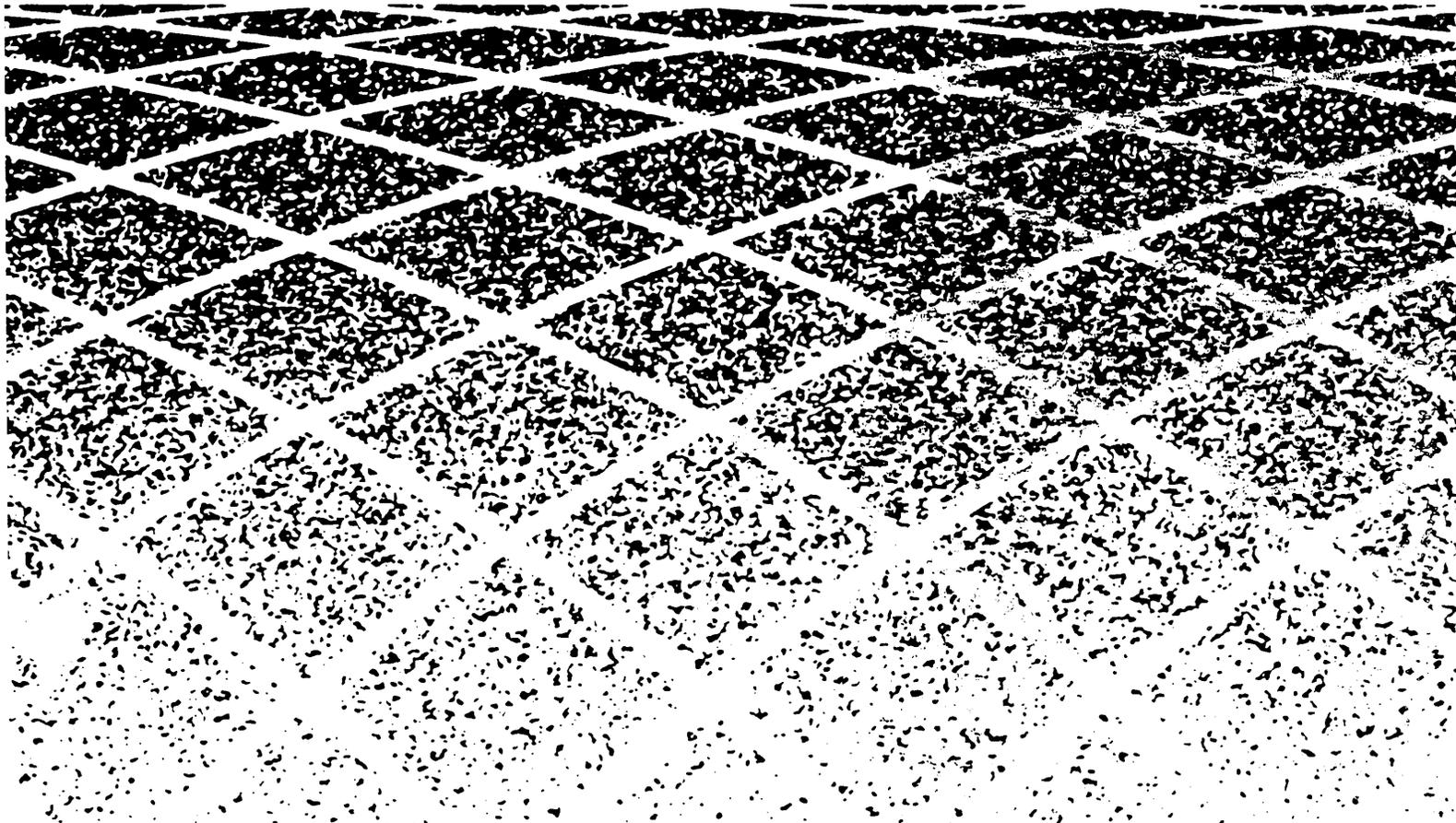




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Call Management System Release 3.0

Planning, Configuration, and Implementation



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R3 CMS Planning, Configuration, and Implementation

Table of Contents

	Page
Chapter 1	
Description of R3 CMS	1-1
Description of the Release 3 Call Management System	1-1
R3 CMS Enhancements	1-2
New User Interface	1-2
More Database Items	1-3
Report Enhancements	1-3
Standard R3 CMS Features	1-4
Reports	1-4
Real-Time Reports	1-4
Historical Reports	1-5
Dictionary	1-5
Exceptions	1-5
ACD Administration	1-6
Custom Reports	1-6
User Permissions	1-7
System Setup	1-7
Maintenance	1-7
Logout	1-8
Shortcuts and Timetables	1-8
Optional R3 CMS Features	1-8
Vectoring	1-8
Graphics	1-9
Forecasting	1-9
Chapter 2	
Planning	2-1
General Information	2-1
ACD Parameters	2-2
Measured Extensions Assigned to Multiple Splits	2-4
Measured and Unmeasured Trunks	2-5
Determining Customer Performance and Data Requirements	2-6
Instructions for Performance Requirements Worksheet	2-8
Instructions for Data Requirements Worksheet	2-14
Determining Report Refresh Rates	2-18
Using the Real-time Refresh Program	2-18
Options of the Real-time Refresh Program	2-18
Running the Program	2-20
Printing Output From the Real-time Refresh Program	2-22
Using the Refresh Rate Worksheets	2-23
Processor Occupancy On a 6386/25 WGS Computer	2-24
Instructions For 6386/25 Processor Occupancy Worksheet	2-24
Processor Occupancy On 6386/33 WGS Computer	2-26
Instructions For 6386/33 Processor Occupancy Worksheet	2-26
Processor Occupancy On a 3B2/522/622/1000 70 Computer	2-28

Instructions For 3B2/522/622/1000 70 Processor Occupancy Worksheet	2-28
Determining Different Refresh Rates	2-30
Instructions For Different Refresh Rates Worksheet	2-31
Trading Off Report Refresh Rates	2-33
Instructions for Refresh Rate Tradeoff Worksheet	2-34
Determining A Single Refresh Rate	2-36
Instructions for Single Refresh Worksheet	2-37
Determining RAM Requirements	2-38
Using the RAM Program	2-38
Running the Program	2-39
Printing Output From the RAM Program	2-41
Determining Disk Storage Requirements	2-42
Using the Disk Program	2-42
Disk Space Allocation	2-42
Running the Program	2-43
Printing Output From the Disk Program	2-45
Using the Disk Storage Worksheets	2-46
Disk Storage Required	2-46
Instructions For Disk Storage Worksheet	2-48
Disk Storage Allocation	2-51
Instructions for Disk Storage Allocation Worksheet	2-52
ACD Engineering Guidelines	2-55
Interpolation	2-55
Agent Engineering Guidelines	2-56
Trunk Engineering Guidelines	2-74
CMS Customer Training	2-77
Other CMS-Related Training	2-78
Documentation	2-79
When to Order Documents	2-80
Chapter 3	
Configuring a WGS/R3 CMS Application	3-1
General Information	3-1
R3 CMS Minimum Computer Configurations	3-2
6386/25 SCSI Server Minimum Configuration	3-3
6386/33 SCSI Server Minimum Configuration	3-4
Hardware	3-5
6386/25 WGS SCSI Server Computer Hardware	3-6
6386/33 WGS SCSI Server Computer Hardware	3-7
Required Hardware For R3 CMS	3-8
General Purpose Synchronous Controller (GPSCAT/E)	3-8
Intelligent Ports Card	3-9
Intelligent Ports Card 1600 (IPC-1600)	3-9
IPC-1600 Ports Cabinet	3-9
Main Memory Expansion	3-10
Main Memory for the 6386/25 WGS SCSI Server Computer	3-10
Main Memory for the 6386/33 WGS SCSI Server Computer	3-10
2 MB SIMMS Memory Kit	3-10
4/16 MB Memory Expansion Board	3-11
Math (Numeric) Coprocessors for 6386 WGS Computers	3-12
MATH Coprocessor for the 6386/25 WGS Computer	3-12

Math Coprocessor for the 6386/33 WGS SCSI Server Computer	3-12
Remote Management	3-13
Miscellaneous Requirements	3-16
Optional Hardware for R3 CMS	3-17
SCSI Packages	3-17
WGS SCSI Host Adapter Package A	3-17
WGS SCSI Host Adapter Package B	3-18
WGS SCSI External Connect Kit	3-18
1000 MB SCSI Internal Hard Disk Kit	3-18
1000 MB SCSI External Hard Disk Kit	3-18
External SCSI Bus Cable	3-19
120 MB SCSI Internal Cartridge Tape Kit	3-19
120 MB SCSI External Cartridge Tape Drive	3-19
Uninterruptible Power Supply	3-20
Software	3-22
Required Software for the 6386/25 WGS Computer	3-22
Required Software for the 6386/33 WGS SCSI Server Computer	3-23
Optional Software	3-24
R3 CMS Forecasting	3-24
R3 CMS Graphics	3-24
R3 CMS Vectoring	3-24
Peripherals	3-25
Terminals	3-25
715 BCT	3-26
705 MT	3-26
615 CMT	3-26
Printers	3-28
Cabling Remote Terminals and Printers	3-31
Additional Switch Hardware and Software	3-34
Additional Generic 3r Switch Hardware and Software	3-35
Additional Generic 2 and System 85 Switch Hardware and Software	3-36
Optional Recorded Announcement Hardware for the Generic 2 and System 85	3-37
Additional Generic 3i and Generic 1 Switch Hardware and Software	3-38
Computer-to-Switch Hardware and Cabling	3-39
Connecting the WGS Computer to the Generic 3r Switch	3-40
Using the Isolating Data Interface	3-41
Using a Modular Processor Data Module	3-43
Using a Private Line	3-45
Connecting the WGS Computer to the Generic 2 or System 85 Switch	3-49
Using the Isolating Data Interface	3-51
Using Local Data Service Units	3-53
Using Remote Data Service Units	3-55
Using an Analog Private Line	3-57
Connecting the WGS Computer to the Generic 3i or Generic 1 Switch	3-59
Using the EIA Connector on the Processor Interface	3-60
Using a Modular Processor Data Module	3-62
Using an Analog Private Line	3-64
CMS Data Migrations	3-68
Where to Send CTC Tapes Containing CMS Migrated Data	3-69

Chapter 4	Implementing the R3 CMS Application	4-1
	The R3 CMS Provisioning Process	4-1
	Problem-Reporting Procedures	4-13
	Problem-Reporting Procedure for the Service Technician	4-13
	Problem-Reporting Procedure for the Customer	4-13
Appendix A	Worksheets	A-1

Chapter 1

Description of R3 CMS

Description of the Release 3 Call Management System

The Release 3 Call Management System (R3 CMS) is a software product that collects and stores data sent from the Automatic Call Distribution (ACD) feature of AT&T telecommunications switches. The ACD feature distributes incoming and local calls to groups of voice terminals called splits. The people who use the voice terminals to answer ACD calls are called agents.

CMS formats the data it collects from the ACD and generates real-time and historical reports that are used to manage elements of the ACD. These ACD elements include agents, splits, trunk groups, and trunks. CMS can also be used to reconfigure (administer) various ACD elements and parameters.

As Figure 1-1 illustrates, CMS software runs on an adjunct processor and communicates with the switch by way of a data link.

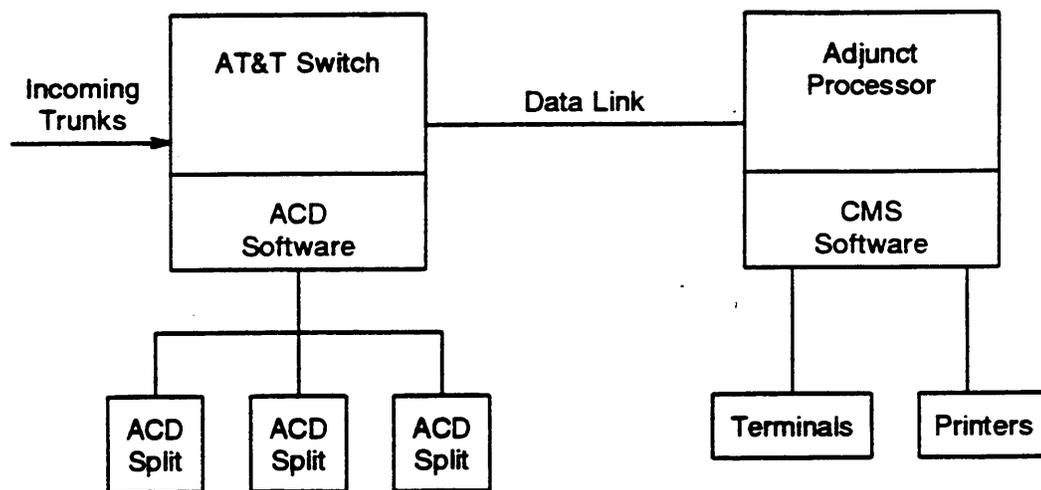


Figure 1-1: R3 CMS Configuration

R3 CMS can collect ACD data from the following AT&T switches:

- System 85 Release 2 Version 4
- DEFINITY Generic 1
- DEFINITY Generic 2
- DEFINITY Generic 3i
- DEFINITY Generic 3r.

The following AT&T computers can run the R3 CMS software application:

- 3B2/522
- 3B2/1000 Model 70
- WGS 6386/25 Model S
- WGS 6386/33 Model S.

The WGS computers and related hardware and software are described in Chapter 3.

R3 CMS Enhancements

R3 CMS is similar to R2 CMS except that R3 CMS has a variety of enhancements. This section gives a brief description of these enhancements. For a more detailed description of the differences between R2 CMS and R3 CMS, read the *R3 Call Management System Change Description* (585-215-411).

Note Upgrade customers should be fully briefed on the significant differences between R2 CMS and R3 CMS.

New User Interface

R3 CMS has a windowing user interface. A single user terminal can have multiple windows for access to real-time or historical reports. Windows can be re-sized and re-positioned and, if an entire report is not visible, the terminal's arrow keys can be used to scroll through the report. Window setups can be recorded and named to simplify daily or shift setup tasks.

More Database Items

R3 CMS has three times as many database items as R2 CMS. Most R3 CMS database items are call based rather than interval based as with R2 CMS. This means that data are added to the CMS database after a call is over rather than during a set interval.

New R3 CMS database items track the following standard and optional switch features and capabilities:

- Adjunct-placed and adjunct-routed calls.
- Agents in multiple splits.
- Multiple split queuing.
- Direct agent calls.
- Outgoing calls placed by an agent or an adjunct processor.
- Event (stroke) counts and Call Work Codes.
- Look Ahead Interflow call attempts and completions.
- Hold time, transfers, and conferences for ACD calls and personal calls.
- Ring time for calls ringing at a voice terminal.

Report Enhancements

The following enhancements have been made to R3 CMS reports:

- Totals and other report calculations are rounded rather than truncated.
- Report titles and column headings have been changed to eliminate differences between real-time and historical reports having the same data.
- Most agent reports include data for all splits in which an agent worked during the period covered by the report.
- Depending on the type of processor and the hardware configuration, real-time reports can be updated as often as every three seconds.
- The intra-hour interval for historical reports can be set to store data hourly, half-hourly, or quarter-hourly.
- Customers can determine how long they wish to store summary historical data.
- Historical data from multiple ACDs can be combined into a single report.
- Standard reports can be customized with much greater flexibility.

- Custom reports can be created containing data from exceptions, forecasting, or from other applications stored in customer tables in the R3 CMS database.
- Forecast reports can be based on user-defined hypothetical data and can contain cost and revenue information.

Standard R3 CMS Features

Figure 1-2 shows the R3 CMS Main Menu and the subsystems that can be accessed from the Main Menu.

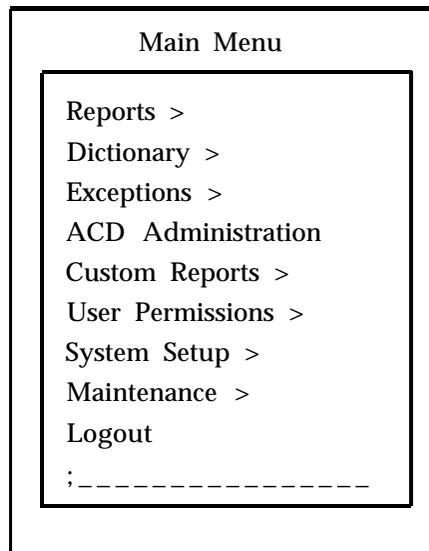


Figure 1-2: R3 CMS Main Menu

Reports

There are two types of standard reports -- real-time reports and historical reports.

Real-Time Reports

Real-time reports show current ACD activity. Data terminals connected to the R3 CMS processor are used to view these reports. Real-time reports are updated at regular intervals. The following is a partial list of the information that is available from real-time reports:

- The number of calls waiting in a split queue.
- The amount of time the oldest call in a split queue has waited.

- The current agent work mode and duration for one agent or all agents in a split.
- The number of calls that were answered.
- The average speed of answer for split calls.
- The number of calls that were abandoned by the caller.
- The average time a caller waited before abandoning a call.
- The percentage of split calls that were answered, answered within the user-defined acceptable service level, or abandoned.
- The current state of a trunk and the duration of the current state.

Historical Reports

Historical reports show ACD activity that occurred on a particular day, week, or month. These reports are usually printed, but they can also be viewed on a data terminal. Historical reports can be printed on demand, scheduled to print on a particular date, or scheduled to print at regular intervals (daily, weekly, or monthly).

Dictionary

This subsystem is used to:

- Assign login identifications to agents.
- Assign names to agents, groups of agents without regard to split assignments, splits, and trunk groups.
- Create agent groups without regard to split assignments.
- Modify names assigned to ACD elements.
- View definitions of CMS database items and calculations.
- Define calculations, constants, and custom database items.
- Search for anything in the Dictionary subsystem.
- Order reports on most parts of the Dictionary subsystem.

Exceptions

This subsystem is used to define upper and lower boundaries for ACD elements. An exception is logged when an ACD activity falls outside of these user-defined boundaries. While viewing real-time reports, a running count of current exceptions is displayed on the terminal screen (exceptions can be displayed at more than one terminal). Exceptions are available on new real-time database items such as time in current work mode. For more complete information on current exceptions, the Real-Time Exceptions Log can be viewed. Also, historical reports on exceptions can be viewed or printed.

ACD Administration

This subsystem is used to:

- Move agent extensions between splits.
- Set a maximum acceptable service level (a time limit for answering calls).
- Start a trace of agent activities (changes in agent work modes).
- Order a report listing extensions that are members of a split.
- Order a report listing trunk members and their equipment locations for a trunk group.
- View trunk group assignments.
- For System 85 and DEFINITY Generic 2 switches **with** the Call Vectoring feature, change trunk group-to-VDN assignments.
- For System 85 and DEFINITY Generic 2 switches **without** the Call Vectoring feature, set the announcement delay time.
- For System 85 and DEFINITY Generic 2 switches **without** the Call Vectoring feature, set up intraflow (the redirection of ACD calls from a local split to another local split or other local destination).

Custom Reports

This subsystem is used to design and create custom real-time and historical reports and offers the following design options:

- Copying existing report designs, including standard report designs. You can then modify the copied design.
- Defining ACD data for report fields.
- Defining ACD data for bar graphs.
- Arranging report fields and bars the way you want them.
- Entering text for field labels, column headers, row headers, or special instructions.
- Emphasizing or deemphasizing text and fields with a variety of highlighting options.
- Editing report designs using block moves, copies, and deletions.
- Defining stationary (no-scrolling) areas.
- Merging data for a report field to include data from different ACDs.
- Merging data for a report field to include data from different time periods.
- Including data from custom data tables that you create and populate.

User Permissions

This subsystem is used to assign user access permissions for CMS subsystems and ACD elements. A user can be given read permission, write permission, or both. Read permission allows a user to view data. For example, a user can be given permission to view one or more reports. Write permission allows a user to add, modify, and delete data and to execute processes. The User Permissions subsystem is also used to specify the maximum number of open windows (1 - 12) a particular user can have and a user's minimum refresh (update) rate (3 to 600 seconds) for real-time reports.

System Setup

This subsystem is used to:

- View switch information.
- Change the time zone offset (if the switch and the CMS processor are located in different time zones).
- Create pseudo-ACDs that are used to load archived historical data from another R3 CMS and to produce a multi-location report.
- Allocate storage space for historical data.
- Identify and specify where to store specific CMS files.
- Specify what and how much agent data will be stored for the Agent Trace historical report.
- Define data storage intervals for historical data (hourly, half-hourly, quarter-hourly).
- Turn data collection on or off.
- Specify how long to store intrahour data and daily, weekly, and monthly summaries.
- Add items to the Main Menu.
- Migrate data from an R2 CMS to an R3 CMS.

Maintenance

This subsystem is used to:

- Back up CMS data.
- Restore CMS data.
- Administer backup and restore devices and printers.
- Check the status of the data link between the switch and the CMS processor.

- View the status of measured ACD elements.
- View the Error Log report.

Logout

Selecting this item from the Main Menu logs the user out of CMS.

Shortcuts and Timetables

The last item on the Main Menu is a semicolon followed by a blank line. This blank line is used to enter a name associated with a shortcut. A shortcut gives you quick access to frequently used windows. For example, if you look at the Real-Time Split Status report for splits 2 and 3 several times a day, you can create and name a shortcut that will display these reports. Then, all you have to do is enter the name of the shortcut on the blank line of the Main Menu and press the [Return] key.

A timetable is similar to a shortcut, except it allows you to schedule tasks for completion at a later time. Printing a historical report is an example of a task. A task can be scheduled to run once, hourly, daily, weekly, monthly, or quarterly (once every 3 months).

Optional R3 CMS Features

Vectoring, Graphics, and Forecasting are optional R3 CMS features. These features are not part of the standard R3 CMS software; they must be purchased in addition to the standard R3 CMS software.

Vectoring

This feature enables R3 CMS to collect and store data from a switch that has the Call Vectoring feature and other features that use vectors. Other features that use vectors include:

- Call Prompting (Generic 1 and Generic 3 only)
- CallVisor™ Adjunct/Switch Application Interface (ASAI)
- Look Ahead Interflow.

Call Vectoring is a highly flexible way of managing incoming ACD and non-ACD calls. A vector is a series of commands, or call processing steps that specifies the treatment for certain incoming calls. Call treatments include:

- Queuing calls to ACD splits.
- Giving caller feedback (such as ringing or music) or checking the status of backup splits if calls cannot be answered immediately.

- Playing announcements.
- Routing calls to internal or external destinations.

This treatment can change automatically based on time of day and day of week, how long a call has waited, changing traffic or staffing conditions.

The vectoring data CMS collects is used in several standard real-time and historical reports. For R2V4 System 85 and DEFINITY Generic 2 switches, vectors can be administered (added, removed, or modified) from the CMS.

Graphics

This feature displays real-time and historical data in bar-graph format. As conditions change, the height of the bars changes. The intensity (for monochrome terminals) or color of a bar changes as user-defined thresholds are met or exceeded, alerting the user to a situation that may require action.

Forecasting

This feature allows you to set up and run various forecasts. A forecast can be based on historical or user-defined hypothetical data. The forecasting feature uses this data to predict the number of calls a split will receive on a future date and the number of agents that will be required to handle that number of calls. Some forecast reports can include cost and revenue information.

Chapter 2

Planning

General Information

The purpose of this chapter is to help you determine the following needs of a customer:

- R3 CMS/ACD performance/data requirements.
- The real-time report refresh rates the customer can obtain.
- The most appropriate R3 CMS computer model.
- The proper amount of Random Access Memory (RAM).
- The proper amount of disk storage.
- The proper number of ACD agents and trunks.

After determining the customer's needs, you must use Chapter 3 to actually configure the customer's system.

A discussion of available R3 CMS training and documentation is also included in this chapter.

ACD Parameters

For each AT&T PBX that R3 CMS supports, Table 2-1 lists the maximum number of ACD entities the PBX can support. The numbers include the total entities that can possibly be used to support an ACD. Notice that many of these numbers exceed the number of ACD entities that R3 CMS will measure (see Table 2-2).

Table 2-1: ACD Parameters Supported by AT&T PBXs

Host Switch	ACD Parameters						
	Splits	Agents	Trunk Groups	Trunks	Vectors	VDNs	Call Arrivals (Per Hour)
Generic 1	99	500*	99	400	n/a	n/a	5,700**
Generic 3i	99	500*	99	400	256	500	7,000
System 85 R2V4	60	1,024*	18-999†	6,000	128	32,000	25,000 (Vectoring) 32,000 (No Vectoring)
Generic 2.1	60	1024*	18-999†	6,000	128	32,000	25,000 (Vectoring) 32,000 (No Vectoring)
Generic 2.2	60	2048*	18-999†	6,000	511	32,000	25,000 (Vectoring) 32,000 (No Vectoring)
Generic 3r	99	3,000*	666	4,000	512	3,000	70,000

* This number represents the maximum number of agents that can be simultaneously logged into the ACD. If, on any Generic 3 PBX, agents log into multiple splits, one agent is counted against the maximum for each split an agent is logged into.

† The PBX can have a maximum of 999 trunk groups, but CMS can only measure 238 trunk groups. In addition, to be measured, a trunk group must be assigned a trunk group number from 18 to 255.

** These rates assume an ideal ACD scenario in which incoming ACD calls comprise 100% of call traffic on trunks to the PBX and the calls are equally divided between two general types of splits, each with the following call flow:

- For the first type of split, calls receive a forced first announcement and are then answered immediately.
- For the second type of split, calls go into queue, where half of the calls receive a first announcement and are then answered immediately and the other half receive a first announcement, a second announcement, and are then answered.

If other applications or other types of call flow are involved with the PBX, call arrivals will be lower.

For each AT&T PBX that R3 CMS supports, Table 2-2 lists the maximum number of ACD entities CMS will measure. Notice that many of these numbers are slightly lower than the maximum number of ACD entities the PBXs will allow (see Table 2-1).

Table 2-2: ACD Parameters Measured by R3 CMS

Host Switch	ACD Entities Measured by CMS						
	Splits	Agents	Trunk Groups	Trunks	Vectors	VDNs	Call Arrivals (Per Hour)
Generic 1	99	400*	99	400/100**	n/a	n/a	5,700
Generic 3i	99	400*	99	400/100**	256	500	7,000
System 85 R2V4	60	1,023*	238†	2,000/100**	128	2,000	25,000 (Vectoring) 32,000 (No Vectoring)
Generic 2.1	60	1023*	238†	2,000/100**	128	2,000	25,000 (Vectoring) 32,000 (No Vectoring)
Generic 2.2	60	1023*	238†	2,000/100**	511	2,000	25,000 (Vectoring) 32,000 (No Vectoring)
Generic 3r	99	1,023*	255	2,000/100**	512	2,000	40,000

*This number represents the maximum number of measured agents that can be simultaneously logged into the ACD. If, on any Generic 3 PBX, agents log into multiple splits, one agent is counted against the maximum for each split an agent is logged into. For example, on a G3i PBX, 133 people each logged into three splits would mean 399 measured agents.

† Measured trunk groups must be numbered between 18 and 255.

** These numbers are for measured and unmeasured trunks. 100 unmeasured trunks must be set aside for use with ACD call transfers, conference calls, and other calls internal to the PBX.

Measured Extensions Assigned to Multiple Splits

On Generic 1, 3i, and 3r, the customer can assign an agent extension to as many splits as desired. Multiple split assignments are commonly used in one or both of the following scenarios:

- The customer has agents who log into multiple splits.
- The customer has more than one shift of agents, where the shifts use the same set of phones, but **do not** work in the same set of splits.

However, each extension-split assignment represents an agent to CMS. Therefore, assigning extensions to multiple splits can quickly consume the agent measurement capability of CMS. For example, on a Generic 3i, if you assign each of 50 agent extensions to four splits, the PBX sends 200 extension-split assignments to CMS. In this case, CMS creates space in real-time data storage for 200 agents, even if the number of agents logged in is less than 200.

If the maximum number of agents CMS can measure (as defined at installation or in the Data Storage Allocation window) is fewer than the split-extension assignments it receives from the PBX, the link between the PBX and CMS will fail. Thus, if CMS allows up to 400 measured agents, but the G3i PBX has 450 split-extension assignments, the link will fail.



Note Do not confuse “agent extensions assigned to multiple splits” and “agents logged into multiple splits.” Even if an agent’s extension is assigned to four splits, the agent can only be logged into three of those splits simultaneously. And CMS will still create space in real-time data storage for four agents (one for each split), even though the agent is not logged into all four splits.

Measured and Unmeasured Trunks

The entries for trunks in Table 2-2 are measured and unmeasured trunks. A minimum of 100 unmeasured trunks are provided by default. This number of unmeasured trunks is required for intra-PBX calls to splits and for transferring calls (transfers seize an unmeasured trunk only until the transfer is complete).

If more than 100 unmeasured trunks are needed for an ACD, the maximum number of measured trunks will decrease accordingly. For example, if the customer has a Generic 3i PBX and chooses to have 200 unmeasured trunks, this will leave 300 trunks available for measurement.

Note A PBX can actually support many more unmeasured trunks than shown in Table 2-2 — **without affecting the available number of measured trunks**. However, these additional trunks can only be used for non-ACD purposes. Using additional unmeasured trunks for ACD will **always reduce** the available number of measured trunks.

The measured trunks available can be determined as follows:

$$t = m - \max(u - 100, 0)$$

Where t is the number of measured trunks, m is the maximum number of measured trunks possible, and u is the number of unmeasured trunks.

For example, R3 CMS is used to monitor a Generic 3i ACD with 150 unmeasured trunks. The maximum number of measured trunks that the R3 CMS will be able to monitor can be determined as follows:

$$t = 400 - \max(u - 100, 0)$$

$$t = 400 - \max(150 - 100, 0)$$

$$t = 400 - 50$$

$$t = 350$$

For this example, R3 CMS will only be able to monitor 350 measured trunks.

Determining Customer Performance and Data Requirements

You must determine the customer's performance and data requirements so that you can then determine the following:

- The computer that will refresh (update) real-time reports with optimum frequency for the customer.
- The amount of Random Access Memory (RAM) the customer must have for the computer.
- The number of disks the customer must have to store data.

Complete the Performance Requirements Worksheet (Table 2-3) and the Data Requirements Worksheet (Table 2-4) to determine customer requirements. The information asked for in these worksheets will also be useful when you use the R3 CMS configurator.

Note To ensure that the requirements you collect are useful, the customer should have a basic understanding of an ACD configuration (splits, VDNs, agents, and so on) and the various types of reports that CMS provides.

**Instructions for
Performance
Requirements
Worksheet**

- Line 1.cust** Select **yes** or **no** to determine if the customer is upgrading from R2 CMS. If you enter **yes**, also enter the customer's R2 CMS computer model.
- Line 2.cust** Enter the type of PBX that CMS will be connected to — Generic 1, System 85 R2V4, Generic 2.1, Generic 2.2, Generic 3i, or Generic 3r.
- Line 3.cust** Enter the number of terminals that will be connected to the customer's computer. These are terminals that split/group supervisors and the CMS administrator(s) will use to view reports and administer the system. The range is 1 to 64. However, the sum of the number of terminals and printers (Line 5.cust) cannot exceed 64.
- Line 4.cust** Enter the number of terminals that will be simultaneously logged into CMS. The range is 1 to 64, but the number cannot exceed the number of terminals connected to the computer, as specified in Line 3.cust.
- Line 5.cust** Enter the number of printers the customer will attach to the CMS computer. The minimum is one. The sum of the number of terminals (Line 3.cust) and printers cannot exceed 64.
- Line 6.cust** Check off each feature of CMS the customer will use. Use of these features affects performance of CMS. Vectoring, Forecasting, and Graphics are CMS features that must be purchased separately.
- Line 7.cust** Enter the number of calls the ACD will receive during the busiest hour in the day. The range is 0 to 40,000.
- Line 8.cust** Enter the customer's preferred length of intrahour interval (in minutes). This is the length of time for which real-time data accumulates before CMS archives the data into the intrahour data tables, clears out real-time data, and begins accumulating real-time data again. The recommended length is 30 minutes. The interval may also be 15 minutes or 60 minutes.
- Line 9.cust** Enter the customer's average agent service time per call (that is, the average length of time an agent spends on each call, including time in call-related after-call-work). The range is 15 to 3600 seconds.

- Line 10.CUST** Enter the average number of real-time reports that each supervisor/administrator terminal will be running at any given point in time. The recommended range is one to three. However, an individual administrator/supervisor may be assigned the capability of running up to 10 real-time reports
- Line 11.CUST** Enter the total number of real-time reports that will be running at any given point in time. This figure should equal $Line4.CUST \cdot Line10.CUST$.
- Line 12.CUST** Enter the total number of historical reports that the customer will run per hour during normal work hours. The range is 0 to 100. However, the sum of historical and forecast reports (Line 14.CUST) cannot exceed 100.
- Line 13.CUST** Enter the maximum number of historical reports that will be run simultaneously during normal work hours. The range is 0 to 200. However, the sum of historical reports, forecast reports (Line 15.CUST), and administration windows (Line 18.CUST) running simultaneously cannot exceed 200.
- Line 14.CUST** **If the customer will use Forecasting**, enter the total number of forecast reports that the customer will run per hour during normal work hours. The range is 0 to 100. However, the sum of historical and forecast reports (Line 12.CUST) cannot exceed 100.
- Line 15.CUST** **If the customer will use Forecasting**, enter the maximum number of forecast reports that will be run simultaneously during normal work hours. The range is 0 to 200. However, the sum of forecast reports, historical reports (Line 13.CUST), and administration windows (Line 18.CUST) running simultaneously cannot exceed 200.
- Line 16.CUST** Enter the maximum number of real-time exception logs that will be run simultaneously during normal work hours. The range is 0 to 60.
- Line 17.CUST** Enter the maximum number of agents that will be traced simultaneously. The range is 0 to 25.
- Line 18.CUST** Enter the maximum number of administration windows that will be run simultaneously during normal work hours. The range is 0 to 200. However, the sum of forecast reports (Line 15.CUST), historical reports (Line 13.CUST), and administration windows running simultaneously cannot exceed 200.

- Line 19.cust** Select **yes** or **no** to indicate whether the customer will be working on custom report design during busy calling periods.
- Line 20.cust** Enter the maximum number of windows that will be open for custom report design during busy calling periods. The range is 0 to 10. However, an individual administrator/supervisor can only have a maximum of four custom report design windows open at one time.
- Line 21.cust** Select **yes** or **no** to determine whether the customer will back up data during busy calling periods.
- Line 22.cust** Enter the average number of agents that will be simultaneously logged into the largest split. If the customer does not intend to run agent reports on the largest split, enter the average number of agents logged into the split whose real-time agent report will be most often run by the customer.
- Line 23.cust** Enter the average number of trunks that the largest ACD trunk group will have. If the customer does not intend to run trunk group reports on the largest trunk group, enter the average number of trunks for the trunk group whose real-time trunk group report will be most often run by the customer.
- Line 24.cust** Select **yes** or **no** to determine whether the customer will load additional non-ACD data onto CMS. This data would most likely be intended for inclusion in custom reports. Examples of types of non-ACD data might be agent costs, call revenues, or agent schedule data. However, data the customer wants to include can be anything.



Use of non-CMS software on the CMS computer is **not** recommended and is **not** supported by AT&T services personnel.

Computer Model

The number of terminals and printers the customer requires (specified in Lines 3.CUST and 4.CUST) is the first criteria for selecting a computer model. The maximum number of terminals/printers the available models can handle are as follows:

6386/25	48
6386/33	64
3B2/522	32
3B2/1000 70	64

However, regardless of whether the customer is a new customer or is an upgrade customer already in possession of a 3B2 computer, you must also complete the Refresh Rates and RAM worksheets to determine which computer is right for the customer. The following list offers general guidelines on which computer you should select to determine available refresh rates and RAM.

- **A new CMS customer** must buy a 6386/25 or 6386/33 computer. If cost is not crucial, a 6386/33 is the preferred choice since it offers approximately 25 percent greater speed than that of the 6386/25. If cost is of primary importance, first determine the available refresh rates for a 6386/25 to see if the computer will meet the customer's needs. If it will not, try the 6386/33 computer.
- **An upgrade from R2 CMS on a 3B2/310 or 3B2/400** requires the customer to upgrade to a 6386/25 or 33 computer. If cost is of primary importance, first determine the available refresh rates for a 6386/25 to see if the computer will meet the customer's needs. If it will not, try the 6386/33 computer.
- **An upgrade from R2 CMS on a 3B2/500 or 3B2/600** requires the customer to upgrade their computer. Though R3 CMS can run on a 3B2/522 or 3B2/622, **customers should be strongly encouraged to upgrade to a 6386/25**

or **6386/33**. The 6386 computers give better performance and the new purchase price of a 6386 is comparable to or less than the cost of a 500-to-522 or 600-to-622 upgrade.

Note Instructions for determining refresh rates for the 3B2/522 and 3B2/622 computers are included in this chapter in case the customer wants to try to run R3 CMS on an existing 3B2 computer.

- **An upgrade from R2 CMS on a 3B2/522 or 3B2/1000 Model 70** may allow the customer to use the existing computer for R3 CMS. However, **customers should be strongly encouraged to upgrade to a 6386/25 or 6386/33** — for the same reasons given for upgrades with 3B2/500s and 3B2/600s.

Note After you have determined that a computer will provide the necessary refresh rate, you must also determine the RAM required for that computer to ensure that the computer can supply sufficient RAM for the customer.

Table 2-4: Data Requirements

	Shift 1	Shift 2	Shift 3	Total
25.CUST Number of agents logged in:	25a.CUST	25b.CUST	25c.CUST	25d.CUST
26.CUST # times agent will login during shift:	26a.CUST	26b.CUST	26c.CUST	26d.CUST
27.CUST Number of intervals in shift:	27a.CUST	27b.CUST	27c.CUST	27d.CUST

Historical Data

ACD Element	Number in System	Days of Intra-hour Data (62 max)	Days of Daily Data (1825 max)	Weeks of Weekly Data (520 max)	Months of Monthly Data (120 max)
28.CUST Agents	(from 25d.CUST)	28b.CUST	28c.CUST	28d.CUST	28e.CUST
29.CUST Splits	29a.CUST	29b.CUST	29c.CUST	29d.CUST	29e.CUST
30.CUST Trunks	30a.CUST	30b.CUST	30c.CUST	30d.CUST	30e.CUST
31.CUST Trunk Groups	31a.CUST	31b.CUST	31c.CUST	31d.CUST	31e.CUST
32.CUST VDNs	32a.CUST	32b.CUST	32c.CUST	32d.CUST	32e.CUST
33.CUST Vectors	33a.CUST	33b.CUST	33c.CUST	33d.CUST	33e.CUST
34.CUST Call Work Codes	34a.CUST	34b.CUST	34c.CUST	34d.CUST	34e.CUST
35.CUST Number of exceptions to be saved					
36.CUST Number of agent trace records to be saved					

Forecast Data

ACD Element	Days of Data
37.CUST Splits (Historical Intra-hour data)	
38.CUST Splits (Historical Daily data)	
39.CUST Splits (Special Day Data)	
40.CUST Splits (Current Day Forecasts)	
41.CUST Splits (Current Day Admin.)	
42.CUST Trunk Groups (Historical Intra-hour and Daily data)	

Instructions For Data Requirements Worksheet

Line 25.cust For each workshift, enter the number of agents that will be simultaneously logged onto the ACD. If the PBX is a Generic 1 or 3i, the maximum is 400. If the PBX is a System 85/Generic 2/Generic 3r, the maximum is 1023. Add together the agents for all shifts. Enter the total.

Note Generic 1 and Generic 3 PBXs allow agents to be simultaneously logged into one, two, or three splits. However, CMS counts an agent for each split an agent logs into. For example, when an agent is simultaneously logged into three splits, CMS counts three agents.

Line 26.cust For each workshift, enter the average number of times an agent will log out during the shift. This number must be included because CMS creates and stores a separate agent login/logout record each time an agent logs out. The range is 1 to 9.

Line 27.cust Enter the number of intrahour intervals in each workshift. Use the following formula to determine these numbers:

$$(hours\ in\ shift) * (intervals\ per\ hour)$$

The intervals per hour can be **4** (for 15-minute intervals), **2** (for 30 minute intervals), or **1** (for 60-minute intervals).

Add together the intervals for all shifts, and enter the total.

Line 28.cust In the **Number in System** column, enter the agent total (from Line 25d.cust). Enter the number of days, weeks, and months CMS should store the various types of agent historical data. Maximums are shown in parentheses — 62 days of intrahour data, 1825 days (5 years) of daily data, 520 weeks (10 years) of weekly data, and 120 months (10 years) of monthly data.

Line 29.cust In the **Number in System** column, enter the number of CMS-measured splits on the ACD. If the PBX is a Generic 1, 3i, or 3r, the maximum is 99. If the PBX is a System 85/Generic 2, the maximum is 60. Enter the number of days, weeks, and months CMS should store the various types of split historical data.

- Line 30.cust** In the **Number in System** column, enter the number of CMS-measured trunks carrying calls to the ACD. If the PBX is a Generic 1, the maximum is 200. If the PBX is a Generic 3i, the maximum is 400. If the PBX is a System 85/Generic 2/Generic 3r, the maximum is 2000. Enter the number of days, weeks, and months CMS should store the various types of trunk historical data.
- Line 31.cust** In the **Number in System** column, enter the number of CMS-measured trunk groups carrying calls to the ACD. If the PBX is a Generic 1/Generic 3i, the maximum is 99. If the PBX is a System 85/Generic 2, the maximum is 238. If the PBX is a Generic 3r, the maximum is 255. Enter the number of days, weeks, and months CMS should store the various types of trunk group historical data.
- Line 32.cust** In the **Number in System** column, enter the number of CMS-measured VDNs on the ACD. If the PBX is a Generic 3i, the maximum is 500. If the PBX is a System 85/Generic 2/Generic 3r, the maximum is 2000. Enter the number of days, weeks, and months CMS should store the various types of VDN historical data.
- Line 33.cust** In the **Number in System** column, enter the number of vectors on the ACD. If the PBX is a Generic 3i, the maximum is 256. If the PBX is a System 85/Generic 2.1, the maximum is 128. If the PBX is a Generic 2.2, the maximum is 511. If the PBX is a Generic 3r, the maximum is 512. Enter the number of days, weeks, and months CMS should store the various types of vector historical data.
- Line 34.cust** In the **Number in System** column, enter the number of unique call work codes agents will use. Call work codes apply only for the Generic 2.2 and Generic 3 PBXs. The maximum number of call work codes is 1999. Enter the number of days, weeks, and months CMS should store the various types of call work code data.
- Line 35.cust** Enter the number of exceptions the customer will want to save on disk for each category of exception (split, agent, trunk group, and so on). The range is 0 to 2000.

Line 36.cust Enter the number of agent trace records the customer will want to save on disk. **CMS stores one record each time an agent changes status (for example, when the agent answers an ACD call, when the agent goes into after-call-work, when the agent goes into AUX work, and so on).** The range is 0 to 99,999. The number of records the customer will want to save can be determined roughly with the following formula:

$$(\# \text{ of agents traced}) * (\# \text{ of days traces saved}) * 1920$$

where 1920 assumes one incoming call per minute for an agent being traced and an average of four status changes (available → ringing → on ACD call → in after-call-work → available) per call.

Note Lines 37.cust through 42.cust should be completed only if the customer has and intends to use the Forecasting feature.

Line 37.cust Enter the number of days of intrahour split data CMS should store for use in generating forecasts. The range is 0 to 365 days. The recommended number is 28.

Line 38.cust Enter the number of days of daily split data CMS should store for use in generating forecasts. The range is 0 to 784 days. The recommended number is 392.

Line 39.cust Enter the number of special days CMS should store for use in generating Special Day Forecasts. Special days are days that represent a model day (like the day after Thanksgiving or a special promotion day) that may recur in the future. The range is 0 to 200. The recommended number is 15.

Line 40.cust Enter the number of Current Day Forecasts CMS should save. Current Day Forecasts are the actual output CMS creates. The range is 0 to 365 days. The recommended number is 31.

Line 41.cust Enter the number of Current Day Configurations CMS should save. A Current Day Configuration is a set of administered parameters CMS uses to run a Current Day Forecast. The minimum is one. The maximum is the total number of splits.

Line 42.cust Enter the number of days of intrahour and daily trunk group data CMS should store for forecast calculations. The range is 35 to 397 days.

Determining Report Refresh Rates

You can determine the best refresh rates (that is, the shortest length of time between refreshes of real-time reports) a customer can get on a specified computer in any of three ways:

- Using the R3 CMS Configurator
- Using the Real-time Refresh Program
- Using the Refresh Rate Worksheets

The latter two methods are described in the following sections.

Using the Real-time Refresh Program

The Real-time Refresh program is distributed electronically from the Technical Marketing Center (TMC). Your computer or another computer in your sales office should store this program. The program calculates the best (shortest) refresh rates a customer's users can get in CMS real-time reports. The program bases its calculations on a selected computer and information specified in the customer's Performance Requirements and Data Requirements Worksheets.



Use this program **only if** one of the following situations exists:

- The R3 CMS Configurator does not show a 30-second or shorter refresh rate for real-time reports, but the customer might be willing to accept worse refresh rates after examining potential trade-offs and report-specific rates.
- The customer wants to know precisely what the shortest possible refresh rates are.

Options of the Real-time Refresh Program

The program gives you two basic options for finding refresh rates:

- **Different periods**

The program finds the best possible refresh rate for each type of report. The best refresh rate for one type of report will normally differ slightly, and sometimes a lot, from the best rate for another type of report. Appropriate use of these varying refresh rates will stabilize use of the computer's central processing unit (CPU), assuming the following things are true:

- The total number of real-time reports that are simultaneously running remains constant.
- Each report is running with the best refresh rate for its type.

This means that the mix of report types running can change and the best possible refresh rates will still be valid.

For example, the program might determine that any Agent report can be run at a 26 second refresh rate, any Group report can be run at a 45 second refresh rate, and any Split report can be run at a 23 second refresh rate. Then, if the total real-time reports running at any one time is 15, CMS can maintain these refresh rates if all 15 reports are Agent reports, if all 15 reports are Group reports, or if the 15 reports consist of 5 Agent reports, 5 Group reports, and 5 Split reports (or any other mix).

With this option, the program also lets you define refresh rates for a number of **preferential reports** (reports that the customer wants to **refresh more often** than the best rate). The program also asks you to give it a number of **sacrificial reports** (reports that should **refresh less often** than the best rate). The program will then tell you how often each type of preferential report can refresh and how often each type of sacrificial report can refresh.

Note Preferential reports and sacrificial reports can be of the same type (for example, the Agent report). That is, the customer could run a total of 15 reports, 10 of which could be Agent reports and 5 of which could be Group reports. Then, out of the 10 Agent reports, the customer could potentially run 5 preferential reports (for supervisors of high volume splits) and 5 sacrificial reports (for supervisors of low volume splits).

- **Single period**

The program finds one best refresh rate that applies to all reports that are running. For this option, you must specify the exact number of reports of each type (that is, how many Agent reports, how many Split reports, how many Vector reports, and so on) the customer will be running simultaneously. The program then will find a single best refresh rate that applies to all the reports, regardless of the type.

For example, the program might determine that if the customer will be running 30 Agent reports and 30 Split Status reports simultaneously — and **no** others, all reports can refresh at 29 seconds. However, if the mix of reports were to change to 25 Agent reports and 35 Split Status reports, the overall refresh rate would change.

Running the Program

Use the following steps to determine refresh rates using the Real-time Refresh program.

1. Complete the Feature/Performance Requirements and Data Requirements Worksheets for the customer.
2. Log into the UNIX system on your computer.
3. Access a UNIX system directory where you have write permissions.
4. Type the full pathname of the directory where the program resides, plus `/realtime`, as shown in the following illustration.

```
$ directory_pathname/realtime
```

The following prompt appears:

```
enter customer name, or just  
hit return if it's not known:
```

5. Enter the customer's name and press [**Return**].
6. Continue to enter data according to the program's instructions. The data you enter is based on the Feature/Performance Requirements and Data Requirements Worksheets.
 - You can exit the program at any time by pressing [**Delete**] or, on some terminals, by pressing [**Break**].

- Some questions and prompts require you to enter multiple values. For these questions, always include a space between values. For example, look at the values input in the following illustration:

```
Enter # of agents, # of splits, and # of VDN's: 200 40 200
200 agents, 40 splits, 200 VDNs.
```

Do not add punctuation between values.

- Use [**Back Space**] to erase characters in a field.
- If you want to go back to the previous question to change your response, type **-1** in the current field. The previous
- If you want to find preferential refresh rates, you must enter a factor as a decimal (a positive number less than 1) by which the program will speed up refresh rates. For example, **.5** would cut a refresh rate of 28 seconds to 14 seconds ($.5 \cdot 28$). **.75** would cut a 28-second refresh rate to 21 seconds ($.75 \cdot 28$).

7. To save output to a file, you must exit the program by answering the final prompts with **n**. The final prompts are:

```
do you want to change the number of reports? (y or n):  
do you want to analyze another case? (y or n):
```

The final output lists the shortest refresh rates the customer can get for all reports. The program sends the refresh rate input and output to a file with the customer's name and the prefix **r**. . In addition, the program sends only the configuration data you entered to another file with the customer's name and the prefix **c.r**. . If you do not enter a customer name, the program will save refresh rate output to a file called **refresh** and the configuration output to a file called **c.refresh**.

Note If you exit the program with [**Delete**], the program will **not** complete the output file and will not create the configuration file.

Printing Output From the Real-time Refresh Program

1. Print the refresh rate output with the following command:

```
$ lp refresh  
or  
$ lp r.<customer_name>
```

Note To print the output, you must still be in the UNIX directory you were in when you ran the program.

Using the Refresh Rate Worksheets

Use the following Refresh Rate Worksheets to manually determine the best refresh rates a customer can get for a given computer. These worksheets give the same results that are given by the Real-time Refresh Program.

You complete the worksheets in two or more phases:

1. Determine the computer's processor occupancy available for report refreshes.
2. Determine the shortest refresh rate in one of the following forms:
 - **Different rates** for each type of real-time report (see the description of "Different periods" for the Real-time Refresh Program). This option also allows you to **trade off** refresh rates between reports (that is, to determine faster refresh rates for some reports and slower rates for other reports).
 - **A single rate** that applies to all types of real-time reports (see the description of "Single period" for the Real-time Refresh Program).

You must use information collected on the Performance/Data Worksheets to find the shortest refresh rates.

**Processor Occupancy
On a 6386/25 WGS
Computer**

Complete the following worksheet to determine the processor occupancy that is available on a 6386/25 for real-time report refreshes. Then complete either the Different Refresh Rates Worksheet (Table 2-8) or the Single Refresh Rate Worksheet (Table 2-9).

Table 2-5: Processor Occupancy Worksheet for 6386/25 WGS

1.REF	SPI processor occupancy (at 1000 calls per hour)	$.002 + (.00068) + (.00104) =$	<small>normal SPI occ</small> <small>only if vectoring is optioned</small> <small>only if exceptions used</small> <small>Total</small>
2.REF	Processor occupancy due to archiving intrahour data	$.525 /$	<small>from Line 8.CUST</small> <small>Total</small>
3.REF	Processor occupancy due to running historical/forecast reports	$.0024 * ($	<small>from Line 12.CUST</small> <small>from Line 14.CUST</small> <small>Total</small>
4.REF	Processor occupancy due to SPI	$.235 + (.00042 *$	<small>from Line 1.REF</small> <small>from Line 7.CUST</small> <small>Total</small>
5.REF	Processor occupancy due to agent traces	$(.00798 *$	<small>from Line 17.CUST</small> <small>from Line 9.CUST</small> <small>Total</small>
6.REF	Processor occupancy available for real-time report refresh	$0.5 -$	<small>from Line 2.REF</small> <small>from Line 3.REF</small> <small>from Line 4.REF</small> <small>from Line 5.REF</small> <small>Total</small>

**Instructions For 6386/25
Processor Occupancy
Worksheet**

Note Use this worksheet to determine the processor occupancy available on a 6386/25 computer for real-time report refreshes. This is the first phase in determining if the 6386/25 can offer the customer acceptable refresh rates.

Line 1.REF Find the sum of .002 and any or all of the other Switch Processor Interface (SPI)* occupancy values (in parentheses) that apply to the customer's feature usage. Add **only** values for those features the customer intends to use.

* SPI is the part of the CMS software that sends messages to and receives messages from the PBX about calls. When a large number of CMS/ACD options are working, SPI becomes very busy. When SPI is busy, it uses a lot of processor power.

- Line 2.REF** In the indicated blank, enter the length of the customer's preferred intrahour reporting interval (from line 8.CUST of the worksheets). Find the quotient of $\frac{.525}{Line_{8.CUST}}$.
- Line 3.REF** In the indicated blanks, enter the number of historical reports (from Line 12.CUST of the worksheets) and forecast reports (from Line 14.CUST of the worksheets) that will be run per hour. Find the product of $.0024 \cdot (Line_{12.CUST} + Line_{14.CUST})$.
- Line 4.REF** In the indicated blanks, enter the total from Line 1.REF and the number of busy-hour calls (from Line 7.CUST in the worksheets). Find the product of $.0235 + (.00042 \cdot Line_{1.REF} \cdot Line_{7.CUST})$.
- Line 5.REF** In the indicated blanks, enter the number of agent traces that will be running simultaneously (from Line 17.CUST in the worksheets) and the average agent service time (from Line 9.CUST). Find the quotient of $\frac{.00798 \cdot Line_{17.CUST}}{Line_{9.CUST}}$.
- Line 6.REF** In the indicated blanks, enter the values from Lines 2.REF, 3.REF, 4.REF, and 5.REF. Find the remainder of $.5 - Line_{2.REF} - Line_{3.REF} - Line_{4.REF} - Line_{5.REF}$.

Line 6.REF is the processor occupancy available on the 6386/25 for report refreshes. To determine available refresh rates, see either "Determining Different Refresh Rates" or "Determining A Single Refresh Rate" later in this section.

**Processor Occupancy
On 6386/33 WGS
Computer**

Complete the following worksheet to determine the processor occupancy that is available on a 6386/33 for real-time report refreshes. Then complete either the Different Refresh Rates Worksheet (Table 2-8) or the Single Refresh Rate Worksheet (Table 2-9).

Table 2-6: Processor Occupancy Worksheet for 6386/33 WGS

1.REF	SPI processor occupancy (at 1000 calls per hour)	$.002 + (.00068) + (.00104) =$	<small>normal SPI occ</small> <small>only if vectoring is optioned</small> <small>only if exceptions used</small> <small>Total</small>
2.REF	Processor occupancy due to archiving intrahour data	$.4 /$	<small>from Line 8.CUST</small> <small>Total</small>
3.REF	Processor occupancy due to running historical/forecast reports	$.0018 * ($	<small>from Line 12.CUST</small> <small>from Line 14.CUST</small> <small>Total</small>
4.REF	Processing occupancy due to SPI	$.0179 + (.00032 *$	<small>from Line 1.REF</small> <small>from Line 7.CUST</small> <small>Total</small>
5.REF	Processor occupancy due to agent traces	$(.00608 *$	<small>from Line 17.CUST</small> <small>from Line 9.CUST</small> <small>Total</small>
6.REF	Processor occupancy available for real-time report refresh	$0.5 -$	<small>from Line 2.REF</small> <small>from Line 3.REF</small> <small>from Line 4.REF</small> <small>from Line 5.REF</small> <small>Total</small>

**Instructions For 6386/25
Processor Occupancy
Worksheet**



Use this worksheet to determine the processor occupancy available on a 6386/33 computer for real-time report refreshes. This is the first phase in determining if the 6386/33 can offer the customer acceptable refresh rates.

Line 1.REF Find the sum of .002 and any or all of the other Switch Processor interface (SPI)* occupancy values (in parentheses) that apply to the customer's feature usage. Add **only** values for those features the customer intends to use.

* SPI is the part of the CMS software that sends messages to and receives messages from the PBX about calls. When a large number of CMS/ACD options are working, SPI becomes very busy. When SPI is busy, it uses a lot of processor power.

- Line 2.REF** In the indicated blank, enter the length of the customer's preferred intrahour reporting interval (from line 8.CUST of the worksheets). Find the quotient of $\frac{.4}{Line_{8.CUST}}$.
- Line 3.REF** In the indicated blanks, enter the number of historical reports (from Line 12.CUST of the worksheets) and forecast reports (from Line 14.CUST of the worksheets) that will be run per hour. Find the product of $.0018 \cdot (Line_{12.CUST} + Line_{14.CUST})$.
- Line 4.REF** In the indicated blanks, enter the total from Line 1.REF and the number of busy-hour calls (from Line 7.CUST in the worksheets). Find the product of $.0179 + (.00032 \cdot Line_{1.REF} \cdot Line_{7.CUST})$.
- Line 5.REF** In the indicated blanks, enter the number of agent traces that will be running simultaneously (from Line 17.CUST in the worksheets) and the average agent service time (from Line 9. CUST). Find the quotient of $\frac{.00608 \cdot Line_{17.CUST}}{Line_{9.CUST}}$.
- Line 6.REF** In the indicated blanks, enter the values from Lines 2.REF, 3.REF, 4.REF, and 5.REF. Find the remainder of $.5 - Line_{2.REF} - Line_{3.REF} - Line_{4.REF} - Line_{5.REF}$.

Line 6.REF is the processor occupancy available on the 6386/33 for report refreshes. To determine available refresh rates, go to either "Determining Different Refresh Rates" or "Determining A Single Refresh Rates" later in this section.

**Processor Occupancy
On a 3B2/522/622/1000
70 Computer**

Complete the following worksheet to determine the processor occupancy that is available on a 3B2/522/622/1000 70 for real-time report refreshes. Then complete either the Different Refresh Rates Worksheet (Table 2-8) or the Single Refresh Rate Worksheet (Table 2-9).

Table 2-7: Processor Occupancy Worksheet for 3B2/522/622 1000 70

1.REF	SPI processor occupancy (at 1000 calls per hour)	$.002 + (.00068) + (.00104) =$	normal SPI occ only if vectoring is optioned only if exceptions used Total
2.REF	Processor occupancy due to archiving intrahour data	$.975 /$	from Line 8.CUST Total
3.REF	Processor occupancy due to running historical/forecast reports	$.0044 * ($	from Line 12.CUST from Line 14.CUST Total
4.REF	Processing occupancy due to SPI	$.0437 + (.00078 *$	from Line 1.REF from Line 7.CUST Total
5.REF	Processor occupancy due to agent traces	$(.0148 *$	from Line 17.CUST from Line 9.CUST Total
6.REF	Processor occupancy available for real-time report refresh	$0.5 -$	from Line 2.REF from Line 3.REF from Line 4.REF from Line 5.REF Total

**Instructions For
3B2/522/622/1000 70
Processor Occupancy
Worksheet**



Use this worksheet to determine the processor occupancy available on a 3B2/522/622/1000 70 computer for real-time report refreshes. This is the first phase to determining if the 3B2 can offer the customer acceptable refresh rates.

Line 1.REF Find the sum of .002 and any or all of the other Switch Processor Interface (SPI)* occupancy values (in parentheses) that apply to the customer's feature

* SPI is the part of the CMS software that sends messages to and receives messages from the PBX about calls. When a large number of CMS/ACD options are working, SPI becomes very busy. When SPI is busy, it uses a lot of processor power.

usage. Add **only** values for those features the customer intends to use.

Line 2.REF In the indicated blank, enter the length of the customer's preferred intrahour reporting interval (from line 8.CUST of the worksheets). Find the quotient of $\frac{.975}{Line_{8.CUST}}$.

Line 3.REF In the indicated blanks, enter the number of historical reports (from Line 12.CUST of the worksheets) and forecast reports (from Line 14.CUST of the worksheets) that will be run per hour. Find the product of $.0044 \cdot (Line_{12.CUST} + Line_{14.CUST})$.

Line 4.REF In the indicated blanks, enter the total from Line 1.REF and the number of busy-hour calls (from Line 7.CUST in the worksheets). Find the product of $.0437 + (.00078 \cdot Line_{1.REF} \cdot Line_{7.CUST})$.

Line 5.REF In the indicated blanks, enter the number of agent traces that will be running simultaneously (from Line 17.CUST in the worksheets) and the average agent service time (from Line 9.CUST). Find the quotient of $\frac{.0148 \cdot Line_{17.CUST}}{Line_{9.CUST}}$.

Line 6.REF In the indicated blanks, enter the values from Lines 2.REF, 3.REF, 4.REF, and 5.REF. Find the remainder of $.5 - Line_{2.REF} - Line_{3.REF} - Line_{4.REF} - Line_{5.REF}$.

Line 6.REF is the processor occupancy available on the 3B2 for report refreshes. To determine available refresh rates, go to either "Determining Different Refresh Rates" or "Determining A Single Refresh Rate" later in this section.

Determining Different Refresh Rates Complete the following worksheet to determine the best (fastest) refresh rate for each type of real-time report.

Table 2-8: Different Minimum Refresh Rates Worksheet

7.REF Preliminary Refresh period (in seconds) for the average real-time report $(\frac{\text{Computer Factor} \times \text{from Line 11.CUST}}{\text{from Line 6.REF}}) = \text{---}$

8.REF Minimum Refresh Rate For Each Report Type

Split Status $\text{from Line 7.REF} \times (0.373 + (0.012 \times (\text{from Line 22.CUST} - 10))) = \text{--- seconds}$

Split $\text{from Line 7.REF} \times [0.373 + (0.012 \times (\text{splits per report} - 10)) + (0.000206 \times (\text{splits per report} - 6)^2)] = \text{--- seconds}$

Split Call Profile $\text{from Line 7.REF} \times 0.349 = \text{--- seconds}$

Agent $\text{from Line 7.REF} \times (0.353 + (0.016 \times (\text{from Line 22.CUST} - 10))) = \text{--- seconds}$

Group $\text{from Line 7.REF} \times (0.351 + (0.016 \times (\text{from Line 22.CUST} - 10))) = \text{--- seconds}$

Queue/Agent Summary $\text{from Line 7.REF} \times 0.14 = \text{--- seconds}$

Trunk Group $\text{from Line 7.REF} \times [0.373 + (0.012 \times (\text{from Line 23.CUST} - 10)) + (0.000036 \times (\text{---} - 6))] = \text{--- seconds}$

Event Count Summary $\text{from Line 7.REF} \times (0.368 + (0.020 \times (\text{from Line 22.CUST} - 10))) = \text{--- seconds}$

Graph Split $\text{from Line 7.REF} \times 0.205 = \text{--- seconds}$

Graph Queue $\text{from Line 7.REF} \times 0.224 = \text{--- seconds}$

Graph Split Call Profile $\text{from Line 7.REF} \times 0.432 = \text{--- seconds}$

Graph VDN Call Profile $\text{from Line 7.REF} \times 0.4 = \text{--- seconds}$

Vector $\text{from Line 7.REF} \times [0.373 + (0.012 \times (\text{vectors per report} - 10)) + (0.000035 \times (\text{vectors per report} - 6)^2)] = \text{--- seconds}$

VDN $\text{from Line 7.REF} \times [0.373 + (0.012 \times (\text{VDNs per report} - 10)) + (0.000049 \times (\text{VDNs per report} - 6)^2)] = \text{--- seconds}$

VDN Call Profile $\text{from Line 7.REF} \times 0.334 = \text{--- seconds}$

Instructions For Different Refresh Rates Worksheet

Line 7.REF In the indicated blank, enter the computer factor for the computer for which you are determining refresh rates. The factor for each computer is as follows:

Computer	Factor
6386/25	.42
6386/33	.32
3B2/522/622/1000 70	.78

Find the quotient of $\frac{\text{computer_factor} \cdot \text{Line}_{11.CUST}}{\text{Line}_{6.REF}}$.

Line 8.REF For each report type listed, enter the data indicated for the blanks, and find the product of the calculation. The product of the calculation is the best (or fastest) refresh rate the customer will get for that type of report and still maintain a stable load on the computer. A stable load means that the customer can run as many reports of a particular type as desired at the determined refresh rate, and the computer's performance will be unaffected. However, if the **total** number of reports the customer will run simultaneously (from Line 11.CUST) changes, the best refresh rates for each report type and/or the computer's performance will change.

Note The R3 CMS Configurator determines a refresh rate for the Agent report only, and uses that rate as its benchmark for whether a computer can provide satisfactory refresh rates for the customer.

If **Line 8.REF rates are equal to or less than 30 seconds**, the upgrade customer may run R3 CMS on the computer.

If Line 8.REF rates are greater than 30, the customer cannot get the recommended performance on this computer. The customer must either:

- Upgrade to a faster computer.
- Reduce feature requirements. Reductions that would improve refresh rates are as follows (from most significant to least significant):
 - Fewer real-time reports
 - Fewer hourly historical/forecast reports
 - Fewer agent traces.

Consult with the customer to see if feature requirements can be reduced, **or** to determine how report refresh rates can be traded off to get faster refresh rates for some reports and slower rates for others, continue with 9.REF through 13.REF.

Trading Off Report Refresh Rates

Complete the Refresh Rate Tradeoff Worksheet to determine how much slower some reports must run when the customer runs other reports at faster refresh rates.

Table 2-9: Refresh Rate Tradeoff Worksheet

9.REF Number of Reports To Have Faster Refresh Rates -----

10.REF Number of Reports With Slower Refresh Rates -----

11.REF Factor for Faster Refresh Rates -----

12.REF Factor for Slower Refresh Rates $(\frac{\text{from Line 10.REF}}{\text{from Line 11.REF}} * \text{-----}) / [(\frac{\text{from Line 10.REF}}{\text{from Line 11.REF}} * \text{-----}) - \frac{\text{from Line 9.REF}}{\text{from Line 11.REF}} * (1 - \text{-----})] = \text{-----}$

13.REF Reports with refresh rate tradeoffs

Type of Report	With Faster Refresh Rates		With Slower Refresh Rates		With No Tradeoff
	a. Number of Reports	b. New Best Refresh Rate	c. Number of Reports	d. New Best Refresh Rate	e. Number of Reports
Split Status					
Split					
Split Call Profile					
Agent					
Group					
Queue/Agent Summary					
Trunk Group					
Event Count Summary					
Graph Split					
Graph Queue					
Graph Split Call Profile					
Graph VDN Call Profile					
Vector					
VDN					
VDN Call Profile					

Instructions for Refresh Rate Tradeoff Worksheet

Line 9.REF Enter the number of reports for which the customer wants a faster refresh rate than the best rate(s) found in Line 8.REF.

Line 10.REF Enter the number of reports for which the customer wants a slower refresh rate than the best rate found in Line 8.REF. These are the reports whose refresh rates are traded off in order to allow the number of reports specified in Line 9.REF to refresh faster.

Line 11.REF Enter a factor, as a decimal less than 1, to specify how much faster the customer wants the faster reports to run. For example, .5 means the reports will refresh twice as fast. .25 means the reports will refresh 4 times as fast.

Line 12.REF Enter the data indicated for the blanks, and find the product of the calculation

$$\frac{(Line_{10.REF} \cdot Line_{11.REF})}{(Line_{10.REF} \cdot Line_{11.REF}) - [Line_{9.REF} \cdot (1 - Line_{11.REF})]}$$

This is the factor to specify how much slower the tradeoff reports should run. For example, 2.0 would mean the reports should run twice as slowly.

Line 13.REF In Column **a.** of the table, enter the number of reports of each type the customer wants to run faster than the best rate. In Column **b.**, enter the faster tradeoff refresh rate for each report type. For any particular report type, the faster refresh rate is determined with the calculation

$$Line_{11.REF} \cdot Line_{8.REF}$$

where $Line_{8.REF}$ is the best refresh rate for the particular report type found under Line 8.REF.

In Column **c.** of the table, enter the number of reports of each type the customer wants to run slower than the best rate. In Column **d.**, enter the slower tradeoff refresh rate for each report type. For any particular report type, the slower refresh rate is determined with the calculation

$$Line_{12.REF} \cdot Line_{8.REF}$$

where $Line_{8.REF}$ is the best refresh rate for the particular report type found under Line 8.REF.

In Column **e.**, enter the number of reports of each type the customer wants to run at the best refresh rate found in Line 8.REF. The total number of reports specified across Columns **a.**, **c.**, and **e.** cannot exceed the total number of reports the customer will be running simultaneously (as specified on Line 11.CUST in the Performance Requirements Worksheet).

Note A number of preferential reports and sacrificial reports can be of the same type (for example, the Agent report). That is, the customer could run a total of 15 reports, 10 of which could be Agent reports and 5 of which could be Group reports. Then, out of the 10 Agent reports, the customer could potentially run 5 preferential reports (for supervisors of high volume splits) and 5 sacrificial reports for supervisors of low volume splits).

Determining A Single Refresh Rate

Complete the following worksheet to find a single minimum refresh rate that will apply to any real-time report, regardless of type.

Table 2-10: Single Refresh Rate Worksheet

7.REF a. Split Status $\frac{\text{Number of reports}}{\text{Total}} * (0.373 + (0.012 * (\frac{\text{from Line 22.CUST}}{\text{Number of reports}} - 10))) = \text{Total}$

b. Split $\frac{\text{Number of reports}}{\text{Total}} * [0.373 + (0.012 * (\frac{\text{splits per report}}{\text{Number of reports}} - 10)) + (0.000206 * (\frac{\text{splits per report}}{\text{Number of reports}} - 6)^2)] = \text{Total}$

c. Split Call Profile $\frac{\text{Number of reports}}{\text{Total}} * 0.349 = \text{Total}$

d. Agent $\frac{\text{Number of reports}}{\text{Total}} * (0.353 + (0.016 * (\frac{\text{from Line 22.CUST}}{\text{Number of reports}} - 10))) = \text{Total}$

e. Group $\frac{\text{Number of reports}}{\text{Total}} * (0.351 + (0.016 * (\frac{\text{from Line 22.CUST}}{\text{Number of reports}} - 10))) = \text{Total}$

f. Queue/Agent Summary $\frac{\text{Number of reports}}{\text{Total}} * 0.14 = \text{Total}$

g. Trunk Group $\frac{\text{Number of reports}}{\text{Total}} * [0.373 + (0.012 * (\frac{\text{from Line 23.CUST}}{\text{Number of reports}} - 10)) + (0.000036 * (\frac{\text{from Line 23.CUST}}{\text{Number of reports}} - 6)^2)] = \text{Total}$

h. Event Count Summary $\frac{\text{Number of reports}}{\text{Total}} * (0.368 + (0.020 * (\frac{\text{from Line 22.CUST}}{\text{Number of reports}} - 10))) = \text{Total}$

i. Graph Split $\frac{\text{Number of reports}}{\text{Total}} * 0.205 = \text{Total}$

j. Graph Queue $\frac{\text{Number of reports}}{\text{Total}} * 0.224 = \text{Total}$

k. Graph Split Call Profile $\frac{\text{Number of reports}}{\text{Total}} * 0.432 = \text{Total}$

l. Graph VDN Call Profile $\frac{\text{Number of reports}}{\text{Total}} * 0.4 = \text{Total}$

m. Vector $\frac{\text{Number of reports}}{\text{Total}} * [0.373 + (0.012 * (\frac{\text{vectors per report}}{\text{Number of reports}} - 10)) + (0.000035 * (\frac{\text{vectors per report}}{\text{Number of reports}} - 6)^2)] = \text{Total}$

n. VDN $\frac{\text{Number of reports}}{\text{Total}} * [0.373 + (0.012 * (\frac{\text{VDNs per report}}{\text{Number of reports}} - 10)) + (0.000049 * (\frac{\text{VDNs per report}}{\text{Number of reports}} - 6)^2)] = \text{Total}$

o. VDN Call Profile $\frac{\text{Number of reports}}{\text{Total}} * 0.334 = \text{Total}$

8.REF Refresh period (in seconds) for the average real-time report $(\frac{\text{Computer Factor} * \text{Total of Lines 7.REF a. to o.}}{\text{from Line 6.REF}}) / \text{Total} = \text{Total}$

Instructions for Single Refresh Rate Worksheet

Line 7.REF For each report type listed, enter the data indicated for the blanks, and find the product of the calculation. For each report type, the blank labeled **Number of reports** contains the number of reports of that type that will be running simultaneously. The total number of reports specified in the **Number of reports** blanks for Lines 7.REFa. through 7.REFo. should not exceed the total number of reports specified in Line 11.CUST in the Performance Requirements Worksheet.

If the customer will not normally run a specific report type, enter 0 in the **Total** blank for that report type.

Line 8.REF In the indicated blank, enter the computer factor for the computer for which you are determining refresh rates. The factor for each computer is as follows:

6386/25 .42

6386/33 .32

3B2/522/622/1000 70 .78

Find the sum of the totals from Lines 7.REFa through 7.REFo and enter the sum in the blank indicated. Find the product of $\frac{\text{computer_factor} \cdot \text{Line}_{\text{Lines 7.REFa-o}}}{\text{Line}_{6.REF}}$.

This is the refresh rate for all reports, regardless of type. All reports can refresh at this rate if the number of reports of each type remains constant. If the number of reports of a particular type changes, however, the single refresh rate will no longer be accurate.

Determining RAM Requirements

You can determine the amount of random access memory (RAM) a computer needs to meet the customer's performance requirements using either of two methods:

- Using the R3 CMS Configurator
- Using the RAM Program.

The latter method is described in the following section.

Using the RAM Program

The RAM program is distributed electronically from the Technical Marketing Center (TMC). Your computer or another computer in your sales office should store this program. The program calculates the minimum amount of RAM needed for a customer's CMS computer. The program bases its calculations on a selected computer and information specified in the Feature/Performance Requirements and Data Requirements Worksheets.

- Note** Use this program **only if** one of the following situations exists:
- The R3 CMS Configurator shows more RAM is required than is possible on the customer's prospective CMS computer, but the customer might be willing to accept a slightly lower performance or fewer terminals after examining potential trade-offs.
 - The customer wants to know precisely how much RAM is required.

Running the Program

Use the following steps to determine RAM using the RAM program.

1. Complete the Feature/Performance Requirements and Data Requirements Worksheets for the customer.
2. Log into the UNIX system on your computer.
3. Access a UNIX system directory where you have write permissions.
4. Type the full pathname of the directory where the program resides, plus `/ram`, as shown in the following illustration.

```
$ directory_pathname/ram
```

The following prompt appears:

```
enter customer name, or just  
hit return if it's not known:
```

5. Enter the customer's name and press [**Return**].

6. Continue to enter data according to the program's instructions. The data you enter is based on the Feature/Performance Requirements and Data Requirements Worksheets.
 - You can exit the program at any time by pressing [**Delete**].
 - Some questions and prompts require you to enter multiple values. For these questions, always include a space between values. For example, look at the values input in the following illustration:

```
Enter # or splits, trunk groups, and trunks: 40 40 250
```

Do not add punctuation between values.

- Use [**Back Space**] to erase characters in a field.
 - If you want to go back to the previous question to change your response, type **-1** in the current field. The previous question will reappear.
7. To save output to a file, you must exit the program by answering the final prompt with **n**. The final prompt is:

```
do you want to run another case? (y or n):
```

The final output lists the estimated memory (RAM) the customer will use, as well as the recommended minimum amount of RAM the customer should have. (Of course, since RAM is sold in specific increments, you should round the recommended RAM up to the next increment of RAM that can be purchased.)

The program sends the RAM output to a file with the customer's name and the prefix `m.` . The program sends the configuration data you entered to another file with the customer's name and the prefix `c.m.` . If you do not enter a customer name, the program will save RAM output to a file called `memory` and the configuration output to a file called `c.memory`.

Note If you exit the program with [Delete], the program will **not** send output to a file.

Printing Output From the RAM Program

1. Print the RAM output with the following command:

```
$ lp memory  
or  
$ lp m.<customer_name>
```

Note To print the output, you must still be in the UNIX directory you were in when you ran the program.

Determining Disk Storage Requirements

You can determine the disk storage a customer needs in any of three ways:

- Using the R3 CMS Configurator
- Using the Disk Program
- Using the Disk Storage Worksheets.

The latter two methods are described in the following sections.

Using the Disk Program

The Disk program is distributed electronically from the Technical Marketing Center (TMC). Your computer or another computer in your sales office should store this program. The program calculates the minimum amount of disk space a customer needs on their CMS computer. The program bases its calculations on a selected computer and information specified in the Feature/Performance Requirements and Data Requirements Worksheets.

Disk Space Allocation

The program not only determines the megabytes (MB) of disk space the customer will need, but also hypothetically allocates data to the required number of disks. The program must hypothetically allocate data in order to determine how many disks the customer needs. This allocation is necessary for two reasons:

1. UNIX, CMS, and other software packages use a significant portion of space on the first disk, and on the second, if there is one. Thus, much of the disk space on Disk 1 (and Disk 2) is used before any data is stored.
2. A given type of data (agent data, split data, VDN data, and so on) must be stored together on a single disk. Data of a specific type cannot be divided up between disks. Thus, if a type of data (for example, agent data) requires a very large amount of disk space, the data will probably not fit on Disk 1 and may, in fact, only fit on a disk dedicated to that type of data. This means that the customer may need a number of disks, even though some of those disks may have a significant amount of unused space.

For example, the disk allocation may determine that the customer needs four disks (which, on a 6386 computer, is a total of 3,300 MB), even though the total data the customer will store is only 2,200 MB.

The program actually determines allocation of data to disk in three different ways:

- DOSS Output** This disk allocation matches the allocation performed by the R3 CMS configurator.
- Tightest Fit** This disk allocation maximizes the use of the lowest numbered disks (1, 2, 3, and so on). This allocation is useful if you want to see if reducing stored data might eliminate the need for the last disk.
- Loosest Fit** This disk allocation spreads out the distribution of data so that unused space is also more evenly distributed among disks. This is the most effective allocation of data, once the number of required disks is accepted by the customer.

Running the Program

Use the following steps to determine disk space using the Disk program.

1. Complete the Feature/Performance Requirements and Data Requirements Worksheets for the customer.
2. If the customer will use the Pseudo-ACD capability, determine the number of megabytes of pseudo-ACD data the customer will want to store.
3. Log into the UNIX system on your computer.
4. Access a UNIX system directory where you have write permissions.
5. Type the full pathname of the directory where the program resides, plus `/disk`, as shown in the following illustration.

```
$ directory_pathname/disk
```

The following prompt appears:

```
enter customer name, or just  
hit return if it's not known:
```

6. Enter the customer's name and press [**Return**].
7. Continue to enter data according to the program's instructions. The data you enter is based on the Feature/Performance Requirements and Data Requirements Worksheets.
 - You can exit the program at any time by pressing [**Delete**].
 - Some questions and prompts require you to enter multiple values. For these questions, always include a space between values. For example, look at the values input in the following illustration:

```
Enter # of splits, trunk groups, and trunks: 40 40 250
```

- Do not** add punctuation between values.
- Use [**Back Space**] to erase characters in a field.
 - If you want to go back to the previous question to change your response, type **-1** in the current field. The previous question will reappear.
8. To save output to a file, you must exit the program by answering the final prompt with **n**. The final prompt is:

```
do you want to run another case? (y or n):
```

The final output lists the estimated disk space the customer's data will use, the number of disks required and how the data should be allocated to those disks.

The program sends the disk output to a file with the customer's name and the prefix `s.` . The program sends the configuration data you entered to another file with the customer's name and the prefix `c.s.` . If you do not enter a customer name, the program will save Disk output to a file called `space` and the configuration output to a file called `c.space` .

Note If you exit the program with [Delete], the program will **not** send output to a file.

Printing Output From the Disk Program

1. Print the Disk output with the following command:

```
$ lp space  
or  
$ lp s.<customer_name>
```

Note To print the output, you must still be in the UNIX directory you were in when you ran the program.

Using the Disk Storage Worksheets

Use the following Disk Storage Worksheet (Table 2-11) and the Disk Allocation Worksheet (Table 2-12) to manually determine the number of disks a customer needs to store data. These worksheets give the same results that are given by the Disk Program.

You complete the worksheets in two phases:

1. Determine the total disk in megabytes (MB) that the customer needs for each type of data.
2. Determine how the data will be allocated to disk. This step is necessary because data of the same type (agent, split, VDN, and so on) must be stored on the same disk. Thus, additional disks may need to be added to store certain types of data, even though some space is still available on previously configured disks.

Disk Storage Required

Complete the following Disk Storage worksheet to determine the number of megabytes (MB) of disk space the customer will need for each type of data. After you complete this worksheet, continue with the Disk Storage Allocation Worksheet (Table 2-12).

Note You should make a copy of the Disk Storage worksheet for each ACD (real or pseudo-) that CMS will store data for, and complete each worksheet separately.

Table 2-11: Disk Storage Worksheet

1.DSK	Agent Intra-hour Records per Day	$(\text{---} * \text{---}) + (\text{---} * \text{---}) + (\text{---} * \text{---}) = \text{---}$
		from Line 25a.CUST from Line 27a.CUST from Line 25b.CUST from Line 27b.CUST from Line 25c.CUST from Line 27c.CUST Total
2.DSK	Agent Data	$(.000226 * \text{---} * \text{---}) + [.000311 * (\text{---} * \text{---} + \text{---} * \text{---} + \text{---} * \text{---})] = \text{---} \text{ MB}$
		Total from Line 1.DSK from Line 28b.CUST from Line 25d.CUST from Line 28c.CUST from Line 28d.CUST from Line 28e.CUST
3.DSK	Split Data	$\text{---} * [(.000401 * \text{---} * \text{---}) + (.000559 * (\text{---} + \text{---} + \text{---}))] = \text{---} \text{ MB}$
		from Line 29a.CUST from Line 27d.CUST from Line 29b.CUST from Line 29c.CUST from Line 29d.CUST from Line 29e.CUST
4.DSK	Trunk Data	$\text{---} * [(.000083 * \text{---} * \text{---}) + (.000131 * (\text{---} + \text{---} + \text{---}))] = \text{---} \text{ MB}$
		from Line 30a.CUST from Line 27d.CUST from Line 30b.CUST from Line 30c.CUST from Line 30d.CUST from Line 30e.CUST
5.DSK	Trunk Group Data	$\text{---} * [(.000156 * \text{---} * \text{---}) + (.000299 * (\text{---} + \text{---} + \text{---}))] = \text{---} \text{ MB}$
		from Line 31a.CUST from Line 27d.CUST from Line 31b.CUST from Line 31c.CUST from Line 31d.CUST from Line 31e.CUST
6.DSK	VDN Data	$\text{---} * [(.000251 * \text{---} * \text{---}) + (.000401 * (\text{---} + \text{---} + \text{---}))] = \text{---} \text{ MB}$
		from Line 32a.CUST from Line 27d.CUST from Line 32b.CUST from Line 32c.CUST from Line 32d.CUST from Line 32e.CUST
7.DSK	Vector Data	$\text{---} * [(.000161 * \text{---} * \text{---}) + (.000201 * (\text{---} + \text{---} + \text{---}))] = \text{---} \text{ MB}$
		from Line 33a.CUST from Line 27d.CUST from Line 33b.CUST from Line 33c.CUST from Line 33d.CUST from Line 33e.CUST
8.DSK	Call Work Code Data	$\text{---} * [(.000061 * \text{---} * \text{---}) + (.000061 * (\text{---} + \text{---} + \text{---}))] = \text{---} \text{ MB}$
		from Line 34a.CUST from Line 27d.CUST from Line 34b.CUST from Line 34c.CUST from Line 34d.CUST from Line 34e.CUST
9.DSK	Exceptions Data	$\text{---} * .000266 = \text{---} \text{ MB}$
		from Line 35.CUST
10.DSK	Agent Trace Data	$\text{---} * .000058 = \text{---} \text{ MB}$
		from Line 36.CUST
11.DSK	Current Day Forecast Output Data	$\text{---} * .000071 * (\text{---} + 1) * \text{---} = \text{---} \text{ MB}$
		from Line 29a.CUST from Line 27d.CUST from Line 40.CUST
12.DSK	Split Forecast Input Data	$(\text{---} * .000039 * \text{---}) + [.000039 * (\text{---} * \text{---} + \text{---} * \text{---})] = \text{---} \text{ MB}$
		from Line 29a.CUST from Line 38.CUST from Line 27d.CUST from Line 29a.CUST from Line 39.CUST from Line 37.CUST
13.DSK	Trunk Group Forecast Input Data	$(\text{---} * .000036 * \text{---}) + (.000048 * \text{---} * \text{---} * \text{---}) = \text{---} \text{ MB}$
		from Line 31a.CUST from Line 42.CUST from Line 31a.CUST from Line 27d.CUST from Line 42.CUST
14.DSK	Agent Login/Logout Data	$.000613 * \text{---} * \text{---} * \text{---} = \text{---} \text{ MB}$
		from Line 25d.CUST from Line 26d.CUST from Line 28b.CUST
15.DSK	Additional Space For Custom Files and Software	$\text{---} \text{ MB}$
		from Line 24.CUST

Instructions For Disk Storage Worksheet

Complete a Disk Storage Worksheet (Lines 1.DSK to 15.DSK) for the ACD to be connected to the customer's CMS. Complete an additional Disk Storage Worksheet for each pseudo-ACD the customer wants CMS to store data for.

Line 1.DSK In the blanks indicated, enter the appropriate values from Lines 25.CUST and 27.CUST. Find the sum of:

$$(Line_{25a.CUST} \cdot Line_{27a.CUST}) + (Line_{25b.CUST} \cdot Line_{27b.CUST}) + (Line_{25c.CUST} + Line_{27c.CUST}).$$

This sum represents the total agent intrahour records CMS will store per day.

Line 2.DSK In the blanks indicated, enter the appropriate values from the worksheets. Find the sum of:

$$(.000226 \cdot Line_{1.DSK} \cdot Line_{28b.CUST}) + [.000311 \cdot Line_{25d.CUST} \cdot (Line_{28c.CUST} + Line_{28d.CUST} + Line_{28e.CUST})].$$

This sum is the total megabytes CMS will use to store agent records on disk.

Line 3.DSK In the blanks indicated, enter the appropriate values from the worksheets. Find the product of:

$$Line_{29a.CUST} \cdot [(.000401 \cdot Line_{27d.CUST} \cdot Line_{29b.CUST}) + (.000559 \cdot (Line_{29c.CUST} + Line_{29d.CUST} + Line_{29e.CUST}))].$$

This product is the total megabytes CMS will use to store split records on disk.

Line 4.DSK In the blanks indicated, enter the appropriate values from the worksheets. Find the product of:

$$Line_{30a.CUST} \cdot [(.000083 \cdot Line_{27d.CUST} \cdot Line_{30b.CUST}) + (.000131 \cdot (Line_{30c.CUST} + Line_{30d.CUST} + Line_{30e.CUST}))].$$

This product is the total megabytes CMS will use to store trunk records on disk.

Line 5.DSK In the blanks indicated, enter the appropriate values from the worksheets. Find the product of:

$$Line_{30a} \cdot [(.000156 \cdot Line_{26d} \cdot Line_{30b}) + (.000299 \cdot (Line_{24c} + Line_{24d} + Line_{24e}))].$$

This product is the total megabytes CMS will use to store trunk group records on disk.

Line 6.DSK In the blanks indicated, enter the appropriate values from the worksheets. Find the product of:

$$Line_{32a.CUST} \cdot [(.000251 \cdot Line_{27d.CUST} \cdot Line_{32b.CUST}) + (.000401 \cdot (Line_{32c.CUST} + Line_{32d.CUST} + Line_{32e.CUST}))].$$

This product is the total megabytes CMS will use to store VDN records on disk.

Line 7.DSK In the blanks indicated, enter the appropriate values from the worksheets. Find the product of:

$$Line_{33a.CUST} \cdot [(.000161 \cdot Line_{27d.CUST} \cdot Line_{33b.CUST}) + (.000201 \cdot (Line_{33c.CUST} + Line_{33d.CUST} + Line_{33e.CUST}))].$$

This product is the total megabytes CMS will use to store vector records on disk.

Line 8.DSK In the blanks indicated, enter the appropriate values from the worksheets. Find the sum of:

$$Line_{34a.CUST} \cdot [(.000061 \cdot Line_{27d.CUST} \cdot Line_{34b.CUST}) + (.000061 \cdot (Line_{34c.CUST} + Line_{34d.CUST} + Line_{34e.CUST}))].$$

This product is the total megabytes CMS will use to store call work code records on disk.

Line 9.DSK In the blank indicated, enter the number of exceptions the customer wants to store. Find the product of

$$Line_{35.CUST} \cdot .000266.$$

Line 10.DSK In the blank indicated, enter the number of agent trace records the customer wants to store. Find the product of $Line_{36.CUST} \cdot .000058$.

Line 11.DSK In the blanks indicated, enter the appropriate values from the worksheets. Find the product of:

$$Line_{29a.CUST} \cdot .000071 \cdot (Line_{27d.CUST} + 1) \cdot Line_{40.CUST}.$$

This product is the total megabytes CMS will use to store current day forecast output records on disk.

Line 12.DSK In the blanks indicated, enter the appropriate values from the worksheets. Find the sum of:

$$(Line_{29a.CUST} \cdot .000039 \cdot Line_{38.CUST}) + [.000039 \cdot Line_{27d.CUST} \cdot Line_{29a.CUST} \cdot (Line_{39.CUST} + Line_{37.CUST})].$$

This product is the total megabytes CMS will use to store split forecast input records on disk.

Line 13.DSK In the blanks indicated, enter the appropriate values from the worksheets. Find the sum of:

$$(Line_{31a.CUST} \cdot .000036 \cdot Line_{42.CUST}) + (.00048 \cdot Line_{31a.CUST} \cdot Line_{27d.CUST} \cdot Line_{42.CUST}).$$

This product is the total megabytes CMS will use to store trunk group forecast input records on disk.

Line 14.DSK In the blanks indicated, enter the appropriate values

This product is the total megabytes CMS will use to store login/logout data on disk.

Line 15.DSK Enter the number of megabytes the customer will need to store any additional software or non-ACD data (from Line 24.CUST in the Performance Worksheet).

Continue by completing the Disk Storage Allocation Worksheet (Table 2-12).

Disk Storage Allocation

Complete the Disk Storage Allocation Worksheet to determine how many disks the customer will require.

Table 2-12: Disk Storage Allocation Worksheet

16.DSK Megabytes of data for all ACDs (by type of data)

Agent data	Split data	Trunk data	Trunk Group data	V D N data	Vector data	
Call Work Code data	Exceptions data	Agent Trace data	Current Day Forecast data	Spilt Forecast Input data	Trunk Group Forecast Input data	Agent Login/Logout data

17.DSK Megabytes of data, listed from largest to smallest

a _____ b _____ c _____ d _____ e _____ f _____
 g _____ h _____ i _____ j _____ k _____ l _____

18.DSK Allocation of data on disk(s)

	Disk 1	Disk 2	Disk 3	Disk 4	Disk 5	Disk 6
Available space	112MB (6386) 112MB (3B2)	780MB (6386) 210MB (3B2)	950MB (6386) 300MB (3B2)	950MB (6386) 300MB (3B2)	950MB (6386) 300MB (3B2)	950MB (6386) 300MB (3B2)
_____	_____	_____	_____	_____	_____	_____
Space left	()	()	()	()	()	()
_____	_____	_____	_____	_____	_____	_____
Space left	()	()	()	()	()	()
_____	_____	_____	_____	_____	_____	_____
Space left	()	()	()	()	()	()
_____	_____	_____	_____	_____	_____	_____
Space left	()	()	()	()	()	()
_____	_____	_____	_____	_____	_____	_____
Space left	()	()	()	()	()	()
_____	_____	_____	_____	_____	_____	_____
Space left	()	()	()	()	()	()

**Instructions for Disk
Storage Allocation
Worksheet**

- Line 16.DSK** In the blanks indicated, enter the megabytes of disk required by all ACDs (real and pseudo-) for each type of data (agent, split, trunk, and so on). For example, in the *Agent* blank, enter the sum of megabytes found on Line 2.DSK in the worksheet for the real ACD and on Line 2.DSK in each of the worksheets for any pseudo-ACD(s).
- Line 17.DSK** Find the largest number of megabytes determined for a data type under Line 16.DSK, and enter that number in 17a.DSK. In 17b.DSK, enter the second largest number of megabytes from Line 16.DSK. Continue for all applicable items under Line 16.DSK.



Note Do not enter Agent Login/Logout data in any of the blanks in Line 17.DSK. Login/logout data must always be allocated to Disk 1, regardless of the amount of space it requires and regardless of the amount of space other types of data require. Therefore, login/logout data does not need to be ranked with other data types with respect to required disk space.

- Line 18.DSK** A CMS computer (6386 or 3B2) can have up to six hard disks. Line 18.DSK contains six columns, one for each possible hard disk. Note that the available storage space on each disk depends on which computer the customer has (3B2 or 6386) and where in the sequence (first, second, third, etc.) the disk is. Both 3B2s and 6386s require a 300 MB disk for Disk 1. However, because various file systems required for the CMS software use much of the space on Disk 1, only 112 MB of space are available for ACD data storage on Disk 1.

Disks 2 through 6 are 1000 MB disks for a 6386 and 300 MB disks for a 3B2. However, the CMS software uses some of the space on Disk 2, just as it does for Disk 1. Therefore, the space left for ACD data storage on Disk 2 is 780 MB for a 6386 or 210 MB for a 3B2.

Finally, the 1000 MB Disks 3 through 6 for a 6386 only allow an actual disk storage of 950 MBs.

The following steps describe how to complete the disk storage allocation matrix of Line 18.DSK. When the data has been assigned, the number of disks that have data assigned to them will be the number of disks the customer should have.

1. In the first blank in the **Disk 1** column, enter the number of megabytes required for Agent Login/Logout data (Line 16.DSK). Subtract the megabytes for login/logout data from the 112 megabytes available on Disk 1. Enter the remainder in the next set of parentheses in the **Disk 1** column. This is the remaining space on Disk 1.
2. Compare the megabytes entered in 17a.DSK with the remaining space on Disk 1. If 17a.DSK is less than Disk 1's remaining space, 17a.DSK will fit on Disk 1. Subtract 17a.DSK from Disk 1's remaining space.

If 17a.DSK will **not** fit in Disk 1's remaining space, check Disk 2 for available space. If 17a.DSK will fit on Disk 2, subtract 17a.DSK from Disk 2's available space.

If 17a.DSK will **not** fit in Disk 2's available space, check Disk 3 for available space. If 17a.DSK will fit on Disk 3, subtract 17a.DSK from Disk 3's available space. If 17a.DSK will **not** fit on Disk 3, the customer cannot save the megabytes desired for this type of data and must reduce the storage requirement.

3. Once 17a.DSK has been assigned to a disk, compare 17b.DSK to the remaining space on all disks. Find the disk with the smallest amount of remaining space that is still big enough to contain 17b.DSK. Subtract 17b.DSK from that disk's remaining space.

For example, say that the remaining space on Disks 1, 2, 3, and 4 is as follows:

Disk 1	73 MB
Disk 2	380 MB
Disk 3	950 MB
Disk 4	950 MB

If 17b.DSK were 100 MB, you would assign 17b.DSK to Disk 2 because Disk 2 has the smallest available space that can contain 17b.DSK. However, say that the remaining space on Disks 1, 2, 3, and 4 was as follows:

Disk 1	73 MB
Disk 2	780 MB
Disk 3	110 MB
Disk 4	950 MB

In this case, you would assign 17b.DSK to Disk 3 because the 110 MBs available on Disk 3 are the smallest amount of available disk space that is still big enough to store the 100 MBs of data we are assigning.

Subtract 17b.DSK from the remaining space on the assigned disk.

4. Repeat Step 3 for all items in Line 17.DSK.
5. When all items in Line 17.DSK have been assigned to disk, the number of disks that have data allocated to them is the number of disks that the customer's system will require.



These instructions allocate space in the most efficient way. However, once the customer's system has been installed, the customer may wish to allocate disk space in ways different than those indicated in these instructions.

ACD Engineering Guidelines

Use this section to determine how many agents and trunks will be required for an ACD being monitored by R3 CMS software. Remember, do not exceed the maximum values of the ACD parameters supported by R3 CMS which are stated in Table 2-2.

Note Be sure to include the customer's future growth expectations when determining the requirements for the ACD. If a growth factor is not included and the customer decides later to add agents, trunks, or splits to the system, the hard disk system on the computer may not be able to accommodate the additional agents, trunks, splits, etc. The R3 CMS configurator selects the computer based on maximum growth projections.

When configuring a new ACD, Tables 2-13 through 2-24 should be used to determine how many agents and trunks will be required to handle a given rate of incoming calls. Each split should be designed individually for the number of agents and trunks required, subject to any pertinent switch limitations.

The number of agents and trunks required to handle the incoming calls to an ACD depends on the business being served by the ACD. For example, if a business has a captive customer base and each call represents the pay out of money, the business may want to provide fewer trunks than agents. An example might be the claims department of an insurance company. On the other hand, when each call represents a new customer and each blocked call represents potential lost income, the business will probably want to provide more trunks than agents to minimize the blocking.

The point is this: the design of the ACD should be based on how a business values a lost or blocked call.

Interpolation

Interpolation is a method of estimating tabular values of a function between two known values of that function. When using Tables 2-13 through 2-23 to determine the number of agents required and Table 2-24 to determine the number of trunks required for a given ACD, you may find that the expected number of call arrivals or the carried load lies somewhere between two entries in the tables. Therefore, the number of agents or trunks required will also lie somewhere between the two entries.

If this is the case, the number of agents required or number of trunks needed can only be found by interpolation. Use the following equation to interpolate between tabular values:

$$y = y_0 + [(y_1 - y_0) \frac{x - x_0}{x_1 - x_0}]$$

Where:

x is the independent variable.

y is the dependent or functional variable.

x_0 is the tabular value of the independent variable that immediately precedes x .

x_1 is the tabular value of the independent variable that immediately succeeds x .

y_0 is the tabular value of the dependent variable that immediately precedes y .

y_1 is the tabular value of the dependent variable that immediately succeeds y .

Agent Engineering Guidelines

Tables 2-13 through 2-23 (later in this section) list the number of ACD agents required to handle a given incoming call load. The top rows on each of these tables show the possible delay times for a given incoming call load (*calls per hour* or *busy hour calls*), and the left-most column lists the agents required to handle the incoming call load.

Note The entries in Tables 2-13 through 2-23 are in *busy-hour calls*, which are the number of calls received by the ACD during peak levels of caller activity.

The double lines drawn across Tables 2-13 through 2-17 show where the maximum number of *busy-hour calls* handled by R3 CMS have been exceeded.

To determine how many agents will be required to handle the incoming call load of an ACD, use Tables 2-13 through 2-23 as follows:

- Estimate the average service time (the time an agent spends processing a call, or talking to a caller). Tables 2-13 through 2-23 contain the data that describe the following service times: 7, 15, 30, 45, 60, 90, 120, 180, 240, 300, and 600 seconds. Choose the appropriate table that represents the service time that the customer desires for the ACD.
- At the top of the table, choose the closest possible delay time in seconds. A *delay* is defined as the elapsed time from when a call is routed to the ACD split until it is answered by an agent. The delay criterion states that 90 percent of the incoming calls will be answered by the agents before the specified delay has occurred.
- *Busy-hour calls* denotes the number of calls received by the ACD during peak levels of caller activity. Based on previous experience or on suspected levels of caller activity, choose the number of *busy-hour calls*.
- After choosing the appropriate table and delay column, find the entry in the table for *busy-hour calls* that is greater than or equal to the number of *busy-hour calls* chosen.
- The number of agent positions required is then found in the left-most column of the respective table.
- You can interpolate between the tables (for different call service times), between the columns (for different delay times), and between the rows (for different number of calls per hour).

Tables 2-13 through 2-23 were prepared by using a range of 1 to 1000 agents. For small service times, this yields high traffic rates, even for a small number of agents. Neither the switch nor the 3B CMS can support these high traffic loads. The high traffic rates are presented in the tables for completeness only.

Example 1:

The classified ads department of a major newspaper receives 400 calls per hour. The average time an agent spends on each call is 3 minutes. If most of the calls should be answered in less than 30 seconds, how many agents should be employed in this department?

Table 2-20 provides data for 180-second (3-minute) call durations. Under the column heading “30” seconds (delay time), find the first entry greater than 400 calls per hour (403). Follow this row left to the “agents” column and find 25 agents. The number of agents required to answer 400 calls (of 3-minute duration) per hour with 90 percent of the callers waiting less than 30 seconds is 25 agents.

For this example, consider the efficiency of the agents and the sensitivity of the parameters to changes in the call arrival rate. The efficiency of the agents is the ratio of the number of agent hours spent on the phone to the number of agent hours in an hour. The number of agent hours spent on the phone is 400 calls per hour times .05 hours (3 minutes) equals 20 agent hours. Therefore, the efficiency is $20 / 25$ (25 agents for 1 hour) equals .80 or 80 percent.

Suppose the calls per hour increased to 425 calls per hour. The efficiency is now $425 * 0.05 / 25 = 0.85$ or 85 percent. The efficiency has increased, but this added efficiency is not free of charge. The delay criterion has changed significantly from about 9.9 percent of all calls taking longer than 30 seconds for an agent to answer to about 18.0 percent (403 calls per hour yield 10.0 percent, but 400 calls per hour were stated). To get the delay criterion back to 9.9 percent would require a delay time of about 58.5 seconds. Another measure of what is happening with the queue is the *average* time spent waiting for service in the queue. With 400 calls per hour, the mean time spent in the queue is 7.53 seconds. With 425 calls per hour, the mean time in the queue is 16.14 seconds. The point of this example is to emphasize the sensitivity of the time in the queue to the arrival rate. In other words, increasing the agent efficiency from 80 percent to 85 percent nearly doubles the various measures of queuing time.

Note For Examples 2 and 3, the ?’s in the tables represent the unknown values you are looking for. The *italicized numbers* in the tables represent numbers that are not included in Tables 2-13 through 2-23.

Example 2:

The reservations department for a hotel chain knows that the average call duration is 5 minutes and that most of the potential customers will not wait more than 1 minute for their call to be answered. How many agents are required to handle 5000 calls per hour? Under the 60-second column of Table 2-22, you will find the following information:

agents	60
400	4697
?	5000
450	5295

To find the number of agents needed to handle 5000 calls per hour, interpolate between the number of agents and calls per hour:

y = number of agents needed

$$y = y_0 + [(y_1 - y_0) \frac{x - x_0}{x_1 - x_0}]$$

$$y = 400 + [(450 - 400) \frac{5000 - 4697}{5295 - 4697}]$$

$$y = 400 + [50 \frac{303}{598}]$$

$$y = 425.335$$

Therefore, 426 agents are needed to support the reservations department.

Example 3:

The manager of a split in an ACD knows that calls average 75 seconds and that the split receives 1500 calls per hour. The manager wants most of the calls to be answered in less than 40 seconds. How many agents are required?

To answer this question, you must interpolate between all parameters — first, between delay time and calls per hour to obtain the number of calls per hour for a 40-second delay time. Under the 30- and 45-second columns of Tables 2-17 and 2-18, you will find:

60 Seconds Average Service Time				75 Seconds	90 Seconds Average Service Time			
	delay times					delay times		
agents	30	40	45		agents	30	40	45
25	1322	?	1364		40	1435	?	1471
?		1500			?		1500	
30	1616	?	1661		45	1630	?	1669

Now interpolate between delay time and calls per hour in both tables to obtain calls per hour for a 40-second delay time.

y = number of calls per hour

$$y = y_0 + [(y_1 - y_0) \frac{x - x_0}{x_1 - x_0}]$$

$$y = 1322 + [(1364 - 1322) \frac{40 - 30}{45 - 30}]$$

$$y = 1322 + [42 \frac{10}{15}]$$

$$y = 1350$$

Now you can fill in the first blank: 1350 calls per hour under the 40-second delay time heading. Repeat the interpolation process three more times to come up with the figures 1646, 1459, and 1656.

60 Seconds Average Service Time				75 Seconds	90 Seconds Average Service Time			
	delay times					delay times		
agents	30	40	45		agents	30	40	45
25	1322	1350	1364		40	1435	1459	1471
?		1500			?		1500	
30	1616	1646	1661		45	1630	1656	1669

Next, interpolate between number of agents and the calls per minute (in both the 60-second and 90-second tables) to obtain the number of agents needed when 1500 calls per minute are expected, as follows:

y = number of agents needed when a 60-second service time is desirable

$$y = y_0 + [(y_1 - y_0) \frac{x - x_0}{x_1 - x_0}]$$

$$y = 25 + [(30 - 25) \frac{1500 - 1350}{1646 - 1350}]$$

$$y = 25 + [5 \frac{150}{296}]$$

$$y = 27.5$$

So now we know that 27.5 agents would be needed when a 60-second service time is desirable. Repeat the above interpolation process once (for a 90-second service time) to come up with the result:

$$y \text{ (number of agents)} = 41.0$$

60 Seconds Average Service Time				75 Seconds	90 Seconds Average Service Time			
	delay times				delay times			
agents	30	40	45		agents	30	40	45
25	1322	1350	1364		40	1435	1459	1471
27.5		1500			41.0		1500	
30	1616	1646	1661		45	1630	1656	1669

Finally, interpolate between agents and service times to determine the number of agents needed when a 75-second service time is desirable.

y = number of agents needed when a 75-second service time is desirable

$$y = y_0 + [(y_1 - y_0) \frac{x - x_0}{x_1 - x_0}]$$

$$y = 27.5 + [(41 - 27.5) \frac{75 - 60}{90 - 60}]$$

$$y = 27.5 + [13.5 \frac{15}{30}]$$

$$y = 34.25 \text{ (or } 35)$$

From exact calculations, 34 agents imply that 12.2 percent of the incoming calls will wait more than 40 seconds. Or, with 35 agents, 5.56 percent will wait more than 40 seconds. If it is desirable that anything above, say, 10 percent is undesirable, a 35th agent must be acquired.

Table 2-13: 7 Seconds Average Service Time

agents	delay times								
	11	15	2 2	3 0	4 5	6 0	9 0	12 0	18 0
1	154	195	253	302	359	392	429	449	470
2	575	648	736	799	865	902	942	962	984
3	1044	1135	1237	1305	1376	1415	1455	1476	1498
4	1531	1633	1743	1815	1888	1928	1969	1990	2012
5	2025	2136	2251	2326	2401	2441	2483	2504	2526
6	2525	2641	2761	2838	2914	2955	2997	3018	3040
7	3027	3149	3272	3350	3428	3469	3511	3533	3555
8	3532	3657	3783	3863	3941	3983	4025	4047	4069
9	4038	4167	4295	4376	4455	4496	4539	4561	4583
10	4545	4677	4808	4889	4996	5010	5053	5075	5097
12	5562	5699	5833	5916	5997	6039	6082	6104	6126
14	6581	6722	6859	6943	7025	7067	7110	7132	7155
16	7602	7746	7885	7971	8053	8095	8139	8161	8183
18	8625	8771	8912	8998	9081	9123	9167	9189	9212
20	9648	9797	9939	10026	10109	10152	10195	10218	10240
25	12208	12362	12508	12596	12680	12723	12767	12789	12812
30	14772	14929	15077	15166	15251	15294	15338	15360	15383
35	17337	17497	17647	17736	17822	17865	17909	17932	17954
40	19903	20065	20217	20307	20393	20436	20481	20503	20526
45	22470	22634	22787	22878	22964	23008	23052	23074	23097
50	25037	25204	25357	25449	25535	25579	25623	25646	25669
60	30174	30343	30499	30591	30677	30721	30766	30789	30811
70	35312	35483	35640	35733	35820	35864	35909	35932	35954
80	40451	40624	40782	40875	40963	41007	41052	41074	41097
90	45591	45765	45924	46018	46105	46150	46195	46217	46240
100	50731	50906	51066	51160	51248	51292	51337	51360	51383
125	63582	63760	63922	64016	64105	64149	64194	64217	64240
150	76435	76615	76778	76873	76961	77006	77051	77074	77097
175	89289	89471	89634	89730	89818	89863	89909	89931	89954
200	102144	102326	102491	102586	102675	102720	102766	102788	102811
225	114999	115182	115347	115443	115532	115577	115623	115646	115668
250	127854	128038	128204	128300	128389	128435	128480	128503	128526
275	140710	140895	141061	141157	141246	141292	141337	141360	141383
300	153565	153751	153917	154014	154104	154149	154194	154217	154240
350	179277	179464	179631	179728	179818	179863	179908	179931	179954
400	204990	205177	205345	205442	205532	205577	205623	205646	205668
450	230702	230891	231059	231156	231246	231291	231337	231360	231383
500	256415	256604	256773	256870	256960	257006	257051	257074	257097
550	282128	282318	282487	282584	282674	282720	282765	282788	282811
600	307842	308032	308201	308298	308389	308434	308480	308503	308525
650	333555	333745	333915	334013	334103	334148	334194	334217	334240
700	359268	359459	359629	359727	359817	359863	359908	359931	359954
750	384982	385173	385343	385441	385531	385577	385623	385646	385668
800	410696	410887	411057	411155	411246	411291	411337	411360	411383
850	436409	436601	436771	436869	436960	437005	437051	437074	437097
900	462123	462315	462485	462583	462674	462720	462765	462788	462811
950	487837	488029	488199	488298	488388	488434	488480	488503	488525
1000	513551	513743	513914	514012	514103	514148	514194	514217	514240

Table 2-14: 15 Seconds Average Service Time

agents	delay times								
	11	15	22	30	45	60	90	120	180
1	44	52	68	86	115	136	163	180	198
2	196	222	261	295	339	367	399	417	437
3	386	425	478	521	572	603	637	656	676
4	592	640	703	752	808	840	876	896	916
5	806	862	933	986	1045	1078	1115	1135	1156
6	1025	1089	1165	1221	1282	1317	1355	1375	1396
7	1248	1317	1399	1457	1521	1556	1594	1615	1636
8	1474	1548	1634	1694	1759	1795	1834	1854	1875
9	1702	1780	1869	1932	1998	2035	2074	2094	2115
10	1931	2013	2106	2170	2237	2274	2313	2334	2355
12	2393	2482	2580	2646	2715	2753	2793	2814	2835
14	2858	2953	3055	3124	3194	3232	3273	3294	3315
16	3326	3425	3531	3601	3673	3712	3752	3773	3795
18	3796	3899	4008	4079	4152	4191	4232	4253	4275
20	4266	4373	4485	4558	4631	4671	4712	4733	4755
25	5448	5562	5679	5754	5830	5870	5911	5933	5955
30	6634	6753	6875	6952	7029	7069	7111	7133	7155
35	7823	7947	8071	8150	8228	8269	8311	8333	8355
40	9013	9141	9268	9349	9427	9468	9511	9533	9555
45	10205	10336	10466	10547	10626	10668	10711	10732	10755
50	11399	11532	11664	11746	11826	11868	11910	11932	11955
60	13787	13926	14061	14144	14225	14267	14310	14332	14355
70	13178	16321	16458	16543	16624	16667	16710	16732	16755
80	18571	18716	18856	18942	19024	19066	19110	19132	19154
90	20965	21113	21254	21341	21423	21466	21510	21532	21554
100	23359	23510	23653	23740	23823	23866	23910	23932	23954
125	29349	29504	29650	29738	29822	29866	29910	29932	29954
150	35341	35499	35648	35737	35822	35865	35909	35932	35954
175	41334	41496	41646	41736	41821	41865	41909	41932	41954
200	47329	47493	47645	47735	47821	47865	47909	47932	47954
225	53325	53490	53644	53735	53821	53865	53909	53932	53954
250	59321	59488	59643	59734	59821	59865	59909	59932	59954
275	65318	65487	65642	65734	65820	65864	65909	65932	65954
300	71315	71485	71641	71733	71820	71864	71909	71931	71954
350	83310	83482	83640	83733	83820	83864	83909	83931	83954
400	95307	95480	95639	95732	95820	95864	95909	95931	95954
450	107303	107478	107638	107732	107819	107864	107909	107931	107954
500	119301	119477	119637	119731	119819	119864	119909	119931	119954
550	131298	131476	131636	131731	131819	131864	131909	131931	131954
600	143296	143474	143636	143731	143819	143864	143909	143931	143954
650	155294	155473	155635	155730	155819	155864	155909	155931	155954
700	167293	167473	167635	167730	167819	167863	167909	167931	167954
750	179291	179472	179635	179730	179819	179863	179909	179931	179954
800	191290	191471	191634	191730	191818	191863	191909	191931	191954
850	203289	203470	203634	203729	203818	203863	203909	203931	203954
900	215287	215470	215634	215729	215818	215863	215909	215931	215954
950	227286	227469	227633	227729	227818	227863	227909	227931	227954
1000	239285	239469	239633	239729	239818	239863	239909	239931	239954

Table 2-15: 30 Seconds Average Service Time

agents	delay times								
	11	15	22	30	45	60	90	120	180
1	16	18	22	26	35	43	57	68	82
2	79	86	98	111	132	147	169	183	200
3	161	173	193	212	240	260	286	301	319
4	252	270	296	320	353	376	404	420	438
5	349	371	403	431	468	493	522	539	558
6	450	476	513	544	585	611	641	659	677
7	554	583	624	659	702	729	760	778	797
8	660	692	737	774	819	847	880	898	917
9	767	803	851	890	937	966	999	1017	1037
10	875	914	965	1007	1055	1085	1118	1137	1157
12	1096	1140	1196	1241	1292	1323	1358	1376	1396
14	1319	1368	1429	1476	1530	1562	1597	1616	1636
16	1544	1597	1663	1712	1768	1801	1836	1856	1876
18	1772	1829	1898	1949	2007	2040	2076	2096	2116
20	2001	2061	2133	2186	2245	2279	2316	2335	2356
25	2577	2645	2724	2781	2843	2877	2915	2935	2956
30	3159	3232	3317	3377	3440	3476	3514	3535	3556
35	3743	3822	3911	3973	4039	4075	4114	4134	4155
40	4330	4414	4507	4571	4637	4674	4714	4734	4755
45	4919	5006	5103	5168	5236	5274	5313	5334	5355
50	5509	5600	5699	5766	5835	5873	5913	5934	5955
60	6692	6789	6894	6963	7034	7072	7113	7134	7155
70	7879	7981	8089	8160	8233	8271	8312	8333	8355
80	9067	9174	9285	9358	9432	9471	9512	9533	9555
90	10257	10368	10482	10556	10631	10670	10712	10733	10755
100	11449	11563	11680	11755	11830	11870	11912	11933	11955
125	14432	14552	14674	14752	14829	14869	14911	14933	14955
150	17419	17545	17670	17750	17828	17869	17911	17933	17955
175	20408	20538	20667	20748	20827	20868	20911	20933	20955
200	23399	23533	23665	23746	23826	23868	23911	23932	23955
225	26392	26529	26662	26745	26826	26867	26910	26932	26955
250	29386	29525	29661	29744	29825	29867	29910	29932	29955
275	32380	32522	32659	32743	32825	32867	32910	32932	32955
300	35375	35519	35658	35742	35824	35867	35910	35932	35954
350	41367	41514	41655	41741	41824	41866	41910	41932	41954
400	47360	47510	47653	47740	47823	47866	47910	47932	47954
450	53354	53507	53652	53739	53823	53866	53910	53932	53954
500	59349	59504	59650	59738	59822	59866	59910	59932	59954
550	65345	65502	65649	65738	65822	65865	65910	65932	65954
600	71341	71500	71648	71737	71822	71865	71909	71932	71954
650	77338	77498	77647	77737	77822	77865	77909	77932	77954
700	83335	83496	83646	83736	83821	83865	83909	83932	83954
750	89332	89495	89646	89736	89821	89865	89909	89932	89954
800	95330	95493	95645	95735	95821	95865	95909	95932	95954
850	101327	101492	101644	101735	101821	101865	101909	101932	101954
900	107325	107491	107644	107735	107821	107865	107909	107932	107954
950	113323	113490	113643	113735	113821	113865	113909	113932	113954
1000	119322	119489	119643	119734	119821	119865	119909	119932	119954

Table 2-16: 45 Seconds Average Service Time

agents	delay times								
	11	15	22	30	45	60	90	120	180
1	10	11	12	14	17	21	29	35	45
2	48	52	57	63	74	83	98	109	122
3	99	105	115	125	142	155	174	186	201
4	157	165	179	193	213	229	251	264	280
5	218	229	246	263	287	305	329	343	359
6	282	296	316	335	363	382	407	422	439
7	348	364	387	409	439	460	486	501	519
8	416	434	460	484	516	538	565	581	598
9	485	504	533	559	593	616	644	660	678
10	555	576	607	635	671	695	723	740	758
12	697	722	758	788	827	852	882	899	918
14	841	870	909	943	984	1010	1041	1059	1077
16	988	1019	1062	1098	1142	1169	1200	1218	1237
18	1135	1170	1216	1254	1300	1327	1360	1378	1397
20	1284	1322	1371	1410	1458	1486	1519	1537	1557
25	1661	1704	1760	1803	1854	1884	1918	1937	1957
30	2042	2090	2151	2198	2251	2282	2317	2336	2356
35	2426	2479	2544	2594	2649	2681	2717	2736	2756
40	2812	2869	2938	2990	3047	3080	3116	3136	3156
45	3199	3260	3333	3387	3445	3479	3516	3535	3556
50	3589	3653	3729	3784	3844	3878	3915	3935	3956
60	4370	4440	4522	4580	4642	4677	4715	4735	4756
70	5154	5230	5316	5376	5440	5476	5514	5535	5556
80	5941	6021	6111	6173	6239	6275	6314	6334	6355
90	6730	6814	6907	6971	7038	7074	7114	7134	7155
100	7520	7607	7703	7769	7837	7874	7913	7934	7955
125	9499	9594	9696	9765	9835	9873	9913	9934	9955
150	11483	11584	11691	11761	11833	11872	11912	11933	11955
175	13470	13576	13686	13759	13832	13871	13912	13933	13955
200	15459	15569	15683	15757	15831	15870	15912	15933	15955
225	17449	17563	17680	17755	17830	17870	17912	17933	17955
250	19441	19558	19677	19754	19829	19870	19911	19933	19955
275	21434	21554	21675	21752	21829	21869	21911	21933	21955
300	23428	23550	23673	23751	23828	23869	23911	23933	23955
350	27417	27543	27670	27749	27827	27868	27911	27933	27955
400	31408	31538	31667	31748	31827	31868	31911	31933	31955
450	35400	35533	35665	35747	35826	35868	35911	35932	35955
500	39393	39530	39663	39745	39826	39867	39910	39932	39955
550	43387	43526	43661	43744	43825	43867	43910	43932	43955
600	47382	47523	47660	47744	47825	47867	47910	47932	47955
650	51378	51521	51658	51743	51824	51867	51910	51932	51955
700	55374	55518	55657	55742	55824	55867	55910	55932	55954
750	59370	59516	59656	59742	59824	59866	59910	59932	59954
800	63366	63514	63655	63741	63824	63866	63910	63932	63954
850	67363	67512	67654	67741	67823	67866	67910	67932	67954
900	71360	71511	71653	71740	71823	71866	71910	71932	71954
950	75358	75509	75653	75740	75823	75866	75910	75932	75954
1000	79355	79508	79652	79739	79823	79866	79910	79932	79954

Table 2-17: 60 Seconds Average Service Time

agents	delay times								
	11	15	22	30	45	60	90	120	180
1	7	7	8	9	11	13	17	22	29
2	35	36	40	43	50	56	66	74	85
3	72	75	81	87	97	106	120	130	143
4	113	118	126	135	149	160	177	188	202
5	158	164	175	186	202	216	234	246	261
6	204	212	225	238	257	272	292	305	321
7	253	262	277	292	313	329	351	364	380
8	302	313	330	346	370	387	410	424	440
9	352	365	383	401	427	445	469	483	500
10	403	417	438	457	484	503	528	542	559
12	508	524	548	570	600	620	646	662	679
14	614	632	659	684	716	738	765	781	799
16	721	742	772	799	833	856	884	900	918
18	830	853	886	914	951	975	1003	1020	1038
20	940	965	1000	1030	1069	1093	1123	1139	1158
25	1218	1248	1289	1322	1364	1390	1421	1439	1457
30	1500	1534	1579	1616	1661	1688	1720	1738	1757
35	1784	1822	1872	1911	1958	1987	2019	2038	2057
40	2071	2112	2165	2207	2256	2285	2319	2337	2357
45	2358	2403	2459	2503	2554	2584	2618	2637	2657
50	2648	2695	2754	2800	2852	2883	2918	2937	2956
60	3229	3281	3346	3395	3450	3481	3517	3536	3556
70	3813	3870	3939	3990	4047	4080	4116	4136	4156
80	4399	4460	4534	4587	4646	4679	4716	4735	4756
90	4987	5052	5129	5184	5244	5278	5315	5335	5356
100	5576	5645	5725	5781	5843	5877	5915	5935	5956
125	7054	7130	7216	7276	7340	7376	7414	7435	7456
150	8536	8618	8709	8772	8838	8875	8914	8934	8955
175	10021	10108	10204	10269	10337	10374	10413	10434	10455
200	11509	11600	11700	11767	11836	11873	11913	11934	11955
225	12998	13094	13196	13264	13335	13373	13413	13434	13455
250	14489	14588	14693	14763	14834	14872	14913	14934	14955
275	15980	16082	16190	16261	16333	16372	16412	16433	16455
300	17473	17578	17688	17760	17832	17871	17912	17933	17955
350	20460	20570	20683	20757	20831	20871	20912	20933	20955
400	23450	23563	23680	23755	23830	23870	23912	23933	23955
450	26440	26558	26677	26754	26829	26870	26911	26933	26955
500	29432	29553	29675	29752	29829	29869	29911	29933	29955
550	32426	32549	32673	32751	32828	32869	32911	32933	32955
600	35419	35545	35671	35750	35828	35869	35911	35933	35955
650	38414	38542	38669	38749	38827	38868	38911	38933	38955
700	41409	41539	41667	41748	41827	41868	41911	41933	41955
750	44404	44536	44666	44747	44826	44868	44911	44932	44955
800	47400	47534	47665	47747	47826	47868	47911	47932	47955
850	50396	50531	50664	50746	50826	50868	50910	50932	50955
900	53393	53529	53663	53745	53826	53867	53910	53932	53955
950	56389	56527	56662	56745	56825	56867	56910	56932	56955
1000	59386	59526	59661	59744	59825	59867	59910	59932	59955

Table 2-18: 90 Seconds Average Service Time

agents	delay times								
	15	22	30	45	60	90	120	180	240
1	5	5	5	6	7	9	11	14	18
2	23	24	26	29	32	37	42	49	54
3	47	50	53	58	63	71	77	87	93
4	75	78	83	90	96	107	115	125	132
5	104	109	115	124	131	144	153	164	171
6	135	141	148	159	168	181	191	204	211
7	167	174	182	194	205	220	230	243	251
8	199	208	217	231	242	258	269	282	290
9	233	242	252	268	280	297	308	322	330
10	267	277	288	305	318	336	347	362	370
12	336	348	361	380	394	414	426	441	450
14	406	421	435	456	471	492	505	521	529
16	477	494	510	532	549	571	584	600	609
18	549	568	585	610	627	650	664	680	689
20	622	642	661	687	705	729	743	760	769
25	807	831	852	882	902	927	942	959	968
30	994	1021	1045	1077	1099	1126	1141	1159	1168
35	1182	1213	1239	1274	1297	1324	1341	1358	1368
40	1373	1406	1435	1471	1495	1524	1540	1558	1568
45	1564	1600	1630	1669	1693	1723	1740	1758	1768
50	1756	1794	1826	1867	1892	1922	1939	1958	1968
60	2142	2185	2220	2263	2290	2321	2338	2357	2367
70	2530	2577	2615	2660	2688	2720	2738	2757	2767
80	2920	2971	3011	3058	3087	3119	3138	3157	3167
90	3311	3365	3407	3456	3485	3519	3537	3557	3567
100	3703	3760	3804	3854	3884	3918	3937	3957	3967
125	4687	4750	4797	4851	4882	4917	4936	4956	4967
150	5673	5742	5792	5848	5881	5917	5936	5956	5967
175	6662	6735	6788	6846	6879	6916	6936	6956	6967
200	7653	7729	7784	7844	7878	7915	7935	7956	7967
225	8645	8725	8782	8843	8878	8915	8935	8956	8967
250	9638	9721	9779	9842	9677	9915	9935	9956	9966
275	10631	10717	10777	10841	10876	10914	10935	10956	10966
300	11626	11714	11775	11840	11876	11914	11934	11956	11966
350	13616	13708	13772	13838	13875	13914	13934	13955	13966
400	15608	15704	15769	15837	15874	15913	15934	15955	15966
450	17601	17700	17767	17836	17873	17913	17934	17955	17966
500	19594	19697	19765	19835	19873	19913	19934	19955	19966
550	21589	21694	21763	21834	21872	21913	21934	21955	21966
600	23584	23691	23762	23833	23872	23912	23933	23955	23966
650	25580	25689	25760	25833	25871	25912	25933	25955	25966
700	27576	27687	27759	27832	27871	27912	27933	27955	27966
750	29573	29685	29758	29832	29871	29912	29933	29955	29966
800	31569	31683	31757	31831	31871	31912	31933	31955	31966
850	33566	33682	33756	33831	33870	33912	33933	33955	33966
900	35563	35680	35755	35830	35870	35912	35933	35955	35966
950	37561	37679	37755	37830	37870	37912	37933	37955	37966
1000	39559	39678	39754	39830	39870	39911	39933	39955	39966

Table 2-19: 120 Seconds Average Service Time

agents	delay times								
	15	22	30	45	60	90	120	180	240
1	3	4	4	4	5	6	7	9	11
2	17	17	18	20	22	25	28	33	37
3	34	36	37	40	43	49	53	60	65
4	54	57	59	63	67	74	80	88	94
5	76	79	82	88	93	101	108	117	123
6	99	102	106	113	119	129	136	146	153
7	122	126	131	139	146	157	165	175	182
8	146	151	156	165	173	185	193	205	212
9	170	176	182	192	201	213	223	234	241
10	195	202	209	220	229	242	252	264	271
12	246	254	262	275	285	300	310	323	331
14	298	307	316	331	342	358	369	383	390
16	350	361	371	387	399	417	428	442	450
18	404	415	427	444	457	475	487	502	510
20	457	470	483	501	515	534	547	561	570
25	594	609	624	646	661	682	695	711	719
30	732	750	767	791	808	830	844	860	869
35	872	892	911	937	956	979	993	1010	1019
40	1013	1035	1056	1084	1103	1128	1143	1159	1169
45	1155	1179	1201	1231	1252	1277	1292	1309	1318
50	1297	1324	1347	1379	1400	1426	1442	1459	1468
60	1584	1614	1641	1675	1697	1725	1741	1758	1768
70	1873	1906	1935	1972	1995	2024	2040	2058	2068
80	2163	2199	2230	2269	2293	2323	2340	2358	2368
90	2454	2493	2526	2566	2592	2622	2639	2658	2668
100	2746	2788	2822	2864	2891	2921	2939	2958	2967
125	3480	3527	3565	3610	3638	3670	3688	3707	3717
150	4216	4268	4309	4357	4386	4419	4437	4457	4467
175	4954	5011	5054	5105	5135	5168	5187	5207	5217
200	5694	5754	5800	5853	5883	5918	5937	5957	5967
225	6436	6499	6547	6601	6632	6667	6686	6706	6717
250	7178	7244	7294	7349	7381	7417	7436	7456	7467
275	7921	7990	8041	8098	8130	8166	8186	8206	8217
300	8665	8737	8789	8847	8880	8916	8936	8956	8967
350	10154	10230	10285	10345	10379	10416	10435	10456	10467
400	11645	11725	11782	11843	11878	11915	11935	11956	11967
450	13137	13220	13279	13342	13377	13415	13435	13456	13466
500	14630	14716	14776	14840	14876	14914	14935	14956	14966
550	16124	16213	16274	16339	16375	16414	16434	16456	16466
600	17618	17710	17773	17839	17875	17914	17934	17955	17966
650	19113	19207	19271	19338	19374	19414	19434	19455	19466
700	20609	20704	20769	20837	20874	20913	20934	20955	20966
750	22105	22202	22268	22336	22374	22413	22434	22455	22466
800	23601	23700	23767	23836	23873	23913	23934	23955	23966
850	25097	25198	25266	25335	25373	25413	25434	25455	25466
900	26594	26696	26765	26835	26873	26913	26934	26955	26966
950	28091	28195	28264	28334	28372	28413	28434	28455	28466
1000	29588	29693	29763	29834	29872	29913	29934	29955	29966

Table 2-20: 180 Seconds Average Service Time

agents	delay times								
	15	22	30	45	60	90	120	180	240
1	2	2	2	2	3	3	3	4	5
2	11	11	11	12	13	14	16	19	21
3	22	23	24	25	26	29	31	35	39
4	35	36	37	39	41	45	48	53	57
5	49	51	52	55	57	62	66	72	76
6	64	66	67	71	74	79	84	91	96
7	79	81	83	87	91	97	102	110	115
8	95	97	100	104	108	115	121	129	134
9	111	113	116	122	126	134	140	148	154
10	127	130	133	139	144	152	159	168	174
12	160	164	168	175	180	190	197	207	213
14	194	198	203	211	217	228	236	246	253
16	228	233	239	247	255	266	274	285	292
18	263	269	275	284	292	305	313	325	332
20	298	304	311	322	330	343	353	364	372
25	387	395	403	416	426	441	451	463	471
30	478	487	497	511	523	539	549	563	571
35	570	581	591	607	620	637	648	662	670
40	662	674	686	704	717	736	747	762	770
45	755	769	782	801	815	834	847	861	870
50	849	864	878	898	913	933	946	961	970
60	1038	1055	1071	1094	1110	1132	1145	1160	1169
70	1228	1247	1265	1290	1307	1330	1344	1360	1369
80	1419	1441	1460	1487	1505	1529	1543	1560	1569
90	1612	1635	1656	1684	1703	1728	1743	1759	1769
100	1804	1829	1852	1882	1902	1927	1942	1959	1968
125	2289	2318	2343	2377	2399	2425	2441	2459	2468
150	2776	2809	2837	2873	2896	2924	2940	2958	2968
175	3264	3301	3331	3369	3394	3423	3440	3458	3468
200	3755	3794	3826	3867	3892	3922	3939	3958	3968
225	4246	4288	4322	4365	4391	4421	4439	4458	4468
250	4738	4783	4819	4863	4890	4921	4938	4957	4967
275	5231	5278	5316	5361	5388	5420	5438	5457	5467
300	5724	5774	5813	5859	5887	5920	5938	5957	5967
350	6713	6766	6808	6857	6886	6919	6937	6957	6967
400	7703	7760	7804	7854	7885	7918	7937	7957	7967
450	8694	8754	8800	8853	8883	8918	8937	8957	8967
500	9686	9750	9797	9851	9882	9917	9936	9956	9967
550	10680	10745	10795	10850	10882	10917	10936	10956	10967
600	11673	11742	11792	11848	11881	11917	11936	11956	11967
650	12668	12738	12790	12847	12880	12916	12936	12956	12967
700	13662	13735	13788	13846	13880	13916	13936	13956	13967
750	14657	14732	14786	14845	14879	14916	14935	14956	14967
800	15653	15730	15785	15845	15879	15916	15935	15956	15967
850	16649	16727	16783	16844	16878	16915	16935	16956	16967
900	17645	17725	17782	17843	17878	17915	17935	17956	17967
950	18641	18723	18780	18842	18877	18915	18935	18956	18966
1000	19638	19721	19779	19842	19877	19915	19935	19956	19966

Table 2-21: 240 Seconds Average Service Time

agents	delay times								
	15	22	30	45	60	90	120	180	240
1	2	2	2	2	2	2	2	3	3
2	8	8	8	9	9	10	11	12	14
3	16	17	17	18	19	20	22	24	27
4	26	27	27	28	30	32	34	37	40
5	36	37	38	40	41	44	46	51	54
6	47	48	49	51	53	57	59	64	68
7	58	60	61	63	66	69	73	78	82
8	70	71	73	76	78	83	87	92	97
9	82	83	85	88	91	96	100	107	111
10	94	96	98	101	104	110	114	121	126
12	118	121	123	127	131	137	142	150	155
14	143	146	149	154	158	165	171	179	185
16	169	172	175	181	186	194	200	208	214
18	195	198	202	208	213	222	229	238	244
20	221	225	229	235	241	251	258	267	273
25	287	292	297	305	312	323	331	341	348
30	354	360	366	376	383	395	404	415	422
35	422	429	436	447	456	469	478	490	497
40	491	499	506	518	528	542	552	564	571
45	561	569	577	590	601	616	626	638	646
50	630	639	649	663	674	689	700	713	721
60	771	781	792	808	820	837	849	862	870
70	912	924	936	954	967	986	998	1012	1020
80	1055	1068	1081	1101	1115	1134	1147	1161	1170
90	1198	1213	1227	1248	1263	1283	1296	1311	1320
100	1341	1358	1373	1395	1411	1432	1445	1461	1469
125	1702	1722	1740	1765	1782	1805	1819	1835	1844
150	2065	2088	2108	2136	2155	2179	2193	2210	2219
175	2430	2455	2477	2507	2527	2552	2567	2584	2593
200	2796	2823	2847	2879	2900	2926	2942	2959	2968
225	3162	3192	3218	3251	3273	3300	3316	3334	3343
250	3530	3562	3589	3624	3647	3675	3691	3708	3718
275	3898	3932	3961	3997	4021	4049	4065	4083	4093
300	4267	4302	4332	4370	4394	4423	4440	4458	4468
350	5005	5045	5077	5117	5142	5172	5189	5208	5218
400	5746	5788	5822	5865	5891	5922	5939	5958	5968
450	6487	6532	6568	6612	6639	6671	6688	6707	6717
500	7229	7277	7315	7360	7388	7420	7438	7457	7467
550	7972	8022	8062	8109	8137	8170	8188	8207	8217
600	8715	8768	8809	8857	8886	8919	8937	8957	8967
650	9459	9514	9557	9606	9635	9669	9687	9707	9717
700	10204	10261	10304	10355	10385	10418	10437	10457	10467
750	10949	11007	11052	11104	11134	11168	11187	11207	11217
800	11694	11754	11800	11853	11883	11918	11937	11957	11967
850	12440	12502	12549	12602	12633	12668	12686	12706	12717
900	13186	13249	13297	13351	13382	13417	13436	13456	13467
950	13932	13997	14045	14100	14132	14167	14186	14206	14217
1000	14678	14744	14794	14849	14881	14917	14936	14956	14967

Table 2-22: 300 Seconds Average Service Time

agents	delay times								
	15	22	30	45	60	90	120	180	240
1	1	1	1	1	1	2	2	2	2
2	6	6	7	7	7	8	8	9	10
3	13	13	13	14	14	15	16	18	20
4	21	21	21	22	23	24	26	28	30
5	29	29	30	31	32	34	36	39	41
6	37	38	39	40	41	44	46	49	52
7	46	47	48	50	51	54	56	60	63
8	56	56	57	59	61	64	67	71	75
9	65	66	67	69	71	75	78	83	86
10	74	76	77	79	81	85	89	94	98
12	94	95	97	100	102	107	111	117	121
14	114	116	117	121	124	129	133	140	144
16	134	136	138	142	145	151	156	163	168
18	155	157	159	164	167	174	179	186	191
20	175	178	181	185	189	196	202	210	215
25	228	231	235	240	245	253	260	268	274
30	281	285	289	296	302	311	318	327	333
35	336	340	345	352	359	369	377	387	393
40	390	395	401	409	416	427	435	446	453
45	445	451	457	466	474	486	494	505	512
50	501	507	513	524	532	545	554	565	572
60	612	620	627	639	649	662	672	684	691
70	725	734	742	755	766	781	791	804	811
80	838	848	857	872	883	899	910	923	931
90	952	963	973	989	1001	1018	1029	1043	1050
100	1067	1078	1089	1106	1119	1137	1148	1162	1170
125	1354	1368	1381	1401	1415	1434	1447	1461	1470
150	1643	1659	1675	1696	1712	1733	1746	1761	1769
175	1934	1952	1969	1992	2009	2031	2045	2060	2069
200	2225	2245	2264	2289	2307	2330	2344	2360	2369
225	2518	2539	2559	2586	2605	2629	2643	2660	2669
250	2811	2834	2855	2884	2904	2928	2943	2959	2969
275	3104	3129	3152	3182	3202	3227	3242	3259	3268
300	3398	3425	3449	3480	3501	3527	3542	3559	3568
350	3987	4017	4043	4076	4098	4125	4141	4159	4168
400	4578	4610	4638	4674	4697	4724	4741	4758	4768
450	5170	5204	5234	5271	5295	5324	5340	5358	5368
500	5762	5799	5830	5869	5894	5923	5940	5958	5968
550	6355	6394	6427	6467	6492	6522	6539	6558	6568
600	6948	6990	7024	7065	7091	7122	7139	7158	7168
650	7543	7586	7621	7664	7690	7721	7739	7757	7767
700	8137	8182	8219	8262	8290	8321	8338	8357	8367
750	8732	8779	8816	8861	8889	8920	8938	8957	8967
800	9327	9376	9414	9460	9488	9520	9538	9557	9567
850	9923	9973	10012	10059	10087	10120	10138	10157	10167
900	10518	10570	10610	10658	10687	10719	10738	10757	10767
950	11114	11167	11209	11257	11286	11319	11337	11357	11367
1000	11711	11765	11807	11856	11886	11919	11937	11957	11967

Table 2-23: 600 Seconds Average Service Time

agents	delay times								
	22	30	45	60	90	120	180	240	360
1	1	1	1	1	1	1	1	1	1
2	3	3	3	3	3	4	4	4	5
3	6	6	7	7	7	7	8	8	9
4	10	10	11	11	11	11	12	13	14
5	14	14	15	15	15	16	17	18	19
6	19	19	19	19	20	21	22	23	25
7	23	23	24	24	25	26	27	28	30
8	28	28	28	29	30	30	32	33	36
9	32	32	33	34	35	36	37	39	41
10	37	37	38	38	40	41	43	44	47
12	47	47	48	48	50	51	53	55	58
14	56	57	58	59	60	62	64	67	70
16	66	67	68	69	71	73	76	78	81
18	77	77	78	80	82	84	87	89	93
20	87	88	89	90	93	95	98	101	105
25	113	114	116	117	120	123	127	130	134
30	140	141	143	145	148	151	156	159	164
35	166	168	170	172	176	179	185	188	193
40	194	195	198	200	205	208	214	218	223
45	221	223	226	228	233	237	243	247	253
50	248	250	254	257	262	266	272	277	282
60	304	306	310	314	320	324	331	336	342
70	360	363	367	371	378	383	390	395	402
80	416	419	424	429	436	442	450	455	461
90	473	476	482	487	495	501	509	514	521
100	530	533	539	545	553	560	568	574	581
125	672	677	684	691	700	708	717	723	731
150	816	822	830	837	848	856	866	873	880
175	961	967	977	984	996	1005	1016	1022	1030
200	1106	1113	1123	1132	1145	1154	1165	1172	1180
225	1251	1259	1270	1280	1293	1303	1314	1322	1330
250	1397	1405	1418	1428	1442	1452	1464	1471	1480
275	1543	1552	1565	1576	1591	1601	1614	1621	1630
300	1690	1699	1713	1724	1740	1750	1763	1771	1780
350	1983	1994	2010	2021	2038	2049	2063	2071	2079
400	2277	2289	2306	2319	2337	2348	2362	2370	2379
450	2572	2585	2603	2617	2636	2648	2662	2670	2679
500	2867	2881	2901	2915	2934	2947	2961	2970	2979
550	3163	3177	3198	3213	3234	3246	3261	3270	3279
600	3459	3474	3496	3512	3533	3546	3561	3569	3579
650	3755	3771	3794	3811	3832	3845	3861	3869	3879
700	4051	4069	4092	4109	4131	4145	4160	4169	4179
750	4348	4366	4391	4408	4431	4444	4460	4469	4479
800	4645	4664	4689	4707	4730	4744	4760	4769	4779
850	4942	4961	4988	5006	5029	5044	5060	5069	5079
900	5239	5259	5286	5305	5329	5343	5360	5369	5378
950	5536	5557	5585	5604	5629	5643	5660	5669	5678
1000	5834	5855	5884	5904	5928	5943	5959	5969	5978

Trunk Engineering Guidelines

The number of trunks required for an ACD is about 1.1 to 1.7 times the number of agents (when a blocked customer represents potential lost revenue). As in the case of agents, the number of trunks required for an ACD is based on the incoming traffic to *each split*, not the ACD as a whole. The left-most column in Table 2-24 lists the number of trunks required to service an ACD depending on the carried load in *erlangs* and the blocking probability. Blocking probability relates to the desired grade of service. The possible blocking probabilities are shown across the top of Table 2-24, and the entries under the blocking probabilities are carried loads in *erlangs*.

To determine the number of trunks needed for a given split, use Table 2-24 as follows:

- Estimate the average call duration: the total time a caller spends waiting for an answer, plus any time on hold (in queue), and plus the service time (the time the caller spends talking to an agent).
- Estimate the number of *busy-hour calls* received by the ACD during peak levels of caller activity.
- Multiply the call duration (in fractions of an hour) by the rate of *busy-hour calls* (in calls per hour). This number is the carried load in *erlangs*.
- Determine the desired grade of service (the blocking probability). The blocking probability for each split is defined as the ratio of blocked calls to the total number of incoming calls.
- In the column corresponding to the desired grade of service, choose the nearest bigger carried load. The number of trunks required is then read from the left-most column.

Note The entries in Table 2-24 are offered loads in *erlangs*.

Example 4:

An airline reservation agency has an ACD that queues calls after two ring cycles. The agency knows that the average caller spends 30 seconds waiting while queued to a split, and requires 6 minutes and 20 seconds to service. The busy-hour call arrival rate is 1980 per hour. How many trunks does the agency need to provide a service level of 99 percent?

Two ring cycles is 12 seconds. Therefore, the average call duration

average call duration = 12+30+380=422 seconds or 0.11722 hours

Therefore, the carried load in *erlangs* is:

$$\text{carried load} = 0.11722 * 1980 = 232.1$$

Under the 1 percent column, you will find that 250 trunks can service a carried load of 226.0 *erlangs* while 275 trunks can service 250.2 *erlangs*. Interpolate as follows:

$y = \text{number of trunks}$

$$y = y_0 + [(y_1 - y_0) \frac{x - x_0}{x_1 - x_0}]$$

$$y = 250 + [(275 - 250) \frac{232.1 - 226}{250.2 - 226}]$$

$$y = 250 + [25 \frac{6.1}{23.2}]$$

$$y = 256.3$$

Therefore, the agency will need 257 trunks to satisfy its customers.

Table 2-24: ACD Trunk Engineering

Trunks	Blocking Probability								
	0.01%	0.02%	0.05%	0.10%	0.20%	0.50%	1.00%	2.00%	5.00%
1	.0002	.0003	.0006	.0011	.0021	.0050	.0100	.0200	.0500
2	.0142	.0202	.0321	.0457	.0652	.1049	.1511	.2190	.3622
3	.0868	.1102	.1516	.1936	.2482	.3473	.4509	.5902	.8544
4	.2347	.2824	.3622	.4388	.5340	.6977	.8607	1.070	1.448
5	.4519	.5269	.6482	.7614	.8981	1.126	1.347	1.624	2.108
6	.7282	.8314	.9952	1.145	1.323	1.614	1.890	2.230	2.812
7	1.054	1.186	1.392	1.577	1.795	2.147	2.476	2.877	3.551
8	1.422	1.582	1.829	2.049	2.306	2.716	3.096	3.555	4.316
9	1.825	2.013	2.300	2.555	2.849	3.316	3.745	4.258	5.102
10	2.260	2.474	2.801	3.089	3.420	3.941	4.417	4.982	5.905
12	3.207	3.473	3.876	4.227	4.628	5.253	5.817	6.482	7.553
14	4.238	4.555	5.030	5.441	5.907	6.630	7.278	8.036	9.243
16	5.338	5.703	6.246	6.715	7.244	8.059	8.786	9.632	10.97
18	6.495	6.905	7.515	8.038	8.626	9.530	10.33	11.26	12.72
20	7.700	8.154	8.827	9.402	10.05	11.04	11.91	12.92	14.49
25	10.88	11.44	12.26	12.96	13.74	14.92	15.96	17.15	18.99
30	14.24	14.90	15.86	16.67	17.57	18.94	20.13	21.49	23.56
35	17.75	18.49	19.58	20.50	21.52	23.05	24.39	25.91	28.19
40	21.37	22.19	23.40	24.42	25.55	27.24	28.72	30.38	32.87
45	25.08	25.98	27.31	28.42	29.65	31.50	33.10	34.89	37.57
50	28.86	29.85	31.28	32.48	33.81	35.80	37.52	39.45	42.31
60	36.62	37.75	39.38	40.75	42.27	44.53	46.48	48.65	51.84
70	44.57	45.83	47.66	49.19	50.88	53.39	55.55	57.95	61.43
80	52.68	54.07	56.07	57.75	59.60	62.35	64.71	67.31	71.08
90	60.92	62.42	64.60	66.42	68.42	71.40	73.94	76.74	80.76
100	69.26	70.87	73.21	75.17	77.31	80.51	83.22	86.21	90.48
125	90.47	92.35	95.07	97.33	99.82	103.5	106.6	110.1	114.9
150	112.1	114.2	117.3	119.8	122.6	126.8	130.3	134.1	139.4
175	134.0	136.3	139.7	142.5	145.6	150.2	154.0	158.2	163.9
200	156.2	158.7	162.4	165.5	168.8	173.8	177.9	182.4	188.6
225	178.5	181.3	185.2	188.5	192.1	197.5	201.9	206.7	213.3
250	201.0	203.9	208.2	211.7	215.6	221.3	226.0	231.1	238.0
275	223.7	226.8	231.3	235.0	239.1	245.1	250.2	255.5	262.7
300	246.4	249.7	254.4	258.4	262.7	269.1	274.4	280.0	287.5
400	338.4	342.3	347.9	352.6	357.8	365.3	371.6	378.2	386.7
500	431.4	435.9	442.3	447.7	453.6	462.2	469.3	476.7	486.2
600	525.1	530.1	537.3	543.4	549.9	559.5	567.3	575.5	585.7
700	619.4	624.9	632.8	639.4	646.6	657.1	665.6	674.5	685.4
800	714.2	720.1	728.7	735.8	743.6	754.9	764.1	773.5	785.1
900	809.3	815.7	824.9	832.5	840.8	852.9	862.7	872.7	884.8
1000	904.7	911.5	921.3	929.4	938.2	951.1	961.5	972.0	984.6
1100	1000	1008	1018	1026	1036	1049	1060	1071	1084
1200	1096	1104	1115	1124	1134	1148	1159	1171	1184
1300	1192	1200	1212	1221	1231	1246	1258	1270	1284
1400	1289	1297	1309	1319	1329	1345	1357	1370	1384
1500	1385	1394	1406	1416	1427	1444	1456	1469	1484
1600	1482	1490	1503	1514	1526	1542	1556	1569	1584
1700	1578	1587	1601	1612	1624	1641	1655	1668	1684

CMS Customer Training

Training for two persons on CMS administration and custom reports is included with the price of the CMS software. The customer's AT&T Project Manager should call 1-800-255-8999 to schedule the appropriate classes for the customer.

The available CMS training courses are shown in the following list. The PECs shown should be used only to enroll additional persons (those who are **not** the two persons to receive training at no charge).

Course Number	PEC	Course Name	Description
BC1012A	1420-CMA	CMS R3 Administration and Supervision With Vectoring	A 5-day course for new customers who purchase the vectoring feature.
BC1013A	1420-CMB	CMS R3 Administration and Supervision	A 4.5-day course for new customers who do not purchase the vectoring feature.
BC1022A	1420-CMC	CMS R3 Administration and Supervision	A 4.5-day course for upgrade customers. This course automatically includes information on the vectoring feature.
BC1014A	1420-CME	CMS R3 Custom Reports	A 3-day course for both new and upgrade customers.

Note Upgrade customers who wish to migrate R2 CMS custom reports to R3 CMS should take the Custom Reports course **as soon as possible** after the Administration course (preferably with the two courses back-to-back), and well **before** the migration process begins. New customers may use the two free training slots for the R3 CMS Custom Reports course up to 6 months after the installation of R3 CMS. After 6 months, the customer must pay for any attendees of the Custom Reports course.

Note When enrolling customers for training, the AT&T Project Manager must be sure the customer is enrolled in the correct course. That is, whether or not the customer is upgrading from R2 CMS and whether or not the customer has vectoring are important factors in determining the course in which to enroll the customer.

The CMS Graphics feature is covered in all of the Administration courses, even if the customer has not purchased the feature. Also, the last lesson (the last half-day) in the Administration course covers the Forecasting feature. If the customer has not purchased the Forecasting feature, the customer may wish to leave before this lesson starts.

Other CMS- Related Training

The customer may benefit by taking additional courses (available at additional charges) in the following subject areas:

- UNIX System
- INFORMIX
- Traffic Theory/Data Analysis
- 6386 Administration
- 3B2 Administration.

In addition, the customer will automatically receive three Individualized Learning Programs (booklets) after one or more of the customer's employees is enrolled in the CMS Administration course. These programs include:

- Introduction to R3 CMS
- ACD Fundamentals
- Call Vectoring Basics.

Documentation

The following documents support the CMS R3 software application:

- *CMS Release 3.0 Administration (585-215-511)* — A document used by CMS administrators to administer the CMS software. The document also contains detailed descriptions of reports and information on:
 - The Vectoring feature.
 - The Forecasting feature.
 - The Graphics feature.
- *CMS Release 3.0 Custom Reports (585-215-513)* — A document used by CMS administrators to create custom reports.
- *CMS Release 3.0 Change Description (585-215-411)* — A document used by customers who are upgrading to R3 CMS from either 3B CMS or from BCMS. The document describes major differences between R3 CMS and both 3B CMS and BCMS.
- *CMS Release 2 to Release 3 Migration (585-215-113)* — A document used by customers who are upgrading to R3 CMS from 3B CMS. The document describes the procedures for migrating historical data, administration data, and custom reports from 3B CMS to R3 CMS.
- *CMS Release 3.0 Installation and Maintenance for WGS Computers (585-215-112)* — A document used by AT&T personnel to install R3 CMS software onto a 6386 Work Group Station computer. The document also describes how to maintain and troubleshoot the software and hardware, which are tasks that the customer or AT&T personnel may perform.
- *CMS Release 3.0 Installation and Maintenance for 3B Computers (585-215-111)* — A document used by AT&T personnel to install R3 CMS software onto a 3B2 computer. The document also describes how to maintain and troubleshoot the software and hardware, which are tasks that the customer or AT&T personnel may perform.
- *R3 CMS Installation and Maintenance Job Aid* — A job aid used by AT&T personnel to install R3 CMS.
- *CMS Release 3 Planning, Configuration, and Implementation (585-215-611)* — A document used by AT&T Account Teams to determine the computer hardware and software requirements for an R3 CMS application.



The select numbers in the document list (for example, **585-215-511**) are necessary for ordering documents from the Customer Information Center (CIC). See the back of the title page of this document for instructions on ordering documents from CIC. The R3 CMS Installation and Maintenance Job Aid is **not** orderable via CIC.

The following documents are always included in the cost of the R3 CMS software:

- CMS R3 Administration
- CMS R3 Custom Reports
- CMS R3 Installation and Maintenance (either for WGS or 3B2 computers)
- R3 CMS Installation and Maintenance Job Aid.

In addition, the following documents are included in the cost of software if the customer is upgrading from 3B CMS to R3 CMS:

- CMS R3 Change Description
- CMS Release 2 to Release 3 Migration.

When to Order Documents

When you place an order for R3 CMS in the R3 CMS configurator, the configurator generates a separate segment which allows you to enter a documentation ship date that is different from the system ship date. In most cases, you should enter the earliest date possible so that the customer will get the documentation long before receiving the system. Early arrival of the documentation will allow the customer to learn about R3 CMS prior to installation.

Note For upgrade customers, this early shipment of documentation is **especially** important. Since many R2 CMS customers rely on the R2 CMS to run their business, the changeover to R3 CMS can be disruptive. Therefore, upgrade customers need as much R3 CMS information as possible as early as possible.

In addition, upgrade customers need to prepare for an R2 CMS to R3 CMS migration. By reviewing the CMS Release 2 to Release 3 Migration document, customers can determine what they must do for a migration and whether they want to do it without AT&T assistance.

Chapter 3

Configuring a WGS/R3 CMS Application

General Information

This chapter describes in detail the computer hardware configurations, peripherals, and software for each computer that supports R3 CMS. The hardware needed to connect the computer and switch is also described.

You can use the worksheets in Appendix A to keep track of the items to be ordered for the customer. The worksheets can also be used to complete the Sales/Service Order forms used by most Marketing Branch Offices.

The following sections in this chapter describe in detail the hardware and software that supports the R3 CMS software application:

- CMS Supported WGS Computer Configurations
- Required hardware
- Optional hardware
- Required Software
- Optional Software
- Peripherals
- Cabling Remote Terminals and Printers
- Additional Switch Hardware and Software
- Computer-to-Switch Hardware and Cabling
- CMS Data Migrations.

You can find more detailed information about the WGS hardware in the *Marketing Guides* for the WGS Computer.



If the customer wishes to add hardware or software not specified in this document, call the Sales and Technical Response Center (STRC) for assistance at 1-800-521-7872. The Technical Response Center can verify whether the customer's configuration is supported.

The configurations described in this document are the recommended and supported configurations for R3 CMS. Customers who choose other non-supported configurations may be charged on a Time-and-Materials basis for installation and maintenance, even if they purchase an R3 CMS maintenance contract.

R3 CMS Minimum Computer Configurations

This section outlines the minimum base configuration needed to run the R3 CMS software application. You may need to add hardware and/or software to this base configuration to meet the individual configurations.

The minimum configuration lists the necessary hardware/software of the system. For more information on each different piece of hardware and software, see the appropriate hardware/software section in this chapter.

6386/25 SCSI Server Minimum Configuration

The 6386/25 SCSI Server base configuration which supports the R3 CMS software application includes the following hardware and software:

Quantity	PEC	Description
1	6950-DB4	6386/25 SCSI Server Computer
1	6950-BH6	UNIX System V/386 Version 3.2.3
1	6950-CA4	GPSC-AT/E X.25 Kit
1	69627	GPSC-AT/E 2-port RS232 cable
1	6950-ET3	705 MT Terminal (System Console)
4	69581	2 MB SIMMS memory kit
1	69582	4/16 MB Memory Expansion Board
1	69575	N80387-6386/25 Math Coprocessor
1	69598	Alternate console adapter
3	69606	25' 10-conductor shielded cable
1	69611	ACU/MODEM Adapter (Remote Console)
1	69612	REMOTE CONSOLE Modem Adapter (RMP Modem)
1	69614	9-10 PIN RJ45 Adapter (Alternate Console)
1	69617	IPC-1600 Ports Card
1	69618	Ports Cabinet for IPC-1600
1	2224-CEO	2400 FDX Error Correction Modem
8	8100-000	Blank Cartridge Tape (for backups)

6386/33 SCSI Server Minimum Configuration

The 6386/33 SCSI Server base configuration which supports the R3 CMS software application includes the following hardware and software:

Quantity	PEC	Description
1	6950-DC2	6386/33 SCSI Server Computer
1	6950-CA4	GPSC-AT/E X.25 Kit
1	69627	GPSC-AT/E 2-port RS232 cable
1	6950-ET3	705 MT Terminal (System Console)
4	69581	2 MB SIMMS memory kit
1	69582	4/16 MB Memory Expansion Board
1	69593	6386/33 Math Coprocessor
1	69598	Alternate console adapter
3	69606	25' 10-conductor shielded cable
1	69611	ACU/MODEM Adapter (Remote Console)
1	69612	REMOTE CONSOLE Modem Adapter
1	69614	9-10 PIN RJ45F Adapter (Alternate Console)
1	69617	IPC-1 600 Ports Card
1	69618	Ports Cabinet for IPC-1600
1	2224-CEO	2400 FDX Error Correction Modem
8	8100-000	Blank Cartridge Tape (for backups)

Hardware

Two models of the WGS computer — 6386/25 SCSI Server and 6386/33 SCSI Server — can be configured to support the R3 CMS software. Both the 6386/25 SCSI Server and 6386/33 SCSI Server computers can be configured to support a maximum of four ACDs.

This section describes the following WGS base configurations:

- 6386/25 WGS SCSI Server Computer Hardware
- 6386/33 WGS SCSI Server Computer Hardware
- Required Hardware for WGS Computers
- Optional Hardware for WGS Computers.

6386/25 WGS SCSI Server Computer Hardware

The 6386/25 WGS SCSI Server computer (PEC 6950-DB4) supports R3 CMS software and includes the following hardware and software:

- One 25 MHz Intel Microprocessor (0 Wait State)
- 4 MB RAM on Motherboard (expandable to 8 MB)
- One SCSI Host Adapter Card and supporting software

Note The SCSI configuration runs on UNIX V 3.2.3 or later versions. The UNIX software must be ordered separately.

- One 300 MB SCSI hard disk
- One 120 MB SCSI Cartridge Tape Unit
- One 3.5-inch, 1.44 MB floppy drive
- User guides, job aides, utility and diagnostic software
- Seven I/O expansion slots
- A real-time, battery-backed clock/calendar
- IBM PC/AT compatible DMA with support for 16-bit data and 28-bit address extensions
- Two serial ports (25-pin and 9-pin connectors)
- One 25-pin Centronics® parallel port
- Mechanical keylock with master key capability
- One socket for either an 80387 or 3167 Weitek math coprocessor at 25MHz speed.

6386/33 WGS SCSI Server Computer Hardware

The 6386/33 WGS SCSI Server computer (PEC 6950-DC2) supports R3 CMS software and includes the following hardware and software:

- One 33 MHz Intel Microprocessor (0 Wait State)
- 4 MB RAM on Motherboard (expandable to 8 MB)
- One SCSI Host Adapter Card and supporting software
- One 300 MB SCSI hard disk
- One 120 MB SCSI Cartridge Tape Unit
- One 3.5-inch, 1.44 MB floppy drive
- PMX/Term software
- UNIX System V, Release 3.2.3 operating system
- User guides, job aides, utility and diagnostic software
- Ten I/O expansion slots (one XT; seven XT/AT; two XT/AT32 bit).

Note Full size (13-inch) AT boards fit into the 6386/33 WGS SCSI Server.

- A real-time, battery-backed clock/calendar
- IBM PC AT-compatible DMA with 32-bit address
- Two serial ports (25-pin and 9-pin connectors)
- One 25-pin Centronics® parallel port
- Mechanical keylock with master key capability
- One socket for either an 80387 or 3167 Weitek math coprocessor at 33MHz speed.

Required Hardware For R3 CMS

This section describes the additional computer-related hardware required for the 6386/25 WGS and 6386/33 WGS SCSI Server computers operating the R3 CMS application software.

General Purpose Synchronous Controller (GPSC-AT/E)

The General Purpose Synchronous Controller (GPSC-AT/E) kit (PEC 6950-CA4) provides a wide range of synchronous communications possibilities for the 6386/WGS and 6386E/WGS computers. In the R3 CMS application, the GPSC-AT/E is the hardware interface that links the WGS computer to an AT&T switch.

The GPSC-AT/E kit consists of the following items:

- Hardware (GPSC-AT/E board)

Note The GPSC-AT/E board requires a 16-bit expansion slot in the WGS computer.

- Diagnostic software (3.5-inch or 5.25-inch floppy diskette)
- Loopback connector
- User's Manual.

Note The X.25 application software (PEC 6950-AM1) is required to allow the WGS computer and the AT&T switch to communicate. The X.25 application software is included with the R3 CMS application software.

The two-port expansion cable (PEC 69627) is needed to connect the GPSC-AT/E board to the cables connected to the switch.

Order one GPSC-AT/E kit and one two-port expansion cable for each WGS computer. Each GPSC-AT/E kit can be connected to two separate ACDs. If the host computer is to support more than two ACDs, order an additional GPSC-AT/E card and two-port expansion cable.

Intelligent Ports Card

The Intelligent Ports Card (IPC-1600) provides high speed data transfer between either the 6386/25 WGS SCSI Server or the 6386/33 WGS SCSI Server products and the attached serial I/O devices. In the R3 CMS application, the IPC board is the hardware interface that allows additional terminals to be connected to the host computer.

Intelligent Ports Card 1600 (IPC-1600)

The IPC-1600 (PEC 69617) provides 16 asynchronous serial RS-232 communication ports. The IPC-1600 board is controlled by a 16-bit microprocessor running at 12.5 MHz.

Note The IPC-1600 ports Cabinet (PEC 69618) is recommended to house the IPC-1600 fanout module.

The IPC-1600 Ports Cabinet is *not included* in the IPC-1600 kit (PEC 69617).

The IPC-1600 kit (PEC 69617) includes the following items:

- A PC-AT compatible circuit board which requires a 16- or 32-bit slot on the system bus
- Two cable assemblies
- A 16-port fanout module
- An MS-DOS Driver Set and Diagnostics software provided on both 3.5-inch and 5.25-inch diskettes
- A UNIX Driver Set provided on both 3.5-inch and 5.25-inch diskettes
- A User's Guide
- One year of toll-free hotline service for customer assistance.

IPC-1600 Ports Cabinet

The IPC-1600 Ports Cabinet (PEC 69618) is a wire frame assembly with a cover. The cabinet provides a mounting space for two 16-port fanout modules. The cabinet can be placed on a table, on the floor, or it can be mounted on a wall. Its use is recommended to help organize, route, and protect the cables and cable connections.

Main Memory Expansion

For the 6386/25 WGS and 6386/33 WGS SCSI Server computers, the *minimum* amount of main memory required by R3 CMS is based on each specific system configuration. To determine the minimum amount of main memory required, refer to the guidelines outlined in Chapter 2, "Planning" of this document.

Main Memory for the 6386/25 WGS SCSI Server Computer

For the R3 CMS application, the 6386/25 WGS SCSI Server computer must have a minimum of 16 MB of main memory. The 6386/25 WGS computer comes equipped with 4 MB of main memory on the motherboard and can be expanded to contain a total of 8 MB of main memory on the motherboard.

Additional main memory is provided by the 2 MB SIMMS Memory Kit (PEC 69581) and the 4/16 MB Memory Expansion Board (PEC 69582).

Note The 6386/25 WGS computer can have a maximum of 40 MB of memory.

Main Memory for the 6386/33 WGS SCSI Server Computer

For the R3 CMS application, the 6386/33 WGS SCSI Server computer must have a minimum of 16 MB of main memory. The 6386/33 WGS SCSI Server computer comes equipped with 4 MB of main memory (on the motherboard) and can be expanded to contain a total of 8 MB of main memory (on the motherboard).

Additional main memory is provided by the 2 MB SIMMS Memory Kit (PEC 69581) and the 4/16 MB Memory Expansion Board (PEC 69582).

Note The 6386/33 WGS computer can have a maximum of 40 MB of memory.

2 MB SIMMS Memory Kit

The 2 MB SIMMS Memory kit (PEC 69581) contains two 1 MB Fast Paged SIMMS which can only be added to the motherboard or the 4/16 MB Memory Expansion Board (PEC 69582). The installation instructions are also included in the kit.

**4/16 MB Memory
Expansion Board**

The 4/16 MB Memory Expansion Board (PEC 69582) is used to increase the amount of memory for the WGS computer using the 2 MB SIMMS Memory kit (PEC 69581). The board comes with 4 MB of memory (on board) and can be expanded to 8 MB or 16 MB of memory. The installation instructions are also included.

**Math (Numeric)
Coproductors for
6386 WGS
Computers**

The Math or Numeric Coprocessor (80387) increases the numeric processing performance of the 6386 WGS computers. The 80387 plugs into the number coprocessor socket on the motherboard. The numeric processor can perform mathematical computations many times faster than the 80386 processor, which results in higher performance for numerical applications.

**Math Coprocessor for
the 6386/25 WGS
Computer**

The Math Coprocessor Kit (PEC 69575) provides a 25 MHz Intel 80387 coprocessor which plugs into a socket on the motherboard of the 6386/25 WGS computer. It provides fast numeric processing for arithmetic functions.

**Math Coprocessor for
the 6386/33 WGS SCSI
Server Computer**

The Math Coprocessor Kit (PEC 69593) provides a 33 MHz Intel 80387 coprocessor which plugs into a socket on the motherboard of the 6386/33 WGS or 6386/33 WGS SCSI Server computer. It provides fast numeric processing for arithmetic functions.

Remote Management

The Remote Management feature provides 2-way communication between the R3 CMS at the customer site and the remote maintenance center supporting the customer. Communication takes place on a dedicated phone line **paid for by the customer**. This feature allows the R3 computer to be maintained from a remote location.

From the remote maintenance center, highly skilled engineers can install, upgrade, maintain, and troubleshoot the R3 CMS software at the customer site. During remote installations and upgrades of the software, an on-site technician must be present to install the physical medium (floppy disk or tape) that contains the software.

The Remote Management feature comprises the following components which must be ordered separately:

- Remote Management Package (PEC 69601) — includes the following components:
 - Remote Maintenance Circuit (RMC) board and supporting software
 - Remote Diagnostics software (1 floppy disk)
- One 2400 FDX Error Correction Modem (PEC 2224-CEO)

Refer to Figure 3-1 and Table 3-1 when ordering the cables and connectors for the Remote Management feature.

Figure 3-1 also shows the cable and connector required to connect the Emergency Power Option of the optional Uninterruptible Power Supply (UPS).

With the Emergency Power Option, the RMP will execute a graceful shutdown approximately one minute after a power outage has occurred. Refer to the *CMS Installation and Maintenance for WGS Computers* (585-215-112) document for details.

Without the Emergency Power Option, the WGS computer will have to be manually shut down after a power outage has occurred. During the power outage the UPS will provide emergency power to the WGS computer for approximately 15 minutes.

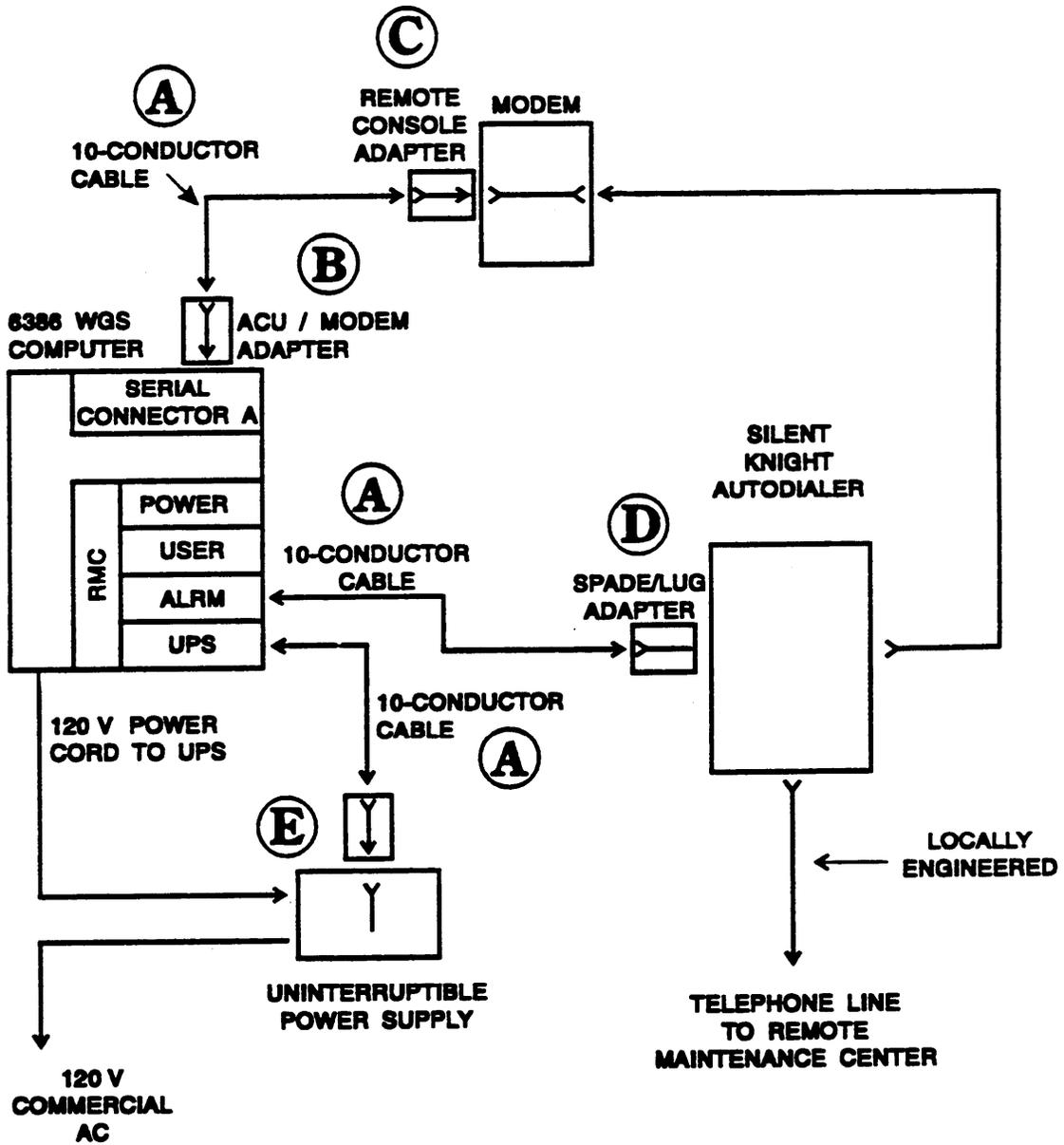


Figure 3-1: 6386 WGS Remote Management Cabling

Table 3-1: 6386 WGS Remote Management Cabling and Connector Codes

Reference to Fig. 4-1	Equipment	PEC	Description
A	10-Conductor Modular Cable	69605 69606 69607	10-foot (M-M) 25-foot (M-M) 50-foot (M-M)
B	ACU/Modem Adapter	69611	
C	Remote Console Modem Adapter	69612	RMP Modem Connector
D	Spade/Lug Adapter	69613	Alarm Interface Adapter
E	UPS Adapter	69624 69604 69612	360VA or 500VA UPS 1 KVA UPS 3KVA or 5KVA UPS

Miscellaneous Requirements

You should order a minimum of eight cartridge tapes (PEC 8100-000) for the WGS computer. These tapes are used at installation time to back up the customer's system. Additional tapes can be purchased to complete routine system backups and restores.

Optional Hardware for R3 CMS

This section describes the optional computer-related hardware that can be ordered for the 6386/25 SCSI Server and 6386/33 WGS SCSI Server computers operating in an R3 CMS application.

SCSI Packages

The Small Computer Serial Interface (SCSI) peripherals are devices which conform to an industry standard interface when connecting a host computer to intelligent peripherals. The SCSI standard interface makes it possible for one computer to support enormous storage capacities. Storage capacities can be increased by adding various SCSI peripherals, such as hard disk drives and cartridge tape drives.

Each SCSI peripheral device is delivered as a complete “package.” Each package contains all the hardware, software, cables, and documentation needed to add that device to your computer.

Note The 6386/25 SCSI Server and 6386/33 WGS SCSI Server computers come equipped with one SCSI Host Adapter as standard equipment.

The 6386/25 SCSI Server can only support one SCSI Host Adapter card.

The 6386/33 SCSI Server can support up to three SCSI Host Adapter cards.

WGS SCSI Host Adapter Package A

The WGS SCSI Host Adapter Package A (PEC 69629) includes the following:

- One SCSI Host Adapter board
- One external 4-foot, 50-pin cable
- One SCSI Diagnostics software provided on both 3.5-inch and 5.25-inch diskettes
- A set of the appropriate documentation.

WGS SCSI Host Adapter Package B

The WGS SCSI Host Adapter Package B (CSG PEC 37758) includes the following:

- One SCSI Host Adapter board
- One AT&T SCSI Support Package software provided on both 3.5-inch and 5.25-inch diskettes
- SCSI Diagnostics software provided on both 3.5-inch and 5.25-inch diskettes
- One external 4-foot, 50-pin cable
- A set of the appropriate documentation.

WGS SCSI External Connect Kit

The WGS SCSI External Connect Kit (PEC 69600) is used to add external SCSI peripherals to the built-in SCSI subsystem. The following items are included in this package:

- One 4-foot external SCSI cable
- One SCSI terminator
- Installation instructions (documentation).

1000 MB SCSI Internal Hard Disk Kit

The 1000 MB SCSI Internal Hard Disk Kit (PEC 69626) includes the following:

- One 1000 MB SCSI internal disk drive
- Cabling and mounting hardware
- Installation instructions.

1000 MB SCSI External Hard Disk Kit

The 1000 MB SCSI External Hard Disk Kit (PEC 69630) includes the following:

- One 1000 MB SCSI external disk drive
- Cabling and mounting hardware
- Installation instructions.

External SCSI Bus Cable

The External SCSI Bus Cable (PEC 69600) includes the following:

- One 4.5 foot external SCSI bus cable
- Connection instructions.

120 MB SCSI Internal Cartridge Tape Kit

The 120 MB SCSI Internal Cartridge Tape Kit (PEC 37770) includes the following:

- One 120 MB SCSI internal cartridge tape drive
- Cabling and mounting hardware
- Installation instructions.

120 MB SCSI External Cartridge Tape Drive

The 120 MB SCSI External Cartridge Tape Drive (Non-BCS PEC 73208) includes the following:

- One 120 MB SCSI external cartridge tape drive
- Cabling
- Installation instructions.

Uninterruptible Power Supply

The Uninterruptible Power Supply (UPS) provides temporary electrical supply for the WGS computer (and other equipment connected to the UPS) for about 15 minutes.

Note If a UPS is not connected to the WGS computer, possible file system damage may occur during a power failure. The extent of the damage could range from losing the last half-hour data save to a disk crash. (During a disk crash, the disk heads come in contact with the disk surface, thereby destroying the disk.) If a disk crash occurs, the disk drive will have to be replaced.

Any power failure without a UPS will cause the loss of some CMS data. It is up to the customer to weigh the cost of the UPS against the value of the CMS data.

The following UPS models can be ordered:

- 360 VA UPS (PEC 2403-036)
- 500 VA UPS (PEC 2403-050)
- 1 KVA UPS (PEC 2403-201)
- 2 KVA UPS (PEC 2403-204)
- 3 KVA UPS (PEC 2403-203)
- 5 KVA UPS (PEC 2403-203).

Note If the UPS is only supporting the R3 CMS host computer, then the 1 KVA UPS is recommended.

If the UPS is connected to the Remote Management Package (RMC board) and a power outage occurs, the RMP executes a graceful shutdown. Refer to the *Remote Management* in this chapter and the *CMS Installation and Maintenance for WGS Computers (585-215-112)* document for details.

The UPS consists of a reserve battery, charger system, and four NEMA type 5-15R outlets for equipment connection.

Visual indicators include:

- Normal
- On battery
- Low battery overload.

Audible indicators include:

- On battery
- Low battery
- Overload.

Remote indicators are provided via a Form C contact closure interface:

- Normal
- On battery
- Low battery
- Overload.

Controls include:

- ON/OFF
- Alarm silence.

Life expectancy of the supplied battery is 3 years or 200 discharges, whichever comes first.

Refer to Table 3-1 and Figure 3-1 for the cable and connector PECs required to connect the UPS to the RMC.

Refer to the *Marketing Guide* on the UPS for more information.

Software

This section describes the additional software that is used with the R3 CMS application.

Required Software for the 6386/25 WGS Computer

For a 6386/25 WGS computer, you must order the following software:

- R3 CMS — Select a PEC which corresponds to the specific R3 CMS system being ordered:
 - R3 CMS with 1 to 100 agent extensions (PEC 1208–311, Attribute MSF13)
 - R3 CMS with 1 to 200 agent extensions (PEC 1208–312, Attribute MSF13)
 - R3 CMS with 1 to 300 agent extensions (PEC 1208–313, Attribute MSF13)
 - R3 CMS with 1 to 400 agent extensions (PEC 1208–314, Attribute MSF13)
 - R3 CMS with maximum number of agent extensions (PEC 1208–315, Attribute MSF13)

Note The INFORMIX SQL Version 2.10.03J, Network Interface Version 1.2.1, and UNIX System V ISV/VAR Toolkit (Korn Shell) (PEC 1331-004) software packages are included (bundled together) with the R3 CMS software PEC. This information is correct for both new and upgrade purchases.

- UNIX System V/386 Version 3.2.3 (PEC 6950-BH6)

Note Refer to the “ Measured Extensions Assigned to Multiple Splits” section in Chapter 2 of this document to verify that the correct number of agent extensions have been purchased.

Required Software for the 6386/33 WGS SCSI Server Computer

For a 6386/33 WGS SCSI Server computer, you must order the following software:

- R3 CMS — Select a PEC which corresponds to the specific R3 CMS system being ordered:
 - R3 CMS with 1 to 100 agent extensions (PEC 1208–311, Attribute MSF13)
 - R3 CMS with 1 to 200 agent extensions (PEC 1208–312, Attribute MSF13)
 - R3 CMS with 1 to 300 agent extensions (PEC 1208–313, Attribute MSF13)
 - R3 CMS with 1 to 400 agent extensions (PEC 1208–314, Attribute MSF13)
 - R3 CMS with maximum number of agent extensions (PEC 1208–315, Attribute MSF13)

Note The INFORMIX SQL Version 2.10.03J, Network Interface Version 1.2.1, and UNIX System V ISV/VAR Toolkit (Korn Shell) (PEC 1331-004) software packages are included (bundled together) with the R3 CMS software PEC. This information is correct for both new and upgrade purchases.

Note The UNIX System V/386 Version 3.2.3 (PEC 6950-BH6) software is packaged with the 6386/33 SCSI Server computer (PEC 6950-DC2).

Note Refer to the “Measured Extensions Assigned to Multiple Splits” section in Chapter 2 of this document to verify that the correct number of agent extensions have been purchased.

Optional Software

This section describes the optional software which can be used with R3 CMS to enhance its operation.

R3 CMS Forecasting

The R3 CMS Forecasting Feature (PEC 1208-3FC) software option allows the CMS administrator to determine how many agents or trunks will be needed in the future based on historical data and parameters set by the CMS administrator.

R3 CMS Graphics

The R3 CMS Graphics Feature (PEC 1208-3GR) software option allows the customer to view real-time and daily historical data in the form of bar graphs. When using the bar graph reports, data is displayed in the form of bars of variable height and intensity (or variable color if the user has a 615 CMT color terminal).

R3 CMS Vectoring

The R3 CMS Call Vectoring Feature (PEC 1208-3CV) software option can be ordered if the customer is ordering or has one of the following switches:

- Generic 3r switch with Call Vectoring
- Generic 3i switch with Call Vectoring
- Generic 2 switch with Call Vectoring
- System 85, R2V4 switch with Call Vectoring.

Peripherals

This section describes the terminals and printers that can be connected to the WGS computer and are recommended for use with the R3 CMS application.

Note For terminals and printers located more than 50 feet from the WGS computer, refer to the *AT&T Information Systems Sales Manual* (774-004) for additional cabling, connectors, and other hardware such as modems and Asynchronous Data Units (ADUs).

Terminals

The following AT&T terminals have been approved to support the R3 CMS application:

- 715 Business Communications Terminal (715 BCT)
- 705 Multitasking Terminal (705 MT)
- 615 Multitasking Terminal (615 MT)
- 615 Color Multitasking Terminal (615 CMT)
- 620 Multitasking Terminal with Graphics (620 MTG)
- 610 Business Communications Terminal (610 BCT)
- 605 Business Communications Terminal (605 BCT)
- 6500 Displays (6528, 6529, 6538, and 6539)
- 4425 DATASPEED.

Note The 605 BCT, 610 BCT, 615 MT, 620 MTG, 4425, and 6500-series terminals are CMS approved terminals but have been manufacturer discontinued (MDed).

715 BCT

The 715 Business Communications Terminal (715 BCT) is an interactive, character-at-a-time keyboard/display terminal that has been specifically designed to work with the AT&T 3B computers, AT&T WGS personal computers, and other UNIX System or DOS hosts. The 715 BCT package includes a 102 key keyboard and a monitor as standard equipment. The monitor for the 715 BCT is available in the following colors:

- Amber (PEC 6950-ET6)
- Paper White (PEC 6950-ET7).

For additional information, refer to the *Marketing Guide* for the AT&T 715 BCT and the *AT&T Information Systems Saks Manual* (774-004).

705 MT

The 705 Multitasking Terminal (705 MT) is an interactive, character-at-a-time keyboard/display terminal that has been specifically designed to work with the AT&T 3B computers, AT&T WGS personal computers, and other UNIX System or DOS hosts. The 705 MT package includes a 102 key keyboard and a monitor as standard equipment. The monitor for the 705 MT is available in the following colors:

- Amber (PEC 6950-ET3 Attribute COL19)
- Paper White (PEC 6950-ET3 Attribute COL10).

For additional information, refer to the *Marketing Guide* for the AT&T 705 MT and the *AT&T Information Systems Sales Manual* (774-004).

615 CMT

The 615 Color Multitasking Terminal (615 CMT) has, in addition to the functionality of the 615 MT, eight user-selectable colors for both foreground and background. **The 615 CMT is the only supported color terminal for CMS Graphics.** The major components for the 615 CMT are as follows:

- 615 CMT Controller (PEC 6950-ET5)
- 96-Key Standard Keyboard (PEC 69567)
- 14-Inch Color Monitor (PEC 69571).

For additional information, refer to the *Marketing Guide* for the AT&T 615 CMT and the *AT&T Information Systems Sales Manual* (774-004).

For each terminal connected to the IPC-1600 fanout module, at least one of the following cables and one terminal/printer adapter must be used:

- Terminal/Printer Adapter (PEC 69608)
- 10-Connector Modular Cable, 10 feet (PEC 69605)
- 10-Connector Modular Cable, 25 feet (PEC 69606)
- 10-Connector Modular Cable, 50 feet (PEC 69607)
- 10-Pin In-Line Extender (PEC 69628).

Note The 10-Pin In-Line Extender is used to connect the modular cables together to create various lengths of cable.

Printers

AT&T printers provide a wide range of speeds and print quality. The printers are categorized into three types:

- *Draft Quality* — gives an idea of what the final document will look like, but the copy will not reproduce well.
- *Near Letter Quality* — output is better than draft quality but not as good as letter quality.
- *Letter Quality* — gives good quality output that may be copied on a photocopier with good results or may be used directly from the printer.

Table 3-2 lists the printers that can be ordered for the CMS application and highlights the characteristics of each printer. Table 3-3 lists the printers that are no longer orderable (discontinued) but support the CMS application and highlights the characteristics of each printer.

Table 3-2: Orderable and Supported Printers

Printer Model	PEC	Printer		Speed		Paper Size	Interface
		Type	Quality	Relative	Char/Sec**		
572	6950-EP5	Dot Matrix	NLQ Draft	Low High	62 250	≤ 10 inches	EIA
573	6950-EP6	Dot Matrix	NLQ Draft	Low High	62 250	≤ 15.5 inches	EIA
580‡	6950-EP3	Dot Matrix	Letter NLQ Draft	Low Medium High	40 62 250	≤ 10 inches	Parallel
583‡	6950-EP8	Dot Matrix	Letter NLQ Draft	Low Medium High	66 133 200	≤ 15.5 inches	Parallel/EIA
593	6950-EP1	Laser	Letter	High	6 ppm†	8.5x11 8.5x14	Parallel
NCR-6417	6951-417	Dot Matrix	NLQ Draft	Low High	62 250	≤ 15.5 inches	Parallel

† — pages per minute.
 ** — 10 characters per inch.
 ‡ — will print bar graphs with high-quality IBM® Enhanced Graphics character set.
 The 583 is a color printer, though it will not print bar graphs in color.

Table 3-3: Discontinued But Supported Printers

Printer Model	Printer		Speed		Paper Size	Interface
	Type	Quality	Relative	Char/Sec		
447	Band	Draft	High	600 lpm*	≤ 16 inches	EIA
475	Dot Matrix	Draft	Low	120	≤ 11 inches	EIA
476	Dot Matrix	Draft	Low	120	≤ 11 inches	EIA
477‡	Dot Matrix	NLQ	High	96-288	≤ 16 inches	EIA
495	Laser	Letter	High	10 ppm†	8.5x11 8.5x14	EIA
5310	Dot Matrix	Draft	High	200	≤ 9.5 inches	EIA
5320	Dot Matrix	Draft	High	200	≤ 15 inches	EIA

† — pages per minute.
‡ — will print with high quality IBM® Enhanced Graphics character set for bar graphs.

For more information about the printers, optional printer hardware, and cabling, refer to the *AT&T Information Systems Sales Manual* (774-004).

Note If the customer is purchasing CMS Graphics, printer models 477, 580, and 583 will give the customer superior graph printouts because these printers support the IBM® Enhanced Graphics character set. Graph printouts on other printers will use the basic ASCII character set.

For each printer connected to the IPC-1600 fanout module, one of the following cables and one terminal/printer adapter must be used:

- Terminal/Printer Adapter (PEC 69608)
- 10-Connector Modular Cable, 10 feet (PEC 69605)
- 10-Connector Modular Cable, 25 feet (PEC 69606)
- 10-Connector Modular Cable, 50 feet (PEC 69607)
- 10-Pin In-Line Extender (PEC 69628).

Note The 10-Pin In-Line Extender is used to connect the modular cables together to create various lengths of cable.

Cabling Remote Terminals and Printers

In some cases, the customer's AT&T 6386 WGS computer and AT&T telecommunications switch may be separated by several miles. If this is the case, the customer may want to install CMS terminals and printers at the switch location.

One way to do this is by multiplexing EIA ports at the computer site over a single analog private line (supplied by the local telephone company at the customer's expense) to the switch site. At the switch site, the CMS terminals and printers are multiplexed to the incoming analog private line.

Refer to the *DATAPHONE* II Series 700 Multiplexer Configuration Guide* (999-100-308 IS) and also contact the **Sales and Technical Response Center** at **1-800-521-7872** for detailed information on the hardware required to multiplex EIA ports on the WGS computer to terminals and printers at remote locations.



Using DATAPHONE II multiplexers to cable the EIA ports on the WGS computer to remote CMS terminals and printers is just one of many possibilities. It is not within the scope of this document to detail the hardware and cabling required for this method or any other method.

* Registered trademark of AT&T.

Another way to do this is by connecting the remote terminals and printers to the CMS host computer using ADU's. Refer to Figure 3-2. To connect a remote terminal or printer to the CMS host computer, the following will be needed:

- One 10-Connector Modular Cable (PEC 69605)
- One ACU Modem Adapter (PEC 69610)
- One Female ADU (PEC 2169-004)
- One D8AM Crossover (PEC 6950-EA9)
- Two D8W Cable (PEC 2725-07G)
- Two 103A Connector Block (PEC 2750-D08)
- One Male ADU (PEC 2169-001)

Note If a printer is being connected to the Male ADU, an ADU power supply (PEC 63180) will also need to be ordered.

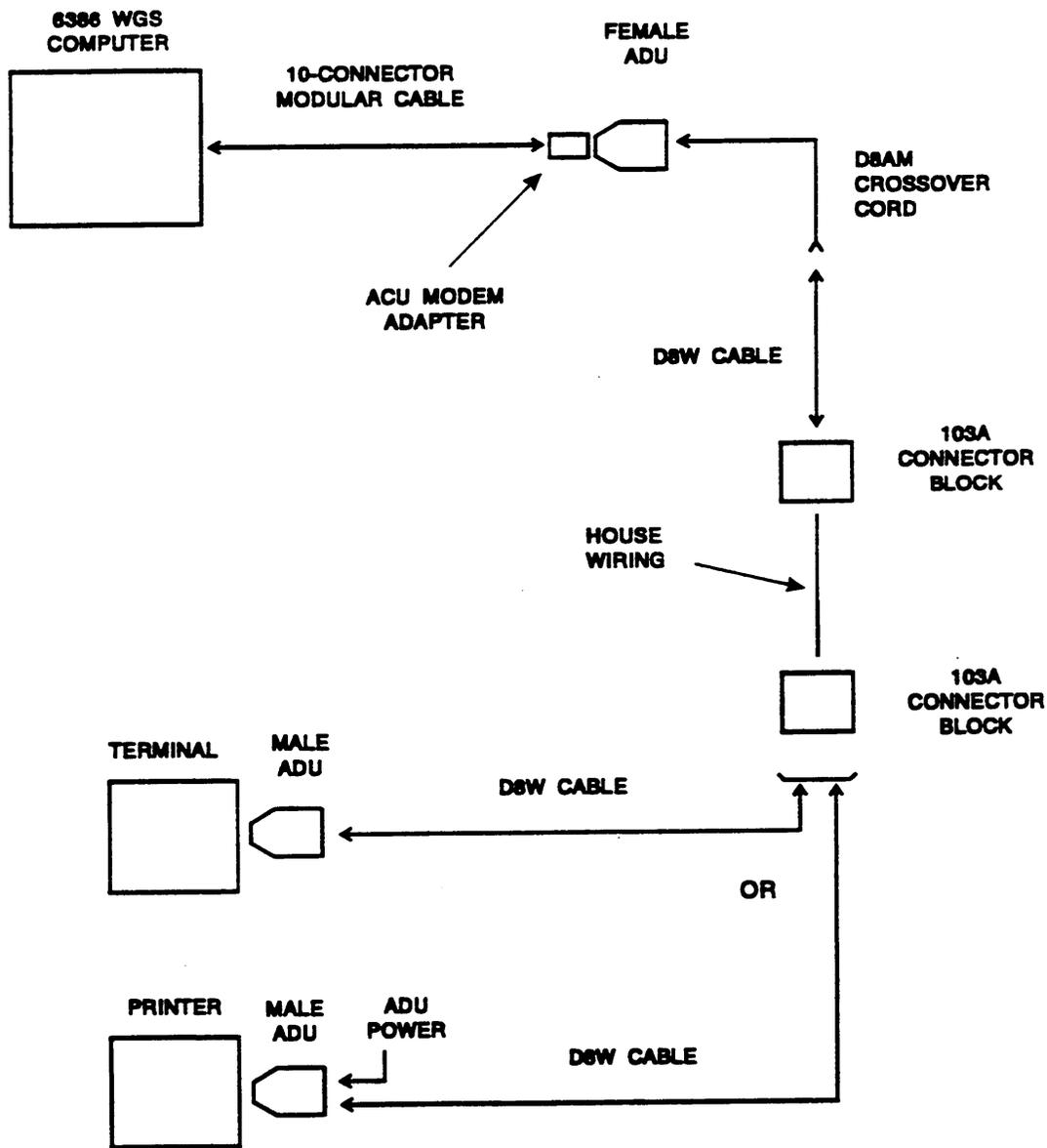


Figure 3-2: Remote Terminal/Printer Cabling

Additional Switch Hardware and Software

This section identifies the switches that can be connected to the 6386 WGS computers in an R3 CMS application. The additional switch hardware and software items required by the CMS application are also discussed.

The following AT&T telecommunications switches support the R3 CMS software application:

- AT&T DEFINITY Communications System Generic 3r — Issue 1
- AT&T DEFINITY Communications System Generic 3i — Issue 1
- AT&T DEFINITY Communications System Generic 2 — Issue 1 and Issue 2
- System 85, R2V4, Issue 1.0 or later
- AT&T DEFINITY Communications System Generic 1 — Issue 1 and Issue 2.

The AT&T switches should be installed with or upgraded to the required software before the R3 CMS software application is installed.

Determining which switch the customer needs or wants in an R3 CMS application is a separate ordering function.

Additional Generic 3r Switch Hardware and Software

If the WGS computer is going to be connected to the Generic 3r switch, the following hardware must be available on the switch:

- Packet Gateway (PGATE Board TN577) (PEC 63317).

If the customer wants the optional recorded announcement feature, the following hardware must also be available on the Generic 3r switch:

- Auxiliary trunk interface (PEC 63118)
- Integrated Announcement Board (TN750B) (PEC 63141).

The following software may be required on a Generic 3r Switch:

- Application-Service (ACD) Software (PEC 1263-ACD)
- Call Vectoring Software (PEC 1263-CVB)
- Call Vectoring Prompting Software (PEC 1263-CVP)
- Call Work Codes Software (PEC 1263-CWC).

Additional Generic 2 and System 85 Switch Hardware and Software

If the WGS computer is going to be connected to the Generic 2 or System 85 switch, the following hardware must be available on the switch:

- DCIU (PEC 65325).

Note For duplicated common controls, order two DCIUs.

Call Vectoring (PEC 1252-CVG) must be included with Generic 2 or System 85, R2V4 switch order if the customer orders the Call Vectoring feature (PEC 1208-3CV) of the R3 CMS software.

If the customer wants the optional recorded announcement feature, the following hardware should also be available, as required, on the Generic 2 or System 85 switch:

- Basic 4-Channel Digital Announcement (PEC 65272) —
PREREQUISITES: PEC 65273 (for a total of four channels) is required if the recorded announcement is to be provided to more than one subscriber line. Also required are four trunks of an auxiliary trunk interface (PEC 65113) and one port of an analog interface (PEC 65347). Two AC converter units (PEC 65271) are required when a system is run on AC power.

or

1-Channel Announcement (PEC 65270) — PREREQUISITES: One trunk of an auxiliary trunk interface (PEC 65113) and one port of an analog interface (PEC 65347) are required. One AC converter unit (PEC 65271) is required when a system is run on AC power.

- 3-Channel Remote Record and Ring Trip Option (PEC 65273).
- Extended Memory Adder Kit (Optional) (PEC 65274) —
PREREQUISITE: PEC 65270, 65272, or 65276.
- 1-Minute Expansion Kits (Optional) (PEC 65275).

Refer to the *AT&T Information Systems Sales Manual* (774-004) for a full description of this recorded announcement option.

**Optional Recorded
Announcement
Hardware for the
Generic 2 and System
85**

Instead of the previously described recorded announcement hardware, the following recorded announcement hardware can be ordered:

- 13A announcement unit (PEC 64966)
- Auxiliary trunk interface (PEC 65113)
- L40 24 SEC pack (PEC 64967).

Note One 13A announcement unit supports up to eight L40 24 SEC packs, one auxiliary trunk interface is required for every four L40 24 SEC packs, and one L40 24 SEC pack is required for every announcement.

Additional Generic 3i and Generic 1 Switch Hardware and Software

If the WGS computer is going to be connected to the Generic 3i or Generic 1 switch with a Modular Processor Data Module (MPDM), the following hardware must be available on the switch:

- Processor Interface (PI Board TN765) (PEC 63153)
- Digital line (PEC 63114)
- Digital announcement board TN750 (PEC 63141).

If the WGS computer is going to be connected to the Generic 3i or Generic 1 switch via the EIA connector on the Processor Interface, the following hardware must be available on the switch:

- Processor Interface (PI Board TN765) (PEC 63153)
- Digital announcement board TN750 (PEC 63141).

The following software may be required on a Generic 3i Switch:

- Application-Service (ACD) Software (PEC 1236-ACD)
- Call Vectoring Software (PEC 1236-CVB)
- Call Vectoring Prompting Software (PEC 1236-CVP)
- Call Work Codes Software (PEC 1236-CWC).

The following software may be required on a Generic 1 Switch:

- Application-Service (ACD) Software (PEC 1233-ACD)

Computer-to-Switch Hardware and Cabling

This section describes the hardware and cables that you must order to connect a WGS computer to the following AT&T telecommunications switches:

- DEFINITY Communications System Generic 3r
- DEFINITY Communications System Generic 3i
- DEFINITY Communications System Generic 2
- System 85 Release 2 Version 4
- DEFINITY Communications System Generic 1.

Refer to the appropriate section to determine the hardware and cabling requirements:

- *Connecting the WGS computer to the Generic 3r Switch*
- *Connecting the WGS computer to the Generic 2 or System 85 Switch*
- *Connecting the WGS computer to the Generic 3i or Generic 1 Switch.*

Connecting the WGS Computer to the Generic 3r Switch

This section describes the hardware and cables required to connect the GPSC-AT/E RS-232C port on the WGS computer to the Packet Gateway board on the Generic 3r switch.

The WGS computer can be connected to these by using one of the following methods:

- *Using the Isolating Data Interface*

If this method is used, the maximum allowable distance between the 6386 WGS computer and the Generic 3r switch is 200 feet.

- *Using a Modular Processor Data Module*

If this method is used, the maximum allowable distance between the WGS computer and the Modular Processor Data Module (MPDM) is 50 feet, and the maximum allowable distance between the MPDM and the Generic 3r is 5000 feet with 24 gauge wire and 4000 feet with 26 gauge wire.

- *Using a Private Line*

This method is required when the distance limitations for the MPDM are exceeded.

Using the Isolating Data Interface

This section describes the hardware and cables required to connect a GPSC-AT/E RS-232C port on the WGS computer to the Packet Gateway board on the Generic 3r switch.

Note For this cabling configuration, the Generic 3r and the WGS computer must not be over 200 feet apart. If the distance is greater than 200 feet, refer to the section *Connecting the WGS Computer to the Generic 3r Switch* for the proper cabling configuration and to the section *Additional Generic 3r Hardware* for switch hardware information.

Note For this configuration, the Generic 3r switch must have a single common control and must be AC powered. This configuration will not work with duplicated common controls or DC power.

The WGS computer can be connected to the Packet Gateway board on the Generic 3r switch by ordering the following hardware:

- One GPSC-AT/E fanout cable (PEC 69627)
- One 10-foot RS-232C to RS-449 transition cable (H600-210, Group 1) (PEC 70308, Attributes LNG50, LNH99)
- One Isolating Data Interface (IDI) kit (PEC 65399A, Attributes CCT01, CCN06, LNG21)
- One RS-232C to RS-449 transition cable:
 - 10-foot H600-210, Group 1 cable (PEC 70308, Attributes LNG50, LNH99)
 - 25-foot H600-210, Group 2 cable (PEC 70308, Attributes LNG21, LNH99)
 - 50-foot H600-210, Group 3 cable (PEC 70308, Attributes LNG11, LNH99)
 - 100-foot H600-210, Group 4 cable (PEC 70308, Attributes LNG13, LNH99)
 - 200-foot H600-210, Group 5 cable (PEC 70308, Attributes LNG17, LNH99).

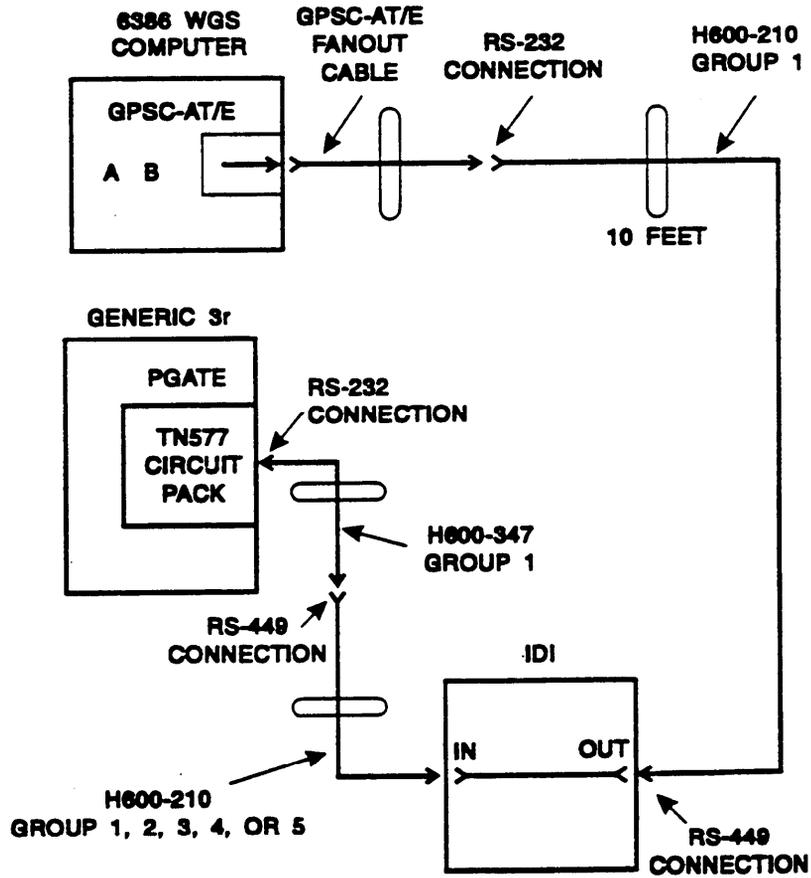


Figure 3-3: WGS Computer to Generic 3r Cabling Via the IDI

Using a Modular Processor Data Module

This section describes the hardware and cables required to connect a GPSC-AT/E RS-232C port on the WGS computer to the Packet Gateway board on the Generic 3r switch.

Note If this method is used, the maximum allowable distance between the WGS computer and the Modular Processor Data Module (MPDM) is 50 feet, and the maximum allowable distance between the MPDM and the Generic 3r is 5000 feet with 24 gauge wire and 4000 feet with 26 gauge wire.

The WGS computer can be connected to the Packet Gateway board on the Generic 3r switch by ordering the following hardware:

- Two MPDMs (PEC 2161-PDM)
- One M25A cable (Male/Male)
 - 1-foot M25A cable (PEC 2721-02A)
 - 4-foot M25A cable (PEC 2721-02D)
 - 10-foot M25A cable (PEC 2721-02K)
 - 25-foot M25A cable (PEC 2721-02S)
 - 50-foot M25A cable (PEC 2721-02V)
- Three B25A cables
 - 5-foot B25A cable (PEC 2720-01E)
 - 10-foot B25A cable (PEC 2720-01K)
 - 15-foot B25A cable (PEC 2720-01P)
 - 20-foot B25A cable (PEC 2720-01R)
 - 30-foot B25A cable (PEC 2720-01T)
 - 60-foot B25A cable (PEC 2720-01W)
 - 100-foot B25A cable (PEC 2720-01Z)
- One GPSC-AT/E fanout cable (PEC 69627).

Note Some of the cabling in Figure 3-3 may have to be locally engineered (4-wire cable).

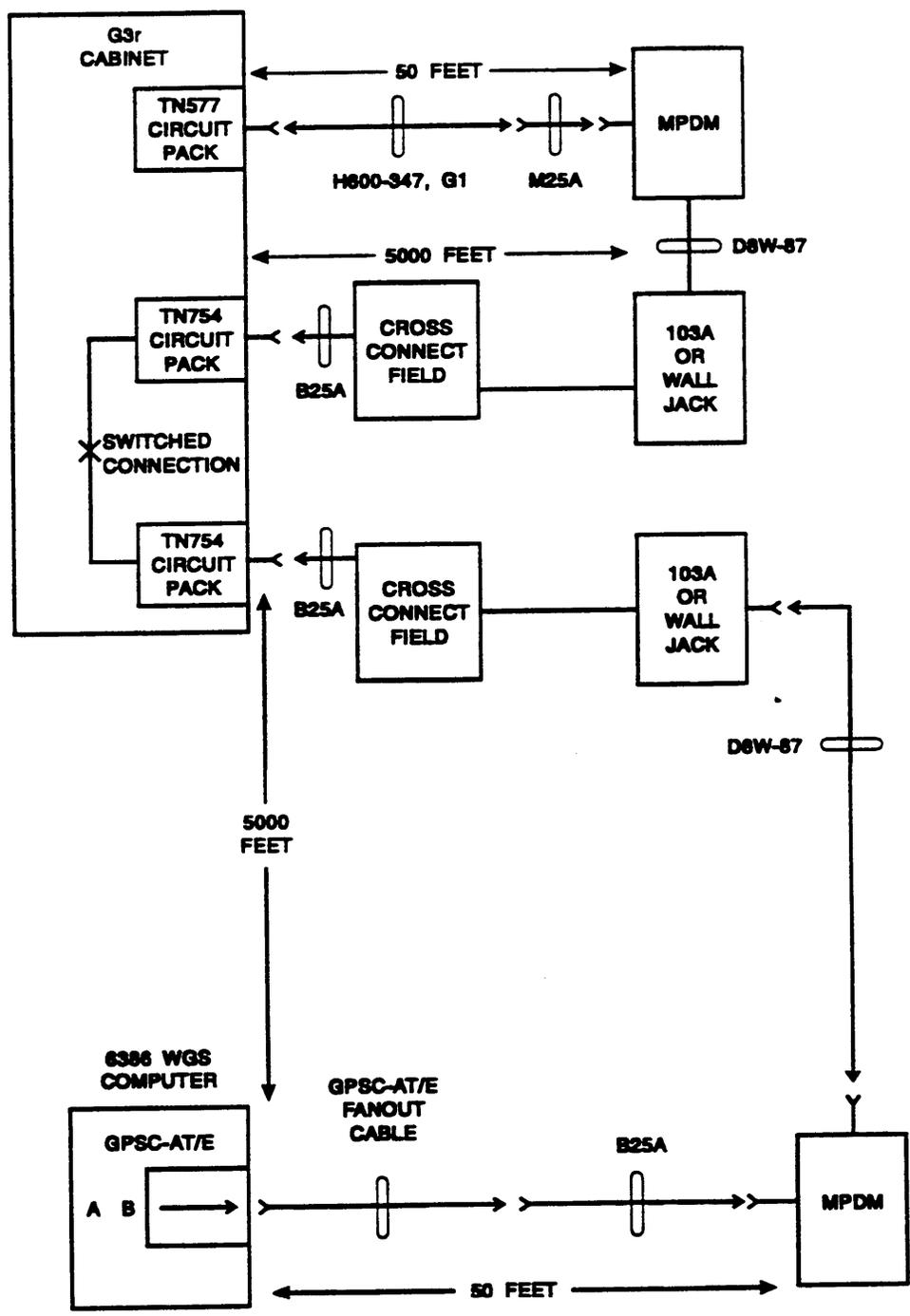


Figure 3-4: WGS Computer to Generic 3r Cabling With an MPDM

Using a Private Line

This section describes the hardware and cables required to connect a GPSC-AT/E RS-232C port on the WGS computer to the Packet Gateway board on the Generic 3r switch.

Note This method is required when the distance limitations for the MPDM are exceeded.

The WGS computer can be connected to the Packet Gateway board on the Generic 3r switch by ordering the following hardware:

- One MTDM (PEC 2162-TDM)
- One stand-alone housing (PEC 21702)
- Two DATAPHONE II modems (PEC 2201-96C)
- Two stand-alone housings (PEC 22631)
- Two B25A cables
 - 5-foot B25A cable (PEC 2720-01E)
 - 10-foot B25A cable (PEC 2720-01K)
 - 15-foot B25A cable (PEC 2720-01P)
 - 20-foot B25A cable (PEC 2720-01R)
 - 30-foot B25A cable (PEC 2720-01T)
 - 60-foot B25A cable (PEC 2720-01W)
 - 100-foot B25A cable (PEC 2720-01Z)
- Two M25A cables (Male/Male)
 - 1-foot M25A cable (PEC 2721-02A)
 - 4-foot M25A cable (PEC 2721-02D)
 - 10-foot M25A cable (PEC 2721-02K)
 - 25-foot M25A cable (PEC 2721-02S)
 - 50-foot M25A cable (PEC 2721-02V)

Note If the Channel Interface Unit is not available on the customer's premises, order PEC 9200-030, which is a stand-alone replacement unit. This unit must be ordered through the Custom Systems organization via the Custom Systems Automation Program (CSAP).

- One GPSC-AT/E fanout cable (PEC 69627).

Note Some of the cabling in Figure 3-4 may have to be locally engineered (4-wire cable). You may also have to refer to the *AT&T Information Systems Sales Manual (774-004)* for further details.

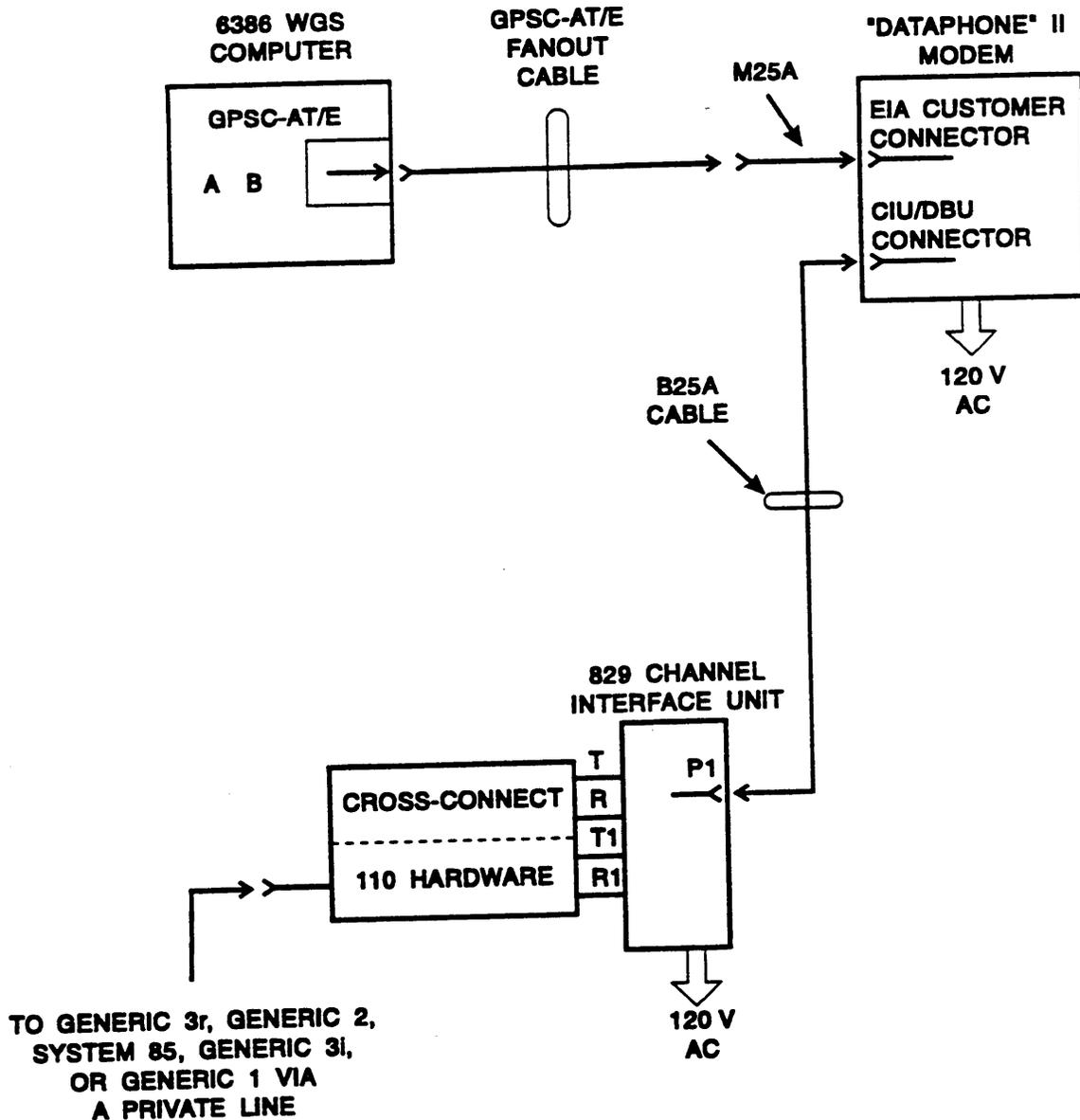


Figure 3-5: WGS Computer Cabling to Analog Private Line

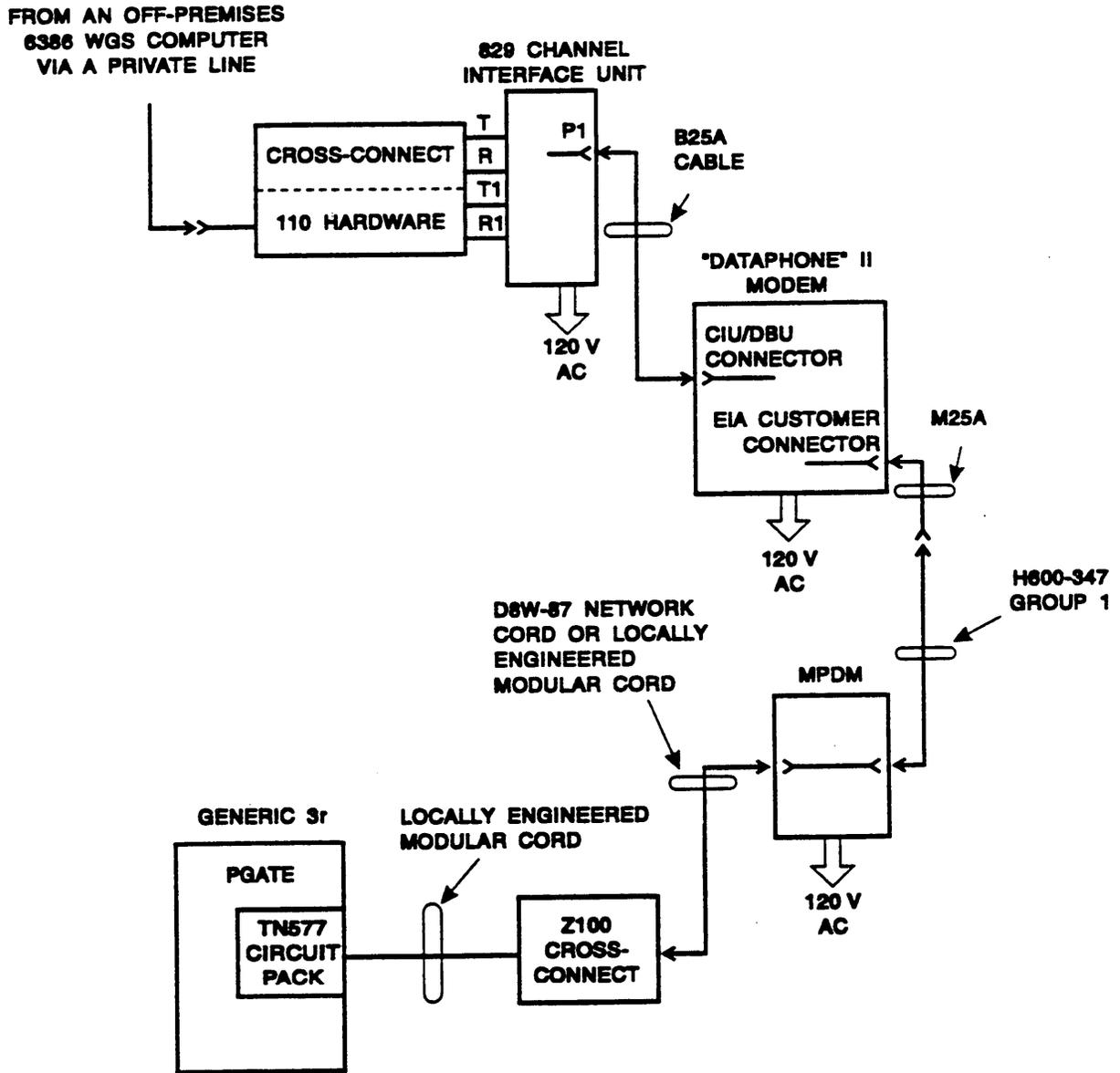


Figure 3-6: Generic 3r Cabling to Analog Private Line

Connecting the WGS Computer to the Generic 2 or System 85 Switch

This section describes the hardware and cables required to connect an ISC RS-232C port on the WGS computer to the Data Communications Interface Unit (DCIU) on the Generic 2 or System 85 switch.

The WGS computer can be connected to the Generic 2 or System 85 by using one of the following methods:

- *Using the Isolating Data Interface*

If this method is used, the maximum allowable distance between the WGS computer and the Generic 2 or System 85 switch is 400 feet.

- *Using Local Data Service Units (DSUs)*

If this method is used, the maximum allowable distance between the WGS computer and the Generic 2 or System 85 switch is 100 feet.

- *Using Remote Data Service Units (DSUs)*

If this method is used, the maximum allowable distance between the WGS computer and the Generic 2 or System 85 switch varies depending on the gauge of the wire used to interconnect the DSUs. Refer to Table 3-4 for maximum distances based on wire size.



If this method is used, 4-wire nonloaded metallic lines are required to interconnect the DSUs. When provided by the telephone company, these 4-wire nonloaded metallic lines are called Local Area Data Channels (LADC).

Refer to the *DATAPHONE II 2500-Series Data Service Units User's Manual* (999-100-188) for more information about using DSUs in a Local Area Data Set (LADS) application.

- *Using an Analog Private Line*

This method is required when the distance limitations for the DSUs have been exceeded.

Table 3-4: LADC Ranges

Wire Gauge (AWG)	DSU Speed (kbps)
19	9.6
22	9.6
24	9.6
26	9.6

Using the Isolating Data Interface

To connect the WGS computer to the Generic 2 or System 85 via an Isolating Data Interface (IDI), order the IDI (PEC 65399A) along with the following appropriate attributes:

- One GPSC-AT/E fanout cable (PEC 69627)
- One ED-1E434-11, Group 175 cable (RS-232C to RS-449 transition cable) (Attribute CCN06)



The IDI must be within 10 feet of the WGS computer, and the maximum distance between the WGS computer and the switch is 400 feet.

- One switch-to-IDI cable:
 - 25-foot RS-449 cable (Attribute LNG21)
 - 35-foot RS-449 cable (Attribute LNG10)
 - 50-foot RS-449 cable (Attribute LNG11)
 - 75-foot RS-449 cable (Attribute LNG12)
 - 100-foot RS-449 cable (Attribute LNG13)
 - 150-foot RS-449 cable (Attribute LNG15)
 - 175-foot RS-449 cable (Attribute LNG16)
 - 200-foot RS-449 cable (Attribute LNG17)
 - 250-foot RS-449 cable (Attribute LNG47)
 - 300-foot RS-449 cable (Attribute LNG48)
 - 400-foot RS-449 cable (Attribute LNG49).
- For single common control, include Attribute CCT01.
- For duplicated common control, include Attribute CCT02 — this attribute includes cable ED-1E434-11, Group 342.

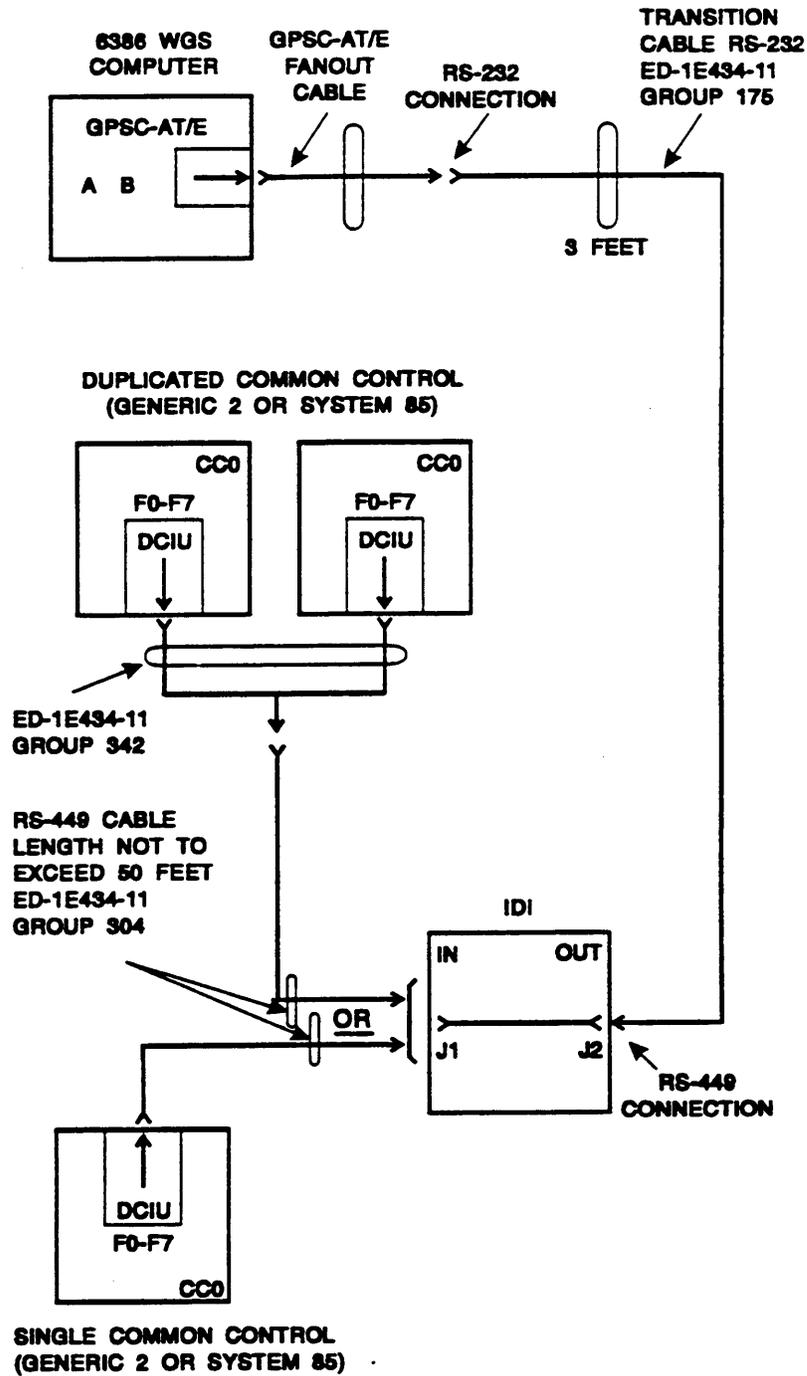


Figure 3-7: WGS Computer to Generic 2 or System 85 Cabling Via the IDI

Using Local Data Service Units

If the WGS computer and Generic 2 or System 85 are not over 100 feet apart, order the following hardware and cables to connect the WGS computer to the Generic 2 or System 85:

- Two Data Service Units (DSUs) (2 PEC 2225-96B) — each DSU includes one D8W-87 Network Cord and one Network Interface Adapter
- One GPSC-AT/E fanout cable (PEC 69627)
- For single common control, order the following cable:
 - 50-foot cable (PEC 65254A) (Attribute CCT01) — this attribute includes cable ED-1E434-11, Group 13.
- For duplicated common controls, order the following RS449 cable:
 - 50-foot cable (PEC 65254A) (Attribute CCT02) — this attribute includes cables ED-1E434-11, Group 13 and ED-1E434-11, Group 342.

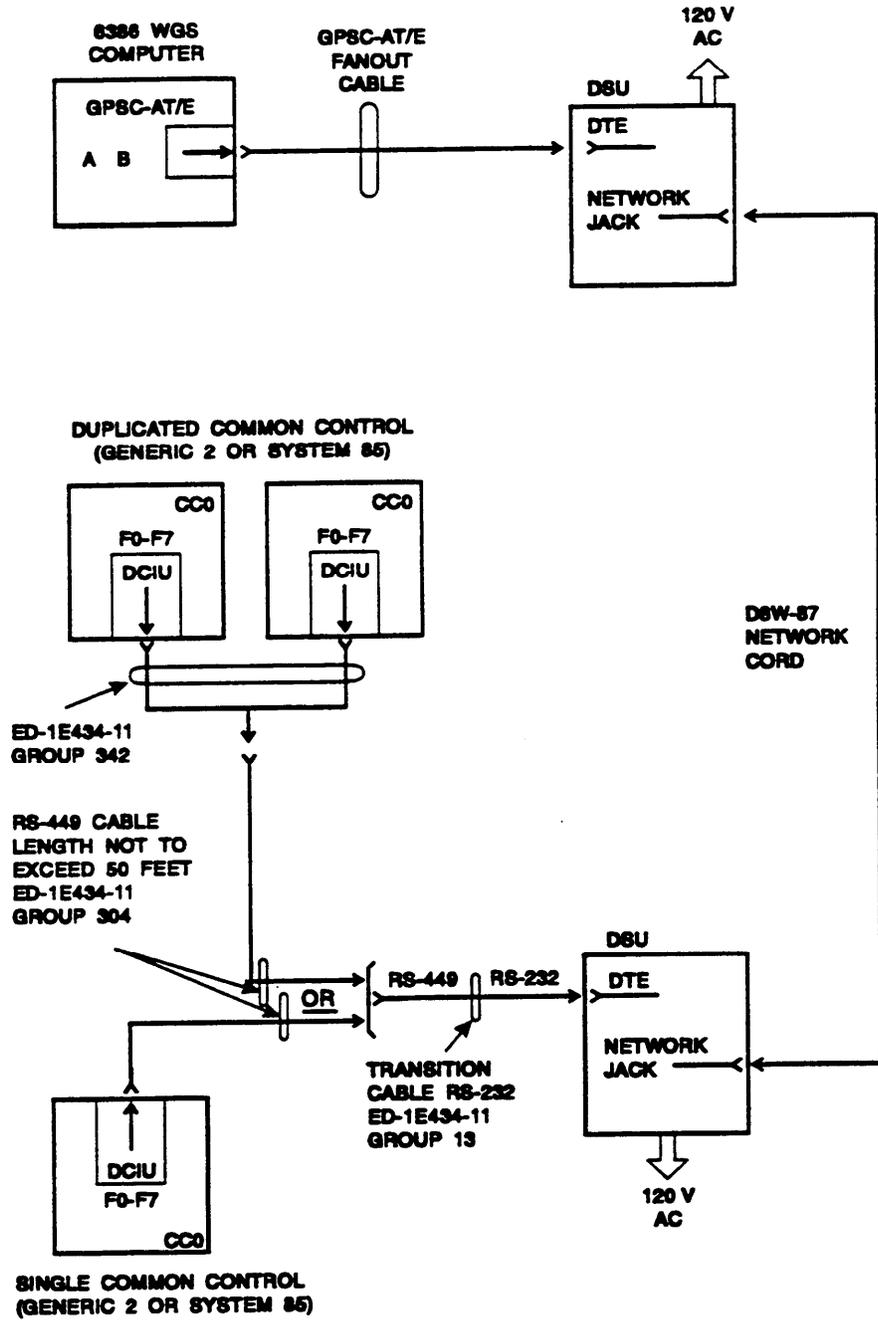


Figure 3-8: WGS Computer to Generic 2 or System 85 Cabling With Local DSUs

Using Remote Data Service Units

If the WGS computer and Generic 2 or System 85 are over 100 feet apart and the LADC range requirements shown in Table 4-4 are not exceeded, order the following hardware and cables to connect the WGS computer to the Generic 2 or System 85 switch:

- Two Data Service Units (DSUs) (2 PEC 2225-96B) — each DSU includes one D8W-87 Network Cord and one Network Interface Adapter
- One GPSC-AT/E fanout cable (PEC 69627)
- For single common control, order the following RS-449 cable:
 - 50-foot cable (PEC 65254A) (Attribute CCT01) — this attribute includes cable ED-1E434-11, Group 13.
- For duplicated common controls, order the following RS-449 cable:
 - 50-foot cable (PEC 65254A) (Attribute CCT02) — this attribute includes cables ED-1E434-11, Group 13 and ED-1E434-11, Group 342.

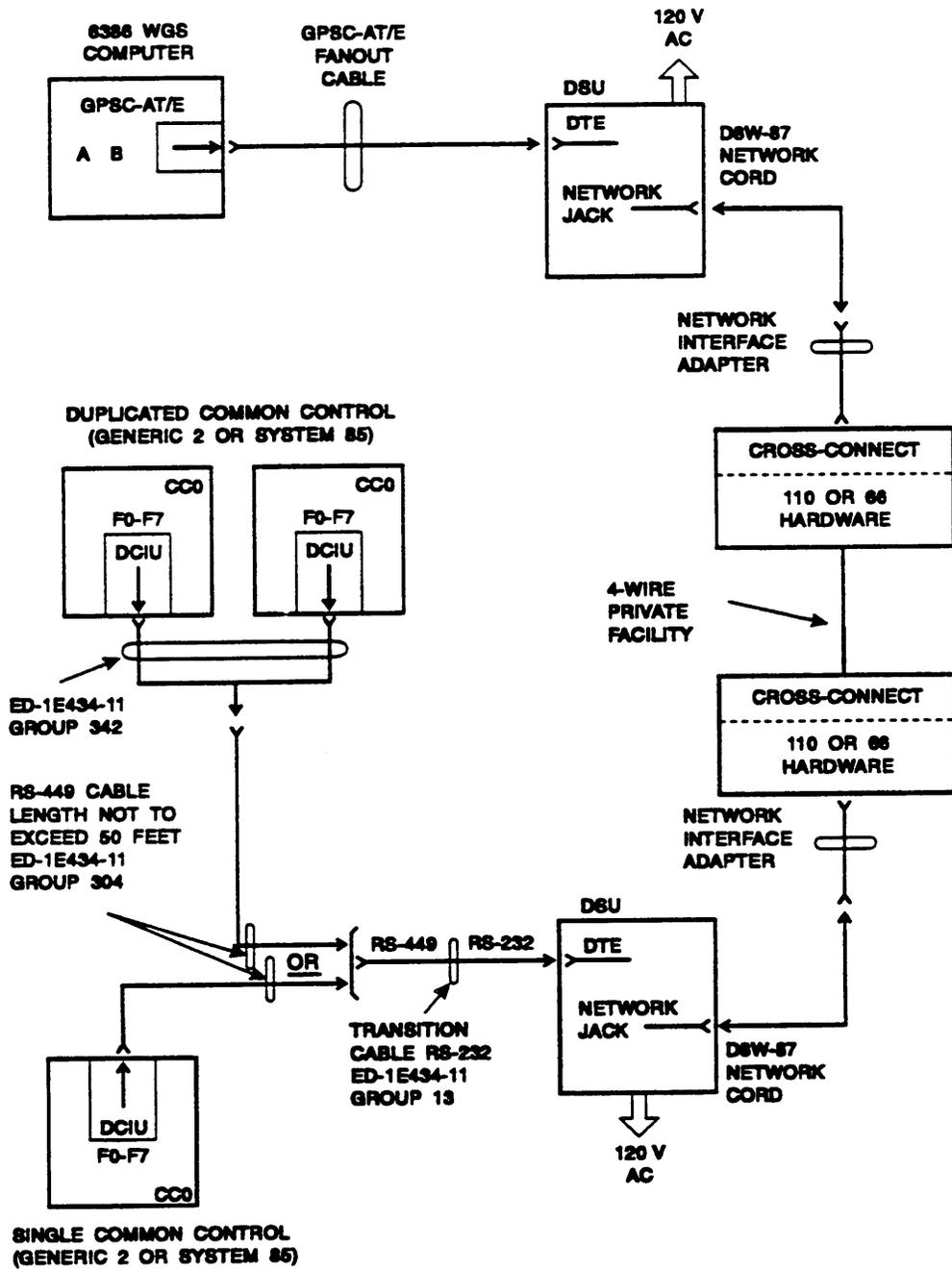


Figure 3-9: WGS Computer to Generic 2 or System 85 Cabling With Remote DSUs

Using an Analog Private Line

This method is required when the distance limitations for the DSUs have been exceeded. Order the following hardware and cables to connect the WGS computer to the Generic 2 or System 85 switch via an analog private line:

- Two DATAPHONE II modems (2 PEC 2201-96C)
- Two stand-alone housings (2 PEC 22631)
- Two M8K cables, 5 feet in length (PEC 2721-08E)



If the Channel Interface Unit is not available on the customer's premises, order PEC 9200-030, which is a stand-alone replacement unit. This unit must be ordered through the Custom Systems organization via the Custom Systems Automation Program (CSAP).

- One GPSC-AT/E fanout cable (PEC 69627)
- For single common control, order the following RS-449 cable:
 - 50-foot cable (PEC 65254A) (Attribute CCT01).
- For duplicated common controls, order the following RS-449 cable:
 - 50-foot cable (PEC 65254A) (Attribute CCT02) — this attribute includes cable ED-1E434-11, Group 342.

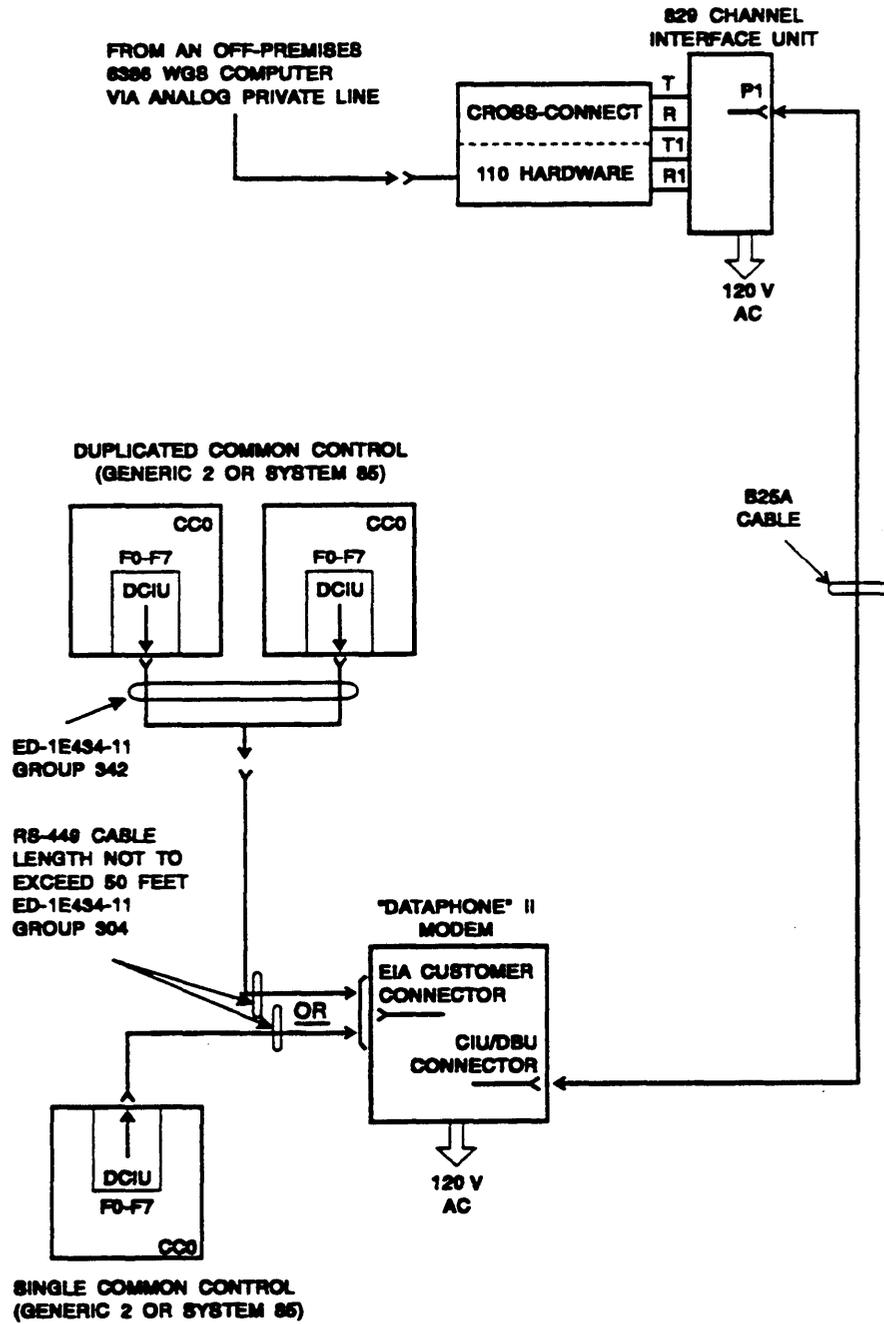


Figure 3-10: Generic 2 or System 85 Cabling to an Analog Private Line

Connecting the WGS Computer to the Generic 3i or Generic 1 Switch

This section describes the hardware and cables required to connect the ISC RS-232C port on the WGS computer to the SCI on the Generic 3i or Generic 1 switch.

The WGS computer can be connected to these by using one of the following methods:

- *Using the EIA Connector on the Processor Interface*

If this method is used, the maximum allowable distance between the 6386 WGS computer and the Generic 3i or Generic 1 switch is 50 feet.



The Generic 3i and Generic 1 can be connected to the WGS computer via the EIA connector on the Processor Interface of the switch.

- *Using a Modular Processor Data Module*

If this method is used, the maximum allowable distance between the WGS computer and the Modular Processor Data Module (MPDM) is 50 feet, and the maximum allowable distance between the MPDM and the Generic 3i or Generic 1 is 5000 feet with 24 gauge wire and 4000 feet with 26 gauge wire.

- *Using an Analog Private Line*

This method is required when the distance limitations for the MPDM are exceeded.

**Using the EIA
Connector on the
Processor Interface**

This section describes the hardware and cables required to connect an ISC RS-232C port on the WGS computer to the EIA connector of a Processor Interface on the Generic 3i or Generic 1 switch.

Note For this cabling configuration, the Generic 3i or Generic 1 and the WGS computer must not be over 50 feet apart. If the distance is greater than 50 feet, refer to the section *Connecting the WGS Computer to the Generic 3i or Generic 1 Switch* for the proper cabling configuration and to the section *Additional Generic 3i and Generic 1 Hardware* for switch hardware information.

Note For this configuration, the Generic 1 switch must have a single common control and must be AC powered. This configuration will not work with duplicated common controls or DC power.

The WGS computer can be connected to the EIA connector of a Processor Interface on the Generic 3i or Generic 1 switch by ordering the following hardware:

- One GPSC-AT/E fanout cable (PEC 69627)
- One Isolating Data Interface (IDI) kit (PEC 65399A, Attributes CCT01, CCN06, LNG21).
- One RS-232C to RS-449 transition cable
 - 10-foot H600-362, Group 1 cable (PEC 70308, Attributes LNG99, LNH01)
 - 25-foot H600-362, Group 2 cable (PEC 70308, Attributes LNG99, LNH04)
 - 50-foot H600-362, Group 3 cable (PEC 70308, Attributes LNG99, LNH09)
 - 100-foot H600-362, Group 4 cable (PEC 70308, Attributes LNG99, LNH20)
 - 200-foot H600-362, Group 5 cable (PEC 70308, Attributes LNG99, LNH24)

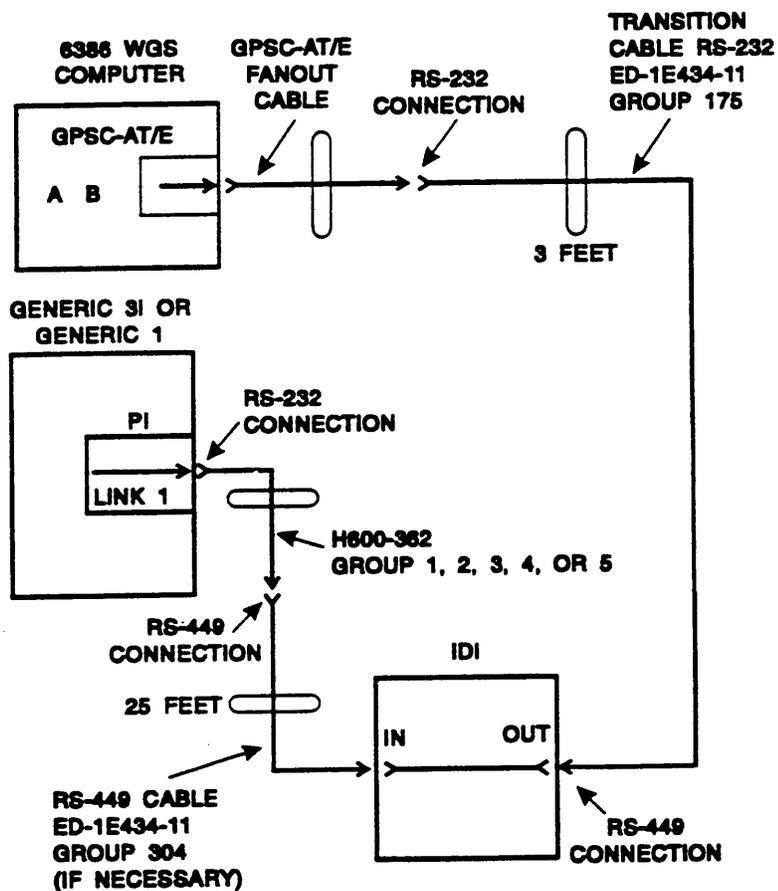


Figure 3-11: WGS Computer to Generic 3i or Generic 1 Cabling Via EIA Interface

Using a Modular Processor Data Module

This section describes the hardware and cables required to connect a GPSC-AT/E RS-232C port on the WGS computer to the Processor Interface on the Generic 3i or Generic 1 switch.

Note If this method is used, the maximum allowable distance between the WGS computer and the Modular Processor Data Module (MPDM) is 50 feet, and the maximum allowable distance between the MPDM and the Generic 3i or Generic 1 is 5000 feet with 24 gauge wire and 4000 feet with 26 gauge wire.

The WGS computer can be connected to the Processor Interface on the Generic 3i or Generic 1 switch by ordering the following hardware:

- One MPDM (PEC 2161-PDM)
- One RS-232 interface (PEC 21611)
- One stand-alone housing (PEC 21702)
- One GPSC-AT/E fanout cable (PEC 69627).

Note Some of the cabling in Figure 3-11 may have to be locally engineered (4-wire cable).

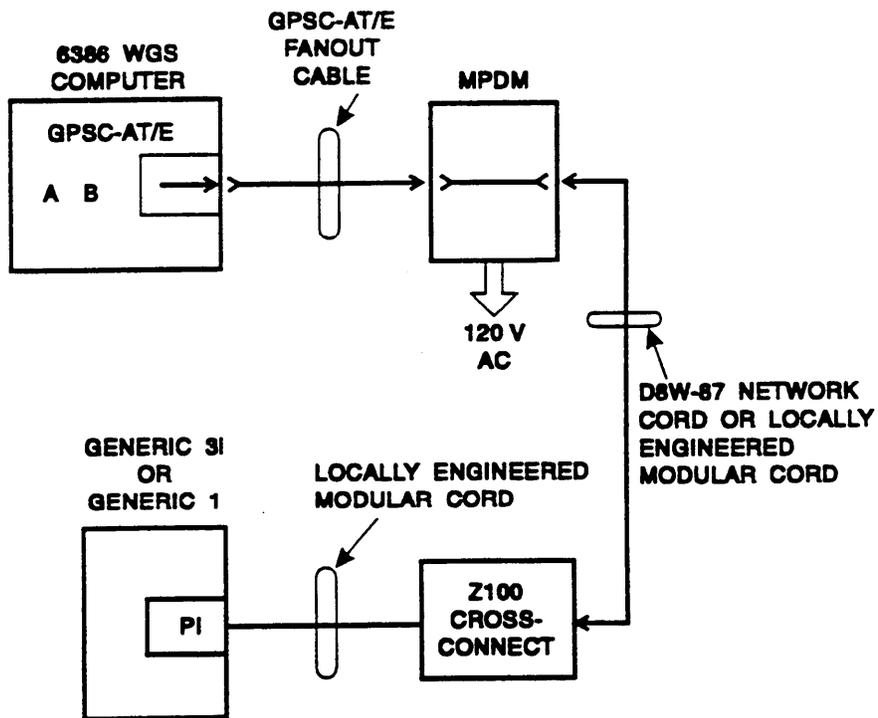


Figure 3-12: WGS Computer to Generic 3i or Generic 1 Cabling With an MPDM

Using an Analog Private Line

This section describes the hardware and cables required to connect a GPSC-AT/E RS-232C port on the WGS computer to the Processor Interface on the Generic 3i or Generic 1 switch.

Note This method is required when the distance limitations for the MPDM are exceeded.

The WGS computer can be connected to the Processor Interface on the Generic 3i or Generic 1 switch by ordering the following hardware:

- One Modular Trunk Data Module (MTDM) (PEC 2162-TDM)
- One stand-alone housing (PEC 21702)
- Two DATAPHONE II modems (PEC 2201-96C)
- Two stand-alone housings (PEC 22631)
- Two B25A cables
 - 5-foot B25A cable (PEC 2720-01E)
 - 10-foot B25A cable (PEC 2720-01K)
 - 15-foot B25A cable (PEC 2720-01P)
 - 20-foot B25A cable (PEC 2720-01R)
 - 30-foot B25A cable (PEC 2720-01T)
 - 60-foot B25A cable (PEC 2720-01W)
 - 100-foot B25A cable (PEC 2720-01Z)
- Two M25A cables (Male/Male)
 - 1-foot M25A cable (PEC 2721-02A)
 - 4-foot M25A cable (PEC 2721-02D)
 - 10-foot M25A cable (PEC 2721-02K)
 - 25-foot M25A cable (PEC 2721-02S)
 - 50-foot M25A cable (PEC 2721-02V)

Note If the Channel Interface Unit is not available on the customer's premises, order PEC 9200-030, which is a stand-alone replacement unit. This unit must be ordered through the Custom Systems organization via the Custom Systems Automation Program (CSAP).

- One GPSC-AT/E fanout cable (PEC 69627).



Some of the cabling in Figure 3-12 may have to be locally engineered (4-wire cable). You may also have to refer to the *AT&T Information Systems Sales Manual* (774-004) for further details.

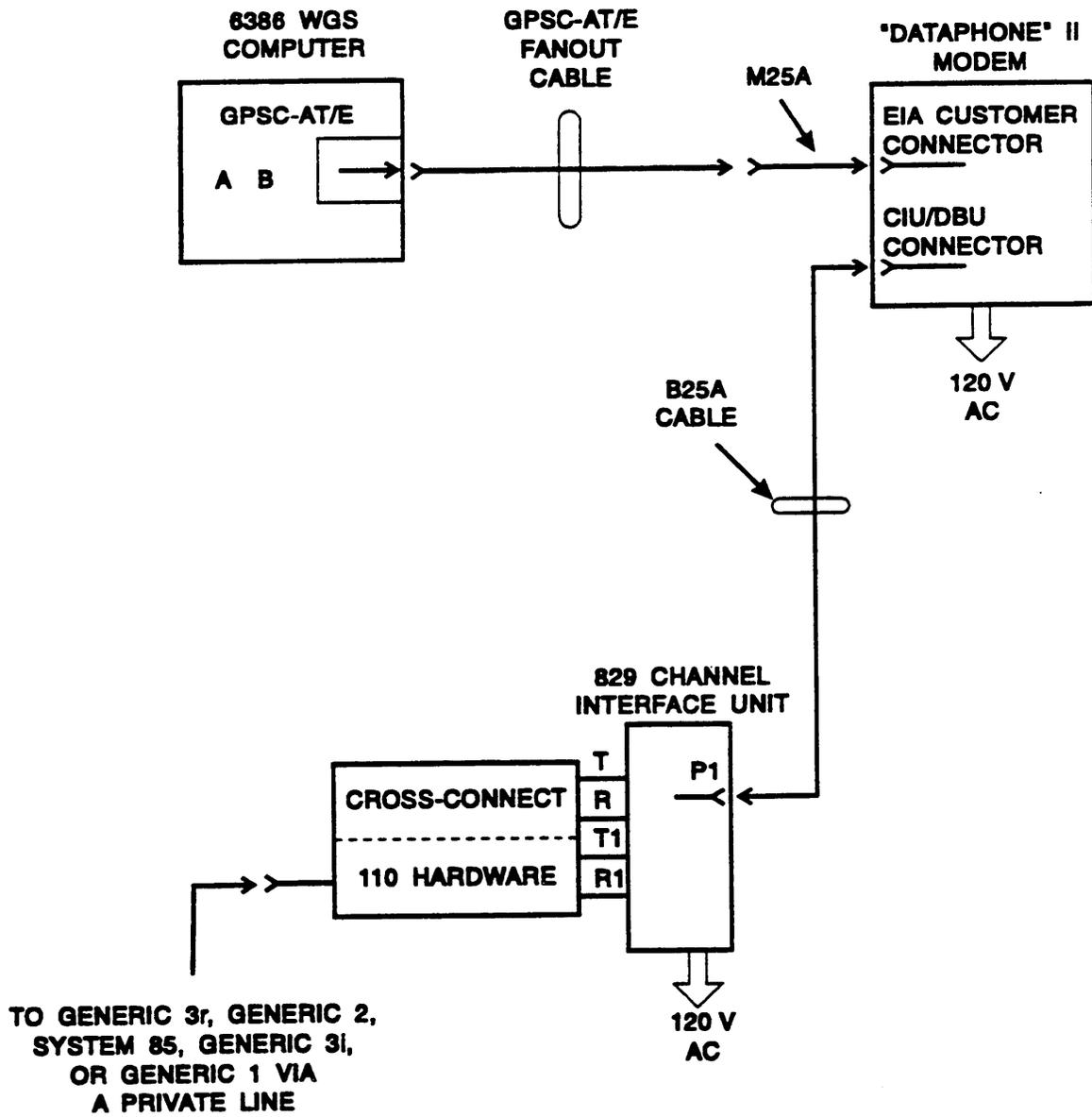


Figure 3-13: WGS Computer Cabling to Analog Private Line

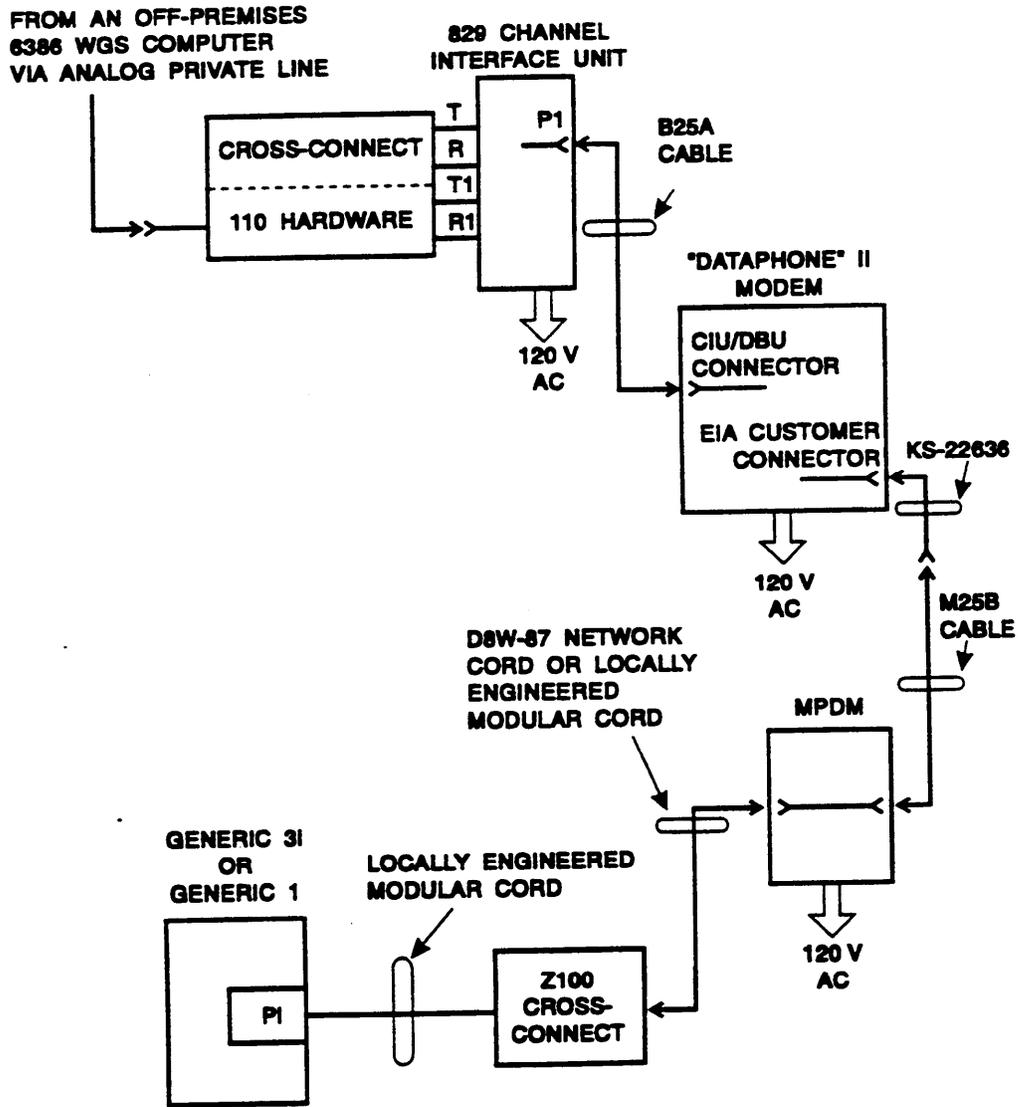


Figure 3-14: Generic 3i and Generic 1 Cabling to Analog Private Line

CMS Data Migrations

Customers who are currently using the CMS software application (R2 CMS) can migrate their CMS historical data as follows:

- From R2 CMS to R3 CMS (PEC 1208-017)

Note The PECs include the R3 CMS software and installation costs but do not include the costs for migrating the customer's CMS historical data which will be based on time and materials.

The process of migrating the CMS historical data from one host computer to another is described as follows:

1. Perform the pre-migration tasks on the R2 CMS host computer.
2. Install the migration program on the R2 CMS host computer.
3. Transfer the R2 administration data to tape.

Note If the customer has CTC tapes, the tapes will have to be sent to the TSC to be converted to the SCSI format. The TSC will then send the appropriate magnetic tape(s) containing the migrated data back to the customer. Refer to the *Where to Send CTC Tapes Containing CMS Migrated Data* section in this chapter.

4. Migrate R2 CMS administration data to the R3 CMS host computer.
5. Perform the post-migration administration tasks.
6. Take down the R2 CMS link connection and connect the link to the R3 CMS host computer.
7. Transfer the R2 CMS historical data to tape.
8. Migrate the R2 CMS historical data to the R3 CMS host computer.
9. Perform post-migration historical data tasks.

Label each tape with the following information:

- Customer's name and address
- R2 to R3 CMS Migration.

**Where to Send
CTC Tapes
Containing CMS
Migrated Data**

The magnetic tapes that contain the CMS migrated data should be sent via overnight express delivery service to:

AT&T Information Systems
TSC CMS Migrations
Room 110
8200 East Maplewood Ave.
Englewood, Colorado 80111

After the TSC receives the cartridge tapes containing the customer's CMS migrated data, the TSC will convert the data to a SCSI format and send the tapes containing the migrated data back to the customer within 2 to 4 business days. Therefore, the customer will lose a minimum of 4 days worth of data (2 to 4 days for processing and 2 days for shipping).

Chapter 4

Implementing the R3 CMS Application

The R3 CMS Provisioning Process

This chapter contains a description of the R3 CMS provisioning process, a CMS Initialization Form, ACD Information Forms, and a description of the procedures for reporting problems that arise during or after an R3 CMS installation. The steps in the R3 CMS provisioning process are as follows:

1. The Account Executive:
 - Completes Pages 1 and 2 of the Needs Assessment Form.
 - Sends Page 1 of the Needs Assessment Form to the Branch Performance Administrator.
 - Requests a Project Code from the Branch Performance Administrator.
 - Starts a Project Binder with a Profit Assurance Form.
2. Branch Performance Administrator-Project Accounting and Management:
 - Assigns a Project Code.
 - Informs the Account Executive of the Project Code.
 - Sends Page 1 of the Needs Assessment Form to the Assistant Contract Manager.
 - Requests a credit check from the Assistant Contract Manager.
3. The Assistant Contract Manager:
 - Performs a preliminary credit check.
 - Performs a Customer Identification Number Linkage.
 - Informs the Account Executive of the client's credit status.
4. The Account Executive:
 - Completes the Needs Assessment Form with the client.
 - Reviews the AT&T Sales Offering and Services Plan with the client.
 - Describes the Project Manager's role to the client.
 - Determines the discount programs for which the client is eligible.
 - Determines what Vectoring/CMS options the client wants and adds them to the Needs Assessment Form.
 - Determines whether to bid the project or not.
5. The Sales Support Manager assigns a Design Specialist to the project.
6. The Design Specialist:
 - Generates a system configuration based on the Needs Assessment Form.
 - Assures the technical accuracy on the system configuration. For complex R3 CMS configurations, this may require a client-site visit.

- Downloads the system configuration into the AT&T Cost Estimator.
 - Issues an 1154 PI (Proposal Inquiry) to the Design Center if the system has:
 - More than 200 agents
 - The Look-Ahead Interflow feature
 - Pseudo ACDs.
7. The Account Executive:
- Reviews the AT&T Cost Estimator Margin Analysis of the system configuration (no Site Survey information is used yet).
 - Requests a Project Manager from the Provisioning Manager if the project meets bid/no bid guidelines.
 - Sends copies of the Needs Assessment Form, System Design, and Equipment Room Floor Plan Requirements to the Provisioning Manager.
 - Adds the AT&T Proposal, System Design, Wire Quotes, and Equipment Room Floor Plan Requirements to the Project Binder.
8. The Provisioning Manager assigns a Project Manager.
9. The Resource Scheduler assigns the Project Manager in Project Accounting and Management.
10. The Project Manager reviews the Project Binder and schedules a client-site survey.
11. The Design Center sends the 1154 PI Deliverables to the Design Specialist.
12. The Design Specialist:
- Sends equipment-room-environment information and Design Center time estimate to the Project Manager.
 - Updates the system configuration based on Design Center recommendations.
13. The Project Manager:
- Performs a Site Survey and reviews the AT&T Sales Offering and Services Plan with the client.
 - Uses the AT&T Cost Estimator to generate a cost estimate.
 - Schedules customer training.
 - Prepares a Project Plan.
 - Informs the Account Executive of non-standard costs, sets the In-Service date, and sends the Account Executive a copy of the Detail Delivery Sheet.
 - Establishes Project Milestones.
 - Loads Service Price Elements into the AT&T Cost Estimator.

14. The Design Specialist assures the technical accuracy of the system configuration.
15. The Resource Scheduler holds resources in Project Accounting and Management.
16. The Account Executive:
 - Sets the price of the system.
 - Presents a formal Proposal/Demonstration for the customer.
 - Loads shipping detail information from the Project Manager into the Complex Provisioning System.
 - Reviews the final AT&T Cost Estimator Margin Analysis.
 - Calls the Project Manager to confirm resources.
 - Adds customer training information, proposed equipment room layout, baseline cost estimate and margin analysis, and project timeline to the Project Binder.
17. The Project Manager:
 - Calls the Resource Scheduler to confirm and hold resources.
 - Contacts the Account Executive and Design Specialist - Wire to confirm and hold wire resources.
 - Notifies the customer of Project Milestones and Mutual Responsibilities.
 - Prepares the Equipment Room Floor Plan and Environmental Requirements Package for the customer.
18. The Account Executive:
 - Compiles the Contract Package for the Assistant Contract Manager.
 - Completes the Account Executive Checklist and sends it to the Assistant Contract Manager with the Contract Package.
 - Updates the Profit Assurance Form.
19. The Assistant Contract Manager prepares the Contract Package and returns it to the Account Executive on the agreed upon date.
20. The Project Manager and Account Executive review the Project Milestones, Equipment Room Floor Plan and Environmental Requirements, and Contract Package with the customer and obtain the customer's signature and progress payment.
21. The Account Executive:
 - Sends a copy of the signed contract to the Assistant Contract Manager.
 - Gives the Project Binder to the Project Manager.

22. The Assistant Contract Manager:
 - Authorizes the Contract Package with the General Manager.
 - Releases a Planning Order to the factory.
 - Notifies the Project Manager of the Approved Contract.
 - Distributes the accepted AT&T Contract to the appropriate parties.
 - Notifies Order Entry/Billing of Planning Order Release, Customer Code, Project Code, and Template Indicator.
23. The Project Manager:
 - Notifies the Resource Scheduler to “Book” resources.
 - Notifies all team members of the Internal Kickoff Meeting.
 - Issues a Maintenance Support Request to the TSC (Technical Service Center).
24. The Resource Scheduler:
 - Books resources in Project Accounting and Management.
 - Sends out the Project Assignment Notification.
25. The Factory:
 - Receives the Planning Order.
 - Assigns an Order Service Agent to the project.
26. The Project Manager receives acknowledgement of Planning Order Acceptance from the factory.
27. The Factory:
 - Scrubs the Planning Order.
 - Notifies the Project Manager of scrub errors.
 - Forecasts inventory and sourcing needs.
28. The Project Manager sends the Scrub Report to the Design Specialist.
29. The Design Specialist updates the system configuration in the Complex Provisioning System based on the Scrub Report.
30. The Project Manager:
 - Distributes documentation from the Project Binder to team members.
 - Conducts the Internal Kickoff Meeting.
 - Conducts the Project Kickoff Meeting.
 - Reviews the Customer Implementation Binder.

31. The Customer:
 - Begins site preparation.
 - Receives CMS documentation.
 - Attends System Administration training.

32. The Software Specialist:
 - Conducts CMS reviews.
 - Marks the equipment room floor plans.
 - Designs CMS and Vectoring according to the requirements specified on the Needs Assessment Form.
 - Obtains customer acceptance of CMS and Vectoring design.
 - Develops a CMS test plan (if required).

33. The Project Manager:
 - Initiates Change Control with the customer.
 - Monitors Post-Changes Control Requests.
 - Coordinates other Sales Business Unit vendors.
 - Orders an INADS (Initialization and Administration System) line.

34. The Software Specialist:
 - Compares hardware and software requirements to the Contract.
 - Completes Hardware/Software Tally Sheet and sends a copy to the Project Manager.

35. The Project Manager:
 - Reviews the Hardware/Software Tally Sheet with the customer for concurrence on changes.
 - Sends the Hardware/Software Tally Sheet and the Profit Assurance Package to the Design Specialist.

36. The Design Specialist:
 - Updates the system configuration in the Complex Provisioning System based on the Hardware/Software Tally Sheet.
 - Assures the technical accuracy of the revised system configuration.
 - Sends the updated Planning Order to the factory.
 - Sends an 1154 FO (Firm Order) to the Design Center.

37. The Project Manager:
 - Updates the AT&T Cost Estimator based on revised customer requirements.
 - Adds additional Service Price Elements to the Change Order Form.
 - Updates the Project Plan.
38. The Design Center returns the 1154 FO Deliverables to the Design Specialist.
39. The Design Specialist:
 - Updates the system configuration based on Design Center recommendations.
 - Sends the updated Planning Order to the factory.
40. The Factory:
 - Receives the updated Planning Order.
 - Sends an acknowledgement of order receipt to the Design Specialist.
 - Scrubs the Planning Order.
 - Sends the Scrub Report to the Project Manager.
41. The Project Manager receives the Scrub Report and sends a copy to the Design Specialist, if necessary.
42. The Design Specialist:
 - Updates the the system configuration in the Complex Provisioning System based on the Scrub Report, if necessary.
 - Signs the Profit Assurance Form.
 - Notifies the Assistant Contract Manager that the design is complete.
 - Sends the signed Profit Assurance and Complex Provisioning System printouts to the Assistant Contract Manager.
 - Sends the Equipment Report to the Project Manager.
43. The Assistant Contract Manager:
 - Generates a Change Order Form.
 - Sends the Change Order Form and Profit Assurance Form to the Project Manager.
44. The Project Manager:
 - Asks the customer to sign the Change Order Form.
 - Accepts the signed Change Order Form on behalf of AT&T.
 - Sends the original Change Order Form to the Assistant Contract Manager.
 - Notifies the Implementation Team of changes.

45. The Assistant Contract Manager sends a copy of the Change Order Form to Order Entry/Billing.
46. The Project Manager:
 - Verifies that the customer is ready for equipment delivery.
 - Verifies the INADS line order.
 - Determines if the equipment room will be ready by the MOJ (Materials on Job) date.
 - Delivers the final Equipment Report and final Project Changes to the Dedicated Switch Installation Crew and the Software Specialist.
 - Authorizes the Firm Order Release to the factory by Order Entry/Billing.
47. Order Entry/Billing transmits the Firm Order to the factory by way of the Complex Provisioning System.
48. The Factory:
 - Receives and processes the Firm Order.
 - Confirms receipt of the Firm Order.
 - Scrubs the Firm Order.
 - Resolves the Scrub Report with the Project Manager.
49. The Project Manager:
 - Receives acknowledgement of Firm Order receipt from the factory.
 - Resolves the Scrub Report with the factory.
50. The Factory:
 - Confirms the MOJ date with the Project Manager.
 - Schedules the order.
 - Builds the equipment.
 - Ships the equipment to the customer site.
51. The Customer:
 - Completes preparation of the equipment room.
 - Completes System Administration training.
52. The Shipper notifies the Project Manager of pending equipment delivery one day before the MOJ date.
53. The customer receives the equipment, counts the boxes, signs for the equipment, and notifies the Project Manager that the equipment has been received.
54. The Project Manager reconfirms the MOJ and In-Service dates with the Technical Service Center.

55. The Dedicated Switch Installation Crew installs the R3 CMS.
56. The Project Manager:
 - Monitors the CMS installation.
 - Reviews the Help Desk and Cutover procedures with the customer.
 - Conducts the Cutover Readiness Review.
57. The Software Specialist tests the R3 CMS.
58. The Dedicated Switch Installation Crew:
 - Installs and tests the CMS terminals.
 - Cuts the CMS into service.
59. The Project Manager and Dedicated Switch Installation Crew resolve Installation Trouble Tickets.
60. The Project Manager:
 - Develops a Punch List with the customer.
 - Closes the order with Order Entry/Billing.
 - Resolves claims.
 - Closes order with the factory.
 - Reviews system hand-off with the customer.
 - Resolves Punch List issues.
61. The Order Entry/Billing:
 - Closes the order.
 - Generates an invoice.
 - Reviews the invoice with the Project Manager.
62. The Project Manager:
 - Reviews the invoice with the customer.
 - Requests customer payment.
 - Hands off account to Aftermarket Supervisor.
63. AT&T conducts a Customer Satisfaction Survey.
64. The Project Manager:
 - Conducts the Internal Post-Cutover Review Team Meeting.
 - Reviews project results.
 - Hands off the Project Binder to the Account Executive.

65. The customer makes the final system payment.
66. The Order Entry/Billing:
 - Receives final payment.
 - Notifies the Project Manager of the final payment.
67. The Project Manager closes the Project Code with Branch Performance Administrator-Project Accounting and Management.

CMS Initialization Form

Customer Information

Name: _____ Street: _____
City: _____ State: _____ Zip: _____
Switch Room Phone: _____ Remote Access Phone: _____
DOSS Order Number: _____
Computer: 3B2/522 3B2/1000 Model 70
 WGS 6386/25 Model S WGS 6386E/33 Model S
UNIX System Release: 3.2.1 V3 3.2.2 3.2.3
X.25 Network Interface Version: 1.1.1 1.2.1
Migration: From 3B2 To 3B2 From 3B2 To 6386
Switch Type: Generic 1 Generic 3i Generic 3r
 System 85 R2V4 Generic 2
Vectoring: Yes No
CMS Graphics: Yes No
CMS Forecasting: Yes No

AT&T Support Information

Marketing Contact

Name: _____
Title: _____
Phone: _____
TSC Installation Date Requested: / / Time: _____ AM PM
TSC Technician*: _____
Project Coordinator: _____ Phone Number: _____
DSO Technician: _____ Pager Number: _____
DSO Foreman: _____ Phone Number: _____
FSO Technician: _____ Phone Number: _____
FSO Foreman: _____ Phone Number: _____

* Completed by the Technical Service Center.

ACD Information Form for the 3B2/522 Computer

ACD Variables	ACD1	Maximum
Switch Name		
Switch Type		
Switch Release		
Time Zone Offset		
Link		
Port		
Splits		60
Agents		1023
Trunk Groups		255
Trunks		1400
Unmeasured Facilities		100
VDNs		256

ACD Information Form for the 3B2/1000 Model 70 Computer

ACD Variables	ACD1	Maximum
Switch Name		
Switch Type		
Switch Release		
Time Zone Offset		
Link		
Port		
Splits		60
Agents		1023
Trunk Groups		255
Trunks		1400
Unmeasured Facilities		100
VDNs		256

ACD Information Form for the WGS 6386/25 Model S Computer

ACD Variables	ACD1	Maximum
Switch Name		
Switch Type		
Switch Release		
Time Zone Offset		
Link		
Port		
Splits		240
Agents		4092
Trunk Groups		1020
Trunks		5600
Unmeasured Facilities		400
VDNs		1024

ACD Information Form for the WGS 6386E/33 Model S Computer

ACD Variables	ACD1	Maximum
Switch Name		
Switch Type		
Switch Release		
Time Zone Offset		
Link		
Port		
Splits		240
Agents		4092
Trunk Groups		1020
Trunks		5600
Unmeasured Facilities		400
VDNs		1024

Problem-Reporting Procedures

This section describes the problem-reporting procedures for an AT&T service technician and for the R3 CMS customer.

Problem-Reporting Procedure for the Service Technician

If the technician encounters a hardware or software problem during or after the R3 CMS installation, the technician should do the following:

1. Try to fix the problem immediately.
2. If the technician cannot solve the problem, call the TSC (Technical Service Center) at 1-800-248-1234.

The technician should provide the TSC with the customer's name, the password for the *root* login ID on the customer's CMS host computer, the phone number of the customer's dial-in port, and a description of the problem.

3. If the TSC cannot solve the customer's problem, they will escalate the problem to a Tier 4 technician in the Field Support Organization of AT&T Bell Laboratories.
-

Problem-Reporting Procedure for the Customer

After the installation, the customer can call the **AT&T Call Center Help Line at 1-800-344-9670** to report a problem with a Call Center switch feature or the R3 CMS hardware or software.

Appendix A

Worksheets

Table A-1: R3 CMS Software Worksheet

NUMBER OF AGENTS	PEC*	QTY	PRICE	TOTAL PRICE
1 to 100 Agents	1208-311			
1 to 200 Agents	1208-312			
1 to 300 Agents	1208-313			
1 to 400 Agents	1208-314			
1 to MAX Agents	1208-315			
OPTIONAL CMS FEATURES	PEC*	QTY	PRICE	TOTAL PRICE
Vectoring	1208-3CV			
Graphics	1208-3GR			
Forecasting	1208-3FC			
R2 CMS TO R3 CMS UPGRADES	PEC	QTY	PRICE	TOTAL PRICE
3B2 to 3B2	1208-321			
3B2 to 6386	1208-331			

TOTAL _____

* The PEC attributes are: MSF13 for 6386 computers, MSF12 for 3B2 computers.

Table A-2: WGS 6386/25 SCSI Server Computer Worksheet

COMPONENT	PEC	QTY	PRICE	TOTAL PRICE
WGS 6386/25 SCSI Server Computer	6950-DB4			
UNIX System V/386 Version 3.2.3	6950-BH6			
GPSC AT/E X.25 Kit	6950-CA4			
GPSC AT/E 2-Port RS232 Cable	69627			
705 MT Terminal, Used as System Console*	6950-ET3			
2 MB SIMMS Memory	69581			
4/16 MB Memory Expansion Board	69582			
N80387-6386/25 Math Coprocessor	69575			
Alternate Console Adapter	69598			
10-Conductor Cable, 25 ft.	69606			
ACU/MODEM Adapter, Connects to COM 1 for Remote Console	69611			
REMOTE CONSOLE Modem Adapter, Connects to 2400 FDX Modem	69612			
9-10 PIN RJ45 F Adapter for Alternate Console	69614			
IPC-1600 Ports Card	69617			
2400 FDX Error Correction Modem	2224-CEO			
IPC-1600 Ports Cabinet	69618			
Cartridge Tapes	8100-000	8		

TOTAL _____

* Screen color attributes are: white = COL10, amber = COL19 (default).

Table A-3: WGS 6386E/33 SCSI Server Computer Worksheet

COMPONENT	PEC	QTY	PRICE	TOTAL PRICE
WGS 6386E/33 SCSI Server Computer	6950-DC2			
GPSC AT/E X.25 Kit	6950-CA4			
GPSC AT/E 2-Port RS232 Cable	69627			
705 MT Terminal, Used as System Console*	6950-ET3			
2 MB SIMMS Memory	69581			
4/16 MB Memory Expansion Board	69582			
6386/33 Math Coprocessor	69593			
Alternate Console Adapter	69598			
10-Conductor Cable, 25 ft.	69606			
ACU/MODEM Adapter, Connects to COM 1 for Remote Console	69611			
REMOTE CONSOLE Modem Adapter, Connects to 2400 FDX Modem	69612			
9-10 PIN RJ45 F Adapter for Alternate Console	69614			
IPC-1600 Ports Card	69617			
2400 FDX Error Correction Modem	2224-CEO			
IPC-1600 Ports Cabinet	69618			
Cartridge Tapes	8100-000	8		

TOTAL _____

* Screen color attributes are: white = COL10, amber = COL19 (default).

Table A-4: Remote Management Worksheet

COMPONENT	PEC	QTY	PRICE	TOTAL PRICE
Remote Management Package	69601			
Adapter to Connect to the Alarm Transmitter/Receiver	69613			

TOTAL _____

Table A-5: Uninterruptible Power Supply Worksheet

COMPONENT	PEC	QTY	PRICE	TOTAL PRICE
1 KVA UPS	2403-201			
2 KVA UPS	2403-204			
10-Conductor RJ45 Cable, 50 ft.	69607			
Adapter for 1 KVA UPS*	2750-C09			

TOTAL _____

* This connector works only with the 1 KVA UPS. For the proper connector for the 2 KVA UPS, call the TSC at 1-800-344-9670.

Table A-6: Terminals Worksheet

TERMINAL	PEC	QTY	PRICE	TOTAL PRICE
615 CMT Controller	6950-ET5			
Color Monitor	69571			
Keyboard	69567			
705 MT (includes controller, monitor, and keyboard)	6950-ET3			
715 BCS White Monitor	6950-ET7			
Amber Monitor	6950-ET6			

TOTAL _____

Table A-7: Printers Worksheet

MODEL AND TYPE	PEC	QTY	PRICE	TOTAL PRICE
572 Serial Dot Matrix (Narrow Platen)	6950-EP5			
573 Serial Dot Matrix (Wide Platen)	6950-EP6			
583 24-Wire Dot Matrix	6950-EP8			
6417 Parallel Dot Matrix				

TOTAL _____

Table A-8: Terminal/Printer Cables and Adapter Worksheet

COMPONENT	PEC	QTY	PRICE	TOTAL PRICE
10-Connector Modular Cable, 10 ft.	69605			
10-Connector Modular Cable, 25 ft.	69606			
10-Connector Modular Cable, 50 ft.	69607			
10 Pin In Line Extender	69628			
Terminal/Printer Adapter	69608			

TOTAL _____

Table A-9: Additional Generic 3r Switch Hardware Worksheet

COMPONENT	PEC	QTY	PRICE	TOTAL PRICE
Packet Gateway	63317			
Integrated Announcement Board	63141			
Auxiliary Trunk Interface	63118			

TOTAL _____

Table A-10: Additional Generic 2/System 85 Switch Hardware Worksheet

COMPONENT	PEC	QTY	PRICE	TOTAL PRICE
DCIU	65325			
Basic 4-Channel Digital Announcement Unit	65272			
Single Channel Digital Announcement Unit	65270			
3-Channel Remote Record and Ring Trip Option	65273			
Extended Memory Adder Kit	65274			
Memory Expansion Kit	65275			
Auxiliary Trunk Interface	65113			
Auxiliary Trunk Interface	63118			
Analog Interface	65347			
Analog Interface	63136			

TOTAL _____

Table A-11: Additional Generic 3i and Generic 1 Switch Hardware Worksheet

COMPONENT	PEC	QTY	PRICE	TOTAL PRICE
Processor Interface	63153			
Digital Line	63114			
Digital Announcement Board	63141			

TOTAL _____

Table A-12: Additional Switch Software Worksheet

SWITCH	SOFTWARE	PEC	QTY	PRICE	TOTAL PRICE
Generic 2 or System 85, R2V4	Call Vectoring	1252-CVG			
	Look-Ahead Interflow	1252-LAI			
Generic 3i	Application - Service (ACD)	1263-ACD			
	Call Vectoring - Basic	1236-CVB			
	Call Vectoring - Prompting (Call Vectoring - Basic is required)	1236-CVP			
	Call Work Codes	1263-CWC			
	Look-Ahead Interflow	1236-LAI			
Generic 3r	Application - Service (ACD)	1263-ACD			
	Call Vectoring - Basic	1263-CVB			
	Call Vectoring - Prompting (Call Vectoring - Basic is required)	1263-CVP			
	Call Work Codes	1263-CWC			
	Look-Ahead Interflow	1263-LAI			
Generic 1	Application - Service (ACD)	1233-ACD			

TOTAL _____

Table A-13: Modems and Data Modules for Computer to Switch Connection Worksheet

TYPE	COMPONENT	PEC	QTY	PRICE	TOTAL PRICE
DSU	Single Modem	2225-96B			
DATAPHONE II Modem	9600 bps	2201-96C			
	Stand-Alone Housing	22631			
	829 Channel Interface Unit Replacement	9200-030			
MPDM	Modular PDM — CMS	2161-PDM			
MTDM	Modular Trunk Data Module	2162-TDM			
	RS-232 Interface	21621			
	Stand-Alone Housing	21702			

TOTAL _____

Table A-14: CMS Host Computer to Generic 2 or System 85 Cabling Worksheet

COMPONENT	PEC/ATT	QTY	PRICE	TOTAL PRICE
IDI	65399A/CCN06			
Switch to IDI Cable: 25 ft. 35 ft. 50 ft. 75 ft. 100 ft. 150 ft. 175 ft. 200 ft. 250 ft. 300 ft. 400 ft.	Attr. LNG21 Attr. LNG10 Attr. LNG11 Attr. LNG12 Attr. LNG13 Attr. LNG15 Attr. LNG16 Attr. LNG17 Attr. LNG47 Attr. LNG48 Attr. LNG49			
RS-449 to RS232 Transition Cable for Single Common Control, 50 Feet	65254A/CCT01			
RS-449 to RS232 Transition Cable for Duplicated Common Control, 50 Feet	65254A/CCT02			
CMS Host to DSU Cable, 12 Feet	2726-03L			
CMS Host to DSU Cable, 25 Feet	2726-03S			
M8K, 5 Feet	2721-08E			
GPSC-AT/E Fanout Cable	69627			

TOTAL _____

Table A-15: CMS Host Computer to Generic 3r Cabling Worksheet

COMPONENT	PEC/ATT	QTY	PRICE	TOTAL PRICE
IDI	65399A/CCT01, CCN06, LNG21			
RS232C to RS-449 Transition Cable: 10 Feet 25 Feet 50 Feet 100 Feet 200 Feet	703803/LNG50, LNH99 703803/LNG21, LNH99 703803/LNG11, LNH99 703803/LNG13, LNH99 703803/LNG17, LNH99			
CMS Host to MPDM or DATAPHONE II Cable: 12 Feet 25 Feet	2726-03L 2726-03S			
M25A Cable: 1 Foot 4 Feet 10 Feet 25 Feet 50 Feet	2721-02A 2721-02D 2721-02K 2721-02S 2721-02V			
B25A Cable: 5 Feet 10 Feet 15 Feet 20 Feet 30 Feet 60 Feet 100 Feet	2720-01E 2720-01K 2720-01P 2720-01R 2720-01T 2720-01W 2720-01Z			
GPSC-AT/E Fanout Cable	69627			

TOTAL _____

Table A-16: CMS Host Computer to Generic 3i or Generic 1 Cabling Worksheet

COMPONENT	PEC/ATT	QTY	PRICE	TOTAL PRICE
IDI	65399A/CCT01, CCN06, LNG21			
RS232C to RS-449 Transition Cable: 10 Feet 25 Feet 50 Feet 100 Feet 200 Feet	703803/LNG99, LNH01 703803/LNG99, LNH04 703803/LNG99, LNH09 703803/LNG99, LNH20 703803/LNG99, LNH24			
CMS Host to DATAPHONE II Cable: 12 Feet 25 Feet	2726-03L 2726-03S			
M25A Cable: 1 Foot 4 Feet 10 Feet 25 Feet 50 Feet	2721-02A 2721-02D 2721-02K 2721-02S 2721-02V			
B25A Cable: 5 Feet 10 Feet 15 Feet 20 Feet 30 Feet 60 Feet 100 Feet	2720-01E 2720-01K 2720-01P 2720-01R 2720-01T 2720-01W 2720-01Z			
GPSC-AT/E Fanout Cable	69627			

TOTAL _____

Index

6386/25 SCSI Server Minimum Configuration	3-3	CMS Data Migrations	3-68
6386/25 WGS SCSI Server Computer Hardware	3-6	Where to Send CTC Tapes Containing CMS Migrated Data	3-69
6386/33 SCSI Server Minimum Configuration	3-4	Computer-to-Switch Hardware and Cabling	3-39
6386/33 WGS SCSI Server Computer Hardware	3-7	Connecting the WGS Computer to the Generic 2 or System 85 Switch	3-49
		Connecting the WGS Computer to the Generic 3i or Generic 1 Switch	3-59
		Connecting the WGS Computer to the Generic 3r Switch	3-40
		Configuring a WGS/R3 CMS Application	
		Additional Switch Hardware and Software	3-34
		Cabling Remote Terminals and Printers	3-31
		CMS Data Migrations	3-68
		Computer-to-Switch Hardware and Cabling	3-39
		General information	3-1
		Hardware	3-5
		Optional Hardware for R3 CMS	3-17
		Peripherals	3-25
		R3 CMS Minimum Computer Configurations	3-2
		Required Hardware For R3 CMS	3-8
		Software	3-22
		Connecting the WGS Computer to the Generic 2 or System 85 Switch	3-49
		Connecting the WGS Computer to the Generic 3i or Generic 1 Switch	3-59
		Connecting the WGS Computer to the Generic 3r Switch	3-40
A			
ACD Engineering Guidelines	2-55		
Agent Engineering Guidelines	2-56		
Interpolation	2-55		
ACD Parameters	2-2		
Measured and Unmeasured Trunks	2-5		
Measured Extensions Assigned to Multiple Splits	2-4		
Additional Generic 2 and System 85 Switch Hardware and Software	3-36		
Additional Generic 3i and Generic 1 Switch Hardware and Software	3-38		
Additional Generic 3r Switch Hardware and Software	3-35		
Additional Switch Hardware and Software	3-34		
Additional Generic 2 and System 85 Switch Hardware and Software	3-36		
Additional Generic 3i and Generic 1 Switch Hardware and Software	3-38		
Additional Generic 3r Switch Hardware and Software	3-35		
Agent Engineering Guidelines	2-56		
C			
Cabling Remote Terminals and Printers	3-31		
CMS Customer Training	2-77		
Other CMS-Related Training	2-78		
D			
Description of R3 CMS			
Description of the Release 3 Call Management System			1-1
Description of the Release 3 Call Management System			1-1
Optional R3 CMS Features			1-8

Problem-Reporting Procedures (Contd)		Trunk Engineering Guidelines	2-74
Problem-Reporting Procedure for the Customer	4-13		
Problem-Reporting Procedure for the Service Technician	4-13		
		U	
		Uninterruptible Power Supply	3-20
		Using the Disk Program	2-42
		Using the Disk Storage Worksheets	2-46
		Using the RAM Program	2-38
		Using the Real-time Refresh Program	2-18
		Using the Refresh Rate Worksheets	2-23
		W	
		When to Order Documents	2-80
		Where to Send CTC Tapes Containing CMS Migrated Data	3-69
R			
R3 CMS Enhancements	1-2		
R3 CMS Minimum Computer Configurations	3-2		
6386/25 SCSI Server Minimum Configuration	3-3		
6386/33 SCSI Server Minimum Configuration	3-4		
Remote Management	3-13		
Required Hardware For R3 CMS	3-8		
General Purpose Synchronous Controller (GPSCAT/E)	3-8		
Intelligent Ports Card	3-9		
Main Memory Expansion	3-10		
Math (Numeric) Coprocessors for 6386 WGS Computers	3-12		
Miscellaneous Requirements	3-16		
Remote Management	3-13		
Required Software for the 6386/25 WGS Computer	3-22		
Required Software for the 6386/33 WGS SCSI Server Computer	3-23		
S			
SCSI Packages	3-17		
Software	3-22		
Optional Software	3-24		
Required Software for the 6386/25 WGS Computer	3-22		
Required Software for the 6386/33 WGS SCSI Server Computer	3-23		
T			
Terminals	3-25		
The R3 CMS Provisioning Process	4-1		