INTRODUCTION TO CLOSED CIRCUIT TELEVISION

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TABLE OF CONTENTS:

3 How Cameras Work
4 CCTV Identification
8 Laptop and Monitor Connections
14 Equipment used in the NW Region
21 Equipment used in the Oly Region
24 Communication w/ the Camera
26 Camera Movements
28 Wire Terminations
31 Switches
34 Internet Protocol
36 Types of Video Systems
44 Troubleshooting
46 Preventative Maintenance
47 Wiring Schematics
52 One Line Diagrams
54 CCTV ITS Drawings
57 Citations
How a camera works:

At its most basic level, a camera has a series of lenses that focus light to create an image of a scene. But instead of focusing light onto a piece of film, video is focused onto a Charge Coupled Device that records light electronically. The semiconductor device (CCD) measures light with a half-inch panel of 300,000 to 500,000 tiny light-sensitive diodes called photosites. Each photosite measures the amount of light (photons) that hits a particular point, and translates this information into electrical charges. A brighter image is represented by a higher electrical charge, and a darker image is represented by a lower electrical charge. But measuring light intensity only gives us a black-and-white image. To create a color image the CCD has to detect not only the total light levels, but also the levels of each color of light. Since you can produce the full spectrum of colors by combining the three colors red, yellow and blue, the CCD only needs to measure the levels of these three colors to be able to reproduce a full-color picture.
Closed Circuit Television Identification:

COHU 8200 MPCD

MPCD- Long camera lens.

Inside the Cabinet- large white control box with cannon plugs protruding from the base of it.

Or- rack mounted MPCD box. (Has a power switch and a green LED on the front.)
COHU 3955 iVIEW

Lens attached to housing on top. Inside the cabinet: a bi-directional transmitter or receiver with a plastic connector with 5 wires coming from the camera cable will be connected to it.
COHU 3965 iVIEW

Housing on side-series (Looks like R2D2). Inside the cabinet: a bi-directional transmitter or receiver with a plastic connector with 5 wires coming from the camera cable will be connected to it.
COHU 3925 iDOME

Lens is a half sphere on the bottom. Inside the cabinet: a bi-directional transmitter or receiver with a plastic connector connected to the control cable coming from the camera.
LAPTOP AND MONITOR CONNECTIONS:

MPC-D Wall Mount: use the cable that has a 7 pin cannon plug on one end and a RS-422 converter on the other. Remove the cannon plug labeled “INPUT”. Attach the cannon plug on the pigtail to the white control box and the RS-422 converter to your laptop.

RS-422 Connector uses: TD(A) Blk TD(B) Red RD(A) Grn RD(B) Wh

COMM CABLE FOR MPC-D Wall Mount
COMM CABLE FOR MPC-D Rack Mount
iVIEW and iDOME- use a cable that has a female plastic connector on one end and an RS-422 converter on the other. Remove the connector from the transmitter/receiver and plug it into the male plastic connector on the pigtail and the RS-422 converter to your laptop.

**NW REGION iVIEW / iDOME**
OLYMPIC REGION iVIEW CABLE
COAX- Remove the coax cable from the video feed interface and connect your coax pigtail to the cable. Connect the other side to your monitor or video card.
The coax cable plugs into the yellow connector from the tuner card. This allows you to view the video from the camera on your laptop. A portable monitor can be used instead of a video tuner card and laptop combination.
EQUIPMENT USED IN THE NW REGION

MPC-D-111 RECEIVER

Fuses
MPC-D Receivers

The terminations for the pan, tilt cable and the lens movement (zoom) cable are located on wiring diagrams located at the end of this manual.
OPTELECOM 3710 A/T Fiber Optic Video/Audio/Data Transmitter

This receiver works in conjunction with the MPC-D-111. The DB9 connector plugs into the 3710 transmitter. While the cannon plug on the other end of the factory pigtail is placed on the INPUT cannon plug located on the underside of the MPC-D receiver. The video cable plugs into the 3710 transmitter.
OPTELECOM 9221 Fiber Optic Receiver with Bi-Directional Data
OPTELECOM 9225 Fiber Optic Transmitter with Bi-Directional Data
Radiant Communications V3510-T-R Transmitter Mpeg Encoder
Side View of V3510-T-R Transmitter Mpeg Encoder
EQUIPMENT FOUND IN THE OLYMPIC REGION

International Fiber Systems (IFS) VT 4930WDM Video Transmitter and Data Transceiver
Indigo Vision 8000 Video Encoder
Side View of Indigo Vision 8000 Video Encoder
COMMUNICATION w/ the CAMERA:

NOTE: The software running program that we use is called WINMPC. It can be downloaded onto a laptop from the COHU website at www.cohu-cameras.com/tech/techndx.html.

Once you download the software, click on the WINMPC icon. A screen will appear containing lens feature control icons, latch commands (power, lens fast, auto iris, etc.), special functions, and a box labeled camera with the number 1 within it. Finding the Camera: Ascertain the DROPP ADDRESS of the camera from the SIMMS Tree or circuit list. Place this number in the box labeled CAMERA. This box is located on the left side of your screen. Then click Camera Set-Up. Go to the RECEIVER TYPE box and select MPC-D. At the bottom of the set-up page, click OK. This should establish communications with the camera. If it doesn’t work, click FIND (located next to the drop address). At this time the laptop will be trying to communicate with the camera. At the bottom of the screen you will see two boxes. One is the TX (transmit) and the other is RX (receive). When the laptop and the camera are communicating, the TX and RX boxes will contain data information. Then, a small box will appear stating that communication with the camera has occurred. Click O.K.
CHOOSING THE TRANSMITTER/RECEIVER TYPE

Receiver Type

- MPC-D
- LCU (3300)
CAMERA MOVEMENTS:

Once the camera has been found, you can move it (pan/tilt) and zoom, via the laptop operating program.

MPCD: For the MPCD type camera, latch commands ‘camera power’ and ‘lens fast’ will be enabled (red dot next to the command). Then, use the sphere (it is broken into 4 quadrants) to move the camera.

iVIEW and iDome: For these types of cameras, you will need to change the type of receiver software that you are using. Click on ‘camera setup’. Then, on the right side of the screen, you will see a box labeled ‘receiver’. Within this box is a drop table that allows you to change the receiver type. Change the receiver type from MPCD to iDome/iView. Then click O.K. at the bottom of the screen to enable this new running program. This program works only with the 3925/3955/3965 styles of cameras. This should allow you to move the camera (pan/tilt) and zoom.
**CAMERA I.D. (label):** To set the camera I.D. click on the ‘Camera I.D.’ command located on the right side of the screen.

Using the SIMMS Tree for the correct label of the camera, type that name (in caps) into the Boxes labeled ‘Line 1’ and ‘Line 2’. Then click ‘Enable (All)’ and click Close. The text should be displayed on the top left of the screen when you look at the video feed from the camera.
Terminated Cohu Cable AC27E
**TERMINATING THE CA295E CABLE**

Using Cohu Cable CA295E cut the plastic casing and the mesh wiring from the cable. Inside will be a bundle of wires. The twisted green/red with black/white plus the blue make up the wiring for a BNC connector: RED + GRN- = IN, WHT + BLK- = OUT, BLU = GRND. The coax is a size RG-59 using a style # 31-71008-1RFX connector made by Amphenol. The larger gage green, black, and white wires are used for the power. The rest of the wires are cut off and shrink tube is placed over them. The BNC connector plugs into the receiver/transmitter. The Fiber Optic pigtail is plugged into the side or bottom of the receiver/transmitter. The other end is then plugged into the Fiber Optic patch panel. RG 59 = 31-71008-1RFX, RG 66 = 31-71032, RG 22 = 31-71008 RFX.
Rugged Comm RS900L ‘Switch’ Bi-Directional Fiber Optic to Ethernet
Rugged Comm RMC 40 ‘switch’ Bi-Directional Fiber Optic to Ethernet
SMC Tiger Switch 6708L2 Ethernet Switch
Etherwan Switch

Internet Protocol (IP) addressing for Communicating with Computers, Switches, Bi-directional Receivers, Encoders, Axis Video Servers, etc.

An IP Address is a **Numerical I.D.** for a computer or a device that communicates via a network. A Sub-net Mask tells your computer or device which I.P. addresses are local to your network and where to send information. Changing the IP address and sub-net mask of your computer allows you to **communicate** with the device that you want to configure; like a switch. When a switch is new, it comes with the factory settings. In order for it to communicate on our network, we have to **re-configure** its IP address and Sub-Net Mask to ones that are suitable to our network. In order to do this, we must first (temporarily) modify our computer’s network settings. Once we have changed our computer’s network settings, we can change the IP values of the switch.

To change the IP settings of the Switch, you must open the **internet browser** at the top of the computer screen and enter the factory default IP address of the switch -Click ok. The switch will have a “home page” that will allow you to **navigate** through its settings. At this time you can enter the switch’s name, location, IP address, Subnet mask and the Ethernet Interface. Ethernet Interface refers to the switches ability to send and receive data in either half duplex or full duplex. For example, in Half Duplex information can move in only **one direction** at a time. In Full Duplex, information can be sent and received at the same time in both directions between switches.
Changing Computer Network Settings:

My Network Places- r click
Properties-l click

Local area connection- r click
Properties- l click
Scroll down to “internet protocol”
Properties- l click

Enter the IP address and the Sub Net mask address should appear

EX:

IP Add: 192.168.0.52
Sub Net: 255.255.255.0

Click OK and you should be connected
3 TYPES OF VIDEO SYSTEMS

All video systems consist of a camera, a bi-directional receiver or encoder at the field cabinet and a bi-directional receiver or decoder back at the management center.

Fiber Optic Video System- Camera images and RS 232/422 commands are transmitted over a fiber optic network via light signals.
T-1 Line Video System- Camera images and RS 232/422 commands are transmitted on a T-1 line using a line conditioner. The line conditioner changes Ethernet video and command packets into twisted pair T-1 packets for transmission over a T-1 data line.
Microwave Video System- Camera images and commands are transmitted using microwaves. Composite video and RS 232/422 commands are first encoded into Ethernet, and later into radio frequencies. The frequencies are then transmitted via microwave antennae.
Three types of microwave antennae’s are currently being used in Olympic Region: Wilan, Axxcelera and Solectek. Each antenna has a corresponding cabinet unit. This unit supplies **48 or 28 vdc** to the radio antenna and also contains an Ethernet port for programming. 120vac comes into the cabinet unit and is then changed to 48 or 28vdc. When two antennas are used to send data in different directions, two cabinet units may be connected to a switch. The bi-directional receiver may also connect to the switch using **Ethernet**. In some installations, only a crossover Ethernet cable is used to connect devices. From the switch the Ethernet goes through the cabinet unit, to the lightning surge suppressor and up to the radio portion of the antennae. At this time the Ethernet is then changed into **Radio Frequency Energy** at 5.8Ghz

**EXAMPLE MICROWAVE ANTENNAE UNITS**
EXAMPLE CABINET UNITS

SOLECTEK CABINET UNIT
AXXCELERA CABINET UNIT

Surge Suppressor

Axxcelera Cabinet Unit
REPEATER SITE

Microwaves need to have line of sight between them in order for the signal to be sent properly. A repeater site is used when obstacles such as hills and trees are present. A repeater allows the signal to be “bent” around the obstacle to keep the signal freely moving.
LIGHTNING SURGE SUPPRESSION
ALPU-TSU
TROUBLESHOOTING

**Possible Problems:**

**The camera has no video**

The camera shut itself off as a safety measure because of a power surge. Turn the camera back on by clicking on the latch command ‘camera power’.

The coax cable connector might be broken. Attach a new connector.

**Incorrect camera I.D.**

Click the box labeled ‘camera I.D.’ (right side of your screen) Look at the labels in the I.D. text boxes. Make sure it corresponds to the correct label in SIMMS and click ‘enable all’. Then click ‘close’. Check on your monitor that the correct I.D. is showing up on the screen.

**No Pan/Tilt**

Check/replace the fuse

**No power to camera**

Check/replace the fuse

For MPC-D, remove the white cover plate. For rack mounted MPC-D, The fuses are inside the unit on the top, so you must remove the unit from the rack. Then, remove the front and top covers to replace the fuses.

**F/O receiver locked up**

Re-set power to receiver/transmitter or loosen the card screws and reseat.

**Fuses are MDL .5, .75, 1.5**
### Possible Problems:

<table>
<thead>
<tr>
<th>Problem</th>
<th>Solution</th>
</tr>
</thead>
<tbody>
<tr>
<td>Blue Screen</td>
<td>No input signal coming to the color monitor.</td>
</tr>
<tr>
<td></td>
<td>Dead camera, no power to camera, broken or separated coax or video cable, center pin of coax is pulled back or cut cable</td>
</tr>
<tr>
<td>Black Screen</td>
<td>Input signal of some sort is coming to the color monitor.</td>
</tr>
<tr>
<td></td>
<td>Fully closed iris, corrosion on the coax or video fittings or connections, indoor rated cable in an outdoor environment is failing, or possibly the transmitting device (although a failed transmitter will often give you &quot;snow&quot;).</td>
</tr>
<tr>
<td>Black Screen with a Camera ID</td>
<td>The ID generator is working but the video isn't, and the causes are the same as above.</td>
</tr>
<tr>
<td>White Screen or Washed Out</td>
<td>Caused by the Iris being wide open. If it’s in manual mode check the setting and make sure it is not wide open; and if it is in auto mode check to see if it will close manually and then put back to auto and see if it washes out again.</td>
</tr>
<tr>
<td>Fuzzy Focus</td>
<td>A common indication of focus being out is that the camera is in focus in wide or narrow field of view but not both, or it is out of focus throughout the entire range. Pick a point in the far distance and zoom in on it. Then manually focus the image until clear. Then zoom back out.</td>
</tr>
<tr>
<td>Camera Movement Impaired or Oscillating</td>
<td>If it has a pan/tilt unit, the limit switch could be bad or it could be getting bad positioning info from the pan/tilt controller. Oscillation could be caused by the mounting structure or loose mounts.</td>
</tr>
</tbody>
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PREVENTATIVE MAINTENANCE

1. Notify TMC and Verify the Equipment’s Status

2. CAMERA CABINET
   A. Check all wiring, cables and terminations
   B. Check modem, server, timer, UPS, transceiver and microwave equipment
   C. Check cabinet paint, seals, locks, hinges, vents, fans, lights, thermostat, heater, etc.
   D. Check input voltage
   E. Clean cabinet and replace filter(s)

3. JUNCTION BOXES
   A. Check all junction boxes for proper elevation, remove debris and check for conduit bonding.
   B. Vegetation control
   C. Paint

4. CAMERA HOUSING
   A. Clean camera lens, housing, pan/tilt assembly
   B. Inspect cables, connectors and mounts
   C. Check humidity indicator card
   D. Inspect nitrogen pressure
      1. Pressure should be 5 PSI. Charge if necessary
   E. Inspect pan/tilt gasket, drive chains/ belts for wear and tension.
RDA = Green  RDB = Red  TDB = White  TDA = Black  Ground = Blue
Microwave One Line Diagram
Fiber Optic One Line Diagram
CCTV

Citations
