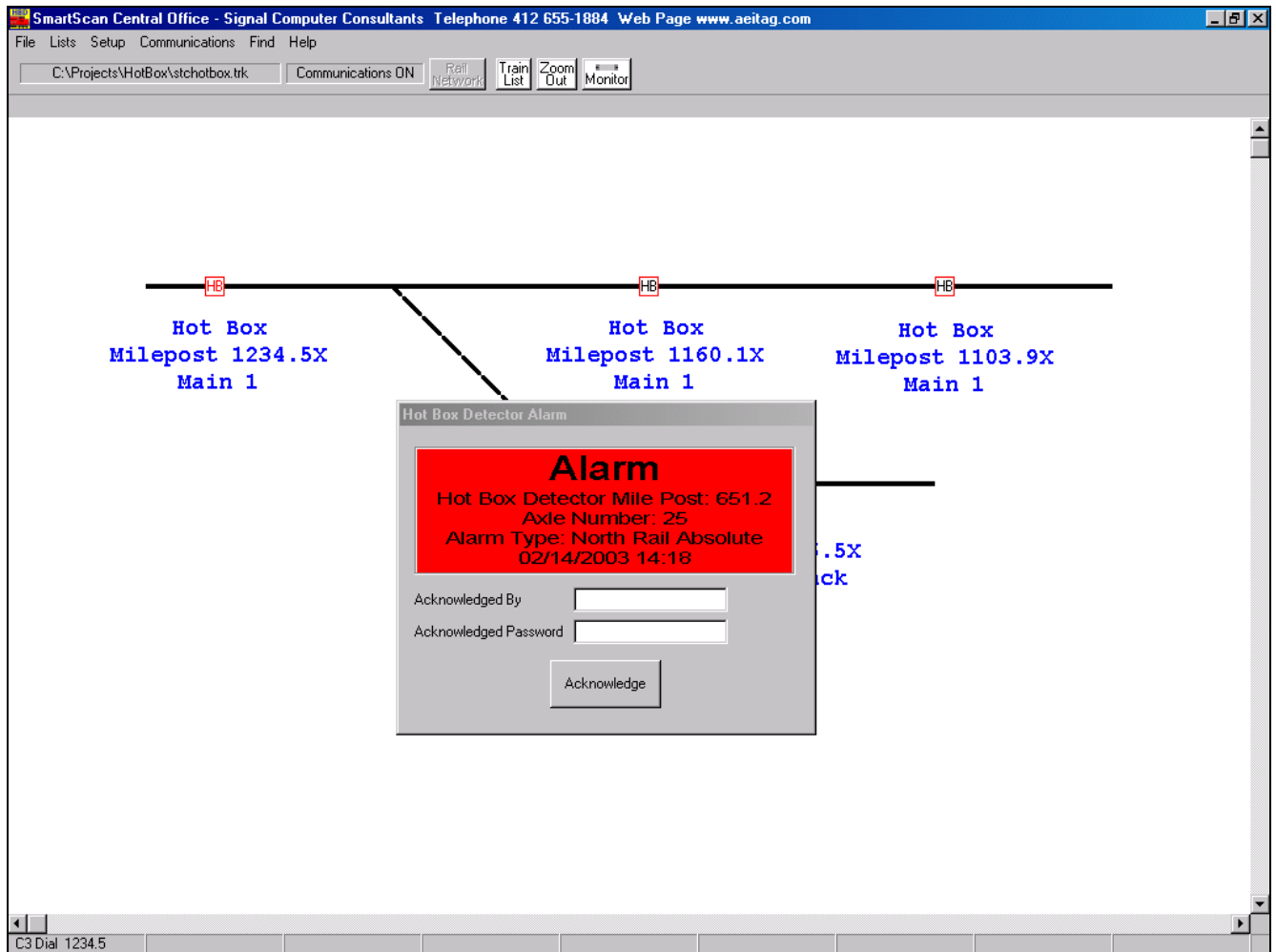


SmartScan

Central Office System

User Manual

March 19, 2003



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1. BRIEF OVERVIEW

The SmartScan Central Office System is a set of two programs that are designed to communicate with Southern Technologies SmartScan Next Generation Hot Box Detectors. The two programs are the SmartScan Central Office Server (referred to throughout this document as the server) and the SmartScan Central Office Network Builder. Both programs can run on any computer running a Windows 32-bit operating system (Windows 95, 98, NT, ME, 2000 or XP).

The SmartScan Central Office Server can communicate with hot box detectors via a dialup or lease line connection. These connections can be either direct or multi-drop. If a multi-drop connection, each field unit will have a unique address (polling address) and will monitor the line for messages containing that address.

The SmartScan Central Office Server program will periodically poll each hot box detector to update the following information:

- Current status of site including:
 - Alarms
 - Train Presence
 - Battery Voltage
- Detailed Train Information
- Current Setup Parameters

The SmartScan Central Office Server will display this and other information on a map of the rail network showing the locations of each hot box detector. The user will draw this map by using the SmartScan Central Office Network Builder program.

When alarms occur in the field, the server will display a flashing dialog on the map and sound audio alerts. An operator must acknowledge these alarms before they will be reset.

The SmartScan Central Office Server program also allows the operator to perform the following functions:

- Display and print detailed hot box detector information on each train passing a site.
- Display and print a summary of all trains in the system.
- Export detailed hot box detector information to a comma delimited text file which can be imported into any word processing, spreadsheet or database program for further processing.

2. INSTALLATION

2.1. Installing SmartScan Central Office Server and Builder Programs

The SmartScan Central Office Server and Builder programs come on a CD-ROM. To install the programs, insert the CD-ROM into the CD-ROM drive. The installation program should automatically start. If it does not start, click the Start and then the Run buttons. In the Open box, type d:autorun.exe if the CD-ROM is the D drive on your computer. If it is not the D drive, type the appropriate drive letter followed by a colon and then autorun.exe (ex. e:autorun.exe, f:autorun.exe, etc.). The display in Figure 1 will then appear.

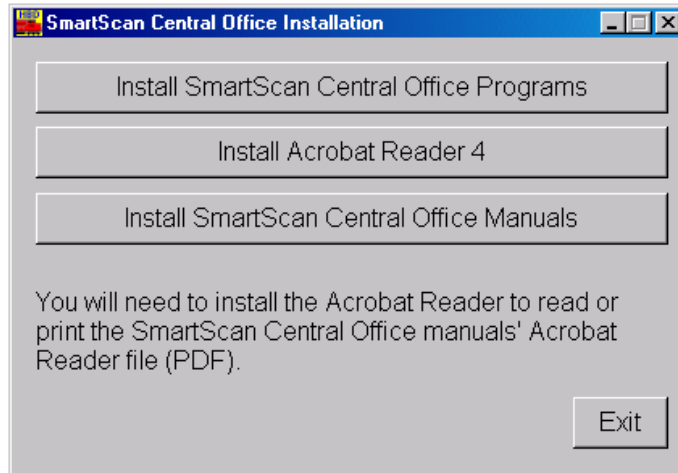


Figure 1 - Installation Display

Click the Install SmartScan Central Office Programs button to install the programs, and follow the instructions. When the SmartScan Central Office programs are installed, they are loaded into the SmartScan folder by default.

To install an icon for the SmartScan Central Office Sever program on your desktop:

- click the Start button
- place the mouse pointer on Programs
- place the mouse pointer on the SmartScan Central Office Server (should be at the bottom of the list) and click the right mouse button
- place the mouse pointer on Send To
- click on Desktop

The SmartScan Central Office Network Builder is installed in a similar fashion.

2.2. Starting the Program

To start the program, click the Start button, point to Programs and then to the SmartScan Central Office Server program, or double click on the appropriate icon on the desktop, if installed.

After starting the program, the Network Map display will appear.

3. TECHNICAL SUPPORT AND UPDATES

Periodically Signal Computer Consultants issues maintenance releases and new versions of this program. Maintenance releases are free and correct problems found with the program and/or provide minor enhancements to the program. Before contacting us with problems, we suggest you check our web page at www.aeitag.com to insure that you have the latest maintenance release of the program. You can also go to our web page by clicking the appropriate web page item under the program's Web Page menu at the top of the screen.

Technical support is free for the first twelve months after installation. A maintenance agreement can be purchased to extend the period of technical support.

For technical support or more information on the maintenance agreement, contact Signal Computer Consultants at:

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4. RAIL NETWORK MAP

When the SmartScan Central Office Server program begins a map of the hot box detector network is displayed (see Figure 2). This map was built by using the SmartScan Central Office Network Builder program, which produced a "track" file (track files have a .trk file name extension) containing the specifications of the network. The SmartScan Central Office Server uses information in the track file to create the map and generate a database of the hot box detectors in the network.

Multiple hot box detector networks can be built, each of which will have its own track file. A new track file can be loaded into the SmartScan Central Office Server by selecting the Open Track File menu item under the File menu.

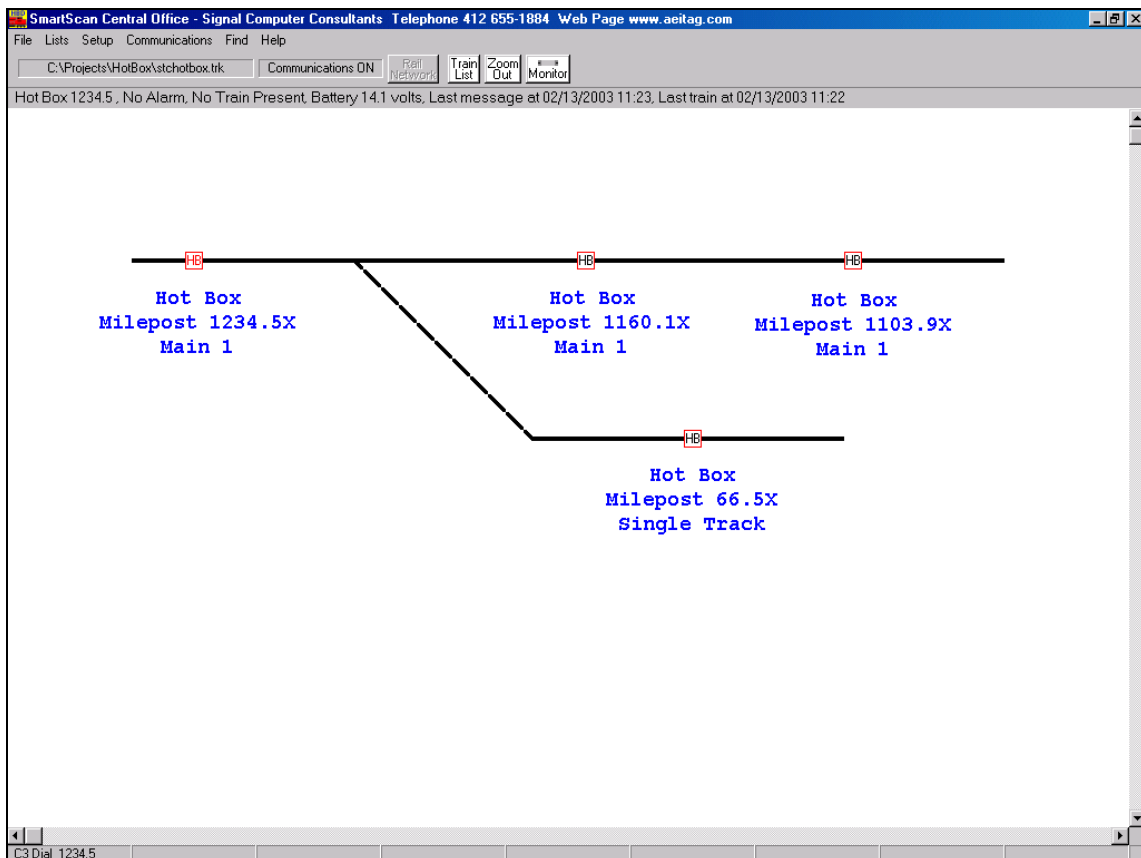


Figure 2 - Rail Network Map

The display in Figure 2 is broken down into four main areas. Starting at the top of the display, these areas are: the Server Status Line, which is located immediately below the menu items; the Device Information Line; the Network Map; and, finally, the Communication Port Status Line, which is at the very bottom of the screen. The following paragraphs describe these areas in more detail.

4.1. Server Status Line

Figure 3 shows the Server Status Line. The first item from the left is the name of the track file the server is current using. This file is created by the SmartScan Central Office Network Builder program and is used by the server program to draw the map and to create the database for the hot box detectors



Figure 3 - Server Status Line

The second item is the communications status. The operator has the ability to turn communications on and off by using the Communications On/Off menu item under the Communications menu.

4.2. Device Information Line

Figure 4 shows the Device Information Line that is located just below the Server Status Line.

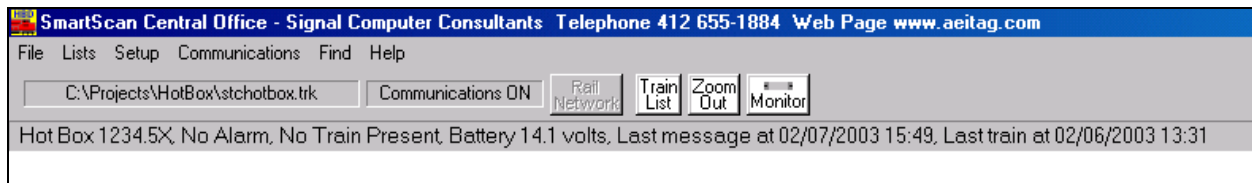


Figure 4 - Device Information Line

This line shows a portion of the information about a selected hot box detector. In Figure 4 the mouse pointer was placed on the hot box detector at mile post 1234.5 on the network map, and information about this detector appeared in the Device Information Line. For hot box detectors this information includes:

- The mile post location
- The current alarm
- The alarm time (only if there is a current alarm)
- Train presence status
- The battery voltage
- The time the server received its last message from the detector
- The time the server received the last train data from the detector

4.3. Network Map

The most useful tool in finding the status of the hot box detectors is the Network Map. The Network Map is located below the Device Information Line and shows the relative geographical positions of all of the hot box detectors in the system (see Figure 2).

4.3.1. Hot Box Detector Symbol Status Codes

The status of each hot box detector in the network is shown by the color of the hot box detector symbol (HB in a red square), a color-coded X over the hot box detector symbol, and whether the hot box detector symbol is flashing. If the hot box detector symbol is flashing, the hot box detector is reporting an alarm. The following lists the color-coded status of the hot box detector symbols:

Color of Hot Box Detector Symbol	Color of X over the Hot Box Detector Symbol	Hot Box Detector Status
Black	No X	The status is Ok. There is no train present.
Red	No X	The status is Ok. There is a train present.
Black or Red	Red X	Server has not been able to communicate with the hot box detector for over 30 minutes.
Black or Red	Blue X	Server has not been able to communicate with the hot box detector for over 5 minutes.
Black or Red	Green X	The server has not received a train record from the hot box detector for over 8 hours. This can mean either no trains have passed the detector in the last 8 hours or the hot box detector is having problems detecting trains or sending data.
Black or Red	Black X	The hot box detector has been software disabled by the operator. The server will not try to communicate with this detector.

4.3.2. Hot Box Detector Pop-up Menu

Placing the mouse pointer on a hot box detector symbol and clicking the right mouse button will cause the pop-up menu in Figure 5 to be displayed.

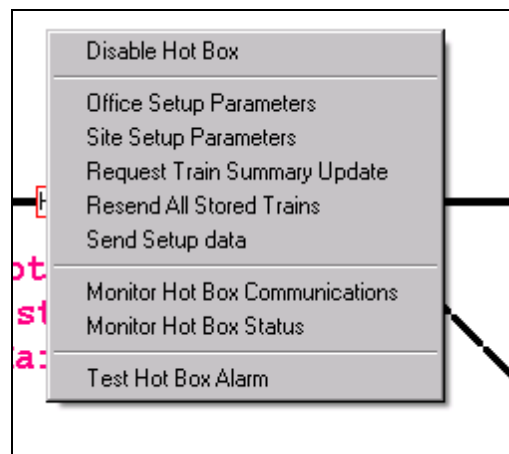


Figure 5 - Hot Box Detector Pop-up Menu

This menu allows the operator to:

- **Enable/Disable Hot Box** - Enable or disables communication with the hot box detector
- **Office Setup Data** - View the hot box detector's setup parameters as created by the SmartScan Central Office Network Builder program (see Paragraph 9.1). These parameters may differ from the setup parameters stored in the field unit.
- **Site Setup Data** - View the hot box detector's setup parameters as currently stored in the field unit (see Paragraph 9.2).
- **Request Train Summary Update** - Request the hot box detector to send its current list of stored trains to the server. Each hot box detector can store up to 500 trains.
- **Resend All Stored Train** - Request the hot box detector to send data to the server on all of its stored trains.
- **Send Setup Data** - Request the server to send the setup data created by the SmartScan Central Office Network Builder program to the hot box detector.
- **Monitor Hot Box Communications** - View communications between the server and the hot box detector in real time (see Paragraph 6.5).
- **Monitor Hot Box Status** - View the current status of the hot box detector in real time (see Paragraph 6.4).
- **Test Hot Box Alarm** - Cause a test hot box alarm to be generated with the audio alert.

4.3.3. Zoom in and Zoom out

The network map has a zoom-in and zoom-out feature. There are two ways to zoom in or zoom out. One way is via the Zoom-In and Zoom-Out button in the toolbar near the top of the screen. Simply click one of these buttons to either zoom in or zoom out.

The second method is to place the mouse pointer anywhere on the network map where a hot box detector or track symbol is not located and then click the right mouse button. This will cause the screen to move from the zoom in view to the zoom out view or vice versa. It will also center the new view on the location at which the mouse was located in the old view.

4.4. Communication Port Status Line

The Communication Port Status Line is at the bottom of the screen (see Figure 6). This line shows the status of all of the enabled communication ports.



Figure 6 - Communication Status Line

In Figure 6, Communication Port 3 [C3] is enabled and is dialing the hot box detector at mile post 1234.5X.

The following are the communication status codes used in the Communication Port Status Line:

Code	Description
Dial	The server is dialing out to the hot box detector via the specified port
Enabled	Port is available to transmit or receive data from the hot box detectors
Disabled	Port is not available because a modem could not be found
Answering	Port is answering the telephone line, but does not have a modem connection
Connected	Port has a modem connection, but has not received a message and, therefore, cannot identify the hot box detector.
RX	Port is receiving data from the hot box detector (hot box detector initiated).
TX	Port is transmitting data to the hot box detector (server initiated).

5. ALARMS

The SmartScan Central Office Server will generate audio and flashing visual alarms when it receives an alarm from a hot box detector in the field and when it loses communications with a hot box detector for over five minutes. An operator must acknowledge any alarm before it will be discontinued.

5.1. Visual Alarm

When a hot box detector reports an alarm to the server, the server will display the alarm as shown in Figure 1.

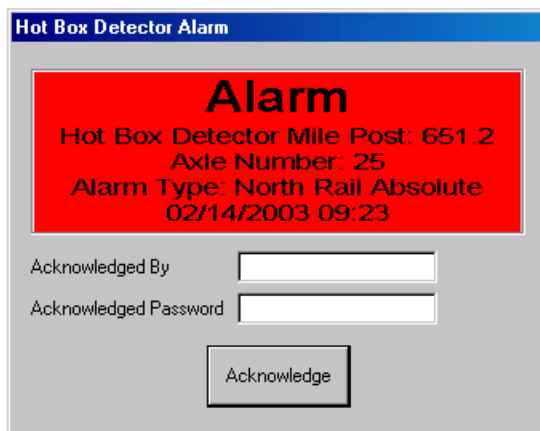


Figure 7 - Visual Alarm Display

This display will flash between red and white until the operator acknowledges the alarm. If password protection is turned on, the operator must enter his/her user name and password (see Paragraph 10) for the alarm to be acknowledged. Once the alarm is acknowledged, the display will stop flashing, the audio alarm will stop, and the Acknowledge button on the display will change to a Close button. The Close button will allow the operator to close the display. The display cannot be closed until the alarm is acknowledged.

While the hot box detector is reporting the alarm, its symbol on the network map will continuously flash. It will continue to flash even if the operator acknowledges the alarm.

Multiple visual alarms, one for each alarming hot box detector connected to the server, can be displayed at the same time.

5.2. Audio Alarm

When a hot box detector reports an alarm to the server, an audio alarm will also sound. The system manager can specify the sound file (.wav file) used for each of the various types of alarms. To specify a sound file, select the Alarm Sound File menu item under the Setup menu. The dialog in Figure 8 will appear.

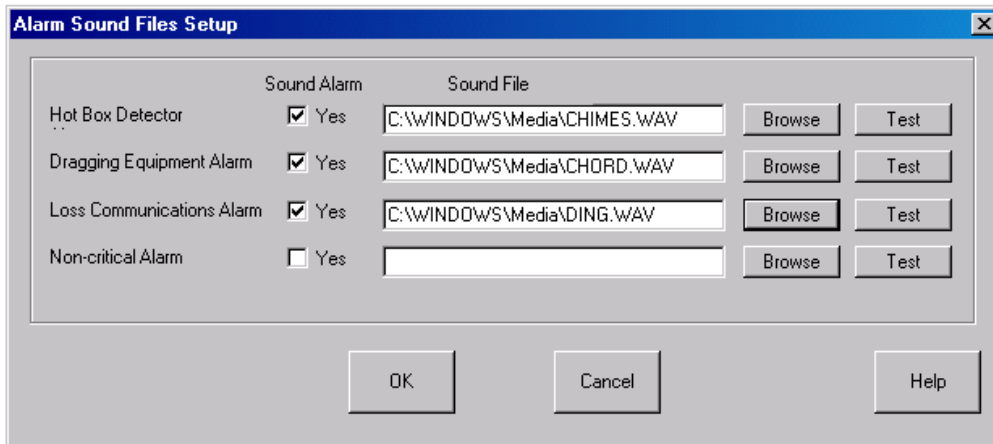


Figure 8 - Alarm Sound Files

5.3. Alarm Records

Any time the server sees a new alarm or an operator acknowledges an alarm, a message will be placed in the maintenance log (see Paragraph 14).

6. HOT BOX DETECTOR COMMUNICATIONS

6.1. Communication Port Status

When the SmartScan Central Office Server program begins it checks the status of all of the communication ports and updates their status in the Communication Port Status Line. To view the detailed communication port status click the Communications Menu item and then the Communication Port Status item from the secondary menu. The display in Figure 9 will appear.

The operator can decide which communication ports will be enabled by checking the appropriate boxes. The server will not try to use any communication port that is not enabled.

The operator can also specify if the communication port uses a dialup or lease line connection.

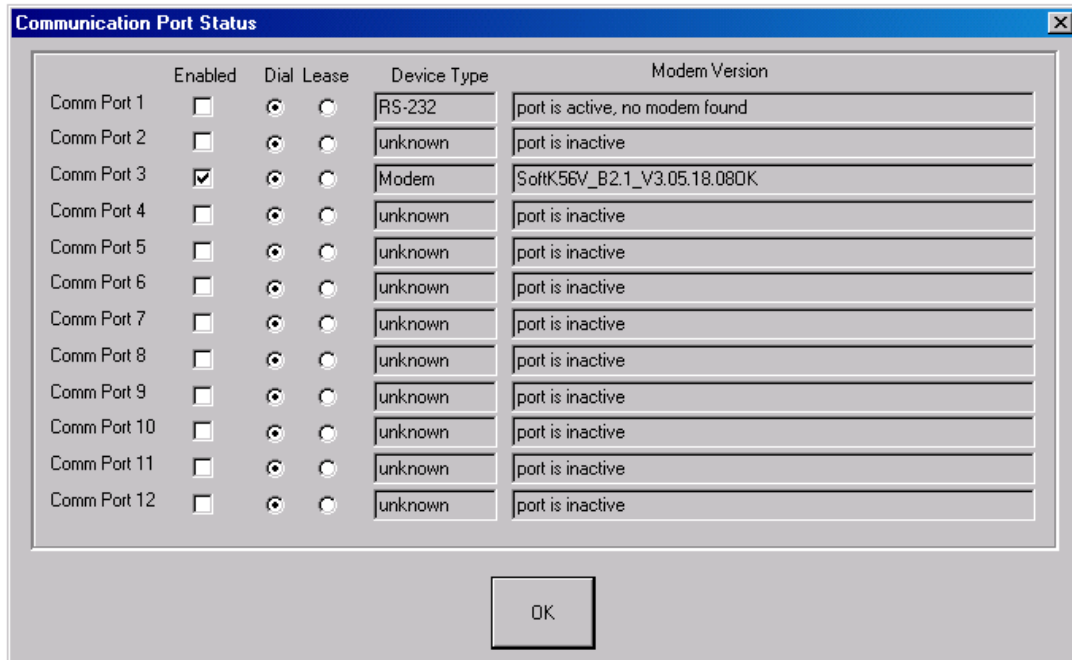


Figure 9 - Communication Port Status

6.2. Turning on Hot Box Detector Communications

Hot Box Detector Communications can be turned on or off by the operator. To turn the communications on or off click the Communications menu item at the top of the network map screen. This causes a secondary menu to appear. Click the Communications On item to turn communications on or off. This item is checked if communications is on.

6.3. Hot Box Detector Communications Setup

There are a number of Communications Setup parameters that must be entered. To display and enter these parameters, click the Communications menu item at the top of the screen and then the Communications Setup item from the secondary menu. Figure 10 will appear.

When the server dials a hot box detector it uses the telephone number in the Hot Box Detector Setup Parameters display (see Paragraph 9.1). It adds the dialing prefix entered in the Communications Setup display to this number, if necessary. The dialing prefix does not appear in this example because it is already part of the telephone number entered in the hot box detector's setup parameters display.

The incoming telephone number is entered via the Communications Setup display for dial-up connections. This is the telephone number the hot box detectors will dial to send information to the server. The server will set up (configure) each hot box detector with this number. If the hot box detector is located in a different area code from the server, the Hot Box Detector Setup Parameters display will specify the dialing prefix to be used with the telephone number.

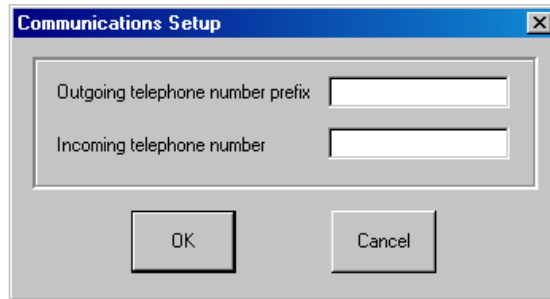


Figure 10 - Communications Setup

6.4. Hot Box Detector Status

The server records the current hot box detector status. To display this status place the mouse pointer on a hot box detector symbol and click the right mouse button. A pop-up menu will appear. Click the Monitor Device Dynamic Data menu item, and the screen shown in Figure 11 will appear.

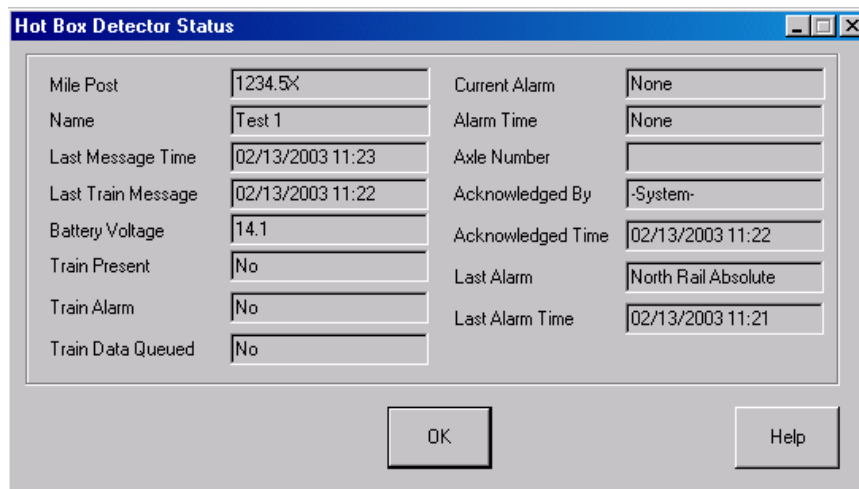


Figure 11 - Hot Box Detector Status

This is a dynamic display. It will automatically update as data changes. Hot Box Detector Status displays for multiple hot box detectors can be viewed at the same time. The following describes the fields in the Hot Box Detector Status display:

- Mile Post** the mile post location.
- Name** the hot box detector name.
- Last Message Time** the last time there was successful communication with the site.
- Last Train Message** the last time the hot box detector sent a train record to the server.
- Battery Voltage** the current battery voltage at the hot box detector.
- Train Present** whether or not a train is currently present at the hot box detector.
- Train Data Queued** whether or not the hot box detector has new train data to send to the server.

Current Alarm	the alarm text if there currently is an alarm or "None" if there is not a current alarm.
Alarm Time	the time when the alarm occurred or "None" if there is not a current alarm.
Axle Number	the axle number in the train that caused the alarm.
Acknowledged By	the name of the individual who acknowledged the alarm.
Acknowledge Time	the time the alarm was acknowledged.
Last Alarm	the alarm text of the last alarm.
Alarm Time	the time when the last alarm occurred.

6.5. Communications Monitor

The server allows the operator to monitor communications between the hot box detectors and the server. The easiest way to monitor communications between a hot box detector and the server is to place the mouse pointer on the symbol of the hot box detector to be monitored and click the right mouse button. This causes a secondary menu to be displayed. Select the Monitor Hot Box Communications, and the display in Figure 12 will appear.

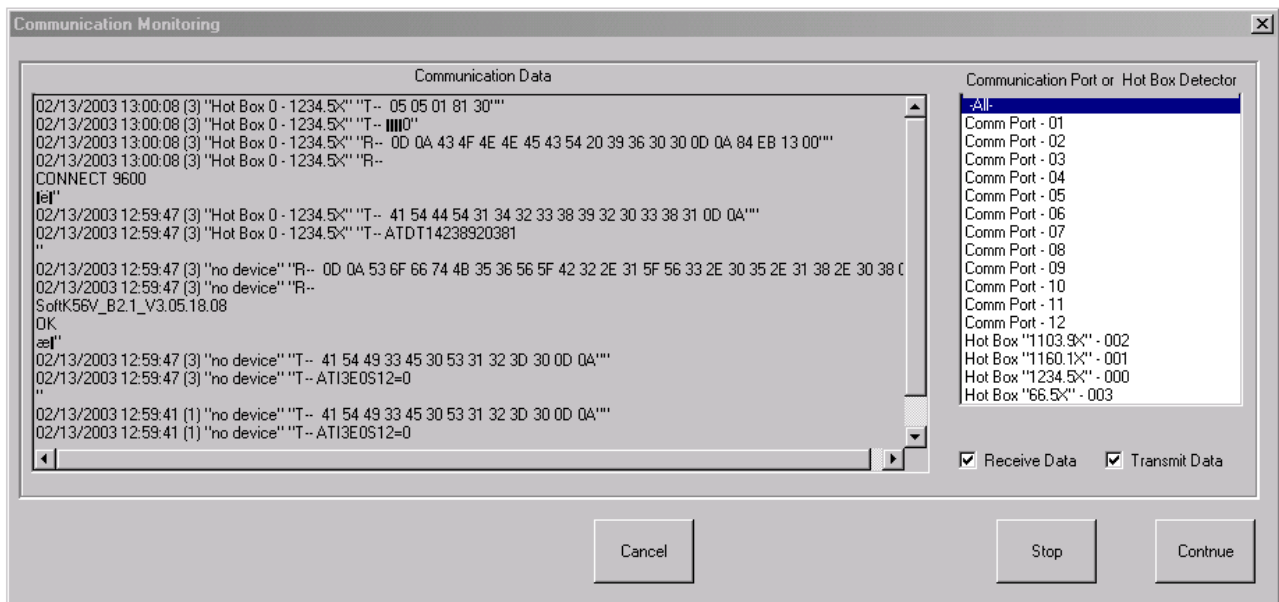


Figure 12 - Communications Monitoring

This display shows a list of all recent communications with the hot box detector in order from most recent to least recent. Each communication record has:

- The date and time the record was transmitted or received.
- The number of the communication port that received or transmitted the message.

- The hot box detector's internal number and mile post to which the message was sent or from which the message was received.
- T or R to indicate whether the message was transmitted by the server to the hot box detector or received by the server.
- The transmitted or received message.

Each communication record is shown as two separate representations. The first representation (bottom most) shows the data as a string of text characters and the second (record above) shows the same data as a set of hexadecimal characters with each pair representing one byte of data. The hexadecimal representation is limited to approximately 30 bytes of data.

The screen shown in Figure 12 is a dynamic display, which will automatically update every 2 seconds with the latest communication records. This makes it difficult to scroll down the Communication Data list box to see earlier messages. To stop the update, click the Stop button at the bottom of the display. To resume the updating of the screen, click the Continue button.

Included with the received messages are messages received and sent to the modem. Messages sent from the server to the modem start with an "AT". The following is a list of some of the modem messages and their meaning:

Modem Message	Description
ATDT and (telephone number)	Dial the telephone number
ATH0	Hang up
+++	Escape to command mode (allows the server to send commands rather than data to the modem)
ATA	Answer the telephone
CONNECT and (connection speed)	Modem connection
NO CARRIER	No modem carrier
RING	Line ring from incoming telephone call

The number of messages that can be displayed is limited to the last 5,000 messages received from all hot box detectors. There is also a display limit of 40,000 characters of data. Because of these limitations there may be times when no data will appear for a hot box detector that has not had any communications with the server for an extended period of time.

To limit the display to just the transmitted or received messages, click the appropriate Transmit Data or Receive Data check box located near the bottom right of the display.

The Communication Port or hot box detector list box on the right side of the display allows the operator to display all messages or only the messages for specific communication ports or hot box detectors. More than one communication port or hot box detector can be monitored at any given time by making multiple selections in the list box.

The Communication Monitoring display can also be called up from the main screen by clicking on the Monitor button. However, when this button is clicked communications from all hot box detectors will be monitored.

6.6. Communication Port Selection

Whenever the server tries to dialup a hot box detector site, it searches for the first available port beginning with the highest communication port number.

6.7. Communication Log

The server maintains a log of all communications between the server and the hot box detectors. This log resides in a file called "server comm log.txt". This is a text file that can be accessed by selecting the Lists menu item and the Communication Log item in the secondary menu. This causes the display in Figure 13 to appear.

Like the message lines seen in the Communications Monitor, each message line received shows the data and time it was received, the communication port number, the hot box detector, if known, and a T if the server transmitted the message or an R if the message was received by the server.

Each communication record is shown as two separate representations. The first representation shows the data as a string of text characters and the second shows the same data as a set of hexadecimal characters with each pair representing one byte of data. The hexadecimal representation is limited to approximately 30 bytes of data.

Because this file is a text file any word processing program can also access it.

The server has a file maintenance function that limits the size of this file. See Paragraph 12 for more information.

```

server comm log.txt - Notepad
File Edit Format View Help
02/06/2003 13:26:35 (1) "no device" T-- 41 54 49 33 45 30 53 31 32 3D 30 0D 0A"
02/06/2003 13:30:53 (1) "no device" "T-- ATI3E0S12=0
"
02/06/2003 13:30:53 (1) "no device" T-- 41 54 49 33 45 30 53 31 32 3D 30 0D 0A"
02/06/2003 13:30:59 (3) "no device" "T-- ATI3E0S12=0
"
02/06/2003 13:30:59 (3) "no device" T-- 41 54 49 33 45 30 53 31 32 3D 30 0D 0A"
02/06/2003 13:30:59 (3) "no device" "R--
SoftK56v_B2.1_v3.05.18.08
OK
A0000a"
02/06/2003 13:30:59 (3) "no device" R-- 0D 0A 53 6F 66 74 4B 35 36 56 5F 42 32 2E 31 5F 56 33 2E
30 35 2E 31 38 2E 30 38 0D 0A 4F 4B 0D 0A C4 FB 01 F0"
02/06/2003 13:30:59 (3) "0 - 1234.5X" "T-- ATDT14238920381
"
02/06/2003 13:30:59 (3) "0 - 1234.5X" T-- 41 54 44 54 31 34 32 33 38 39 32 30 33 38 31 0D 0A"
02/06/2003 13:31:20 (3) "0 - 1234.5X" "R--
CONNECT 14400
/I"
02/06/2003 13:31:20 (3) "0 - 1234.5X" R-- 0D 0A 43 4F 4E 4E 45 43 54 20 31 34 34 30 30 0D 0A 2F
49 00 28"
02/06/2003 13:31:20 (3) "0 - 1234.5X" "T-- 00000"
02/06/2003 13:31:20 (3) "0 - 1234.5X" T-- 05 05 01 81 30"
02/06/2003 13:31:21 (3) "0 - 1234.5X" "R-- 0000102/06/03 13:31"
02/06/2003 13:31:21 (3) "0 - 1234.5X" R-- 05 05 01 81 01 31 30 32 2F 30 36 2F 30 33 20 31 33 3A
33 31 00 00 04 ED 00 00 00 04 49 00 F4 C4"
02/06/2003 13:31:21 (3) "0 - 1234.5X" "T-- 00003yy"
02/06/2003 13:31:21 (3) "0 - 1234.5X" T-- 05 05 01 81 33 FF FF"
02/06/2003 13:31:21 (3) "0 - 1234.5X" "R-- 000040-A"
02/06/2003 13:31:21 (3) "0 - 1234.5X" R-- 05 05 01 81 01 34 1E 97 41 00 03 31 32 33 34 2E 35 58
00 04 00 84 0C 03 02 06 0A 0B 02 6E 9A 4B 2B 36 ED AD 96 12 12 03 03 02 02 57 02 6E 02 6E 00 00
B4 00 82 02 8C 00 9B 31 2E 36 30 00 00 64 03 02 02 03 0A 00 03 0B 67 01 00 00 00 19 00 00 13 12
02 02 43 01 00 00 00 19 00 38 13 12 02 02 7B 01 00 00 00 19 00 3B 13 12 02 02 7E 01 00 00 00 19
02 32 13 12 02 02 77 01 00 00 00 19 00 3C 12 11 02 02 7D 01 00 00 00 19 00 3B 13 12 02 02 7E 02
00 00 00 19 00 A2 12 11 02 02 E4 02 00 00 00 19 00 00 70 29 43"

```

Figure 13 - Communication Log

6.8. Maintenance Log

The server maintains a maintenance log file called "server maint log.txt". This is a text file that can be accessed by selecting the Lists menu item and the Maintenance Log item in the secondary menu. This causes the display in Figure 14 to appear.

The maintenance file contains system maintenance messages such as when the server started, when communications was turned on or off, when alarms occurred, etc. It also contains messages about communication problems with the hot box detectors or if the program finds internal errors.

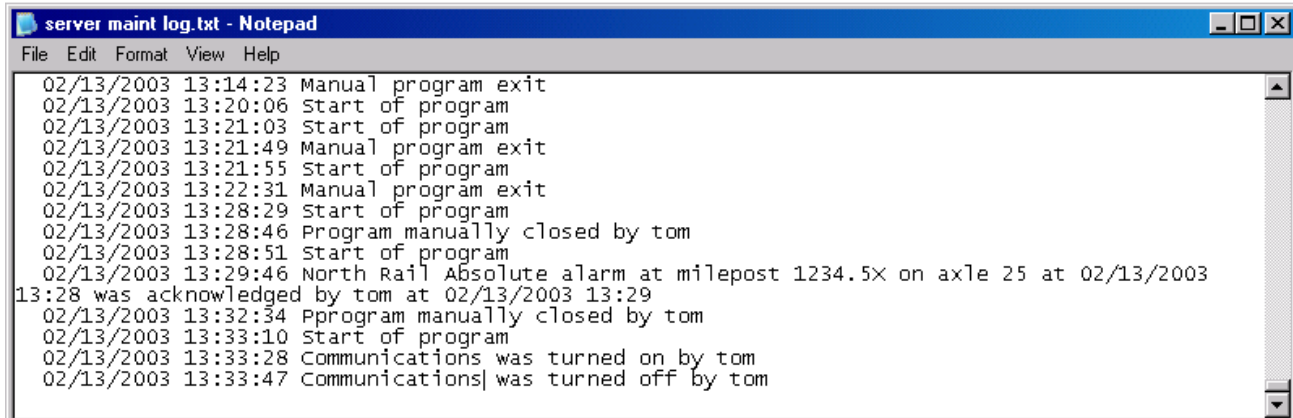


Figure 14 - Maintenance Log

Because this file is a text file, any word processing program can also access it.

The servers have a file maintenance function that limits the size of this file. See Paragraph 12 for more information.

7. TRAIN RECORDS

The Train Records List display shows a list of the last 1000 train records received from the hot box detectors. All fields associated with a train record can be included in the Train Records List display.

7.1. Train Records List Display

The Train Records List display is shown in Figure 15. The total number of train records in the list is shown on the status line under the tool bar. Below the status line and a set of operator buttons are the column headers followed by a list of train records.

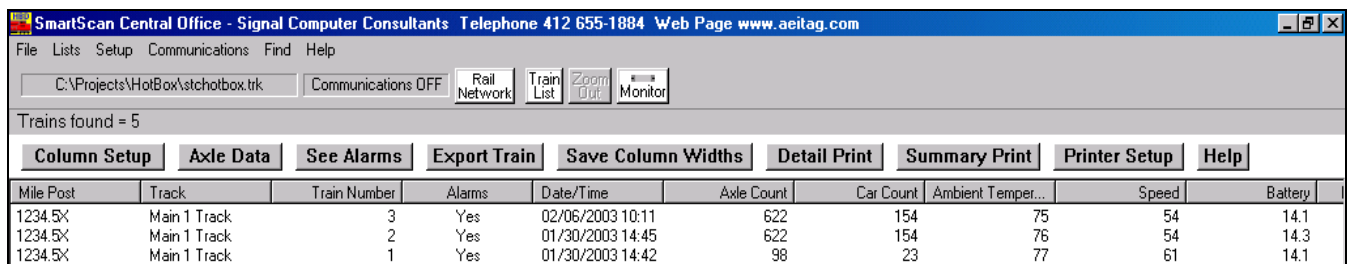


Figure 15 - Train Records List Display

7.2. Column Setup Button

By clicking the Column Setup button, the user can customize the information displayed in the each train record. This will cause the Column Order Setup display to appear (see Figure 16).

To determine the fields that will be included in each train record, place the cursor on the field name in the left-hand list of Available Fields and click the left mouse button. This causes the field to be highlighted. Then click the Add button. The field will then be moved to the Selected Column Fields list. Pointing the cursor to each field and holding the control key down while clicking the left mouse button can select multiple fields.

To remove fields from the Selected Column Fields list, select the fields to be removed and click the Remove button.

The fields in the Selected Column Fields list are in the same order they will appear in each train record of the Train Records List. The top field in the Selected Column Fields list will be in the left-most column of each train record in the Train Records List. Each field down the list will be in the column to the right of the previous field in the train record. To change the order of the fields in the report, select the fields you want to be closer to the left side of the list and click the Advance button. The fields that are selected will move one position up the list or one column to the left in the report. You can advance any field to the top of the list and advance multiple selected fields.

The Train Records List display will immediately be customized per the parameters in the Column Order Setup display when the "OK" button is clicked.

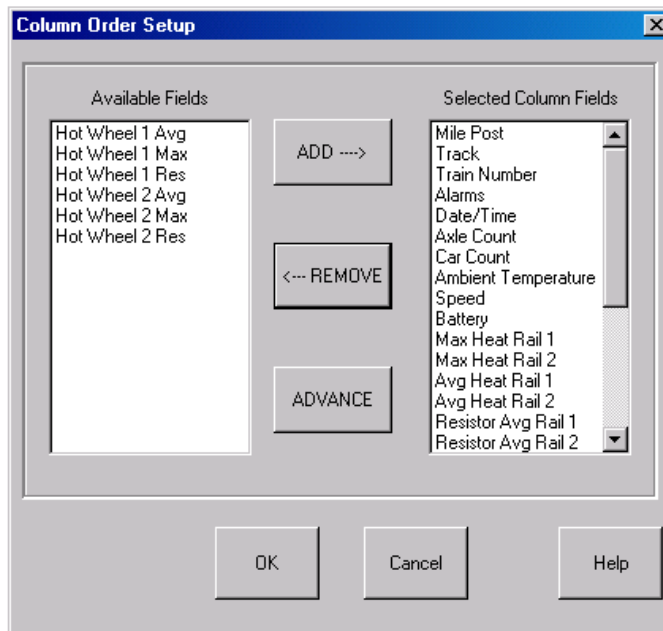


Figure 16 - Train Record List Column Order Setup Display

7.3. Axle Data Button

From the Train Records List display the operator can call up additional data on axles for a particular train record by selecting the train record in the list and clicking on the Axle Data button. This will cause the Axle Data List display for the selected train record to appear. See Paragraph 8 for more information.

7.4. See Alarms Button

Because a train record can have multiple alarms associated with it, it is not possible to display all the possible alarms in the Alarm column of the Train Records List display. The Alarm column will contain a "Yes" if the train record has one or more alarms associated with it or "No" if there are no alarms associated with the train record. To see the alarms for a particular train record, select the train record and click the See Alarms button above the column headers. The program will then display the Train Alarms display shown in Figure 17.

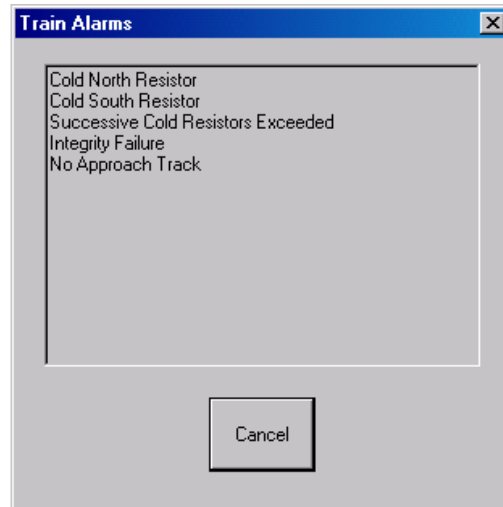


Figure 17 - Train Alarms

7.5. Export Train Button

All data about a selected train record can be exported into a delimited text file by clicking the Export Train button. See Paragraph 11 for more details.

7.6. Save Column Widths Button

The operator can adjust the width of the columns in this display. Place the mouse pointer on the vertical line between two column headers (for example, on the line between the Mile Post and Track column headers), depress the left mouse key, and drag the mouse to the left or right to resize the columns.

To save the new column sizes, click the Save Column Widths button above the column headers. The next time this display is called up it will have the column widths that were displayed when this button was clicked.

7.7. Detail Print Button

Selecting the train record in the list and clicking on the Detail Print button will cause a detail report of a train record to be printed. Figure 18 and Figure 19 is an example of this report.

Southern Technologies Corporation Next Generation Detector System TRAIN DETAIL							
Train#: 2		Speed: 54		Milepost: 1234.5X			
Date: 01/30/2003		Axles: 622		Track: Main 1 Track			
Time: 14:45		Direction: West		Temperature: 76			
Battery: 14.3							
Rail	Max	Avg	Resistor	Txdr Counts	Alarm	Limit	Carside Parms
North	203	21	3	T01 622	Absolute	180	Slope: 1.60
South	184	22	4	T02 622	Differential	130	Minimum: 100
					Hot Wheel	652	
					Cold Rail Temp	10	
Wheel	Max	Avg	Resistor				
North	6	6	2				
South	10	6	3				
Firmware Versions							
Analyzer: Comm:							
System Alarms							
Cold North Resistor							
Cold South Resistor							
Successive Cold Resistors Exceeded							
Integrity Failure							
No Approach Track							
Axle Alarm Summary							
13 South Rail Absolute							
20 North Rail Absolute							
50 South Rail Absolute							

Figure 18 - Train Record Detail Report Page 1

Car	Axle	Rail		Wheel		ON	OFF	Alarms
		North	South	North	South			
8	35	21	21	6	10	25	162	
	36	22	22	6	10	26	58	
	37	22	22	6	6	26	561	
	38	22	22	6	10	26	58	
Carside Ave:		North 22	South 22	Carside Alarms:		North 135	South 135	
9	39	21	21	6	6	24	162	
	40	22	22	6	6	26	59	
	41	22	22	6	10	26	561	
	42	21	21	6	6	24	60	
Carside Ave:		North 21	South 21	Carside Alarms:		North 133	South 133	
10	43	21	21	6	6	25	163	
	44	22	22	6	6	26	58	
	45	22	22	6	6	26	561	
	46	22	21	6	10	26	58	
Carside Ave:		North 22	South 21	Carside Alarms:		North 135	South 133	
11	47	21	21	6	10	25	162	
	48	22	22	6	10	26	58	
	49	22	22	6	6	26	561	
	50	21	183	6	6	25	60	South Rail Absolute
Carside Ave:		North 21	South 22	Carside Alarms:		North 133	South 135	
12	51	21	20	6	10	25	162	
	52	22	22	6	10	26	58	
	53	22	22	6	6	26	561	
	54	22	22	6	6	26	58	
Carside Ave:		North 22	South 22	Carside Alarms:		North 135	South 135	
13	55	21	21	6	10	25	162	
	56	22	22	6	6	26	58	
	57	22	22	6	10	26	561	
	58	22	22	6	6	26	58	
Carside Ave:		North 22	South 22	Carside Alarms:		North 135	South 135	
14	59	21	20	6	6	25	162	
	60	22	22	6	10	26	58	
	61	22	22	6	6	26	561	
	62	22	22	6	10	26	58	
Carside Ave:		North 22	South 22	Carside Alarms:		North 135	South 135	

Figure 19 - Train Record Detail Report Pages 2 to End

7.8. Summary Print Button

Clicking on the Summary Print button will cause a summary report of all train records to be printed. Figure 20 is an example of this report.

Southern Technologies Corporation Next Generation Detector System TRAIN SUMMARY													
Version Info.....		Analyzer: Communicator:				Milepost: 1234.5X Track: Main 1 Track							
Alarm Limits.....		Absolute: 180 Differential: 130 Hot Wheel: 650				Carside Slope: 1.60 Carside Minimum: 100 Cold Wheel Temp: 10							
Train# Balt	Date	Time	Cars	Axles	T01	T02	Speed (mph)	Dir	Rail Average		Wheel Average		Amb Temp
2	01/30/2003	14:45	154	622	622	622	54	W	21	22	6	6	76
i4.3v													
3	02/06/2003	10:11	154	622	622	622	54	W	21	21	6	6	75
i4.1v													
2	01/30/2003	14:45	154	622	622	622	54	W	21	22	6	6	76
i4.3v													
1	01/30/2003	14:42	23	98	98	98	61	E	22	22	6	6	77
i4.1v													
1	00/05/2003	09:01	154	622	622	622	54	W	21	21	6	6	74
i4.1v													
2	00/05/2003	09:18	154	622	622	622	54	W	21	21	6	6	75
i4.3v													

Figure 20 - Train Summary Report

8. AXLE DATA

The Axle Data List display shows a list of all the axle data for a particular train record. All fields associated with an axle can be included in the Axle Data List display.

8.1. Axle Data List Display

The Axle Data List display is shown in Figure 21. The total number of axles in the list is shown on the status line under the tool bar. Below the status line and a set of operator buttons are the column headers followed by a list of the axle data.

Car ID	Car Number	Axle Number	Alarms	On Time	Off Time	Rail 1 Temp	Rail 2 temp	Hot Wheel 1 Temp	Hot Wheel 2 Temp
	1	1		25	0	22	21	6	6
	1	2		25	56	22	21	6	6
	1	3		25	59	22	21	6	6
	1	4		25	562	22	21	6	6
	1	5		25	60	21	20	6	6
	1	6		25	59	22	21	6	6
	2	7		25	162	21	20	6	6
	2	8		25	59	22	21	6	6
	2	9		25	60	21	20	6	10
	2	10		25	562	22	21	6	6
	2	11		25	59	22	21	6	6
	2	12		25	59	22	21	6	6
	3	13	South Rail Differential	25	162	21	176	6	6
	3	14		25	59	22	21	6	6
	3	15		25	59	22	21	6	6

Figure 21 - Axle Data List Display

8.2. Column Setup Button

The user can customize the information to be displayed in the columns of the Axle Data List display. Clicking the Column Setup button will cause the Column Order Setup display to appear (see Figure 22).

To include a field in the Axle Data List display, select the field name from the Available Fields list box, and then click the Add button. The field will then be moved to the Selected Column Fields list box. Pointing the cursor to each field and holding the control key down while clicking the left mouse button will select multiple fields. In the screen shot shown in Figure 22 there are no field names in the Available Fields list box because all of the available fields have already been moved to the Selected Column Fields list box to be included in the Axle Data List display.

To remove field(s) from the Selected Column Fields list box, select the field(s) to be removed and click the Remove button.

The fields in the Selected Column Fields list are in the same order they will appear in each line of the Axle Data List. The top field in the Selected Column Fields list will be in the left-most column of each axle data record in the Axle Data List. Each field down the list will be in the column to the right of the previous field in each axle data record. To change the order of the fields in the report, select the field(s) you want to be closer to the left side of the axle data records and click the Advance button. The fields that are selected will move one position up the list or one column to the left in the report. You can advance any field to the top of the list and advance multiple selected fields.

The Axle Data List display will immediately be customized per the parameters in the Column Order Setup display when the "OK" button is clicked.

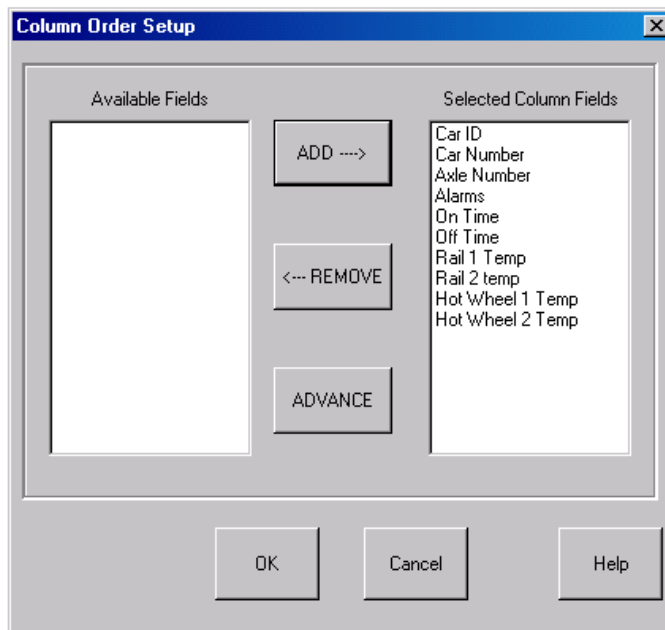


Figure 22 - Axle Data List Column Order Setup Display

8.3. Return To Train List Button

The Return To Train List button causes the Train Record List display to reappear.

8.4. Export Train Button

Data about the last selected train record can be exported into a comma delimited text file by clicking the Export Train button. See Paragraph 11 for more details.

8.5. Save Column Widths Button

The operator can adjust the widths of the columns in this display. Place the mouse pointer on the vertical line between two column headers (for example, on the line between the Car ID and Car Number column headers), depress the left mouse key, and drag the mouse to the left or right to resize the columns.

To save the new column sizes, click the Save Column Widths button above the column headers. The next time this display is called up it will have the column widths that were displayed when this button was clicked.

8.6. Print Button

Clicking on the Print button will print a detail report of the train record as explained in Paragraph 7.7.

9. HOT BOX DETECTOR SETUP PARAMETERS

The SmartScan Central Office Server program maintains two sets of hot box setup parameters. One set is called the Office Setup Parameters and is created by using the SmartScan Central Office Network Builder program. The second set is the setup parameters that are currently loaded into the physical hot box detector. The server obtains these parameters by sending a message to the hot box detector when the program is first started. The following describes these two sets of parameters.

9.1. Hot Box Detector Office Setup Parameters

To view the hot box detector office setup parameters for a particular hot box detector, place the mouse pointer on the hot box detector symbol on the Network Map, click the right mouse button, and then select the Office Setup Parameters menu item. This will cause the display in Figure 23 to appear.

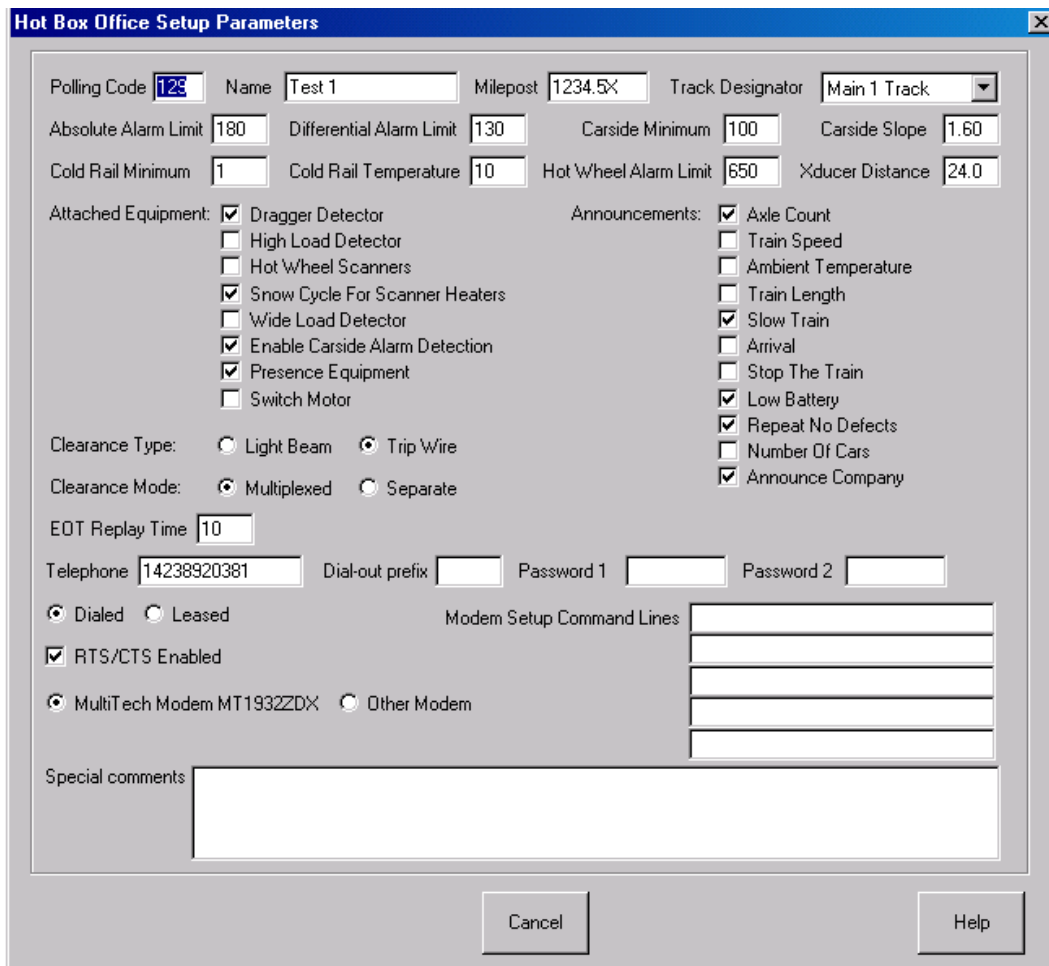


Figure 23 - Hot Box detector Office Setup Parameters

Please note that this is a read-only display. None of the fields in this display can be modified in the SmartScan Central Office Server program. They can only be modified in the Smart Scan Central Office Network Builder program.

The following describes the fields in this display:

- Polling Code** the communications address code if the hot box detector is on a multi-drop communication line.
- Name** the hot box detector name.
- Mile Post** the mile post location.
- Track Designator** the identifier of the track the hot box detector is monitoring.
- Absolute Alarm Limit** see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.
- Differential Alarm Limit** see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.
- Carside Minimum** see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.

Carside Slope	see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.
Cold Rail Minimum	see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.
Cold Rail Temperature	see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.
Hot Wheel Alarm Limit	see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.
Xducer Distance	see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.
Attached Equipment	see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.
Clearance Type	see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.
Clearance Mode	see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.
EOT Replay Time	see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.
Telephone	if the hot box detector is connected to a dialup telephone line, the associated telephone number of the line.
Dial-out Prefix	if the hot box detector is connected to a dialup telephone line, any dialing prefix it must use to dial the server.
Password 1	see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.
Password 2	see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.
Dial or Lease	indicates whether the hotbox detector is on a dialup or lease communications line.
Modem Setup Command Lines	see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.
RTS/CTS Enabled	see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.
MultiTech or Other Modem	see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.
Special Comments	any special comments about the hot box detector.

9.2. Hot Box Detector Site Setup Parameters

To view the hot box detector site setup parameters for a particular hot box detector, place the mouse pointer on the hot box detector symbol on the Network Map, click the right mouse button and then select the Site Setup Parameters menu item. This will cause the display in Figure 24 to appear.

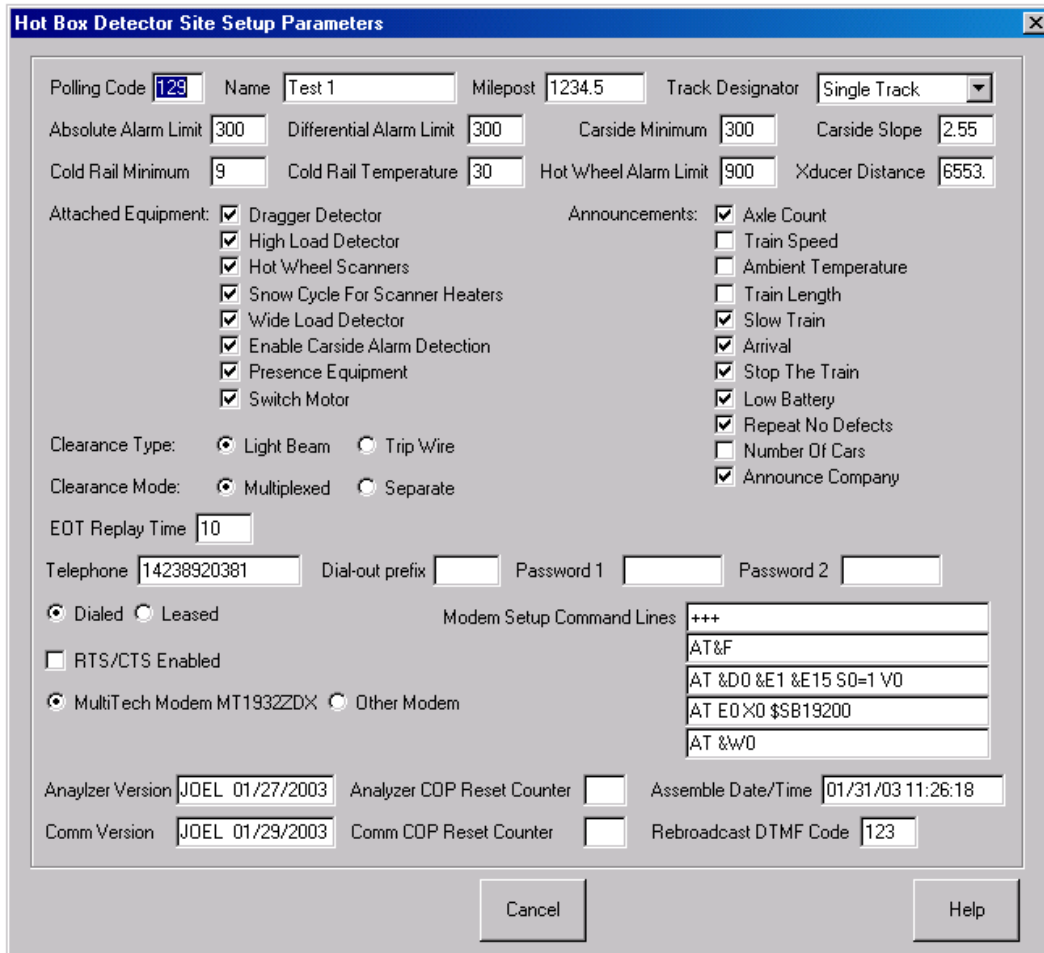


Figure 24 - Hot Box Detector Site Setup Parameters

Please note that this is a read-only display. None of the fields in this display can be modified in the SmartScan Central Office Server program. They can only be modified by making changes to the parameters loaded into the physical hot box detector equipment.

The following describes the fields in this display:

- Polling Code** the communications address code if the hot box detector is on a multi-drop communications line.
- Name** the hot box detector name.
- Mile Post** the mile post location.
- Track Designator** the identifier of the track the hot box detector is monitoring.
- Absolute Alarm Limit** see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.
- Differential Alarm Limit** see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.

Carside Minimum	see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.
Carside Slope	see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.
Cold Rail Minimum	see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.
Cold Rail Temperature	see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.
Hot Wheel Alarm Limit	see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.
Xducer Distance	see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.
Attached Equipment	see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.
Clearance Type	see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.
Clearance Mode	see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.
EOT Replay Time	see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.
Telephone	if the hot box detector is connected to a dialup telephone line, the associated telephone number of the line.
Dial-out Prefix	if the hot box detector is connected to a dialup telephone line, any dialing prefix it must use to dial the server.
Password 1	see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.
Password 2	see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.
Dial or Lease	indicates whether the hotbox detector is on a dialup or lease communications line.
Modem Setup Command Lines	see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.
RTS/CTS Enabled	see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.
MultiTech or Other Modem	see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.
Analyzer Version	see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.
Analyzer COP Reset Counter	see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.

Assemble Date/Time	see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.
Comm Version	see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.
Comm COP Reset Counter	see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.
Rebroadcast DMTF Code	see Southern Technologies SmartScanNG After Installation Manual (EUD-2003024) for information about this field.

10. Password Maintenance Display

The system manager can set up password protection. To assign passwords, the system manager chooses the Password Maintenance menu item under the Setup menu, which causes the Password Maintenance display to appear (see Figure 25).

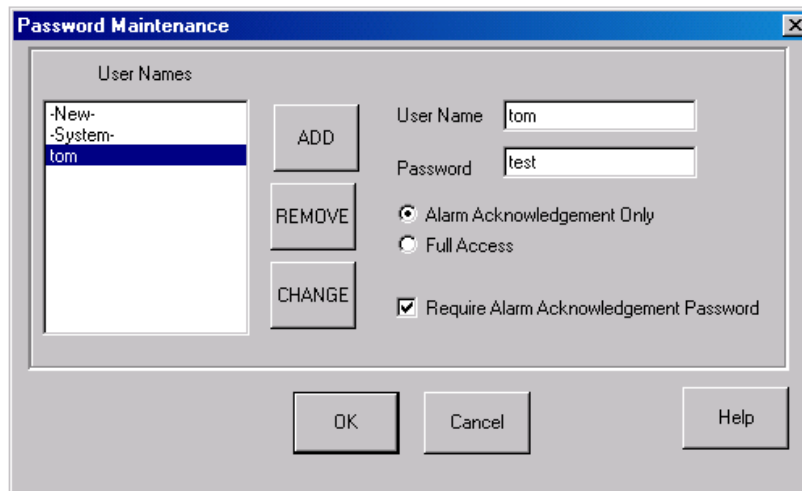


Figure 25 - Password Maintenance Display

There are two levels of password protection that can be implemented. These are: alarm acknowledgement only, which allows the operator to acknowledge alarms only, but not change critical system parameters; and full access, which allows the operator to acknowledge alarms and change all system parameters.

To activate these various levels of protection, check the Require Alarm Acknowledgement Password box.

Please note that all user names and passwords are case dependent.

To add a new user simply type a user name and password into the appropriate boxes, specify the access level by checking the appropriate access level box, and click the Add button.

To edit a password, select the user name in the User Names list. The information associated with the user name will appear in the User Name and Password boxes to the right of the list. Modify the data in these boxes including the access level and click the Change button to update.

To remove a password, select the user name in the User Names list and click the Remove button.

The system will not allow you to remove the "-System-" user name or change it. It will, however, allow you to change the password for this user name.

11. EXPORT DATA

To allow other programs to access data stored by the SmartScan Central Office Server program, the program automatically creates two types of comma delimited text files. It also allows the operator to generate a comma limited text file for a particular train record.

11.1. Automatically Generated Export Files

The first type of automatically generated export file contains information about the current status of all the hot box detectors. The second type of file contains data on the last twenty train records for each hot box detector. These files are placed in a folder that can be specified by the system manager. To specify this folder click on the Export File Folder menu item under the setup menu.

The following paragraphs describe the two types of automatically generated export files.

11.1.1. Hot Box Status Export File

The SmartScan Central Office Server will periodically create a file called "Hot Box Status Export.txt" which contains status information on all of the hot box units connected to the system.

This file is a comma delimited text file and can be displayed with any word processing program such as Notepad, WordPad or Word. All records (segments) in the file are terminated with a line feed character (Hex 0A).

Each record in the file is called a segment. There are three segment types. The following table defines the segment types and their associated codes:

Segment Code	Maximum Number In File	Description
START	1	Message Header Segment
HOTBOX	100	Yard Segment
END	1	Message Trailer Segment

A segment code is at the beginning of each segment. The segment code is separated from the other fields in the segment by a comma. All fields within the segment with the exception of the segment code are in quotations. The following is the general layout of all types of segments:

Segment code, "field 1", "field 2", "field 3", ...<line feed character>

The first segment in the file is the START Message Header. The last segment in the file will be the END Message Trailer. All other segment types must be positioned in the file between the START and END segments.

The HOTBOX segments may be in any order after the START Message Header segment and before the END Message Trailer segment. The following is the general order of the segments within the file:

```
START
HOTBOX
HOTBOX
HOTBOX
HOTBOX
HOTBOX
HOTBOX
HOTBOX
END
```

Each of the following tables describes the fields for each segment type and includes an example:

START Message Header Segment

Field Number	Data Name	Data Format	Description
ST1	Version	Numeric 1 to 4 digits	Version number of the file format
ST2	Date/Time	MM/DD/YYYY<space> HH:MM:SS	Date and time the file was created MM = month DD = day of month YYYY = year HH = hour MM = minute SS = second

Example:

```
START,"0001","02/08/2003 11:24:37"
```

HOTBOX Segment

Field Number	Data Name	Data Format	Description
HB1	Milepost	Alpha/Numeric 1 to 8 characters	Milepost
HB2	Train Presence	Alpha/Numeric 13 to 16 characters	Indicates with one of the following messages whether (or not) a train is currently present: Train Present No Train Present
HB3	Alarm	Alpha/Numeric 5 to 8 characters	Indicates with one of the following messages whether (or not) the train at the site has an alarm: Alarm No Alarm
HB4	Train Data Queued	Alpha/Numeric 17 to 20	Indicates with one of the following messages whether (or not) the site has a train message queued to be sent to the office: Train Data Queued No Train Data Queued
HB5	Last Message Date/Time	MM/DD/YYYY<space> HH:MM	Date and time the last message was received by the office from the field MM = month DD = day of month YYYY = year HH = hour MM = minute
HB6	Last Train Date/Time	MM/DD/YYYY<space> HH:MM	Date and time the last train data message was received by the office from the field MM = month DD = day of month YYYY = year HH = hour MM = minute
HB7	Battery Voltage	XX.X where X is a digit	Battery voltage in tenths of volts

HB8	Axle Alarm	Alpha/Numeric 6 to 40 characters	Description of axle alarm for the current train. This field will contain "None" if there is no alarm, or one of the following: North][East] Rail Absolute [South][West] Rail Absolute [North][East] Rail Differential [South][West] Rail Differential [North][East] Hot Wheel [South][West] Hot Wheel [North][East] Rail Pyro Saturation Alarm [South][West] Rail Pyro Saturation Alarm Carside Slope, [North][East] Side Carside Slope, [South][West] Side Wide Load, [North][East] Side Wide Load, [South][West] Side Dragging Equipment High Load
HB9	Axle Alarm Date/Time	MM/DD/YYYY<space> HH:MM or "None"	Date and time the current axle alarm was received or "None" if no current alarm MM = month DD = day of month YYYY = year HH = hour MM = minute
HB10	Acknowledged By	Alpha/Numeric 1 to 20 characters	Operator name of the individual at the office who acknowledged the alarm
HB11	Acknowledged Date/Time	MM/DD/YYYY<space> HH:MM or "None"	Date and time the current axle alarm was acknowledged by someone at the office or "None" if the alarm has not been acknowledged MM = month DD = day of month YYYY = year HH = hour MM = minute

HB12	Last Axle Alarm	Alpha/Numeric 6 to 40 characters	Description of axle alarm for the last alarm received by the office that is not the current alarm. This field will contain "None" if there was no last alarm or one of the following: [North][East] Rail Absolute [South][West] Rail Absolute [North][East] Rail Differential [South][West] Rail Differential [North][East] Hot Wheel [South][West] Hot Wheel [North][East] Rail Pyro Saturation Alarm [South][West] Rail Pyro Saturation Alarm Carside Slope, [North][East] Side Carside Slope, [South][West] Side Wide Load, [North][East] Side Wide Load, [South][West] Side Dragging Equipment High Load
HB13	Last Axle Alarm Date/Time	MM/DD/YYYY<space> HH:MM or "None"	Date and time the last axle alarm (not the current axle alarm) was received or "None" if no last alarm MM = month DD = day of month YYYY = year HH = hour MM = minute
HB14	Hot Box Detector Enable	"Enabled" or "Disabled"	Indicates whether the operator has enabled or disabled communication

Example:

**HOTBOX,"1234.5X","No Train Present","No Alarm","No Train Data Queued",
"02/07/200315:49","02/06/2003 13:31","14.1","None","None","Unknown",
"02/06/2003 15:51","North Rail Absolute","02/06/2003 15:48","Enabled"**

END Message Trailer Segment

Field Number	Data Name	Data Format	Description
END1	Number of Segments	Numeric 1 to 4 digits	Number of segments in the file not including the START and END segments

Example:

END,"1"

11.1.2. Hot Box Train Export File

The Hot Box Office program will periodically create a file called "Hot Box Train Export.txt" which contains the last 20 train records from each hot box detector connected to the system.

This file is a comma delimited text file and can be displayed with any word processing program such as Notepad, WordPad or Word. All records (segments) in the file are terminated with a line feed character (Hex 0A).

Each record in the file is called a segment. There are four segment types. The following table defines the segment types and their associated codes:

Segment Code	Maximum Number In File	Description
START	1	Message Header Segment
TRAIN	2000	Train Header Segment
AXLE	120000	Axle Record Segment
END	1	Message Trailer Segment

A segment code is at the beginning of each segment. The segment code is separated from the other fields in the segment by a comma. All fields within the segment with the exception of segment code are in quotations. The following is the general layout of each segment:

Segment code, "field 1", "field 2", "field 3", ...<line feed character>

The first segment in the file is the START Message Header. The last segment in the file will be the END Message Trailer. All other segments types must be positioned in the file between the START and END segments.

The TRAIN segment is always followed by the AXLE segments associated with the train. After the last AXLE segment for a train, a new TRAIN segment may follow. The following is the general order of the segments within this type of file:

```

START
TRAIN
AXLE
AXLE
AXLE
.
.
.
AXLE
TRAIN
AXLE
AXLE
    
```

AXLE
 .
 .
 .
 AXLE
 END

Each of the following tables describes the fields for each segment type and includes an example:

START Message Header Segment

Field Number	Data Name	Data Format	Description
ST1	Version	Numeric 1 to 4 digits	Version number of message format
ST2	Date/Time	MM/DD/YYYY<space> HH:MM:SS	Date and time the file was created MM = month DD = day of month YYYY = year HH = hour MM = minute SS = second

Example:

START,"0001","02/08/2003 11:24:37"

TRAIN Segment

Field Number	Data Name	Data Format	Description
TRN1	Train Number	Numeric 1 to 3 digits	Each hotbox unit assigns a unique train number to each train record
TRN2	Milepost	Alpha/Numeric 1 to 8 characters	Milepost of the hot box detector that reported the train
TRN3	Track Designator	Alpha/Numeric 1 to 21 characters	The identifier of the track the hot box detector is monitoring

TRN4	Train Status	Hexadecimal 8 digits (0 to F) representing 32 bits. Bit 0 is the least significant bit. Bit 31 is the most significant bit.	<p>This is a 32-bit field with each bit representing an alarm status for the train. Multiple alarms may occur. The following is a list of alarms and their assigned bits:</p> <table border="1" data-bbox="818 363 1385 1871"> <thead> <tr> <th>Bit</th> <th>Alarm</th> </tr> </thead> <tbody> <tr><td>0</td><td>Cold [North][East] Rail</td></tr> <tr><td>1</td><td>Cold [South][West] Rail</td></tr> <tr><td>2</td><td>Cold [North][East] Resistor</td></tr> <tr><td>3</td><td>Cold [South][West] Resistor</td></tr> <tr><td>4</td><td>Dead [North][East] Resistor</td></tr> <tr><td>5</td><td>Dead [South][West] Resistor</td></tr> <tr><td>6</td><td>Successive Cold Rails Exceeded</td></tr> <tr><td>7</td><td>VERY Slow Train</td></tr> <tr><td>8</td><td>Short Train</td></tr> <tr><td>9</td><td>Cold [North][East] Wheel Scanner</td></tr> <tr><td>10</td><td>Successive Cold Resistors Exceeded</td></tr> <tr><td>11</td><td>Successive Cold Wheels Exceeded</td></tr> <tr><td>12</td><td>Successive Cold Wheel Resistors Exceeded</td></tr> <tr><td>13</td><td>Low Battery</td></tr> <tr><td>14</td><td>Dead [South][West] Wheel Scanner Resistor</td></tr> <tr><td>15</td><td>Integrity Failure</td></tr> <tr><td>16</td><td>Stuck Dragger Pretrain</td></tr> <tr><td>17</td><td>Dead Battery</td></tr> <tr><td>18</td><td>Track Circuit Enabled, No Gates</td></tr> <tr><td>19</td><td>Midrange Transducer Miscounts</td></tr> <tr><td>20</td><td>High Range Transducer Miscounts</td></tr> <tr><td>21</td><td>Stuck Dragger During Train Passage</td></tr> <tr><td>22</td><td>Stuck Dragger Recovered</td></tr> <tr><td>23</td><td>Stuck High Load Detector</td></tr> <tr><td>24</td><td>Stuck Wide Load Detector Pretrain [North][East] Side</td></tr> <tr><td>25</td><td>Stuck Wide Load Detector Pretrain [South][West] Side</td></tr> <tr><td>26</td><td>No Approach Track</td></tr> <tr><td>27</td><td>Cold [South][West] Wheel Scanner</td></tr> <tr><td>28</td><td>Cold [North][East] Wheel Scanner Resistor</td></tr> <tr><td>29</td><td>Cold [South][West] Wheel Scanner Resistor</td></tr> </tbody> </table>	Bit	Alarm	0	Cold [North][East] Rail	1	Cold [South][West] Rail	2	Cold [North][East] Resistor	3	Cold [South][West] Resistor	4	Dead [North][East] Resistor	5	Dead [South][West] Resistor	6	Successive Cold Rails Exceeded	7	VERY Slow Train	8	Short Train	9	Cold [North][East] Wheel Scanner	10	Successive Cold Resistors Exceeded	11	Successive Cold Wheels Exceeded	12	Successive Cold Wheel Resistors Exceeded	13	Low Battery	14	Dead [South][West] Wheel Scanner Resistor	15	Integrity Failure	16	Stuck Dragger Pretrain	17	Dead Battery	18	Track Circuit Enabled, No Gates	19	Midrange Transducer Miscounts	20	High Range Transducer Miscounts	21	Stuck Dragger During Train Passage	22	Stuck Dragger Recovered	23	Stuck High Load Detector	24	Stuck Wide Load Detector Pretrain [North][East] Side	25	Stuck Wide Load Detector Pretrain [South][West] Side	26	No Approach Track	27	Cold [South][West] Wheel Scanner	28	Cold [North][East] Wheel Scanner Resistor	29	Cold [South][West] Wheel Scanner Resistor
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			30	Dead [North][East] Wheel Scanner Resistor
			31	Test Train
TRN5	Train Date/Time	MM/DD/YYYY <space> HH:MM or "None"	Date and time the train passed the hot box detector. MM = month DD = day of month YYYY = year HH = hour MM = minute	
TRN6	Axle Count	Numeric 1 to 3 digits	Number of axles in the train	
TRN7	Car Count	Numeric 1 to 3 digits	Number of cars in the train	
TRN8	Ambient Temperature	Numeric 1 to 3 digits with negative sign if negative temperature	Ambient outside temperature in Fahrenheit	
TRN9	Train Speed	Numeric 1 to 3 digits	Train's exit speed in miles per hour	
TRN10	Battery Voltage	XX.X where X is a digit	Battery voltage in tenths of volts	
TRN11	Maximum Heat Rail 1	Numeric 1 to 3 digits	Maximum temperature for Rail 1 in Fahrenheit	
TRN12	Maximum Heat Rail 2	Numeric 1 to 3 digits	Maximum temperature for Rail 2 in Fahrenheit	
TRN13	Average Heat Rail 1	Numeric 1 to 3 digits	Average temperature for Rail 1 in Fahrenheit	
TRN14	Average Heat Rail 2	Numeric 1 to 3 digits	Average temperature for Rail 2 in Fahrenheit	
TRN15	Average Resistor Rail 1	Numeric 1 to 3 digits	Average resistor temperature for Rail 1 in Fahrenheit	
TRN16	Average Resistor Rail 2	Numeric 1 to 3 digits	Average resistor temperature for Rail 2 in Fahrenheit	
TRN17	Maximum Wheel Rail 1	Numeric 1 to 3 digits	Maximum hot wheel temperature for Rail 1 in Fahrenheit	
TRN18	Average Wheel Rail 1	Numeric 1 to 3 digits	Average hot wheel temperature for Rail 1 in Fahrenheit	
TRN19	Direction	Alpha 4 to 5 characters	Train's direction of travel. The field has one of the following values: North South East West	
TRN20	Transducer 1 Count	Numeric 1 to 3 digits	Number of hits on wheel sensor 1	
TRN21	Transducer 2 Count	Numeric 1 to 3 digits	Number of hits on wheel sensor 2	

TRN22	Two Axle Car Count	Numeric 1 to 3 digits	Number of two axle cars
TRN23	Absolute Limit	Numeric 1 to 3 digits	Absolute temperature limit in Fahrenheit
TRN24	Differential Limit	Numeric 1 to 3 digits	Differential temperature limit in Fahrenheit
TRN25	Hot Wheel Limit	Numeric 1 to 3 digits	Hot wheel temperature limit in Fahrenheit
TRN26	CS Limit	Numeric 1 to 3 digits	Carside temperature limit in Fahrenheit
TRN27	Carside Slope	X.XX where X is a digit	Carside slope
TRN28	Carside Minimum	Numeric 1 to 3 digits	Carside minimum
TRN29	Maximum Wheel Rail 2	Numeric 1 to 3 digits	Maximum hot wheel temperature for Rail 2 in Fahrenheit
TRN30	Average Wheel Rail 2	Numeric 1 to 3 digits	Average hot wheel temperature for Rail 2 in Fahrenheit
TRN31	Hot Wheel Resistor Rail 1	Numeric 1 to 3 digits	Hot wheel resistor temperature for Rail 1 in Fahrenheit
TRN32	Hot Wheel Resistor Rail 2	Numeric 1 to 3 digits	Hot wheel resistor temperature for Rail 2 in Fahrenheit
TRN33	Cold Rail Temperature	Numeric 1 to 3 digits	Cold rail temperature limit in Fahrenheit
TRN34	Alarm Count	Numeric 1 to 3 digits	Number of alarmed axles
TRN35	Rail 1 Side	Alpha 4 to 5 characters	Rail 1 side designator. The field has one of the following values: North East
TRN36	Rail 2 Side	Alpha 4 to 5 characters	Rail 2 side designator. The field has one of the following values: South West

Example:

TRAIN,"3","1234.5X","Main 1 Track","0400840C","02/06/200310:11","622","154","75","54","14.1","203","176","21","21","3","3","6","6","West","622","622","0","180","130","652","155","1.60","100","10","6","2","3","10","3","North","South"

AXLE Segment

Field Number	Data Name	Data Format	Description
AXLE1	Axle Number	Numeric 1 to 3 digits	Number of the axle from the front of the train. The first axle is 1.
AXLE2	Car	4 alpha characters	Car identification number if the hot box

	Identification	and 6 numeric digits	detector is equipped with an AEI reader and the rail car is tagged
AXLE3	Car Number	Numeric 1 to 3 digits	Number of the car the axle is on. The first car in the train is 1.
AXLE4	Axle Alarm	Alpha/Numeric 6 to 40 characters	Description of axle alarm. This field will contain "None" if there is no alarm or one of the following: [North][East] Rail Absolute [South][West] Rail Absolute [North][East] Rail Differential [South][West] Rail Differential [North][East] Hot Wheel [South][West] Hot Wheel [North][East] Rail Pyro Saturation Alarm [South][West] Rail Pyro Saturation Alarm Carside Slope, [North][East] Side Carside Slope, [South][West] Side Wide Load, [North][East] Side Wide Load, [South][West] Side Dragging Equipment High Load
AXLE5	Time On	Numeric 1 to 3 digits	Time, in milliseconds, the axle was between sensors
AXLE6	Time Off	Numeric 1 to 3 digits	Time, in milliseconds, it takes for next axle to hit first sensor after previous axle left last sensor
AXLE7	Rail 1 Temperature	Numeric 1 to 3 digits	Rail 1 temperature in Fahrenheit
AXLE8	Rail 2 Temperature	Numeric 1 to 3 digits	Rail 2 temperature in Fahrenheit
AXLE9	Hot Wheel Rail 1 Temperature	Numeric 1 to 3 digits	Hot wheel temperature on Rail 1 in Fahrenheit
AXLE10	Hot Wheel Rail 2 Temperature	Numeric 1 to 3 digits	Hot wheel temperature on Rail 2 in Fahrenheit

Example:

AXLE,"1",",","1","None","25","0","22","21","6","6"

END Message Trailer Segment

Field Number	Data Name	Data Format	Description
END1	Number of Segments	Numeric 1 to 4 digits	Number of segments in the file not including the START and END segments

Example:

END,"1"

11.2. Manually Generated Export Files

An export file for a particular train record can be manually generated by clicking the Export Train button in the Train Record List display (see Paragraph 7.5) or the Axle Data List display (see Paragraph 8.4). A dialog will then appear and ask the operator to enter a file name. Once entered, the file will be created and will have the same format as the Hot Box Train Export file (see Paragraph 11.1.2) with the exception that only one train will be reported.

12. FILE MAINTENANCE

There are three major files that should be maintained. These are the Train Record file, the Communications Log File, and the Maintenance Log file.

12.1. Automatic Backup of the Train Record File

The system can automatically make back-up copies of the Train Record file ("Train Records.car") via the display shown in Figure 26. Select the File Maintenance menu item under the Setup menu to bring this screen up.

The operator can specify whether the Train Record file should be automatically backed up, how often, and the required number of back-up copies. The time can be specified in minutes, hours, or days. The system will make a new back-up copy unless the file has not changed since the last back-up copy was made.

The system will maintain up to 99 back-up copies. These back-up copies will have a file extension of .bxx. The xx portion of the extension is a number from 01 to 99. The file extension of .b01 is given to the latest back-up copy, and .b99 would be the oldest backup copy if the operator specified that 99 back-up copies should be maintained.

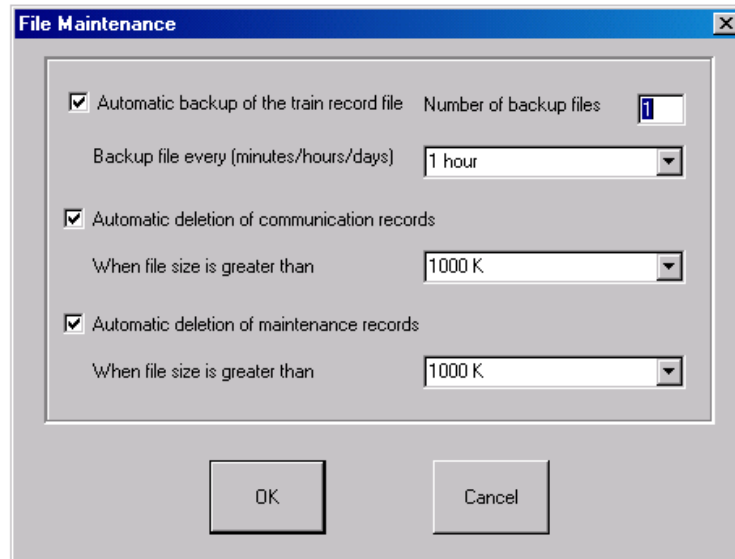


Figure 26 - File Maintenance

12.2. Automatic Deletion of the Communications Log Records

The system maintains a communications log. The log is kept in a file named "server comm log.txt" and can be viewed by selecting the Communications Log menu item under the Lists menu.

The records to be deleted can be determined by the size of the file. The operator specifies the maximum size of the file in 1,000 byte increments. Periodically the system will check if the file is larger than the maximum size and delete only the oldest records in the file to reduce the file's size to just below the maximum size.

12.3. Automatic Deletion of the Maintenance Log Records

The system maintains a maintenance log, which is kept in a file named "server maint log.txt" and can be viewed by selecting the Maintenance Log menu item under the Lists menu.

The records to be deleted can be determined by the size of the file. The operator specifies the maximum size of the file in 1,000 byte increments. Periodically the system will check if the file is larger than the maximum size and delete only the oldest records in the file to reduce the file's size to just below the maximum size.

13. MISCELLANEOUS FUNCTIONS

13.1. Finding Hot Box Detectors

To find a hot box detector, click the Find menu item at the top of the screen. This causes a secondary menu to appear from which you can select the type of device. Figure 27 shows the results of selecting the Find Hot Box Detector menu item.

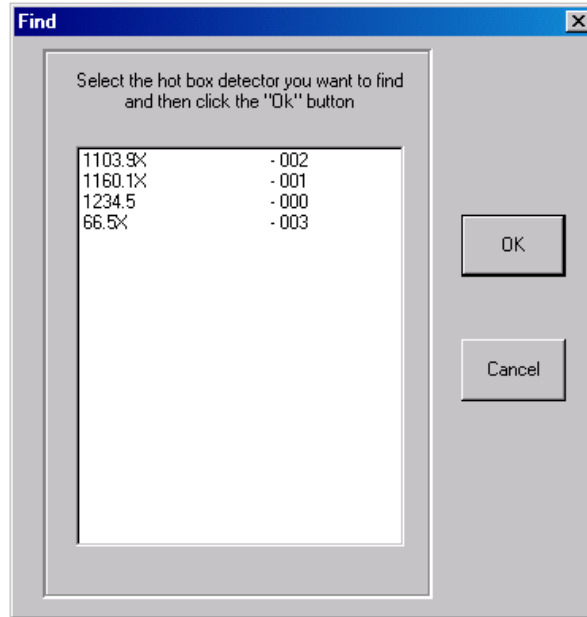


Figure 27 - Find Hot Box Detector

To locate a particular hot box detector, click on the name in Figure 27, and the mouse pointer will jump on the screen to the location of that hot box detector.

13.2. Printing Network Map Display

To print the Network Map display, select the File menu and then the Print Network Map menu item from the secondary menu.

14. SYSTEM SPECIFICATIONS

Maximum Number of Train Records	1000
Maximum Number of Axles per Train	1000
Maximum Number of Hot Box Detectors	100
Maximum Track Layout Horizontal Grid Size	500
Maximum Track Layout Vertical Grid Size	500
Maximum Individual Bitmaps per Track Layout file	100
Maximum Bitmap Insertions per Track Layout File	200
Maximum Text areas per Track Layout File	100

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