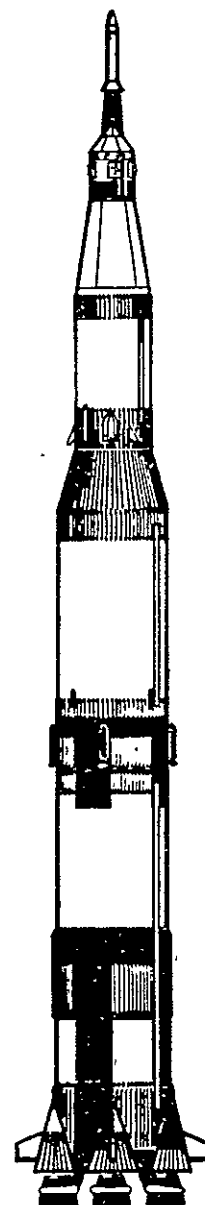


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THE **BOEING** COMPANY

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FINAL REPORT
FOR THE VIP'S ADDRESSABLE INTERFACE UNIT
MARCH 31, 1971



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REPORT

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HOUSTON, TEXAS

ELECTRICAL/ELECTRONICS

April 5, 1971
5-2934-HOU-290

To: D. R. Osgood NASA/MSC EB4
cc: O. Patterson NASA/MSC EB4
Subject: Final Report on GRE Modifications

The following is The Boeing Company's final report on Contract NAS9-9347 for the period from April 1, 1970 through March 31, 1971. The work accomplished for each task is summarized in the following. Detailed reports were submitted where noted.

TASK A

Technical recommendations were made on NASA's modifications to enable one GRE to process earth resources infra-red data. Assistance was given in the initial start-up of the GRE by operating and adjusting the GRE's original functions and by determining and recommending the changes required to make the newly installed modifications compatible.

TASK B

An investigation of the GRE's resolution capabilities was conducted in April, 1970, by making a film run containing horizontal and vertical lines of various widths and by reviewing developmental data compiled at the time of original manufacture. The processed film was submitted to Mr. D. Osgood, NASA, and reviewed data is summarized again in the following:

1) Resolution

When using an 800 Hz line rate, the highest frequency sine wave having the full black-to-white film densities that the GRE's will reproduce, is one that results in 20 line-pairs per mm. The total horizontal resolution across the film width then is 480 line pairs or 960 television lines. Sine waves to 40 line pairs per mm are discernable but are degraded by the film grain which at this spatial frequency is 12 to 16 grain widths per sine wave cycle.

2) Linearity

A linearity of 0.05% was measured from a crosshatch pattern in both the horizontal and vertical axes.

3) Noise

No noise is visibly added by the GRE under 30X magnification except that caused by phosphor impurities in the kinescope.

Because the requirement for the capability to process high resolution lunar survey data did not materialize, the capability for processing data from a computer or core memories has not been extended in GRE #1 beyond the three formats of 320, 525 and 1280 lines per frame at a line rate of 800 Hz.

TASK C

An addressable interface was designed, installed and tested in GRE 1. The interface provides the necessary logic circuitry to permit control and monitoring of GRE functions by a digital computer. The hardware produced consisted of interface circuits installed in GRE 1 and two cards of digital logic circuits, one for the GRE and one for the IBM 2701 interface.

In developing the GRE interface, a generalized addressable interface was developed which is extendable to all of the computer and peripheral equipment in the Visual Information Processing System. Specifically, the concepts developed were the command and data bus format, the line driver/receiver party line interconnection of the interface cards, the power distribution and grounding plan, and the initial layout of the packaging cards and the card file chassis.

A detailed report of the addressable interface developed is attached.

TASK D

An analog image enhancement device was designed and developed to improve the sharpness of the Apollo 11 television data which was degraded primarily by the television system's limited bandwidth. The device developed detected edge contours in a scene and synthesized a corrective waveform which was added back into the lower frequency video to make the edges appear sharp. The primary task was developing an edge detector which would find the proper amplitude and polarity of the edges and yet discriminate against noise.

Approximately 40 minutes of data was reconstructed into motion picture format using this analog enhancement device. The detail report completing the task was submitted August 27, 1970 as Report No. 5-2934-HOU-264. Because of the high probability that the Apollo 11 ten-frame-per-second format would not be used on future missions, it was decided by mutual agreement not to make a permanent installation of the analog enhancement device in any of the GRE's.

Prepared by: Dale D. Haakenson
D. J. Haakenson

Approved by: W. L. Neale
W. L. Neale

DETAILED REPORT ON TASK C
"THE ADDRESSABLE INTERFACE UNIT"

Prepared Under Contract
NAS9-9347

March 31, 1971

Prepared by: Dale A. Haakenson
D. Haakenson

Approved by: W. L. Neale
W. L. Neale

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1.0 OPERATIONAL DESCRIPTION

1.1 GENERAL

The Command and Data Bus was developed to be part of the Visual Information Processing System (VIPS). The Command and Data Bus is an addressable interface allowing a demand-response, bidirectional transfer of commands and data between the digital computers and their peripheral equipment. The command and data portions of the interface bus were designed such that their utilization may be simultaneous. This is possible because each bus has its own control lines. The intended operational mode is for computer control items and the data transfer modes to be set up by the command bus and only data for digital processing be transferred on the data bus.

The transmitter's use of the command bus is initiated by raising the Command Select and Command Ready control lines. The Command Ready is not raised until the command and parity bits are valid. The receiver acknowledges by returning a 1 μ s Command Acknowledge. The command sequence is terminated by the transmitter sending a Command Transfer Finished upon which the receiver returns a 1 μ s End of Record. A similar sequence of events takes place for the transfer of data on the data bus. The counterpart data bus functions are Data Select, Data Ready, Data, Data Parity, Data Acknowledge, Data Transfer Finished, and Data End of Record. The system timing diagrams are shown in Figure 4.

An error detection scheme was designed which detects errors in data or command parity and impossible command or data modes of operation. The particular error modes which will be detected are: commanding a device to receive data when the data bus is already busy and commanding a device to transmit when the data bus is busy.

The system responses for the later two errors are that the transmitter raises the Command Error in the first case and the receiver raises the Command Error in the second case. Errors in parity, when detected, are reported by the receiver, raising the respective Command Parity Error or Data Parity Error.

1.2 IBM 2701 INTERFACE CARD

1.2.1 Correlation of the IBM 2701 data-out functions with the VIPS Command

Bus bit position is as follows:

<u>IBM 2701</u>	<u>VIPS COMMAND BUS</u>
Data Out 1	Address Bit 0
" 2	" 1
" 3	" 2
" 4	" 3
" 5	" 4
" 6	Command Bit 0
" 7	" 1
" 8	" 2
" 9	" 3
" 10	" 4
" 11	" 5
" 12	" 6
" 13	" 7
" 14	" 8
" 15	" 9
" 16	" 10

- 1.2.2 Correlation of the IBM 2701 data-out functions with the VIPS Data Bus bit positions is as follows:

<u>IBM 2701</u>	<u>VIPS DATA BUS</u>
Data Out 1	Data Bit 0
" 2	" 1
" 3	" 2
" 4	" 3
" 5	" 4
" 6	" 5
" 7	" 6
" 8	" 7
" 9	" 8
" 10	" 9
" 11	" 10
" 12	" 11
" 13	" 12
" 14	" 13
" 15	" 14
" 16	" 15

- 1.2.3 Correlation of the IBM 2701 data-in functions (Read Mode) with the VIPS Data Bus bit positions is as follows:

<u>IBM 2701</u>	<u>VIPS DATA BUS</u>
Data In 1	Data Bit 0
" 2	" 1
" 3	" 2
" 4	" 3
" 5	" 4
" 6	" 5
" 7	" 6
" 8	" 7
" 9	" 8
" 10	" 9
" 11	" 10
" 12	" 11
" 13	" 12
" 14	" 13
" 15	" 14
" 16	" 15

1.2.4 Correlation of the VIPS address and command bit positions with the IBM 2701 Interface Card commandable functions are:

<u>VIPS COMMAND BUS</u>	<u>IBM 2701 INTERFACE CARD</u>
Address Bit 0	Address Bit 0
" 1	" 1
" 2	" 2
" 3	" 3
" 4	" 4
Command Bit 0	Enables 2701 to receive EOR's
" 1	Enables 2701 to receive EOF's
" 2	Enables 2701 to receive Interrupts
" 3	Enables IBM 360 External Interrupt No. 1
" 4	Enables IBM 360 External Interrupt No. 2
" 5	Enables IBM 360 External Interrupt No. 3
" 6	Enables IBM 360 External Interrupt No. 4
" 7	Enables IBM 360 External Interrupt No. 5
" 8	Spare
" 9	Spare
" 10	Spare

1.3 GRE Interface Card :

1.3.1 Correlation of the VIPS Command Bus functions are as follows

<u>VIPS COMMAND BUS</u>	<u>GRE INTERFACE CARD</u>
Address Bit 0	Address Bit 0
" 1	" 1
" 2	" 2
" 3	" 3
" 4	" 4
Command Bit 0	"1" = Command GRE to transmit data
" 1	"1" = Command change
" 2	Spare Channel
" 3	Spare Channel
" 4	"1" = Command GRE Main Power On

VIPS COMMAND BUSGRE INTERFACE CARD

Command Bit	5	"1" = Command Focus On
"	6	"1" = Command Anode On
"	7	"0" = Test Pattern, "1" = Input Video
"	8	"1" = Film Drive On
"	9	Spare
"	10	Spare

1.3.2 Correlation of the VIPS Data Bus bit positions with the monitored GRE functions are:

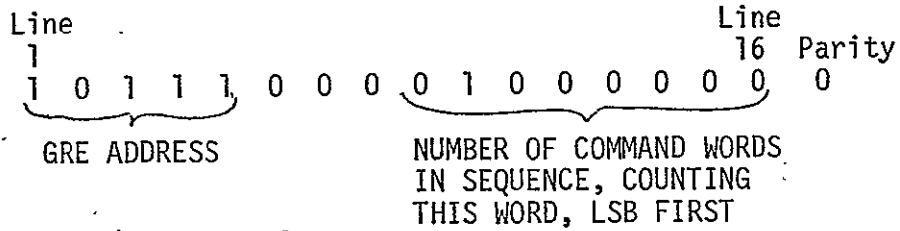
VIPS DATA BUSMONITORED GRE FUNCTIONS

Data Bit	0	"1" = GRE Fault
"	1	"1" = Main Power On
"	2	"1" = Focus On
"	3	"1" = Anode On
"	4	"1" = Video Selected
"	5	"1" = Film Drive On
"	6	"1" = CRT Not Blanked
"	7	Spare
"	8	Spare
"	9	Spare
"	10	Spare
"	11	GRE Address Bit 0
"	12	" " 1
"	13	" " 2
"	14	" " 3
"	15	" " 4

1.4 Programming Considerations

1.4.1 The following example is given to aid computer programming through the IBM 2701 and VIPS Command and Data Bus interface. The programming sequence that may be used to initially turn on the GRE is as follows:

2. Data Out, Word 1:



3. Raise Write Ready
4. Look for Demand in response
5. Data Out, Word 2:
0 0 0 0 0 0 1 0 0 1 1 1 0 0 0 0, Parity = 1
6. Raise Write Ready
7. Look for Demand in response
8. Raise WC=0 & Write Ready
9. Look for EOR in response
10. Lower the Write Select, WC=0, and Write Ready

The above sequence should have turned on the GRE Main Power, Focus, and Anode. For proper operation of the GRE, the previously furnished instructions still apply with respect to turn-on sequence, warm-up times and etc. The logic for the GRE Interface Card was designed to prevent an incorrect sequence of commands from resulting in damage to the equipment.

- 1.4.2 The following example will command the GRE to transmit one data status word through the 2701 interface:

1. Raise Write Select
2. Data Out, Word 1:

1 0 1 1 1 0 0 0 0 1 0 0 0 0 0 0, Parity = 0

3. Raise Write Ready
4. Look for Demand in response
5. Data Out, Word 2:
0 0 0 0 0 1 0 0 0 0 0 0 0 0 0, Parity = 0
6. Raise Write Ready
7. Look for Demand in response
8. Raise WC=0 and Write Ready
9. Look for EOR in response
10. Lower the Write Select, WC=0, and Write Ready
11. Raise Read Select
12. Raise Read Ready
13. Look for Demand
14. Read Data In
15. Lower Read Ready
16. Look for EOR
17. Lower Read Select

The data read should be the functions turned on in Section 1.4.1.

1.4.3 The error conditions may be interpreted as follows:

- a) When no response is received to the initial Write Ready, it should be interpreted that the command bus was busy.
- b) When a parity error is received during the transmission of commands, it should be interpreted that the receiving device has detected a command parity error unless the command is a command-to-receive data. In this case, the parity error indicates the 2701 card detected the Data Bus was busy.

- c) When a parity error is received just after a peripheral device has been commanded to transmit data, it should be interpreted that that device detected the Data Bus busy.
- d) When a parity error is received during a data transmitting mode, it should always be interpreted that the receiving device has detected an error in data parity.

2.0 PHYSICAL DESCRIPTION

2.1 Interface Cards

The logic for the interfaces was designed using TTL Integrated Circuits in 14 and 16 Pin Dual In-Line Packages, DIP's, and discrete components such as resistors, capacitors and diodes mounted on blank 14 and 16 pin DIP discrete component modules. The DIP's were packaged on Augat panels having 6 groups of 9 contact rows. The interconnecting wiring between the DIP's was wire-wrapped to the contact posts on the reverse side. Two 122 contact connector tabs were used for inputs and outputs. The connector for the command and data bus was located at the Group A end and the connector for the interfaced equipment (e.g., the IBM 2701 and GRE equipment) at the Group F end. The card pin functions used were those agreed upon at the February progress report meeting and are shown on the detailed logic diagrams. (See Figure 6)

The DIP's were arranged in 26 vertical rows with 0.1 μ f miniature capacitors spaced in the pair of unused contacts between the ends of adjacent DIP's. A more compact arrangement, if needed, would be to arrange the DIP's in a checkerboard manner with the decoupling capacitors permanently wire wrapped to the contact posts on the reverse side.

This arrangement would allow an additional 24 DIP's to be placed on the board. The total board capacity would then be 204 DIP's of which 26 may be of 16 pin type and the remainder being the 14 pin type.

2.2 GRE Installation

The manual controls for the GRE functions commandable from the VIP's Command and Data Bus interface are located on a panel entitled, "Composite Control Panel" which is just below the oscilloscope in rack 1A1. A chassis was mounted to the rear of this panel which contains the relays and electronic components for the control and monitoring of GRE functions. One interconnecting cable is required between the VIP's interface and the GRE. The cable connects directly to the rear of the Composite Control Chassis and is accessible by opening the rear access door to 1A1.

2.3 Drawing List

2.3.1 IBM 2701 Interface

VIPS-021-01 Detailed Logic Drawing

VIPS-021-2 Logic Module Layout

VIPS-021-4 Detailed Wire Listing

VIPS-021-3 Integrated Circuit Listing

VIPS-021-5B Discrete Component Modules

VIPS-021-5C RC Timing Modules

VIPS-021-5D Resistor Modules for 2701 Drivers

2.3.2 GRE Interface --

VIPS-022-01 Detailed Logic Drawing

VIPS-022-2 Logic Module Layout

VIPS-022-4 Detailed Wire Listing

VIPS-022-3 Integrated Circuit Listing

VIPS-022-5B Discrete Component Modules

VIPS-022-5C Panel, GRE Composite Control

VIPS-022-5D RC Timing Modules

VIPS-022-5E Discrete Component Modules

3.0 ELECTRICAL

3.1 Power Distribution

A schematic of the power distribution recommended in a previous report is shown in Figure 1. Decoupling of each interface card with the power supply, ground, and other interface cards was provided by the input filtering. The inductor in the ground line blocked the high frequency components of chassis ground transients from disturbing the ground potential on each interface card. It was also recommended that returns be provided for all signals to peripheral equipment and that the laboratory and bus chassis ground not be used for signal returns. A schematic of the recommended laboratory grounding system is shown in Figure 2.

A number of 0.1 μ f ceramic capacitors was recommended to be distributed on each interface card between the +Vcc, -Vcc and ground planes.

This will bypass the high frequency current components that are required by the rapid rise-times of TTL circuits and will provide better leading and trailing edges in the logic signals.

3.2 Power Consumption

The power consumption experienced for each interface card was as follows:

IBM 2701:

+5 Volts - 3.9 amperes

-5 Volts - 0.68 ampere

GRE:

+5 Volts - 2.7 amperes

-5 Volts - 0.40 ampere

3.3 Logic Circuits

Series SN74XX and SN75XX Transistor-Transistor Logic (TTL) integrated circuits were used exclusively in the design of the IBM 2701 and GRE interfaces. The TTL circuits were selected because of their immunity to noise, application simplicity, speed and availability of logic functions, registers, counters, multivibrators, etc. There was a large margin in the noise and speed capabilities of this logic which offers a good growth capability for system speed.

3.4 Command and Data Bus Circuits

A differential line driver/receiver circuit was used at the Command and Data Bus interface. A schematic of the bus interface previously recommended is shown in Figure 3. The line drivers were constant current source, differential output types such that the common mode return current through the system ground was a steady state value. The drivers have enable/disable gates which, when in the disabled state, have very large output impedances that do not load the bus when another driver

is enabled. The line drivers used have a 6 ma. current source that generated a difference voltage of 0.6 Volt across a 100 ohm line impedance when switching logical states. The line receivers used have differential inputs which provide a logical "0" or "1" output depending on the polarity of the signal lines. The receivers have a large input impedance so as to not load the bus structure even if a large number of receivers are used. The line receivers tended to have a noise output when that respective line pair was not driven. This receiver noise was inhibited by the enable gates. The data, command, and interrupt control functions will require appropriate consideration to inhibit receiver noise when these functions are not in use. It was recommended that the Line Termination Network, as shown in Figure 3, contain the matched and balanced transmission line terminations and noise inhibitive circuitry.

The primary advantage in using the differential line driver/receiver for this interface was noise immunity. If a balanced transmission line, such as a twisted pair is used, nearly all noise induced on the line will be common mode. Ground potential shifts as high as ± 3 Volts will be allowed at any of the interfaced equipment and its corresponding interface card without undue effects as they will be a common mode. This will prevent data and control errors due to laboratory ground loops and allow each piece of equipment to be connected to the laboratory ground.

It is pointed out that the command and data bus structure designed offers a considerable growth capability in speed. It would require a minimum

modification to the bus structure to synchronously transfer data at rates greater than 10^7 bits per second in each of the parallel 16 bit positions of the Command and Data Busses.

3.5 Logic Description - IBM 2701 Interface Card

The IBM 2701 Interface Card transforms all of the IBM 2701 Write and Read functions into those compatible with the VIP's Command and Data Bus. The 16 Write lines from the IBM 2701 were further broken out into 16 command lines and 16 data lines. The sequence of events through this interface require four word types in the IBM 2701 Write mode. These word types are: (1) Introductory Word consisting of the address for the equipment to be selected and the number of command words; (2) Command words; (3) Data words; and (4) Dummy Write word with Word Count = 0. The logic on the IBM 2701 card operates in the following manner for the Write sequence: The Write Select will enable the 2701 card to receive the succeeding command providing the VIP's command bus is not already in use. If the command bus is busy, the 2701 card does not respond to the Write Select and Write Ready and allows the 2701 to "Time-Out." When the command bus is not busy, the address and number of commands to be transmitted portions of the initial word are loaded on latching registers Z34, Z36, Z39 and Z40. The succeeding command words then are transmitted and gated through to the command bus. Each command is counted on Z41 and Z42. When the count equals the number loaded on Z39 and Z40 during the first word, the next Write word from the 2701 will be transferred as data to the VIP's Data Bus through registers Z28, Z29, Z30 and Z31 along with the

Command Transfer Finish (CTF) to terminate the command sequence. If a Word Count equals 0 is also given from the 2701, the VIP's Data Bus is not enabled and only the CTF is put on the command bus. A D-type multivibrator, Z27-1, is used to store the command count when it is reached, and one is used to store the fall of the Command End of Record (CEOR), Z26-2.

The 2701 card has the capability of having the EOR, EOF, Interrupt and five additional functions enableable when addressed through the VIP's Command Bus. The address can be changed by interchanging the address module located at the top of Group C, Contact 1. Any five bit address may be used in this module. The address delivered with the card is 10110. All of the responses to commands from this section of the 2701 card are made to the VIP's Command Bus which are sensed by the card transmitting the command which may be the 2701 card.

Parity from the 2701 is checked with Z1 and Z2 and regenerated with Z3 and Z4 in the command transfer mode and passed through directly in the data transfer mode. When data is transferred from the VIP's Data Bus to the 2701, the parity is passed through directly also.

3.6 Logic Description - GRE Interface Card

The GRE Interface Card was designed such that it can be commanded to receive commands from the VIP's Command Bus or transmit a data status word on the VIP's Data Bus. The GRE's address is encoded on Z1, a 16 pin module, with an address of 10111. Z2 is an identical module encoded

with the same address for identifying the GRE when the data status word is transmitted on the Data Bus. Parity of received commands is checked by Z3 and Z4 and is generated for transmitted data by Z5 and Z6. When a command is received having the GRE's address and proper parity, it is loaded on register Z22, Z23 and Z24. A later phase of the clock will load respective command changes on multivibrators Z42, Z48, Z52, Z58 and Z63. The multivibrators have an alternate clear input from the VIP's Master Clear or from the GRE Clear on the GRE Composite Control Panel. In addition, each multivibrator is alternately controlled through its preset and clear functions in a 2-way switch arrangement between commands from the command bus and from switch functions on the Composite Control Panel. That is, each GRE function can be controlled by either a command from the Command Bus or by a manual switch input at the GRE.

The data transmitted from the GRE consists of one word of GRE address and status information followed by a time slot occupied by the Data Transfer Finished (DTF). The GRE functions reported in the status word are the Address, GRE Fault, Main Power, Focus, Anode, Video Select, Film Drive and CRT Blanking. The status information always appears at the input to the Data Register Z25, Z26, Z27 and Z28 and is clocked through to the VIP's Data Bus when commanded. The data transmit command is given by inserting a "Read" bit in the command word which is sensed by Z20. When Z20 is latched, the data transmit sequence begins by raising the Data Select and Data Ready lines and strobing the Data Register. When a Data Acknowledged is received, the Data Ready is lowered and the Data Transmit Finished (DTF) is raised by Z56A. The

receiver then returns the Data End of Record (DEOR) which resets the GRE's data transmit logic and lowers the Data Select.

An alternate mode of data transmission from the GRE Interface Card is initiated by the detection of a malfunction. The malfunction detection logic is enabled only when the GRE Recording Camera has been commanded on by the VIP's Command Bus. To report such a malfunction, Z34 "Ands" the Data Select with the output of the Malfunction Detector to clock Z21. An output is latched on Z21 if the VIP's End of File (EOF) function is not in-use. A 1 μ s EOF pulse is given to interrupt the control computer enabled to receive the EOF. The Write mode then proceeds as if the GRE Interface Card had been commanded to Write. In the event an EOF was in use when the malfunction was first detected, Z21 will be reset with the fall of the Data EOR and is reclocked when the Data Select falls.

AIU POWER DISTRIBUTION

INTERFACE CARD

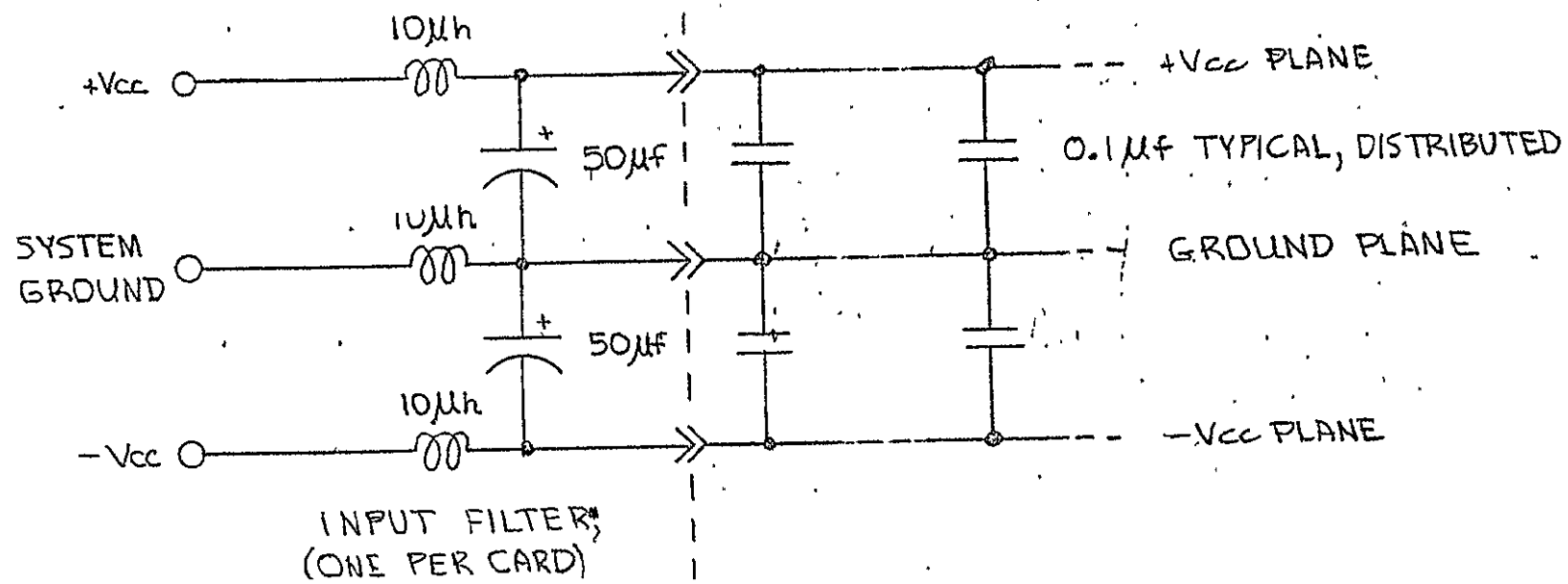


FIGURE 1: POWER DISTRIBUTION PLAN

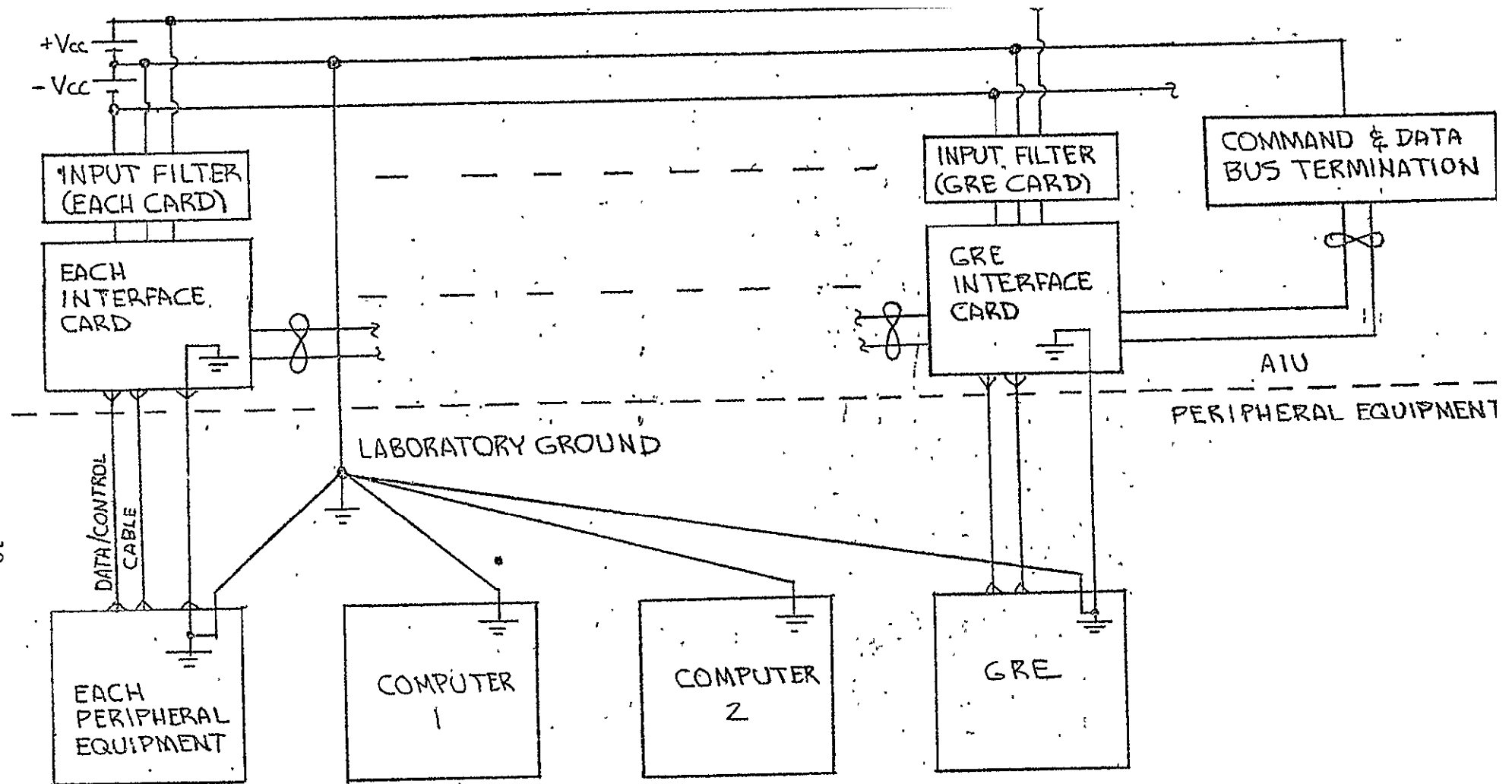


FIGURE 2: RECOMMENDED LABORATORY GROUNDING PLAN

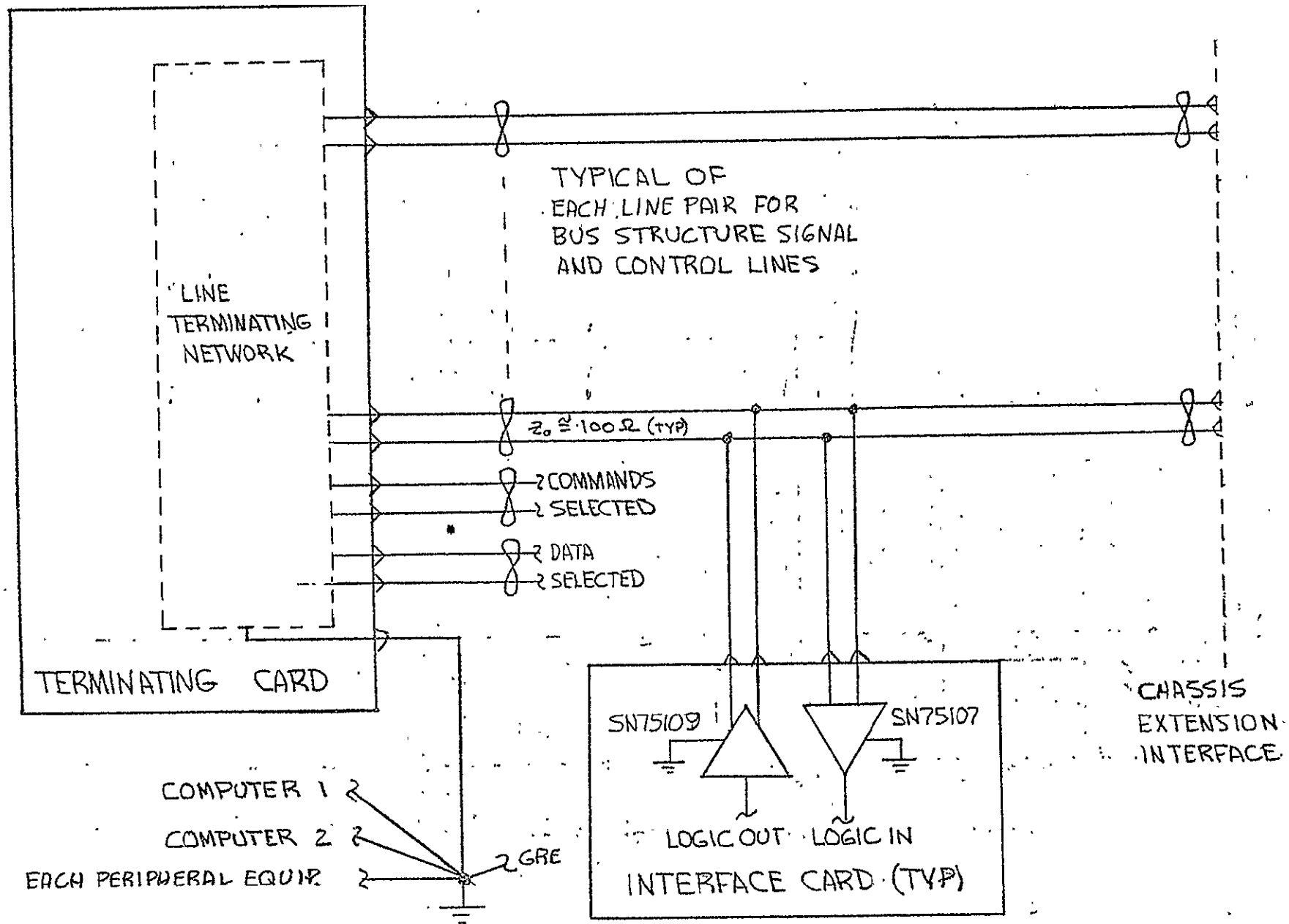
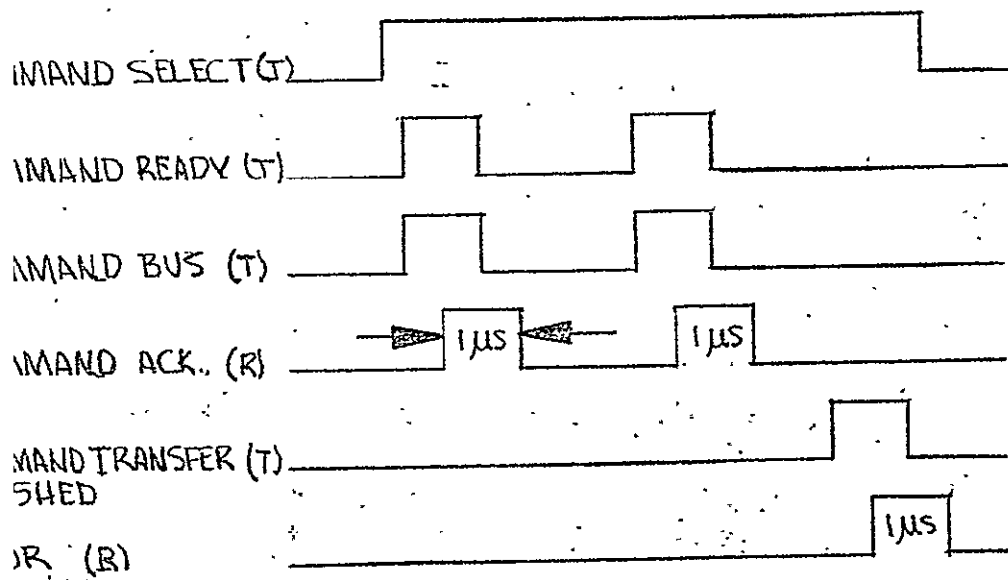
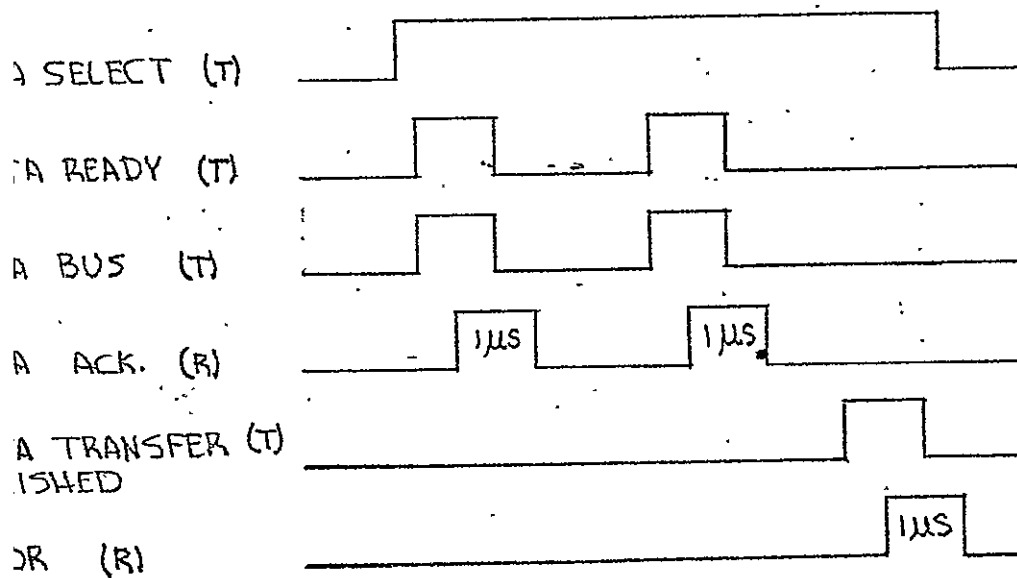


FIGURE 3: INTERFACE BUS STRUCTURE



COMMAND TRANSFER TIMING

NOTE: (T) - ORIGINATED BY TRANSMITTER
(R) - RESPONSE FROM RECEIVER



DATA TRANSFER TIMING

FIGURE 4: VIPS TIMING DIAGRAMS

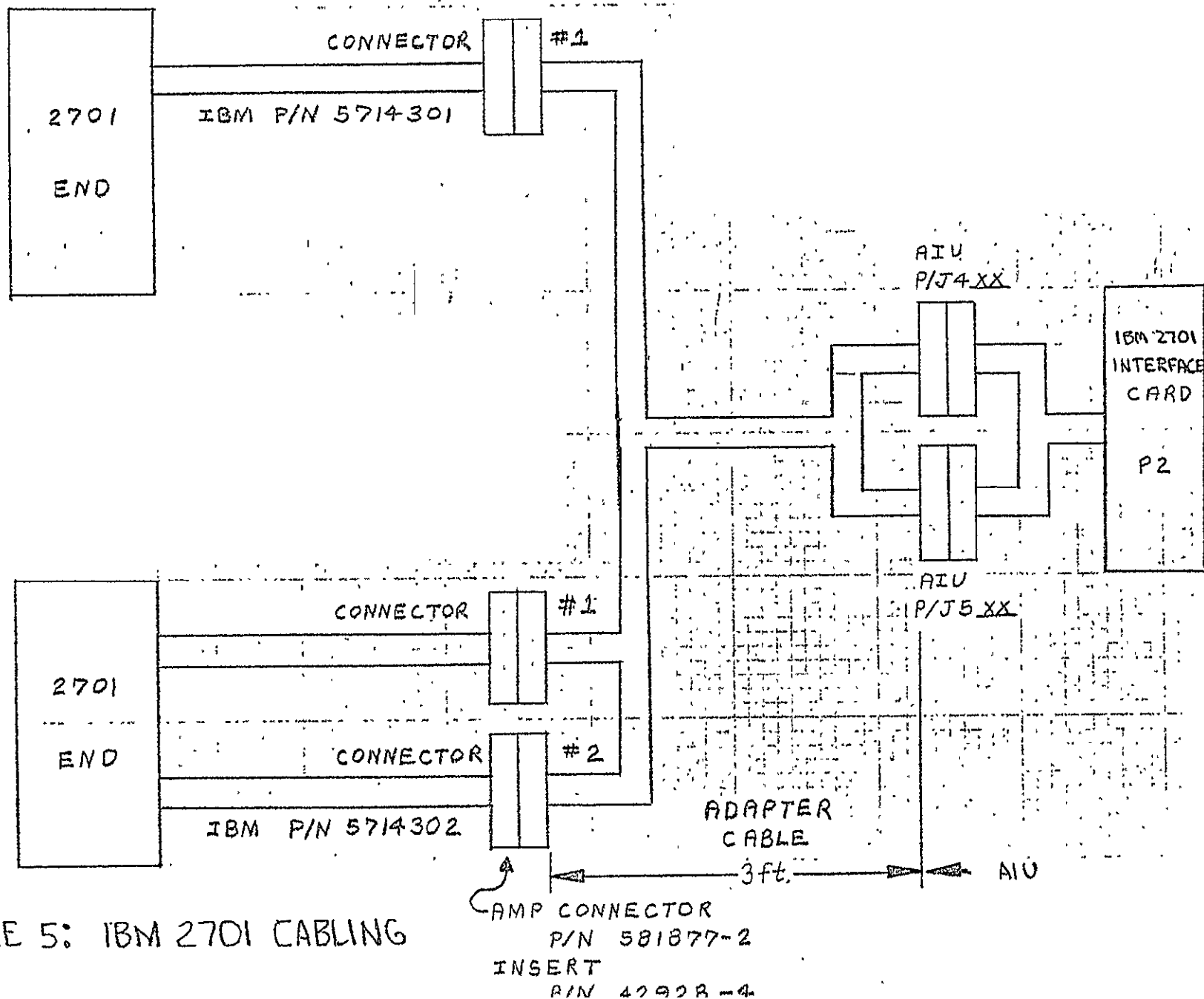


FIGURE 5: IBM 2701 CABLING

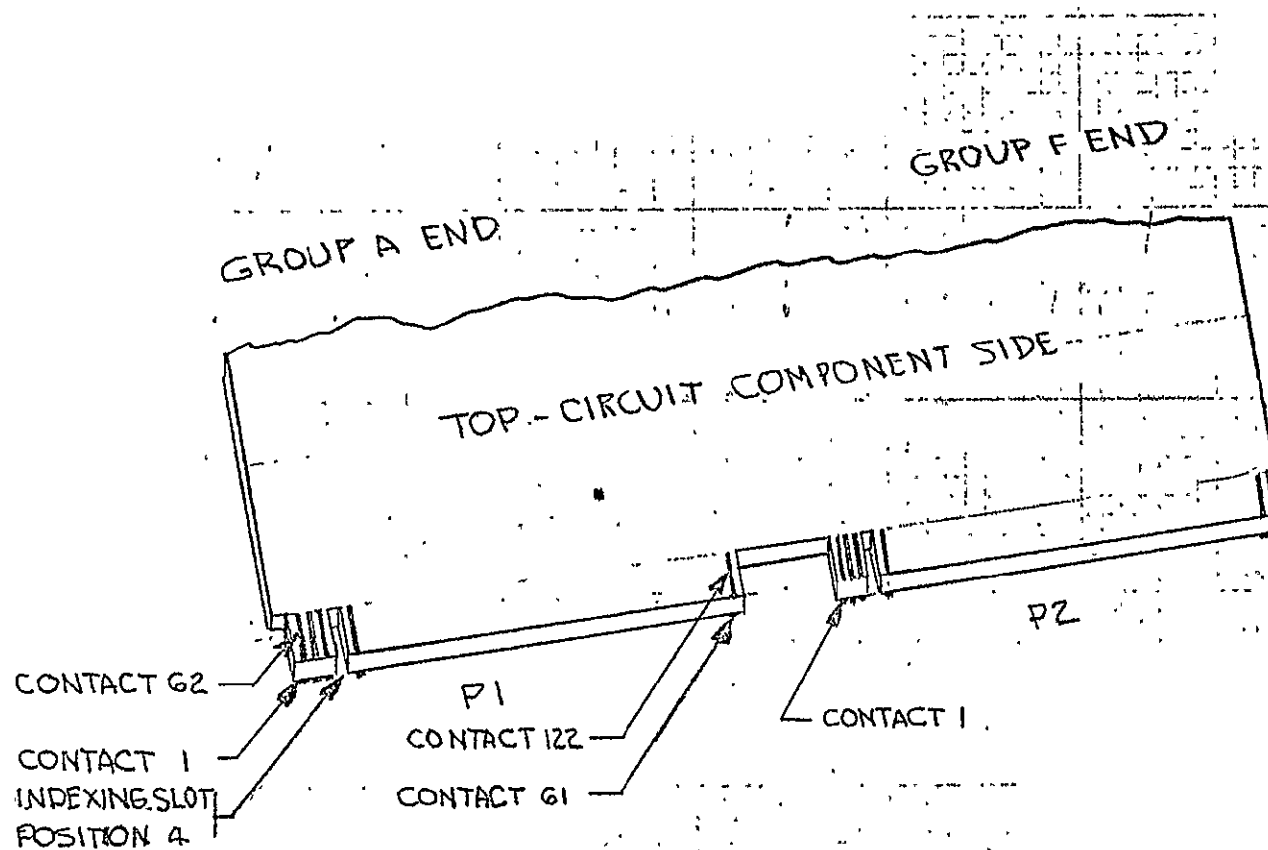


FIGURE 6: CIRCUIT BOARD CONTACT POSITION DIAGRAM

4.1 DETAILED WIRE LISTING FOR THE IBM 2701 INTERFACE CARD (VIPS-021-4)

DETAIL WIRE LISTING FOR THE IBM 2701 INTERFACE CARD

FH50 - FH32	+Vcc - FD32	GND - EH32	FD16 - FD15
FH32 - FH24	+Vcc - FD24	GND - EH24	FD8 - FD7
FH24 - FH16	+Vcc - FD16	GND - EH16	EJ32 - EJ31
FH16 - FH8	+Vcc - FD8	GND - EH8	EJ16 - EJ15
FH8 - FB8	+Vcc - EG40	FB22 - FB24	EG40 - EG39
FB8 - FB16	+Vcc - EG32	FB14 - FB6	EG32 - EG31
FB16 - FB24	+Vcc - EG24	FB 6 - EJ6	EG24 - EG23
FB24 - FB32	+Vcc - EG16	EJ38 - EJ22	FH32 - FH30
FB32 - FB50	+Vcc - EG8	EJ22 - EJ24	FH24 - FH22
FB50 - FH50	GND - FJ32	EJ6 - EJ8	FH16 - FH14
FB50 - EJ50	GND - FJ24	EG16 - EG15	FH8 - FH6
EJ50 - EJ40	GND - FJ16	EG8 - EG7	FB32 - FB30
EJ40 - EJ24	GND - FJ8	EE24 - EE23	+Vcc - EE41
EJ24 - EJ8	GND - FG40	FF32 - FH31	+Vcc - EE24
EJ8 - FB8	GND - FG32	FF24 - FH23	+Vcc - EE16
FJ32 - FJ25	GND - FG24	FF16 - FH15	+Vcc - EC32
FJ24 - FJ17	GND - FG16	FF8 - FH7	+Vcc - EC16
FJ16 - FJ9	GND - FG8	EJ32 - FB31	+Vcc - EA33
FJ8 - FJ1	GND - FE40	FD24 - FB23	+Vcc - EA17
FC32 - FC75	GND - FE32	EJ16 - FB15	+Vcc - DH35
FC24 - FC17	GND - FE24	FD8 - FB7	+Vcc - DH9
FC16 - FC9	+5 - EJ32	EG40 - EJ39	+Vcc - DF41
FC8 - FC1	+5 - EJ16	EG24 - EJ23	+Vcc - DF25
FA40 - FA33	GND - FE41	EG8 - EJ7	+Vcc - DF9
FA24 - FA1	GND - FE16	FF40 - FF39	+Vcc - DD33
FA8 - FA1	GND - FE8	FF32 - FF31	+Vcc - DD9
+Vcc - FD41	GND - FA40	FF24 - FF23	+Vcc - DB33
+Vcc - FF40	GND - FA32	FF16 - FF15	+Vcc - DB17
+Vcc - FF32	GND - FA24	FF8 - FF7	+Vcc - CJ41
+Vcc - FF24	GND - FA16	FD41 - FD39	+Vcc - CJ25
+Vcc - FF16	GND - FA8	FD32 - FD31	+Vcc - CJ9
+Vcc - FF8	GND - EH40	FD24 - FD23	+Vcc - CG34

Detail Wire Listing for the IBM 2701 Interface Card (Cont'd)

+Vcc - CG18	EJ50 - BH49	GND - CB34	BF33 - BF25
+Vcc - CE42	EJ6 - BD1	GND - CB16	BF25 - BF17
+Vcc - CE26	+Vcc - CA34	GND - BJ50	BF17 - BD1
+Vcc - CE9	+Vcc - CA16	GND - BJ33	BF49 - BB49
+Vcc - CC34	+Vcc - BH50	GND - BJ17	BB49 - BB41
+Vcc - CC18	+Vcc - BH33	GND - GE49	BB41 - BB33
GND - EF41	+Vcc - BH17	GND - BE41	BB33 - BB25
GND - EF24	+Vcc - BD49	GND - BE33	BB25 - BB17
GND - EF16	+Vcc - BD41	GND - BE25	BB17 - BB9
GND - ED32	+Vcc - BD33	GND - BE17	BB9 - BD7
GND - ED16	+Vcc - BD25	GND - BE9	BB49 - AG49
GND - EB33	+Vcc - BD17	GND - BA49	AG49 - AG41
GND - EB17	+Vcc - BD9	GND - BA41	AG41 - AG33
GND - DJ35	+Vcc - AJ49	GND - BA33	AG33 - AG25
GND - DJ9	+Vcc - AJ41	GND - BA25	AG25 - AG17
GND - DG41	+Vcc - AJ33	GND - BA17	AG12 - AG9
GND - DG25	+Vcc - AJ25	GND - BA9	AG9 - BB7
GND - DG9	+Vcc - AJ17	GND - AF49	AG49 - AC49
GND - DE33	+Vcc - AJ9	GND - AF41	AC49 - AC41
GND - DE9	+Vcc - AE49	GND - AF33	AC41 - AC33
GND - DC33	+Vcc - AE41	GND - AF25	AC33 - AC25
GND - DC17	+Vcc - AE33	GND - AF17	AC25 - AC17
GND - DA41	+Vcc - AE25	GND - AF9	AC17 - AC9
GND - DA25	+Vcc - AE17	GND - AB49	AC9 - AG7
GND - DA9	+Vcc - AE9	GND - AB41	GND - BJ49
GND - CH34	+Vcc - AA49	GND - AB33	GND - BG49
GND - CH18	+Vcc - AA41	GND - AB25	GND - BG41
GND - CF42	+Vcc - AA33	GND - AB17	GND - BG33
GND - CF26	+Vcc - AA25	GND - AB9	GND - BG25
GND - CF9	+Vcc - AA17	BH49 - BF49	GND - BG17
GND - CD34	+Vcc - AA9	BF49 - BF41	GND - BC49
GND - CD18	GND - BE1	BF41 - BF33	GND - BC41

Detail Wire Listing for the IBM 2701 Interface Card (Cont'd)

GND - BC33	DH16 - DJ18	GND - DG13	GND - DE2
GND - BC25	DH8 - DH29	GND - DG2	GND - DC42
GND - BC17	+Vcc - DF48	GND - DE42	GND - DC34
GND - BC9	EA46 - DF40	GND - DE34	GND - DC26
GND - AH49	DH30 - DF32	+Vcc - DD32	GND - DB20
GND - AH41	DH31 - DF24	+Vcc - DD16	GND - DB12
GND - AH33	DH18 - DF16	+Vcc - DD8	GND - DB4
GND - AH25	DH20 - DF8	+Vcc - DB48	GND - DA42
GND - AH17	+Vcc - DD48	+Vcc - DB40	GND - DA34
GND - AH9	+Vcc - DD40	+Vcc - DB32	GND - DA26
GND - AD49	GND - EE45	+Vcc - DC20	GND - DA18
GND - AD41	GND - EE36	+Vcc - DC12	GND - DA10
GND - AD33	GND - EF25	+Vcc - DC4	GND - DA2
GND - AD25	GND - EF9	+Vcc - CJ48	GND - CH43
GND - AD17	GND - EF1	+Vcc - CJ40	GND - CH35
GND - AD9	GND - ED42	+Vcc - CJ32	GND - CH27
+Vcc - EF45	GND - ED25	+Vcc - CJ24	GND - CH19
+Vcc - EF36	GND - EB17	+Vcc - CJ16	GND - CG13
+Vcc - EE31	GND - ED9	+Vcc - CJ8	GND - CG4
+Vcc - EE15	GND - ED1	CC8 - CG49	GND - CF43
+Vcc - EE7	GND - EB34	+Vcc - CG41	GND - CF35
EA48 - EC48	GND - EB26	+Vcc - CG33	GND - CF27
+Vcc - EC31	GND - EB18	+Vcc - CG25	GND - CF19
+Vcc - EC23	GND - EB10	+Vcc - CH13	GND - CE13
+Vcc - EC15	GND - EB2	+Vcc - CH4	+Vcc - CF4
+Vcc - EC7	GND - DJ36	+Vcc - CE49	+Vcc - CC49
+Vcc - EA40	GND - DJ13	+Vcc - CE41	+Vcc - CC41
+Vcc - EA32	GND - DJ2	+Vcc - CE33	+Vcc - CC33
+Vcc - EA24	GND - DG42	+Vcc - CE25	CC4 - CC25
+Vcc - EA16	GND - DG34	+Vcc - CF13	CC6 - CC17
+Vcc - EA8	GND - DG26	GND - DE26	+Vcc - CA49
DH42 - EA46	GND - DG18	GND - DE10	+Vcc - CA41

Detail Wire Listing for the IBM 2701 Interface Card (Cont'd)

+Vcc - CB29	AH33 - AA32	AA9 - AC8	GND - AF26
+Vcc - CB20	AC33 - AC31	AC7 - AA5	GND - AH26
+Vcc - CA15	AA25 - AA24	AA25 - AG48	GND - AF18
+Vcc - CA7	AC25 - AC23	AG47 - AE45	GND - AH18
+Vcc - BH40	AA17 - AA16	AE41 - AG40	GND - AF10
+Vcc - BH32	AC17 - AC15	AG39 - AE37	GND - AH10
+Vcc - BH24	AA9 - AA8	AE33 - AG32	GND - AF2
+Vcc - BH16	AC9 - AC7	AG31 - AE29	GND - AH2
+Vcc - BH8	AE49 - AE48	AE25 - AG24	GND - BA42
+Vcc - BF8	AG49 - AG47	AG23 - AE21	GND - BC42
GND - CE42	AE41 - AE40	AE17 - AG16	AJ41 - AJ40
GND - CD43	AG41 - AG39	AG15 - AE13	BB41 - BB39
GND - CD35	AE33 - AE32	AE9 - AG8	AJ33 - AJ32
GND - CD27	AG33 - AG31	AG7 - AE5	BB33 - BB31
GND - CD19	AE25 - AE24	AJ49 - BB48	AJ25 - AJ24
GND - CD11	AG25 - AG23	BB47 - AJ45	BB25 - BB23
GND - CB43	AE17 - AE16	GND - AB42	AJ17 - AJ16
GND - CB35	AG17 - AG15	GND - AD42	BB17 - BB15
GND - CA29	AE9 - AE8	GND - AB34	AJ9 - AJ8
GND - CA20	AG9 - AG7	GND - AD34	BB9 - BB7
GND - CB9	AJ49 - AJ48	GND - AB26	BD49 - BD48
GND - CB1	BB49 - BB47	GND - AD26	BF49 - BF47
GND - BJ34	AA49 - AC48	GND - AB18	BD41 - BD40
GND - BJ26	AC47 - AA45	GND - AD18	BF41 - BF39
GND - BJ18	AA41 - AC40	GND - AB10	BD33 - BD32
GND - BJ10	AC39 - AA37	GND - AD10	BF33 - BF31
GND - BG2	AA33 - AC32	GND - AB2	BD25 - BD24
BJ6 - BJ2	AC31 - AA29	GND - AD2	BF25 - BF23
AA49 - AA48	AA25 - AC24	GND - AF42	BD17 - BD16
AC49 - AC47	AC23 - AA21	GND - AH42	BF17 - BF15
AA41 - AA40	AA17 - AC16	GND - AF34	BD9 - BD8
AC41 - AC39	AC17 - AA13	GND - AH34	BH50 - BH48

Detail Wire Listing for the IBM 2701 Interface Card (Cont'd)

AJ41 - BB40	GND - BE42	FH39 - FG11	EJ43 - EH35
BB39 - AJ37	GND - BG42	FJ40 - FG10	FA44 - EH34
AJ33 - BB32	GND - BE34	FH38 - FF11	EJ42 - EH27
BB31 - AJ29	GND - BG34	FJ38 - FF10	FA42 - EH26
AJ25 - BB24	GND - BE26	FJ37 - FG3	FC37 - EH19
BB23 - AJ21	GND - BG26	FH37 - FG2	FB37 - EH18
AJ17 - BB16	GND - BE18	FG36 - FF3	FC36 - EH11
BB15 - AJ13	GND - BG18	FH35 - FF2	FB35 - EH10
AJ9 - BB8	GND - BE10	FH34 - FE35	FB34 - EH3
BB7 - AJ5	GND - BG10	FJ35 - FE34	FC35 - EH2
BD49 - BF48	GND - BE2	FH33 - FD35	FB33 - EF19
BF47 - BD45	GND - BJ42	FJ33 - FD34	FC33 - EF18
BD41 - BF40	FA34 - FA18	FD48 - FE27	+Vcc - FH45
BF39 - BD37	FA18 - FA2	FE49 - FE26	FH45 - FJ43
BD33 - BF32	FJ26 - FJ18	FD47 - FD27	FJ43 - FJ48
BF31 - BD29	FJ18 - FJ10	FE47 - FD26	FJ34 - FH36
BD25 - BF24	FJ10 - FJ2	FE46 - FE19	+Vcc - FJ34
BF23 - BD21	FC26 - FC18	FD46 - FE18	FH36 - FJ39
BH17 - BF16	FC18 - FC10	FE45 - FD19	FE43 - FD45
BF15 - BD15	FC10 - FC2	FD44 - FD19	+Vcc - FE43
BD1 - BD7	FJ49 - FG34	FD43 - FE11	FD45 - FE48
BH49 - BH45	FH48 - FG35	FE44 - FE10	FA43 - EJ45
GND - BA34	FF35 - FJ47	FD42 - FD11	+Vcc - FA43
GND - BC34	FF34 - FJ47	FE42 - FD10	EJ45 - FA48
GND - BA26	FJ46 - FG27	EJ48 - FE3	FC34 - FB36
GND - GC26	FH46 - FG26	FA49 - FE2	+Vcc - FC34
GND - BA18	FJ45 - FF27	EJ47 - FD3	FB36 - FJ46
GND - BC18	FH44 - FF26	FA47 - FD2	FF33 - FF34
GND - BA10	FH43 - FG19	FA46 - FA27	FF25 - FF26
GND - BC10	FJ44 - FG18	EJ46 - FA26	FF17 - FF18
GND - BA2	FH42 - FF19	FA45 - FA11	FF9 - FF10
GND - BC2	FJ42 - FF18	EJ44 - FA10	FF1 - FF2

Detail Wire Listing for the IBM 2701 Interface Card (Cont'd)

FD33 - FD34	FG25 - FG26	EH10 - GND	DJ20 - DF5
FD25 - FD26	FG17 - FG18	EH2 - GND	DJ22 - DH13
FD17 - FD18	FG9 - FG10	EF18 - GND	DJ24 - DH5
FD9 - FD10	FG1 - FG2	DD8 - DH27	EB44 - DH39
FD1 - FD2	FE33 - FE34	DF32 - DH29	EB46 - DF37
EJ25 - EJ26	FE25 - FE26	DF24 - DH31	CD2 - CC30
EJ9 - EJ10	FE17 - FE18	DF16 - DH18	DJ33 - DD29
EG33 - EG34	FE9 - FE10	DF8 - DH20	CD4 - CC22
EG25 - EG26	FE1 - FE2	DH16 - DH22	CD6 - CC14
EG17 - EG18	FA25 - FA26	DH8 - DH24	EB42 - DD13
EG9 - EG10	FA9 - FA10	DH42 - EA44	CD8 - CG46
EG1 - EG2	EH33 - EH34	DF40 - EA46	EB48 - EC45
EE17 - EE18	EH25 - EH26	CC33 - CC2	CD3 - CC29
FF34 - FG33	EH17 - EH18	DD32 - DH33	DJ34 - DD28
FF26 - FG25	EH9 - EH10	CC25 - CC4	CD5 - CC21
FF18 - FG17	EH1 - EH2	CC17 - CC6	CD7 - CC13
FF10 - FG9	EF17 - EF18	DD16 - EA42	EB43 - DD12
FF2 - FG1	FG34 - GND	CG49 - CC8	CD9 - CG45
FD34 - FE33	FG26 - GND	EC48 - EH48	EB49 - EC44
FD26 - FE25	FG18 - GND	DJ28 - DD4	DD5 - DH28
FD18 - FE17	FG10 - GND	DJ30 - DF28	DF29 - DH30
FD10 - FE9	FG2 - GND	DJ32 - DF20	DF21 - DH32
FD2 - FE1	FE34 - GND	DJ19 - DF12	DF13 - DH19
EJ26 - FA25	FE26 - GND	DJ21 - DF4	DF5 - DH21
EJ10 - FA9	FE18 - GND	DJ23 - DH12	DH13 - DH23
EG34 - EH33	FE10 - GND	DJ25 - DH4	DH5 - DH25
EG26 - EH25	FE2 - GND	EB45 - DH38	DH39 - EA45
EG18 - EH17	FA26 - GND	EB47 - DF36	DF37 - EA47
EG10 - EH9	FA10 - GND	DJ27 - DD5	CC30 - CC3
EG2 - EH1	EH34 - GND	DJ29 - DF29	DD29 - DH34
EE18 - EF17	EH26 - GND	DJ31 - DF21	CC22 - CC5
FG33 - FG34	EH18 - GND	DJ18 - DF13	CC14 - CC7

Detail Wire Listing for the IBM 2701 Interface Card (Cont'd)

DD13 - EA43	EB37 - FF36	41 - FF47	37 - ED39
CG46 - CC9	EB35 - FG28	102 - FF48	98 - ED40
EC45 - EA49	EA34 - FF28	42 - FG48	38 - DH44
FG37 - EB40	EA36 - FG20	103 - FG49	99 - DH45
FF37 - EB38	EA38 - FF20	43 - FC42	39 - DJ46
FG29 - EB36	EB31 - FG12	104 - FC43	100 - DJ47
FF29 - EA35	EB29 - FF12	22 - FB43	FF42 - FJ30
FG21 - EA37	EB27 - FG4	83 - FB44	FG43 - FJ31
FF21 - EA39	EA26 - FF4	23 - FC45	FG44 - FH28
FG13 - EB32	EA28 - FE36	84 - FC46	FF43 - FH29
FF13 - EB30	EA30 - FD36	25 - FB47	FF46 - FJ22
FG5 - EB28	EB23 - FE28	86 - FB48	FG46 - FJ23
FF5 - EA27	EB21 - FD28	26 - FC48	FG47 - FH20
FE37 - EA29	EB19 - FE20	87 - FC49	FF48 - FH21
FD37 - EA31	EA18 - FD20	27 - EH42	FF49 - FJ14
FE29 - EB24	EA20 - FE12	88 - EH43	FG49 - FJ15
FD29 - EB22	EA22 - FD12	29 - EG43	FB42 - FH12
FE21 - EB20	EB15 - FE4	90 - EG44	FC43 - FH13
FD21 - EA19	EB13 - FD4	30 - EH45	FC44 - FJ6
FE13 - EA21	EB11 - FA28	91 - EH46	FB44 - FJ7
FD13 - EA23	EA18 - FA12	31 - EG47	FB46 - FH4
FE5 - EB16	EA12 - EH36	92 - EG48	FC46 - FH5
FD5 - EB14	EA14 - EH28	32 - EH48	FC47 - FC30
FA29 - EB12	EB7 - EH20	93 - EH49	FB48 - FC31
FA13 - EA11	EB5 - EH12	33 - ED33	FB49 - FB28
EH37 - EA13	EH5 - EB4	94 - ED34	FC49 - FB29
EH29 - EA15	EF21 - EA3	34 - EC34	EG42 - FC22
EH21 - EB8	1 - FG42	95 - EC35	EH43 - FC23
EH13 - EB6	62 - FG43	35 - ED36	EH44 - FB20
EB3 - EH4	2 - FF44	96 - ED37	EG44 - FB21
EA2 - EF20	63 - FF43	36 - EC38	EG46 - FC14
EB39 - FG36	21 - FG45	97 - EC39	EH46 - FC15
	82 - FG46		

Detail Wire-Listing for the IBM 2701 Interface Card (Cont'd)

EH47 - FB12	GND - FC7	15 - FD48	Vcc - FF45
EG48 - FB13	GND - FB5	76 - FE49	Vcc - FB45
EG49 - FC6	GND - FA39	16 - FD47	Vcc - EG45
EH49 - FC7	GND - FJ37	77 - FE47	Vcc - EC36
EC33 - FB4	GND - FA23	17 - FE46	Vcc - DH46
ED34 - FB5	GND - EJ21	78 - FD46	29 - AD48
ED35 - FA38	GND - FA7	18 - FE45	90 - AD47
EC35 - FA39	GND - EJ5	79 - FD44	32 - AC46
EC37 - EJ36	3 - EJ48	19 - FD43	93 - AC45
ED37 - EJ37	64 - FA49	80 - FE44	31 - AD40
ED38 - FA22	53 - FH48	20 - FD42	92 - AD39
EC39 - FA23	114 - FJ49	31 - FE42	50 - AA39
EC40 - EJ20	5 - FJ46	40 - FH47	110 - AA38
ED40 - EJ21	66 - FH46	101 - FJ47	51 - AA39
DJ45 - FA6	6 - FJ45	44 - EJ47	112 - AA34
DH45 - FA7	67 - FH44	105 - FA47	52 - AA31
DH47 - EJ4	7 - FH43	45 - FA46	113 - AA30
DJ47 - EJ5	68 - FJ44	106 - FJ46	53 - AA27
GND - FJ31	8 - FH42	16 - FA45	114 - AA26
GND - FH29	69 - FJ42	107 - EJ44	54 - AA23
GND - FJ23	9 - FH39	17 - EJ43	115 - AA22
GND - FH21	70 - FJ40	108 - FA44	34 - AA19
GND - FJ15	10 - FH38	18 - EJ42	95 - AA18
GND - FH13	71 - FJ38	109 - FA42	39 - AA15
GND - FJ7	11 - FJ37	19 - FC37	100 - AA14
GND - FH5	72 - FH37	10 - FB37	40 - AA11
GND - FC31	12 - FJ36	10 - FC36	101 - AA10
GND - FB29	73 - FH35	11 - FB35	41 - AA7
GND - FC23	13 - FH34	11 - FB34	102 - AA6
GND - FB21	74 - FJ35	12 - FC35	42 - AA3
GND - FC15	14 - FH33	2 - FB33	103 - AA2
GND - FB13	75 - FJ33	13 - FC33	

Detail Wire Listing for the IBM 2701 Interface Card (Cont'd)

32 - AA43	43 - BG40	12 - AE7	15 - AG30
93 - AA42	104 - BG39	73 - AE6	76 - AG29
31 - AA47	44 - BF38	13 - AE3	16 - AH32
92 - AA46	105 - BF37	74 - AE2	77 - AH31
50 - BB14	45 - BG32	14 - AJ47	17 - AG38
111 - BB13	106 - BG31	75 - AJ46	78 - AG37
51 - BC8	46 - BF30	15 - AJ43	18 - AH40
112 - BC7	107 - BF29	76 - AJ42	79 - AH39
52 - BB6	47 - BG24	16 - AJ39	19 - AG46
113 - BB5	108 - BG23	77 - AJ38	80 - AG45
53 - BE16	48 - BF22	17 - AJ35	20 - AH48
114 - BE15	109 - BF21	78 - AJ34	81 - AH47
54 - BD14	49 - BG16	18 - AJ31	21 - AC6
115 - BD13	110 - BG15	79 - AJ30	82 - AC5
39 - BE8	43 - AE47	19 - AJ27	22 - AD8
100 - BE7	104 - AE46	80 - AJ26	83 - AD7
40 - BD6	44 - AE43	20 - AJ23	23 - AJ11
101 - BD5	105 - AE42	81 - AJ22	84 - AJ10
41 - BG48	45 - AE39	21 - AJ19	24 - AJ7
102 - BG47	106 - AE38	82 - AJ18	85 - AJ6
42 - BF46	46 - AE35	22 - AJ15	25 - AJ3
103 - BF45	107 - AE34	83 - AJ14	86 - AJ2
35 - AC38	47 - AE31	10 - AC14	1 - BD47
96 - AC37	108 - AE30	71 - AC13	62 - BD46
9 - BH47	48 - AE27	11 - AG14	38 - AG6
70 - BH46	109 - AE26	72 - AG13	99 - AG5
6 - AC30	49 - AE23	12 - AH16	37 - BD39
67 - AC29	110 - AE22	73 - AH15	98 - BD38
35 - AE19	10 - AE15	13 - AG22	2 - BD35
96 - AE18	71 - AE14	74 - AG21	63 - BD34
9 - AD32	11 - AE11	14 - AH24	5 - BC39
70 - AD31	72 - AE10	75 - AH23	66 - BC40

Detail Wire Listing for the IBM 2701 Interface Card (Cont'd)

7 - BB38	3 - BD19	EF6 - FB10	FG31 - FG23
66 - BB37	64 - BD18	EC1 - FC4	FG23 - FG15
8 - BC31	BB11 - CF49	EC2 - FB2	FG15 - FG7
69 - BC32	BC5 - CF47	EC3 - FA36	FG7 - FE39
57 - BC16	BB3 - CE44	EC4 - EJ34	EF12 - FE31
118 - BC15	BF13 - CE46	EC5 - FA20	FE31 - FE23
56 - BC24	BD11 - CF45	EC6 - EJ18	FE23 - FE15
117 - BC23	BB11 - C31	ED7 - FA4	BE24 - BE23
33 - BB21	BC5 - C7	ED6 - EJ2	AF15 - AF16
94 - BB22	BB3 - C28	EF26 - FJ27	AF11 - AF12
3 - BB29	BE13 - C4	FJ27 - FG39	AF7 - AF8
64 - BB30	BD11 - C25	FJ27 - FJ19	AF3 - AF4
23 - AD16	C8 - CD41	FJ19 - FJ3	BA48 - BA47
84 - AD15	C29 - CD40	FJ3 - FH1	BA43 - BA44
24 - AC22	C5 - CD39	FH1 - FC27	BA39 - BA40
85 - AC21	C26 - CD38	FC27 - FB25	BA35 - BA36
25 - AD24	C2 - CD37	FB25 - FC19	BA31 - BA32
86 - AD23	CD37 - CD36	FC19 - FB17	BA27 - BA28
1 - AH8	CD36 - CC39	EF28 - FC11	BA23 - BA24
62 - AH7	CC39 - CC40	FC11 - FB9	BA19 - BA20
38 - BD43	CF48 - C30	FB9 - FC3	BA15 - BA16
99 - BD42	CF46 - C6	FC3 - FB1	BA7 - BA8
37 - BC48	CE43 - C27	FB1 - FA35	BA11 - BA12
98 - BC47	CE45 - C3	FA35 - EJ33	BA3 - BA4
2 - BB46	CF44 - C24	EJ33 - FA19	AB39 - AB40
63 - BB45	EE1 - FJ4	FA19 - EJ17	AB35 - AB36
7 - BD31	EE2 - FH2	EJ17 - FA3	AB31 - AB32
66 - BD30	EE3 - FC28	FA3 - EJ1	AB27 - AB28
8 - BD27	EE4 - FB26	EF30 - FJ11	AB23 - AB24
69 - BD26	EE5 - FC20	FJ11 - FH9	AB19 - AB20
33 - BD23	EE6 - FB18	FH9 - FE7	AB15 - AB16
94 - BD22	EF7 - FC12	EF14 - FG31	AB11 - AB12

Detail Wire Listing for the IBM 2701 Interface Card (Cont'd)

AB7 - AB8	BJ7 - AB5	ED2 - EF4	BE4 - BD2
AB3 - AB4	BG3 - AB20	EF2 - DA38	BD2 - BG44
AF47 - AF48	BF2 - AB4	EF2 - ED27	BG44 - BF42
AF43 - AF44	BF3 - AF48	FJ20 - ED22	BF42 - BG36
AF39 - AF40	BF4 - AF44	ED22 - EC22	BG36 - BF34
AF35 - AF36	BF5 - AF40	CA37 - CA43	BF34 - BG28
AF31 - AF32	BF6 - AF36	CA43 - BH34	BG28 - BF26
AF27 - AF28	BF7 - AF32	BH34 - BH26	BF26 - BG20
AF23 - AF24	BG8 - AF28	BH26 - BH18	BG20 - BF18
BJ22 - AF16	BG7 - AF24	CA39 - BH10	BF18 - BH12
BJ19 - AF12	BG6 - BJ4	BH10 - CA1	CF31 - EE26
BH19 - AF8	BG5 - BJ3	CA1 - CA9	EE25 - BB26
BH22 - AF4	EE1 - BJ23	BJ5 - FC40	AH28 - AG26
BJ30 - BA48	EE2 - BJ20	BJ6 - BJ2	AH28 - AH20
BJ27 - BA44	EE3 - BH20	BJ5 - CB49	AH20 - AG18
BH27 - BA40	EE4 - BH23	CB49 - BJ40	AH20 - AH12
BH30 - BA36	EE5 - BJ31	BJ40 - BJ32	AH12 - AG10
BJ38 - BA32	EE6 - BJ28	BJ32 - BJ24	AH12 - AH4
BJ35 - BA28	EF7 - BH28	BJ24 - BJ16	CF28 - BJ46
BH35 - BA24	EF6 - BH31	BJ16 - CB7	BJ46 - AF14
BH38 - BA20	EC1 - BJ39	CB7 - CB15	AF14 - AF13
CB48 - BA16	EC2 - BJ36	BC20 - BB10	AF13 - AF6
CB45 - BA12	EC3 - BH36	BB10 - BB42	AF6 - AF5
CA45 - BA8	EC4 - BH39	AD28 - AC26	AF5 - BA46
CA47 - BA4	EC5 - CB48	BB42 - AD44	BA46 - BA45
BH2 - AB90	EC6 - CB45	AD44 - AC42	BA45 - BA38
BH3 - AB46	ED7 - CA45	AC42 - BC12	BA38 - BA37
BH4 - AB32	ED6 - CA48	BC12 - BC4	BA37 - BA30
BH5 - AB25	DA16 - FJ20	BC4 - BB2	CE27 - BA29
BH6 - AB24	DA15 - ED5	BB2 - BE12	BA29 - BA22
BH7 - AB16	FJ20 - ED4	BE12 - BD10	BA22 - BA21
BJ8 - AB12	ED3 - EF5	BD10 - BE4	BA21 - BA14

Detail Wire Listing for the IBM 2701 Interface Card (Cont'd)

BA14 - BA13	BH11 - BG7	AG42 - AH36	CE5 - CA21
BA13 - BA6	AB46 - AB45	CF30 - AG34	CA21 - CA30
BA6 - BA5	AB45 - CE29	AG34 - AH28	CA30 - CB30
BA5 - BE46	AB46 - AB38	CA48 - BH12	CJ35 - DE44
BE46 - BE37	AB38 - AB37	CA45 - BJ12	CJ35 - DA28
BE37 - BC36	AB37 - AB30	CB45 - BJ15	DC38 - FC40
BC36 - BE30	AB30 - AB29	CB48 - CA6	CF17 - CG11
AF22 - AG2	AB29 - AB22	BH39 - CA3	CE15 - CH10
AG2 - BE38	AB22 - AB21	BH36 - CB3	CE12 - CH15
BE38 - BB18	AB21 - AB14	BJ36 - CB6	CF10 - CH17
BB34 - BE29	AB14 - AB13	BJ39 - CA14	CF8 - CG2
BC27 - DC31	AB13 - AB6	BH31 - CA11	CF6 - CH1
BB34 - BE21	AB6 - AB5	BH28 - CB11	CE3 - CH6
DC32 - BE22	CE31 - AF46	BJ28 - CB14	CF1 - CH8
BE22 - BC44	AF46 - AF45	BJ31 - CB28	CG15 - CG5
BE22 - BE45	AF45 - AF38	BH23 - CB27	EF29 - EF27
CA33 - BH2	AF38 - AF37	BH20 - CB28	DJ38 - DJ39
CA32 - BH3	AF37 - AF30	BJ20 - CB31	DJ39 - FB39
CA26 - BH4	AF30 - AF29	BJ23 - CB32	DJ37 - DC15
CA25 - BH5	AF29 - AF22	CA14 - CF16	DC15 - DC14
CA24 - BH6	AF21 - DF46	CB6 - CF15	DC14 - DC7
CB13 - BH7	AC34 - AF22	CA3 - CF12	DC7 - DC6
CB10 - BJ8	CF32 - AD28	CA3 - CF11	DJ42 - EC12
CA10 - BJ7	AC26 - AD20	CA6 - CF7	DJ42 - DD47
CA13 - BF2	AD20 - AC18	BJ15 - CF6	DD47 - CH25
CB5 - BF3	AC18 - AD12	BJ12 - CF2	DD47 - DE48
CB2 - BF4	AD12 - AC10	BH12 - CE1	DD44 - CJ36
CA2 - BF5	AC10 - AD4	ED18 - CF14	DA32 - CG19
CA5 - BF6	AD4 - AC2	CF14 - CE14	CJ36 - DC37
BJ14 - BF7	AC2 - AH44	CE14 - CF5	DC8 - DB6
BJ11 - BG8	AH44 - AG42	CF5 - CE5	DB8 - DB34

Detail Wire Listing for the IBM 2701 Interface Card (Cont'd)

DC39 - DB38	CG36 - CE28	CJ15 - DB13	FJ12 - DC30
DB38 - DA35	EF31 - EF29	DB6 - CJ28	DC30 - DB47
DC36 - DB35	EF31 - ED15	CJ28 - CJ30	FH10 - CJ45
DB35 - DC34	DJ3 - EC29	CJ30 - CJ31	CJ45 - CJ44
DB36 - DC34	EC29 - CD47	DA24 - DA23	CJ44 - BE32
DB36 - DB37	CG10 - CF25	CJ4 - DA23	BE32 - BE31
CB37 - DC44	CH12 - CF24	DA7 - DA22	DG45 - DC28
CB37 - CG32	CH16 - CF22	CJ2 - DA21	DC27 - FA30
CB36 - CG22	CG16 - CF21	DA5 - DA20	CD15 - CD14
CG20 - DC47	CG1 - CE20	DA3 - DA19	CD14 - CD11
DC47 - DC48	CH3 - CE21	CJ12 - CJ21	BE28 - BE27
CG24 - CB38	CH7 - CE23	CJ14 - CJ22	CD12 - BE27
CG23 - CH21	CG7 - CE24	CJ18 - CJ15	BC13 - DB29
CH21 - DD46	CF20 - CH32	CJ10 - CJ27	CH44 - BE24
DD45 - CA35	CF19 - CH30	CJ26 - DE46	CH47 - CH46
DD43 - CG28	CH30 - CH29	CJ26 - DA12	CH46 - CH43
CG28 - CG29	CG13 - CG14	DA12 - ED20	
CG36 - CG31	CG12 - DB6	ED20 - ED19	DE39 - BB19
CG31 - DA46	CH11 - CJ5	EE49 - FA31	CD23 - CD22
	CH12 - DA8	EE48 - FA15	CD22 - CD19
DA45 - CJ47	CG17 - CJ3	EE42 - EH31	CD20 - BE44
CH23 - CH28	CH11 - DB3	EE40 - EH23	BE44 - BE43
CH24 - DJ39	CH14 - DB2	EE39 - EH15	DC43 - BE40
EC10 - CB40	CG17 - DB5	EE34 - EH7	BE40 - BE39
CB41 - DF44	DB5 - DB16	EE33 - EF23	CD29 - CH24
ED30 - DA44	CG3 - DA6	FH18 - EF15	CD29 - CD30
DA43 - CG38	DA6 - DB14	EF15 - EF13	CD28 - BE20
DA45 - CG40	CH2 - DA4	EF13 - ED13	BE20 - BE19
CG39 - DB26	DA4 - DB11	ED13 - CF37	CF36 - DB27
CG35 - DA48	CH5 - CJ13	CF37 - DB46	DB27 - DA47
CG36 - BE35	CJ13 - DB10	CF37 - CF33	DA47 - DB43
BE35 - BE36	CG8 - CJ15	CF33 - CF31	DB43 - BB43

Detail Wire Listing for the IBM 2701 Interface Card (Cont'd)

CJ46 - AF20	ED43 - EE46	EE38 - ED12	AB48 - AB47
AF20 - AF19	EE46 - EF46	BE5 - EF48	CJ34 - AB44
CF38 - DB44	EF46 - EE37	BD3 - EF47	DC45 - CJ34
DB44 - AH5	EE37 - EF37	BG45 - EF44	CE32 - CE30
ED30 - EC18	FJ28 - ED11	BF43 - EF43	CE32 - AB44
EC25 - EC9	ED11 - DA36	BG37 - EF39	AB44 - AB43
EC26 - FB38	DA36 - DA31	BF35 - EF38	EE30 - CD49
EC27 - EC28	DA31 - ED29	BG29 - EF35	CD49 - AC43
EC28 - ED25	ED29 - ED38	BF27 - EF34	EC14 - CB49
DA44 - DA37	DA36 - CB37	CF29 - CE28	
DA37 - CH37	DA39 - FH26	CC44 - BE48	
CH37 - ED14	DA39 - CJ39	BE48 - BE47	
EC17 - FF38	EE29 - DA40	AD37 - ED10	CJ42 - DG44
EC21 - BJ48	CJ38 - CG39	DE6 - DE5	
BJ48 - BJ47	CF40 - ED44	DE5 - DE2	
ED23 - CG27	DG40 - DE40	DG30 - DG29	DF42 - AC35
DE28 - CC47	DE36 - DE16	DG29 - DG26	CE48 - CC35
CC47 - CC48	DE37 - BB27	DG22 - DG21	CE47 - CD48
CC48 - CA38		DG21 - DG18	BC21 - EH38
DE32 - CC46	CF40 - DE13	DG14 - DG13	BC18 - EH33
DE20 - DE30	DE13 - DE12	DG13 - DG10	BB35 - FA14
DE30 - DE26	DC29 - CE38	DG6 - DG5	BC34 - FA9
DF45 - DF46	CE38 - CE39	DG5 - DG2	DG32 - DG20
DF45 - CH37	CF39 - CF40	DJ14 - DJ13	DG26 - DG18
DF47 - DG47	CF40 - CF41	DJ13 - DJ10	DG16 - DG4
DG48 - AD45	CF41 - DG35	DJ6 - DJ5	DG10 - DG2
DA11 - DA29	DG38 - DG37	DJ5 - DJ2	DJ16 - DJ4
DA29 - CJ37	DG37 - DG34	DJ3 - ED21	DJ10 - DJ2
DE47 - FB38	EC11 - DA14	DG35 - FD6	EE27 - DE4
DE47 - ED45	DA13 - EC19	DA27 - CA40	EE25 - DE2
ED45 - ED44	EC19 - EC20	CA40 - AB48	DE4 - DG12
			DE2 - DG10

Detail Wire Listing for the IBM 2701 Interface Card (Cont'd)

DG12 - DJ12	AD26 - FG33	FB6 - DE35	GND - FC24
DG10 - DJ10	AD21 - FG30	GND - DG18	GND - FC32
DJ3 - CJ33	AD18 - FG25	GND - DG26	AA44 - AB45
DE4 - DG28	AC19 - FG30	DG27 - DG20	AA36 - AB37
DE2 - DG26	AD18 - FG25	GND - DG21	AA28 - AB29
CD44 - ED46	AD13 - FG22	DD42 - DA32	AA20 - AB21
CD43 - ED42	AD10 - FG17	ED11 - ED29	AA12 - AB13
DB42 - DG36	AD5 - FF22	DA31 - CB37	AA4 - AB5
DC42 - DG34	AD2 - FG17	DE3 - DA36	AE40 - AF45
DE43 - DE14	AC3 - FG14	FC38 - FJ26	AE36 - AF37
DE42 - DE10	AD2 - FG9	FC38 - FC26	AE28 - AF29
AE35 - CD11	AH45 - FF14	FC38 - FA34	AE20 - FB39
AF34 - CD9	AH42 - FG9	+VCC - FC39	AE20 - BH44
CE35 - CD31	AG43 - FGC	AD43 - DA35	CND - BJ45
BC45 - CD21	AH42 - FG1	AH11 - AD35	AD19 - AD20
BC42 - CD19	AH37 - FF6	AH11 - AH3	AD11 - AD12
CH45 - CD45	AH34 - FF1	AH3 - BC35	AD3 - AD4
CH43 - CD43	AG35 - FE38	DC35 - BC13	AH43 - AH44
DG46 - DJ40	AH34 - FE33	FC40 - BJ5	AH35 - AH36
DG42 - DJ36	AH29 - FD38	CB49 - BJ5	AH27 - AG26
CH27 - DE26	AH26 - FE33	GND - CB9	AH19 - AG18
CG27 - DE28	AG27 - FE30	DE35 - FD6	AF12 - AF13
AC11 - FD14	AH26 - FE25	GE35 - CD31	AE4 - AF5
AD10 - FE9	AH21 - FD30	GND - DG13	AJ44 - BA45
FE14 - AG11	AH18 - FE25	GND - DJ13	AJ36 - BA37
FE9 - AH10	AG19 - FE22	GND - BF1	AJ28 - BA29
AD29 - FE6	AH18 - FE17	GND - FA8	AJ20 - BA21
AD26 - FE1	AH13 - FD22	GND - FC8	AJ12 - BA13
AC27 - FG39	AH10 - FE17	GND - FC16	AJ4 - BA5

Detail Wire Listing for the IBM 2701 Interface Card (Cont'd)

BD44 - BH44	38 - AG5	DA46 - DB28
BD36 - BD44	99 - AG6	DB29 - FH10
BD28 - BD36	CH22 - CH24	CG28 - CJ47
FB40 - BC20	CH22 - DD49	CG37 - CG21
	CH22 - CG21	CH38 - CH40
BC11 - BC12		CD46 - CG37
BC19 - BD28	Tucc - 1K	CC45 - CD46
BD20 - BC19	1K - CF32	DE45 - DD44
BC3 - BC19		BC29 - DB31
BC3 - BE11	+Vcc - 1K	DB30 - DG43
BE11 - BE3	1K - CF30	BC27 - BD20
BE3 - BG43		BB26 - BC28
BG43 - BG35	+Vcc - 1K	BB26 - BE30
BG35 - BG27	1K - CF28	CH45 - BE22
BG27 - BG19		BC37 - DC32
BG19 - BG11	+Vcc - 1K	DC31 - DF43
BF10 - GND	1K - CE27	
EH39 - EE43		
FH25 - FJ26	+Vcc - 1K	
FH17 - FJ18	1K - CE29	
CJ38 - CH39		
BC19 - CH40	+Vcc - 1K	
ED27 - ED2	1K - CE31	
AD45 - DG46		
DG48 - DJ40	+Vcc - 1K	
CA35 - CJ43	1K - EF14	
CJ43 - EC13		
CA36 - DD45	+Vcc - 1K	
	1K - EF12	

GROUP A
UPPER ROW

1	=	AB48
2	=	AB44
3	=	BE24
4	=	BE40
5	=	BE44
6	=	AF20
7	=	AH12
8	=	AB40
9	=	AB36
10	=	AB32
11	=	AB28
12	=	AB24
13	=	AB16
14	=	AB12
15	=	AB8
16	=	AB4
17	=	AF48
18	=	AF44
19	=	AF40
20	=	AF36
21	=	AF32
22	=	AF28
23	=	AF24

GROUP A
LOWER ROW

1	=	FD6
2	=	FA30
3	=	FA14
4	=	EH38
5	=	FF38
6	=	FG38
7	=	FE6
8	=	FG30
9	=	FF30
10	=	FG22
11	=	FF22
12	=	FG14
13	=	FF14
14	=	FG6
15	=	FF6
16	=	FE38
17	=	FD38
18	=	FE30
19	=	FD30
20	=	FE22
21	=	FD22
22	=	FE14
23	=	FD14

GROUP F
UPPER ROW

1	=	FJ28
2	=	FH26
3	=	GND
4	=	FH18
5	=	FJ12
6	=	FH10
7	=	FJ20
8	=	FJ4
9	=	FH2
10	=	FC28
11	=	FB26
12	=	FC20
13	=	FB18
14	=	FC12
15	=	FB10
16	=	FC4
17	=	FB2
18	=	FA36
19	=	EJ34
20	=	FA20
21	=	EJ18
22	=	FA4
23	=	EJ2

GROUP F
LOWER ROW

1	=	BE48
2	=	BE36
3	=	BE20
4	=	BE32
5	=	BE28
6		
7	=	BJ48
8	=	AF16
9	=	AF12
10	=	AF8
11	=	AF4
12	=	BA48
13	=	BA44
14	=	BA40
15	=	BA36
16	=	BA32
17	=	BA28
18	=	BA24
19	=	BA20
20	=	BA16
21	=	BA12
22	=	BA8
23	=	BA4

PIN FUNCTION LIST FOR ADAPTER CABLE FROM IBM 2701 TO THE AIU:

FROM IBM 2701 CABLE
PART NO. 5714301 (AIU END)

	<u>Connector</u>	<u>Pin</u>	<u>TO AIU</u>
Read Select	1	1	P/J4 58
	1	2	102
Write Select	1	3	P/J5 8
	1	4	12
Read Ready	1	7	P/J4 65
	1	8	70
Write Ready	1	9	P/J5 1
	1	10	4
Demand	1	11	P/J4 2
	1	12	5
Suppress Parity	1	13	P/J4 59
Error	1	14	63
Redundancy Error	1	17	P/J4 52
	1	18	55
WC=0	1	19	P/J4 73
	1	20	76
EOR	1	21	P/J4 10
	1	22	13
EOF	1	23	P/J4 16
	1	24	20
Interrupt	1	27	P/J4 23
	1	28	26
Parity IN	1	29	P/J5 15
	1	30	18
Parity OUT	1	31	P/J5 47
	1	32	50

PIN FUNCTION LIST FOR ADAPTER CABLE FROM IBM 2701 TO THE AIU:

FROM IBM 2701 CABLE
PART NO. 5714301 (AIU END)

	<u>Connector</u>	<u>Pin</u>	<u>TO AIU</u>
Data OUT 1	1	1	P/J5 53
	1	2	56
Data OUT 2	1	3	P/J5 59
	1	4	63
Data OUT 3	1	7	P/J5 74
	1	8	77
Data OUT 4	1	9	P/J5 3
	1	10	7
Data OUT 5	1	11	P/J5 11
	1	12	14
Data OUT 6	1	13	P/J5 24
	1	14	27
Data OUT 7	1	17	P/J5 30
	1	18	33
Data OUT 8	1	19	P/J5 36
	1	20	39
Data IN 1	1	21	P/J5 41
	1	22	44
Data IN 2	1	23	P/J5 35
	1	24	38
Data IN 3	1	27	P/J5 29
	1	28	32
Data IN 4	1	29	P/J5 23
	1	30	26
Data IN 5	1	31	P/J5 16
	1	32	20
Data IN 6	1	33	P/J5 10
	1	34	13

PIN FUNCTION LIST FOR ADAPTER CABLE FROM IBM 2701 TO THE AIU:

FROM IBM 2701 CABLE
PART NO. 5714301 (AIU END)

	Connector	Pin	TO AIU
Data IN 7	1	37	P/J5 2
	1	38	5
Data IN 8	1	39	P/J5 73
	1	40	76
Data OUT 9	2	1	P/J4 1
	2	2	4
Data OUT 10	2	3	P/J4 8
	2	4	12
Data OUT 11	2	7	P/J4 15
	2	8	18
Data OUT 12	2	9	P/J4 22
	2	10	25
Data OUT 13	2	11	P/J4 28
	2	12	31
Data OUT 14	2	13	P/J4 34
	2	14	37
Data OUT 15	2	17	P/J4 40
	2	18	43
Data OUT 16	2	19	P/J4 46
	2	20	49
Data IN 9	2	21	P/J5 65
	2	22	70
Data IN 10	2	23	P/J5 58
	2	24	62
Data IN 11	2	27	P/J5 52
	2	28	55
Data IN 12	2	29	P/J5 46
	2	30	49

PIN FUNCTION LIST FOR ADAPTER CABLE FROM IBM 2701 TO THE AIU:

FROM IBM 2701 CABLE
PART NO. 5714301 (AIU END)

	<u>Connector</u>	<u>Pin</u>	<u>TO AIU</u>
Data IN 13	2	31	P/J5 40
	2	32	43
Data IN 14	2	33	P/J5 34
	2	34	37
Data IN 15	2	37	P/J5 28
	2	38	31
Data IN 16	2	39	P/J5 22
	2	40	25

4.2 DETAILED WIRE LISTING FOR THE GRE INTERFACE CARD (VIPS-022-4)

Detail Wire Listing for the GRE Interface Card

AA50 - AC50
 AC50 - AE50
 AE50 - AG50
 AG50 - AJ50
 AJ50 - BB50
 BB50 - BD50
 BD50 - BF50
 BF50 - BH50
 BH50 - CA50
 CA50 - CC50
 CC50 - CE50
 CE50 - CG50
 CG50 - EG50
 EG50 - FF50

-5 Dist.

+Vcc - AA42	+Vcc - CJ42
+Vcc - AC42	+Vcc - DB42
+Vcc - AE42	+Vcc - DD42
+Vcc - AG42	+Vcc - DF42
+Vcc - AJ42	+Vcc - DH42
+Vcc - BB42	+Vcc - EA42
+Vcc - BD42	+Vcc - EC42
+Vcc - BE42	+Vcc - EE42
+Vcc - BH42	+Vcc - EG42
+Vcc - CA42	+Vcc - EJ42
+Vcc - CC42	+Vcc - FB42
+Vcc - CE42	+Vcc - FD42
+Vcc - CG42	+Vcc - FF42
+Vcc - EJ25	+Vcc - DD15
+Vcc - FB25	+Vcc - DF15

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Detail Wire Listing for the GRE Interface Card (Continued)

+Vcc - AA17	GND - AB50	GND - DC42	GND - BA17
+Vcc - AC18	GND - AD50	GND - DE42	GND - BC17
+Vcc - AE18	GND - AF50	GND - DG42	GND - BE17
+Vcc - AG18	GND - AH50	GND - DJ42	GND - BG17
+Vcc - AJ17	GND - BA50	GND - EB42	GND - BJ17
+Vcc - BB17	GND - BC50	GND - ED42	GND - CB17
+Vcc - BD17	GND - BE50	GND - EF42	GND - CD17
+Vcc - BE17	GND - BG50	GND - EH42	GND - CF8
+Vcc - BH17	GND - BJ50	GND - FA42	GND - DA8
+Vcc - CA17	GND - CB50	GND - FC42	GND - DC8
+Vcc - CC17	GND - CD50	GND - FE42	GND - DE8
+Vcc - CE26	GND - CF50	GND - FG42	GND - DG8
+Vcc - CE8	GND - CH50	GND - CF26	GND - FA19
+Vcc - CJ8	GND - EH50	GND - DA26	GND - FC19
+Vcc - DB8	GND - FG50	GND - DC26	GND - DE9
+Vcc - DD8	GND - AB42	GND - DE26	GND - DG9
+Vcc - DF8	GND - AD42	GND - DG26	
+Vcc - CJ26	GND - AF42	GND - DJ26	
+Vcc - DB26	GND - AH42	GND - EB26	
+Vcc - DD26	GND - BA42	GND - ED26	
+Vcc - DF26	GND - BC42	GND - EF25	
+Vcc - DH26	GND - BE42	GND - EH25	
+Vcc - EA26	GND - BG42	GND - FA26	
+Vcc - EC26	GND - BJ42	GND - FC26	
+Vcc - EE25	GND - CB42	GND - FE26	
+Vcc - EG26	GND - CD42	GND - AB17	
+Vcc - FJ26	GND - CF42	GND - AD18	
+Vcc - FB26	GND - CH42	GND - AF18	
+Vcc - FD26	GND - DA42	GND - AH18	

Detail Wire Listing for the GRE Interface Card (Continued)

AA42 - AA49	DF42 - DF41	+Vcc - EJ33	+Vcc - AA8
AC42 - AC49	DH42 - DH41	+Vcc - FB33	+Vcc - AC9
AE42 - AE49	EA42 - EA41	+Vcc - AA24	+Vcc - AE9
AG42 - AG49	EC42 - EC41	+Vcc - AC25	+Vcc - CA7
AJ42 - AJ49	EE42 - EE41	+Vcc - AE25	+Vcc - CC7
BB42 - BB49	EG42 - EG41	+Vcc - AG25	+Vcc - CE7
BD42 - BD49	EJ42 - EJ41	+Vcc - AJ25	+Vcc - CJ7
BF42 - BF49	FB42 - FB41	+Vcc - CE25	+Vcc - DB7
BH42 - BH49	FD42 - FD41	+Vcc - CJ25	+Vcc - DD7
CA42 - CA49	DB42 - DB49	+Vcc - DB25	+Vcc - DF7
CC42 - CC49	DD42 - DD49	+Vcc - DD25	
CE42 - CE49	DF42 - DF49	+Vcc - DH25	
CG42 - CG49	DH42 - DH49	+Vcc - EA25	
EG42 - EG49	EA42 - EA49	+Vcc - EE24	
FF42 - FF49	EC42 - EC49	+Vcc - EG25	
AA42 - AA41	+Vcc - AC33	+Vcc - AA16	
AC42 - AC41	+Vcc - AE33	+Vcc - AC17	
AE42 - AE41	+Vcc - AG33	+Vcc - AE17	
AG42 - AG41	+Vcc - BD33	+Vcc - AG17	
AJ42 - AJ41	+Vcc - BF33	+Vcc - BA12	
BB42 - BB41	+Vcc - CC33	+Vcc - BC12	
BD42 - BD41	+Vcc - CE33	+Vcc - BE12	
BF42 - BF41	+Vcc - CJ33	+Vcc - BG12	
BH42 - BH41	+Vcc - DB33	+Vcc - BJ12	
CA42 - CA41	+Vcc - DD33	+Vcc - CB12	
CC42 - CC41	+Vcc - DF33	+Vcc - CD12	
CE42 - CE41	+Vcc - DH33	+Vcc - CE17	
CJ42 - CJ41	+Vcc - EA33	+Vcc - DH17	
DB42 - DB41	+Vcc - EC33	+Vcc - EC16	
DD42 - DD41	+Vcc - EG33	+Vcc - EE16	

Detail Wire Listing for the GRE Interface Card (Continued)

GND - AB43	GND - AH35	GND - DE27	GND - CA12
GND - AD43	GND - BA35	GND - DG27	GND - CC12
GND - AF43	GND - BC35	GND - DJ27	GND - CF11
GND - AH43	GND - BE35	GND - EB27	GND - DJ11
GND - BA43	GND - BG35	GND - ED27	GND - ED10
GND - BC43	GND - BJ35	GND - EH27	GND - EF10
GND - BE43	GND - CB35	GND - FA27	GND - AB2
GND - BG43	GND - CD35	GND - FC27	GND - AD3
GND - BJ43	GND - CF35	GND - AB18	GND - AF3
GND - CB43	GND - DA35	GND - AD19	GND - CB1
GND - CD43	GND - DC35	GND - AF19	GND - CD1
GND - CF43	GND - DE35	GND - AH19	GND - CF1
GND - CH43	GND - DG35	GND - BA19	GND - DA1
GND - DC43	GND - DJ35	GND - CF19	GND - DC1
GND - DE43	GND - EB35	GND - DA19	GND - DE1
GND - DG43	GND - ED35	GND - DC19	GND - DG1
GND - DJ43	GND - EF35	GND - DE19	
GND - EB43	GND - EH35	GND - DJ19	
GND - ED43	GND - FA35	GND - EB19	
GND - EH43	GND - FC35	GND - EF18	
GND - FG43	GND - FE35	GND - EH19	
DB43 - DC43	GND - AD27	GND - AB10	
DD43 - DE43	GND - AF27	GND - AD11	
DF43 - DG43	GND - AH27	GND - AF11	
DH43 - DJ43	GND - BE27	GND - AH11	
EA43 - EB43	GND - BG27	GND - AJ12	
EC43 - ED43	GND - CD27	GND - BB12	
GND - AB35	GND - CF27	GND - BD12	
GND - AD35	GND - DA27	GND - BF12	
GND - AF35	GND - DC27	GND - BH12	

Detail Wire Listing for the GRE Interface Card (Continued)

AH12 - BF13	AF30 - AE32	BC44 - BA44	CB40 - CB41
BG13 - BH13	AB38 - AD39	AH44 - AF44	CD40 - CD41
AH12 - CA13	AD38 - AF39	AD44 - AB44	CF40 - CF41
CB13 - CC13	AF38 - AH39	CH44 - CF44	CH44 - EH44
AG11 - AE29	AH38 - BA39	CD44 - CB44	
AG11 - AF30	BA38 - BC39	BJ44 - BG44	CB45 - CA43
AE32 - AD37	BE38 - BE39	BE44 - BC44	BJ45 - BH43
AG11 - AB38	BG39 - BG38	BA44 - AA44	BG45 - BF43
AD39 - AD38	BJ39 - BJ38	AF44 - AD44	BE45 - BD43
AF39 - AF38	CB39 - CB38	AB36 - AB37	BC45 - BB43
AH39 - AH38	CD39 - CD38	AD36 - AD37	CH29 - CH45
BA39 - BA38	CG27 - CG28	AF36 - AF37	CG43 - CF45
BC39 - BC38	+Vcc - CG30	AH36 - AH37	CE43 - BA45
AG13 - BE38	CG31 - CG32	BA36 - BA37	AJ43 - AH45
BE39 - BG39	CE37 - CC37	BC36 - BC37	AE43 - AD45
BG38 - BJ39	CA37 - BH37	BE36 - BE37	AC43 - AB45
BJ38 - CB39	BF37 - BD37	BG36 - BG37	CH30 - EG43
CB38 - CD39	BB37 - AJ37	BJ36 - BJ37	FF43 - FG45
+Vcc - CG27	AJ37 - AG37	CB36 - CB37	CH30 - DC49
CG28 - CG29	AE37 - AC37	CD36 - CD37	DC49 - DG49
CG30 - CG31	AA2 - AB39	CF36 - CF37	DJ49 - EB49
CG32 - CG33	AG37 - AE37	AB40 - AB41	GND - DE48
CH27 - CE37	AC37 - AA37	AD40 - AD41	DB47 - DB46
CC37 - CA37	AB39 - CF39	AF40 - AF41	DD47 - EH37
BH37 - BF37	GND - CF38	AH40 - AH41	EH36 - DD46
BD37 - BB37	GND - AG43	BA40 - BA41	DF47 - DF46
BF13 - BG13	CH28 - CH44	BC40 - BC41	DH47 - DH46
BH13 - BJ13	CF44 - CD44	BE40 - BE41	EA47 - EA46
CA13 - CB13	CB44 - BJ44	BG40 - BG41	EC47 - EC46
CC13 - CD13	BG44 - BE44	BJ40 - BJ41	EH44 - FG44

Detail Wire Listing for the GRE Interface Card (Continued)

EC41 - EE28	CC29 - BG25	ED27 - ED30
EC33 - EE30	CA3 - CH2	CB4 - CB5
AG25 - BF18	CC3 - CH4	CD4 - CD5
AE17 - BF20	CE3 - CH6	CF4 - CF5
AJ25 - BF22	CJ3 - CH8	DA4 - DA5
CC33 - BF24	DB3 - DJ2	DC4 - DC5
CA7 - CG1	DD3 - DJ4	DE4 - DE5
CC7 - CG3	DF3 - DJ6	DG4 - DG5
CE7 - CG5	AB46 - CB3	AH22 - AH23
CJ7 - CG7	CB3 - CD3	AF14 - AF15
DB7 - DH1	CD3 - DA3	BA22 - BA23
DD7 - DH3	DA3 - DE3	CD30 - CD31
DF7 - DH5	CD7 - CF3	ED38 - ED39
EC38 - EF28	DA7 - DC3	ED30 - ED31
EC30 - EF30	DE7 - DG3	
AG22 - BG18	AB46 - AC12	
AE14 - BG20	AH21 - AA7	
AJ22 - BG22	AA44 - AD8	
CC30 - BG24	AD8 - AB6	
CA4 - CH1	CB1 - CB4	
CC4 - CH3	CD1 - CD4	
CE4 - CH5	CF1 - CF4	
CJ4 - CH7	DA1 - DA4	
DB4 - DJ1	DC1 - DC4	
DD4 - DJ3	DE1 - DE4	
DF4 - DJ5	DG1 - DG4	
EC37 - EF29	AH19 - AH22	
EC29 - EF31	AF11 - AF14	
AG21 - BG19	BA19 - BA22	
AE13 - BG21	CD27 - CD30	
AJ21 - BG23	ED35 - ED38	

Detail Wire Listing for the GRE Interface Card (Continued)

CD45 - CB45
CA43 - BJ45
BH43 - BG45
BF43 - BE45
BD43 - BC45
CH45 - CG43
CF45 - CE43
BA45 - AJ43
AH45 - AF45
AF45 - AE43
AD45 - AC43
AB45 - AA43
EG43 - EH45
EH45 - FG45
FG46 - DE49
DG49 - DJ49
EB49 - ED49
DC47 - DC46
DE47 - DE46
DG47 - DG46
DJ47 - DJ46
EB47 - EB46
ED47 - ED46

Detail Wire Listing for the GRE Interface Card (Continued)

AD46 - AB24	AD46 - AC27	AF41 - BD27	AH13 - AG12
AC44 - AB22	AC44 - AC28	AF37 - BD28	AG12 - AG14
AF46 - AB20	AF46 - AC29	AH41 - BD29	AE21 - AH13.
AE44 - AA19	AE44 - AC30	AH37 - BD30	AE3 - AE19
AH46 - AA21	AH46 - AC31	BA41 - BD31	AD12 - AF33
AD46 - AA26	BC46 - AC32	BA37 - BD32	AD12 - AE7
AC44 - AB27	BB44 - AD32	BC41 - BE32	AF33 - CF16
AF46 - AA29	BE46 - AD33	BC37 - BE33	AF4 - CF14
AE44 - AB30	BD44 - AC19	BE41 - BF27	AF6 - CF13
AH46 - AA32	BG46 - AC20	BE37 - BF28	CF12 - CF24
AB26 - AB11	BF44 - AC21	BG41 - BF29	AC3 - CF23
AA28 - AB12	BJ46 - AC22	BG37 - BF30	CF25 - CF33
AB29 - AB13	BH44 - AC23	BJ41 - BF31	CF32 - CF41
AA31 - AB14	CB46 - AC24	BJ37 - BF32	CG44 - CF21
AB32 - AB15	CA44 - AD24	CB41 - BG32	CF22 - CF31
AB16 - CH30	CD46 - AD25	CB37 - BG33	FC23 - GND
AA13 - AB16	AJ44 - CE28	CD41 - BG28	FC24 - DE3
AA14 - AA13	CE27 - AD31	GND - BE31	ED21 - FC22
AA10 - AA23	AJ44 - AD30	CH30 - BE30	EH17 - FC25
AA22 - AB5	AD29 - AD23	BE29 - BG31	FC21 - CF20
AB23 - AA27	AD28 - AD22	BE28 - BG30	DE36 - DD48
AB21 - AB28	AD20 - AD16		DD35 - DD48
AB19 - AA30	AD16 - AD5		FE44 - FG48
AA18 - AB31			FE45 - FG49
AA20 - AA33			CD45 - DE10
			AH22 - DE11
			CF22 - DE12
			AF23 - AF24

Detail Wire Listing for the GRE Interface Card (Continued)

<u>Out</u>	<u>In</u>
AF41 - BF16	BG15 - FF44
AF37 - BF15	DE49 - BG14
AH41 - BF10	BG11 - EG44
AH37 - BF9	BG10 - EH46
BA41 - BH16	BJ15 - EB37
BA37 - BH15	BJ14 - ED18
BC41 - BH10	BJ11 - DC47
BC37 - BH9	BJ10 - GND
BE41 - CA16	CB15 - GND
BE37 - CA15	CB14 - GND
BG41 - CA10	CB11 - GND
BG37 - CA9	CB10 - DG18
BJ41 - CC16	CD15 - DF20
BJ37 - CC15	CD14 - DG21
CB41 - CC10	CD11 - DF23
CB37 - CC9	CD10 - DG24
+Vcc - EC18	
+Vcc - EC25	

Detail Wire Listing for the GRE Interface Card (Continued)

CH32 - DF18	CD28 - CD37	BC46 - AF6
DF18 - DG19	DB30 - DA30	BB44 - AF32
DG19 - DF21	DA30 - DA31	BE46 - BA11
DF21 - DG22	DA31 - CJ30	BD44 - BA10
DG22 - DF24	GND - CJ28	BG46 - BC15
GND - DF19	GND - DA29	BF44 - BC14
GND - DG20	AA50 - AA48	BJ46 - BC11
GND - DF22	AC50 - AC48	BH44 - BC10
GND - DG23	AE50 - AE48	CB46 - BE15
GND - DF25	AG50 - AG48	CA44 - BE14
BG15 - DC28	AJ50 - AJ48	CD46 - BE11
BG14 - DC29	BB50 - BB48	GND - BE10
BG11 - DC30	BD50 - BD48	AF31 - AH33
BG10 - DC31	BF50 - BF48	AH32 - AF24
BJ15 - DC32	BH50 - BH48	AF25 - AH17
BJ14 - DC33	CA50 - CA48	AH16 - AJ13
BE30 - DB30	CC50 - CC48	AJ13 - BA13
DB30 - DB31	CE50 - CE48	BA13 - BB13
DG31 - AG32	CG50 - CG48	BB13 - BC13
AG31 - DG30	EG50 - EG48	BC13 - BD13
CE44 - AF5	FF50 - FF48	BD13 - BE13
AF5 - CF17	AA48 - AA38	BB16 - EG31
CF17 - CF29	AC48 - AC38	BB15 - DE32
CF28 - DG29	AE48 - AE38	BB10 - DJ24
DG28 - CJ38	AG48 - AG38	BB9 - EB40
CJ37 - CJ31	AJ48 - AJ38	BD16 - ED15
CH46 - CJ29	BB48 - BB38	CF22 - DG15
CJ27 - AE20	BD48 - BD38	DG15 - DG11
CJ27 - CD29	BF48 - BF38	DG11 - DF11
	BH48 - BH38	DF11 - DF13
	CA48 - CA38	DF13 - DE14
	CC48 - CC38	
	CE48 - CE38	

Detail Listing for the GRE Interface Card (Continued)

AC7 - DC2	EG27 - FB38	EH46 - EH41
AA2 - AD6	EG27 - FA41	EH46 - DJ17
AD6 - AD17	EG27 - FD40	EH40 - EJ40
AC7 - AD14	FC31 - EG32	EG44 - EH39
AD7 - CH31	FC28 - EG29	EG44 - DJ16
GND - AC4	DA22 - FB39	EH38 - FA40
AC4 - AC5	DA22 - FC33	FG46 - DJ13
AC5 - AC6	FC33 - FC29	
AA6 - CF2	FB35 - FC32	
AB7 - AH25	FC36 - FC30	
AB2 - AB4	EH28 - DA23	
GND - AA3	EH29 - FC38	
AA3 - AA4	FC38 - FB37	
AA4 - AA5	FC35 - FC37	
AA2 - AC13	GND - FB36	
BA46 - AC15	AD6 - FB40	
CF46 - AH15	FB40 - FC40	
AH14 - AF29	ED20 - EH33	
AF28 - AH31		
AH30 - AB37		
AD6 - AF6	EJ39 - FE40	
GND - AE4	FD35 - DJ14	
AE4 - AE5	FE36 - DB48	
AE5 - AE6	FC40 - EH32	
AF12 - AB41	EH32 - FE39	
AF13 - AC11	CE39 - FE38	
DG2 - EG30	GND - FE37	
EG30 - DE31	GND - FD38	
DE31 - DJ23	GND - FD37	
DJ23 - EB39	GND - FD36	
EB39 - ED14	GND - FD39	
EG28 - FC39	GND - EH37	

Detail Wire Listing for the GRE Interface Card (Continued)

DF29 - EH23	GND - DD36	DJ36 - DD23	EJ19 - EA31
DE28 - DD40	DD36 - DD37	DD19 - DJ25	CJ19 - DG41
DE28 - EG22	DD37 - DD38	DD22 - DJ22	DG41 - DG37
EG22 - DE28	DD38 - DD39	DE39 - DH23	EB28 - DG38
DJ17 - FA29	DE39 - EG24	GND - DH22	EA27 - DG40
FA28 - DF29	EG24 - EH24	DH23 - DJ30	DG39 - EB41
DF27 - DE40	GND - EG20	DJ30 - DJ31	DG36 - EB38
DE36 - DD48	GND - EH21	GND - DH28	DJ40 - EA39
	EH41 - DH48	DH28 - DH29	GND - EA38
	DJ21 - DH16	DH29 - DH30	GND - EB29
	DJ21 - DJ39	DH30 - DH31	GND - EA28
	DJ21 - DJ32	DJ31 - DH40	EA39 - EA32
DD28 - EG21	DJ20 - DH38	DH40 - DJ40	EA32 - EB32
EG21 - EH22	EH39 - DH15	GND - DJ37	ED12 - ED37
DJ16 - EJ28	FG46 - DH12	GND - DH36	ED12 - EF39
EJ27 - DF48	DH12 - DH13	EB37 - EF14	ED11 - ED29
DD27 - FA33	DH11 - DH32	EF13 - DJ48	ED11 - EE38
FA32 - EG23	DJ28 - DG48	EB37 - EB31	ED41 - ED48
EG23 - DE25		EB36 - EF12	ED33 - EC48
DE25 - DE21		EF11 - EA48	
EG19 - DE24		EB36 - EA30	
EH20 - DE22		EB36 - EB48	
DE23 - DE33	DH20 - DJ38		EC11 - EF38
DE20 - DE30	DJ38 - DH37		EF38 - EE37
CH31 - DD31	DH19 - EJ30		EC10 - EE11
GND - DD30	EJ29 - DH39	ED19 - EA40	EE10 - EE39
DE39 - DD31	DH39 - DD20	EA36 - EB30	EE10 - DF36
DE38 - DE39	DD20 - DD24	EB30 - EA29	DF36 - DF40
DE37 - GND	DH35 - DD21	EA35 - CJ20	

Detail Wire Listing for the GRE Interface Card (Continued)

EE35 - DF37

EF36 - DF39

DF35 - ED16

DF38 - ED13

EB32 - EC14

EC13 - GND

GND - EF37

GND - EE36

DJ12 - DC48

EH40 - DH48

Detail Wire Listing for the GRE Interface Card (Continued)

31 - AB49	47 - CB49	20 - BF40	22 - ED20
92 - AB48	108 - CB48	81 - BF39	83 - EH12
32 - AA47	48 - CA47	21 - BF35	5 - DC45
93 - AA46	109 - CA46	82 - BF36	66 - DC44
50 - AD49	49 - CD49	22 - BH40	6 - FD46
111 - AD48	110 - CD48	83 - BH39	67 - FD45
51 - AC47	33 - CF49	23 - BH35	7 - EH17
112 - AC46	64 - CF48	84 - BH36	68 - ED21
52 - AF49	1 - AA35	24 - CA40	23 - FF37
113 - AF48	62 - AA36	85 - CA39	84 - FF38
53 - AE47	7 - AC40	25 - CA35	8 - +Vcc
114 - AE46	68 - AC39	86 - CA36	69 - DD45
54 - AH49	2 - AC35	9 - CC40	9 - ED22
115 - AH48	63 - AC36	70 - CC30	70 - EH13
38 - AA40	2 - CE47	57 - CC35	10 - +Vcc
99 - AA39	63 - CE46	118 - CC36	71 - DF45
37 - BA49	10 - AE40	57 - CH49	11 - +Vcc
98 - BA48	71 - AE39	118 - CH48	72 - DG45
34 - AJ47	11 - AE35	35 - CE40	12 - ED23
95 - AJ46	72 - AE36	96 - CE39	73 - EH14
39 - BC49	12 - AG40	29 - CB47	13 - +Vcc
100 - BC48	73 - AG39	90 - CG46	74 - DH45
40 - BB47	13 - AG35	59 - +Vcc	14 - EH10
101 - BB46	24 - AG36	GND - 120	75 - DJ45
41 - BE49	14 - AJ40	GND - 121	15 - EH11
102 - BE48	25 - AJ39	60 - AA50	76 - EA45
42 - BD47	15 - AJ35	120 - 121	16 - ED19
103 - BD46	76 - AJ36	60 - FF50	77 - EH15
43 - BG49	16 - BB40	8 - CC47	17 - +Vcc
104 - BG48	77 - BB39	69 - CC46	78 - EB45
44 - BF47	47 - BB35	1 - DB45	18 - +Vcc
105 - BF46	78 - BB36	62 - +Vcc	79 - ED45
45 - BJ49	18 - BD40	2 - EH49	19 - +Vcc
106 - BJ48	79 - BD39	63 - EH48	80 - EC45
46 - BH47	19 - BD35	3 - EG47	20 - ED24
107 - BH46	80 - BD36	64 - EG46	81 - EH16
			21 - ED18
			82 - GND

Detail Wire Listing for the GRE Interface Card (Continued)

ED18 - DF32
DF31 - EF24
DF30 - EF16
EF15 - EF22
DF18 - EF23
EF20 - DG32
DB27 - DG33
EH12 - EH30
DD32 - ED22
EH13 - DD29
DH24 - ED23
EH14 - DH21
EH15 - EA37
EH16 - EC12
EC15 - ED24
+Vcc - EG16
90 - GND
AC16 - AC13
AD17 - AD13

Detail Wire Listing for the GRE Interface Card (Continued)

	Bottom Row	Top Row
AG11 - BA32		
AG11 - AF30	1 - AB46	1 - AB37
BA32 - AD37	2 - AA44	2 - AD37
CC44 - AF21	3 - --	3 - CF46
AH20 - AF20	4 - BA46	4 - AD41
AF22 - AF8	5 - AB41	5 -
AF22 - BA33	6 - CF41	6 -
AF8 - DA32	7 - AJ44	7 - CD41
BA29 - AD41	8 - AD46	8 - AF41
CF46 - BA31	9 - AC44	9 - AF37
+Vcc - EG10	10 - AF46	10 - AH41
+Vcc - EG11	11 - AE44	11 - AH37
BJ11 - DC47	12 - AH46	12 - BA41
DJ12 - DC48	13 - BC46	13 - BA37
	14 - BB44	14 - BC41
	15 - BE46	15 - BC37
FG36 - FF47	16 - BD44	16 - BE41
FG37 - FF46	17 - BG46	17 - BE37
DB30 - CC43	18 - BF44	18 - BG41
+Vcc - AJ33	19 - BJ46	19 - BG37
GND - BA27	20 - BH44	20 - BJ41
DB44 - GND	21 - BC46	21 - BJ37
DD44 - GND	22 - CA44	22 - CB41
DF44 - GND	23 - CD46	23 - CB37
DG44 - GND		
DH44 - GND		
DJ44 - GND		
EA44 - GND		
EB44 - GND		
ED44 - GND		
EC44 - GND		
AH22 - AD8		

VIPS CHASSIS TO GRE CABL

P503 - P3

1 - F
4 - G
8 - H
12 - J
15 - K
18 - L
53 - M
56 - N
22 - P
25 - R
28 - S
31 - T
34 - u
37 - a
59 - V
63 - s
40 - g
43 - h
46 - e
49 - f
52 - j
55 - k
58 - m
62 - n
65 - p
70 - q
73 - r
76 - U
2 - v
5 - w
10 - y
13 - x
16 - z
20 - AA

P503 - P3

23 - BB
26 - CC
29 - DD
32 - EE
35 - FF
38 - GG
41 - HH
44 - JJ
47 - KK
50 - LL
66 - A
71 - B
74 - C
77 - D
3 - W
7 - X
11 - Y
14 - Z
17 - b
21 - c
24 - MM
27 - NN

GRE CARD TO VIPS CHASSIS CABLE

J203 - J503

1 - 1
62 - 4

2 - 8
63 - 12

3 - 15
64 - 18

22 - 53
83 - 56

5 - 22
66 - 25

6 - 28
67 - 31

7 - 34
68 - 37

23 - 59
84 - 63

8 - 40
69 - 43

9 - 46
70 - 49

10 - 52
71 - 55

11 - 58
72 - 62

12 - 65
73 - 70

13 - 73
74 - 76

14 - 2
75 - 5

15 - 10
76 - 13

16 - 16
77 - 20

J203 - J503

17 - 23
78 - 26

18 - 29
79 - 32

19 - 35
80 - 38

20 - 41
81 - 44

21 - 47
82 - 50

24 - 66
85 - 71

25 - 74
86 - 77

26 - 3
87 - 7

27 - 11
88 - 14

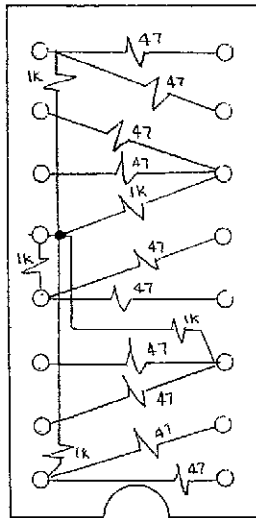
28 - 17
89 - 21

29 - 27
90 - 24

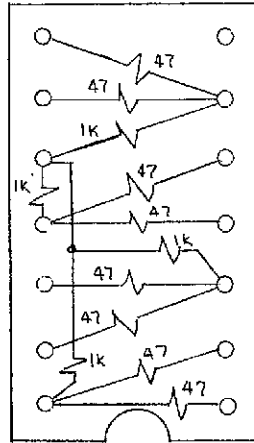
30 - 30
91 - 33

31 - 36
92 - 39

FOLDOUT FRAME 1



SR1
SR2
SR3
SR4



SR5

FOLDOUT FRAME 2

THE BOEING COMPANY

DISCRETE COMPONENT
MODULE - IBM 2701 REC.
VIPS, -021-5B

INTEGRATED CIRCUIT LISTING FOR IBM 2701 INTERFACE CARD

<u>REF. DESIGNATOR</u>	<u>DEVICE</u>	<u>DESCRIPTION</u>
Z1 - Z4	SN 74180N	Parity Generator
Z5 - Z22	SN 74121N	One-Shot Multivibrator
Z23 - Z24	SN 7470N	J-K Multivibrator
Z25 - Z27, Z68	SN 7474N	Dual D Multivibrator
Z28 - Z34	SN 54H87N	4 Bit True/Complement
Z35 - Z40	SN 7475N	Quad Latch
Z41 - Z43	SN 7493N	4 Bit Binary Counter
Z44 - Z45	SN 7483N	4 Bit Binary Adder
Z46 - Z48	SN 7430N	8 Input NAND
Z49 - Z52	SN 74H21N	Dual 4 Input AND
Z53 - Z55, Z67	SN 74H11N	Triple 3 Input AND
Z56 - Z60, Z66 Z65 - Z73	SN 7404N	Hex Inverter
Z61	SN 7420N	Dual 4 Input NAND
Z62 - Z63	SN 7402N	Quad 2 Input NOR
Z64 - Z65	SN 7407N	Hex Driver
Z66	SN 7408N	Quad 2 Input AND
D1 - D18	SN 75450N	Dual Peripheral Driver
D19 - D41	SN 75109N	Line Driver
R1 - R36	SN 75107N	Line Receiver

INTEGRATED CIRCUIT LISTING FOR THE GRE INTERFACE CARD

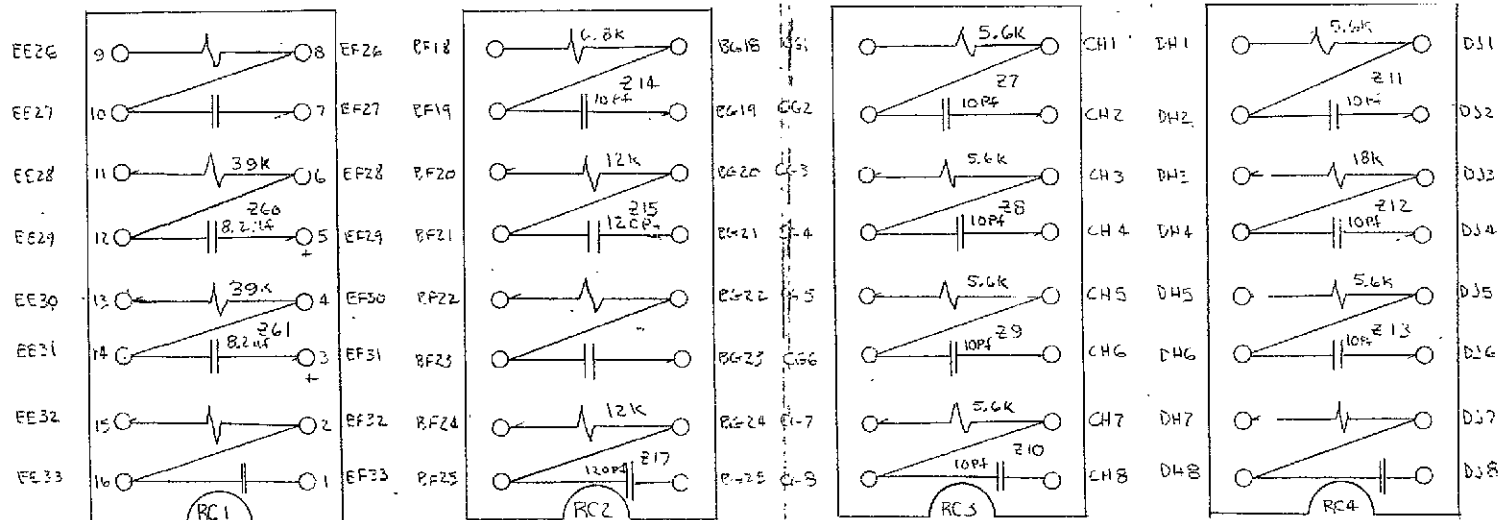
<u>REF. DESIGNATOR</u>	<u>DEVICE</u>	<u>DESCRIPTION</u>
D1 - D12	SN 75109N	Line Driver
D20 - D25	SN 75450N	Dual Peripheral Driver
R1 - R13, R20, R21	SN 75107N	Line Receiver
Z1, Z2	-----	GRE Address Module
Z3 - Z6	SN 74180N	Parity Gen/Chkr
Z7 - Z17	SN 74121N	One-Shot MV
Z18 - Z21	SN 7470N	J-K MV
Z22 - Z28	SN 7475N	Quad Latch
Z29	SN 7404N	Hex Inverter
Z30, Z31	SN 7430N	8 Input Nand
Z32, Z33	SN 74H21N	Dual 4-Input And
Z34, Z35	SN 74H00N	Quad 2-Input Nand
Z36, Z37	SN 7402N	Quad 2-Input Nor
Z38, Z39	SN 7404N	Hex Inverter
Z40, Z41	SN 7470N	J-K MV
Z42	SN 7474N	Dual D MV
Z43	SN 7400N	Quad 2-Input Nand
Z44	SN 7440N	Dual 4-Input Nand
Z45	SN 7404N	Hex Inverter
Z46	SN 7410N	Tri 3-Input Nand
Z47	SN 7404N	Hex Inverter
Z48	SN 7474N	Dual D MV
Z49	SN 7470N	J-K MV
Z50	SN 7470N	Dual D MV
Z51	SN 7400N	Quad 2-Input Nand
Z52	SN 7474N	Dual D MV

INTEGRATED CIRCUIT LISTING FOR THE GRE INTERFACE CARD (Continued)

<u>REF. DESIGNATOR</u>	<u>DEVICE</u>	<u>DESCRIPTION</u>
Z53, Z54	SN 7470N	J-K MV
Z55	SN 7400N	Quad 2-Input Nand
Z56	SN 7474N	Dual D MV
Z57	SN 7404N	Hex Inverter
Z58	SN 7474N	Dual D MV
Z59	SN 7470N	J-K MV
Z60, Z61	SN 74121N	One-Shot MV
Z62	SN 7470N	J-K MV
Z63	SN 7474N	Dual D MV
Z67		-18VDC Receiver Module
Z68, Z69	SN 7404N	Hex Inverter
Z70, Z71	SN 7400N	Quad 2-Input Nand
Z72		Discrete Component Module
Z73		+18 VDC Receiver Module
RR1, RR2, RR3		Discrete Component Module
RC1, RC2, RC3		Timing RC Modules
Z64, Z78	SN 7474N	Dual D MV
Z74	SN 7404N	Hex Inverter
Z75, Z76	SN 7408N	Quad 2-Input Nand
Z77	SN 7402N	Quad 2-Input Nor

FOLDOUT FRAME 1

FOLDOUT FRAME 2



NOT REPRODUCIBLE

4

3

2

1

LTR ZONE

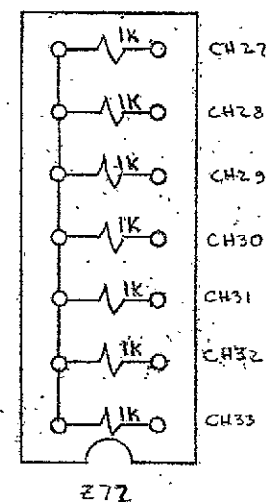
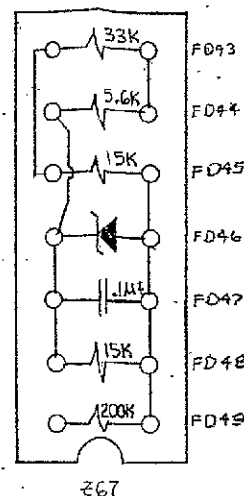
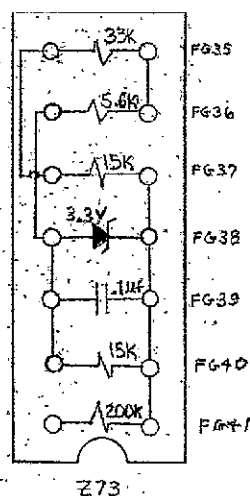
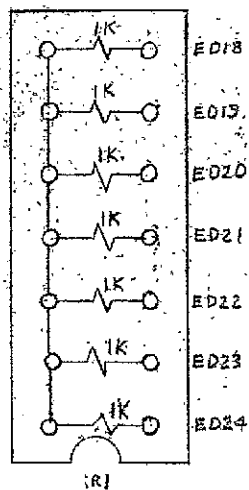
REVISION

DATE APPROVAL

BOLDOUT FRAME

BOLDOUT FRAME 2

BOLDOUT FRAME 3



PART NUMBER		DESCRIPTION		MATERIAL		SPECIFICATION	
SURFACE FINISH IN MICROINCHES RMS UNLESS NOTED OTHERWISE 	DIMENSIONAL TOLERANCE: UNLESS NOTED OTHERWISE .0 ± .10 .00 ± .02 .000 ± .005 ANGULAR ±	SIGNATURES		DATE		NATIONAL AERONAUTICS AND SPACE ADMINISTRATION MANNED SPACECRAFT CENTER HOUSTON, TEXAS DISCRETE COMPONENT MODULES GRE INTERFACE	
		DR					
		ENG <i>D. J. Henderson</i>		12/11/70			
				CH			
		APP					
		AUTH				SHEET 1	
NEXT ASSEMBLY				SCALE			

4

3

2

1

LTR ZONE

REVISION

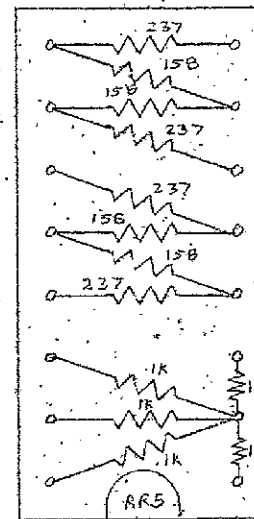
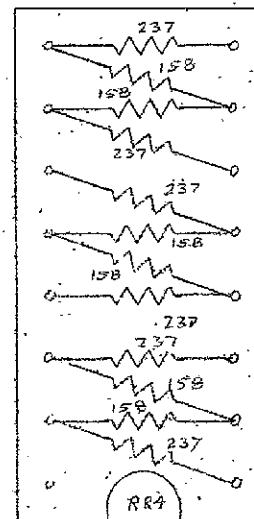
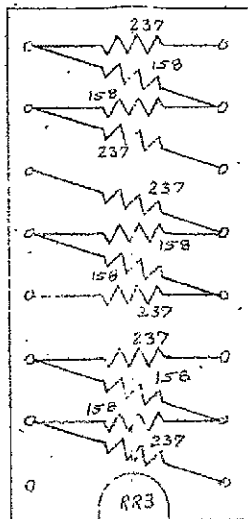
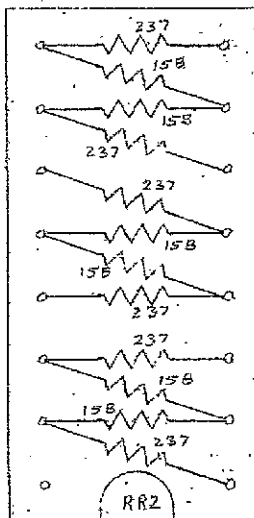
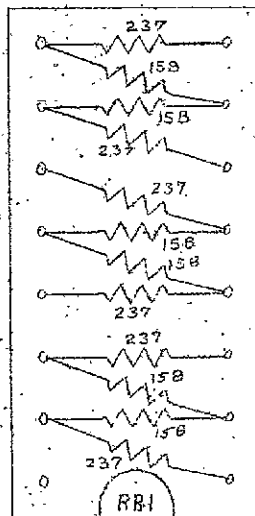
DATE APPROVAL

FOLD-OUT FRAME 1

FOLD-OUT FRAME 2

⊕3

FOLD-OUT FRAME 3



NOT REPRODUCIBLE

PART NUMBER		DESCRIPTION		MATERIAL		SPECIFICATION	
SURFACE FINISH IN MICROINCHES RMS UNLESS NOTED OTHERWISE ✓	DIMENSIONAL TOLERANCE UNLESS NOTED OTHERWISE .0 ± .10 .00 ± .02 .000 ± .005 ANGULAR ±	SIGNATURES	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION MANNED SPACECRAFT CENTER HOUSTON, TEXAS RESISTOR MODULES FOR 2701 DRIVERS			
		DR: <i>Chadwick</i>	11/13/70				
		ENG: <i>Chadwick</i>	11/13/70				
		CHK: <i>W. Anderson</i>	3/21/71				
		APP		CODE IDENT NO.		SIZE	DWG NO.
		AUTH				B	VIPS-Q21-5D
NEXT ASSEMBLY				SCALE		SHEET 1	

4

3

2

1

LTR ZONE

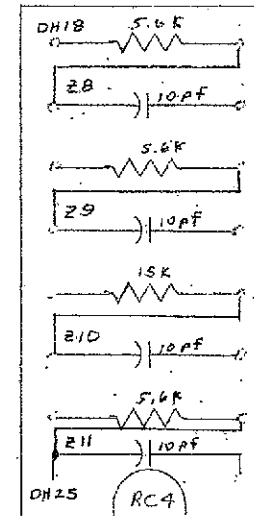
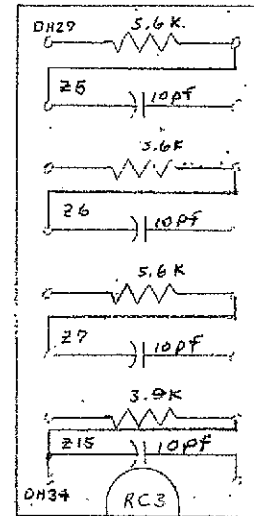
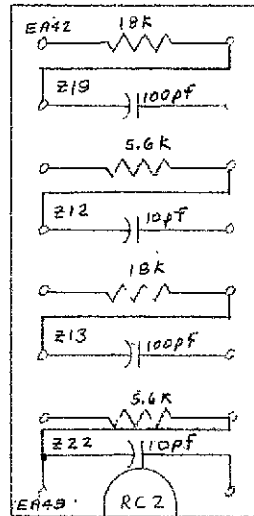
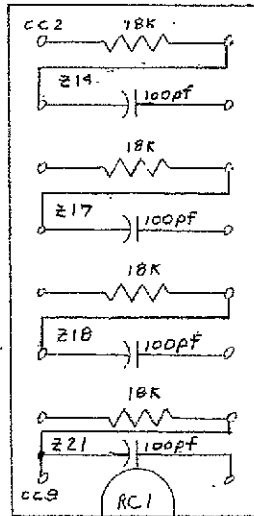
REVISION

DATE APPROVAL

FOLDOUT FRAME

FOLDOUT FRAME 2

FOLDOUT FRAME 3



NOT REPRODUCIBLE

PART NUMBER		DESCRIPTION		MATERIAL		SPECIFICATION	
SURFACE FINISH IN MICROINCHES RMS UNLESS NOTED OTHERWISE	DIMENSIONAL TOLERANCE UNLESS NOTED OTHERWISE	SIGNATURES	DATE	NATIONAL AERONAUTICS AND SPACE ADMINISTRATION MANNED SPACECRAFT CENTER - HOUSTON, TEXAS			
		DR. <i>[Signature]</i>	11/13/70				
		ENG. <i>[Signature]</i>	11/13/70	RC TIMING MODULES			
		CH. <i>[Signature]</i>	3/31/71				
✓	.0 ± .10 .00 ± .02 .000 ± .005 ANGULAR ±	APP		CODE IDENT NO.	SIZE	DWG NO.	
		AUTH		B		VIPS-021-5C	
NEXT ASSEMBLY				SCALE	SHEET 1		



2

