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TELEMETRY ON-LINE MONITORING, COMPRESSION, AND TRANSMISSION SYSTEM FOR THE MANNED SPACE FLIGHT NETWORK (TOMCAT)

VOLUME 1
SYSTEMS DESCRIPTION

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NASA — GODDARD SPACE FLIGHT CENTER

GREENBELT, MARYLAND

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SYSTEMS DESCRIPTION

Prepared by

TOMCAT Systems Group
Data Support Office
Data Systems Division
Goddard Space Flight Center

Released by:

Sidney S. Lechter

Sidney S. Lechter
Head, TOMCAT Systems Group
Data Support Office

TECHNICAL TERMS AND DEFINITIONS

Terms used in the following description of the TOMCAT system are listed together with their definitions:

Agena	Second-stage booster to be used in docking-in-space operations
AMR	Atlantic Missile Range
Data word (computer)	Eight binary bits at the low-order end of the 18-bit computer word which represent specific data
(PCM)	Eight binary bits in the most significant part of the 64-bit multiplex register in the PCM system
Dump mode	That mode of operation when the data telemetered are from the spacecraft on-board recording system; these data are recorded during those times when no ground station can "see" the spacecraft and are played back at an accelerated bit rate
Flight controller	The man who monitors operation of a particular spacecraft or launch system and controls certain spacecraft or booster operations
Frame sync reference	A unique bit configuration stored in minor-frame words 1, 2, and 3 which is used to detect when the PCM ground station has locked onto the telemetry sync pattern
Gemini	The two-man orbiting spacecraft program; includes those premanned-flight spacecraft and launchings
GMT	Greenwich Mean Time
GSFC	Goddard Space Flight Center, NASCOM, and Computation Center

High-speed mode	That mode of operation in which the telemetry data are transmitted to a primary station at a 2 or 40.8 kilobit/sec rate
Low-speed mode	That mode of TOMCAT operation in which summaries are transmitted to GSFC/MSCC at 60 or 100 word-per-minute rate of teletypewriter
Major frame	A specific number of minor frames which comprises a complete date transmission
Minor frame	A specific number of data words which are preceded by a specific pattern of binary bits called frame sync reference
MSCC	Manned Spaceflight Control Center, Manned Spacecraft Center, Houston, Texas
PCM	Pulse Code Modulated: the method of modulating the telemetry transmitter carrier using digital pulses
Playback mode	That mode of TOMCAT operation when summaries and printouts are excerpted from telemetry data previously recorded on tape
Primary station	A remote site which includes the capability to generate summary messages and printouts
Prime subframes	Those minor frame channels which are used to store parameters relating to Gemini spacecraft subsystem status and engineering
Printout	Printout of a single parameter or grouping of parameters selectable by a three-decimal-digit code; these printouts support the Flight controller system
Real-time mode	That mode of TOMCAT operation when summaries and printouts are excerpted from the data stream presently being telemetered from the spacecraft

RO	A Receive Only teletypewriter used to print out parameters for support of the flight controllers
ROTR	The Receive Only Teletype Reperforator used to communicate between the TTY and GSFC/MSCC
Secondary station	A remote site which possesses the high-speed capability only
Subframes	Those areas of a minor frame which are commutated to store specific data repetitively
Summary	Grouping of specific parameters selectable by a three-decimal-digit code for transmission to the central data reduction center
Titan	Gemini program first-stage booster
TOMCAT	Telemetry On-line Monitoring, Compression, And Transmission
TTY	The parameter teletype message to GSFC/MSCC and/or the equipment used to transmit the message

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ACKNOWLEDGMENTS

The following members of the TOMCAT Systems Group have contributed to the successful design, development, and implementation of the telemetry on-line monitoring, compression, and transmission system:

Mr. James A. Blumke
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Mr. Jairus A. Larson
Mr. Sidney S. Lechter
Mr. Donald J. Neff
Mr. Kenneth G. Schmidt
Mr. Lowell K. Shelton
Mr. Lester H. Wentz
Mr. William E. Willis, Jr.

TELEMETRY ON-LINE MONITORING, COMPRESSION, AND TRANSMISSION SYSTEM (TOMCAT)

Section I

INTRODUCTION

General

This report describes the data handling system for (1) fulfillment of automatic telemetry summary generation requirements of the Gemini network; (2) selection of data to support site flight control personnel; and (3) transmission of compressed raw Gemini and Agena data to the Goddard Space Flight Center (GSFC) NASCOM and Computation Center.

Initially, the system will communicate data to the GSFC NASCOM and Computation Center for further reduction and rebroadcast to the Manned Space Flight Network. When the Manned Spaceflight Control Center (MSCC) becomes operational, the summaries will be transferred there for reduction and rebroadcast. For the purposes of this report, both centers will be referred to as GSFC/MSCC.

Ground Control and Data Acquisition Network

The ground control and data acquisition network consists of GSFC/MSCC and thirteen remote centers, as shown in Figure 1. Data received from the spacecraft are compressed, summarized, and relayed to GSFC/MSCC for detailed data reduction. At the computer-equipped remote sites, particular parameters associated with spacecraft subsystem status and engineering factors are stripped out and printed to support site flight controller personnel.

Processing System Operational Modes

The TOMCAT system uses two operational modes: a low-speed mode for summary generation and on-line remote site printout, and a high-speed mode for transmission of compressed remote site data to a primary site for summary generation and on-line display. All summary data are transferred to GSFC/MSCC for further data reduction.

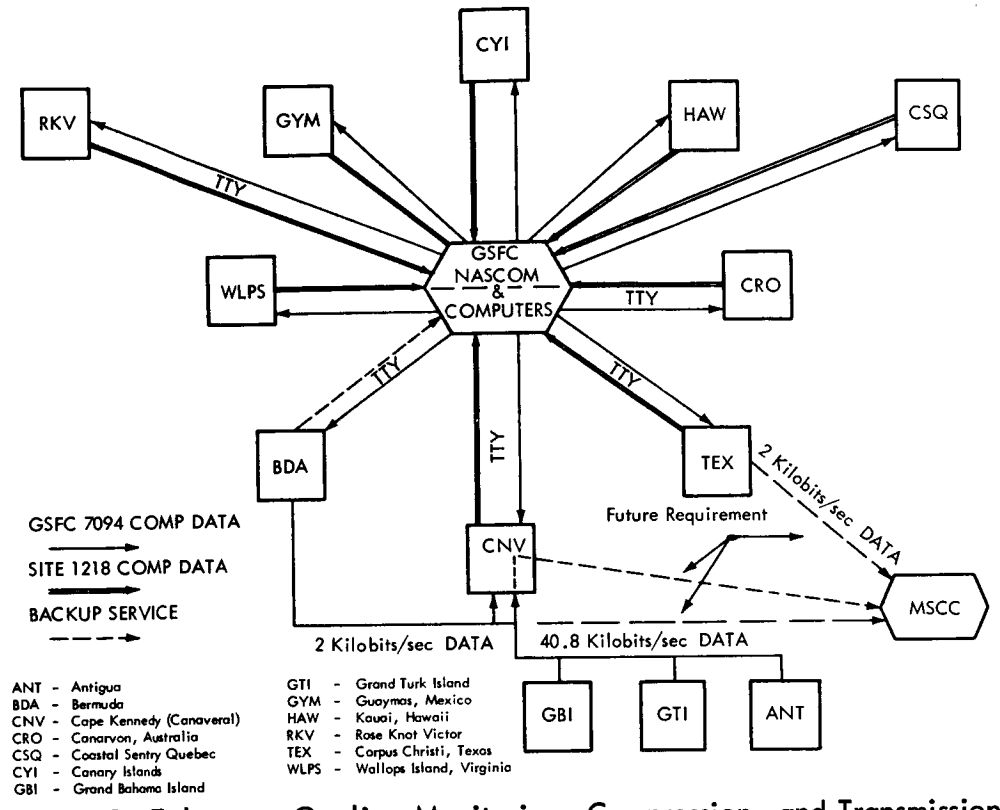


Figure 1—Telemetry On-line Monitoring, Compression, and Transmission system network.

A primary site is one that possesses full facilities for summary generation and communication to GSFC/MSCC and flight controller consoles. A secondary site generates compressed data via high-speed data links and does not have facilities for on-site flight controller support.

The downrange Atlantic Missile Range sites will transmit data at an accelerated bit rate of 2 kilobits/sec, as will the Bermuda and Texas sites. On missions after GT-2, the downrange sites will have the capability to transmit Gemini, Agena, and Titan II data at an accelerated bit rate of 40.8 kilobits/sec.

Processing System Computer Operation

The TOMCAT system is based around the UNIVAC 1218 computer having 16K words of core storage. The computer uses an 18-bit word with input to and output from memory, using eight channels each. Each channel provides 18 parallel data lines plus the necessary control lines for real-time operation.

Automatic program interrupt permits a flight controller to interrupt computation upon request. Figure 2 shows the Univac Central Processor, I/O Console, and Teletype Unit. Figure 3 shows the data flow for automatic summary generation for a single spacecraft.

Data inputs to the computer are Pulse-Code-Modulated (PCM) trains at a bit rate of 51.2 kilobits/sec for Gemini and 16.384 kilobits/sec for Agena. The system operates in conjunction with two PCM stations, and the computer can identify and handle data from either system upon arrival at the computer. Selection of either Gemini or Agena data for summary transfer or on-line printout is manual at the flight controller keyboards. The computer recognizes the selection upon activation of the appropriate interrupt line and switches to the routine developed for satisfying the display request. When the request is for a printout, the data are routed to the requesting console readout. When the request is for a summary, the data are output via teletype to GSFC/MSCC for further reduction.

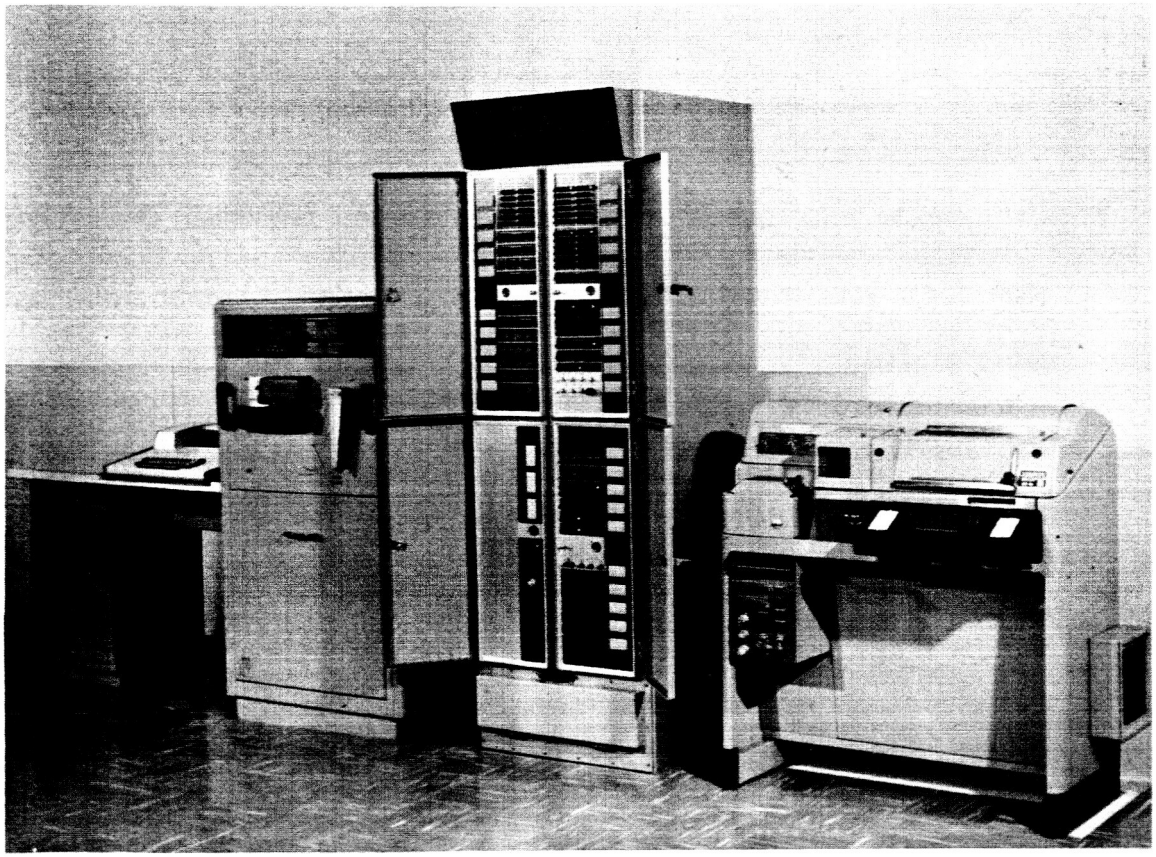


Figure 2—Univac central processor, I/O console, and teletype unit.

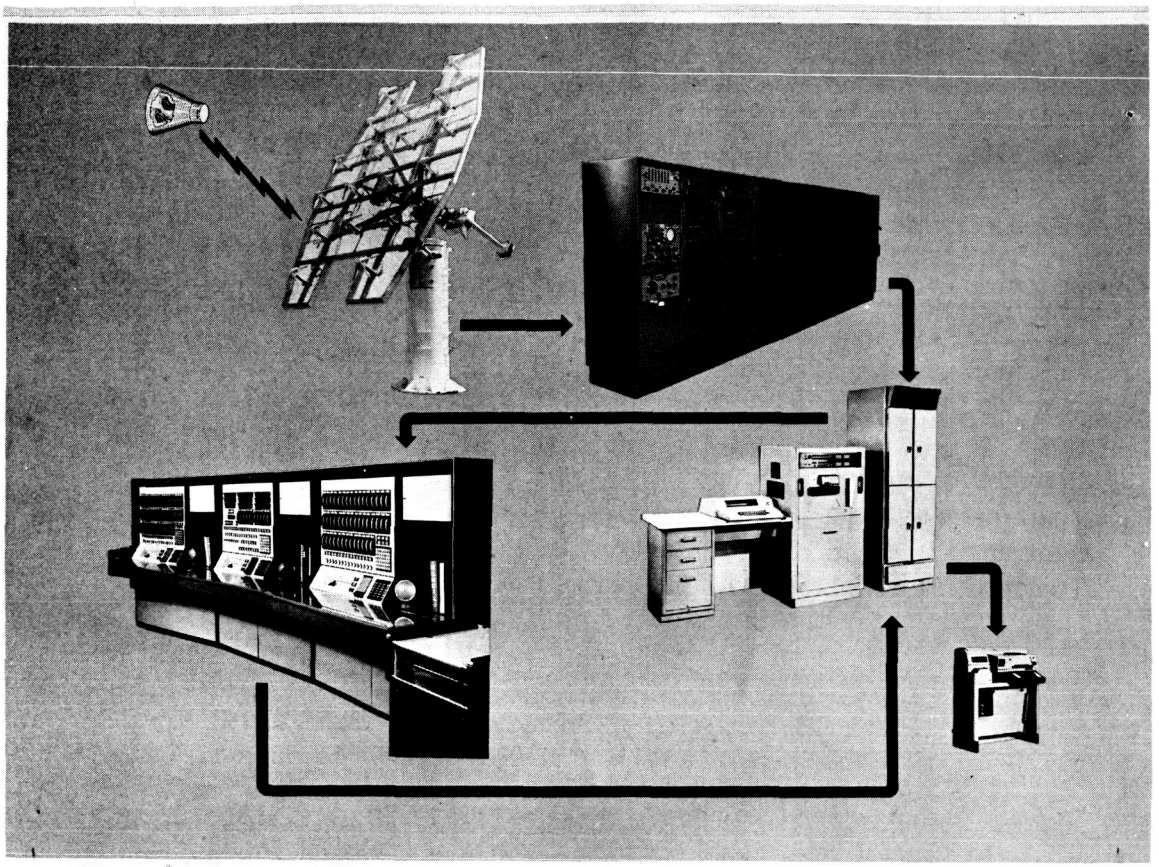


Figure 3—Data flow for automatic telemetry summaries.

Summary Operation

When a summary transmission has been requested, the data are output over the teletype lines in the format shown in Figure 4. When the request is recognized by the computer and when it initiates transmission, an identifying one-line printout is given at the on-line printer to notify the requesting console operator that transmission has started. The data transmitted is converted to a 2-letter code. Each letter in the code consists of 4 of the 8 bits in a parameter word. Parity bits are added to the 4-bit to complete the 5-bit teletype word.

Printout Operation

When the console operator requests a printout, it can take three general forms: a group printout, single printout, and a discrete data printout. A group printout consists of a set of parameters which have been converted

9-24-64/14-52-37/G930 M3

Typical On-Board-Computer printout (scientific notation)

```
 1   001-04-50
 4   047-21-16
 7   1.2036618   EXP02
10   1.8977396   EXP02
13   2.6377157   EXP02

16   6.5148650   EXP04
19   7.8717590   EXP04
22   9.2286531   EXP04
25   -3.4367454  EXP03
28   -2.9548704  EXP03

31   -2.4729955  EXP03
34   -3.8889072  EXP00
37   -2.9475001  EXP00
40   -3.1851108  EXP04
43   1.2029615   EXP05

46   41305217
49   1.9930096   EXP03
52   3.0210096   EXP03
55   3.9847595   EXP03
58   0.0000000   EXP00

61   0.0000000   EXP00
64   0.0000000   EXP00
67   5.1007034   EXP02
```

9-24-26/18-1-48/G500
01111101

Typical discrete word printout, each bit indicates an ON/OFF status condition

9-24-64/15-1-21/G800
OFF

Typical discrete printout of one of eight bits in discrete word

9-24-64/18-1-36/G495

Typical group printout percent full scale

```
1   85.9
2   87.8
3   10.2
```

9-24-64/15-25-53/G020
86.2

Typical single word printout (percent full scale)

JJ

5070011010401102546440

Typical Summary Transmission format teletypewriter printout. Two-letter code represents two 4-bit fields of an 8-bit data word.

```
TTTLAA   OSTOOK   TOTIOT
ORTXHL   HDRHTO   VKZRND
RHZSZK   DDJTDL   XVTITT
NLNDNQ   LNLZLJ   TOHKSN
DQTTJT   JITTRV   IORASZ
DLHLII   XAAIAO   IXVRVT
VTVSOK   IXTTTT
```

Figure 4—Typical summary transmission and printout formats.

to a percentage of full-scale readings for printout. A single printout is the percentage of full-scale value of the parameter selected. Discrete data printouts are used to indicate those data items which can be represented as ON/OFF sets. In these cases a binary 1 indicates an ON, and a zero an OFF. Samples of these printouts are shown in Figure 4.

TELEMETRY FORMATS

General

For the purpose of real-time data processing, three telemetry formats are important: The spacecraft Gemini and Agena formats, and the TOMCAT input operational format. Descriptions of these formats follow.

Gemini Telemetry Formats

Gemini telemetry is transmitted serially from the spacecraft in a synchronized major frame consisting of 192 minor frames. Each minor frame consists of 80 eight-bit words. The major frame is read into the ground system at 51.2 kilobits/sec and requires 2.4 sec for a complete major frame transmission. The PCM ground station strips out those parameters associated with spacecraft subsystem status and engineering factors, which are contained for the most part in the prime subframe, and transfers them to the computer in parallel at 1728 eight-bit words per 2.4 seconds, as shown in Figure 5.

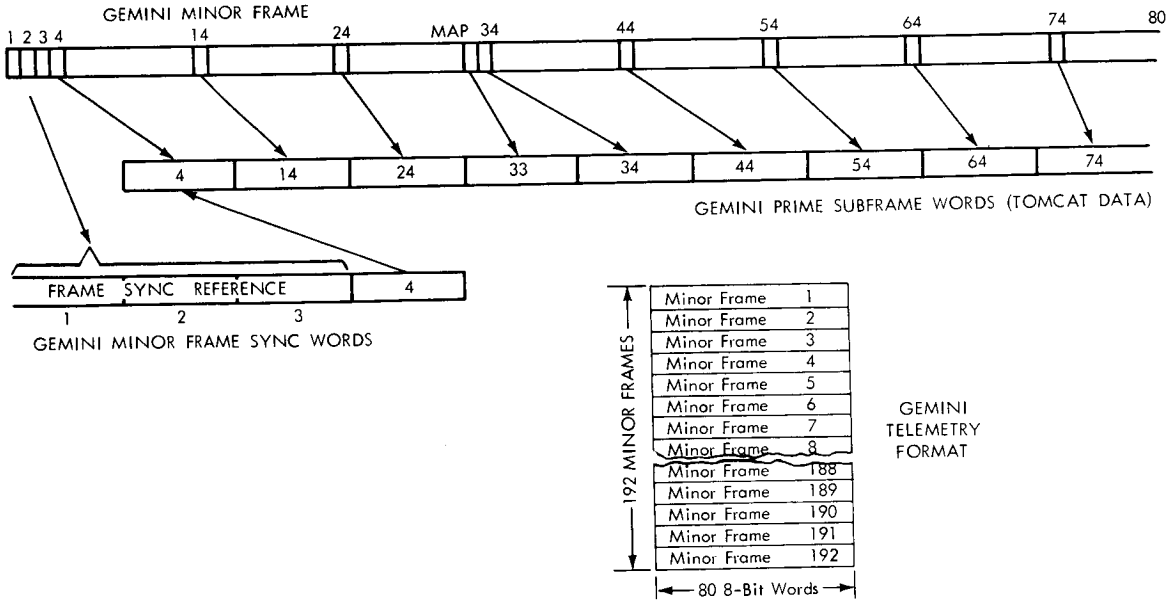


Figure 5—Gemini telemetry data formats.

Prime subframe words are assigned to minor frame word positions 4, 14, 34, · · ·, 74 with an interval of ten word positions between prime subframe words. Major frame sync reference is provided by accumulating the count of minor frames processed and updating the count to a maximum of 192. When the limit is reached, a unique signal is used to signify the end of the major frame. Minor frame sync reference is provided by a unique 24-bit pattern stored in minor frame words 1, 2, and 3. Detection of frame sync reference causes generation of eight read pulses which are synchronized with the occurrence of prime subframe words. Minor frame word position 33 is assigned to the Message Acceptance Pulse (MAP). This pulse is telemetered to signify that the airborne computer has received a ground-generated command.

Agena Telemetry Formats

Agena telemetry is transmitted serially from the spacecraft in a synchronized major frame consisting of 16 minor frames, as shown in Figure 6.

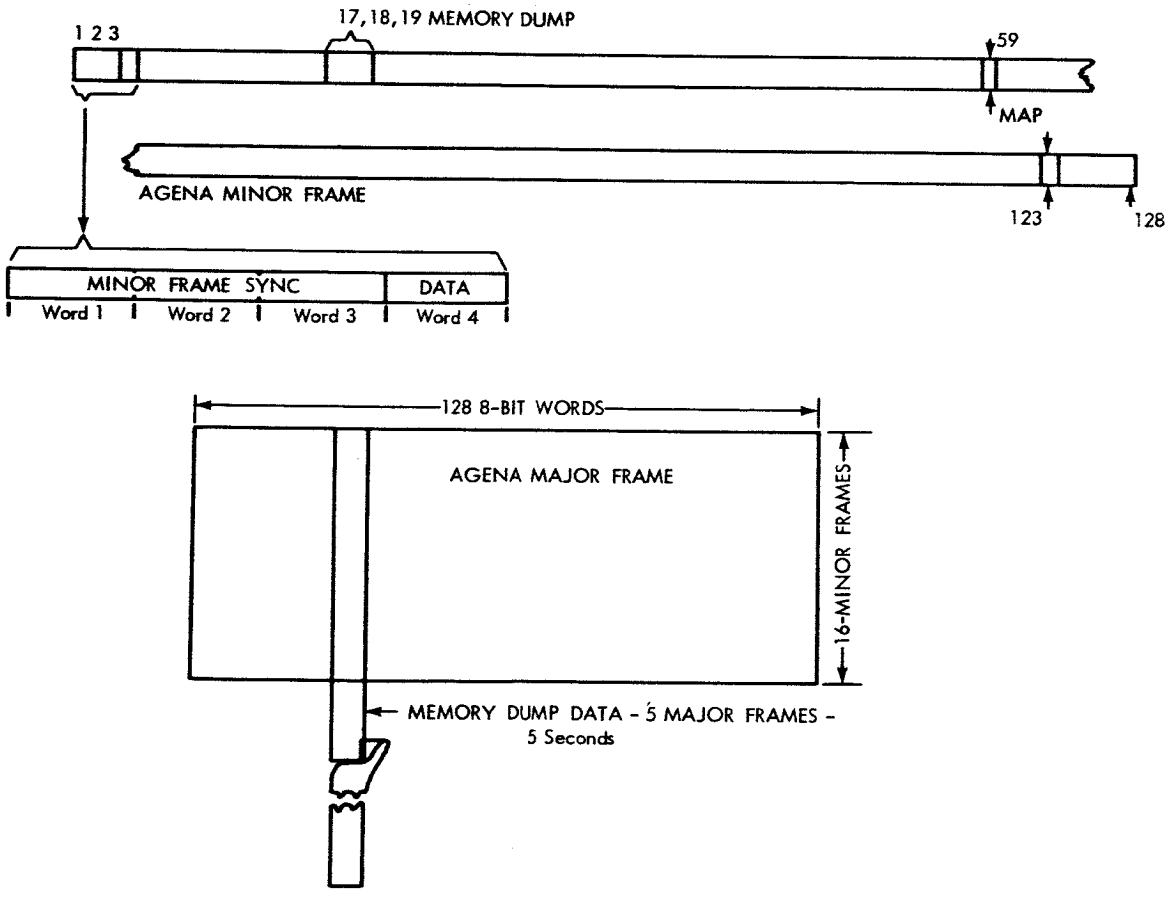


Figure 6—Agena data telemetry format.

Each minor frame consists of 128 eight-bit words. A major frame is read once each second. Three words within the frame are assigned to the spacecraft on-board-computer-memory dump. These words are sampled each minor frame and through five major frame times, therefore requiring 5 seconds for a complete "dump read."

TOMCAT Processing Formats

The TOMCAT system operates primarily on the Gemini prime subframes; however, for Agena all frames are read in and may be processed. In the following description, the word frame will reference Gemini prime subframes and all Agena frames.

TOMCAT Operating Modes

TOMCAT may operate in four modes: Gemini real time, Gemini dump, Agena real time, and Agena dump. In the real-time modes, parameters are selected for summary transmission to GSFC/MSCC in real time through the CAM keyboards and logic. The processed summaries are rebroadcast back to the remote sites by the Computation Center. In the dump modes, the data are read from the spacecraft at accelerated bit rates. These data include the prime subframes for Gemini and the raw Agena data which are recorded on tape. These data are then read into the TOMCAT real-time system at a decelerated rate and processed in the same manner as real-time data. Summary generation and transmission and parameter printout may be accomplished in the real-time operation modes or in the decelerated dump mode.

STATION EQUIPMENT, DESCRIPTIONS AND CONFIGURATIONS

General

Several equipment configurations are used at the Gemini sites. Six stations use a single configuration, while the remaining stations use modifications of that arrangement to fulfill the specific requirements of those stations. A listing of the equipment used, together with brief descriptions, follows. The equipment configurations used at specific sites are diagrammed and described in the later paragraphs of this section.

Flight Controller Consoles (FCC)

These consoles are used to monitor Gemini and Agena flight parameters. Console controls include the Computer Address Matrix (CAM) keyboards for requesting parameter printout and summary transmission to GSFC/MSCC. The requests are encoded and transferred to the UNIVAC 1218 by logic mounted in Telemetry Output Buffer No. 2 (TOB-2). The FCC display panel at Cape Kennedy also includes a 3-decimal visual display used to display the first parameter of a selected printout. Also in each console is a teletype printer (RO) used to print out the parameters selected for flight controller aid.

Pulse-Code-Modulated Data Handling Equipment (PCM–DHE)

All stations included in the network use PCM telemetry. The station accepts the serially transmitted data from the spacecrafts, signal conditions the pulse train, assembles the 8-bit data word, and transfers that word to the telemetry output buffers in parallel.

Telemetry Output Buffers (TOB)

A telemetry output buffer is associated with each PCM station with the exception of the downrange AMR sites. Each TOB is capable of buffering either Gemini or Agena telemetry data for use in the FCC as well as transfer data to the computer buffers, which in turn communicate with the computer. Significant with the TOB's is that the computer telemetry buffers as well as the logic for the Computer Address Matrix (CAM) and the station GMT clock-computer buffer are located in one drawer in TOB-2.

Computer Address Matrix (CAM)

The computer address matrices, shown in Figure 7, are used to generate requests identifying data to be transmitted to GSFC/MSCC in the summaries or to be displayed by printout at the FCC. The request is generated at the CAM keyboards mounted on the front panels of the FCC. The CAM logic electronics accumulates the request word and generates an interrupt. After the computer answers the interrupt, the request word is transferred to computer memory for decoding. The CAM electronics are located in TOB-2.

The CAM keyboard has four rows of five keys each. Rows 1 and 2 are used to generate identifiers for the particular system and operational mode; rows 3

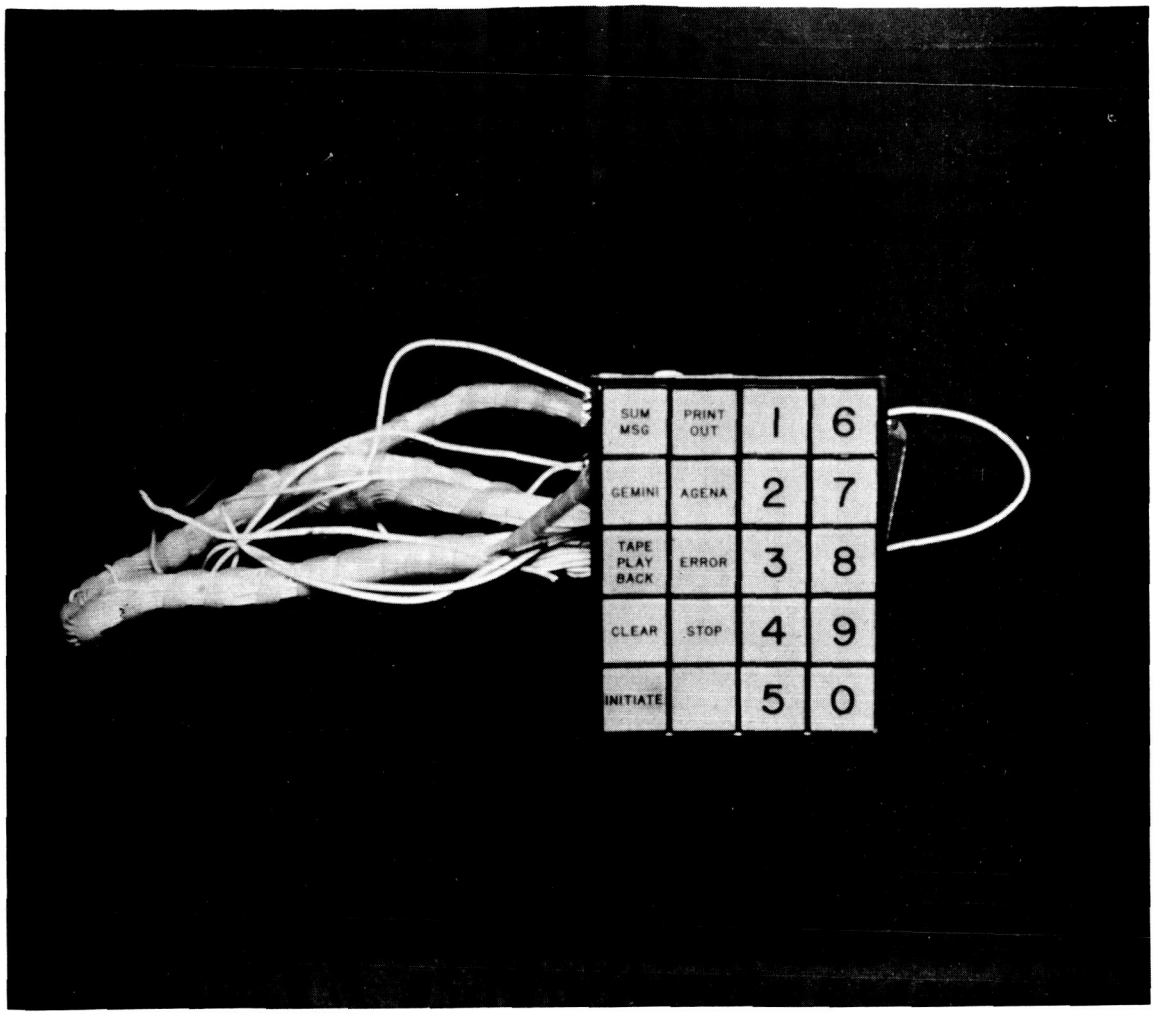


Figure 7—Computer address matrix.

and 4 are used to select the 3-decimal character data identifier. Each key generates the 1-2-4-8 Binary Coded Decimal (BCD) representation for decimal digits 0 through 9. The binary representation normally associated with a decimal zero (0000) is considered illegal in this system; therefore, a BCD 1010 is assigned to decimal zero. The normal zero representation is used to designate an error. Each printout and summary request consists of three fields. The 3-decimal characters occupy bit positions 0 through 11. Bit position 12 is used for the Agena flag bit, with bit position 13 assigned to the Gemini flag bit. The operational mode flag bits are assigned to bit positions 14 through 17 as shown on page 11.

Bit Position	Key Label	Function
15	PRINTOUT	Actuates readout function at the FCC digital display and printer
16	STOP	Stops a long-list printout
14	TAPE PLAYBACK	Place a flag bit in the request word to notify the program to prevent time errors when operating in the playback mode. Signifies that the time comparisons in the computer are not referenced to real GMT. Also to insert a tape playback notification in sum headers.
17	SUMMARY	Actuates the data summary transmission to GSFC/MSCC

Each printout or summary transmission is identified by spacecraft (Gemini or Agena) and a 3-decimal digit number.

Computer Address Matrix Operation

When the operator actuates the INITIATE key and the PRINTOUT pushbutton is lit, the parameter list identified by the request word will be printed out on the associated printer. When the operator requests a long-list printout, he may stop the printout at any point by depressing the STOP and INITIATE pushbuttons. On a short-group parameter printout, the operator may repeat the printout as often as desired by merely depressing the INITIATE pushbutton. Repetition of the printout does not require repetitive "inputting" of the request word; however, should the operator desire another parameter or group, he MUST actuate the CLEAR and then insert the new request word and reINITIATE.

Operation in the SUMMARY mode is identical with that of the PRINTOUT mode except that the data are transmitted to GSFC/MSCC via the TTY rather

than printed out. The parameters which make up the different summaries are located in the network support plan manuals for each mission.

Station Equipment Functional Configurations

The equipment complement and functional configurations are established in accordance with the missions assigned to each station. There are five configurations, each designated by number. Six primary stations use the basic station layout; the remaining primary stations use a modification of this layout to fulfill their specific requirements. Three secondary stations are located downrange in the Atlantic Missile Range.

Primary Station, Configuration 1

This station layout is shown in Figure 8 and is used at the following stations: Canary Islands; Carnarvon, Australia; Coastal Sentry Quebec; Rose Knot Victor; Kauai, Hawaii; Guaymas, Mexico; and Wallops Island, Virginia. Wallops Island is used for training purposes only and is not actually "plugged into" the data acquisition network during operation.

Primary Station, Configuration 2

This configuration, shown in Figure 9, is used at Cape Kennedy, Florida, and includes the 3-character digital display for displaying the first parameter in a PRINTOUT list. This station also receives the 2 kilobit/sec data transmitted from Bermuda and Grand Turk Island (before it is converted to transmit 40.8 kilobit/sec rate data) and is "reformatted" for low-speed summaries and flight controller displays.

Primary Station, Configuration 3

Shown in Figure 10, this is used at the Bermuda primary station. The prime mode of operation at this station is high-speed transmission. As a backup, low-speed summaries can be generated and transmitted to GSFC/MSCC for further computations. The high-speed mode is used to transfer data (at 2 kilobits/sec) over a voice line to Cape Kennedy for summary generation and on-line printout.

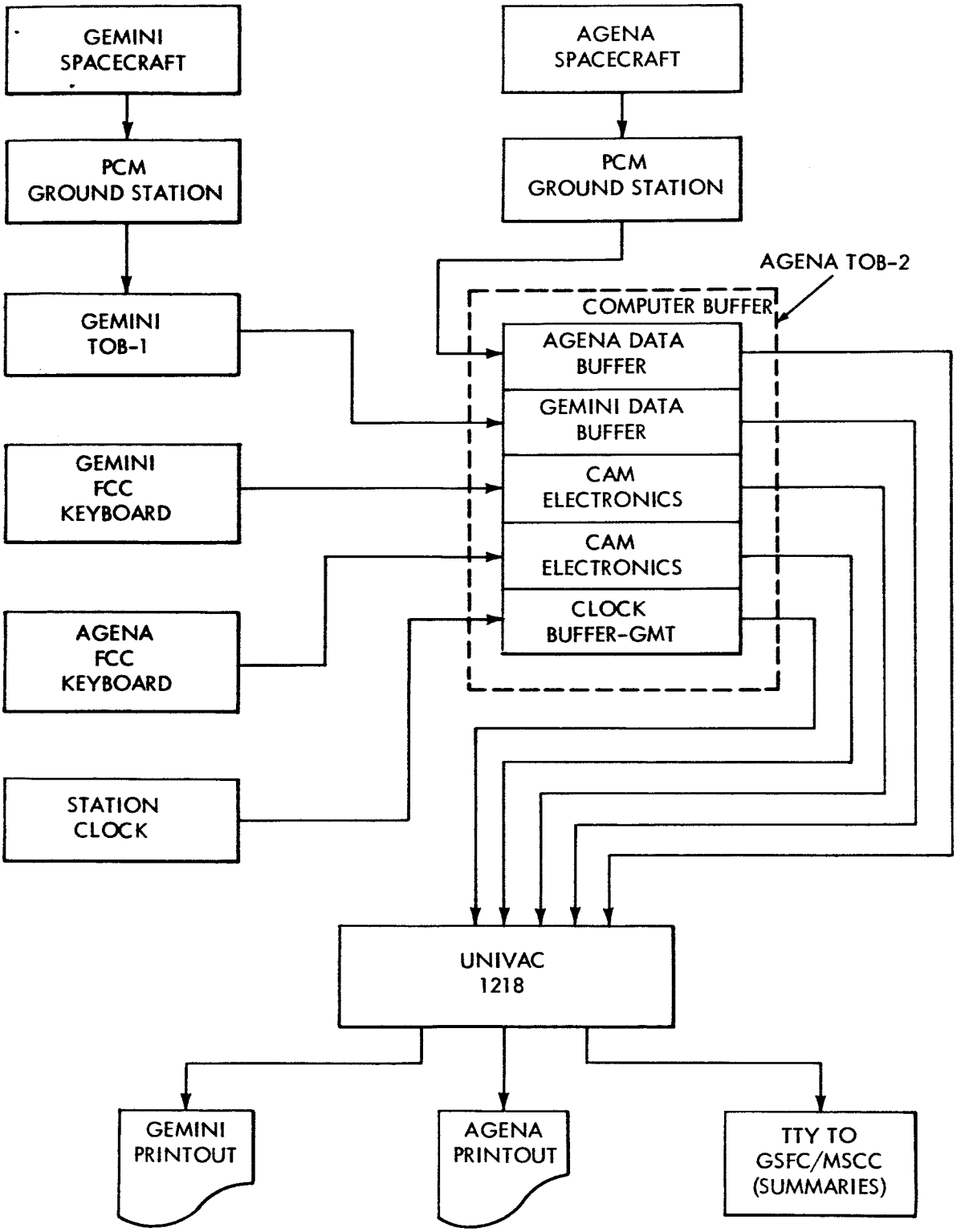


Figure 8—Primary station, configuration 1.

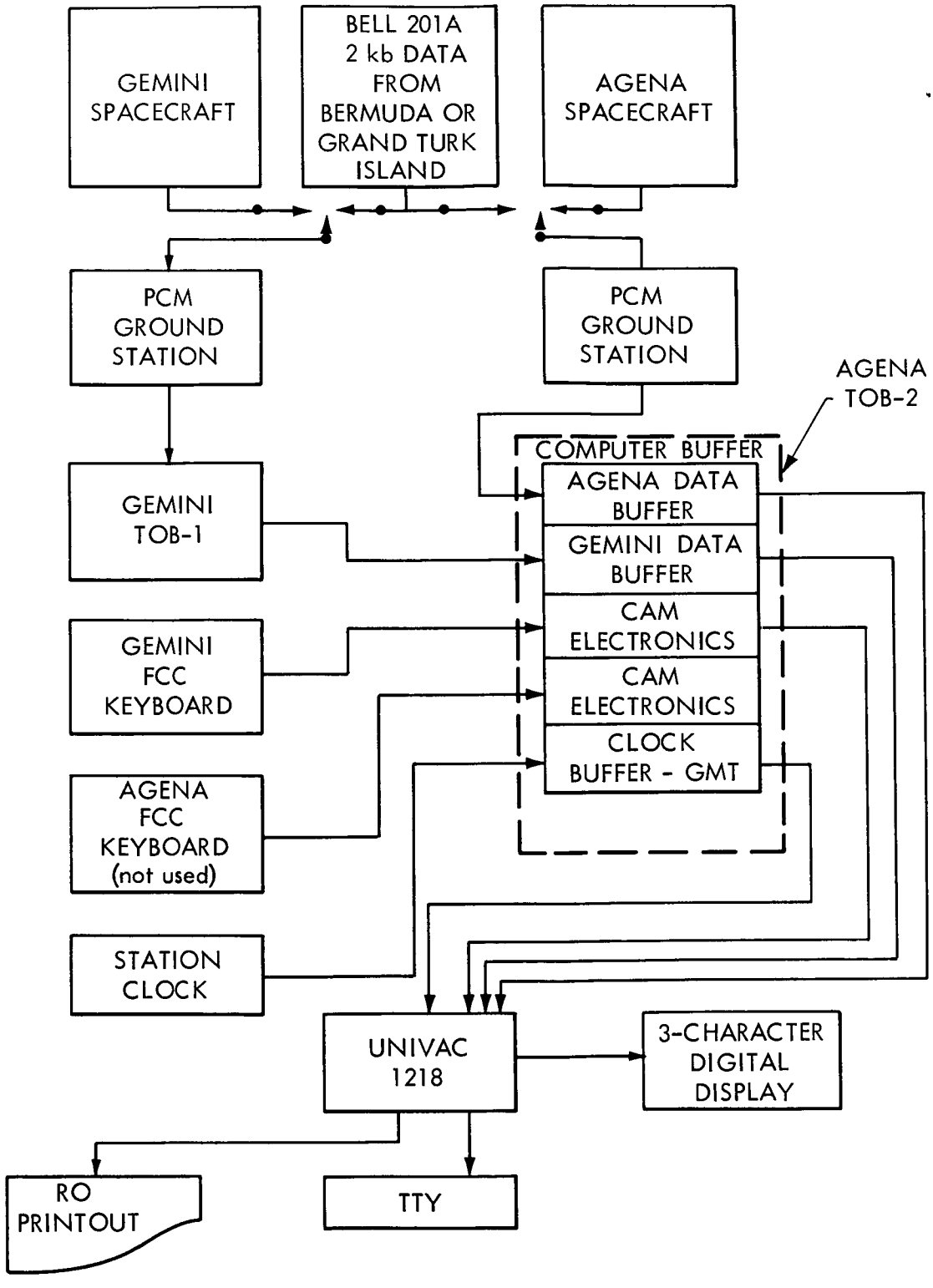


Figure 9—Cape Kennedy primary station equipment, configuration 2.

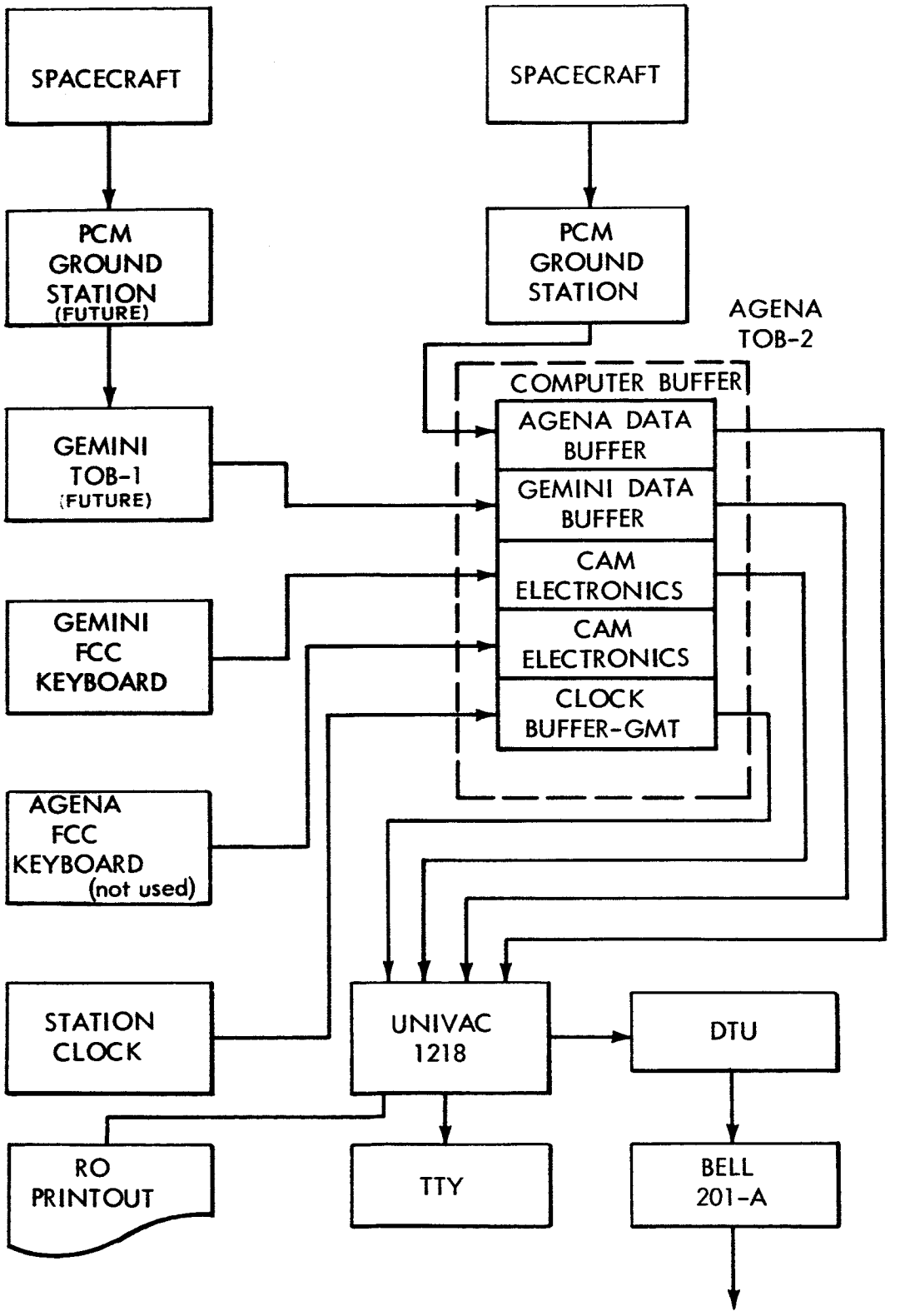


Figure 10—Bermuda primary station equipment, configuration 3.

Primary Station, Configuration 4

Configuration 4 is installed at Corpus Christi, Texas. This layout includes both the low-speed and the high-speed prime configurations. Until MSCC is operational, the low-speed transmission mode will be employed. Afterward, the high-speed mode of operation will be prime.

Secondary Stations, Configuration 5

Configuration 5 is used at the secondary stations located at Grand Turk Island, Grand Bahama Island, and Antigua. These stations transmit multiplexed Gemini and Agena data to Cape Kennedy for summary generation and display. They form an operational complex (Figure 11) which permits only one site to be "plugged in" at a time. The equipment configuration for this complex is shown in Figure 12. The data transmission will be at the 40.8 kilobit/sec rate.

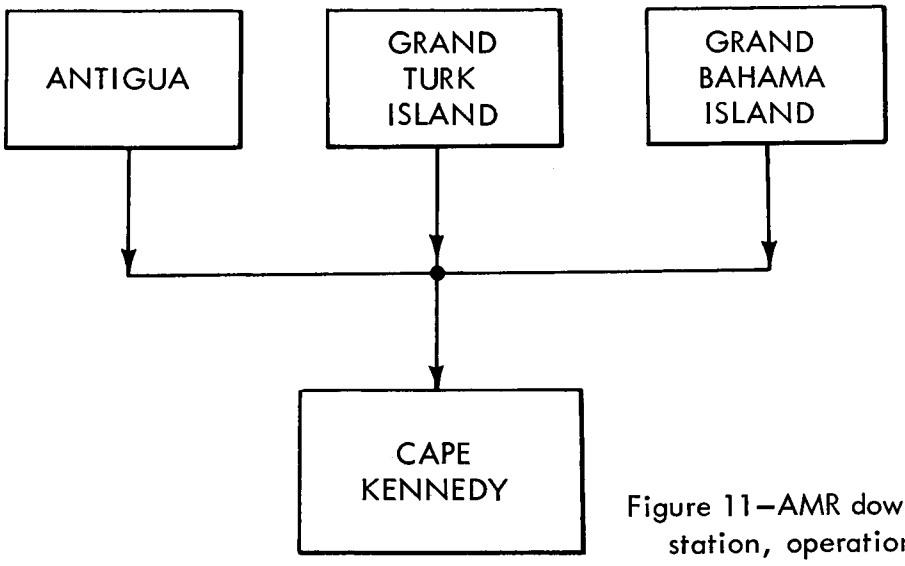


Figure 11—AMR downrange secondary station, operational data flow.

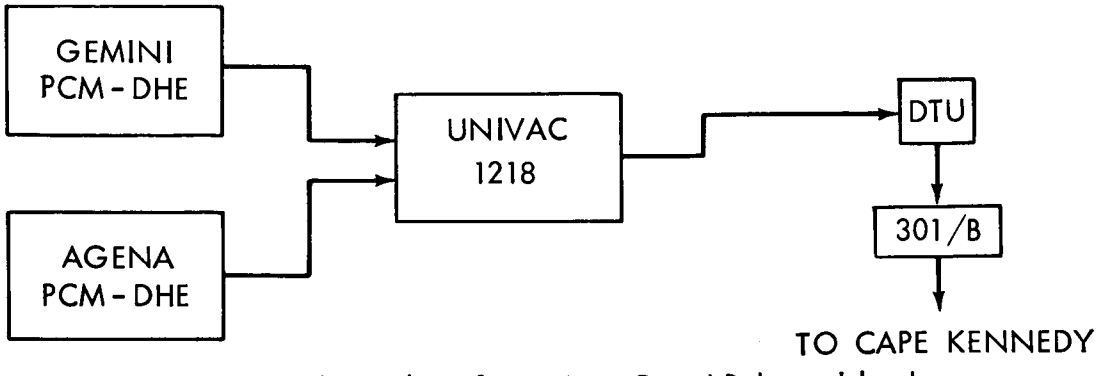


Figure 12—Special configuration—Grand Bahama Island, Grand Turk Island, and Antigua.

TOMCAT PROGRAMS

There are presently four TOMCAT programs written to fulfill the requirements of the system. Subsequent volumes will contain the detailed information of these programs.

TOMCAT I

This computer program is located at configuration 1 tracking sites in the network. These are required to receive both Gemini and Agena Data that is presented in the Real-Time, or Tape Playback (Real-Time and Dump) Modes. This data is then made available to the Flight Controllers through the RO and to the network through the TTY.

TOMCAT II

This computer program is located at Configurations 3 and 4 tracking sites in the network, and are required to receive Gemini data in either Real-Time or Tape Playback Modes. The program is then required to compress and edit the data that it is receiving, and transmit this new data train over the 2 kilobit transmitting facilities.

TOMCAT III

This computer program is located at Cape Kennedy only (configuration 2). It is designed to accept: 1) Gemini and Agena Data in the Real-Time or Tape Playback Modes, 2) the transmitted 2 kilobit data, and 3) the 40.8 kilobit transmission. The program will also be able to present this data to either the RO or the TTY.

TOMCAT IV

This computer program is designed to accept the entire "Live" or Tape Playback data train at a 51.2 kilobit rate. It then edits this train of data reducing its contents to a 40.8 kilobit size and then transmits this new train of data from the respective AMR tracking site to Cape Kennedy. This new train of data contains all of the information that any TOMCAT program in existence now is expected to handle. The PCM handles this train of data differently so that it might give the TOMCAT III program the data in exactly the same form as if it were Gemini or Agena Data in either the Real-Time or Tape Playback Modes. This program is located at all configuration 5 sites.

TELEMETRY ON-LINE MONITORING, COMPRESSION, AND TRANSMISSION SYSTEM (TOMCAT)

Section II

(Prepared by William E. Willis, Jr.)

INTRODUCTION

The purpose of this section is to explain in detail the procedures and methods employed in accomplishing the installation, checkout, and operation of the UNIVAC 1218 Computer System along with the associated interfacing which was required at each of the Gemini tracking stations.

Since this installation was accomplished in phases due to modularity of the overall system, an attempt will be made to describe each phase. In accomplishing this installation using the methods which are described herein, many errors were detected (i.e. miss-wiring, bad cables, bad switches, bad circuit modules) however, these will not be discussed in this text.

The primary purpose of this testing was to assure that upon completion of the final phase, the entire system was working as required for Gemini Mission Support. This document describes one method which was used and does not necessarily mean that other methods of system testing could not be accomplished without obtaining satisfactory results.

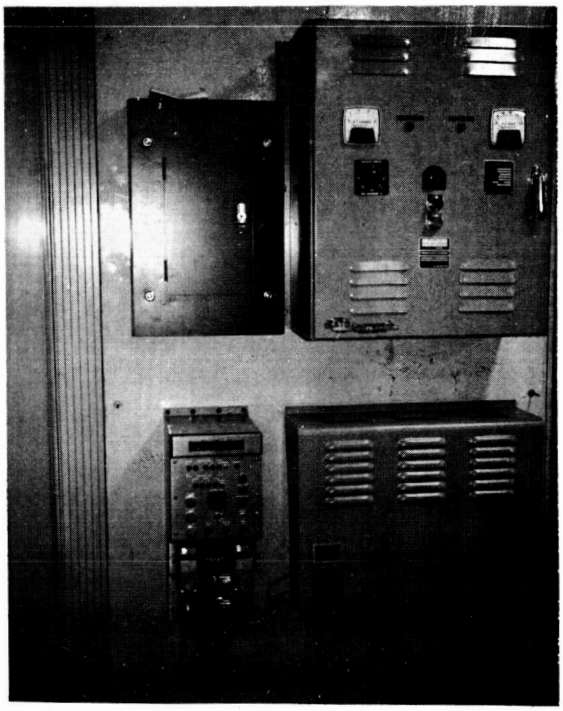
PHASE I. Physical Installation and Acceptance Testing

Engineering Instructions (EI) were prepared and sent to each site. The following paragraphs list and describe the logical order of events in which the physical installations were accomplished. Cable wiring tabulations, subsystem test programs and the Engineering Instructions are contained as attachments to this document.

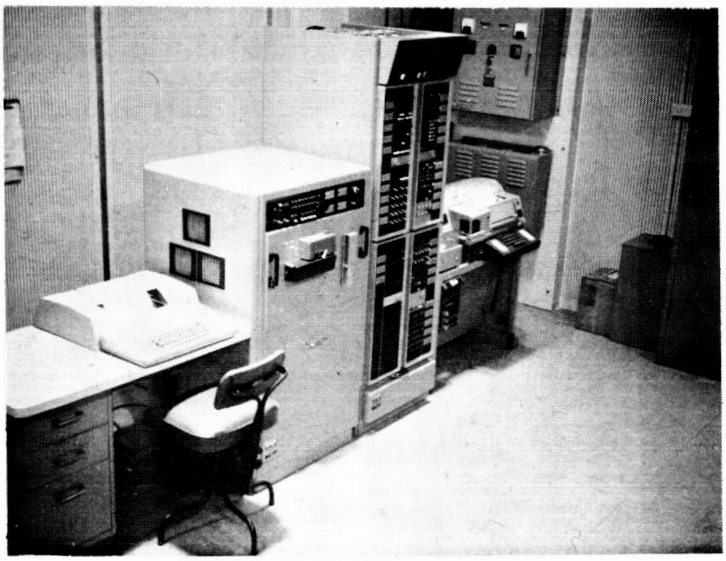
1. Installation of power cable, circuit breakers for 400 cycle and 60 cycle power.

2. Prepare the floor for placing the 1218 Computer in its proper place.

3. Locate the wall mount adapter 1262.



4. Input/Output console, 1218 Computer and 1259 TTY all in line and install cables associated with computer system configurations.



5. Perform acceptance test on UNIVAC 1218 Computer System

   MG and MG Controller
   1262 Wall Mounted Adapter
   1259 TTY Unit and Adapter
   1232 Input/Output Console
   1218 Computer
   and all cables associated with the basic 1218 system as supplied by UNIVAC

6. Start running the cables (also provided by UNIVAC) to the various other subsystems which are included in the overall configuration as shown on cable distribution diagrams.

GC-GEM-1002723	Figure 3
GC-GEM-1002728	Figure 4
GC-GEM-1002733	Figure 5
GC-GEM-1002734	Figure 6
GC-GEM-1002746	Figure 7

7. At this point all cables should have been run between the various components but not connected to equipment. These cable numbers are as listed below:

CABLE NUMBER	
W-209	Timing Distribution Frame connector number 10J22 to the Telemetry Output Buffer #2, connector 1J28
W-301	Agena System Console unit number one computer address matrix connector 1J11 to the Telemetry Output Buffer #2, connector 1J29
W-311	Gemini System Console unit number three computer address matrix connector 3J11 to the Telemetry Output Buffer #2, connector 1J15
W-306	Agena Console unit number one R.O. Teletype, connector 1J20 to a terminal board TB1A, terminal 1 and 2, which is to be mounted in the near vicinity of the UNIVAC 1262 Wall Mounted Adapter

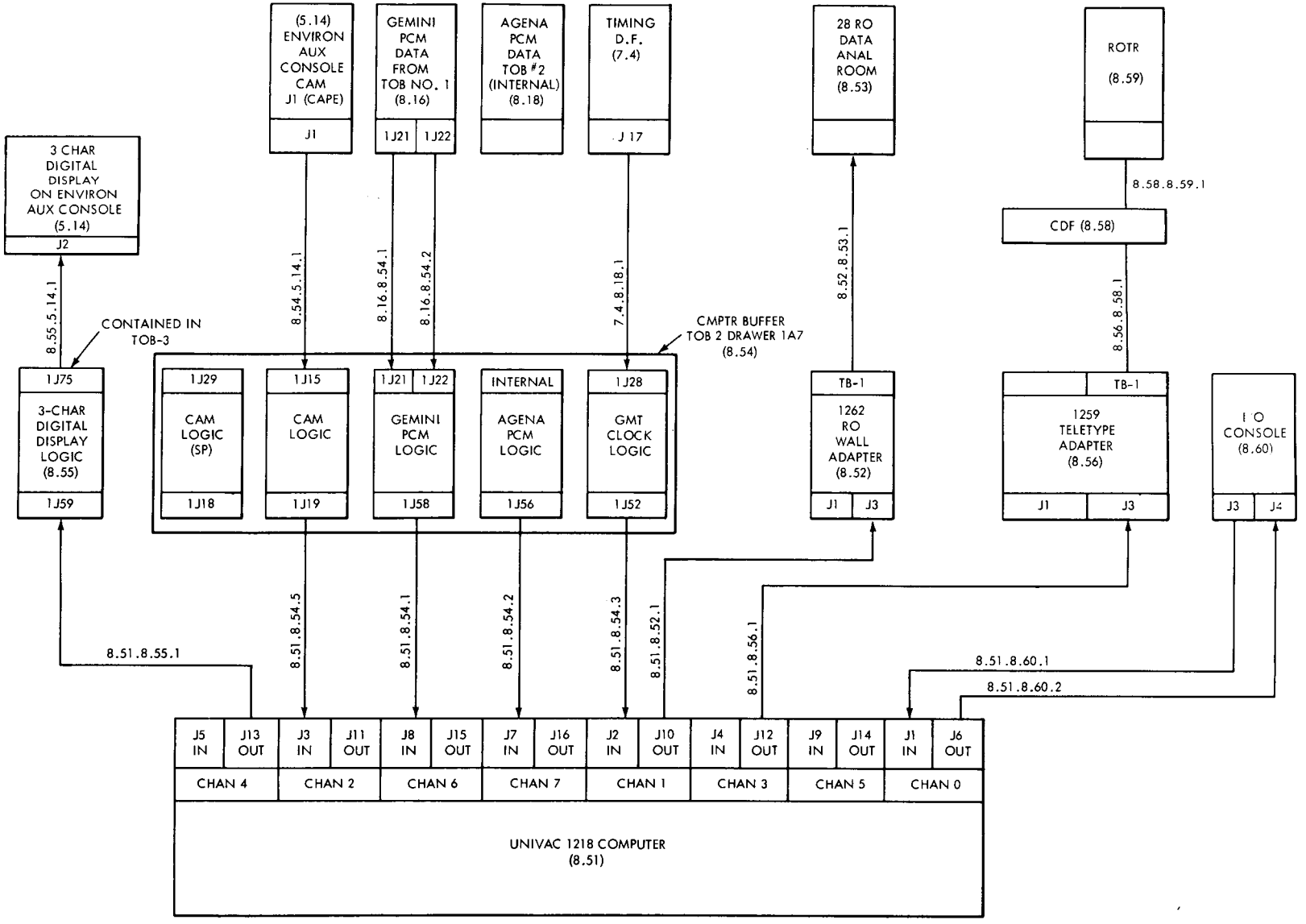


Figure 3—Cable and distribution list - Cape Kennedy only.

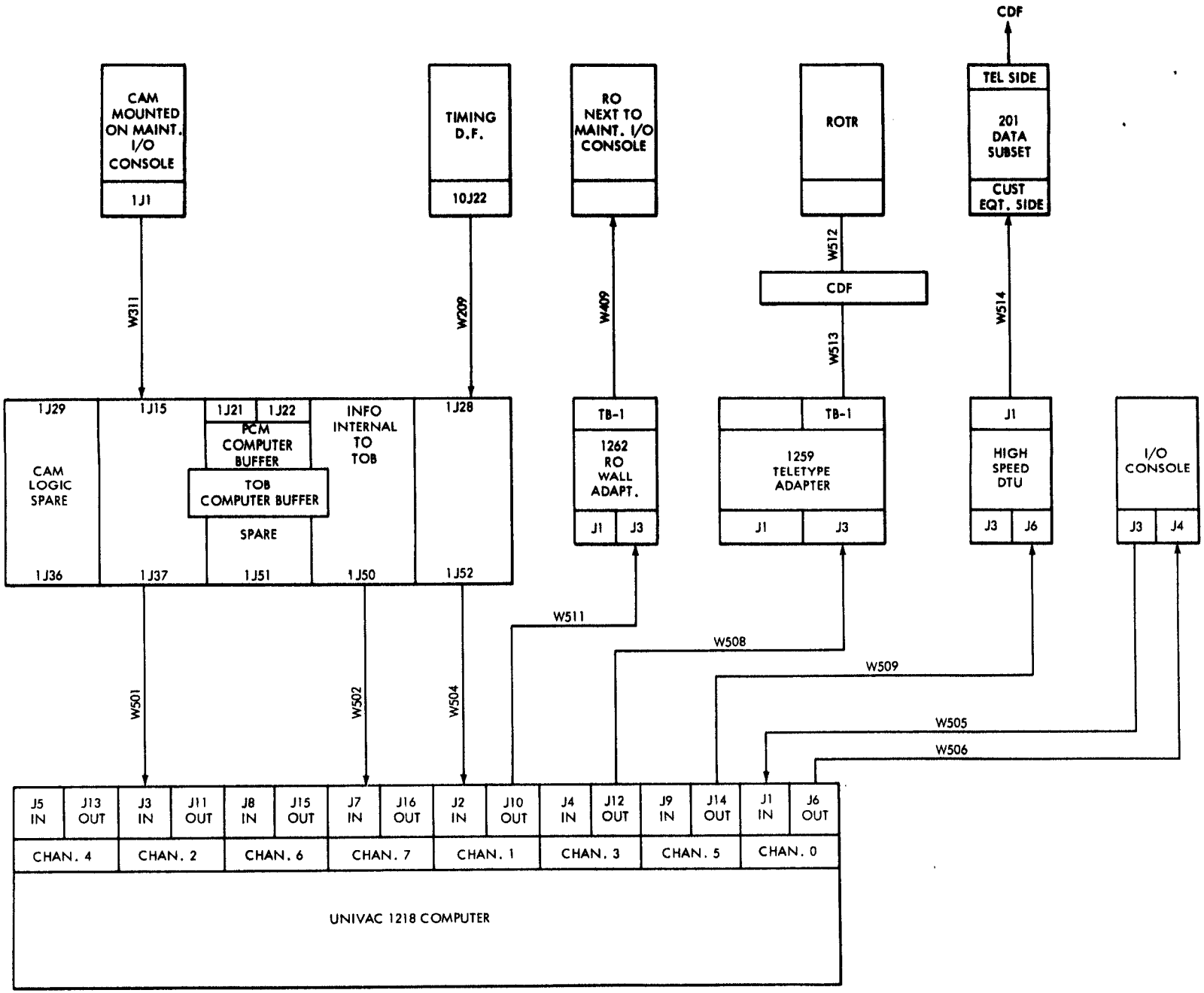


Figure 4—Cable distribution diagram - BDA only.

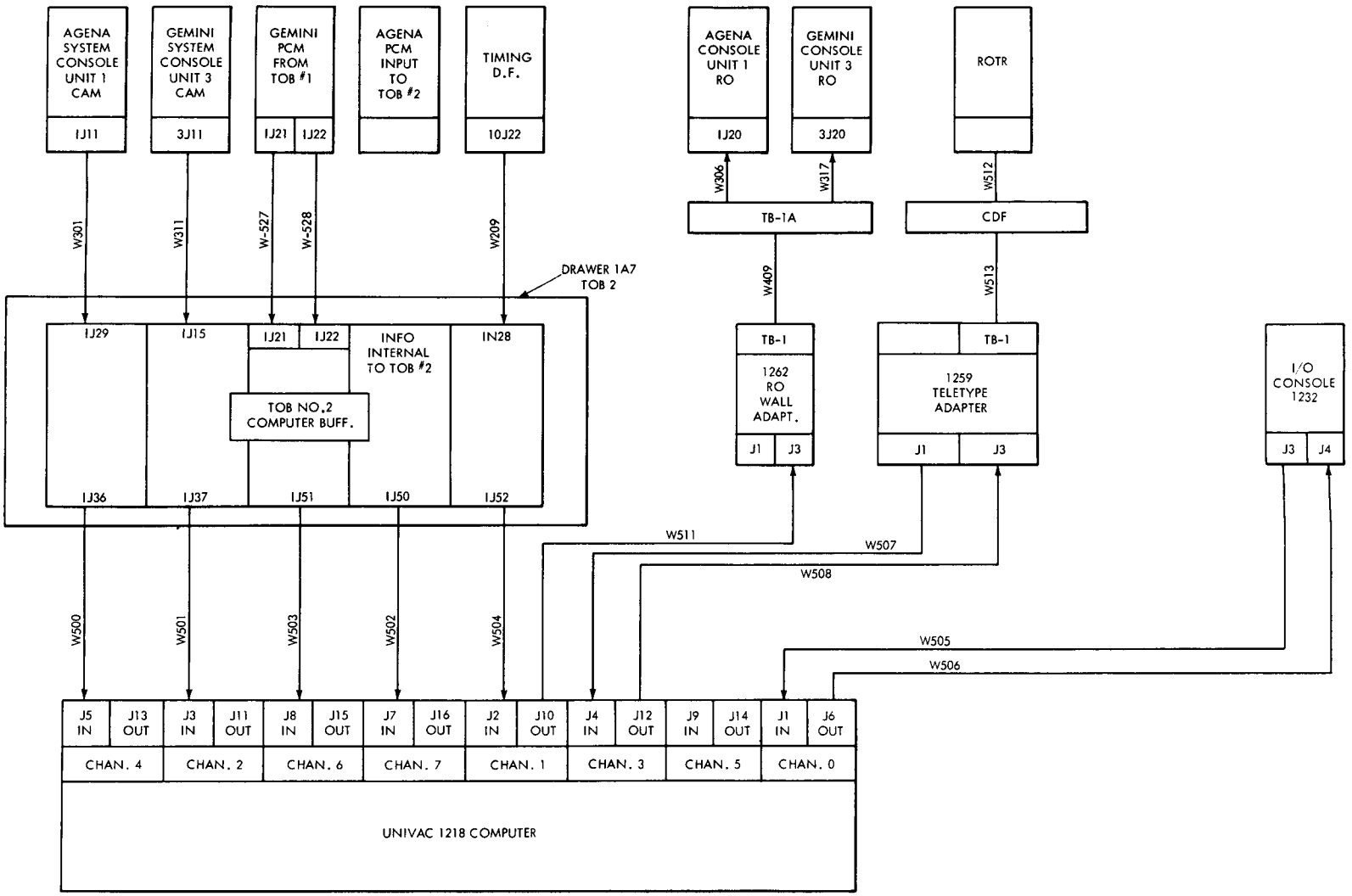


Figure 5—Cable and distribution diagram - CYI, CRO, HAW, GYM, WLPS.

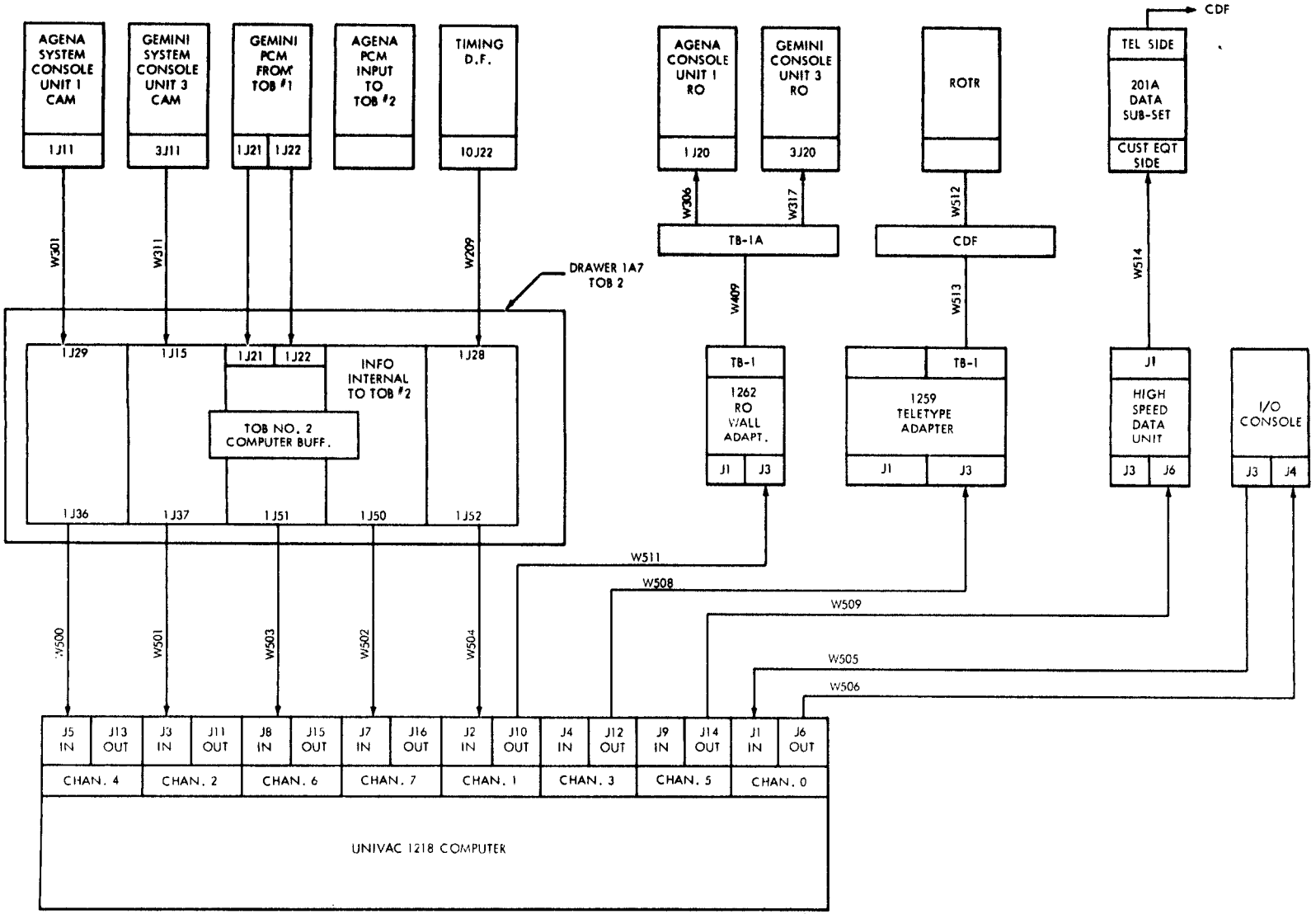


Figure 6—Cable and distribution diagram - Tex only.

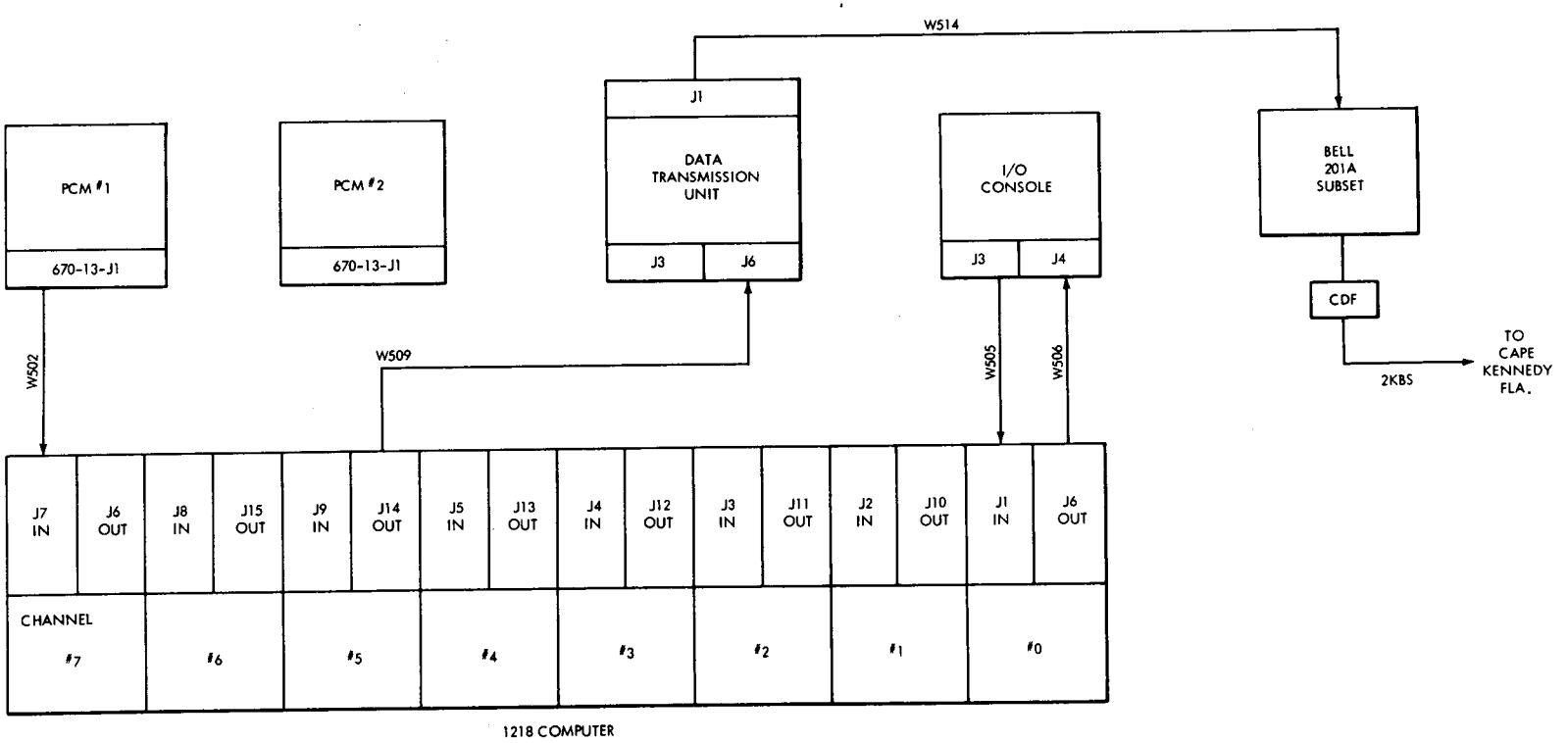


Figure 7—Signal cable distribution diagram, Grand Turk Island for the GT-2 Mission only.

CABLE NUMBER	
W-317	Gemini Console unit number three R.O. Teletype, connector 3J20 to a terminal board TB1A, terminals 3 and 4 which is to be mounted in the near vicinity of the UNIVAC 1262 Wall Mounted Adapter
W-409	Terminal board TB1A to terminal board TB1 located on the UNIVAC 1262 Wall Mounted Adapter. Instructions for connecting these wires can be obtained from drawing number GC-GEM-1002718, Rev. C, Figure 8.
W-500	Telemetry Output Buffer number 2, connector 1J36 to the UNIVAC 1218 Computer, channel number 4 input connector J5
W-501	Telemetry Output Buffer number 2, connector 1J37 to the UNIVAC 1218 computer, channel number 2 input connector J3
W-503	Telemetry Output Buffer number 2, connector 1J51 to the UNIVAC 1218 Computer, channel number 6 input connector J8
W-502	Telemetry Output Buffer number 2, connector 1J50 to the UNIVAC 1218 Computer, channel 7 input connector J7
W-504	Telemetry Output Buffer number 2, connector 1J52 to the UNIVAC 1218 Computer, channel 1 input connector J2
W-505	UNIVAC 1232 Input/Output Console, output connector J3 to the UNIVAC 1218 Computer, channel 0 input connector J1
W-506	UNIVAC 1232 Input/Output Console, input connector J4 to the UNIVAC 1218 Computer, channel 0 output connector J6
W-507	UNIVAC 1259 Teletype Adapter, connector J1 to the UNIVAC 1218 Computer, channel 3 input connector J4 (this cable is installed to accomplish BST's and DST's). At the present time there are no input requirements which warrant the use of this cable during actual mission operations.

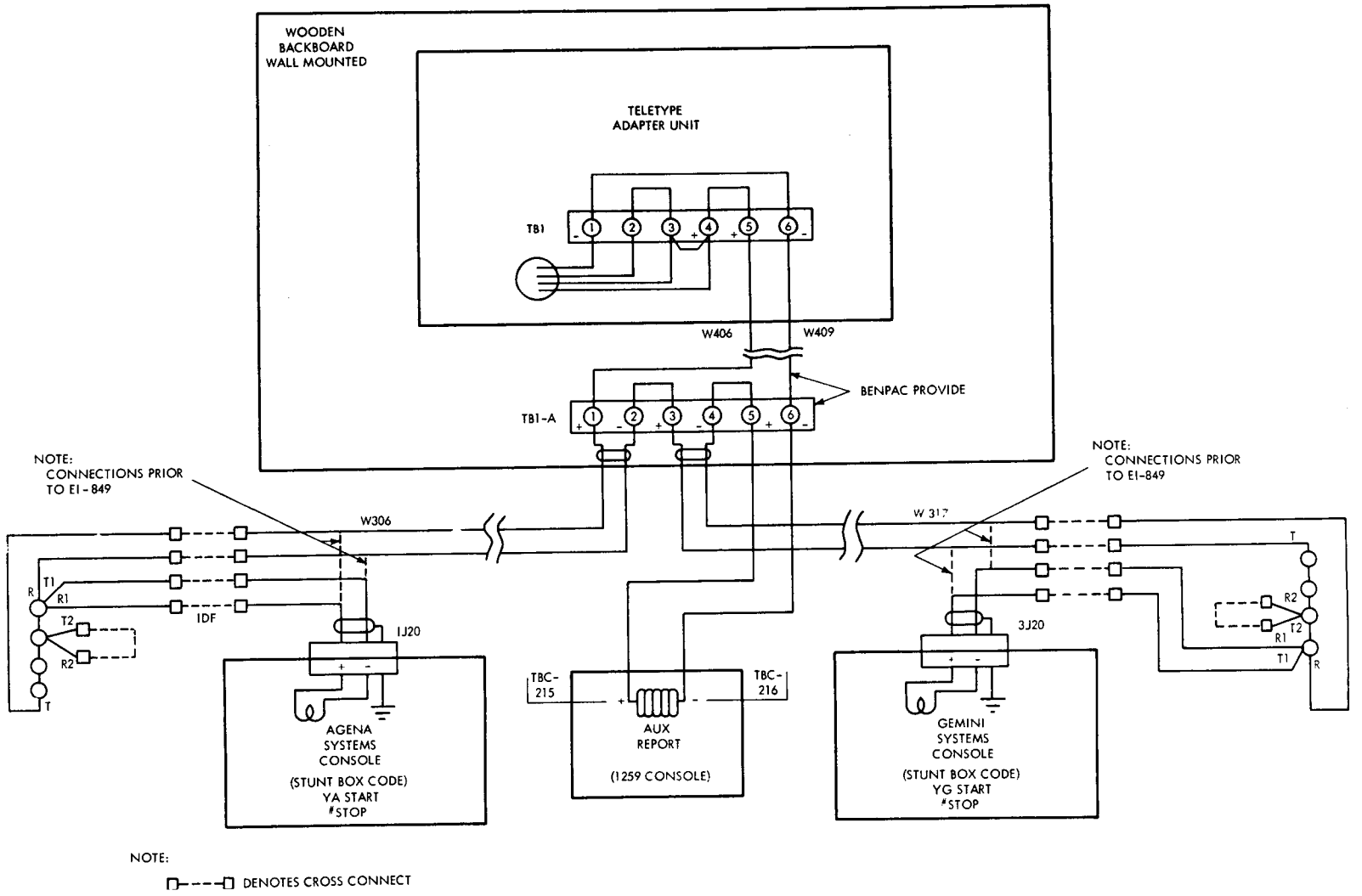


Figure 8—Gemini/Agena systems console teletype RO wiring diagram.

CABLE NUMBER	
W-508	UNIVAC 1259 Teletype Adapter connector J3 to the UNIVAC 1218 Computer, channel 3 output connector J12
W-511	UNIVAC 1262 Wall Mounted Adapter, connector J3 to the UNIVAC 1218 Computer channel
W-512	Site's Central Distribution Frame to the input terminal of a 100-wpm ROTR which will be installed in the Communications Area for retransmission at 60 wpm on regular TTY lines to the GSFC IBM 7094 computers. (Connection terminal numbers are to be decided by Site Commo Supervisor.)
W-513	Site's Central Distribution Frame to the 1259 Teletype Adapter, terminal TBC 132 and 133. (Polarity of the connection is not a factor in this case since a dry relay closure is being provided only.)
W-527	Telemetry Output Buffer number 2, connector 1J21 to the Telemetry Output Buffer number 1, connector 1J21
W-528	Telemetry Output Buffer number 2, connector 1J22 to the Telemetry Output Buffer number 2, connector 1J22

With all cables, as described above installed, we are ready to start the first interface checks.

PHASE II. Interface Checks with Computer Buffer

The computer buffer unit consists of one tray of logic which is contained in drawer 1A7, TOB #2. Logic in the computer buffer functions to provide an interface for entry into the UNIVAC 1218 Computer. This interface is composed of two channels of Pulse Code Modulation Data (PCM), two flight controller computer address matrices (CAM), and a Greenwich Mean Time Clock (GMT). Figure 9 illustrates the block diagram association of the computer buffer unit with respect to the two output buffer units, flight controller console, time reference equipment and the computer. A check list, which was used to check all operations pertaining to the output logic of the computer buffer, follows.

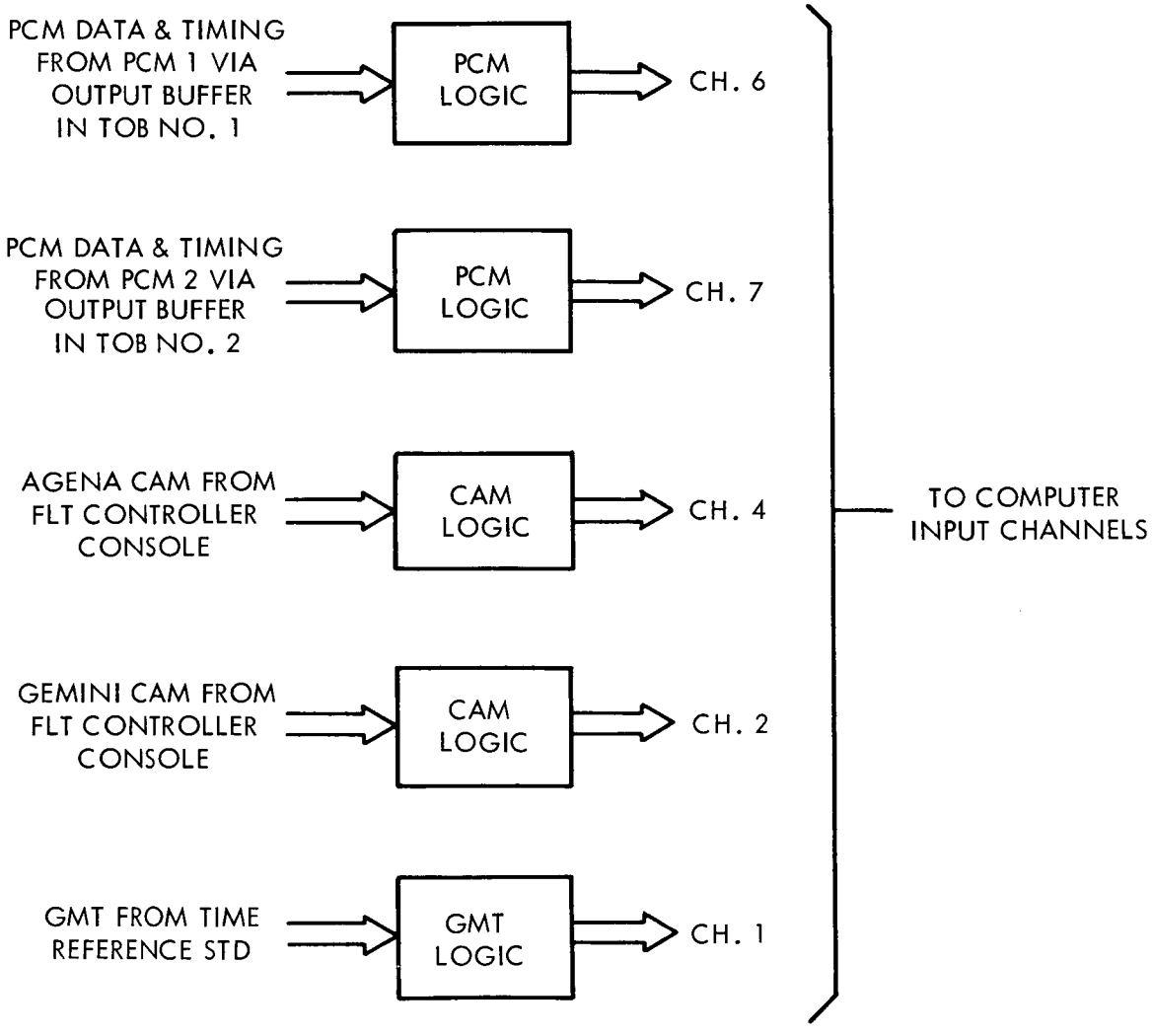


Figure 9—Functional division of computer buffer unit, block diagram.

ON SITE ACCEPTANCE TEST CHECK LIST COMPUTER BUFFER
TOB TRAY 1A7

Date: June 28, 1964 Serial No. Carnarvon Tracking Station

Test 1. Initial Condition Relay

1. Agena CAM Logic OK
2. Gemini CAM Logic OK
3. PCM 1 Logic OK
4. PCM 2 Logic OK
5. GMT Logic OK

Test 2. GMT Clock Logic

1. IPPS Derivation Logic OK
2. Interrupt & Ack. OK
3. Seconds decade (@ 1 PPS)
   - 8. OK
   - 4. OK
   - 2. OK
   - 1. OK

   10's Seconds decade (@ 100 PPS)
   - 4. OK
   - 2. OK
   - 1. OK

   Minutes decade (@ 100 PPS)
   - 8. OK
   - 4. OK
   - 2. OK
   - 1. OK

   10's Minutes decade (@ 1,000 PPS)
   - 4. OK
   - 2. OK
   - 1. OK

   Hours decade (@ 1,000 PPS)
   - 8. OK
   - 4. OK
   - 2. OK
   - 1. OK

Test 3. Gemini PCM Logic (PCM 1)

1. FG #1 Reset OK
2. Strip Pulses (all 4 lines) OK
3. Sync Status Lines
   a. Frame Lock OK
   b. SF1 Search OK
4. Computer Interrupt & Ack. OK
5. Computer Input Request & Ack. OK
6. Format Indication
   a. Gemini Real Time (F1) OK
   b. Gemini Dump (F2) OK
   c. Agena Real Time (F3) OK
   d. Agena Dump (F4) OK
7. Data Lines
   a. 128 Bit OK
   b. 64 Bit OK
   c. 32 Bit OK
   d. 16 Bit OK
   e. 8 Bit OK
   f. 4 Bit OK
   g. 2 Bit OK
   h. 1 Bit OK

Test 4. Agena PCM Logic (PCM 2)

1. FG #1 Reset OK
2. Strip Pulses (all 4 lines) OK
3. Sync Status Lines
   a. Frame Lock OK
   b. SF1 Search OK
4. Computer Interrupt & Ack. OK
5. Computer Input Request & Ack. OK
6. Format Indication
   a. Gemini Real Time (F1) OK
   b. Gemini Dump (F2) OK
   c. Agena Real Time (F3) OK
   d. Agena Dump (F4) OK
7. Data Lines
   a. 128 Bit OK
   b. 64 Bit OK
   c. 32 Bit OK
   d. 16 Bit OK
   e. 8 Bit OK
   f. 4 Bit OK
   g. 2 Bit OK
   h. 1 Bit OK

Test 5. Agena C.A.M. Logic

1. Interrupt and Computer Ack. OK
2. Functional Switches
   a. Summary OK
   b. Print Out OK
   c. Gemini OK
   d. Agena OK
   e. Tape PB OK
   f. Stop OK
3. BCD Register

100	OK	10	OK	1	OK
200	OK	20	OK	2	OK
400	OK	40	OK	4	OK
800	OK	80	OK	8	OK

4. Error Indication (All 10 lines) OK

Test 6. Gemini C.A.M. Logic

1. Interrupt and Computer Ack. OK
2. Functional Switches
   a. Summary OK
   b. Print Out OK
   c. Gemini OK
   d. Agena OK
   e. Tape PB OK
   f. Stop OK
3. BCD Register

100	OK	10	OK	1	OK
200	OK	20	OK	2	OK
400	OK	40	OK	4	OK
800	OK	80	OK	8	OK

4. Error Indication (All 10 lines) OK

Test 7. Acknowledge Fault Relay

a. Agena C.A.M. OK

b. Gemini C.A.M. OK

c. GMT Clock OK

d. PCM 1 OK

e. PCM 2 OK

Wm. C. Hilliard Jr.
Test Performed By

H. S. Henderson Jr.
RADIATION, INC. Representative

Wm. C. Hilliard Jr.
NASA Representative

System Interfacing with TOB #2 Drawer 1A7

Telemetry data, which are transmitted by the Agena and/or Gemini space vehicles, are received and decommutated by two separate PCM systems as shown in Figure 10. These PCM systems are basically similar and differ primarily with regard to the program instituted for each operation.

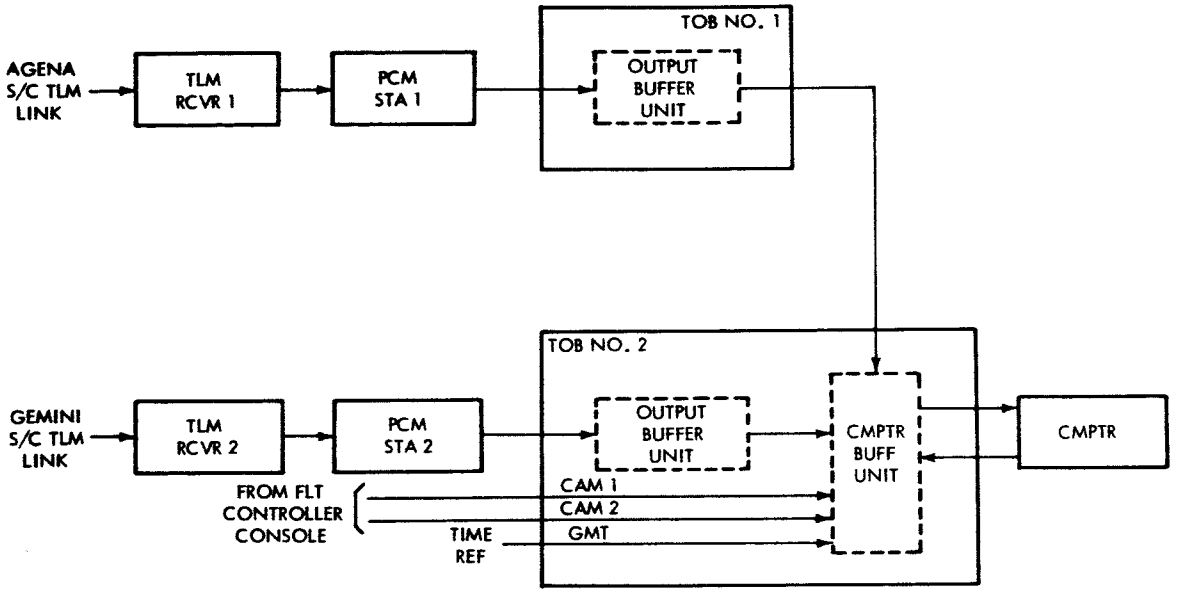


Figure 10—Computer buffer inter-system relationship, block diagram.

The Agena spacecraft telemetry link is normally associated with the PCM system #1 and the Gemini spacecraft normally is identified with PCM system #2. For these reasons, PCM #1 and PCM #2 are interfaced with TOB #1 and TOB #2, respectively. TOB's 1 and 2 have identical output buffer units which provide PCM 1 and 2 outputs, respectively, to the computer buffer contained in TOB #2. DC control levels initiated by the Flight Controller CAM are supplied on two channels, CAM to the computer buffer. Also, the time reference input as received by another system is supplied to the computer buffer as a GMT input. Figure 11 is a block diagram of the functional sections that make up the computer buffer. The two PCM LOGIC blocks contain identical logic circuits and function on either the Agena or Gemini data format without modification. Also, the two CAM LOGIC blocks are identical except one is assigned to function specifically with Agena Flight Controller requests and the other assigned specifically with Gemini Flight Controller requests, however, either CAM can be operated to request the other spacecraft systems information. The Gemini CAM can be operated

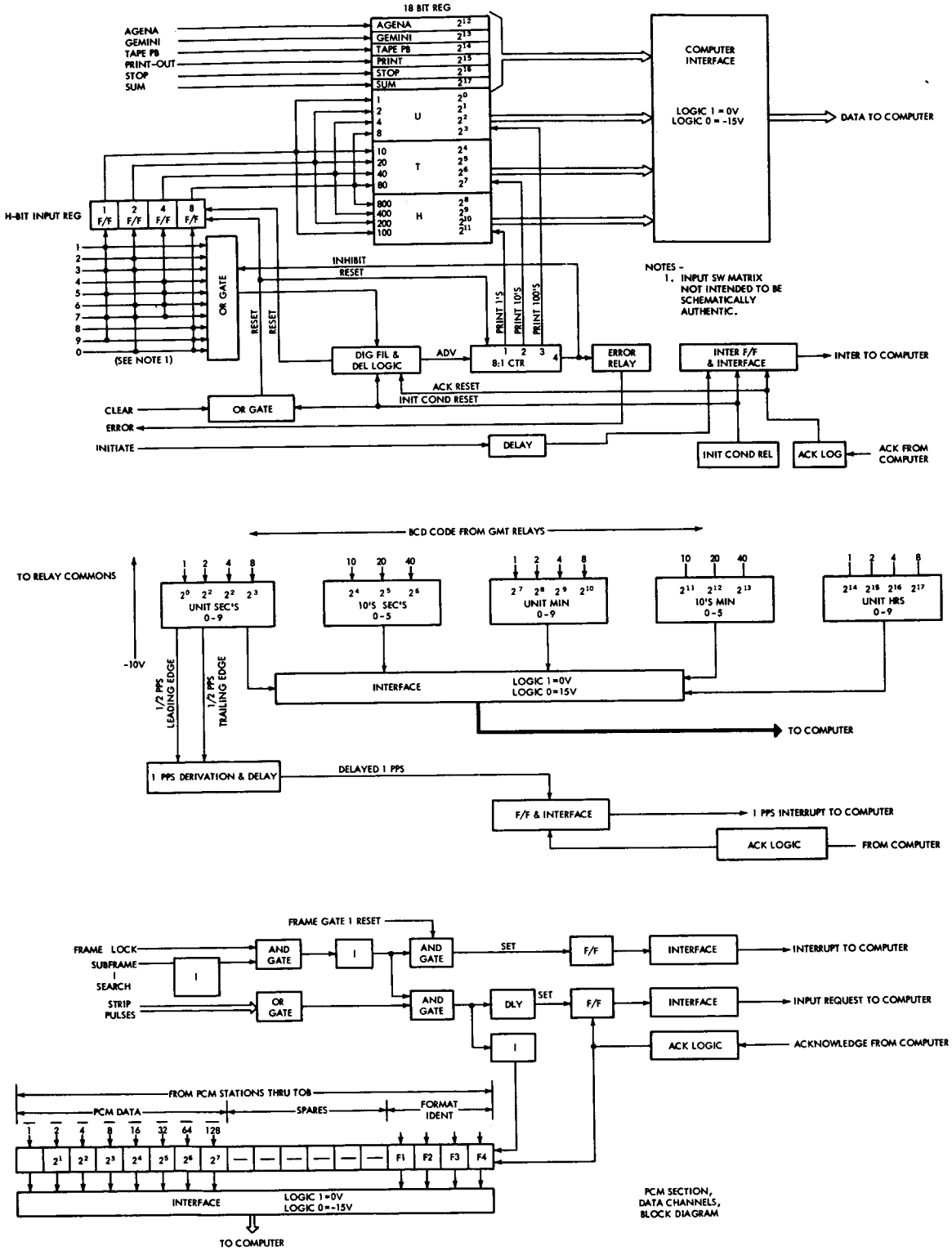


Figure 11—Computer Buffer GMT - Block Diagram

to request Agena systems information and the Agena CAM can be operated to request Gemini systems information. The GMT LOGIC is a single channel which contains time in one second pulses for application to the computer program as an up-dated time tag reference.

CAM Logic Circuits

General - The CAM logic circuits are comprised of two identical channels which function with the Agena or Gemini computer storage data. The CAM logic provides the Flight Controller with the ability to generate an 18-bit code address for computer control. For purpose of this discussion, the name "Flight Controller" will be referred to as "operator". Figure 12 illustrates a typical four-by-five switch panel of a type that is provided in each Flight Controller Console. The following characteristics are associated with each switch action on the CAM.

a. SUM-MSG and PRINT-OUT are latching switches as only one can be engaged at a time, never both at once.

b. Agena and Gemini are latching as defined above.

c. TAPE PLAYBACK is an alternate action type.

d. CLEAR is a momentary action type.

e. INITIATE is a momentary action type.

f. STOP is an alternate action type.

g. ERROR is an indicator only.

h. 1 through 0 are momentary action switches.

Control Functions - Six bits of data are directly controlled by the SUM (summary), PRINT-OUT, A (Agena), G (Gemini), TAPE PB (tape playback), and STOP switches. The remaining 12 bits are generated by depressing a choice of three decimal switches (1 through 0, inclusive). These decimal switches generate a 12-bit 1-2-4-8 BCD word that selectively ranges from 000 to 999. The CLEAR and INT (initiate interrupt) switches, including the ERROR indicator, do not contribute to the 18-bit word structure. The CLEAR indicator clears only the output register of the CAM buffer and the INT switch provides an external interrupt to the computer causing it to read the data which is presently setting on the computer input lines.

SUM MSG	PRINT OUT	1	6
AGENA	GEMINI	2	7
TAPE PLAY BACK	ERROR	3	8
CLEAR	STOP	4	9
INITIATE		5	0

Figure 12—Typical switch configuration for controlling Agena and Gemini CAM from remote location.

CAM Error Conditions - If a fourth decimal switch selection has been accidentally made by the operator, the logic contained in the CAM buffer will process the data as if it were a normal request. However, a counter stage built within the logic block will reach a count of four causing the error indication to light on the CAM matrix. The CAM logic will remain in this state until a clear indication has been given by depressing the CLEAR indicator located on the CAM matrix. The operator can now re-establish his 12-bit code and re-initiate a computer request. Another type error condition can occur when for any reason the operator has not completed his selection, the portion of his request not completed, the CAM buffer register will contain only binary zero codes. A binary zero is sensed by the computer as an error. A decimal 0 (ten) or BCD 12 is sensed as a binary zero by the computer and must be selected when a zero is used in the desired computer address word structure.

Initiate and Acknowledge Functions - The generation of the 12-bit BCD code in the 18-bit register is complete when the operator has completed his third switch depression. At this time, the operator depresses the INITIATE switch which causes a logic 1 to be set in the interrupt logic. This logic, through interface, raises the computer interrupt line. The computer recognizes the interrupt during its normal priority routine (which is normally recognized and serviced within 20 microseconds) and reads the 18-bit data word into its internal memory. The acknowledge logic (in the computer) resets the interrupt logic and thereby removes the interrupt from the computer input lines. The same 12-bit BCD word will remain on the input lines until it has been cleared by the CAM operator. In this manner, it is not necessary for the operator to reset the decimal switch logic for re-initiating the same 18-bit word. When the operator is ready to reinsert a new word, he must depress the CLEAR button to reset the CAM logic to initial zero condition and then reset the switches for the desired word.

PCM Buffer Logic

General - The PCM Logic is illustrated in the block diagram, Figure 11.

NOTE

The following inputs are derived via the TOB from the PCM Ground Station:

a. Twelve bits of data which consist of an 8-bit PCM binary coded data word and four format indicator bits.

b. Four lines providing prepatched strip pulses.

c. F.G. #1 Reset (master frame rate) of 1-second or 2.4 seconds).

d. Two synchronization status lines; frame lock and subframe 1 search.

The eight-bit data words and the four format indication bit appear on the computer buffer's input lines at the word rate of either Gemini or Agena formats. When the pre-patched strip pulses occur, the corresponding data word and format bits are made available for entry in the computer.

Normally, PCM #1 provides Agena data and PCM #2 provides Gemini data to the TOB's, however, the PCM stations may assume either format by

switching inputs and patch panels. The PCM Buffer logic will, therefore, operate with either the Gemini or the Agena format. The input rates are determined by the PCM station from which the inputs are derived.

Agena PCM Data Format -

a. A word rate of 488 microseconds.

b. 128 words/minor frame

c. 16 minor frames per major frame.

A major frame of data occurs at 1-second intervals. Only 125 of the 128 words per frame are loaded into the computer; 125 times 16 equals 2000 strip pulses which occur during the 1-second frame interval.

The beginning of each successive major frame is indicated by a frame gate #1 pulse (FG #1 Reset) from the PCM station.

There is a secondary requirement; when the TOB is accepting data, the PCM station must be in synchronization. Should the frame-lock become out-of-sync or subframe one go into SEARCH, no further data is loaded into the computer, until synchronization has been re-established.

A computer input channel consists of:

a. An 18-bit parallel word entry.

b. An interrupt line.

c. An input request line.

d. An acknowledge line.

The PCM data input channel uses 12 of the 18 bits; the eight LSB (least significant bits) from the PCM stations 64-bit binary multiplex output and the four MSB (most significant bits for the four format indication bits). The six bits remaining are left as spare slots should an increase in capability be required in the future.

When the PCM ground station is synchronized, the strip pulses and the FG #1 reset pulse appear at the computer buffers input logic. A flip-flop is set when the FG #1 reset signal appears which, in turn, produces an

interrupt signal on the computer input lines. This condition signals the beginning of a major frame of data to the computer. In the Agena format 2000 strip pulses will appear before the next interrupt signal. When the interrupt is recognized by the computer, it removes the interrupt by sending a pulse to the TOB on the acknowledge line.

The first strip pulse follows the FG #1 Reset. The leading edge of the strip pulse is used to load the data on the input lines to the computer buffer's storage register and on to the computers input lines. The trailing edge of the strip pulse is used to set a flip-flop which energizes the computers input request line.

The computer recognizes the input request signal and loads the data on the lines into the computer memory, and acknowledges the input request by a pulse on the acknowledge lines which removes the input request and resets the data lines to "zero" state. This sequence is repeated for all 2000 data words and strip pulses before the second FG #1 Reset pulse is received which indicates the beginning of the next major frame of data. Figure 13 shows the Agena PCM Logic Timing.

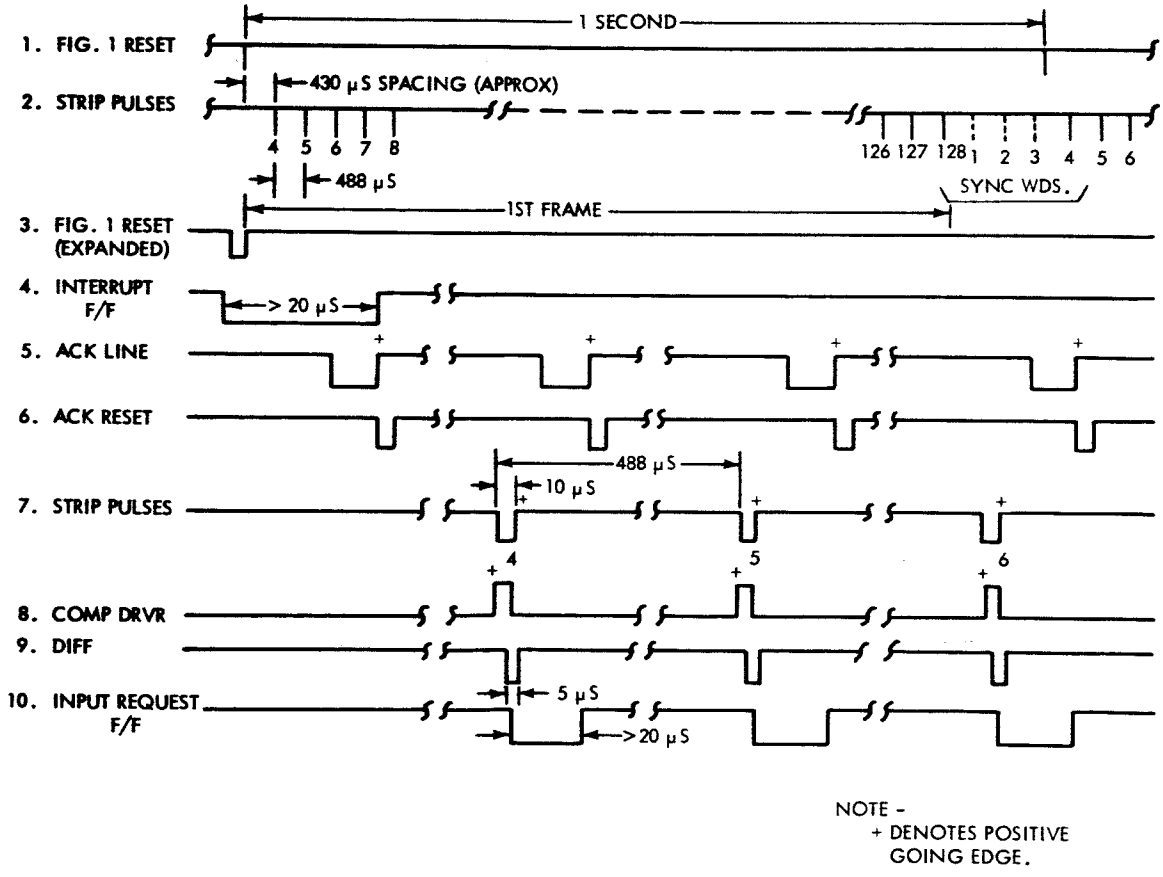


Figure 13—Agena PCM logic timing diagram.

GEMINI FORMAT -

The Gemini format consists of:

a. A word rate of 156 microseconds.

b. 80 words per minor frame.

c. 192 minor frames per major frame.

A major frame of data occurs at 2.4-second intervals. Only 9 of the 80 words per minor frame are loaded into the computer, therefore, 9 times 192 equals 1728 pulses occur during the 2.4 seconds major frame interval. The beginning of each successive major frame of data is indicated by a FG #1 Reset pulse from the PCM station. Figure 14 shows the Gemini PCM Logic Timing.

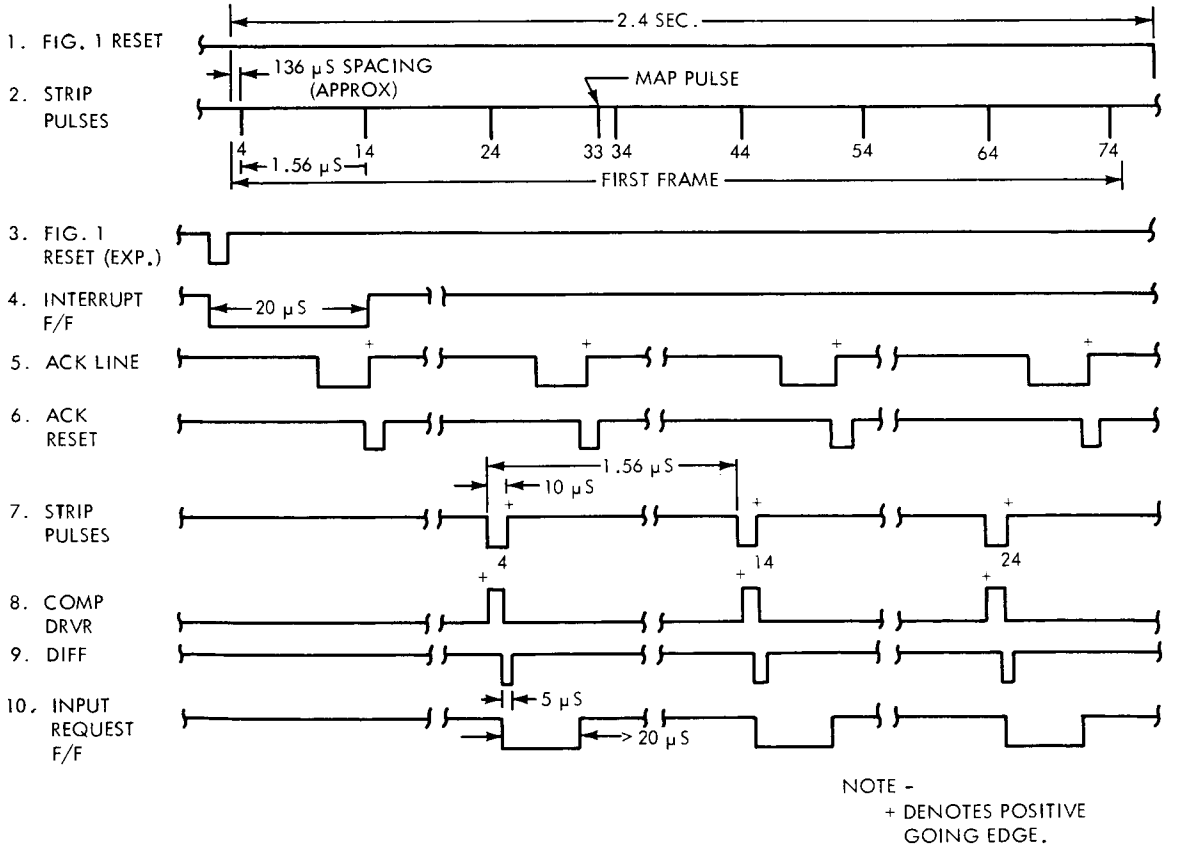


Figure 14—Gemini PCM logic timing diagram.

Program - The generation of interrupts from the FG #1 Reset pulse, the generation of input requests from the strip pulses and the requirements for synchronization status are the same for both Gemini and Agena formats. The two sets of PCM input logic are identical and the rate-of-occurrence of the interrupts and input requests are dependent on operating the format of the individual PCM station.

The computer is programmed to recognize the operating program as either Gemini or Agena format as indicated by the four format bits.

Greenwich Mean Time Input Buffer

The Greenwich Mean Time (GMT) input buffer logic is discussed in reference to Figure 11.

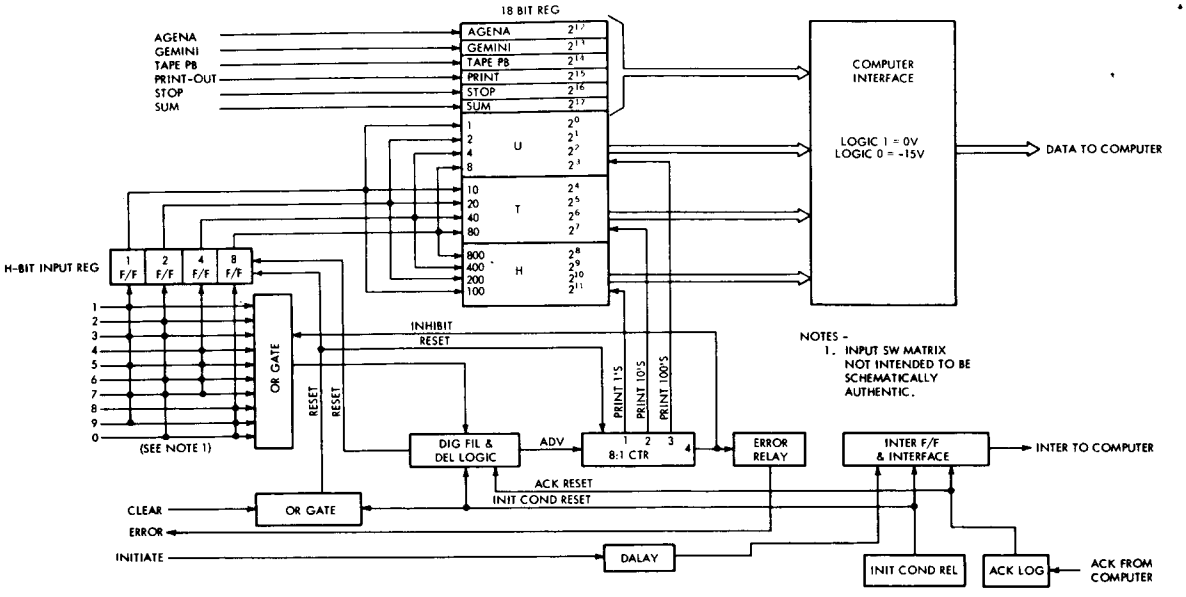
The block diagram shows that the GMT clock is presented to the computer buffer as a 1-2-4-8 binary-coded decimal (BCD) word through a series of relay closures. The computer buffer function is to present the TIME data word to the computer and place an interrupt signal on the computer-interrupt line as the mean time is up-dated each second.

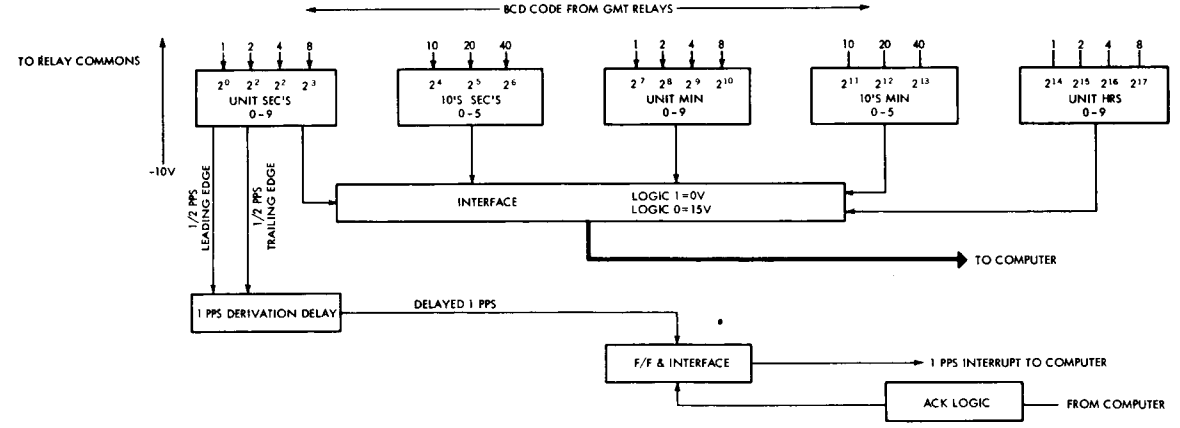
An intermediate flip-flop storage register is inserted to maintain the same isolation and interface in the five input channels. This flip-flop register follows the input code in the relays and drives the interface circuits to the computer TIME data input lines with the correct logic voltage.

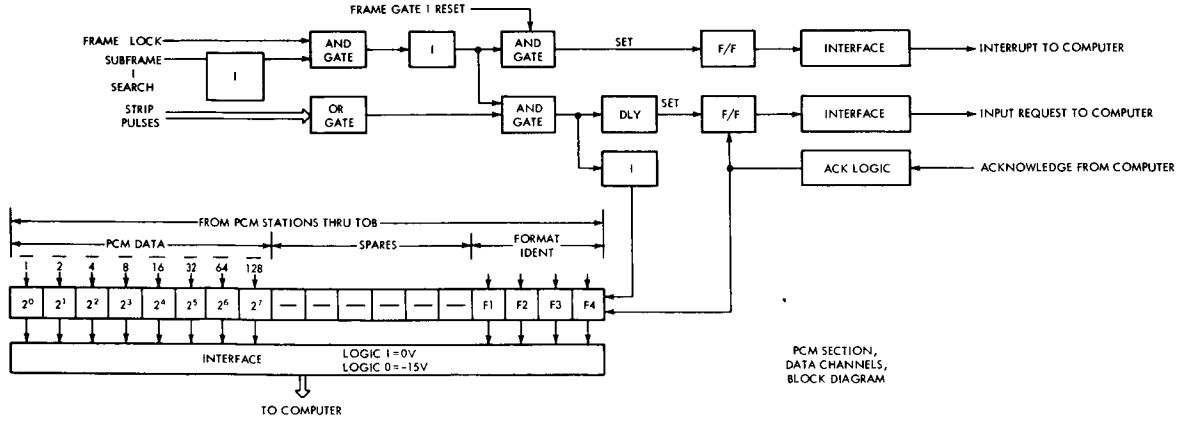
An interrupt signal occurs each second to transfer the GMT data into the computer as it is updated each second. Sufficient delay is incorporated to avoid the effects of relay-bounce and to allow the data lines to settle. This results in an updated and stabilized data transfer to the computer memory.

When the interrupt signal is recognized by the computer, the time code is read from the lines. The computer then provides an acknowledge signal to the acknowledge logic in the computer buffer. This logic resets the interrupt flip-flop and removes the interrupt signal from the line. Each time the clock is updated, at one second intervals, this process is repeated.

The GMT clock reads a maximum of 23 hours, 59 minutes, and 59 seconds. Twenty bit positions in BCD code are required to accumulate this time. As the computer input channels contain only 18 data lines, the maximum time code which can be entered is 9 hours, 59 minutes, and 59 seconds.







PCM SECTION, DATA CHANNELS, BLOCK DIAGRAM

Therefore, it is necessary to manually read the "tens" of hours into the computer to reference real time within the 24-hour period. The computer can detect the number of carries from the "one's of hours" decade and thereby maintain real time following the introduction of initial time.

PHASE III. Complete System Checkout

After completing all interface checks with the computer buffer, and the remaining subsystems connected to the buffer we can now proceed with the complete system checkout. Subsystems which are now tied in are as follows:

a. GMT Time Standard (TDF)

b. PCM System #1 (AGENA SYSTEM)

c. Telemetry Output Buffer #1 (TOB #1)

d. PCM System #2 (GEMINI SYSTEM)

e. Telemetry Output Buffer #2 (TOB #2)

f. Agena Computer Address Matrix

g. Agena R.O. Teletypewriter

h. Gemini Computer Address Matrix

i. Agena R.O. Teletypewriter

j. Computer Buffer, drawer 1A7, TOB #2

The UNIVAC 1218 Computing System comprised the following components:

a. 1218 Military Digital Computer

b. 1232 UNIVAC Input/Output Console

c. 1259 Teletypewriter ASR, Modified

d. 1262 Wall Mounted Teletype Adapter

Assumed that the PCM patch boards are in their respective patch bays and patched properly and all other systems in working order, we now commence with operational checkout procedures.

1. Load the official RO and TTY test program as per instructions listed in the attachments as R.O. TEST PROGRAM. The purpose of the check is

to assure of a proper communication link between the 1218 Computer, 1259 ASR Teletype, and R.O.'s mounted in the Agena and Gemini consoles. If proper stunt box codes have been properly installed in these R.O.'s, YAYA for the Agena R.O., YGYG for the Gemini R.O., print out will be accomplished. In running this test under computer control every function of the TTY code and R.O. machine operation will have been exercised. After completing the checks a visual inspection of the hard copy obtained from each machine must be performed. An example of the hard copy obtained is also attached to the operating instructions.

2. Load the INPUT DISPLAY TEST PROGRAM as per instructions listed in the attachments as INPUT DISPLAY PROGRAM. The purposes of this program are as listed in the Operating Instructions.

CAM Computer Input

By depressing any CAM switch or switches and causing a computer interrupt by depressing the INITIATE SWITCH will display the actual bit configuration in the computer display registers. This test was accomplished by each switch being tested separately. After confidence had been gained in the electronic functions associated with the CAM through to the computer, valid request comprising three characters along with associated control bit functions were initiated from the CAM. From this point on it was possible to check every possible bit configuration that could be generated from the CAM and inputted to the computer.

Interrupt Test - Another function of this program is to count the interrupts that are occurring from either PCM station within a given period of time. This program can be used with either format patched into either one of the two PCM Systems. Operating instructions are specified in the INPUT DISPLAY PROGRAM.

Buffer Word Count

The purpose of this test is to count the total number of 8-bit data words that are taken into the computer during a predetermined period of time. With a PCM system properly patched for the Gemini format, and the proper strip pulses patched it is possible to check for a valid word count to each buffer stored in the computer memory. With the Gemini format the computer register would display the count of the words received between each interrupt. This count should be 1728 words each 2.4 seconds.

The same information being true for the Agena buffer except that the buffer size is 2000 words and the interrupt occurs at a 1 second rate.

By accomplishing the aforementioned testing, system confidence can be gained to the point where an over all systems test utilizing all sub-systems can now be accomplished.

By using the PCM Simulator and inputting a known data pattern to the PCM System of the proper format (which can be changed on command) we are now making the final systems tests.

1. Load the TOMCAT program into the UNIVAC 1218 Computer as per instructions.

2. Select a CAM request which will print out on the R.O. display a discrete event. By selecting this request the CAM operator will receive the print out on the R.O. of the actual bit configuration of the data word which is being inputted to the computer. Any modification of this bit structure will be displayed upon a CAM request.

   Examples of the 8 data bits being printed are as follows:

```
YG

5-26-64/19-26-23/G142
 00000000
#

YG

5-26-64/19-27-40/G142
 11111111
#

YG

5-26-64/19-28-10/G142
 00001111
#

YG

5-26-64/19-29-10/G142
 11001100
#
```

```
YG

5-26-64/19-30-15/G142
 00110011
#

YG

5-26-64/19-32-05/G142
 10000000
#

YG

5-26-64/19-33-40/G142
 01000000
#

YG

5-26-64/19-35-10/G142
 00100000
#

YG

5-26-64/19-37-05/G142
 00010000
#

YG

5-26-64/19-38-10/G142
 00001000
#

YG

5-26-64/19-40-04/G142
 00000100
#
```

```
YG

5-26-64/19-41-18/G142
 00000010
#

YG

5-26-64/19-43-01/G142
 00000001
#
```

By performing this particular check a thru-put check starting at the front end of the PCM Ground Station and ending with final output of the computer can be accomplished. Also by performing this test in this manner it is possible to exercise the functions of all sub-systems associated with the over-all operation.

MANNED SPACE FLIGHT NETWORK

Engineering Instruction

Title: Shipboard Installation of 1218 Computer Complex EI 719

Attachments: Cable Running List
Templates (Refer to Para. 7.3.2)
Drawings (Refer to Para. 7.3.2)
Figure 1

Subsystem: Computer
Date Issued: 3-26-64
Date Shipped: 3-30-64

1.0 STATIONS AFFECTED:

RKV, CSQ

2.0 MODIFICATION PURPOSE/EQUIPMENT AFFECTED:

2.1 Purpose

To provide the installation instructions for the 1218 Computer Complex on the RKV and CSQ.

2.2 Equipment Affected:

1218 Computer
1232 I/O Console
1259 Teletype Adapter
1262 Teletype Wall Adapter
Motor Generator Set
Motor Generator Controller

2.3 Time Estimate

Three weeks.

3.0 MODIFICATION INSTRUCTIONS:

3.1 Using the templates furnished and the site equipment layout drawing, prepare the deck and bulkhead for mounting the equipment.

3.2 Mount the equipment in its intended area, installing shock mounts where required.

3.3 Install the signal cables per the attached Installer's Cable Running List. The "Note" column of this list will indicate the source of these cables. The UNIVAC furnished cables between the TOB and the 1218 are furnished with Deutsch connectors for mating with the TOB and Cannon connectors for mating with the 1218 Computer. The remaining UNIVAC furnished cables are provided with Cannon connectors on both ends.

3.4 Ground all cabinet E1 terminals to the ship's hull using the AWG-4 cable furnished.

3.5 A remote start-stop switch for the motor generator is to be installed. Mount an Allen-Bradley switch, P/N 2HA4, near the motor generator. Run a three wire armored cable from the switch location to the motor generator controller panel and terminate as shown on Figure 1. (Note: the switch will be provided at a later date. However, the cable should be run and tied off until the switch is received.)

4.0 PARTS REQUIRED/SUPPLIED:

Qty.	Source	Part
1 ea.	UNIVAC	1218 Computer
1 ea.	UNIVAC	1232 I/O Console
1 ea.	UNIVAC	1259 Teletype Adapter
1 ea.	UNIVAC	1262 Wall Mount Teletype Adapter
1 ea.	UNIVAC	1387 Motor Generator and Controller Set
5 ea. (50 ft)	UNIVAC	Cables with Cannon and Deustch connectors (PIN 795-6091-01)
6 ea. (50 ft)	UNIVAC	Cables with Cannon connectors (PIN 795-601-01)
1 ea.	NASA Depot	Allen-Bradley switch, P/N 2HA4
100 feet	NASA Depot	AGW-4 power cable

5.0 WHO WILL IMPLEMENT MODIFICATION:

5.1 AMR installation personnel will physically install the equipment and connect the power circuits (per EI 705) under the supervision of the NASA site engineer.

5.2 The UNIVAC maintenance engineer will be responsible for making all signal cable connections and preparing the Computer Complex for acceptance testing.

6.0 REQUIRED COMPLETION DATE:

6.1 This modification is to be implemented upon receipt.

6.2 Configuration of completion is to be sent via TTY to Willis/Koslosky/Hartje/Lechter/Begenwald/Heller, UNV.

7.0 SPECIAL INSTRUCTIONS:

7.1 Testing

The UNIVAC engineer will conduct all appropriate checkout and acceptance tests. Acceptance tests will be conducted under NASA supervision.

7.2 Operational/Maintenance Instructions

Refer to the appropriate Computer Complex System manuals.

7.3 Documentation Affected:

7.3.1 Manuals

To be provided at a later date as Attachment 1 to this EI.

7.3.2 Drawings

Two copies of the following drawings are furnished with this EI:

UNIVAC No.	NASA No.	Title
4055568	Not assigned	1259 TTY Set, Outline & Dimensional Data
4055570	Not assigned	1262 TTY Adapter (Wall Mount) Outline & Dimensional Data
7005679	Not assigned	1232 I/O Console, Outline & Dimensional Data

UNIVAC No.	NASA No.	Title
7005570	Not assigned	Motor Generator & Controller, Outline & Dimensional Data
7008894	Not assigned	1218 Computer, Outline & Dimensional Data
265765	Not assigned	Signal Cable Assembly, 84 Conductor
—	1002722	Signal Data Flow

Two copies of the template drawings for the following are furnished with this EI:

Motor Generator
Motor Generator Controller
1218 Computer
1232 I/O Console
1262 Teletype Adapter (Wall Mount)

8.0 COGNIZANT ENGINEERS:

8.1 NASA

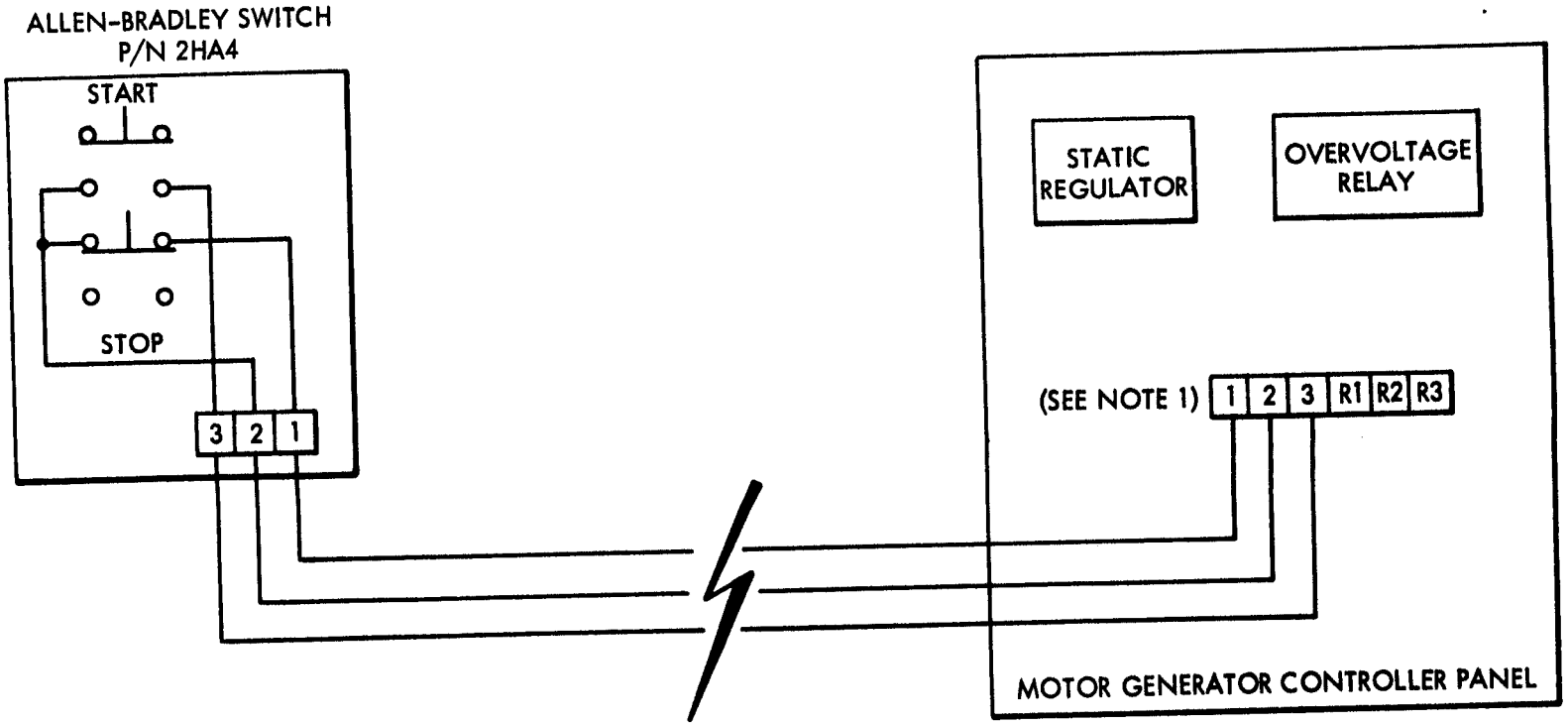
E. Willis/S. Lechter, Code 546
Goddard Space Flight Center
Greenbelt, Maryland 20771

9.0 SPARE PARTS PROVISIONING:

To be provided at a later date.

10.0 APPROVED BY:

for H. Willi Wood
N. R. Heller
Goddard Space Flight Center



NOTES:

1. IF JUMPER EXISTS BETWEEN TERMINALS 1 AND 2, IT WILL HAVE TO BE REMOVED AT THE TIME OF THE SWITCH INSTALLATION.

2. SWITCH TO BE FURNISHED AT A LATER DATE.

Figure 1, EI 719

7.3 Documentation Affected

7.3.1 Manuals

Two copies of the manuals listed below are being furnished with the equipment to the applicable sites. Control numbers have been assigned as follows:

Control No.	Title
MH-1013-1	Digital Data Computer Type 1218, Vol. I through V (for SN 24 through 31)
MH-1013-2	Digital Data Computer Type 1218, Vol. I through V (for SN 34 through 40)
MH-1014	Input/Output Console Type 1232A
MH-1015	Teletypewriter Set Types 1259 and 1262
ME-1107	A/N Keyboard Type 7361
ME-1108	High Speed Tape Punch Set (BRPE)
ME-1109	Parts High Speed Tape Punch Set (BRPE)
ME-1110	Perforated Tape Reader
ME-1111	Teletype Model 35 ASR Vol. 1 and 2
ME-1112	Teletype Model 35 ASR Parts
ME-1113	Model 28 Page Printer Sets and Automatic Send-Receive Set (Criticomm) Vol. 1 through 3
ME-1114	Data Transmission Unit 2000
ME-1115	Kato Generators

Except for manuals MH-1013-1 and MH-1013-2 revisions correcting discrepancies found in the manuals listed above will be forwarded to the sites and inserted into the manuals on a page for page replacement basis.

Revisions to the Digital Data Computer manuals MH-1013-1 and MH-1013-2 will be forwarded to the sites as follows:

a. A basic revision to the Digital Data Computer Type 1218 manual will be forwarded to all sites. This revision will update and correct basic errors found in the manual. When the revision is inserted into the manual, the manual will then become the updated basic computer manual.

b. Two separate and distinct revisions will be prepared for use with the updated basic manual. One revision will reflect computer serial numbers 24, 27, 29, 30, and 31. This revision will be inserted into the basic manuals held at GSFC, RKV, CSQ, CRO, and MCC. The control number for this revised manual will be MH-1013-1.

The other revision will reflect computer serial numbers 34, 35, 37, 38, 39, and 40. This revision will be inserted into the basic manuals held at CYI, TEX, BDA, GYM, HAW, and WLP. The control number for this revised manual will be MH-1013-2. Thus two separate and distinct manuals reflecting the computer systems at Manned Flight Network stations will be in existence.

MANNED SPACE FLIGHT NETWORK

Engineering Instruction

Title: Installation of 1218 Computer Complex EI 754

Attachments: Cable Running List
Templates (Refer to para. 7.3.2)
Drawings (Refer to para. 7.3.2)
Figures 1, 2 and 3

Subsystem: Computer
Date Issued: 5-4-64
Date Shipped:

1.0 STATIONS AFFECTED:

CNV (#29)*	CYI (#35)	HAW (#42)	TEX (#36)	*Indicate serial
BDA (#38)	CRO (#30)	GYM (#40)	WLP (#43)	number of computer

2.0 MODIFICATION PURPOSE/EQUIPMENT AFFECTED:

2.1 Purpose

To provide the installation instructions for the 1218 Computer Complex.

2.2 Equipment Affected:

1218 Computer
1232 I/O Console
1259 Teletype Adapter
1262 Teletype Wall Adapter
Motor Generator Set
Motor Generator Controller
2000 Data Transmission Unit (BDA and TEX only)

2.3 Time Estimate

Three (3) weeks

3.0 MODIFICATION INSTRUCTIONS:

3.1 Using the templates furnished (as guides) Figures 1 and 2, and the site equipment drawing (see Section 7.3.2), prepare the floor and walls for mounting the equipment. Refer to Figures 1 and 2 for the location of

the 1/2-inch expansion shield anchors. The length of the galvanized steel pipe may vary because of undulations in the concrete floor and varied depths of the raised false flooring. The pipe must be cut to fit local conditions. Install threaded rod in concrete anchors and cut rod so that 1-1/2 inches of rod is above top of raised false floor. At BDA and TEX the Data Transmission Unit is to be secured to the 1218 Computer.

3.2 Install computer cabinet on threaded rods and secure with hardware furnished. Place the remaining equipment in its intended area and secure.

3.3 (This step not applicable to CNV and BDA) Mount TB1-A (BenPac furnished) near the RO Wall Mounted Adaptor to series the connection to TB-1 on the adaptor. Refer to drawing GC-GEM-1002718, Rev. A.

3.4 At BDA only, the Computer Address Matrix (CAM) is to be mounted on the I/O Console. Refer to GD-GEM-1119350, Rev. B.

3.5 Install the signal cables per the attached Installer's Cable Running List. The UNIVAC furnished cables between the TOB and the 1218 are furnished with Deutsch connectors for mating with the TOB and Cannon connectors for mating with the 1218 Computer. The remaining UNIVAC furnished cables are provided with Cannon connectors on both ends.

3.6 Ground all cabinet E1 terminals to site common ground using the AWG-4 cable furnished.

3.7 A remote start-stop switch for the motor generator is to be installed. Mount an Allen-Bradley switch, P/N 2HA4, near the motor generator. Run a three wire cable from the switch location to the motor generator controller panel and terminate as shown on Figure 3. (Note: The switch will be provided at a later date. However, the cable should be run and tied off until the switch is received.)

4.0 PARTS REQUIRED/SUPPLIED:

4.1 Each site will be furnished with the following:

Qty	Source	Item
1	UNIVAC	1218 Computer
1	UNIVAC	1232 I/O Console

Qty	Source	Item
1	UNIVAC	1259 Teletype Adapter
1	UNIVAC	1262 Wall Mount Teletype Adapter
1	UNIVAC	1387 Motor Generator and Controller Set
1	UNIVAC	200 Data Transmission Set
(BDA, TEX only)		
1	Depot	Allen-Bradley Switch P/N 2HA4
100 ft	Depot	AGW-4 Power Cable
*6	Depot	Flush Anchor, Self-Drilling Tubular Expansion Shield (67B65), 1/2" dia.
*6	Depot	Threaded Steel Rod (7044E11), 1/2" dia.
*6	Depot	Schedule 40 Galvanized Steel Pipe, 1" dia.
*12	Depot	Galvanized Threaded Steel Pipe Flange, 1" dia.
*6	Depot	Lock Washer & Nut, 1/2" dia.

*These items comprise the Installation Securing Kit, one per each site except BDA and TEX which will receive two kits each.

4.2 Each site will receive the following cables in the quantity indicated:

4.2.1 Cables with Cannon and Deustch connectors (Pin 795-6091-01)

CNV - 1 ea, 73 ft
CNV - 4 ea, 65 ft
BDA - 3 ea, 55 ft
CYI - 5 ea, 65 ft
CRO - 5 ea, 75 ft
HAW - 5 ea, 90 ft
GYM - 5 ea, 80 ft
TEX - 5 ea, 55 ft
WLP - 5 ea, 90 ft

4.2.2 Cables with Cannon connectors (Pin 795-601-01)

BDA and TEX - 8 ea, 50 ft
All other sites - 6 ea, 50 ft

5.0 WHO WILL IMPLEMENT MODIFICATION:

5.1 Site installation personnel will physically install equipment and connect the power circuits (per EI 705) and all signal cables except those furnished by UNIVAC under the supervision of the NASA site engineer.

5.2 The UNIVAC maintenance engineer will be responsible for making all UNIVAC furnished signal cable connections and preparing the Computer Complex for acceptance testing.

6.0 REQUIRED COMPLETION DATE:

6.1 This modification is to be implemented upon receipt of equipment.

6.2 Confirmation of completion is to be sent via TTY to Willis/Hartje/Lechter/Begenwald/Heller, UNV.

7.0 SPECIAL INSTRUCTIONS:

7.1 Testing

The UNIVAC Engineer will conduct the following checkout and acceptance tests. Acceptance tests will be conducted under NASA supervision.

UNIVAC ACCEPTANCE SPECIFICATIONS

DS 4676 - (Sections 3 and 4 only): Computer Digital Data - UNIVAC 1218 Acceptance Specifications
DS 4682 - Sections 3.4, 3.5 and 4.0 only) UNIVAC 1232A Acceptance Specifications
DS 4724 Teletype Test Acceptance Specifications
Special (RO Wall Mounted Adapter) Test provided by GSFC, NASA
*EF 3663 Data Transmission Unit Test (UNIVAC 2000 Line Terminal)
*Applicable to BDA and TEX only.

7.2 Operational Maintenance Instructions

Refer to the appropriate Computer Complex System manuals.

7.3 Documentation Affected:

7.3.1 Manuals

Two copies of the manuals listed below are being furnished with the equipment to the applicable sites. Control numbers have been assigned as follows:

Control No.	Title
MH-1013-1	Digital Data Computer Type 1218, Vol. I thru V (for SN 24 thru 31)
MH-1013-2	Digital Data Computer Type 1218, Vol. I thru V (for SN 34 thru 40)
MH-1014	Input/Output Console Type 1232A
MH-1015	Teletypewriter Set Types 1259 and 1262
ME-1107	A/N Keyboard Type 7361
ME-1108	High Speed Tape Punch Set (BRPE)
ME-1109	Parts High Speed Tape Punch Set (BRPE)
ME-1110	Perforated Tape Reader
ME-1111	Teletype Model 35 ASR Vol. 1 and 2
ME-1112	Teletype Model 35 ASR Parts
ME-1113	Model 28 Page Printer Sets and Automatic Send-Receive Set (Criticomm) Vol. 1 thru 3
ME-1114 (BDA, TEX only)	Data Transmission Unit 2000
ME-1115	Kato Generators
Not assigned	UNIVAC 1218 Programmer Reference Manual

Except for manuals MH-1013-1 and MH-1013-2 revisions correcting discrepancies found in the manuals listed above will be forwarded to the sites and inserted into the manuals on a page for page replacement basis.

Revisions to the Digital Data Computer manuals MH-1013-1 and MH-1013-2 will be forwarded to the sites as follows:

a. A basic revision to the Digital Data Computer Type 1218 manual will be forwarded to all sites. This revision will update and correct basic errors found in the manual. When the revision is inserted into the manual, the manual will then become the updated basic computer manual.

b. Two separate and distinct revisions will be prepared for use with the updated basic manual. One revision will reflect computer serial numbers 24, 27, 29, 30 and 31. This revision will be inserted into the basic manuals held at GSFC, RKV, CSQ, CRO and MCC. The control number for this revised manual will be MH-1013-1.

The other revision will reflect computer serial numbers 35, 36, 38, 40, 42 and 43. This revision will be inserted into the basic manuals held at CYI, TEX, BDA, GYM, HAW and WLP. The control number for this revised manual will be MH-1013-2. Thus two separate and distinct manuals reflecting the computer systems at Manned Flight Network stations will be in existence.

7.3.2 Drawings

Two copies of the following drawings are furnished with this EI.

UNIVAC No.	NASA No.	Title
4055568	Not assigned	1259 TTY Set, Outline & Dimensional Data
4055570	Not assigned	1262 TTY Adapter (Wall Mount) Outline & Dimensional Data
7005679	Not assigned	1232 I/O Console, Outline & Dimensional Data
7005570	Not assigned	Motor Generator & Controller, Outline & Dimensional Data
7005502	Not assigned	1218 Computer, Outline & Dimensional Data, CRO, CNV
7008894	Not assigned	1218 Computer Outline & Dimensional Data, BDA, CYI, HAW, GYM, TEX, WLP
265765	Not assigned	Signal Cable Assembly, 84 Conductor
—	1002723, Rev. B	Cable Distribution Diagram, CNV
—	1002734, Rev. A	Cable Distribution Diagram, TEX
—	1002728, Rev. A	Cable Distribution Diagram, BDA
—	1002733, Rev. A	Cable Distribution Diagram, CYI, CRO, HAW, GYM, WLP
—	1002718, Rev. A	Gemini and Agena Systems Console Teletype RO Wiring Diagram (All except CNV, BDA)

UNIVAC No.	NASA No.	Title
—	1118317, Rev. A	MCC Floor Plan and equipment layout
—	1119350, Rev. B	Gemini Equipment Layout, BDA
—	1119113, Rev. E	Gemini Equipment Layout, TEX
—	1119110, Rev. E	Gemini Equipment Layout, CYI
—	1004900, Rev. L	Gemini Equipment Layout, CRO
—	1119111, Rev. E	Gemini Equipment Layout, HAW
—	1119112, Rev. G	Gemini Equipment Layout, GYM
—	1118999, Rev. E	Gemini Equipment Layout, WLP

Two copies of the template drawings for the units listed below are furnished for reference with this EI. For the 1218 Computer, refer to Figures 1 and 2 for dimensional information.

Motor Generator
Motor Generator Controller
1232 I/O Console
1262 Teletype Adapter (Wall Mount)

8.0 COGNIZANT ENGINEERS:

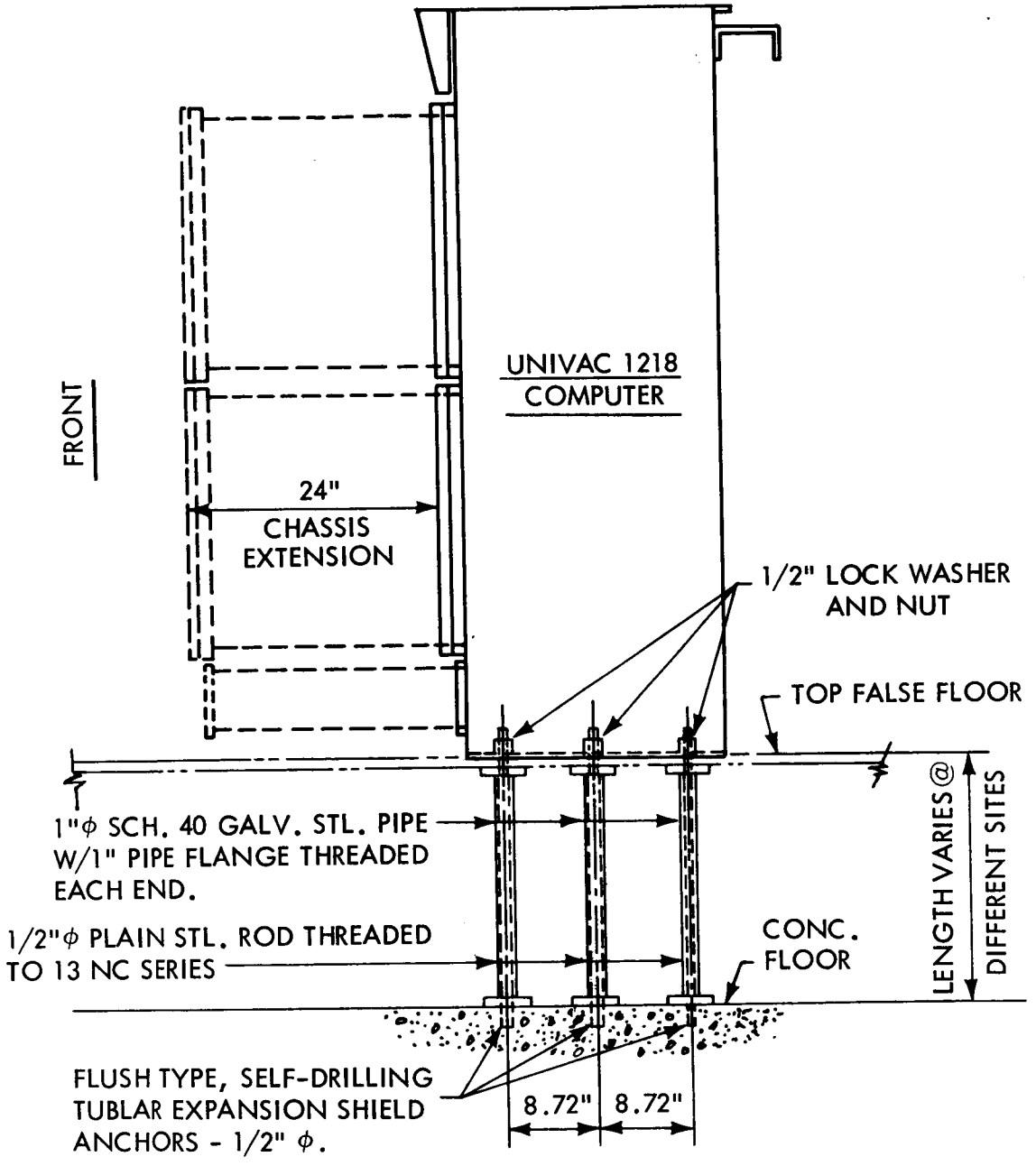
S. Lechter/E. Willis, Code 546
Goddard Space Flight Center
Greenbelt, Maryland 20771

9.0 SPARE PARTS PROVISIONING:

To be provided at a later date.

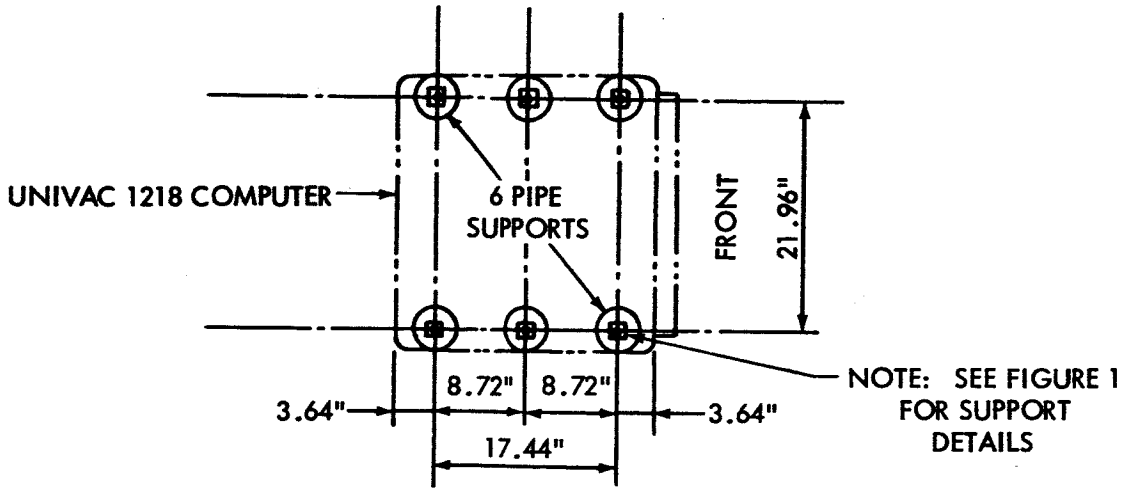
10.0 APPROVED BY:

N. R. Heller
Goddard Space Flight Center

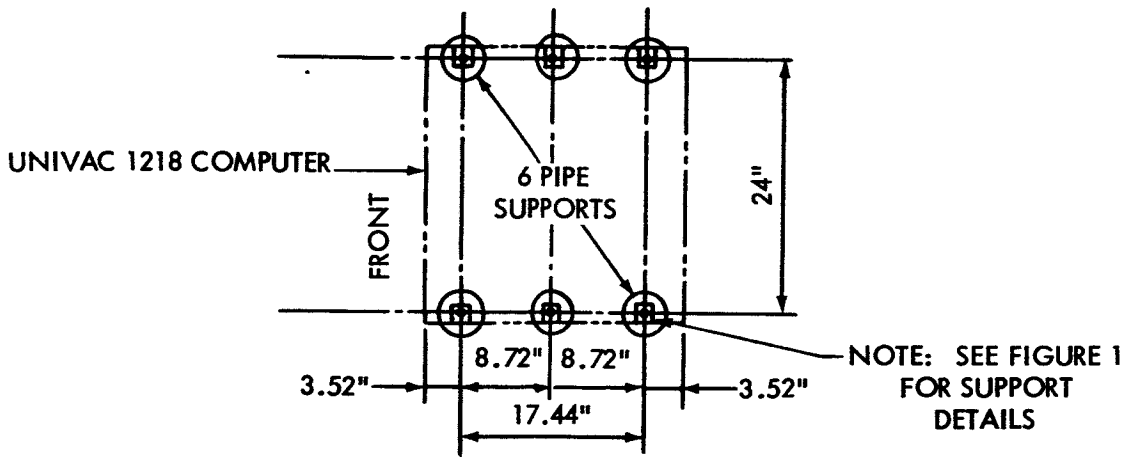


NOTE: SEE FIGURE 2 FOR LOCATION

Figure 1, EI 754

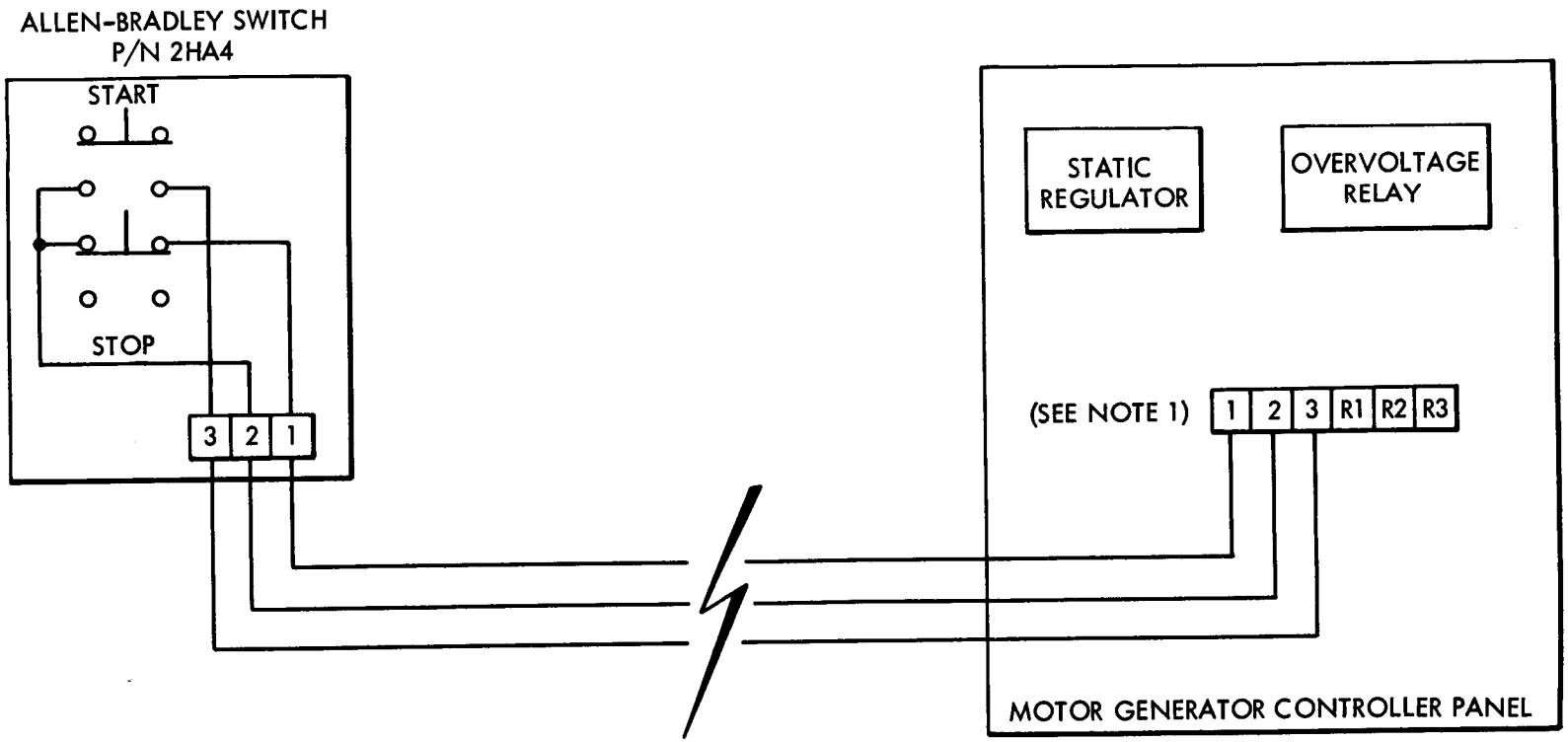


A - APPLICABLE TO CNV AND CRO ONLY



B - APPLICABLE TO BDA, CYI, HAW, GYM, TEX, AND WLP ONLY

Figure 2, EI 754



NOTES:

1. IF JUMPER EXISTS BETWEEN TERMINALS 1 AND 2, IT WILL HAVE TO BE REMOVED AT THE TIME OF THE SWITCH INSTALLATION.
2. SWITCH TO BE FURNISHED AT A LATER DATE.

Figure 3, EI 754

INSTALLER'S CABLE RUNNING LIST

Cable Number	Cable Furnished by	From	To	Applicable Sites
W301	BenPac	1J11 on ASMC CAM	1J29 on TOB #2	All except CNV and BDA
W311	BenPac	3J11 on GSMC CAM	1J15 on TOB #2	All except CNV and BDA
W311	BenPac	1J1 on CAM	1J15 on TOB	BDA only
—	Radiation	1J21 on TOB #1	1J21 on TOB #2	All except CNV and BDA
—	Radiation	1J22 on TOB #1	1J22 on TOB #2	All except CNV and BDA
—	Radiation	Agena PCM Data (TOB #2)	Computer Buffer	All except CNV and BDA
W209	BenPac	10J22 on TDF	1J28 on TOB #2	All except CNV and BDA
W506	UNIVAC	J6, Ch.#0 on Computer	J4, on I/O Console	All except CNV
W508	UNIVAC	J12, Ch.#3 on Computer	J3 on 1259 TTY Adapter	All except CNV
W505	UNIVAC	J3 on I/O Console	J1, Ch.#0 on Computer	All except CNV
W511	UNIVAC	J10, Ch.#1 on Computer	J3 on RO Wall Adapter	All except CNV

Cable Number	Cable Furnished by	From	To	Applicable Sites
W409	BenPac	TB1-5(+) on RO Wall Adapter TB1-6(-)	TB1A-1(+) TB near RO Wall Adapter TB1A-4(-)	All except CNV and BDA
W409	BenPac	TB1-5(+) on RO Wall Adapter TB1-6(-)	(+) and (-) on RO	BDA only
W306	BenPac	TB1A-1(+) TB near RO Wall Adapter TB1A-2(-)	1J20 on ASMC	All except CNV and BDA
W317	BenPac	TB1A-3(+) TB near RO Wall Adapter TB1A-4(-)	3J20 on GSMC	All except CNV and BDA
W513	NASA	TB1-5(+) 1259 TTY Adapter TB1-6(-)	CDF	All except CNV
W512	NASA	CDF	ROTR	All except CNV
W500	UNIVAC	1J36 on TOB #2 CAM	J5, Ch.#4 on Computer	All except CNV and BDA
W501	UNIVAC	1J37 on TOB #2 CAM	J3, Ch.#2 on Computer	All except CNV
W502	UNIVAC	1J50 on TOB #2 PCM	J7, Ch.#7 on Computer	All except CNV
W503	UNIVAC	1J51 on TOB #2 PCM	J8, Ch.#6 on Computer	All except CNV and BDA

Cable Number	Cable Furnished by	From	To	Applicable Sites
W504	UNIVAC	1J52 on TOB #2 GMT	J2, Ch.#1 on Computer	All except CNV
W509	UNIVAC	J14, Ch.#5 on Computer	J6 on Data Trans Unit	BDA and TEX only
W514	UNIVAC	J1 on Data Trans. Unit	201A Data Subset	BDA and TEX only
8.54.5.14.1	BenPac	J1 on Envir Aux. Console	1J15 on Computer Buffer	CNV only
8.16.8.54.1	Radiation	1J21 on TOB #1	1J21 on TOB #2	CNV only
8.16.8.54.2	Radiation	1J22 on TOB #1	1J22 on TOB #2	CNV only
7.4.8.18.1	BenPac	J17 on TDF	1J28 on TOB #2	CNV only
8.51.8.56.1	UNIVAC	J12, Ch.#3 on Computer	J3 on 1259 TTY Adapter	CNV only
8.51.8.60.2	UNIVAC	J6, Ch.#0 on Computer	J4 on I/O Console	CNV only
8.51.8.60.1	UNIVAC	J3 on I/O Console	J1 Ch.#0 on Computer	CNV only
8.51.8.52.1	UNIVAC	J10, Ch.#1 on Computer	J3 on RO Wall Adapter	CNV only
8.52.8.53.1	BenPac	TB1-5(+) on RO Wall TB1-6(-) Adapter	(+) and (-) on RO	CNV only

Cable Number	Cable Furnished by	From	To	Applicable Sites
8.56.8.58.1	Site	TB1-5(+) TB1-6(-) on 1259 TTY Adapter	CDF	CNV only
—	Site	CDF	ROTR	CNV only
8.51.8.54.5	UNIVAC	1J19 on TOB #2 (CAM Logic)	J3, Ch.#2 on Computer	CNV only
8.51.8.54.1	UNIVAC	1J58 on TOB #2 PCM	J8, Ch.#6 on Computer	CNV only
8.51.8.54.2	UNIVAC	1J56 on TOB #2 PCM	J7, Ch.#7 on Computer	CNV only
8.51.8.54.3	UNIVAC	1J52 on TOB #2 GMT	J2, Ch.#1 on Computer	CNV only
8.51.8.55.1	UNIVAC	J13, Ch.#4 on Computer	1J59 on TOB #3	CNV only
8.55.5.14.1	BenPac	1J75 on TOB #3	J2 on Envir. Aux. Console	CNV only

(Data Support Office Preliminary June 24, 1964)

RO TEST PROGRAM

PURPOSE:

To check communication link between computer and the two RO (receive only) units.

OPERATING PROCEDURE:

1. Load UPAK 1 anywhere above 3000_8
2. Load RO TEST program
   a. UPAK 1 base address + 6
   b. Start
   c. Normal stop with AU and A_L Cleared
3. P = 1200
4. Start
5. Set skip key settings desired
   a. Skip key 0 to type on AGENA RO
   b. Skip key 1 to type on GEMINI RO
   c. Skip keys 0 and 1 to type on both AGENA and GEMINI RO's
   d. Skip key 2 to stop output at completion of last initiated out; to re-start program just release skip key 2 and push high speed.

NOTE: Key settings may be altered at any time during program execution with no problem.

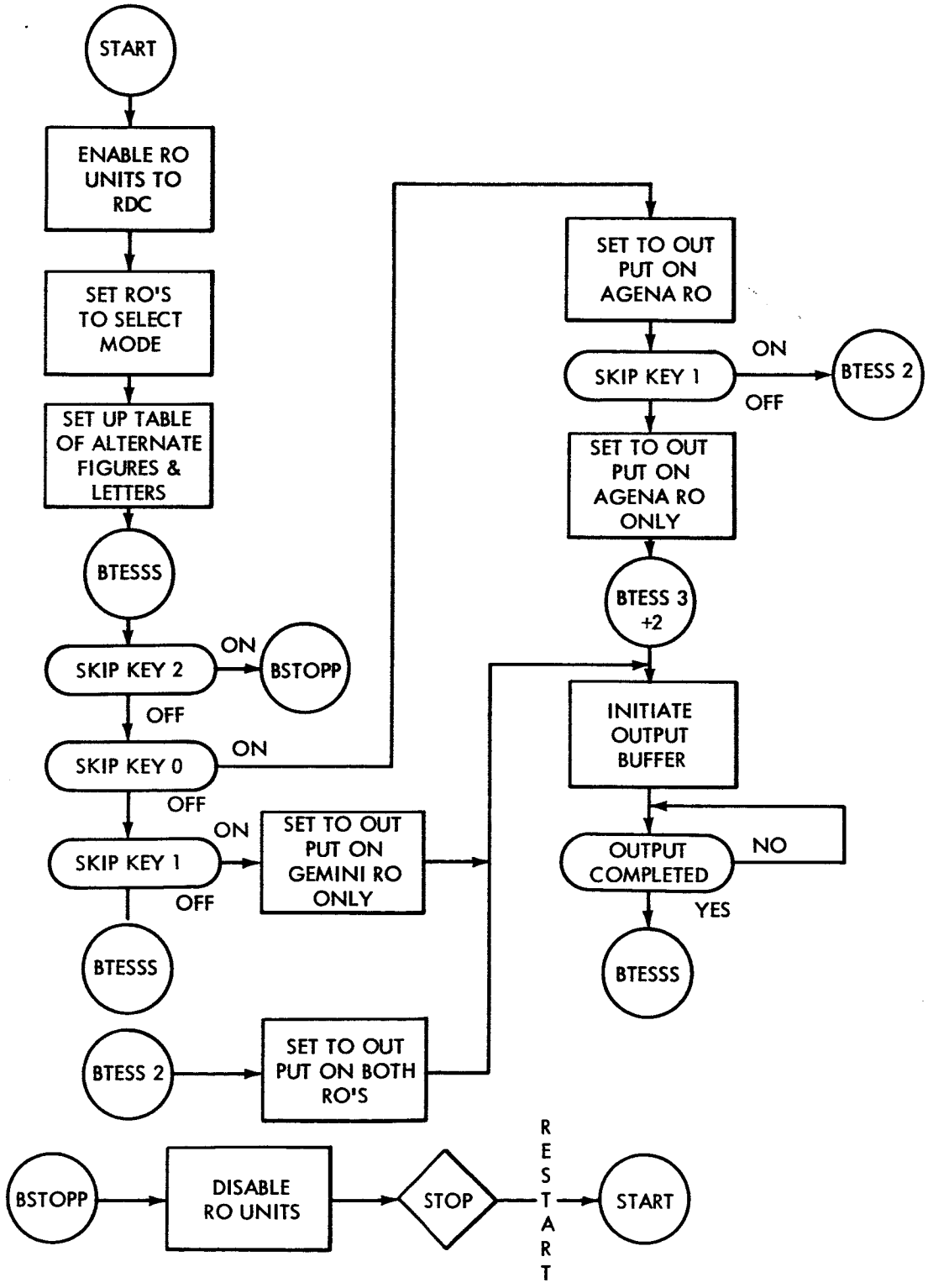
OUTPUT:

See Appendix A for Agena RO output.
See Appendix B for Gemini RO output.

MEMORY STORAGE USED:

1200_8 to 2175_8

RO TEST PROGRAM
DATA SUPPORT OFFICE



Attachment 2

AGENA OUTPUT

```
YAYBYCYDYEYFYHYIYY
YAYG YAYG
DOWN
       WE
            GO
OFFICIAL RO TEST PROGRAM

THE QUICK BROWN FOX JUMPED OVER THE LAZY DOGS  BACK 1234567890 TIMES.
A1B2C3D4E5F6G7H8I9J0K(L)M'N O&P Q$R S-T"U/V:W;X?Y,Z.  NOW FILL IN FIGS
A1B2C3D4E5F6G7H8I9J0K(L)M'N O&P Q$R S-T"U/V:W;X?Y,Z.  NOW START AGAIN.
#
```

OR

```
 YGYBYCYDYEYFYHYIYY
YAYG YAYG
DOWN
       WE
            GO
OFFICIAL RO TEST PROGRAM

THE QUICK BROWN FOX JUMPED OVER THE LAZY DOGS  BACK 1234567890 TIMES.
A1B2C3D4E5F6G7H8I9J0K(L)M'N O&P Q$R S-T"U/V:W;X?Y,Z.  NOW FILL IN FIGS
A1B2C3D4E5F6G7H8I9J0K(L)M'N O&P Q$R S-T"U/V:W;X?Y,Z.  NOW START AGAIN.
#
```

GEMINI OUTPUT

```
 YGYBYCYDYEYFYHYIYY
YAYG YAYG
DOWN
       WE
            GO
OFFICIAL RO TEST PROGRAM

THE QUICK BROWN FOX JUMPED OVER THE LAZY DOGS  BACK 1234567890 TIMES.
A1B2C3D4E5F6G7H8I9J0K(L)M'N O&P Q$R S-T"U/V:W;X?Y,Z.  NOW FILL IN FIGS
A1B2C3D4E5F6G7H8I9J0K(L)M'N O&P Q$R S-T"U/V:W;X?Y,Z.  NOW START AGAIN.
#
```

OR

```
 YBYCYDYEYFYHYIYY
YAYG YAYG
DOWN
       WE
            GO
OFFICIAL RO TEST PROGRAM

THE QUICK BROWN FOX JUMPED OVER THE LAZY DOGS  BACK 1234567890 TIMES.
A1B2C3D4E5F6G7H8I9J0K(L)M'N O&P Q$R S-T"U/V:W;X?Y,Z.  NOW FILL IN FIGS
A1B2C3D4E5F6G7H8I9J0K(L)M'N O&P Q$R S-T"U/V:W;X?Y,Z.  NOW START AGAIN.
#
```

Input Display Test Program

OPERATING INSTRUCTIONS FOR INPUT DISPLAY

SET-UP

1. Load Program; Master and I/O Clear; and Set Stops Ø, 1 and 2.

2. Key Channels to be displayed into the last 3 Octal digits of AL.

   a. The channel number entered in the least significant digit (8^0) will be displayed in AL.

   b. The channel number entered in the next digit (8^1) will be displayed in AU.

   c. The channel number entered in the third digit (8^2) will be displayed in CO.

3. Key the number of channels to be displayed into the least significant two bits of AU.

4. Set Skip 3 to output the GMT Elapsed Time Clock to the 3 Character Digital Data Display, if desired.

5. Set Skip 4 to output an AL key-in to the 3 Character Digital Data Display.

6. Start with P set at 24Ø and press Start. Uses locations 240 through 1500.

OPERATION

1. The program will accept from 1 to 3 channels for display. If more than 1, the channels may be in any combination. The program operates under the assumption that the input device requested to be displayed is ready, willing and able to input data. If more than 3 channels are requested in AU (or a negative number is keyed into AU) the program will treat the request as if 3 channels were requested.

2. The program will type on the I/O Console, the display requested and come to a Stop 2. If an error has been made in the key-in, set Skip 2, enter the

correct information and press Start. The new request will then be typed on the console. When the typeout contains the desired display release Skip 2 and press Start.

3. If the number of channels desired has not been entered into AU, a typeout to this effect will be made, and the computer will come to a Stop ø. Should this occur, key-in the proper number into AU and press Start (except when Skip 4 is set; see Par. 5).

4. At the user's option the 3 Character Digital Data Display may be selected for display by setting Skip 3 when the rest of the request is being entered in the A registers. Skip 3 causes the GMT Elapsed Time Clock to be outputted to the 3 Character Digital Data Display.

Note: The circuitry of the 3 Character Digital Data Display uses electromechanical relays which limit the rate at which it may accept data. The maximum clock rate to be used, therefore, is 1ø times the normal rate. If the rate is 1øø, it may not function properly, and if set at 1øøø it will not work. When using this option the 3 Character Digital Data Display will not correspond exactly to the clock reading since the clock uses a 3-4-3-4 bit/character configuration and the display uses a 4-4-4 bit/character configuration.

5. Also, at the user's option Skip 4 may be set, which will cause the computer to print that fact, and the value (least 12 significant bits) keyed into AL will be outputted to the 3 Character Digital Data Display. Thereafter each value keyed into AL will be outputted and the computer will come to an unconditional stop (Stop 5). This sequence is repeated until Skip 4 is released. Then the computer will come to a 1 Stop at which time a new request may be entered into the A registers (see Par. 6).

Note: Four bits are required for the 3 Character Digital Data Display. Also, when using this option do <u>not</u> enter any value into AU, since a value in AU will cause the data word in AL to be interpreted as channels to be displayed.

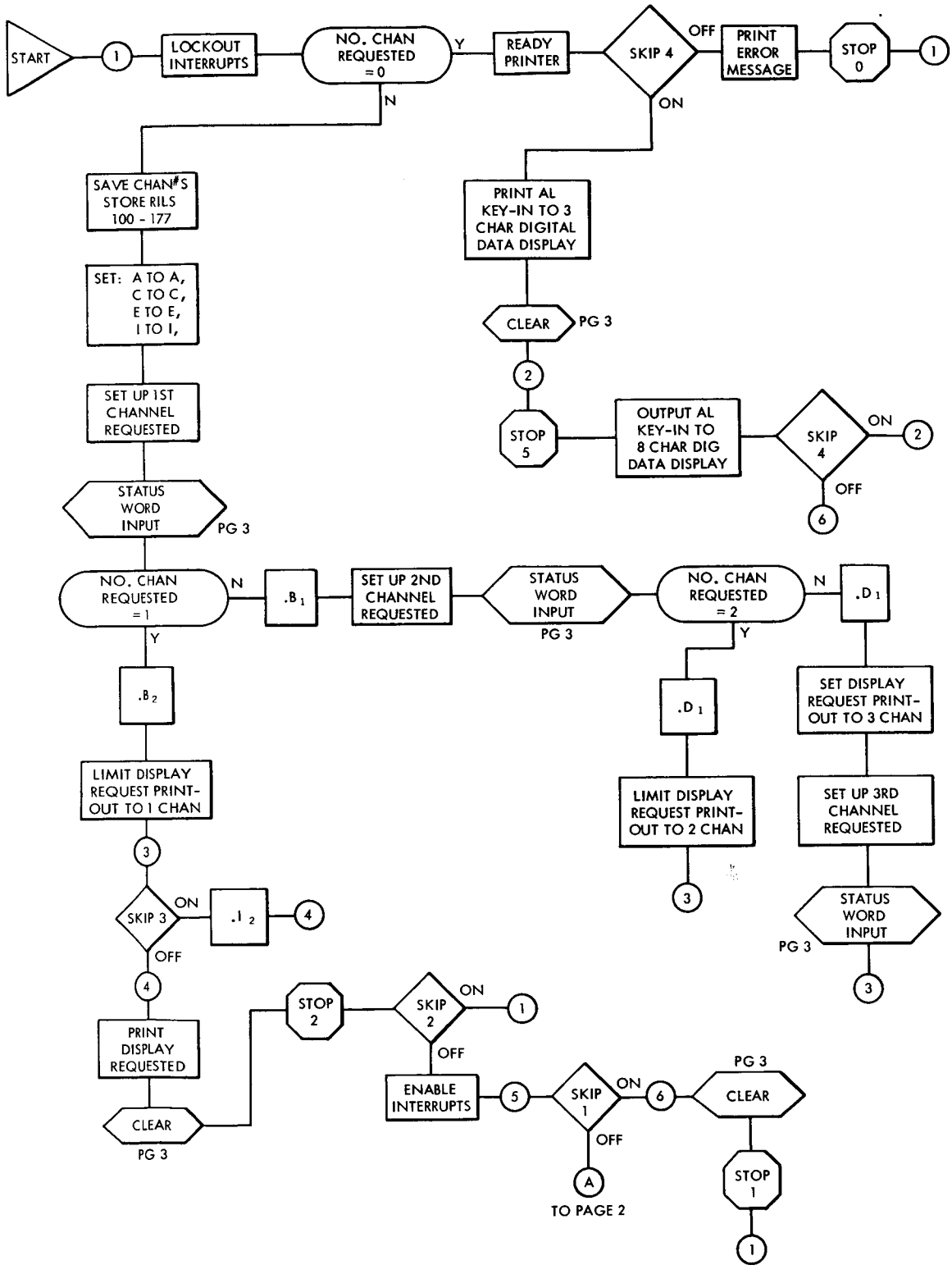
6. To bring the program to an orderly halt, set Skip 1 and the computer will come to a 1 Stop. If a new request is desired, release Skip 1, enter the new request and press Start.

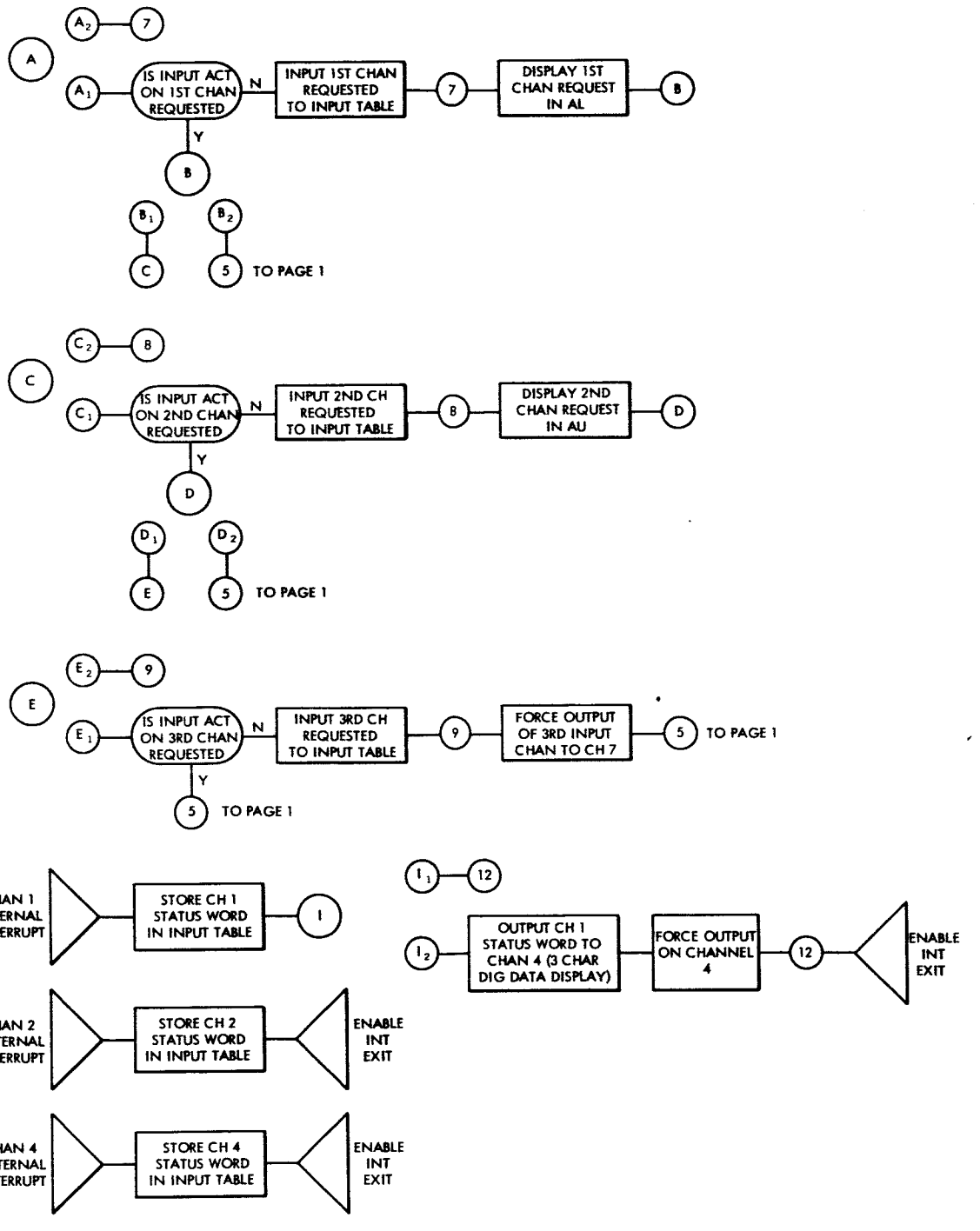
Words/Frame Gate—S/A 1320
Display Word Count, Ch 6 in AU
Ch 7 in AL

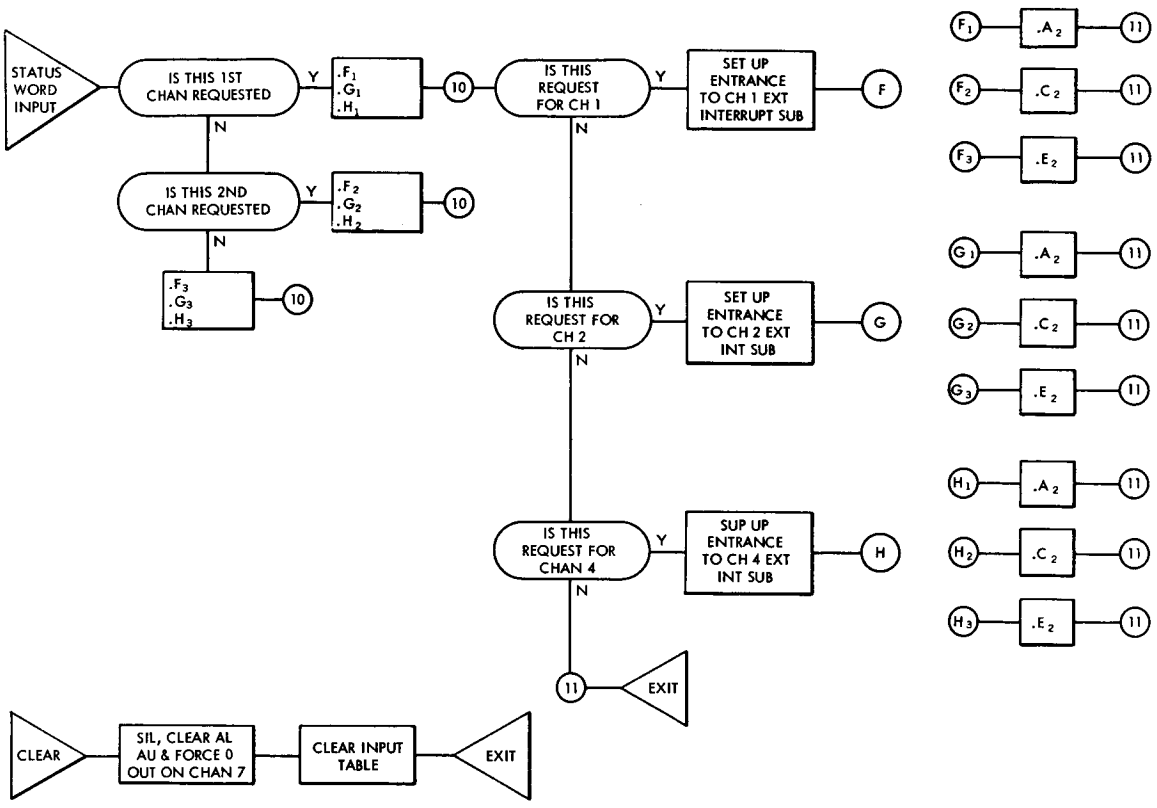
Ext. Ent. Status Words—S/A 1400
Display Status Word, Ch 6 in AU
Ch 7 in AL

Count External Interrupts/Minute S/A 1440
Display Count, Ch 6 in AU
Ch 7 in AL

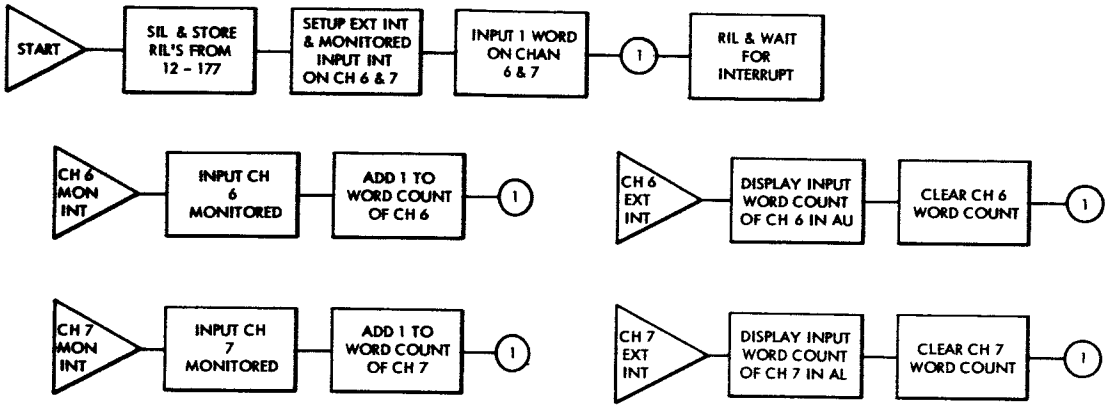
Gemini Interrupts Should be 31_8/Min
Agena Interrupts Should be 74_8/Min


START
1
LOCKOUT INTERRUPTS
NO. CHAN REQUESTED = 0
Y
N
READY PRINTER
SKIP 4
OFF
ON
PRINT ERROR MESSAGE
STOP 0
1
SAVE CHAN#S STORE RILS 100 - 177
SET: A TO A, C TO C, E TO E, I TO I,
SET UP 1ST CHANNEL REQUESTED
STATUS WORD INPUT
PG 3
PRINT AL KEY-IN TO 3 CHAR DIGITAL DATA DISPLAY
CLEAR
PG 3
2
STOP 5
OUTPUT AL KEY-IN TO 8 CHAR DIG DATA DISPLAY
SKIP 4
ON
2
OFF
6
NO. CHAN REQUESTED = 1
N
.B1
SET UP 2ND CHANNEL REQUESTED
STATUS WORD INPUT
PG 3
NO. CHAN REQUESTED = 2
N
.D1
Y
.B2
LIMIT DISPLAY REQUEST PRINT-OUT TO 1 CHAN
3
SKIP 3
ON
.I2
4
OFF
4
PRINT DISPLAY REQUESTED
CLEAR
PG 3
STOP 2
SKIP 2
ON
1
OFF
ENABLE INTERRUPTS
5
SKIP 1
ON
6
PG 3
CLEAR
OFF
A
TO PAGE 2
STOP 1
1
.D1
LIMIT DISPLAY REQUEST PRINT-OUT TO 2 CHAN
3
SET DISPLAY REQUEST PRINT-OUT TO 3 CHAN
SET UP 3RD CHANNEL REQUESTED
STATUS WORD INPUT
PG 3
3

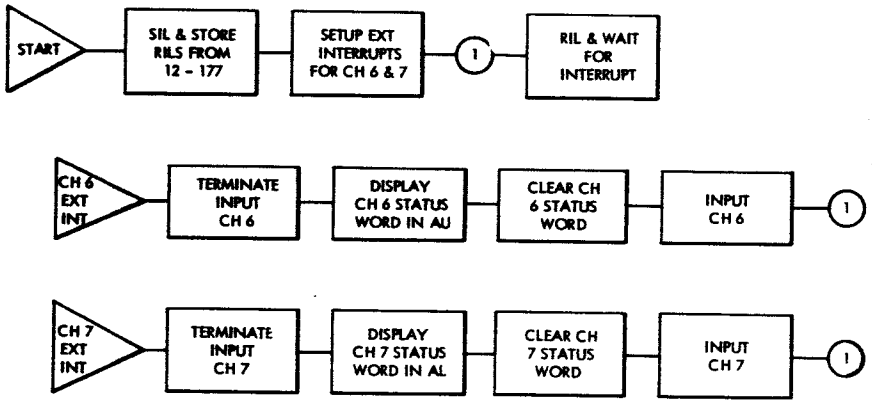

A2
7
A
A1
IS INPUT ACT ON 1ST CHAN REQUESTED
N
INPUT 1ST CHAN REQUESTED TO INPUT TABLE
7
DISPLAY 1ST CHAN REQUEST IN AL
B
Y
B
B1
B2
C
5
TO PAGE 1
C2
B
C
C1
IS INPUT ACT ON 2ND CHAN REQUESTED
N
INPUT 2ND CH REQUESTED TO INPUT TABLE
B
DISPLAY 2ND CHAN REQUEST IN AU
D
Y
D
D1
D2
E
5
TO PAGE 1
E2
9
E
E1
IS INPUT ACT ON 3RD CHAN REQUESTED
N
INPUT 3RD CH REQUESTED TO INPUT TABLE
9
FORCE OUTPUT OF 3RD INPUT CHAN TO CH 7
5
TO PAGE 1
Y
5
TO PAGE 1
CHAN 1 EXTERNAL INTERRUPT
STORE CH 1 STATUS WORD IN INPUT TABLE
1
CHAN 2 EXTERNAL INTERRUPT
STORE CH 2 STATUS WORD IN INPUT TABLE
ENABLE INT EXIT
CHAN 4 EXTERNAL INTERRUPT
STORE CH 4 STATUS WORD IN INPUT TABLE
ENABLE INT EXIT
I1
12
I2
OUTPUT CH 1 STATUS WORD TO CHAN 4 (3 CHAR DIG DATA DISPLAY)
FORCE OUTPUT ON CHANNEL 4
12
ENABLE INT EXIT


STATUS WORD INPUT
IS THIS 1ST CHAN REQUESTED
Y
.F1 .G1 .H1
10
N
IS THIS 2ND CHAN REQUESTED
Y
.F2 .G2 .H2
10
N
.F3 .G3 .H3
10
IS THIS REQUEST FOR CH 1
Y
SET UP ENTRANCE TO CH 1 EXT INTERRUPT SUB
F
N
IS THIS REQUEST FOR CH 2
Y
SET UP ENTRANCE TO CH 2 EXT INT SUB
G
N
IS THIS REQUEST FOR CHAN 4
Y
SUP UP ENTRANCE TO CH 4 EXT INT SUB
H
N
11
EXIT
CLEAR
SIL, CLEAR AL AU & FORCE 0 OUT ON CHAN 7
CLEAR INPUT TABLE
EXIT
F1 .A2 11
F2 .C2 11
F3 .E2 11
G1 .A2 11
G2 .C2 11
G3 .E2 11
H1 .A2 11
H2 .C2 11
H3 .E2 11

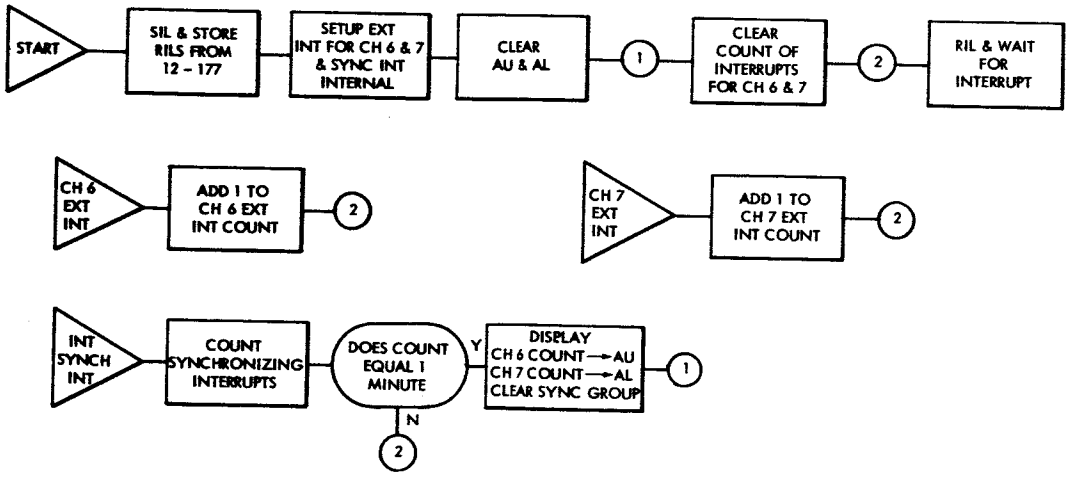
COUNT WORDS OF INPUT ON CHANNELS 6 & 7



CHANNELS 6 & 7 EXTERNAL INTERRUPT STATUS WORD DISPLAYS



COUNT OF INTERRUPTS ON CHANNELS 6 & 7



OPERATING INSTRUCTIONS FOR CRICK

Memory Test for Low Core (0-177) and Bootstrap

SET-UP

1. Load Program; Start at 500; Set Stop ø (Uses Locations 500 through 761)

2. Set Stop 1 to bring the Program to an Orderly Halt

3. Use Skip ø to bypass the Worst Pattern Test of a Failed low core location

OPERATION

The program stores 2 basic patterns; 252525 and 000000. The pattern is complemented for successive locations. The location is tested by comparing what was stored with what should have been stored. This is done 4096 times and then the alternate basic pattern is used (also 4096 times). After the two basic patterns are used the program tests Bootstrap by attempting to write 0's in each Bootstrap location and making a comparison with a previously stored correct version of Bootstrap. This too, is done 4096 times. After all testing is complete (about 4 minutes) the program will stop if Stop 1 is set, if not, only one basic pattern is used each cycle thereafter.

FAILURE OCCURRENCE

Any failure will cause a ø Stop.

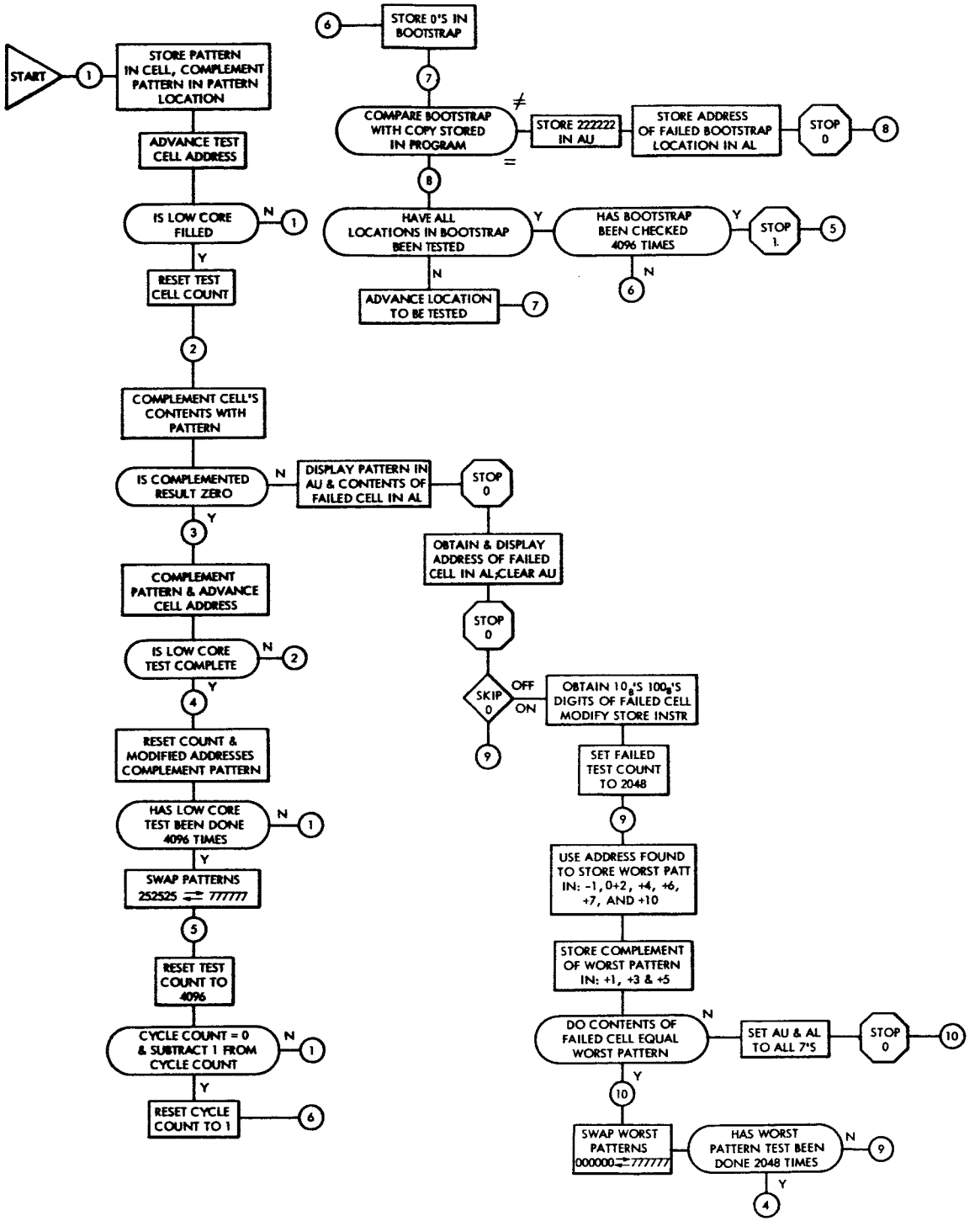
a. Low Core: When the ø Stop occurs AU will contain the pattern which should have been stored and AL will contain the pattern which was stored. Depress Start; another ø Stop will occur with the address of the failed location in AL and 0's in AU. At this point the user has the option of ignoring the error and continuing to test each subsequent location by setting Skip ø and depressing Start, or testing the failed location with the worst pattern by depressing Start with Skip ø off.

The worst pattern test stores all 0's in the even numbered locations with location 7 the same as location 0, and all 1's in the odd locations. The program then reverses the odd-even pattern. This worst pattern test is repeated 2048 times. If the cell fails again a ø Stop will occur with all 7's in AU and AL. At the completion of the worst pattern test the program initiates a new cycle for low core.

The purpose of using Skip ∅ to ignore the failure is to provide a means for examining the cells immediately higher than the failed location after a failure has occurred. It is recommended that the program be permitted to enter the worst pattern test after a failure and, that the worst pattern test be by-passed when the same failure occurs the second time.

b. Bootstrap: If a failure occurs in Bootstrap the program will come to an error stop (Stop ∅) with all 2's in AU and the address of the offending location in AL. In this case, simply depress Start to continue the program.

CRICK


START
STORE PATTERN IN CELL, COMPLEMENT PATTERN IN PATTERN LOCATION
ADVANCE TEST CELL ADDRESS
IS LOW CORE FILLED
N
Y
RESET TEST CELL COUNT
COMPLEMENT CELL'S CONTENTS WITH PATTERN
IS COMPLEMENTED RESULT ZERO
DISPLAY PATTERN IN AU & CONTENTS OF FAILED CELL IN AL
STOP 0
OBTAIN & DISPLAY ADDRESS OF FAILED CELL IN AL; CLEAR AU
STOP 0
SKIP 0
OFF
ON
OBTAIN 10_8'S 100_8'S DIGITS OF FAILED CELL MODIFY STORE INSTR
SET FAILED TEST COUNT TO 2048
USE ADDRESS FOUND TO STORE WORST PATT IN: -1, 0+2, +4, +6, +7, AND +10
STORE COMPLEMENT OF WORST PATTERN IN: +1, +3 & +5
DO CONTENTS OF FAILED CELL EQUAL WORST PATTERN
SET AU & AL TO ALL 7'S
STOP 0
SWAP WORST PATTERNS 000000 ⇌ 777777
HAS WORST PATTERN TEST BEEN DONE 2048 TIMES
IS COMPLEMENT RESULT ZERO
IS LOW CORE TEST COMPLETE
RESET COUNT & MODIFIED ADDRESSES COMPLEMENT PATTERN
HAS LOW CORE TEST BEEN DONE 4096 TIMES
SWAP PATTERNS 252525 ⇌ 777777
RESET TEST COUNT TO 4096
CYCLE COUNT = 0 & SUBTRACT 1 FROM CYCLE COUNT
RESET CYCLE COUNT TO 1
STORE 0'S IN BOOTSTRAP
COMPARE BOOTSTRAP WITH COPY STORED IN PROGRAM
≠
=
STORE 222222 IN AU
STORE ADDRESS OF FAILED BOOTSTRAP LOCATION IN AL
STOP 0
HAVE ALL LOCATIONS IN BOOTSTRAP BEEN TESTED
HAS BOOTSTRAP BEEN CHECKED 4096 TIMES
STOP 1
ADVANCE LOCATION TO BE TESTED

OPERATING INSTRUCTIONS FOR THE DTU TEST PROGRAM

1. All starts must be made with P set to 500. The program uses locations 500 through 4077.

2. Stop 1 will stop the computer after each message is complete. The message may be reinitiated by depressing Start. If stop 1 is not set the message will be reinitiated automatically.

3. Data words are obtained from the word manually entered into AU. This word may be changed while the program is running, the change will be effective after each message has been completed.

4. Modes of Operation:

   a. External Function Mode

(1) Master Clear:	Set Stop 2	The program will force out an external function to master clear the DTU and stop. To recycle, master clear the computer, reset P to 500 and press Start.
(2) Transmit:	Set Stop 2	This follows a master clear to the DTU; by depressing Start after the first Stop 2 (for the master clear) the program will force out an external function to Transmit and Stop. To recycle, master clear the computer, reset P to 500 and press Start (this recycles both the master clear and transmit external functions).

   b. Transmit Mode

(1) Forced Output:	Stop 2 Off Skip 1 Off Skip 2 Off Skip 3 On Skip 4 Optional	After forcing external functions to master clear and transmit; a SOM, 1 data word and an EOT are forced out. If Skip 4 is set, 1 data word will be forced out

continuously (the EOT will not be sent until Skip 4 is released). The program has a 12 ms. delay after each output word.

(2) Normal Output: Stop 2 Off, Skip 1 Off, Skip 2 Off, Skip 3 Off, Skip 4 Optional

This will operate the same as the Forced Output Mode but does not force out the SOM, the single data word and the EOT. Skip 4 works in a similar manner, i.e., 1 data word will be output continuously and the EOT will not be sent until Skip 4 is released. The program will not proceed with the next output until the current word has been completed.

c. Communications Test Mode

(1) Gemini Message: Stop 2 Off, Skip 1 Off, Skip 2 On, Skip 3 On

After forcing external functions to master clear and transmit, the program will output 3 synch words for the Gemini PCM and 497 data words.

(2) Agena Message: Stop 2 Off, Skip 1 Off, Skip 2 On, Skip 3 Off

After forcing external functions to master clear and transmit, the program will output 3 synch words for the Agena PCM and 247 data words.

d. Transmit and Receive Mode

(1) 500 Word Message: Stop 2 Off, Skip 1 On, Skip 2 Off, Skip 3 On, Skip 4 and Stop Ø Optional

After forcing external functions to master clear and transmit, the program will output a SOM, 498 data words and an EOT. If Skip 4 and Stop Ø are set, the program will compare the SOM and Data Words transmitted with those received. If an error occurs the computer will come to an error stop (Stop Ø).

Depressing Start returns the program to the point in the program where the error was detected.

(2) 250 Word Message: Stop 2 Off
Skip 1 On
Skip 2 Off
Skip 3 Off
Skip 4 and
Stop ∅ Optional

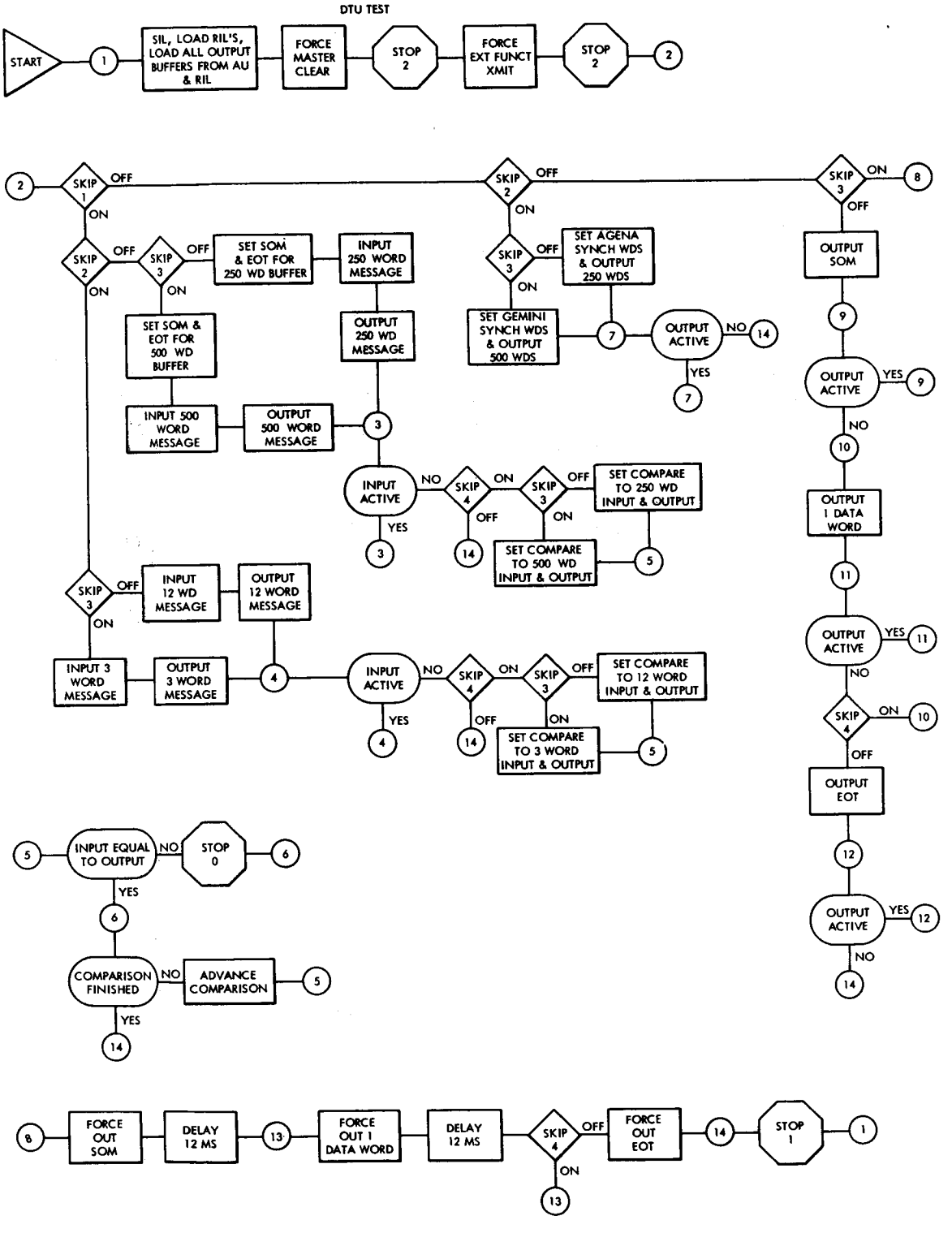
This operates the same as the 500 word message with the exception that there are 248 data words.

(3) 12 Word Message: Stop 2 Off
Skip 1 On
Skip 2 On
Skip 3 Off
Skip 4 and
Stop ∅ Optional

This operates the same as the 500 word message with the exception that there are 10 data words.

(4) 3 Word Message: Stop 2 Off
Skip 1 On
Skip 2 On
Skip 3 On
Skip 4 and
Stop ∅ Optional

This operates the same as the 500 word message with the exception that there is only 1 data word.



Attachment 5

TABLE 46. PINS OF 1218

	J9, J4, J2, J7	J14, J12, J10, J16	J1, J8, J3, J5	J6, J15, J11, J13
PIN NO.	ODD INPUT CONNECTOR	ODD OUTPUT CONNECTOR	EVEN INPUT CONNECTOR	EVEN OUTPUT CONNECTOR
1	In. Req.	Out. Ack.	In. Req.	Out. Ack.
2	In. Ack.	Out. Req.	In. Ack.	Out. Req.
3	Ext. Int.	E.F.	Ext. Int.	E.F.
4	Spare (1)	E.F. Req.	Spare (1)	E.F. Req.
5	2^{32}	2^{32}		
6	2^{33}	2^{33}		
7	2^{34}	2^{34}		
8	2^{35}	2^{35}		
9	2^{0}	2^{0}	2^{0} (52)	2^{0} (52)
10	2^{1}	2^{1}	2^{1} (53)	2^{1} (53)
11	In. Req. R	Out. Ack. R	In. Req. R	Out. Ack. R
12	In. Ack. R	Out. Req. R	In. Ack. R	Out. Req. R
13	Ext. Int. R	E.F. R	Ext. Int. R	E.F. R
14	Spare (1) R	E.F. Req. R	Spare (1) R	E.F. Req. R
15	2^{32}R	2^{32}R		
16	2^{33}R	2^{33}R		
17	2^{34}R	2^{34}R		
18	2^{35}R	2^{35}R		
19	2^{0}R	2^{0}R	2^{0}R (63)	2^{0}R (63)
20	2^{1}R	2^{1}R	2^{1}R (64)	2^{1}R (64)
21	Unused	Unused		Spare
22	2^{2}	2^{2}	2^{2} (54)	2^{2} (54)
23	2^{3}	2^{3}	2^{3} (55)	2^{3} (55)

TABLE 46. PINS OF 1218 (CONT.)

PIN NO.	ODD INPUT CONNECTOR	ODD OUTPUT CONNECTOR	EVEN INPUT CONNECTOR	EVEN OUTPUT CONNECTOR
24	2^4	2^4	2^4 (56)	2^4 (56)
25	2^5	2^5	2^5 (57)	2^5 (57)
26	2^6	2^6	2^6 (70)	2^6 (70)
27	2^7	2^7	2^7 (71)	2^7 (71)
28	2^8	2^8	2^8 (72)	2^8 (72)
29	2^9	2^9	2^9 (73)	2^9 (73)
30	2^{10}	2^{10}	2^{10} (74)	2^{10} (74)
31	2^{11}	2^{11}	2^{11} (75)	2^{11} (75)
32	2^{12}	2^{12}	2^{12} (76)	2^{12} (76)
33	2^2R	2^2R	2^2R (65)	2^2R (65)
34	2^3R	2^3R	2^3R (66)	2^3R (66)
35	2^4R	2^4R	2^4R (67)	2^4R (67)
36	2^5R	2^5R	2^5R (68)	2^5R (68)
37	2^6R	2^6R	2^6R (80)	2^6R (80)
38	2^7R	2^7R	2^7R (81)	2^7R (81)
39	2^8R	2^8R	2^8R (82)	2^8R (82)
40	2^9R	2^9R	2^9R (83)	2^9R (83)
41	2^{10}R	2^{10}R	2^{10}R (84)	2^{10}R (84)
42	2^{11}R	2^{11}R	2^{11}R (85)	2^{11}R (85)
43	2^{12}R	2^{12}R	2^{12}R (86)	2^{12}R (86)
44	Unused			Spare
45	Cable Shield	Cable Shield	Cable Shield	Cable Shield
46	Unused			Spare
47	2^{13}	2^{13}	2^{13} (77)	2^{13} (77)

TABLE 46. PINS OF 1218 (CONT.)

PIN NO.	ODD INPUT CONNECTOR	ODD OUTPUT CONNECTOR	EVEN INPUT CONNECTOR	EVEN OUTPUT CONNECTOR
48	2^{14}	2^{14}	2^{14} (5)	2^{14} (5)
49	2^{15}	2^{15}	2^{15} (6)	2^{15} (6)
50	2^{16}	2^{16}	2^{16} (7)	2^{16} (7)
51	2^{17}	2^{17}	2^{17} (8)	2^{17} (8)
52	2^{18}	2^{18}		
53	2^{19}	2^{19}		
54	2^{20}	2^{20}		
55	2^{21}	2^{21}		
56	2^{22}	2^{22}		
57	2^{23}	2^{23}		
58	2^{13}R	2^{13}R	2^{13}R (87)	2^{13}R (87)
59	2^{14}R	2^{14}R	2^{14}R (15)	2^{14}R (15)
60	2^{15}R	2^{15}R	2^{15}R (16)	2^{15}R (16)
61	2^{16}R	2^{16}R	2^{16}R (17)	2^{16}R (17)
62	2^{17}R	2^{17}R	2^{17}R (18)	2^{17}R (18)
63	2^{18}R	2^{18}R		
64	2^{19}R	2^{19}R		
65	2^{20}R	2^{20}R		
66	2^{21}R	2^{21}R		
67	2^{22}R	2^{22}R		
68	2^{23}R	2^{23}R		
69	Cable Shield	Cable Shield	Cable Shield	Cable Shield
70	2^{24}	2^{24}		
71	2^{25}	2^{25}		

TABLE 46. PINS OF 1218 (CONT.)

PIN NO.	ODD INPUT CONNECTOR	ODD OUTPUT CONNECTOR	EVEN INPUT CONNECTOR	EVEN OUTPUT CONNECTOR
72	2^{26}	2^{26}		
73	2^{27}	2^{27}		
74	2^{28}	2^{28}		
75	2^{29}	2^{29}		
76	2^{30}	2^{30}		
77	2^{31}	2^{31}		
78	Unused	Unused		Spare
79	Unused	Unused		Spare
80	2^{24}R	2^{24}R		
81	2^{25}R	2^{25}R		
82	2^{26}R	2^{26}R		
83	2^{27}R	2^{27}R		
84	2^{28}R	2^{28}R		
85	2^{29}R	2^{29}R		
86	2^{30}R	2^{30}R		
87	2^{31}R	2^{31}R		
88	Unused	Unused		Spare
89	Unused	Unused		
90	Unused	Unused		

DATA LINE INTERFACE TEST POINTS

Input Selectors: Reference PX 2526, Fig. 9-76 thru 9-81, pages 9-153 thru 9-164.

Channel →	0	1	2	3	4	5	6	7
Prefix →	A1TB	A2TB	A1TB	A2TB	A1TB	A2TB	A1TB	A2TB
Bit Pos. ↓	J1	J2	J3	J4	J5	J9	J8	J7
2^0	2F3	9G7	2L3	9J6	2G4	9D6	2D5	9G5
2^1	2I3	9J7	2D4	9D7	2J4	9G6	2G5	9J5
2^2	2J5	9L4	4F5	7K8	4L5	7E8	4G6	7N7
2^3	4J6	9D5	4I5	7N8	4D6	7H8	4J6	7B8
2^4	4B7	7H7	4H7	7B7	6E6	7H6	6J5	5B8
2^5	4E7	7K7	4K7	7E7	6I6	7K6	4F8	5E8
2^6	6D5	5K7	6J4	5E7	6D4	5J6	6H8	5D6
2^7	6G5	5N7	4B8	5H7	6G4	5B7	6K8	5G6
2^8	6B8	5G5	6K7	5L4	6E7	5F4	6L6	3K8
2^9	6E8	5J5	6N7	5D5	6H7	5I4	6B7	3N8
2^{10}	8E7	3E8	8J6	3N7	8D6	3H7	8G5	3B7
2^{11}	8H7	3H8	8B7	3B8	8G6	3K7	8J5	3E7
2^{12}	8L4	3I6	8F4	1L3	10F4	1I4	8N8	1F5
2^{13}	8D5	3L6	8I4	1I3	10I4	1F4	10D5	1L4
2^{14}	8H8	1I5	8E8	1F6	8K7	1L6	10G5	1E7
2^{15}	8K8	3N1	8B8	1L5	8N7	1I6	10J5	1B7
2^{16}	10D6	1K7	10J6	1B8	10G7	1H8	10D8	1N8
2^{17}	10G6	1H7	10D7	1N7	10J7	1E8	10G8	1K8

Input Jack to Channel Translator

J1 → Ch 0	J5 → Ch 4
J2 → Ch 1	J9 → Ch 5
J3 → Ch 2	J8 → Ch 6
J4 → Ch 3	J7 → Ch 7

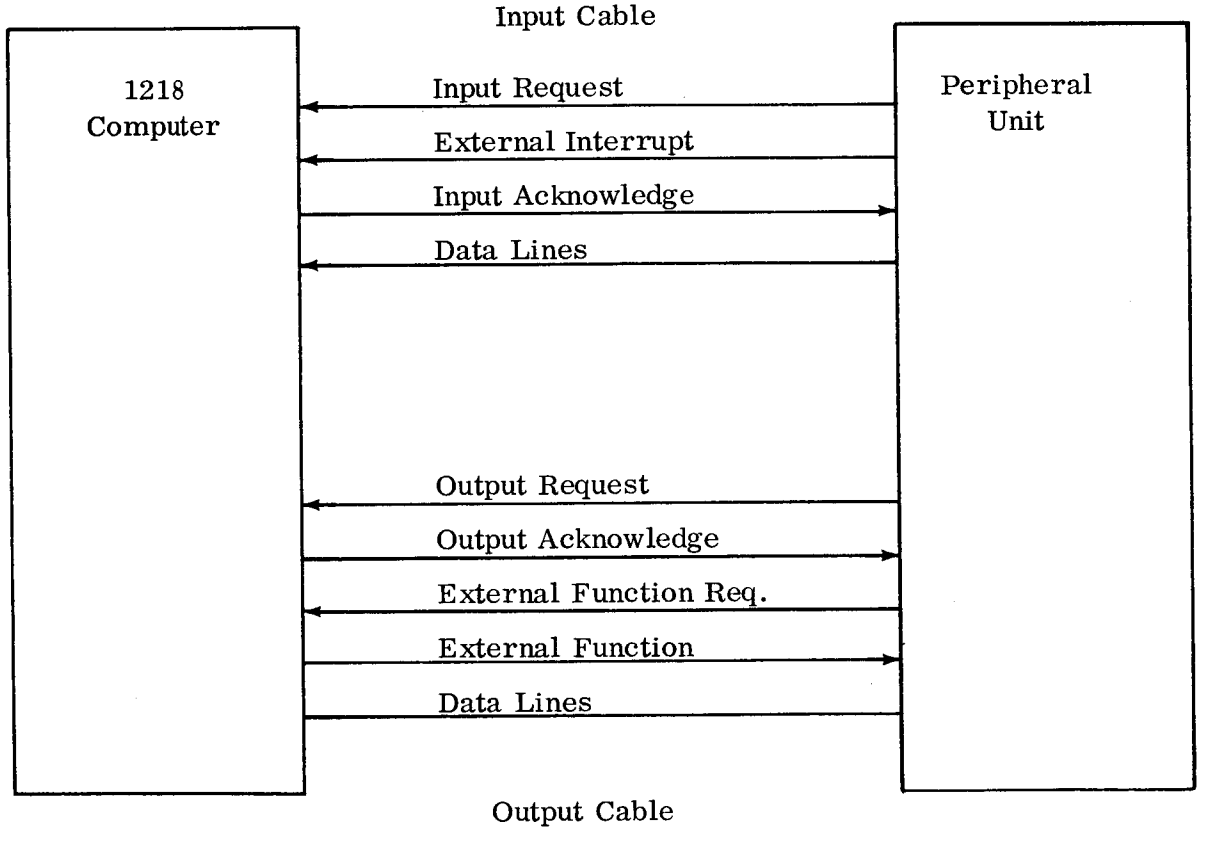
Output Jack to Channel Translator

J6 → Ch 0	J13 → Ch 4
J10 → Ch 1	J14 → Ch 5
J11 → Ch 2	J15 → Ch 6
J12 → Ch 3	J16 → Ch 7

CONTROL LINE INTERFACE TEST POINTS

Note: Prefix for all test points: A1TB____

Ref. Fig:	Name	Ch 0	Ch 1	Ch 2	Ch 3	Ch 4	Ch 5	Ch 6	Ch 7
9-88	External Int. Request	9D6	7K7	7G6	5G7	3L7	3L5	3F7	3F5
9-83	Input Data Request	9H6	7B8	7J6	5J7	3D8	3F6	3I7	3I5
9-104	Input Data Ack.	2A2	4J2	4K3	2C2	8N2	10I8	10L4	10L5
9-90	Output Data Req.	9H7	7H8	7H7	5G8	3J8	3L6	1D8	1D6
9-105	Output Data Ack.	7J8	3C6	1D3	7L8	3C7	1H3	7N8	1F3
9-86	Ext. Function Req.	9D7	7E8	7E7	5D8	3G8	3I6	1D7	1D5
9-105	Ext. Function	9K5	7L6	3J4	9C8	7M7	3L4	9E8	3C5



Output Selectors: Reference PX 2526, Fig. 9-106 thru 9-109, pages 9-213 thru 9-220.

Channel →	0	1	2	3	4	5	6	7
Prefix →	A1TB	A1TB	A1TB	A1TB	A1TB	A1TB	A1TB	A1TB
Bit Pos. ↓								
2^0	2E2	8C3						
2^1	4L2	10C2						
2^2	4C4	10E2						
2^3	2G2	8E3						
2^4	4N2	10G2						
2^5	4E4	10I2						
2^6	2I2	8G3	SAME AS CHANNEL 0	SAME AS CHANNEL 1	SAME AS CHANNEL 0	SAME AS CHANNEL 1	SAME AS CHANNEL 0	SAME AS CHANNEL 1
2^7	4C3	10K2						
2^8	4G4	10M2						
2^9	2K2	8I3						
2^{10}	4E3	10C3						
2^{11}	4I4	10E3						
2^{12}	2M2	8K3						
2^{13}	4G3	10G3						
2^{14}	4K4	10I3						
2^{15}	2C3	8C4						
2^{16}	4I3	10K3						
2^{17}	4C5	10C4						

Unit: TOB		GMT TIME	Unit: TIMING D F	
Terminal Block Test Point: (Prefix)	Connector 1J28 Part No. DEUTSCH 3057-16A	FUNCTION (TIME TO 23: 59: 59)	Connector 10J22 Part No. BENDIX 71-285523-55P	Terminal Block Test Point: (Prefix)
	1	Ret. BCD (-10 V)	A	
	2	Units Sec 1	B	
	3	Units Sec 2	C	
	4	Units Sec 4	D	
	5	Units Sec 8	E	
	6	Tens Sec 1	F	
	7	Tens Sec 2	G	
	8	Tens Sec 4	H	
	9	Units Min 1	J	
	10	Units Min 2	K	
	11	Units Min 4	L	
	12	Units Min 8	M	
	13	Tens Min 1	N	
	14	Tens Min 2	P	
	15	Tens Min 4	R	
	16	Units Hours 1	S	
	17	Units Hours 2	T	
	18	Units Hours 4	U	
	19	Units Hours 8	V	
	20	Tens Hours 1	W	
	21	Tens Hours 2	X	
	22		Y	
	23		Z	
	24		a	
	25		b	

Unit: TOB		GMT TIME	Unit: TIMING DF	
Terminal Block Test Point: (Prefix)	Connector 1J28 Part No. DEUTSCH 3057-16A	FUNCTION (TIME TO 23: 59: 59)	Connector 10J22 Part No. BENDIX 71-285523-55P	Terminal Block Test Point: (Prefix)
	26		C	
	27		d	
	28		e	
	29		f	
	30		g	
	31		h	
	32		i	
	33		j	
	34		k	
	35		m	
	36		n	
	37		p	
	38		q	
	39		r	
	40		s	
	41		t	
	42		u	
	43		v	
	44		w	
	45		x	
	46		y	
	47		z	
	48		AA	
	49		BB	
	50		CC	

Unit: TOB		GMT TIME	Unit: TIMING D F	
Terminal Block Test Point: (Prefix)	Connector 1J28 Part No. DEUTSCH 3057-16A	FUNCTION (TIME TO 23: 59: 59)	Connector 10J22 Part No. BENDIX 71-285523-55P	Terminal Block Test Point: (Prefix)
	51		DD	
	52		EE	
	53		FF	
	54		GG	
	55		HH	
	56			
	57			
	58			
	59			
	60			
	61			

Unit: CAM AGENA SYSTEM CONSOLE UNIT 1			Unit: TOB	
Terminal Block Test Point: (Prefix 1TB)	Connector 1J11 Part No. BENDIX 71-285-523-55S	FUNCTION	Connector 1J29 Part No. DEUTSCH 3057 16A	Terminal Block Test Point: (Prefix)
28 B	B	Summary Message	1	
28 A	A	Summary Message Return	2	
28 D	D	Print Out	3	
28 C	C	Print Out Return	4	
28 F	F	Gemini	5	
28 E	E	Gemini Return	6	
28 H	H	Agena	7	
28 G	G	Agena Return	8	
28 K	K	Tape Playback	9	
28 J	J	Tape Playback Return	10	
28 M	M	Error	11	
28 L	L	Error Return	12	
28 P	P	Clear	13	
28 N	N	Clear Return	14	
28 S	S	Stop	15	
28 R	R	Stop Return	16	
28 U	U	Initiate (N. O.)	17	
28 T	T	Initiate Return (Common)	18	
28 W	W	Spare	19	
28 V	V	Spare	20	
29 B	Y	Push Button Indicator #1	21	
29 A	X	" " " " Return	22	
29 D	Z	" " " #2	23	
29 C	a	" " " " Return	24	
29 F	c	" " " #3	25	

Unit: CAM AGENA SYSTEM CONSOLE UNIT 1			Unit: TOB	
Terminal Block Test Point: (Prefix 1TB)	Connector 1J11 Part No. BENDIX 71-285-523-55S	FUNCTION	Connector 1J29 Part No. DEUTSCH 3057 16A	Terminal Block Test Point: (Prefix)
29 E	b	Push Button Indicator #3 Return	26	
29 H	e	" " " #4	27	
29 G	d	" " " " Return	28	
29 K	g	" " " #5	29	
29 J	f	" " " " Return	30	
29 M	i	" " " #6	31	
29 L	h	" " " " Return	32	
29 P	k	" " " #7	33	
29 N	j	" " " " Return	34	
29 S	n	" " " #8	35	
29 R	m	" " " " Return	36	
29 U	q	" " " #9	37	
29 T	p	" " " " Return	38	
29 W	s	" " " #0	39	
29 V	r	" " " " Return	40	
30 A	t	Initiate (N.C.)	41	
30 B	u		42	
30 C	v		43	
30 D	w		44	
30 E	x		45	
30 F	y		46	
30 G	z		47	
30 H	AA		48	
30 J	BB		49	
30 K	CC		50	

Unit: CAM AGENA SYSTEM CONSOLE UNIT 1		FUNCTION	Unit: TOB	
Terminal Block Test Point: (Prefix 1TB)	Connector 1J11 Part No. BENDIX 71-285-523-55S		Connector 1J29 Part No. DEUTSCH 3057 16A	Terminal Block Test Point: (Prefix)
30 L	DD		51	
30 M	EE		52	
30 N	FF		53	
30 P	GG		54	
30 R	HH		55	
30 S			56	
30 T			57	
30 U			58	
30 V			59	
30 W			60	
			61	

5/19/64

CABLE: W306

REFER TO DRAWING: GC-GEM-1002733A

FROM: TB-1A

TO: AGENA CONSOLE UNIT 1 RO, 1J20

TWISTED PAIR

Unit: CAM GEMINI SYSTEM CONSOLE UNIT 3		FUNCTION	Unit: TOB	
Terminal Block Test Point: (Prefix 1TB)	Connector 3J11 Part No. BENDIX 71-285-523-55S		Connector 1J15 Part No. DEUTSCH 3057 16A	Terminal Block Test Point: (Prefix)
28 B	B	Summary Message	1	
28 A	A	Summary Message Return	2	
28 D	D	Print Out	3	
28 C	C	Print Out Return	4	
28 F	F	Gemini	5	
28 E	E	Gemini Return	6	
28 H	H	Agena	7	
28 G	G	Agena Return	8	
28 K	K	Tape Playback	9	
28 J	J	Tape Playback Return	10	
28 M	M	Error	11	
28 L	L	Error Return	12	
28 P	P	Clear	13	
28 N	N	Clear Return	14	
28 S	S	Stop	15	
28 R	R	Stop Return	16	
28 U	U	Initiate (N.O.)	17	
28 T	T	Initiate Return (Common)	18	
28 W	W	Spare	19	
28 V	V	Spare	20	
29 B	Y	Push Button Indicator #1	21	
29 A	X	" " " " Return	22	
29 D	a	" " " #2	23	
29 C	Z	" " " " Return	24	
29 F	c	" " " #3	25	

Unit: CAM GEMINI SYSTEM CONSOLE UNIT 3		FUNCTION	Unit: TOB	
Terminal Block Test Point: (Prefix 1TB)	Connector 3J11 Part No. BENDIX 71-285-523-55S		Connector 1J15 Part No. DEUTSCH 3057 16A	Terminal Block Test Point: (Prefix)
29 E	b	Push Button Indicator #3 Return	26	
29 H	e	" " " #4	27	
29 G	d	" " " " Return	28	
29 K	g	" " " #5	29	
29 J	f	" " " " Return	30	
29 M	i	" " " #6	31	
29 L	h	" " " " Return	32	
29 P	k	" " " #7	33	
29 N	j	" " " " Return	34	
29 S	n	" " " #8	35	
29 R	m	" " " " Return	36	
29 U	q	" " " #9	37	
29 T	p	" " " " Return	38	
29 W	s	" " " #0	39	
29 V	r	" " " " Return	40	
30 A	t	Initiate (N.C.)	41	
30 B	u		42	
30 C	v		43	
30 D	w		44	
30 E	x		45	
30 F	y		46	
30 G	z		47	
30 H	AA		48	
30 J	BB		49	
30 K	CC		50	

Unit: CAM GEMINI SYSTEM CONSOLE UNIT 3		FUNCTION	Unit: TOB	
Terminal Block Test Point: (Prefix 1TB)	Connector 3J11 Part No. BENDIX 71-285-523-55S		Connector 1J15 Part No. DEUTSCH 3057 16A	Terminal Block Test Point: (Prefix)
30 L	DD		51	
30 M	EE		52	
30 N	FF		53	
30 P	GG		54	
30 R	HH		55	
30 S			56	
30 T			57	
30 U			58	
30 V			59	
30 W			60	
			61	

5/19/64

CABLE: W317

REFER TO DRAWING: GC-GEM-1002733A

FROM: TB-1A

TO: GEMINI CONSOLE UNIT 3 RO, 3J20

TWISTED PAIR

5/19/64

CABLE: W409

REFER TO DRAWING: GC-GEM-1002733A

FROM: 1262 RO WALL ADAPTER, TB-1

TO: TB-1A

TWO TWISTED PAIR

Rev 5/19/64 Cable W500 Refer to Drawing No. GC-GEM-1002733A Pg. 1 of 4

Unit: 1218		CAM LINE	Unit: TOB EIC$_a$	
Terminal Block Test Point: (Prefix A1TB)	Connector J5 Part No. CANNON DPD 4500-4301	FUNCTION (3 BCD DIGITS + CONTROL)	Connector 1J36 Part No. DEUTSCH 3057 16A	Terminal Block Test Point: (Prefix)
3D8	1	Input Request **9 8 6$_t$	59	
3N2	2	Input Acknowledge 9 4$_t$ 8	37	
3L7	3	External Interrupt 9 2$_t$ 7$_a$ Initiate	39	
	4	Spare (1) 9 0$_t$ 8	41	
	5	9 5 3		
	6	9 7 7$_t$		
	7	9 3 3		
	8	9 7 5		
2G4	9	2^0 (52) 9 1$_t$ 3$_t$ Units 1	23	
2J4	10	2^1 (53) 9 2 8 Units 2	43	
	11	Input Request R 9 8 7	60	
	12	Input Acknowledge R 9 8 5	38	
	13	External Interrupt R 9 7$_a$ 3$_t$	40	
	14	Spare (1) R 9 8 1	42	
	15	9 6 3		
	16	9 7 8$_t$		
	17	9 3 4		
	18	9 7 6$_t$		
	19	2^0 R (63) 9 3 2	24	
	20	2^1 R (64) 9 0 3	44	
	21		45	
4L5	22	2^2 (54) 9 1 5 Units 4	57	
4D6	23	2^3 (55) 9 4 4$_t$ Units 8	35	
6E6	24	2^4 (56) 9 2$_t$ 4 Tens 1	7	
6I6	25	25 (57) 9 7$_t$ 3 Tens 2	33	

Unit: 1218		CAM LINE				Unit: TOB	EIC$_a$
Terminal Block Test Point: (Prefix A1TB)	Connector J5 Part No. CANNON DPD 4500-4301	FUNCTION (3 BCD DIGITS + CONTROL)				Connector 1J36 Part No. DEUTSCH 3057 16A	Terminal Block Test Point: (Prefix)
6D4	26	26 (70)	9	0_t 4	Tens 4	17	
6G4	27	27 (71)	9	1 3_t	Tens 8	5	
6E7	28	28 (72)	9	0 0_t	Hun. 1	1	
6H7	29	29 (73)	9	1_a 1_t	Hun. 2	3	
8D6	30	210 (74)	9	0 8	Hun. 4	9	
8G6	31	211 (75)	9	2 6	Hun. 8	11	
10F4	32	212 (76)	9	3 7	Agena	25	
	33	22 R (65)	9	2t 5		58	
	34	23 R (66)	9	4 5_t		36	
	35	24 R (67)	9	3_t 4		8	
	36	25 R (68)	9	3 8		34	
	37	26 R (80)	9	1_t 4		18	
	38	27 R (81)	9	1 4		6	
	39	28 R (82)	9	0 1_{at}		2	
	40	29 R (83)	9	2 1		4	
	41	210 R (84)	9	1_a 0_t		10	
	42	211 R (85)	9	2 7_t		12	
	43	212 R (86)	9	4 7_a		26	
	44					46	
	45	Cable Shield		0		47	
	46						
10I4	47	213 (77)	9	5 3_{at}	Gemini	55	
8K7	48	214 (5)	9	4 6_t	R O	53	
8N7	49	215 (6)	9	0 2_t	Stop	31	
10G7	50	216 (7)	9	1_a 5_t	Tape P/B	15	

Unit: 1218		CAM LINE			Unit: TOB	EIC$_a$
Terminal Block Test Point: (Prefix A1TB)	Connector J5 Part No. CANNON DPD 4500-4301	FUNCTION (3 BCD DIGITS + CONTROL)			Connector 1J36 Part No. DEUTSCH 3057 16A	Terminal Block Test Point: (Prefix)
10J7	51	2^{17} (8)	9 1_a 7_t	Summary	13	
	52		9 0 4			
	53		9 0 6_t			
	54		9 0_t 2			
	55		9 2 2_t			
	56		9 2 4			
	57		9 1_{at} 7			
	58	2^{13} R (87)	9 5 4		56	
	59	2^{14} R (15)	9 4 7_t		54	
	60	2^{15} R (16)	9 0 3_t		32	
	61	2^{16} R (17)	9 1_a 6_t		16	
	62	2^{17} R (18)	9 1_a 8		14	
	63		9 0 5_t			
	64		9 0 7_t			
	65		9 2 1_{at}			
	66		9 2 3_t			
	67		9 2 5			
	68		9 2_t 7			
	69				48	
	70		9 5 5_t			
	71		9 5 7_{at}			
	72		9 4 8_t			
	73		9 0 6			
	74		9 6 2			
	75		9 6 4			

Unit: 1218		CAM LINE	Unit: TOB	EIC$_a$
Terminal Block Test Point: (Prefix A1TB)	Connector J5 Part No. CANNON DPD 4500-4301	FUNCTION (3 BCD DIGITS + CONTROL)	Connector 1J36 Part No. DEUTSCH 3057 16A	Terminal Block Test Point: (Prefix)
	76	9 6 6$_t$		
	77	9 6 8$_t$		
	78		51	
	79		49	
	80	9 6$_t$ 5$_t$		
	81	9 8$_t$ 5		
	82	9 5 0$_t$		
	83	9 6 1$_t$		
	84	9 6 3		
	85	9 6 5		
	86	9 6 7		
	87	9 7 0$_t$		
	88		52	
	89		50	
	90			
		9 8 8$_t$		
		9 1$_{at}$	19	
		9 0$_t$	20	
		9 2$_t$	21	
			22	
OUT REQ.		** COLOR CODE: a = light color	27	
OUT ACK.		t = tracer	28	
E. F. REQ.			29	
E. F.			30	
			61	

Unit: 1218		CAM LINE			Unit: TOB EIC$_b$	
Terminal Block Test Point: (Prefix A1TB)	Connector J3 Part No. CANNON DPD 4500-4301	FUNCTION (3 BCD DIGITS + CONTROL)			Connector 1J37 Part No. DEUTSCH 3057 16A	Terminal Block Test Point: (Prefix)
7J6	1	Input Request	**9 8 6$_t$		59	
4K3	2	Input Acknowledge	9 4$_t$ 8		37	
7G6	3	External Interrupt	9 2$_t$ 7$_a$	Initiate	39	
	4	Spare (1)	9 0$_t$ 8		41	
	5		9 5 3			
	6		9 7 7$_t$			
	7		9 3 3			
	8		9 7 5			
2L3	9	2^0 (52)	9 1$_t$ 3$_t$	Units 1	23	
2D4	10	2^1 (53)	9 2 8	Units 2	43	
	11	Input Request R	9 8 7		60	
	12	Input Acknowledge R	9 8 5		38	
	13	External Interrupt R	9 7$_a$ 3$_t$		40	
	14	Spare (1) R	9 8 1		42	
	15		9 6 3			
	16		9 7 8$_t$			
	17		9 3 4			
	18		9 7 6$_t$			
	19	20 R (63)	9 3 2		24	
	20	21 R (64)	9 0 3		44	
	21				45	
4F5	22	2^2 (54)	9 1 5	Units 4	57	
4I5	23	2^3 (55)	9 4 4$_t$	Units 8	35	
4H7	24	2^4 (56)	9 2$_t$ 4	Tens 1	7	
4K7	25	2^5 (57)	9 7$_t$ 3	Tens 2	33	

Unit: 1218		CAM LINE			Unit: TOB EIC$_b$	
Terminal Block Test Point: (Prefix A1TB)	Connector J3 Part No. CANNON DPD 4500-4301	FUNCTION (3 BCD DIGITS + CONTROL)			Connector 1J37 Part No. DEUTSCH 3057 16A	Terminal Block Test Point: (Prefix)
6J4	26	2^6 (70)	9 0_t 4	Tens 4	17	
4B8	27	2^7 (71)	9 1 3_t	Tens 8	5	
6K7	28	2^8 (72)	9 0 0_t	Hun. 1	1	
6N7	29	2^9 (73)	9 1_a 1_t	Hun. 2	3	
8J6	30	2^{10} (74)	9 0 8	Hun. 4	9	
8B7	31	2^{11} (75)	9 2 6	Hun. 8	11	
8F4	32	2^{12} (76)	9 3 7	Agena	25	
	33	2^2 R (65)	9 2_t 5		58	
	34	2^3 R (66)	9 4 5_t		36	
	35	2^4 R (67)	9 3_t 4		8	
	36	2^5 R (68)	9 3 8		34	
	37	2^6 R (80)	9 1_t 4		18	
	38	2^7 R (81)	9 1 4		6	
	39	2^8 R (82)	9 0 1_{at}		2	
	40	2^9 R (83)	9 2 1		4	
	41	2^{10} R (84)	9 1_a 0_t		10	
	42	2^{11} R (85)	9 2 7_t		12	
	43	2^{12} R (86)	9 4 7_a		26	
	44				46	
	45	Cable Shield	0		47	
	46					
8I4	47	2^{13} (77)	9 5 3_{at}	Gemini	55	
8E8	48	2^{14} (5)	9 4 6_t	RO	53	
8B8	49	2^{15} (6)	9 0 2_t	Stop	31	
10J6	50	2^{16} (7)	9 1_a 5_t	Tape P/B	15	

Unit: 1218		CAM LINE		Unit: TOB	EIC$_b$
Terminal Block Test Point: (Prefix A1TB)	Connector J3 Part No. CANNON DPD 4500-4301	FUNCTION (3 BCD DIGITS + CONTROL)		Connector 1J37 Part No. DEUTSCH 3057 16A	Terminal Block Test Point: (Prefix)
10D7	51	217 (8)	9 1_a 7_t Summary	13	
	52		9 0 4		
	53		9 0 6_t		
	54		9 0_t 2		
	55		9 2 2_t		
	56		9 2 4		
	57		9 1_{at} 7		
	58	213 R (87)	9 5 4	56	
	59	214 R (15)	9 4 7_t	54	
	60	215 R (16)	9 0 3_t	32	
	61	216 R (17)	9 1_a 6_t	16	
	62	217 R (18)	9 1_a 8	14	
	63		9 0 5_t		
	64		9 0 7_t		
	65		9 2 1_{at}		
	66		9 2 3_t		
	67		9 2 5		
	68		9 2_t 7		
	69			48	
	70		9 5 5_t		
	71		9 5 7_{at}		
	72		9 4 8_t		
	73		9 0 6		
	74		9 6 2		
	75		9 6 4		

Unit: 1218		CAM LINE	Unit: TOB	EIC_b
Terminal Block Test Point: (Prefix A1TB)	Connector J3 Part No. CANNON DPD 4500-4301	FUNCTION (3 BCD DIGITS + CONTROL)	Connector 1J37 Part No. DEUTSCH 3057 16A	Terminal Block Test Point: (Prefix)
	76	9 6 6_t		
	77	9 6 8_t		
	78		51	
	79		49	
	80	9 6_t 5_t		
	81	9 8_t 5		
	82	9 5 0_t		
	83	9 6 1_t		
	84	9 6 3		
	85	9 6 5		
	86	9 6 7		
	87	9 7 0_t		
	88		52	
	89		50	
	90			
		9 8 8_t		
		9 1_{at}	19	
		9 0_t	20	
		9 2_t	21	
			22	
		** COLOR CODE: a = light color	27	
OUT REQ.		t = tracer	28	
OUT ACK.			29	
E. F. REQ.			30	
E. F.			61	

Unit: 1218		TLM LINE		Unit: TOB OIC$_a$	
Terminal Block Test Point: (Prefix A2TB)	Connector J7 Part No. CANNON DPD 4500-4301	FUNCTION (8 BITS + CONTROL)		Connector 1J50 Part No. DEUTSCH 3057 16A	Terminal Block Test Point: (Prefix)
A1TB3I5*	1	Input Request	**9 8 6$_t$	59	
A1TB10L5*	2	Input Acknowledge	9 4$_t$ 8	37	
A1TB3F5*	3	External Interrupt	9 2$_t$ 7$_a$	39	
	4	Spare (1)	9 0$_t$ 8	41	
	5	2^{32}	9 5 3		
	6	2^{33}	9 7 7$_t$		
	7	2^{34}	9 3 3		
	8	2^{35}	9 7 5		
9G5	9	2^0 TLM Data Bit 0 (LSB)	9 1$_t$ 3$_t$	23	
9 J5	10	2^1 TLM Data Bit 1	9 2 8	43	
	11	Input Request R	9 8 7	60	
	12	Input Acknowledge R	9 8 5	38	
	13	External Interrupt R	9 7$_a$ 3$_t$	40	
	14	Spare (1) R	9 8 1	42	
	15	2^{32} R	9 6 3		
	16	2^{33} R	9 7 8$_t$		
	17	2^{34} R	9 3 4		
	18	2^{35} R	9 7 6$_t$		
	19	2^0 R	9 3 2	24	
	20	2^1 R	9 0 3	44	
	21			45	
2N7	22	2^2 TLM Data Bit 2	9 1 5	57	
7B8	23	2^3 TLM Data Bit 3	9 4 4$_t$	35	
5B8	24	2^4 TLM Data Bit 4	9 2$_t$ 4	7	
5E8	25	2^5 TLM Data Bit 5	9 7$_t$ 3	33	

*PREFIX EXCEPTIONS

Unit: 1218		TLM LINE	Unit: TOB OIC$_a$	
Terminal Block Test Point: (Prefix A2TB)	Connector J7 Part No. CANNON DPD 4500-4301	FUNCTION (8 BITS + CONTROL)	Connector 1J50 Part No. DEUTSCH 3057 16A	Terminal Block Test Point: (Prefix)
5D6	26	2^6 TLM Data Bit 6 9 0_t 4	17	
5G6	27	2^7 TLM Data Bit 7 (MSB) 9 1 3_t	5	
3K8	28	2^8 9 0 0_t	1	
3N8	29	2^9 9 1_a 1_t	3	
3B7	30	2^{10} 9 0 8	9	
3E7	31	2^{11} 9 2 6	11	
1F5	32	2^{12} 9 3 7	25	
	33	2^2 R 9 2_t 5	58	
	34	2^3 R 9 4 5_t	36	
	35	2^4 R 9 3_t 4	8	
	36	2^5 R 9 3 8	34	
	37	2^6 R 9 1_t 4	18	
	38	2^7 R 9 1 4	6	
	39	2^8 R 9 0 1_{at}	2	
	40	2^9 R 9 2 1	4	
	41	2^{10} R 9 1_a 0_t	10	
	42	2^{11} R 9 2 7_t	12	
	43	2^{12} R 9 4 7_a	26	
	44		46	
	45	Cable Shield 0	47	
	46			
1L4	47	2^{13} 9 5 3_{at}	55	
1E7	48	2^{14} Gemini Real Time 9 4 6_t	53	
1B7	49	2^{15} Gemini Dump 9 0 2_t	31	
1N8	50	2^{16} Agena Real Time 9 1_a 5_t	15	

Unit: 1218		TLM LINE	Unit: TOB OIC$_a$	
Terminal Block Test Point: (Prefix A2TB)	Connector J7 Part No. CANNON DPD 4500-4301	FUNCTION (8 BITS + CONTROL)	Connector 1J50 Part No. DEUTSCH 3057 16A	Terminal Block Test Point: (Prefix)
1K8	51	2^{17} Agena Dump 9 1_a 7_t	13	
	52	2^{18} 9 0 4		
	53	2^{19} 9 0 6_t		
	54	2^{20} 9 0_t 2		
	55	2^{21} 9 2 2_t		
	56	2^{22} 9 2 4		
	57	2^{23} 9 1_{at} 7		
	58	2^{13} R 9 5 4	56	
	59	2^{14} R 9 4 7_t	54	
	60	2^{15} R 9 0 3_t	32	
	61	2^{16} R 9 1_a 6_t	16	
	62	2^{17} R 9 1_a 8	14	
	63	2^{18} R 9 0 5_t		
	64	2^{19} R 9 0 7_t		
	65	2^{20} R 9 2 1_{at}		
	66	2^{21} R 9 2 3_t		
	67	2^{22} R 9 2 5		
	68	2^{23} R 9 2_t 7		
	69		48	
	70	2^{24} 9 5 5_t		
	71	2^{25} 9 5 7_{at}		
	72	2^{26} 9 4 8_t		
	73	2^{27} 9 0 6		
	74	2^{28} 9 6 2		
	75	2^{29} 9 6 4		

Unit: 1218		TLM LINE	Unit: TOB OIC$_a$	
Terminal Block Test Point: (Prefix A2TB)	Connector J7 Part No. CANNON DPD 4500-4301	FUNCTION (8 BITS + CONTROL)	Connector 1J50 Part No. DEUTSCH 3057 16A	Terminal Block Test Point: (Prefix)
	76	230 9 6 6$_t$		
	77	231 9 6 8$_t$		
	78		51	
	79		49	
	80	224 R 9 6$_t$ 5$_t$		
	81	225 R 9 8$_t$ 5		
	82	226 R 9 5 0$_t$		
	83	227 R 9 6 1$_t$		
	84	228 R 9 6 3		
	85	229 R 9 6 5		
	86	230 R 9 6 7		
	87	231R 9 7 0$_t$		
	88		52	
	89		50	
	90			
		9 8 8$_t$		
		9 1$_{at}$	19	
		9 0$_t$	20	
		9 2$_t$	21	
			22	
			27	
OUT REQ.		**COLOR CODE: a = light color	28	
OUT ACK.		t = tracer	29	
E. F. REQ.			30	
E. F.			61	

Unit: 1218		TLM LINE		Unit: TOB	EIC$_c$
Terminal Block Test Point: (Prefix A1TB)	Connector J8 Part No. CANNON DPD 4500-4301	FUNCTION (8 BITS + CONTROL)		Connector 1J51 Part No. DEUTSCH 3057 16A	Terminal Block Test Point: (Prefix)
317	1	Input Request	**9 8 6$_t$	59	
10L4	2	Input Acknowledge	9 4$_t$ 8	37	
3F7	3	External Interrupt	9 2$_t$ 7$_a$	39	
	4	Spare (1)	9 0$_t$ 8	41	
	5		9 5 3		
	6		9 7 7$_t$		
	7		9 3 3		
	8		9 7 5		
2D5	9	2^0 (52) TML Data Bit 0 (LSB)	9 1$_t$ 3$_t$	23	
2G5	10	2^1 (53) TLM Data Bit 1	9 2 8	43	
	11	Input Request R	9 8 7	60	
	12	Input Acknowledge R	9 8 5	38	
	13	External Interrupt R	9 7$_a$ 3$_t$	40	
	14	Spare (1) R	9 8 1	42	
	15		9 6 3		
	16		9 7 8$_t$		
	17		9 3 4		
	18		9 7 6$_t$		
	19	2^0 R (63)	9 3 2	24	
	20	2^1 R (64)	9 0 3	44	
	21			45	
4G6	22	2^2 (54) TLM Data Bit 2	9 1 5	57	
4J6	23	2^3 (55) TLM Data Bit 3	9 4 4$_t$	35	
6J5	24	2^4 (56) TLM Data Bit 4	9 2$_t$ 4	7	
4F8	25	2^5 (57) TLM Data Bit 5	9 7$_t$ 3	33	

Unit: 1218		TLM LINE FUNCTION (8 BITS + CONTROL)		Unit: TOB EIC$_c$	
Terminal Block Test Point: (Prefix A1TB)	Connector J8 Part No. CANNON DPD 4500-4301			Connector 1J51 Part No. DEUTSCH 3057 16A	Terminal Block Test Point: (Prefix)
6H8	26	2^6 (70) TLM Data Bit 6	9 0_t 4	17	
6K8	27	2^7 (71) TLM Data Bit 7 (MSB)	9 1 3_t	5	
6L6	28	2^8 (72)	9 0 0_t	1	
6B7	29	2^9 (73)	9 1_a 1_t	3	
8G5	30	2^{10} (74)	9 0 8	9	
8J5	31	2^{11} (75)	9 2 6	11	
8N8	32	2^{12} (76)	9 3 7	25	
	33	2^2 R (65)	9 2_t 5	58	
	34	2^3 R (66)	9 4 5_t	36	
	35	2^4 R (67)	9 3_t 4	8	
	36	2^5 R (68)	9 3 8	34	
	37	2^6 R (80)	9 1_t 4	18	
	38	2^7 R (81)	9 1 4	6	
	39	2^8 R (82)	9 0 1_{at}	2	
	40	2^9 R (83)	9 2 1	4	
	41	2^{10} R (84)	9 1_a 0_t	10	
	42	2^{11} R (85)	9 2 7_t	12	
	43	2^{12} R (86)	9 4 7_a	26	
	44			46	
	45	Cable Shield	0	47	
	46				
10D5	47	2^{13} (77)	9 5 3_{at}	55	
10G5	48	2^{14} (5) Gemini Real Time	9 4 6_t	53	
10J5	49	2^{15} (6) Gemini Dump	9 0 2_t	31	
10D8	50	2^{16} (7) Agena Real Time	9 1_a 5_t	15	

Unit: 1218		TLM LINE	Unit: TOB EIC$_c$	
Terminal Block Test Point: (Prefix A1TB)	Connector J8 Part No. CANNON DPD 4500-4301	FUNCTION (8 BITS + CONTROL)	Connector 1J51 Part No. DEUTSCH 3057 16A	Terminal Block Test Point: (Prefix)
10G8	51	2^{17} (8) Agena Dump 9 1_a 7_t	13	
	52	9 0 4		
	53	9 0 6_t		
	54	9 0_t 2		
	55	9 2 2_t		
	56	9 2 4		
	57	9 1_{at} 7		
	58	2^{13} R (87) 9 5 4	56	
	59	2^{14} R (15) 9 4 7_t	54	
	60	2^{15} R (16) 9 0 3_t	32	
	61	2^{16} R (17) 9 1_a 6_t	16	
	62	2^{17} R (18) 9 1_a 8	14	
	63	9 0 5_t		
	64	9 0 7_t		
	65	9 2 1_{at}		
	66	9 2 3_t		
	67	9 2 5		
	68	9 2_t 7		
	69		48	
	70	9 5 5_t		
	71	9 5 7_{at}		
	72	9 4 8_t		
	73	9 0 6		
	74	9 6 2		
	75	9 6 4		

Unit: 1218		TLM LINE	Unit: TOB	EIC_c
Terminal Block Test Point: (Prefix A1TB)	Connector J8 Part No. CANNON DPD 4500-4301	FUNCTION (8 BITS + CONTROL)	Connector 1J51 Part No. DEUTSCH 3057 16A	Terminal Block Test Point: (Prefix)
	76	9 6 6_t		
	77	9 6 8_t		
	78		51	
	79		49	
	80	9 6_t 5_t		
	81	9 8_t 5		
	82	9 5 0_t		
	83	9 6 1_t		
	84	9 6 3		
	85	9 6 5		
	86	9 6 7		
	87	9 7 0_t		
	88		52	
	89		50	
	90			
		9 8 8_t		
		9 1_{at}	19	
		9 0_t	20	
		9 2_t	21	
			22	
		**COLOR CODE: a = light color	27	
OUT REQ.		t = tracer	28	
OUT ACK.			29	
E. F. REQ.			30	
E. F.			61	

Unit: 1218		GMT TIME		Unit: TOB	OIC$_b$
Terminal Block Test Point: (Prefix A2TB)	Connector J2 Part No. CANNON DPD 4500-4301	FUNCTION (TIME TO 9: 59: 59)		Connector 1J52 Part No. DEUTSCH 3057 16A	Terminal Block Test Point: (Prefix)
A1TB7B8*	1	Input Request	**9 8 6_t	59	
A1TB4J2*	2	Input Acknowledge	9 4_t 8	37	
A1TB7K7*	3	External Interrupt	9 2_t 7_a	39	
	4	Spare (1)	9 0_t 8	41	
	5	2^{32}	9 5 3		
	6	2^{33}	9 7 7_t		
	7	2^{34}	9 3 3		
	8	2^{35}	9 7 5		
9G7	9	2^{0} Units Sec 1	9 1_t 3_t	23	
9J7	10	2^{1} Units Sec 2	9 2 8	43	
	11	Input Request R	9 8 7	60	
	12	Input Acknowledge R	9 8 5	38	
	13	External Interrupt R	9 7_a 3_t	40	
	14	Spare (1) R	9 8 1	42	
	15	2^{32} R	9 6 3		
	16	2^{33} R	9 7 8_t		
	17	2^{34} R	9 3 4		
	18	2^{35} R	9 7 6_t		
	19	2^{0} R	9 3 2	24	
	20	2^{1} R	9 0 3	44	
	21			45	
9L4	22	2^{2} Units Sec 4	9 1 5	57	
9D5	23	2^{3} Units Sec 8	9 4 4_t	35	
7H7	24	2^{4} Tens Sec 1	9 2_t 4	7	
7K7	25	2^{5} Tens Sec 2	9 7_t 3	33	

*PREFIX EXCEPTION

Unit: 1218		GMT TIME		Unit: TOB OIC$_b$	
Terminal Block Test Point: (Prefix A2TB)	Connector J2 Part No. CANNON DPD 4500-4301	FUNCTION (TIME TO 9: 59: 59)		Connector 1J52 Part No. DEUTSCH 3057 16A	Terminal Block Test Point: (Prefix)
5K7	26	2^6 Tens Sec 4	9 0_t 4	17	
5N7	27	2^7 Units Min 1	9 1 3_t	5	
5G5	28	2^8 Units Min 2	9 0 0_t	1	
5J5	29	2^9 Units Min 4	9 1_a 1_t	3	
3E8	30	2^{10} Units Min 8	9 0 8	9	
3H8	31	2^{11} Tens Min 1	9 2 6	11	
316	32	2^{12} Tens Min 2	9 3 7	25	
	33	2^2 R	9 2_t 5	58	
	34	2^3 R	9 4 5_t	36	
	35	2^4 R	9 3_t 4	8	
	36	2^5 R	9 3 8	34	
	37	2^6 R	9 1_t 4	18	
	38	2^7 R	9 1 4	6	
	39	2^8 R	9 0 1_{at}	2	
	40	2^9 R	9 2 1	4	
	41	2^{10} R	9 1_a 0_t	10	
	42	2^{11} R	9 2 7_t	12	
	43	2^{12} R	9 4 7_a	26	
	44			46	
	45	Cable Shield	0	47	
	46				
3L6	47	2^{13} Tens Min 4	9 5 3_{at}	55	
115	48	2^{14} Units Hours 1	9 4 6_t	53	
3N1	49	2^{15} Units Hours 2	9 0 2_t	31	
1K7	50	2^{16} Units Hours 4	9 1_a 5_t	15	

Unit: 1218		GMT TIME	Unit: TOB OIC$_b$	
Terminal Block Test Point: (Prefix A2TB)	Connector J2 Part No. CANNON DPD 4500-4301	FUNCTION (TIME TO 9: 59: 59)	Connector 1J52 Part No. DEUTSCH 3057 16A	Terminal Block Test Point: (Prefix)
1H7	51	2^{17} Units Hours 8 $9\ 1_a\ 7_t$	13	
	52	2^{18} $9\ 0\ 4$		
	53	2^{19} $9\ 0\ 6_t$		
	54	2^{20} $9\ 0_t\ 2$		
	55	2^{21} $9\ 2\ 2_t$		
	56	2^{22} $9\ 2\ 4$		
	57	2^{23} $9\ 1_{at}\ 7$		
	58	2^{13} $9\ 5\ 4$	56	
	59	2^{14} R $9\ 4\ 7_t$	54	
	60	2^{15} R $9\ 0\ 3_t$	32	
	61	2^{16} R $9\ 1_a\ 6_t$	16	
	62	2^{17} R $9\ 1_a\ 8$	14	
	63	2^{18} R $9\ 0\ 5_t$		
	64	2^{19} R $9\ 0\ 7_t$		
	65	2^{20} R $9\ 2\ 1_{at}$		
	66	2^{21} R $9\ 2\ 3_t$		
	67	2^{22} R $9\ 2\ 5$		
	68	2^{23} R $9\ 2_t\ 7$		
	69		48	
	70	2^{24} $9\ 5\ 5_t$		
	71	2^{25} $9\ 5\ 7_{at}$		
	72	2^{26} $9\ 4\ 8_t$		
	73	2^{27} $9\ 0\ 6$		
	74	2^{28} $9\ 6\ 2$		
	75	2^{29} $9\ 6\ 4$		

Unit: 1218		GMT TIME		Unit: TOB OIC$_b$	
Terminal Block Test Point: (Prefix A2TB)	Connector J2 Part No. CANNON DPD 4500-4301	FUNCTION (TIME TO 9: 59: 59)		Connector 1J52 Part No. DEUTSCH 3057 16A	Terminal Block Test Point: (Prefix)
	76	2^{30}	9 6 6_t		
	77	2^{31}	9 6 8_t		
	78			51	
	79			49	
	80	2^{24} R	9 6_t 5_t		
	81	2^{25} R	9 8_t 5		
	82	2^{26} R	9 5 0_t		
	83	2^{27} R	9 6 1_t		
	84	2^{28} R	9 6 3		
	85	2^{29} R	9 6 5		
	86	2^{30} R	9 6 7		
	87	2^{31} R	9 7 0_t		
	88			52	
	89			50	
	90				
			9 8 8_t		
			9 1_{at}	19	
			9 0_t	20	
			9 2_t	21	
				22	
		**COLOR CODE: a = light color		27	
OUT REQ.		t = tracer		28	
OUT ACK.				29	
E. F. REQ.				30	
E. F.				61	

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CABLE: W505

REFER TO DRAWING: GC-GEM-1002733A

CONNECTOR TYPE (BOTH ENDS): CANNON DPD 4500-4301, 90 PINS

FROM: 1218 COMPUTER, J1

TO: I/O CONSOLE, J3

STANDARD 1218 COMPUTER CABLE IN ACCORDANCE WITH "1218 COMPUTER WIRE TABULATIONS, PX2963, TABLE 46"

USE EVEN INPUT CONNECTOR COLUMN

FOR COMPUTER TEST POINTS, REFER TO "OUTPUT SELECTORS," OR UNIVAC TECHNICAL MANUAL, VOLUME IV, SECTION 9, FIG. 9-106 THRU 9-109, PAGES 9-213 THRU 9-220, CHANNEL 0

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CABLE: W506

REFER TO DRAWING: GC-GEM-1002733A

CONNECTOR TYPE (BOTH ENDS): CANNON DPD 4500-4301, 90 PINS

FROM: 1218 COMPUTER, J6

TO: I/O CONSOLE, J4

STANDARD 1218 COMPUTER CABLE IN ACCORDANCE WITH "1218 COMPUTER WIRE TABULATIONS, PX2963, TABLE 46"

USE EVEN OUTPUT CONNECTOR COLUMN

FOR COMPUTER TEST POINTS, REFER TO "OUTPUT SELECTORS," OR UNIVAC TECHNICAL MANUAL, VOLUME IV, SECTION 9, FIG. 9-106 THRU 9-109, PAGES 9-213 THRU 9-220, CHANNEL 0

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CABLE: W508

REFER TO DRAWING: GC-GEM-1002733A

CONNECTOR TYPE (BOTH ENDS): CANNON DPD 4500-4301, 90 PINS

FROM: 1218 COMPUTER, J12

TO: 1259 TELETYPE ADAPTER, J3

STANDARD 1218 COMPUTER CABLE IN ACCORDANCE WITH "1218 COMPUTER WIRE TABULATIONS, PX2963, TABLE 46"

USE ODD OUTPUT CONNECTOR COLUMN

FOR COMPUTER TEST POINTS, REFER TO "OUTPUT SELECTORS," OR UNIVAC TECHNICAL MANUAL, VOLUME IV, SECTION 9, FIG. 9-106 THRU 9-109, PAGES 9-213 THRU 9-220, CHANNEL 3

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CABLE: W511

REFER TO DRAWING: GC-GEM-1002733A

CONNECTOR TYPE (BOTH ENDS): CANNON DPD 4500-4301, 90 PINS

FROM: 1218 COMPUTER, J10

TO: 1262 R O WALL ADAPTER, J3

STANDARD 1218 COMPUTER CABLE IN ACCORDANCE WITH "1218 COMPUTER WIRE TABULATIONS, PX2963, TABLE 46"

USE ODD OUTPUT CONNECTOR COLUMN

FOR COMPUTER TEST POINTS, REFER TO "OUTPUT SELECTORS," OR UNIVAC TECHNICAL MANUAL, VOLUME IV, SECTION 9, FIG. 9-106 THRU 9-109, PAGES 9-213 THRU 9-220, CHANNEL 1

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CABLE: W512

REFER TO DRAWING: GC-GEM-1002733A

FROM: CDF

TO: ROTR

TWISTED PAIR

5/19/64

CABLE: W513

REFER TO DRAWING: GC-GEM-1002733A

FROM: 1259 TELETYPE ADAPTER, TB-1

TO: CDF

TWISTED PAIR

Rev 5/19/64 Cable Refer to Drawing No. GC-GEM-1002733A Pg. 1 of 1

Unit: TOB #1		FUNCTION	Unit: TOB #2	
Terminal Block Test Point: (Prefix)	Connector 1J21 Part No. AMP COAX 200458-3		Connector 1J21 Part No. AMP COAX 200458-3	Terminal Block Test Point: (Prefix)
	1	$\overline{2}$	1	
	2	$\overline{1}$	2	
	3	Format Indicator #1 (Gemini Real Time)	3	
	4	" " #2 (Gemini Dump)	4	
	5	" " #3 (Agena Real Time)	5	
	6	" " #4 (Agena Dump)	6	
	7	Frame Lock	7	
	8	Sub Frame #1 Search	8	
	9	" " #2 "	9	
	10	" " #3 "	10	
	11	Strip #1	11	
	12	" #2	12	
	13	" #3	13	
	14	" #4	14	
	15	Frame Gate Gen. #1 Reset	15	
	16		16	
	17		17	
	18		18	
	19		19	
	20		20	

Rev 5/19/64 Cable Refer to Drawing No. GC-GEM-1002733A Pg. 1 of 1

Unit: TOB #1			Unit: TOB #2	
Terminal Block Test Point: (Prefix)	Connector 1J22 Part No. AMP COAX 200458-3	FUNCTION	Connector 1J22 Part No. AMP COAX	Terminal Block Test Point: (Prefix)
	1	64 Bit Multiplex Bit #1	1	
	2	" " " " #2	2	
	3	" " " " #3	3	
	4	" " " " #4	4	
	5	" " " " #5	5	
	6	" " " " #6	6	
	7	" " " " #7	7	
	8	" " " " #8	8	
	9	Strip # 5	9	
	10	" # 6	10	
	11	" # 7	11	
	12	" # 8	12	
	13	" # 9	13	
	14	" #10	14	
	15	$\overline{128}$	15	
	16	$\overline{64}$	16	
	17	$\overline{32}$	17	
	18	$\overline{16}$	18	
	19	$\overline{8}$	19	
	20	$\overline{4}$	20	

KEYBOARD REQUEST NUMBERS FOR FLYBY TESTS

GEMINI MAIN SUMMARY FORMAT 000

May 19, 1964
Data Support Office
L. H. Wentz, Jr.

FCN		Seq. No.	Parameter Name
001	A107	AA02	Time Since Lift-Off (SET)
004	A078	*BA01	FC O_2 Mass Quantity
005	A046	*BA02	FC O_2 Tank Pressure
006	A079	*BA03	FC H_2 Mass Quantity
007	A043	*BA04	FC H_2 Tank Pressure
008	D030	BD01	FC Section 1A Current
009	D010	BD02	FC Section 1B Current
010	D011	BE01	FC Section 2A Current
011	D012	BE02	FC Section 2B Current
012	B054	BG01	Main Bus Volts
013	B050	BG02	Squib Bus No. 1 Volts (Armed)
014	B051	BG03	Squib Bus No. 2 Volts (Armed)
015	B052	BG04	Control Bus Voltage
016	D013	BH01	Battery and FC Sect. No. 1 Current
017	D014	BH02	Battery and FC Sect. No. 2 Current
018	A077	CA01	ECS O_2 Mass Quantity Pri. System
019	F042	CA02	ECS O_2 Tank Press. Pri. System
020	B043	CB01	Cabin, Press. (To Fwd. Compt.)
021	D006	CB02	Cabin Air Temperature
022	B044	CC01	Suit Press. Left (to cabin)
023	B045	CC02	Suit Press. Right (to cabin)
024	D002	CC03	Suit Inlet Air Temp. Left
025	D003	CC04	Suit Inlet Air Temp. Right
026	B007	CC05	Secondary O_2 Rate
027	B046	CC06	CO_2 Part. Pressure
028	G015	CH02	Coolant Rad. Outlet Temp. Pri. Loop
029	G011	CD03	Control Valve Coolant Temp. Outlet of -147 Valve Pri.
030	G030	*CD01	Control Valve Coolant Temp. Outlet to F/C Sect. 1 Pri.

*Wiring Installed—Parameters not required transducers may or may not be installed

GEMINI MAIN SUMMARY FORMAT 000

FCN		Seq. No.	Parameter Name
031	G016	*CF04	FC Section 1 Pri. Coolant Outlet Temp.
032	G017	*CF03	FC Section 2 Pri. Coolant Outlet Temp.
033	G032	CH01	Coolant Rad. Inlet Temp-Pri Loop
034	F067	CJ01	Coolant Pump Inlet Press. Pri. Loop
035	F070	CJ03	Delta Press. Coolant Pump Pri. Loop
036	F049	CH04	Coolant Rad. Delta Press. Rad. Pri. Loop
037	F069	*CL01	Water Pressure (F. C. Mode)
038	B047	EB01	Horizon Sensor Pitch Output
039	B045	EB02	Horizon Sensor Roll Output
040	B008	EB03	Horizon Sensor Search Mode
041	B065	EC01	ACME AC Voltage Regulated Power
042	B067	EC03	ACME +20 VDC B+ Regulated Power
043	B068	EC04	ACME +10 VDC Bias Regulated Power
044	B069	EC05	ACME -10 VDC Bias Regulated Power
045	B015	MA22	Calibrate
046	G021	GB01	OAMS Fuel Feed Temperature
047	G022	GB02	OAMS Oxidizer Feed Temp.
048	F051	GC01	OAMS Source HE Pressure
049	G023	GC02	OAMS Source HE Temperature
050	G024	GC03	OAMS Temp., Reg HE at Fuel Tank
051	G025	GC04	OAMS Temp., Reg HE at Oxid. Tank
052	F052	GC05	OAMS Press. Regulated HE
053	D022	HA02	RCS Oxid. Feed Temp. System A
054	D023	HB02	RCS Oxid. Feed Temp. System B
055	A088	HC01	RCS Source N_2 Press. System A
056	A084	HC02	RCS Source N_2 Press. System B
057	D024	HC05	RCS Source N_2 Temp. System A
058	D025	HC06	RCS Source N_2 Temp. System B
059	A085	HC03	RCS Reg. N_2 Press. System A
060	A086	HC04	RCS Reg. N_2 Press. System B
061	B064	NA06	Fli. Cdr. Oral Temp.
062	B071	NB06	Fli. Eng. Oral Temp.

*Wiring Installed—Parameters not required transducers may or may not be installed

GEMINI CONTINGENCY FORMAT A 100

FCN		Seq. No.	Parameter Name
101	A107	AA02	Time Since Lift-Off (SET)
104	G013	*BB05	FC O_2 Temp. at Heat Exch. Outlet
105	G014	*BC03	FC H_2 Temp. at Heat Exch. Outlet
106	D020	BF01	Temp. Battery No. 1
107	D021	BF05	Temp. Squib Battery No. 1
108	D005	CB03	Cabin Inner Skin Temp.
109	A105	CB07	Cabin Fwd. Compt. Abs. Pressure (Ref)
110	B041	CA03	ECS O_2 Supply Press. Sec. System No. 1
111	B042	CA04	ECS O_2 Supply Press. Sec. System No. 2
112	D031	CK05	Coolant (Pri) Temp. Water Heat Exch.
113	G012	*CD07	Control Valve Coolant Temp. Inlet To -141 Valve Pri
114	G018	CJ15	Coolant Pump PKG Temp. PRI
115	F044	CL02	Water Temp. Inlet to RV
116	F045	CL03	Water Temp. Outlet to RV
117	A043	CK01	Delta Press. Suit Heat Exch. Prim.
118	A047	CK03	Delta Press. Cabin Heat Exch. Pri.
119	G010	*CD02	Control Valve Coolant Temp. Inlet to F/C Sect. 2 Sec.
120	G019	*CG04	FC Sect. 1 Sec. Coolant Outlet Temp.
121	G020	*CG03	FC Sect. 2 Sec: Coolant Outlet Temp.
122	A094	CK02	Delta Press. Suit Heat Exch. Secondary
123	A098	CK04	Delta Press. Cabin Heat Exch. Sec.
124	F068	CJ02	Coolant Pump Inlet Press. Sec. Loop
125	F071	CJ04	Delta Press. Coolant Pump Sec. Loop
126	F050	CH05	Coolant Radiator Delta Press. Rad. Sec. Loop
127	G007	LA03	DCS RCVR Sig Sgth-Quadx
128	G008	LA04	DCS RCVR Sig Sgth-Dipxr
129	G026	LA05	DCS Package Temp.
130	F023	LA06	DCS +28 VDC Regulated Power

*Wiring Installed—Parameters not required transducers may or may not be installed

GEMINI CONTINGENCY FORMAT A 100

FCN		Seq. No.	Parameter Name
131	F054	LA07	DCS -18 VDC Regulated Power
132	F055	LA08	DCS +23 VDC Regulated Power
133	G005	LA02	DCS +6 VDC Regulated Power
134	F056	LA09	DCS -6 VDC Regulated Power
135	F057	LB01	S Band Beacon Output Power
136	F058	LB03	S Band Beacon Receiver PRF
137	G027	LB04	S Band Beacon Package Temp
138	G029	LD01	Acquisition Aid Beacon Pkg. Temp.
139	G031	LE01	HF Transceiver Pkg. Temp.
140	F048	LE03	HF Transceiver AGC Voltage
141	F059	LE04	HF Transceiver B+ Voltage
142	B015	MA22	Calibrate
143	B057	MA17	RV - Hi-Level Zero Ref.
144	D001	MA21	RV - Lo-Level Full Scale
145	D008	MA24	RV - Ref Junction Temp.
146	B049	MA37	RV - Hi-Level Full Scale
147	D009	MA38	RV - Lo-Level Zero Ref.
148	G009	MB02	Adptr - Lo-Level Zero - RV
149	G001	MB03	Adptr - Lo-Level Full Scale - RV
150	F060	MC01	RF Power MF Xmtr
151	G028	MC02	Case Temp. MF Xmtr

GEMINI CONTINGENCY FORMAT B 175

FCN		Seq. No.	Parameter Name
176	A107	AA02	Time Since Lift-Off (SET)
179	G006	GD01	OAMS Injector Head Temp., TCA No. 9
180	D004	HD01	RCS Injector Head Temp., TCA No. 8
181	G004	HH01	Retro Rocket Case Temp.
182	G002	HH06	Retro Pkg. Temp. No. 1
183	G003	HH07	Retro Pkg. Temp. No. 2
184	A022	EA01	Pitch Rate
185	A023	EA02	Roll Rate
186	A024	EA03	Yaw Rate
187	B066	EC02	AC Frequency Regulated Power
188	A028	KA01	Spacecraft Longitudinal Acceleration (Z)

GEMINI CONTINGENCY FORMAT B 175

FCN		Seq No.	Parameter Name
189	A029	KA02	Spacecraft Lateral Acceleration (X)
190	A030	KA03	Spacecraft Vertical Acceleration (Y)
191	A032	KB02	Spacecraft Static Press.
192		Bilevel Word No. 9	
	A059	AG10	Pitch Rate Scale Factor
	A060	AG11	Roll Rate Scale Factor
	A061	AG12	Yaw Rate Scale Factor
193	B053	DA01	Pitch Gyro Torque Current
194	B055	DA02	Roll Gyro Torque Current
195	B056	DA03	Yaw Gyro Torque Current
196	A100	DB03	IMU TCA Output X-Axis Accel
197	A081	DB06	IMU TCA Output X-Axis Gyro
198	B062	DD01	Pitch (Launch or Rend-Ree) Attitude Error
199	B058	DD02	Roll (Launch or Rend-Ree) Attitude Error
200	B059	DD03	Yaw (Launch or Rend-Ree) Attitude Error
201	B060	DE01	IGS + 35 VDC Regulated Power
202	B061	DE02	IGS + 27.2 VDC Regulated Power
203	B063	DE05	IGS + 9.6 VDC Regulated Power
204	B015	MA22	Calibrate
205	D007	*JA04	Range Rate (Target)
206	D028	*JB02	Antenna Face Plate Temp.
207	A090	*JB03	Radar Pressurization
208	D029	*JB04	Xmtr Tube Temp.
209	A087	*JC01	Xmtr Tube Current (RF PWR).
210	A101	*JC02	AGC Voltage (RF Atten.)
211	A089	*JC03	Narrow Band AGC Voltage
212	D032	*JD01	Oscillator Crystal No. 1 Current
213	A096	*JE01	Radar + 1650 VDC Regulated Power
214	A095	*JE05	Radar + 20 VDC Regulated Power

*Wiring Installed—Parameters not required transducers may or may not be installed

GEMINI CONTINGENCY FORMAT C 230
(ELS)

FCN		Seq. No.	Parameter Name
231	G013	*BB05	FC O_2 Temp. at Heat Exch. Outlet
232	G014	*BC03	FC H_2 Temp. at Heat Exch. Outlet
233	D020	BF01	Temp. Battery No. 1
234	D021	BF05	Temp. Squib Battery No. 1

GEMINI CONTINGENCY FORMAT D 240
(ELS)

FCN		Seq. No.	Parameter Name
241	D005	CB03	Cabin Inner Skin Temp.
242	A107	CB07	Cabin Fwd. Compt. Abs. Pressure (Ref)
243	B041	CA03	ECS O_2 Supply Press. Sec. System No. 1
244	B042	CA04	ECS O_2 Supply Press. Sec. System No. 2

GEMINI CONTINGENCY FORMAT E 250
(COMMUNICATIONS)

FCN		Seq. No.	Parameter Name
251	G007	LA03	DCS RCVR Sig Sgth-Quadx
252	G008	LA04	DCS RCVR Sig Sgth-Dipxr
253	G026	LA05	DCS Package Temp.
254	F053	LA06	DCS + 28 VDC Regulated Power
255	F054	LA07	DCS - 18 VDC Regulated Power
256	F055	LA08	DCS + 23 VDC Regulated Power
257	G005	LA02	DCS + 6 VDC Regulated Power
258	F056	LA09	DCS - 6 VDC Regulated Power
259	F057	LB01	S Band Beacon Output Power
260	F058	LB03	S Band Beacon Receiver PRF
261	G027	LB04	S Band Beacon Package Temp.
262	G029	LD01	Acquisition Aid Beacon Pkg Temp.
263	G031	LE01	HF Transceiver Pkg. Temp.

*Wiring Installed—Parameters not required transducers may or may not be installed

GEMINI CONTINGENCY FORMAT E 250
(COMMUNICATIONS)

FCN		Seq. No.	Parameter Name
264	F048	LE03	HF Transceiver AGC Voltage
265	F059	LE04	HF Transceiver B+ Voltage
266	B015	MA22	Calibrate

GEMINI CONTINGENCY FORMAT F 280
(INSTRUMENTATION)

FCN		Seq. No.	Parameter Name
281	B015	MA22	Calibrate
282	B057	MA17	RV — Hi-Level Zero Ref.
283	D001	MA21	RV — Lo-Level Full Scale
284	D008	MA24	RV — Ref Junction Temp.
285	B049	MA37	RV — Hi-Level Full Scale
286	D009	MA38	RV — Lo-Level Zero Ref.
287	G009	MB02	Adptr — Lo-Level Zero — RV
288	G001	MB03	Adptr — Lo-Level Full Scale — RV
289	F060	MC01	RF Power MF Xmtr
290	G028	MC02	Case Temp. MF Xmtr

GEMINI CONTINGENCY FORMAT G 300
(OAMS, RCS, ACME)

FCN		Seq. No.	Parameter Name
301	G006	GD01	OAMS Injector Head Temp., TCA No. 9
302	D004	HD01	RCS Injector Head Temp., TCA No. 8
303	G004	HH01	Retro Rocket Case Temp.
304	G002	HH06	Retro Pkg. Temp. No. 1
305	G003	HH07	Retro Pkg. Temp. No. 2
306	A022	EA01	Pitch Rate
307	A023	EA02	Roll Rate
308	A024	EA03	Yaw Rate
309	B066	EC02	AC Frequency Regulated Power
310	A028	KA01	Spacecraft Longitudinal Acceleration (Z)

GEMINI CONTINGENCY FORMAT G 300
(OAMS, RCS, ACME)

FCN		Seq. No.	Parameter Name
311	A029	KA02	Spacecraft Lateral Acceleration (X)
312	A030	KA03	Spacecraft Vertical Acceleration (Y)
313	A032	KB02	Spacecraft Static Press.
314		BiLevel Word No. 9	
	A059	AG10	Pitch Rate Scale Factor
	A060	AG11	Roll Rate Scale Factor
	A061	AG12	Yaw Rate Scale Factor

GEMINI CONTINGENCY FORMAT H 330
(IGS)

FCN		Seq. No.	Parameter Name
331	B053	DA01	Pitch Gyro Torque Current
332	B055	DA02	Roll Gyro Torque Current
333	B056	DA03	Yaw Gyro Torque Current
334	A100	DB03	IMU TCA Output X-Axis Accel
335	A081	DB06	IMU TCA Output X-Axis Gyro
336	B062	DD01	Pitch (Launch or Rend-Ree) Attitude Error
337	B058	DD02	Roll (Launch or Rend-Ree) Attitude Error
338	B059	DD03	Yaw (Launch or Rend-Ree) Attitude Error
339	B060	DE01	IGS + 35 VCD Regulated Power
340	B061	DE02	IGS + 27.2 VDC Regulated Power
341	B063	DE05	IGS + 9.6 VDC Regulated Power
342	B015	MA22	Calibrate

GEMINI CONTINGENCY FORMAT I 350
(RADAR)

FCN		Seq. No.	Parameter Name
351	D007	*JA04	Range Rate (Target)
352	D028	*JB02	Antenna Face Plate Temp.

*Wiring Installed—Parameters not required transducers may or may not be installed

GEMINI CONTINGENCY FORMAT I 350
(RADAR)

FCN		Seq. No.	Parameter Name
353	A090	*JB03	Radar Pressurization
354	D029	*JB04	Xmtr Tube Temp.
355	A087	*JC01	Xmtr Tube Current (RF PWR).
356	A101	*JC02	AGC Voltage (RF Atten.)
357	A089	*JC03	Narrow Band AGC Voltage
358	D032	*JD01	Oscillator Crystal No. 1 Current
359	A096	*JE01	Radar + 1650 VDC Regulated Power
360	A095	*JE05	Radar + 20 VDC Regulated Power

GEMINI CONTINGENCY FORMAT J 370
(PRIMARY COOLANT SYSTEM)

FCN		Seq. No.	Parameter Name
371	D031	CK05	Coolant (Pri) Temp. Water Heat Exch.
372	G012	*CD07	Control Valve Coolant Temp. Inlet To -141 Valve Pri.
373	G018	CJ15	Coolant Pump PKG Temp. PRI
374	F044	CL02	Water Temp. Inlet to RV
375	F045	CL03	Water Temp. Outlet to RV
376	A093	CK01	Delta Press. Suit Heat Exch. Prim.
377	A097	CK03	Delta Press. Cabin Heat Exch. Pri.

GEMINI CONTINGENCY FORMAT K 390
(SECONDARY COOLANT SYSTEM)

FCN		Seq No.	Parameter Name
391	G010	*CD02	Control Valve Coolant Temp. Inlet to F/C Sect. 2 Sec.
392	G019	*CG04	FC Sect. 1 Sec. Coolant Outlet Temp.
393	G020	*CG03	FC Sect. 2 Sec. Coolant Outlet Temp.
394	A094	CK02	Delta Press. Suit Heat Exch. Secondary

*Wiring Installed—Parameters not required transducers may or may not be installed

GEMINI CONTINGENCY FORMAT K 390
(SECONDARY COOLANT SYSTEM)

FCN		Seq. No.	Parameter Name
395	A098	CK04	Delta Press. Cabin Heat Exch. Sec
396	F068	CJ02	Coolant Pump Inlet Press. Sec. Loop
397	F071	CJ04	Delta Press. Coolant Pump Sec. Loop
398	F051	CH05	Coolant Radiator Delta Press. Rad. Sec. Loop