Data Server for PC5200 as Remote Terminal
V1.00 9/22/05

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Table of Contents

Introduction

The Mirador PC5200 Remote Terminal Server is a suite of Win32 programs that allows users of Mirador's PC5200 Intecolor terminal emulator to connect to a control system host by way of a LAN or the internet. The remote terminal server is designed for security and reliability. The components of the system run as Win32 services that automatically re-start following any reboots of the hosting hardware; access to these services is controlled by a simple group membership test. Additional security measures can be implemented using SSH, if required.
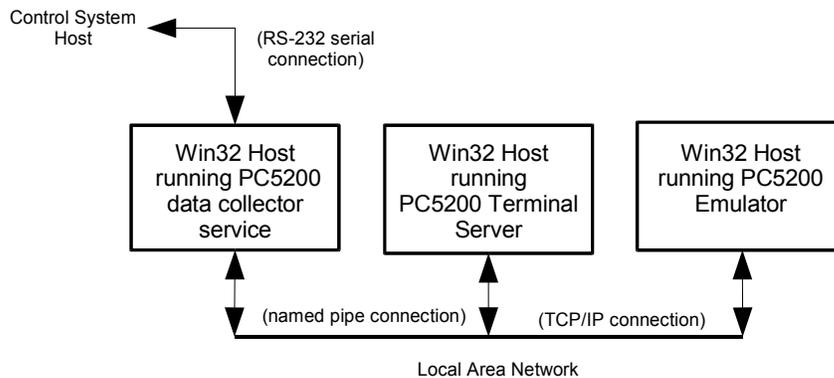
Architecture

The program suite consists of two Win32 executables.

- pc52clct.exe - the data collector program
- pc52srvr.exe - the communications server program

The component programs perform specific functions that are described in detail in the following sections of this document. The programs communicate with each other by means of a named pipe. This communications mechanism allows the user to install the system in a number of different ways, depending on the physical relationships of the control system host, server host and PC5200 clients and requirements for administrative control and security. Two examples are given below.

Simplest LAN Configuration

Control System Host — (RS-232 serial connection)

```
+------------------+   +------------------+   +------------------+
| Win32 Host       |   | Win32 Host       |   | Win32 Host       |
| running PC5200   |   | running          |   | running PC5200   |
| data collector   |   | PC5200 Terminal  |   | Emulator         |
| service          |   | Server           |   |                  |
+------------------+   +------------------+   +------------------+
```

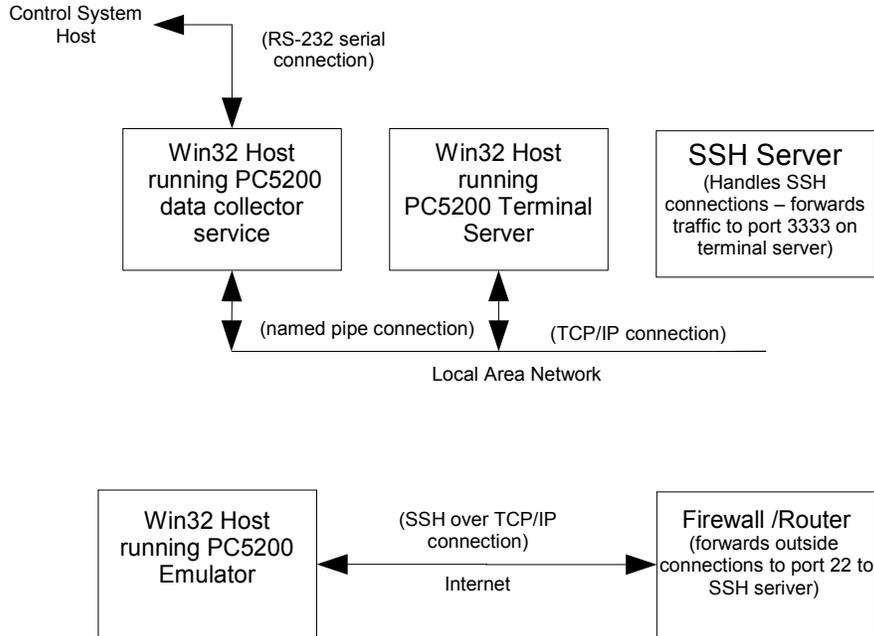(named pipe connection)   (TCP/IP connection)

Local Area Network

In a minimal configuration, the data collector and server programs are installed on the same workstation. This workstation is connected to the control system host by an RS-232 cable and to a local area network. PC5200, running on another workstation that is also on

the local network, connects directly to the remote terminal service, providing a user name and password. Once authenticated, the PC5200 user is connected to the control system host by way of the remote terminal server and the data collector.

This type of configuration is appropriate when all hosts are "trusted" and there are no stringent administrative requirements for access to a host that provides TCP/IP and named pipe based services.

Internet Configuration

Control System Host

(RS-232 serial connection)

| Win32 Host running PC5200 data collector service | Win32 Host running PC5200 Terminal Server | SSH Server (Handles SSH connections – forwards traffic to port 3333 on terminal server) |

(named pipe connection)   (TCP/IP connection)

Local Area Network

| Win32 Host running PC5200 Emulator | (SSH over TCP/IP connection) Internet | Firewall /Router (forwards outside connections to port 22 to SSH seriver) |

In a network environment in which pipe servers (as well as TCP / IP network servers) are under system administrator control and subject to security requirements and / or the control system host is situated far from any server host, the data collector and terminal server services can run on different machines. The data collector creates no pipes and opens no network ports, so it can run under a normal user's authority. The terminal server does create pipes and opens network ports, so it can run under administrator authority with appropriate access controls.

When clients are expected to connect to the terminal server from outside a trusted network, the terminal server host can be situated behind a firewall/SSH server and the firewall host can control remote client access to the terminal server using SSH authentication methods and other firewalling rules. It is only necessary for the clients to request port forwarding to the terminal server when making connections to the SSH server. The PC5200 client fully supports this.

Creating an SSH "tunnel" for traffic moving over the internet or other WAN between the PC5200 terminal emulator and the control system host provides complete security for the conduct of "mission critical" control, since SSH uses a very secure authentication method (RSA public/private key pairs) and provides strong encryption of all traffic.

Functions of the Data Collector

The data collector, pc52clct.exe, runs on a Windows PC that is connected by an RS-232 serial cable to the control system host.   The data collector is a Win32 service. It has no graphical user interface (no window) of its own. It is intended to run all the time as a background task. While it typically runs under the authority of an ordinary user, it is installed and set up to start and run automatically, so that the user does not have to log on and manually launch it. Once installed and started, its operation is automatic.

When it starts, the data collector service first initializes the serial port which will handle communications with the control system host. It then establishes a network connection to the terminal server service program by opening the server's named pipe. The collector then commences reading data received from the control system host at the serial port and forwarding that data to the server over the pipe. Likewise, it begins reading data from the server's pipe (originating at a remote terminal emulator) and forwarding that data to the control system host via the serial connection.

Serial communications parameters can be set by the user of the collector program.

Functions of the Server

The server, pc52srvr.exe, is also a Win32 service application with no graphical user interface (window) of its own, intended to run constantly "in the background". It function is to create and control the communications channels that are used by the data collector and the PC5200 emulator clients.

When it starts up, the server first creates a named pipe to support communications between it and the data collector service. The data collector will open this pipe. The pipe will then be available to pass serial data collected from the external control system host to the server, and to pass data received by the server back to the control system host by way of the collector.

Next, the server starts listening for client connections on a TCP port (for now port 3333). PC5200 clients can connect to this port, either directly (providing a user name and password as prompted), or by way of a "tunnel" through a secure SSH connection.

Direct connection would be appropriate for trusted clients on a private network. An SSH tunnel is preferred for remote clients connecting by way of the internet. To establish a

tunneled connection with the server, each client must first establish an SSH session with an SSH server. In the process of establishing this connection, the client requests that the SSH server forward session traffic to the Mirador terminal server. The PC5200 client is fully capable of supporting both direct and tunneled SSH connections.

The server function is implemented in a separate executable in order to facilitate security measures that are often necessary when communications take place over a network. In a minimal configuration, the data collector and server can run on the same PC under the same user's authority and clients on a trusted network can connect directly. In a more secure networked configuration, the server is typically run on a designated server machine under the authority of the system administrator. The system administrator can control which users can connect to the server's pipes over the network by creating a terminal server user's group and making those users members of the group. When the administrator installs the server, he or she specifies to the server the name of the group that has been created, whose members will have access to the pipes the server manages.

System Requirements

Each PC that is to host one or both of the service programs must be running Windows NT4.0, 2000 or XP Professional, have CPU and memory resources appropriate to operating system, and have an Ethernet connection. The PC running the collector program must have one available serial port.

Note that Windows XP Home Edition does not support user groups or participation in a domain. Therefore it is not suitable for running these services.

Installation

Installing the Data Collector Service

The Data Collector must be installed on the computer that will be connected by serial line to the control system host serial port. If the server program is to be installed on a different machine, the PC on which the Data Collector is installed must have network access to that machine, and that machine's name must be known at installation time. Note that the installation of the collector may require Administrator access rights, depending on system administration policy.

The data collector is installed and configured with command line switches and options. The various switches and options available are always accessible with a command line help.
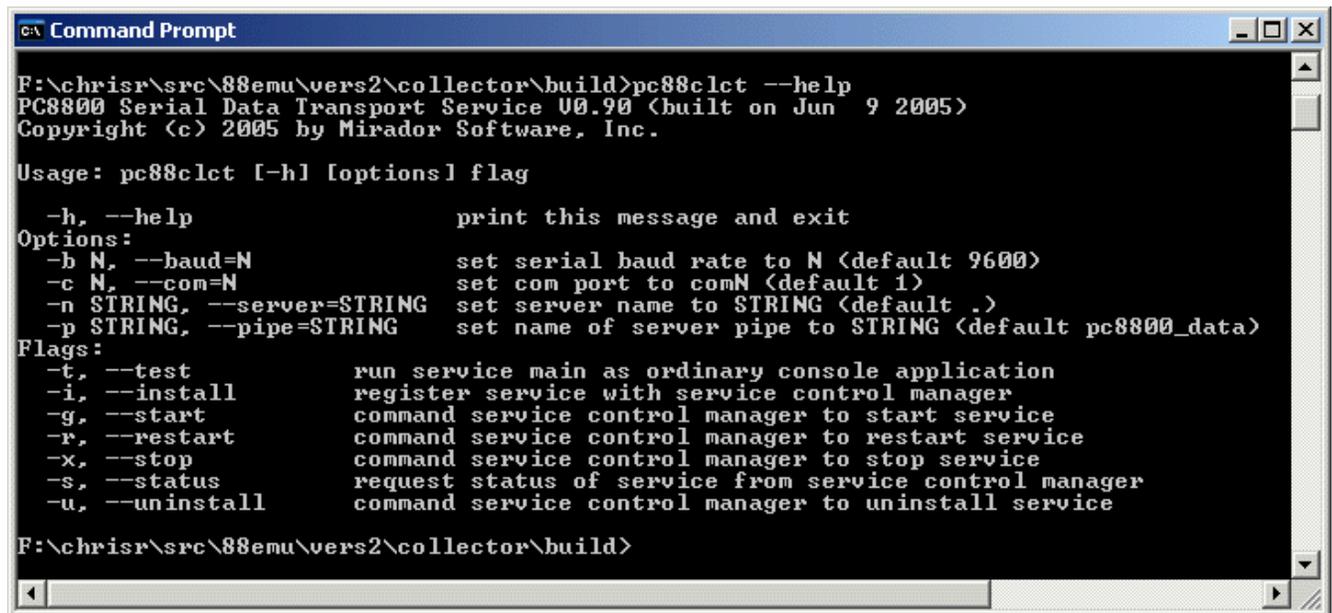
```
Command Prompt                                                  _ □ ×

F:\chrisr\src\88emu\vers2\collector\build>pc88clct --help
PC8800 Serial Data Transport Service V0.90 (built on Jun  9 2005)
Copyright (c) 2005 by Mirador Software, Inc.

Usage: pc88clct [-h] [options] flag

  -h, --help                   print this message and exit
Options:
  -b N, --baud=N               set serial baud rate to N (default 9600)
  -c N, --com=N                set com port to comN (default 1)
  -n STRING, --server=STRING   set server name to STRING (default .)
  -p STRING, --pipe=STRING     set name of server pipe to STRING (default pc8800_data)
Flags:
  -t, --test            run service main as ordinary console application
  -i, --install         register service with service control manager
  -g, --start           command service control manager to start service
  -r, --restart         command service control manager to restart service
  -x, --stop            command service control manager to stop service
  -s, --status          request status of service from service control manager
  -u, --uninstall       command service control manager to uninstall service

F:\chrisr\src\88emu\vers2\collector\build>
```

From a Windows command shell, install the service by issuing the following command

   >pc52clct -i

This command registers the service with the Windows Service Control Manager.

To start the service, issue the following command, with any required options:

   >PC5200clct –g

Alternatively, you can use the system control panel to start the service. Navigate to Start->Settings->Control Panel->Services. Find the new service *name_of_service* in the list of services in the dialog box and double click on it to get a configuration dialog box.

In the configuration dialog box, set

Startup type to 'Automatic'

Log On As 'This Account'

The account should be that of a member of the PC5200 user's group with the member's password.

Startup Parameters: *server_name*

server_name is the name of the host running the pipe service program. If the server program is running on the same machine as the data server, the name is 'LocalHost' or '.'.

Exit the configuration dialog box, and start the service. Finally, exit Control Panel->Services.

Installing the Terminal Server Service

The server may be installed on the same machine that is running the data collector or it may be installed on another machine to which the data collector has access via a network.

Prior to installing the server, a new user's group should be created on the host machine (or in the network domain). The user's group should contain the names of all users who will be authorized to use the server. The name of the group must be specified when the server is installed and configured as a service. Note that the creation of this group and other steps in the installation process will probably require Administrator access rights.

The terminal server is installed and configured with command line switches and options. The various switches and options available are always accessible with a command line help.
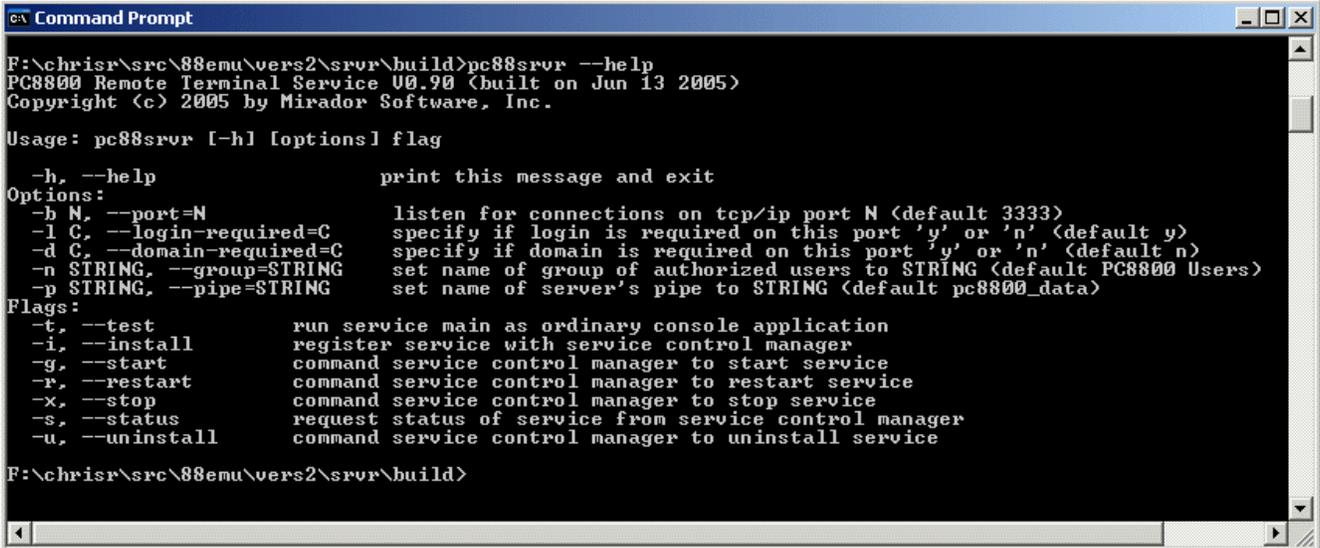
```
F:\chrisr\src\88emu\vers2\srvr\build>pc88srvr --help
PC8800 Remote Terminal Service V0.90 (built on Jun 13 2005)
Copyright (c) 2005 by Mirador Software, Inc.

Usage: pc88srvr [-h] [options] flag

  -h, --help                 print this message and exit
Options:
  -b N, --port=N             listen for connections on tcp/ip port N (default 3333)
  -l C, --login-required=C   specify if login is required on this port 'y' or 'n' (default y)
  -d C, --domain-required=C  specify if domain is required on this port 'y' or 'n' (default n)
  -n STRING, --group=STRING  set name of group of authorized users to STRING (default PC8800 Users)
  -p STRING, --pipe=STRING   set name of server's pipe to STRING (default pc8800_data)
Flags:
  -t, --test                 run service main as ordinary console application
  -i, --install              register service with service control manager
  -g, --start                command service control manager to start service
  -r, --restart              command service control manager to restart service
  -x, --stop                 command service control manager to stop service
  -s, --status               request status of service from service control manager
  -u, --uninstall            command service control manager to uninstall service

F:\chrisr\src\88emu\vers2\srvr\build>
```

From a Windows command shell, install the service by issuing the following command

   >pc52srvr -i

This command registers the service with the Windows Service Control Manager.

To start the service, issue the following command, with any required options:

   >PC5200srvr –g

Alternatively, you can use the system control panel to start the service. Navigate to Start->Settings->Control Panel->Services. Find the *name_of_service* on the list of services in the dialog box and double click on it to get a configuration dialog box.

In the configuration dialog box, set

  Startup type to 'Automatic'

  Log On As 'This Account'

The account should be '.\Administrator' with the administrator's password

  Startup Parameters: *PC5200_user_group_name*

The PC5200_user_group_name is the name of the user group previously created by the Administrator.
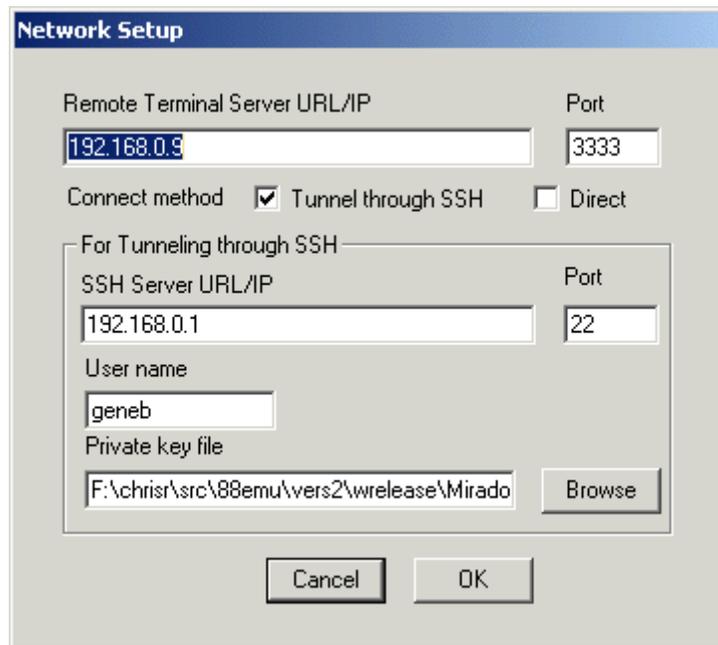
4. Exit the dialog box, and start the service.

5. Finally, exit Control Panel->Services.

Registry Usage

The server program does not make any use of the registry.

Connecting with PC5200

PC5200 is an ordinary Win32 application. It can connect to a control system host directly by way of a serial port, or remotely through the server and collector services described above (with or without the mediation of an SSH server).

Network Setup

Remote Terminal Server URL/IP   Port
192.168.0.9   3333

Connect method ☑ Tunnel through SSH   ☐ Direct

For Tunneling through SSH

SSH Server URL/IP   Port
192.168.0.1   22

User name
geneb

Private key file
F:\chrisr\src\88emu\vers2\wrelease\Mirado   Browse

Cancel   OK

PC5200 provides a network setup dialog to allow the user to specify the address of the host running the remote terminal service. See the illustration below. If the user is not connecting over the internet or other WAN that is subject to security attacks, she can specify a direct connection by checking "Direct" for the "Connect method". In that case, she does not need to specify an SSH server address, etc. After specifying the terminal server host, she merely clicks on "OK" and then, from the PC5200 main menu, selects the "Network" connection method, and "On Line". PC5200 will then connect to the terminal server and the server will present a login prompt. After the user logs in, giving a user name and password for the server, she is connected to the control system host.

To establish a connection over the internet from a remote location, the user might be required to use SSH tunneling for security reasons. In that case, after specifying the terminal server host in the Network Setup dialog, the user should check "Tunnel through SSH" as the connect method and fill in the fields required for this type of connection. The user must already have created an RSA public/private key pair, and provided her public key to the system administrator. The system administrator must have created an account for her on the SSH server (under some user name) and associated her public key with her account. When the user sets up the PC5200 client for an SSH session, she provides the SSH server's address, her user name on that server, and a path to her private key file. Login then proceeds more or less as for the direct connect method. PC5200 automatically requests that the SSH server forward the SSH session traffic to the remote terminal server.

Appendix - Serial Communications Cable

The wiring of a typical cable connecting the control system host to a serial port on the PC running the data collector program is shown below.

Host DB-25			PC DB-9	
FG	1			
SG	7	5		SG
RX	3	3		TX
TX	2	2		RX
CTS	5	7		RTS
RTS	4	8		CTS