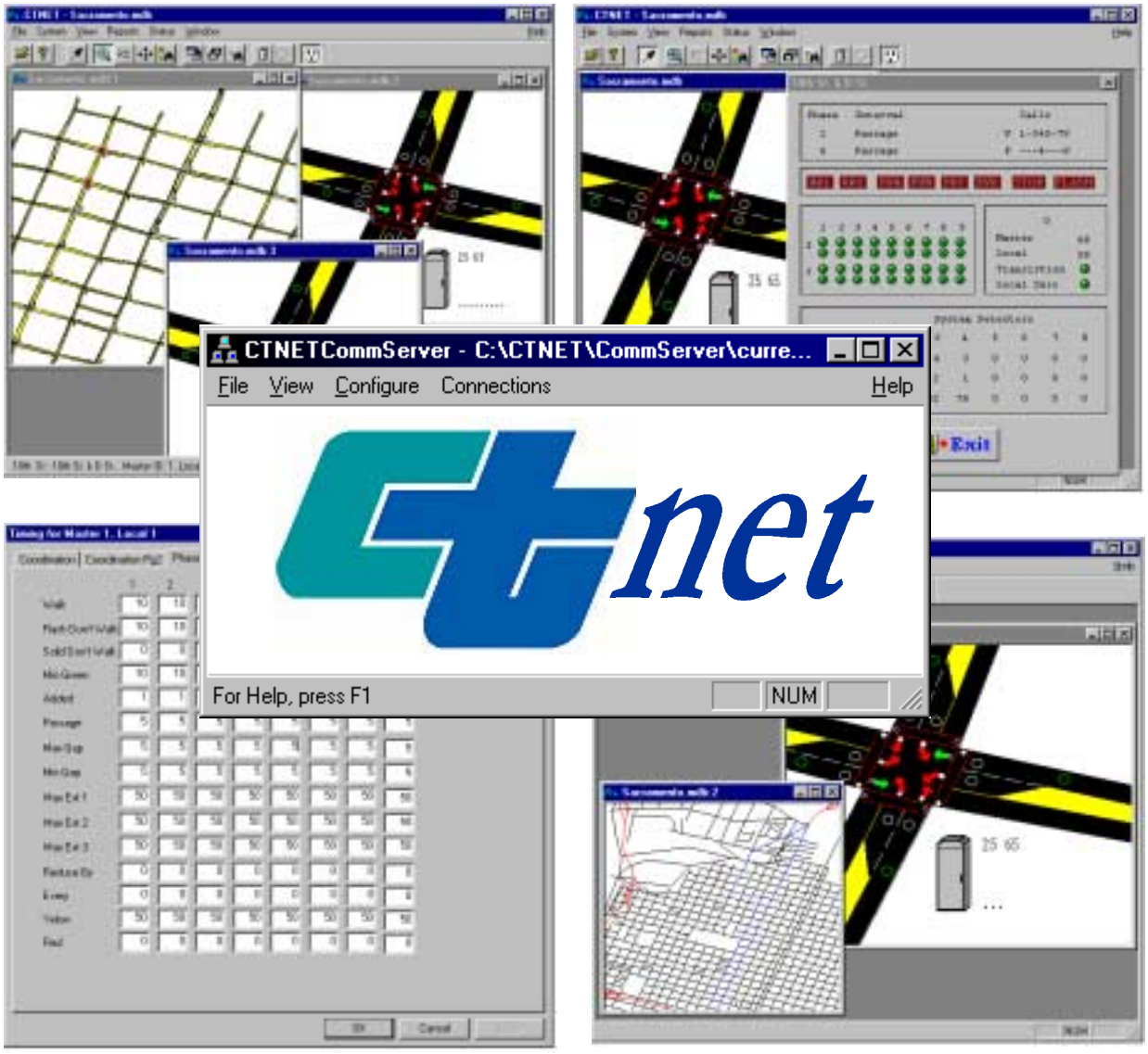
User's Manual



CommServer and Client

Version 1.43
November 2002

State of California; Department of Transportation

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CHAPTER 1

Introduction

CTNET is a map-based, object-oriented, distributed software system for integrated management of traffic signals. CTNET will allow the operators to remotely manage, view and log real-time traffic signal field data.

CTNET is designed and developed in-house by the office of Electrical Systems, Traffic Operations Program within Caltrans Headquarters. It does not require any expensive licensing or third party software and can be freely distributed to other Caltrans Programs (Maintenance, Construction, Planning, etc.) as needed. Local agencies and private parties may use the software to browse information on shared intersections. These parties will be able to browse the information by making a remote dial up connection to one of the *CTNET CommServer*. CTNET uses Geographically accurate map based on U.S. Census Bureau's TIGER (Topologically Integrated Geographic Encoding and Referencing) System. TIGER data for all California counties is available for use with CTNET.

CTNET is programmed in Visual C++ using Microsoft Foundation Classes (MFC) Library. MFC Library provides a true object-oriented windows application-programming interface (API) and ensures long term compatibility with other windows based applications and hardware. CTNET code is easily maintainable. The office of Electrical Systems will continue to maintain the code and make any enhancements/ customizations.

CTNET is a Client/Server based application. CTNET Client application is called '*CTNET Client*' and the communication server application is called '*CTNET CommServer*'. *CTNET Client* application uses TCP/IP protocol to connect to CTNET CommServer, and CommServer in turn connects to the field devices via TCP/IP, dial up or leased lines. Since CTNET uses TCP/IP communication, the CTNET CommServer can be placed anywhere on Caltrans WAN, and the clients all over the state will be able to connect to that server. This makes CTNET an open distributed system.

The CTNET version 1.0 system consists of several applications running across a serial and/or Internet Protocol (IP) network:

- *C8 version 4* Local Program
- Field Master Program
- CTNET CommServer
- *CTNET Client*

C8 version 4 Local Program is an updated version of C8. This new version supports AB 3418 and AB 3418 Extended (AB 3418E) messages to implement Traffic

Response Coordination and CTNET communication. The Field Master Program, not CTNET, manages all coordination at this time.

The CTNET CommServer manages all connections to the field master via serial (dial-up and leased) as well as digital Frame Relay connections. The *CTNET Client*s connect and login to the CTNET CommServer over the Wide Area Network (WAN) or by dial-up networking with Windows NT Server Remote Access Services (RAS).

The *CTNET Client* software graphically displays field information in real-time on a map. The Client can connect to one CTNET CommServer per county per document. In other words, the Client can open up several documents and view several different counties from several different servers located anywhere on the WAN.

System Benefits:

- Monitor System Performance Remotely
- Real-time Detector and Phase Information
- Remote Diagnostics
- Manage Field Elements Remotely
  - Timing Plans
  - Coordination
- Data Collection
  - Volume, Occupancy, Speed from existing field elements
- Remote access from anywhere on Caltrans Wide Area Network (WAN)
- Dial-in network access for Caltrans and Local Agencies
- Historical Reports of Plan/Offset, Preemption, Bad Detectors
- Safety
  - Remote Data Collection
  - Remote Diagnostics

CTNET Client receives information from the field master via the CTNET CommServer. Information from the field master is updated in real-time and placed on the map as appropriate. Available once per second information includes:

- Cabinet alarm state - preemption and flash.
- Phase - reds, yellows, greens, and PEDs.
- Phase calls – vehicle and PEDs.
- Detector presence.

Volume and occupancy is available from configured system detectors and can be stored in a database per user request. Speed is calculated from volume and occupancy based on average vehicle length. The stored information can be used to generate historical reports using Microsoft Access.

CTNET system has multiple levels of security to allow fine-grained control over access to individual components of the system. The following security options are supported:

- Client Login Security
- Various levels of access control provided by CTNET CommServer
- Windows NT Server adds an extra layer of security by authenticating user accounts to CTNET CommServer machine.
- Field Master with dial-back option

CHAPTER 2

System Requirements

CTNET executes within a 32-bit Microsoft Windows operating environment, which includes Windows95, Windows98 or Windows NT 4.0. Because Windows 3.x does not fully support the Win32, CTNET will not execute in a Windows 3.x environment. Also, since Windows NT 3.51 does not fully support the new common controls added with the release of Windows95, CTNET will not execute in a Windows NT 3.51 environment.

CTNET system requirements will vary depending upon its intended use. For instance, large districts with 100 plus locals connected to a single CommServer should use a Pentium 300 MHz with 64 Mb RAM, while a smaller district dialing an isolated master intersection with 10 locals could operate with any Pentium-based computer with 32 Mb RAM.

Recommended hardware:

Client Machines

Minimum hardware requirements are an Intel Pentium-based PC, 16 megabytes of RAM, 100 megabytes available disk space, one available serial port, a Hayes compatible 28.8 bps dial-up modem, Network Interface Card (NIC), and a 15“ SVGA Color Monitor.

Recommended hardware is an Intel Pentium 200MHz (or better) PC, 64 megabytes of RAM, 1.0 Gbytes available disk space, one available serial port, NIC, one Hayes compatible 28.8 bps dial-up modem, CD-ROM drive, and a 17 “ SVGA Color Monitor.

Server Machines

Minimum hardware requirements are an Intel Pentium based PC, 32 megabytes of RAM, 2.0 Gbytes available disk space, NIC, Comtrol RocketPort Multiport Card and Connector Interface Panel, Hayes compatible dial-up modems, CDROM drive, and a 15 “ SVGA Color Monitor.

Recommended hardware is an Intel Pentium 300MHz (or better) PC, 64 megabytes of RAM, 2.0 Gbytes available disk space, NIC, Comtrol RocketPort Multiport Card and Connector Interface Panel, Hayes compatible dial-up modems, CD-ROM drive, and a 17 “ SVGA Color Monitor.

Note: Both *CTNET Client* and *CommServer* require Data Access Objects (DAO) to make information persistent. Microsoft Access provides an option to install DAO. DAO can also be installed with CTNET “setup.exe” program after installing the *Client* and *CommServer* applications (refer to Chapter 3 “Installation” for more information).

CHAPTER 3

Installation

This chapter describes how to install and uninstall CTNET Client and CommServer. It has following sections:

- Installing CTNET Client and CommServer
- Starting CTNET Client
- Starting CommServer
- Starting the Report Template
- Uninstalling CTNET Client and CommServer

Installing CTNET CLIENT & CommServer

Follow these steps to install CTNET Client and CommServer programs:
Insert the Installation CD in the CD-ROM drive of your computer.
Choose Run from the Windows Start menu to display the Run dialog box. Then type the following and click OK:

*drive:**setup.exe*

where drive is the CD-ROM drive identifier.

The install wizard guides you through the installation process; you can select where to install CTNET Client and CommServer programs, which elements to install and what should be the name of the folder in the Start Programs menu.

The steps to be followed in the installation process are:

Step1

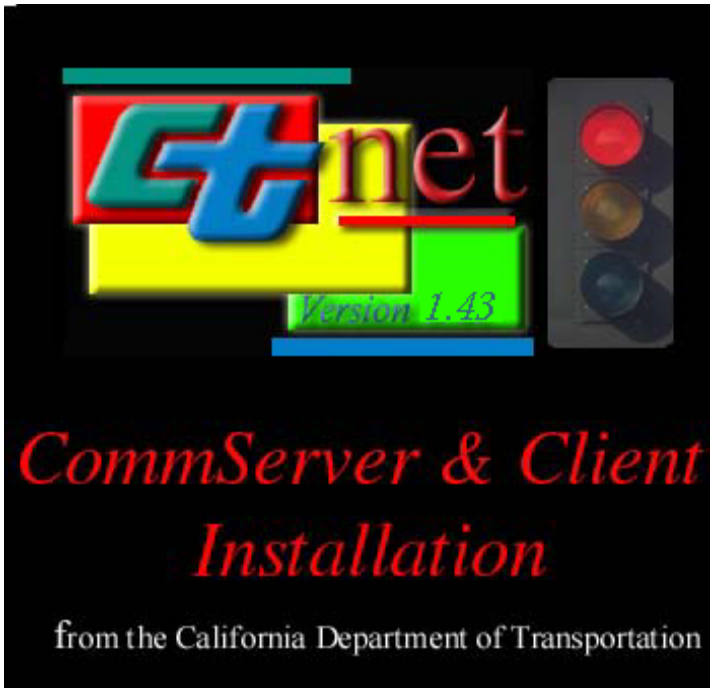

Figure 3.1 – CTNET Installation Splash Screen

This screen will be displayed for a few seconds.

Step 2

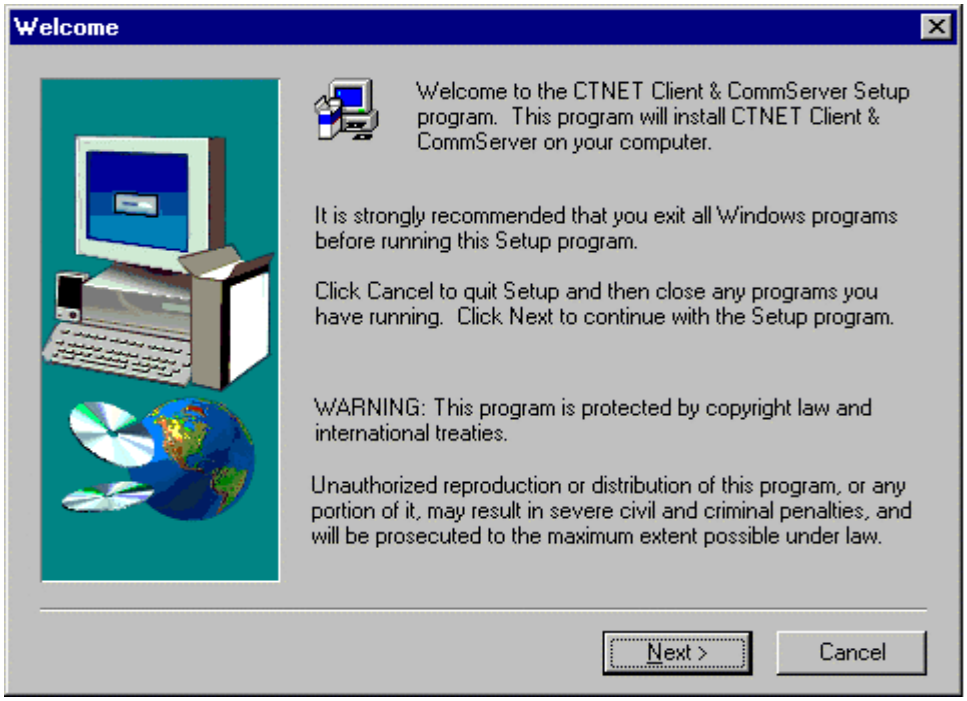

Figure 3.2 – Welcome Screen

Click on “Next” button to go to the next step.

Step 3.

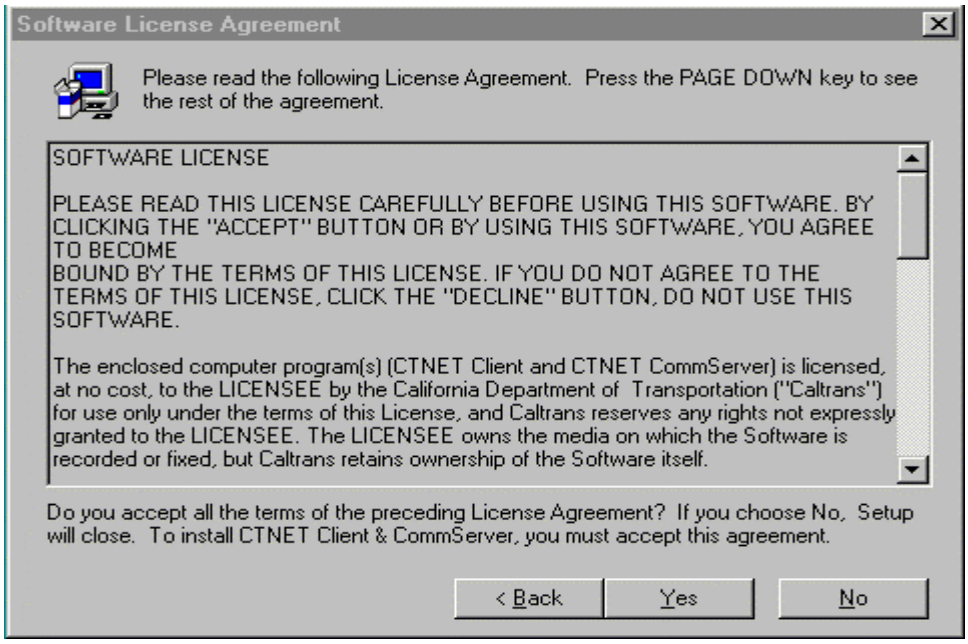

Figure 3.3 – License Agreement

Read the Software License Agreement and click on “Yes” button.

Step 4

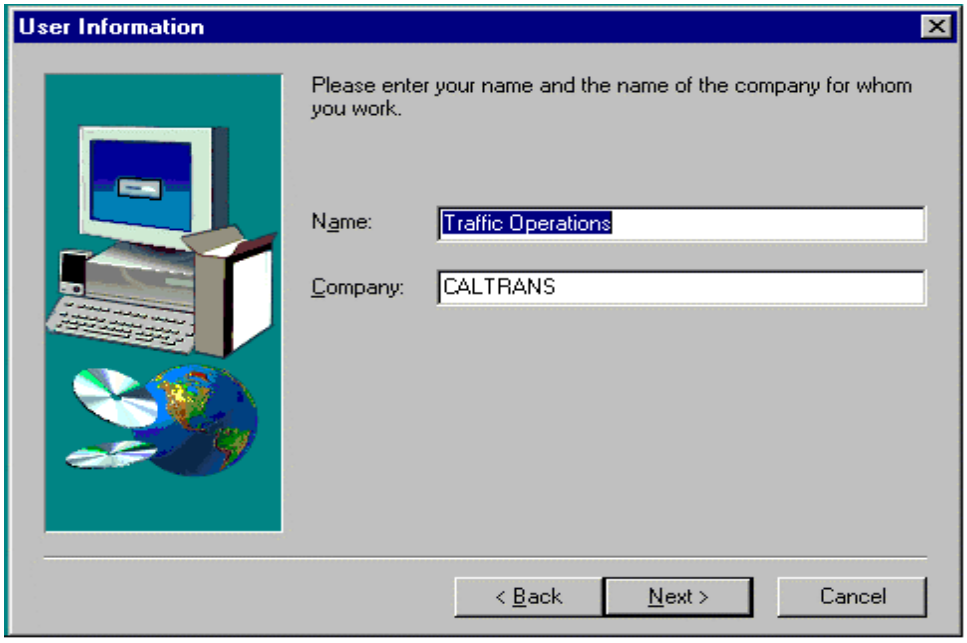

Figure 3.4 – Registration Information

Enter the registration information here and then click on the “Next” button.

Step 5

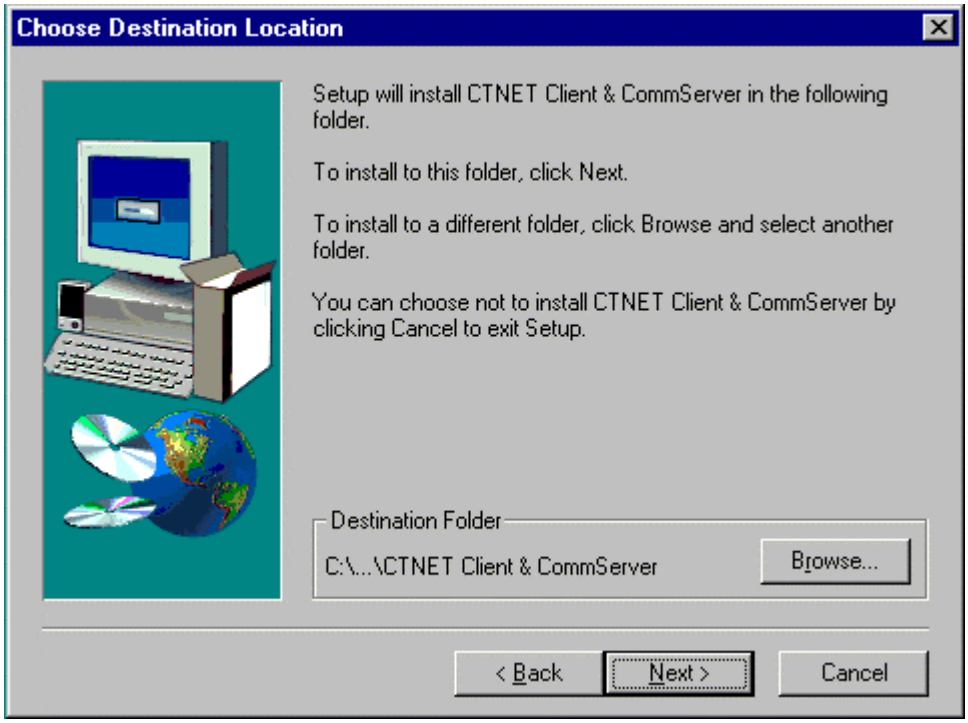

Figure 3.5 – Select Destination Folder

You can choose to install the *CTNET Client* and *CTNET CommServer* software in the any folder of your choice by clicking on the Browse button otherwise it will be installed in the default folder shown above. When done click on the “Next” button.

Step 6

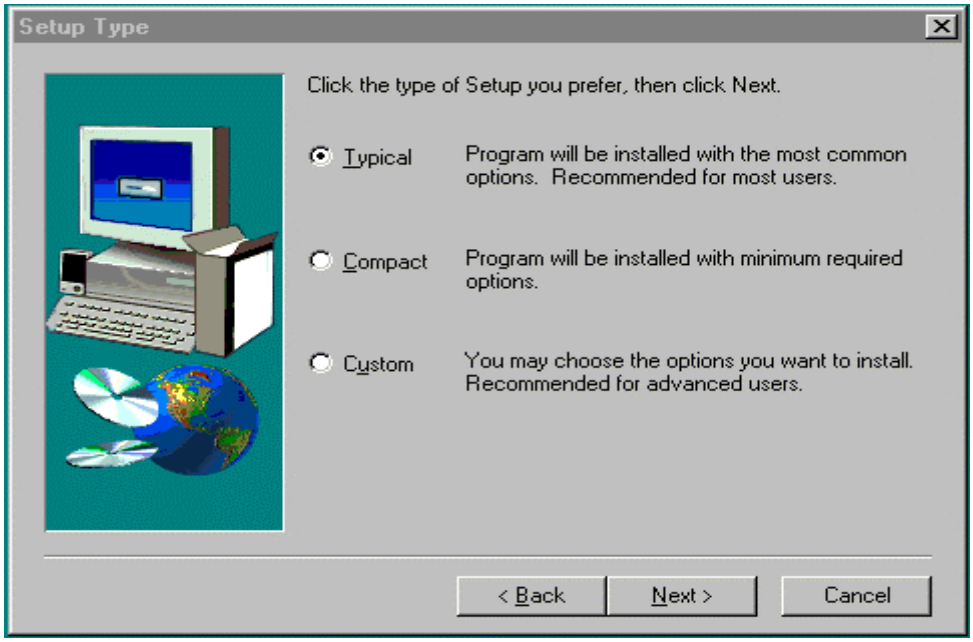

Figure 3.6 – Setup Types

You can choose the type of installation you want here by clicking on any one of the types shown above and then click on the “Next” button. The different setup types are explained below.

Typical	this installs CTNET Client, DAO and some other DLL and EXE files and utilities that are needed to run CTNET.
Compact	this selection is same as typical but it doesn't install DAO files to your system. This option should be chosen only if DAO is already installed on the system.
Custom	With this selection you can choose the components you want to install on your system.

The custom setup provides options to install additional components such as county map files and documentation.

Note: Both *CTNET Client* and *CommServer* require Data Access Objects (DAO) to make information persistent.

Step 7

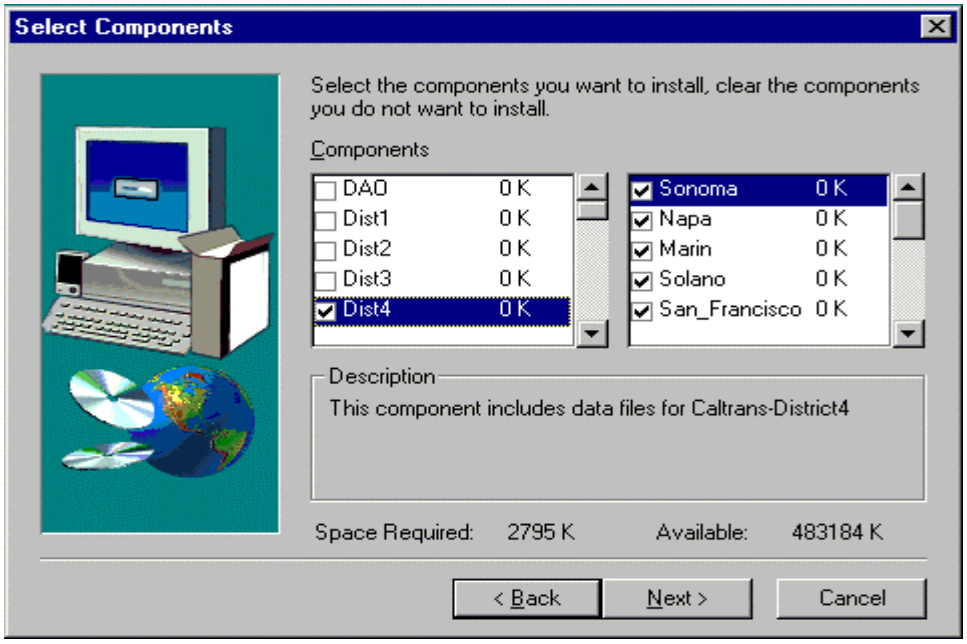

Figure 3.7 – Select Components

If you choose custom installation in the previous step, you can then select from the components shown in this screen, the components you want to install on your system. Given below is the list of all the districts and the counties. When done click on the Next button.

List of all the Caltrans districts and their counties:

District 1 (Eureka) Del Norte Humboldt Lake Mendocino	**District 2 (Redding)** Lassen Modoc Plumas Siskiyou Tehama Shasta Trinity
District 3 (Marysville) Butte El Dorado Glenn Nevada Placer Sierra Sutter Sacramento Yuba	**District 4 (Oakland)** Alameda Contra Costa Marin Napa San Francisco Solano Sonoma Santa Clara San Mateo

District 5 (San Luis Obispo) Monterey San Benito San Luis Obispo Santa Cruz Santa Barbara	**District 6 (Fresno)** Fresno Kern King Madera Tulare
District 7 (Los Angeles) Los Angeles Ventura	**District 8 (San Bernadino)** Riverside San Bernadino
District 9 (Bishop) Inyo Mono **District 11 (San Diego)** Imperial San Diego **District 12 (Santa Ana)** Orange	**District 10 (Stockton)** Alpine Amador Calaveras Mariposa Stanislaus Tuolumne San Joaquin Merced

Step 8

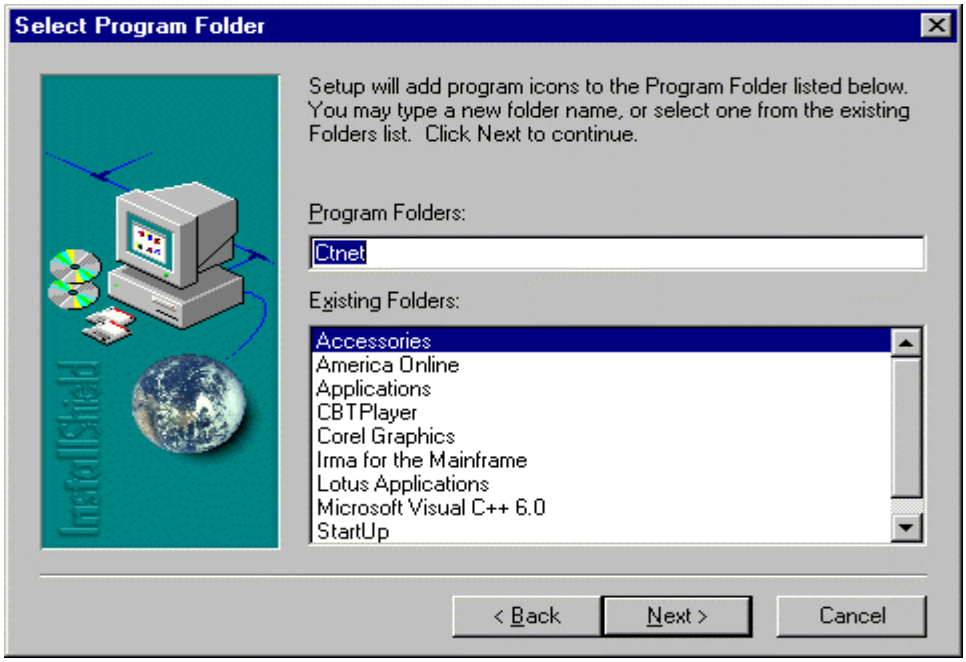

Figure 3.8 – Select Program Folder

You can change the name of program folder in the start programs menu here. When done click on the “Next” button.

Step 9

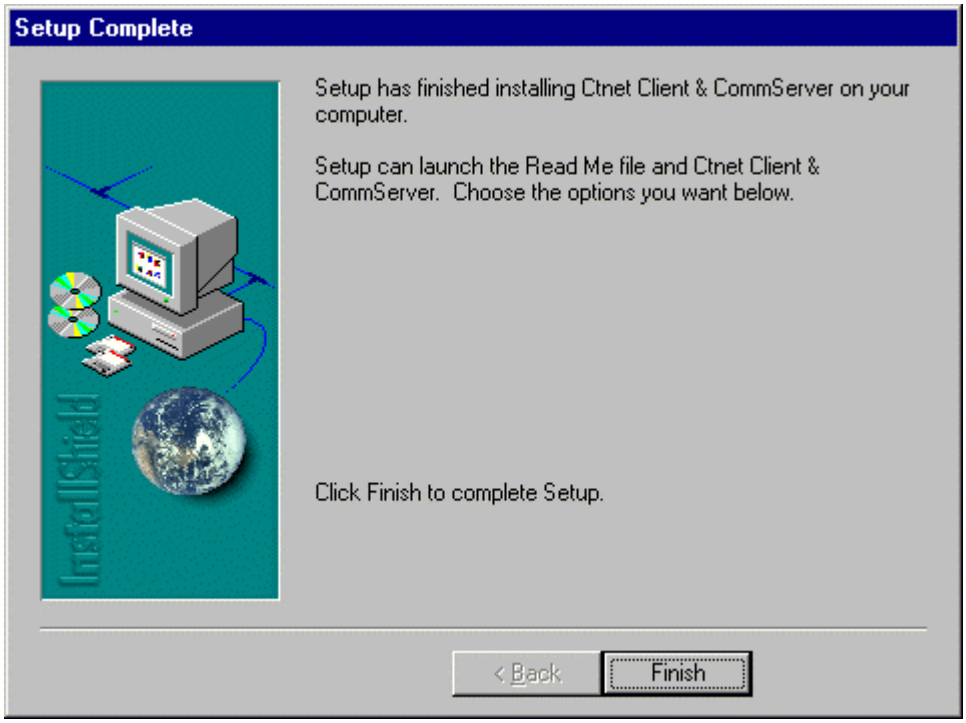

Figure 3.9 – Setup Complete

Click on finish to complete the installation.

Starting CTNET Client

To start *CTNET Client* program, choose *'Programs/ Ctnet/ CTNET Client'* from Windows Start menu.

Starting CommServer

To start *CTNET CommServer* program, *choose 'Programs/ Ctnet/ CTNET CommServer'* from Windows Start menu.

Starting the Report Template

To start *CTNET Report* Template, choose *'program/ Ctnet/ Reports'* from Windows Start menu.

Uninstalling CTNET Client and CommServer

Follow these steps to uninstall CTNET Client and CommServer programs:

- Choose Settings from the Windows Start menu.
- Choose Control Panel to display the Control Panel Window.
- Choose Add/Remove Programs from the Control Panel window.
- Click on the Install/Uninstall tab and highlight CTNET Client.
- Click Add/Remove and follow the instructions on the screen.

Note: Uninstall does not remove any files created in CTNET Client after the program has been installed however it will uninstall all the county data files installed with this program

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Overview

CTNET is an object-oriented Windows based Client/Server application. The client application is called '*CTNET Client*' and is developed using Win32 Application-Programming Interface (API). The application will run on any Pentium based machine running Windows 95 or Windows NT. The client application will not run on Windows 3.X as Windows 3.X does not support Win32 API. For more information on system requirements, refer to Chapter 2 "*System Requirements*".

CTNET Client is a map-based application, using a Geographically accurate map based on U.S. Census Bureau's TIGER (Topologically Integrated Geographic Encoding and Referencing) System. *CTNET Client* converts text formatted TIGER data to a Microsoft Access database format and uses it to generate county maps. The maps generated can be viewed at different zoom levels, from a view of the entire county down to individual intersections.

Starting the Client Program

From the Windows startup menu select *'Programs/Ctnet/CTNET Client'* from

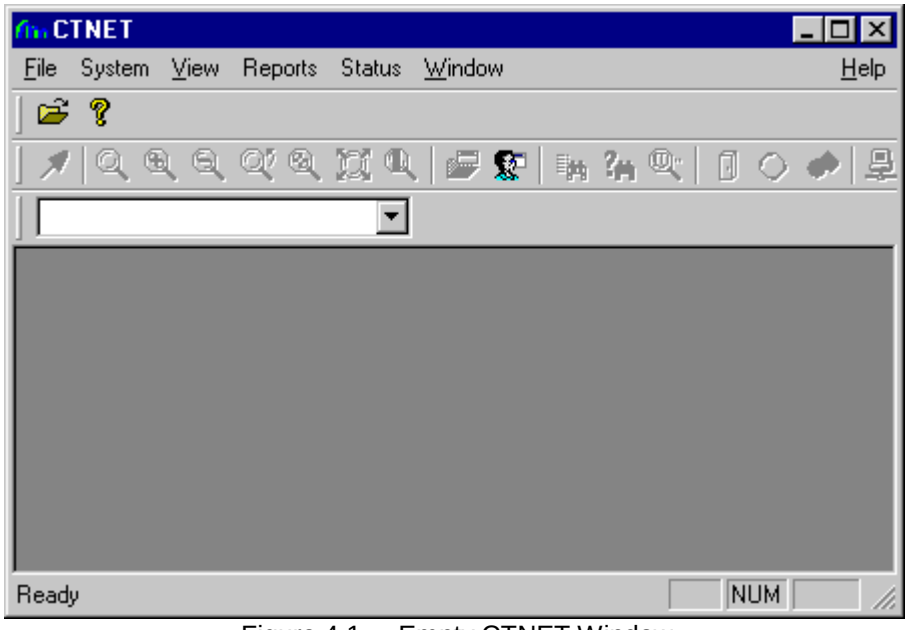


Figure 4.1 – Empty CTNET Window

Windows Startup menu. (The installation process should put a shortcut to *CTNET Client* (*CTNET Client*.exe) application in Windows startup menu, if the shortcut

doesn't exist please refer to the note below). The program starts with an empty CTNET window as shown in Figure 4.1.

The empty window has menu and toolbar at top and the status bar at bottom. The window doesn't have a document open yet, so it appears blank and most of the menus and toolbar items are disabled.

Note: A shortcut to this program should be loaded in the Programs folder, or in a Ctnet folder under the Programs folder. If this is not the case, open Windows Explorer or My Computer and go to the location where the CTNET program files were loaded. Create a Shortcut to this program by right clicking on a "*CTNET Client*.exe" and choosing the menu item Create Shortcut. Next right-click the new file "Shortcut to *CTNET Client*.exe". Choose the menu item Cut. Now right-click on the Windows Start button on the Windows Taskbar. Choose the Explore menu item. Windows Explorer will open at the Start Menu folder. Navigate to the location where you want the shortcut to be located and right-click, choosing the menu item paste. The name of the new file can be edited, for instance to remove the "Shortcut to" or ".exe" by clicking on the text and typing new name.

Opening a document

Opening a document in CTNET means opening a database file, which contains information about the county map. The database file is generated from raw TIGER (Topologically Integrated Geographic Encoding and Referencing) data by using a conversion utility provided with the *CTNET Client* software. Database files for all California counties will be generated and distributed with CTNET systems as per district's needs.

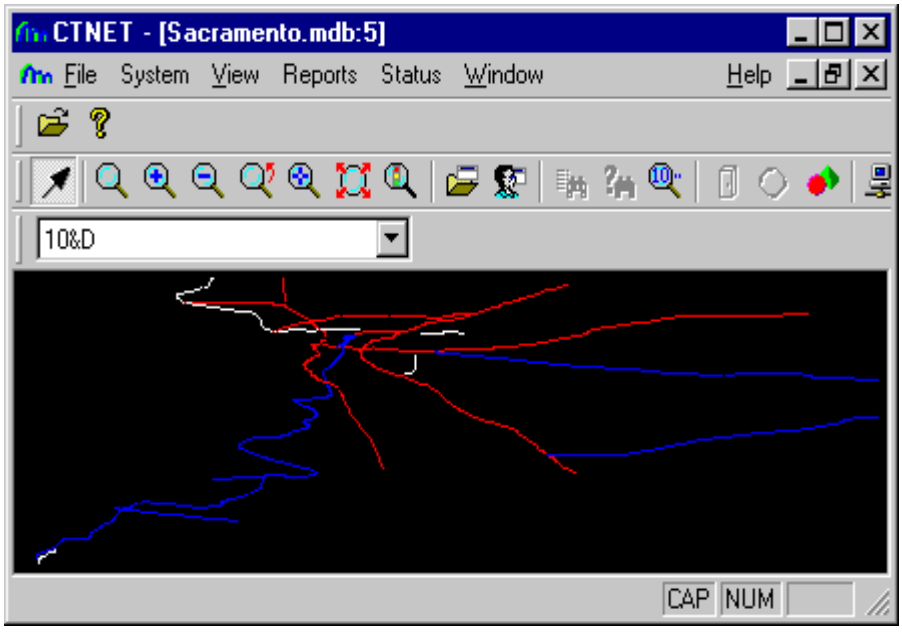


Figure 4.2 – Sacramento County Map

To open a document:

- From the File menu choose Open and an Open file window will appear.
- Browse through the directory to locate the desired database file and click open.
- The database will be loaded and county map will be displayed in a new window. The blue lines on the map indicate State Highways, red lines indicate State Freeways and black lines indicate the main streets. Figure 4.2 shows Sacramento County map as displayed by CTNET.

ToolBars

The application toolbar, as shown below in Figure 4.3 is a set of buttons to control most frequent user interactions with the *CTNET Client* software. Moving the mouse cursor over a button will display a short functional description of the button's action. A larger explanation is displayed in the status bar, located at the bottom of the *CTNET Client* program window.

Figure 4.3 – CTNET Client Application Toolbar

The Toolbar buttons are divided into the following six Groups:

System Button Group

These tools help users to open a county database and get information about *CTNET Client* program

The File Open button opens an existing database file and displays the county map.

The About button opens an About dialog box displaying information about the *CTNET Client* program.

Select Button Group

The Select button turns the mouse pointer to a normal arrow allowing users to select map objects.

Zoom Button Group

The county map is fully zoomable to any level from a birds eye view down to individual corridors or intersections using these Zoom tools.

The Pan/Zoom magnifying glass button can pan the map within window, and zoom in or zoom out for desired views of the county map.


The Previous Zoom button returns the current window view to the previous zoom.


The Zoom to Extents button displays the entire county map at the top zoom level.


The Zoom to Signal button opens a dialog box and displays all configured intersections.


The Zoom in button for the desired view of the county map.


The Zoom out button for the desired view of the county map.

View Button Group

These tools permit the user to create multiple views of the same county map with each view showing different sections of the map at different zoom levels. The user can also save views of the commonly referenced intersections for easy access in the future.


The Open View button opens a new window and creates another view of the selected area.


The User View Configuration button opens a dialog to change or save views.


The Display Alarms button displays the system alarms in a dialog box.


The Sniffer button displays the communication status.

Objects Button Group

These buttons are used to add objects to the county map. The added objects are stored in the county map database for future use.


The Add Cabinet button adds cabinets at desired locations on the county map.


The Add Detector button adds detectors at desired locations on the county map.

The Add Bitmap button adds user defined objects at desired locations on the county map.

Connect Button Group

The Connect button toggles the user login/logout to the CTNET *CommServer.*

Menu Bar

The Menu Bar at top of the window has various options as explained below. The menu bar duplicates some of the toolbar button functionality.

File Menu

The File menu has only one command activated at this time:

File/Open menu command opens a file open window to browse through the directory system and open an existing county map database file. This command has the same functionality as the “File Open” button in the toolbar.

The file menu stores the directory path of the previously opened database files and lists them at the bottom. To open a previously opened database file just select its listed path.

System Menu

System menu has three activated commands:

1. System/Login/Logout command is a toggle switch for logging in or logging out of the *CTNET CommServer.* This command has the same functionality as the “Connect” button in the toolbar. When the users are logged in, selecting this menu option will log them out.

2. System/Configuration command enables the user to setup some default values for the *CTNET Client* application. This menu has submenus with the following options:

    - Change Password command allows the users to change their login password for *CTNET CommServer.* This command will be active only when the user is logged in to the CTNET CommServer and has permission to change his password.

    - Zoom Adjust permits the users to set preferences for 1st, 2nd and 3rd level zooms.

    - CTNET Properties enables users to set up default values for the interval text strings as well as the vehicle length to be used for speed calculations.

3. System/Utilities menu command provides some utilities to convert data formats to make data compatible with CTNET. It has a submenu with only one option activated:

    - Import data option is used to import TIGER data and convert it into a Microsoft Access database format.

View Menu

The View menu has following options to adjust the active window views:

1. View/Toolbar toggles the System Button Group on or off. When selected, this menu has a checkmark and the System Button Group appears in the upper left corner.

2. View/Status Bar toggles the status bar on or off. When selected, this menu has a check mark and the status bar appears at the bottom. It is recommended to keep the status bar active as it provides important information throughout the program.

3. View/Zoom menu contains following options:

    - Zoom in zooms in to the next lower level. The keyboard plus (+) key has the same functionality.

    - Zoom out zooms out to the next higher level. The keyboard minus (-) key has the same functionality.

    - Zoom to Top Level displays the entire county map at top zoom level. The "Zoom to extents" button in the toolbar performs the same function.

    - Zoom to Signal opens a dialog box and displays all configured intersections. Double clicking on any of the configured intersections will zoom the current active window to the extents of that intersection. The "Zoom to Signal" button on the toolbar has same functionality.

4. View/Center turns the mouse cursor into a cross hair. When the mouse is clicked anywhere in the active window the view is redrawn with the point clicked as the center of the window. It is a valuable tool for moving around the map at any zoom level.

Reports Menu

Nothing in the reports menu is activated as CTNET reports are provided through the Microsoft Access (refer to chapter 5 "Reports").

Status Menu

The Status menu has options to monitor system status for system operation and any alarms received from the *CommServer.*

1. Status/Alarms Log allows the user to view system alarms through a dialog box. The “View Alarm” button on the toolbar provides the same functionality.

Window Menu

This is the same menu as most of the Windows based programs (e.g.MS Word, Excel, etc.) provide. It has the functionality of selecting windows, cascading windows or tiling windows. The system provides a list of open windows at bottom of the menu, which enables users to switch between the open windows.

Moving Around an Opened Document

As explained in the previous section, the county map database is opened at the top zoom level. Tools are provided to move around the map and zoom into desired corridors or intersections. These tools are referred as the “Zoom Button Group” in the toolbar section of the manual. This section will explain how to use these tools to move around in the county map.

The first step in identifying the area of interest is to become familiar with the relative locations within the county map. To do that, move the cursor within the county map while pointing to the State Highways and State Freeways and looking at their names in the status bar. Once the area of interest is identified, click the “Pan/Zoom” tool from the toolbar. The mouse pointer will take the shape of a magnifying glass telling user that the application is in Pan/Zoom mode. In this mode, the mouse buttons perform the following functions:

- Clicking left mouse button without moving the cursor will re-center (pan) the map on cursor position.

- Clicking and holding down the left mouse button while dragging a rectangle over the desired area will zoom in to that area. Another way the Zoom in to the desired area is to use the plus (+) key on the keyboard or selecting the Zoom in option from the menu.

- Clicking the right mouse button zooms out for a broader area look. The Keyboard minus (-) key or Zoom out menu option performs the same function.

Click and drag a small rectangle over the identified area. When the mouse button is released the program will zoom in and display the area contained within the small rectangle. Repeat this procedure until the area of interest is displayed at the desired zoom level. During the Zoom in /Zoom out process if the user needs to go one step back, click on the “Previous Zoom” button.

Clicking on the “Zoom to Extents” button returns the window display to the top zoom level county map. This can be used to retrieve the entire map if it had been inadvertently repositioned outside the window area. The “Zoom to Extends” button returns to the base county map from any level of zoom operation whereas the “Previous Zoom” button returns back only one level.

The system keeps a list of all configured intersections by keeping track of the assigned cabinets. Clicking on the “Zoom to Signal” button displays all the configured intersections in a dialog box similar to Figure 4.4. The intersection list can be sorted

by the Master-Local number or by the intersection name. The dialog box has two combo boxes:

List By	sorts the intersection list by master and local controller numbers or by the Intersection name.
Master	includes all configured master controllers or limits to one master controller.

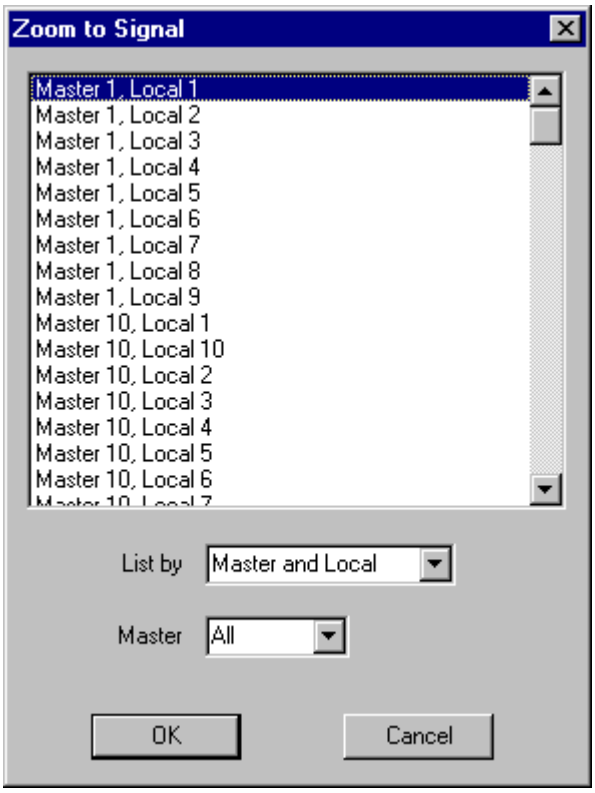


Figure 4.4 – Zoom to Signal Dialog Box

Double clicking or selecting the desired intersection and pressing “OK”, will zoom the current active window to that intersection. This is a valuable feature when most of the intersections are already configured and the user knows about the assigned master-local numbers or the intersection names.

Managing the Views

Additional view windows can be created using the “Open View” toolbar button. Additional windows allow the user to create multiple views of the same or different intersections.

To create additional view windows:

- Select the “Open View” button, the mouse cursor will change to a mouse pointer with a square indicating that the program is in open view mode.
- Using the mouse drag a small rectangle over the window area that you desire to be the new window. When the mouse button is released the new

window will be created and it will be the active window as indicated by the highlighted title bar.

- Click on the “Select” tool to come out of the open view mode.

The windows can be moved around, as in any other Windows based program. The additional windows can be at different zoom levels, which permits the users to open alternate views of a single intersection. The user can also view a series of intersections along an arterial network.

Once the desired area is identified and zoomed, the view can be saved for future use. To save a view, click on the “User View Configuration” button, a dialog box as shown in the Figure 4.5 will open.

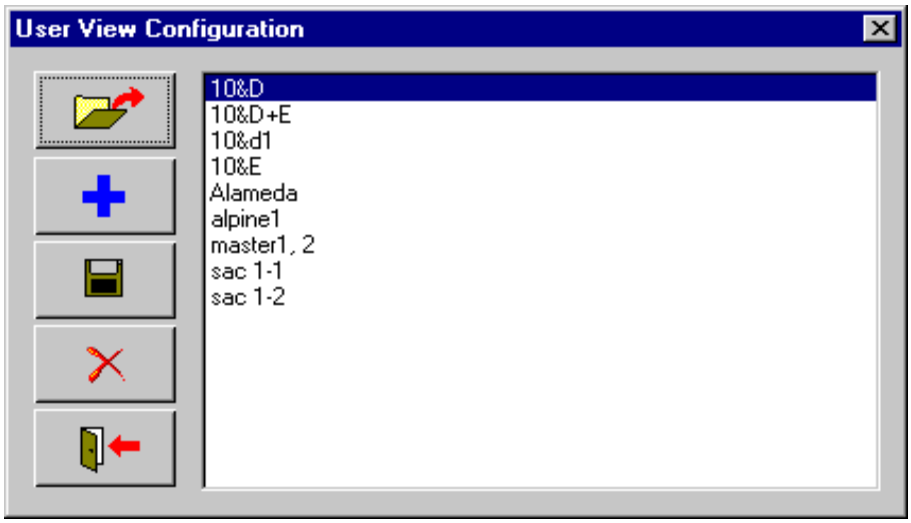


Figure 4.5 – User View Configuration Dialog Box

Click on this save button and type in the desired view configuration dialog box shown in the Figure 4.6. Click "OK" to save the configuration.

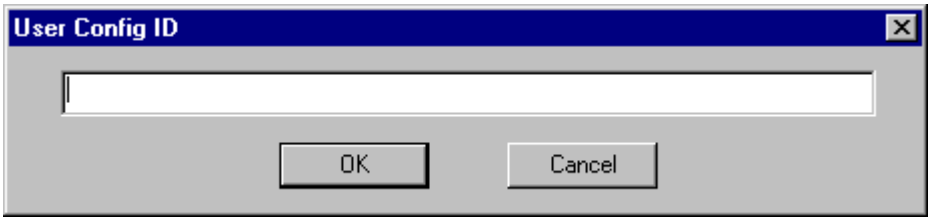


Figure 4.6 – User Configuration Name Dialog Box

To open a previously saved User View Configuration:

- Click on the “User View Configuration” button. The dialog box as shown in the Figure 4.5 will appear.

- Double click on the desired configuration or select it and click “Open View” button to close the previously opened windows and open new ones.
- Select the desired configuration and click “Add View” to open additional windows without closing the previously opened windows.
- When the view is opened close the dialog box by clicking close or clicking on the Close Window button in the title bar.

CTNET Client Defaults

Choosing System/Configuration/CTNET Properties menu item brings up a property sheet as shown below in Figure 4.7. The property sheet allows users to setup the default values for various operations including:

- Interval Text strings
- Average Vehicle length for speed calculations
- View Log
- Database file name for CTNET Reports

Default Interval Text Strings

Figure 4.7, shows the property page for setting the default strings for Interval descriptions. If the user doesn't change any values the program automatically sets up defaults as shown in the figure below.

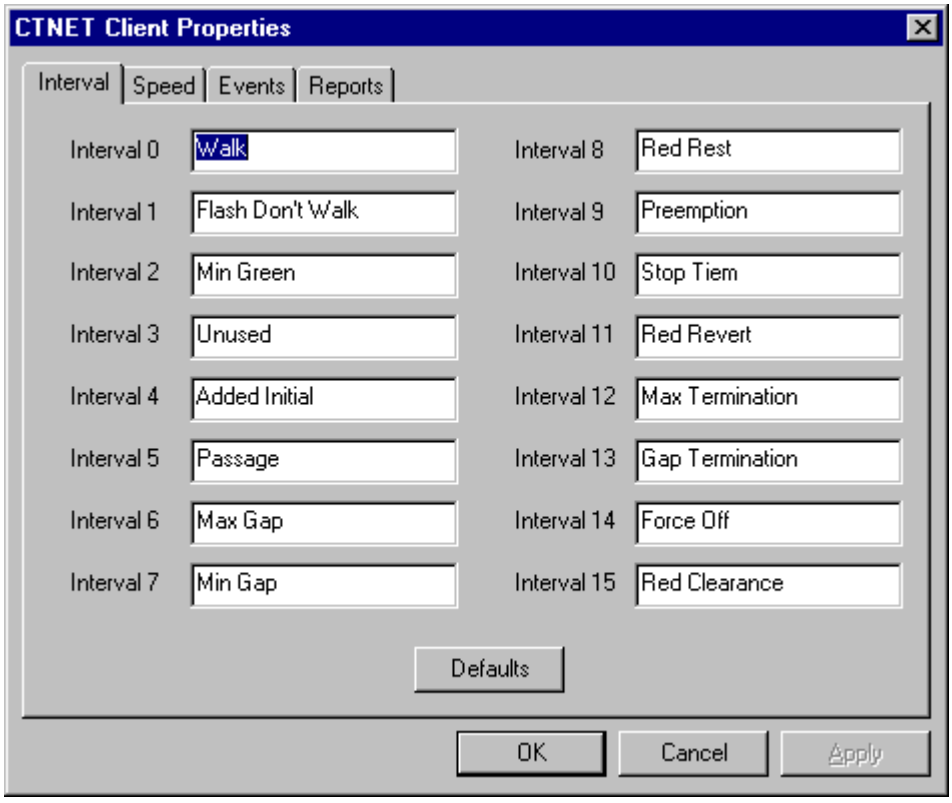


Figure 4.7 – Default Interval Text Strings Property Sheet

Default Average Vehicle Length

Figure 4.8, shows the property page for setting the default value for setting the average vehicle length for speed calculations. The program is setup to use a default value of 26 feet per car. The user can change this value by using this property sheet.

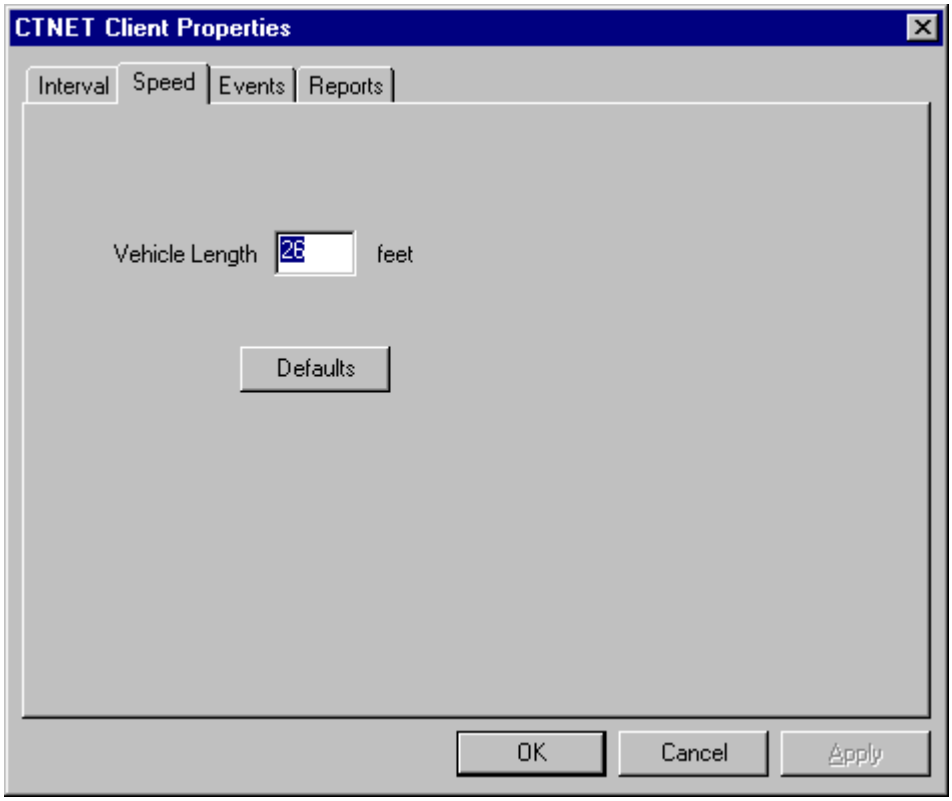


Figure 4.8 – Default Vehicle Length Property Sheet

Default View Logs

Figure 4.9, Shows the property page for setting the defaults for viewing preempt or system alarms automatically. The users can setup which Railroad and Emergency Vehicle preempts and/or system alarms they want to view automatically. When any of the chosen condition occurs the system will prompt the user by opening up a dialog box and displaying the log.

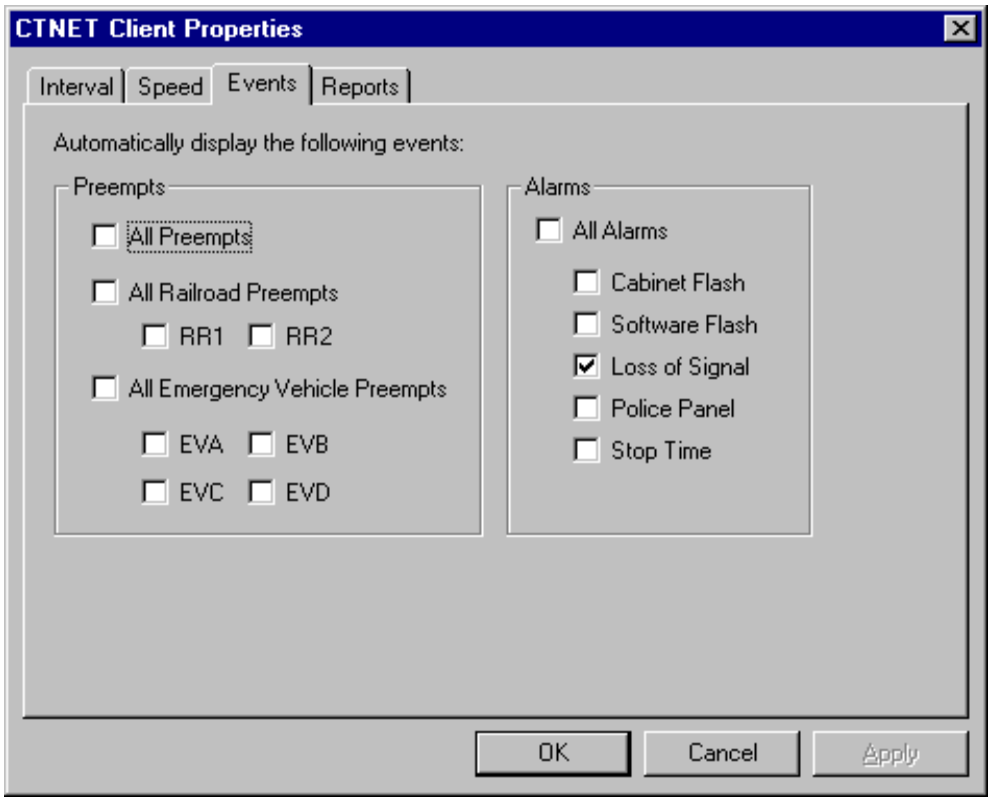


Figure 4.9 – Default View Log Property sheet

Default Filename for CTNET Reports

Figure 4.10, shows a property page for setting a default database file name for storing the timing data. The system automatically uses a default filename of "CTNETtiming". This property page gives users options for using the default filename, setting up their own default filename, or prompting them for a new filename everytime they want to store timing data.

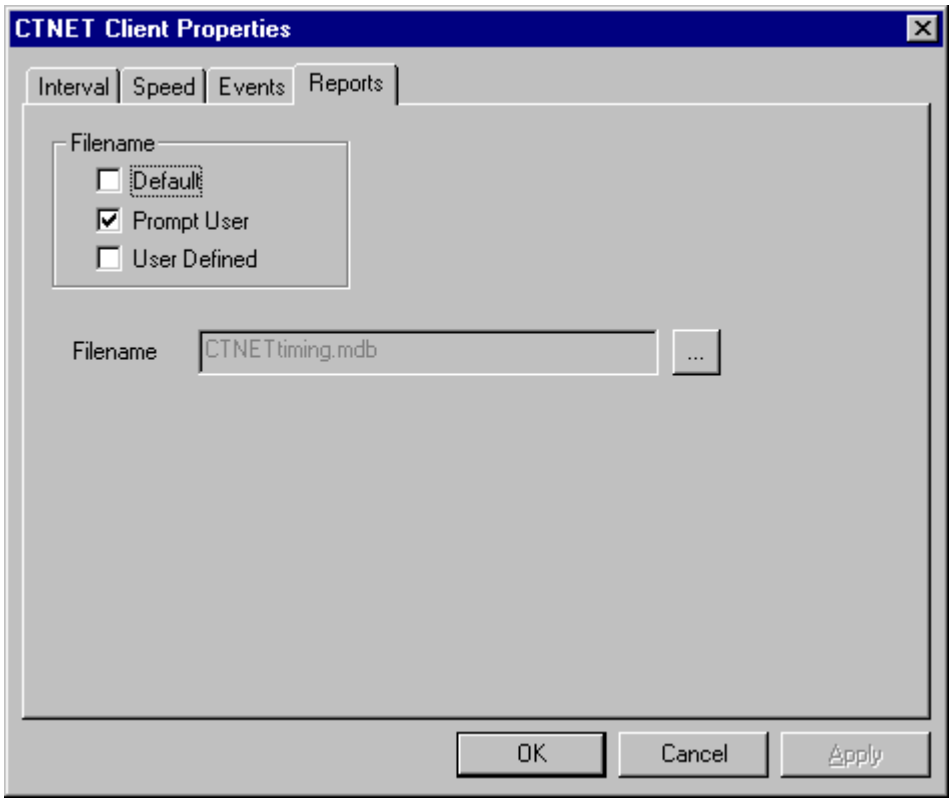


Figure 4.10 – Default Reports Filename Property sheet

Configuring an Intersection

As mentioned in the previous sections *CTNET Client* uses TIGER data for drawing the county map. Initially, the map is drawn at top zoom level with the blue lines indicating the State Highways, red lines indicating the State Freeways and the black lines indicating the main streets. As the user zooms in to the desired area, details about intersections and corridors become visible. *CTNET Client* uses default values for the number of lanes on the freeways (3 lanes), highways (2 lanes) and local streets (1 lane) and draws them according to these defaults. Individual intersections or corridors need to be edited and objects like controller cabinets and loop detectors need to be added to match the physical attributes of the intersection. This section will explain how to configure the individual intersections and corridors using the tools provided for this purpose.

After identifying and zooming into the desired intersection (refer to the section on Moving Around an Opened Document'), follow the steps listed below to configure an intersection. The detailed information on these steps is explained later in this section.

Configuring an Intersection, step by step:

- Using the cabinet tool add the controller cabinet.
- Edit the cabinet and assign Field Element #, Local Controller # and Description to the cabinet.

- Open the cabinet and assign it to the intersection.
- Double click in the intersection and edit the intersection attributes. This will require editing the leg attributes and making phase assignments for each leg of the intersection.
- Place the loop detectors using the detector tool.
- Configure the loop detectors.

Adding the Controller Cabinet

Click on the Cabinet tool to select it (If the cabinet tool is not activated and can not be selected, refer to note below). The mouse cursor will change to a rectangle indicating that the program is in “Place Cabinet” mode. The program will remain in this mode until the user clicks on the Select tool. This feature enables the user to add multiple cabinets to multiple intersections one after the other without selecting the cabinet tool again.

Move the cursor to the intersection quadrant where the cabinet needs to be placed and click. A rectangular cabinet object will be added to the map. If no more cabinets need to be added click on the Select tool to disable the “Place Cabinet” mode.

Note: The cabinet tool is not activated when the county map is displayed at the top zoom level. As the user zooms in, and the individual intersections become visible the cabinet tool becomes active.

Editing the Controller Cabinet

Right click on the cabinet to open the cabinet menu. Select the ‘Edit’ option from the menu, a cabinet edit property sheet will open as shown in the Figure 4.11.

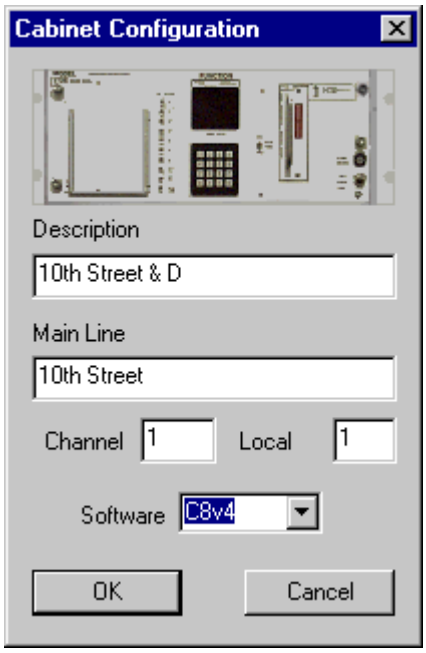


Figure 4.11 – Cabinet Edit Dialog Box

Enter information in the cabinet edit property sheet as described below and click OK.

Description	provides additional information on the location of the Field Element. It is recommended to describe the intersection based on cross streets names for easy reference. The “Zoom to Signal” feature sorts on this description.
Main Line	identifies name of the main line for arterial view
(Channel) Field Element #	identifies a unique number used by the *CTNET CommServer.*
Local Controller #	it is a unique number identifying the Local controller. The local controller numbers start from 1 and go sequential.
Software	identifies C8v4, Tscp(2070) or "other" software.

Opening and Closing the Controller Cabinet

Normally the cabinet stays closed, however, the cabinet needs to be opened for various operations such as:

- Adding, deleting or moving the loop detectors,
- Viewing the detector assignment, or
- Deleting the cabinet.

The cabinet can be opened or closed using the Open/Close toggle menu option in the cabinet menu. If the cabinet is closed, right click on the cabinet to open cabinet

menu and choose Open/Close option. The cabinet door will open as shown in Figure 4.12.

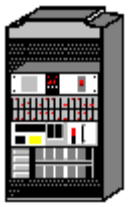


Figure 4.12 – An Open Cabinet

Deleting the Controller Cabinet

The cabinet can not be deleted until the cabinet door is open.

To delete the cabinet:

- If the cabinet is not already open, right click on the cabinet and choose Open/Close toggle option from the cabinet menu.
- Right click once again on the cabinet and choose Delete menu item.

Assigning the Controller Cabinet

The cabinet must be assigned to the intersection before editing any of the intersection attributes.

To assign the cabinet:

- If the cabinet is not already open, right click on the cabinet and choose Open/Close toggle option from the cabinet menu.
- Right click in the center of the intersection to open the intersection menu and choose Assign Cabinet menu item.

Editing the Intersection Attributes

Double click in the middle of the intersection or right click and choose Edit Intersection Attributes' menu item to open the Edit Intersection property sheet as shown in the Figure 4.13. The property sheet consists of multiple tabs with each tab representing one intersection leg, the intersection legs are ordered starting with zero axis and moving clockwise.

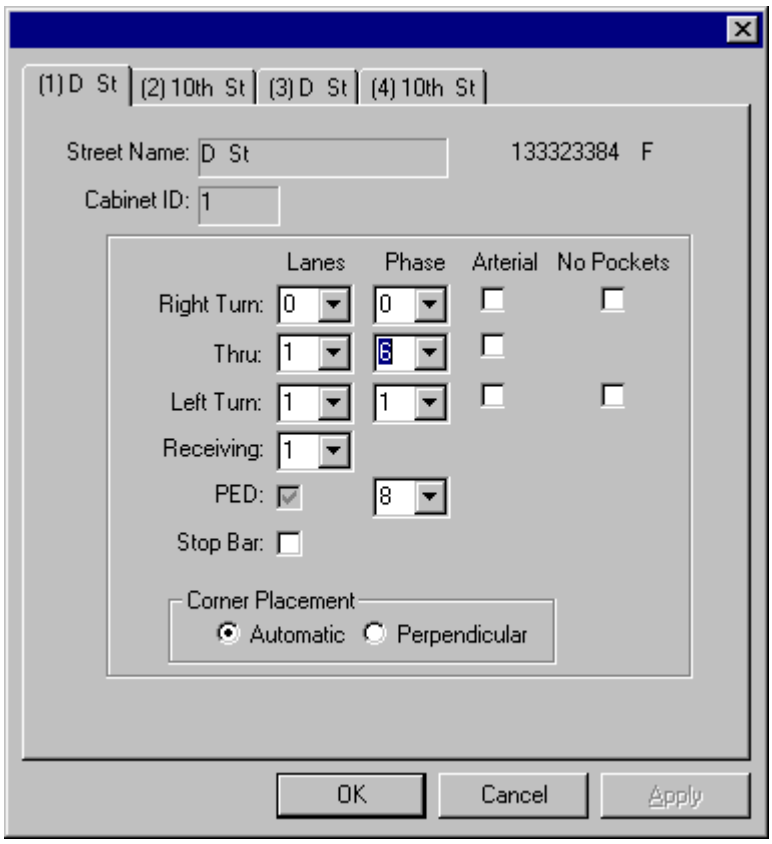


Figure 4.13 – The intersection Property Sheet

Start with the top tab and fill in the property sheet information to match physical configuration of the intersection leg. Continue the process and enter attributes for all other intersection legs.

The Intersection leg attribute property sheets can also be opened individually for each leg by double clicking on the leg. The leg attributes property sheet details information about the intersection leg.

Right Turn	using the combo box for Lanes enter the number of right turn lanes. Make the phase assignment for the right turn using the phase combo box. Click the Arterial check box if you want to see the phase movement in the corridor arterial view (see note below). Check the No pockets check box if the right turn pocket should not be drawn (drawing right turn pockets will be available in next version)
Thru	follow the procedure for right turn and enter number of through lanes, make phase assignment and check the arterial box (if needed), see note below.
Left Turn	enter Left Turn information following the steps explained for right turn.

Receiving	enter the number of receiving lanes.
PED	make pedestrian phase assignment.
Stop Bar	check this box for drawing a stop bar (No PED).
Corner Placement	normally the cross walk and the stop bar are drawn automatically at an angle which makes their inner ends to meet and draw a polygon for the intersection. In special cases the cross walks and stop bars may need to be at 90 degrees to the street angle. In these cases, select the Perpendicular radio button.

After entering leg attributes for all intersection legs click 'OK' to finish. The intersection view will be redrawn to match the attributes.

Note: Arterial view displays a number of intersections on the same corridor showing traffic progression. Arterial view is at higher zoom level and does not show intersection details. Users can define what phases they want to see in a particular arterial view.

Adding Loop Detectors

It is strongly recommended to edit the intersection attributes and choose correct number of lanes before placing the loop detectors, otherwise, the loop detectors will have to be moved after any change in the number of lanes is made.

Click on the Detector tool to select it (If the Detector tool is not active and can not be selected refer to the note below). The mouse cursor will change to a small rectangle indicating that the program is in "Add Detector" mode. The program will remain in this mode until the user clicks on the Select tool. This feature enables the users to add multiple detectors without selecting the detector tool again.

Once the detector tool has been selected, move the mouse to the intersection quadrant and start adding the detectors by clicking the mouse. After adding the last detector click on the Select tool to come out of the "Add Detector" mode.

Note: The Detector tool is not activated when the cabinet is closed. Right click on the cabinet and choose Open/Close menu option to open the cabinet.

Configuring the Loop Detectors

Open the cabinet by right clicking on the cabinet and choosing open/close menu option. Once the cabinet opens, loop detector assignment will appear for each detector. If the detector assignment needs to be edited, follow the steps below:

- Double click on the detector or right click on the detector and choose Edit menu option to open Detector Assignment Dialog box as shown in the Figure 4.14.
- Fill in the new detector assignment number and System Detector number as needed and click 'OK.
- Note that if a detector is assigned as the system detector, it's color changes from white to green.
- Continue to make the changes for the other detectors until the assignments match the physical configuration of the intersection.

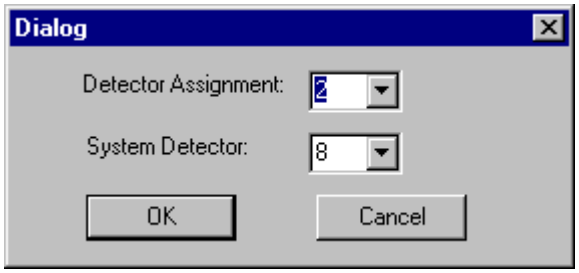


Figure 4.14 – Edit Loop Detector Dialog box

CTNET supports 28 detectors and 8 system detectors for each intersection or local controller The system detectors provide volume and occupancy data. The system detectors must be configured at the local controller level (refer to Appendix B for detector assignments)..

Note: The cabinet has to be open to see the detector assignments. The detector assignments can be edited both in cabinet open and closed modes.

Moving Loop Detectors

The cabinet has to be open for moving the loop detectors.

- If the cabinet is not already open, right click on the cabinet and choose the Open/Close menu option to open the cabinet.
- Click on the detector. Hold the mouse while dragging the detector to a new location.

Deleting Loop Detectors

The cabinet has to be open to delete the loop detectors.

- If the cabinet is not already open, right click on the cabinet and choose the Open/Close menu option to open the cabinet.
- Right click on the detector and choose the Delete menu option.

Login/Logout to the CTNET CommServer

CTNET Client uses TCP/IP (Transmission Control Protocol/Internet Protocol) to establish a connection to the *CTNET CommServer.* Once the connection is established, the communication between the *Client* and the *CommServer* takes place-using UDP (User Datagram Protocol). Use of these open protocols enables to have *CTNET CommServer* anywhere on Caltrans Wide Area Network (WAN) and the clients throughout the WAN can make a connection. In other words, the client can open several documents and view several different counties from several different servers located anywhere on the WAN. This does not mean that the system lacks security. The CTNET CommServer administrator can fully configure the clients and assign access level (refer to section on "Security" in *CTNET CommServer user's Manual).* Also, the CTNET CommServer IP address can be configured using IP Switches/Routers to restrict accessibility.

To login, click on the Connect button or select the Login/Logout menu option, a dialog box as shown in the Figure 4.15 will appear. Fill in the information as needed and click OK. The Connect button will appear depressed indicating that the client is logged into the *CommServer*

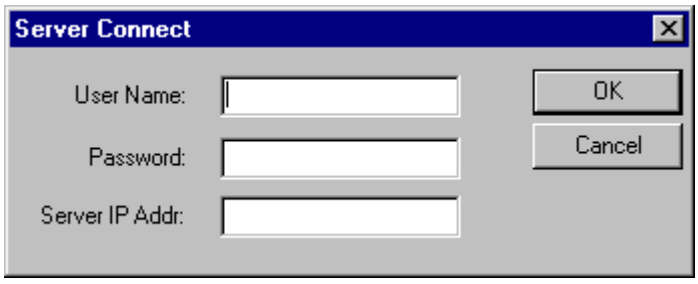


Figure 4.15 – Login Dialog Box

User Name	user account name assigned by the *CTNET CommServer* administrator
Password	the administrator will assign a default password for every account created on the *CTNET CommServer*. For most users, the administrator will also assign the ability to change the password. The users should Login using the

	default password and change their password immediately to ensure system security.
Server IP Addr	the administrator will provide the *CTNET CommServer* IP address to the users. The IP address may be in the normal dot notation e.g. (149.136.40.23) or in DNS (Domain Name System) notation e.g. (CTNET_HQ1).

It is easier to remember the server names instead of the IP addresses, so it is suggested to have a static IP address for the *CTNET CommServer* with the corresponding DNS name. Ask the district Information Service Administrator for more information on this topic.

Once logged in, the user can view and change information based on the access level assigned by the *CTNET CommServer* administrator. Refer to the section on "Managing the Clients" in chapter 6 "*CTNET CommServer User's manual* " for information on the client access levels, and request the user account based on the required access.

To Logout of the *CTNET CommServer*, click on the depressed Connect button or choose Login/Logout menu option.

Displayed information

When the client is logged into the *CTNET CommServer*, information from the field master is updated in real-time and is placed on the map as appropriate.

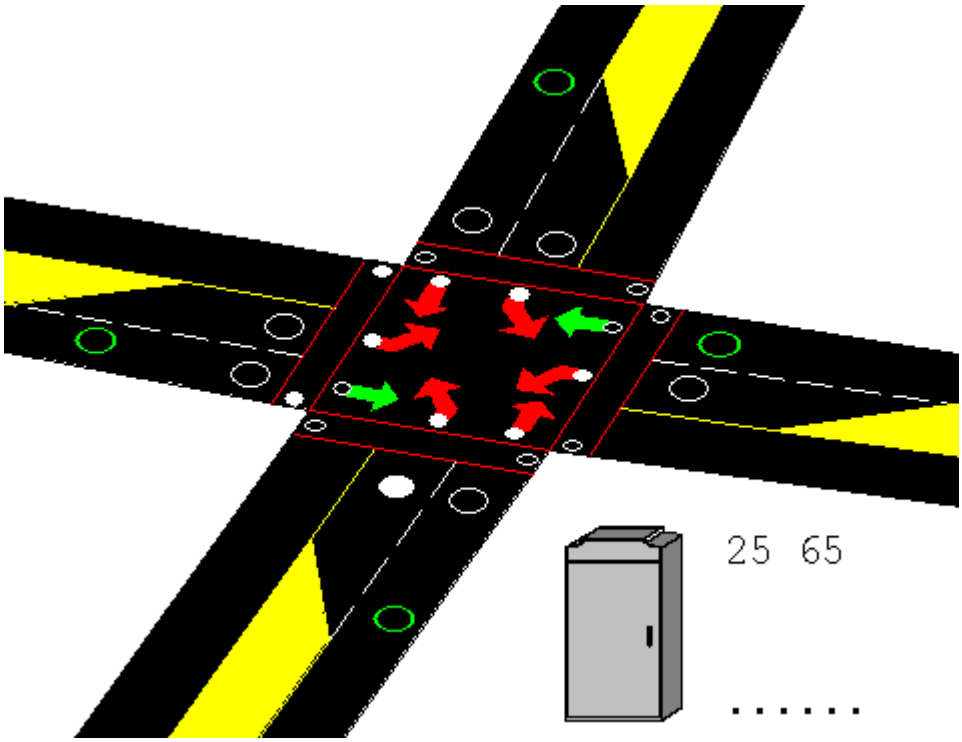


Figure 4.16 – A typical intersection view

In Figure 4.16, the numbers next to the cabinet (25 65) indicate phase and interval just like 170 front panel. A better explanation for the interval can be viewed in cabinet detail view as explained latter in this section. The dots (**. . . . .**) indicate incoming messages. Each time a message is received the system adds a dot to indicate that the message has been received and the information on the map has been updated.

Available once per second information includes:

Phase

- reds, yellows, greens are indicated by the arrows changing colors.
- PEDs are indicated by the crosswalk changing colors.

Calls

- Vehicle calls are indicated by the little white circles at the base of the arrows. A solid white circle means that there is a call against that phase.
- PEDs calls are indicated by the little circles in the crosswalk. A solid white circle means there is a call against that PED phase.

Detector Presence

The Detector Presence is indicated by solid white loop detector circle. Cabinet detail view also displays this information.

Cabinet alarms

Preemption and Los of Signal are displayed on the cabinet (Figure 4.17 shows RR1, EVA preemption and LOS) as well as in the cabinet detail view. A big cross on the cabinet indicates a Loss of signal (LOS) alarm. Loss of signal means the *CTNET CommServer* is receiving messages from the Master controller, but the master controller is not receiving responses from a particular local controller.

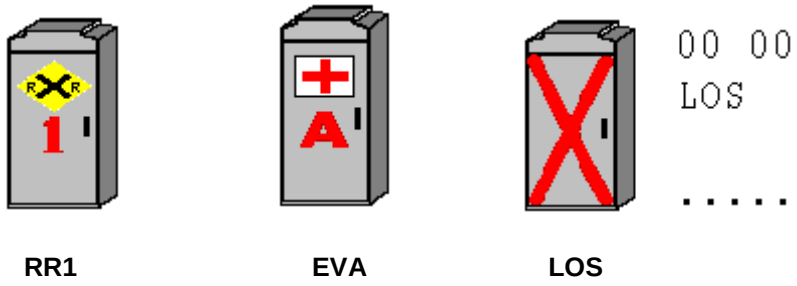


Figure 4.17 – RR1, EVD preemption and Loss of Signal (LOS)

The system can also be configured to collect Volume and Occupancy data and view timing coordination and configuration plans.

Controller Timing Plans

Controller Timing Plans can be viewed if the user has access rights assigned by the *CTNET CommServer* administrator. The timing data can also be stored in a Microsoft Access Database as explained in the section on " Timing Charts" later in this section.

Volume, Occupancy and Speed

A green color of the loop detector indicates that the loop detector has been configured as the system detector. Moving the cursor over to that detector will display Volume and Occupancy in the status bar. Cabinet detail view also displays this information. The data can be stored in Microsoft Access database as explained in the section on "Data Collection" later in the manual.

Cabinet Detail View

Cabinet Detail View is shown in Figure 4.18. Phase, interval and vehicle phase call information is displayed in the top part of the cabinet detail view.

Railroad and emergency vehicle pre-emption along with STOP and FLASH are indicated by corresponding RED buttons turning ON (bright red).

The left middle rectangle displays detector presence, corresponding green light turn ON(bright green) when the detectors are occupied.

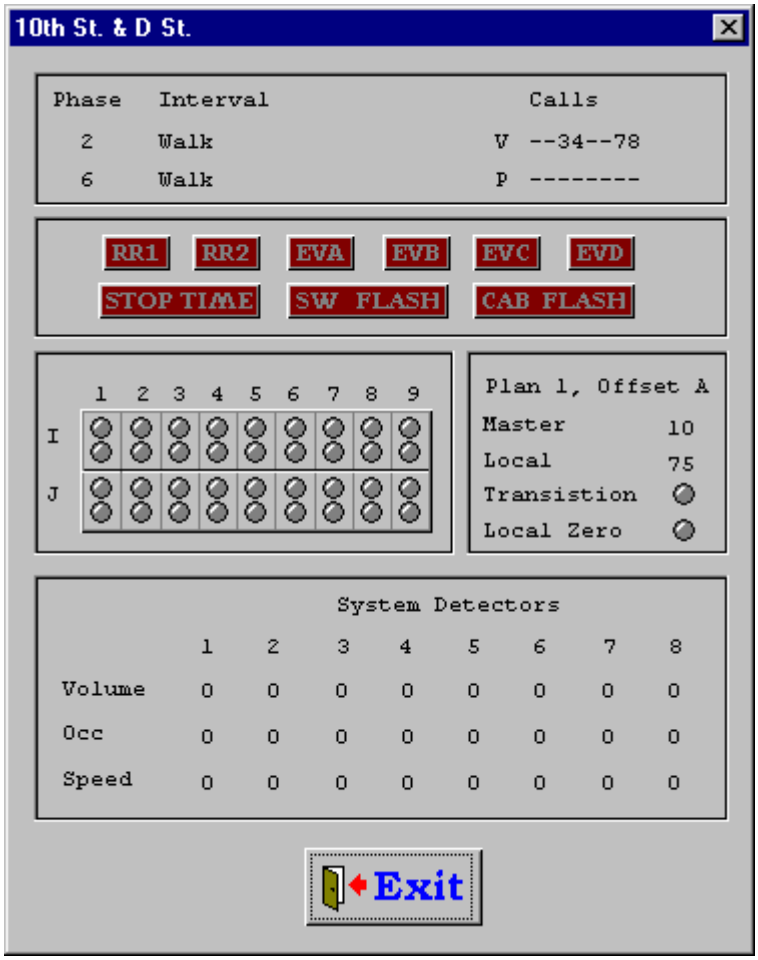


Figure 4.18 – Cabinet Detail View

Timing plan and offset is displayed in the right middle rectangle, along with the master and local clocks. The transition light comes ON when the local clock is trying to catch up with the master clock. The local zero light is turned on when the master clock passes local zero.

The lower rectangle displays volume, occupancy and derived speed for the configured system detectors.

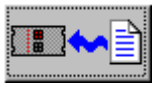
Note: The volume is number of cars passing a system detector per minute. Occupancy is percentage of time the system detector remains occupied. Speed is derived based on uninterrupted traffic calculations and is in mile per hour.

Timing Charts

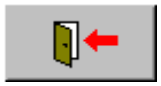
CTNET CommServer administrator assigns privileges to view timing data. To check if the user has access to view timing, login to the *CTNET CommServer*, right click on the cabinet to open the cabinet menu and see if Get Timing option is highlighted. If Get Timing menu option is grayed out then the user does not have access privileges to view timing data. Contact the *CTNET CommServer* administrator to request any changes in the user accounts and access privileges.

The Cabinet/Get Timing menu option opens a data sheet with timing data uploaded from the field master as shown in Figure 4.19. Next CTNET version will include coordination and configuration data sheets shown in Figure 4.20 and 30.

The data sheet has two buttons:



Loads timing data to the controller. The timing data was previously stored in the data base file.



Exits the Timing Dialog Box.

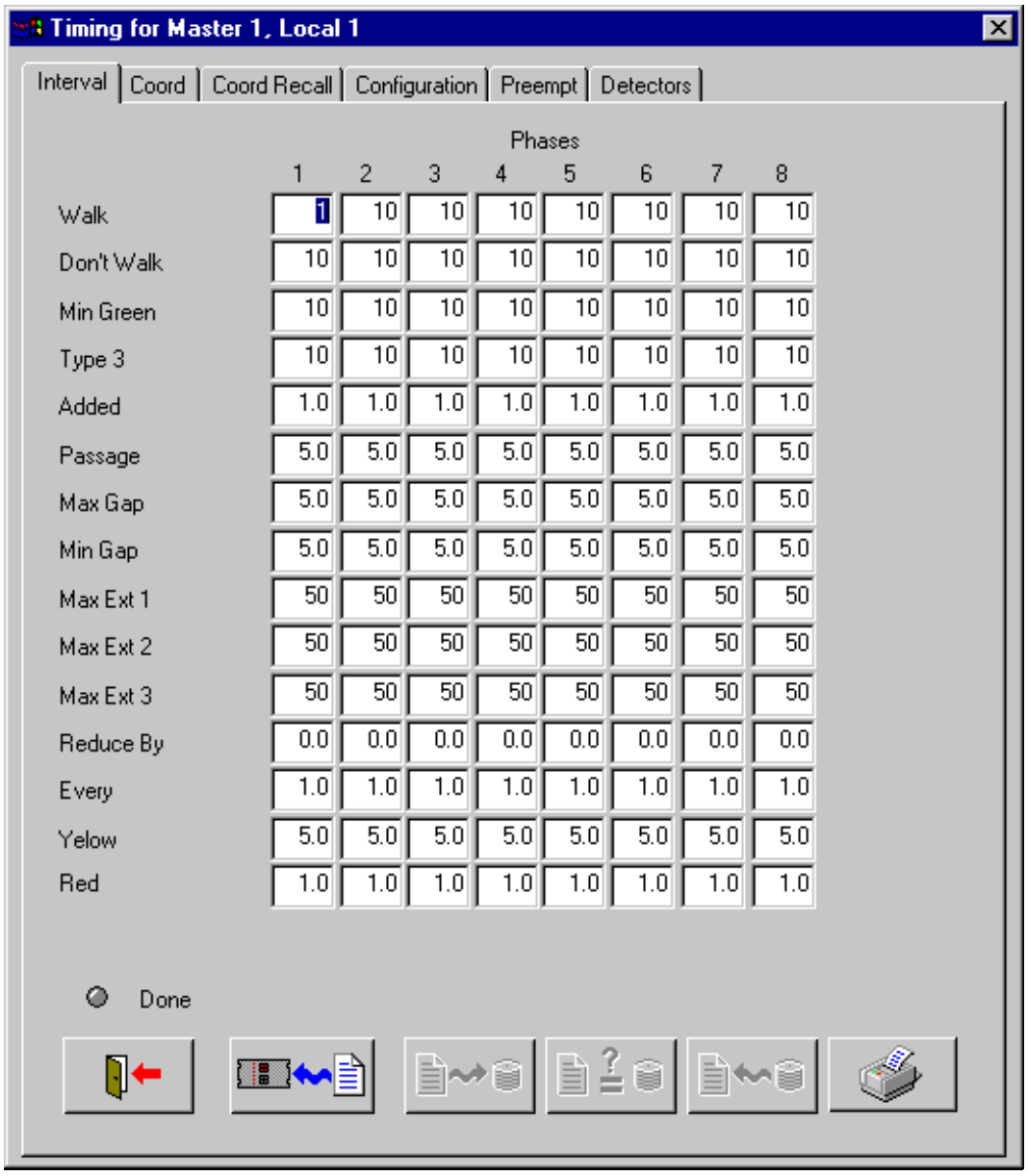


Figure 4.19 – Phase Timing Page

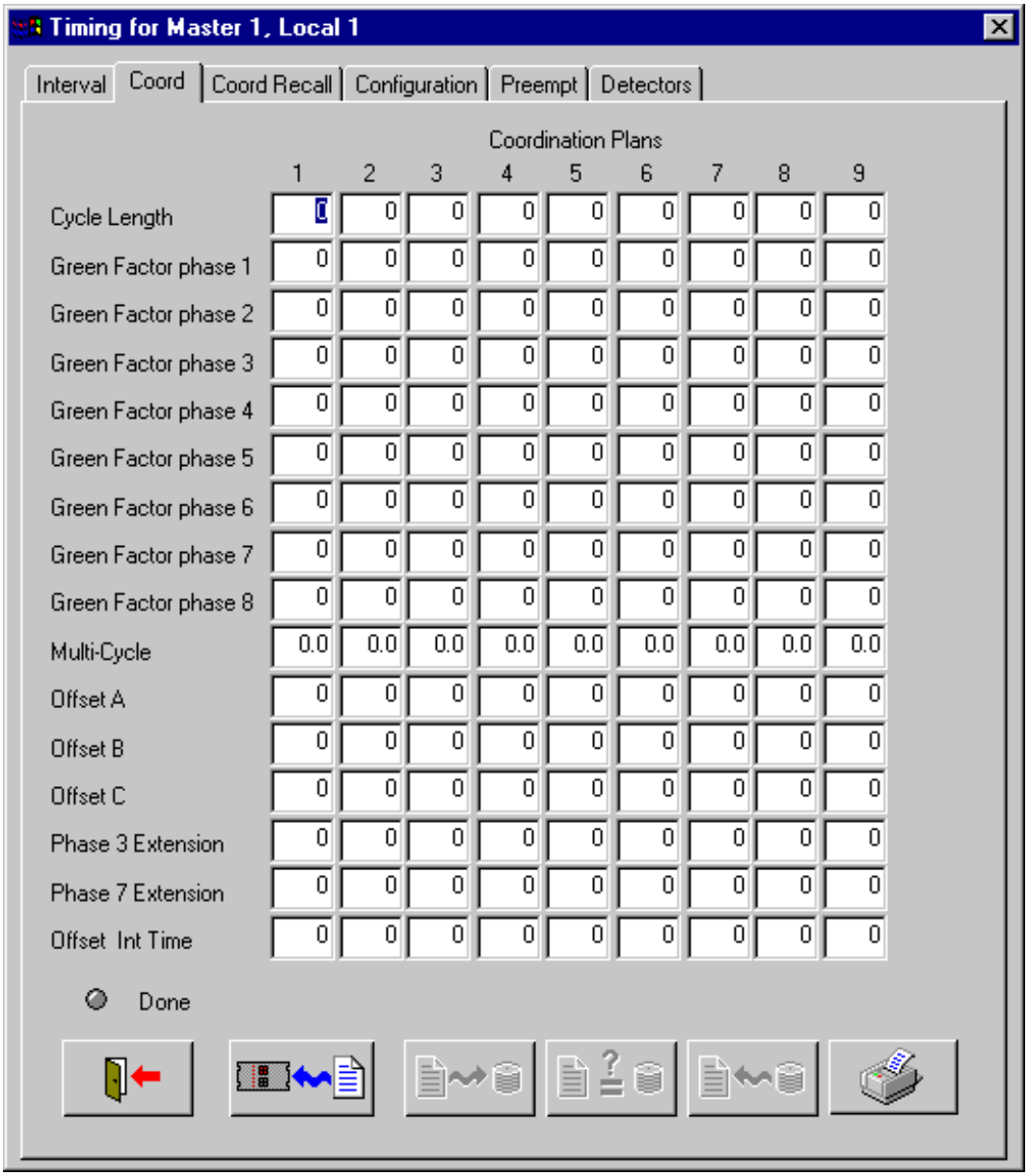


Figure 4.20 – Coordination Page

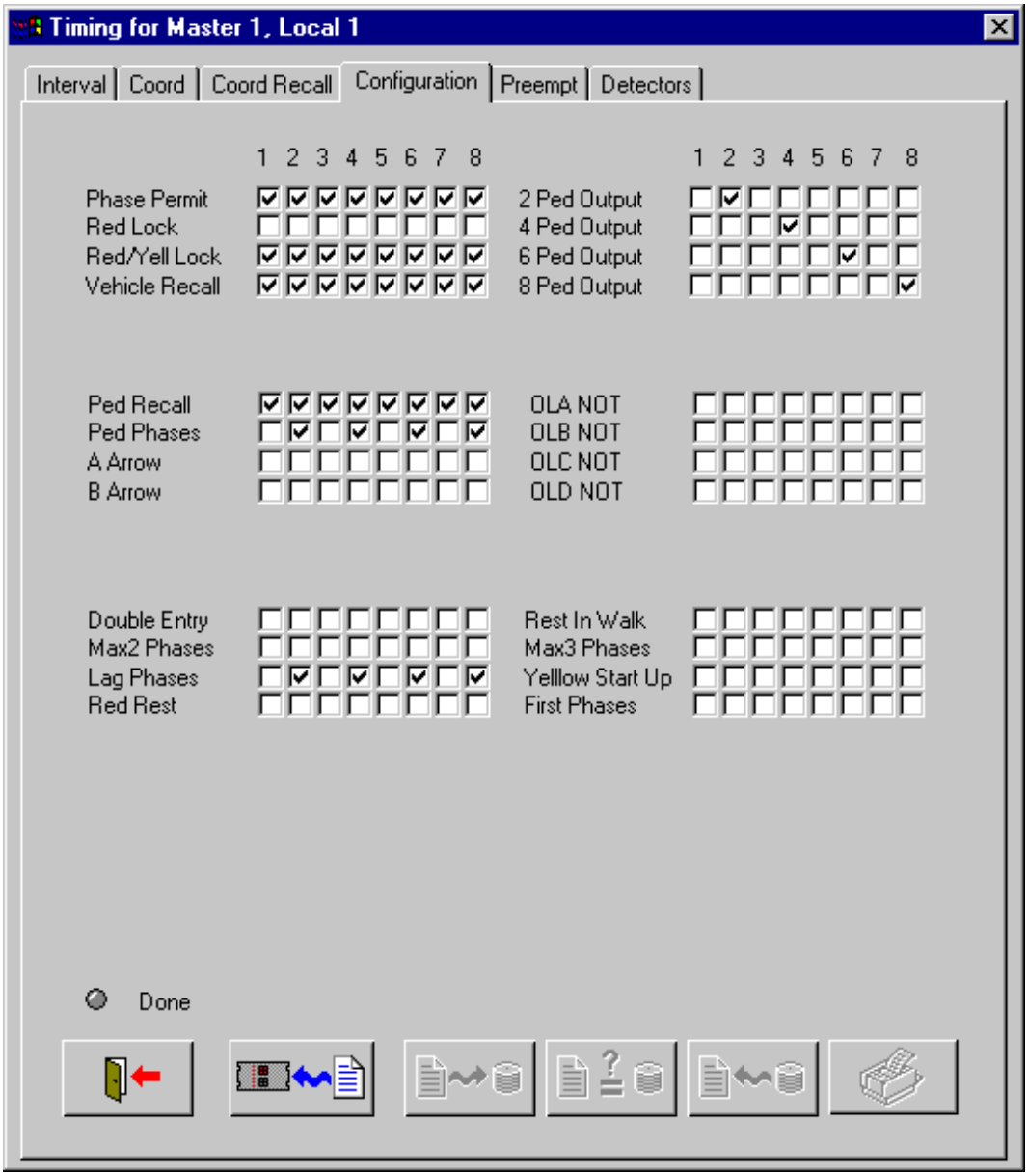


Figure 4.21 – Configuration Page

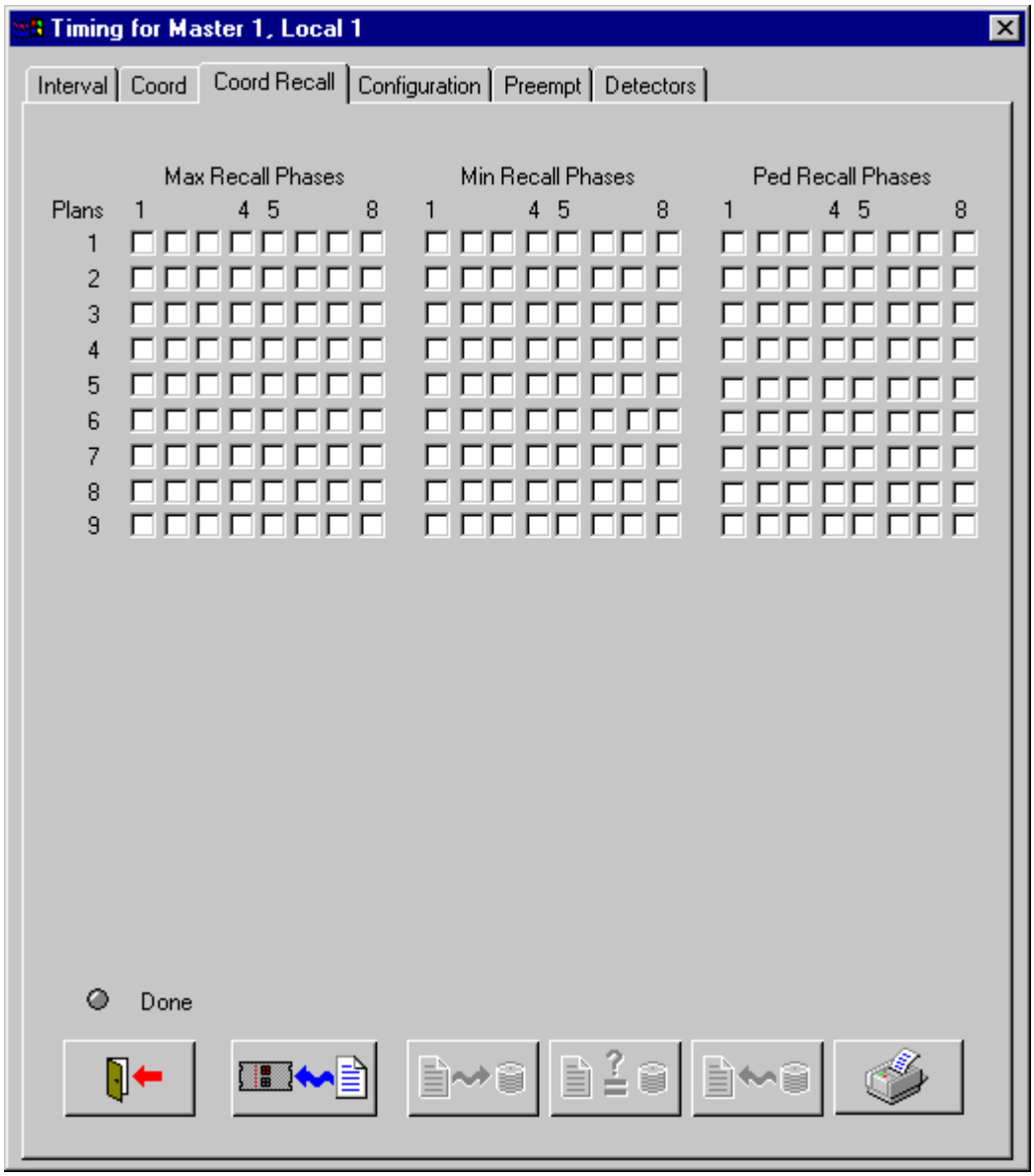


Figure 4.22- Coordination Recall Page

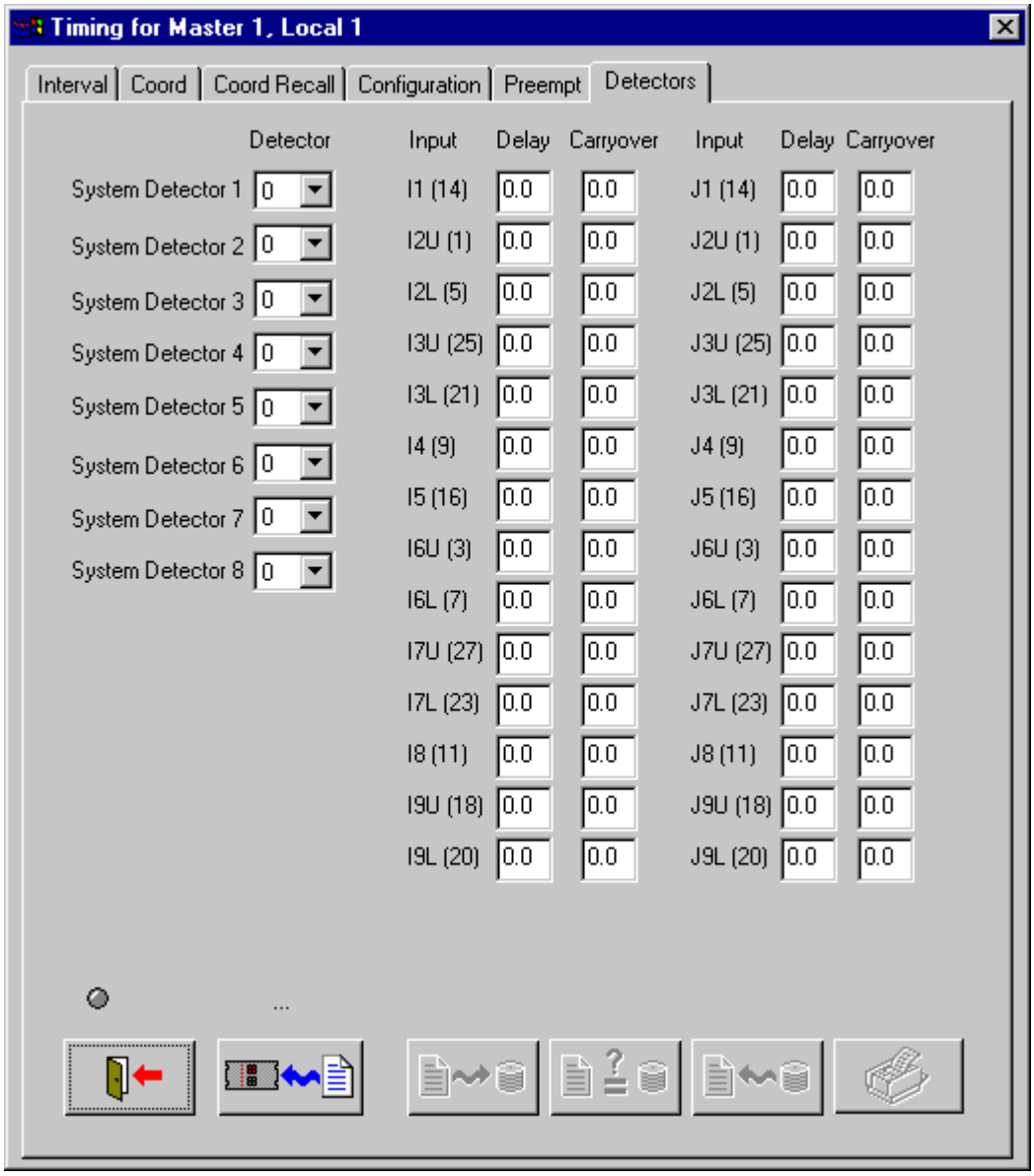


Figure 4.23- Detectors Page

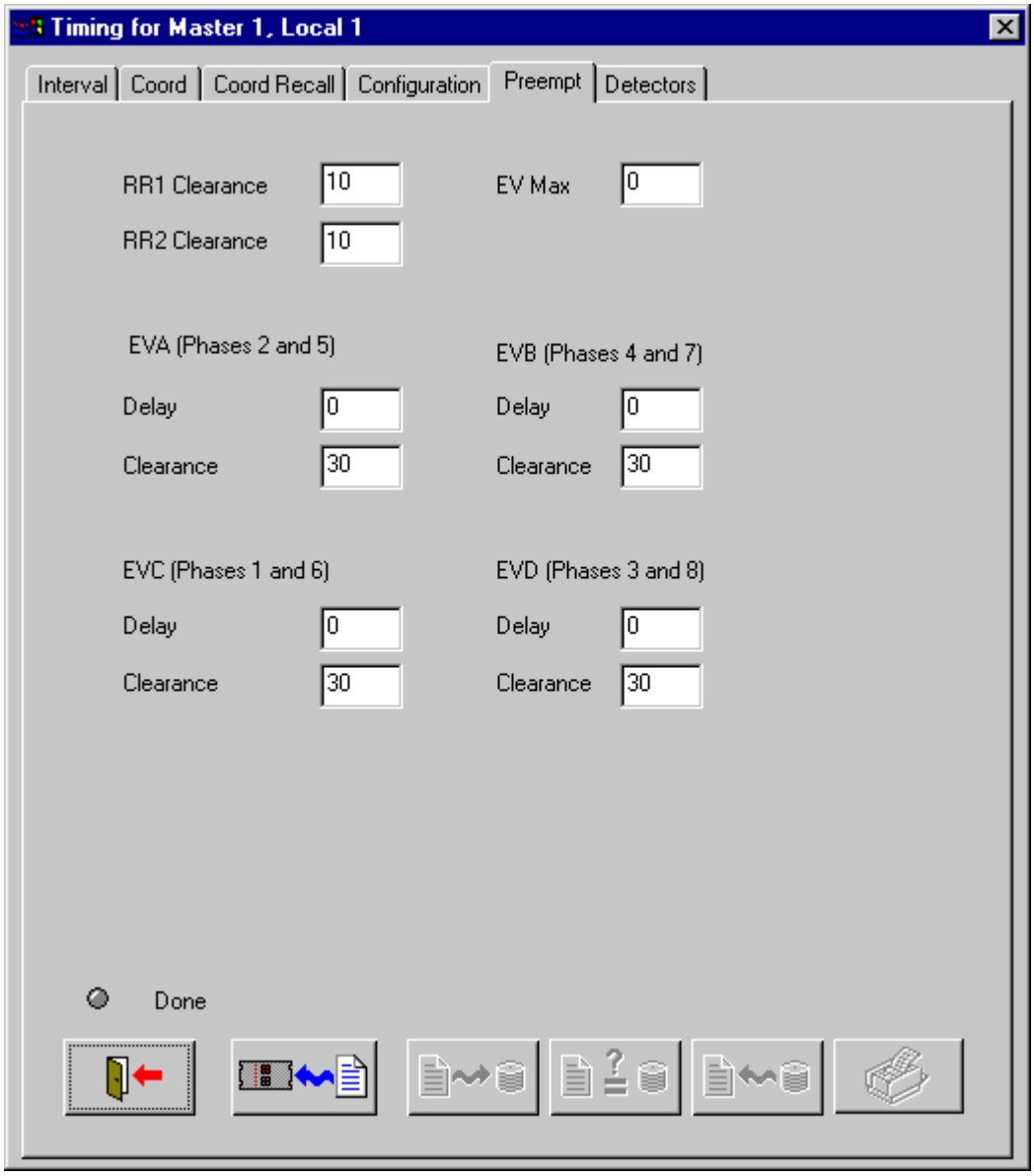


Figure 4.24- Preempt Page

System Logs

The System provides two types of logs: Preemption log and System Alarms log

To view the Preemption log, click on the 'Display Alarms' button in the toolbars. A dialog box opens and displays Preemption log as shown in Figure 4.25 . The Log displays all preemptions (RR1,RR2, EVA,EVB,EVC,EVD) with graphical symbols and details like: Master and Local controller numbers; start time, end time and total duration of each preemption.

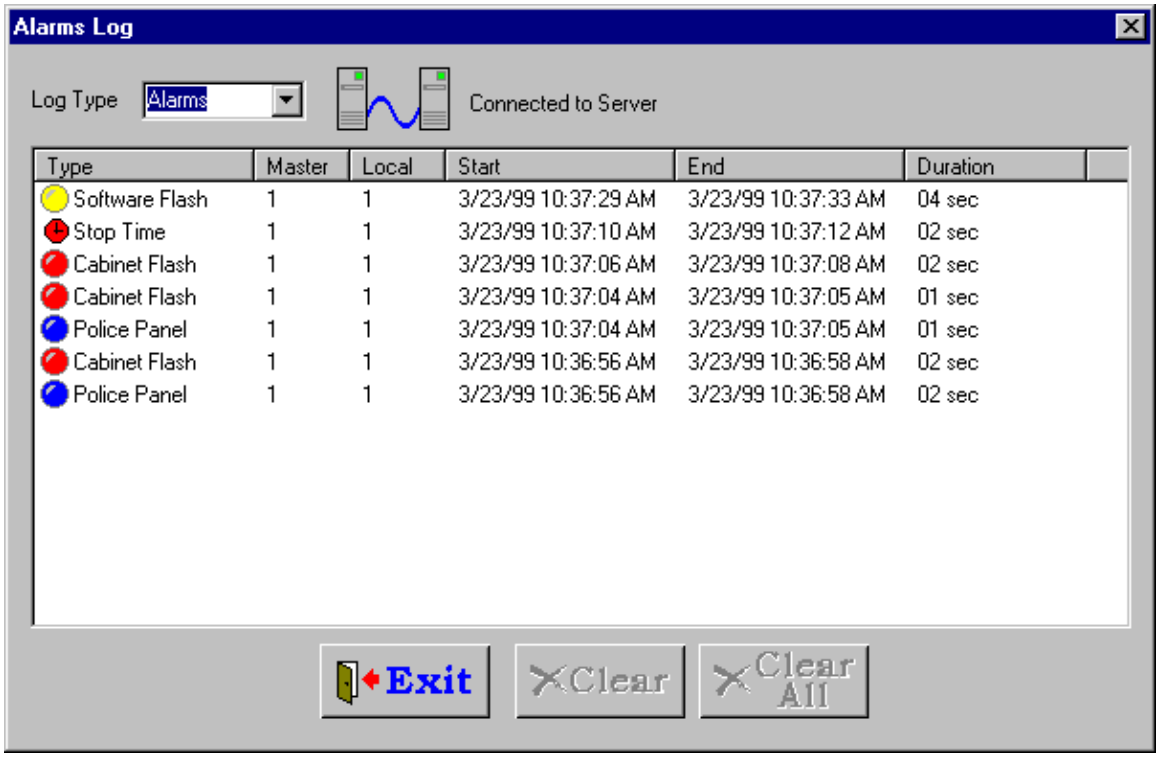


Figure 4.25 – Preemption Log

To view the alarms log, select ‘Alarms’ from the combo box at the top of the dialog box. The Alarms will be displayed as shown in the Figure 4.26

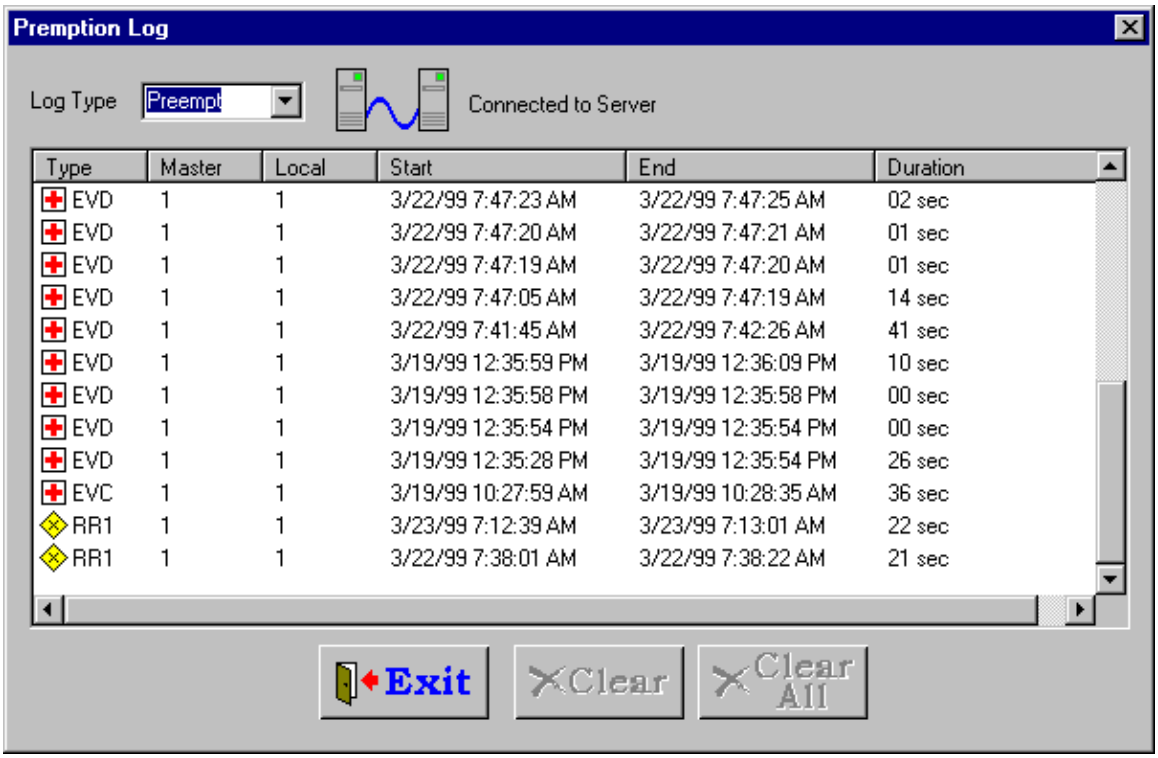


Figure 4.26 – Alarms Log

RAM Map View

CTNET provides the RAM Map view of Master Controller just like 170 controller front panel. To view RAM map, right click on the cabinet and choose 'Ram Map view' menu option. Dialog box as shown in Figure 4.27 will appear. Refer to C8 manual to use the keypad for switching among various displays (base display, Ring A display, Ring B Display) and memory locations.

Figure 4.27 – RAM Map View

Data Collection

Volume and Occupancy data can be collected from the configured system detectors. (Please, refer to C8 manual for information on configuring the system detectors). Follow the steps to collect data and store it in MS access database.

- Zoom to the desired intersection
- Login to CTNET CommServer
- Right click on the cabinet and choose Start Data Collection menu option. If the option is not highlighted see note below.
- Dialog box as shown in the Figure 4.28will appear. Fill in the start time, end time and interval information and click OK.
- From the Create file dialog box choose an existing file or enter a name to create a new database file and click OK.
- The system will automatically open the database file at start time and continue to store information at specified interval until the end time arrives. The database file will automatically close at end time.
- If for any reason the data collection process has to be stopped before the end time, right click on the cabinet and choose Stop Data Collection menu option.

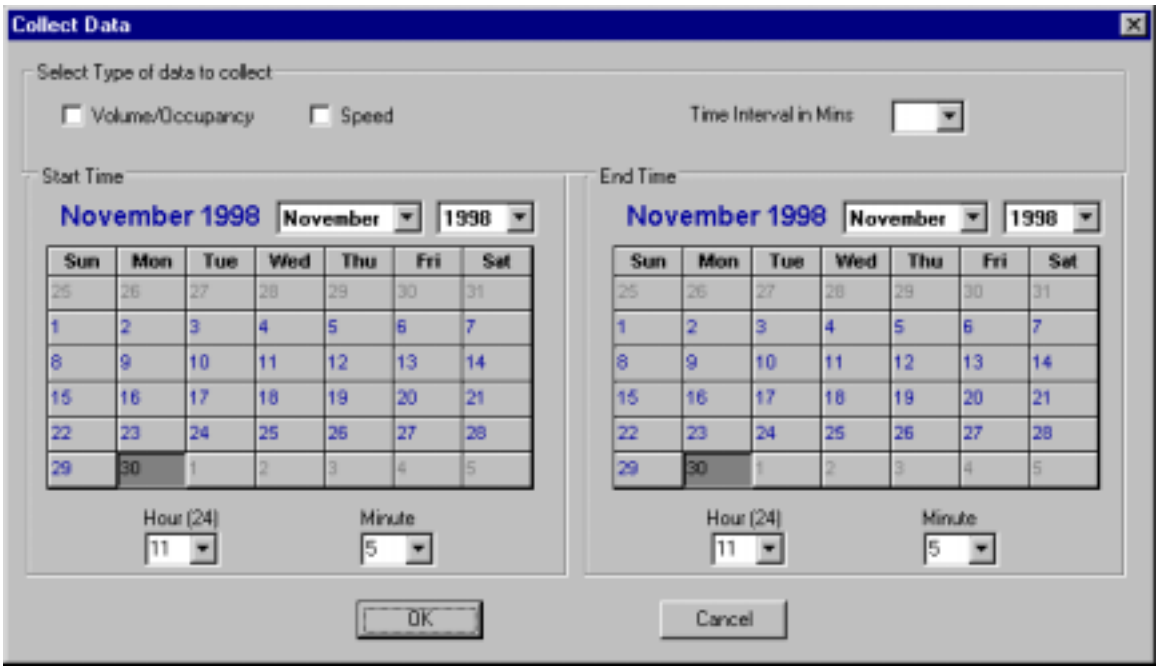


Figure 4.28 – Data Collection Dialog Box

The start time and end time calendars are fully clickable and they default to today's date. The start hour, minute and end time hour, minute is combo boxes and default to present time. Time interval is the time in minutes the system will generate a data record to store in the database file. Normally, the system receives data from the system detectors every minute. To limit the database file size the user may want to store data every 15 mins or so.

Speed is calculated from the volume and occupancy data based on the user defined average vehicle length. The user can set the average vehicle length by choosing System/ Configuration/ CTNET properties menu option and selecting the speed tab. The default vehicle length is 26 feet.

Reports

CTNET Client collects and stores data in Microsoft Access database format. An experienced Microsoft Access database user can view, search, sort and print the data as needed. Templates for common types of reports have been designed and are available for use with CTNET. Refer to chapter 5 on "*Reports*" for detailed information on the designed report templates.

Overview

CTNET Reports allow users to display CTNET data in an organized and effective way. Before the CTNET report can be generated, the user must configure the *CTNET Client* to perform data collection (refer to Chapter 4 “Data Collection” for more information). Once the *CTNET Client* collects data and saves to a database file, the reports can be generated from the stored database file using Microsoft Access.

To assist users with creating reports, CTNET comes with a predesigned report template called *CTNETreports.mdb*. Because the name of *CTNETreports.mdb* is used by report template, the user must not save the database file with this name when collecting data.

CTNET Reports consist of system detector data (volume, occupancy and speed) and are displayed in a format selected by the user. A sample CTNET report generated by the report template is shown in Figure 5.1.

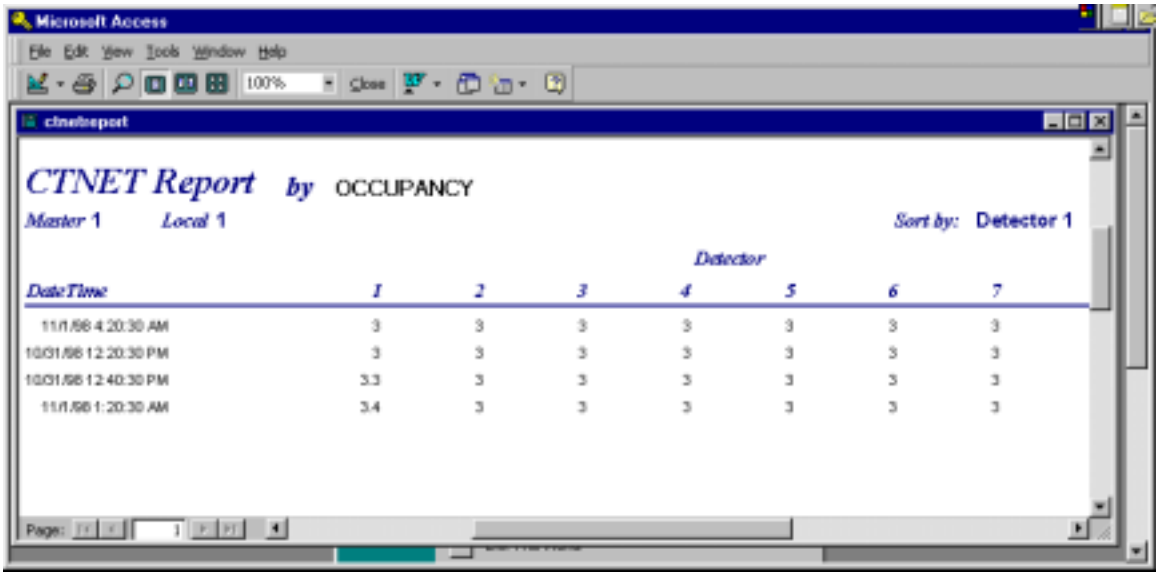


Figure 5.1 – A Sample Report

Starting the CTNET report

If you are experienced with Microsoft Access, you can start up Microsoft Access and generate the reports by creating your own database objects. But if you are not experienced with Microsoft Access, it may be less cumbersome to use the *CTNET Reports* template to generate the reports.

To use the *CTNET Reports* template:

Start *CTNET Reports*:

1. On the Windows taskbar, click Start -> Programs -> Ctnet -> CTNET Reports. The CTNET Report Menu window appears.

This template consists of no data when starting for the first time. You need to add link to the database file saved in the Data Collection process by the *CTNET Client* (See Data Collection in previous chapter) before the CTNET Report Menu can be used.

To add link to database file:

2. On the File menu, point to Get External Data, and then click Link Tables... The Link dialog box appears.
3. Browse through the directory structure to locate the desired CTNET database file created by the *CTNET Client*. Be sure the folder of the CTNET database file appears in the Look in: box. Select the CTNET database file, and then click Link. The Link Tables dialog box appears.
4. Click Select All to link to all tables, and then click OK. The CTNET Report Menu is ready for operation.

Perform these steps only once for linking to the same database file. If you want to generate reports based on another database file, you need to first remove the old linked tables, and then add links to the new database tables by performing the previous steps 2 to 4 again.

To remove link to database file:

1. Click the database button located at the top of the window. The CTNETreport:Database dialog box appears.
2. Click the Tables tab, and then select the linked table.
3. Press the DELETE key on the keyboard. A message dialog box appears confirming the deletion of the linked table.
4. Click YES. Microsoft Access deletes the link and removes the table's name from the list.


Database Button


Linked Table

Since these steps remove only one linked table at a time, you need to repeat steps 1 to 4 to remove all old linked tables.

Note: When you delete a linked table, you are deleting only the information that Microsoft Access uses to open the table, not the table itself. You can link to the same table again later if you want.

The CTNET Report Menu

The CTNET Report Menu, as shown in Figure 5.2, can be used to manage the database and generate reports. This menu provides the user with the options for previewing reports, viewing and deleting records.

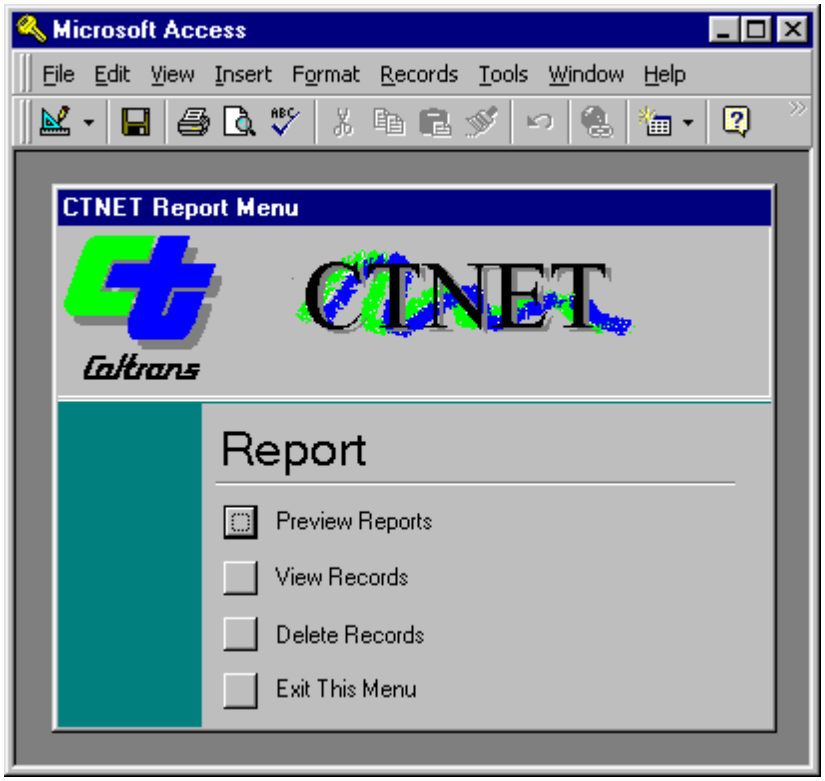


Figure 5.2 - The CTNET Report Menu

Previewing Reports

The Preview Reports dialog box, as shown in Figure 5.3, allows users to create timing and/or system detector data (occupancy, volume and speed) reports. The reports can be based on either the data from all controllers or selected controllers. The sort by option is only available for system detector data reports.

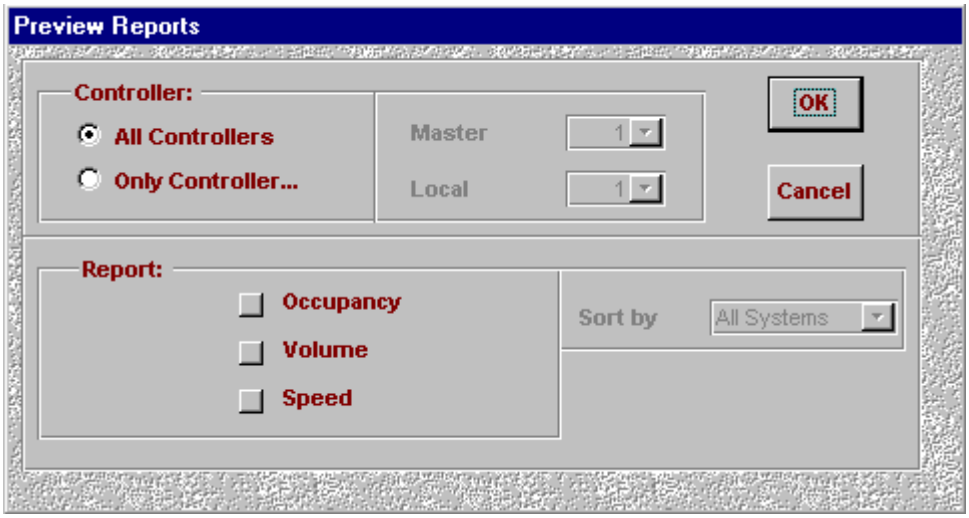


Figure 5.3 - The CTNET Preview Reports dialog box.

To preview a report:

1. Select one or more of the report options.
2. Select one of the following controller options:

Options	Description
All Controllers	generate report based on data from all controllers.
Only Controller…	generate report based on data from the controllers selected in Master and Local boxes.

   The default controller option is All Controllers.
3. If Only Controller… is selected, click Master and local to select the appropriate controllers.
4. In the Sort by: box, select the detector that the sorting is based on. This option is not available for timing reports. The All Systems option indicates no sorting.
5. Click OK. The CTNET report appears.
6. If you want to close the report, click on the X button on the report title bar.

Viewing Records

The View Records dialog box, as shown in Figure 5.4 and 38, allows the user to navigate the CTNET database and view CTNET data records individually. The records can be based on either the data from all controllers or selected controllers.

The three buttons on the left of the dialog provide the following functions:

 Go to the next record

 Go to the previous record

 Exit this dialog box

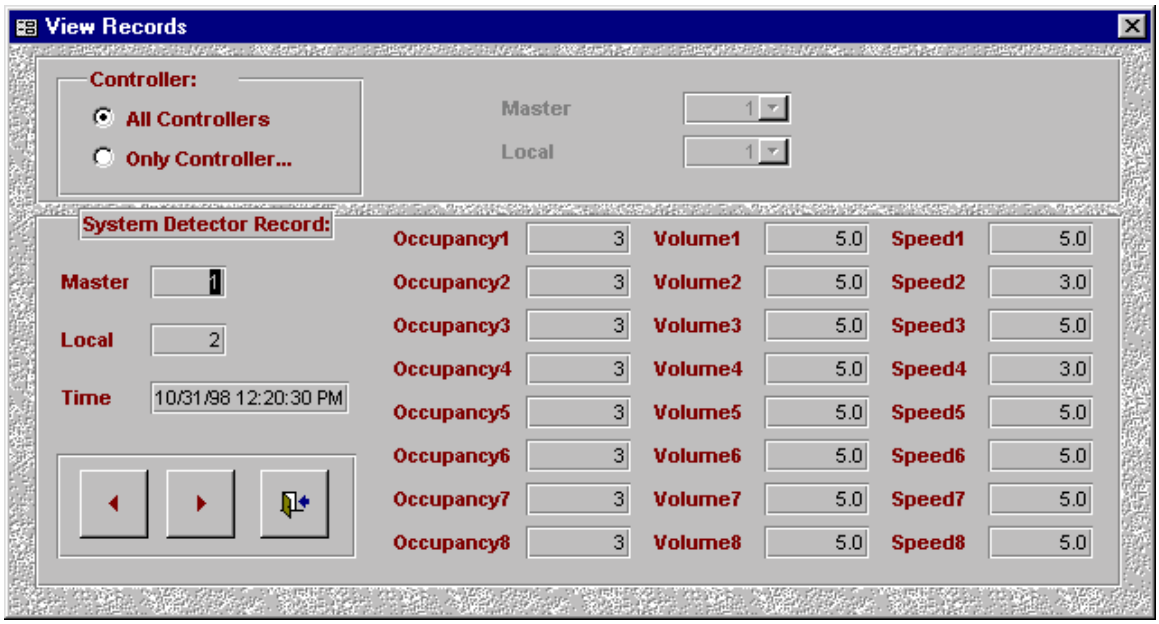


Figure 5.4 - The CTNET View Records dialog box for system detector record

To view records:

1. In the Record types dialog box as shown in Figure 5.5, click the appropriate record option, and then click OK. The View Records dialog box appears.
2. If you choose the system detector data record option, select a controller option and navigate to the desired record by clicking the right arrow or left arrow button. If you choose the timing record option, click the Master and/or Local down arrow and select the appropriate controllers. The record data changes accordingly.
3. Click Exit this dialog box button or X box on the title bar to close the View Records dialog box.

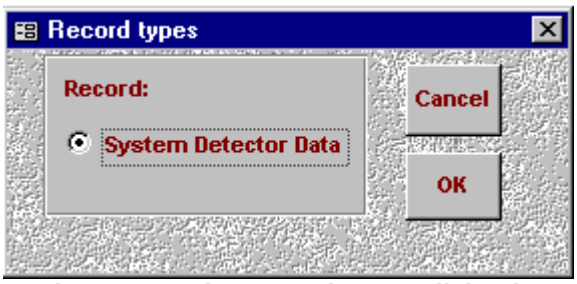


Figure 5.5 - The Record Types dialog box

Deleting Records

The Delete Records dialog box, as shown in Figure 5.6, allows the user to streamline the database by deleting records from the database. The deletion is based on time and controller options.

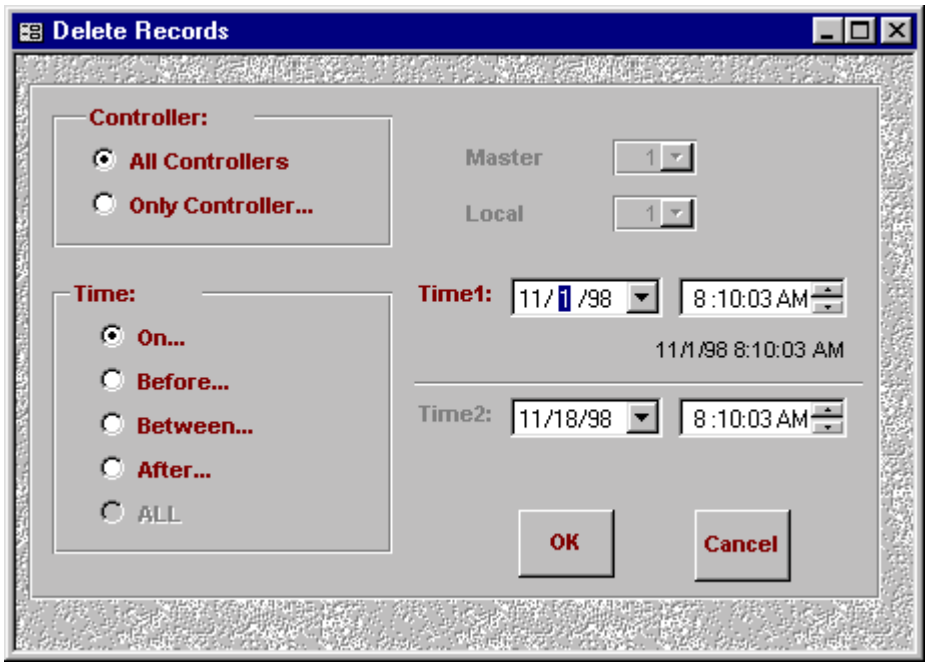


Figure 5.6 - The CTNET Delete Records dialog box.

To delete records:

1. Select a controller option.
2. Select one of the following time options:

Options	Description
On…	delete only the records matched with Time 1.
Before…	delete all records before Time 1.
Between…	delete all records between Time 1 and Time 2.

After…	delete all records after Time 1.
ALL	delete all records regardless of the data time from the database. This option is only available when the only controller… option is selected. This prevents user from deleting the entire database unintentionally.

3. Click the first Time 1 down arrow. The calendar dialog box appears.
4. Pick a date from the calendar.
5. In the second Time 1 box, type or select the desired time you want.
6. If Between… is selected, repeat step 2 to 5 for Time 2.
7. Click OK. A message dialog box appears confirming the deletion of these records.
8. Click YES to delete records from the database.

CHAPTER 6

CTNET CommServer

Overview

All communication between clients and field elements are managed through the CTNET Communication Server program appropriately called "*CTNET CommServer.exe*". The *CTNET CommServer* provides a system view of all connections. From the *CTNET CommServer* a CTNET administrator can connect or disconnect field elements, monitor their status, and manage user accounts and connections.

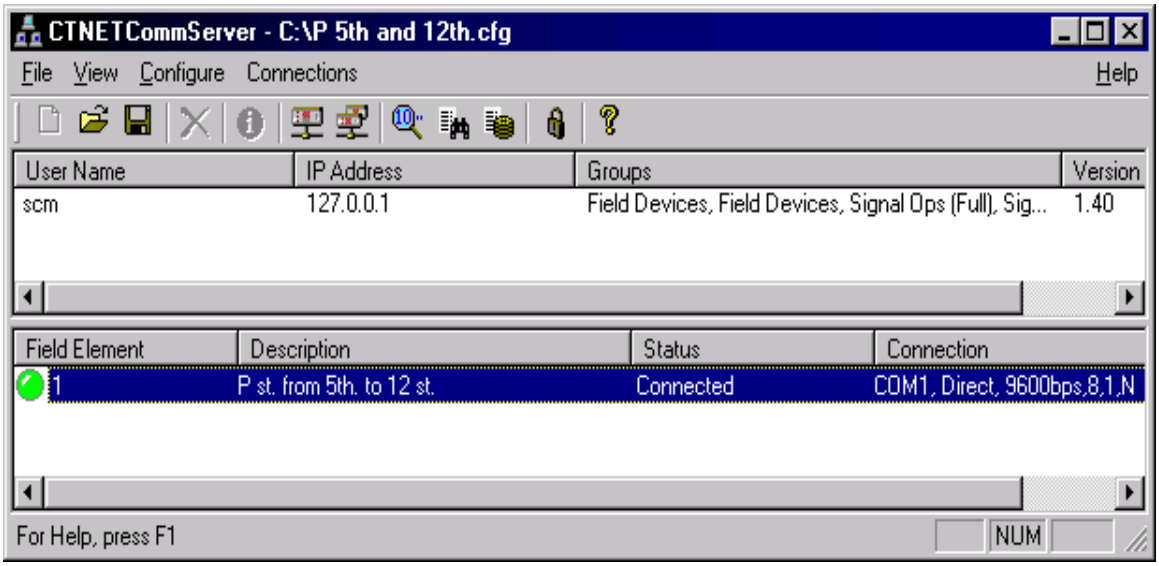


Figure 6.1 – *CTNET CommServer*

System information is divided into two regions in the *CTNET CommServer* window: Client Connections and Field Element Connections. Each area displays pertinent information in its own resizable pane. Selecting a pane item and clicking a button on the toolbar can accomplish most common functions on a pane.

Note: A shortcut to this program should be loaded in the Programs folder, or in a Ctnet folder under the Programs folder. If this is not the case, open Windows Explorer or My Computer and go to the location where the CTNET program files were loaded. Create a Shortcut to this program by right clicking on a "CTNET CommServer.exe" and choosing the menu item "Create Shortcut". Next right-click the new file "Shortcut to CTNET CommServer.exe". Choose the menu item Cut. Now right-click on the Windows Start button on the Windows Taskbar. Choose the "Explore" menu item. Windows Explorer will open at the Start Menu folder. Navigate to the location where you want the shortcut to be located and right-click, choosing the menu item paste. The name of the new file can be edited, for instance to remove the "Shortcut to" or ".exe" by clicking on the text and typing new name.

CTNET CommServer displays all system information through field and client connections. The *CTNET CommServer* allows an administrator to create, modify and connect or disconnect field elements and user accounts. A field device's status is displayed with a red light for not connected, yellow light for connected but with a communication error, and green for connected with no errors. The *CTNET CommServer* displays clients by account name, IP address and user groups.

Security

CTNET CommServer supports multiple levels of security to allow fine-grained control over access to individual components of the system. The following security options are supported:

- Field Master with dial-back
- C8 RAM change restrictions
- *CTNET CommServer* user accounts and their permissions
- *CTNET CommServer* program lock
- MS Windows NT Server user accounts (optional)

Field master security is accomplished using a dial-back phone number. The field master's NVRAM can be configured to store this information. The *C8 Field Master* verifies the connection by hanging up and dialing back a pre-configured number. This ensures that only authorized phone numbers can access the system. This process is transparent to the CTNET CommServer. All parameters are controlled at the Field Master.

C8 version 3 restricts the RAM locations that could be changed remotely. C8 version 4 provides the same security. For more information see the C8 manual.

The *CTNET CommServer* security prevents unauthorized network connections to the *CTNET CommServer* and logs all connections, requests, modifications and errors to an encrypted persistent database. The CommServer administrator manages user accounts and privileges, as well as monitoring user access. *CTNET CommServer* requires a user identification and password pair for initial login.

CTNET CommServer provides a program lock to prevent casual misuse while the system is operating but unattended. The *CTNET CommServer* will continue to communicate with field elements and clients, however all user interaction with the

CTNET CommServer will be inhibited. However without operating system security features in place it is not possible to prevent an experienced user from bypassing these security features and modifying or deleting disk files.

Lastly, a robust level of security can be achieved by running *the CTNET CommServer* on MS Windows NT Server, which does have full security support, including user identification, password, and access control. MS Windows NT Server supports user security at the operating system level, preventing unauthorized users from accessing the server to modify the CTNET database and configuration files. *Windows NT Server* security can be implemented across the Caltrans WAN or over dial-up networking with Remote Access Service (RAS). Because Windows95 does not fully support security features, it is possible only to prevent casual attacks on CTNET under Windows95.

Field Element Configurations

With the *CTNET CommServer* version 1.0 all field connections must be to field masters. Future versions will support direct connection to one or more local intersections. All field connection settings on the *CTNETCommServer* must be configured and saved to a configuration file for future use.

Toolbars

The application toolbar, as shown below in Figure 6.2, controls the most frequent interactions with the *CTNET CommServer*. The Toolbar is separated into 4 button groups to coordinate actions. Moving the mouse cursor over a button will display a short functional description of the button's action. A larger explanation will be displayed in the status bar, located at the bottom of the *CTNET CommServer* program window. The toolbar can be docked to any side of the CommServer window by clicking an empty area of the toolbar while dragging to any side of the window and releasing the mouse button. If the mouse button is released away from the sides of the CommServer window the toolbar becomes a floating toolbar.

Figure 6.2 - *CTNET CommServer* Toolbar

File Group Buttons

The File Group Buttons controls the current configuration file that contains the attributes of the Field Elements. The *CTNET CommServer* program is file based, so that different set of field elements can be loaded by opening a different configuration file. This would be the case when there are fewer modems and COM ports available than field elements.

The Default Configuration button creates a new empty configuration file.

The Open Config File button opens an existing configuration file.

The Save Config File button saves the current configuration file to disk.

Client Group Buttons

The Client Group Buttons controls actions on a connected client. If the buttons are not activated, click on a client to activate them.

The Disconnect Client button logs the currently selected client out of the *CTNET CommServer*.

The Get Client Info button opens a dialog box to view client information on the currently selected client.

Field Element Group Buttons

The Field Element Group Buttons controls actions on a new or configured field element. If the buttons are not activated, select a field element pane to activate the buttons.

The Connect or Disconnect Field Element button connects or disconnects all selected field elements.

The Connect or Disconnect All Field Elements button will connect or disconnect all highlighted field elements.

For the Connect or Disconnect buttons, if any of the selected field elements are connected, all selected field elements will be disconnected, otherwise the selected field elements will be connected.

Administrator Group Buttons

The Administrator Group Buttons controls administrative tasks.

The Lock button locks the *CTNET CommServer* from all user interactions.

The View Logs button opens a dialog box to display current alarms, login, login errors, and client actions.

The About button opens an About dialog box displaying information about the *CTNET CommServer* program.

Client Pane

The Client Pane displays information about clients that are currently connected to the *CTNET CommServer*. As clients connect and disconnect the client pane will automatically update to indicate the current client connections. If no clients are connected, "No Clients" will be displayed in the pane.

Figure 6.3 – Client Pane

Columns separate client information. These columns can be resized in case the column information is too large for the current column width by moving the mouse cursor to the right of the column border, clicking down and stretching the column.

User Name	displays the name of the user that is connected.
Address	provides the IP address and port number of the connected client.
Groups	lists the User Groups to which the client belongs. User Groups controls the client's privileges.
Version	is the CTNET Client software version number. This is useful to make sure the client is using the current software version.

Field Element Pane

The Field Element Pane, as shown below in Figure 6.4, displays information about field elements that are configured for *the CTNET CommServer*. As field elements are connected or disconnected, the field element pane will automatically be updated to the current communication status of the field element.

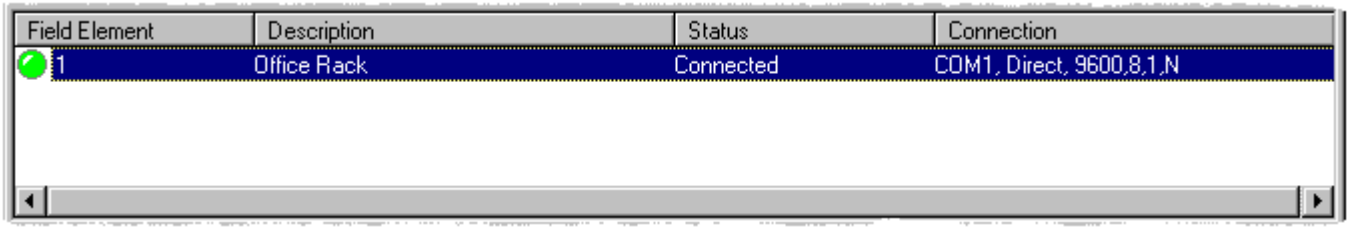


Figure 6.4 – Field Element Pane

CTNET CommServer version 1.0 requires that all field elements be the master controllers. The next version of CTNET will provide connections to one or more local controllers without need for a master controller.

Field element pane displays its information in columns. These columns can be resized in case the column information is too large for the current column width by moving the mouse cursor to the right of the column border, clicking down and stretching the column. The columns include the following information:

Field Element	displays the field element's unique number and the status ball. The field element number is the Master address that is used by the *CTNET Client* program.
Description	provides additional information about the field element.
Status	indicates the communication status of the field element. Possible values are Disconnected, Connected, Initializing or Comm Failure.
Connection	displays communication attributes of the field element. The Connection field displays the COM port configuration or the IP address of the field element.

The status ball indicates whether the field element is:

- disconnected,
- receiving invalid communication packets or no packets at all, or
- connected with no communication errors.

Communication errors indicate receiving invalid communication packets or no packets at all.

The Field Element ID is the unique field element number that is configured on the *CTNET Client*. This number should be unique for field elements within a county and a CommServer computer, even though they may span several configuration files. This number needs to me unique because the number identifies a unique field element on the *CTNET Client.* If field element numbers overlap, *CTNET Client* may not display field information accurately.

The status field indicates if the field element is connected, disconnected or initializing.

The connection displays the field element connection attributes. If the connection is through a COM port, the COM port attributes (port, baud, data bits, parity, and stop bits) are displayed. Data bits, parity, and stop bits should be "8,N,1". If this is not the case, change the port attributes.

Note: Port attributes are changed in the Windows Control Panel. The COM port attributes are changed under Windows NT 4.0 by double clicking on the Ports icon and making the desired change. Under Windows 95 double clicking on the Control Panel's System icon, selecting the Device Manager tab and going to the Ports (COM & LPT) tree item changes in port attributes.

First Time Starting CTNET CommServer

The first execution of the *CTNET CommServer* requires the CTNET administrator to accept the License Agreement.

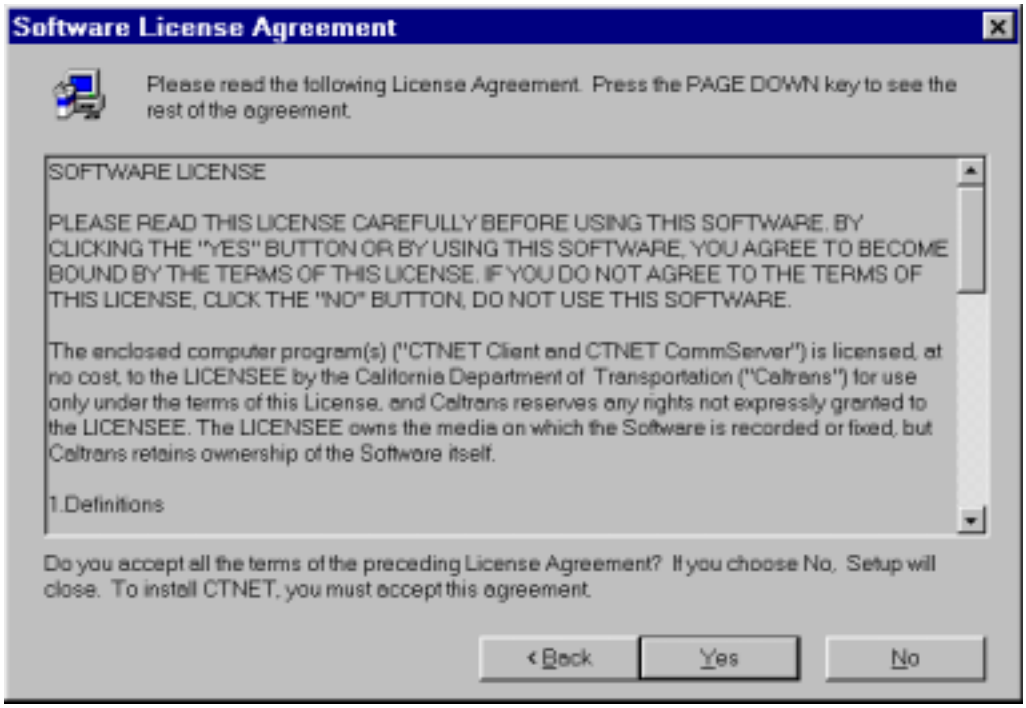


Figure 6.5 – CTNET License agreement

If the CTNET Administrator declines to accept the license agreement the CTNET CommServer will temporarily start and immediately close. The License Agreement will continue to appear every time the program is started until the License Agreement has been accepted.

Logging into CTNET CommServer

Once the License Agreement has been accepted the Administrator will be prompted to enter a User ID and Password when the login dialog appears as shown in Figure 6.6 below. The initial values that need to be entered into the login are:

User ID: admin
Password: ctnet

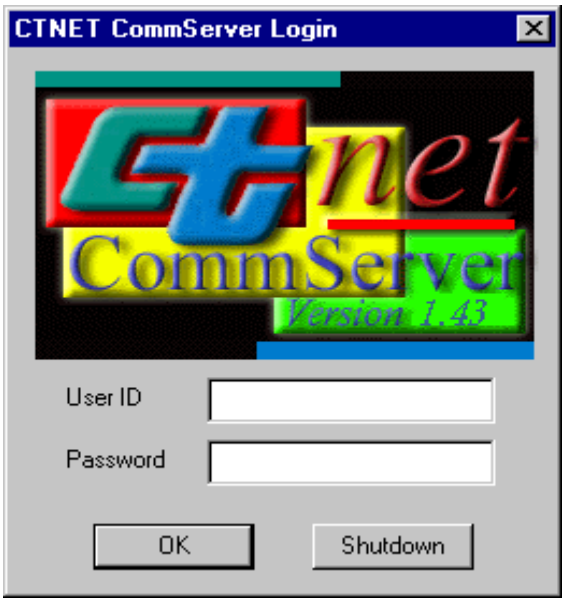


Figure 6.6 – CTNET CommServer Login

When typing the password the characters typed will be displayed as *****. These values are case sensitive and should be changed once the program begins for the first time. See section “Modifying User Accounts” for details on changing the user account and password.

Managing Field Elements

Field elements are managed though the field element pane located in the lower half of the *CTNET CommServer* window.

Adding New Field Elements

A new field element can be added to the field element pane by clicking the menu item Configure/Field Elements/Add, or double clicking on a vacant area of the field element pane. The Add Field Element property sheet will open as shown in Figure 6.7.

Note: In order to modify a field device the administrator who is logged in to the *CTNET CommServer* must have the permission Field Connections (Modify). See section “Administrative Permissions” for more information.

The Add Field Element property sheet consists of two property pages or tabs: Description and Connection. These two property pages are used to let the *CTNET CommServer* know about the type of hardware, application and communication the field element uses.

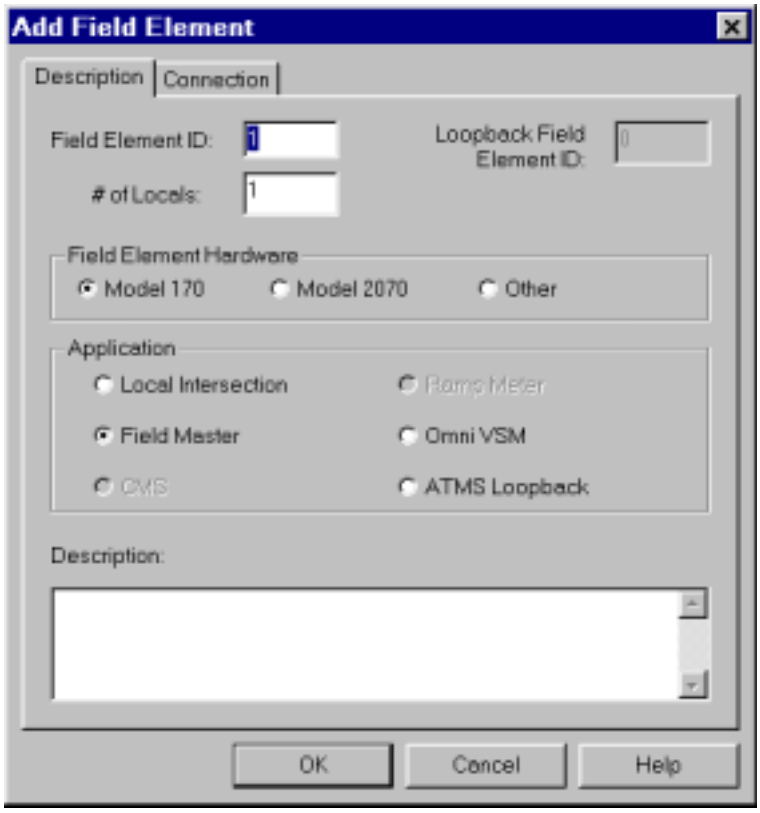


Figure 6.7 – Add Field Element Dialog Description Page

Description Property Page

The Description property page as shown above in Figure 47 details information about the field element hardware and application.

Field Element ID	must be a unique field element identifier.
Field Element Hardware	indicates the type of controller hardware in the field.
Application	is the field element application. Field Master is the only option with CTNET version 1.0.
Description	provides an additional information about the field element.

The Field Element ID is the field element number that is configured on the *CTNET Client*.

The Field Element Hardware indicates the controller type in the field. Currently only the Model 170 controller supports CTNET. Support of CTNET on the Model 2070 controller will begin in 1999.

The only application that CTNET version 1.0 supports is a Field Master. The next version of CTNET will support one or more local intersections per Field element connection.

The Description field should be used to effectively describe the field element. For instance, if the field master controls a coordinated arterial on Highway 1from D Street to J Street, an effective description might be “Highway 1 from D St. to J St.”

Connection Property Page

The Connection property page as shown in Figure 6.8 details information about the type of network connection between the CTNET CommServer and the field element.

Note: There can only be one Field Element Master per lease line. This is because the Field Master does not have an actual address. The *CTNET CommServer* internally maps the Field Element ID to reference a unique field element.

CTNET supports three types of connections to field elements.

- dialed with dial back,
- lease line direct connect, and
- TCP/IP.

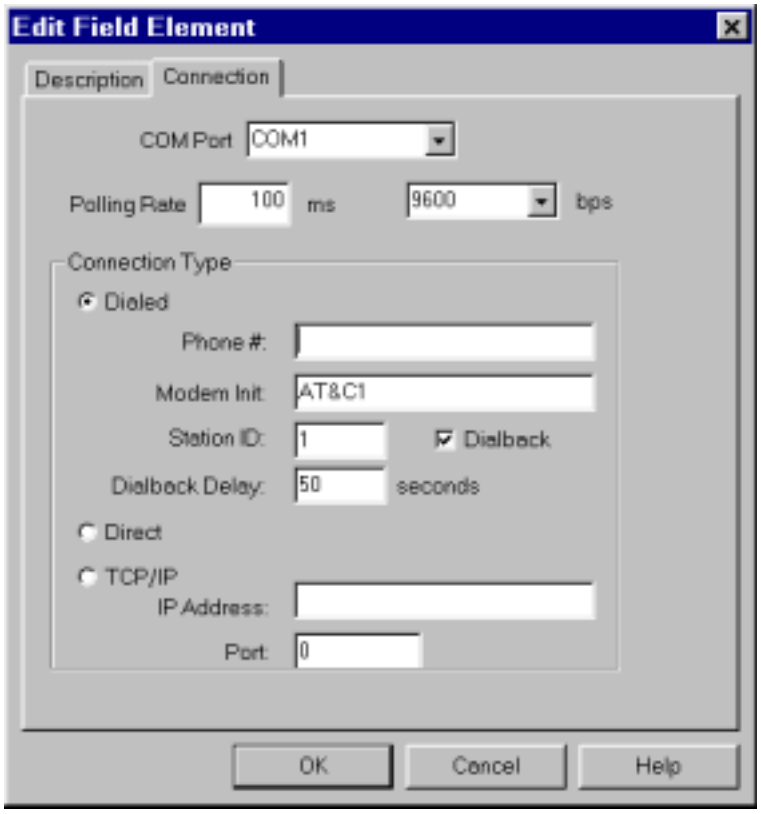


Figure 6.8 – Edit Field Element Dialog Connection (Dialed) Page

There are two main areas of on the Connection property page. These are COM Port and Connection Type.

COM Port	identifies a unique physical connection.
Connection Type	indicates dialed, direct or TCP/IP connection.

The COM Port drop-down lists all available COM ports. If a multi-port serial card is added, such as boards from the manufactures Digiboard or a Rocketport, the number of COM ports can be increased in increments of 16 or 32 additional ports depending on the card. All COM Port connections., other than None, must be unique to the configuration file.

Dialed serial communication is a temporary connection to a field element. Figure 6.8 shows a dialed connection to a field element. Clicking on the Dialed radio button sets the field element as a dialed connection. With the dialed option, two other fields need to be completed: the Phone number and the Modem Initialization string. Refer to the modem's user's manual for information on initialization strings.

The Direct radio button can be used to set a lease line field element. Direct lease line serial is a dedicated 24 hours a day, 7 days a week connection to a field element. It should be noted that CTNET version 1.0 supports only one master field element per communication link. The Direct setting is shown below in Figure 6.9.

Note: As you may have noticed there is no place to set serial port attributes, such as baud rate, start and stop bits, and parity on the Add Field Element Property Sheet. The serial port attributes are set in the Control Panel of the operating system.

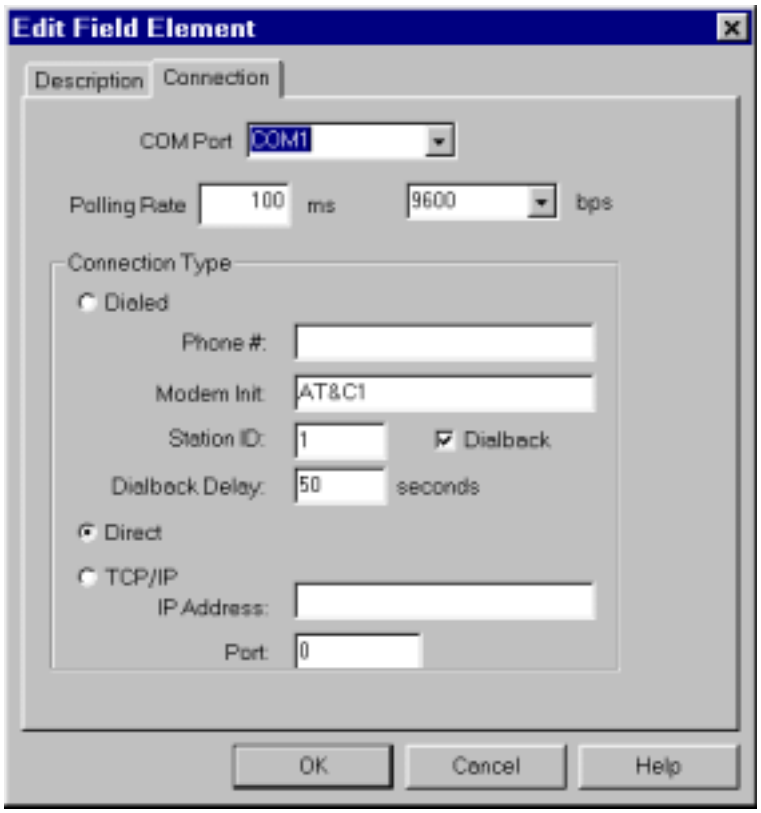


Figure 6.9 – Edit Field Element Dialog Connection (Direct) Page

TCP/IP is the de facto Internet network communication standard to communicate between two or more networked devices. Figure 6.10 shows a TCP/IP connection to a field element. The TCP/IP radio button selects an IP-based network communication route to the field element. This option can be used with Frame Relay or any other digital communication as long as the field element is visible to the LAN or WAN. The IP Address can be in dot notation or domain name convention. The Port Number is the application port number of the field device. The TCP/IP setting is shown below in Figure 6.10.

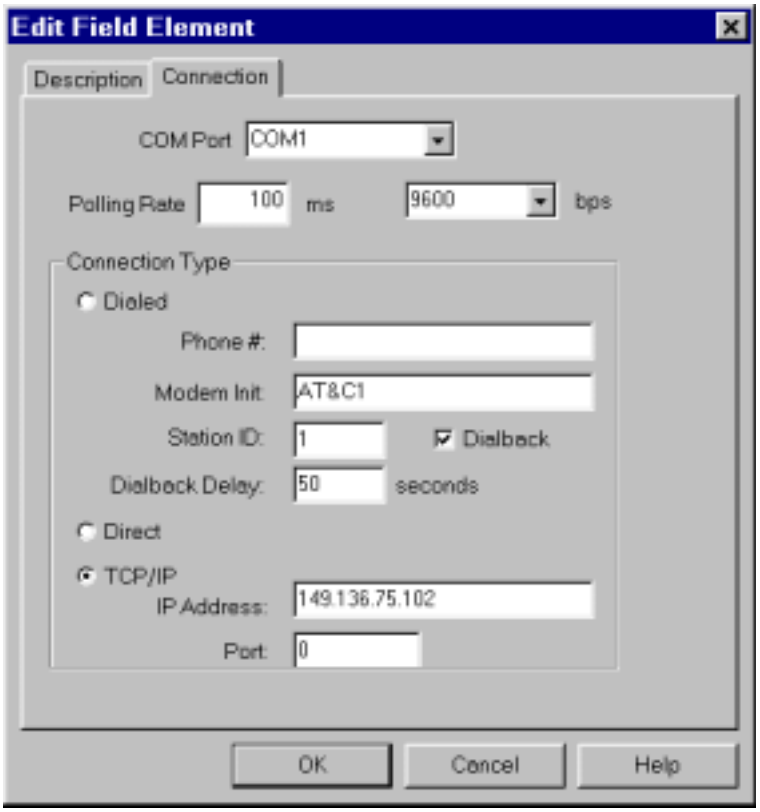


Figure 6.10 – Edit Field Element Dialog Connection (TCP/IP) Page

Modifying Field Elements

A configured field element can be modified by double clicking on the field element in the field element pane or by clicking the filed element once and then clicking on the menu Configure/Field Elements/Properties. The user should disconnect the field element before editing its properties. The modified field element properties may be saved in the configuration file.

Modifying a Field Element, Step by Step

1. Make sure field element is disconnected.
2. Double-click on field element.
3. Edit field element properties in the property sheet.
4. Click OK button to accept changes, or Cancel to reject changes.
5. Save Configuration file by clicking the Save Configuration File button.

Note: In order to modify a field device the administrator who is logged in to the *CTNET CommServer* must have the permission Field Connections (Modify). See section Administrative Permissions for more information.

Deleting Field Elements

A configured field element can be deleted by clicking on a field element once and pressing the Delete button on the keyboard. Always make sure the field element is disconnected before deleting the field element. Also, save the configuration file when finished modifying field elements.

Deleting a Field Element, Step by Step

1. Disconnected field element if connected.
2. Single-click on field element to select it.
3. Hit the Delete key on the keyboard.
4. Save configuration file.

Note: In order to delete a field device the administrator who is logged in to the *CTNET CommServer* must have the permission Field Connections (Modify). See section "Administrative Permissions" for more information.

Connecting and Disconnecting Field Elements

Single or multiple Field Elements can be connected or disconnected by clicking on the toolbar Connect/Disconnect button, or by clicking on the menu item. Clicking and dragging multiple field elements in the field element pane can select multiple field elements. A field element can be connected or disconnected by clicking on the toolbar Connect/Disconnect Device button, or clicking the menu item Connections/Field Devices/Connect/Disconnect. This will toggle the connection from connected to disconnected, or visa versa.

Connecting/Disconnecting a single Field Element, Step by Step

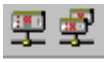
1. Single-click on field element.
2. Click the Connect/Disconnect Device button.

Connecting/Disconnecting a multiple Field Elements, Step by Step

1. Press the Ctrl button and single-click on desired field element(s).
2. Click the Connect/Disconnect Device button.

Note: In order for a field device to be connected or disconnected the administrator who is logged in to the *CTNET CommServer* must have the permission Field Connections (Connect). See section "Administrative Permissions" for more information.

Connecting and Disconnecting All Field Elements



All field elements can be connected or disconnected by clicking on the toolbar Connect/Disconnect All Devices button, or clicking the menu item Connections/Field Devices/Connect or Disconnect All. This will toggle the field element connections from connected to disconnected, or visa versa. If one or more field elements are connected the user needs to confirm disconnecting all field devices.

Connecting or Disconnecting All Field Elements, Step by Step

1. Click anywhere in the field element pane.
2. Click the Connect or Disconnect All Elements button.
3. If one or more devices were already connected, then click OK to confirm you want to disconnect all field elements.

Managing Clients

Client Connections are managed though the Client pane located in the upper portion in the *CTNET CommServer* window. Client privileges are managed and controlled by the User Groups to which they belong. Users and Groups are fully configurable to meet the needs of the CTNET Administrator. The permissions of all the groups can be as restrictive or open as the CTNET Administrator wishes.

Note: In order for a Group to be added or modified the administrator who is logged into the *CTNET CommServer* must have the permission Accounts. See section Administrative Permissions for more information.

User Groups

A group of permissions are configured together to coordinate common permissions into a single collection called a User Group. All User Groups consist of a User Group name and a list of permissions. Permission parameters that are specific to field devices include a master and local address combination that can be used to fine tune control on the permission. The master value is the same as the Field Element ID.

CTNET installs with four User Groups.

Group Name	Description
Administrator	Modifies client and field element connections.
Field Devices	Modifies field element connections.
Signal Guest	Views limited signal information.
Signal Ops (Full)	Views signal information, including timing and alarms.

Table 6.1 – Default User Groups

The default groups can be deleted or modified to meet the requirements of the CTNET Administrator.

CTNET version 1.0 groups all permissions into four distinct services: Admin, Client, Communication and Signal. Each Service has its own set of permissions that can be tailored to the intended function of the User Group. Some CTNET permissions are not yet implemented and their status is indicated as Future in each table.

Administrative Permissions

Administrative functions are grouped in the Admin service. Admin controls CTNET CommServer operations on clients and field elements. The Admin permissions are listed below in Table 6.2.

Administrator Permission	Status	Description
Accounts	Done	Administrator can create, delete and modify users, groups and preferences.
Field Connections (Connect)	Done	Administrator can connect field devices.
Field Connections (Modify)	Done	Administrator can connect, create, delete and modify field connections.
Client Disconnect	Done	Administrator can delete client connections.
Log (Read)	Done	Administrator can view CommServer log entries.
Log (Write)	Done	Administrator can delete log entries.

Table 6.2 – Admin Permissions

Client Permissions

Client permissions are grouped in the service Client. Client controls CTNET Client operations over the network. The Client permissions are listed below in Table 6.3.

Client Permission	Status	Description
Password (Set)	Done	Clients can change their own password.
Send Note	Future	Clients can send Administrator a note.

Table 6.3 – Client Permissions

Communication Permissions

Communication permissions are grouped in the Communication service, providing system communication status and alarm information. The Communication permissions are listed below in Table 6.4.

Communication Permission	Status	Description
Comm Status	Future	Client can view field elements and their status.
Comm Alarms (Read)	Future	Client can read communication alarms.
Comm Alarms (Write)	Future	Client can delete communication alarms.
Comm Alarms (Save)	Future	Client can save communication alarms to local drive.

Table 6.4 – Communication Permissions

Signal Permissions

Signal permissions are grouped in the Signal service, providing security for action o a signal. This service controls what signal operations a CTNET Client can view, upload, download and save. The Signal permissions are listed below in Table 6.5.

Signal Permission	Status	Description
Status (Get)	Done	Client can view signal phase, calls, alarms, and pattern.
Phase Timing (Upload)	Done	Client can upload signal phase timing.
Phase Timing (Download)	Future	Client can download signal phase timing.
Phase Timing (Save)	Done	Client can save signal phase timing to local drive.
Coord Timing (Upload)	Future	Client can upload signal coordination timing.
Coord Timing (Download)	Future	Client can download signal coordination timing.
Coord Timing (Save)	Future	Client can save signal coordination timing to local drive.
Configuration (Upload)	Future	Client can upload signal configuration.
Configuration (Download)	Future	Client can download signal configuration.
Configuration (Save)	Future	Client can save signal configuration to local drive.
Time of Day (Set)	Future	Admin can set signal time of day.
Pattern (Set)	Future	Admin can set signal pattern (plan/offset) number.
Detectors (Upload)	Done	Client can upload signal detector data (volume & occupancy).
Detectors (Save)	Done	Client can save signal detector data (volume & occupancy) to local drive.
Detector Alarms (Read)	Future	Client can view detector alarms.
Detector Alarms (Write)	Future	Client can delete detector alarms.
Detector Alarms (Save)	Future	Client can save detector alarms to local drive.
Flash Alarms (Read)	Future	Client can view signal Flash alarms.
Flash Alarms (Write)	Future	Client can delete signal Flash alarms.
Flash Alarms (Save)	Future	Client can save signal Flash alarms to local drive.
Focus (Set)	Done	Client can set focus mode on signal.

Table 6.5 – Signal Permissions

Note: At the minimum, a client who needs to view signal data must have the permission Status (Get). The master and local values can be configured to block out intersections the client does not need to view or get information.

An example of a User Group could be a group of users that need to view the timing data for specific intersections but do not need to see the timing of all intersections. For example, if group needs to view and save the phase timing data without download to Master 5, Locals 2 and 4 they would have the following permissions:

Phase Timing (Upload)	Master 5, Local 2, 4
Phase Timing (Save)	Master 5, Local 2, 4

The default Master and Local settings are set to all. To change the default settings, click on Preferences under the Configure menu to display the CommServer Preferences dialog, as shown in part in Figure 6.11. The current default is displayed next to each Master and Local. In the CommServer Preferences dialog click the property button next to the Master or Local to change the settings as needed.

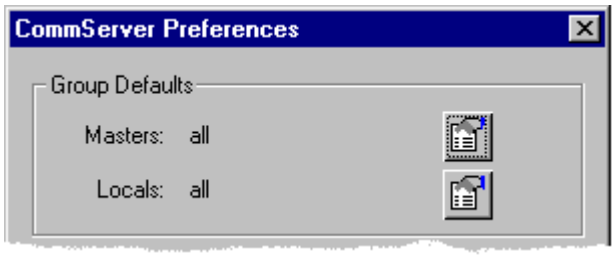


Figure 6.11 – CommServer Preferences (Default Master and Locals)

Configuring User Groups

To configure a User Group click on the Groups menu item under Configure menu. The dialog Configure User Groups opens as shown below in Figure 6.12.

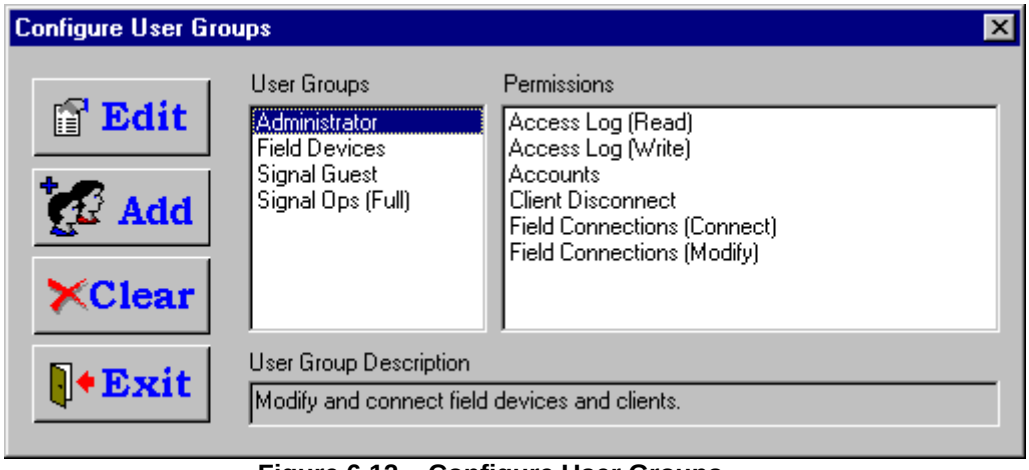


Figure 6.12 – Configure User Groups

The Configure User Groups dialog lists the configured User Groups, their permissions and a short description of the User Group. The list of a User Group's permissions and its description will update whenever a user clicks on a different User Group.

The top three buttons on the left of the dialog permits the CTNET Administrator to edit, create or delete a User Group. The bottom button, Exit, closes the dialog. Notice the button says Exit and not OK or Cancel. This is because any User Group that is created, modified or deleted is immediately updated in a persistent database. The database is encrypted to prevent any computer hacker from viewing the data

The four buttons on the left of the dialog provide the following functions:

Edit	edits the currently selected User Group.
Add	creates a new User Group.
Clear	deletes the currently selected User Group.
Exit	closes the Configure User Groups dialog.

Double clicking on a User Group, clicking the edit button, or clicking the Add button opens the User Group Properties similar to what is shown below in Figure 6.13.

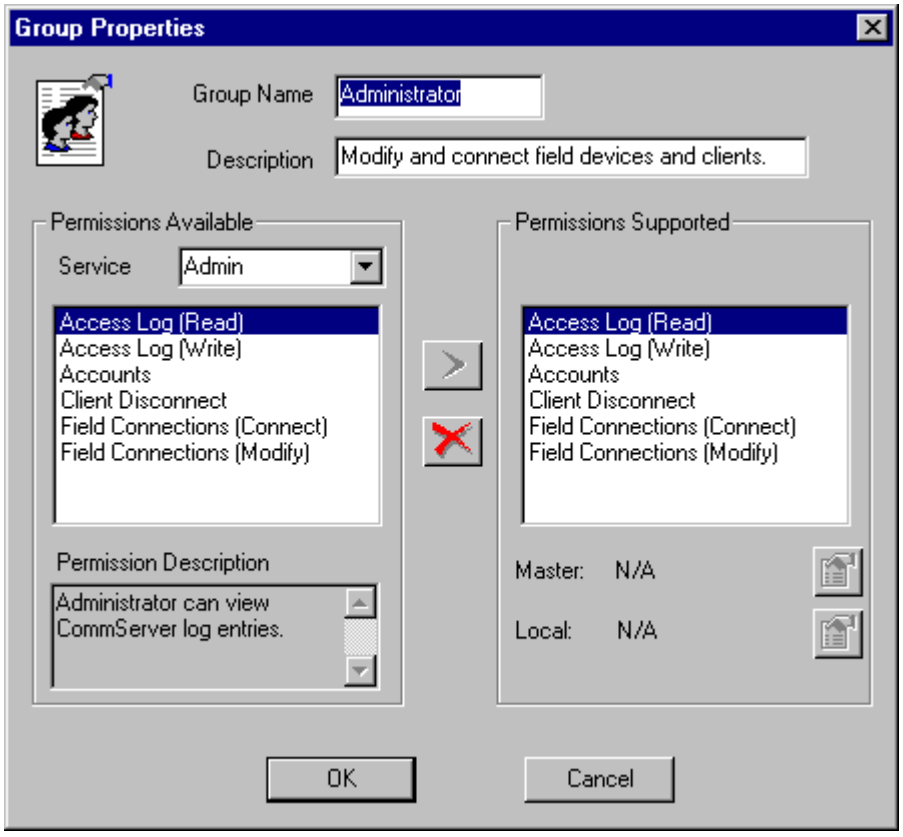


Figure 6.13 – User Group Properties

With User Group Properties dialog the CTNET Administrator tailors the User Group to the intended purpose. There are three distinct regions on the dialog: general information about the group, Permissions Available, and Supported Permissions.

The top portion of the dialog provides inputs for Group Name and a Description of the group's purpose. The Group Name must be unique.

Permissions Available groupbox displays information on the currently selected Service and permission. The Service dropdown allows the administrator to choose one of the following services: admin, client, comm, signal. The listbox lists all permissions that belong to the currently selected Service. The Permission Description box provides additional information of the currently selected permission in the listbox.

Supported Permissions groupbox displays information permissions supported by this group and the currently selected permission. The Master and Local list addresses supported by the currently selected permission in the Supported Permissions listbox.

Adding Permissions to the Group

Supported Permissions are added from the Permissions Available by double clicking on the permission in the listbox of the Permissions Available groupbox. Another way to move a permission from Permissions Available to the Permissions Supported is select the available permission and then click the button with a green arrow. The Supported Permissions listbox will display all permissions associated with a Service. Clicking on the Service dropdown and selecting a different service will change the current Service.

Removing Permissions Supported from the Group

A supported permission can be removed from the Permissions Supported listbox by double clicking on the permission, or selecting the permission and clicking the button with the red X.

Changing Master and Local Settings on a Permission

The Master and Local setting of a signal permission can be changed by clicking on the signal permission in the Permissions Supported listbox and clicking the property button to the right of either the Master or Local. The Master Addresses or Local Address dialog will open as shown below in Figure 6.15.

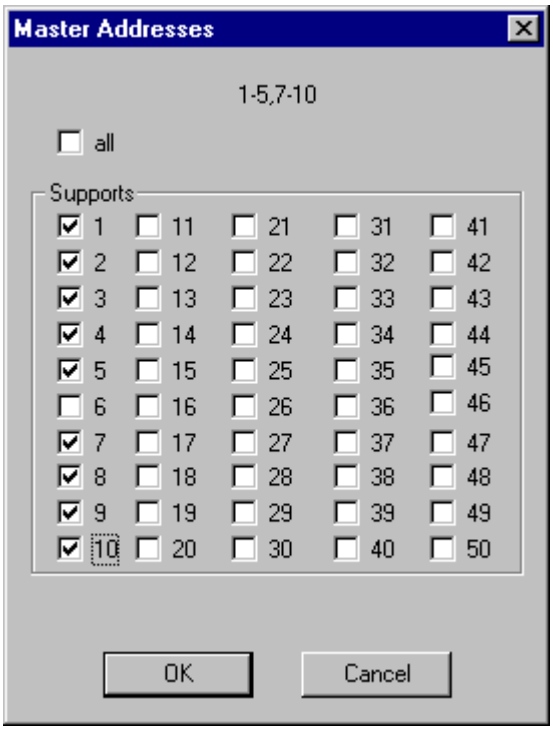


Figure 6.14 – Addresses

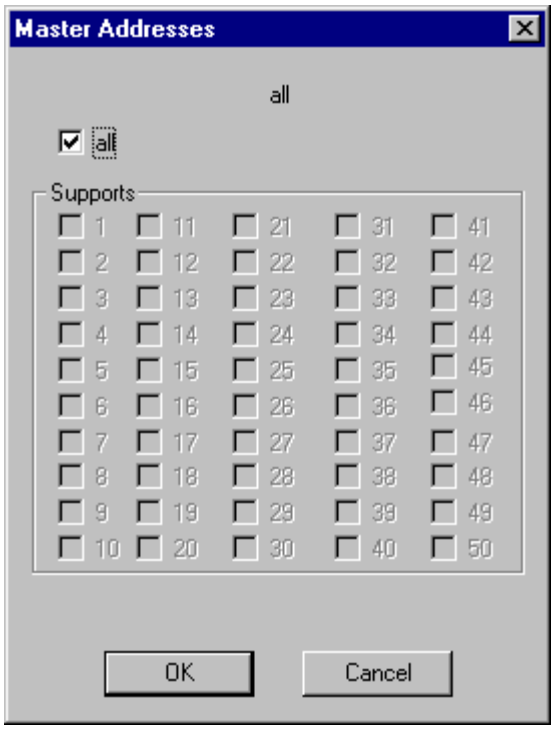


Figure 6.15 – Addresses (all)

The default values are all for both the master and local addresses. However these can be changed for each Signal permission. Figure 6.14 shown above has been changed by clearing the all checkbox to enable the Supports checkboxes, and checking the individual addresses that are needed. Clicking OK will save the settings to the current permission.

Modifying User Groups, Step by Step

1. Click on the menu item Groups under the Configure menu to display the Configure User Groups dialog.
2. In the Configure User Groups dialog double-click on the group you want to modify that is listed in the User Groups listbox. This will open the Group Properties dialog.
3. In the Group Properties dialog edit the group.
4. Click OK button to accept changes, or Cancel to reject changes. If the OK button is pressed the changes will immediately be saved. The Group Properties dialog will close.
5. Click the Exit button on the Configure User Groups dialog and the dialog will close.

Adding User Groups, Step by Step

1. Click on the menu item Groups under the Configure menu to display the Configure User Groups dialog.
2. In the Configure User Groups dialog click the Add button. This will open the Group Properties dialog.

3. In the Group Properties dialog edit the group. Add a unique Group Name and configure the permissions.
4. Click OK button to accept changes, or Cancel to reject changes. If the OK button is pressed the changes will immediately be saved. The Group Properties dialog will close.
5. Click the Exit button on the Configure User Groups dialog and the dialog will close.

Deleting User Groups, Step by Step

1. Click on the menu item Groups under the Configure menu to display the Configure User Groups dialog.
2. In the dialog click on the group you want to delete that is listed in the User Groups listbox.
3. In the Configure User Groups dialog click the Clear button.
4. You will be prompted with the message to Are you sure you want to permanently remove that group. Click the Yes button to delete.
5. Click the Exit button on the Configure User Groups dialog and the dialog will close.

User Accounts

All user accounts consist of a unique user name, an assortment of connection attributes, and a list of user groups to which they belong. User accounts can be applicable to an individual or unspecified user, as in the case of a guest account.

CTNET installs with two default user accounts:

User ID	Password	Groups
admin	ctnet	Administrator
guest	(none)	Signal Guest

Table 6.6 – Default User Accounts

The default user accounts can be deleted or modified to meet the requirements of the CTNET Administrator.

Note: In order for a User Account to be added or modified the administrator who is logged into the *CTNET CommServer* must have the permission “Accounts.” See section Administrative Permissions for more information.

Modifying User Accounts

To configure a User Account click on the Users menu item under Configure menu. The dialog Configure User Accounts opens as shown below in Figure 6.16.

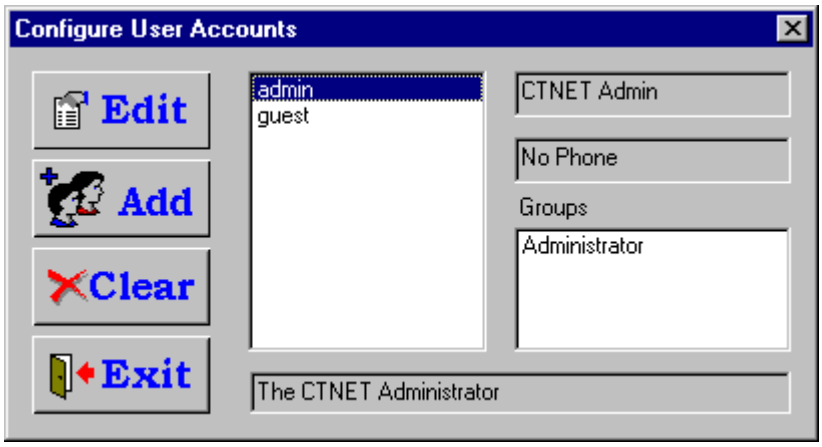


Figure 6.16 – Configure User Accounts

The Configure User Accounts dialog lists the configured User Accounts, their user name, phone number, list of User Groups they belong to, and a short description of the user. The list of a User Groups, phone number and the description will update whenever a different User Account is clicked.

The top three buttons on the left of the dialog permits the CTNET Administrator to edit, delete, or create a User Account. The bottom button, Exit, closes the dialog. Notice the button says Exit and not OK or Cancel. This is because any User Account that is created, modified or deleted is immediately updated in a persistent database. The database is encrypted to prevent any computer hacker from viewing the data.

The four button on the left of the dialog provide the following functions:

Edit	edits the currently selected User Account.
Add	creates a new User Account.
Clear	deletes the currently selected User Account.
Exit	closes the Configure User Account dialog.

Double clicking on a user group, clicking the edit button, or clicking the Add button opens the User Account Properties similar to what is shown below in Figure 6.17.

The User Account Configuration allows the CTNET Administrator to tailor the user account to the intended purpose. There are three distinct regions on the dialog: general information, attributes and user groups.

The top portion of the dialog provides inputs for user account general information.

Name	is the name of the user.
User ID	provides the user identification name. This field must be a unique identifier. This is the login name of the user.
Password	is the login password of the User Account.
Phone #	provides a phone number where the user can be reached.
Created	indicates when the user account was first created.
Description	provides additional information about the field element.

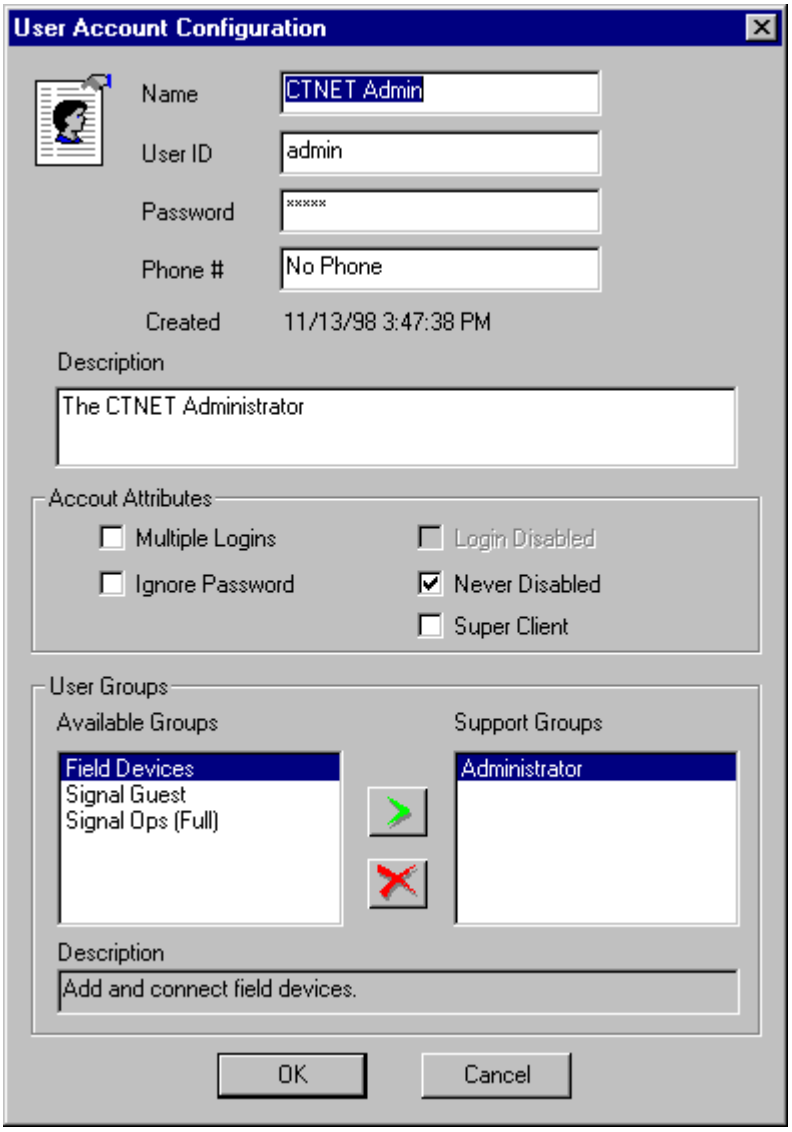


Figure 6.17 – User Accounts Configuration

The middle section, User Attributes, provides login controls. Checking the control indicates the following for the user account:

Multiple Logins	denotes the account can have multiple logins with the same user account.
Ignore Password	indicates the password checking will be ignored.
Login Disabled	indicates login for this user account has been disabled.
Never Disabled	indicates this user account should never be disabled due to bad passwords.
Super Client	indicates this user account is a potential Super Client.

Guest accounts will typically support multiple logins without password checking. Multiple Logins and Ignore Password can be set to support this, or changed to meet the requirements of the CTNET Administrators.

Administrative accounts will usually never be disabled. This is because if there is only one administrator you do not want them to be locked out of the system from entering bad passwords. The Login Error Log will keep track of all these errors.

A user account can be temporarily enabled or disabled by checking the Login Disabled checkbox. When the box is checked, the *CTNET CommServer* will not allow that user account to connect. Also, when the maximum number of login errors have been exceeded, this box will automatically become checked, unless the Never Disabled checkbox is set.

The Super Client is a special type of account that is used to collect information, such as alarms and preempts, by the *CTNET CommServer*. There can be only one designated Super Client on the system at a time. However, there can be multiple potential Super Clients connected to the system.

The Super Client is administered on a first come, first serve basis, when *CTNET Clients* login to the *CTNET CommServer*. If the Super Client logs out, the first potential Super Client the system finds will become the new Super Client. The Super Client can be anywhere on the network or even on the same machine.

Supported Groups groupbox displays the groups to whom this user account currently belongs.

Adding User Groups to the User Account

Supported Groups are added from the Available Groups by double clicking on the group in the listbox of the Available Groups groupbox. Another way to move a group from Available Groups to the Supported Groups is selecting the group and then clicking the button with a green arrow.

Removing User Groups Supported from the Group

A supported group can be removed from the Supported Groups listbox by double clicking on the group, or selecting the group and clicking the button with the red X.

CommServer Defaults

The *CTNET CommServer* provides default values that can be configured to meet system and user preferences. CTNET version 1.0 limits defaults that can be configured including Group Defaults, Login Defaults, Startup, and Field Connections. To edit the *CTNET CommServer* preferences click on the Preferences menu item under the Configure menu. The dialog CommServer Preferences will open similar to what is shown in Figure 6.18.

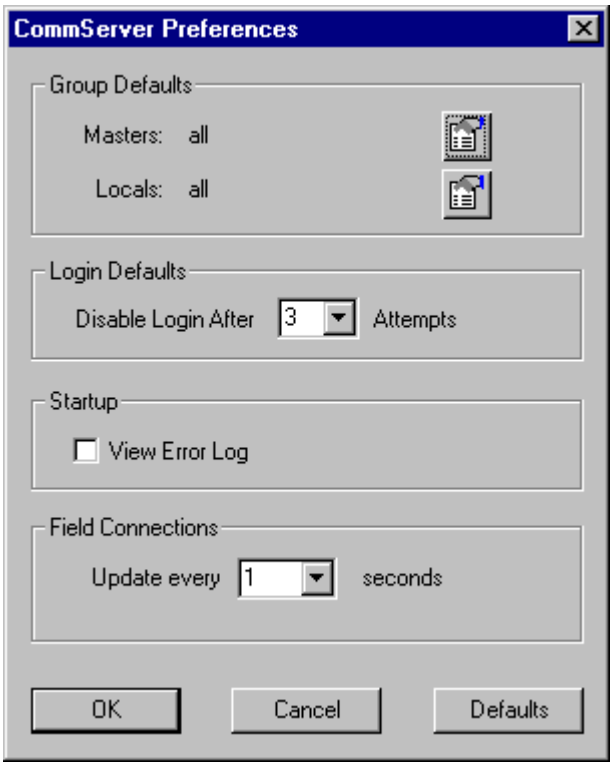


Figure 6.18 – User Accounts Configuration

Note: In order for the CommServer Preferences to be modified the administrator who is logged into the *CTNET CommServer* must have the permission Accounts. See section "Administrative Permissions" for more information.

The Group Defaults allow the CTNET Administrator to set the default strings for the Master and Locals. These values are initially set to all but can be changed to any combination on master and locals.

The Login Defaults sets the number of login errors on a user account before disabling that User ID. This value can be as restrictive (with a value of one) or lenient (with a value of nine) as possible. When the maximum has been reached the user will no longer be able to connect to the *CTNET CommServer*. A CTNET administrator with the permission Accounts has to edit the disabled User Account and uncheck the Login Disabled checkbox.

If set, the Startup option to view the Error Log lets the Error Log to be positioned on the screen at startup. If this is not checked the Error Log will automatically appear whenever an error is logged.

Field Connections update every X seconds. For low communication rates, such as 1200 bps, the field Element connection indicators will strobe from connected to disconnected. This is because the CommServer checks the period set by the Update

every X seconds to see if a new message has been received. If a valid message has not been received then the status indicators will change to yellow and comm error.

The Defaults button will reload the default values to all the controls in the CommServer Preferences dialog.

Logs

The *CTNET CommServer* provides logs to monitor the system events. Clicking the Logs menu item under the View menu, or clicking the View Logs button on the toolbar opens the Logs dialog. The title bar will change to the currently selected log type. There are seven logs that can be viewed with the Log dialog:

Access	displays CTNET client Access such as Set Focus and Get Signal Phase Timing requests.
Accounts	indicates when user accounts where created, modified and deleted.
Alarms	shows active and past alarms.
Login	displays all users that are connected or have connected.
Login Errors	shows all login errors such as invalid password or users, account disabled, duplicated users, etc.
Preempt	shows Railroad and Emergency Vehicle preempts.
Server	shows when server created and times the server was running.

The Log can be changed to another log type by selecting the View Log drop down. The window title bar will change name to reflect the new log. The column information will update to reflect the new changes as well.

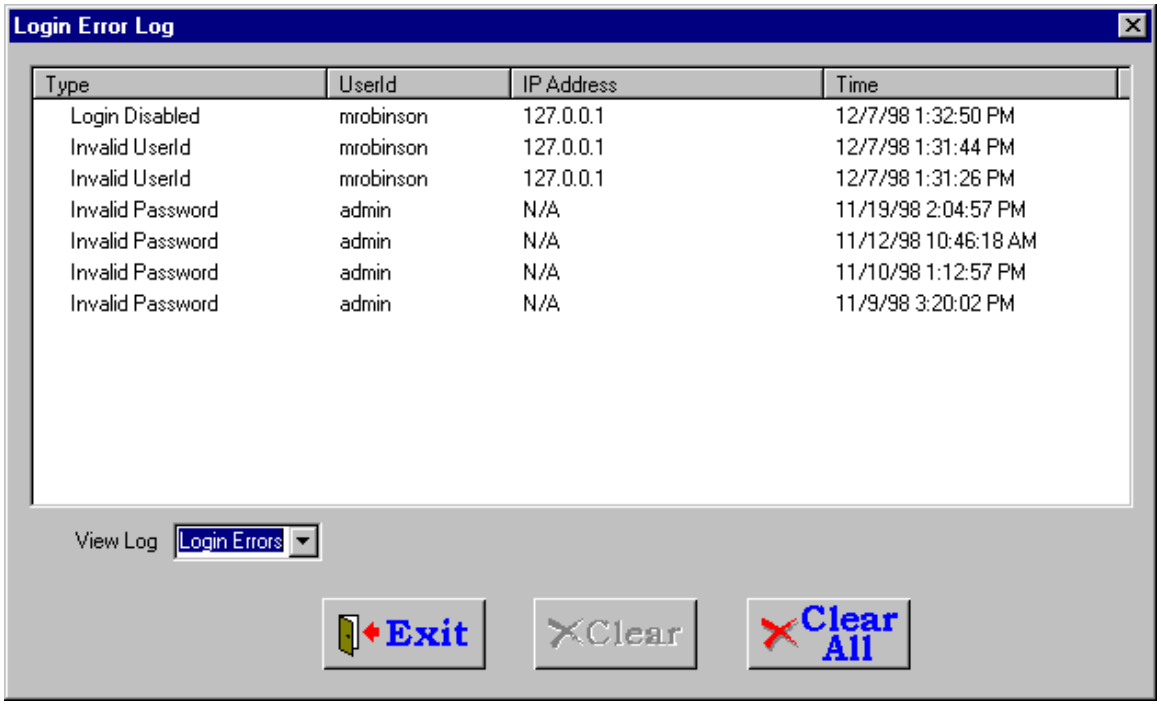


Figure 6.19 – Logs (Login Error Log)

All updates to the logs are static, taking a snapshot of the current log information. Clicking the Clear All button clears all non-active alarms. The next version of CTNET will support individual log entry delete.

Note: In order for Logs to be deleted the administrator who is logged into the *CTNET CommServer* must have the permission Log (write). See section Administrative Permissions for more information.

Field Master Software Settings

F-D-C --- message reply waiting time limit in 100 msec.
Allowed entry 1-255.

This determines the time limit that the master will wait for a reply from a local before polling for the next local. Timer starts when the master starts sending the first byte. Recommended minimum settings for:

9600bps leased line modem, set to 2.
9600bps wireless modem, set to 3.
1200bps leased line modem, set to 10.

F-D-E --- dialup vs. leased line option.

0 for dialup line
8 for leased line.

DIAL UP OPERATION

After the field master received a call from any server PC, the field master will check the received PC id number against the allowed number of 1-3. If the number is 1-3, the master will set the modem off-hook and then dial back the calling server PC.

DIALUP CALL BACK NUMBERS --- 3 call back numbers are allowed.
The 3 Keyed Entry Numbers are:

1. E-A-0
2. E-B-0
3. E-C-0

15 digits maximum numeric call back numbers are allowed.
255 ($ff) is to be entered to designate end of a call back number.

CTNET Detector Assignments

	1	2	3	4	5	6	7	8	9
"I" U	14 φ1	1 φ2	25 φ2	9 φ2	16 φ3	3 φ4	27 φ4	11 φ4	18 φ1
"I" L		5 φ2	21 φ2			7 φ4	23 φ4		20 φ3
"J" U	13 φ5	2 φ6	26 φ6	10 φ6	15 φ7	4 φ8	28 φ8	12 φ8	17 φ5
"J" L		6 φ6	22 φ6			8 φ8	24 φ8		19 φ7

Table - Detector Assignments for CTNET

Reading the table

The first column of the table represents Input files "I" or "J" and Upper (U) and Lower (L) slots. The top row has 1to 9 slot numbers. Each column within the table has the detector number along with the phase assignment.

Examples:

Detector number 25 is referred as 2I3U. It means that detector number 25 is assigned to phase2, input file"I" and is in upper 3rd slot.

Detector number 19 is referred as 7J9L, detector 19 is assigned to phase 7, input file "J" and is in lower 9th slot.

ACRONYMS

DNS	Domain Name System
EV	Emergency Vehicle
HTML	Hypertext Markup Language
HTTP	Hypertext Transfer Protocol
IP	Internet Protocol
LAN	Local Area Network
LOS	Loss of Signal
PED	Pedestrian
RR	Railroad
TCP	Transmission Control Protocol
TCP/IP	Transmission Control Protocol/ Internet Protocol
TIGER	Topologically Integrated Geographic Encoding and Referencing
UDP	User Datagram Protocol
WAN	Wide Area Network

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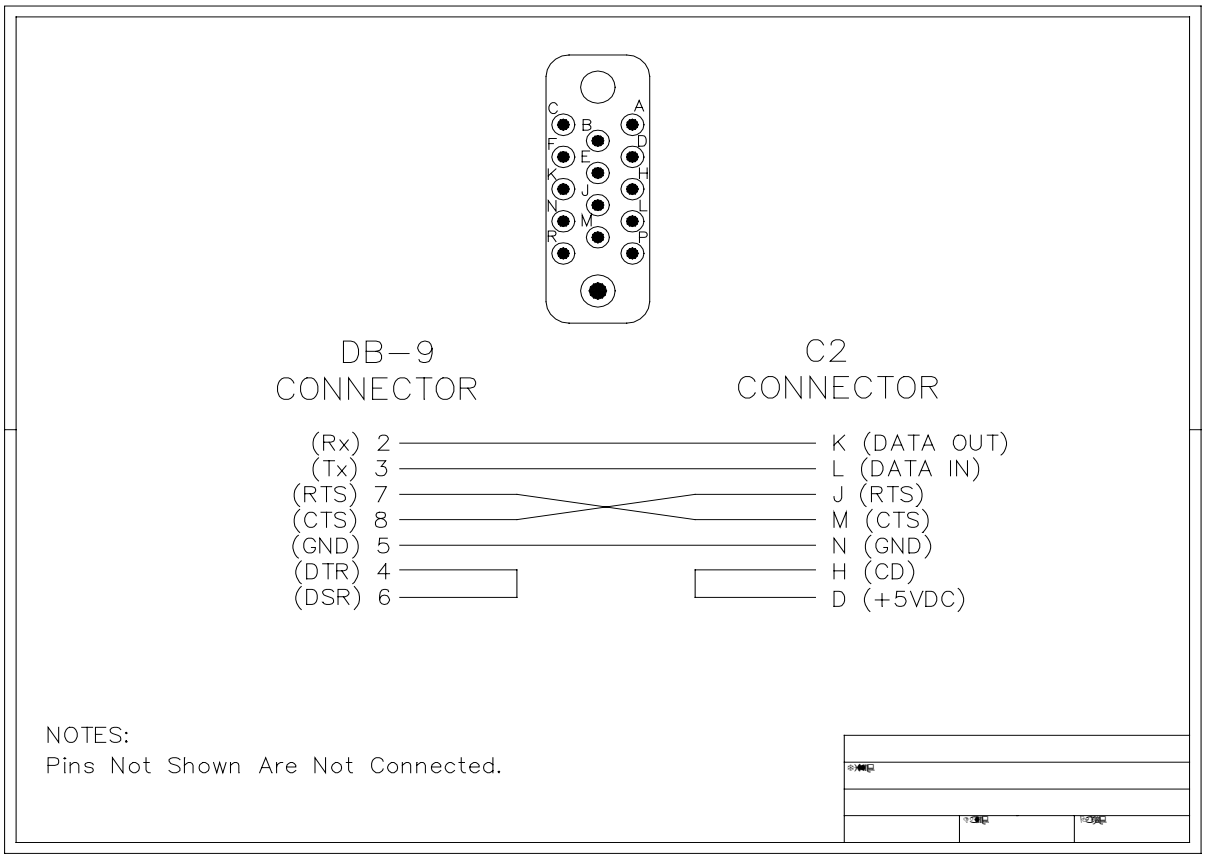
Direct Connect Wiring Diagram



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- Name
- Company or agency
- Address
- Email Address

To:

Ahmad Rastegarpour
California Department of Transportation
1120 N Street, ms 36
Sacramento, CA 95814

Or via email:

ahmad_rastegarpour@dot.ca.gov

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