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QVS Software

4690 Terminal Concentrator for Windows

USER MANUAL

QVS Software, Inc

Revision History

Document Number	Date	Author	Comments
	7/26/05	Larry Bumgardner	Added Summary Journaling feature description
	6/16/04	Larry Bumgardner	Added description of 4690 TC
	1/16/04	Donn Machak	Added Windows socket protocol flow.
	1/14/04	Donn Machak	Application Event Log messages section added.
	3/01/01	Donn Machak	Initial

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1. Introduction

1.1 Overview

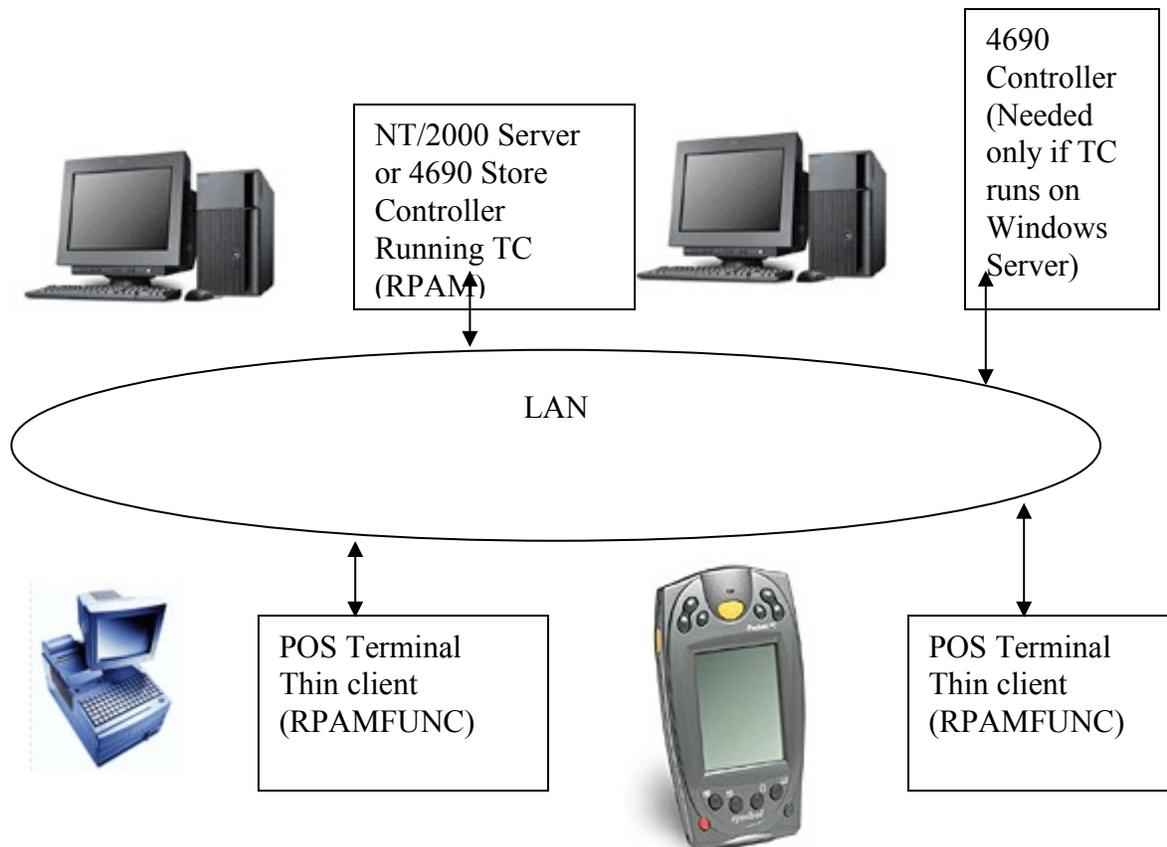
The QVS terminal concentrator (TC) product provides an environment which allows the execution of multiple copies of a terminal sales application on a WinNT, a Win2000 server, or a 4690 OS Store Controller. The applications are not aware they are running on a server. Physical devices such as the Point Of Sale (POS) display, keyboard, scanner, MSR (magnetic stripe reader), and printers are not present on the concentrator. Instead, the TC RPAM (Remote Peripheral Access Method) layer provides a means by which the physical devices can be anywhere.

There is a concentrator side of RPAM and a terminal side. The terminal side is known as TERMRPAM or RPAMFUNC. The current POS environment supported by TC is IBM 4690.

1.2 Intended Audience

This document is to serve as a guide for all users of TC. It is assumed that the reader is experienced in using IBM 4690/OS as well as Microsoft Windows NT.

1.3 Terminal Concentrator Diagram



1.4 Features and Limitations

TC is a software solution that provides a migration path for existing 4690 users to implement an open architecture POS Terminal Solution.

Supported applications include:

- General Sales Application (GSA)
- Chain Sales Application (CSA)
- Supermarket Application (SA)
- Custom POS Applications coded to the IBM CBASIC or C-API environment.

Contact IBM for licensing requirements.

The TC product supports up to 64 separate LAN, Wireless, or Store Loop terminals.

Below is a flow of how the TC server communicates with a client application and the Windows socket methods involved. In this case the client is an MPOS (Mobile Point Of Sale) device. DLC protocol can also be used for some applications.

MPOS Device

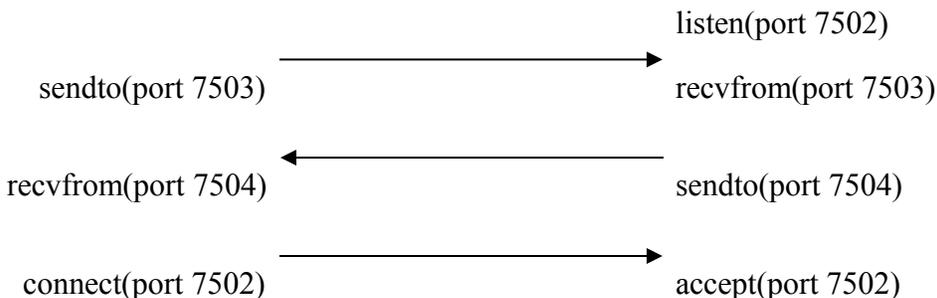
Default port is 7504

TC Server

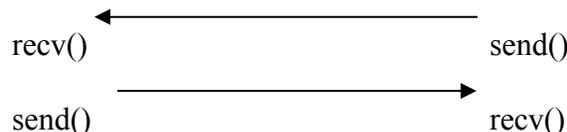
Default listen port is 7502

Default find port is 7503

1) UDP Protocol to initialize communications between the MPOS device and the TC Server by first issuing a broadcast message via the sendto() Windows socket call.



2) IP protocol now used with known sockets established from UDP protocol in step 1.



If communications is broken then the above steps are performed again.

2. Installation Procedures for TC Running on WinNT or Win2000

2.1 Hardware Requirements

2.1.1 Memory

TC requires a minimum of 16MB as a base amount in addition to the required memory needed for the installed operating system.

Each terminal will require an additional 500KB. eg. 60 terminals would require 30MB (500KB * 60 terminals = 30MB). In the example just shown, that would be 62MB. If the concentrator is going to run other applications or servers, you have to add in for that. This is a good start for estimating – a memory working set analysis has to be done once a full system is integrated.

2.1.2 Disk Space

TC's binaries are not very large but its debug logging facility will generate a lot of data. Disk space needed is as follows:

- 3MB initial TC install
- 40MB per terminal for log data
- 250MB for TC processes and log data
- If the user implements Journal Support for IBM Mod 2, 3, or 4 printers, additional disk space will be needed for this data.

2.2 Software Requirements

- One of the following:
 - NT 4.0 Workstation with Service Pack #6A
 - Win2000
 - 4690 OS at Version 3 Release 3 or higher
- DLC Protocol installed (Windows Only)
- PKZIP software used for compressing log data (Windows Only)

2.3 Installation Procedures for TC Running on Windows Servers

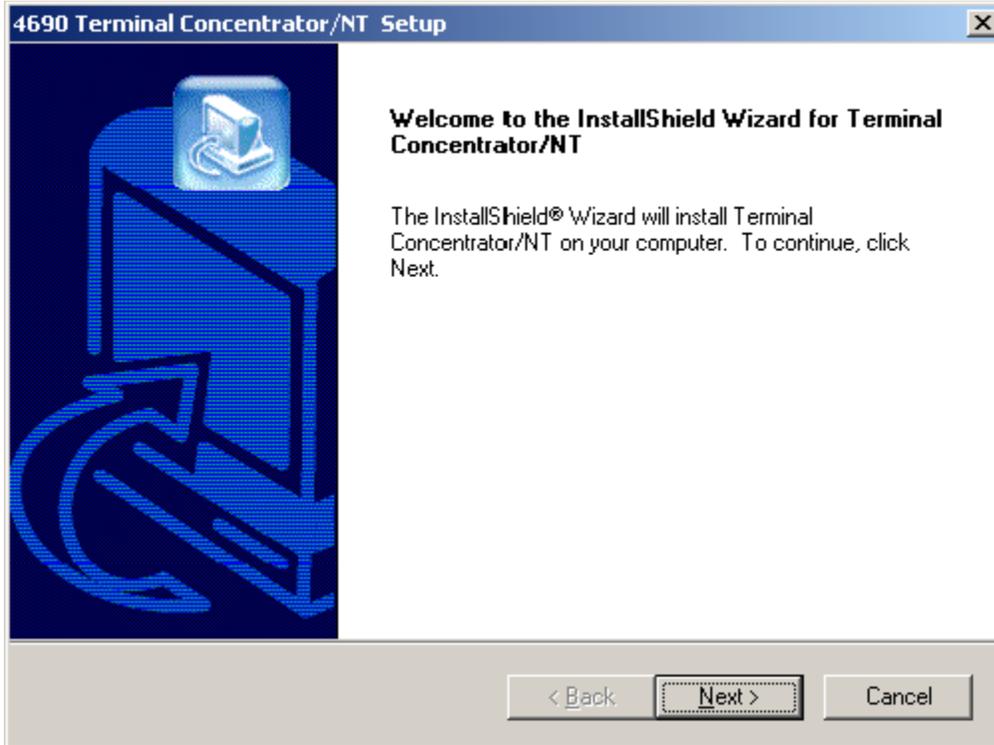
2.3.1 ZIP file

Unzip the appropriate TC ZIP file into a newly created directory on the PC you are going to install the TC product. Be sure and retain the path folder names.

2.3.2 Run SETUP.EXE from DISK1 directory

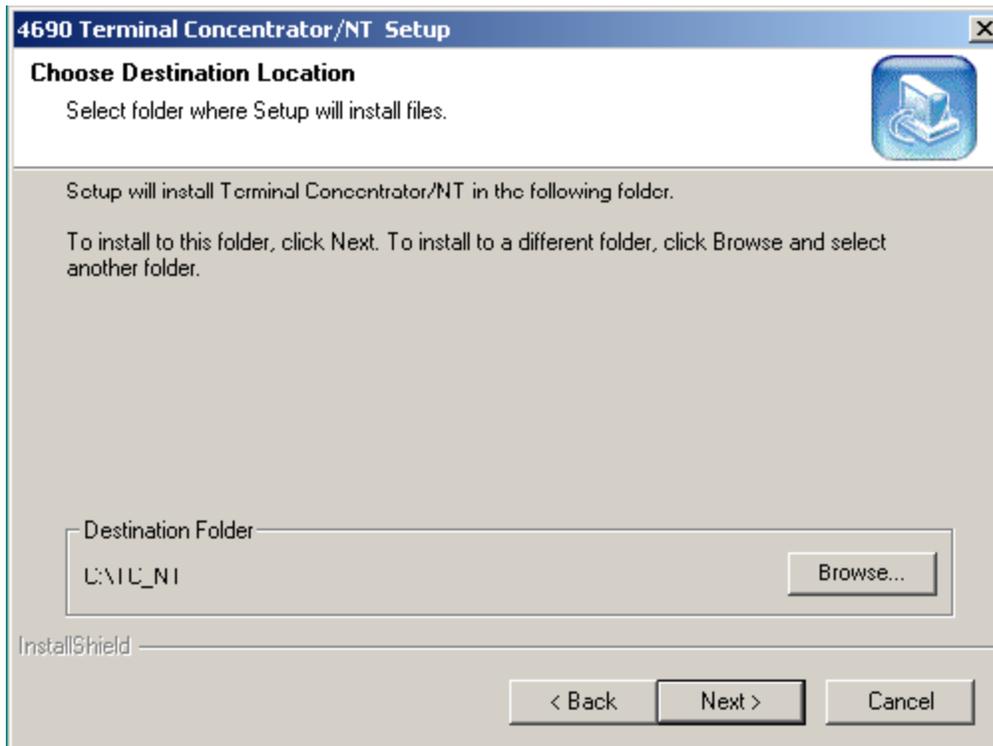
This will launch the InstallShield version of the TC product installation.

2.3.2.1 InstallShield Screen 1



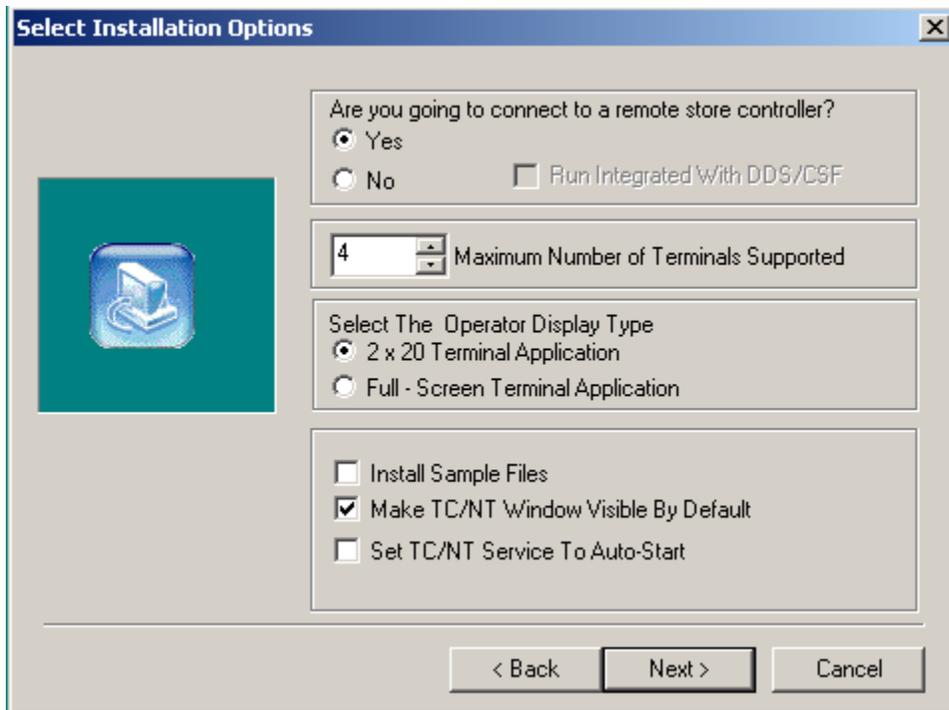
Click "Next."

2.3.2.2 *InstallShield Screen 2*



Click “Next” (recommended to accept the default destination folder name).

2.3.2.3 *InstallShield Screen 3*



Are you going to connect to a remote store controller?

- Yes - (default) This will be the normal installed environment.
- No – Choose this answer if you are installing the TC product on a PC with DDS/CSF. The DDS/CSF environment is an IBM product which allows a 4690 OS to run on a WinNT OS.

Maximum Number of Terminals Supported

Enter the maximum number of terminals that are to be supported by TC. The current maximum number of terminals supported is 4 or 64 depending on the user's license agreement.

Select the Operator Display Type

Choose the type of POS Terminal Application that is going to be used.

Install Sample Files

Check this box if you want sample files to be installed. If checked a subdirectory called SAMPLES will be created with subdirectories called CBASIC, CSAMPLES, VBSAMPLE, VCSAMPLE containing sample application code.

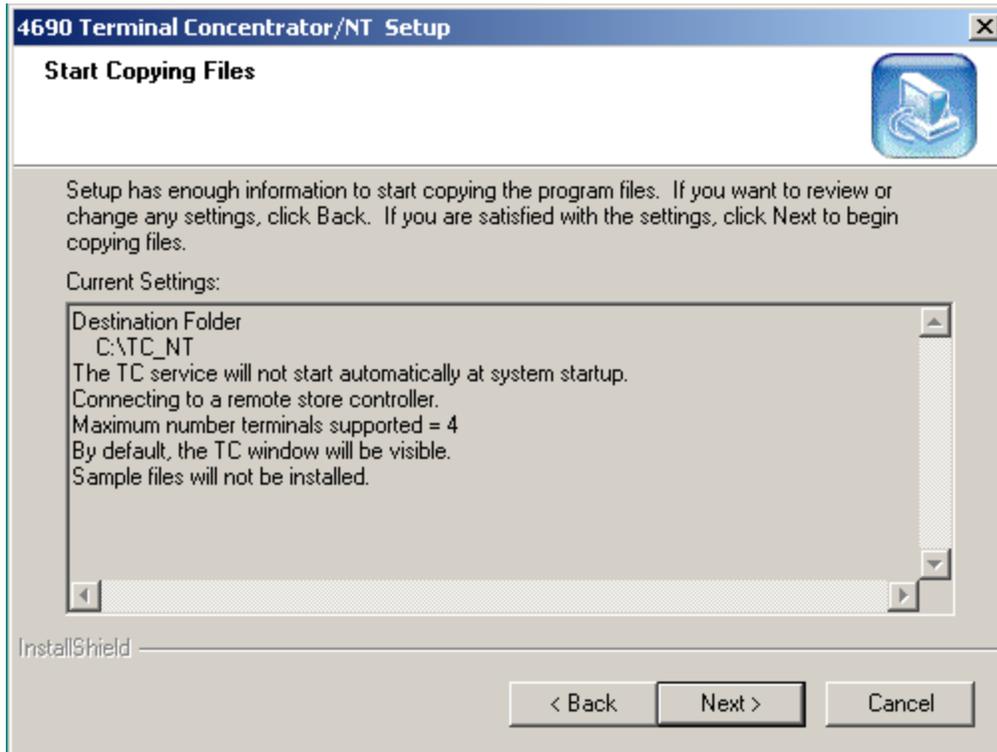
Make TC/NT Window Visible By Default

If checked, the TC/NT Window will be displayed when TC is started and running.

Set TC/NT Service to Auto-Start

Check this box to automatically start the TC/NT Service when the machine is rebooted.

2.3.2.4 InstallShield Screen 4



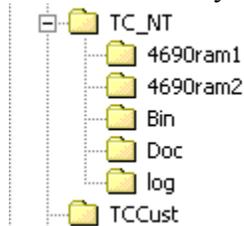
Validate the settings and click “Next” if correct else “Back” to correct entries.

2.3.2.5 InstallShield Screen 5



2.3.3 Directory structure

The TC directory tree is created as follows:



The 4690RAM1 directory is a virtual 4690 RAM disk created to emulate the x: RAM disk used by the 4690 application. Subdirectories will be created below this directory named Txxx where xxx is the terminal number for each terminal loaded by TC.

The 4690RAM2 directory is of the same structure as the 4690RAM1 directory tree and emulates the y: RAM disk used by the 4690 application.

The Bin directory contains the binary files used for the TC product. The Doc directory will contain documentation files. The Log directory is used to store log files created by TC which are very useful in problem determination.

The TCCUST directory contains batch files used to control the behavior of the terminal concentrator.

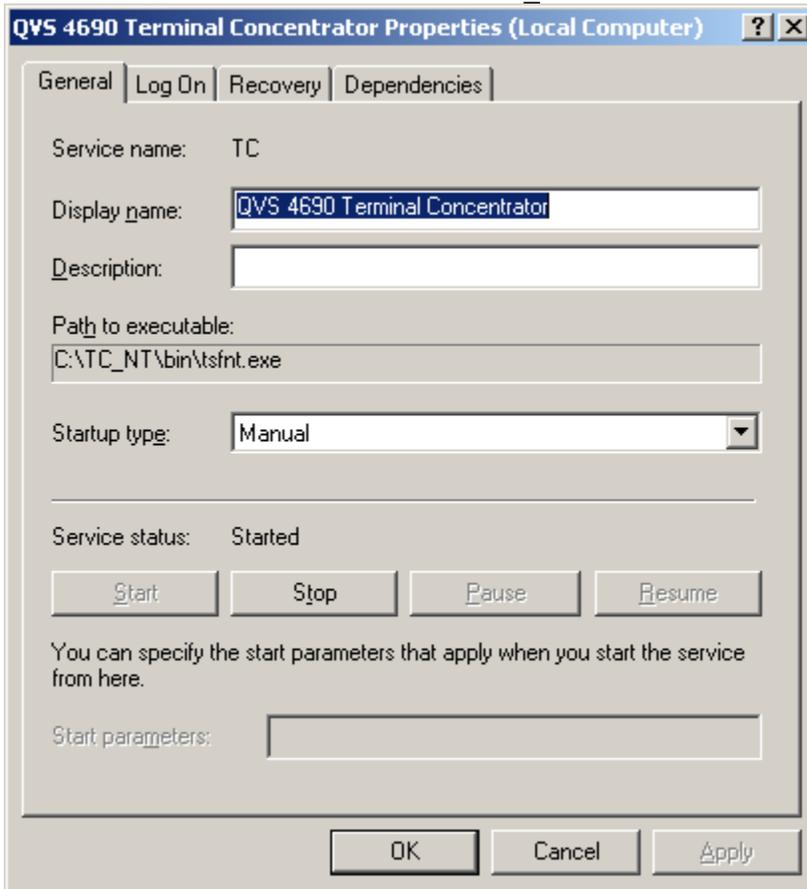
File descriptions will follow.

2.3.4 [Installed files](#)

2.3.4.1 *BIN directory*

TSFNT.EXE

Windows service which launches the TC_SVC.BAT and restarts the batch file if it exits.



TSFNT service registry entry location:

HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\TC

UTIL.BAT

Batch file used when manually launching the terminal concentrator from the Start Menu that controls the behavior of TC. Possible controls would include the ability to start, stop, enable logging, disable logging, enable auto-start, and disable auto-start the terminal concentrator.

TC_SVC.BAT

Batch file used to archive up to five sets of log files and responsible for launching the TC process (TPROCESS.EXE) itself or by calling a batch file located in the TCCUST directory that will in turn launch the TC process.

This main TC batch file has three main sections: preprocessing, start tc, and post processing. Each of these sections can be customized by adding additional .bat file to the \TCCust

directory. Since there are multiple versions of TC, TC comes with a set of \TCCust files which QVS might modify for a particular customer. These \TCCust .BAT files can be modified directly, or, to make maintenance easier, the QVS provided .BAT files are set up to look for user-written .BAT files. The user written .BAT files are called TCUSER1.BAT, TCUSER2.BAT, and TCUSER3.BAT and go in the \TCCust directory. 1, 2, and 3 correspond to pre, start, and post respectively.

TPROCESS.EXE

The terminal concentrator executable that is started to run the TC environment and responsible for displaying the current condition of the terminals. A sample TC display is as follows if the product was installed to support four terminals.



If more than four terminals are defined the maximum that will be shown by TC upon starting will be twelve. If more than twelve terminals are defined, more 2x20 displays will be displayed as they come online and the user will be able to page down through the entire list available.

E46DUMPF.EXE

Dump formatter program that will read dump files and create user friendly readable output log files. To receive a complete list of command syntax simply execute the program as follows: e46dumpf -?

E46DUMPF [dumpfile] [options]

User must supply dumpfile or options.

Most commonly used options are:

- ? Display use information
- a Format all pan files and binary log files

-b Format binary log files (*.bin) and generate output files (*.blg)

2.3.5 Registry entries created from installation

2.3.5.1 Event Logging

Upon installation the proper event logging registry entries will be made so that TC may log a number of messages to the Windows Application Event Log.

To use the event logging function under Windows , you need to setup a number of things first. Windows uses the registry to locate files (.EXE or .DLL) that contain resource strings.

TC uses RegisterEventSource and ReportEvent functions to actually log messages to the event log service. The name specified as a parameter to RegisterEventSource must match the name of the TC key in the registry as follows:

HKEY_LOCAL_MACHINE\SYSTEM\CurrentControlSet\Services\EventLog\Application\TC

This key holds the following values if TC was installed into the TC_NT directory:

```
(REG_EXPAND_SZ) EventMessageFile  value: C:\TC_NT\bin\tlrdvrps.dll
(REG_DWORD)     TypesSupported    value: 7
```

The predefined application event log message strings used by TC are as follows:

MessageId=0x1001
Severity=Informational
SymbolicName=MSG_STARTUP
Language=English
%1 Version %2 has started.
String example logged:
QVS 4690 Terminal Concentrator Feature (RPA)/NT (Sockets) Version 02.00.99.39 Dec 16 2003 10:30:52 has started.

MessageId=0x1002
Severity=Informational
SymbolicName=MSG_STOPPED
Language=English
%1 Version %2 has stopped.
String example logged:
QVS 4690 Terminal Concentrator Feature (RPA)/NT (Sockets) Version 02.00.99.39 Dec 16 2003 10:30:52 has stopped.

MessageId=0x1003
Severity=Informational
SymbolicName=MSG_PANIC
Language=English
%1 terminated unexpectedly.
String example logged:
QVS 4690 Terminal Concentrator Feature (RPA)/NT (Sockets) terminated unexpectedly.

MessageId=0x1004
Severity=Informational
SymbolicName=MSG_PANIC_APPL
Language=English
A process of %1 terminated unexpectedly.
String example logged:
A process of QVS 4690 Terminal Concentrator Feature (RPA)/NT (Sockets) terminated unexpectedly.

MessageId=0x1005
Severity=Informational
SymbolicName=MSG_OUT_OF_MEMORY
Language=English
%1 encountered an out of memory error.
String example logged:
QVS 4690 Terminal Concentrator Feature (RPA)/NT (Sockets) encountered an out of memory error.

3. Installation Procedures for TC Running on 4690 OS Store Controllers

3.1 Prerequisites

4690 OS at V2R3 or higher
TCP/IP configured and operational for each Store Controller
32 Meg of available 4690 Store Controller memory

3.2 Installation and Configuration

The 4690 Installation disks take advantage of the IBM ASM installation method. A readme accompanies these installation disks which gives you detailed information on how you should install TC and configure it. Typically, you will simply install TC for 4690 by placing Disk 1 in the A: drive and typing from a command line:

```
A:\install
```

The installation of the executables is automatic from that point. Any error messages posted must be heeded and corrected before proceeding. QVS personnel will have configured special files that you will need for your configuration.

The installation assumes that the CLIENT terminal for this system will be an IBM 4690 OS terminal. If this is not the case, additional information will be provided to you for configuring for a specific type of terminal.

For a 4690 OS terminal to be configured to run as a TC client and for the proper background jobs to be set up, the following steps should be executed:

1. If TC is already installed on your controllers and you are updating an existing TC installation, you should now reboot all terminals which are running TC. SKIP THE REMAINING STEPS.
2. If you are installing a first-time installation of 4690 TC, please execute this step and the following steps:
copy c:\tc46\install\qcditrp.sam to c:\tc46\qcdifile.mst
3. Using Controller Configuration at the Master Controller, add a new background application to the Master Controller as follows:
Initial Message: QVS Terminal Concentrator for 4690
Program Name: "TC_BIN:TC4690.286"
All Start Conditions: Y

All Stop Conditions: N

Note: Remember to page down to the last screen.

priority: 1

4. Using Controller Configuration at the Master Controller, add a new background application to the Alternate Master Controller
 - Initial Message: QVS Terminal Concentrator for 4690
 - Program Name: "TC_BIN:TC4690.286"
 - All Start Conditions: Y
 - All Stop Conditions: N
 - Note: Remember to page down to the last screen.
 - priority: 1
5. Activate controller configuration
6. Reboot both the master and alternate master controllers.
7. Using terminal configuration, create new keyboard RPAKBD01 of 4693 POS/USB type. Use keyboard definition ADXKBF01 as a model (default keys are correct)
8. Terminal Concentrator requires two terminal definitions to be created for each terminal you intend to use. If, for example, you want to use terminal 3 and 4 (a 4693 Mod 1 and 2 pair) with this product, you should define terminals 3 and 4 as you normally would. You must then create a mirror image definition of each of these terminals using terminal numbers 803 and 804, respectively. These definitions must use the same Device Groups as used for terminals 3 and 4, but they must use a new keyboard definition (RPAKBD01) and a new Application name (R::TC_BIN:TERMRPAM.286). For example, if terminals 3 and 4 are partner terminals, then terminals 803 and 804 should also be defined as partner terminals. Using terminal configuration, define as many of these mirror definitions as you intend to run using Terminal Concentrator.
9. Activate controller and terminal configuration
10. Reboot both the master and alternate master controllers.
11. Using Terminal Set Characteristics Program (S1,71,S2) at the terminal, redefine the terminal address to be the mirror terminal number for that terminal. For example, for terminal 3, set the terminal number to the 803 address.

For example, terminal 3 (having terminal image 803 also defined) should use 803. In response to a Z001 prompt while running STC, the user should key in 1803,S2. If there is a partner terminal, set its address as 804.

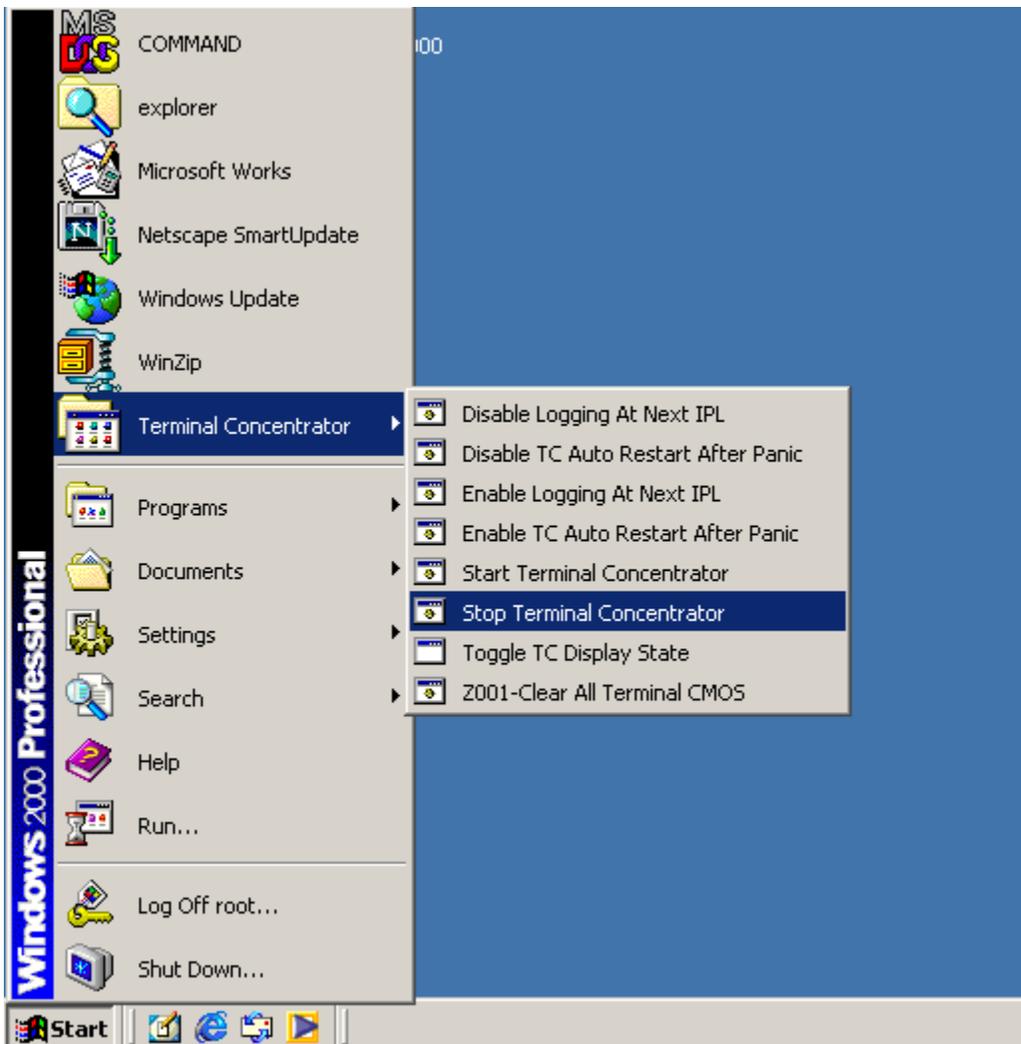
When the terminal reboots, it should load the special Terminal Concentrator application which, in turn, will run the normal 4690 application defined for that terminal. Example:

Terminal 803 would run the application defined for terminal 3. It would also use the application keycodes specified in the keyboard layout for terminal 3.

4. General Instructions

4.1 Operating Instructions for TC Running on Windows

The terminal concentrator can be started automatically or manually. The following image depicts the available choices when starting TC from the Start Menu:



4.1.1 [Disable/Enable Logging At Next IPL](#)

These two choices from the TC menu allows the diagnostic capabilities to be turned on and off. All TC diagnostic files are kept in the \TC_NT\LOG directory. Diagnostic logging is not intended for production use but can be very useful during development and testing environments.

4.1.2 [Disable/Enable TC Auto Restart After Panic](#)

These two choices allow the user to have the terminal concentrator to restart automatically or not after a panic. Normally in a test environment the user should not restart TC automatically so that log files can be gathered to help determine the reason for the system panic.

4.1.3 [Start Terminal Concentrator](#)

This starts the terminal concentrator product. Before the product is started a check is made for any existing trace log files in the \TC_NT\LOG directory. If any exists they are compressed and saved in a file called TCLOGS.001 for reference. A maximum of five compressed files are kept (TCLOGS.001 through TLOGS.005) in the \TC_NT\LOG directory.

The other TC menu choices should be self-explanatory.

4.2 *Operating notes*

4.2.1 TSF_STORE_NUM

In lab environments, it is recommended that you set the store number for TC. This allows multiple controllers/concentrators on the same network. To do this, set the environment variable TSF_STORE_NUM in your system environment to your store number. It's important that you set this value in the system environment rather than the user environment because it will not be found if it's in the user environment and the concentrator is running as a service.

4.2.2 NVRAM Emulation

NVRAM (Non-Volatile Random Access Memory) is emulated in the TC environment by the creation of a file called BATPRMEM.DAT located in the root directory of where TC is installed. This file will contain the NVRAM used by all the POS terminals.

NVRAM is divided into two areas, the operating system data and the application data. The operating system data consists of the store number, terminal number, and hard totals information.

In a lab environment the user should delete this file prior to setting the store number mentioned above and before launching TC. Only one BATPRMEM.DAT file is created whether you have one or more terminals being controlled by TC. An example lab batch file is as follows:

```
del \TC_NT\BATPRMEM.DAT
set TSF_STORE_NUM=75
start tprocess
```

4.2.3 RAM Disk Emulation

POS Terminal applications can use two RAM (Random Access Memory) Disks. They are referenced as RAM Disk X and RAM Disk Y. TC will manage the reading and writing of data to the RAM disks by creating their images as disk files on the PC that TC was installed. TC will create subdirectories under it's main directory called 4690RAM1 (RAM Disk X) and 4690RAM2 (RAM Disk Y).

If the POS terminal application accesses a RAM Disk file then TC will create another subdirectory off of the RAM Disk directory names above using the terminal number for creation. eg. Terminal 23 copies item file called EAMITEM.DAT to RAM Disk X for increased performance. If TC was installed in the directory called TC_NT then in this example TC will create the file \TC_NT\4690RAM1\T023\EAMITEM.DAT on the PC.

Upon TC starting these RAM Disk directory trees are cleared.

4.2.4 Saving Summary Journal Information for IBM Mod 2, 3, or 4 Printers

If you are running a POS application that assumes an IBM Model 2, 3, or 4 printer, you can use a feature of Terminal Concentrator that saves Summary Journal entries to a file instead of writing them to the printer. A file is created for each terminal supported by TC for each day. It can archive several days' summary journal records. The files containing the summary journal data will be saved by default in the **c:\tc_nt\sjinfo** folder. The format of the files is **SJLOGnnn.DAT** where "**nnn**" represents the terminal number. If you choose to archive more than the current day of data, the format will be **SJLOGnnn.yyy** where "**yyy**" represents prior days. The format of "**yyy**" is "**001**", "**002**", "**003**", etc representing yesterday, the day prior, and the day prior to that, respectively. To set this up, the configuration file for Terminal Concentrator, **QCDIFILE.MST**, must have a section added as follows:

```
[SJ]
; EjDur="xxx" activates the journal filekeeping. "xxx" is the number of days
; to be archived. "0" implies just the current day.
; EjParse="Y" removes all Escape sequences from the summary journal data to
; allow print of the saved data on a standard printer
; EjPath="path" Ex: "c:\ejdata" specifies a different folder in which to keep the
; journal data. The user is responsible for creation of that folder.
; NOTE: the path cannot be ended with a "\" (a backslash)
; EjAddCR = "Y" specifies that a Carriage Return should be written at the end
; of each print line written to the disk file.
```

4.3 *Instrumentation and Debugging for Windows Environments*

4.3.1 Features

TC is instrumented to allow analysis and debugging of TC operations. Features of the system's analysis and debug facilities include the following:

1) Application event logging

The following TC messages are written to the application event log:

QVS 4690 Terminal Concentrator Feature (RPA)/NT (Sockets) Version 02.00.00.99 Jun 6 2003 10:21:17 has started.

QVS 4690 Terminal Concentrator Feature (RPA)/NT (Sockets) Version 02.00.00.99 Jun 6 2003 10:21:17 has stopped.

QVS 4690 Terminal Services For Windows terminated unexpectedly.

2) Internal subroutine tracing

- 3) xDC function call tracing
- 4) The trace facility used by TC optionally puts trace messages to an in-memory trace buffer or to a trace file. The trace facility buffers 32K of data before writing to the disk in order to reduce overhead. For each process, the trace facility supports alternating between two log files. When one log file hits a maximum size, it switches to the second. The log file names are TSFn.LOG and TSFn.LO1 where n is the process sequence number. TSFn.LOG always contains the latest log information.
- 5) Application dump on application-generated general exception errors
- 6) System dump on system-generated general exception errors
- 7) Application dump on internally recognized application fatal conditions (panic)
- 8) System dump on internally recognized system fatal conditions
- 9) Formatter program for TC dumps (.PAN files) and binary trace files.

4.3.2 Instrumentation Command Line Switches – Set I

The Set I switches are available when the TC process is first started. See the Set II switches section which follows for information on the switches that are supported for controlling the TC tracing and logging when the subsystem is already up and running.

TPROCESS [options]

Options are:

-V[*nnn*] Verbose debug information in trace log file. By default, -V affects all processes that get started. Optionally, a process sequence number can be specified. If so, logging is only enable for that process. Multiple -V*nnn* options can be used on the same command line (up to 5).

4.3.3 Instrumentation Command Line Switches – Set II

The Set II switches are supported for controlling TC when it is already operating. When TPROCESS is started it detects if another instance is already running. If another TPROCESS.EXE instance is already running, the second invocation is used to send control commands to the already running system.

TPROCESS [options]

Options are:

-V[*nnn*] Toggle option that hex logs certain data buffers to trace log file. See Set I description for more information. If an *nnn* of 999 is specified, -V will be toggled for all future processes.

-K[*I*] Terminate TSF environment that is already running. If -K*I* specified, system panic file is generated.

4.3.4 Exception Handling

When an OS exception occurs for the TC process, the TC exception handler will get control. For all exceptions that will cause abnormal process termination (i.e. general protect fault), the exception handler makes copies of the process state information (registers) and stack from the fault location. When the TC process termination routine gets control, the exception information is unconditionally logged to the TSFn.LOG file and a .PAN file is generated.

4.3.5 In-memory Tracing

For cases where a problem can't be recreated and all that exists are the .PAN files, some in-memory trace information is available in the .PAN file. This information is no where near as useful as the .LOG file output from a -V run of the system, so if a problem is recreateable, get the debug log files!

4.3.6 Field Problem Data Collection and Analysis

All problem analysis information that is generated by TC is placed in the .\LOG directory where \ is the parent directory where TC was installed. When a problem occurs in the field, the intent is for all files in this directory to get compressed and sent in for analysis. If the problem is recreateable, the problem should be recreated after starting the system with the -V option.