60474000

CONTROL DATA CORPORATION

CDC® 2550-101 EMULATOR 6671/6676

REFERENCE MANUAL

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FUNCTION

The 2550-101 emulator, when connected to a CYBER 6000 or CYBER 70/170 series host computer, appears as several 6671 and/or 6676 data set controllers (DCS).

The emulator responds to the host channel commands which are entered into the emulation coupler (EC). See figure 1-1. The commands are interpreted, and tasks that are appropriate for the 6671 and 6676 DSCs are performed. These tasks consist of activating, deactivating, and conducting communications over designated lines. A maximum of 128 remote terminal lines, with line speeds ranging up to 9600 bps, can be accommodated by the emulator.

EQUIPMENT CONFIGURATION

The equipment configuration required to operate the emulator is illustrated in figure 1-1 and consists of:

- Network Processor Unit with 32K of memory.
- One or two emulation couplers (to interface one or two CYBER channels).
- One or more communications line adapters (CLAs). Each CLA is capable of terminating two half- or full-duplex communications lines. The emulator accommodates as many as 64 CLAs or as many as 128 communications lines.
- One operator console (1711-4, M33, or M35 Teletype).

The maximum configuration enables communications between two host computer peripheral processor units (PPUs) and 128 (HDX or FDX) remote terminal lines. The PPUs may be attached to the same host or to two separate hosts.

CONFIGURATION RESTRICTIONS

The equipment configurations using the emulator are bound by the following restrictions:

- A maximum of 16 lines can be accommodated by a 6671 DSC emulation.
- A maximum of 64 lines can be accommodated by a 6676 DSC emulation.
- A maximum of four data set controllers can be accommodated by the emulator. In configurations where two emulation couplers are used, the total number of DSC emulations cannot exceed four.
- A maximum of 128 remote terminal lines can be accommodated by the combination of 667X DSC emulations.

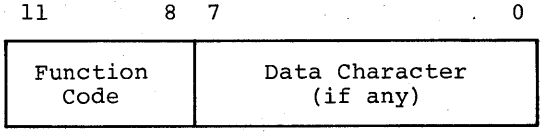
HOST INTERFACE STRUCTURE

The transfer of data and commands between the host and the emulation coupler (EC) is performed in blocks over the PPU channel. The length of each block is determined by the DSC type. The number of lines assigned to a DSC does not determine the block length.

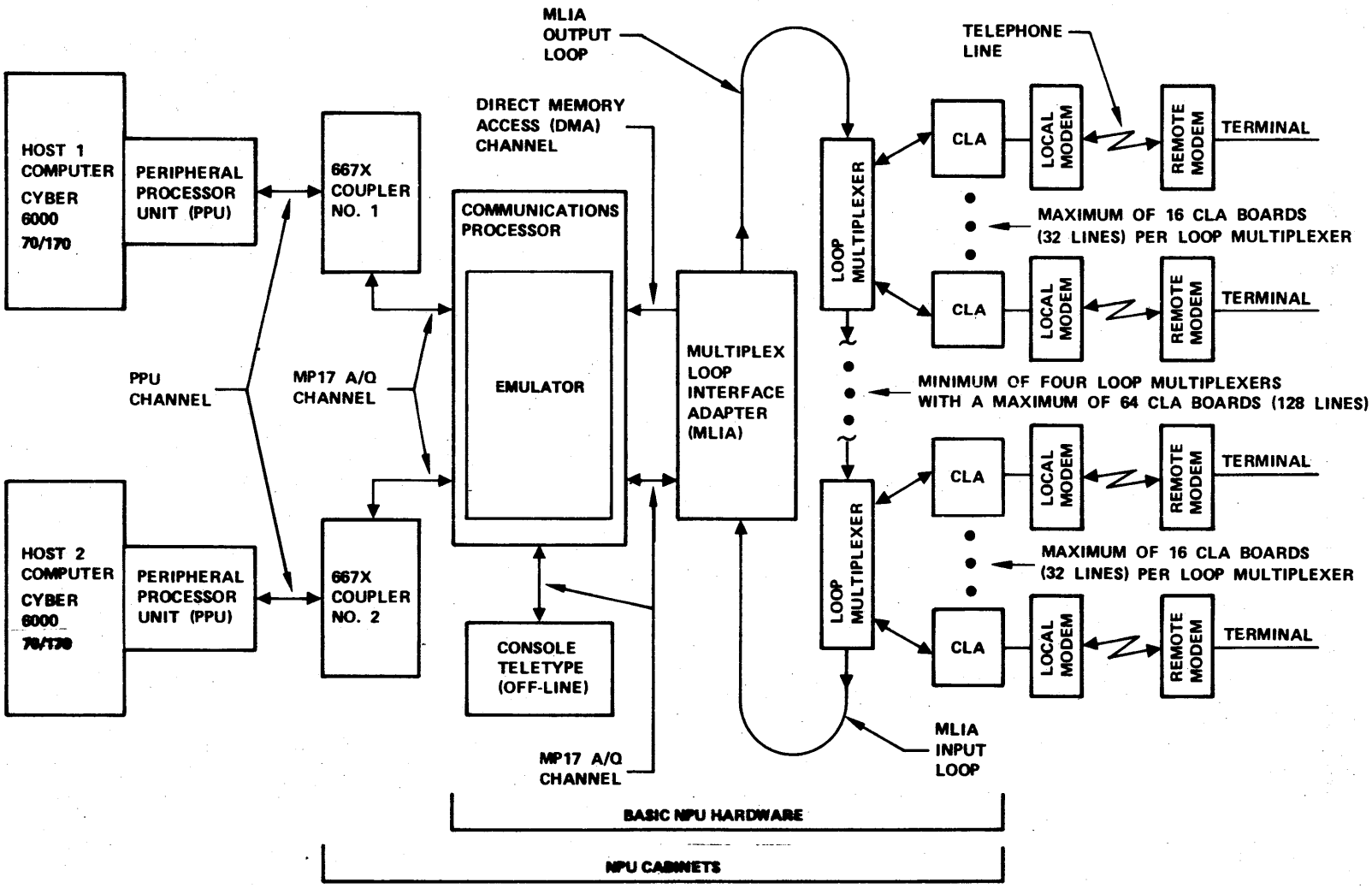
The block contains a 12-bit word for each line on a given DSC. The words are stored in the EC memory to be serviced subsequently by the emulation controlware.

In addition to the input and output blocks transferred between the host and the network processor unit (NPU), a status word for each of the emulated DSCs is transferred to the PPU.

OUTPUT WORD FORMAT



The output word issued by the host directs the emulator to condition a remote terminal line, or to transmit the accompanying data character over the line. The tasks performed by the emulator are determined by the function code in the output word. The function codes applicable to the 6671 DSC emulation are defined in table 1-1, and those applicable to a 6676 DSC are defined in table 1-2.



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PREFACE

This manual describes the functional and operational characteristics of the 2550-101 Network Processor Unit (formerly Host Communications Processor). It is recommended that the user be familiar with the functional characteristics of the 6671/6676 Data Set Controllers and the 255X hardware.

The 2550-101 operates with the same set of terminals currently supported by standard 6671 and 6676 Data Set Controllers and associated multiplexer drivers operating under NOS 1.0 or SCOPE 3.4/INTERCOM 4.2.

Additional information on the emulator and the hardware elements can be found in the publications listed below. For latest revision information, see the Literature Distribution Services Catalog.

Publication	Publication Number
2550-100 Controlware Product Configurator	74750600
2550-101 Emulator 6671/6676 Installation Handbook	60474100
6671 Data Set Controller Hardware Reference Manual	60399900
6676-B/C TTY Multiplexer Reference Manual	38707800
255X Network Processor Unit Hardware Maintenance Manual	60472000
255X Network Processor Unit Hardware Reference Manual	74700500

This product is intended for use only as described in this document. Control Data cannot be responsible for the proper functioning of undescribed features or parameters.

TABLE 1-1. FUNCTION CODE DEFINITION FOR 6671 DSC EMULATION

Function Code			Controlware Tasks to be Performed
Octal (See Note 1)	Hex	Bits (11-8)	
0	0	0000	No operation. No data transferred.
1	2	0010	Enable receiver section of CLA to resync. Carrier and line connection unaffected. No data transferred.
2	4	0100	Turn off carrier after transmitting the preceding valid data character (e.g., MPC). Resynchronization of receiver permitted. No data should be contained in this word. See Note 2.
3	6	0110	Turn off carrier after transmitting the preceding valid data character (e.g., MPC). Resync the receiver. No data should be contained in this word. See Note 2.
4	8	1000	Turn on carrier and transmit appended data character.
5	A	1010	Turn on carrier and resync receiver. Data character to be transmitted may be appended.
6	C	1100	Resync receiver, turn off carrier, and drop line connection. No data transferred. See Note 2.
7	E	1110	Resync receiver, connect modem. No data transferred.
6	D	1101	Overwrites former data character within the EC.

Note 1

The octal notation applies to bits 9 through 11.

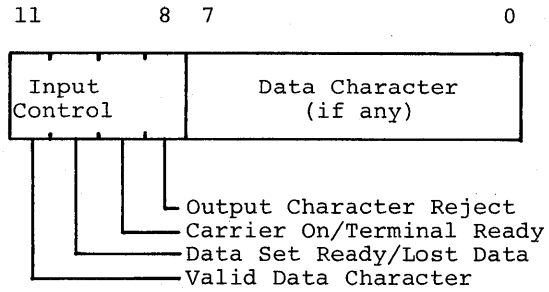
Note 2

These function codes wait until the last character has been transmitted on the line before carrier is affected. On asynchronous dedicated lines, the emulator reconnects the modem 100 to 200 milliseconds after dropping the carrier as a result of a function code of 6 (octal).

TABLE 1-2. FUNCTION CODE DEFINITION FOR 6676 DSC EMULATION

Function Code			Controlware Tasks to be Performed
Octal	Hex	Bits (11-8)	
0	0	0000	No operation
4	8	1000	Output required; data character appended to be transmitted
6	C	1100	Disconnect modem line connection. After a time-out period of 100 to 200 milliseconds, the emulator sends a connect signal to the modem.

INPUT WORD FORMAT



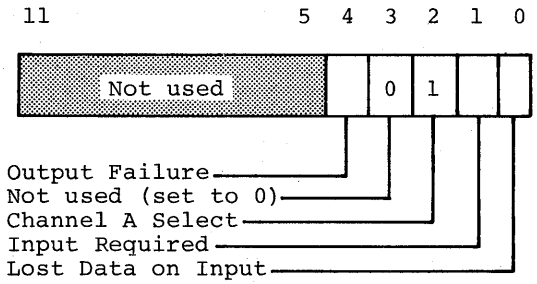
The input word provided by the emulator for the host indicates the status of the remote terminal line and data transfer status, and also contains an input data character (if available). The input control field is updated by the emulator. The conditions in the input control field are defined as follows:

- Bit 8 - Output Character Reject (OCR): set by the EC when the corresponding output word for a given line has been overwritten by a new block issued by the PPU before the output word has been serviced. The OCR flag is reset by the PPU program input request.

- Bit 10-9 - set and cleared by the emulator.
  00 --- data set not ready/carrier off
  01 --- carrier on/terminal ready
  10 --- data set ready/carrier off
  11 --- lost data - one or more characters have not been input from the CLA when they were available, hence they were lost.

- Bit 11 - Valid character (VC) set when bits 0-7 contain an input data character. VC is reset after a PPU input request.

STATUS WORD FORMAT



The emulator maintains a status word within the EC for each of the DSCs emulated. The PPU requests status from each of the emulated DSCs prior to issuing an output or input block. The conditions set in the equipment status word are defined below:

- Lost Data on Input (LDI): Set by the emulator when a data transfer overrun is detected on one of the remote terminal lines assigned to the particular DSC emulation. LDI is cleared by the EC after a status input request from the PPU is received.

- Input Required (IR): Set by the emulator after a character from any of the remote terminal lines assigned to the DSC emulation has been placed into an input buffer word. IR is cleared by the EC after an input block request from the PPU is received.

- Output Failure (OF): Set by the emulator when a remote terminal line output request cannot be serviced because the corresponding coupler output buffer word is empty. OF is cleared by the EC after an output block request from the PPU is received.

REMOTE TERMINAL LINE INTERFACE STRUCTURE

The transfer of data between the emulator and the remote terminal lines is performed serially through the communications line adapter (CLA) for the particular line. The format of data sent and received from the CLAs is described in the CLA maintenance manuals (see preface). When operating in the synchronous mode, the emulator attaches a message parity character (which has odd parity) and two PAD characters to the output message stream. Incoming data is checked for odd-parity ASCII control characters (SYN, SOH, ETX). The emulator checksums all input characters with the exception of the SYN character and replaces the incoming parity character with the difference between the incoming and the calculated parity character. The difference (normally zero) is sent to the host following the ETX character. Character recognition is not provided on asynchronous lines.

DATA RATES AND TRANSMISSIONS

Transmission rates of 8-bit characters (plus data control pulses) between the emulator and the remote terminal equipment are determined by the modem as listed in table 1-3.

At the above rates, the emulator requires that the host provide input data based on the character time; otherwise data will be lost. The character times per baud rates are listed in table 1-4.

The emulator can also provide terminations to the local terminals without modems if the CLAs are equipped with the proper RS-232 cables.

DATA MODES

The emulator operates in both half-and full-duplex modes; the mode is determined by the type and configuration of the modem used. The 103 mode is related to asynchronous data transmission. To operate half-duplex on asynchronous lines which are not equipped with 103-compatible modems, the host program must issue a function select code of 2 or 3 (octal) to command the emulator to drop the carrier and turn the line around.

TABLE 1-3. TRANSMISSION RATES BETWEEN EMULATOR AND REMOTE TERMINALS

Typical Modems	Baud (bps)	Mode
AT&T 103	101, 134.5, 150, 300	103
AT&T 202	600, 1200	103
AT&T 201A	2000	201
AT&T 201B	2400	201
Milgo 4400/4800	4800	201
Milgo 5500/96	9600	201

TABLE 1-4. CHARACTER TIMES PER BAUD RATES

Baud (bps)	Character Time (milliseconds)
100	100.0
134.5	66.92
150	66.67
300	33.33
600	16.67
1200	8.33
2000	4.00
2400	3.33
4800	1.67
9600	0.833

DATA AND CONTROL FLOW MANAGEMENT

The transfer of data between the host computer and the remote terminal lines, and the execution of tasks issued by the host is managed by the emulator controlware. Primarily, the controlware manages the data and control flow between the emulation coupler and the multiplex loop hardware as illustrated in figure 2-1.

Flow management is discussed in terms of input/output flow from the host vantage point. All activity in the NPU processor is initiated by the host.

OUTPUT DATA AND CONTROL FLOW

Data output or input on a particular remote terminal line is initiated by the host. A sequence of 12-bit output words is issued over the host PPU channel to the emulator. The sequence of output words determines the activity of the NPU.

Emulation Coupler Output Flow

The 12-bit output word is received and stored by the emulation coupler in the Output Coupler Buffer Memory (CBM). The position occupied by the output word within the CBM is determined by its position in the output block transmitted over the PPU channel. The CBM includes a thirteenth bit (protect bit) for each word. The protect bit is set by the emulation coupler when the output word is stored. The protect bit remains set until the word is serviced by the emulator or the host forces an overwrite of the output word.

After the output word has been stored in the CBM, the emulation coupler strips the function code (bits 11-8) from the output word and appends it to the equipment/line address of the particular output word. The address is determined by the output word position in the output block. The address/function word formed by the emulation coupler is stored in the coupler circular buffer (CCB). The CCB serves as a worklist for the emulator controlware.

The processing of the output word issued by the host is illustrated in figure 2-2.

Controlware Output Flow

The emulator controlware output flow takes two paths. The output word issued by the host is processed either by reading the CCB or by the direct reading of the output CBM when an output data demand is received from the CLA.

1. CCB Entry Processing: The controlware reads the CCB entries and executes the tasks specified in the function code. The function code may direct the controlware to: (a) initiate transmission, (b) initiate reception, (c) terminate transmission, (d) terminate reception, or (e) transmit a data character on the specified remote terminal line. The controlware issues the appropriate commands to the CLA and, if a data character is to be transmitted, reads the CBM and sends the data character to the CLA. The tasks performed are first validated for consistency with the equipment type.

2. CBM Entry Processing: After communication over the remote terminal line has been initiated, an output data demand can be accepted from the corresponding CLA. The address of the CLA requiring an output data character is supplied by the multiplex loop hardware. The controlware interprets the address and reads the appropriate output word from the CBM. Commands corresponding to the function code in the output word and the data character are sent to the CLA. The output character processing routine is interrupt-driven and can only be initiated after the particular CLA has been activated by a command corresponding to a task entered into the CCB. For further details on the multiplex loop hardware, refer to the 255X Hardware Reference Manual (see preface).

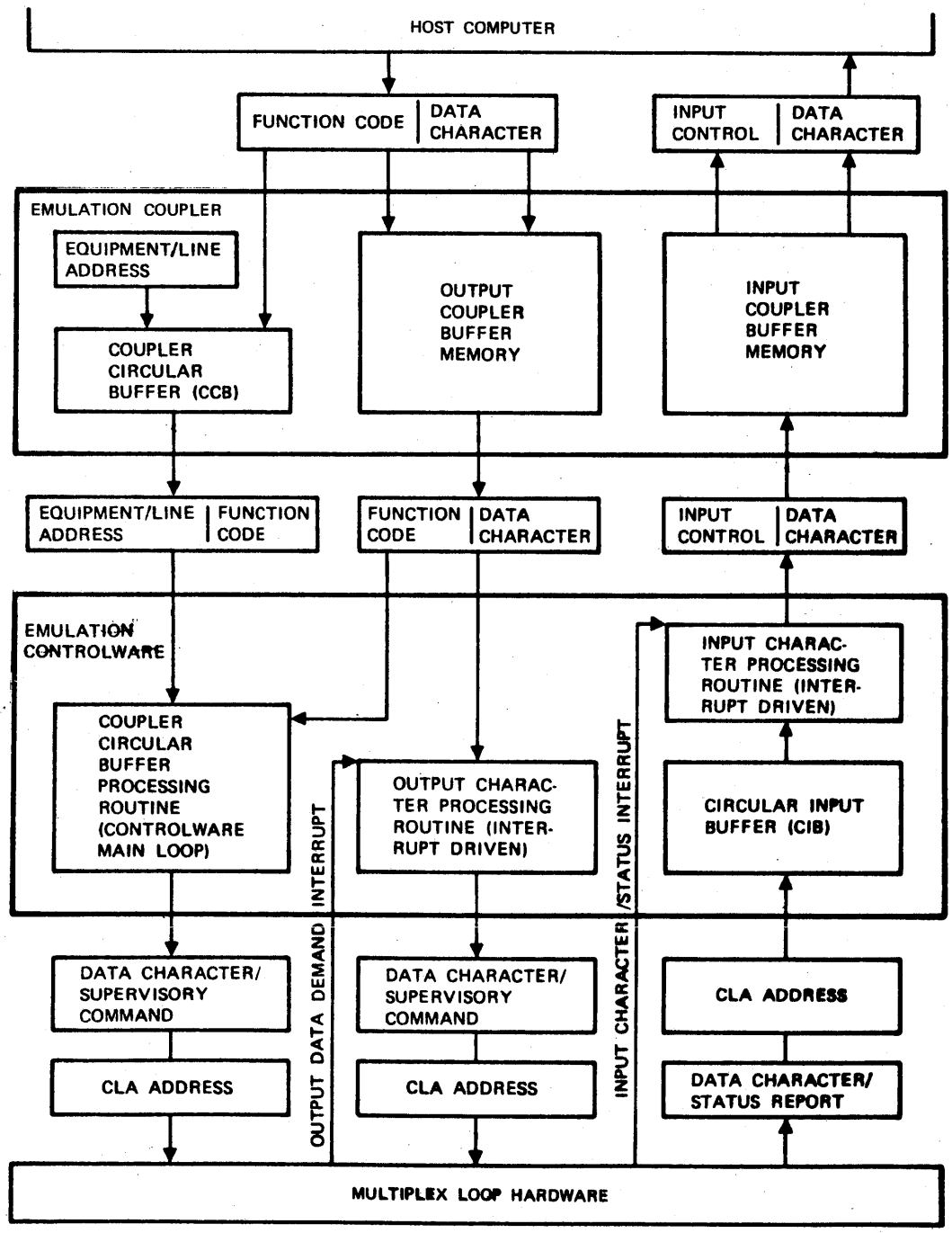


Figure 2-1. Data and Control Flow Through Coupler and Emulator Controlware

INPUT DATA FLOW

The transfer of data from the remote terminal lines is initiated by the host with an appropriate function code in an output word issued to the emulator. After input from a remote terminal line has been enabled, data from the remote terminal lines and supervisory status reports from the corresponding CLA are serviced by the emulator and entered into the CBM for transfer to the host.

Controlware Input Flow

Data from the remote terminal lines and status reports from the CLAs are stored in a circular input buffer (CIB) in main memory by the multiplex loop hardware. The input character processing routine is activated when one or more entries have been placed into the CIB. CLA status entries are interpreted and, if necessary, the input control field of the appropriate input word in the input CBM is updated. Data from the remote terminal lines are stored in bits 0 through 7 of the input CBM, and the Input Required flag in the equipment status word is set. See section 1, Input Word Format, for the format of the input CBM.

Emulation Coupler Input Flow

The Valid Data, Data Set Ready, Carrier-On flags and the data character are set in the input CBM exclusively by the emulator. Lost data is indicated when the emulator tries to write a character to the input CBM when the CBM was full; that is, the PPU program did not read the CBM within a character time.

NOTE

The emulator is capable of buffering two characters per line; therefore, three input characters are required before lost data is reported. Lost data can also be reported when a data overrun condition occurs in the CLA; e.g., the input data buffer in the CLA was still full when a new input character was fully assembled. This condition may be caused by a malfunction of the multiplex loop hardware.

The output character reject flag is set by the emulation coupler when output words are overwritten in the output CBM. This flag is passed to the PPU via the input control field in the input CBM during the next input block read.

The emulator sets the Input Required flag in the equipment status word after an input word is written into the input CBM. The PPU subsequently performs an input block read from the emulation coupler. This completes the input cycle from the remote terminal line to the host.

EMULATION CONFIGURATION OPTIONS

Table 2-1 lists the emulation options available to the user. The configuration parameters and the procedure used to install the parameters are described in the 2550-101 Emulator Installation Handbook (see preface).

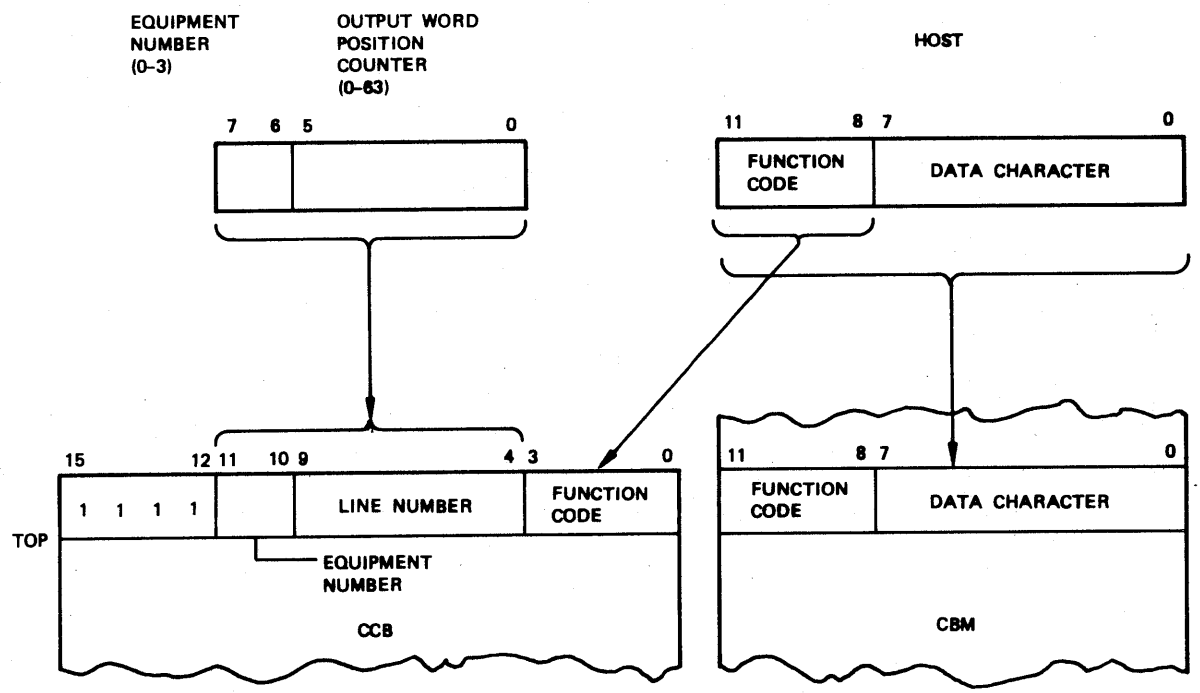


Figure 2-2. Processing of Output Words Issued by Host

TABLE 2-1. EMULATION OPTIONS

System Variable	Options	Restrictions
Number of Couplers	One Coupler	One coupler emulates a maximum of four 667X DSCs
		One coupler links only to one PPU
	Two Couplers	Two couplers require links to separate PPUs. The PPUs may serve different host CYBERs or may serve the same host CYBER
		The two couplers together emulate a maximum of four 667X DSCs
Equipment Type	6671-3	6671-3 DSC emulation supports a maximum of 16 lines
		Synchronous and asynchronous lines are supported by the 6671-3 DSC emulation
	6676-A/B/C	6676 DSC emulation supports a maximum of 64 lines
		6676 DSC emulation supports only asynchronous lines
Number of Lines/DSC	(1-16) or (1-64)	The number of lines assigned is restricted by the DSC type
		The maximum number of lines for all four DSC emulations is 128
Line Type	Switched	None
	Dedicated	None
Line Use	Synchronous	Accommodated only by 6671-3 DSC emulations
	Asynchronous	Accommodated by all 667X DSC emulations
Character Length	6 bits	None
	7 bits	None
	8 bits	Maximum number of bits: 8 including the parity bit
Character Parity	Odd	None
	Even	None
	Ignore	None
Stop Bits	One stop bit	Asynchronous lines only
	Two stop bits	Asynchronous lines only
Baud Rate	110, 134.5, 300, 600, 1200 2400,4800,9000 150	Asynchronous lines only Accomodated by all 667X DSC emulations Accommodated only by 6671-3 DSC emulation
	2000, 2400, 4800, 9600	Synchronous lines only
Mode	Half-duplex	If operating with a non-103-compatible modem, the PPU program must issue the line turnaround commands (function select code of 2 (octal))
	Full-duplex	None

SPECIFICATIONS FOR EACH LINE

CBM
Coupler Buffer Memory - A 512-word buffer (12 bits per word) contained within the emulation coupler and subdivided into input/output and equipment sections. Contains output words from the host and input words to be sent to the host.

CCB
Coupler Circular Buffer - A FIFO buffer within the emulation coupler which contains equipment/line address and function code entries to serve as a worklist for the emulator.

CIB
Circular Input Buffer - A 128-word buffer (16 bits per word) contained within the processor into which the MLIA enters all input from the CLAs.

DSC
Data Set Controller - A device (6671-3, 6676-A, or 6676-B/C) controlling several remote terminal lines. Generally designates the object of emulation for the emulator.

EC
667X Emulation Coupler - A physical device, part of the HCP/NPU that provides the interface between the PPU channel and the Emulator for a maximum of four 667X DSC emulations.

HCP
Host Communications Processor - A data communications system that serves as a front end for a host CYBER computer and several remote terminal lines. Generally refers to the 2550-2 configuration.

ODD
Output Data Demand - A request for output data issued by a CLA and transferred to the emulator in the form of a CLA address by the MLIA.

PPU
Peripheral Processor Unit - A processor controlling the data channel to and from the host computer.

NPU
Network Processor Unit - Same as Host Communications Processor but represents only 2551-1, 2551-2, and 2552-2, configurations.

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