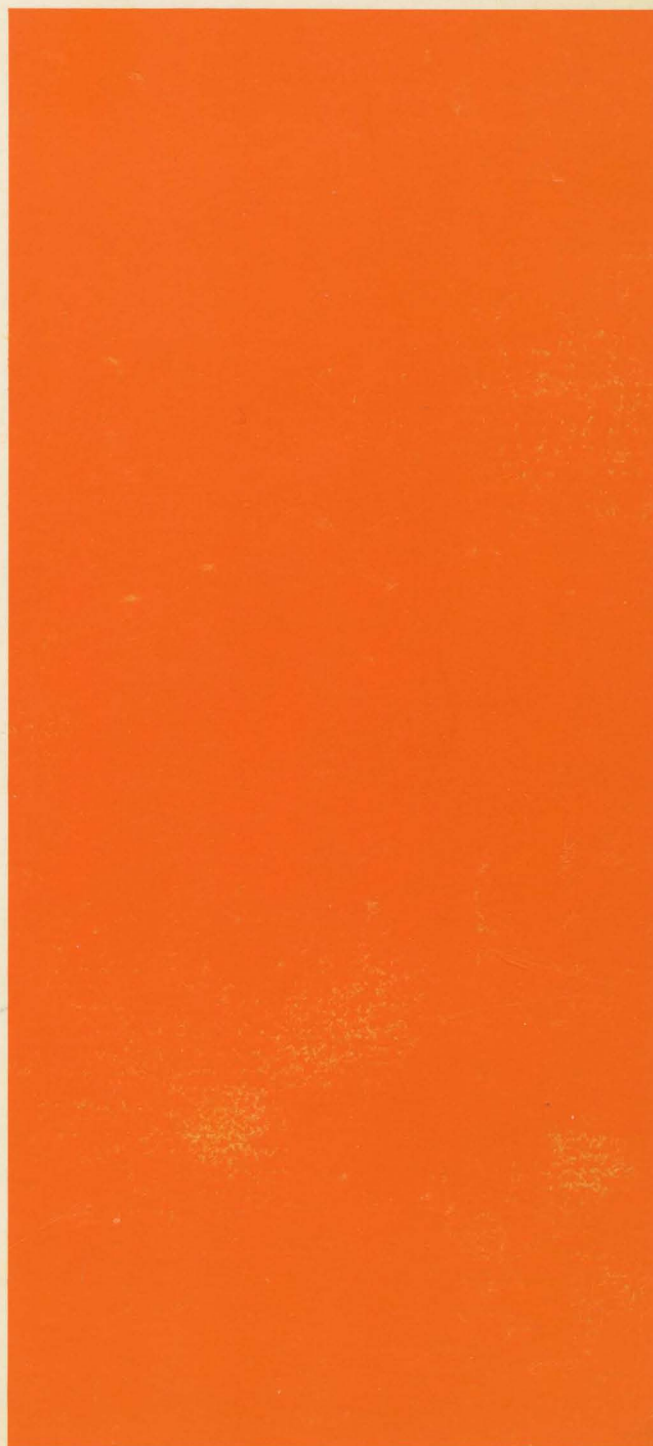# Honeywell

REMOTE TERMINAL SYSTEM (GRTS)

SERIES 600/6000

SOFTWARE

Honeywell

SERIES 600/6000

SUBJECT:

> Describes Operation and Use of the Honeywell Remote Terminal System of the
> Series 6000 and Series 600 Information Processing Systems.

SPECIAL INSTRUCTIONS:

> This manual, Order Number DA79, Rev. 0, is a new manual. It replaces the
> GRTS/355 Programming Reference Manual, Order Number BJ66 (formerly
> CPB-1664). This manual contains information on software released in Series 6000
> Software Release (SR) C and Series 600 ST 5.0.

SOFTWARE SUPPORTED:

> Series 600 Software Release 8.0
> Series 6000 Software Release F

> INCLUDES UPDATE PAGES ISSUED AS ADDENDUM A, AUGUST 1972;
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> April 1972

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> DA79, Rev. 0

FUNCTIONAL LISTING OF PUBLICATIONS
for
SERIES 600 SYSTEM

FUNCTION	APPLICABLE REFERENCE MANUAL		
	TITLE	FORMER PUB. NO.	ORDER NO.
	Series 600:		
Hardware reference:			
Series 600	System Manual	371	BM78
DATANET 355	DATANET 355 Systems Manual	1645	BS03
Operating system:			
Basic Operating System	Comprehensive Operating Supervisor (GCOS)	1518	BR43
Control Card Formats	Control Cards	1688	BS19
System initialization:			
GCOS Startup	System Operating Techniques	DA10	DA10
Communications System	GRTS/355 Startup Procedures	1715	BJ70
Storage Subsystem Startup	DSS180 Disk Storage Subsystem Startup Procedures	DA11	DA11
Data management:			
File system	GCOS File System	1513	BR38
Integrated Data Store (I-D-S)	Integrated Data Store	1565	BR69
Integrated Data Store	Multi-Access I-D-S	DA80	DA80
File Processing	Indexed Sequential Processing	DA37	DA37
Program maintenance:			
Object Program	Source Object Editor	1723	BJ71
System Editing	System Library Editor	1687	BS18
Test system:			
Peripheral on-line testing	GCOS On-Line Peripheral Test System (OPTS-600)	1573	BR76
Language processors:			
Macro Assembly Language	Programming Reference Manual	1004	BN86
COBOL Language	COBOL Reference Manual	1652	BS08
COBOL Usage	COBOL User's Guide	1653	BS09
ALGOL Language	ALGOL	1657	BS11
JOVIAL Language	JOVIAL	1650	BS06
FORTRAN Language	FORTRAN	1686	BJ67
FORTRAN IV Language	FORTRAN IV	1006	BN88
DATANET 355	DATANET 355 Macro-Assembly Program	1660	BB98
Generators:			
Sorting	Sort/Merge	1005	BN87
Merging	Sort/Merge	1005	BN87
Simulators:			
DATANET 355 Simulation	DATANET 355 Simulator	1663	BW23
Remote terminal system:			
DATANET 355	GRTS/355 Programming Reference	1664	BJ66

FUNCTIONAL LISTING OF PUBLICATIONS
for
SERIES 6000 SYSTEM

FUNCTION	APPLICABLE REFERENCE MANUAL		
	TITLE	FORMER PUB. NO.	ORDER NO.
	Series 6000:		
Hardware reference:			
Series 6000	Summary Description	DA48	DA48
DATANET 355	DATANET 355 Systems Manual	1645	BS03
Operating system:			
Basic Operating System	Comprehensive Operating Supervisor (GCOS)	1518	BR43
Control Card Formats	Control Cards	1688	BS19
System initialization:			
GCOS Startup	System Startup and Operation	DA06	DA06
Communications System	GRTS/355 Startup Procedures	1715	BJ70
Storage Subsystem Startup	DSS180 Disk Storage Subsystem Startup Procedures	DA11	DA11
Data management:			
File System	GCOS File System	1513	BR38
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SECTION I

REMOTE TERMINAL SYSTEM

The Remote Terminal System (GRTS) provides the communications capabilities for a Honeywell Series 6000[1] Information Processing System operating under the General Comprehensive Operating Supervisor (GCOS). GRTS is an extension of GCOS that permits a variety of remote terminal devices - remote computer terminals, keyboard/display terminals and teletypewriter terminals - to communicate with the Series 6000 Information Processing System via one of three Communications Subsystems.

Each of the Communications Subsystems (CSS) has its own GRTS control program.

- GRTS/355 in a DATANET 355 CSS (including Model AB-1).

- GRTS/305 in a DATANET 305 CSS.

- GRTS/30 in a DATANET 30 CSS.

This manual describes programming using the GRTS/355 and GRTS/305 control programs. GRTS/30 programming is described in the GRTS/30 programming reference manual.

GRTS FUNCTIONS

Operating under the Remote Terminal System, a user at a remote computer terminal can perform such functions as:

1. Enter a job deck at a remote computer terminal for processing by Series 6000 or Series 600 system at a central computer site. The user may wait for the output or call back later to retrieve it.

2. Direct output to be printed or punched at the originating terminal, at another terminal, or at the central computer system.

3. Obtain the status of jobs in the central system.

4. Enter into direct, interactive communication with a user program executing in the central computer system.

5. Abort a file that is being output (by a console switch) or abort a job that has been input (via a GRTS control record).

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[1]The system described in this manual is also available on the Series 600 system. The term central computer system refers to Series 600 and Series 6000. The DATANET 305 CSS is not available on the Series 600 system.

DATANET 305 Communications Subsystem

Operating under the GRTS/305 control program, the DATANET 305 CSS serves the small-to-medium scale communications requirements of a Series 6000 system. (Note: The DATANET 305 CSS is not available for the Series 600 system.) This subsystem permits direct access operations for up to 12 teletypewriter terminals (110-300 bps) and remote batch operations for two Model G-115 remote computer terminals (or one Model G-115 computer and one DATANET 760 keyboard/display unit). A mixture of terminal types may be configured.

Up to 10 VIP controllers on a poll and select configured channel are accommodated. Each of these controllers can have a maximum of two display terminals.

For a non-poll and select channel, a maximum of 32 controllers may be configured, however, this number of terminals may degrade system operation.

The DATANET 305 subsystem interfaces with the Series 6000 system via a common peripheral channel of IOM-0. Up to three DATANET 305 CSS's may be configured on the same system.

Coexistence of Communications Subsystems Types

Modifications to the DATANET 30 hardware, GRTS/30 program and GCOS software now permit the coexistence of the DATANET 30, DATANET 305 and DATANET 355 CSSs in a single system hardware configuration. The maximum unmixed configuration is four DATANET 355s, or three DATANET 30s, or three DATANET 305s. The sum of all DATANETs configured in a mixed configuration can not exceed three CSSs per Series 6000 system.

MODES OF OPERATION

The Remote Terminal System permits the user at a remote terminal to use one of three operating modes: remote batch, direct access or remote batch utility.

Remote Batch

The remote batch mode gives a user at a remote computer terminal the ability to process batch jobs (in card deck form) for submission to the central computer system for execution. The card deck for one or more jobs is read into the remote computer terminal which transmits it via the communications network to the central computer system. In the central system, the job is executed along with other batch jobs. When the job is completed, the output can be sent to the originating terminal, to another terminal specified in the program deck, or output at the central computer site.

The remote batch mode also provides the capability to obtain status of jobs being processed, to abort an activity of a job that is being output or to backspace an output operation.

The mass store link facility is configured in the system at startup, and its operation is transparent to the terminal user. The initialization of mass store link is covered in the following manuals:

1. Configuration of mass store link in the Series 6000 system is covered in the System Startup and Operation reference manual.

2. Configuration of mass store link in the Series 600 system is covered in the System Operating Techniques reference manual.

3. Configuration and definition of mass store link in the DATANET 355 CSS are covered in the GRTS/355 Startup Procedures reference manual.

STANDARD REMOTE COMPUTER TERMINAL INTERFACE

In order to function as a remote computer terminal on a DATANET 355 Communications Subsystem, a computer must meet the requirements of the Remote Computer Interface (Section III). This is a software interface which operates under control of the GRTS/355 control program.

The basic requirement of this interface is that information and control messages must be in a format acceptable to GRTS/355. In addition, the remote computer operates in a message/response mode. Only the operations defined in the interface descriptions can be used by the remote computer terminal operating with the GRTS/355 system.

In addition to defining the transmission of information between the remote computer and the DATANET 355, this interface also provides error checking and recovery procedures to assure that the data accepted contains no errors and that no data is handled more than once. When a data message is in error, the remote system is asked to retransmit the message, and the message containing the error is deleted. In conjunction with this error checking and recovery, the DATANET 355 Communications Subsystem generates and checks parity on the seven-bit characters received from and transmitted to the remote computer.

The remote computer interface also provides direct access (DAC) capability for remote computer terminals. (DAC is not used by the standard Model G-115 system software). This capability permits the remote computer to communicate directly with a specified program being executed in the central computer system. The accessed program assumes control in the DAC mode of operation, and GRTS/355 functions as a passive unit, transferring messages between the program and the remote computer.

SECTION II

GRTS SYSTEM DESCRIPTION

The Remote Terminal System (GRTS), operating in a GCOS environment, consists of control programs residing in three independent hardware systems.

- GRTS in the Communications Subsystem (CSS).

- GRTS/115 in the remote computer terminal.

- GRTS/6000 in the central computer system.

Each CSS has its own GRTS control program as follows:

- GRTS/355 - Control program for DATANET 355 CSS.

- GRTS/305 - Control program for DATANET 305 CSS.

- GRTS/30 - Control program for DATANET 30 CSS.

GRTS Control Program

A GRTS control program (GRTS/355, GRTS/30, or GRTS/305) controls the operation of a Communications Subsystem as it performs the following functions:

1. Receives and processes information from remote terminals. In this, GRTS allows any type of job to be submitted from a remote terminal for input to a central computer system. All or part of the output may be directed to the originating terminal, to specified terminals, or to be output at the central computer system.

2. Allows a slave (user) program, executing in the central system, to communicate with a teletypewriter terminal in a direct access mode of operation.

3. Permits the use of a mixture of communications lines (2000 - 50,000 bits per second for synchronous transmission; 110 - 1800 bits per second for asynchronous transmission), which can handle a variety of terminals.

4. Permits a terminal user at a remote location to communicate with GCOS through a command language to request specific system action.

SECTION III

SYSTEM OPERATION

GRTS permits a user at a remote location to utilize the capabilities of a large-scale Information Processing System. The user has broad flexibility in the types of terminals he wants to use in submitting his jobs and in the types of transmission line service he requires for his terminals.

A GRTS user can carry on a conversational (interactive) exchange of information with a program executing in the central computer system by using the Direct Access (DAC) mode of the following terminals:

- Teletypewriter   - Teletype Models 33, 35, 37 or 38; GE TermiNet 300, IBM 2741, Hazeltine 2000 or equivalent.

- Keyboard/Display - DATANET 760, VIP765, VIP775, VIP785, VIP7700, MTS7500 or equivalent. The DATANET 305 processor supports only the DATANET 760, VIP775 and VIP785 keyboard display terminals.

- Remote Computer   - The GRTS remote computer interface permits a computer system at a remote location to operate in the Direct Access (DAC) mode. At present, the standard GRTS/115 software does not include DAC capability. However, computer systems that meet the requirements of the remote computer interface for DAC capability may use this facility.

The primary use of the remote computer terminal is the submission of batch jobs to the central computer system for processing. Jobs entered at a remote computer terminal are transmitted to the central site via a DATANET Communications Subsystem. In the central computer system, the job from the terminal enters the normal processing stream and is handled like any other job. The user may wait for the program output or reconnect later to retrieve the output. The user may redirect the output to another remote computer terminal or request that the output be printed/punched at the central computer system.

GRTS/355 permits the use of up to six document reader/sorters, per DATANET 355, (Honeywell MRS200, DRD200, or DRD236) for data entry to a Series 6000 Direct Access (DAC) program. The interface to the Series 6000 DAC program consists of 6-bit BCD data, rather than the 9-bit ASCII data used with other DAC terminals. These reader/sorters do not operate in batch mode. The main characteristics of these reader/sorters are:

- MRS200 - MICR (Magnetic Ink Character Recognition) Reader/Sorter
         - E13B MICR Font
         - 1200 Documents per minute
         - 12 pockets

- DRD200 - Optical Document Reader/Sorter
  - COC5 Optical Bar Font
  - Mark Sense Recognition (optional)
  - 1200 Documents per minute
  - 2 pockets

- DRD236 - High-speed MICR Reader/Sorter
  - E13B MICR Font
  - 1625 Documents per minute
  - up to 32 pockets

DIRECT ACCESS JOB FLOW

Teletypewriter DAC

A user at a teletypewriter communicates in an interactive, conversational exchange of messages with a direct access program executing in the central computer system. After the user has established a connection to the program, the program takes control of the two-way exchange of messages.

4. In the two-way communication between the program and the terminal, the program requests GRTS/6000 to send a message to the terminal. GRTS/6000 then requests the GRTS program in the CSS to transmit the message to the terminal. When the user at the terminal responds to the message, GRTS accepts the line of input from the terminal and sends it to the DAC program via GRTS/6000. Thus GRTS assumes a passive role in direct access, passing information between the DAC program in the central computer system and the user at the terminal.

5. This interactive flow of information continues until terminated by the terminal user or by the DAC program.

PAPER TAPE INPUT

If data is to be input from paper tape, the punched tape should be in the reader when the terminal user types in TAPE and gives a carriage return. The system responds with READY. The tape reader is turned on manually and a block of information is read into the central computer system. This information must contain all control records for the program, including line numbers.

Under GRTS, if the data cannot be processed as it is read in, the BREAK light on the terminal is turned on and the paper tape mode is terminated. The DAC program may then request more input or terminate the operation. In normal paper tape mode, an X-OFF character causes a message to be sent to the central computer system to terminate the paper tape operation.

Paper tape input requires special buffering to accumulate multiple lines before transmitting the job to the central computer system. X-OFF is not part of the termination for each line of paper tape input, but it is the only way to terminate the paper tape input mode.

If an error occurs in the central computer system during paper tape input, the tape reader is stopped, and an error message is sent to the terminal to describe the malfunction.

Keyboard/Display Terminal DAC

The keyboard/display terminal (DATANET 760, VIP765, VIP775, VIP785, VIP7700, MTS7500) permits the user to exercise the following direct access functions:

● Entry and display of data or requests.

● Transmission of information to the central computer system.

● Receipt and display of responses from the central computer system.

As a terminal on the DATANET Communications Subsystem, a keyboard/display terminal operates only in the direct access mode and normally transmits data on a one line up to one page basis. This type terminal uses the following GRTS control records:

● Identification

● Break

● Disconnect

As in other direct operations, when the terminal is connected to the user program the program assumes control and the remote computer terminal responds to requests issued by the program. This two-way flow of information continues until terminated by the terminal or the user program.

REMOTE COMPUTER BATCH OPERATION

The remote batch facility of GRTS permits a user at a remote computer terminal to submit programs in card deck form for processing by the central computer system.

NOTE: In this description, the Model G-115 Information Processing System is the remote computer described. However, other computer systems that meet the requirements of the GRTS remote computer terminal interface may be used as a remote computer terminal on a DATANET 355 CSS.

Remote computer terminals use six GRTS control records to communicate with the GRTS control program:

- Identification

- Input

- Send Output

- Disconnect

- Abort

- Request Status

In addition to these GRTS control records, the remote computer terminal has two manual controls that allow the operator to perform key output functions. He can abort a file being output to the terminal, or backspace data being output to the terminal. The data can be backspaced the equivalent of two pages.

Sequence of Operation - GRTS/355

The following sequence of operations describes the processing of batch jobs submitted from a remote computer terminal:

1. The terminal operator loads the job deck, including the appropriate GRTS cards, into the terminal card reader. (The deck setups are illustrated in Appendix B.)

2. The connect to the DATANET 355 CSS depends on the type of line service:

   a. On a standard telephone line service, the connect is accomplished by the operator dialing the assigned GRTS telephone number.

   b. On a private line, the connection is continuous and operation is initiated by loading the job deck and pressing the OPERATE pushbutton.

7. When the storage buffer is full or a control record is received that indicates end of data, the information in the holding buffer is transferred as a block to central system disk storage via the Mass Store Link facility, and the central computer system is told that the job is available. If the Mass Store Link is unavailable or excluded by the NOMSL option on the RCD card, the data is transferred to the central computer system via the Intercomputer Adapter (ICA). In the latter case, GRTS/6000 opens a file on mass storage and stores the information there: files are opened for each job as it is received in the central system.

   If the job cannot be accepted, the terminal is notified by GRTS/355 of the rejection and the reason for the rejection. The line is then terminated.

8. Within the central computer system, the job from the remote computer is handled like a batch job from any other source. The job goes through core and peripheral allocation, scheduling, and execution.

9. In the central system, GCOS processes the job, performing the specified operations, creating new files as required, and storing them on the storage device(s) specified in the job.

10. When execution is completed, GRTS/6000 directs the output to the originating terminal or to another terminal specified on a $ REMOTE control card in the job deck. The File and Record Control subroutines within the user's program transmit the files to GRTS/6000 in 320-word blocks (maximum of 320 words per block) for SYSOUT storage.

11. If the remote computer terminal waits for the job to terminate, GRTS/6000 transmits output to the terminal after completion of the job. If the terminal did not wait for the output, the blocks of information remain in the central computer system until requested by the terminal, or until the central system console operator requests that the output be stored on magnetic tape or directed to another terminal.

12. When GRTS/6000 transfers the blocks of data to the DATANET 355 CSS, GRTS/355 edits each line (unless the terminal requests no edit), deletes all trailing blanks, performs code conversion, and formats each line for transmission to the remote computer terminal.

13. At the remote computer terminal, the data is converted to digital format and output on the remote computer's printer and/or punch.

TERMINATION

   A terminate may be initiated by the operator at the remote computer terminal or by the GRTS/355 control program. If the connect is established, GRTS/115 sends a terminate message when the operator intervenes in the operation by pressing RESET and RUN (CLEAR and START on a Model 2 G-115 terminal). GRTS/355 precedes its terminate with a message, unless the remote computer interface received a terminate from the terminal. The RESET and RUN function does not work with EIA interfaced line controllers (dial-up only). The line is disconnected by the hardware when the RESET button is pushed.

   A terminate causes re-initialization of the system and halts data transmission. However the transmission line remains physically connected. The remote computer operator may restart his operation by loading a card deck in the card reader and pressing RUN (or OPERATE) to send a select.

Operation - (GRTS/30 and GRTS/355)

The Remote Batch Utility Program is operated as a privileged slave program. An operator using the program stores it in the "operations utility" file, and initiates it with a "SPAWN" command from the console. Since the program requires PRIVITY, the operator must further acknowledge its initiation by typing "RUN" at the appropriate time. Communication lines on a DATANET-355 may be dedicated to the remote batch function by assigning the direct access program name - GERTS - to the configuration card for the line; otherwise the user may manually connect by typing "GERTS" in response to the "PROGRAM NAME--" request.

System Interface

1. SYSTEM INPUT - Remote batch jobs input from a terminal are entered into the job stream by passing the job file to System Input in a manner similar to that used by Remote System Input. In a system scheduler environment, jobs entered by this program are subject to the same discipline as if they had been submitted from a remote batch computer terminal.

2. SYSTEM OUTPUT - Output, status and abort requests are passed to sysout (GEOT) as if they had come directly from a remote batch computer terminal. GEOT processes the requests in the normal manner, except that output data and status blocks are passed back to the program, instead of to the terminal. In a mass storage link environment, keyboard terminals do not use the link, just the direct access mode.

3. DIRECT ACCESS LINE SWITCH - A method similar to that used by time-sharing to transfer control of a terminal to another direct access program is used in this application.

4. TERMINAL INPUT/OUTPUT - All input and output for keyboard terminals is done by means of MME GEROUT. The direct access program name is "GERTS".

5. MASS STORAGE REQUIREMENTS - Mass storage is allocated to the program only as required for job input files. MME GEMORE is used to obtain space.

ADDITIONAL REMOTE BATCH TERMINALS

Currently two additional terminals may use the GRTS interface to communicate with a Series 600/6000 central system in the remote batch mode. These terminals are:

● IBM 2780 Data Transmission Terminal

● Remote Line Printer - RLP300

IBM 2780 Terminal (DATANET 355 only)

The IBM 2780 terminal operates under Binary Synchronous Communications (BSC) procedures using the standard GRTS/355 remote batch interface disciplines.

Since the IBM 2780 does not punch binary cards, any banner cards normally used for job separation, are left blank (not punched).

Remote Line Printer - RLP300 (DATANET 30 and 355)

The RLP300 on a DATANET CSS interfaces with the central system similar to a printer on a G-115 remote computer terminal. The data is transmitted over a voice-grade (2400 baud) line in blocks of up to 320 words and in compressed A-B pair format.

When the RLP300 terminal is powered up, a signal is sent to the CSS. The CSS in turn sends a "SEND INITIAL OUTPUT" command to the central computer system. The central system never responds to the RLP300 terminal with "OUTPUT NOT AVAILABLE". If no output is ready to send, the central system sends "WAIT FOR OUTPUT", to be followed sometimes with "OUTPUT READY AFTER WAIT". The CSS again requests output. GCOS has been changed to check the terminal type when there is no output to send, and to send the "WAIT FOR OUTPUT" message.

DAC FOR DOCUMENT READER/SORTERS

Connecting to DAC Program

Document reader/sorters are connected directly to the DATANET 355 CSS. In order to initiate a connect to a DAC program, the reader/sorter must make a transition from not ready, to ready. This action causes the reader/sorter to be connected to a program having a program name of DES600.

Programming Considerations

Document reader/sorters are input only devices, but prestructured data is output by the DAC program to GRTS/355 to direct it in making pocket selection decisions. This prestructured data must be present in the DATANET 355 CSS before document entry may occur. Control of the document reader/sorter is accomplished by the DAC program since it starts and stops the reader/sorter.

Certain MME GEROUT op-codes have been re-defined for document reader/sorters. The following list gives valid op-codes for document reader/sorters and a brief explanation of each:

	Op-code (octal)	Meaning
Redefined	03	Send Table Data
	04	Send Last Table Data and Receive Status
	21	Control (Start handler, Table size, etc.)
	22	Continue Reading
	30	Stop Handler
	05	Program Inquiry
	06	Request Terminal Type
	17	Disconnect line
	20	Request line status

SECTION IV

PROGRAMMING PROCEDURES

GRTS CONTROL RECORDS

The control records (control cards or control data) for the Remote Terminal
System direct operations and actions involved in the remote terminal functions.
These control records are entered at a remote terminal and direct the actions of
the GRTS control program in the Communications Subsystem.

NOTE: Except as specified in the text, the control records described in
the following paragraphs apply to both the GRTS/355 and GRTS/305
control programs.

Other types of records which may be encountered in the input job stream are
GCOS control records, which direct central system operations, and data records,
which contain data and/or instructions.

Each job submitted from a remote computer terminal must contain the GRTS
control records necessary to access the central computer system and to perform
the functions required by the terminal user, as well as the data for the job. In
direct access, data records are submitted in reply to a user program request
during program execution.

The general format for a GRTS control record (except for keyboard/display
terminals) is:

<u>1   4   7</u>

$*$xxxyyyyyy

Where: $*$ - Uniquely identifies a GRTS control record.

xxx - Operation field containing a mnemonic code specifying the
operation GRTS is to perform. This field contains the
terminal ID for the identification control record.

yyyyyy - Data field specifying the job number or program name. This
field contains the user ID and password for the
identification control record.

Input Control Record

The input control record tells the Communications Subsystem that a remote computer terminal is ready to enter a job deck for batch mode processing by the central computer system. The format is:

```
1   4   7
$*$RCDyyyyyy
```

Where: RCD - Read Card.

yyyyyy = Blank   - No constraints on reading the card deck.

= ∅NOMSL - No Mass Store Link (GRTS/355 only).

Send Output Control Record

The Send Output Control Record indicates that a remote computer terminal is ready to receive output from the central computer system.

```
1   4   7
$*$OUTyyyyyy
```

Where: yyyyyy is one of the following:

Blank - Any output for the terminal is acceptable.

SNUMB - Terminal requires output for specified program (SNUMB) only.

C - Terminal wishes to continue (from point of interruption) an output file that was interrupted previously. Some duplication of output usually occurs with this feature.

Disconnect Control Record

The Disconnect control record informs GRTS that the terminal (remote computer or keyboard/display terminal) has completed its input and the line should be disconnected. The format is:

For a remote computer terminal -

```
1   4
$*$DIS
```

For a keyboard/display terminal -

```
$*$DIS
```

The possible status responses from the central system are:

```
READING-RMT    ┐
READING-CR     │
READING-MT     │
READING-D/D    │
WAIT-ALOC      │
WAIT-PERIP     │
WAIT-CORE      │
IN HOLD        ├   SNUMB ACT-NO XX
IN LIMBO       │
EXECUTING      │
SWAPPED        │
WAIT-TAPE      │
TOO BIG        │
OVERDUE        │
IN RESTART     │
TERMINATING    ┘

                   ┌   RELEASED
SNUMB OUTPUT       │   FINISHED
                   ┤   STARTED
                   └   WAITING


SNUMB IN CATALOG CLASS .NAME
```

The $*$STS control record may also be used to list the special request against the terminal sending the record or to redirect the output for the terminal to the on-line printer at the central computer site.

In the $*$STS control record, if yyyyyy = !ONL∅ the output for the terminal is printed at the central computer site. Two possible system responses are:

REDIRECT ID TO ONL ACCEPTED

      or

SYSOUT QUEUE FULL, RETRY REDIRECT REQUEST

After the request is accepted, system operator approval of the redirection is asked:

*OPER, CAN STA <u>id</u> REDIRECT HIS SYSOUT TO ON-LINE

TYPE YES IF OK,

EOM IF NOT OK

If the operator answers YES, the Redirect request is carried out; if his response is EOM, the request is ignored and normal processing continues. The operator must base his decision on whether or not he has issued a special request to redirect output for the requesting station. If he has issued this special request, he responds with an EOM; if not, he types YES followed by an EOM.

Table 4-1. Function Codes Generated by VIP Keyboard Options
For VIP765, VIP775, VIP785 Terminals

EKB 761 WITH FKG 761/766	EKB 763 WITH FNG 762	EKB 764 WITH AKG 761/762/763	FUNCTION CODE ENTERED	
KEY LABEL	KEY LABEL	KEY LABEL	FC1	FC2
CLR A B C D E F G 1 2 3 4 5 6 7 8	CLR A B C D E F G	S101 S201 S301 S102 S202 S302 S103 S203 S303 S104 S204 S304 S105 S205 S305 S106 S206 S306 S107 S207 S307 S108 S208 S308 S109 S209 S309 S110 S210 S310 S111 S211 S311 S112 S212 S312 S113 S213 S313 S114 S214 S314 S115 S215 S315 SGL LINE PTL LINE	A B C D E F G 1 2 3 4 5 6 7 8 B A	SEE NOTES 1 1

NOTES:

1. All keyboards listed, automatically transmit when a function code key is depressed.

2. For EKB 761 and EKB 763, FC2 is a blank code for all keys.

3. For EKB 764, FC2 is a "blank" code for S101 through S115, "A" for S201 through S215, and "B" for S301 through S315.

4. EKB 764 automatically clears the function codes after transmission, EKB 761 and EKB 763 do not.

    For the VIP7700 terminal, the user can specify the FC1 and FC2 in output messages to be returned by the terminal in the next input message. This provides a Series 6000 program routing control capability.

Function Key Break (GRTS/305)

    GRTS/305 permits the first function character (FC1) to be any character from A through G or 1 through 8. The second function character (FC2) can be the same as FC1 and in addition, a blank can be used.

Function Code Reset Conditions

The contents of FC1 and FC2 are reset to SPACE codes under the following conditions:

● Power on

● CTR/0 (zero key in numeric pad)

● Receipt of ACK

● CTR/CLEAR (keyboard command to clear display and reset the terminal to its initial conditions).

GCOS CONTROL RECORDS

$ REMOTE Control Record

The $ REMOTE control record is a GCOS control card which specifies the terminal to which output is to be sent. This card is placed in a GRTS job deck to assign an output file to a remote computer terminal other than the originating terminal. The receiving terminal must be specified by ID on the card. A maximum of nine files may be output per activity. If the output is a standard SYSOUT file which is to be returned to the originating terminal, a $ REMOTE control record is not needed. The format for a $ REMOTE control record is as follows:

1	8	16
$	REMOTE	aa,bb

Where: aa - A two-character file code the programmer assigns to a file. System output files such as P* may also be assigned.

bb - A two character, alphanumeric destination code identifying the terminal to which the output file should be sent.

The file codes most commonly used within software programs, such as GMAP and FORTRAN, are as follows:

P* - Contains the material normally sent to SYSOUT for printing at the central site.

C* - Contains binary punch card information generated by the compilers and assemblers.

K* - Contains COMDK cards generated by GEFRC.

The $ REMOTE card is not used exclusively by remote terminals. A user job submitted at the central site may contain a $ REMOTE card to designate some files as terminal output. In this use, the $ REMOTE card must contain the bb field.

Message (MSGn) Cards

The MSG1 and MSG2 cards permit a remote terminal user to communicate with system operators at the central site. The general format of the message card is:

1	8	16
$	MSGn	c,message text

Where: n = 1 or 2 (MSG3 is used for System Scheduler HOLD function).

c = Logical console number (1-4) corresponding to console TY1, TY2, TY3 or TY4.

MSG1 causes the message text to be output on the designated console during the initial job scan and causes the job to be put in a HOLD status. An operator must then request RUN to execute the job.

MSG2 causes the text to be output the first time the associated activity is considered for allocation. This causes no job delay other than I/O time.

Multiple cards of either or both types may be used as needed. The form of the message is:

*sssss (Message text)

GRTS/355 MESSAGES

The messages described in the following paragraphs are sent to the remote terminals by the GRTS/355 control program to describe various system conditions.

SIZ - Job source too long.

                    NUM - No available program number for job.

                    DSC - Excessive disk errors.

                    DUP - Duplicate SNUMB's.

                    LNK - No disk/drum links available.

    FILE BACKSPACED

    FILE ABORTED -- xxx

    Where: xxx = BCW - Block control word and record control word do not
                        agree.

                = EOF - Received EOF record, but not final output from central
                        computer system.

                = OP - Operator aborted this file.

                = ND - No data received from central computer system.

                = RCW - Record control word too long for empty line buffer (no
                        split).

Keyboard/Display Terminal Messages

    The GRTS control program may send one of the following messages to a
keyboard/display terminal.

    LINE TERMINATED -- xxx

    Where: xxx = INC - Invalid control card.

                = IMF - Invalid message format.

                = IPS - Invalid page size.

                = CP - Central computer system disconnects.

                = DIS - Disconnect from keyboard/display terminal or invalid
                        op code sent by central computer system.

                = TIMEOUT - Timeout.

                = EXCESS RETRIES - Too many retries due to negative acknowl-
                                   edgements, or busy status from the terminal.

                = NO TERML. RESP. - No response from terminal.

                = CP REJECTED - Central computer system rejects op code.

                = DAC ERROR - Invalid op code from central computer system.

                = CIU - Errors in Computer Interface Unit (GRTS/305 only).

                = BUF - No buffers available (GRTS/305 only).

    RETRANSMIT LAST MESSAGE - PARITY ERROR

INPUT TERMINATED REASON **xxx** (reason code **xxx** from central computer system)

Where: xxx = PTF - No PAT entries available for input.

            = SNB - Missing SNUMB card.

            = SIZ - Job source too long.

            = NUM - No available program number to assign to job.

            = DSC - Excessive disk errors.

            = DUP - Duplicate SNUMB's.

            = LNK - No disk/drum links available.

            = ID - Duplicate ID.

xxxOUTPUT WAITING

Where: xxx   is treated the same as for OUTPUT RELEASED. Output   for this
                job is either waiting to be printed or punched or is in the
                process of being printed or punched. This message will always
                reflect all output destinations and the status of the output
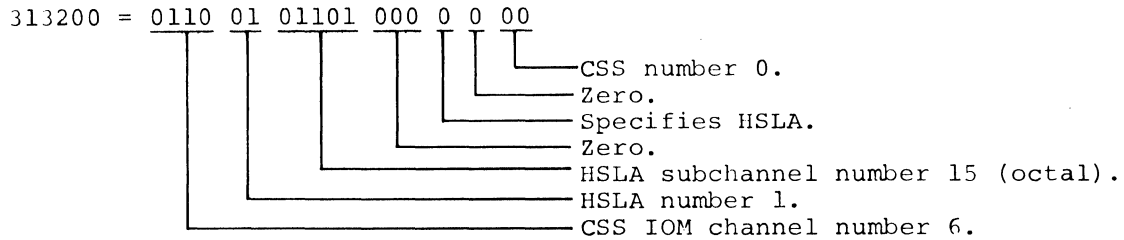   for these destinations.

xxNO OUTPUT

Where: xx =   two-character station ID. Although output was designated for
                this station, there is no output.

Status Request Responses for Job and Station ID

OUTPUT RDY   Output is ready for this job.

EXECUTING   Job is currently executing.

SWAPPED   Job temporarily swapped out of core storage.

WAIT-CORE   Execution is being held until enough storage is available to
                load this job.

WAIT-PERIP   Execution is being held until peripheral requirements become
                available.

WAIT-ALOC   Job is not a candidate for allocation. System conditions
                prevent allocation of any program at this time.

WAIT-TAPE   Job requirements for magnetic tape units exceed the number of
                units currently available.

TOO BIG   Job requirements exceed limits set at the central site. Before
                this job can run, permission must be granted at the central
                site console.

IN HOLD   Job is not eligible for allocation at this time. Temporarily
                placed in HOLD by the central site operator.

IN LIMBO   Job is being held until central site operator retrieves the
                magnetic tape files.

OVERDUE   Allocation for this job is overdue.

READING-RMT   Job is currently reading into the system from a remote
                station.

READING-MT   Job currently reading into the system from a central site
                magnetic tape.

READING-D/D   System Input program for Disk/drum is reading (jobs submitted
                through TSS CARDIN or GRTS/115 batch).

The configuration definition number 313200 defines the following:

```
313200 = 0110 01 01101 000 0 0 00
                                 └──────CSS number 0.
                             └──────────Zero.
                           └────────────Specifies HSLA.
                       └────────────────Zero.
                └───────────────────────HSLA subchannel number 15 (octal).
            └───────────────────────────HSLA number 1.
        └───────────────────────────────CSS IOM channel number 6.
```

Note: In these examples, spaces have been inserted in the binary representation for clarity.

MME GEROUT

MME GEROUT Definition

Remote System Input/Output (GEROUT) forms an integral part of the remote access system within GCOS. GEROUT serves as a remote terminal interface and coordinator for the following GCOS programs:

- Remote SYSOUT (.MROUT)

- Remote System Input (.MRGIN)

- Direct Access GCOS Programs (Direct Access Output, Direct Access Output/Input, Remote Inquiry, Terminal Identification)

All remote I/O requests for these programs are initiated by MME GEROUT calling sequences. The MME GEROUT calling sequences are an integral part of the user program executing in the central computer system and are used when the program needs to communicate with a terminal. In the direct access mode of operation, GEROUT enables the user program to communicate with a terminal to perform the following types of operations:

- Send output to/receive output from the terminal

- Identify the terminal

- Obtain the status of the terminal

- Disconnect a terminal

Bit 35=1   Used in conjunction with the Direct Access Output/Then Input
op code, this short timeout bit causes GRTS to disconnect the
terminal after one minute instead of the normal 10-minute
timeout.

2.   These command bits are not used by remote computer and keyboard/display
terminals.

Input command bits are as follows:

1.   For keyboard/display terminals -

Bits 18-24/25-31 - ASCII function characters (FCl and FC2 respectively)
entered from special keys on the terminal keyboard.

Bit 32   - Print status if terminal operator sent data using
PRT key instead of TX key.

Bits 33-34   - Not used.

Bit 35   - Truncation warning flag   set   at   intercomputer
interface if Series 6000 program has not provided
sufficient buffer space for complete input text.

2.   For remote computer terminals -

Bits 18-34   - Not used.

Bit 35   - This bit set indicates the data received exceeded
the allowable number of characters (was greater than
1272 characters).

3.   For teletypewriter terminals -

Bit 33=1   - Used with paper tape input to indicate that the
paper tape mode is terminated because the central
computer system did not take the data fast enough.

Bit 34=1   - This bit set indicates that this is the last block
of paper tape input.

Direct Access Output

The Direct Access Output MME allows a slave program in execution to send
output to one or more terminals. The calling sequence is as follows:

```
L      MME      GEROUT
L+1    VFD      18/Record Pointer,06/03,H12/Terminal ID
L+2    ZERO     Status Word Pointer, Courtesy Call
L+3    Next Instruction
```

For a DATANET 305 Communications Subsystem (CSS), the record pointer
designates the symbolic location of word 0 of the data block, which contains the
number of words in the block and the media code of the output if to a
voice-grade terminal. If transmission is to a Model G-115 terminal, the format
of words 1 to n is one print line, using six-bit characters, with an octal 77
indicating the end of print line and the next character used as the slew
character. If transmission is to a teletypewriter, word 0 does not include a
media code, and word 1 contains the count of the characters to be transmitted
(<312 characters). Words 2 to n contain the actual characters to be transmitted.
The characters are right-justified within a nine-bit field. Characters in
partial words are left-justified in the word.

Example: MME GEROUT - Terminal DAC Output -

```
*            INITIALIZE VFD INSTRUCTION OF MME GEROUT
      LDA       SVID           INSERT STATION ID IN MME SEQUENCE
      STCA      VFD,03
      EAX1      BUFFER         INSERT ADDR OF DATA BUFFER
      STX1      VFD
      MME       GEROUT         TERMINAL DAC OUTPUT
VFD   VFD       18/0,6/3,12/0
      ZERO      STATUS,0       STATUS=LOCATION OF I/O STATUS WORD
*            EXAMINE I/O STATUS WORD
      LDA       STATUS         STATUS WORD FOR I/O REQUEST
      TZE       WAIT           I/O IS STILL IN PROGRESS
      ERA       4,DL           BIT 33 = 1 IF NORMAL TERMINATE
      TZE       DONE           NORMAL TERMINATE, CONTINUE PROCESSING
      ALR       32             BIT 32 = 1 IF GRTS BUSY ALREADY
      TMI       GBUSY          STATION HAS I/O GOING ON PRESENTLY
      ALR       2              BIT 34 = 1 IF DISCONNECT OCCURRED
      TMI       DISCN          DISCONNECT - TERMINAL NO LONGER CONNECTED
*            BREAK CONDITION MUST HAVE OCCURRED, BIT 33 = 1
      ...BREAK CONDITION PROCESSING...
BUFFER ZERO    6,0            WORD COUNT
      ZERO      20,0           CHARACTER COUNT
      OCT       015012110105   CR LF H E
      OCT       114114117040   L  L  O
      OCT       117125124040   O  U  T
      OCT       124110105122   T  H  E  R
      OCT       105040015012   E     CR LF
```
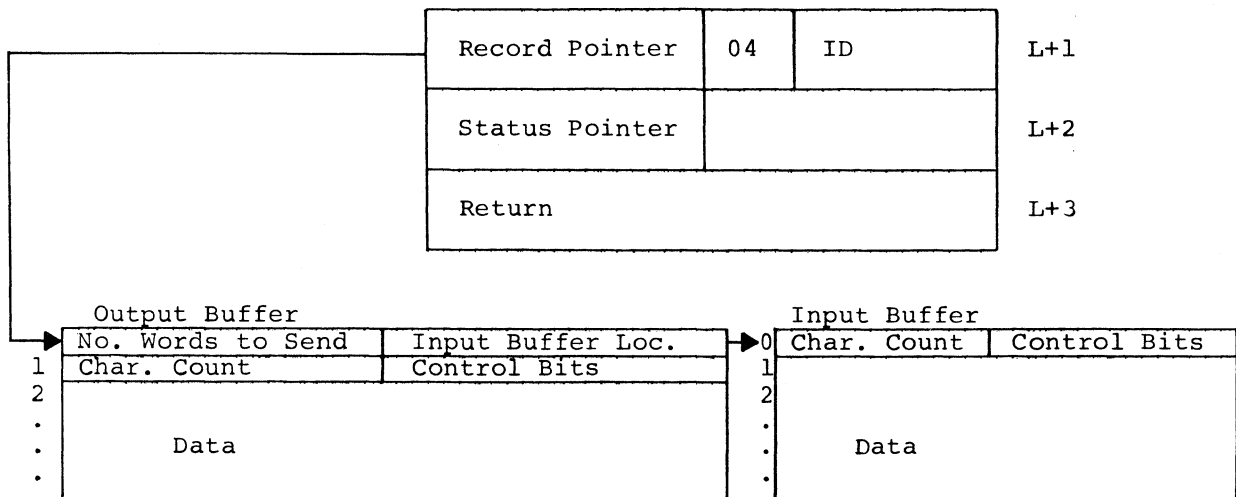
Direct Access Output, Then Input

    This MME allows the user program executing in the central computer system to transmit a data message to a terminal and to receive a data response from that terminal.

    In addition to the requirements for the DAC Output MME GEROUT, the user program must provide an input buffer address in the lower part of word 0 of the data block for the Output/Input MME. GRTS inserts a nonzero I/O status in the user program only after the input data has been received by GRTS and placed in the user input buffer.

    A maximum of 21 data words is placed in the user input buffer when input is received from a teletypewriter terminal. The carriage control character on the teletypewriter input is transmitted to the computer system.

```
L       MME     GEROUT
L+1     VFD     18/Record Pointer,6/04,H12/Terminal ID
L+2     ZERO    Status Word Pointer, Courtesy Call
L+3     Next instruction
```

    The record pointer designates the symbolic location of word 0 of the output data block, which contains the number of words in the data block and the address of the input buffer.

Record Pointer	04	ID	L+1
Status Pointer			L+2
Return			L+3

Output Buffer

	No. Words to Send	Input Buffer Loc.
1	Char. Count	Control Bits
2		
.	Data	
.		

Input Buffer

	Char. Count	Control Bits
0		
1		
2		
.	Data	

    The status word pointer points to a word that contains the status of the operation in progress. The format of this control word is the same as described in Direct Access Output except that bit 33 = 1 indicates output transmission has been completed and the input received has been placed in the user's input buffer.

A remote terminal, which does not specify a user program identification when it issues a DAC command, is connected only to a slave program which issues a MME GEROUT specifying that station's ID. Terminal connection in this case is made by station ID. MME GEROUT's which can accomplish this connection are:

```
DAC   Output
DAC   Output/Input
DAC   Output/Prepare PPT
```

An operation code of 05 specifies user program inquiry regarding direct access.

The user program may have two outstanding I/O inquiries at a time. The inquiries must be issued from unequal locations and have unequal inquiry names. Equal combinations cause the program to be aborted.

To determine whether a positive response was received, the user program should initialize (set to zero) the terminal identification field of the MME sequence prior to using the remote inquiry.

The BCD user program identification is a six-character BCD word by which the user identifies his DAC program.

Example: MME GEROUT - Remote Inquiry -

```
          MME      GEROUT              REMOTE INQUIRY
  SID     VFD      18/0,6/5,12/0       LAST 12 BITS ARE FOR STATION ID
          BCI      1,NAME              NAME OF DAC SLAVE PROGRAM (maximum six
                                       characters)
  *       TEST STATION ID FIELD OF VFD INSTRUCTIONS FOR NONZERO ID
  TEST    LDA      SID                 VFD INSTRUCTION OF MME
          ANA      =07777,DL           SAVE ONLY ID
          TNZ      *+4                 NEW STATION CALLED IN
          LDQ      =01161000           NO NEW STATION
          MME      GEWAKE              CALL ME BACK IN FIVE SECONDS
          TRA      TEST                TEST FOR NEW STATION
  *       HAVE CONNECTED TO A TERMINAL; SAVE STATION ID FOR FURTHER USE IN
          OTHER DAC MME GEROUT INSTRUCTIONS
          STA      SVID                SAVE STATION ID
```

Program Requests Terminal Type

Once connected to a terminal, the user program can determine its type by means of the Terminal Type MME GEROUT.

```
  L      MME      GEROUT
  L+1    VFD      6/Type,12/0,06/06,H12/Terminal ID
  L+2    Terminal Not Connected
  L+3    Next Instruction
```

Type indicates whether the terminal is a remote computer, teletypewriter, or keyboard/display terminal (DATANET 760, VIP765, or VIP775). (DATANET 305 CSS does not handle keyboard-display terminals.)

COLTS Module Activation (GRTS/355 only)

   This MME GEROUT, operation code 07, activates the T and D module (COLTS/355) in GRTS/355. This MME is restricted to on-line communications T and D for the DATANET 355 CSS. A non-T and D program attempting to use op code 07 will be aborted.

Program Requests Line Disconnect

   A user program can request that GRTS disconnect a particular remote terminal by using:


```
L      MME      GEROUT
L+1    VFD      18/0,06/17,H12/Terminal ID
L+2    ZERO     Status Word Pointer, Courtesy Call
L+3    Next Instruction
```


   An operation code of 17 (octal) specifies a line disconnect request.

   The terminal ID is a two-character code identifying the terminal to be disconnected.

   If a status word pointer is given, GRTS/6000 sets bit 34=1 to show the line disconnected. In response to this MME, GRTS/6000 sends a command to GRTS in the CSS to disconnect the station specified by the user program.

   In response to this MME, GRTS sends a request to the Communications Subsystem to disconnect the station ID specified by the user program. This program must not issue further I/O commands to that station ID while the disconnect MME is in progress. As soon as the disconnect appears in the status word, the user program may attempt to connect to that station ID again, either through a Remote Inquiry or by issuing another I/O command referencing the station ID.

Example: MME GEROUT - Line Disconnect -


```
*         INSERT STATION ID OF TERMINAL TO BE DISCONNECTED
          LDA      SVID              INSERT STATION ID IN CHARACTERS 4 AND 5
          STCA     DIS,03            INSERT IN VFD OF MME
          MME      GEROUT            LINE DISCONNECT
DIS       VFD      18/0,06/17,12/0
          ZERO     STATUS            STATUS WORD POINTER
```

A user program can send a message to a teletypewriter and in return receive paper tape input from the terminal. The message is:

```
L       MME     GEROUT
L+1     VFD     18/Record Pointer,06/21,H12/Terminal ID
L+2     ZERO    Status Word Pointer, Courtesy Call
L+3     Next Instruction
```

The record pointer is a pointer to the output data block. (This is the same as the record pointer described earlier in the chapter under Direct Access Output, Then Input.)

An operation code of 21 (octal) indicates output and initiation of paper tape mode.

The terminal ID is a two-character code identifying the teletypewriter.

The status word pointer is the same as for Direct Access Output, Then Input. The format of the input and output command bits is as described under MME GEROUT Definition.

In response to this MME, GRTS/6000 transmits the user program data to GRTS and informs GRTS that the terminal will now send paper tape input. Prior to the execution of the MME, the user program must have words 0 and 1 of the output data in the proper format in the data buffer.

Word 0 of the data buffer must contain the number of words to be transmitted (including the character count word) and the address of the input buffer which will receive the first block of PPT input. Word 1 must contain the number of nine-bit characters to be transmitted (a maximum of 312 characters is allowed).

The status word will be set to zero when the data has been picked up from the slave program and will be set to nonzero when the MME request has been completed.

The format of the paper tape input data is the same as that of the DAC input data block, except that a maximum of 31 words will be received (character-count control word and 30 data words). In the control word, bit 34 is set to 1 if an end of paper tape is received by the Communications Subsystem. Bit 33 is set to 1 if a timing error occurs (this means that input was received by the CSS faster than it was requested by the slave program). In the case of a timing error, the last line of data is unreliable (garbled), and the last line must be retransmitted.

Example: MME GEROUT - Accept DAC PPT Input -

```
*           INSERT STATION ID OF TERMINAL IN PPT MODE
            LDA         SVID            STATION ID IN CHARACTERS 4 AND 5
            STCA        INPPT,03        INSERT IN VFD OF MME
            MME         GEROUT
INPPT       VFD         18/INPUT,06/22,12/0
            ZERO        STATUS
*           TEST FOR COMPLETION
TEST        LDA         STATUS
            TNZ         *+4             NONZERO STATUS
            LDQ         =01161000       I/O STILL IN PROGRESS
            MME         GEWAKE          CALL ME BACK IN FIVE SECONDS
            TRA         TEST            TEST FOR NEW STATION
            CMPA        4,DL            NORMAL TERMINATE
            TZE         NORM            YES, TEST FOR EOT OR TIMING ERROR
            CMPA        2,DL
            TZE         DISCON          TERMINAL DISCONNECTED
            CMPA        1,DL
            TZE         BREAK           BREAK CONDITION
*           TERMINAL WAS BUSY
            ...
NORM        LXL2        INPUT           X2 = LOWER OF 1ST WORD OF BUFFER
            CMPX2       6,DU            TIMING ERROR
            TZE         ERROR           YES
            CMPX2       2,DU            END OF DATA TEST
            TZE         END
*           PROCESS INPUT DATA AND ASK FOR ANOTHER BLOCK
            ...
INPUT       BSS         31              INPUT BUFFER FOR BLOCK OF PPT INPUT
STATUS      OCT         0
```

Time-Sharing to Direct Access Switching

The following calling sequence is used for switching the line mode from Time-Sharing to Direct Access:

```
L       MME     GEROUT
L+1     VFD     18/0,06/25,H12/Station Identification
L+2     BCI     1,SNUMB Number
L+3     Normal Return
```

Direct Access to Time-Sharing Switching

The following calling sequence is used for switching the line mode from Direct Access to Time-Sharing:

```
L       MME     GEROUT
L+1     VFD     18/0,06/26,12/0
L+2     BCI     1,SNUMB Number
L+3     Normal Return
```

This calling sequence switches the mode of the line connected to the slave program identified in the L+2 from Direct Access Mode to time-sharing mode. If the line connected to the slave program was originally a time-sharing line, the switch is made and the station identification of that line is put in bits 24-35 of L+1 of the calling sequence. Time-sharing is the only program which can issue this MME.

Example: MME GEROUT - Stop Paper Tape Input -

```
*         INSERT      STATION ID OF TERMINAL IN PPT MODE
          LDA         SVID              STATION ID IN CHARACTERS 4 AND 5
          STCA        INPPT,03          INSERT STATION ID IN VFD OF MME
          MME         GEROUT
INPPT     VFD         18/0,06/30,12/0
          ZERO        STATUS, COURTESY CALL
*         TEST FOR COMPLETION
```

Change Terminal Characteristics

All teletypewriter (TTY) terminals are assumed to have a carriage width of 80 characters. A direct access program may specify the carriage width of a given terminal (that deviates from this standard input line of 80 characters) via MME GEROUT function code 44. The calling sequence is as follows:

```
L         MME         GEROUT
L+1       VFD         18/BUF,06/44,H12/ID
L+2       ZERO        L (status),L(courtesy call)
L+3       Normal return

BUF       ZERO        # words,0
          ZERO        4,0 (data sent to 355)
          VFD         9/1,27/# characters (new input line limit)
```

GRTS establishes the new line length and requests output from the central processor. This new line length remains until the central processor sends a new command to alter it or the terminal disconnects which restores the line limit to 80 characters plus a carriage return.

ABORTS

The following aborts may occur as a result of executing MME GEROUT function code 44.

Invalid MME Parameter

Contents of BUF+2 are invalid; that is, bits 0-8 are not equal to 1 and/or the number of characters specified in bits 9-35 does not fall within the limits of 1-410 (decimal). The MME request may be made from any terminal type, however, output will occur only for a TTY or IBM2741.

```
K2 = Bad status return pointer
K4 = Invalid DCW pointer
K5 = Invalid courtesy call pointer
```

RMT Terminal Record Size

The number of words times four (4) is less than the number of characters.

2. While in the Mass Store Link mode, a small input job may appear lost, since it has been completely read in, including the following card. The job is not lost, but if the CSS can no longer accept input, it terminates the line with an appropriate message and ignores the job. The last card read may be a GRTS control card or an SNUMB card, which GRTS/355 considers an end-of-job, for the current job in process. This job is sent to the Mass Store Link (MSL) module to be placed on disk storage (DSS180, DSS181 or DSS190). If, for example, no storage space is available for the program, the MSL module attempts to reroute the job to the central computer system. If the central computer system is unavailable, the CSS has no place to keep this job so it is discarded and a message is sent to the console operator to explain the condition. Since the card following the discarded job has been read in, the operator may associate the message with the following job.

3. If the size of the available MSL space is less than a preset threshold, (currently five links), any new jobs input will be routed to the central processor through the ICA.

4. An important operational consideration arises when a Mass Store Link device, using the DSS181 or DSS190 subsystems, is placed in the Write Protect mode. To bring the device back on-line from this mode, it must be powered down (off) and then powered up (on).

TERMINAL ALLOCATION/DEALLOCATION IN DAC

When a terminal requests direct access, either by a blank data field or by a specific program name, the terminal becomes available for allocation to a user program in the central computer system. This condition is retained in a GRTS/6000 table.

If a terminal requests direct access with a blank data field, the first user program activity that issues a DAC I/O command specifying that terminal's ID is marked allocated to that terminal. No other user program may communicate with the terminal.

When a terminal requests direct access to a specific user program, the terminal cannot be allocated to the program until it issues a remote inquiry to GEROUT. If there is a terminal in the availability list with that user program name, the terminal is allocated to that program. When the activity terminates, the terminal again becomes available for allocation. Thus, multiple activities must execute either a remote inquiry operation or a DAC I/O command specifying that terminal ID in order to read from or write to the terminal. Only the specified user program may be allocated to the terminal.

When an activity terminates, all terminals allocated to that activity for direct access are deallocated, but not disconnected. When a job terminates, any terminals allocated to that job are disconnected. When an activity terminates, the operator receives an ACTIVITY TERMINATED message. If this is his last activity, the terminal is disconnected following the message. Whenever a line disconnects, the terminal ID is removed from the list of direct access terminals.

SECTION V

STANDARD REMOTE COMPUTER TERMINAL INTERFACE

GRTS/355 INTERFACE

Computer systems, which are to be used as remote terminals on a DATANET 355 Communications Subsystem (CSS) under the GRTS/355 control program, must satisfy the requirements of the Standard Remote Computer Interface. Basically this software interface requires that information and control messages transmitted to the DATANET 355 CSS be in the format specified in this chapter. Where applicable, the terminal must acknowledge (either positively or negatively) each message sent by GRTS/355 and must execute any commands contained in the message.

Information And Control Record Messages

Information and control record messages relate to the transmission of data between GRTS/355 and the remote terminal. These messages are made up of eight-bit (seven-bits plus parity) ASCII characters (both control and data characters must be in ASCII code). They must be in the following general format for transmission to the DATANET 355 subsystem.

Header

S Y N	S Y N	S Y N	S Y N	S O H	F C	S C	A C	O C	I C	STX	Text (0-324 characters)	ETX	BCC

```
SYN - Synchronization character (0010110)
SOH - Start of header character (0000001)
 FC - Format code
 SC - Sequence code (1000001 or 1000010)
 AC - Address code (1000000)1
 OC - Operation code
 IC - Identification code (1000000)1
STX - Start of text character (000010)
ETX - End of text character (000011)
BCC - Block check character
```

---

[1]Included in message but not used by GRTS/355, or GRTS/305.

6. Information message, split, compression (1001011) — the text may be compressed and records in the text may be split across messages. An uncompleted record in a message is continued after the STX of the next message. The text may contain multiple records.

7. Information message, user defined text (1001101) — the text of a message with this FC may be in any format defined by the user. If compression is specified by the select auxiliary field, output data is compressed by GRTS/355. Also, each output character is scanned for a termination character - ETX, ETB, or EOT. If a termination character is found, it is replaced with a rubout character (1111111). The user should keep in mind that the DATANET 355 hardware recognizes the termination characters ETX and ETB on input.

SEQUENCE CODE

The Sequence Code (SC) is used to assure that data is neither lost nor used more than once. This code alternates between 1000001 and 1000010.

ADDRESS CODE

Although not used for GRTS/355, the Address Code (1000000) is a part of the standard interface and must be included in the message format.

OPERATIONS CODE

The Operations Code (OC) character specifies the operation to be performed and describes the acknowledgements which may be given.

Bits 1-3 of the OC character define the instructions which specify operations to be performed.

Bits			Operations Instruction	Operation Specified
3	2	1		
0	0	0	No Request	This instruction neither requests nor inhibits the sending of data by the receiving computer.
0	1	0	Transmit Data	This instruction is used by GRTS/355 to request that data be sent to the system. This is not used when text is included. The remote computer never transmits this instruction, since the output control card makes the data request.
1	0	0	Wait	This instruction is sent by the remote terminal with or without text (even though GRTS/355 does not handle text if included) to request that GRTS/355 delay communications. GRTS/355 waits seven seconds and then transmits the previous message with the sequence code unchanged. GRTS/355 does not send a WAIT instruction.

BLOCK CHECK CHARACTER

The Block Check Character (BCC) is an Exclusive OR of the message characters following the SOH and up to and including the ETX. Since the DATANET 355 CSS checks for odd parity, the BCC must have odd parity.

SAMPLE MESSAGE FORMATS

The following sample messages illustrate the remote computer interface message operation:

1. No split, no compression:

    SOH,FC,SC,AC,OC,IC,STX,MC--#1--RS,MC--#2--RS,MC--#3--RS,ETX,BCC

2. Split, no compression:

    SOH,FC,SC,AC,OC,IC,STX,MC--#1--RS,MC--#2--RS,MC--#3--ETX,BCC

3. Split, compression:

    SOH,FC,SC,AC,OC,IC,STX,MC--#1--RS,MC--#2--X,US,CT--RS,
    MC--#3--ETX,BCC

Data Compression[1]

When a record contains a series of three or more of the same data characters, the series is compressed to reduce the number of characters being transmitted. When compression occurs, a string of repeated characters is transmitted as follows:

    ----X UC----
         SC

Where: X - Any repeated data character.

        US - An ASCII character (0011111).

        CC - A six-bit binary count. The BCD character represented by the binary count must be translated to ASCII for transmission to the Communications Subsystem. This count is the number of times the compressed character is to be repeated (maximum 63).

This data compression technique permits compression of any character and also allows for the compression of different characters within the same record.

_____

[1]The DATANET 305 data, from the Series 6000 system, is edited and compressed by the Series 6000 system.

Each record begins with a Media Code (MC) containing the device identification, if required, and the type of encoding used on the data in the associated record. These media codes are defined as follows:

1. Input media codes (from remote computer to GRTS/355):

    BCD record - 1001000

    Binary record - 1010000

2. Output Media Codes (from GRTS/355 to remote computer):

    Punch BCD - 1001111

    Punch Binary - 1010111

    Teleprinter - 1001110 -- This code is used for operator messages from GRTS/355 and will be used only with a special control record. Data is always BCD.

    Print - 1001100 -- Data must always be BCD. When this code is used, the character preceding the record separator is a slew code governing the slewing of the printer. This is the only code which includes a slew code. This dictates that the line is to be printed, and then the printer spaced up.

The binary slew code must be translated to ASCII for transmission to the CSS. The seven-bit ASCII configurations for slew codes are as follows:

BIT PATTERNS							MEANING
7	6	5	4	3	2	1	
0	1	1	0	0	0	0	No slew
0	1	0	0	0	0	0	Top of Page
0	1	1	0	0	0	1	1 Line
0	1	1	0	0	1	0	2 Lines
0	1	1	0	0	1	1	3 Lines
0	1	1	0	1	0	0	4 Lines
0	1	1	0	1	0	1	5 Lines
0	1	1	0	1	1	0	6 Lines
0	1	1	0	1	1	1	7 Lines
0	1	1	1	0	0	0	8 Lines
0	1	1	1	0	0	1	9 Lines

The message type character contains an instruction field and an acknowledgment field. The message type character bit assignments (in ASCII) are as follows:

BITS	7	6 5 4	3 2 1
USAGE	1	ACKNOWL-EDGEMENT FIELD	INSTRUCTION FIELD

The acknowledgement field has the same meaning as the acknowledgement field of the operations code of an information message, except that the Negative-OC Wrong is replaced by Negative-Type Wrong. See OC Acknowledgements.

The coding for the instruction field of the type character is as follows:

Instruction	Bits 3	2	1
No Instruction	0	0	0
Select	0	1	0
Terminate	0	1	1
Ready for Disconnect (RFD)	1	0	0
Not Ready for Disconnect (NRFD)	1	0	1
Disconnect	1	1	0

No Instruction — Used by the remote computer to send acknowledgement information to GRTS/355 in response to a service message. GRTS/355 never sends this instruction, but accepts this as a valid acknowledgement to any service message.

Select — Indicates that the sending computer is ready to transmit data. This causes both computers to go into an active mode. After GRTS/355 has accepted a Select, all preceding Select instructions are ignored until the line is placed in the idle mode (terminated or disconnected). If in active mode GRTS/355 expects a response and receives a Select, it transmits the previous message.

Terminate — Informs the receiver that no more data is to be transmitted, but the line is to remain connected. This puts GRTS/355 and the terminal in idle mode. In idle mode, each computer must remain ready to receive another service message. Terminate is ignored if the line is already in idle. To avoid an unrecoverable situation caused by operator intervention, GRTS/355 will not accept a Terminate service message response to a Terminate service message.

Connect

The Connect to the GRTS/355 takes one of several forms depending on the type of service used by the remote computer terminal.

1. On switched lines, the remote computer operator dials in to the DATANET 355 Communications Subsystem. GRTS/355 responds to the dial-in, brings up data terminal ready; and goes into an idle mode.

2. On private (hard-wired) lines, GRTS/355 accepts the data set ready signal from the terminal and enters the idle mode. Dial-in is not required for private lines.

In the idle mode, no messages are exchanged, but the line remains connected to the remote computer terminal and in receive mode. If the system remains in the idle mode for seven minutes, GRTS/355 disconnects the line. While in the idle mode, the remote computer must be ready to receive/transmit a Select or a Ready for Disconnect.

There are two conditions of idle mode:

1. Line Connected to central computer system - This condition is present when waiting for initial output from the system.

2. Line disconnected from the central computer system.

START ACTIVE MODE (EXCHANGE OF MESSAGES)

When the line is connected to the central computer system, two situations can occur:

1. GRTS/355 can receive a Select from the remote computer before initial output data is received from the central computer system. This occurs when the remote computer needs to send more data to or make a request of (via control cards) the computer system.

   a. The computer system is disconnected.

   b. An information message with no data and a transmit data operation code is sent to the remote computer.

2. GRTS/355 can receive initial output from the central computer system.

   a. A select is sent to the remote computer.

   b. The remote computer is expected to acknowledge the select with a No Instruction service message.

   c. Upon receiving the acknowledgement, active mode is entered and output data is sent to the remote computer.

If these two situations occur at the same time (GRTS /355 receives a select from the remote computer and output data from the central computer system simultaneously), the central computer is given priority and the select from the remote computer is ignored.

DATA OUTPUT (DATA FROM GRTS/355 TO REMOTE COMPUTER)

If GRTS/355 receives initial output for the remote computer while in idle mode, a Select service message will be sent to the remote computer. This is true even if the remote computer terminal has just sent a Select. The terminal must then send an Acknowledgement service message with no instruction in the Type instruction field. When data is received, the format code will indicate the nature of the data, and the operation code will be No Request. The terminal should handle the data, if received error free, and answer with an information message with a No Data, No Request operation code, and an acknowledgement. GRTS/355 then sends the next message. This operation continues until data output is completed.

WAIT MESSAGES

If the remote computer terminal cannot handle data or send data, it may send an information message with a Wait operation code. GRTS/355 waits seven seconds and then transmits the previous message.

This wait may occur when a required peripheral is not available to the remote computer terminal. Any data sent with a Wait operation code is not handled by GRTS/355. If communication is kept in a wait condition for 15 minutes, GRTS/355 will initiate disconnect procedures by sending a Ready for Disconnect service message to the terminal.

The "wait" op code message may, or may not, have its sequence code changed. If it is changed, input data may be lost. It is best to keep the same sequence code and change it only when new data is being inputted. If the remote computer is receiving data from the DATANET 355 CSS, the sequence code is meaningless if the "wait" op code is in effect.

GRTS/355 never sends a Wait message to the remote computer terminal.

SPECIAL CONTROL RECORDS

Special control records are sent one record per message.

GRTS/355 may send a special control record at any time during active mode.

1. The format code for a special control record will be 1000100 indicating no compression.

2. The media code on the record will be 1001110 indicating BCD data to the teleprinter. This is a message to the operator at the remote computer.

SPECIAL CONTROL RECORDS FROM REMOTE COMPUTER

   During input, any BCD record with a $ as the first data character will be
sent as a special control record. This may or may not be compressed. During
output, one of two special control records (File abort or File Backspace) may be
sent to GRTS/355. The format code may be either 1000100 or 1000101, and the
media code must be 1001000. The text consists of one character indicating either
file abort (0110001) or file backspace (0110010). This character is followed by   ▌
a record separator, end of text, and block check character.

6. Received message error-free containing no data - Received message contained NAK.

   a. Received sequence code altered from last accepted message - Retransmit last message with same transmit sequence code and acknowledgement.

   b. Received sequence code same as last accepted message - Retransmit last message with same transmit sequence code and acknowledgement.

Received Message Contains Data

Same SC	Change SC	ACK	NAK	ERR	
				X	Retransmit last message with NAK and same transmit SC
	X	X			Process data -- change transmit SC Transmit next message with ACK
	X		X		Process data -- change transmit SC Transmit next message with ACK
X		X			Data already processed, changed SC transmit next message with ACK
X			X		Data already processed, retransmit message with same transmit SC and ACK

Received Message Contains No Data

Same SC	Change SC	ACK	NAK	ERR	
				X	Retransmit last message with NAK and same transmit SC
	X	X			Change transmit SC, transmit next message with ACK and new data
X		X			Change transmit SC, transmit next message with ACK and new data
	X		X		Retransmit last message with ACK and same transmit SC
X			X		Retransmit last message with ACK and same transmit SC

After transmitting a message to the remote computer terminal GRTS/355 begins a seven-second timeout. If no response is received from the remote computer within seven seconds, GRTS/355 retransmits the last message with the same sequence code and an acknowledgement (NAK).

DISCONNECT INITIATED BY GRTS/355

When a Disconnect is initiated by the GRTS/355 control program, the following messages are used:

1. Ready for Disconnect service message (RFD) - GRTS/355 precedes this message with a message to the terminal (special control record) giving the reason for the disconnect.

   The remote computer must answer this message with an RFD or a No Instruction service message and then disconnect the line. The remote computer may not answer with a Not Ready for Disconnect message, as the instruction by GRTS/355 must be executed.

2. Disconnect - The Disconnect service message will be sent when the line is too bad to properly handle a RFD. Upon receiving this message, the remote computer disconnects the line without sending a response.

DISCONNECT INITIATED BY REMOTE COMPUTER

When the disconnect function is initiated by the remote computer, the following messages are used:

1. Ready for Disconnect Service (RFD) - No reason for the disconnect is sent to GRTS/355. GRTS/355 responds with a RFD, and the line is then disconnected by both the remote computer and GRTS/355.

2. Disconnect - If GRTS/355 receives a disconnect it will drop the line without answering the message.

Remote Computer Direct Access (DAC)

To enter the Direct Access mode after the terminal has been accepted, requires a DAC Control card. This card establishes the connection to a program executing in the central computer system, so that the terminal and program may communicate with each other.

$*$DACnnnnnn

Where: nnnnnn - Name of the slave program executing in the central computer system with which the terminal wants to communicate.

When the DAC control card is detected, GRTS/355 sends the Connect to Slave operation code and the name of the job to the central computer system. At this point, the program assumes control, the GRTS/355 remote computer software functions as a passive unit passing messages between the central computer system and the remote computer terminal as directed by the slave program. The format character (FC) will state "User Defined Text".

FC = 1001101 (user defined text)

MESSAGE FORMAT

In the DATANET 355 CSS, a maximum of 324 characters can be transmitted or received in one message. Since one block of data to or from the central system may contain 1272 characters (four characters per word X 318 words; two words of each 320-word block are used for control), data is transmitted to the DATANET 355 CSS in several messages. To inform the receiving station that more data will follow in the next message, the ASCII control character ETB is used to terminate the message. The last message of the group of messages is terminated by an ETX character, which indicates all the data for this data block has been transmitted.

SYN	SYN	SYN	SYN	SOH	FC	SC	AC	OC	IC	STX	DATA	ETB	BCC

Up to 324
Characters
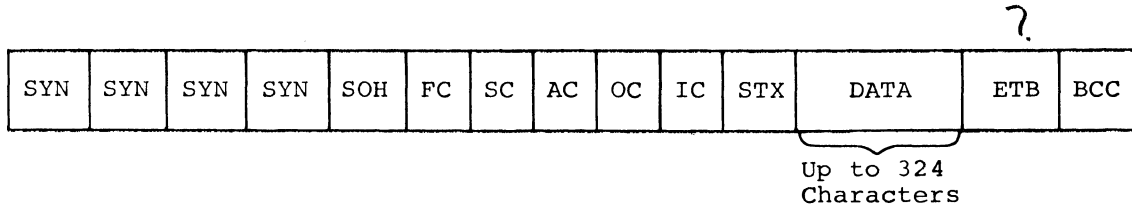
General System Characteristics

COMPRESSION

In DAC mode, a remote computer may request compress/no compress on data. This request is made in the auxiliary field of the Select service message. If compression is specified, the remote computer DAC interface compresses repeated characters in the output strings as follows:

----X,US,CC----

Where: X - The repeated data character.

US - An ASCII character (0011111)

CC - A count of the number of times the compressed character is to be repeated.

If compression is specified, GRTS/355 checks each input character to determine if it is the compression character. This character is used in expanding the input for transmission to the program in the central computer system.

Once a remote computer establishes contact with a DAC program, the Remote Computer Module takes commands from the DAC program to control the terminal. After each command sequence has been completed, the Remote Computer Module places the communication lines in the transmit mode, returns control to the DAC program and waits for the next command. The assumption here is that the DAC program always has something to do with the terminal. This is not always the case since the last input data received may have completed the transaction. In this situation, the DAC program may retire and wait for a "break" from the terminal.

Formerly, the remote computer sent a "break" message in response to a message from the CSS. After a response was received from the terminal, the communication line was immediately placed in the transmit mode to overlap the line turn-around time with the next command from the DAC program.

To overcome the remote computer lockout condition when the DAC program has no data for the terminal, the DAC program now sends a command with the DAC-IDLE bit on. After the command sequence is complete, the communication line is placed in the receive mode and the DAC program informed of the completed command. In the DAC-IDLE mode, the DATANET 355 CSS either accepts a "break" message from the remote computer, or the next command from the DAC program, whichever arrives first. Either condition ends the DAC-IDLE mode.

Depending upon the character count field, a data message will, or will not, be transmitted to the terminal. If the character count is illegal or "0", the CSS ignores the output data and proceeds with the remainder of the command. If the command was "Accept Direct Output", the CSS requests more output data from the DAC program. "Accept Direct Output/Wait for Input" command results in the CSS asking the remote for the input.

VIP line discipline device messages which are passed back and forth between the Series 6000 user programs and the DATANET 355 VIP module are in the following format.

No. of bits	18	7	7	4	n
	Character Count	FC1	FC2	C/S	text

Series 6000
Word No.   1   2-n
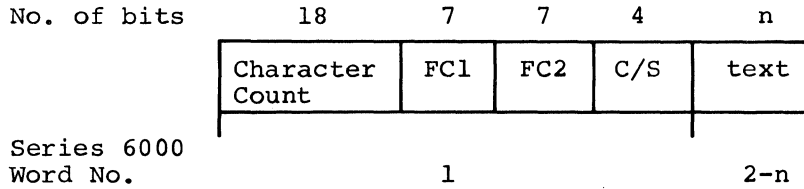
The character count is the tally of nine-bit ASCII character bytes in the text field.

FC1 and FC2 are function codes transferred to/from the VIP message header format. These are ASCII characters with the parity and unused ninth bit removed to save space. All supported devices using the VIP line discipline transmit function codes to the Series 6000. The DATANET 760, VIP765, 775 and 785 do not use these when they are received from the Series 6000. The VIP7700 does utilize these function codes when received from the Series 6000 system. The default function codes sent by the terminal are ASCII space codes (40 octal).

C/S is a four-bit command (sent to terminal) and status (received from terminal) field defined as follows:

Send
bit 1 - Reserved for future use.
    2 - Not yet defined.
    3 - Not yet defined.
    4 - Not yet defined.

Receive
bit 1 - Print status (GRTS/305,355)
    2 - Not yet defined.
    3 - Not yet defined.
    4 - Truncation warning status; text character count originally exceeded 320 x 36-bit words and will be truncated at the 355/6000 interface.

The text field contains the message. Header characters through the STX are stripped off but the ETX character at the end of the message is retained.

The GRTS/305 remote computer interface is identical to the GRTS/355 remote computer interface. (See page 5-1.)

Information formerly on pages 5-21 through 5-24 has been deleted.

SECTION VI

SYSTEM CONSIDERATIONS

The basic components for a remote terminal system are:

- Series 6000 Information Processing System

- GCOS Operating System

- DATANET Communications Subsystem

- GRTS Programming System

- Terminals - Remote Computer, Teletypewriter, Keyboard/Display

- Data Communications System

Representative system configurations are illustrated in Figures 6-1 and 6-2. System configuration data is given in Figure 6-3.
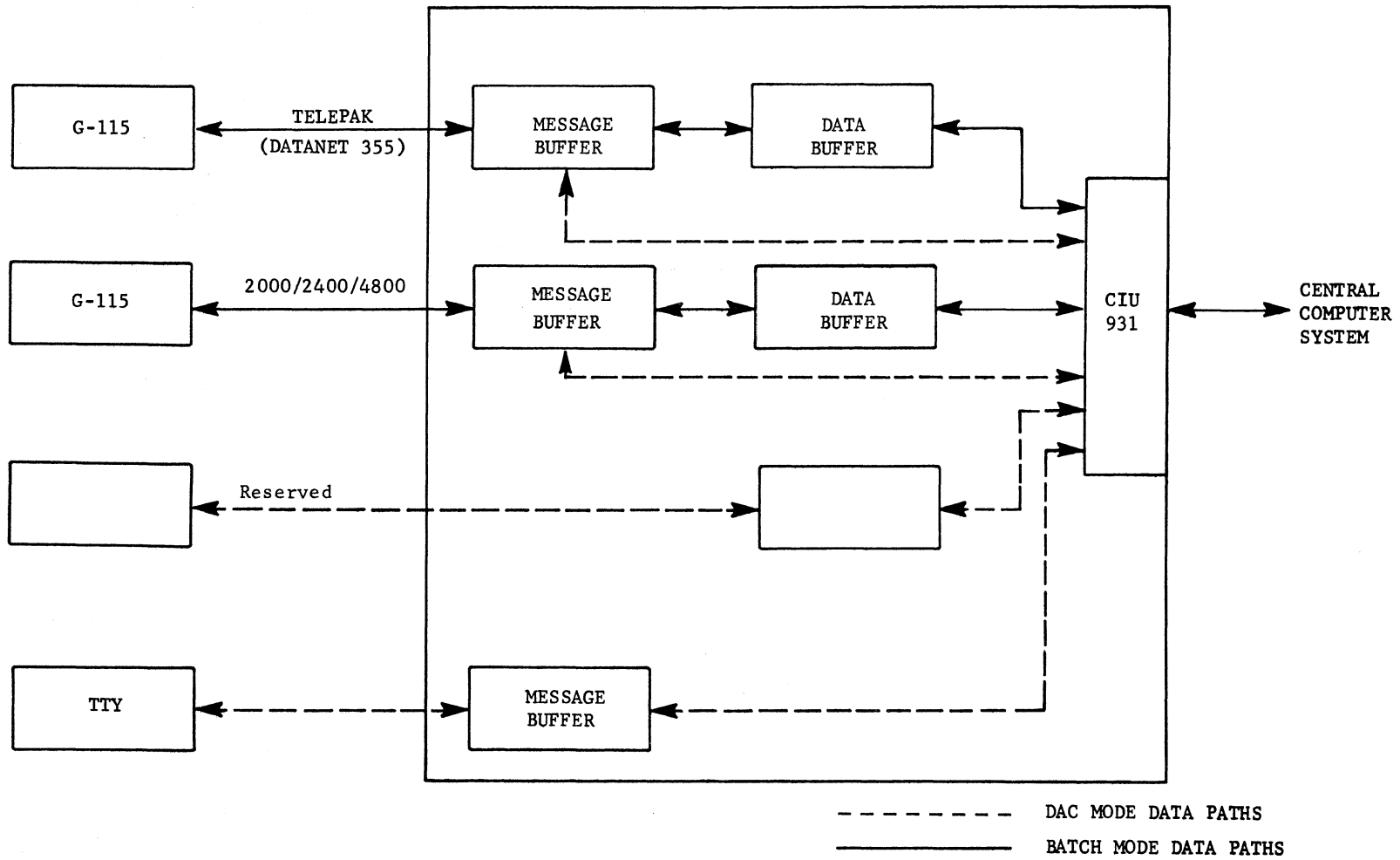
Figure 6-2.   DATANET 305 System Layout

COMPONENT DESCRIPTION	MINIMUM	OPTIONAL	SELECT QUANTITY
Keyboard-Display Terminals			
Display Terminal Unit	X		X
Display Controller Unit	X		X
DATANET 355 CSS			
DATANET 355 (16k minimum/32k maximum)	X		
Intercomputer Adapter (ICA) or			
Direct Interface Adapter (DIA)	X		
High Speed Line Adapter (HSLA)	X		
Low Speed Line Adapter (LSLA)	X		
Card Reader		X	
Printer		X	
Console	X		
Data Sets:			
Asynchronous -			
Bell 103A			
Bell 103E			
Bell 103F			
Bell 103G			
Bell 108			X
Bell 109			
GE DIGINET 100 Series			
Voltage Current Adapter (EIA)			
Synchronous -			
Bell 201A			
Bell 201B			
Bell 202C			
Bell 202D			
Bell 203A (Duplex Environment)			
Bell 301B			
Bell 303B			
Bell 303C			
GRTS/355 Control Program	1		

Figure 6-3 (cont). System Parameters

INFORMATION PROCESSING SYSTEM

The Series 6000 Information Processing System is a large-scale, digital information processing system with multi-dimensional operating capabilities. The system is modular in design, permitting a high throughout rate and enabling it to serve many users simultaneously. The basic central system consists of

- Processor

- Storage Module (64k-256k of core storage)

- Input/Output Multiplexer

- System Console

In addition, the system will require standard peripherals such as card reader(s), printer(s), punch(es), etc. The computer system for a specific site will be sized and configured to satisfy the processing needs of the site. The software for the computer system includes the following:

- GCOS   - The operating system which supervises the overall programming and operation of the system.

- GRTS   - An associated three-part routine to GCOS which controls the operation of the remote terminal system. The version of GRTS to be used depends on which Communications Subsystem is configured.

- Mass Store Link   - The facility that allows the DATANET 355 CSS and the central computer system to share a dedicated area in the DSS180 or DSS181 subsystem.

- Language Processors - FORTRAN, COBOL, ALGOL, and JOVIAL compilers which provide a flexible applications capability.

- Library System   - The many special routines which make GCOS a highly efficient system, capable of performing a great variety of processing functions.

- System Editor   - The maintenance package which permits modification, expansion and improvement of the operating system.

- Time-Sharing System - The program in the Series 6000 which permits time-sharing operations.

DATANET 355 COMMUNICATIONS SUBSYSTEM

The DATANET 355 Communications Subsystem (CSS) is a high performance Communications Subsystem which can link a variety of terminals to the system. The flexibility designed into the DATANET 355 subsystem permits the use of terminals with widely differing operating characteristics and data transmission speeds. The DATANET 355 CSS is made up of the following components:

- 355 Computer (Processor, Store Module, and Input/Output Module)

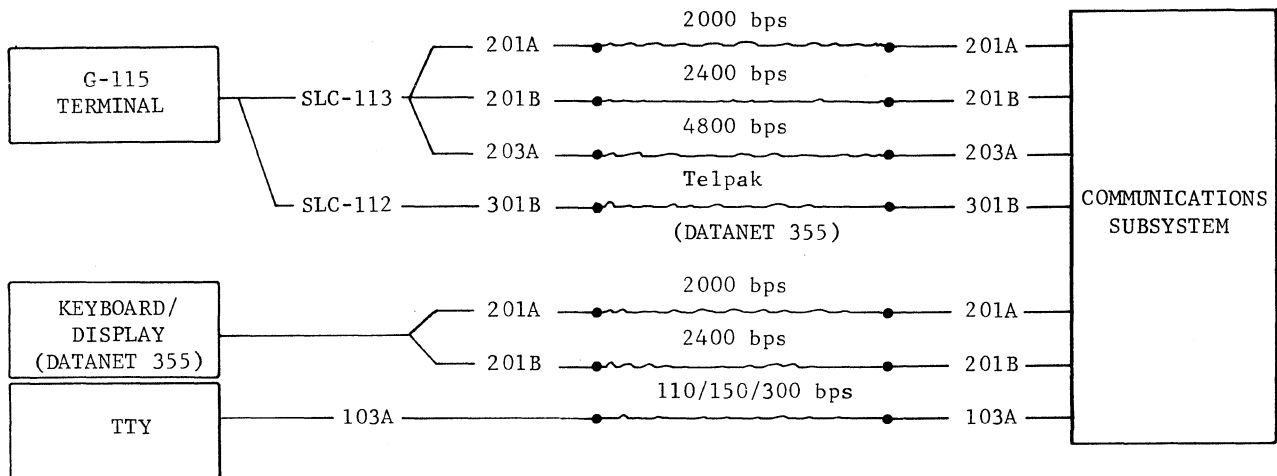## DATANET 305 COMMUNICATIONS SUBSYSTEM

The DATANET 305 Communications Subsystem is designed to handle the small-to-medium scale communications requirements for a Series 6000 system. Operating under the GRTS/305 control program, this CSS receives, temporarily stores, processes, and forwards data from remote terminals to a central site computer system for processing. In the reverse of this procedure, the processed data is sent to a terminal via the CSS. The output may be sent to the originating terminal or to another terminal specified in the program deck. The data may also be output via an on-line printer in the central computer system.

The DATANET 305 CSS hardware configuration is as follows:

- Processor with 16K memory.

- CIU933 Computer Interface Unit Group 1 (provides CSS to central computer system interface).

- Line Buffers:

    1. Low speed line buffers are BBU933 Bit Buffer Units, which use BBC932 and BBC933 Bit Buffer Channels. Line speeds may not be mixed on a BBU. Configuring terminals with various speeds will require several BBU's. Addresses assigned contiguously from 3 to 14 (depending on devices configured).

    2. High speed line buffer is the CWU931 Character Word Unit which can interface up to two CBC931 Character Buffer Channels (2000/2400/4800 bps). Code level -16, sync code - 13026 (octal). Addresses assigned 1 and 2 for G-115 terminal.

DATA COMMUNICATIONS SYSTEM

Data communications is basically the transfer of encoded data between two or more points via one or more types of electrical transmission mediums such as wire, coaxial cable, and microwave. As described in this manual, data communications requires a data set to interface the computer equipment with the transmission system. A basic data communications system may contain the following elements:

The data communications network of a Communications Subsystem consists of:

- Data sets   — to interface the transmission communications channels to the terminals and to the Communications Subsystem.

- Transmission Channels — to convey information from one point to another.

The data sets used in a remote terminal system must be matched to the requirements of the terminals. In addition, the data sets at each end of a transmission line must be compatible. The following list matches typical terminal-data set combinations and indicates the types of operation for each.

Switched network service permits interconnection with terminals at telephones located locally or at remote locations. WATS (Wide Area Telephone Service) provides volume usage on a flat or measured basis and is frequently used with switched service.

Private telephone lines are suitable when only a few locations are to be interconnected and has the advantage of restricted line usage. This service is also available on a full duplex basis. Full duplex mode permits continuous transmission capability in both directions. This can be used with some data sets to eliminate channel turn around time.

As with data sets, channel facilities are available (in some cases) from several network operators. The specific facilities to be used will be determined by the availability of services and the specific needs of the site.

The grade of service used by a site depends on the communications requirements of the site: i.e., amount of data to be transferred, privacy of line, availability of lines, types of data communications, types of terminals on the system, and cost considerations.

G-115 INFORMATION PROCESSING SYSTEM

The G-115 is a small-scale information processing system designed to operate as:

- A card processing system to perform the functions carried out in a punched card tabulation installation.

- A remote terminal on a central site Series 6000 Information Processing System.

- An independent information processing system capable of being programmed for many applications, particularly data processing associated with tabulations, inventories, record keeping, and file updating.

The basic G-115 system consists of a processor with 4k of core storage, an input/output unit, a printer, a card reader, and other (optional) peripherals. Programming for the G-115 system is done by the G-115 assembly language, a basic assembly language that provides simple mnemonics and symbolic phrases. In addition, the supporting programs include a remport generator, loader, utility routines, conversion routines, service routines, and arithmetic routines.

As a terminal on the DATANET 355 Communications Subsystem, a G-115 system may operate in one of two modes depending on the interface unit. With a SLC-113 or SLC-114 interface unit, the G-115 uses the voice-grade GRTS/115 program and voice-grade transmission service. With a SLC-112 interface unit, the G-115 uses the broadband GRTS/115 program and broadband transmission service (Telpak).

APPENDIX A

TERMINAL OPERATING PROCEDURES

REMOTE COMPUTER TERMINAL

The Model G-115 Information Processing System, operating under the GRTS/115 program, serves as a remote computer terminal on a Communications Subsystem (CSS). It provides remote batch programming capability for the system. Even though it is used as a remote terminal for a Series 6000 or Series 600 system, the G-115 system retains its capabilities as a computer system and can be used off-line as a card processor.

The G-115 terminal may operate under either of the following GRTS/115 service classes.

- GRTS/115 Voice-grade (SLC-113 Interface Unit with Contact Closure, or SLC-114 Interface Unit with EIA)

- GRTS/115 Telpak (SLC-112 Interface Unit)

  NOTE: Telpak operation requires a special configuration card in the bootload deck, and is not available on a DATANET 305 CSS.

Processor Control Panel

The controls and indicators on the control panels of two different modules of G-115 Processor are shown in Figure A-1.

The switches and indicators are described in the following paragraphs:

DC ALARM	DC READY		ON		READY		ALERT	SWITCH 1	SWITCH 2	SINGLE	HALT	WAIT
OFF					RESET	LOAD 2	LOAD 3			STOP	RUN	

Figure A-1. Model 1, G-115 Indicators and Switches

ON		DC ALERT	POWER ON	MAINT ON	SWITCH 1	SWITCH 2	STEP BY STEP	LOAD 1
		POWER OFF		LAMPSCHECK				LOAD 2
		STANDBY		MEM CLEAR	CLEAR	LOAD	HALT	OPERATOR CALL
							START	

Figure A-2. Model 2, G-115 Indicators and Switches

MODEL 2 PROCESSOR

Switch/Light	Purpose/Action
ON	Turns Processor AC power on or off.
DC ALERT	Indicates excessive temperature in Processor. DC power is automatically turned on when this light goes off. Notify Field Engineer.
POWER OFF	Turns off DC power.
POWER ON	Turns on DC power.
MAINT. ON	Indicates a maintenance switch is on. Notify Field Engineer.
LAMPSCHECK	Checks lamps on operator's panel. If lamps do not light, notify Field Engineer.
SWITCH 1	Used to abort a GRTS output file and to bypass checksum testing during input.
SWITCH 2	Used to backspace an output file. Used with RESET and RUN to send a Select.
STEP BY STEP	This switch lets program be executed one instruction at a time: RUN switch serves as stepping switch. This switch may be disabled by INS instruction.
LOAD 1	Selects card reader on connector 1.
LOAD 2	Selects input unit on connector 2.
STANDBY	Indicates Processor is awaiting order from a peripheral unit.
MEM CLEAR	Clears core store.
CLEAR	Sets internal conditions to initial status.
LOAD	Loads input from unit selected by LOAD 1 or LOAD 3.
HALT	Indicates program stopped in single mode or on a HALT instruction.

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│ │                                                                    DA79 │   │
│ │  ┌──────────┐ ┌──────────┐ ┌────────────┐ ┌────────────┐ ┌──────────┐ ┌──────────┐
│ │  │          │ │          │ │            │ │ LOCAL FEED │ │  OPERATE  │ │   HALT   │
│ │  │ POWER OFF│ │ POWER ON │ │ LAST BATCH │ ├────────────┤ ├──────────┤ ├──────────┤
│ │  │          │ │          │ │            │ │ FEED ALERT │ │READ ALERT │ │ BIN ALERT│
│ │  └──────────┘ └──────────┘ └────────────┘ └────────────┘ └──────────┘ └──────────┘
│ └──────────────────────────────────────────────────────────────────────┘   │
└────────────────────────────────────────────────────────────────────────────┘
```
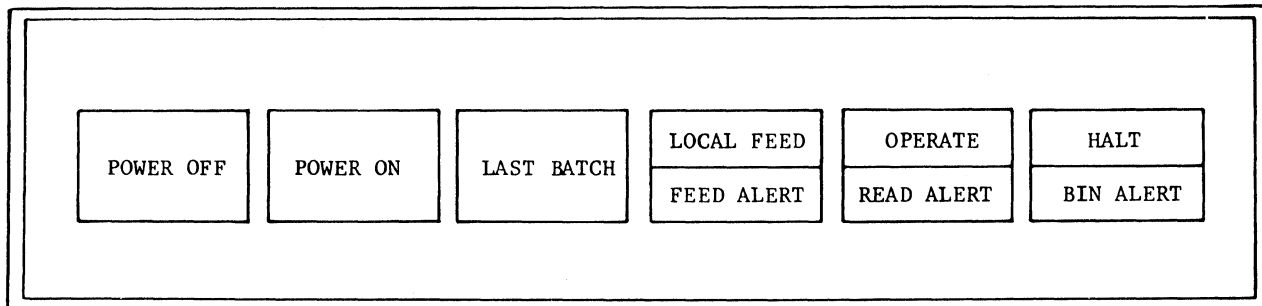
Figure A-3. CRZ100 Controls and Indicators

CARD READER

Startup of the CRZ100 Card Reader is as follows:

1. Press POWER ON pushbutton.

2. Load the card deck, face down, with card row 9 closest to the operator.

3. Place card weight on deck.

4. Press OPERATE pushbutton.

```
   OPERATIVE          │    SIGNAL      │          COMMAND
     ZONE             │     ZONE       │           ZONE
                      │                │
┌────────────────────────────────────────────────────────────────────────────┐
│ ┌──────────────────────────────────────────────────────────────────────┐   │
│ │                                                                         │   │
│ │  ┌────────┐ ┌────────┐ ┌────────────┐ ┌────────┐ ┌──────────┐ ┌────────┐ ┌────────┐
│ │  │        │ │        │ │ READ CHECK │ │ SELECT │ │ 51 COL.  │ │  STOP  │ │        │
│ │  │  OFF   │ │  ON    │ ├────────────┤ │ ALERT  │ ├──────────┤ ├────────┤ │        │
│ │  │        │ │        │ │  MISFEED   │ │        │ │ 80 COL.  │ │ REJECT │ │        │
│ │  └────────┘ └────────┘ └────────────┘ └────────┘ └──────────┘ └────────┘ └────────┘
│ │  ┌────────┐ ┌────────┐ ┌────────────┐ ┌────────┐ ┌──────────┐ ┌────────┐ ┌────────┐
│ │  │        │ │        │ │            │ │ HOPPER │ │ MANUAL   │ │  END   │ │        │
│ │  │STANDBY │ │OPERATE │ │    JAM     │ │STACKER │ │  FEED    │ │  OF    │ │        │
│ │  │        │ │        │ │            │ │        │ │          │ │ FILE   │ │        │
│ │  └────────┘ └────────┘ └────────────┘ └────────┘ └──────────┘ └────────┘ └────────┘
│ └──────────────────────────────────────────────────────────────────────┘   │
└────────────────────────────────────────────────────────────────────────────┘
```
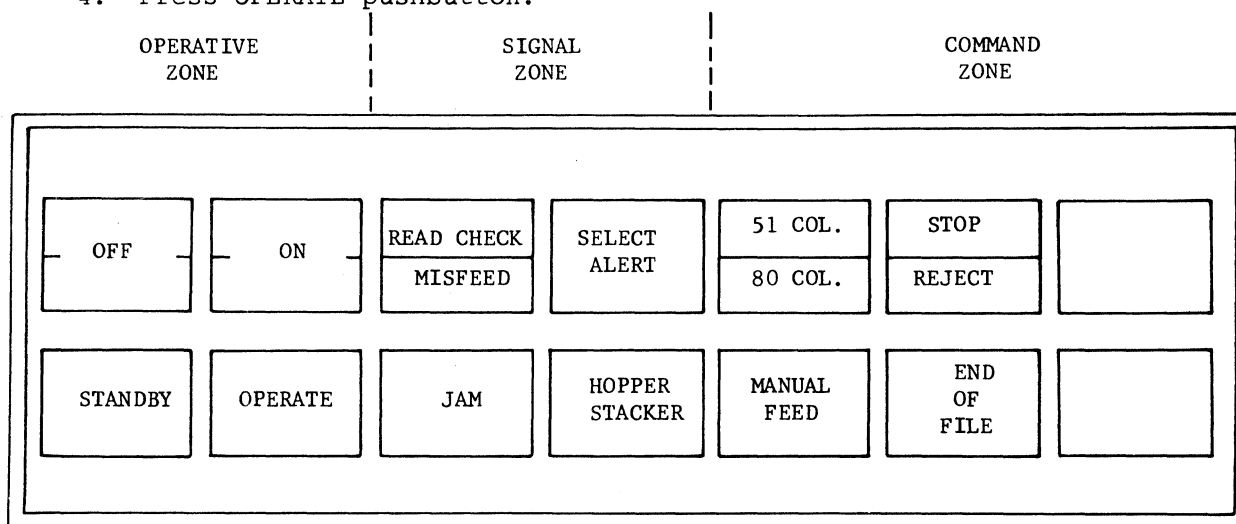
Figure A-4. CRZ120 Controls and Indicators

Startup of the CRZ120 Card Reader is as follows:

1. Press ON pushbutton (STANDBY light comes on).

2. Load the card deck. Top edges must be down and the first column must be to the right.

3. Press OPERATE pushbutton.

```
┌──────┬──────┐   ┌─────────────┐   ┌─────────────┐
│  AC  │  DC  │   │             │   │             │
├──────┴──────┤   │   OFF LINE  │   │   ON LINE   │
│     OFF     │   │             │   │             │
├─────────────┤   ├─────────────┤   ├─────────────┤
│░░░░░░░░░░░░░│   │░░░░░░░░░░░░░│   │░░░░░░░░░░░░░│
└─────────────┘   └─────────────┘   └─────────────┘

┌─────────────┐   ┌──────┬──────┐   ┌──────┬──────┐
│             │   │OUT OF│ BIN  │   │      │      │
├─────────────┤   │SERVIC│ALERT │   │ERROR │ JAM  │
│    FEED   · │   │      │      │   │      │      │
├─────────────┤   └──────┴──────┘   └──────┴──────┘
│░░░░░░░░░░░░░│
└─────────────┘
```
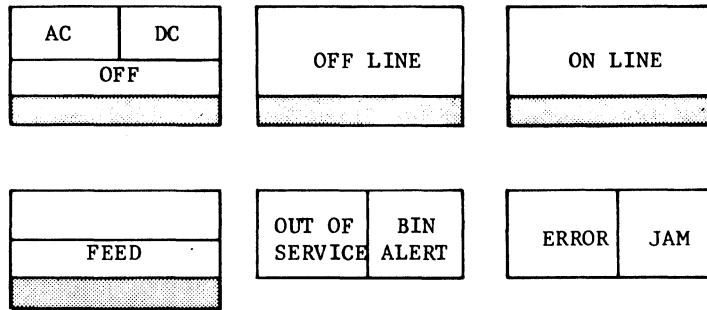
Figure A-6.   CPZ101 Controls and Indicators

CARD PUNCH

Start the CPZ101 Card Punch by the following procedure:

1. Press the OFF LINE pushbutton. Assure that the light is on.

2. Press the ON LINE pushbutton. Assure that the light is on.

3. Press OFF LINE then FEED for manual feed.

4. Put back ON LINE.

Start the CPZ103 Card Punch as follows:

1. Press PWR ON (the STD BY light comes on indicating manual mode).

2. Load cards in hopper, face down, with 9-edge first.

3. Press OPER (STD BY light goes off, indicating automatic mode).

Cards may be added into the CPZ103 while the punch is operating if the hopper contains at least 200 cards at the time the cards are added. Cards may be removed during operation if at least 600 cards are left in the stacker.

To stop CPZ103:

1. If punching has stopped, remove cards and press the OPER pushbutton.

2. Press PWR OFF pushbutton.

1. The peripheral address of the card punch in the G-115 system is assumed to be 00 by the GRTS/115 program. If the card punch is at some other address, a patch card specifying the actual address must be inserted in front of the last card in the GRTS/115 deck. This card is as follows:

   <u>1_____</u>
   DN550105F1xx

   Where: xx - A two-digit hexadecimal number specifying the correct address of the card punch. Normally when a Multiple Peripheral Adapter is used on connector 03, the card punch is connected to a slot with a peripheral address of 20.

2. The GRTS/115 control program is normally used with voice-grade lines. In order to run GRTS/115 on Telpak Lines (broadband), the following configuration patch card must be inserted just before the last card in the GRTS/115 program deck:

   <u>1_____</u>
   DN5501061500

3. GRTS/115 operates with 2000/2400/4800 bps lines and standard peripherals. However, if a slow speed card reader (i.e., model CRZ100) is used on a 4800 bps line, the following configuration patch card must be inserted just before the last card of the GRTS/115 program deck: *

   <u>1_____</u>
   DN5502041C0500

4. The GRTS/115 deck card count is punched in columns 71-74 of the last card in the deck. This is checked after the deck is loaded to detect lost or additional cards. If the count and the actual number of cards in the deck differ, the start pushbutton must be pressed twice to start the G-115 system. This can be averted by correcting the card count to accommodate any added patch cards.

   Example: If a configuration patch card had been added to a GRTS/115 deck whose last card showed a card count of 7C in columns 71-74, the card count would be increased by one by reproducing the last card and punching the character "D" in column 74. This would make the card count show the addition of the patch and allow the program to begin after pressing the start button only once.

ENTERING GRTS INPUT

Batch input under GRTS/115 is accomplished as follows:

1. Assure that GRTS/115 is in the G-115 core storage.

2. Assure that the printer is set to operate.

3. Check the VFU loop for required printout format.

4. With the input deck arranged for remote input (GRTS control cards included, etc.) load the deck into the Card Reader and press the OPERATE pushbutton.

MANUAL ABORT DURING GRTS OUTPUT

Use the following procedure to abort a job file being printed or punched at the terminal:

1. Set SWITCH 1 on the Processor control panel (light comes on).

2. Wait for the message FILE ABORT - OP on the console.

3. Reset SWITCH 1 (light goes off).

Printing or punching is assumed if there are more files to the job. Repeat this procedure for each file to be aborted.

BACKSPACE DURING GRTS OUTPUT

To perform a backspace operation during output:

1. Set SWITCH 2 on the Processor control panel (light comes on).

2. Wait for the message FILE BACKSPACED.

3. Reset SWITCH 2 (light goes off).

The files within the central computer system are backspaced to a maximum of eight 320-word blocks. This backspacing is approximately three printed pages or 85 binary card images.

ON-LINE RESTART PROCEDURE

The on-line restart procedure for the G-115 terminal is performed at the G-115 Processor control panel.

1. Press SINGLE/STOP pushbutton (lower).

2. Press RESET[1] pushbutton.

3. Press SINGLE/STOP pushbutton (upper).

4. Press RUN pushbutton.

5. Put printer in operate mode.

GRTS/115 is reinitialized and is ready to read in a job when RUN is pressed a second time. A disconnect message occurring on the printer indicates that GRTS/115 has received a disconnect due to "n" consecutive errors occurring.

---

[1] See footnote page A-10.

Model 33 Teletype Terminal

The principal parts of the Model 33 Teletype terminal unit are the control unit, keyboard, paper tape punch (optional), and paper tape reader (optional). Figure A-7 shows the keyboard and the control of this terminal.
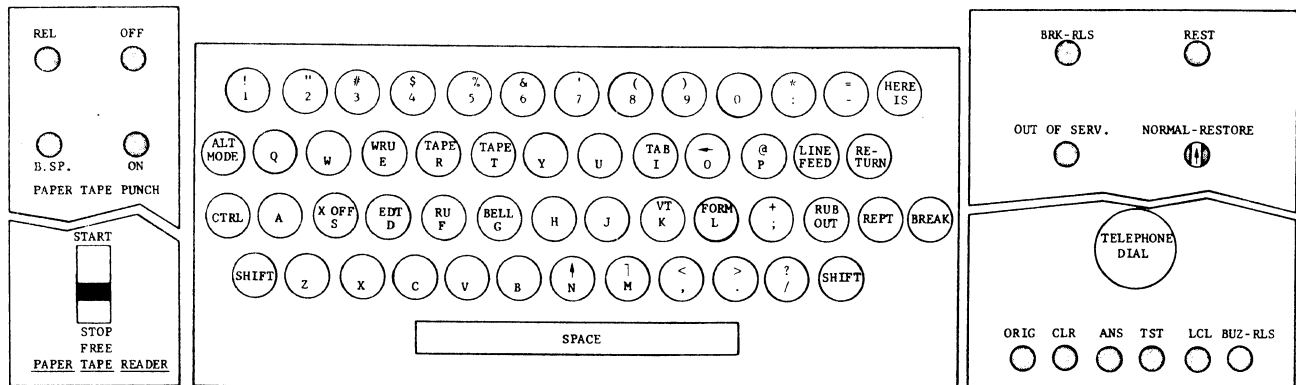
Figure A-7. Keyboard and Controls (Model 33 Teletype Terminal)

CONTROL UNIT

The control unit consists of the following:

Rotary Dial	For dialing telephone numbers.
ORIG (Originate)	Press to obtain a dial tone.
CLR (Clear)	Press to turn off the teleprinter unit.
LCL (Local)	Press to perform local off-line work such as tape punching.
BUZ-RLS (Buzzer Release)	Buzzer sounds when paper supply is low. Key is pressed to silence buzzer. Replace paper roll and press CLR.
BRK-RLS (Break Release)	Button is pressed to free keyboard after a break signal. (The signal causes the keyboard to lock until this button is pressed.)
NORMAL-RESTORE	Should always point to NORMAL.
Loudspeaker	Usually located under the keyboard at the right. A volume control key permits adjusting the volume of the loudspeaker. (In some cases a handset may be provided.) If the control is turned as far as possible counterclockwise, no dial tone is audible.

PAPER TAPE READER

The reader is located at the lower left side of the teleprinter unit and is used for reading information from paper tape. The tape reader has one control switch:

    START - Forward position starts the tape moving through the reader.

    STOP - Bottom position stops the tape reader.

    FREE - Locked bottom position allows the tape to be pulled manually
            through the reader.

To position tape in the tape reader:

1. Open the clear plastic tape gate by pushing the gray lock on the right
    side to the right.

2. Place the tape surface facing upward with the tape feed holes (small
    holes) over the tape feed wheel (the smaller side of the tape to the
    left).

3. Place the code holes of the first character to be read slightly behind
    the sensing pins and preceded by any number of RUBOUT characters.

4. Close and lock the tape gate by pushing down. When ready to read, put
    the tape read switch in the start position. The operator must start the
    tape for each transmission to the computer. (NOTE: Before starting, use
    system command TAPE.)

Model 35 Teletype Terminal

The principal parts of the Model 35 Teletype terminal are the control unit, keyboard, paper tape punch, and paper tape reader. Figure A-8 shows the keyboard and controls of this teleprinter unit.

The control unit consists of the following:

Rotary Telephone Dial	For dialing telephone numbers.
ORIG (Originate)	Press to obtain a dial tone.
CLR (Clear)	Press to turn off the teleprinter unit.
LCL (Local)	Press for local off-line work such as tape punching.
BUZ-RLS (Buzzer Release)	Buzzer sounds when paper supply is low. Key is pressed to silence buzzer. Replace paper roll and press CLR.
BRK-RLS (Break Release)	Press to free keyboard after a break signal. (The signal causes the keyboard to lock until the button is pressed.)
NORMAL-RESTORE	Should always point to NORMAL.
Loudspeaker	Usually located under the keyboard at the right. A volume control key premits adjusting the volume of the loudspeaker (In some cases a handset may be provided.) If the control is turned as far as possible counterclockwise, no dial tone is audible.

Control Modes:

K (keyboard)   Obtains page copy only.

KT (keyboard tape)   Obtains page copy and perforates tape simultaneously
                                or transmits and punches tape and page copy
                                simultaneously.

T (Tape)   Perforates tape only or transmits tape with page
                                copy.

TTS (Tape to Tape)   Transmits tape without page copy.

TTR (Tape to Tape Receive)   Perforates tape from a remote source without page
                                copy.

MOTOR IN   Permits punching tape locally (without page copy)
                                without placing station in the local mode.

When originating a call, the station is automatically switched to the T mode. If a request to the computer is to be made, the user must press the K button before any transmission can be effected, and he must press K to release the keyboard after a break.

KEYBOARD

The keyboard resembles that of a standard typewriter, with the following exceptions.

1. Letters of the alphabet are printed in capital letters only; there are no lower case letters.

2. The shift key is nonlocking and must be held down when typing characters in upper case positions.

3. RETURN key returns the carriage to the left margin.

4. LINE FEED key moves the paper up one line at a time.

5. HERE IS key is used in the conjunction with the tape punch: generates two inches of blank tape; that is, a header or trailer for a paper tape.

6. REPT (Repeat) key repeats the same character when the desired key is pressed. The character key is released and the REPT is held until the required number of characters have been typed. (If it is an upper case character, the shift key must be held along with the REPT key.)

7. RUBOUT key has a nonprinting function and is used following the operation of the RETURN to end a program line of paper tape input. RUBOUT can also be used in conjunction with the backspace button on the tape punch to delete errors in punched tape.

8. XOFF (control and S key), when perforated in tape, turns the tape reader off at the time it is read by the tape reader. Must always be followed by at least one RUBOUT character. Has no effect when typed on line.

9. The XOFF key is operated in conjunction with the control key (CTRL). It is a nonprinting, operational function. Holding the control key pressed and then pressing the XOFF key activates this function.

To position tape in the tape reader:

1. Press the square button to release the tape gate.

2. Place the tape surface facing upward with the tape feed holes (small holes) over the tape feed wheel (the smaller section of tape facing away from the operator).

3. Place the code holes of the first character to be read slightly behind the sensing pins and preceded by any number of RUBOUT characters.

4. Close and lock the tape gate by pushing down.

DIRECT ACCESS OPERATION

The following procedure for Direct Access (DAC) operation refers to a Model 35 Teletype terminal. These instructions differ slightly for a Model 33 Teletype terminal.

1. Press the ORIG key. Lamp lights under the key.

2. Wait for dial tone and dial the assigned GRTS/355 number.

3. If the dial-in is to a specific program, for example the Time-Sharing System, the following message is received:

    HIS SERIES 6000,SERIES 600 ON mmddyy AT time CHANNEL nnn

    Where: mmddyy = Month, day, year.

           nnn = Channel number

    The program dialed then requests user information such as identification, password, etc. When this information is received and validated by the system, the program assumes control of the communication.

    NOTE: The programs which may be dialed directly will depend on the system configuration.

4. If the dial-in is not to a specific program, the response to a dial-in is

    PROGRAM NAME--

    The terminal user may then specify the program to which he wishes access (Time-Sharing System may be specified). When the connection to the program is made, the program assumes control of the communication.

    If the user program requests paper tape input, the paper tape may be read in when requested.

Character Delete characters may be used. Line Delete characters should be used as follows:

    Data String
    C/X (line delete character)
    XOFF
    RUBOUT (at least two)
    Corrected String
    CR
    XOFF
    RUBOUT

    If the tape contains a line of more than 160 characters, it is handled as a normal line and a LINE TOO LONG message is printed at the terminal on line termination. The next input string will be used as the response to the output/input request.

EDITING CAPABILITIES

    The editing capabilities of a teleprinter terminal are:

    1. Delete current line by pressing the CTRL and X key simultaneously.

    2. Delete the preceding character by pressing the SHIFT and commercial AT (@) keys.

IBM 2741 Communications Terminal (GRTS/355 Only)

    The keyboard of the IBM 2741 terminal is similar to that of a standard typewriter except for the control keys used for time-sharing operation. These keys are:

Key   Function

RETURN   Returns the carriage and simultaneously transmits the contents of the line to the system.

Shift and 1   In combination, deletes whatever has been typed on the current line and returns the carriage.

Shift and ½   In combination, deletes the character immediately preceding it on the line. If the key is pressed a number of times, that number of consecutive characters immediately preceding the first shift and ½ will be deleted from the line.

ATTN   Permits the user to stop printing or to cancel an instruction. After receiving the ATTN code, system types out READY.

To use the Hazeltine 2000 Terminal, set the control panel switches/knobs as indicated below. The control panel is located behind a folding panel just below the face of the CRT.

SWITCH/KNOB	SETTING
Power Switch	ON
EOT/CR Switch	EOT
Parity Knob	EVEN
Contrast Knob	As required to clearly see data on screen
Half/Full/Batch Knob	Half
Baud Rate Knob	Same as subchannel configuration card (usually 1200 baud)
CA ON/AUTO Switch	CA AUTO

After setting the control panel switches, turn the terminal on by pushing the ON/OFF button on the right side of the keyboard. The terminal takes about 30 seconds to warm up after being turned on. At the end of this time, random characters are usually displayed on the screen. Clear the screen by pushing the "shift" and "clear" keys simultaneously. This clears the screen and causes the cursor to appear in the upper left-hand corner of the screen. Press the "reset" button on the lower right-hand side of the keyboard to insure the terminal is in receive mode (the "receive mode" light should be on). The terminal is now ready for dialing into the system. Dialing is done in the normal manner.

Shortly after the calling sequence has been completed, the "receive mode" light goes off; after which, an EOT character (Control-D) should be transmitted by the operator to the system and the system should respond with output to the terminal. On the Hazeltine 2000 terminal, the EOT character is used in place of the carriage return for input. If a carriage return is sent, it does not terminate the input mode as it does on other TTY dicipline devices. GRTS continues to accept data until it receives an EOT; after which, GRTS performs its normal edit of the line. This edit is now terminated by either a carriage return or an EOT. The EOT is converted to a carriage return. Thus, it is not necessary to send a carriage return; but, if one is sent, it is the last character shipped to the Series 6000 system. Any characters between the carriage return and the EOT are lost.

Characters are sent from the terminal to the DATANET processor as they are typed; therefore, errors cannot be corrected by backing up the cursor and overtyping. The characters   (character delete), Control X (line delete) and Control C (logical disconnect) retain their meaning on the Hazeltine 2000 terminal, except that the Control X and Control C must be followed by an EOT before anything happens. When in logical disconnect mode, an EOT is the logical reconnect character instead of the Control A.

KEYBOARD/DISPLAY TERMINALS

Operation of the VIP series (except VIP7700) keyboard/display terminals is described in Type 765/775/785 Visual Information Projection (VIP) System, (order number AA19).

KEY LEGEND	UNSHIFTED	SHIFTED	CONTROL (CTR)
O	O	O	F.C. (o)
P	P	P	F.C. (p)
"	"	"	F.C. (`) (grave accent)
| (left bar)	|	|	F.C. (K)
⌐	⌐	⌐	F.C. (O) (alpha)
A	A	A	F.C. (a)
S	S	S	F.C. (s)
D	D	D	F.C. (d)
F	F	F	F.C. (f)
G	G	G	F.C. (g)
H	H	H	F.C. (h)
J	J	J	F.C. (j)
K	K	K	F.C. (k)
L	L	L	F.C. (l) (alpha)
; +	;	+	F.C. (+)
: *	:	*	F.C. (*)
| (right bar)	|	|	F.C. (M)
Z	Z	Z	F.C. (z)
X	X	X	F.C. (x)
C	C	C	F.C. (c)
V	V	V	F.C. (v)
B	B	B	F.C. (b)
N	N	N	F.C. (n)
M	M	M	F.C. (m)
, <	,	<	F.C. (<)
. >	.	>	F.C. (>)
/ ?	/	?	F.C. (?)
SPACE BAR	(SPACE)	(SPACE)	F.C. (SPACE)
1 (Numeric Pad)	no operation	1	F.C. (C)
2 (Numeric Pad)	no operation	2	F.C. (F)
3 (Numeric Pad)	no operation	3	F.C. (I)
4 (Numeric Pad)	no operation	4	F.C. (B)
5 (Numeric Pad)	no operation	5	F.C. (E)
6 (Numeric Pad)	no operation	6	F.C. (H)
7 (Numeric Pad)	no operation	7	F.C. (A)
8 (Numeric Pad)	no operation	8	F.C. (D)
9 (Numeric Pad)	no operation	9	F.C. (G)
. (Numeric Pad)	no operation	.	F.C. (J)
0 (Numeric Pad)	no operation	0	function code clear
− (Numeric Pad) (minus)	no operation	−	F.C. (−)

Figure A-8.1 cont.   VIP7700 Keyboard Functional Description

Additional information concerning operating procedures may be found in VIP7700 Reference Manual, AL29.

4. For private lines, the DATA-SET READY light will be on as soon as the DATANET 355 CSS is booted.

5. The terminal is now ready for inputting or outputting to the DATANET 355 CSS.

Input a Job

1. Load the input deck in the card reader.

   (Sample input deck)

   ```
   $*$ID∅USERID$PASSWORD
   $*$RCD
   $       SNUMB

   $       ENDJOB
   $       SNUMB

   $       ENDJOB
   $*$OUT
   ```

   THE LAST $*$ card is not necessary; if the END-OF-FILE condition is activated. The line will be logically disconnected with a <u>blank</u> reason code.

2. If the entire input deck can be placed in the reader hopper, turn the END-OF-FILE button.

3. Ready the line printer so that any output messages can be printed. NOTE: Rotating the mode switch initializes the IBM 2780.

4. Push and hold the reader START button until the cards start to feed.

5. The input may be stopped at any time by pressing the STOP button. To continue input, press the START button. Since the STOP button drops printer ready, ready this again.

6. If the last card read is not a $*$ card and the END-OF-FILE condition is not activated, place a $*$ card (DIS,OUT,etc), or the rest of the input deck in the hopper, turn the END-OF-FILE light on, and push the START button.

7. After the last card, the line is switched, and the appropriate output sent to the IBM 2780.

Output a Print Job Only

1. Load the following cards into the card hopper:

   ```
   $*$ID∅USERID$PASSWORD
   $*$OUT
      (END-OF-FILE light-on)
   ```

2. Proceed as in job input, **steps 2 to 4.**

Sequence of Operation

The following procedure is used to operate the RLP300 terminal:

1. Initialize the DATANET 355 Processor with the RLP300 defined in the startup deck ($HSLA card).

2. Turn on power to the RLP300 printer.

3. Wait for the check indicator (red light) to extinguish (approximately 30 seconds).

4. Place the RLP300 printer in operation by pressing the START pushbutton.

The RLP300 printer is now on-line and sends a Select message to the DATANET 355 Processor. From this point on, output is automatically directed to the RLP300 printer as it becomes available. With the exception of processing error conditions (out of paper, jam, etc.), no additional operator intervention is required.

RLP300 Error Recovery

All messages transmitted to/from the RLP300 are checked for character parity and longitudinal parity by both the DATANET CSS and the RLP300. Any errors detected will result in an automatic retry by the CSS. Up to seven retries are attempted before the channel is considered inoperable. If the printer subsystem itself is inoperable (paper out, jam, etc.), the subsystem notifies the DATANET CSS with a "wait - subsystem requires manual intervention" message. The CSS then sends an ABORT to the Series 6000 processor and enters a wait mode. SYSOUT then notifies the central system operator console with a message and the operator enters a recovery dialogue with the system.

FEED ALERT (red)

    Indicates that the machine has stopped because it failed to feed a document six consecutive times.

SEQUENCE/ALERT (white/red)

    Turns sequence check feature on and off. SEQUENCE glows white when on. Red ALERT indicates document out of sequence, used off-line only.

ENDORSE/ALERT

    Enables and disables endorser. ENDORSE is white when endorser is operating. ALERT glows red to indicate endorser malfunction.

POWER (yellow)

    Turns on d-c power to device. Illuminated yellow when on.

MDS ON/OFF (white/white)

    Enables and disables MULTIPLE DIGIT SELECT (off line only). Top portion glows when on, bottom glows when off.

EQUAL/UNEQUAL (white/white)

    Defines method of off-line sorting during Multiple Digit Select operation.

ON LINE/OFF LINE

    Changes operating mode to alternate state.

POCKET ALERT (blue)

    Comes on when any sort pocket is full.

OPERATE/RESET (green/blue)

    Operate will start the feeding of documents unless a condition exists that will cause it to remain in Reset, such as a document jam.

D1 to D12 (Digit select switches)

    Each button selects the digit within a field on which documents are sorted.

F1 to F10

    Defines the document field to be sorted on depending on the manner of plugboard wiring.

MANUAL HALT (blue)

    Stops document feeding.

Operating Controls
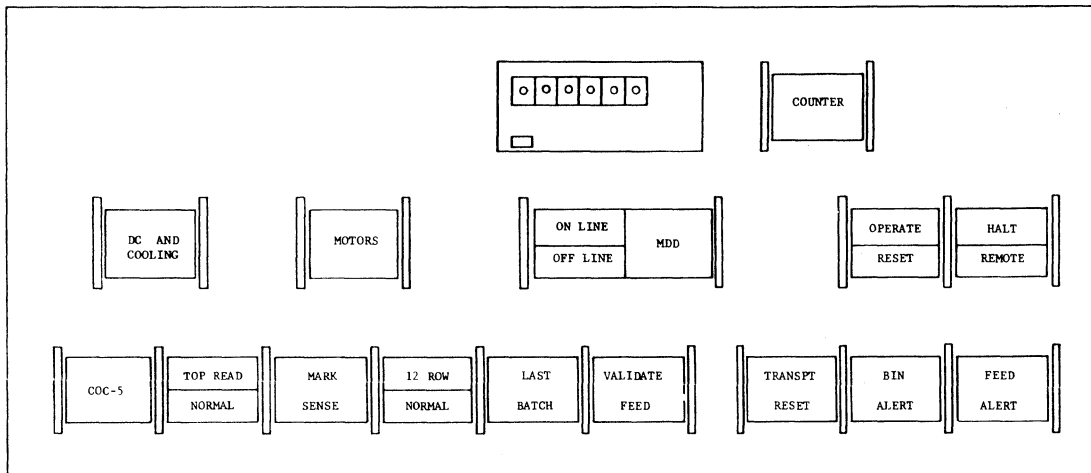
Figure A-10. Operator Control Panel

Figure A-10 shows the switches and indicators on the operator control panel. The function of each of these controls is briefly specified below.

DC and COOLING Switch

This switch controls the application of AC power to the DC power supply, and to the cooling blowers. The switch indicator glows yellow when power is on; it is dark when power is off.

MOTORS Switch

This switch controls the application of AC power to the transport dri motor, the vacuum blower and the riffle air blower. The switch indicat glows yellow when the switch is on and dark when it is turned off.

VALIDATE FEED Switch

This switch serves to enable or disable the feed validation feature. When feed validation is enabled, the switch is illuminated white and detection of a multiple feed will result in Data Alert Multiple Feed status being transmitted to the central processor. When feed validation is disabled the switch is dark and the multiple feeds are ignored.

Normal operation calls for enabling this switch. The disable position is used when documents of different thicknesses are being fed together.

TRANSPORT RESET Switch

This switch is used to both indicate and clear a jam attention condition. When a document becomes jammed in the feed belts, or when a read lamp or jam detect lamp fails, the switch indicator glows blue, the document feed stops, the bogies are tripped and Attention Document Jam status is sent to the central processor.

After correcting the problem, the transport mechanism is reset by actuating this switch.

BIN ALERT Indicator

This indicator glows blue whenever the input hopper becomes empty or either of the two stacker pockets is filled. Attention Bin Alert status also will be sent to the central processor.

FEED ALERT Indicator

Whenever six successive attempts to feed a document fail, this indicator will illuminate red, Attention Feed Alert status is sent to the central processor and the document handler stops trying to feed documents.

COUNTER Switch and Counter

The COUNTER switch when actuated illuminates white and enables counter operation. Actuating the switch a second time will cause the indicator to go dark and disable the counter.

The counter is a six-digit total item counter with a reset button on the face of the counter. The counter reset button should not be pushed when the counter is operating.

NOTE: The following read mode selection indicator switches are always on the operator panel, but are only operational when the mark sense option is installed.

COC-5 Switch

This switch when actuated glows white and enables the COC-5 reader. Actuating the switch a second time causes it to go dark and disables the COC-5 reader.

TOP READ-NORMAL Switch

When the subsystem is in the COC-5 read mode, actuating this switch selects either top read, or normal. When the COC-5 switch is actuated either the top read or the normal field of the TOP READ-NORMAL switch will glow white indicating the read mode that the machine is in. The alternate read mode may then be selected by actuating the switch.

LOADING PRECAUTIONS

After the motors have been turned on, approximatley 10 seconds will transpire before the RESET lamp is illuminated, during which time feed riffle air pressure will be built up. Documents should not be loaded until this air pressure has reached its maximum, as indicated by the RESET lamp being on.

The documents run should be jogged prior to loading. Documents exhibiting excessive end "flattening" should be discarded. Folds and extraneous paper burrs should be removed.

If the multiple feed detection feature VALIDATE FEED switch actuate is used, all documents in a given batch should be the same thickness and approximately the same color.

Placement of the documents into the feed area should be such that the pack is against the feed shoe plate, but not so tightly that the riffle air will not separate the documents near the feed shoe area. In particular, the feed backup plate should not be pushed against the document pack such that the riffle air cannot separate the documents. Excessive pressure against the documents will cause faulty feeding and jams.

The skew correction "finger" should be brought down into position such that the finger rides on the top edges of the documents.

When no documents are in the feeder and the backup plate is against the feeder shoe, the BIN ALERT lamp will be on. When the backup plate is withdrawn, the lamp will turn off unless one of the output stackers is full. When either output stacker is full, a white indicator lamp adjacent to the full stacker will illuminate.

RUNNING DOCUMENTS

In the off-line mode, when documents are loaded and the mode selection made, document feed will commence when the OPERATE/RESET switch is depressed. The OPERATE lamp should turn on and the RESET and HALT lamps turn off. Document feed will halt upon an error detection condition, bin alert, or actuation of the HALT switch.

In the on-line mode, operation of the OPERATE/RESET switch will cause the OPERATE lamp to turn on, but document feed will not commence until a feed command is received from the processor. Document feed may be halted on-line by actuation of the HALT switch. If halted by a processor command, the REMOTE indicator will also turn on.

TURNING OFF POWER

To stop motors, depress MOTOR switch. Stacker drums will stop and riffle air will stop.

To turn entire unit off, depress DC AND COOLING switch. After approximately a four second delay, the unit will turn off. It is not necessary to depress the MOTOR switch.

Operating Controls

The controls and indicators on the operator's control panel and elsewhere on the reader/sorter are described below.

OPERATOR'S CONTROL PANEL

The switches on the operator's control panel (Figure A-11) provide for the operation of the reader/sorter, and the indicators signal the current status of the device. The functions of the controls and indicators are described below.

[1]Provided feature installed.
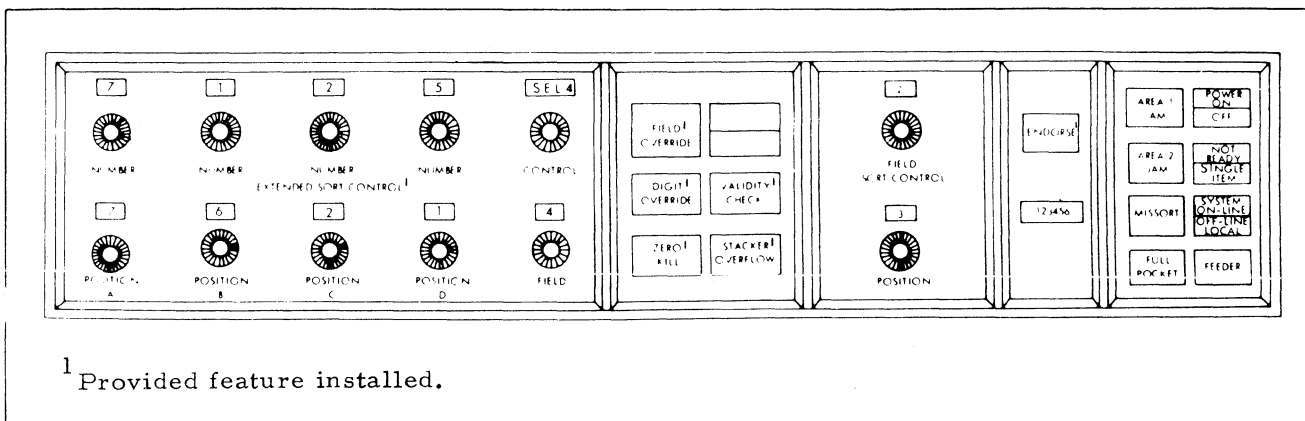
Figure A-11. Operator's Control Panel, DRD236 High Speed Document Reader/Sorter

POWER ON/OFF - Push-button (split indicator) switch

Utilized to either apply or remove power to reader/sorter. POWER ON is illuminated (green) when power is applied to reader/sorter. OFF is illuminated (red) when any power controls for transport motors or logic power are off.

SORT CONTROL Switches:

FIELD - Rotary Switch

Field Selection Dial located near center of control panel with POSITION
(Digit Selection Dial) switch located immediately below. FIELD dial used to
select particular field (1-8) on which to sort document in off-line mode.
If no field is selected in off-line mode, all documents read will be routed
to Reject pocket.

POSITION - Rotary Switch

Digit Selection Dial used to designate specific digit position on which
off-line sort is to be made in a given field. POSITION dial has 12
different positions (1-12) which permit 12-digit field to be sorted. Dial
corresponds to actual digits within field and not to blanks or hyphens.

EXTENDED SORT CONTROL Switches:

FIELD - Rotary Switch

Dial used to select one of eight fields to be sorted on. Number of
available sort fields can range from two to eight depending on number of
off-line sort features installed.

POSITION A,B,C,D - Rotary switches (4)

Dial used to select sort position (1-8) within selected field. Four
different digit positions can be selected; one for each position switch.

NUMBER - Rotary switches (4)

Dial used to select comparison digit (0-9 and OFF) for selection made by
corresponding POSITION dial directly below it.

CONTROL - Rotary switch

Dial used to select mode of operation - EDIT, SEL 1, SEL 2, SEL 4, and OFF

EDIT

If all 1-4 selected characters indicated by four NUMBER switches agree with
comparison digits, then document is sorted by off-line sort control;
otherwise, document will be sent to designated override pocket. Off-line
sort control sorts documents to pockets 0-9.

SEL 1

If all 1-4 selected characters agree with comparison digits selected by
NUMBER switches, document will be routed to designated override pocket. All
other documents are sorted by off-line sort control to pockets 0-9.

SEL 2

If either one or two selected characters agree with comparison digits,
documents will be sorted to designated override pocket. Document with
second pair of selected digits will be sorted to another designated
override pocket if they compare to second pair of comparison digits. All
other documents are sorted to pockets 0-9 by off-line sort control.

FIELD OVERRIDE - Push-button indicator

Illuminated (green) when Field Override capability (Feature 236-16) is installed and activated. Feature will sort documents containing specific 8-digit consecutive code to designated override pocket. All other documents will be sorted to regular pockets.

DIGIT EDIT - Push-button indicator

Illuminated (green) when Digit Edit capability (Feature 236-14) is installed and activated. Feature will sort documents, having either of two specific digits in specific location to regular sort pockets. All other documents will be sorted to designated pocket.

ZERO KILL - Push-button indicator

Illuminated (green) when Zero Kill capability (Feature 236-15) is installed and activated. Feature will sort documents with zeroes in specific location to designated "zero kill" pocket, if sort contains only zeroes to left of sort digit. If digit in sort position is not zero, or if any positions to the left contain other than zeroes, document is sorted to pocket corresponding to digit in sort position.

DIGIT OVERRIDE - Push-button indicator

Illuminated (green) when Digit Override capability (Feature 236-13) is installed and activated. Feature will enable documents containing specific digit or digits in specific location to be sorted to either one or two designated override pockets. All other documents will be sorted to their regular pockets.

STACKER POCKET LIGHTS

A small round light (red) is located above each pocket of the reader/sorter. The significance of these stacker pocket lights is determined by referring to three indicators on the operator's control panel, viz, FULL POCKET, AREA 2 JAM, and MISSORT. With the exception of a jam, illumination of a stacker pocket light causes the feeder to halt and the transport to continue running.

When a stacker pocket light is illuminated in conjunction with the FULL POCKET indicator, the operator should empty the pocket designated by the red light.

When a stacker pocket light is illuminated in conjunction with the AREA 2 JAM indicator, the operator should relieve the document jam at the pocket designated by the red light.

When a stacker pocket light is illuminated in conjunction with the MISSORT indicator, the operator should respond according to previously arranged instructions. The light of the pocket containing the missorted document(s) in this case will blink.

A stacker pocket light can also be illuminated by external control; e.g., on-line after a pocket has obtained a predetermined number of documents. The control panel lights are not affected in this kind of situation.

The operator may insert additional documents into the input hopper at any time; however, certain steps must be followed.

1. Place additional documents in input hopper _behind_ feeder flag, and maintain sufficient tension.

2. Raise feeder flag to vertical position, and push additional documents forward.

3. While maintaining forward tension on documents, slide feeder flag to rear of document stack.

4. Lower feeder flag behind last document, and allow tension to be automatically maintained by feeder flag.

APPENDIX B

SAMPLE DECK SETUPS

The deck setups in this appendix are for entering various types of jobs into the Series 6000 system from a remote computer terminal.

```
/$*$OUT
/$ ENDJOB
/$ REMOTE PR
/
/  ACTIVITY 2
/$ REMOTE AB
/
/  ACTIVITY 1
/$ SNUMB
/$ ENDJOB
/
/  ACTIVITY 2
/
/  ACTIVITY 1
/$ SNUMB
/$*$RCD
/$*$ID⌀USERID$PASSWORD
```

Where: AB and PR are file codes for user's output files.

Multiple Job from Remote Computer, Wait for Output

```
/$*$OUTSNUMB
/$ ENDJOB
/$ REMOTE PR
/
/  ACTIVITY 2
/$ REMOTE AB
/
/  ACTIVITY 1
/$ SNUMB
/$ ENDJOB
/
/  ACTIVITY 2
/
/  ACTIVITY 1
/$ SNUMB
/$*$ RCD
/$*$ID⌀USERID$PASSWORD
```

Where: AB and PR are codes for user's output files.

Multiple Job from Remote Computer, Wait for Ontput with SNUMB

```
 /$*$OUT
/$*$IDØUSERID$PASSWORD
```

```
   /$*$OUT
  /$ ENDJOB
 /
 / ACTIVITY 1
/$ SNUMB
/$ ENDJOB
 /
/ ACTIVITY 1
/$ SNUMB
/$*$RCD
/$*$IDØUSERID$PASSWORD
```

Multiple Job from Remote Computer, Receiving Output, No Response
from Series 6000 System - Line Disconnected, Call Back for Output

```
 /$*$OUTC
/$*$IDØUSERID$PASSWORD
```

```
   /$*$OUT
  /$ ENDJOB
 /
 / ACTIVITY 1
/$ SNUMB
/$ ENDJOB
 /
/ ACTIVITY 1
/$ SNUMB
/$*$RCD
/$*$IDØUSERID$PASSWORD
```

Multiple Job from Remote Computer, Receiving Output, No Response from
Series 6000 System - Line Disconnected, Call Back to Continue Output

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APPENDIX C

GRTS ABORT CODES

41   Invalid I/O status pointer in MME GEROUT calling sequence.

43   Invalid DCW pointer. This abort code is also used when an illegal character count is encountered.

72   Invalid MME GEROUT op code.

73   PAT area has been exhausted.

74   Output record too large for terminal type.

75   Undefined remote terminal station ID. The abort code is also used when there is a duplicate remote inquiry name.

76   Invalid GEROUT program identification. Nonprivileged slave program has identified itself as Time-Sharing System. The abort code is also used when the program number is illegal.

APPENDIX D

CHARACTER SETS AND CODES

OCTAL AND HEXADECIMAL - CHARACTER CODES

Character Set	Series 600/6000 6-bits	G-115 8-bits	TTY/USASCII DATANET-760 7-bits
	Octal	Hexadecimal	Octal
0	00	40	60
1	01	41	61
2	02	42	62
3	03	43	63
4	04	44	64
5	05	45	65
6	06	46	66
7	07	47	67
8	10	48	70
9	11	49	71
A	21	51	101
B	22	52	102
C	23	53	103
D	24	54	104
E	25	55	105
F	26	56	106
G	27	57	107
H	30	58	110
I	31	59	111
J	41	A1	112
K	42	A2	113
L	43	A3	114
M	44	A4	115
N	45	A5	116
O	46	A6	117
P	47	A7	120
Q	50	A8	121
R	51	A9	122
S	62	B2	123
T	63	B3	124
U	64	B4	125
V	65	B5	126
W	66	B6	127
X	67	B7	130
Y	70	B8	131
Z	71	B9	132
(Blank)	20	50	40
[	12	4A	133
#	13	4B	43
@	14	4C	100
:	15	4D	72
>	16	4E	76
?	17	4F	77

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OCTAL NUMB.	USASCII CHAR.	OCTAL NUMB.	USASCII CHAR.	OCTAL NUMB.	USASCII CHAR.	OCTAL NUMB.	USASCII CHAR.
000	NULL	040	SP	100		140	GRA
001	SOH	041	EXP	101	A	141	a
002	STX	042	"	102	B	142	b
003	ETX	043	#	103	C	143	c
004	EOT	044	$	104	D	144	d
005	ENQ	045	%	105	E	145	e
006	ACK	046	&	106	F	146	f
007	BELL	047	'	107	G	147	g
010	BSP	050	(	110	H	150	h
011	HT	051	)	111	I	151	i
012	LF	052	*	112	J	152	j
013	VT	053	+	113	K	153	k
014	FFD	054	,	114	L	514	l
015	CR	055	-	115	M	155	m
016	SO	056	.	116	N	156	n
017	SI	057	/	117	O	157	o
020	DLE	060	0	120	P	160	p
021	DC1	061	1	121	Q	161	q
022	DC2	062	2	122	R	162	r
023	SX3	063	3	123	S	163	s
024	DC4	064	4	124	T	164	t
025	NAK	065	5	125	U	165	u
026	SYN	066	6	126	V	166	v
027	ETB	067	7	127	W	167	w
030	CAN	070	8	130	X	170	x
031	EM	071	9	131	Y	171	y
032	SUB	072	:	132	Z	172	z
033	ESC	073	;	133	LBK	173	LBR
034	FS	074	LTN	134	RSL	174	VTL
035	GS	075	=	135	RBK	175	RBR
036	RS	076	GTN	136	CFX	176	TLD
037	US	077	?	137	_	177	DEL

See the following page for definition of terms.

APPENDIX E

GLOSSARY

Alphanumeric character

General term for an alphabetic, numeric, or special character.

ASCII

American Standard Code for Information Interchange.

ASCII eight-level code

Standard code used for data communications. It consists of seven data bits and one parity bit.

ASR

Automatic Send-Receive.

Batch

The grouping of control records (both GRTS/355 and GCOS) and data records into a single deck of punched cards that is entered as a job deck for processing.

BCD

Binary Coded Decimal.

bps

Bits per second.

Buffer

A device used to store encoded data temporarily. It is primarily used to compensate for differences in data-flow rates or the time of occurrence of events between two different devices.

Call-in

Procedure consists of (1) press TALK pushbutton on telephone handset, (2) lift receiver off cradle and wait for dial tone, (3) dial the assigned GRTS number, (4) when another and different tone is heard, press DATA pushbutton, (5) replace receiver on the cradle, and (6) when transmission is completed, lift receiver, press TALK pushbutton, and replace receiver on the cradle.

Character code

The numeric system (such as octal or hexadecimal) used to represent the internal bit configuration of a computer character.

Character set

The complete set of alphabetic, numeric and symbolic characters utilized by a data processor or a terminal.

Common Carrier Switched
Network (CCSN)

The general telephone service available to the public for business and personal use.

GRTS/355	GRTS control program for DATANET 355 CSS.
GRTS/115	The GRTS control program for G-115 terminal.
GRTS/600	The GRTS control program that is an integral part of GCOS, providing the software interface between GCOS and GRTS.
ICM	Intercomputer message.
Interact (with)	Refers to direct access of a terminal with a user program that is in execution in the Series 6000 system.
Job deck	Consists of GCOS control records (beginning with $ SNUMB and ending with $ ENDJOB) and the accompanying data records to be processed. It is the standard job deck that is submitted at the central computer site, as distinguished from the GRTS deck.
Job number	SNUMB of job to be processed by GCOS.
KSR	Keyboard Send-Receive.
LF	A teletypewriter control signal that produces a line feed at the printer mechanism.
Line switching	The process of electrically connecting two stations for a temporary communication.
lpm	Lines per minute.
Message control center	Within GRTS/355, it is a DATANET 355 that (1) controls data-message transfers, (2) coordinates the general system operation, and (3) prepares data in a form suitable either for entry into the Series 6000 system or transmission to the terminals.
Messages	ICM
	Communication between DATANET 355 and Series 6000 that indicates pertinent information concerning actions taken and to be taken. It may include a block of data.
	Printout
	Communication generated by DATANET 355 or Series 6000 system that is sent to a terminal printer for the attention of the operator.

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