DXI SAC Software: Configuring a CCTV Switcher

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1. Intent & Scope

The Application Note describes how to configure a CCTV switcher under the DXI system.

2. Introduction

A CCTV switcher is usually interfaced to the DXI system when there is a requirement to view, via a video monitor, the area surrounding an intercom station. This allows the staff member at the master station to verify, before opening a door, that the person making the call request has authorization to enter the area.

3. Options and Parameters

3.1 When to switch the CCTV

The DXI system provides two mechanisms to switch the master station's video monitor to the intercom station camera.

1. One option is to switch the monitor to the intercom station camera when the call request button at the intercom station is pressed (i.e. you can view the area surrounding the station even before answering the call).
2. The second option is to switch the monitor to the intercom station camera when the audio connection is made between the master station and the station (i.e. you view the area surrounding the station only when the call is in progress).

The configuration for these options will be described later.

Although these options can be specified on a per camera basis it is recommended that all cameras in the system use the same switching mechanism. This will simplify the installation set-up.

3.2 CCTV Switcher Preset Settings

Some CCTV switchers allow "preset" settings that change the pan/tilt/zoom settings for the individual cameras. For example, by changing the rotation and zoom of a CCTV camera located at the end of a hall it can be made to focus on either a station half way down the hall, or on a station at the other end of the hall. The DXI system can associate this camera with these two stations by specifying the camera number and the preset number.

3.3 Multiple Video Monitors

Some facilities use two (or more) video monitors at the master station for intercom operations. A common example for door intercoms is to display one side of the door on one video monitor, and the other side of the door on the other video monitor. The DXI system can switch multiple cameras to multiple video monitors in this method if required.

3.4　Serial Port Parameters

For serial port switchers, you need to specify the serial port number, baud rate, data bits, stop bits, parity, and flow control.

The serial port number indicates which serial port on the SAC computer to use. Most new SAC computers have two serial ports each with a DB9 connector for interfacing. Either one of these serial ports can be used for a CCTV switcher, providing it is not being used for other external devices (such as a serial port host or fire alarm annunciation system). If necessary when ordering a new SAC computer, extra serial port expander cards are available and can be requested on a special order basis.

The serial port parameters must match the equivalent parameters in the CCTV switcher. Most newer serial port communications devices use 8 data bits, 1 stop bit, no parity, and hardware flow control, while 9600 baud is a common default for baud rate.

3.4.1　Special notes

3.4.1.1 Baud rate

 Baud rates higher than 9600 baud require special consideration. It is recommended that hardware flow control be used for higher baud rates to ensure that data is not lost during communication (see flow control notes below). Also, if you use higher baud rates, ensure that the QNX system initialization file for this SAC computer has hardware serial port buffering enabled (all SAC computers configured by Harding since 2001 have this set). If this SAC was not set up with the Harding default setup, check the /etc/config/sysinit.X file for the SAC computer. The line that starts with Dev.ser should contain "Dev.ser -F -x -b9600 -t8" … with the "-t8" option being the one to turn on the hardware serial port buffering.

3.4.1.2 Flow control

Normally we recommend that hardware flow control be used if the switcher supports it. The serial port cable between the SAC computer and the switcher should include have the hardware handshake wires. If the switcher or the SAC computer is not able to continuously handle data at the specified baud rate, this hardware flow control provides a mechanism to pause the other side's data transmission while it catches up.

3.4.1.3 DTE vs. DCE equipment

The RS-232 specification has two types of devices: Data Terminal Equipment (DTE), and Data Communications Equipment (DCE). Computers are usually DTE devices, while modems are usually DCE devices. A DXI SAC computer is a DTE device in this context (just like any other computer). Check the CCTV switcher to determine whether it is a DTE or DCE device.

Normally a DTE (such as a computer) is connected to a DCE (such as a modem) with a straight-through cable – i.e. when using a DB9, Pin 3 (Tx) on a DTE is connected to pin 3 (Rx) on a DCE, likewise Pin 2 (Rx) on a DTE is connected to pin 2 (Tx) on a DCE. However, if two DTE devices are connected together (two computers for example), you need to make a "null modem" cable to cross over the transmit and receive signals (and handshaking signals if appropriate). Example wiring diagrams for null modem cables can be found in Section 6.

3.5   Redundant SAC Computers and Serial Port Switchers

If you have redundant SAC computers, along with a serial port switcher with only one serial input port, you need to be able to switch the serial port on the switcher between both SAC computers. This will usually require a third party 2-to-1 automatic serial port switch that allows switching one device (such as a modem) between two computers. Contact Harding Instruments customer support if you have redundant SAC computers and a serial port CCTV switcher with only one serial input port for further information on how to make this work.

Note: Redundant SAC computers with the "Alarm point method" switching using a DIO card will work without any other external devices, since the DXI LonWorks communication already seamlessly handles redundant SAC computers.

4.   Interface Methods

Two main methods are used to interface a CCTV switcher to the DXI system. Most switchers can only be interfaced in one of the two ways.

Note: Some devices (currently the Pelco 9760 with Data Translator) can be interfaced either way – as direct - connect control, or as alarm point control, since both direct connect camera->monitor commands and alarm point commands can be transmitted via the serial port on these type of devices. In this case, you should pick one method and use it for all CCTV control on this DXI exchange.

4.1   Direct Connect Method

The first method is for the DXI system to directly control camera to video monitor switching by using a CCTV switcher with a serial port input. The DXI in this case will send the appropriate command to display the camera (associated with the intercom station) onto the video monitor (associated with the master station).

4.2   Alarm Point Method

The second method is by using alarm input points on the CCTV switcher. Each alarm input point on the switcher will represent a unique camera->monitor combination that will allow the switcher to display the appropriate intercom station camera on the master station video monitor. This method normally requires a DIO card on the DXI system (to turn on the alarm input points to the switcher) and a CCTV switcher with contact inputs (to allow the CCTV switcher to read the alarm input points). The DIO outputs will be wired to the CCTV contact inputs to communicate this information.

A special case is the Pelco 9760 with DT serial port input – alarm inputs can be sent through the serial port to trigger these "alarm input points" or macros. In this case, you only need a serial cable between the DXI system and the Pelco 9760 DT.

In either case, the CCTV switcher needs to be programmed so that each alarm input point connects the appropriate camera input to the appropriate video monitor output.

5. Configuration

When configuring the CCTV switcher, follow either section 5.1 (for direct connect method) or section 5.2 (for alarm point input method). Do not perform the steps for both sections.

5.1 Direct Connect Camera->Monitor Control

Direct connect camera->monitor control requires a supported CCTV switcher with a serial port input.

The DXI SAC computer will control this switcher through one of the SAC computer's serial ports, which will be connected to the CCTV switcher.

5.1.1 CCTV Switcher Card Setup

The first step is to set up the hardware parameters for the CCTV switcher. Enter the Maintenance menus, select Edit, then Modify Hardware.

The CCTV switcher parameters will be set up as a DXI "Card". Select the "Card" database and hit 'Enter' to go into the appropriate screen. The first page of the Card database will appear as shown on the right.

Using F10 for Add, create a new card number that will not conflict with other DXI card numbers (this example will use 1000).

```
↓ / Enter: Next Field.           ↑: Previous field.            Home: Next Page
    ←/→: Select        PgUp/PgDn: Next/previous entry        End: Quit
                                        F9: Delete  F10: Add      F1: Help
Card ID:            1000                    Page 1 of 3
Name (English):     Pelco CCTV
Name (French):      ?
Name (Spanish):     ?
Exchange:           1
Net A channel:      No Channel
Net B channel:      No Channel
Type:               PELCO_9760DT_CTRL
Password:           0
Serial Port:        1
Baud Rate:          9600               (bits per second)
Data bits:          8                  (7 or 8)
Stop bits:          1                  (0 to 2)
Parity:             None
Flow Control:       HW
Mother Card:        0
Debounce:           25                 (milliseconds)
Master:             10                 (to report faults on)
Host Ack:           0                  (0=Off 1=On)
Set Time:           0                  (0=Off 1=On)
Log Level:          5
```

Set the following parameters (see section 3.4 for serial port settings):

Name:	Enter the description of the card (i.e. "Pelco CCTV")
Exchange:	Enter the Exchange number of the SAC computer(s) that this switcher will connect to (usually 1)
Type:	Select the appropriate CCTV switcher type (PELCO_9760DT_CTRL, MAXPRO, etc.)
Net A Channel:	
Net B Channel:	Set to NO Channel (not absolutely necessary but indicates to staff that it is not a LonWorks device
Serial Port:	Enter the serial port on the SAC that this will connect to (usually 1 or 2)
Baud Rate:	Enter the baud rate (must be the same as the CCTV switcher's settings)
Data Bits:	Enter the number of data bits

Stop Bits: Enter the number of stop bits

Parity: Enter the parity type (None, Odd, or Even)

Flow Control: Select the type of flow control used (SW, HW, or None).

Master: Set to one of the primary master stations in the system. The SAC may send a hardware alarm message to this master station to indicate that there is a problem with the CCTV switcher if it does not respond to commands.

Log Level: This allows you to determine the level of logging of CCTV commands. A level of 5 will show the command sent to the CCTV switcher each time a camera is switched. This is useful for debugging during initial setup. Once the system has been proven to work properly, the level can be set to a lower value (1 for example) to avoid cluttering up the logs with CCTV switching commands. For extensive debugging information (usually at Harding) Log level 15 can be used.

After configuring the card, use the "Card Swap" function of the SAC software to swap in the CCTV card ID number, which will activate the video switcher driver in the DXI system.

5.1.2 Master Station Video Monitor Setup

For each video monitor, a monitor station needs to be created. Enter the Maintenance menus, select Edit, then Modify Hardware.

The CCTV video monitor will be set up as a DXI "Station". Select the "Station" database and hit 'Enter' to go into the appropriate screen. The first page of the Station database should appear.

Using F10 for Add, create a new station number that will not conflict with other DXI station numbers.

```
↓ / Enter: Next Field.          ↑: Previous field.              Home: Next Page
    ←/→: Select        PgUp/PgDn: Next/previous entry           End: Quit
                       F8:Renumber   F9: Delete  F10: Add        F1: Help
Station ID:            2                      Page 1 of 2
Station type:          Monitor
Audio card ID:         0
Audio resource:        0
Video In Res 1:        0.0              (Card Resource.Preset)
Video In Res 2:        0.0              (Card Resource.Preset)
Video In Res 3:        0.0              (Card Resource.Preset)
Video In Res 4:        0.0              (Card Resource.Preset)
Video Out card ID:     1000
Video Out resource:    1
Output card:           0
Output resource:       0
Exchange:              1
Station has LED:       0      (0=No 1=Yes)
Station camera list:
Stn-camera map:
Alarm FAAS Pt:         0.1.1
Dsbl FAAS pt:          0.0.0
Fault FAAS Pt:         0.1.2
Secondary FAAS pt:     0.0.0
Full duplex:           0      (0=Half 1=Full)
Sidetone:              0      (0=Off 1=On)
```

Set the following parameters:

Station type: Select "Monitor"

Audio Card ID: 0

Audio resource: 0

Video In Res 1:   0.0

Video In Res 2:   0.0

Video In Res 3:   0.0

Video In Res 4:   0.0

VideoOut card ID:	Enter the CCTV card number (I.E. "1000")
VideoOut resource:	Enter the output number on the CCTV card
	(i.e. "1" for the first video monitor out jack)
Output card:	0
Output resource:	0
Exchange:	Enter the Exchange number of the SAC computer that this switcher will connect to (usually 1)
Station has LED:	0
Station camera list:	Leave blank

5.1.3 Master Station Video Monitor Group Setup

If any master (or masters) has more than one video monitor, a video monitor group must be created for each such master. This will associate all of the video monitors with the same master so the DXI system will properly handle multiple cameras on multiple video monitors properly.

Enter the Maintenance menus, select Edit, then Modify Hardware.

The CCTV video monitor group will be set up as a DXI "Station". Select the "Station" database and hit Enter to go into the appropriate screen.

Using F10 for Add, create a new station number that will not conflict with other DXI station numbers.

Set the following parameters:

Station type:	Select "MonitorGroup"
Audio Card ID:	0
Audio resource:	0
Video In Res 1:	0.0
Video In Res 2:	0.0
Video In Res 3:	0.0
Video In Res 4:	0.0
VideoOut card ID:	0
VideoOut resource:	0
Output card:	0
Output resource:	0
Exchange:	Enter the Exchange number of the SAC computer that this switcher will connect to (usually 1)

Station has LED: 0

Station camera list: Leave blank

The only settings that should be changed from the default are the Station type and Exchange.

5.1.4 Intercom Station Camera Setup

Next, each intercom station must be associated with the appropriate camera (or cameras).

Enter the Maintenance menus, select Edit, then Modify Hardware.

Select the "Station" database and hit 'Enter' to go into the appropriate screen.

For each intercom station with a camera, go to the appropriate intercom station with page up/down or by using the search function.

Set up the intercom station as normal, and then change the "Video In Res" settings for the station. The format for each "Video In Res" setting is the CCTV card number, CCTV camera input number on that card, and the CCTV preset number for that camera, separated by periods. Unused settings should be set to 0.0.

For example, if the CCTV was defined as card 1000, the following Video In Res" settings would reflect the appropriate cameras on the CCTV switcher:

Camera 1:   1000.1

Camera 10 preset 1:   1000.10.1

Camera 10 preset 2:   1000.10.2

A master station can have up to 4 video monitors associated with it. Thus, there can be up to 4 cameras associated with a station. These are specified in the "Video In Res 1" to "Video In Res 4" fields.

For example, if station 101 has camera 5 preset 1 associated with it, while station 102 on the other side of the door has camera 3 (and no preset) associated with it the settings for stations 101 and 102 may look like this:

Station 101:

Video In Res 1:   1000.5.1

Video In Res 2:   1000.3

Station 102:

Video In Res 1:   1000.3

Video In Res 2:   1000.5.1

In this way, the first video monitor on the master control station will always show the active CCTV camera, and the second video monitor will show the camera on the other side of the door (so you can see when the person has cleared the door).

The relevant settings for intercom camera stations are as below:

Video In Res 1:   Enter the video in for the first camera (or 0.0 if none)

Video In Res 2:   Enter the video in for the second camera (or 0.0 if none)

Video In Res 3:   Enter the video in for the third camera (or 0.0 if none)

Video In Res 4:   Enter the video in for the fourth camera (or 0.0 if none)

VideoOut card ID: 0.0

VideoOut resource: 0.0

Station camera list: Leave blank

5.1.5 Master Station / Video Monitor Association

For each master station with a video
monitor, you need to associate the master
with the video monitor(s).

Enter the Administration menus, select
Edit, then Modify Software.

Select the "Master" database and hit 'Enter'
to go into the appropriate screen.

Go to the master ID number with page
up/down or by using the search function.

Change the "Monitor ID" field to the
station number of the video monitor. This

```
↓ / Enter: Next Field.          ↑: Previous field.          Home: Next Page
   ←/→: Select        PgUp/PgDn: Next/previous entry        End: Quit
                                                            F1: Help
Master ID:             1                Page 2 of 4
Annunciate alarms:     0                (0=AtSecondary 1=AtPrimary)
External Buzzer:       0                (0=NONE 1=Relay1 2=Rela2)
Ext call Q light:      0                (0=NONE 1=Relay1 2=Rela2)
Stn call list:         1-100
Music zone list:
Master Enable list:    2
Card list:
Auxiliary fms:
Event Priorities:      0
Monitor ID:            100
Monitor Rate:          10               (seconds)
Stn Monitor list:      0
PLC Out Register:      0                (decimal)
PLC In register:       1                (decimal)
PLC Queue reg:         0                (decimal)
PLC Queue length:      1                (decimal)
Radio Monitor list:
Panel LED in Call:
Can enable self:       1                (1=Yes 0=No)
Can disable self:      1                (1=Yes 0=N0)
```

is currently on the second page of the master station configuration.

If a master has only one video monitor, enter the number of the "Monitor" station defined for that video monitor
in the previous steps. If the master has more than one video monitor, enter the number of the "MonitorGroup"
station defined in the previous steps.

5.1.6 Video Monitor Group Setup

If any masters have multiple video monitors (if you have set up a MonitorGroup in the previous steps) you need
to tell the DXI system which video monitors are in the group.

Enter the Administration menus, select Edit, then Modify Software.

Select the "Station" database and hit Enter to go into the appropriate screen.

For each video monitor group, you need to list which video monitors are associated with the group.

Go to the monitor group ID number with page up/down or by using the search function.

In the "Station group list" field, enter a list of monitor stations.

For example, if this video monitor group consists of video monitor stations 1001 and 1002, this video monitor
station's "Station group list" would read "1001-1002".

Also enter an appropriate name for the monitor group in the "Name" field (i.e. "Master 1 Video").

5.1.7 Video Monitor Setup

This step is optional, and just sets a readable name for each video monitor to make the log files more understandable.

Enter the Administration menus, select Edit, then Modify Software.

Select the "Station" database and hit Enter to go into the appropriate screen.

For each video monitor, go to the monitor group ID number with page up/down or by using the search function.

Enter an appropriate name for the video monitor in the "Name" field (I.E. "Master 1 Left Video").

5.1.8 Station Camera Switching Mode

In section 3.1, there are two mechanisms that the DXI system can use to determine when to switch the CCTV camera to the monitor. The default mechanism is to switch the CCTV camera to the video monitor only when a call is currently connected (active). If this is the way you want it, you do not need to follow the below steps.

However, if you want the DXI system to switch the CCTV camera to the monitor when the call request button is pushed, you need to tell the DXI system to use the alternate mechanism.

Enter the Administration menus, select Edit, then Modify Software.

Select the "Station" database and hit Enter to go into the appropriate screen.

For each intercom station with a camera, go to the intercom station ID number with page up/down or by using the search function.

In the "Camera starts on" field, enter "1" (for CRQ mode) to switch when a call request is received, or "0" (for call mode) to go back to the default setting (to switch when connected).

This should complete the CCTV configuration.

5.2 Alarm Point Control

Alarm point control requires either a DIO and a contact input CCTV switcher, or a serial software alarm point activated switcher (such as a Pelco 9760DT).

5.2.1 Alarm Point Output Card Setup

The alarm point output card in this case is either a DIO (which provides physical relay or digital level outputs) or a serial port CCTV switcher (which will use "software" alarm outputs).

First of all, the hardware parameters for the alarm point output card need to be set up.

Enter the Maintenance menus, select Edit, then Modify Hardware.

Select the "Card" database and hit Enter to go into the appropriate screen.

Using F10 for Add, create a new card number that will not conflict with other DXI card numbers (this example will use 1000).

5.2.1.1 DIO Alarm Point Output Card

If using a DIO as the alarm point output card, set the following parameters:

Name: Enter the description of the card (I.E. "CCTV DIO 1")

Exchange: Enter the Exchange number of the SAC computer(s) that this DIO is connected to on the Lonworks network (usually 1)

Net A Channel: "Remote A" for rack/wall mount DIO cards, "Backplane" for card cage DIO cards

Net B Channel: "Remote B" for rack/wall mount DIO cards, "No Channel" for card cage DIO cards

Type: Select "DIO"

Mother Card: 0

Master: Set to one of the primary master stations in the system. The SAC will send a hardware alarm message to this master station to indicate that there is a problem with the DIO.

After configuring the card, use the "Card Swap" function of the SAC software to swap in the DIO card ID number, which will activate the DIO in the DXI system.

5.2.1.2 CCTV Alarm Point Output Card

If using a serial port CCTV switcher as the alarm point output card, set the following parameters (see Section 3.4 above for serial port settings):

Name: Enter the description of the card (I.E. "Pelco CCTV")

Exchange: Enter the Exchange number of the SAC computer(s) that this switcher will connect to (usually 1)

Type: Select the appropriate CCTV switcher type (PELCO_9760DT_CTRL, etc.)

Serial Port: Enter the serial port on the SAC that this will connect to (usually 1 or 2)

Baud Rate: Enter the baud rate (must be the same as the CCTV switcher's settings)

Data Bits: Enter the number of data bits

Stop Bits: Enter the number of stop bits

Parity: Enter the parity type (None, Odd, or Even)

Flow Control: Select the type of flow control used (SW, HW, or None).

Master: Set to one of the primary master stations in the system. The SAC may send a hardware alarm message to this master station to indicate that there is a problem with the CCTV switcher if it does not respond to commands.

Log Level: This allows you to determine the level of logging of CCTV commands. A level of 5 will show the command sent to the CCTV switcher each time a camera is switched. This is useful for debugging during initial setup. Once the system has been proven to work properly, the level can be set to a lower value (1 for example) to avoid cluttering up the logs with CCTV switching commands. For extensive debugging information (usually at Harding) Log level 15 can be used.

After configuring the card, use the "Card Swap" function of the SAC software to swap in the CCTV card ID number, which will activate the video switcher driver in the DXI system.

5.2.2 Master Station Video Monitor Setup

For each video monitor, a monitor station needs to be created.

Enter the Maintenance menus, select Edit, then Modify Hardware.

The CCTV video monitor will be set up as a DXI "Station". Select the "Station" database and hit Enter to go into the appropriate screen.

Using F10 for Add, create a new station number that will not conflict with other DXI station numbers.

Set the following parameters:

Station type: Select "Monitor"

Audio Card ID: 0

Audio resource: 0

Video In Res 1:   0.0

Video In Res 2:   0.0

Video In Res 3:   0.0

Video In Res 4:   0.0

VideoOut card ID: 0.0

VideoOut resource: 0.0

Output card: 0

Output resource: 0

Exchange: Enter the Exchange number of the SAC computer that this switcher will connect to (usually 1)

Station has LED: 0

Station camera list: Enter a list of stations that have cameras that this video monitor will display (I.E. "2001, 2005, 2101-2104" if stations 2001,2005,2101,2102,2103, and 2104 have cameras that will be displayed on this monitor)

Stn-Camera map: Hit 'Enter' on this field. At the bottom of the screen, the DXI will display a station number (from the above list) and ask you to enter the card and channel number for the alarm output point (separated by a period). For example, if you want station 2001 to turn on alarm output point 2 on the DIO or CCTV card #1000 when it is connected, you would enter "1000.2" when "Stn # 2001" is displayed at the bottom of the screen. Once all of the stations in the "Station camera list" are entered, the bottom line will turn blank and the cursor will return to the selection fields.

5.2.3 Intercom Station Camera Setup

All of the camera to video monitor setup for this type of CCTV switcher is handled in the "monitor" station setup, so nothing needs to be done here. In particular, leave the "Video In Res 1" to "Video In Res 4" sections at the default 0.0 settings.

5.2.4 Master Station / Video Monitor Association

For each master station with a video monitor, you need to associate the master with the video monitor.

Enter the Administration menus, select Edit, then Modify Software.

Select the "Master" database and hit Enter to go into the appropriate screen.

Go to the master ID number with page up/down or by using the search function.

Change the "Monitor ID" field to the station number of the video monitor. This is currently on the second page of the master station configuration.

5.2.5 Video Monitor Setup

This step is optional, and just sets a readable name for each video monitor to make the log files more understandable.

Enter the Administration menus, select Edit, then Modify Software.

Select the "Station" database and hit Enter to go into the appropriate screen.

For each video monitor, go to the monitor group ID number with page up/down or by using the search function.

Enter an appropriate name for the video monitor in the "Name" field (I.E. "Master 1 Video").

5.2.6   Station Camera Switching Mode

In section 3.1, there are two mechanisms that the DXI system can use to determine when to switch the CCTV camera to the video monitor. The default is to switch the CCTV camera to the video monitor only when a call is currently connected – if this the desired method, the below steps are unnecessary.

However, if you want the DXI system to switch the CCTV camera to the monitor when the call request button is pushed, you need to tell the DXI system to use the alternate mechanism.

Enter the Administration menus, select Edit, then Modify Software.

Select the "Station" database and hit Enter to go into the appropriate screen.

For each intercom station with a camera, go to the intercom station ID number with page up/down or by using the search function.

In the "Camera starts on" field, enter "1" (for CRQ mode) to switch when a call request is received, or "0" (for call mode) to go back to the default setting (to switch when connected).

This should complete the CCTV configuration.

6. Serial Cables

If the CCTV switcher includes a cable to connect to a PC, you can use that cable directly to connect to a SAC computer.

If the CCTV switcher is a DCE, then a standard straight-through PC to modem cable can be used.

If the CCTV switcher is a DTE (like the SAC computer is), then you need a null modem cable.

The following tables show how to make a standard serial if the CCTV switcher has a standard 9 pin or 25 pin connector.

6.1 9 pin DTE (SAC) to 9 pin DCE (CCTV) straight-through cable

SAC Name	SAC Pin	CCTV Pin	CCTV Name
Tx	3	3	Tx
Rx	2	2	Rx
RTS	7	7	RTS
CTS	8	8	CTS
DSR	6	6	DSR
DCD	1	1	DCD
DTR	4	4	DTR
Gnd	5	5	Gnd

SAC end is female, CCTV end is male

6.2   9 pin DTE (SAC) to 25 pin DCE (CCTV) straight-through cable

SAC Name	SAC Pin	CCTV Pin	CCTV Name
Tx	3	2	Tx
Rx	2	3	Rx
RTS	7	4	RTS
CTS	8	5	CTS
DSR	6	6	DSR
DCD	1	8	DCD
DTR	4	20	DTR
Gnd	5	7	Gnd

SAC end is female, CCTV end is male

6.3   9 pin DTE (SAC) to 9 pin DTE (CCTV) null modem cable

SAC Name	SAC Pin	CCTV Pin	CCTV Name
Tx	3	2	Rx
Rx	2	3	Tx
RTS	7	8	CTS
CTS	8	7	RTS
DSR (connect to DCD) DCD (connect to DSR)	6 1	4	DTR
DTR	4	6 1	DSR (connect to DCD) DCD (connect to DSR)
Gnd	5	5	Gnd

SAC end is female, CCTV end is female

6.4   9 pin DTE (SAC) to 25 pin DTE (CCTV) null modem cable

SAC Name	SAC Pin	CCTV Pin	CCTV Name
Tx	3	3	Rx
Rx	2	2	Tx
RTS	7	5	CTS
CTS	8	4	RTS
DSR (connect to DCD) DCD (connect to DSR)	6 1	20	DTR
DTR	4	6 8	DSR (connect to DCD) DCD (connect to DSR)
Gnd	5	7	Gnd

SAC end is female, CCTV end is female