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SANTA BARBARA PLANT

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MLC4/5 SOFTWARE LOADER

### PRODUCT SPECIFICATION

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## INTRODUCTION

The MLC4/5, a "soft" version of the current MLC is composed of a single base-card and up to four quad-adaptor cards each capable of driving up to four datacomm lines. Before it is capable of driving a line, each quad-adaptor must be downloaded by a program with the firmware necessary to run. In addition each of the four lines must be loaded with the proper configuration before it can run. This is also done by a program but after the firmware has been loaded to the quad.

Previously there were a number of adapters available for the MLC. These ran such disciplines as SYNC, ASYNC, TWDI, TELETYPE and BISYNC. In addition each adapter had a number of parameters (timeout values for example) which were set into the adapter via hardware straps. The line configuration which is loaded to each line of a quad-adaptor card serves to configure each line to run a potentially different discipline as well as supply the values for what was previously entered via hardware straps on older adapters.

Therefore before the MLC4/5 can be used by software the firmware must be loaded into the quad-adapters and the appropriate line configurations must also be loaded. This must be done after every clear-start. In addition if while running the MLC4/5 has a parity error within it's firmware the firmware and appropriate line configurations must be reloaded. Also if it is desired for a line of a quad-adaptor to run a discipline different from that which was originally loaded the alternate line configuration must be loaded to that line of the adapter.

Included in the 10.0 release is a file "SYSTEM/MLFIRMWARE". This contains the firmware to be loaded to a MLC4/5 and one line configuration named "DEFAULT". This configuration describes a standard TWDI line configuration. This configuration may be used by the standard Network Controller released in 10.0 "SYSTEM/CONTROLLER".

All datacomm programs which are to access a MLC4/5 must be capable of loading the firmware and line configurations to the MLC. A similar routine has been included in each of these programs to do the load and to do a reload when necessary. However all of these programs will obtain their firmware and line configurations from the standard system file SYSTEM/MLFIRMWARE.

### FILE SYSTEM/MLFIRMWARE

The File SYSTEM/MLFIRMWARE is created and modified only with the program SYSTEM/MLCLOADER. It contains both the firmware which must be loaded to the quad-adapters as well as what line configurations have been defined by the user. The file is capable of containing 50 line configurations. It however contains only one line configuration when released.

The file is composed of a header record followed by the firmware which is in turn followed by the space to hold the line configurations. The file is composed of one AREA, contains 90 character records, blocked 90/20.

The format of the header record is as follows:

#### 01 HEADER FORMAT

02 FILLER	BIT(8),
02 STARTING_RECORD	BIT(24),
02 ENDING_RECORD	BIT(24),
02 NEXT_AVAILABLE	BIT(24),
02 EOF_POINTER	BIT(24),
02 FIRMWARE_EOF	BIT(24),
02 LINE_FILE_SIZE	BIT(24),
02 FILLER	BIT(564);

The firmware in the file begins at record 1 and continues up to but not including the record number in FIRMWARE\_EOF. LINE\_FILE\_SIZE contains the number of records in the file. The first four items in the header record are used to delimit the configurations in the file. The configurations are stored in a doubly linked list to which records are added and deleted by the program SYSTEM/MLCLOADER. The first configuration in the file is pointed to by STARTING\_RECORD. The last configuration in the file is pointed to by ENDING\_RECORD. Available entries in the file are in a linked list, the start of which is pointed to by NEXT\_AVAILABLE. The logical end of the file is pointed to by EOF\_POINTER. Available space past EOF\_POINTER is used only when there is no space in the available linked list. This is indicated when the value of NEXT\_AVAILABLE is equal to the value of EOF\_POINTER all space up to EOF\_POINTER is full. The next configuration in the file goes at the position defined by EOF\_POINTER and then both of the two values are bumped.

The format of each line configuration record is:

01	LINE_FILE_STRUCTURE	
02	DEFINED	BIT(3),
02	NEXT_RECORD	BIT(24),
02	LAST_RECORD	BIT(24),
02	NAME	CHARACTER(10),
02	CONFIGURATION	BIT(552),
02	FILLER	BIT(326);

DEFINED is non\_zero if the record is active. NEXT\_RECORD and LAST\_RECORD are the links for the list. NAME is the name of that configuration. CONFIGURATION is the actual data which is to be loaded to a line of a quad adapter. It consists of a series of 24 bit values, the first 3 bits being the parameter number, the last 16 bits being the parameter value.

All configurations accessed by datacomm programs are done so by the name of the configuration. The name of the configuration is defined within the program and at load time the file SYSTEM/MLFIRMWARE is opened and a search of the linked list of entries performed to find the configuration of that name.

The firmware in the file is stored as a series of header and data records. At least one data record must separate header records. A header record must be the first firmware record in the file. All firmware records are stored in character form and are converted to hex before being loaded to the quad adapter.

All header records have an "H" in column one and a four character numeric field columns six through nine. This field defines the address in the quad adapter where the following data is to be loaded. All data records are delimited by "a" characters the first of which must be in column six. If the entire record is filled with data the ending "a" will be in column 39. So no more than 32 characters of data exist per record.

### PROGRAM SYSTEM/MLCLOADER

The program SYSTEM/MLCLOADER is used to create and modify the file SYSTEM/MLFIRMWARE. In the initial release of MLC4/5 it may also be used to implement the CCITT interface to the quad adapter. When running in a "debug" mode it may also be used to exercise the features of the MLC4/5.

When modifying the firmware file, input to the program is via a remote file opened by the program. The CCITT interface is via ODT commands to the program. In its "debug" mode input may be via either the remote file interface or the system ODT.

Operation of the program is controlled via settings of its switches. Four switches are used by the program:

SWITCH 0: 0 - Default value, no action taken.

1 - Initiate the DC/AUDIT interface at BOJ time. A message will be displayed when the file is opened. (This interface may be controlled via the system ODT also.)

SWITCH 1: 0 - Open the remote file. (Default value)

1 - Do not open the remote file. (All input must be via the system ODT.)

SWITCH 2: 0 - Disable all "debug" functions. (Default value)

1 - Enable "debug" mode

SWITCH 9: 0 - Default value, no action taken.

1 - Create the file SYSTEM/MLFIRMWARE and go to EOJ.

These switches are checked only at BOJ time. If modified later they will be ignored.

Since utilizing a remote file requires datacomm to be active in the system, the setting of SWITCH 1 will permit exercising the MLC4/5 and modifying the CCITT settings of the quad adapter without a datacomm system being active. SYSTEM/MLCLOADER does it's own datacomm functions when either exercising the quad or changing the CCITT settings of the quad so when running in this mode it only may access a line not being used by any other datacomm program.



## REMOTE FILE INTERFACE

The following section describes the commands entered to the program via the remote file interface. These are the commands which may be used to modify the file SYSTEM/MLFIRMWARE. There are additional commands which may be entered through the remote file interface. These are commands which exercise the MLC4/5 and are only permissible when the program is running in its "debug" mode. These will be described later in the section on "debug" commands.

The name of the remote file opened by the program is "REMOTEMLC4". It is a simple remote file. The program is not an MCS. The program interacts with only one station at a time.

All input to the program via the remote file interface is expected to be in upper case. The only exception to this is when a NAME of a configuration is entered. The name may be any series of non blank characters. Also within the fields presented on the various screens input may be free form. However imbedded blanks within tokens are not permitted.

The SYSTEM/MLCLOADER's remote file interface is designed to run strictly to a TD820/TD830/MT983 type device. It utilizes the various functions of these terminals and therefore running to any other type of remote device will give undefined results. Also since these terminals may be set up so that they do not go into LOCAL mode but stay in RCV mode it is necessary to prompt the program (use of the "SPCFY" key is recommended to prompt the program). In this way the program will not destroy previous messages to the screen by multiple messages since it is necessary to prompt the program for additional output.

**Please note:** In the examples of output from the program which follow, the "?" characters are not present on the screens. These will appear as forms characters at the terminal. Since these are not printable characters they appear here as "?" characters.

When the program goes to BOJ and opens its remote file, the following screen is displayed at the terminal:

```
PRESS "SPCFY" NEXT TO OPTION DESIRED.  
CREATE LINE CONFIGURATION ----- ? ?  
CHANGE LINE CONFIGURATION ----- ? ?  
DELETE LINE CONFIGURATION ----- ? ?  
PRINT CONFIGURATIONS ----- ? ?  
STOP RUN ----- ? ?
```

Except for the recommended method for prompting the program, this screen is the only one where the use of the "SPCFY" key is expected. The "RET" key on the keyboard will skip the cursor through the options and the "SPCFY" key will indicate which option is to be done. The response by the program will be determined as a result of the option requested.

CREATE LINE CONFIGURATION.

The program will respond with the following screen:

```
NAME ----- ?           ?           NUMBER --- 396
BAUD-RATE ----- ?       ?
DISCIPLINE ----- ?       ?
RECEIVE-DELAY ----- ?    ?
TRANSMIT-DELAY ----- ?    ?
INITIAL-TIMEOUT ----- ?   ?
TEXT-TIMEOUT ----- ?     ?
STOP-BITS ----- ?        ?
VERTICAL-PARITY ----- ?   ?
CHARACTER-SIZE ----- ? ?
CONTINUOUS-CARRIER ----- ? ?
BCS ----- ?             ?
PAD ----- ?             ?
TRANSPARENCY ----- ? ?
DIAL-MODE ----- ? ?
SWITCHED ----- ? ?
BREAK-ENABLE ----- ? ?
LONG-BREAK ----- ? ?
PSEUDO-CARRIER-DETECT -- ? ?
NEW-SYNC ----- ? ?
EOT-DISCONNECT ----- ? ?
CCITT ----- ? ?
```

The field "NUMBER --- 396" indicates the record number in the file where the configuration will reside if correctly entered.

The following values are permissible for each entry:

- NAME Any non blank field may be entered. It may be from 1 - 10 characters in length. If no name is entered, the record number will be used as the name of the configuration.
- BAUD-RATE The line speed of the configuration is to be entered. Speeds of 110 baud through 19,200 baud are permissible.
- DISCIPLINE Six disciplines are possible, "SYNC", "ASYNC", "TWDI", "TTY", "BI-SYNC-E" (EBCDIC BI-SYNC) and "BI-SYNC-A" (ASCII BI-SYNC).
- RECEIVE-DELAY Any numeric value from 0 - 99999 may be entered. This value is in milliseconds.

TRANSMIT-DELAY	Any numeric value from 0 - 99999 may be entered. This value is in milliseconds.
INITAL-TIMEOUT	Any numeric value from 0 - 99999 may be entered. This value is in milliseconds.
TEXT-TIMEOUT	Any numeric value from 0 - 99999 may be entered. This value is in milliseconds.
STOP-BITS	Values of 0, 1, 1.5 or 2 may be entered.
VERTICAL-PARITY	Either "NONE", "ODD" or "EVEN" may be entered.
CHARACTER-SIZE	Either 5, 6, 7 or 8 may be entered.
CONTINUOUS-CARRIER	Either a "Y" or "N" may be entered if the option is desired.
BCS	Either "NONE", "EVEN", "ODD" or "CRC" may be entered.
PAD	Either "Y" or "N" may be entered depending on if the option is desired.
TRANSPARENCY	Either "Y" or "N" may be entered depending on if the option is desired.
DIAL-MODE	Either a "Y" or "N" may be entered.
SWITCHED	Either a "Y" or "N" may be entered.
BREAK-ENABLE	Either a "Y" or "N" may be entered.
LONG-BREAK	Either a "Y" or "N" may be entered.
PSEUDO-CARRIER-DETECT	Either a "Y" or "N" may be entered.
NEW-SYNC	Either a "Y" or "N" may be entered.
EOT-DISCONNECT	Either a "Y" or "N" may be entered.
CCITT	Either a "Y" or "N" may be entered.

It is advisable to refer to the MLC4/5 spec for the exact meaning of each of the above parameters.

Please also note that the two CCITT paramaters SELECT-RATE and SELECT-STANDBY were not included in the above list. While these are valid paramaters it is expected that these two parameters would be entered via different means.

When entering the configuration the screen should be transmitted from the HOME position so that the entire screen may be entered since the entire screen will be checked for validity.

The value of each parameter will be checked. In addition to the value entered for each parameter, two other checks are done. It will not be possible to set both the "DIAL-MODE" and "NEW-SYNC" parameters or the "EOT-DISCONNECT" and "CCITT" parameters in the same configuration.

After entering the screen if no errors were detected the following message will be returned:

CONFIGURATION NUMBER <number> - <name> ACCEPTED.

A prompt to the program will return the original menu again.

Should any errors have been detected they will be returned to the terminal. The configuration will not have been accepted. It will have to be re-entered. In addition to errors as a result of bad values entered, an error message will result if either the NAME entered had been previously defined for another configuration or if the firmware file is full of configurations. In the latter case it will be necessary to delete a configuration before another could be entered.

An example of the three types of error messages returned as well as the one warning possible is:

CONFIGURATION NAME IS NOT DEFINED - RECORD\_NUMBER WILL BE USED

CONFIGURATION FILE FULL.

A CONFIGURATION OF NAME <name> IS ALREADY DEFINED.

THE FOLLOWING PARAMETERS WERE IN ERROR:

BAUD-RATE  
CONTINUOUS-CARRIER  
PAD  
TRANSPARENCY  
SWITCHED

### CHANGE LINE CONFIGURATION.

If this option is specified the program will respond with the message:

```
ENTER CONFIGURATION NAME - ?           ?
```

The user must then enter the name of a previously defined configuration. If not the following message will be returned.

```
THAT CONFIGURATION IS NOT DEFINED.
```

It will then be necessary to prompt the program to have the original menu returned. If a valid name is entered then that configuration will be returned in the following form:

```
NAME ----- ?DEFAULT ?           NUMBER --- 393
BAUD-RATE ----- ?09600?
DISCIPLINE ----- ?           TWDI?
RECEIVE-DELAY ----- ?00000?
TRANSMIT-DELAY ----- ?00000?
INITIAL-TIMEOUT ----- ?03000?
TEXT-TIMEOUT ----- ?00032?
STOP-BITS ----- ?           1?
VERTICAL-PARITY ----- ?EVEN?
CHARACTER-SIZE ----- ?7?
CONTINUOUS-CARRIER ----- ?N?
BCS ----- ?NONE?
PAD ----- ?N?
TRANSPARENCY ----- ?N?
DIAL-MODE ----- ?N?
SWITCHED ----- ?N?
BREAK-ENABLE ----- ?N?
LONG-BREAK ----- ?N?
PSEUDO-CARRIER-DETECT -- ?N?
NEW-SYNC ----- ?N?
EOT-DISCONNECT ----- ?N?
CCITT ----- ?N?
```

In this case also the screen should be transmitted with the cursor in the home position.

The screen entered will be checked for validity just as when creating a new configuration.

**NOTE:** When changing a configuration, if the NAME of the configuration is changed, the result will be not to change the requested configuration but to create a new configuration, a mirror of the one requested to be changed but with changes applied. In this it is a simple matter to create new line configurations without having to enter all the necessary parameters.

Error messages returned when creating a line configuration are capable of being returned here also.

If the screen was correctly entered the following message will be returned:

CONFIGURATION NUMBER <number> - <name> changed.

If the name of the configuration was changed the <number> and <name> returned will reflect that of the new configuration. A prompt will then be required to return the original menu.

#### DELETE LINE CONFIGURATION.

If this option is requested the program will respond with the following message.

ENTER CONFIGURATION NAME OR "ALL" - ?

If "ALL" is not entered then the name will be checked and an error returned if the configuration named is not defined (a prompt will then be necessary).

If "ALL" is entered then each configuration will be returned to the screen one at a time. If "ALL" is not entered then the configuration requested will be returned. The configurations will not be automatically deleted. The terminal will be placed in forms mode with a "Y" or "N" response required. The user must respond with either of these two answers. Only a "Y" will cause the configuration to be deleted. If an invalid response is entered then the following message is returned:

INVALID RESPONSE PLEASE ENTER "Y" OR "N".

After a prompt the configuration will again be written to the screen. The format of the screen is:

NAME -----	DEFAULT	NUMBER ---	393
BAUD-RATE -----	09600		
DISCIPLINE -----	TWDI		SHOULD THIS BE DELETED
RECEIVE-DELAY -----	00000		ENTER "Y" OR "N"
TRANSMIT-DELAY -----	00000		? ?
INITIAL-TIMEOUT -----	03000		
TEXT-TIMEOUT -----	00032		
STOP-BITS -----	1		
VERTICAL-PARITY -----	EVEN		
CHARACTER-SIZE -----	7		
CONTINUOUS-CARRIER -----	N		
BCS -----	NONE		
PAD -----	N		
TRANSPARENCY -----	N		
DIAL-MODE -----	N		
SWITCHED -----	N		
BREAK-ENABLE -----	N		
LONG-BREAK -----	N		
PSEUDO-CARRIER-DETECT --	N		
NEW-SYNC -----	N		
EOT-DISCONNECT -----	N		
CCITT -----	N		

After the delete has been performed, if "ALL" had been entered then the following message will be returned:

END DELETE <number> CONFIGURATIONS DELETED.

If a single name was supplied then the following is returned:

CONFIGURATION NUMBER <number> [NOT] DELETED.

A prompt will then be necessary.

### PRINT CONFIGURATIONS.

This option allows the user to obtain a printed copy of the line configurations in the firmware file.

The initial response to entering this option is similar to when a delete line configuration in that the following message is returned:

ENTER CONFIGURATION NAME OR "ALL" - ? ?

If "ALL" is entered then a copy of all line configurations will be printed. Each configuration will be printed on a separate page in a format identical to how line configurations appear at the terminal. After the configurations are printed the following message will be returned:

<number> RECORDS PRINTED.

If the name of a configuration is entered then after the name is checked for validity it will be printed and the following message returned to the screen:

RECORD NUMBER <number> - <name> PRINTED.

After either of the above messages the program must be prompted before the original menu will be returned.

## ODT INTERFACE

When not running in debug mode only six commands are possible:

IOLOG

STOP

SET SELECT-STANDBY ON <pp:cc:uu>

RESET SELECT-STANDBY ON <pp:cc:uu>

SET DATA-RATE ON <pp:cc:uu>

RESET DATA-RATE ON <pp:cc:uu>

STOP will send the program to EOJ.

IOLOG will either start or stop auditing to the DC/AUDIT.FILE depending on the previous state of the file. Either of the following message will be displayed:

IOLOG STARTED: <date> <time>

AUDIT FILE CLOSED AT <time> ON <date>.

If in trying to open the file another program was using the file the following message will be displayed:

"DC/AUDIT.FILE" LOCKED.

The last four commands are used to modify the settings of the CCITT parameters within the quad adapter.

<pp:cc:uu> are the Port, Channel and Unit Number of the line of a quad adapter to which the load of the parameter is to be done. ":" characters must be present pp, cc and uu fields may be one or more characters. cc must be 0. uu must not be greater than 15. pp must not be greater than 5.

If any of the above commands were entered in error then the following message will be displayed:

INVALID INPUT COMMAND.



If the latter four commands were entered without error the following message will be displayed:

COMMAND IN PROCESS.

The loader routine within SYSTEM/MLCLOADER will then be called to do the load. Following the load one of the following messages will be returned depending upon the result of the load:

END COMMAND, NO ERROR DETECTED.

ADDRESS SPECIFIED IS NOT A MLC4/5.

FIRMWARE LOAD NECESSARY.

ERROR DETECTED DURING CONFIGURATION LOAD.

The meaning of the first two messages should be obvious. The third indicated that a load of the firmware must be done before the CCITT options may be loaded. The last indicates that the load failed. This usually implies that there is some problem with the MLC4/5.

#### DEBUG MODE

When SYSTEM/MLCLOADER is executed with SWITCH 2 set to some non-zero value a number of additional commands will be possible. These commands may be entered through either the remote file interface or through the ODT. With these commands it will be possible to drive the special functions of the MLC4/5. Loads of the firmware, as well as loads and unloads of the line configurations will be possible. It is also possible to interrupt the quad adapter and reload the firmware and line configuration. Finally it is possible to exercise the CCITT options of the quad adapter via the remote file interface.

All of these debug commands will cause the loader routine within the program to be accessed if the command was entered without error. If the command was entered via the ODT then the following message will be displayed before the loader routine is entered.

COMMAND IN PROCESS.

Following the exit from the loader routine one of thirteen messages will be returned to either the ODT or the terminal these are:

END COMMAND, NO ERROR DETECTED.

ADDRESS SPECIFIED IS NOT A MLC4/5.

FILE "SYSTEM/MLFIRMWARE" NOT PRESENT.

ERROR DETECTED IN FIRMWARE.

CONFIGURATION "<name>" IS NOT DEFINED.

ERROR DETECTED DURING FIRMWARE LOAD.

ERROR DETECTED DURING CONFIGURATION LOAD.

ERRR DETECTED DURING UNLOAD.

LOAD OF FIRMWARE NOT NECESSARY.

LOAD OF CONFIGURATION NOT NECESSARY.

FIRMWARE LOAD NECESSARY.

ADAPTER NOT PRESENT.

INCOMPATIBILITY ERROR DETECTED DURING START.

It is not possible for all of these errors to be returned with each command.

In the case of running via the remote file interface, the usual prompt must be entered after the result of the command has been returned so that the original menu may be given again.

## REMOTE FILE INTERFACE

In debug mode when the program goes to 80J and opens it's remote file, the following screen is displayed at the terminal:

```
PRESS "SPCFY" NEXT TO OPTION DESIRED.  
CREATE LINE CONFIGURATION ----- ? ?  
CHANGE LINE CONFIGURATION ----- ? ?  
DELETE LINE CONFIGURATION ----- ? ?  
PRINT CONFIGURATIONS ----- ? ?  
STOP RUN ----- ? ?  
LOAD FIRMWARE ----- ? ?  
LOAD CONFIGURATION ----- ? ?  
FORCE LOAD FIRMWARE ----- ? ?  
FORCE LOAD CONFIGURATION ----- ? ?  
NOL LOAD ----- ? ?  
UNLOAD CONFIGURATION ----- ? ?  
SET/RESET SELECT-STANDBY ----- ? ?  
SET/RESET ALTERNATE RATE ----- ? ?
```

The first five options have been described previously.

### LOAD FIRMWARE. / FORCE LOAD FIRMWARE. / UNLOAD CONFIGURATION.

While these commands perform seperate functions their format is similar.

The firmware in the firmware file will be loaded with the first command. It will be done only if the quad adapter indicates that a load of the firmware is necessary. The second command will also load the firmware to the quad adapter but will do so regardless of wether the firmware has been previously loaded. It will interrupt the quad adapter and force a reload of the firmware. The third command will unload the current configuration from the quad adapter and display the result on the screen. It will be necessary for the firmware to have been previously loaded for this command to not return an error.

When this command is requested the program will respond with the message:

```
ENTER HARDWARE ADDRESS - PP:CC:AA  
? : : ?
```

It is expected that two numeric characters for each field be entered. The ":" characters are required. The fields entered will be checked for validity and if an error was detected then the following message is returned:

```
ADDRESS ENTERED IS INVALID.
```

These commands will terminate as described above. However in the case of the UNLOAD command additional data will be returned to the terminal. A page of output similar to those usually returned to the screen will be delivered. It will contain a description of the current line configuration within the quad adapter. It will also contain the settings of the CCITT parameters within the quad adapter. A sample screen would be:

```
BAUD-RATE ----- 09600
DISCIPLINE ----- TWDT
RECEIVE-DELAY ----- 00000
TRANSMIT-DELAY ----- 00000
INITIAL-TIMEOUT ----- 03000
TEXT-TIMEOUT ----- 00032
STOP-BITS ----- 1
VERTICAL-PARITY ----- EVEN
CHARACTER-SIZE ----- 7
CONTINUOUS-CARRIER ----- N
BCS ----- NONE
PAD ----- N
TRANSPARENCY ----- N
DIAL-MODE ----- N
SWITCHED ----- N
BREAK-ENABLE ----- N
LONG-BREAK ----- N
PSEUDO-CARRIER-DETECT -- N
NEW-SYNC ----- N
EDT-DISCONNECT ----- N
CCITT ----- N
SELECT-RATE ----- N
SELECT-STANDBY ----- N
```

**LOAD CONFIGURATION. / FORCE LOAD CONFIGURATION. / NDL LOAD.**

The action of these three commands is also different but the input to the commands is similar.

The first command will cause a line configuration to be loaded to the quad adapter. In order for this to be done the firmware must have been previously loaded to the quad adapter and the quad must indicate that a configuration has yet to be loaded. The second command will interrupt the quad adapter and force a reload of both the firmware and the named line configuration. The third command will access the quad adapter in a manner similar to the way NDL accesses it. It will examine the state of the quad adapter and load the firmware to it only if the quad indicates that a load of the firmware is necessary. It will then always load the line configuration to the quad regardless of whether a configuration had been previously loaded or not.

Following the request for either of these commands, a hardware address must be entered just as in the case of the above three commands. The means for entering the address is identical to

that for the above commands. The same error message may result.

After the address is entered it will be necessary to enter the name of the line configuration which is to be loaded to the quad adapter. The following message is returned to the screen:

```
ENTER CONFIGURATION NAME - ?           ?
```

The firmware file will be scanned for a configuration which matches the name which the user entered. If no match was found, the following error will be returned:

```
THAT CONFIGURATION IS NOT DEFINED.
```

A prompt would then be required to return the original menu.

If a match was found the loader routine will be called as described above.

#### SET/RESET SELECT-STANDBY. / SET/RESET SELECT-RATE.

The use and action of these commands is similar. They are used to set and reset the CCITT functions of the quad.

Both of these commands require the address of the quad adapter which is to be accessed to be entered. The manner for entering the address is identical to that for the above six commands with the same results.

Whichever of the commands were entered, the program then responds with the message:

```
WHICH OPTION? (USE "SPCFY" KEY.)  
SET OPTION ----- ? ?  
RESET OPTION ----- ? ?
```

This is the only other portion of input to the program where the "SPCFY" key is expected to be used. If the "SPCFY" key is not used or used from outside the forms fields then the following message will be returned:

```
ERROR: INVALID COMMAND.
```

The usual prompt returns the original menu.

If the option is entered correctly then the loader routine is entered with the results described above.

## ODT INTERFACE

Five "debug" commands are possible through the ODT. All require the address of a quad adapter to be entered. Three commands require the name of a configuration to be supplied also. The formats of these commands are:

LOAD FIRMWARE TO <pp:cc:uu>

FORCE LOAD FIRMWARE TO <pp:cc:uu>

LOAD CONFIGURATION <name> TO <pp:cc:uu>

FORCE LOAD CONFIGURATION <name> TO <pp:cc:uu>

NDL LOAD <name> TO <pp:cc:uu>

These commands may be abbreviated, their format then being:

LF <pp:cc:aa>

FF <name> <pp:cc:aa>

LC <name> <pp:cc:aa>

FC <name> <pp:cc:aa>

NL <name> <pp:cc:aa>

For the commands to be valid the <name> field must be the name of a previously defined line configuration.

The three portions of the hardware address must be numeric of any length. The values of the three fields will be checked for validity. The ":" characters are mandatory.

The action of these commands is similar to those defined for use via the remote file interface. The first will load the firmware to the quad but do so only if the quad is in need of firmware. The second will load firmware to the quad regardless of the state of the quad. It will cause the quad to be interrupted and the firmware reloaded. The third command will load a line configuration to the quad. It will do so only if the quad has had firmware loaded to it and is in need of a configuration. The fourth command will force a reload of both the firmware and the line configuration regardless of the state of the quad adapter. It will interrupt the quad and reload both. The last command duplicates the loading method of the quad used by NDL. It will check the quad and load the firmware only if the quad adapter indicates that a load is necessary. It will however always load the line configuration regardless of whether the quad indicates one is necessary or not. In this way NDL is assured that it is running the correct configuration for it's needs.

### CHANGES TO NDL

There have been many changes to NDL in order to support the MLC4/5. These include a routine to load the firmware and line configurations the quad adapter, code to sense the presence of a MLC4/5 at open time and do the load and code to do a reload whenever a parity error within the quad adapter is detected. Changes have also been made to the NDL microcode within the SDL interpreter. These are changes to sense that a parity error has occurred within the quad adapter and to report this to the network controller so that it may do a reload.

There is only one change as far as the user is concerned. A new statement has been defined in NDL syntax. When defining a LINE in an NDL program an additional line of code is possible to define the name of the line configuration which is to be loaded to the MLC4/5. The syntax is:

```
CONFIGURATION = <Configuration Name>.
```

The statement is only legal when defining a line in the NDL compile.

NDL/DUMP and NIF/ANALYZER have both been changed to reflect the presence of a CONFIGURATION within a line definition.

If a Configuration has been defined for line it will be assumed by the resultant network controller that line is on a MLC4/5. It will attempt to load the firmware to that line (if the quad adapter indicates that a firmware load is required) and will always load the configuration of the name defined in the CONFIGURATION statement in the NDL compile for that line. The network controller will do this whenever an OPEN is being processed for a line on a MLC4/5 which was previously inactive.

It should be noted that the configuration defined within the NDL compile must have been defined within the file SYSTEM/MLFIRMWARE or else the attempted load by the network controller will fail since the configuration is undefined. This will be reflected by the fact that the open will be denied with the reason that the adapter is missing. Prior to being down loaded the quad adapter responds to a TEST op with an ID indicating that no hardware is present. Should the load fail the hardware will indeed appear as if no hardware is present and hence the OPEN is denied for that reason. If a no configuration is specified in the compile for a line which is on a MLC4/5 the OPEN will also fail for the same reason since no load will ever be attempted by the network controller.



If a configuration is defined in the NDL compile for a line which is not on a MLC4/5. The line will still run properly. Prior to doing a load the loader routine within the network controller will verify that the address of the line is indeed that of a MLC4/5. If it is not it will not do the load.

There is some overhead within the network controller if any line is to access a MLC4/5. 18,000 bits of additional value stack space are required by the network controller to call it's routine to load the firmware and line configuration. If no line configurations are defined in the NDL compile this memory will not be added to the network controllers value stack since the loader routine will never be called.

Finally it should be noted that the initial release of NDL to support the MLC4/5 will not allow the user to use the AUTODIAL feature in NDL when accessing a MLC4/5. Dialout is handled differently on this MLC. Plans are to include this feature in the 11.0 release.

### CURRENT CCITT INTERFACE

The initial release of NDL to support the MLC4/5 will not support the CCITT interface of the MLC. These are the ability to set SELECT-STANDBY and SELECT-RATE for lines on the quad adapter. On the previous MLC these were set via switches on the adapter. On the MLC4/5 these must be set/reset via a special load to the quad adapter. Changes to NDL to support these options are scheduled for the 11.0 release. For the initial release these must be done via the program SYSTEM/MLCLOADER. As mentioned above ODT commands to the program have been defined to do the load. It would be advisable to execute SYSTEM/MLCLOADER so that it does not open it's remote file when doing this. Also when doing this it will be necessary to have no other data comm program using the line which SYSTEM/MLCLOADER is to access. So if the line is active within the network controller it will be necessary to do a RELEASE LINE before executing the loader program.

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