TeleComp
Research & Development Corp

MULTIMATE

POLYMORPHIC MEDIATION INTERFACE *APPLICATION*

USER'S MANUAL

RELEASE 2.X

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1. Introduction

There has always been a need to share the precious resources of certain network elements. With some protocols, this was accomplished with a port sharing device and a spider network of cabling. Other more complicated protocols required an eternal PAD and even more cabling. Although the expense was high, there was no other way to share the resource.

The MultiMate application was designed to eliminate the wasteful expense of external PADs and port sharing devices. In addition, strategies for redundancy and disaster recovery became available through the judicious use of MultiMate.

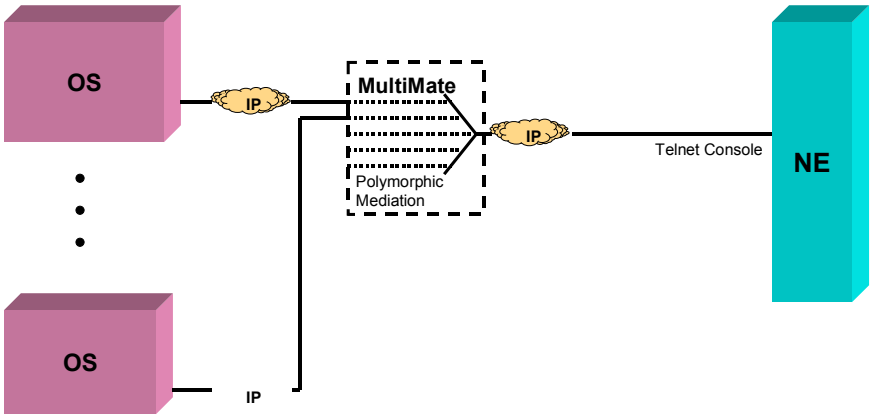
The Multimate application is ***polymorphic***. That is, it can mediate between different types of endpoints, even using different protocol sets, and thereby create a cohesive sharing environment where none was previously possible.

Please note the deployment examples. If there are any questions as to the applicability of MultiMate to any deployment; these should be addressed to the author at angel@trdcusa.com.

2. Sample Deployments

The most straightforward use of MultiMate is for the sharing of an administrative console. Some uses are for sharing between an OS and a dedicated access terminal.

Sharing a Telnet Console with MultiMate



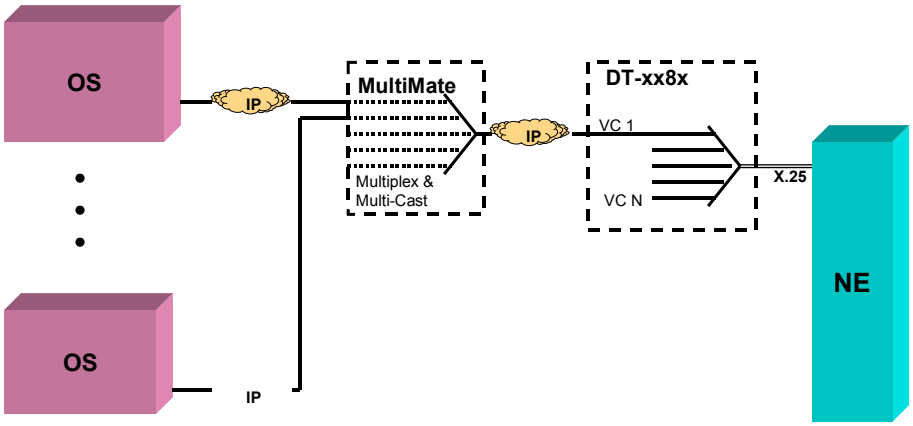
In the diagram above, each OS has access to the telnet console of the network element. If the network element had a serial console, there would be an access device, such as a DT-xx8x, to make the TCP/IP to serial connection.

Each OS may have a different protocol set, or no protocol set. If no protocol set is utilized; data forwarding is based on a timer. In such situations, if there is frame oriented data; the Multimate does allow timed exclusive access.

Many network elements use TL1 as their base protocol. The MultiMate application provides a full virtual pad to each OS in such a situation that avoids the use of timers and exclusive access.

Some network elements use (B)X.25 as its native interface. In these, the stream to be shared is a single virtual circuit on an X.25 line. In the past, this was done with an expensive rube Goldberg solution with a PAD, a port sharing device and no less than three ports. The MultiMate solution is elegant as follows:

Sharing an X.25 VC with MultiMate

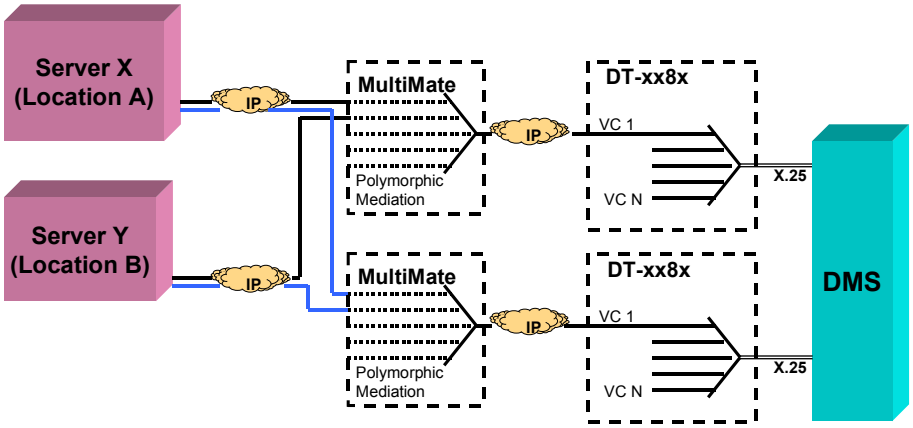


- X.25 Terminated & Mediated on the DT-xx8x.
- Selected VC is transported to DT-6xxx MultiMate application.
- The selected is then Multiplexed to unique TCP ports.
- Servers connect individually to the DT-6xxx MultiMate.
- Any Data from NE is sent to Both OS Servers.
- Data from ANY OS Server is sent to the NE.
- Up to 64 connection points.

In the above, it is evident that there are no wires other than the single X.25 connection to the network element. Rather than being able to share a simple 2:1, the solution allows up to a 16:1 sharing concentration. By replacing the external PAD and port sharing devices, and the elimination of the extraneous ports, the MultiMate application saves considerable expenditures.

The elegance of the MultiMate application can be used for disaster recovery purposes. In the following two diagrams, the logical and physical view of a redundant system is depicted with emphasis on fault recovery.

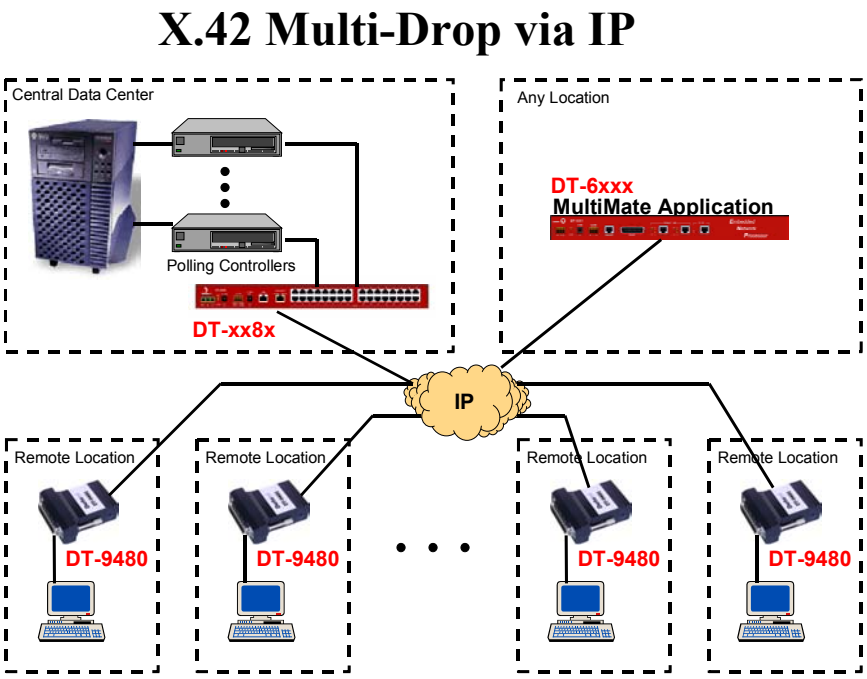
Disaster Recovery - Logical View



The logical view above shows that each operation system has simultaneous access to the network element. Although the disaster recovery is an active-standby approach, the solution does have an active-active potential.

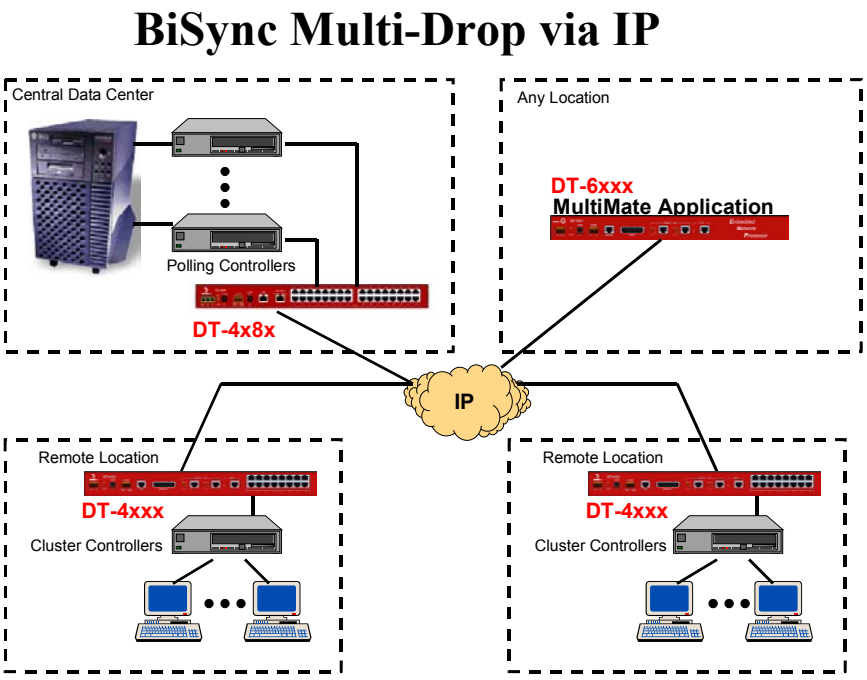
The physical deployment may be varied, but generally each location would have its own DT-6xxx hardware with the MultiMate Application. If a third site were used for DR, then it would also replicate the configuration. The MultiMate allows for a 16-way deployment that could easily accommodate any disaster recovery deployment.

There are other applications of the MultiMate from X.25 sharing. The X.42 protocol set is used for the Lottery. These are easily carried by implementing a multicast network with MultiMate. Consider the following:



In the diagram above, the X.42 polling controllers share up to 16 remote locations per polling link. The deployment is the most cost effective available.

The X.42 example is not unique. The same could be done of any other protocol. The following is a bisynchronous protocol example.



In essence, the MultiMate application can be used to create any multidrop network in a virtual fashion.

3. FEATURES

This section defines the features of the **MultiMate** application. This is done as a list, but some features require further elaboration.

- Support for one Common Interface endpoint per instance. The TCP stream in common may originate from any device. Typically, a **DT-xx8x** implementing an X.25 PAD is used for X.25 virtual circuits. But, any other protocol set may be used.
- The common interface endpoint may be inbound, or outbound. The typical configuration is for this interface to be outbound.
- The common interface endpoint connection may be static or dynamic. When static, the interface is originated and maintained as soon as the **MultiMate** application, and common endpoint, is placed into service. When a dynamic connection is selected, the interface is established when the first shared endpoint mediation stream makes the connection, and disconnected when the last shared mediation stream disconnects. Disaster recovery deployments typically require dynamic configuration of the common interface.
- Up to 16:1 polymorphic mediation per instance of the **MultiMate** application.
- Each mediation stream, and the common stream, may have protocol sets that are dissimilar from each other; or no protocol set at all.
- A Configuration Console is available to be used by the **MultiMate** administrator for configuration, diagnostic and measurement purposes.

4. TCP PORTS

The TCP Numbers associated with a **MultiMate** application instance are listed in the table below and depend on the instance number. It should be noted that the common interface to MultiMate is typically an outbound connection. The table shows the TCP port if the common connection is configured as inbound. Outbound TCP port numbers are dynamic and not shown in this table.

#	Sharing	Common	MultiMate Admin
1	30001 - 30016	30000	10001
2	30201 - 30216	30200	10002
3	30401 - 30416	30400	10003
4	30601 - 30616	30600	10004
5	30801 - 30816	30800	10005
6	31001 - 31016	31000	10006
7	31201 - 31216	31200	10007
8	31401 - 31416	31400	10008
9	31601 - 31616	31600	10009
10	31801 - 31816	31800	10010
11	32001 - 32016	32000	10011
12	32201 - 32216	32200	10012
13	32401 - 32416	32400	10013
14	32601 - 32616	32600	10014
15	32801 - 32816	32800	10015
16	33001 - 33016	33000	10016
17	33201 - 33216	33200	10017
18	33401 - 33416	33400	10018
19	33601 - 33616	33600	10019
20	33801 - 33816	33800	10020
21	34001 - 34016	34000	10021
22	34201 - 34216	34200	10022
23	34401 - 34416	34400	10023
24	34601 - 34616	34600	10024
25	34801 - 34816	34800	10025
26	35001 - 35016	35000	10026
27	35201 - 35216	35200	10027
28	35401 - 35416	35400	10028
29	35801 - 35816	35800	10029
30	36001 - 36016	36000	10030

5. MULTIMATE REQUIRED CONFIGURATION

The MultiMate defaults each of the Sharing connection protocol parameters to common values associated with the TL1 protocol. If these are sufficient, then no further configuration is needed.

The MultiMate has a default Common connection as an outbound. The default configuration does not define the IP address, and TCP port of the common connection. This connection consequently defaults to an 'Out of Service' state. The connectivity parameters associated with the common interface must always be configured.

The MultiMate defaults the Common connection protocol parameter to common values associated with the TL1 protocol. If these are sufficient, then no further configuration is needed.

The MultiMate is a polymorphic application and the protocol parameters of each interface does not need to match. In the event that the interfaces differ, the MultiMate will provide the mediation logic to assure connectivity. Check with the author to verify that the exact permutation desired is currently supported in the MultiMate release level to be utilized.

6. Applications Commands

The DT-6xxx software is composed of two components. One component, called the ***Infrastructure,*** exists to support all applications. The second component is comprised of the individual **application*(s)***.

The ***Infrastructure*** provides Operating System functions, selected interfaces, protocol stacks, SNMP functions, and system OA&M while each **application** uses the services of the resident ***Infrastructure***.

5.1 Input Conventions

All parameters may be given on the command line. Parameters of the form **name=<value>** may be given in any order.

For several complex commands, listed below, missing parameters, or corrections of errors in given parameters, of the form **name=<value>** are collected by prompting the console user. The user responds to a prompt for the **name** by typing the required **<value>** followed by *newline*. Defaults are supplied in some cases, so the user need only enter *newline*.

- Commands may be entered in upper or lower case.
- Parameters of the form **name=value** may use upper or lower case for **name**.
- Default values, if any, are shown in parenthesis as part of the prompt.
- Case is preserved for values.
- When a password is being requested by a prompt, input is not echoed.
- Backspace erases one character and **@** deletes the current line of input. Most commands are killed by **del** key.

5.2 Login

Syntax: login PASSWD=<password> *(The default password is "**initial**")*

The **login** command is used to allow access to the other configuration commands.

The **PASSWD** parameter is not echo suppressed. However, if the **PASSWD** parameter is not provided, the console prompts for a password; the response *is* an asterisk echo in this case.

If the password is valid, the user is placed in the *logged in* mode. Once the console user is logged *in*, the balance of the commands are accessible.

Note: Each application instance is allowed to be assigned a different password.

5.3 Logout

Syntax: logout

The **logout** command is only allowed if the console user is logged *in*. It requires no arguments. It will set the console to the logged *out* mode.

Passwords are up to seven characters in length. The characters are alphanumeric and special characters are not allowed.

5.4 Change Password

Syntax: chgpass PASSWD=<old> NEWPASS=<new> CONFIRM=<new>

The chgpass command is used to change a user password on the system console. The command is only allowed if the user is logged *in*.

All three parameters must be given on the same line as the command. None of those entries are echo-suppressed.

If the current password is valid, and the two entries for the new password match, the password is changed to the new value.

5.5 Help

Syntax: help [Command]

The **help** command is always visible. The **help** command displays the currently allowed commands for the mode that the unit is currently entered. If the optional **[Command]** is provided, the displayed help will be limited to that command.

5.6 Version

Syntax: ver

The **version** command is only visible when the application is *logged in*. The command has no arguments. It displays the current build, software version, and database version of the **MultiMate** application.

5.7 Placing Components In Service

Syntax: rs <PT_ID>

The **restore** command is only visible when the application is *logged in*. The command is used to place the common endpoint, or any of the sharing endpoints, into service. A TCP connection is not available until the component is placed into service.

At least one argument is required. That argument is the component type to be placed into service. The common endpoint may be abbreviated with the letter 'C'. The sharing endpoints are in the range of 1 through 16 inclusive.

Once the component is brought into service, it will await a TCP session if the connection type is **rcv**. If the connection type is **orig**, a TCP session will be established with the endpoint specified in the component configuration.

5.8 Taking Components Out of Service

Syntax: rm <PT_ID>

The **remove** command is only visible when the application is *logged in*. The command is used to place the common endpoint, or any of the sharing endpoints, out of service. Any TCP connection using those components is automatically taken down when the component is removed from service. Depending on the options specified, other related connections may be taken down and enter the 'Ready for Service' statue as a consequence of a remove operation. For example, removing the common endpoint will disconnect all of the sharing endpoints and make them 'Ready for Service'.

At least one argument is required. That argument is the component type to be removed from service. The **<PT_ID>** parameter is a 'C' for the common endpoint or a number in the range of 1 through 16 inclusive for each of the sharing endpoints.

5.9 Endpoint Connectivity Configuration

Syntax: endpt <PT_ID> [type=<ORIG|RCV>]
[dest=<IP Address>]
[dport=<TCP Port>]
[cug=[+|-]<cug num>]
[conn=<STATIC | DYNAMIC>]

This command configures an individual endpoint. The **<PT_ID>** parameter is a 'C' for the common endpoint or a number in the range of 1 through 16 inclusive for each of the sharing endpoints.

The **[type=<ORIG|RCV>]** option specifies the direction of the endpoint connection. An endpoint that waits for an incoming connection (**[type=rcv]**), or an originator of a connection (**[type=orig]**).

The destination for an originating endpoint is defined by **dest=<ipaddr>** and **dport=<tcp_port>**. The TCP port assigned to an incoming call is fixed on a per endpoint basis and listed in the interface table.

The **[cug=[+|-]<CUG_num>]** option allows the inclusion or deletion of a Closed User Group in the list of CUGs assigned to the user port. The "**+**" will add the **<CUG_num>** to the CUG list. The "**-**" is used to delete the **<CUG_num>** from the list.

The **[conn=<STATIC | DYNAMIC>]** is an option that only has relevance for the common endpoint. When set to STATIC, the common endpoint is immediately connected upon a restore to service. When set to DYNAMIC, the common endpoint is connected when the first sharing endpoint connection is made. It then continues to stay connected as long as at least one sharing endpoint remains connected. If all sharing endpoints disconnect for any reason, the common endpoint connection is terminated. This feature is used for disaster recovery connectivity notice propagation.

5.10 ENDPOINT PROTOCOL CONFIGURATION

Syntax: vpad <PT_ID> [svc=< PAD | MAC | RBP >]
[padecho=< ON | OFF >]
[paderase=< NONE | BS | <HEX BYTE>]
[padidle=< #X.3 Ticks >]
[padparity=< TRANS | EVEN | ODD >]
[padcrlf=< NONE | RMT | PT | BOTH >]
[padfwd=< NONE | CR | CRDROP |
SEMI | ALL | GRPx >]
[padcmap=< ON | OFF >]
[padapi=< TELNET | RAW >]
[padcug=[+|-]<CUG Number>]

This command configures an individual endpoint protocol options. The **<PT_ID>** parameter is a 'C' for the common endpoint or a number in the range of 1 through 16 inclusive for each of the sharing endpoints.

The **svc=< PAD | RBP | MAC >** option determines the type of protocol service for the endpoint. The **<PT_ID>** must have been specified on the command line. When set to the value of **PAD**, the endpoint is terminated in an X.3 PAD. When a value of **MAC** is selected, a special interface for the MacStar operation system is used. When a value of **RBP** is selected, the *Record Boundary Preservation* protocol is selected. Other interfaces can be included, see the last section of this document for contact information.

The **padecho=< ON | OFF >** refers to reference #2 in the X.3 parameter list. When set to **OFF**, the PAD will not echo characters back to the IP endpoint. When set to the value of **ON**, all characters are to be echoed back to the IP source.

The **paderase=< NONE | BS | <HEX BYTE> >** option specifies reference #16 in the X.3 parameter list. It is used with manual telnet connections to an endpoint. It sets the buffer editing "erase" character. When the special "erase" character is received by the MultiMate for a specific endpoint, the previous character in the packet accumulation buffer is deleted. If the **padecho** option was also enabled, a "Backspace Blank Backspace" sequence is emitted to the user. When the **paderase** option is set to NONE, the PAD will not have a special "erase" character. When the value is BS, it is set to the ASCII backspace character 0x08. Otherwise, any character may be entered as a hexadecimal byte in 0xXX notation. This option is only valid on endpoints configured with the PAD interface.

The **padidle=<#X.3 ticks>** parameter refers to reference #4 of the X.3 parameter list. This is the time forwarding condition. When it expires, it will forward any data collected to the endpoint. The timer is reset to the specified timer value whenever a forwarding condition is reached. The value is based on ticks of 1/20th of a second each per the X.3 specification.

The **padparity=< TRANS | EVEN | ODD >** parameter is not present in the X.3 parameter list. It allows special parity treatment for interface to network elements that require parity. The default value is transparent operation. The value of **TRANS** sets the operation to be transparent. When the parity treatment is transparent, the data is not modified in either direction. The value of **EVEN** sets the operation to be even parity towards the destination endpoint(s), and stripped parity towards the connection source of this endpoint. The value of **ODD** sets the operation to be odd parity towards the destination endpoint(s), and stripped parity towards the connection source of this endpoint.

The **padcrlf=<NONE | RMT | PT | BOTH>** parameter refers to reference #13 of the X.3 parameter list. This is the action to be taken when a CR is received in the data stream from the remote IP endpoint. A value of **NONE** indicates that there is to be no LF (line feed) insertion. A value of **RMT** will insert an LF following a CR whenever it is sent towards the remote IP endpoint. A value of **PT** will insert an LF following a CR whenever it is sent towards the destination endpoint(s). A value of **BOTH** will insert an LF following a CR in either direction.

The **padfwd=<NONE | CR | CRDROP | SEMI | ALL | GRPx>** option specifies reference #3 of the X.3 parameter list. This is the forwarding condition (outside the PAD timer) which will forward data towards the destination endpoint(s). A value of **NONE** indicates that there are no character forwarding conditions. A value of **CR** indicates that a carriage return will forward any accumulated data (including the carriage return). A value of **CRDROP** indicates that a carriage return will forward any accumulated data (but not including the carriage return). A value of **SEMI** indicates that a semicolon will forward any accumulated data including the semicolon. A value of **ALL** indicates that all data is to be forwarded immediately. The **ALL** option has the effect of generating single user character forwards towards the destination endpoint(s). The **GRPx** values specify selected groups of forwarding characters. **GRP1** forwards on ESC, BEL, ENQ, and NAK. **GRP2** forwards on DEL, CAN, DC2. **GRP3** forwards on ETX, EOT. **GRP4** forwards on HT, LF, VT, and FF. Multiple forwarding conditions are allowed simultaneously. Setting **padfwd** to a value aggregates with the previous value of **padfwd**. The **padfwd=none** is required to clear the forwarding conditions.

The **padcmap=< ON | OFF >** option provides the automatic case mapping from lower case to upper case. When the option is set to **ON**, all lower case characters are automatically converted to upper case. When **OFF**, no transformations are performed.

The **padapi=< TELNET | RAW >** option provides a means of selecting the PAD virtual circuit to use **raw** protocol. The **raw** protocol is essentially asynchronous, but without the benefit of Telnet RFC encapsulation. It is used for applications that do not implement the Telnet RFC. The default for this option is to use the Telnet encapsulation.

The **padcug=[+|-]<CUG Number>** parameter allows the virtual circuit connection to be protected by closed user group membership. The closed user group feature is significant only for PAD service. The closed user group address entries are defined with the **cug** command. Any or all closed user group entries may be assigned with a virtual circuit.

5.11 Display Measurements

Syntax: dmeas < PT_ID >

The **dmeas** command is only visible when the application is logged in. The command is used to display the current measurements on any endpoint.

A **<PT_ID>** with a value of 'C' will display the measurement information for the common endpoint being supported by this instance of the application.

A **<PT_ID>** with a value of 1 through 16 inclusive will display the measurement information for a particular sharing endpoint.

A **<PT_ID>** with a value of ALL will display an aggregate of all the measurement data.

5.12 Verify Configuration

Syntax: vfy [all | app | <PT_ID> | cug]

The **vfy** command is only visible when the application is logged in. The command is used to display the configured options on the X.25 link, or a virtual circuit resident on the X.25 link.

The **<PT_ID>** parameter will display the configuration information for the endpoint specified. The common endpoint is represented by a 'C', and the sharing endpoints are specified by a number in the range of 1 through 16 inclusive.

The **APP** parameter will display information about the application instance. This includes user comments, and the instance identifier.

The **CUG** parameter will display information about the configuration of the closed user groups.

5.13 Displaying Current Connections

Syntax: dc

The **dc** command is used to display all of the current connections into the MultiMate application. This includes the common endpoint, and any of the sharing endpoints. The command will issue a report that shows the connection peer for each active connection.

5.14 Snooping Traffic

Syntax: snoop [OFF | ALL | SW | <PT_ID Range>] [verbose]

The MultiMate application has a diagnostic ability to snoop on any of the endpoints. This is done with the **snoop** command. All output is directed to the OA&M connection.

If the command is invoked with no arguments, it produces a report of all active snooper configurations.

If the command is invoked with the **OFF** option, all of the snooper configurations are disabled.

If the command is invoked with a **<PT_ID>** of 'C', the common endpoint is snooped. Output is displayed on the OA&M session.

If the command is invoked with a **<PT_ID Range>** of one through 16 inclusive, or a range of those values, the sharing endpoints associated will be snooped. Output is displayed on the OA&M session.

If the command is invoked with the **SW** option, then the internal switch of the MultiMate application has its operation snooped. Output is displayed on the OA&M session.

If the command is invoked with the **ALL** option, then all the endpoint snooper functions are enabled simultaneously.

The additional parameter of **[verbose]** will display all of the data bytes in addition to the standard decoding. The output of this option may become quite voluminous.

5.15 Prompt Labels

Syntax: label ["Any Label" | NONE]

The prompt on the application console may be customized with a label up to sixty characters in length. Spaces and special characters are allowed within the double quotes. The double quotes are required on this command. The value of **none** deletes any existing label on the prompt. The current configuration is displayed during a *verify configuration*, by invoking the **label** command without arguments, or merely by the prompt display.

5.16 Application Comments

Syntax: comment [L1="Any Comment"]
[L2="Any Comment"]
[L3="Any Comment"]

The application may have comments which are displayed with the *verify configuration* command. Up to three lines of comments are available. Each line may have a comment up to 64 characters in length. Each comment is double quoted to allow for spaces to be embedded. A comment with no characters (i.e. "") is used to delete a comment which is not desired. It is not necessary to delete prior to adding a new comment. The new comment shall replace the existing comment at the line specified.

5.17 Closed User Groups

Syntax: cug <CUG Number> [ipaddr=<IP Address>] [submask=<IP Mask>]

The **CUG** command allows the definition of address sets to create multiple closed user groups. The address sets are then used by the link, console, and virtual circuits in creating individual closed user groups. The **<CUG Number>** has a range of one through sixteen.

5.18 CONSOLE SECURITY

Syntax: console [cug=[+|-]<CUG Number>]

The **CONSOLE** command allows the assignment of a closed user group to the administration session. The closed user group must include the current administrator to prevent accidental lockout. This restriction is enforced.

7. MULTIMATE MEASUREMENTS AVAILABLE

This appendix itemizes the measurements available using the *display measurements* (**dmeas**) command.

The base measurements are always displayed, and the error and exception counters are only displayed if nonzero.

The measurements available are as follows:

Measurement Description	Type
Number of Frames Received	Base
Number of Frames Transmitted	Base
Number of Bytes Received	Base
Number of Bytes Transmitted	Base

A Frame is loosely defined in MultiMate as a group of data where a forwarding condition was met.

For example, when the RBP protocol is specified; a frame would be each RBP message.

When a TL1 PAD were specified as the endpoint protocol; a frame would be each time a semicolon caused a forward of a message.

8. Support for X.3 PAD Parameter values

The **MultiMate** application supports the relevant X.3 PAD parameters. Since the **MultiMate** application is not a physical device, some of the parameters are not readily applicable. Responses via X.29 will carry default values if queried.

The table below will indicate all the X.3 parameters, and the support of these parameters by the **MultiMate** application.

Ref #	Description	Supported Options	Note	Config
1	PAD recall	0 – None	User Command session provided by Datakit CC or DT-xxxx or DT-2020.	No
2	Echo	0 – No Echo 1 – Echo		Yes
3	Data Forwarding Characters	0 – None 2 – CR 126 – All Characters		Yes
4	Idle Delay	0-255	Ticks are in 1/20th of a second.	Yes
5	Ancillary Device Control	0 – None	Configured on DT-4000 or SAM/DT-2020 port configuration	No
6	Control of PAD service signals and PAD command signals.	0 – No PAD service signals are transmitted.	DT-4000 or SAM is DTE service center.	No
7	Operation of PAD on receipt of break from IP	0 – Nothing 1 – Send X.25 Interrupt 2 – Send X.25 Reset 4 – X.29 “Indication of Break”		Yes
8	Discard Output	0 – Normal Data Delivery		No
9	Padding after CR	0 – No Padding after CR		No
10	Line Folding	0 – No line folding		No
11	Binary Speed	18 – 64000bps	For Reporting Only	No
12	Flow Control of the PAD	0 – No use of X-ON and X-OFF	These are functions of the DT-4000 and SAM devices.	No
13	LineFeed Insertion after CR	0 – No Linefeed Insertion 1 – Insert Linefeed after CR towards IP. 2 – Insert Linefeed after CR from IP		Yes
14	Padding after Linefeed	0 – No Padding after LF		No
15	Editing	0 – No use of editing.	User command session performed via the DK CC,	No

			the DT-4000, and the DT-2020.	
16	Character Delete	None	User command session performed via the DK CC, the DT-4000, and the DT-2020.	No
17	Line Delete	None	User command session performed via the DK CC, the DT-4000, and the DT-2020.	No
18	Line Display	None	User command session performed via the DK CC, the DT-4000, and the DT-2020.	No
19	Editing PAD service signals	0 - None		No
20	Echo Mask	0 - None		No
21	Parity	0 – No generation or checking.	Parity performed by DT-4000 or SAM.	No
22	Page Wait	0 - Disabled		No
23	Input field size	0 - Undefined	User command session performed via the DK CC, the DT-4000, and the DT-2020.	No
24	End of Frame Signals	0 – Undefined Size	EOF is determined and encoded per the RFC since this is an IP application.	No
25	Extended Data Forwarding Signals	0 – No extended Data		No
26	Display Interrupt	0 – No display interrupt		No
27	Display Interrupt Confirmation	0 – No display interrupt confirmation.		No
28	Diacritic Character Coding	0 – Basic Coding		No
29	Extended Echo Mask	0 – No Extended Echo Mask		No

9. END-USER LICENSE AGREEMENT FOR SOFTWARE

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