

System Innovations, Inc.

WeatherScene™

Operators Manual

November, 1998

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**WeatherScene™ Operators Manual**  
**Revision Sheet**

<b>Date of Change</b>	<b>Description of Change</b>
11/01/98	Version 1.0 issued.

# Section 1

## General Information

### System Overview

WeatherScene™ is a state-of-the-art, highway monitoring system. It collects video images and weather data at remote locations, with optional capabilities such as traffic flow, solar radiance, precipitation, and highway roadbed information (refer to fig. 1.1). The information is compressed and transmitted via a communication architecture to a central Control Display Unit (CDU). The CDU controls the remote units, displays video, archives the video, and monitors and archives the weather data, traffic flow and roadbed conditions.

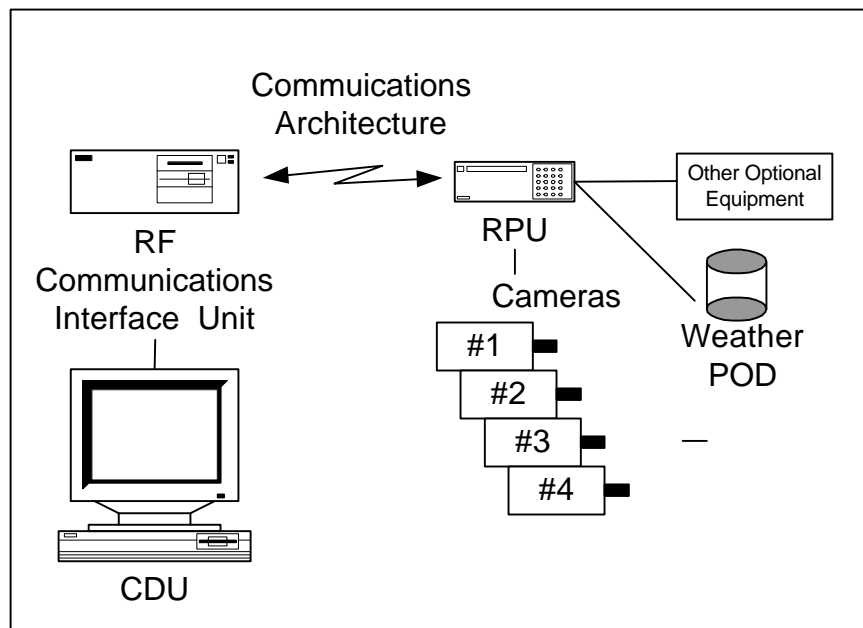


Figure 1.1 WeatherScene™ Block Diagram

The CDU consists of a personal computer (PC) with a high resolution monitor and a RF Communications Interface Unit (RFCIU) that connects via the communications architecture to the remote units located along the roads being monitored. It also can distribute data to other customers via a dial-up modem connection, local area network (LAN), or the Internet.

A WeatherScene™ standard remote site consists of numerous data acquisition subsystems that are integrated to collect and transmit data to the CDU.

The Remote Processor Unit (RPU) processes the data and controls the system at the remote site. It controls the collection of video, weather, traffic flow and road conditions data, compresses the video images, employs power management techniques to decrease power consumption and transmits all the information back to the CDU.

The RPU can handle up to four cameras of any mix of color or black and white (b/w). Each camera can be installed with a mixture of interchangeable lenses. They can be arranged to provide panoramic (360°) coverage or aimed at critical high traffic areas

The weather pod provides temperature, barometric pressure, humidity, visibility, average wind velocity, wind gust velocity and wind direction.

All data acquisition sensors/devices (cameras, weather pod) are mounted on a cross-member and brace assembly supplied by System Innovations. The mounting system is mounted on a pole or structure supplied by the customer.

Power to the remote system can be supplied by a variety of ways depending on the availability of AC power. Combinations of AC power, rechargeable batteries and solar power can supply power to the RPU and roadside equipment.

The communications architecture that links the CDU and the RPU is extremely flexible. A common phone link, a low power RF link or a combination of the two can link the RPU to the CDU. For example, the RPU is located near, but not next to an accessible phone line, the RF communications link can send and receive information to a communications interface unit connected to a nearby phone line. The information is then interfaced via a phone modem and sent to the CDU over the phone line. Another example is by using an existing phone line at the installation site and directly connecting the modem to the phone line and the RPU. In either case, all information, video and command via the communications architecture will be transparent to the user.

## **Optional Features**

WeatherScene™ hardware is the same or similar to assemblies that were developed and marketed by System Innovations for other applications. Its software is also based on a fundamental monitoring concept/capability that is used by several remote sensor systems. Consequently, your system may not use all the features/options illustrated in the software. Below is a list of optional features. Contact Systems Innovations for assistance with integrating or upgrading the basic highway monitoring system with any of these capabilities.

- The road sensors are inserted in/under the traffic lane surface. They provide analog information to the road sensor controller which determines road

surface temperature, chemical saturation (surface salinity), estimated surface freezing temperature (based on surface salinity) and road conditions.

- The Remote Traffic Microwave Sensor (RTMS) collects traffic flow information. The RTMS subsystem is a mini radar. RF energy is used to count vehicles (volume), determine percent of lane occupancy, identify the average speed of traffic and either count long vehicles or give the average time interval (headway) information on up to 8 lanes of traffic. The RTMS is a commercial system that System Innovations integrated into WeatherScene™ to provide a more complete view of highway activities.
- Since the WeatherScene™ RPU is designed to minimize power consumption, a solar array with sealed lead acid batteries is available if commercial AC power is not accessible.
- Low Light Camera Systems. WeatherScene™ is designed to work with all camera/lens systems and thermal imager that produce either a NTSC (RS-170) or CCIR (PAL) output.
- Pan, Tilt, Zoom Camera System. A pan, tilt, zoom camera head that is controlled with the CDU software is available.
- Remote Controlled Relay. A remote relay (2 amp), that the CDU operator controls, is available. This allows remote activation of devices such as electronically operated gates, door locks or a remote caution light activation.
- Infrared Illuminator. An infrared LED illuminator can be integrated with low light b/w cameras to give a limited “night vision” capability.
- Relay Unit. This relay unit is available to receive and transmit weather and video data from distant RPU locations to the CDU or the RFCIU in situations where direct RF communications is not possible. This is used to extend the RF link of the communications architecture.
- An optional solar radiance sensor can also be included as a separate sensor that will provide a measurement of the solar radiance from a whole hemisphere. It is suitable for measuring global sun plus sky radiation.
- Water depth and flow sensor that measures the actual water depth and makes flow measurements which are transmitted back to the CDU for display and archiving.

## Section 2

### Theory of Operation

#### Remote Site Hardware

Remote Processing Units (RPU) are the “eyes” of the WeatherScene™ system and controls all activities at the roadside. All ancillary equipment is connected to the RPU that is connected via the communications architecture to the CDU. One of the big advantages of the WeatherScene™ system is its low power consumption, which allow it to be installed virtually anywhere with little infrastructure support. All the assemblies at the remote sites are designed and integrated to conserve power. Power management is further optimized by placing all the command/control functions at the CDU (minimizes remote site data processing), compressing the video data and turning on the electronics assemblies/components only when needed.

Normally, all the subsystems, except the Road Traffic Management System, are powered down to a reduced power mode or sleep mode awaiting a command from the CDU. When the CDU or Operator requires information (weather data, traffic flow information, road conditions or video images), a request for the information is sent to the RPU over the communications architecture. The commanded remote site sends its status, acknowledges the command and performs the task. When the requested information has been collected, the RPU sends the data back to the CDU over the communications architecture. How the RPU collects the weather data, road conditions, traffic flow information and a video image is described below.

Weather Monitoring. Weather data is provided by the round Weather Pod that is mounted on the WeatherScene™ supplied mast assembly. Standard meteorological data (average wind speed, wind direction, wind gust velocity, temperature, humidity, barometric pressure, and visibility) is collected by the WeatherScene™ System. The weather pod during installation is oriented towards north and the wind direction is calculated from the POD orientation. When the operator requests weather information, the CDU will send a “Get Weather” command to the selected RPU. The RPU passes the request to the weather pod where the data acquisition sequence is started. It takes approximately 5 minutes to cycle through all the weather sensors and sequentially collect the information. All collections are “snapshot” data acquisitions over a preset time period. For example, the average wind speeds and peak wind gusts are taken during a 153 second window. After the weather has been obtained, the Weather Pod transfers the data to the RPU where it sends the data back to the CDU via the communications architecture.



Video Monitoring. The WeatherScene™ System can provide near real-time video of road conditions using up to four black and white, infrared, and/or color cameras on the WeatherScene™ mast assembly. The type of cameras can be mixed if desired to provide image flexibility. For example, two color cameras can provide daytime monitoring of the road and two IR cameras can provide night or low light coverage, thereby providing 24 hour video monitoring coverage. In addition, a variety of fixed lenses can be mixed with the cameras to provide additional viewing coverage – wide angle for maximum viewing of the road, telephoto to extend the viewing distance of the camera. The operator has two choices when requesting video with the WeatherScene™ system: “Grab Frame” and “Real Time Video.” the “Grab Frame” video command is sent out from the CDU, the RPU will power up the selected camera and obtain a single frame of video data. This is often referred to as a snap shot view. Once the single frame of data is obtained, it is sent via the communications architecture to the CDU for processing and viewing. The “Real Time Video” command continuously cycles sending back multiple video images of the road conditions or traffic. The frame rate when using “Real Time Video” is dependent on the amount of data compression the operator has selected on the main screen. With a large compression ratio, the video file is smaller and the display frame rate is higher. Conversely, if the compression ration is low, more data needs to be transmitted and processed, therefore the frame rate is slower. This will continue until the operator halts the activity.

In both cases, each video image is collected, digitized, compressed and sent by the RPU as a digital file to the CDU via the communications architecture. A proprietary algorithm is applied to the video image to reduce the size or compress the video file. The amount of compression is selectable by the operator. WeatherScene™ has the option to save individual video files in the JPEG format that can be viewed by third party software (Corel DRAW, Adobe Photoshop, Paint, etc.)

Once the requested activity has been completed, the RPU goes back into its sleep mode (only the receiver and RTMS remain powered up).

Road Conditions Monitoring. The Road Conditions sensor subsystem is an optional subsystem comprised of two road sensors that are implanted in the highway roadbed surface and subsurface to measure highway temperature, chemical saturation (salinity) and surface moisture. A separate road sensor controller that is connected to the RPU controls the road sensors. When the operator requests road sensor data, the CDU sends a request to the RPU, which powers up the road sensor controller, requests the road conditions, and temporarily stores the information. The controller also computes the anticipated freezing temperature, and determines chemical saturation (surface salinity). To conserve power, after the RPU receives the data, it automatically powers down the road sensor controller.

Once the RPU receives the data, it automatically sends it to the CDU via the communications architecture.

Traffic Flow Monitoring. The Road Traffic Monitoring System (RTMS) is an optional mini-radar that can cover up to 8 lanes of traffic in the “Sidefire Hwy” mode. When activated, traffic flow statistics are collected constantly by the RTMS stored at a user determined preset interval (10 – 600 seconds). The interval statistics are automatically transferred to the RPU, which sends the information via the communication architecture to the CDU. The RTMS provides statistics on lane occupancy, traffic volume and traffic average speed.

Solar Radiance Monitoring. An optional solar radiance sensor can be installed to report the amount of solar radiance received from the whole hemisphere. The solar radiance sensor incorporated in the WeatherScene™ is a commercial off the shelf sensor. The sensor is supplied power and controlled by the RPU. The solar radiance measurement is automatically obtained whenever the operator requests weather via the main screen. The solar radiance sensor requires calibration at least every 2 years.

River/Stream Monitoring. An optional water depth and flow measuring sensor is available that can monitor the water levels and flow of a river or stream and send the information back to the operator for observation and analysis. Alarms can be set up that will notify the operator if the river or stream approaches flood level or has increased flow rates that could produce dangerous conditions for a bridge or overpass.

## **RPU Power System**

As mentioned earlier, the WeatherScene™ system is designed to minimize power consumption at the roadside. This feature reduces and simplifies installation by reducing or eliminating costly infrastructure improvements at each installation site. WeatherScene™ can operate with several power options that can be specifically tailored to the operators existing site conditions. If AC power is available, the system can be tied directly into 110/120VAC 50/60 hertz power. If AC power is not available, a DC Solar/Battery option can be installed without forcing the addition of AC power infrastructure to the installation site.

The solar power system is designed to provide continuous DC power to the remote site and has sufficient capacity to sustain the site during cloudy/inclement periods for up to three days in duration and requires limited maintenance. The solar power system is comprised of:

Solar Panels: Solar energy is collected using two 60-watt photovoltaic panels and currently uses two Solarex MSX-60 solar panels. Each panel

has an operating voltage of 17.1 VDC and a load current of 3.50 amps. They are warranted to provide 80% of their rated power output for 20 years. A shunt regulator is installed on each solar panel to protect the charging circuit and prevent overcharging the batteries.

Sealed batteries: Four 33 Amp/Hr lead acid batteries are supplied to store the energy captured by the solar power system. These batteries are commercial off the shelf batteries and can be purchased from either System Innovations, or any battery supplier. These batteries have sufficient capacity to power the system during overcast and cloudy days. The battery bank has a high capacity to preclude excessive discharge, thus extending its life expectancy and reducing long term system maintenance costs.

### **WARNING**

It is possible to install NiCad rechargeable batteries in the system. However, the charging circuitry of the solar panels will not operate correctly and damage or fire can result by using the NiCad batteries.

## **Communications Architecture**

The communications architecture between the remote processing unit and the central monitoring station can use a variety of communication paths. Again, flexibility and reduction in infrastructure are the major advantages of the WeatherScene™ system. The following figures show the basic communication architectures that are commonly used in major system installations.

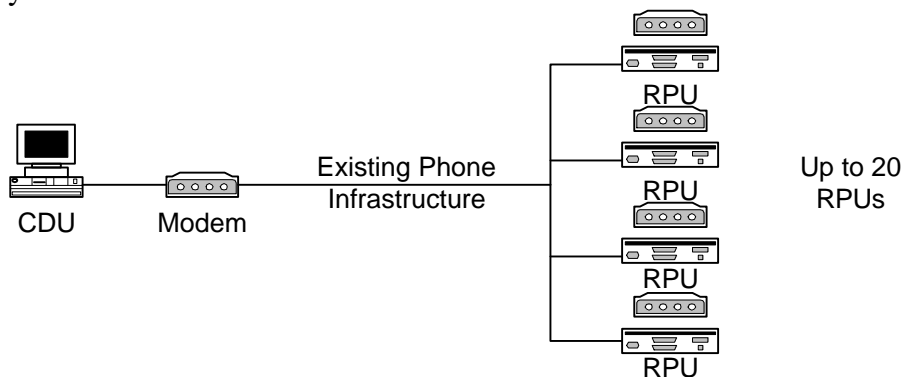


Figure 2.1 Communications Architecture Using Existing Phone Infrastructure

Figure 2.1 shows the communications architecture at an installation site that has access to existing or easily installed phone lines. Each of the RPUs has commercial off the shelf

(COTS) external modems that when commanded by the CDU will send the data using standard modem protocols. To obtain data from the RPU, the CDU uses Windows 95/98 modem commands, calls the selected RPU and requests the data. The RPU obtains the data and sends it back to the CDU. Once the data has been successfully received by the CDU, the call is automatically terminated. The CDU can be configured to call up to a maximum of 20 RPUs on an operator set schedule or an impromptu schedule, as the operator desires.

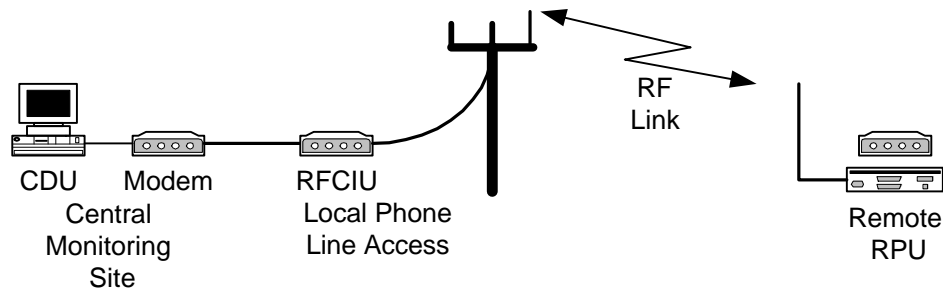


Figure 2.2 RF Communications Link to Local Phone Line

Figure 2.2 shows a different communications architecture where local phone lines are not present at the installation site but are nearby. Instead of having to bring in the phone lines, WeatherScene™ can relay the data via an RF line of sight communications link. The data is then transmitted to a more convenient point where phone service is already available. Once the data arrives at the local phone node, it is then injected via a COTS external modem connected to the RFCIU and forwarded to the CDU. In addition, if necessary, a repeater can be installed in the RF communications path that can further increase the distance between the WeatherScene™ installation site and the local phone node.

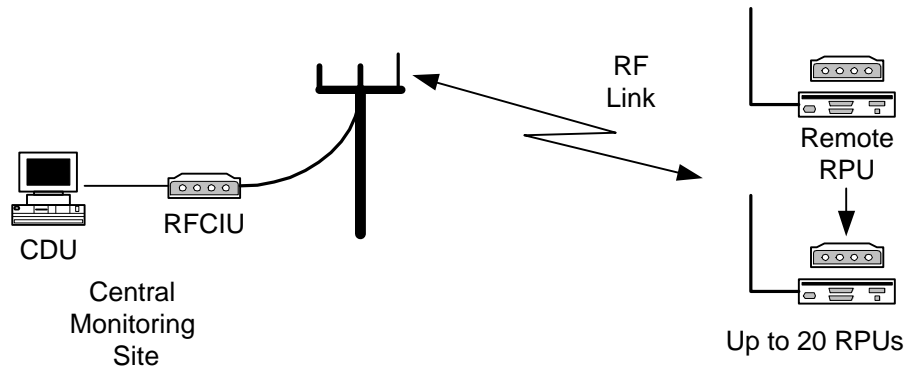


Figure 2.3 Direct RF Connection to the RPUs

In Figure 2.3, the Central Monitoring site is directly connected via the RF communications architecture to a maximum of 20 RPUs that are remotely installed. Each RPU must be within RF communications line of sight of the RFCIU antennas. Normally, the RFCIU

antennas are mounted on a very high point of ground or structure. The RPU's are located along a valley highway that can clearly see the RFCIU antennas. The RFCIU is directly connected to the CDU for control and image viewing. It must be noted that the CDU can be part of a larger network via the software to make the WeatherScene™ information available to all or part of the network.

Figures 2.1, 2.2 and 2.3 depict the basic communications architectures for the WeatherScene™ system. WeatherScene™ data can be for example injected via a dedicated Internet server on to the Internet and be accessed via any Internet service provider. The data can also be sent to a Wide Area Network (WAN). All these types of communications architectures are possible with the flexibility of WeatherScene™.

## **Control Display Unit Hardware**

### **Overview**

The CDU is installed at a centralized location where all the WeatherScene™ data is integrated and viewed by the operator. The CDU also controls the actual data collection of the RPU's and can directly monitor a maximum of 20 Remote Processing Units.

### **Control Display Unit Personal Computer**

The CDU desktop computer controls all system activities. It displays and archives data. It initiates and controls all those tasks identified in Section 3 (Operations). It is a commercial off the shelf (COTS) PC, with these minimum requirements:

- Pentium II, 300 Mhz or higher
- 16 Mbyte RAM, 32 Mbyte
- Two serial comm ports
- 1024 x 768 video card
- Mouse (PS/2 mouse or RS-232 mouse with a third comm port)
- Modem and/or network card are required if you plan to connect add-on viewers to the CDU
- 17" inch, 1024 x 768, .28 dpi, video monitor

It is imperative that you utilize a PC with the fastest CPU speed possible since downloading and displaying the video frames consumes data processing resources. Refresh rates are tied directly to task completion (clock speed). It is recommended that the CDU PC be a dedicated computer and not be used for other computing tasks due to the demanding tasking of the WeatherScene™ data.

## **CDU Software**

WeatherScene™ software is provided with a Windows 95/98® **SETUP** program that automatically installs the appropriate program elements on your hard drive. Operation of the WeatherScene™ software is provided in Sections 3 and 4.

## **Optional Equipment**

### **Remote Device Activation**

The operator at the central monitoring site can activate an auxiliary relay on the RPU. Uses of this capability are: to “open a door or gate to allow an authorized entry”; “turn on a light or preset traffic message board “; or broadcast an audible warning. A 12 VDC 50-watt relay is used to switch any customer provided external signal. The relay can safely handle a maximum of 300 VDC or a 2 amp load as long as the 50 watt limitation isn’t exceeded.

### **Infrared Illuminator**

An optional infrared illuminator can be used with a b/w camera to give a “night-vision” capability to the WeatherScene™ system. Most b/w, CCD cameras have a limited infrared (1 – 1.7 micron wavelength) capability. By using an array of infrared LEDs, it is possible to illuminate a 30 degree field of view out to approximately 75 yards. The illuminator is powered up with its associated camera unit and cycled off when done to conserve power.

# Section 3

## Software and Control

### Overview

After the operator configures the system, WeatherScene™ collects and archives data autonomously. This section describes how the operator (at the CDU) programs, controls, views and records video, and status information, from the RPU using the WeatherScene™ software. This section of the manual is not meant to dictate concepts of operation for WeatherScene™ system users, but is a guide for performing system activities.

The control hierarchical chart (Ref to Fig 3.1) shows top-level features/ functions that are available in the operational software. Optional features of the software such as the Device Activation are indicated on the chart by dashed lines.

The procedures in this section provide steps to exercise the features. Housekeeping routines for data transfer and storage are provided in Section 4.

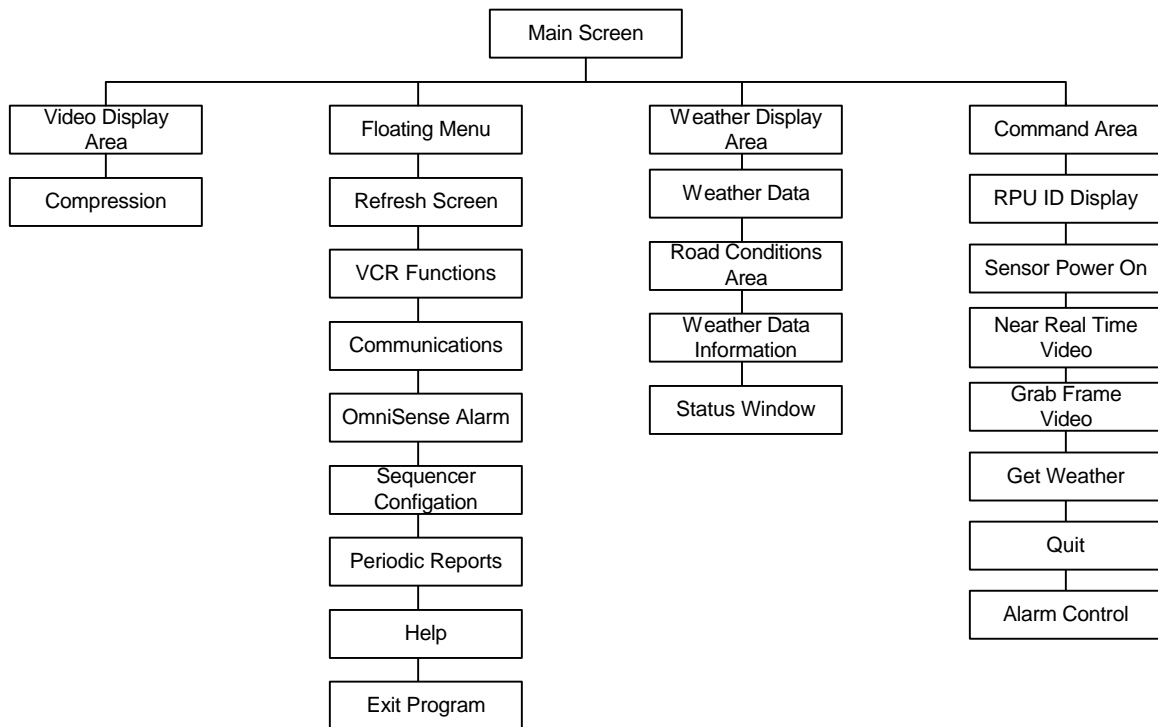


Figure 3.1 WeatherScene™ Program Hierarchy

## **Windows 95/98® Procedures**

An operator should be familiar with Windows 95/98® point-and-click operations. It is assumed the operator knows how to “click” or “double-click” on an icon or menu item with the left or right mouse buttons, without further elaboration. In operations with the mouse, assume the left button is used unless specified which button to use. If the window provides a hot-key option (which is denoted by an underlined letter within the menu option), the operator can use the hot key instead of the point-and-click method. Using the arrows keys to highlight the desired menu item and selecting it with the ENTER key is a third option.

The control software is organized such that by using a combination of the mouse and the right control button, the operator can maneuver through the various selections to the control command that is desired. Please review the hierarchical diagram in Figure 3.1 and become familiar with the overall command and control scheme of the WeatherScene™ software.

## **Fixed and Laptop Displays**

Due to the differences in video screen sizes and resolution, WeatherScene™ Control Software is available in two versions. The software and how the system works is identical except for the initial WeatherScene™ screen. For fixed systems where the software is installed on a 17 inch, high resolution monitor, the main screen allows the operator to view 2 video images at a time on the screen. The laptop version (WeatherScene LT) allows the operator to view only a single video image at a time. This is due to the display limitations of the laptop LCD display. For this manual, the full version will be discussed, however, all software and control screens and how they operate are identical in both versions.

## **Getting Started**

When the WeatherScene™ software was installed, a program shortcut was automatically created to place an “WeatherScene™” icon on the Windows 95/98® desktop. Double-click the icon to start activate the WeatherScene™ program. A warning box is displayed to remind the operator that decompressing and displaying the video images requires extensive computer resources and can be adversely affected if other programs are running in the background. Use the mouse or press the ENTER key to acknowledge the warning.

## **WeatherScene™ Main Screen**

This is the main display screen (Ref to Fig 3.2) used by the WeatherScene™ software. It consists of three sections: Video frame display; Status window; and Command area. All of the set up and monitoring features of the WeatherScene™ software are accessible from either this display or from a floating menu that is accessible by activating the right button



while the mouse is located within the video frame display area. The floating menu is described later.

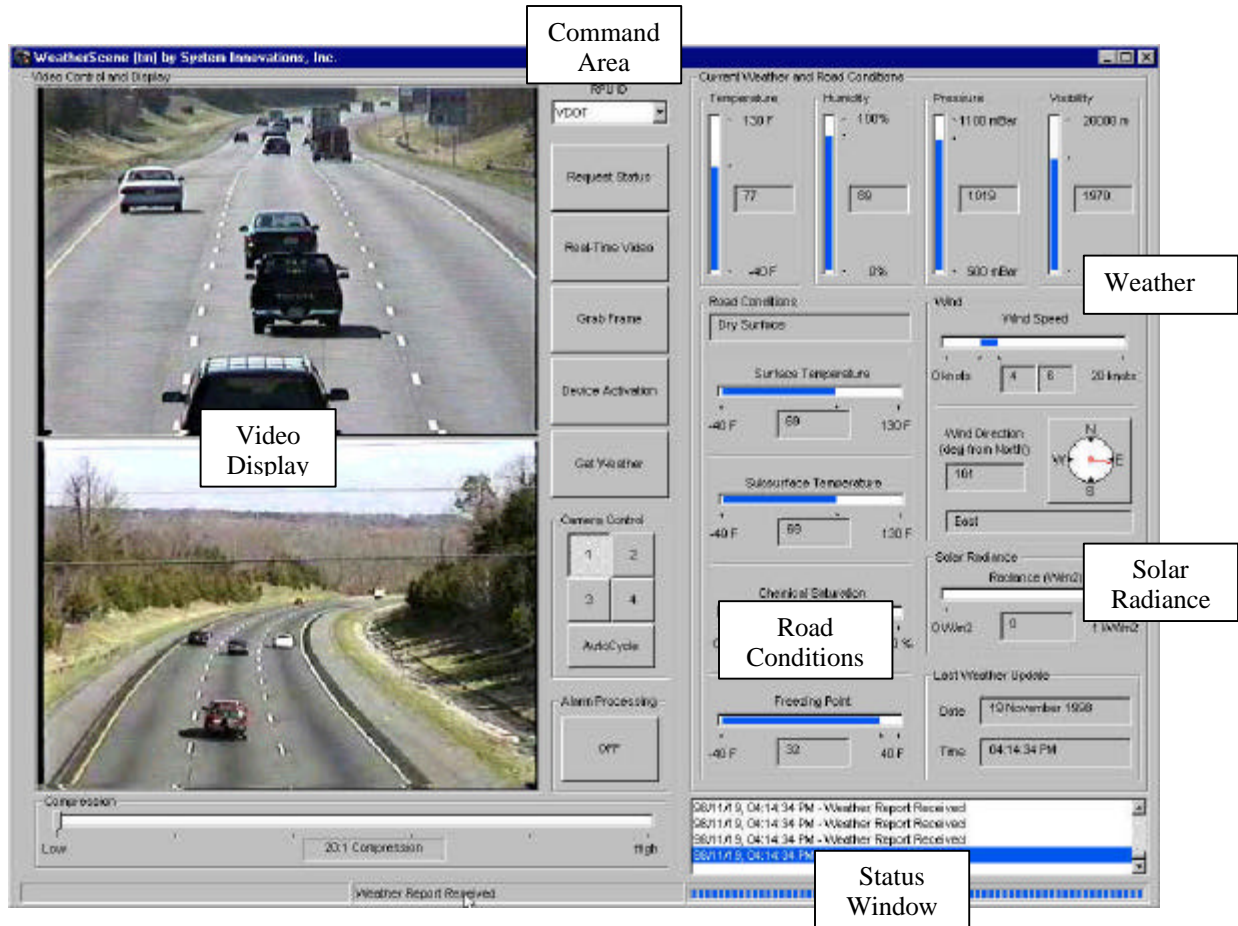


Figure 3.2 WeatherScene™ Main Screen

### Video Frame Display

The Video Frame Display is the large left hand section of the main screen. This is where the actual video images are displayed from the video data coming from the cameras (max. of 4) of the selected RPU (identified in the "RPU ID" window in the command area). The video image is controlled by the camera selected in the Camera Control area on the right hand side of the main screen. For example, select Camera #1 and the system will command the RPU to obtain an image from camera #1 which is then transmitted to the CDU and displayed in the Video Frame Display area.

### Image Analysis Window

The Image Analysis Window is designed to assist the operator with reviewing activities of interest. Double-click in the video frame area with the left button. The desired video frame will be expanded to fill the full video frame in the image analysis window. There

are three features/functions available in the image analysis window: electronic zoom, save image (.bmp, .gif, .jpg, etc.) and open/import a previously stored image (.bmp, .gif, .jpg, etc.). Right click anywhere on the image analysis window to display the floating menu and access the features.



Figure 3.3 Image Analysis Window

### Electronic Zoom

From the image analysis floating menu (Ref to Fig 3.4), you can zoom in on the video frame of data. It is possible to zoom from 1:1 to 10:1.

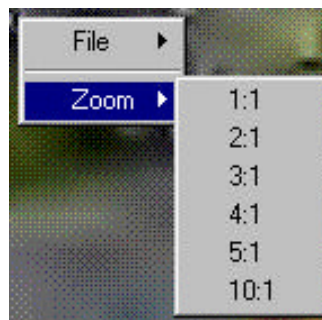


Figure 3.4 Image Analysis Zoom Feature

## Saving the Image

The video frame in the Image Analysis Window can be saved as an image file (.bmp, .gif, .jpg, etc.) using the floating menu. Use the right button to bring up the floating menu. Right click on “File” (Ref to Fig 3-5), and “Save Image”. A “Select filename” window (Ref to Fig 3.6) appears. Use the mouse and keyboard to determine where the file will be stored, what type of file (.bmp, .gif, .jpg, etc.) and the file name before you left click on the “Save” button with the mouse.

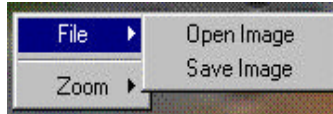


Figure 3.5 Save/Open Image Submenu  
(Image Analysis Window)

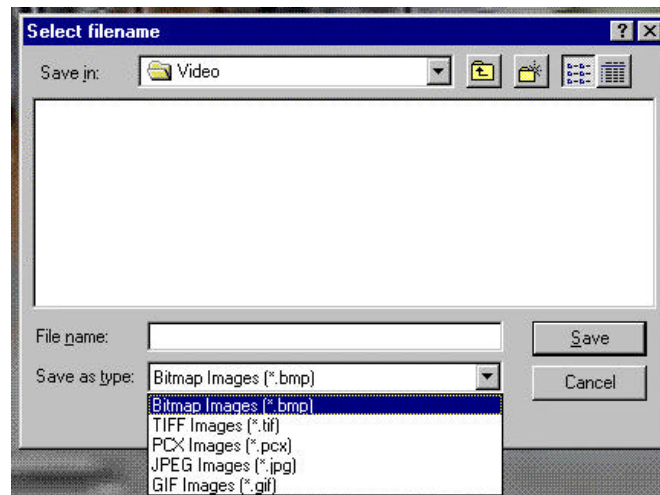


Figure 3.6 Saving an Image Analysis Window

## Open an Image

After the Image Analysis Window is opened, any stored image can be imported for analysis using the floating menu. Use the right button to bring up the floating menu. Right click on “File” and “Open Image”. A “Select image” window (Ref to Fig 3.7) appears. Use the mouse and keyboard to select the file you wish to view.

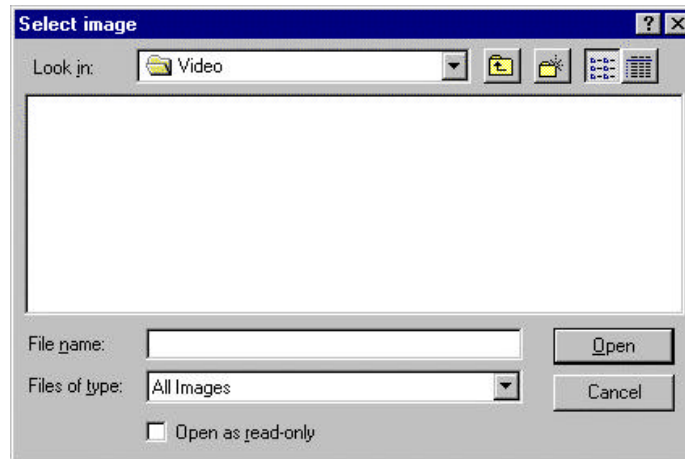


Figure 3.7 Open an Image

## Compression

The video compression slider bar is located at the bottom of the video display area. The operator can change the amount of compression the system uses when taking the video image. A higher compression ratio of video data allows faster transmission of the data and creates more efficient file management but sacrifices video frame resolution. Smaller compression ratios increase transmission time, but video frame resolution is better. The default setting is 20:1, which gives the highest video frame resolution. Compression also effects the display frame rate when viewing “Real Time Video”. The lower compression ration requires more time to receive the video data and process it for viewing. Conversely, a high compression ratio will reduce the amount of data in the video frame and speed up the transmission time and processing time required to display the image.

To change the compression ratio, click on top of the sliding bar in the “Compression” window. Hold the left button down and while moving the sliding bar toward the desired setting. Release the button at the desired setting. You can also move the cursor inside the sliding bar area by clicking on the white space and using the left/right keyboard arrows to move the sliding bar in preset intervals from 20:1 to 500:1.

## Status Window

At the bottom right of the WeatherScene™ main Screen (refer to Fig. 3.2) is a status window that shows the system status messages as they occur and when the last weather check was performed. When an RPU reports its status, transmits video, sends weather/road condition data or the operator initiates a command to obtain data from the RPU, a status entry is made in the window. The current date, time and a text description of the event are displayed. All entries are stored in the “Activity.log” file in the “C:/Data” subfolder on the hard drive. If video files are recorded, for future reference, it is recommended that the “Activity.log” file is saved also. The “.log” file helps complete the information on the events under which the video data was captured.

If you click the right mouse button in the status window, a floating, “Clear Message Area” menu appears. A left mouse button click clears the status window, but doesn’t erase the “Activity.log” file.

Date and time stamps for the weather and road condition data collection is also displayed in the status window. This data is software controlled and can’t be manipulated.

## **Command Area**

Functions and features that are routine and performed regularly are placed in the middle section of the WeatherScene™ Main Screen. (Ref. to Fig. 3.2)

The command area is comprised of several command buttons that the operator can use to: change RPUs; request RPU status; request weather data be obtained; change or request a single or multiple video frames; select a single video camera; control a remote relay(optional); activate weather or traffic alarm processing. These functions are described in further detail in the following paragraphs.

### **RPU IDs**

This data field displays the RPU (more than one RPU can be monitored by the CDU) that is currently providing both weather and video data on the main screen. A maximum of twenty RPUs can be configured (via the floating menu) for each CDU. The RPU IDs are set at the factory and cannot be changed. To determine the RPU ID, each RPU has a serial number and ID number tag affixed inside the RPU case. For large WeatherScene™ systems, a system configuration sheet will be provided for each CDU that lists all the RPUs assigned to the system. Configuring the RPU is done in the Communications/RPU Identification Menu (Ref to Figure 3.18).

To change WeatherScene™ RPUs;

1. Click the data field arrow to see all the RPUs that are configured for this CDU.
2. Highlighting the new RPU ID and click the left button to select it.
3. The new RPU ID will now appear in the Sensor ID message window.

### **Status Request**

This feature queries the RPU shown in the RPU ID window for its current status. Normally, if the RPU is operational, the return message will report “STATUS OK”. This command can also be used to verify the operational status of the communications links between the CDU and RPU.

To initiate a status request:

1. Click on the “Request Status” button in the command area of the display.
2. The CDU will send a query to the RPU
3. Observe in the Status window a “ RPU XXXX Status OK”.

## **Real-Time Video**

This button requests the multiple capture and transmission of streaming video frames from the RPU identified in the “RPU ID” data field and the camera selected (1-4). If AutoCycle is selected in the camera control box, then the images displayed will be alternately displayed (i.e. cameras 1 & 3 will alternate in the upper video display area, and 2 & 4 will alternate in the lower display area.) through all the cameras that are connected to the RPU and continue to alternate until “Real Time Video” is deactivated or the hard disk fills up if the images are being saved.

To start collecting real time video:

1. Click the “Real-Time Video” button.
2. Observe request for video in the status window.
3. Observe display of the video image(s) in the appropriate window(s) as requested in by the Control Buttons.

## **Grab Frame**

A single video frame (from the selected RPU shown in the RPU ID data field and camera selected by the Camera Control Buttons) can be requested with the “Grab Frame” button. Grab Frame feature is a good method to quickly check the highway for traffic or inclement weather conditions.

To collect a single video frame:

1. Select the RPU ID and the Camera
2. Click on the “Grab Frame” button in the command area.
3. Observe request for video in the status window.
4. Observe the video image being displayed in the video display area of the CDU.

## **Device Activation (Optional)**

This optional feature allows the operator to control relay activated devices connected to the RPU. These can be for example, warning lights, entrance gate, message signs, etc.. The RPU relay is de-energized (N.O or Normally Open) and when the “Device Activation” control button is activated at the CDU, the relay in the RPU (identified by the RPU ID) is energized (closed). If this option was not purchased, this function is disabled in the software and should be ignored.

To activate the Device Relay:

1. Click on the “Device Activation” button to manipulate the remote device.

NOTE: Always ensure the “Device Activation” feature is not active, when it is not needed or was not purchased. “Device Activation” turns on additional control electronics and wastes battery power.

## **Get Weather**

The “Get Weather” button is used to request weather from the selected RPU. WeatherScene™ is designed to obtain routine meteorological updates based on the operator’s requirements and remote site power capacity. However, if weather information is immediately required for critical traffic management decisions, the Operator can immediately request weather data with the “Get Weather” button. Once the RPU receives the get weather command, the weather pod will start the 5 minute weather data acquisition cycle. After 5 minutes, the data is transferred to the RPU and retransmitted to the CDU for display. This control feature allows the operator to force an update when the situation warrants. Optional road condition information and a solar radiation measurement are also updated. The latest weather information is always displayed in the Weather information area of the main screen. The date and time of the observation is also displayed at the bottom of the main screen.

The weather data is automatically archived in a data file on the CDU computer hard drive and can be exported into various database or spreadsheet third party software. See Section 4 for more information on the archive process.

To “Get Weather”:

1. Left click on the “Get Weather” control to update weather and road condition data. The “Last Weather Update” and “Activity Log” in the status window will update to reflect the activities that occur because of this action.

## **Camera Control**

This section of the Command area (Ref to Figure 3.2) allows the operator to select one of the maximum of four cameras connected to the RPU or select the AutoCycle mode.

### **Single Camera Control**

The operator can manually select one from the maximum of four cameras that can be attached to the RPU. Once the operator has selected the camera, the operator selects either “Real Time Video” or “Grab Frame”. The RPU will collect the video data and

transmit it to the CDU for display. Either a single frame or continuous video data, respectively, will be displayed from the selected camera.

### **AutoCycle**

This setting works with only with the “Real-Time Video” button and allows the operator to view video data from all the cameras attached to the RPU. The RPU will automatically acquire a video image from all the cameras and sequentially send them to the CDU for display. This will continue until the operator deselects the “Real Time Video” button.

### **Weather Information Area**

Weather information is shown on the right side of the WeatherScene™ main screen (Refer to Figure 3.2). The latest weather data from the RPU that is listed in the RPU ID window is displayed automatically as it is received. Weather parameters such as: temperature, relative humidity, barometric pressure, visibility, solar radiance, average wind velocity, gust velocity and wind direction are displayed in graphical and numerical form. These values reflect actual weather data at the roadside and cannot be changed. Time and date the weather information is displayed at the bottom of the main screen in the “Last Weather Update” box. The time and date assigned to the weather data is the internal date/time of the CDU as the weather is received from the RPU.

**NOTE:** It is very important that the CDU Windows 95/98 internal clock is set to the proper time and date or data archive files that are automatically generated by WeatherScene™ can be corrupted.

### **Road Conditions Information Area**

If the optional road condition module is connected to the RPU, additionally road condition information is acquired from two sensors implanted in the highway whenever the weather is collected or updated. A text description (Dry Surface, Wet Surface, Wet Surface – Below Freezing, Partially Frozen Surface, Dew on Surface and Frost on Surface) of the road conditions, actual road temperature, chemical saturation (surface salinity) and the road’s freezing point (computed using the road temperature and road surface salinity) are displayed. These values reflect actual highway conditions and cannot be changed.

### **Solar Radiance Information Area**

If the solar radiance module is connected to the RPU, WeatherScene™ will provide the solar radiance from a whole hemisphere that can be viewed by the sensor. The unit is a



pyranometer sensor using a silicon photodiode as the sensing instrument. The unit of measurement is given in watts/meter<sup>2</sup> and is shown in the Solar Radiance area of the Weather Information Window. The solar radiance is measured and updated whenever the “Get Weather” command is sent to the RPU and updated whenever new weather information is to be sent to the CDU.

## Floating Menu Functions/Features

The System Monitor and Status Display is geared to put those functions and features required for daily/routine operations at the operator’s fingertips without cluttering the window. Additional, less frequent, setup and control functions (Ref to Fig 3.8) are accessible through a floating menu. For example, some of these tasks are: Installing a new RPU, Saving video image data, Setting up a periodic report schedule, or accessing the Help pages.

To view the floating menu, position the mouse anywhere on the System Monitor and Status Display area, except the status window, and click the right button. The floating menu will automatically appear.

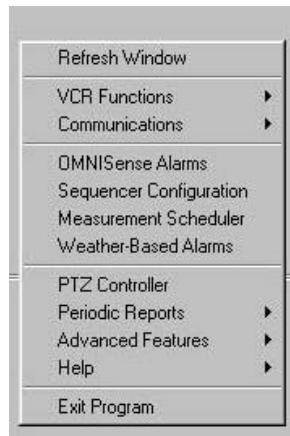


Figure 3.8 Pull Down Menu

### Refresh Window

Video displays are overwritten whenever the floating menu is activated and when deactivated will leave a blank area in the video image. To restore the video image, click the left button while the “Refresh Window” area is highlighted with the mouse.

### VCR Functions

All video data is stored in a default “.601” file format. The “VCR Functions” button provides a method to store and playback data files on the hard drive. Playing back files with the WeatherScene™ software is very similar to operating a VCR.

## Record Images to File

To record images to a file, the operator must open a record file to save incoming video data. Once a file has been opened, all incoming data is appended to the file until “recording” is stopped.

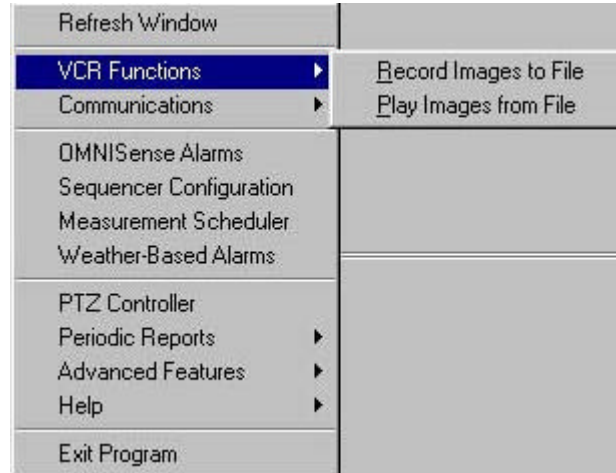


Figure 3.9 VCR Recording Menu

### To Start Recording

1. Bring up the floating menu by positioning the mouse in the video frame area and clicking the right button.
2. Right click on “VCR Functions” and “Record Images to File” (Ref to Fig 3.9). The “Select file where images will be logged” window will appear (Ref to Fig 3.10). The window default is the C:\Program Files\Sii\ folder or to the folder where the most recent file was stored. A default file name is derived from the CDU computer’s internal date and time. The operator can change this if necessary.

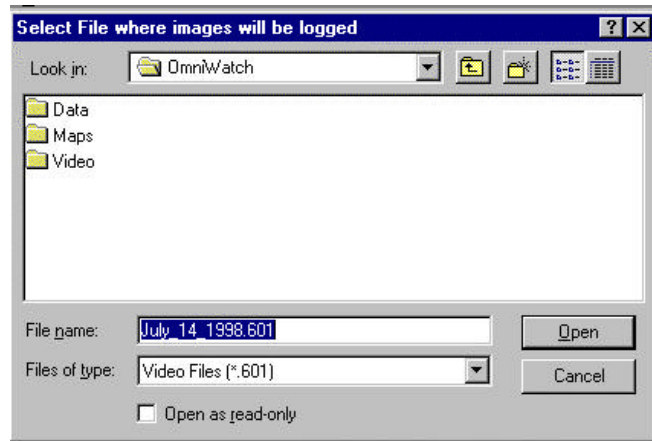


Figure 3.10 VCR Save Files Menu

3. Select the default file name and location by clicking “Open” with the left mouse button or enter another choice using the mouse and keyboard. For long-term, routine monitoring operations, setting up folders based on months and subfolders based on weeks/days are recommended.
4. When data recording is started, a “Logging Information” advisory window appears (Ref to Fig 3.11). The window identifies how much disk space is available and approximately how long it would take to fill the hard drive (based on the current compression ratio) if the video recorder is activated. Click on the “OK” button or press the “Enter” key, if there is sufficient disk space. If insufficient space is unavailable, recording of the video images is not possible, however, video frames can be received and displayed on the main screen, only the capability to save the video data is lost. If video recording is required or anticipated, recommend either transfer or deleted existing files to free up hard drive space.(See Section 4 for procedures for video file management.)

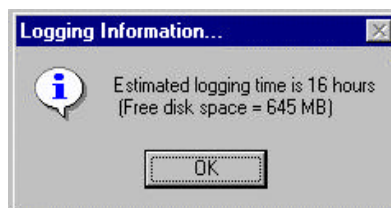


Figure 3.11 Logging Information Window

5. To verify incoming video data is being recorded, click with the right button in the video display area to bring up the floating menu. Highlight “VCR Functions”. If

there is a “check mark” in front of the “Record Images to File”, then recording of the images shown in the Video Image Area is active (Ref to Fig 3.9).

### To Stop Recording

1. Bring up the floating menu. Click on “VCR Functions” and highlight “Record Images to File”. This toggles the recording off. The “check mark” (Ref to Fig 3.9) will disappear.

### To Play a File Back

NOTE. Viewing images from the file causes real-time data processing to stop. A buffer will store 3 – 8 pictures (depending on compression rate) and alarm processing will continue, but notification of an alarm activity will not occur.

Video data is stored in the “.601” compressed format. When playing back the information, it is possible to view the data in a rapid (frame after frame) method or one frame at a time. Use the following steps to view the stored data.

1. Bring up the floating menu. Select “VCR Functions” and “Play Images from File”.
2. The “Select Imagery File to play” window (Ref to Fig 3.12) will appear. Use the mouse and keyboard to select the desired file.

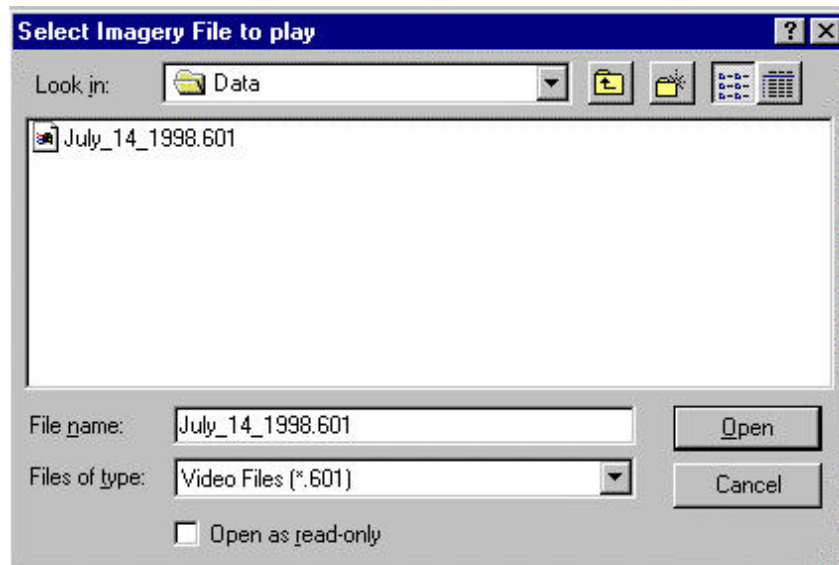


Figure 3.12 VCR Functions/Play Images from File

3. The “Video Playback” window (Ref to Fig 3.13) appears. This window provides “buttons” (similar to those on a VCR) for controlling and reviewing the data. The

“Video Information” area identifies the data file information for the video that will be displayed.

4. The “Playback Control” buttons allow you to select how and what video data you wish to view.

The “Rewind” (<<) button resets the viewer to the beginning of the file.

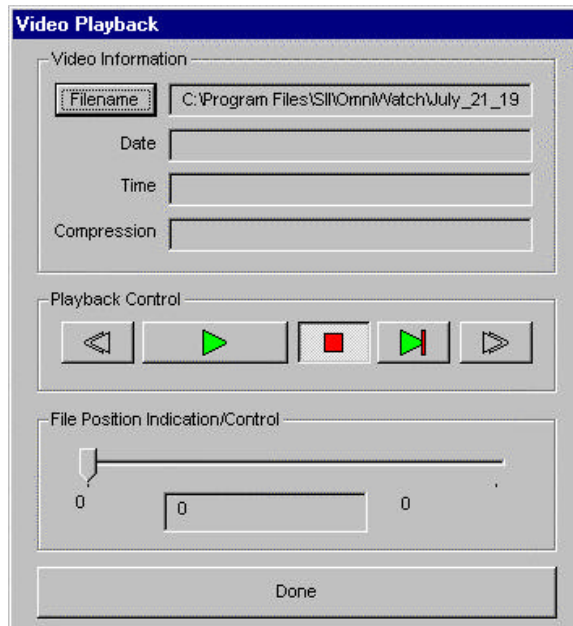


Figure 3.13 VCR Functions/Playback Video Window

The “Play” (>) button shows the video frames one after another rapidly, as the frames were collected.

The “Stop” (■) button stops the video playback.

The “Step” (>|) button displays the next video frame.

The “Fast Forward” (>>) button goes to the end of the file.

Since the video file can contain from one to hundreds of video images, the “File Position Indication/Control” area indicates visually where, in the data file, the displayed video frame is located in the sequence the file was recorded. The operator can use the sliding bar to move within the data file to find the area of interest. The operator can also use the “Single Frame Advance” command to display the next picture in sequence or continue the playback of the file automatically from beginning to end.

NOTE: The Image Analysis Window (refer to Figure 3.3) can be accessed and used by double clicking with the left button on the image.

## Communication Features

Selecting “Communications” on the floating menu (Ref to Fig 3.14) configures all WeatherScene™ communications.

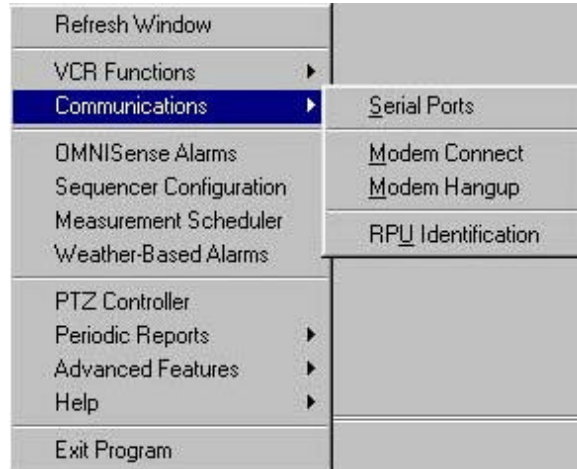


Figure 3.14 Communications Features

## Serial Ports

The serial communications ports for the CDU and the RFCIU are normally configured upon installation of the software and don't require changing. The default settings for the command data port are COM Port 1. The default settings for the video data port are COM Port 2. However, using this window, the COM Ports can be changed if necessary for a unique PC Communication port configuration. Since the CDU uses two COM ports, it is necessary to change both the command data port and the video data port or the system will not work properly.

To reconfigure both of the serial communications ports:

1. Position the mouse in the video display area and click the right button to bring up the floating menu. Highlight “Communications” and click on “Serial Ports” (Ref to Fig 3.15).
2. Using the mouse on the ▼ on the right hand side of the selection window. The comm port selections will scroll down. Use the mouse to select the COMM ports for both the Command/Video and the Video. The default settings are: COM 1 selected for the Command/Video Port and COM2 for the Video Port. Each must have a separate port, the system will not work properly if both have the same port selected. Ensure the cables between the CDU and the RFCIU are connected to the proper COM ports on the computer.

3. When finished with selecting the COMM Ports, use the mouse to activate the ‘Done’ button on the bottom of the screen.



Figure 3.15 Communications/Serial Ports

### **Special Windows 95/98<sup>®</sup> Optimization**

If you purchased the CDU computer from System Innovations or had the WeatherScene™ software installed by the manufacturer, this step has already been completed and not necessary. However, if you are installing the software on another computer or changing the COM ports from other than the original factory setup then this procedure must be completed in order to optimize the software.

#### To Optimize the COM port communications:

1. From the Windows 95/98<sup>®</sup> Desktop Click on “Start” button , move the mouse to “Settings” and select the “Control Panel” option.
2. From the icon display box, click the “System” icon
3. The “System” dialog box will appear. Using the Mouse select the “Device Manager” tab and click on it (refer to Fig. 3.16) .

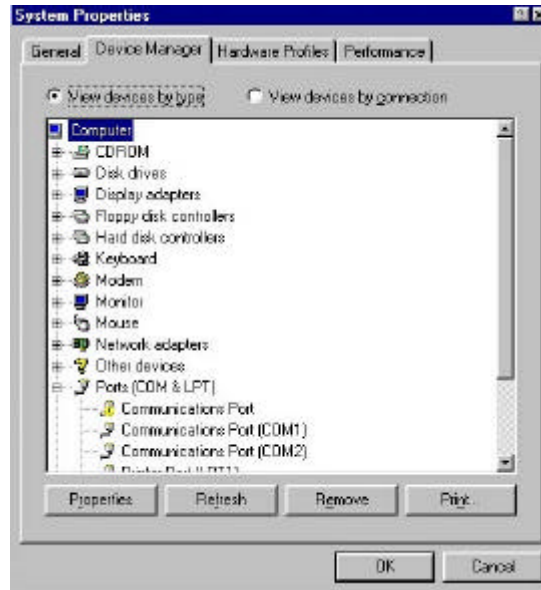


Figure 3.16 System Properties –Device Manager Dialog Box

4. Use the mouse to click on the COM Port you are selecting. This will bring up the Communications Port (COMX) Properties Dialog Box. Don't change any of the settings but using the mouse select the "Advanced" button. This will call up the Advanced Port Settings Dialog Box (refer to Fig. 3.17).

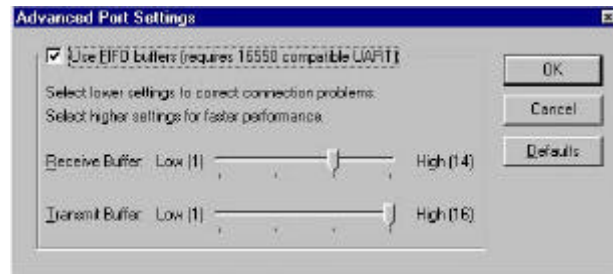


Figure 3. 17 Advanced Port Settings

The last step is to move the Receive Buffer selection indicator to the second mark from the low end of the scale, (see the arrow). Once the indicator has been positioned, Click "OK" and return to the Device Manager Dialog Screen and repeat for the other COM port. Once both have been reset, click "OK and return to the Windows 95/98<sup>®</sup> Desktop.

## Modem

This feature allows another CDU (Remote) with WeatherScene<sup>™</sup> software to control another CDU system (Host) via a phone line and modems. The Host system is connected



to the RFCIU, allowing the Remote CDU to be used to control or obtain video from RPU's connected to the Host CDU. In order to use this feature, both the Remote and Host CDUs must have modems installed, access to a phone line and be properly configured using Windows 95/98<sup>®</sup> setup procedures.

To setup the Host CDU:

1. From the WeatherScene™ Main Screen on the Host CDU, position the mouse in the video frame area and click the right button to bring up the floating menu. Highlight “Communications” and click on “Modem Connect” (Ref to Fig 3.14 and Fig 3.18).

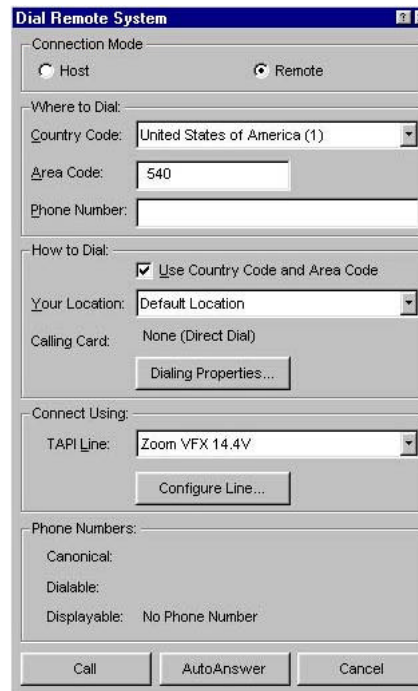


Figure 3.18 Communications/Modem

2. Using the mouse, click on the Host radio button in the Connection Mode box.
3. Information in the Where to Dial and How to Dial boxes are not necessary since the Remote System will initiate the phone call normally.
4. In the Connect Using box verify the correct modem is shown in the TAPI line dialog box. If not or the box is blank, activate the Configure line button and configure the modem in accordance with the modem/computer manufacturer instructions and Windows 95/98<sup>®</sup> procedures.
5. Using the mouse, select the AutoAnswer button. This will allow the Host computer to automatically answer the call from the Remote CDU. Another Windows 95/98<sup>®</sup> dialog box will be displayed notifying that the computer is now in the AutoAnswer mode. Click “OK”.

The Host CDU is now setup to receive command data from the Remote CDU and send to the Remote CDU video data.

To setup the Remote CDU:

1. Using the WeatherScene™ software installed on the Remote CDU, position the mouse on the Main Screen in the video display area and click the right button to bring up the floating menu. Highlight “Communications” and click on “Modem Connect” (Ref to Fig 3.14 and Fig 3.18).
2. Using the mouse, click on the Remote dot in the Connection Mode box.
3. In the “Where to Dial” the following information needs to be entered:
  - Select Country Code
  - Enter Area Code of the Host CDU phone
  - Enter the Phone Number of the Host CDU phone
4. In the “How to Dial” box the following information needs to be entered:
  - Check box if the country code and/or the Area Code needs to be dialed when the modem dials the Remote CDU phone .
  - Select “Your Location”
  - Use the Dialing Properties to enter or modify any of the information listed in the “How to Dial” box
5. In the “Connect Using” box, select the modem from the Windows 95/98® listing or activate the Configure Line button to enter and configure the modem using the Windows 95/98® dialog screens. After you have configured the modem, ensure the modem is selected in the TAPI Line box.

To initiate the connection from the Remote to the Host CDU:

1. Using the WeatherScene™ software installed on the Remote CDU, position the mouse on the Main Screen in the video display area and click the right button to bring up the floating menu. Highlight “Communications” and click on “Modem Connect” (Ref to Fig 3.14 and Fig 3.18) or Right click the RPU ID Box and highlight “Connect via Modem” in the dialog box.
2. Verify the information in the dialog box is correct, then activate the “Dial” button at the bottom of the dialog box.
3. To verify the CDUs are connected, return to the WeatherScene™ Main Screen and request a Status of the RPU in the command area (Refer to Fig. 3.2)

To terminate the connection from the Remote to the Host CDU:

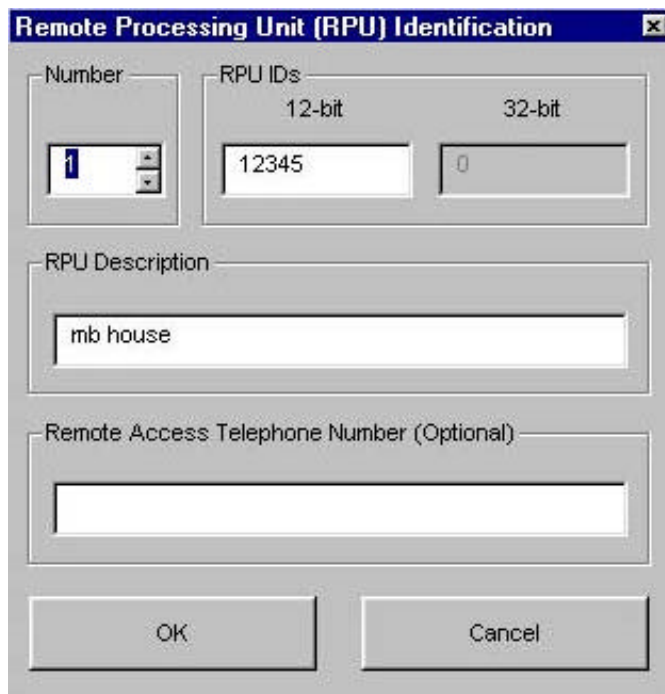
1. Using the WeatherScene™ software installed on the Remote CDU, position the mouse on the Main Screen in the video display area and click the right button to bring up the floating menu. Highlight “Communications” and click on “Modem Hang-up” (Ref to Fig 3.14), or right click the RPU ID Box and highlight “Hang-up” in the dialog box.

## Remote Unit Identification

Each RPU has a unique identification code assigned at the factory, which becomes the code entered in the Remote Unit Identification Menu (Ref to Fig 3.19). The Remote Processing Unit Identification code can be found on the Model Identification Tag attached to the RPU. A maximum of 20 RPUs can be monitored by a single CDU. Once the Remote Processing Unit Identification is entered, it is automatically added to the RPU listing in the RPU ID window (Ref to Fig 3.2). Only one RPU can be controlled and video displayed on the CDU window at a time.

To add, modify or delete a RPU:

1. Position the mouse in the video display area and click the right button to bring up the floating menu. Highlight “Communications” and click on “Remote Unit Identification”(refer to Fig. 3.19).
2. The “Number” field identifies how many RPUs (1 – 20) are configured in the CDU software. Each CDU can be configured for a maximum of 20 RPUs. The entries in all the other data fields change to correspond to your selection.



The screenshot shows a dialog box titled "Remote Processing Unit (RPU) Identification". It features a "Number" spinner box set to 1, "RPU IDs" fields with values 12345 and 0, an "RPU Description" field containing "mb house", and an empty "Remote Access Telephone Number (Optional)" field. "OK" and "Cancel" buttons are at the bottom.

Figure 3.19 Remote Processing (RPU) Unit Identification

3. The “Remote Processor Unit ID” is a 4 digit code (RPU Unit ID) that is used to specifically identify that particular RPU in the communications between the RPU and

CDU. This mandatory entry is found on the RPU model identification tag attached to the RPU case. The 32-bit Remote Unit ID is disabled.

4. Enter a short “Description” that identifies where the RPU is located (Example: Harbor, Airfield, Bunker #2, etc.). It is recommended you limit your entry to 12 characters or less since this allows unobscured viewing of the description in the “RPU ID” data field on the System Monitor and Display window.
5. If the system is set up in a client/host network, enter the phone number in the “Telephone Number” field of the Host CDU that the RPU is assigned. In this configuration, the client requesting a video image would call via a dial-up modem connection to the Host that would repeat the query to the specific RPU via the RF communications link. If this capability is used, enter the Host phone number.

### **Sequencer Configuration**

The sequencer software provides a method of establishing a sequence to capture data from selected RPUs/cameras.. This feature works well for surveillance monitoring requirements, routine checks and conducting diagnostic tests of the system.. To access the menu window, position the mouse in the video display area and click the right button to bring up the floating menu. Highlight and click with the right button on “Sequencer Configuration” (Ref to Fig 3.20).

The Sequencer summary window provides a summary of the camera sequence that is currently in the software. To Insert or Delete a step, highlight the step in the summary window and using the mouse either Insert or Delete. When done, the Operator can return to the Main Window without activating the sequencer. To enable the sequencer, the Operator must use the “Enable Sequencer” button on the Image Sequencer configuration screen.

#### To configure the Step and Description Settings

1. Select the “Step” (1 thru 10) to set up or edit. All the step information is shown in the “Sequencer Summary( refer to Fig.3.21).
2. Enter a short text description (mandatory) to identify the camera being selected (Example: “Perimeter Gate”).

NOTE: The sequencer skips any step that doesn’t have a text description.
--

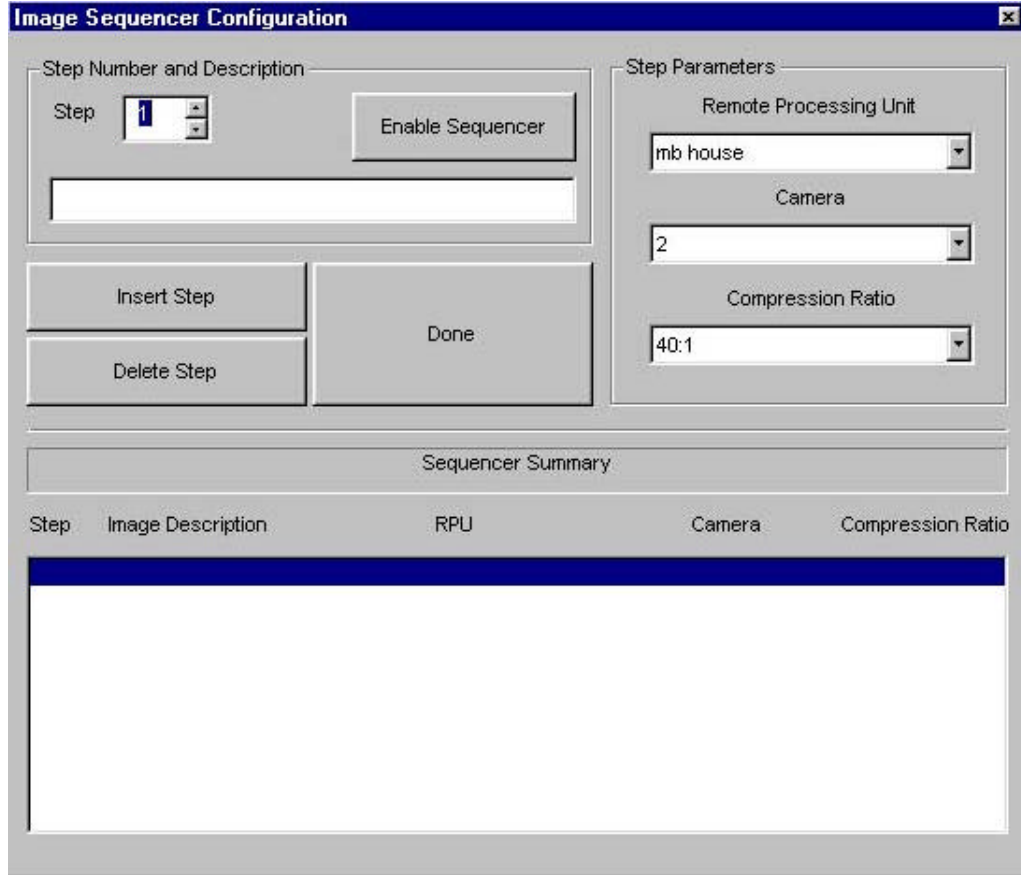


Figure 3.20 Image Sequencer Configuration

3. Enter the Step or camera parameters for each step
  - A. Place the mouse on the “RPU ID” data field options arrow (▼).
  - B. Select the RPU Base ID that will collect the video frame.
  - C. Place the mouse on the “Camera” data field options arrow (▼) and select the camera (1 – 4). The AutoCycle mode is not available.
  - D. Select the “Compression Ratio” using the data field options arrow (▼).
4. Check the Sequencer Summary window for proper configuration

The Sequencer Summary shows all the “steps” the software will perform. Steps can’t be modified in the summary area but can be selected either for modification or cancellation. To select a step to be modified, highlight and click using the left button, the selected step parameters are displayed in their respective windows.

### To delete a sequencer step

1. Highlight with the mouse the step to be deleted in the window or use the arrow next to the step window to move up or down to the step number to be deleted.
2. Highlight the description of the step in the Step Number and Description Area and delete it using the delete key on the keyboard or the "Delete" button.
3. When finished use the mouse to push the "Done" button.

### **Measurement Scheduler**

This feature provides the operator with the ability to schedule when weather is to be taken by a particular RPU. The measurements are weather, road conditions and traffic flow. (Refer to figure 3.21)

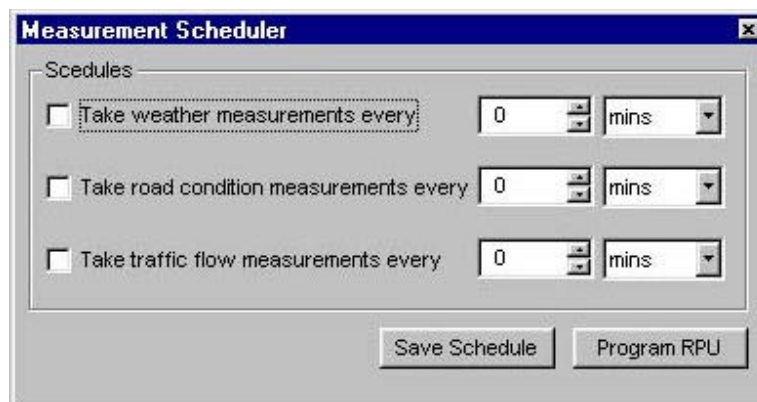


Figure 3.21 Measurement Scheduler

### **Weather-Based Alarms**

This feature allows the operator to program the RPUs to call with an alarm if the operator entered weather alarms are met. For example, if the operator has the visibility alarm set for notification when the visibility is below 1 mile, if that condition was met by the RPU, it would automatically gather the all the weather data and then send an alarm notification to the CDU. The operator can then select the alarmed RPU and call up the actual weather data. Alarms can be set for any weather parameter, road condition parameter, or traffic measurement parameter.

### To set weather condition alarms:

1. Using the mouse select the Weather Conditions Tab from the menu(ref. to fig. 3.22).
2. Using the mouse, click the check box for the alarm condition to be set.
3. Enter the alarm parameters in the boxes.

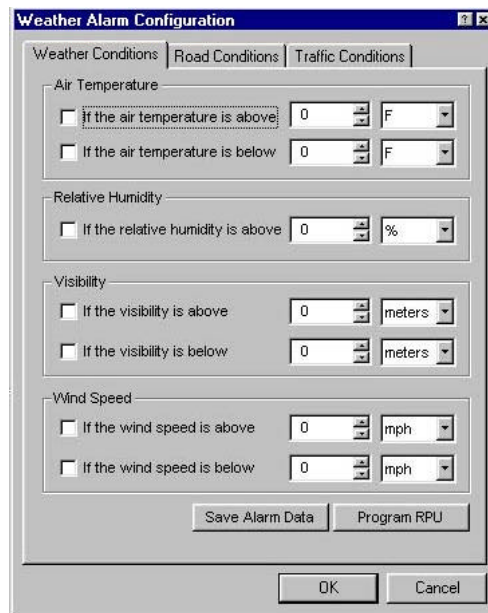


Figure 3.22 Weather Conditions Alarms

To set road condition alarms:

1. Using the mouse select the Road Conditions Tab from the menu.(ref. to fig. 3.23)
2. Using the mouse, click the check box for the alarm condition to the set
3. Enter the alarm parameters in the boxes.

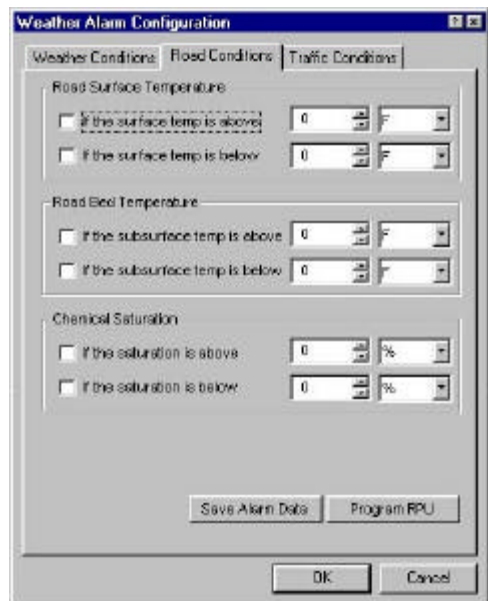


Figure 3.23 Traffic Condition Alarm

### To set traffic condition alarms:

1. Using the mouse select the Traffic Conditions Tab from the menu.(ref. to fig. 3.24)
2. Using the mouse, click the check box for the alarm condition to the set
3. Enter the alarm parameters in the boxes.

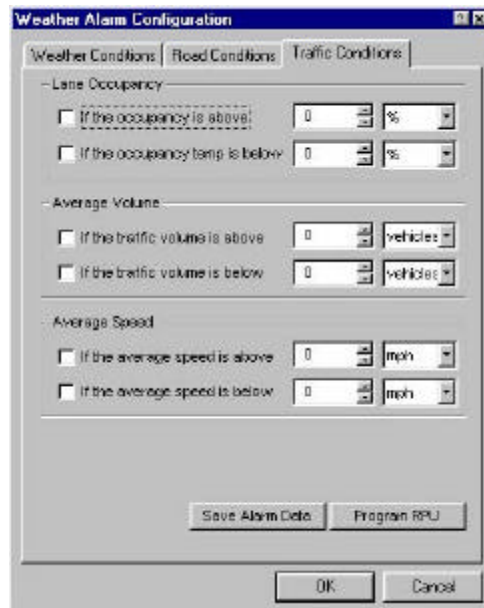


Figure 3.24 Traffic Condition Alarm

### **Periodic Reports**

This feature provides an automated, scheduled data collection capability for a single RPU (identified in the “RPU ID” data field). With this feature, the operator can select a RPU and have it obtain either video or weather data at set timed intervals. The “Request Interval” initiates a data request command at the interval entered in the data field (0-32,768 seconds. Note, however, that even though the CDU can monitor 20 RPUs, it can only perform one periodic weather report and one periodic frame grab function at a time.

### To initiate Video Periodic Reports

1. Select the RPU(the “RPU ID” window) and camera (Camera Control )that will capture the video frame.
2. Position the mouse in the video display area and click the right button to bring up the floating menu. Highlight “Periodic Reports” and click on “Periodic Frame Grab” in the floating menu (Ref to Fig 3.26).



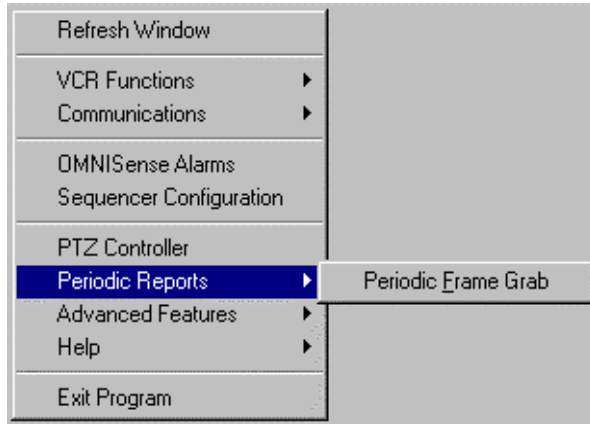


Figure 3.25 Periodic Frame Grab

3. The “Configure Periodic Frame Grab” window (Ref to Fig 3.26) appears. Select “Enable Periodic Request” and enter the report interval in seconds between frame grab requests. Click “OK”.

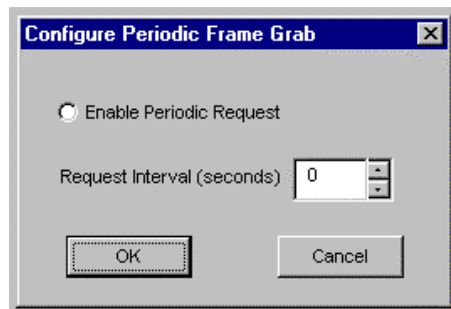


Figure 3.26 Periodic Frame Grab

To initiate periodic Weather Reports:

1. Select the RPU(the “RPU ID” window) from which the weather data is to be obtained.

2. Position the mouse in the video display area and click the right button to bring up the floating menu. Highlight “Periodic Reports” and click on “Periodic Weather Report” in the floating menu (Ref to Fig 3.25).

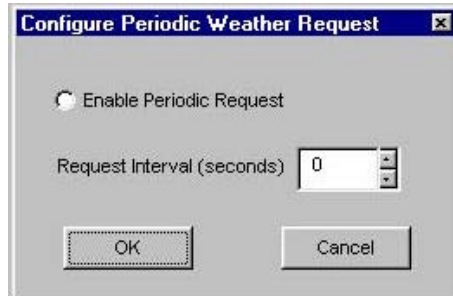


Figure 3.27 Periodic Weather Request

3. The “Configure Periodic Weather Report” window (Ref to Fig 3.27) appears. Select “Enable Periodic Request” and enter the report interval in seconds between weather data requests. Click “OK”.

## Advanced Features

### Motion Compensation

The WeatherScene™ software has hardware and software motion compensation to improve the video data collected. These functions are automatically selected when the software is loaded. The default setting is on for both features.

#### To activate or change the settings

1. Position the mouse in the video display area and click the right button to bring up the floating menu.
2. Highlight “Advanced Features” and verify “Hardware Motion Compensation” and “Software Motion Compensation” have a checkmark beside them (Ref to Fig 3.24).

**NOTE:** Motion compensation provides the best video data for images with motion in the camera field of view. It is a default setting of the operating software .

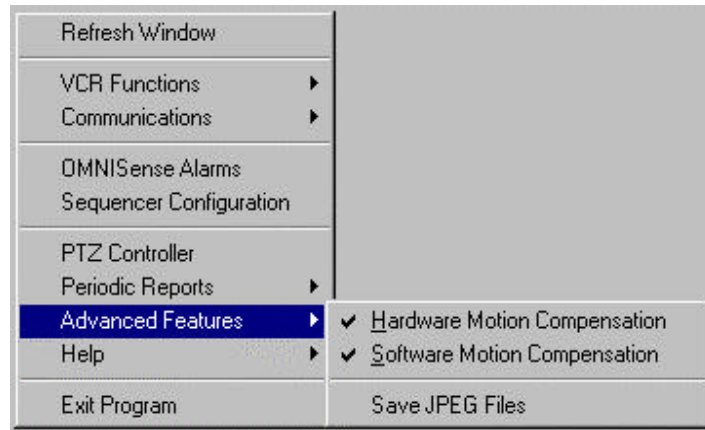


Figure 3.28 Advanced Features  
(Motion Compensation)

### Save JPEG Files

Another advanced, optional, feature of the WeatherScene™ software is the ability to store the last frame of video data from each camera, on each RPU, as JPEG files, in a rotating buffer on the CDU. This prepares the data for placement on a web page (allows broadcasting over the Internet). Additional software must be purchased for data distribution over the Internet. See your Systems Innovations account representative for additional information.

**NOTE:** Ensure the “Save JPEG Files” feature is not activated unless you are distributing the video data on the Internet. This feature requires extensive data processing, slows data acquisition and drains battery power (if a laptop is being used as a CDU).

This feature is defaulted inactive for all normal installations and cannot be activated without the optional software installed.

To ensure the “Save JPEG Files” is inactive

1. Position the mouse in the video display area and click the right button to bring up the floating menu. Highlight “Advanced Features” selection.
2. Verify “Save JPEG Files” does not have a checkmark beside them (Ref to Fig 3.24).

## Help (Assistance Information)

Like other software programs, WeatherScene™ software has on-line assistance and “help” information available to assist the operator. It is available via the floating menu (Ref to Fig 3.29)

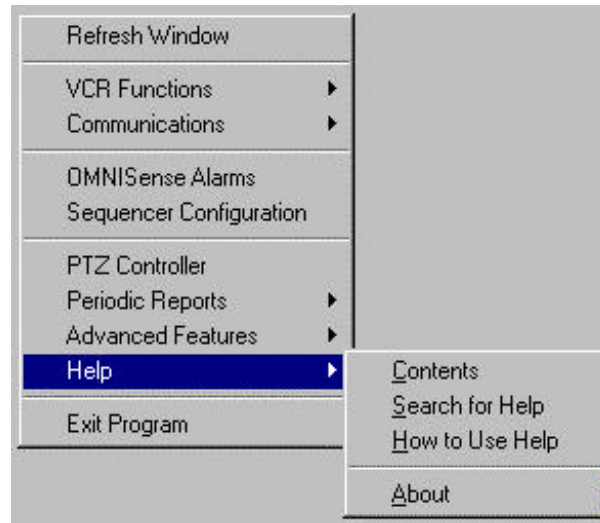


Figure 3.29 Accessing the Help Menu

The “Contents”, “Search for Help”, “How to Use Help” and “About” are standard Windows® 95/98 Help window features and they respond in similar fashion.

To access the “Help” feature,

1. Position the mouse in the video display area and click the right button to bring up the floating menu. Highlight “Help” selection (refer to Fig.3.29).
2. Using the mouse, highlight the submenu item and select it using the right button. This places you in the help menu.

## Section 4

### Video Data Management

#### Overview

This section provides information on managing the large video files, how to record, backup and archive. The “Activity.log” file is automatically generated if the operator is recording video (refer to Figure 3.9). The \*.601 file has the actual digital video frames and depending on the length of time the VCR function is activated, can be quite large. The operator can save approximately 41 (with only 20:1 compression) video images on a single, blank 3½” diskette. Therefore, if the video data is to be archived, it is recommended that the \*.601 file be archived in conjunction with shift change, or some other convenient time period depending of the amount of data routinely collected. It is assumed that the operator is very familiar with both Window 95/98® and the Windows 95/98® accessory applications.

NOTE. Starting the VCR functions causes data processing to stop. A buffer will store 3 – 8 pictures (depending on compression rate) and alarm processes, but notification of an alarm activity doesn’t occur.

#### Copy Video Files to a Diskette

1. Use the Windows® Explorer to find the “Activity.log” data file. Double click on it. This will open the log using the “WordPad” program.
2. Save the data file under a name that is similar to the “.601” video data file that the log entries are time correlated with (i.e. April\_12\_1998.log).
3. Open the “Activity.log” file again. Delete all the information in the file and save the file. (This clears the activity log such that new log entries that are time correlated to the “.601” video data file that will be started in the procedure below will be put into an empty “Activity.log” file.)
4. Close WordPad.
5. Change the file name where video (.601) data is recorded on the CDU using the steps below.
  - A. Position the pointer anywhere on the video frame area and click the right button. A floating menu will appear.
  - B. Use the pointer to open the “VCR Functions” menu.

- C. Click on the “Record Images to File” selection to open the “Select File where images will be logged” window. (Ref to Fig 3.10).
  - D. In the “File name:” data field, enter a file name (such as April\_12\_1998.601) to use for recording data from the upcoming day/shift. Use the pointer to select “Open”.
  - E. After clicking “Open”, a “Logging Information” menu will be displayed. It provides an estimated logging time and available free disk space is available (Ref to Fig 3.11). Click “Ok” to start recording data in the new file.
6. Insert a blank, 32 floppy diskette into the appropriate drive on the CDU.
  7. Minimize the WeatherScene™ display and open Window® Explorer.
  8. Use the pointer to navigate the hard drive and highlight the “.601” video file on which recording was just terminated. Highlight it. Drag the file from the “Contents” listing (right menu) to the “32 Floppy (A:)” icon in the “All Folders” listing (left menu). This will copy the file on to the floppy diskette.

#### To View Archived Video Files from A Diskette

Use the steps below to view archived files with the WeatherScene™ software:

1. Position the pointer anywhere in the video frame area and click the right button. A floating menu will appear.
2. Use the pointer to open the “VCR Functions” menu.
3. Click on the “Playback Images from File” selection to open the “Select Imagery file to play” window (Ref to Fig 3.12).
4. Use the pointer to change the “Look In” field to “3½ Floppy (A:)”.
5. Highlight the data file to be reviewed and click “Open”. The “Video Playback” window will be displayed. (Ref to Fig 3.13)
6. Use the “Step” control in the “Playback Control section of the menu to step through and review the video pictures.

Archiving and purging of data from the hard drive should be performed on a regular basis to clear hard drive space for future video recording. Even in compressed form, video files can consume large amounts of hard drive space very quickly.

#### **Video Data Backup**

It is recommended this procedure be performed weekly. Perform this task more frequently if an extensive amount of data is routinely collected and archival is required.

Determine what interval keeps the data manageable and provides the least impact. This procedure establishes the necessary steps to archive data files to a storage medium.

The WeatherScene™ system should be operating normally and on-line.

A box of preformatted 3½” floppy diskettes is required to store large amounts of archived data.

#### To Back up a Video File

1. Ensure there is a floppy diskette in the drive on the CDU (normally Drive A:).
2. Using Windows® 95/98 commands, click on “Start”, “Programs”, “Accessories”, “System Tools” and “Backup” respectively.
3. This opens the backup menu. Navigate the “Select files to backup” portion of the backup routine to get to the folder where all the data collected is stored on the hard drive. Normally, these files are stored in the “Program Files”, “Sii” and “WeatherScene™” folders and “Data” folder.
4. “Check” the activity logs (.log) files that are correlated with the video data files.
5. Click the “Next Step”.
6. In the “Select a destination for the backup:”, click “3½ Floppy (A:)”
7. Click “Start Backup”.
8. The “Backup Set Label” menu will come up. Enter a description of the data to be stored.

NOTE: The file can be password protected.
---

9. Press the “Enter” key. The CDU will start writing data to the diskette. If the diskette fills up, it will notify you to insert another diskette and continue the backup. Remove the full diskette, put a properly annotated label on it, insert another diskette and continue the backup process until all the video data is stored.
10. Once the data has been stored, the “Operation Complete” menu will appear. Click “Ok” and close out all the windows except the WeatherScene™ window.
11. Remove the 3½” floppy diskette from the disk drive and label it.
12. Open Windows® Explorer. Navigate to the folder where all the data files are located and move all video files, with the exception of the most current file, into the “Recycle Bin”. Once data files are in the recycle bin, “empty” the bin.

NOTE: Since large amounts of data are being stored and deleted, it is recommended that periodically, the operator uses Scandisk and defragment the hard drive. These procedures will ensure the desktop computer continues to work at optimum performance.

## Weather Information Archive Data

### Overview

WeatherScene receives the weather data from the various RPUs as they collect and send it to the CDU. The CDU will automatically display the last weather information that it has received from the RPU selected in the RPU ID window. The operator must be aware that this information may be several hours or days old and should check the “Last Weather Update” information box for the date and time of the data being displayed. To update the weather, the operator need only activate the “Get Weather” button in the command area. Once the new weather information is received, it will be automatically updated on the weather and road conditions display areas. The weather information is archived in data files on the hard drive in a delimited comma format. This is a standard data type format and can be imported into many third party software packages for analysis or printing (Excel, Lotus, Access, FoxPro, etc.)

The weather data will be stored in RPU specific data files. For example, weather data from RPU 2701 will be saved in a separate file under that name in the Sii directory on the CDU hard drive. Optional weather sensors such as the road conditions, RTMS module and solar radiance will be saved in a separate file due to differences in data collection times. Separating the data in this manner allows the operator to import the data into other analysis software with consistent collection times for the data elements.

### Weather POD Archive Data Format

The following weather information is saved in a delimited comma format in the Sii Directory under the file name: WX XXXX.Log. Where the XXXX is the RPU ID Unit number report the data. An example data sequence is:

**98/12/15,04:52:12 PM,90,994.1,44,20000,0,1,31**

The fields are comma delimited as follows:

<u>Sequence of data</u>	<u>Example values</u>	<u>Measurement Units</u>
Date	98/12/15	YY/MM/DD
Time	04:52:12 PM	HH:MM:SS AM/PM
Air Temperature	90	Degrees Fahrenheit



Barometric Pressure	994.1	Millibars
Relative Humidity	44	Percent
Visibility	20000	Meters
Average Wind Speed	0	Miles per Hour
Gust Wind Speed	1	Miles per Hour
Wind Direction	31	Degrees from North

Table 4.1 Weather POD Archive Data Format

### Road Condition Archive Data Format

The following road condition information is saved in a delimited comma format in the Sii Directory under the file name: Road XXXX.Log. Where the XXXX is the RPU ID Unit number report the data. An example data sequence is:

**98/15/15,04:41:48 PM,0,92,128,0,32,3,223**

The fields are comma delimited as follows:

<u>Sequence of data</u>	<u>Example values</u>	<u>Measurement Units</u>
Date	98/12/15	YY/MM/DD
Time	04:41:48 PM	HH:MM:SS AM/PM
Zenos Unit ID	0	Not relevant data
Road Surface Temperature	92	Degrees Fahrenheit
Road Bed Temperature	128	Degrees Fahrenheit
Chemical Saturation	0	Percent
Predicted Freezing Point	32	Degrees Fahrenheit
Road Condition Code:	3	
3 Dry Surface		
4 Wet Surface		
5 Wet Surface below Freezing		
6 Partially Frozen Road Surface		
9 Dew Covered Road Surface		
10 Frost on Road Surface		
Solar Radiance	223	Watts/meter <sup>2</sup>

Table 4.2 Road Conditions Archive Data Format

# Appendix A

## WeatherScene™ System Specifications

The WeatherScene™ system is designed and fabricated to take advantage of the latest state-of-the-art electronics and optical components. The general specifications for a generic WeatherScene™ system are listed below.

### WeatherScene™ Video Specifications

Number of Cameras:	Maximum of 4 per RPU
Video Compression Rates:	20:1 to 500:1
Single Frame File Size:	1.5 to 35 Kbytes per video frame
Framing Rate:	Varies from 1 frame every two seconds to 10 frames per second (based on the data rate and compression rate)

### Typical Camera Specifications

#### Black and White Camera - CX Series (CX-EV48 and CX-ECS)

Video Signal System:	EIA Standard
Image Output:	1 V p-p at 75 ohms
Scanning System:	2:1 Interlace
Resolution	380 lines horizontal, 350 lines vertical
Sensitivity:	CX-EV48: 0.6 lux, CX-ECS: 0.3 lux
S/N Ratio:	47 dB
Effective Picture Elements:	512 (H) x 492 (V)
Power Source:	DC, 9 to 12 V ( $\pm 1V$ )
Load:	500 ma (maximum)
Operating Temperature:	-20° to 140° F

#### Color Camera - CX-NV36

Video Signal System:	NTSC Standard
Image Output:	1 V p-p at 75 ohms
Scanning System:	2:1 Interlace
Resolution:	350 lines (horizontal and vertical)
Sensitivity:	4 lux
S/N Ratio:	Greater than 45 dB
Effective Picture Elements:	512 (Horizontal) x 492 (Vertical)

Power Source: DC, 12 to 16 VDC ( $\pm 1$  V)  
Load (recommended): 500 ma  
Operating Temperature: -20° to 140° F

#### RTMS Traffic Flow and Count Specifications

Coverage: maximum of 8 lanes  
Radar RF Information: 10.525 Ghz, 10 milliwatts (mw)  
Typical Mode Used: Sideline Highway  
Sampling Window: 10 to 600 seconds

#### Information Provided to the CDU Operator

Volume: Number of vehicles passing through each lane zone  
Occupancy: Percent (%) of time each lane zone is occupied  
Speed: Average speed of vehicles going through each lane zone  
Optional Setting: Long Vehicles (Number of long vehicles passing through each lane zone) or Headway (Average time interval between vehicles in each zone)

#### Weather Pod - Meteorological Monitoring Specifications/Ranges

Sampling Cycle: Requires 5 minutes, as a minimum  
Sampling Interval: 300 to 32,768 seconds (approx. 9 hours), User adjustable.  
Temperature: -45° to 130° F,  $\pm 1^\circ$  F  
Humidity: 0 to 100%,  $\pm 5\%$   
Barometric Pressure: 500 to 1100 millibar (mb),  $\pm 1$  mb  
Visibility: .06 to 2 nautical miles,  $\pm 10\%$   
Average Wind Velocity: 0 to 45 knots,  $\pm 2$  knots  
Wind Gust Velocity: 0 to 45 knots,  $\pm 2$  knots  
Wind Direction: 0° to 360°,  $\pm 10^\circ$

#### Road Sensor Conditions/Ranges Specifications

Road Conditions: Dry Surface, Wet Surface, Wet Surface – Below Freezing, Partially Frozen Surface, Dew on Surface and Frost on Surface)  
Road Temperature: -40° to 130° F  
Chemical Saturation: 0 to 100%  
Freezing Point: -5° to 32° F

#### Data Link for Traffic Flow, Weather, Road Conditions and Video

Frequency: 2.4 Ghz  
Carrier Modulation: Frequency Hopping, Spread Spectrum  
Data Rate: 115.2 KBPS  
RF Power Output: 90 milliwatts

Command Link

Carrier Frequency: as delivered in Mhz  
Carrier Modulation: Manchester Encoded FSK  
Data Rate: 1200 BPS  
RF Power Output: 90 milliwatts nominal

RPU Status Data Link

Carrier Frequency: as delivered in Mhz  
Carrier Modulation: Manchester Encoded FSK  
Data Rate: 1200 BPS  
RF Power Output: 90 milliwatts nominal

Remote Site Power Requirements

Remote Processing Unit (idle)  
Consumption: 270 milliwatts  
Volts/Amps: 11 to 14 VDC / 20 milliamps

Remote Processing Unit (active)

Consumption: 11.5 watts  
Volts/Amps: 11 to 14 VDC / 850 milliamps

Remote Traffic Microwave Sensor (continuous)

Consumption: 2 watts  
Volts/Amps: 12 VDC / 125 milliamps

Road Sensors/Controller

Consumption: 1.6 watts  
Volts/Amps: 10 to 16 VDC / 100 milliamps

Weather Pod

Consumption: 4.7 watts, maximum  
Volts/Amps: 13 to 16.3 VDC / 290 milliamps, maximum

Environmental Parameters

Traffic Flow Sensor, Road Sensors/Controller, Cameras, Weather Pod and Remote Processing Unit

Temperature Range: -40° to 150° F  
Humidity: 0% to 100%

Computer Display Unit (All components)

Temperature Range: 32° to 110° F  
Humidity: 0% to 95%

Control Display Unit

Floor Space Required: 4 ft x 8 ft (approximate)  
Personal Computer: Pentium II, 300 Mhz or higher (recommended)

32 Mbytes RAM (recommended)  
4 Gbyte Hard drive or larger (recommended)  
56 KBPS, FaxModem(Optional)  
Color Monitor 17", .28 dpi, 1024 x 768 pixels  
(required)

Solar Radiation Sensor

Manufacturer	Li-Cor Radiation Sensors
Model Number	LI-200SA Pyranometer
Sensitivity	80 $\mu$ A per 1000 W/m <sup>2</sup>
Linearity	Max. deviation of 1% up to 3000W/m <sup>2</sup>
Stability	<+/-2% change over 1 year
Response Time	10 $\mu$ s.
Temperature Dependence	+/- 0.15% per °C max.
Calibration	Recommended every 2 years
Detector	Silicon Photovoltaic detector
Size:	2.38Ddia x 2.54 cm H (0.94"x 1.0")