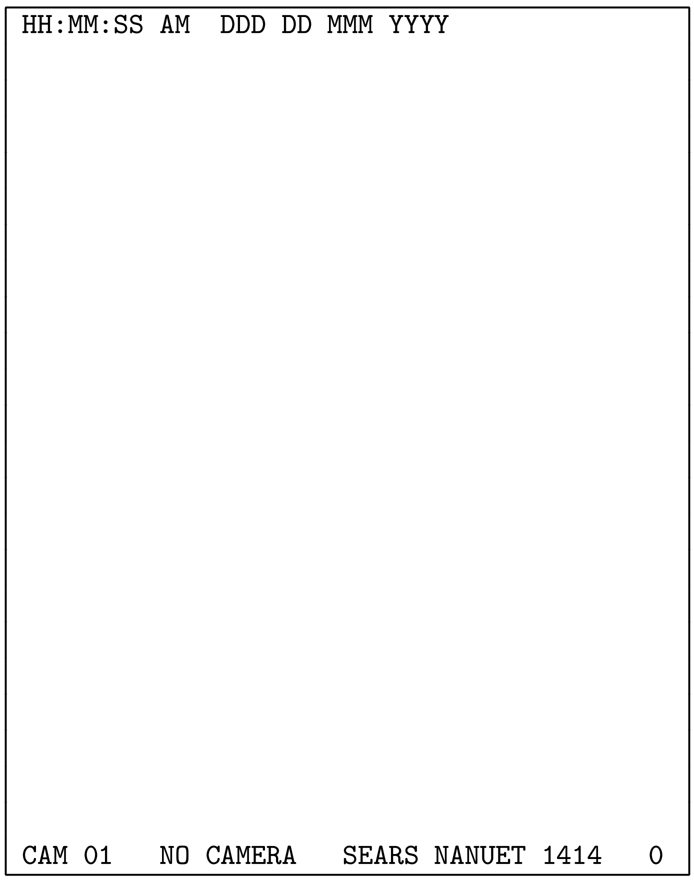


Figure 25. Typical monitoring screen on an RC32

```
HH:MM:SS AM  DDD DD MMM YYYY

  SENSORVISION POWER UP SEQUENCE STARTED


  (C) SENSORMATIC ELECTRONICS CORP. 1997
          RF 002         REV M


      DOME CONFIGURATION IN PROGRESS
```

Figure 26. Power up screen on an RC32

```
HH:MM:SS AM  DDD DD MMM YYYY

MAIN MENU

1.  SET TIME DATE, FACILITY NAME

2.  NAME CAMERA

3.  PROGRAM SEQUENCE SWITCHING

4.  PROGRAM DOME

5.  PROGRAM AUTO-SWITCHING DOME ALARM

6.  PROGRAM AUTO-SWITCHING ALARM CLOCK

7.  PROGRAM ZONE STAGING

8.  CASSETTE CONTROL

9.  SYSTEM STATUS


USE ARROW KEYS........PRESS "ENTER"
```

Figure 27. Main Menu on an RC32

14.7 Unique RC32 controller command sequences

Getting the RC32 up and working was quite easy, however the commands that it sends is a cause for concern and because **none of them match any known command**. (Even though the checksum is always correct!)

14.7.1 Controller Power up sequence with an RC32

```
<02AUG01B.CAP>
00:00,  35: 0-01 0-F1 0-0E          < 1: Undefined command 1 Len = 3>
00:00,  36: 1-01                    < 1: ACK>
00:00,  37: 0-01 0-F1 0-0E          < 1: Undefined command 2 Len = 3>
00:00,  38: 1-01                    < 1: ACK>
00:00,  39: 0-01 0-F1 0-0E          < 1: Undefined command 3 Len = 3>
00:00,  40: 1-01                    < 1: ACK>
00:00,  41: 0-02 0-E0 0-1E          < 2: Aux 1,2,3,4 off>
00:00,  42: 0-02 0-E0 0-1E          < 2: Aux 1,2,3,4 off>
00:00,  43: 0-02 0-E0 0-1E          < 2: Aux 1,2,3,4 off>

00:00,  50: 0-05 0-F1 0-0A          < 5: Undefined command 4 Len = 3>
00:00,  51: 0-05 0-F1 0-0A          < 5: Undefined command 5 Len = 3>
00:00,  52: 0-05 0-F1 0-0A          < 5: Undefined command 6 Len = 3>

00:00, 131: 0-20 0-E0 0-00          <32: Aux 1,2,3,4 off>
00:00, 132: 0-20 0-E0 0-00          <32: Aux 1,2,3,4 off>
00:00, 133: 0-20 0-E0 0-00          <32: Aux 1,2,3,4 off>
00:00, 134: 0-01 0-B8 0-47          < 1: Pattern End>
00:00, 135: 1-01                    < 1: ACK>
00:00, 136: 0-01 0-B8 0-47          < 1: Pattern End>
00:00, 137: 1-01                    < 1: ACK>
00:00, 138: 0-01 0-B8 0-47          < 1: Pattern End>
00:00, 139: 1-01                    < 1: ACK>
```

14.7.2 Dome Power up sequence with an RC32

```
<02AUG01B.CAP>
00:00, 143: 1-01 1-C1 1-3E          < 1: Dome Power Up Message>
00:00, 144: 0-70                    <112: ACK., cksum bad = 0x0070, msg length = 1>
00:00, 145: 1-01 1-C1 1-3E          < 1: Dome Power Up Message>
00:00, 146: 0-70                    <112: ACK., cksum bad = 0x0070, msg length = 1>
00:00, 147: 1-01 1-C1 1-3E          < 1: Dome Power Up Message>
00:00, 148: 0-70                    <112: ACK., cksum bad = 0x0070, msg length = 1>
```

[25] $Header: d:/sears/RCS/rc32.inc,v 1.2 2001-11-30 15:12:04-08 Hamilton Exp Hamilton $

15 VM96 (RC216) information

A VM96 is (from the advertising brochure from Sensormatic):

"SensorVision
Video Surveillance Systems

ViewManager 96

Video Matrix Switcher

RC216H"

"ViewManager 96 is the most innovative and powerful video system controller ever offered. The unique TouchTracker controller is designed for one handed, laptop or tabletop operation of the system. The TouchTracker provides one button activation of system activities, vector proportional pan and tilt control and user assignable zoom and focus control keys. Operators can select cameras, views, patterns, sequences, salvos and zones by name through a unique on-screen user menu and TouchTracker buttons."

"Features

- Versatile system size — minimum 16 video inputs and 4 video outputs, maximum 96 video inputs and 8 video outputs
- Futuristic TouchTracker hand held controller
- Programmable quick views, patterns, sequences, zones and salvos
- Plain language usage on screens to simplify operation
- Multilevel user restrictions
- Full matrix switching capability
- Embedded PC platform for future plug and play option
- A new generation of versatile programmable video security"

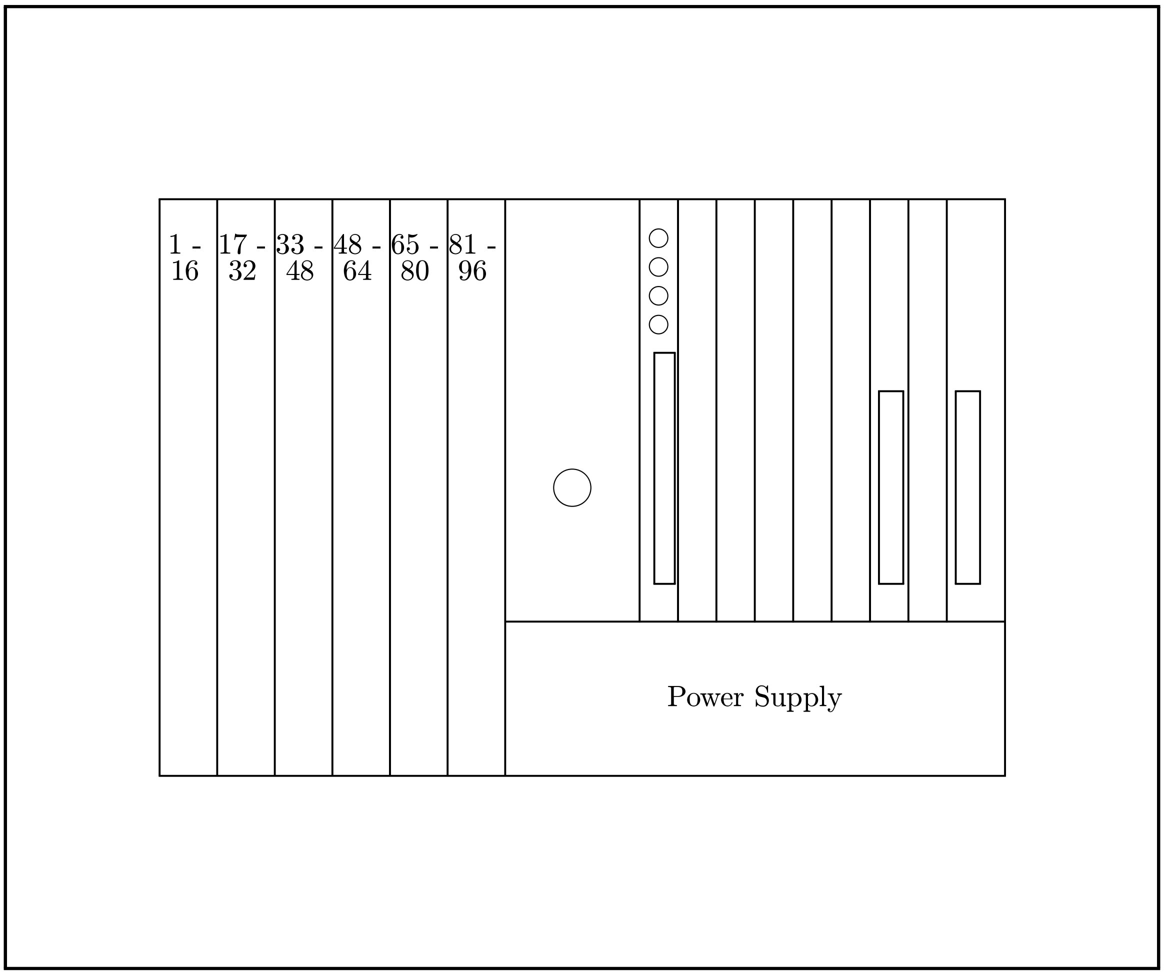
15.1 VM96 chassis connections

The right rear of a VM96 (RC216 Figure 28, page 72) is marked as follows:

[26] `$Header: d:/sears/RCS/vm96.inc,v 1.11 2002-02-28 12:57:48-08 Hamilton Exp Hamilton $`

Sensornet	
1	Net 1
2	
3	Net 2
4	
5	Net 3
6	
7	Net 4
8	
1	RX HI +
2	RX LO -
3	TX +
4	TX LO -
5	RX HI +
6	RX LO -
7	TX HI +
8	TX LO -
—422—	

Table 41. Rear IO connections with an RC216H/VM96



$RCSfile: vm96.inc,v $

Figure 28. VM96 (RC216) Rear view

15.2 SensorNet protocol

The "DeltaDome II, Installation and Service Guide" (8000-2708-01, Rev A, page 8) indicates that this protocol:

1. Utilizes one pair of unshielded twisted pair, 22 AWG, non-polarized cable.
2. Supports a maximum of 32 devices on a line.

In the manual for the "ADTT16 Enhanced Touch Tracker, 8000-2672-02, Rev. A" (ADTT16E), it mentions (on page 12) that SensorNet:

1. Has a bit rate of 230.4 Kbps,
2. Uses SDLC as a Link Layer Protocol,
3. Utilizes a "Proprietary" Application Protocol,
4. With Network Nodes for Enhanced Touch Tracker and SensorNet Domes.

From an investigation at Sears Clovis on 15MAY01, it appears that the Sensornet Net X outputs consist of:

1. A type of Manchester data encoding.
2. The baud rate of the signal is about 500 KHz.
3. The bit rate of the signal is about 238 KHz.
4. Commands repeat about every 25 ms.
5. Command blocks consist of three command blocks.
6. Some commands consist of two sub-command blocks and some consist of one larger sub-command block.
7. If two sub-command blocks are sent then they are sent about every 520 μs apart.
8. Each short sub-command block is about 316 μs long.
9. An expanded sub-command block shows the presence of Manchester formatted data.
10. Assuming that each data bit is about 316 μs long and that each bit of data is about 4.2 μs long, indicates that a "typical" command might consist of about 64 or so bits (or better yet about 8 bytes). This takes into account probable leading data bits for synchronization, start and parity bits on the data bytes.
11. The start of each sub-command has a variable width starting bit. After that the data is reasonably consistent.
12. Odd and even numbered Sensornet "Net" outputs appear to be complemented and have the same information.

15.3 RC216 messages

So far the following on-screen messages from a RC216 have been detected:

1. `Camera 44 is OFFLINE`, this message is displayed whenever the RC216 does not get a response (answer to a POLL command) from a previously working camera/dome.
2. `Camera 44 is ONLINE`, this message is displayed whenever the RC216 gets a message from a POLL command when the unit was previously marked as being "offline". It lasts for about 5 seconds.
3. `Pattern 20` is displayed when a dome is running a pattern.

15.4 Operating notes

1. To enter a pattern:
   A. Enter the menu system of the controller by hitting the "`Menu`" key on the TouchTracker.
   B. Select a pattern number to use. It is unclear if a currently defined pattern may be changed.

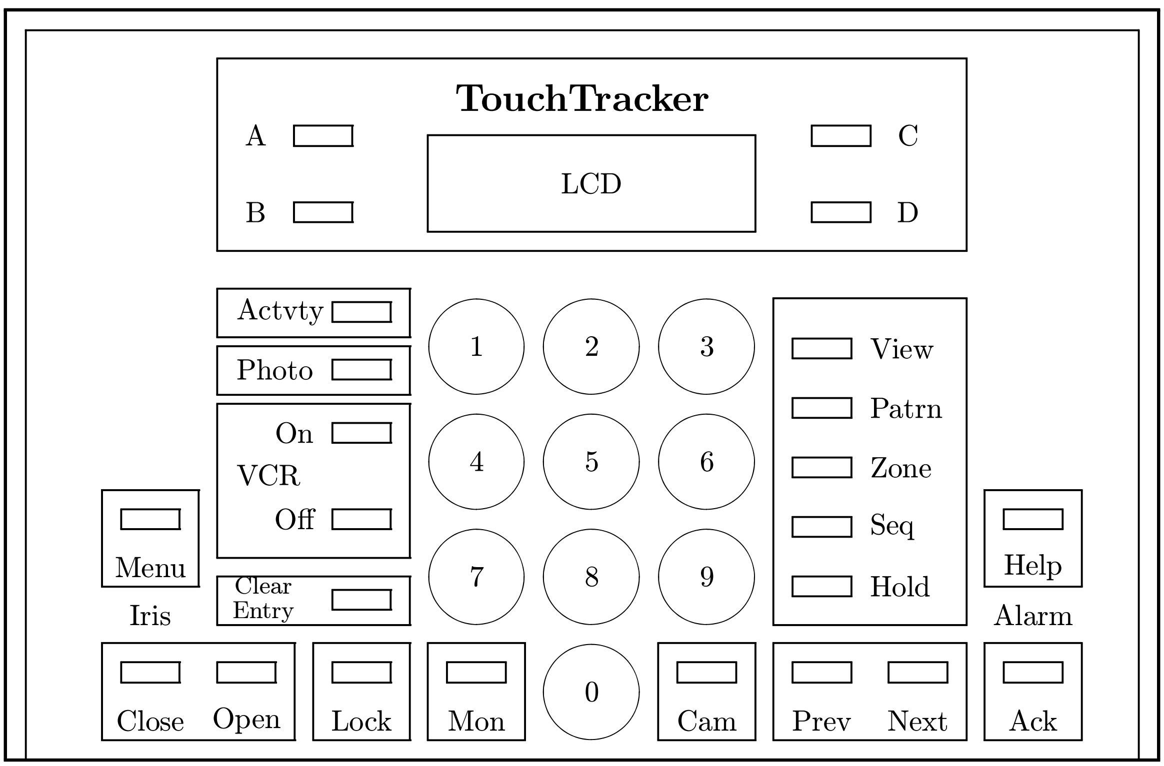
      Note that while actually defining a pattern the Spectra will put up a message saying "`PROGRAMMING PAT`" on the screen. This message does conflict with the controller's messages and may not be turned off.
   C. When done with the pattern, hit the "`Ack`" button on the TouchTracker.
   D. The controller will then ask if you want to run the new pattern. Hit the "`Ack`" button on the TouchTracker to run the new pattern. Note Sensormatic domes do not save the pattern until the user indicates that the pattern is OK. At this point the Spectra has already save the most recent pattern.

      There is a difference between the way that a Spectra and a DeltaDome/SpeedDome saves patterns. The Spectra saves commands for a given amount of time, while the Sensormatic domes save 99 commands **no matter how long it takes to run them**.
   E. To complete the test/new pattern run, hit the "`Clr`" key on the TouchTracker.
   F. To actually save the new pattern hit the "`Ack`" key on the TouchTracker to save the pattern and complete the pattern saving process. (Remember that the Spectra always has the new pattern saved. However the controller does not know that it is a Spectra so it "talks" to the Spectra as though it is a DeltaDome/SpeedDome.)
2. To run a pattern continuously:
   A. Hit the "`C`" button on the TouchTracker.
   B. Enter in the pattern number. Note that patterns are system wide, i.e. the controller will "know" that pattern #22 is for dome #3 etc.
   C. Hit the "`Patrn`" key on the TouchTracker.

D. And whichever dome the pattern applies to, will start running its pattern continuously. Remember that this is the only way that a Spectra runs patterns. It may be that a Sensormatic dome will only run a pattern once or that the controller stops the pattern after a given amount of time. (Which is happening in unknown.)

3. To have a dome "flip", hit the "`D`" key on the TouchTracker.

4. To change the state of AUX 4 (windshield/wiper on/off), hit the "`B`" key on the TouchTracker. The TXB-S422 translates AUX 4 to Auxilary #1. This is done so that with an Esprit, auxilary #1 is used to control the windshield wiper. Thus the windshield wiper may be turned on and off through use of the "`B`" key.



$RCSfile: tt.inc,v $

Figure 29. VM96 type TouchTracker layout

[27] `$Header: d:/sears/RCS/tt.inc,v 1.5 2002-02-14 16:08:02-08 Hamilton Exp Hamilton $`

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