

IBM

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Saturn Instrument Unit

System Test Reference Manual

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**Volume I
Control System**



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SYSTEM TEST REFERENCE MANUAL

VOLUME I **CONTROL SYSTEM**

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INTRODUCTION

The Saturn IB Launch Vehicle consists of two propulsion stages (S-IB and S-IVB), an Instrument Unit, and a payload. The function of the S-IB Stage is to lift the vehicle through the denser portions of the earth's atmosphere. The second stage, the S-IVB Stage, provides the final velocity and direction needed to boost the payload to its predetermined target in space.

The Instrument Unit, which is located between the S-IVB Stage and the payload, includes the equipment for the vehicle's Navigation, Guidance, and Control Systems.

This volume is one of three describing these systems, their associated flight hardware, and electrical support equipment. Each volume and its contents are broken down as follows:

VOLUME 1 - CONTROL SYSTEM

- Control Accelerometers
- Control-EDS Rate Gyros
- Control Signal Processor
- Flight Control Computer

VOLUME 2 - GUIDANCE SYSTEM

- Launch Vehicle Digital Computer
- Launch Vehicle Data Adapter
- Switch Selectors *

VOLUME 3 - ST-124M-3 INERTIAL STABILIZER SYSTEM

- ST-124M-3 Inertial Platform Assembly
- ST-124M-3 Platform Electronics Assembly
- Accelerometer Signal Conditioner
- ST-124M-3 Platform AC Power Supply
- 56 Volt Power Supply*

The contents of this volume will give the reader information on the Control System and the electrical support equipment used to test its operation and accuracy. This volume also includes physical layout drawings of the IU (see Appendix A) and loop schematic drawings with connector wiring charts of the electrical support equipment (see Appendix B).

* By definition, the Switch Selector and 56 Volt Power Supply are part of the electrical system but are tested within the Guidance System and ST-124M-3 Inertial Stabilizer System.

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SECTION I CONTROL SYSTEM

The IU Control System is designed to maintain and control vehicle attitude by forming the guidance commands to be used by the controlling engines of the active stage.

Attitude control of the Saturn Launch Vehicle may be divided into two parts, powered (burn) flight control and coast flight control.

During first-stage burn, vehicle attitude is achieved by gimbaling the four outboard engines of the S-IB Stage. See Figure 1-1. These control engines are actually moved about their mounting axes by piston-like hydraulic actuators.

During the powered phase of the S-IVB Stage flight, yaw and pitch maneuvers are accomplished by gimbaling its single propulsion engine. Roll maneuvers are executed by an Auxiliary Propulsion System (APS). The APS system consists of two relay packages and six thrust nozzles. The relay packages control the selective firing of the thrust nozzles which are permanently attached to the vehicle's structure. See Figure 1-1. The ON-OFF thrust action of the nozzles produces the desired thrust direction. The APS system is used exclusively during coast flight control of the S-IVB Stage.

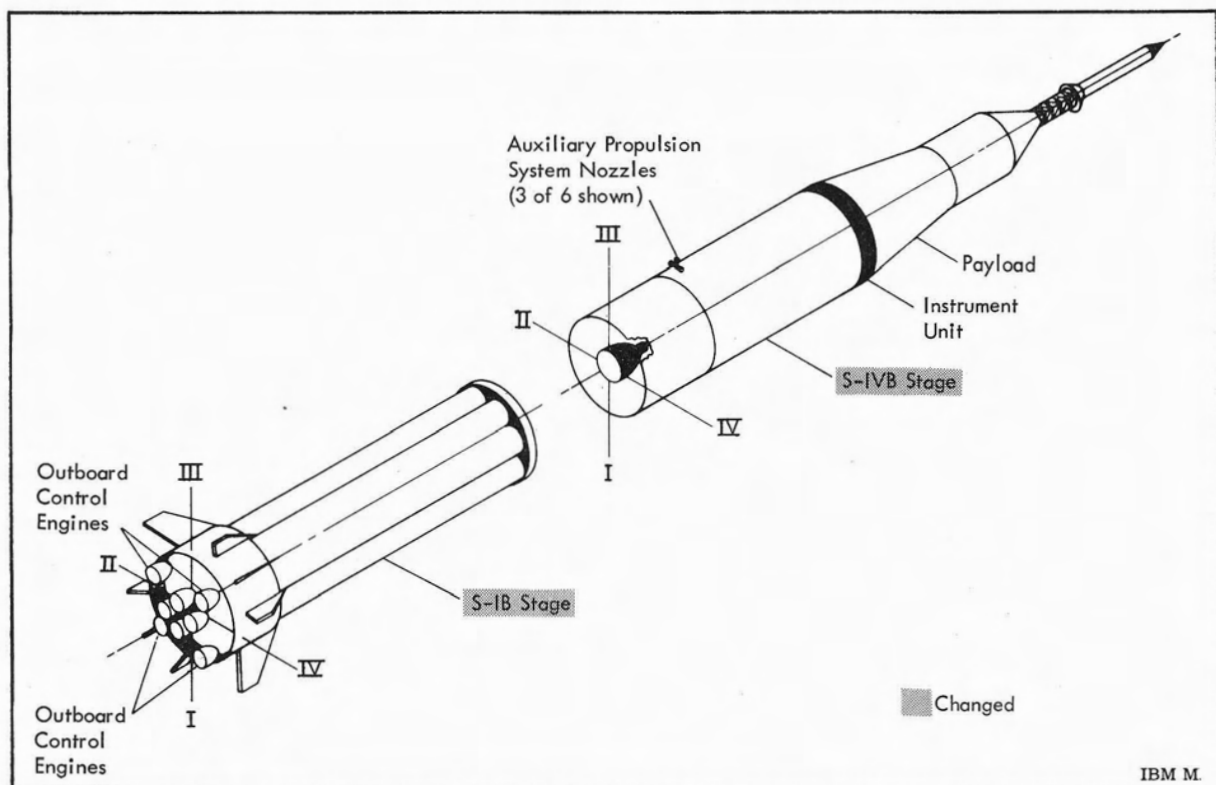


Figure 1-1 Saturn IB Stage and Engine Layout

SECTION II CONTROL SYSTEM COMPONENTS

Figure 2-1 is a simplified block diagram of the components which make up the Saturn IB Control System. The Flight Control Computer, shown in the center of the figure, is the heart of the Control System. The computer accepts signals from three sources:

- Attitude error signals (ψ) from the LVDC/LVDA.
- Attitude angular rate change signals ($\dot{\phi}$) from rate gyros.
- Lateral acceleration rate signals ($\dot{\gamma}$) from Control Accelerometers.

The Flight Control Computer uses the angular rate changes ($\dot{\phi}$) to modify and temper the attitude error commands originating from the vehicle's guidance system. These rate change values are used to maintain the rate of vehicle attitude changes within safe, prescribed limits during all phases of the flight.

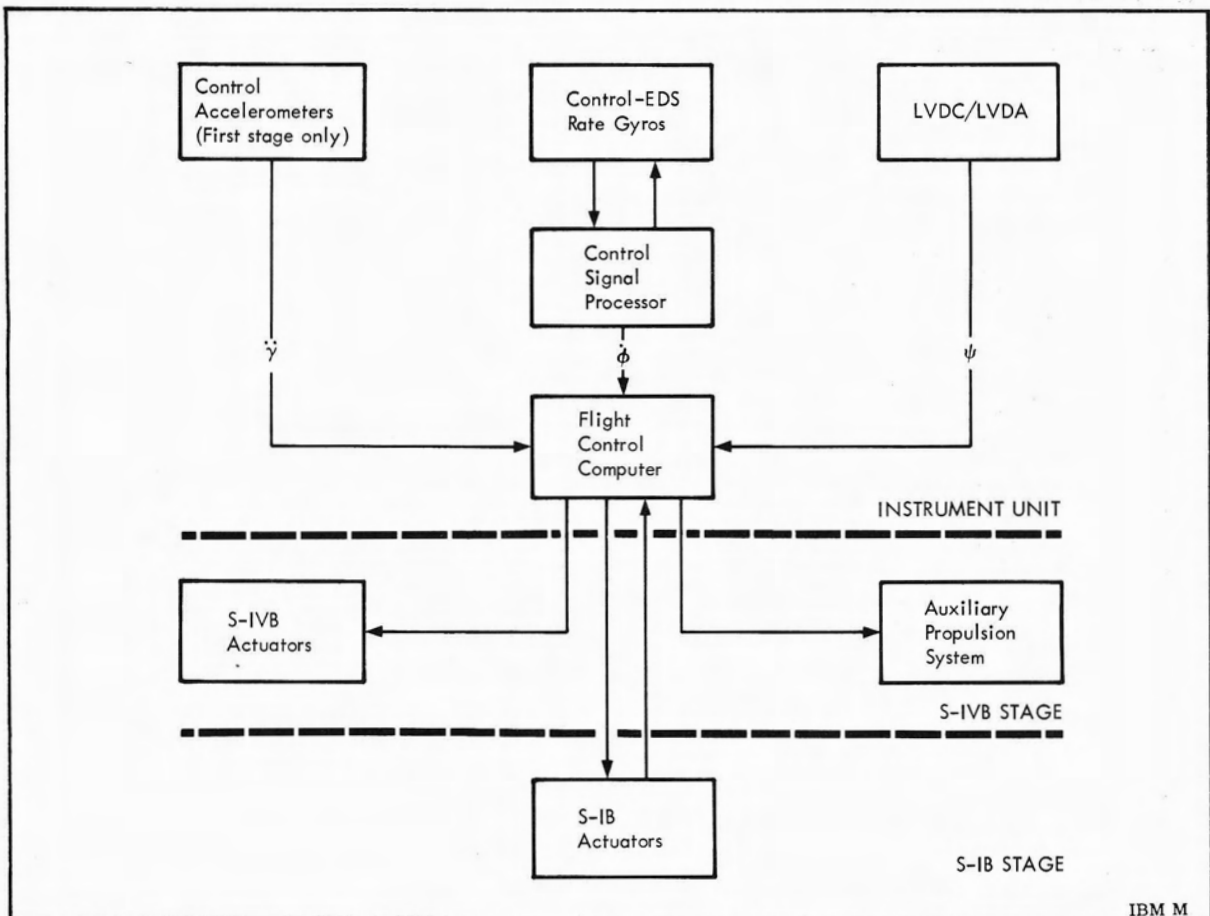


Figure 2-1 Control System Block Diagram (Flight Configuration)

Because of high aerodynamic loading pressures during first-stage burn, lateral acceleration measurements are also used in forming the command signals. In the subsequent burn and coast phases of the S-IVB

Stage flight, the lateral acceleration signals are not needed since the vehicle is clear of the atmosphere which produced the lateral pressures.

2.1 CONTROL ACCELEROMETERS

Control Accelerometers (Figure 2-2) are used on Saturn Vehicles to sense lateral accelerations encountered during the flight of the S-IB Stage. This lateral acceleration is caused by high-velocity winds and pressures that occur above the earth. The outputs of these accelerometers are used by the Control System to minimize structural loading which results from vehicle deflection by these "Jet Stream" winds.

Two Control Accelerometers are mounted within the Instrument Unit structure in reference to the vehicle pitch and yaw axes. The physical location of these components may be seen in Appendix A. The yaw Control Accelerometer, designated 603A26, is mounted on location panel 21; the pitch Control Accelerometer, designated 601A25, is mounted on location panel 2.

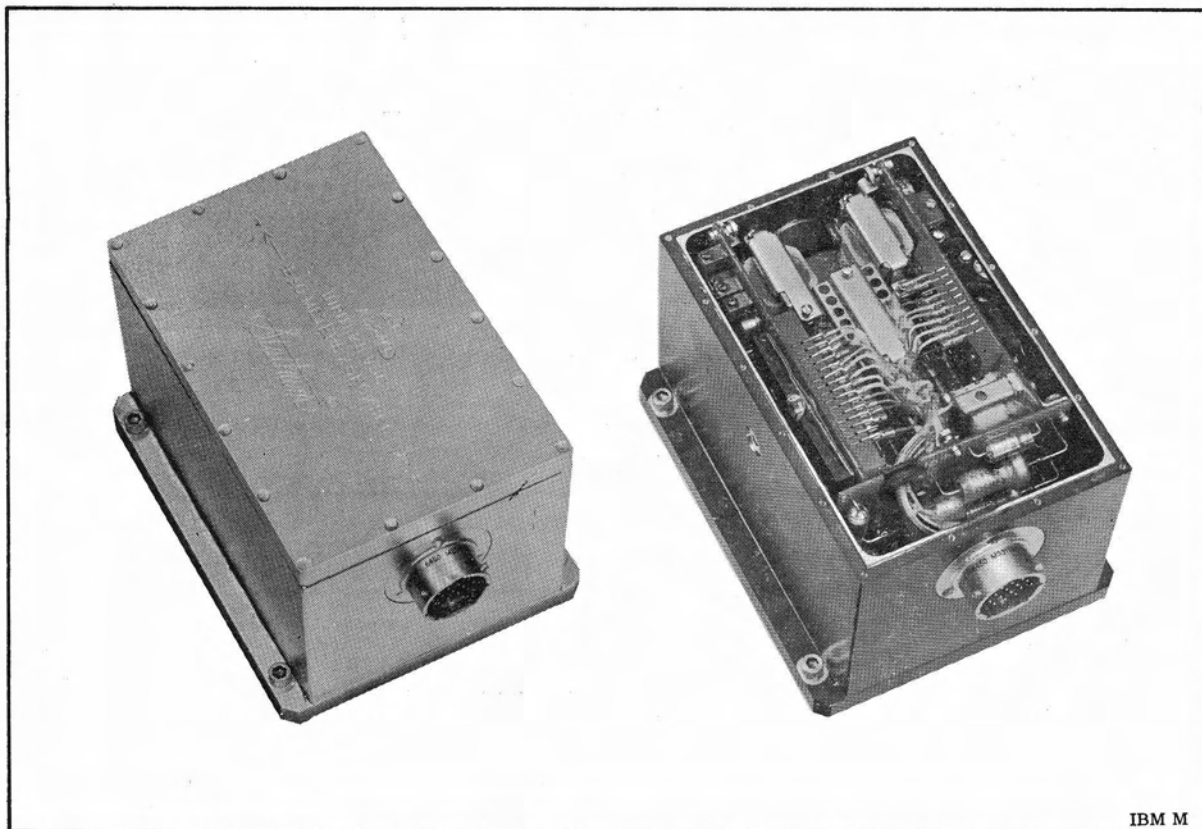


Figure 2-2 Control Accelerometer (Three-Quarter View)

These accelerometers are force-balanced, mass-type and are capable of sensing accelerations of up to 10 meters/second² with a scale factor of 1 volt/meter/second². The output signal, represented by $\ddot{\gamma}$ (gamma-double dot), is the acceleration input to the Flight Control Computer which was shown in Figure 2-1.

Figure 2-3 is a block diagram of a control accelerometer. Vehicle power is regulated and then converted to a 115 Vac, 400 cycle, excitation voltage which is used by an inductive pickoff coil (sensor). The ac output of this sensor is then amplified and demodulated within the assembly to a dc voltage which is proportional to acceleration. This output is fed to the Flight Control Computer.

In flight, the accelerometers are free to sense the lateral movements of the vehicle. In test, the vehicle and its components are not in motion so vehicle dynamics must be simulated.

Testing of the Control Accelerometers is controlled and monitored by a Control Accelerometer Panel which is part of the Electrical Support Equipment (ESE).

Lateral acceleration is simulated by utilizing a "force coil" which is built into each Control Accelerometer package. The force coil produces a calibrated deflection of the mass which is then measured by the accelerometer in the normal way. The coil is energized by the output of an operational amplifier which is part of the ESE (see Figure 2-3). Functional details of the Control Accelerometer Panel are included in Section III of this manual.

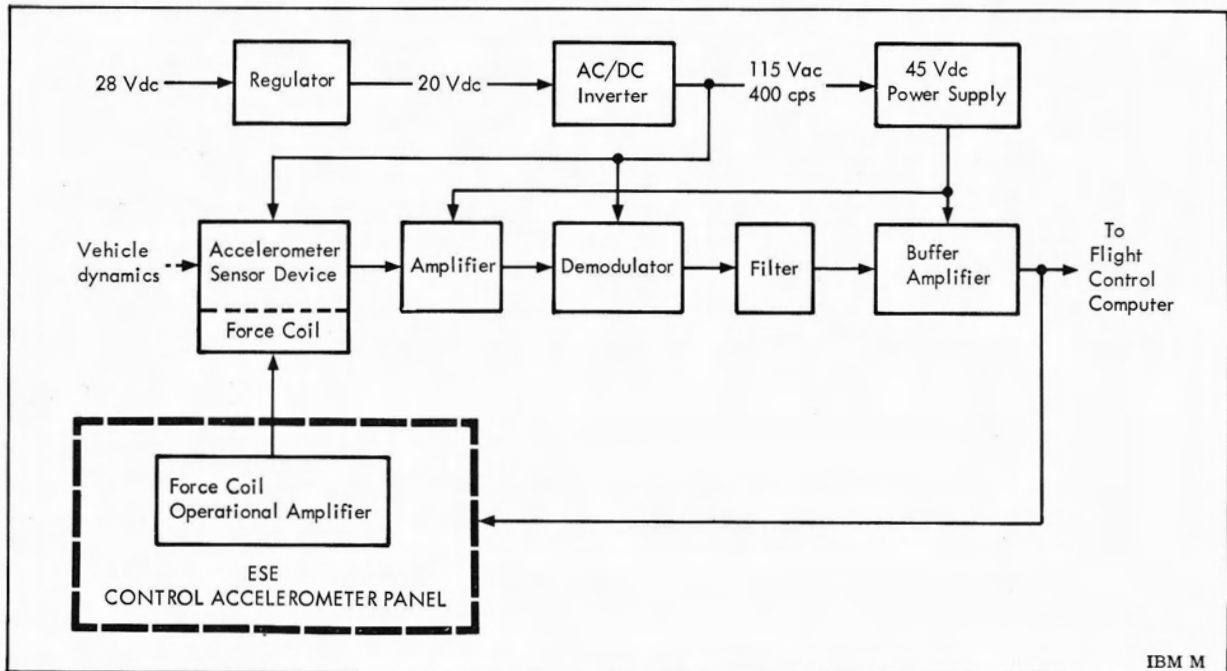


Figure 2-3 Control Accelerometer Block Diagram

2.2 CONTROL-EDS RATE GYRO PACKAGE

Rate gyros are used to measure the angular rate of vehicle movement about its three axes. These angular rates ($\dot{\phi}_P$ $\dot{\phi}_Y$ $\dot{\phi}_R$) are utilized by the Flight Control Computer to maintain the change of vehicle attitude within the prescribed limits of structural safety. The rate change measurements are also used by the Emergency Detection System (EDS) in monitoring vehicle maneuvers for vehicle and passenger safety. The rate gyros used are able to sense angular rates of change of up to 10 degrees per second.

The Control-EDS Rate Gyro Package, shown in Figure 2-4, is physically located on location panel 15 of the Instrument Unit (see Appendix A). For reliability purposes, nine rate gyros are mounted within the Control-EDS Rate Gyro Package (hereinafter referred to as Package). The rate gyros are divided into three groups, with each group containing a pitch, roll, and yaw gyro. Their output signals are sent to the Control Signal Processor for selection and comparison purposes.

Figure 2-5 is a simplified block diagram of the Package. For simplicity, only Group 1 is shown. The rate gyros use a microsyn-type pickoff which receives its excitation voltage (400 cps) from the Control Signal Processor (hereinafter referred to as Signal Processor). The gyro spin motors also receive their power from the Signal Processor. A torquer coil is used to generate an indication of gyro wheel speed.

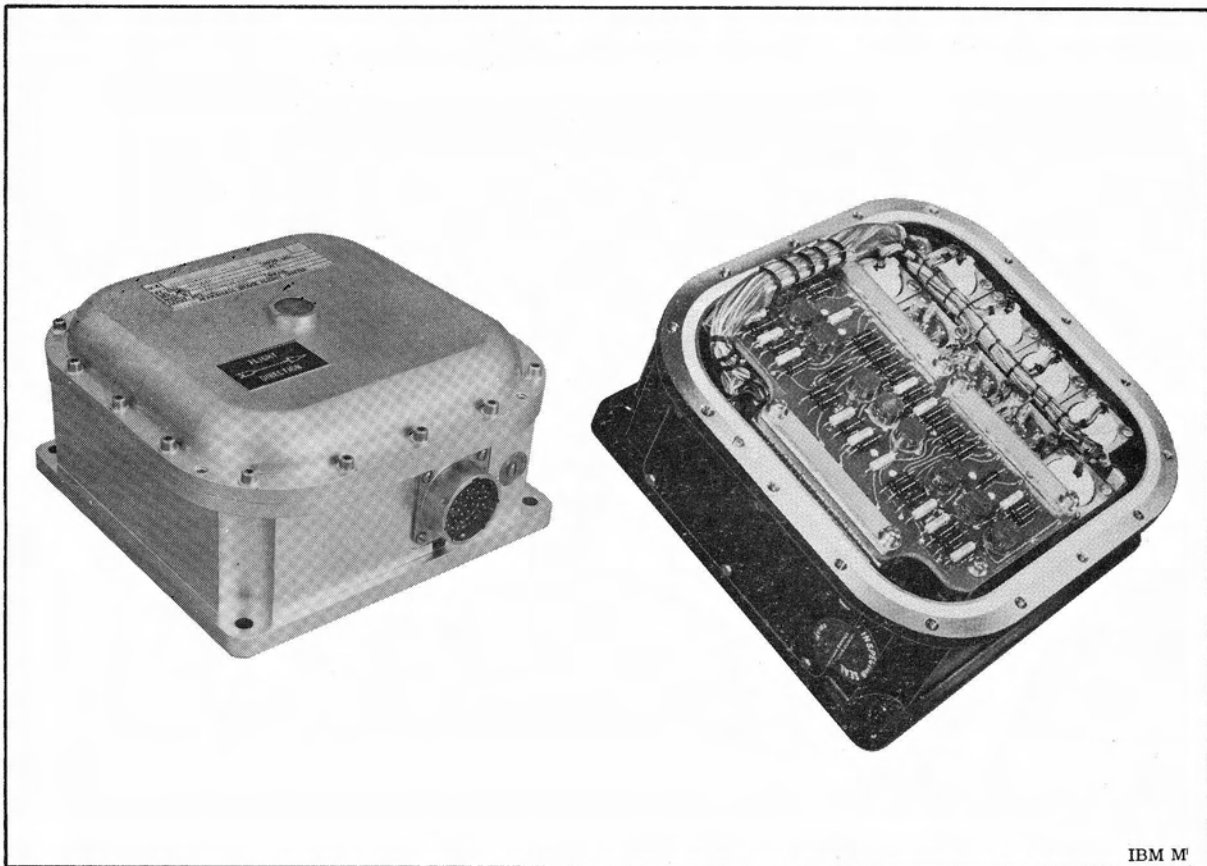


Figure 2-4 Control-EDS Rate Gyro Package (Three-Quarter View)

In flight, the rate gyros are controlled by the angular motion of the vehicle. During test, vehicle dynamics must be simulated. Testing of the Package is controlled by an EDS/Control Rate Gyro Panel which is part of the Electrical Support Equipment (ESE). This panel is shown on Figure 3-4. Angular movement is simulated by the same coil that is used to monitor wheel speed. This torquer coil produces a calibrated torque to the rate gyros. It is energized by the output of an operational amplifier within the EDS/Control Rate Gyro Panel. Functional details of the test panel and its operation are included in Section III of this manual.

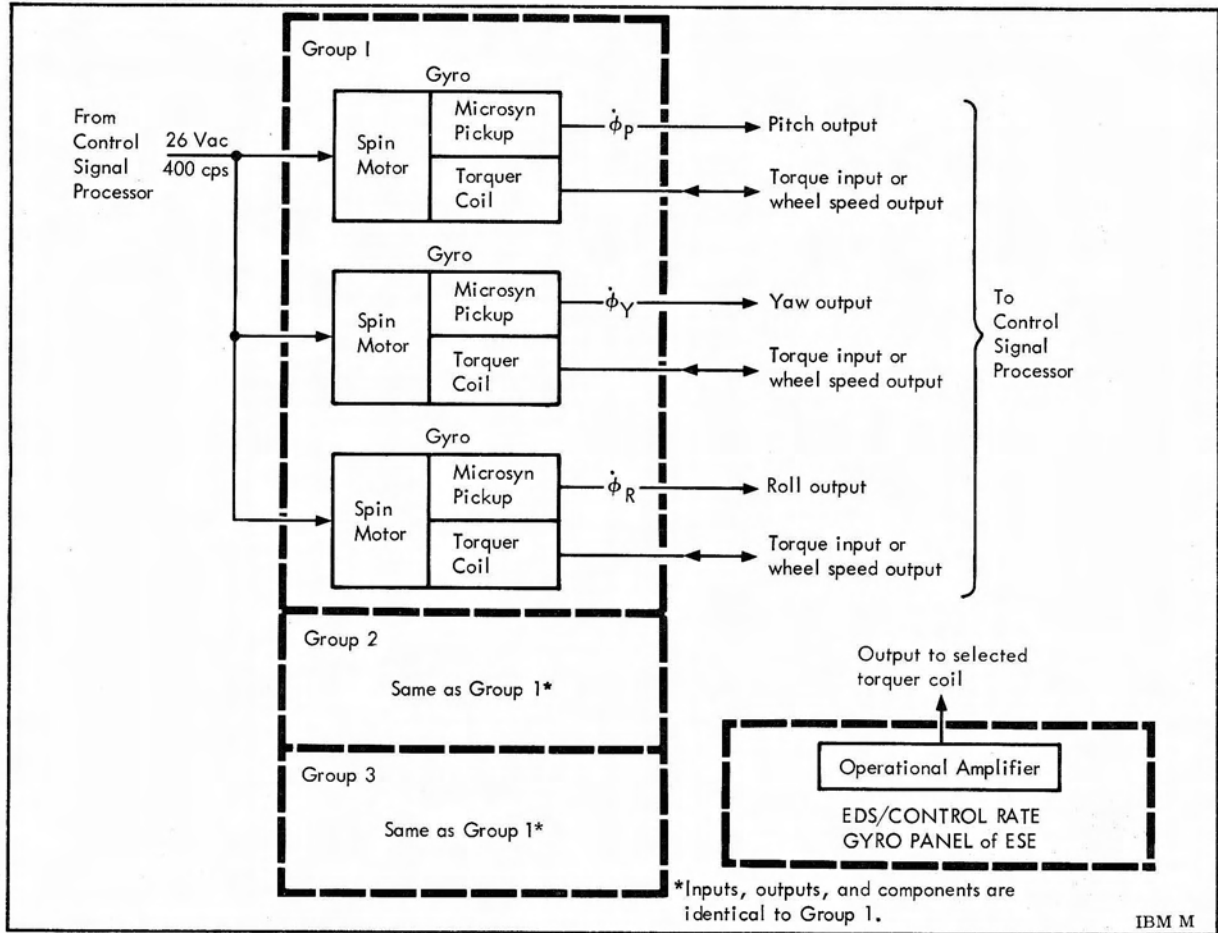


Figure 2-5 Block Diagram of Flight Control-EDS Rate Gyro Package

2.3 CONTROL SIGNAL PROCESSOR

The Control Signal Processor (hereinafter referred to as Signal Processor) demodulates the ac signal from the Control-EDS Rate Gyros into dc signals required by the Flight Control Computer. The Signal Processor compares and selects one pitch, yaw, and roll output signal from the triple redundant gyros. The Signal Processor also supplies the Control-EDS Rate Gyro Package with the necessary control and reference voltages.

The Signal Processor, shown in Figure 2-6 is physically located on location panel 15 of the Instrument Unit (see Appendix A).

Figure 2-7 is a block diagram of the Signal Processor. The rate gyro inputs (ac) are converted to the dc signals by their associated demodulator circuits. Resolution for these signals is 4.5 volts/degree/second. The output signals, represented by the phi-dot ($\dot{\phi}_P \dot{\phi}_Y \dot{\phi}_R$) are the attitude rate inputs to the Flight Control Computer.

The output of the reference and active demodulators are compared within their respective comparator circuits. If at any time, there is a significant difference between the active and reference signals, a relay switches the spare signal output into the Flight Control Computer. An assumption is made that the spare signal is within tolerance.

Each rate switch receives a 400-hertz output from one gyro. The 400 Hz output will energize a relay when the amplitude of the signal reaches a predetermined magnitude. This relay generates an Emergency Detection System (EDS) signal.

Input signals to the wheel speed sensor circuits are proportional to the speed of their respective gyros. Any deviation from a preset amount will generate a discrete signal for telemetry and Electrical Support Equipment.

The power supply circuits supply 26 Vac, 400 Hz to the Control-EDS Rate Gyro Package and to the reference demodulators. They also furnish 60 Vdc and 28 Vdc for internal Signal Processor use.

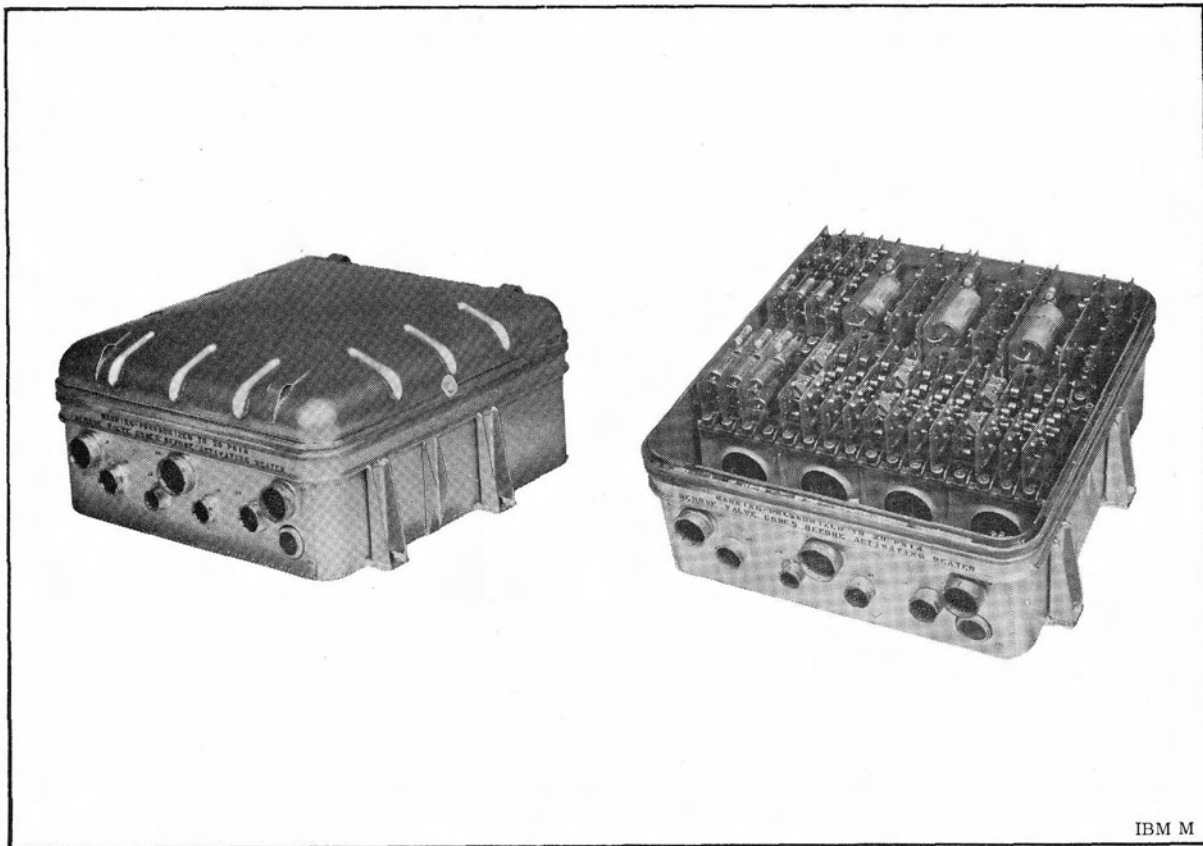


Figure 2-6 Control Signal Processor (Three-Quarter View)

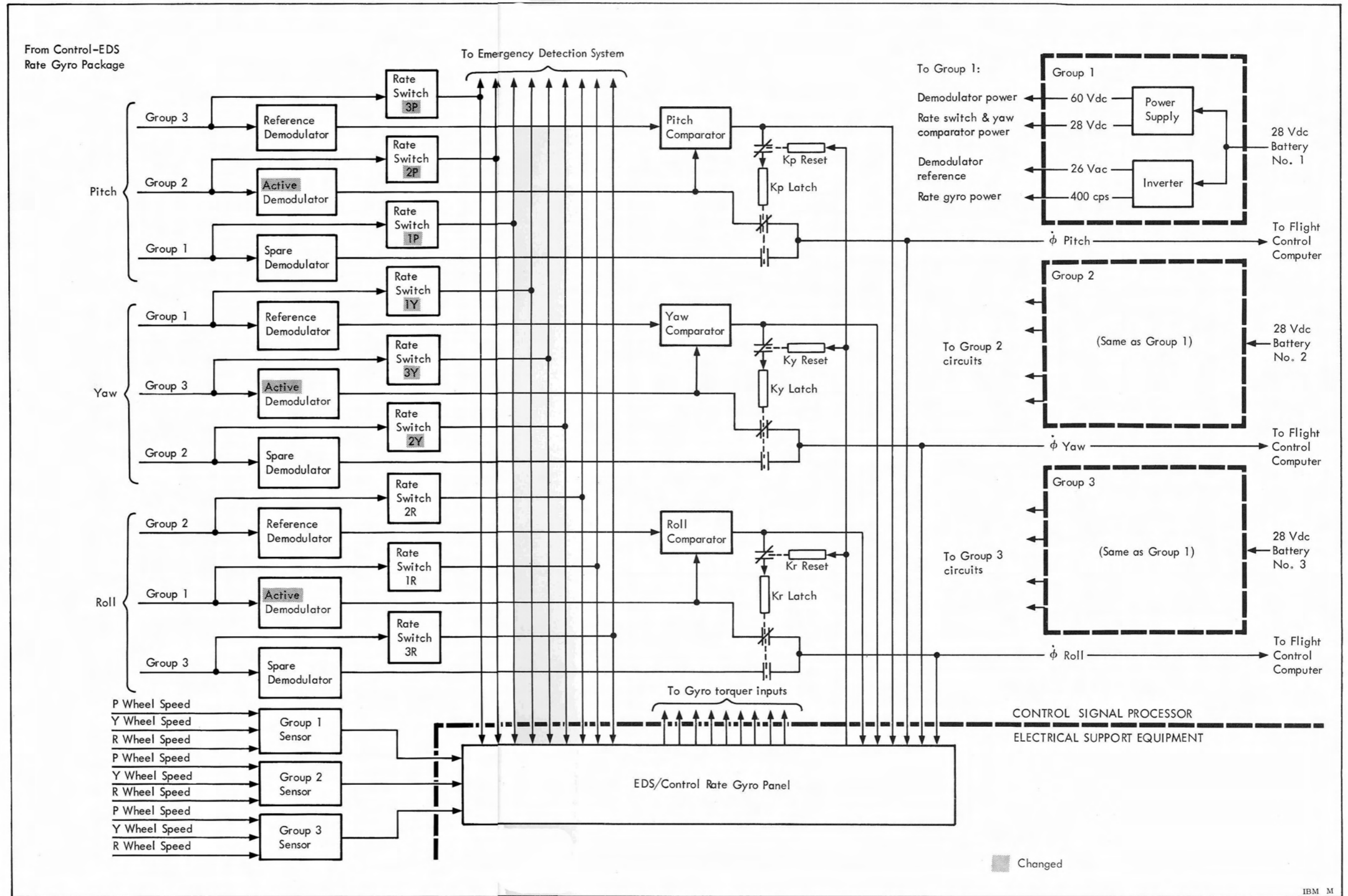


Figure 2-7 Block Diagram of Control Signal Processor

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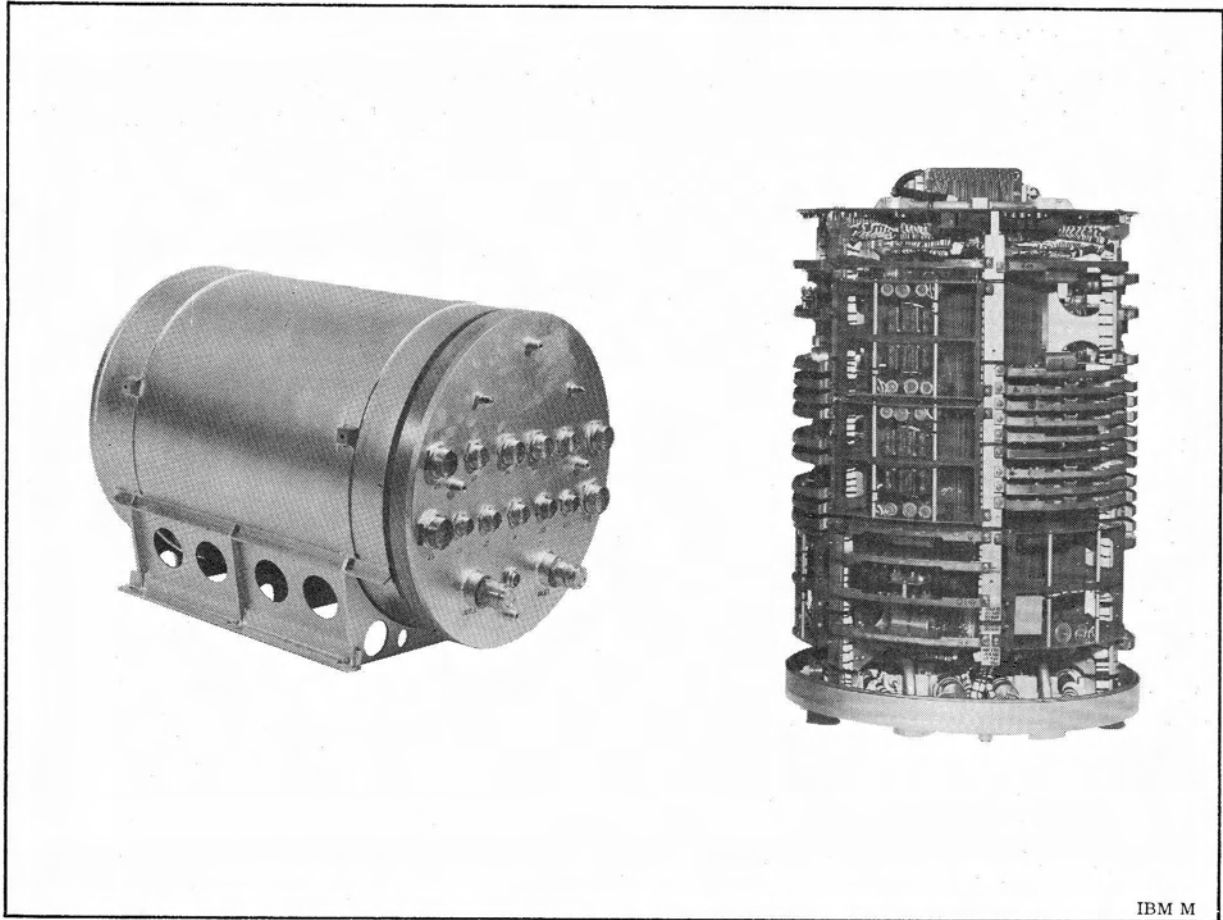
2.4 FLIGHT CONTROL COMPUTER

The Flight Control Computer, shown in Figure 2-8 is an analog computer which generates the proper control commands for the engine actuators and S-IVB Auxiliary Propulsion System. To accomplish this, the Flight Control Computer processes and combines analog signals from the LVDA or spacecraft, control sensors, and feedback from the engine actuators. The computer also provides 60 Vdc power to the first-stage engine actuators.

The Flight Control Computer (designated 602A27) is physically located on location panel 16 of the Instrument Unit. See Appendix A for a physical layout of the Instrument Unit.

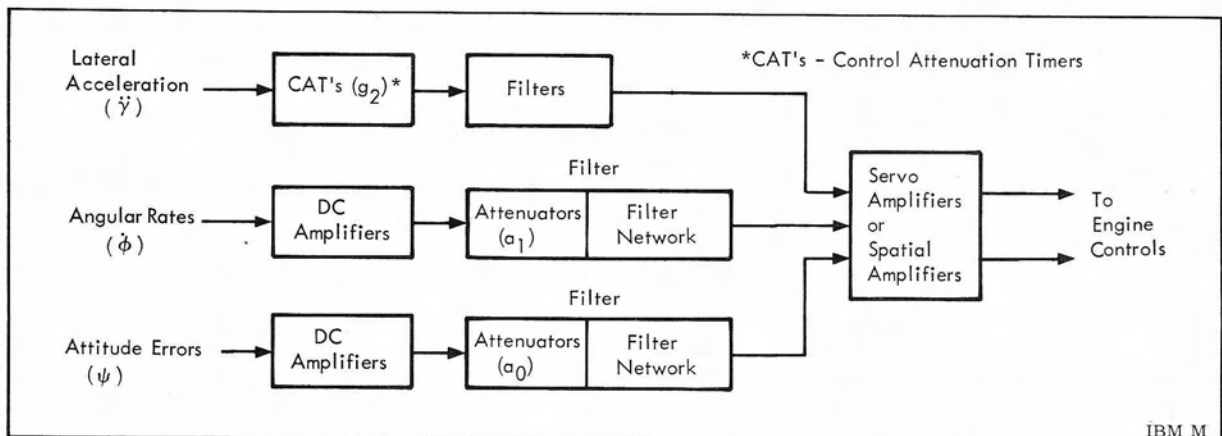
Three input channels accept the various control signals listed in Table 2-1. Each channel then amplifies, scales, and filters its respective signal according to a predetermined, time-variable set of gain factors. The symbols for these gain factors are also shown in the table.

Figure 2-9 is a simplified block diagram of the Saturn IB Flight Control Computer. After the control sensor signals ($\dot{\phi}$ and $\ddot{\gamma}$) pass through a dc amplifier, attenuators are used to provide the proper adjustment of the gain factors. Filters shape the signals to achieve phase and gain stabilization. Final adjustment of signal amplitude is accomplished by a scaling resistor network which is included in the filter circuitry. The processed signals are then summed and amplified by either a servo or spatial amplifier. The output signals are the control signals for either engine servo actuators or an auxiliary steering system which will be explained later.



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Figure 2-8 Flight Control Computer (Three-Quarter View)



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Figure 2-9 Simplified Block Diagram of Flight Control Computer

The attenuators are either of 2 types, a motor-driven, cam-controlled potentiometer called a Control Attenuation Timer (CAT) or a relay-switched, fixed-resistor network. The CAT provides attenuation that varies continuously as a function of time, while the relay-switched resistor networks change attenuation in discrete steps at predetermined time intervals. These relays are commanded by signals from the LVDC/LVDA and are referred to as "switch points".

Figure 2-10 is an overall block diagram of the Saturn IB Flight Control Computer. The figure includes power supplies, input/output signals, and all other essential circuitry.

Three input channels accept the various control signals listed in Table 2-1. The attitude error and attitude rate channels are used in all phases of the flight. These signals are on dual redundant input lines to the Flight Control Computer. These redundant input lines are then routed, by use of quadruple redundant input relays, to filters, scalars, and amplifiers. Figures 2-10a and 2-10b show the redundant inputs and relays for the yaw axis of the attitude error and attitude angular rate input channels. Lateral acceleration signals are only used during the powered flight of the S-IB Stage and are not redundant. Each channel scales, filters, and amplifies its respective signal according to a predetermined, time-variable set of gain factors. The symbols for the signals and their respective channels are shown in Table 2-1.

For simplicity, and since the flight controls are time variable, the Flight Control Computer operation will be explained by phases of the vehicle flight. These flight phases are: S-IB Stage powered flight, S-IVB Stage powered flight, and S-IVB Stage coast flight.

Table 2-1 Input Signals to the Flight Control Computer

Input Channel	Symbol	Gain Factor	Signal Source
Lateral Acceleration			
Pitch	\ddot{Y}_P	} g_2	Control Accelerometers
Yaw	\ddot{Y}_Y		
Angular Rate			
Pitch	$\dot{\phi}_P$	} a_1	Control-EDS Rate Gyros
Yaw	$\dot{\phi}_Y$		
Roll	$\dot{\phi}_R$		
Attitude Error			
Pitch	ψ_P	} a_0	LVDA/LVDC or Spacecraft
Yaw	ψ_Y		
Roll	ψ_R		

2.5 S-IB STAGE POWERED FLIGHT

Figure 2-11 is a block diagram of the Flight Control Computer configuration for the S-IB Stage flight. Input signals from the LVDC/LVDA and Signal Processor pass through identical dc amplifiers and their associated attenuators and filters before entering the servo amplifier blocks. It should be noted that the roll signals are fed to all eight amplifiers since roll is a function of pitch and yaw. Control Accelerometer signals ($\ddot{\gamma}$) which are used only during this flight phase are varied by the control attenuation timer. These acceleration signals are then routed to their respective servo amplifiers. Feedback from each actuator, called a Beta (β) signal, is the fifth input to each of the servo amplifiers. This signal voltage is proportional to the engine actuator position.

Figure 2-12 shows the engine and engine actuator configuration for the S-IB Stage. The four outboard engines are used for attitude control as well as forward thrust. The inboard engines are not movable and are used for propulsion only.

There is one servo amplifier for each S-IB engine actuator. Four amplifiers are associated with the pitch function, and four with the yaw function. Roll, as mentioned earlier, is a function of pitch and yaw so these maneuvers need no special amplifiers.

Ground testing of the Flight Control Computer is controlled and monitored by a Flight Control Computer Panel which is part of the Electrical Support Equipment (ESE). The panel is shown on the bottom of the figure. Also included, are some of the panel monitor and control signal lines. Details of the test panel and its associated functions are included in Section III of this manual.

2.6 S-IVB STAGE POWERED FLIGHT

Control of the S-IVB Stage differs somewhat from the S-IB Stage control because of the difference in engine configurations. The S-IB Stage utilizes four engines for propulsion and four more for steering and propulsion. The S-IVB Stage has only one engine for both propulsion and steering. This one engine is therefore limited to yaw and pitch maneuvers. Roll maneuvers are accomplished by an extra steering system known as the Auxiliary Propulsion System (APS). Figure 2-12 shows the engine layout for both stages of the Saturn IB Vehicle. The figure also shows the jet-type nozzles used by the APS to create the desired side thrusts.

NOTE: Firing a combination of either nozzles I_{III} and III_{IV} or I_{IV} and III_{II} will impart a rolling motion in the vehicle.

The pitch and yaw commands are generated in much the same manner as in the S-IB Stage. Figure 2-13 is a block diagram of the Flight Control Computer for the S-IVB powered flight phase. After being conditioned by attenuator and filter circuits, the rate gyro signals ($\dot{\phi}_P$ and $\dot{\phi}_Y$) are used as one of two input signals to their respective servo amplifiers. The second input to the servo amplifiers is the attitude error signals (ψ_P and ψ_Y) computed by the LVDC/LVDA. These signals are amplified by the same dc amplifier circuits used during the S-IB portion of the flight.

The servo amplifier circuits are triple redundant and are labelled as "reference", "command", and "spare" servo amplifiers. The output of the reference and command amplifiers are compared, and if their outputs are similar, the output of the command servo amplifier is used as the command signal to its associated engine actuator.

However, if a predetermined dissimilarity exists, the comparator circuitry will "switch" to the spare servo amplifier output. It is assumed that the spare servo amplifier output is acceptable. This comparator switching is irrevocable except in ground testing - once energized, a relay latch will hold and no further comparisons or switching can be made for that output command.

The roll commands to the APS nozzles are processed in the following manner. The attitude roll rate ($\dot{\phi}_R$) and attitude roll error (ψ_R) signals are amplified in identical dc amplifiers and then routed

directly to spatial amplifiers. These amplifiers sum the input voltages and generate the control signals (ON or OFF) for the APS attitude control nozzles. The spatial amplifiers are triple redundant and have their outputs compared in the same manner as the servo amplifiers.

- Testing of this circuitry is accomplished through the Control Computer Input Substitute Panel shown on Figure 2-13. A detailed description of the panel and its functions are given in Section III of this manual.

2.7 S-IVB STAGE COAST FLIGHT

The coast phase of the S-IVB Stage begins at the moment of orbital injection (and the single engine is cut off). During this flight phase, vehicle attitude is maintained solely by the Auxiliary Propulsion System. Generally, the attitude of the vehicle will be maintained perpendicular to the local vertical while in this orbital portion of the space flight.

The roll function utilizes the same Flight Control Computer circuits and APS hardware used during the S-IVB powered flight. Yaw functions also become an input to the yaw-roll spatial amplifiers for this flight phase. See Figure 2-14. However, pitch maneuvers require another triple set of spatial amplifiers. These pitch outputs are compared in exactly the same manner as the yaw-roll outputs. Figure 2-12 shows the APS nozzle layout and also includes an S-IVB polarity table which shows the nozzle action for each maneuver.

Testing of this portion of the Flight Control Computer configuration is similar to the testing procedures used for the S-IVB powered flight. Figure 2-14 shows the ESE test panel. A detailed explanation of test panel functions and controls is given in Section III of this manual.

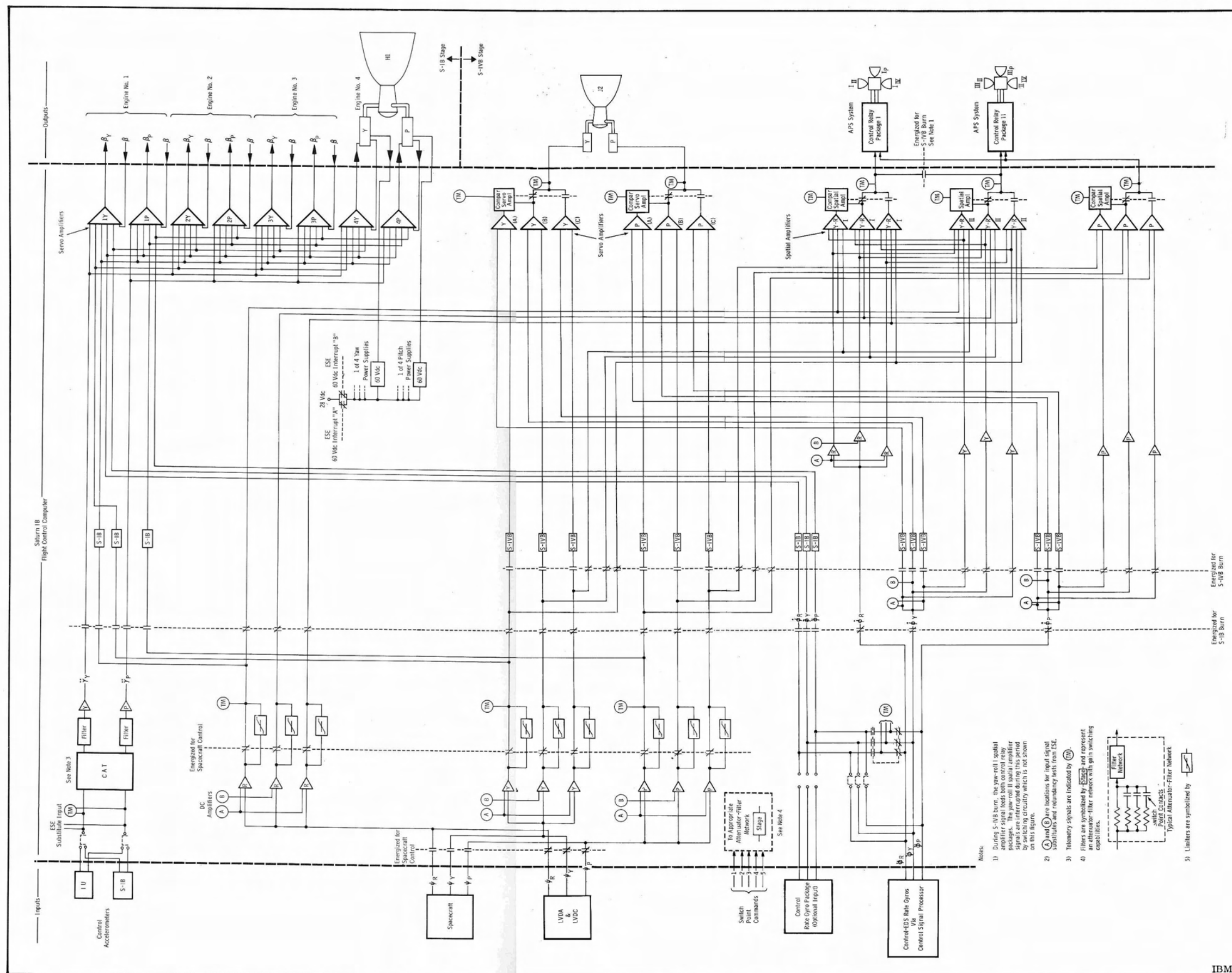


Figure 2-10 Detailed Block Diagram of Flight Control Computer

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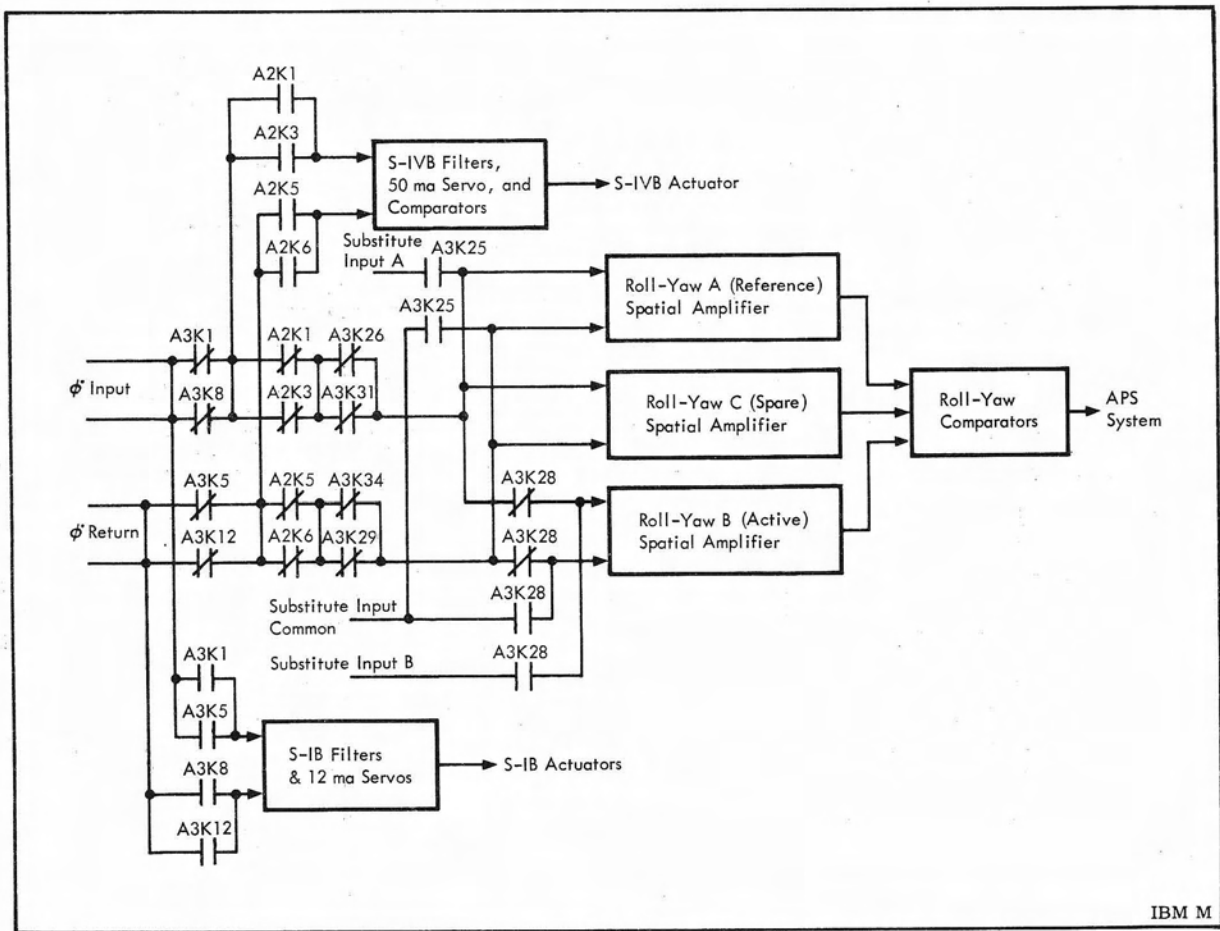


Figure 2-10a Attitude Error and Apollo Yaw Input Channel Redundant Relays

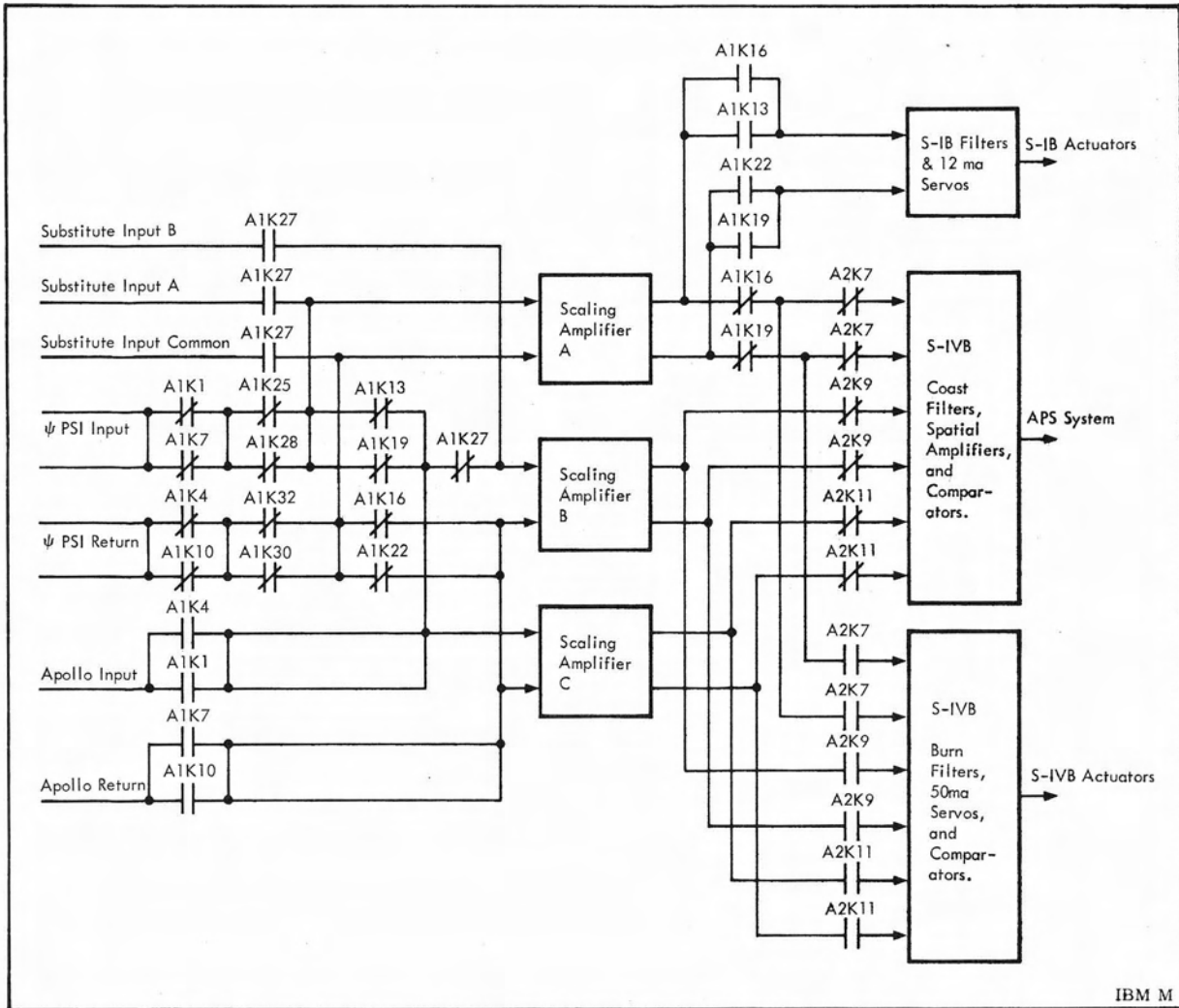


Figure 2-10b Attitude Angular Rate Yaw Input Channel Redundant Relays

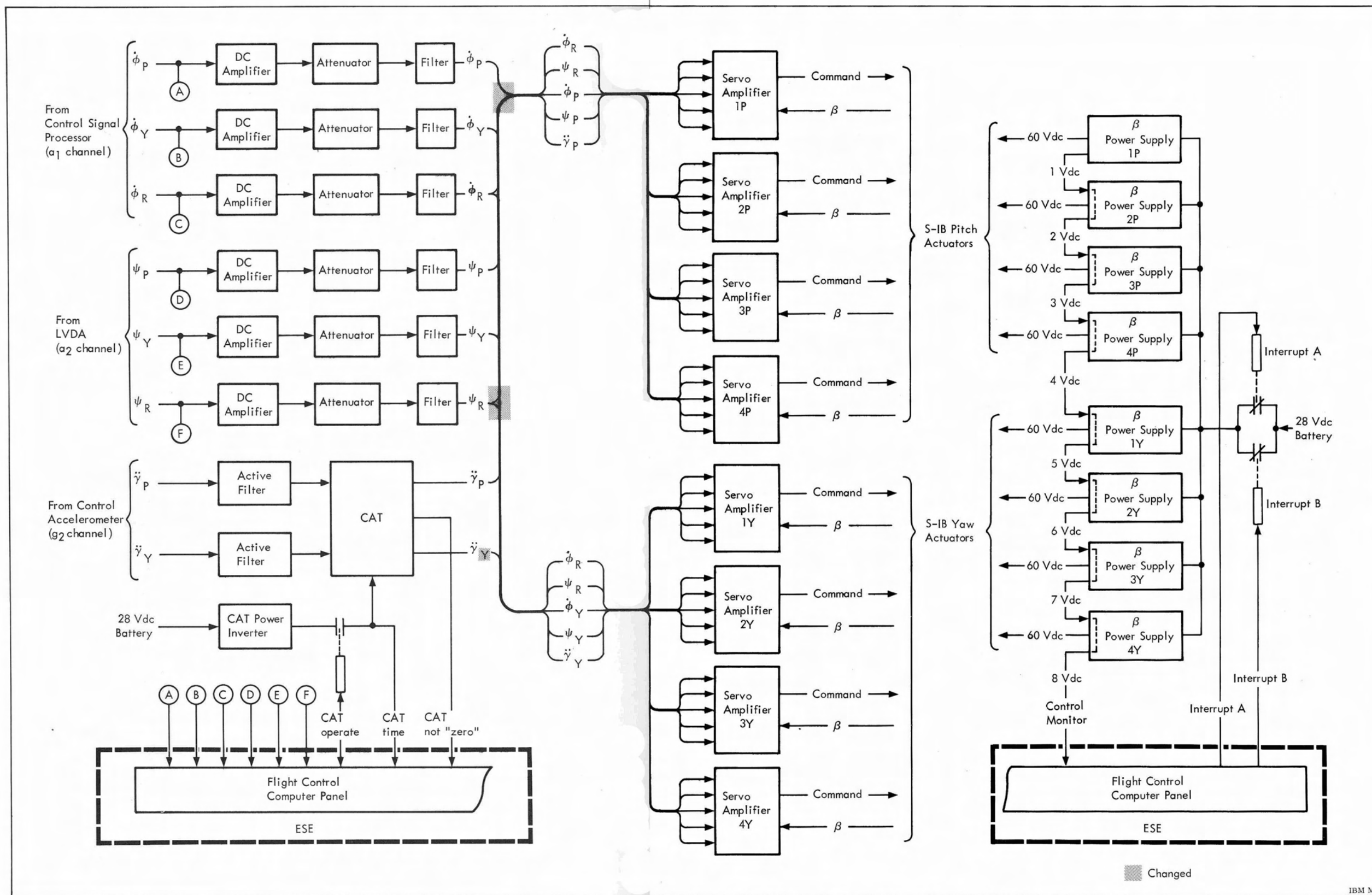


Figure 2-11 Block Diagram of Flight Control Computer (S-IB Phase)

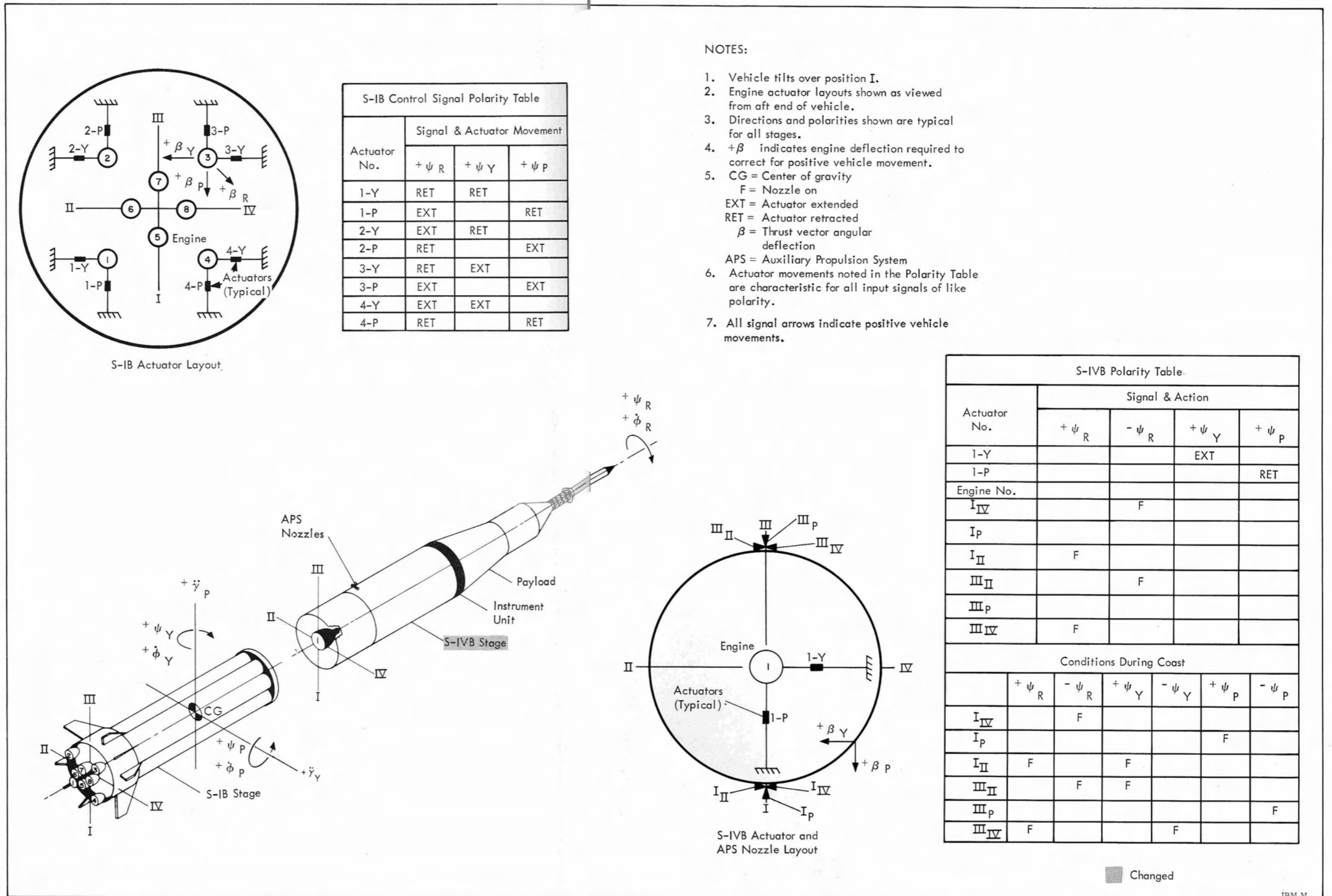


Figure 2-12 Saturn IB Engine and Actuator Configuration

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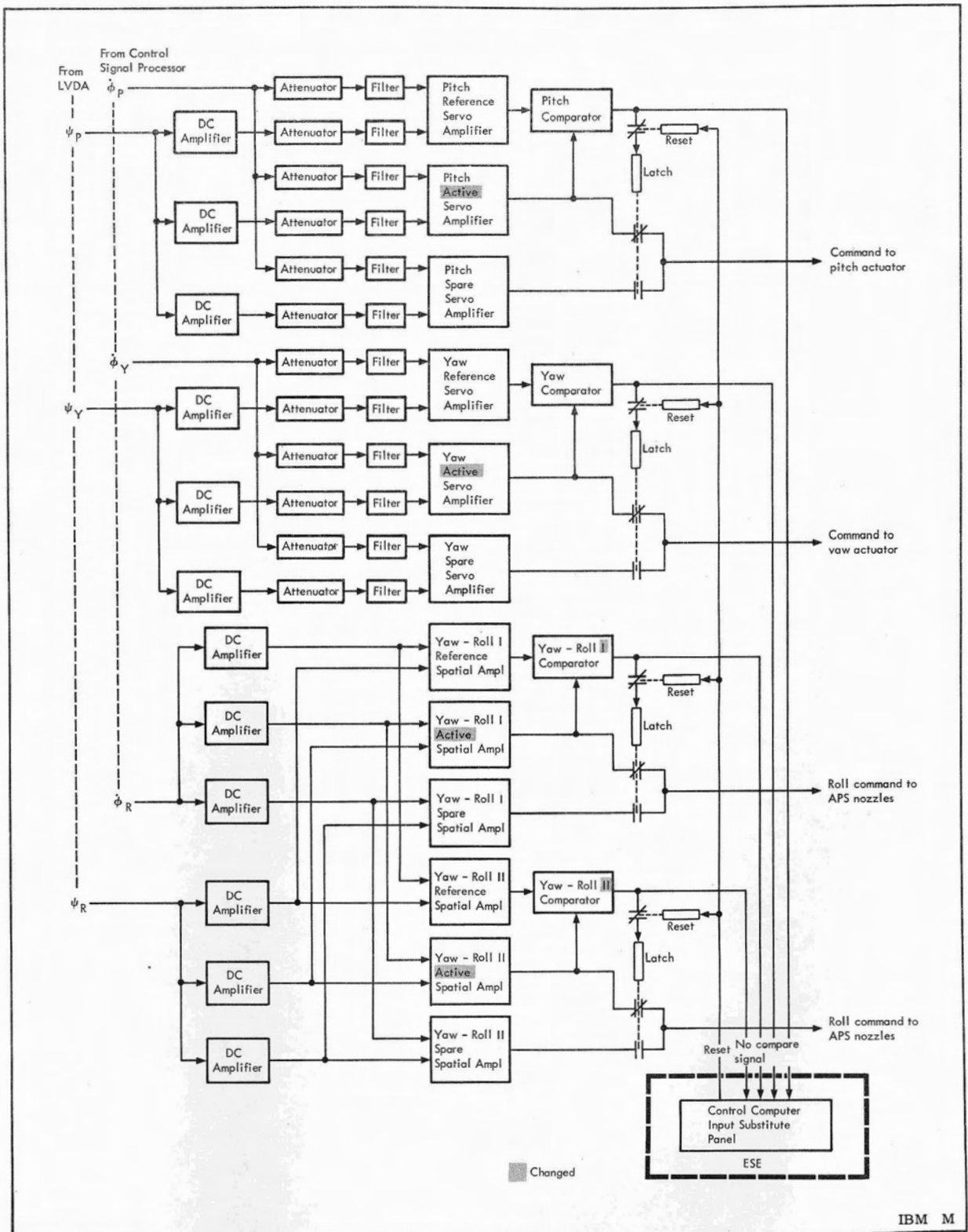
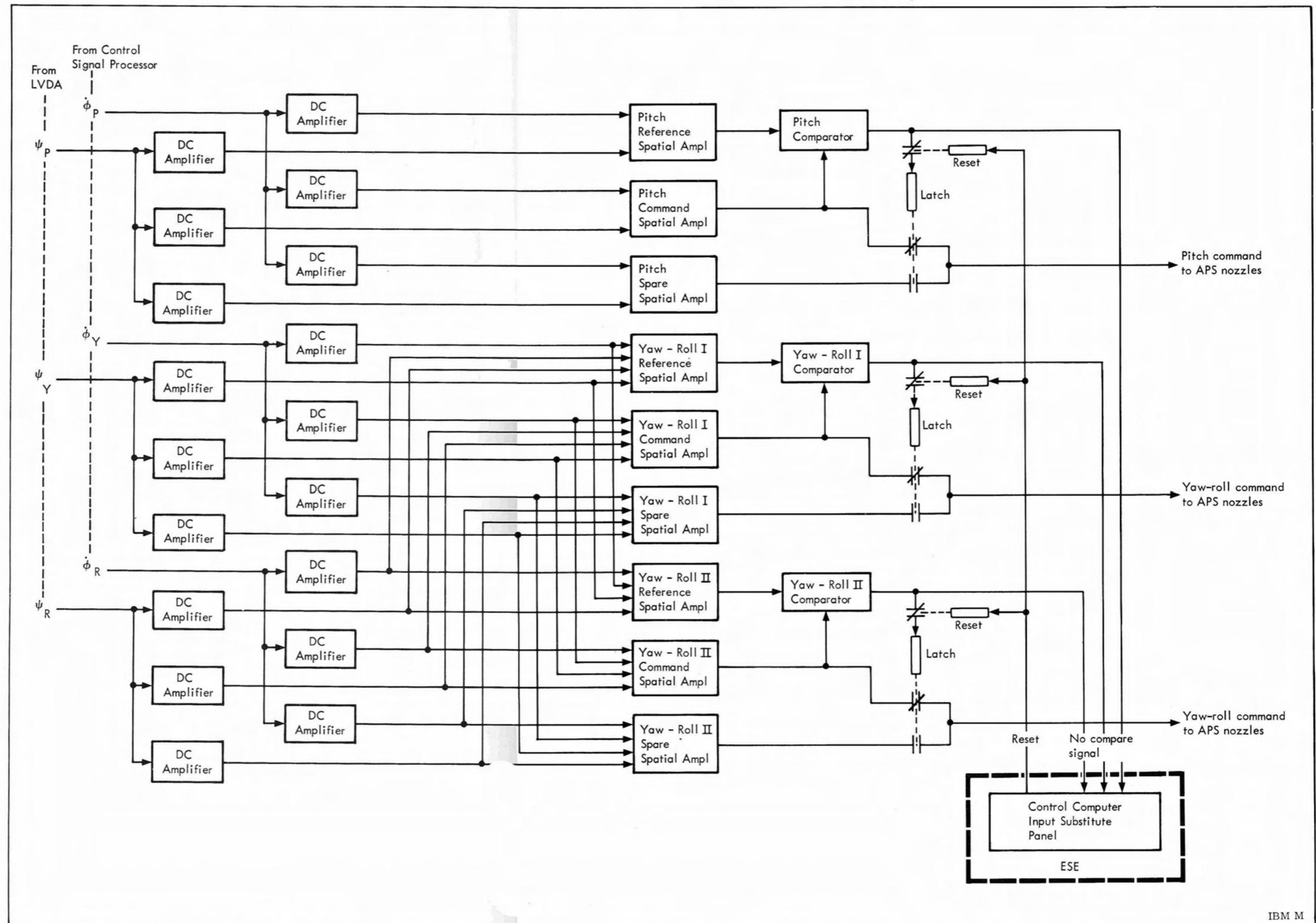


Figure 2-13 Block Diagram of Flight Control Computer (S-IVB Burn)



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Figure 2-14 Block Diagram of Flight Control Computer (S-IVB Coast)

SECTION III ELECTRICAL SUPPORT EQUIPMENT

The Electrical Support Equipment used to test and control the Saturn IB Control system is shown in block diagram form in Figure 3-1. The figure also shows the interconnections between the flight and test equipment

Since many of the measurements depend upon vehicle or equipment motion, many of the components and movements are simulated by test panel controls. Many of these simulations and measurements may also be controlled by an RCA-110A Ground Control Computer.

Figure 3-2 shows the test panels for Saturn IB Electrical Support Equipment (ESE). Only the test panels directly associated with the control system are labelled. The remainder of this section contains an explanation of the ESE test panels. References should be made to the block diagrams in Section II for the associated equipment interconnections.

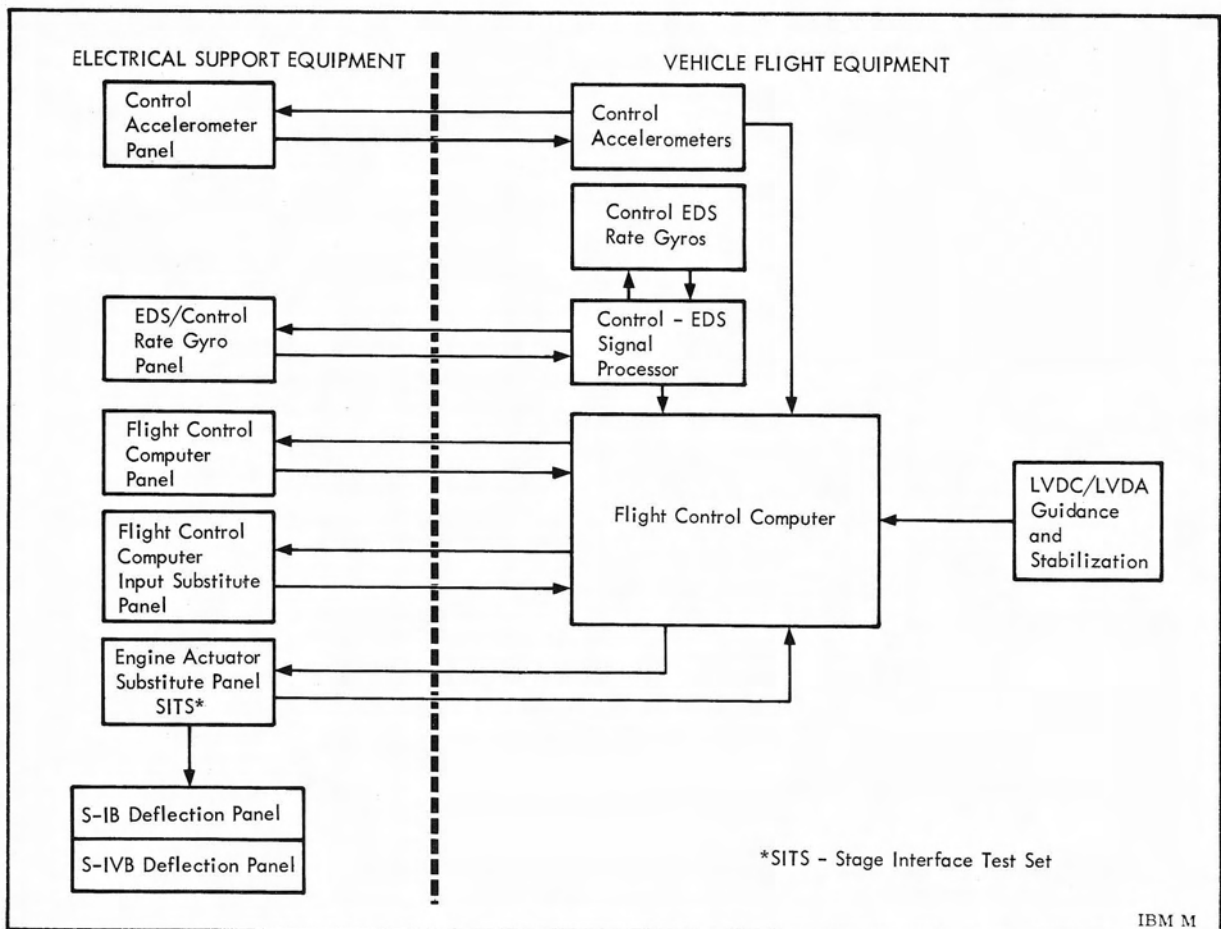


Figure 3-1 S-IB Control System Block Diagram (Test Configuration)

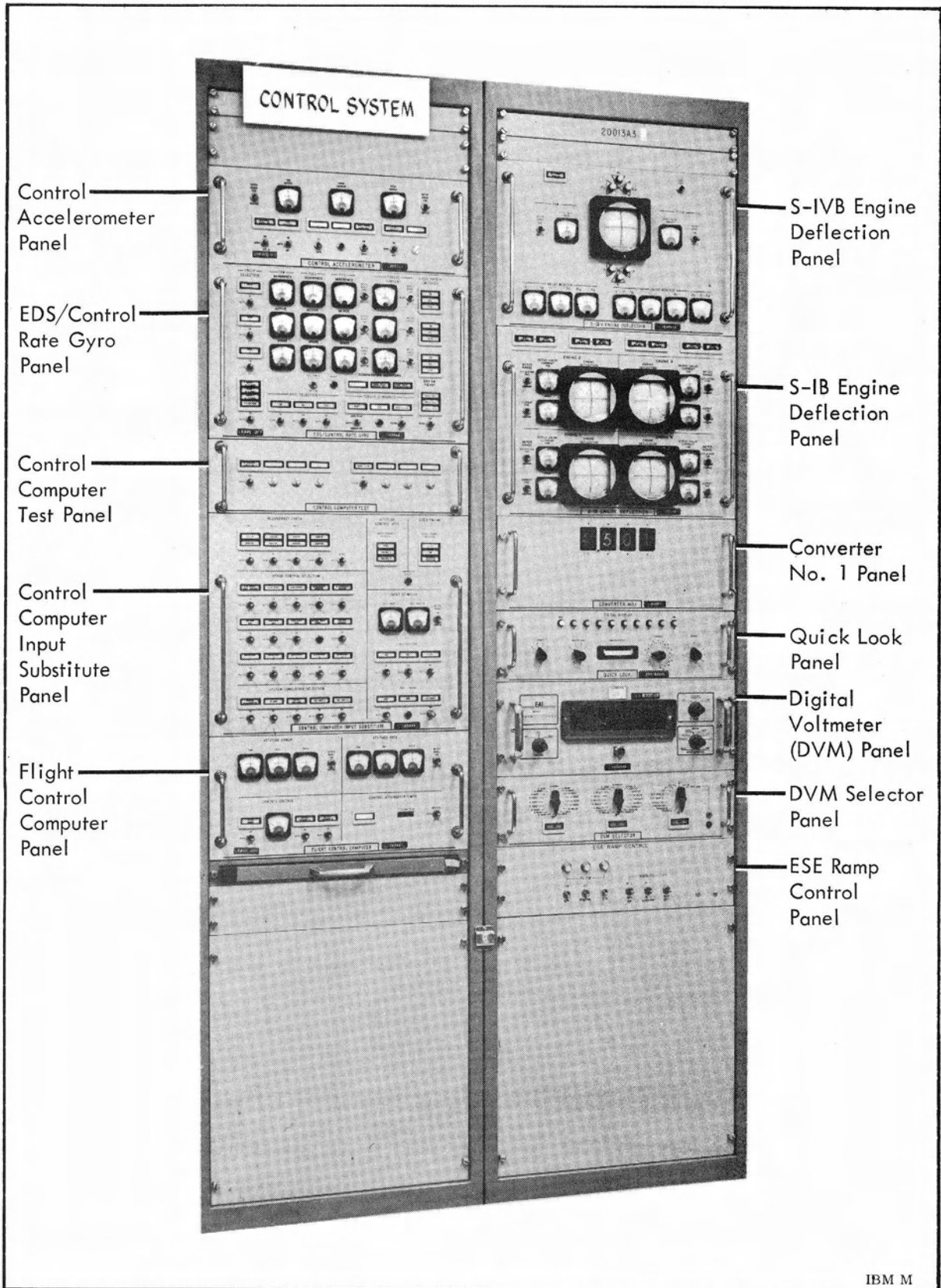
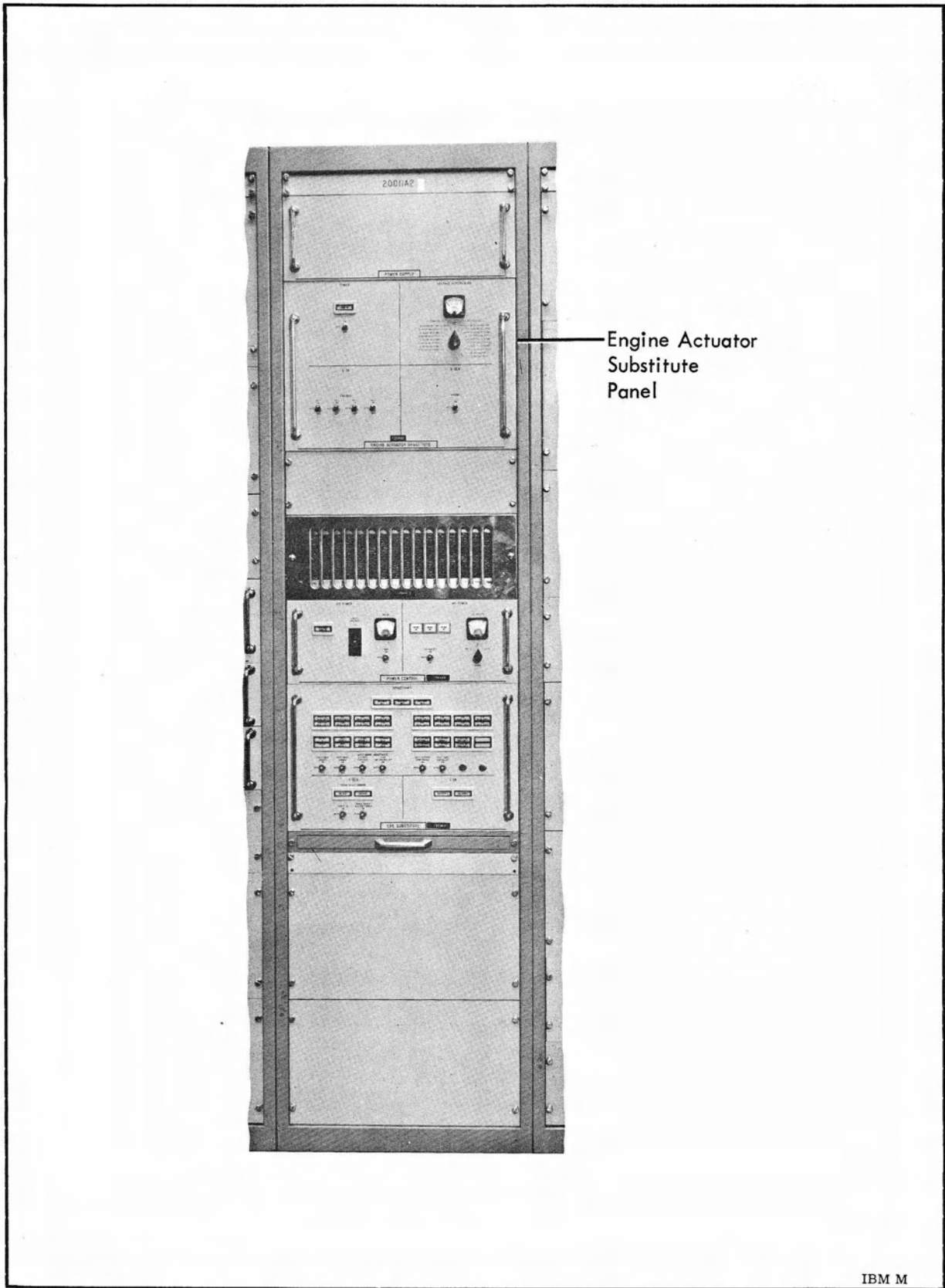


Figure 3-2 Control System Panels (Sheet 1 of 2)

IBM M



Engine Actuator
Substitute
Panel

IBM M

Figure 3-2 Control System Panels (Sheet 2 of 2)

3.1 CONTROL ACCELEROMETER PANEL

The Control Accelerometer Test Panel provides a means of selecting, controlling and monitoring the vehicle Control Accelerometers during the test operations. The control functions of the panel with their associated switches, indicators, and meters are shown in Figure 3-3.

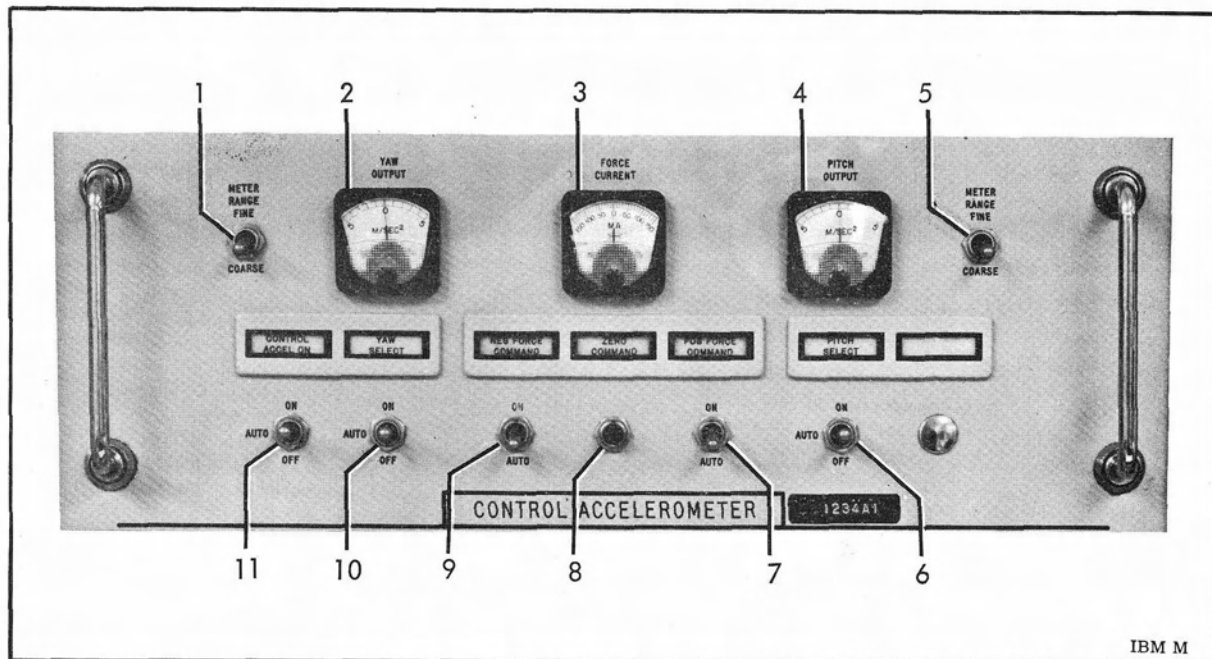


Figure 3-3 Photo of Control Accelerometer Panel

Legend for Figure 3-3

- The indicator lamps (associated with each switch), when lit, show an ON condition of that switch.
- All switches with an AUTO position, when placed in that position, allow the associated function to be controlled by the S-IB Ground Control Computer (RCA-110A).

Index No.	Panel Designation	Purpose and Use
1	METER RANGE	Controls range of YAW OUTPUT meter (2). In FINE position, meter range is 0 ± 0.5 meter/second ² . In COARSE position, meter range is 0 ± 5 meters/second ² .
2	YAW OUTPUT	Indicates output of yaw Control Accelerometer. Meter calibration is in meters/second ² .

Legend for Figure 3-3 (Cont)

Index No.	Panel Designation	Purpose and Use
3	FORCE CURRENT	Indicates output of force coil operational amplifier in milliamperes (17 ma = 1 meter/second ²). Meter range is changed by either index number 1 or 5.
4	PITCH OUTPUT	Indicates output of pitch Control Accelerometer. Meter is calibrated in meters/second ² .
5	METER RANGE	Controls range of PITCH OUTPUT meter. See index number 1 for details.
6	PITCH SELECT	Selects pitch Control Accelerometer to be tested. ON position connects force coil to output of ESE force coil operational amplifier. AUTO position allows switch function to be controlled by S-IB Ground Control Computer (RCA-110A).
7	POSITIVE COMMAND	Controls output of force coil operational amplifier. When in ON position, amplifier output increases in positive direction until switch is released or amplifier saturation occurs. AUTO position will hold amplifier output at present level and place amplifier under computer control.
8	ZERO COMMAND	Drives output of force coil operational amplifier to zero.
9	NEGATIVE COMMAND	Identical to index number 7 with exception of polarity.
10	YAW SELECT	Identical to index number 6 with the exception of yaw direction.
11	CONTROL ACCELEROMETER	Controls power to the Control Accelerometers, force coil operational amplifier, and zero detector (index number 8 circuitry).

3.2 EDS/CONTROL RATE GYRO PANEL

The EDS/Control Rate gyro panel provides a means of controlling and monitoring the Control-EDS Rate Gyros and Control-EDS Signal Processor during test. The controlling functions of the panel and their associated switches, indicators, and meters are shown in Figure 3-4.

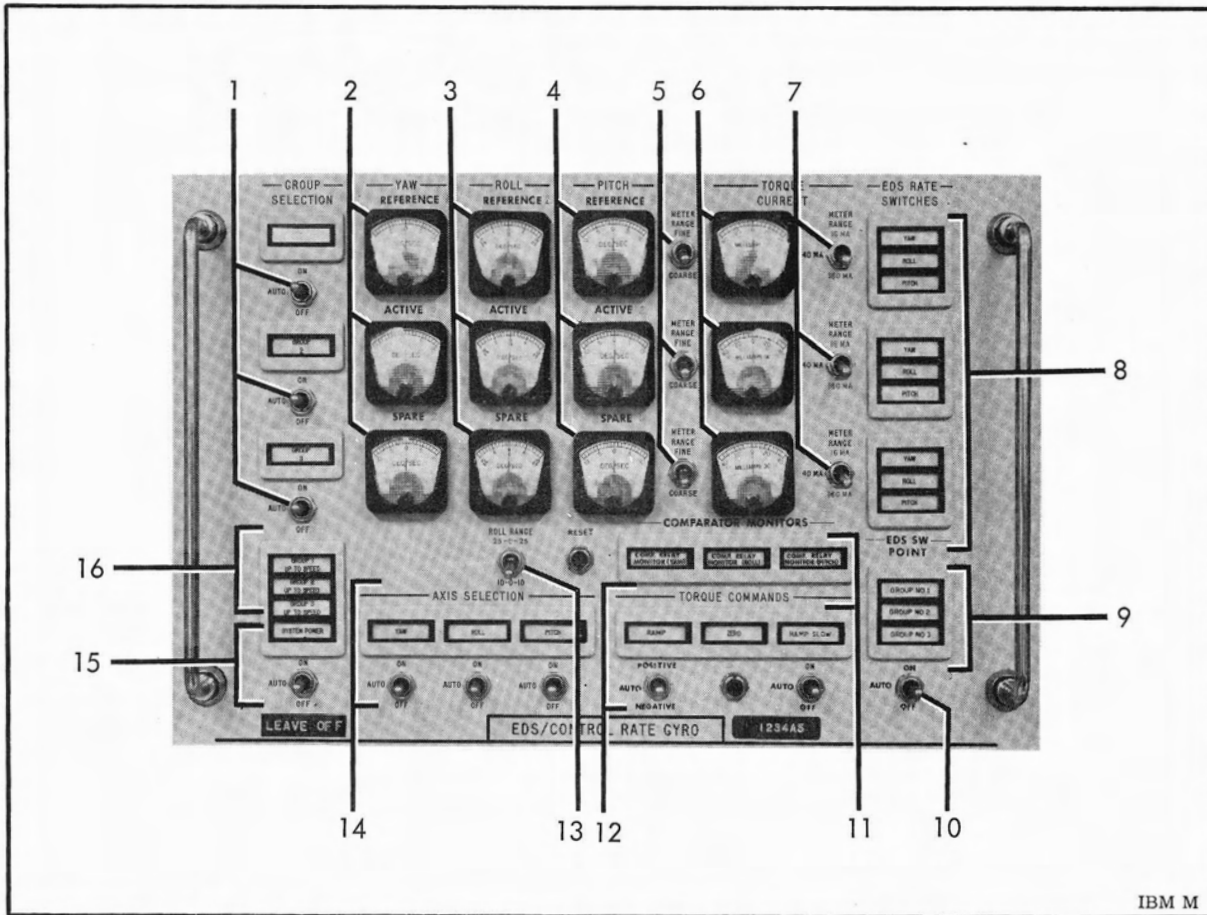


Figure 3-4 EDS/Control Rate Gyro Panel

Legend for Figure 3-4

- The indicator lamps (associated with each switch), when lit, show an ON condition of that switch.
- Except for the TORQUE COMMANDS switches, all switches with an AUTO position, when placed in that position, allow the associated function to be controlled by the S-IB Ground Control Computer (RCA-110A).

Index No.	Panel Designation	Purpose and Use
1	GROUP SELECTION	Select associated group of rate gyros for testing.
2	YAW OUTPUT	Indicate yaw output of the Control-EDS Signal Processor for the group selected. Meters are calibrated in degrees/second.
3	ROLL OUTPUT	Same function as index number 2 except for ROLL.
4	PITCH OUTPUT	Same function as index number 2 except for PITCH.
5	METER RANGE	Each switch controls range of its associated group of OUTPUT meters. Coarse range is 0 ± 10 degrees/second, and FINE range is 0 ± 1 degree/second.
6	TORQUE CURRENT	Indicates output of associated torquing operational amplifier in milliamperes (8 milliamperes = 1 degree/second).
7	METER RANGE	Each switch controls the range of its associated TORQUE CURRENT meter. Meter ranges are 16, 40, and 160 milliamperes.
8	EDS RATE SWITCHES	Indicate that an excessive rate of angular change has been sensed by the associated group of Control-EDS Rate Gyros.
9	EDS SW POINT GROUP NO. 1,2,3	Indicates which EDS/switch point group is ON.
10	EDS SW POINT	Selects one of two switch levels for operation of the Control Signal Processor.
11	COMPARATOR MONITORS COMP. RELAY MONITORS (YAW, ROLL, PITCH)	Indicate when associated comparator monitor relay has been activated. Restores command channel to an active status and returns spare to standby.

Legend for Figure 3-4 (Cont)

Index No.	Panel Designation	Purpose and Use
12	<p>TORQUE COMMANDS</p> <p>POSITIVE & NEGATIVE</p> <p>ZERO</p>	<p>These switches control output of selected rate gyro torquing operational amplifier (input to selected force coil). When held in ON position, either switch increases amplitude of associated amplifier until released or amplifier saturates. AUTO position holds amplifier output at present level.</p> <p>This switch drives output of amplifier to zero.</p>
13	ROLL RANGE	<p>Changes range of ROLL OUTPUT meters (index number 3). LOW range measures 10-0-10 meters/second. HIGH range measures 0-20 meters/second regardless of input polarity.</p>
14	<p>AXIS SELECTION</p> <p>YAW, ROLL, PITCH</p>	<p>Selects gyro to be tested within selected group and connects output of selected group rate gyro torquing operational amplifier to associated gyro force coil.</p>
15	SYSTEM POWER	<p>Controls power to Control-EDS Rate Gyros, Signal Processor, torquing operational amplifiers, and zero detectors.*</p>
16	<p>UP-TO-SPEED</p> <p>GROUP 1, 2, 3</p>	<p>Indicate when gyros have reached operational speed.</p>
<p>* Part of ZERO torque command circuitry (index number 12).</p>		

3.3 CONTROL COMPUTER INPUT SUBSTITUTE PANEL

The Control Computer Input Substitute Panel supplies substitute inputs to the Flight Control Computer and gives a status indication of the Flight Control Computer and the substitute inputs. Controlling functions of the panel and their associated switches, indicator lamps, and meters are shown in Figure 3-5.

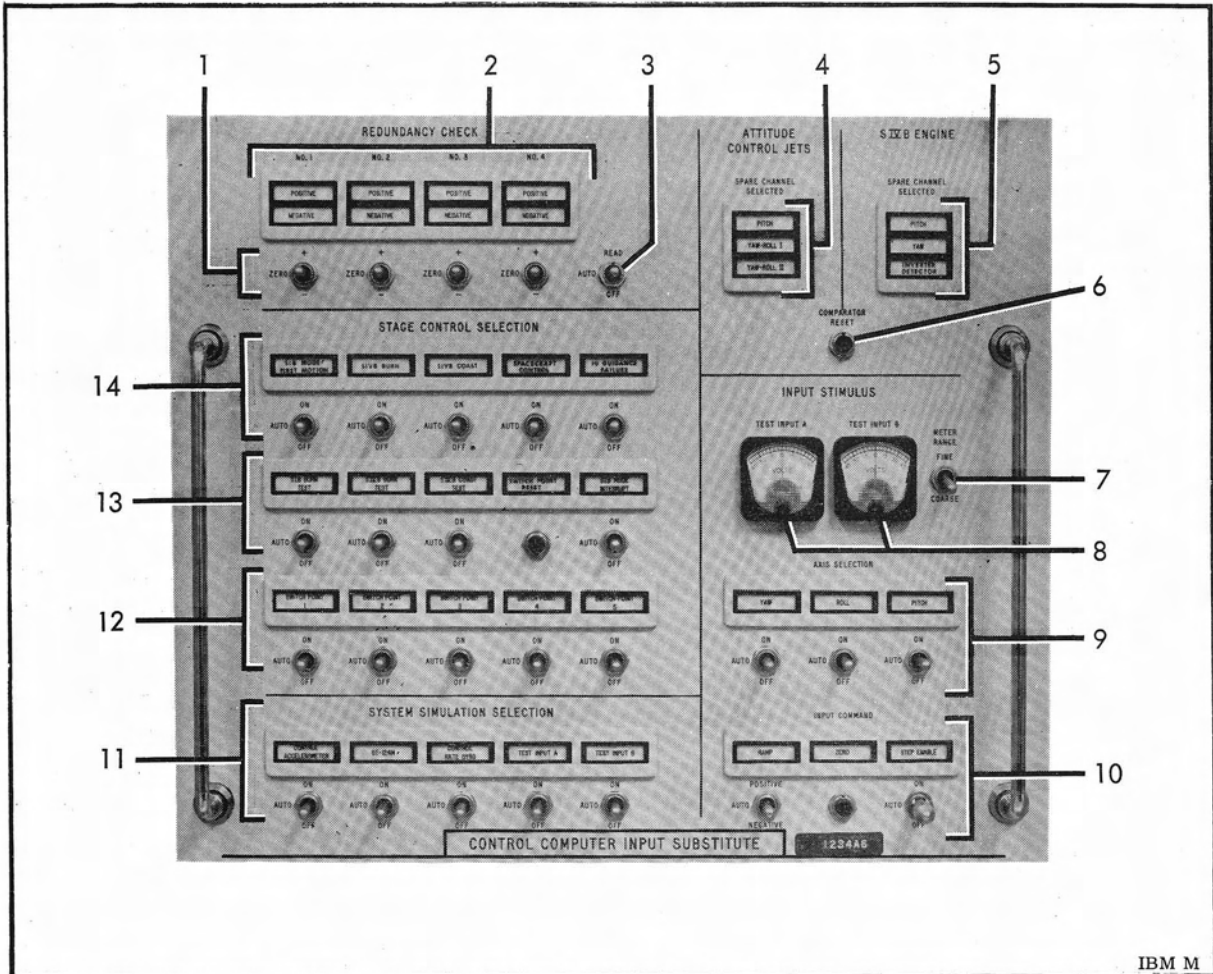


Figure 3-5 Control Computer Input Substitute Panel

Legend for Figure 3-5

- All indicator lamps, unless listed separately, give an ON indication of their associated switch function.
- All switches with an AUTO position, when placed in that position allow the associated function to be controlled by the S-IB Ground Control Computer (RCA-110A).

Index No.	Panel Designation	Purpose and Use
1	REDUNDANCY CHECK	Select redundant input relays which provide an input path to the Flight Control Computer at all times. Selection code is given in Table 3-1.
2	REDUNDANCY CHECK	Indicate the selection mode by index number 1 switches. A ZERO condition is indicated when POSITIVE and NEGATIVE lamps are not lighted.
3	READ	Must be in READ position to allow REDUNDANCY CHECK switches (index number 1) to be electrically operable.
4	ATTITUDE CONTROL JETS (Spare Chan Selected)	Indicate when associated spare channels of S-IVB APS spatial amplifiers have become activated.
5	S-IVB ENGINE (Spare Chan Selected)	Indicate when associated spare channels of S-IVB activator servo amplifiers have become activated.
6	COMPARATOR RESET	Resets any activated spare channel to its normal state.
7	METER RANGE	Changes range of TEST INPUT meters (index number 8) from FINE range of 0±4.5 volts to COARSE range of 0±45 volts.
8	TEST INPUT A,B	Measure output of associated test input operational amplifier.
9	AXIS SELECTION	Connect the axis input of selected channel to output of selected test input operational amplifier.
10	INPUT COMMAND RAMP ZERO	Causes output of test input operational amplifiers to increase in direction selected by switch operations. Drives output of input operational amplifiers to zero.

Legend for Figure 3-5 (Cont)

Index No.	Panel Designation	Purpose and Use
	STEP ENABLE	Provides a method of introducing a "step input" into the Flight Control Computer. Under normal operation, an axis may not be selected unless output of associated operational amplifier is at zero. By placing STEP ENABLE switch in ON position, operational amplifier may be driven to desired output and at that time desired axis may be selected. This provides an immediate input of a desired voltage level rather than having input rise gradually to that level.
11	SYSTEM SIMULATION SELECTION CONTROL ACCELEROMETER, ST-124, and CONTROL RATE GYRO TEST INPUT A, TEST INPUT B,	Connect associated input channel of Flight Control Computer to output of selected input operational amplifier. Select TEST INPUT A and/or B input operational amplifiers.
12	SWITCH POINT 1 thru 5	Select various switch points (gains) of Flight Control Computer.
13	STAGE CONTROL SELECTION S-IB BURN TEST, S-IVB COAST TEST, S-IVB BURN TEST SWITCH POINT RESET S-IB MODE INTERRUPT	Select mode of operation of Flight Control Computer. Resets switch points (gains) to normal state. Switch points are selected by index number 12. Disables S-IB burn mode relays and is used primarily for testing at KSC. Indicator lamp will light when any of TEST MODE switches are energized. (Denotes that S-IB burn mode relays in Flight Control Computer have been disabled).
14	STAGE CONTROL SELECTION S-IB MODE/FIRST MOTION, S-IVB BURN, S-IVB COAST, SPACECRAFT CONTROL, IU GUIDANCE FAILURE	Select the mode of operation for the Flight Control Computer.

Table 3-1 Redundancy Check Switch Relay Chart
for
Control Computer Input Substitute Panel

Switch Position				Flight Control Computer Relays Picked	Switch Position				Flight Control Computer Relays Picked
1	2	3	4		1	2	3	4	
0	0	0	+	A3K1-2-3-4	0	0	0	-	A1K19-20-21
0	0	+	0	A3K5-6-7	0	0	-	0	A1K22-23-24
0	0	+	+	A1K1-2-3	0	0	-	-	A2K6
0	+	0	0	A1K4-5-6	0	-	0	0	A3K25-26-27
0	+	0	+	A1K25-26-27	0	-	0	-	A2K3-4
0	+	+	0	A1K30-31	0	-	-	0	A2K6
0	+	+	+	A1K34-35-36	0	-	-	-	A2K5
+	0	0	0	A2K1-2	-	0	0	0	A3K28-29-30
+	0	0	+	A2K3-4	-	0	0	-	A1K32-33
+	0	+	0	A2K1-2	-	0	-	0	A1K28-29
+	0	+	+	A3K31-32-33	-	0	-	-	A1K10-11-12
+	+	0	0	A2K5	-	-	0	0	A1K7-8-9
+	+	0	+	A1K16-17-18	-	-	0	-	A3K12-13-14-15
+	+	+	0	A1K13-14-15	-	-	-	0	A3K8-9-10-11
+	+	+	+	SPARE	-	-	-	-	SPARE

3.4 FLIGHT CONTROL COMPUTER PANEL

The Flight Control Computer panel supplies partial control of the Flight Control Computer. The panel also indicates the status of attitude error command (ψ) and attitude rate signal ($\dot{\phi}$) inputs as well as the status of the control provided. Figure 3-6 identifies the control functions of the panel as well as the associated switches, indicator lamps, and meters.

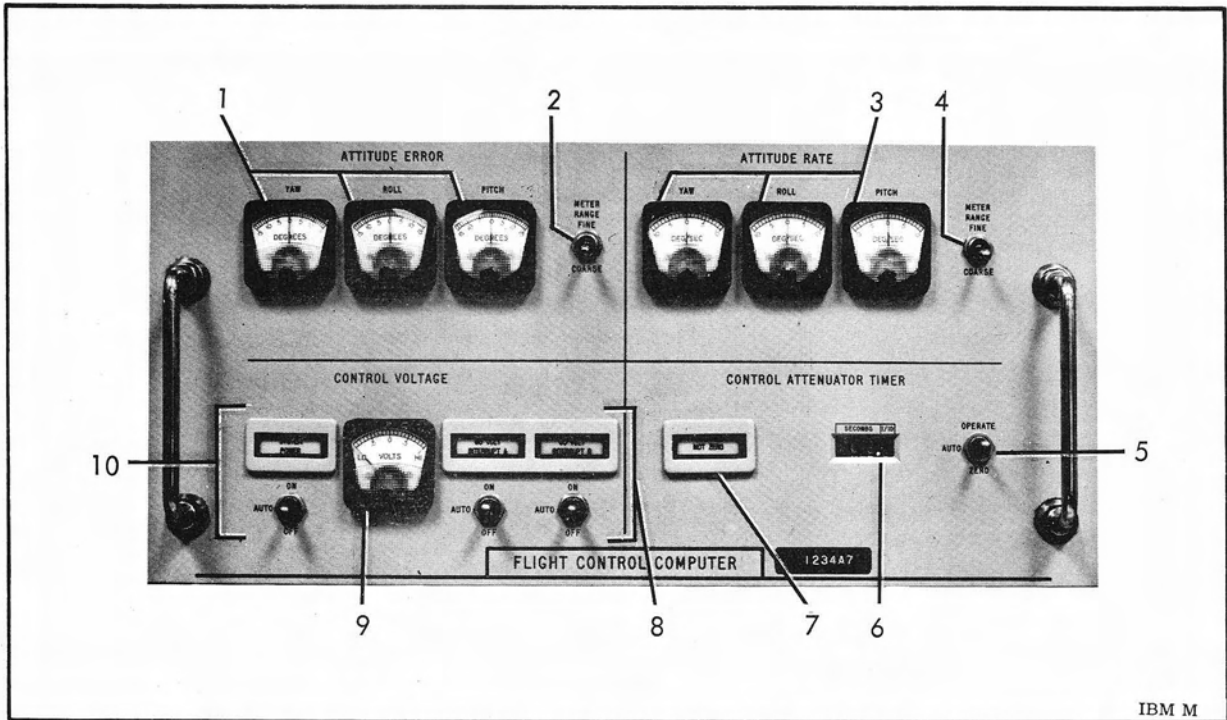


Figure 3-6 Flight Control Computer Panel

Legend for Figure 3-6

- All indicator lamps, unless listed separately, give an ON condition of the associated switch function.
- All switches with an AUTO position, when placed in that position, allow the associated function to be controlled by the S-IB Ground Control Computer (RCA-110A).

Index No.	Panel Designation	Purpose and Use
1	ATTITUDE ERROR	Measure guidance and stabilization inputs to the Flight Control Computer for their respective axis.
2	METER RANGE	Changes range of ATTITUDE ERROR meters (index number 1) from FINE range of 0±1.5 degrees to COARSE range of 0±15 degrees.
3	ATTITUDE RATE	Measure rate gyro inputs to Flight Control Computer for their respective axes.
4	METER RANGE	Changes range of ATTITUDE RATE meters (index number 3) from FINE range of 0±1 degree/second to COARSE range of 0±10 degrees/second.
5	CONTROL ATTENUATOR	Advances or "zeroes" CAT. Note: CAT is "zeroed" by advancing it completely through CAT cycle.
6	CAT	Shows amount of time CAT has run from zero position.
7	NOT ZERO	Indicates when CAT is not at zero position.
8	60 VOLT INTERRUPT A, B	Redundant switches used primarily by the KSC personnel to interrupt the output of the 60 Vdc Beta power supplies. This removes the S-IB Beta feed-back voltages. Both switches must be ON in order to achieve interrupt. By pulsing the 60 Vdc interrupt line, the Flight Control Computer is put into S-IB pre-burn mode. This mode is the same as S-IB burn mode with the exception that CAT remains at zero position.

Legend for Figure 3-6 (Cont)

Index No.	Panel Designation	Purpose and Use
9	CONTROL VOLTAGE	Shows any deviation from 8 volts on S-IB Beta monitor line. This shows status of the eight Beta power supplies since each supply furnish 1 volt for a total of 8 volts at the meter. Meter reads LO-0-HI which represents a 7-8-9 volt reading.
10	SYSTEM POWER	Controls power to Flight Control Computer.

3.5 S-IVB ENGINE DEFLECTION PANEL

The S-IVB Engine Deflection panel indicates S-IVB engine position and actuator current. It is also used to monitor Auxiliary Propulsion System relay and valve operation. Figure 3-7 identifies the panel functions and their associated instrumentation.

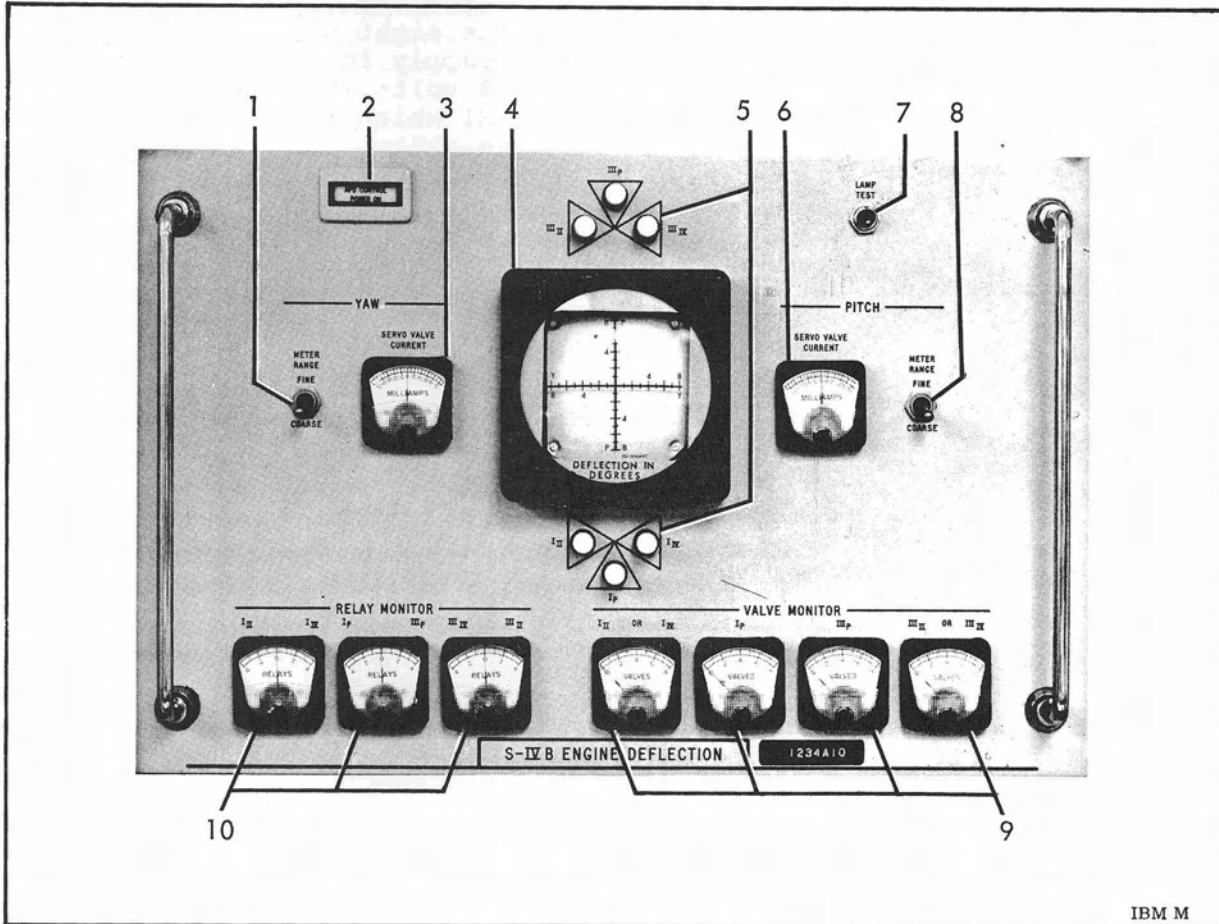


Figure 3-7 S-IVB Engine Deflection Panel

Legend for Figure 3-7

Index No.	Panel Designation	Purpose and Use
1	METER RANGE	Changes range of YAW SERVO VALVE CURRENT meter (index number 3) from FINE range of 0±5 milliamperes to COARSE range of 0±50 milliamperes.
2	APS CONTROL POWER ON	(Not Used)
3	SERVO VALVE CURRENT (YAW)	Measures servo valve (actuator valve) current of associated engine actuator.
4	DEFLECTION IN DEGREES	Vertical-horizontal coordinate type meter which visually indicates engine position. Pitch axis is on vertical scale, and yaw axis is on horizontal scale.
5	APS	Visually indicate that the associated APS jet (nozzle) is firing.
6	SERVO VALVE CURRENT (PITCH)	Serves same function as index number 3.
7	LAMP TEST	Lights APS INDICATOR lamps (index number 5) to test their reliability.
8	METER RANGE	Serves same function as index number 1.
9	VALVE MONITOR	Indicate whether all 8 valves* associated with a jet have operated correctly.**
10	RELAY MONITOR	Indicates whether all 4 relays* associated with a jet have operated correctly.**

*Each of the 6 APS jets is controlled by an attitude control relay module which contains 4 relays. Each of these relays controls a fuel valve and an oxidizer valve for a total of 8 valves per nozzle.

**Any reading of less than full scale on these meters is an indication of failure.

3.6 S-IB DEFLECTION PANEL

The S-IB Deflection panel measures actuator current for each of the eight S-IB Stage engine actuators. It also gives a visual indication of each of the four S-IB outboard engine positions. Figure 3-8 identifies the functions of the panel with their associated indicators, meters, and switches.

NOTE: Since the indication for each of the 4 engines is identical, only those functions for engine number 3 will be identified.

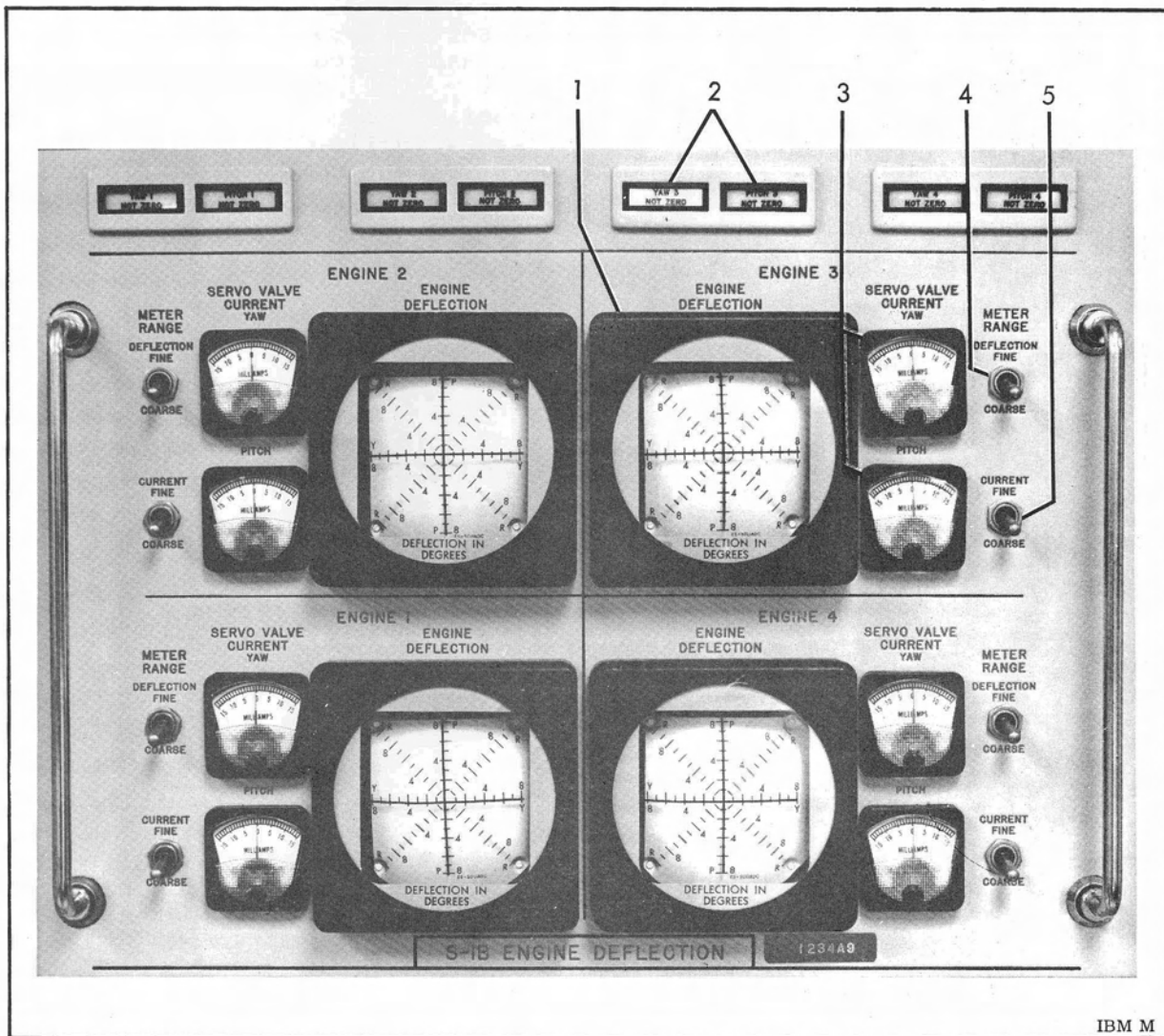


Figure 3-8 S-IB Engine Deflection Panel

Legend for Figure 3-8

Index No.	Panel Designation	Purpose and Use
1	ENGINE DEFLECTION	Positions of the 4 engines are shown on the four vertical-horizontal coordinate type ENGINE DEFLECTION meters. Pitch deflection is shown on the vertical axis, yaw deflection on the horizontal axis, and roll deflection is shown along resultant vector lines of the pitch and yaw deflections.
2	YAW 3 NOT ZERO, PITCH 3 NOT ZERO	Indicate when associated engine actuator is not at "zero" position.
3	SERVO VALVE CURRENT	Indicate difference in current between the two actuator coils*. Current is known as Delta I (ΔI).
4	METER RANGE DEFLECTION	Changes range ENGINE DEFLECTION meter (index number 1) from FINE range of 0.8 degree for full deflection to COARSE range of 8 degrees for full deflection.
5	METER RANGE CURRENT	Changes range of the SERVO VALVE CURRENT meters (index number 3) from FINE range of 0±1.5 milliamperes to COARSE range of 0±15 milliamperes.

*The four S-IB outboard engines utilize two dual-coil, push-pull type actuators.

3.7 CONVERTER NO. 1 AND QUICK LOOK PANELS

The Converter No. 1 and Quick Look panels provide a means of reading a Telemetry/Digital Data Acquisition System (TM/DDAS) input signal to the Electrical Support Equipment.

The Quick Look panel shown in Figure 3-9 furnishes a digital and analog display of the selected TM/DDAS input signal. Four rotary switches mounted on the panel are used to select this desired signal. Selection coding may be found by referring to the Instrumentation Program and Components (IP & C) list.

The Converter No. 1 panel (also shown in Figure 3-9) provides a direct-reading, analog conversion of the TM/DDAS signal selected by the Quick Look panel.

Switch and indicator functions are shown and explained in the figure.

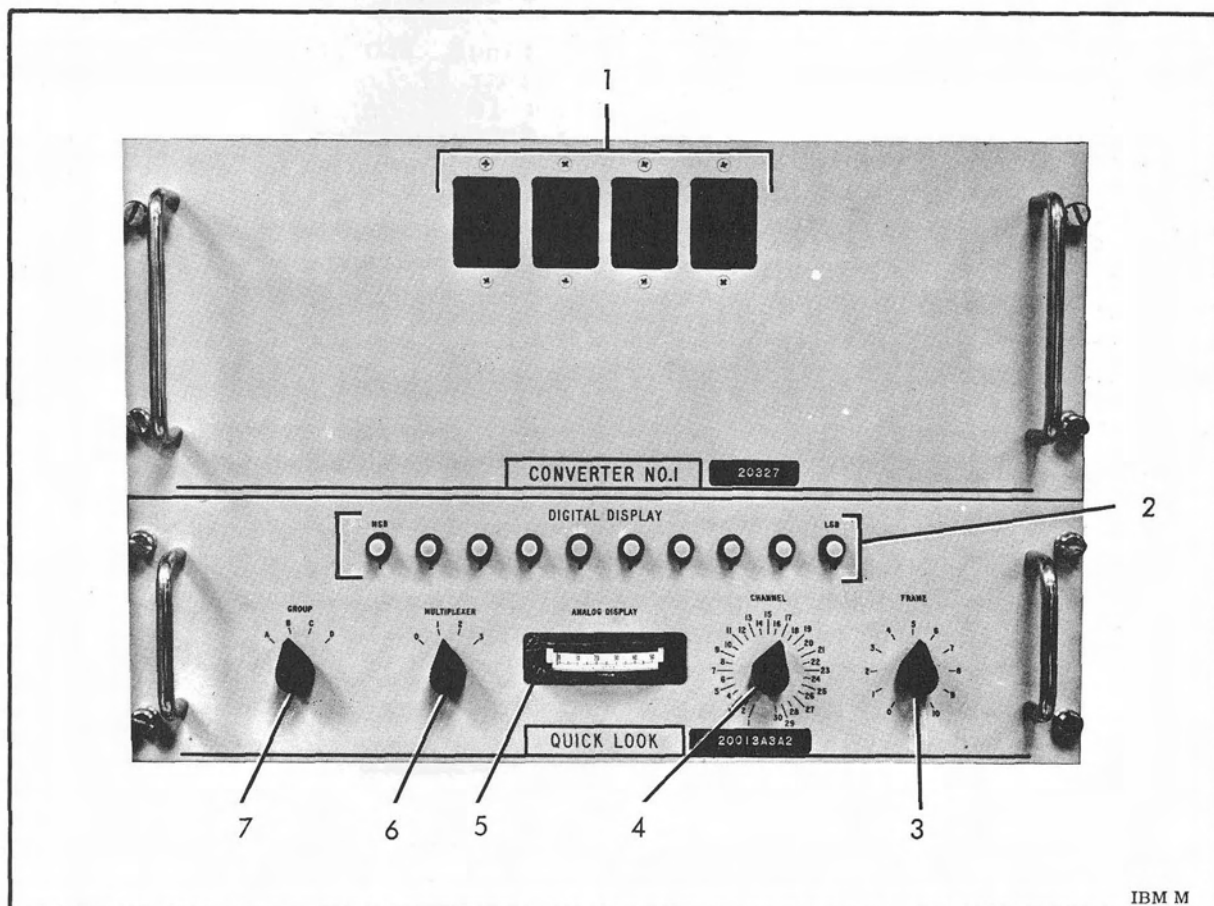


Figure 3-9 Converter No. 1 and Quick Look Panels

Legend for Figure 3-9

Index No.	Panel Designation	Purpose and Use
1	DIRECT NUMERICAL READOUT	Provide direct, numerical readout of the input signal selected by the Quick Look panel. It is an analog conversion of digital TM/DDAS signal.
2	DIGITAL DISPLAY	Provides a digital display of TM/DDAS signal selected by selector switches (index numbers 3, 4, 6, 7).
3	FRAME	Selects TM/DDAS frame to be displayed by these panels.
4	CHANNEL	Selects TM/DDAS channel to be displayed by these panels.
5	ANALOG DISPLAY	Provides analog reading of the selected input signal. It is an analog conversion of digital TM/DDAS signal.
6	MULTIPLEXER	Selects desired multiplexer output to be displayed by these panels.
7	GROUP	Selects desired multiplexer group for display by these panels.

3.8 DVM AND DVM SELECTOR PANELS

The Digital Voltmeter (DVM) panel is a Model 5001, transistorized digital voltmeter manufactured by Electronics Associates, Inc. The panel provides a direct numerical readout of the voltage selected by the DVM Selector panel.

The Digital Voltmeter (DVM) Selector panel provides a means of input switching to the Digital Voltmeter. The panel functions are shown in Figure 3-10. Internal wiring of the selector panel is given in Appendix B.

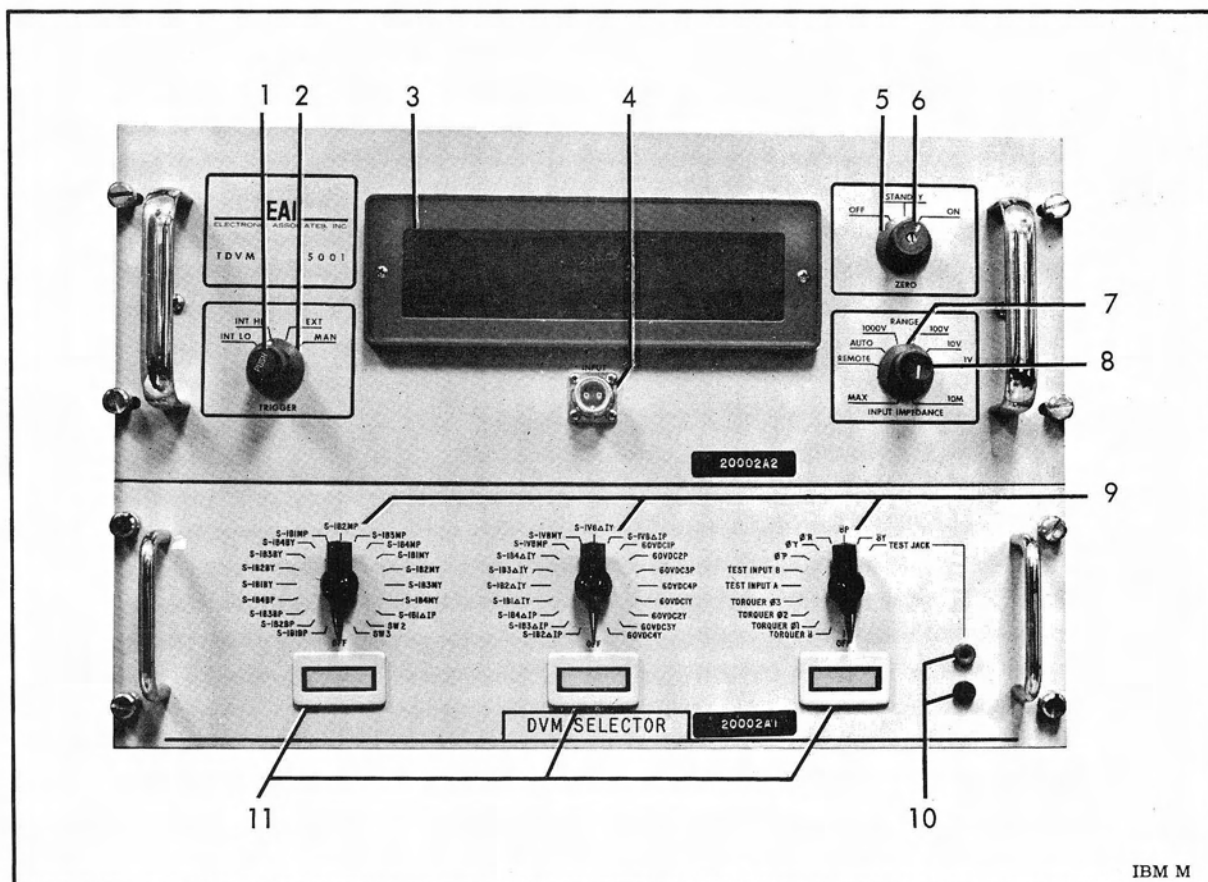


Figure 3-10 DVM and DVM Selector Panels

Legend for Figure 3-10

Index No.	Panel Designation	Purpose and Use
1	TRIGGER	Permits manual control of sampling rate of DVM. Each depression of the push-button triggers the sampling circuits for one display reading.
2	INT LO thru MAN	Selects desired sampling rate for test voltage readings. INT LO: 2 cps INT HI: 200 cps EXT : Utilizes ext trig sources. MAN : Sampling rate is controlled by index No.1.
3	DIRECT NUMERICAL READOUT	Provides a direct, numerical readout of the voltage selected by the DVM Selector panel.
4	INPUT	Permits external voltages (other than those selected by DVM Selector panel) to be measured by this panel.
5	OFF-STANDBY-ON	Power control switch. In STANDBY, input circuits are open, but power supplies are energized. In ON position, all circuits are energized and input jacks are connected to input circuitry.
6	ZERO	Permits zero-setting of indicator.
7	INPUT IMPEDANCE	Selects desired input impedances for 1 and 10 volt ranges.
8	RANGE	Selects REMOTE, AUTO, or manual range of READOUT indicator (index number 3).
9	SW1, SW2, SW3	Connect panel inputs (as designated on switch) to panel output. SW1 must be in SW2 or SW3 position for those switches to be electrically operative.
10	TEST JACK	Allows external voltages to be measured by DVM. TEST JACK is selected by SW3.
11	SW1, SW2, SW3	Indicate which switch (index number 9) is in use.

3.9 ENGINE ACTUATOR SUBSTITUTE PANEL

The engine actuator substitute panel provides an electronic substitute for the engine actuators. Figure 3-11 visually identifies the control functions of the panel with their associated switches, meters, and indicators.

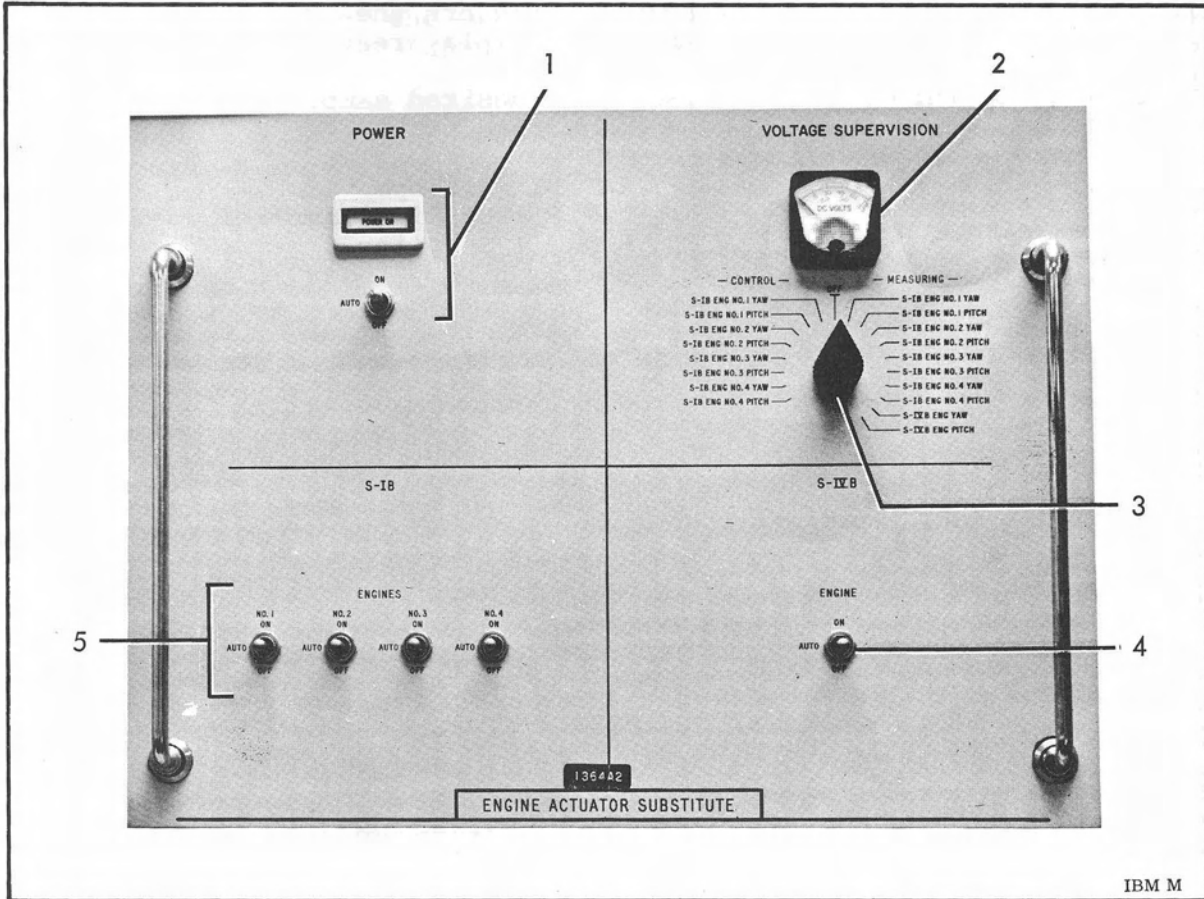


Figure 3-11 Engine Actuator Substitute Panel

Legend for Figure 3-11

Index No.	Panel Designation	Purpose and Use
1	POWER ON	Provides power to the 1364A12 power supply (see Figure 3.2). This supply provides voltage for substitute actuator operation.
2	VOLTAGE SUPERVISION	Measures voltage selected by VOLTAGE SUPERVISION switch (index number 3). Meter has a range of 0 to 75 volts when a CONTROL function is selected and 0 to 7.5 volts when a MEASURING function is selected.
3	VOLTAGE SUPERVISION	Output of desired 60-volt "Beta" power supply may be monitored by selecting a CONTROL function. By selecting a MEASURING function, desired 5-volt excitation voltage for engine actuator measuring potentiometers may be measured.
4	S-IVB ENGINE	Selects associated substitute actuator.
5	S-IB ENGINE	Same as index number 4.

3.10 ESE RAMP CONTROL PANEL

The ESE Ramp Control Panel (Figure 3-12) provides a means to over-ride the S-IB Ground Control Computer ramp functions.

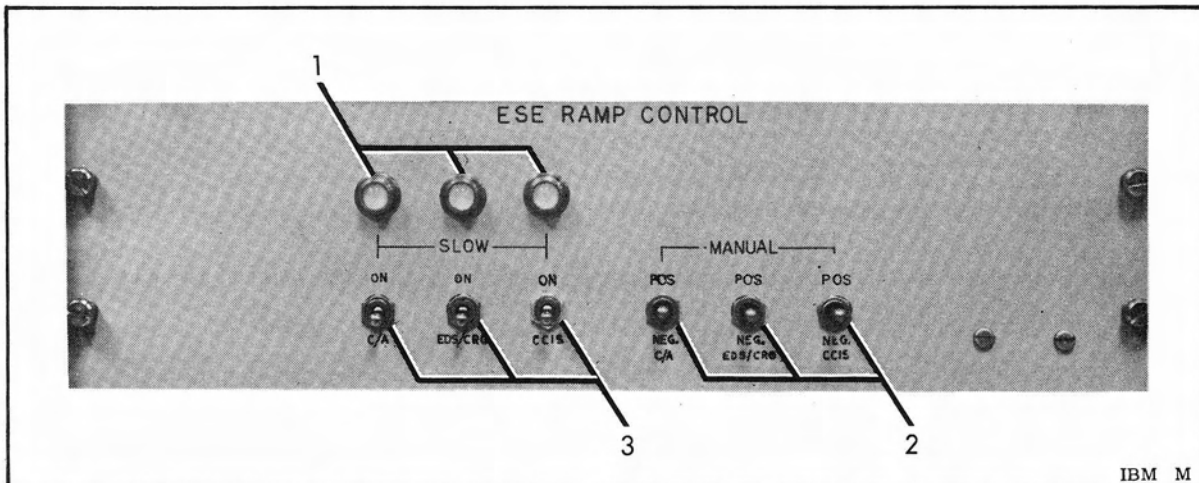


Figure 3-12 ESE Ramp Control Panel

Legend for Figure 3-12

Index No.	Panel Designation	Purpose and Use
1	SLOW	Indicates that the SLOW RAMP is ON.
2	MANUAL	Causes output of operational amplifiers to increase in the direction selected by switch operation. Provides the operator with a way to over-ride the S-IB Ground Control Computer.
3	SLOW	Provides the operator with a way to over-ride the S-IB Ground Control Computer for SLOW RAMP operation of the associated panel. C/A = Control Accelerometer EDS/CRG = EDS/Control Rate Gyro CCIS = Control Computer Input Substitute

3.11 CONTROL COMPUTER TEST PANEL

The Control Computer Test Panel provides the controls for Redundancy Check No. 5 and Slow Ramp Control of the S-IB Ground Control Computer. The panel with its associated switches and indicators is shown on Figure 3-13.

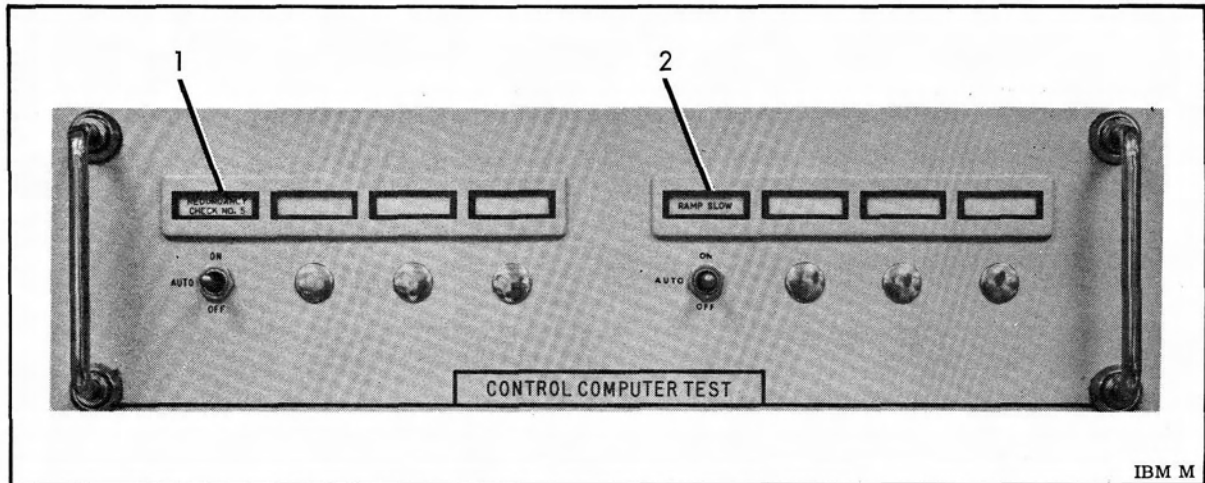


Figure 3-13 Control Computer Panel

Legend for Figure 3-13

All switches with an AUTO position, when placed in that position allow the associated function to be controlled by the S-IB Ground Control Computer (RCA-110A).		
Index NO.	Panel Designation	Purpose and Use
1	REDUNDANCY CHECK NO. 5 ON/OFF	Indicates that redundant check No. 5 has been selected. Used to select redundant check No. 5.
2	RAMP SLOW ON/OFF	Indicates that the slow ramp switch is ON. Used to provide a slow ramp input for the operational amplifiers in the S-IB Ground Control Computer.

APPENDIX A

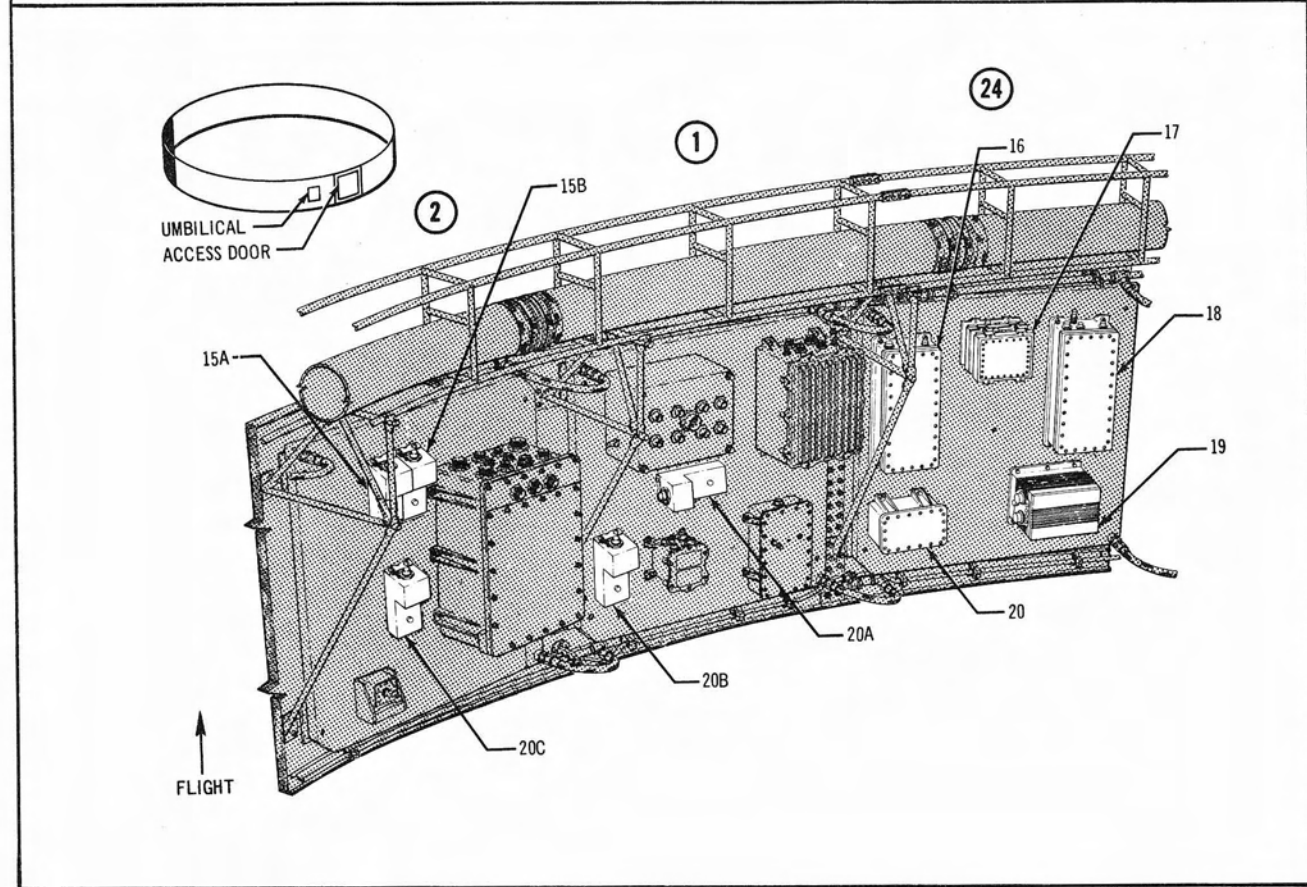
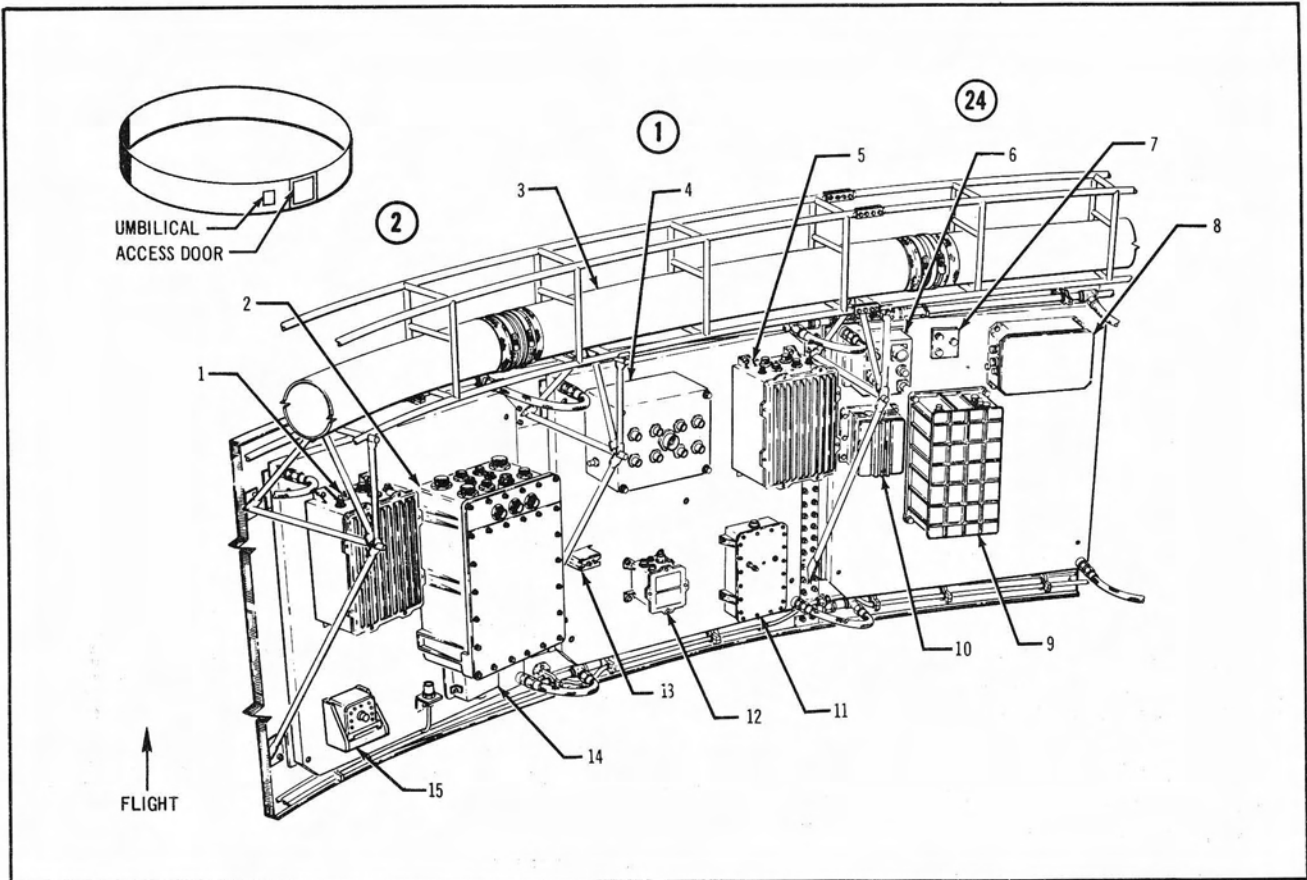
INSTRUMENT UNIT PHYSICAL LAYOUT DRAWINGS

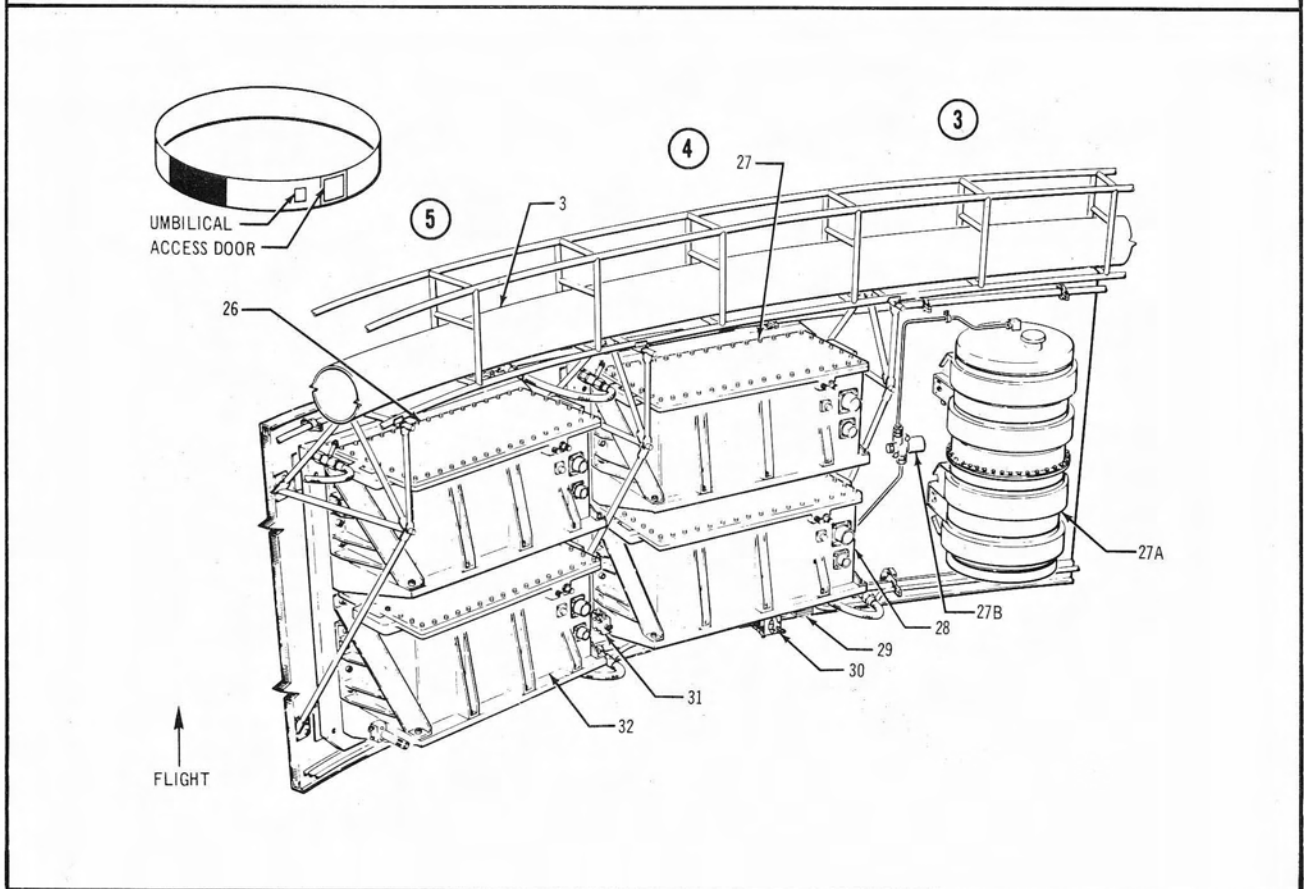
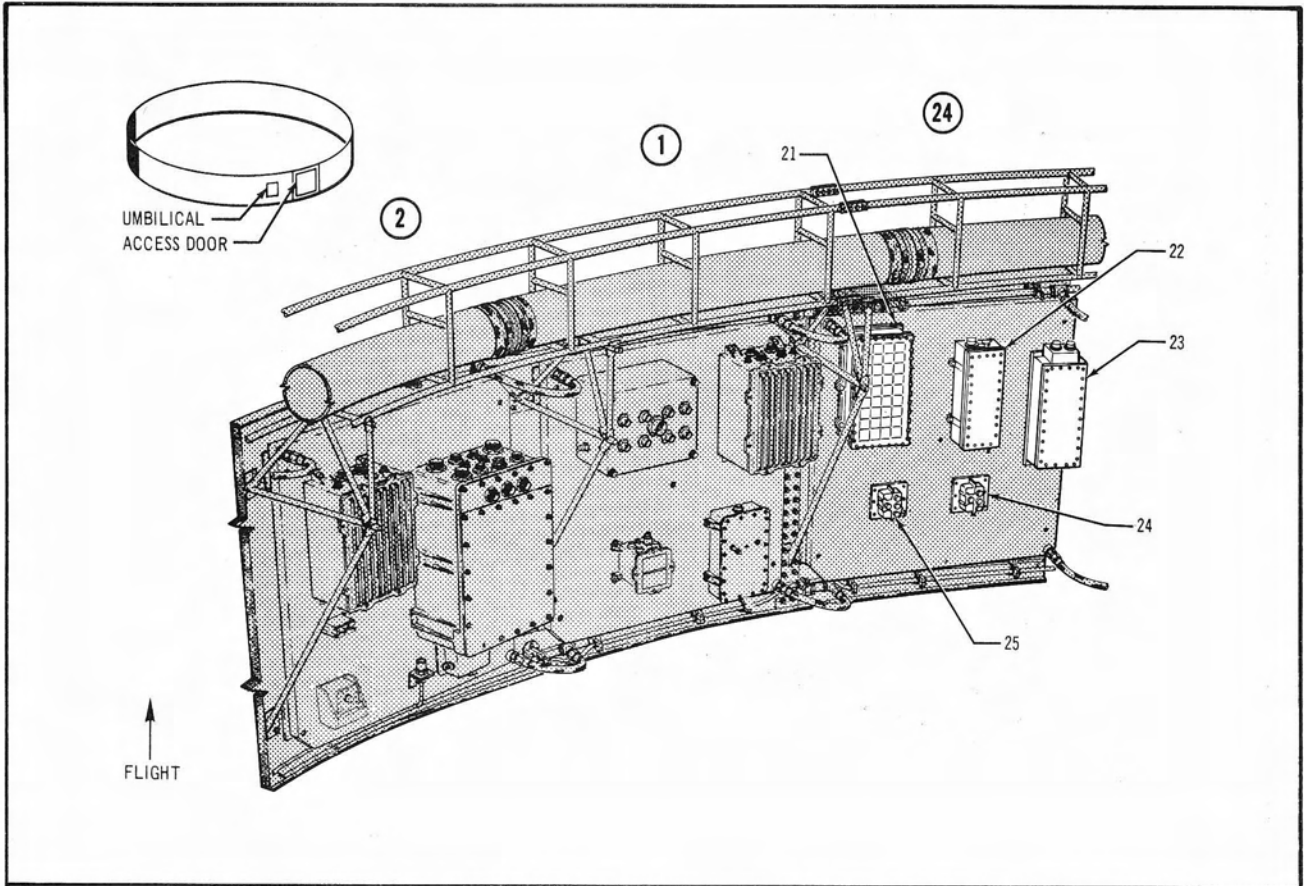
In the following drawings, the flight hardware is not identified by vehicle effectivity. If effectivity information is needed, the IU System Description and Component Data Manual should be consulted.

More than one view of an IU location panel may be shown to illustrate changing configurations. Shaded areas indicate hardware which has not been affected by the change.

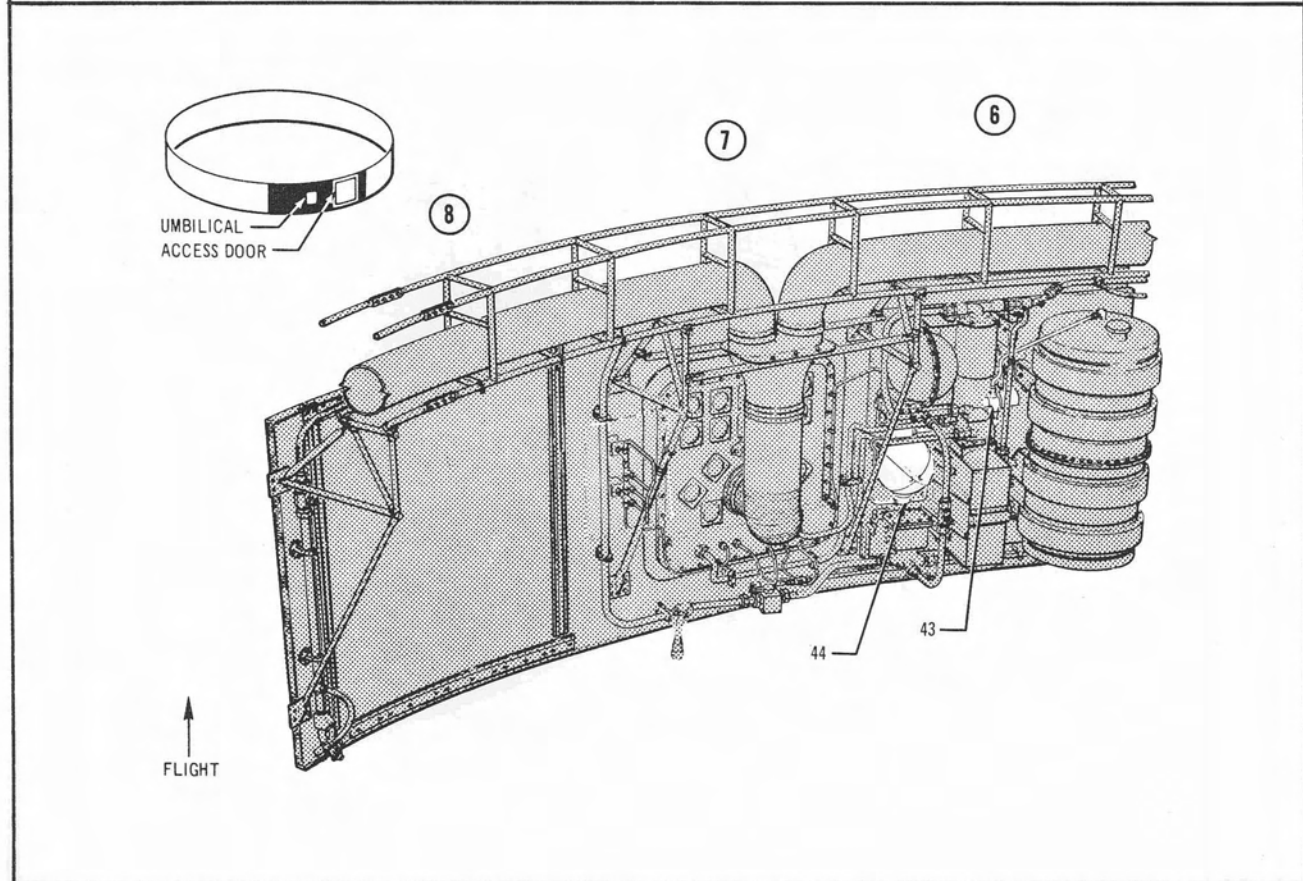
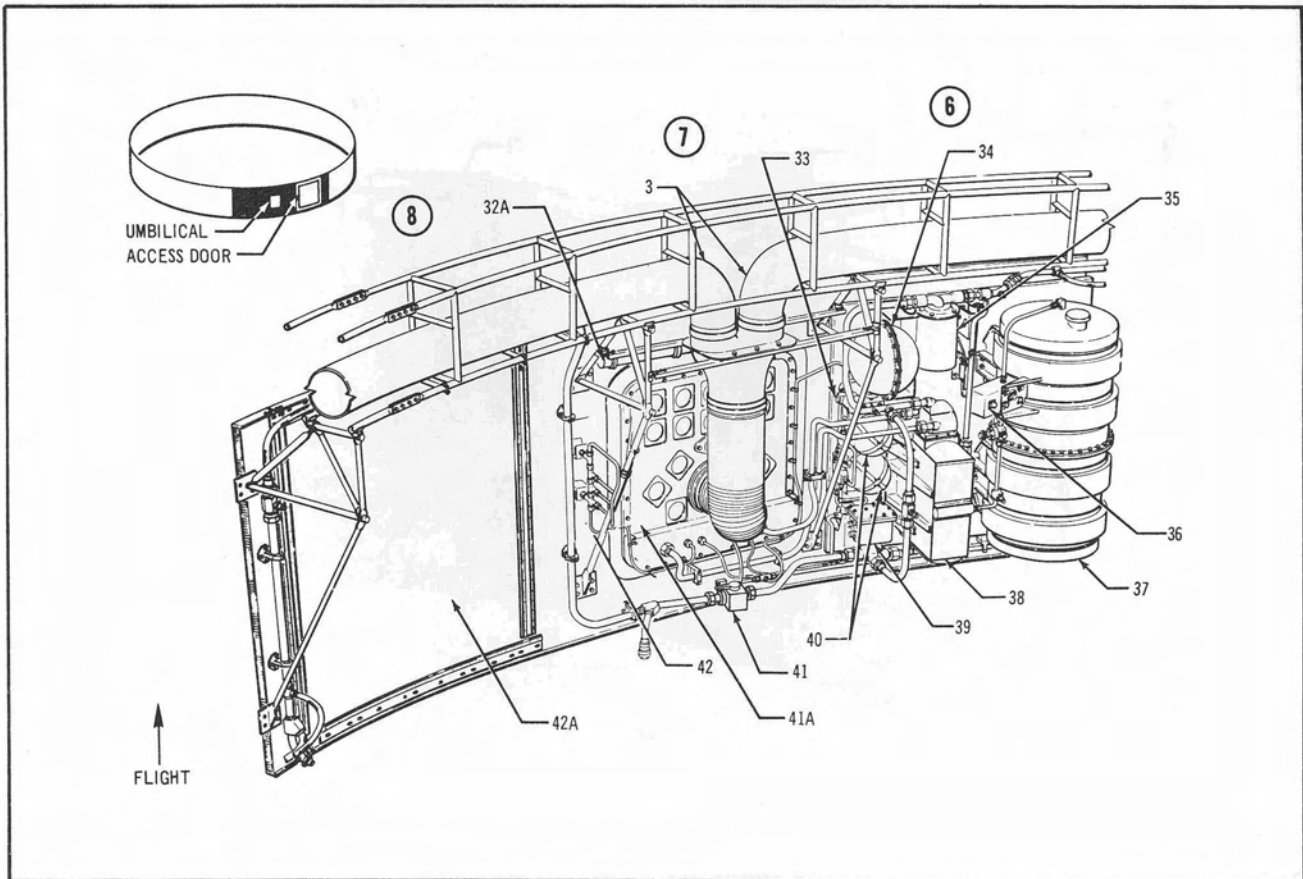
The Instrument Unit physical layout drawings are included as an aid to locating the flight hardware described in this volume.

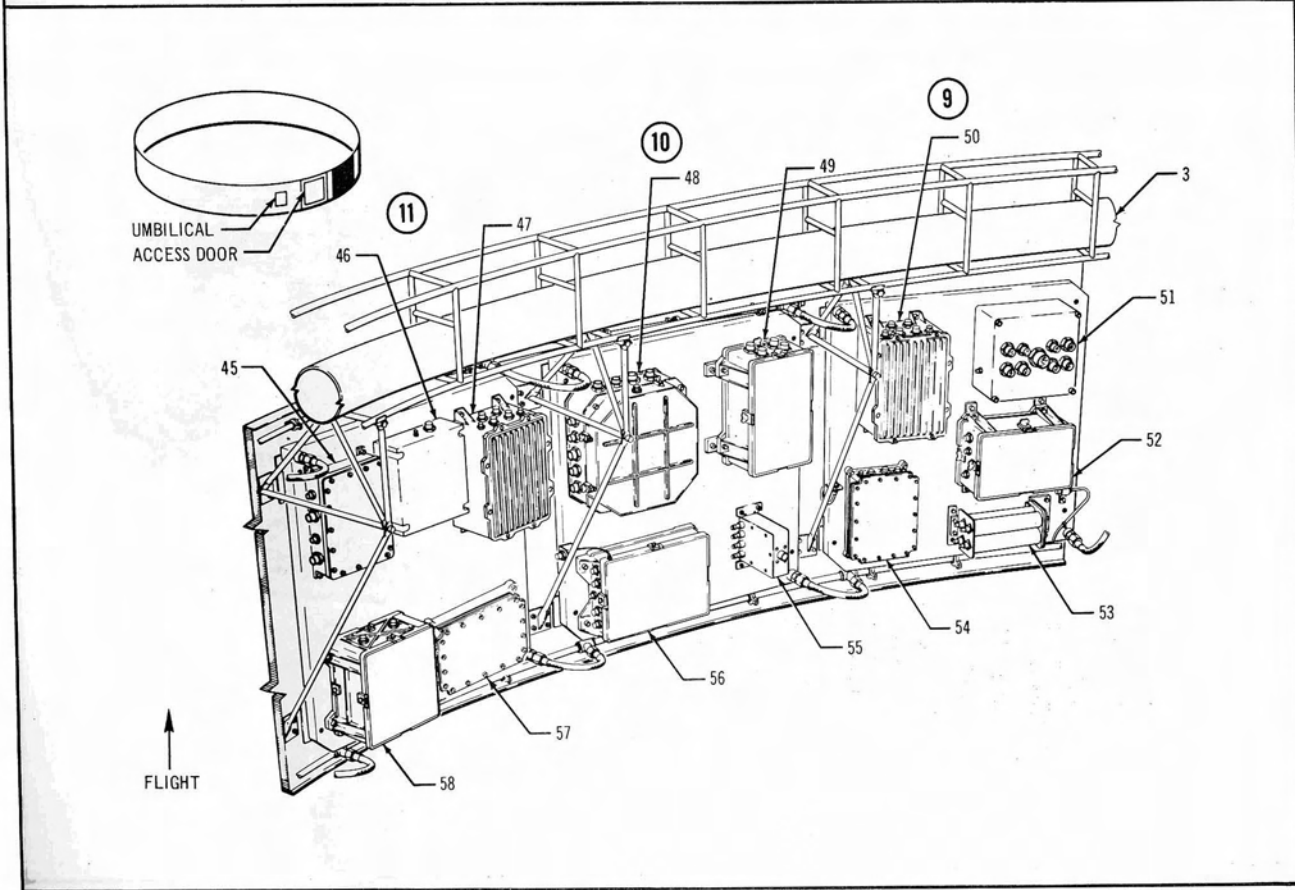
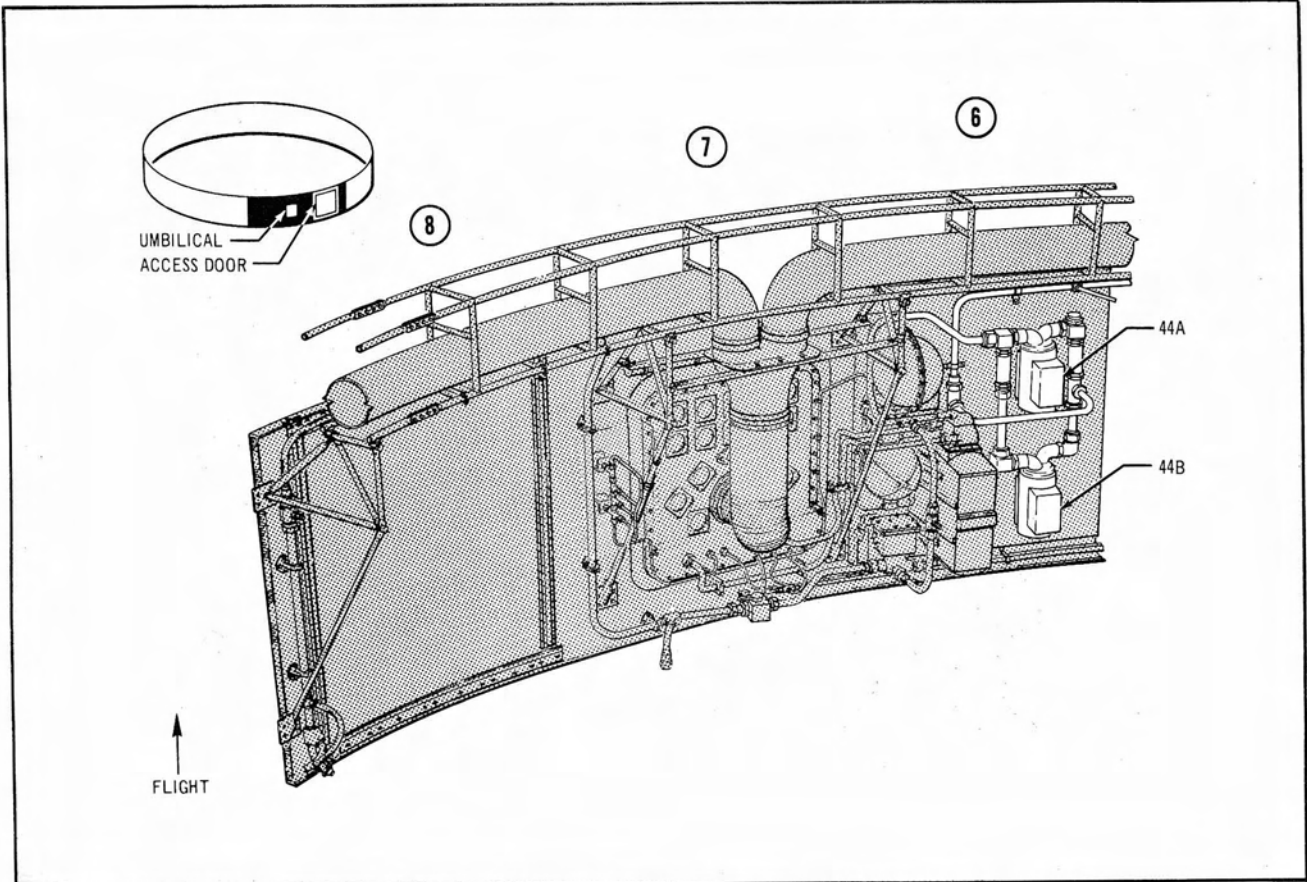
VOLUME I
CONTROL SYSTEM



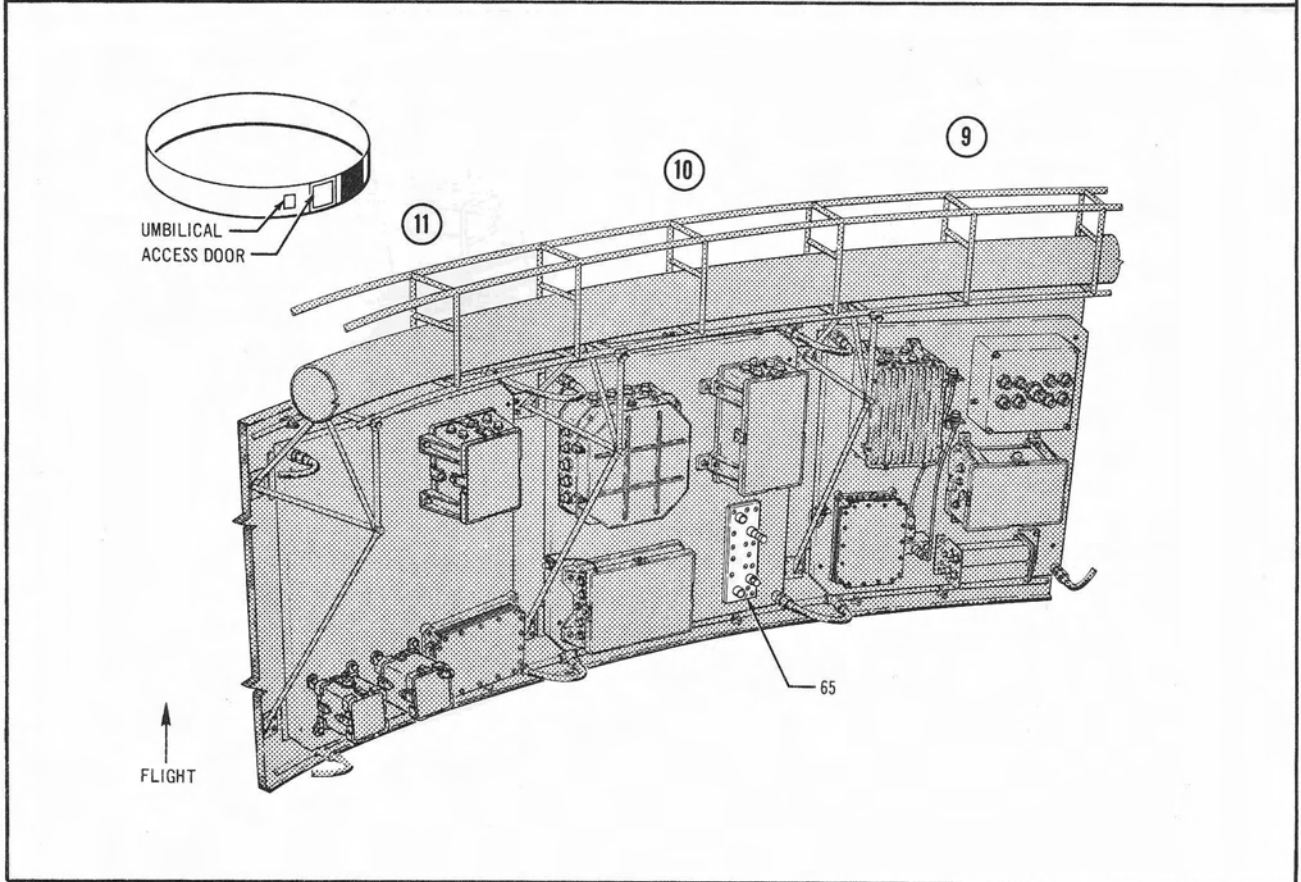
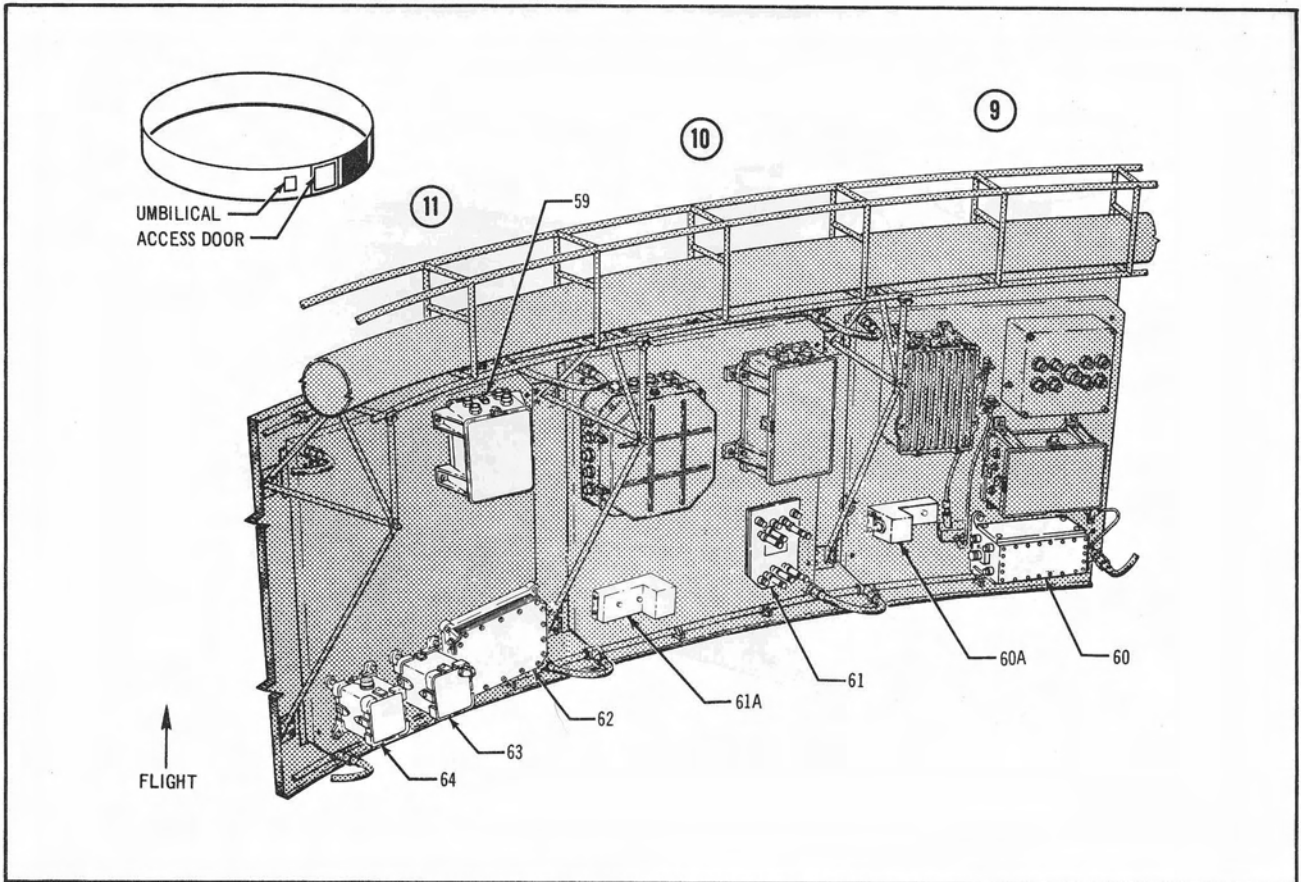


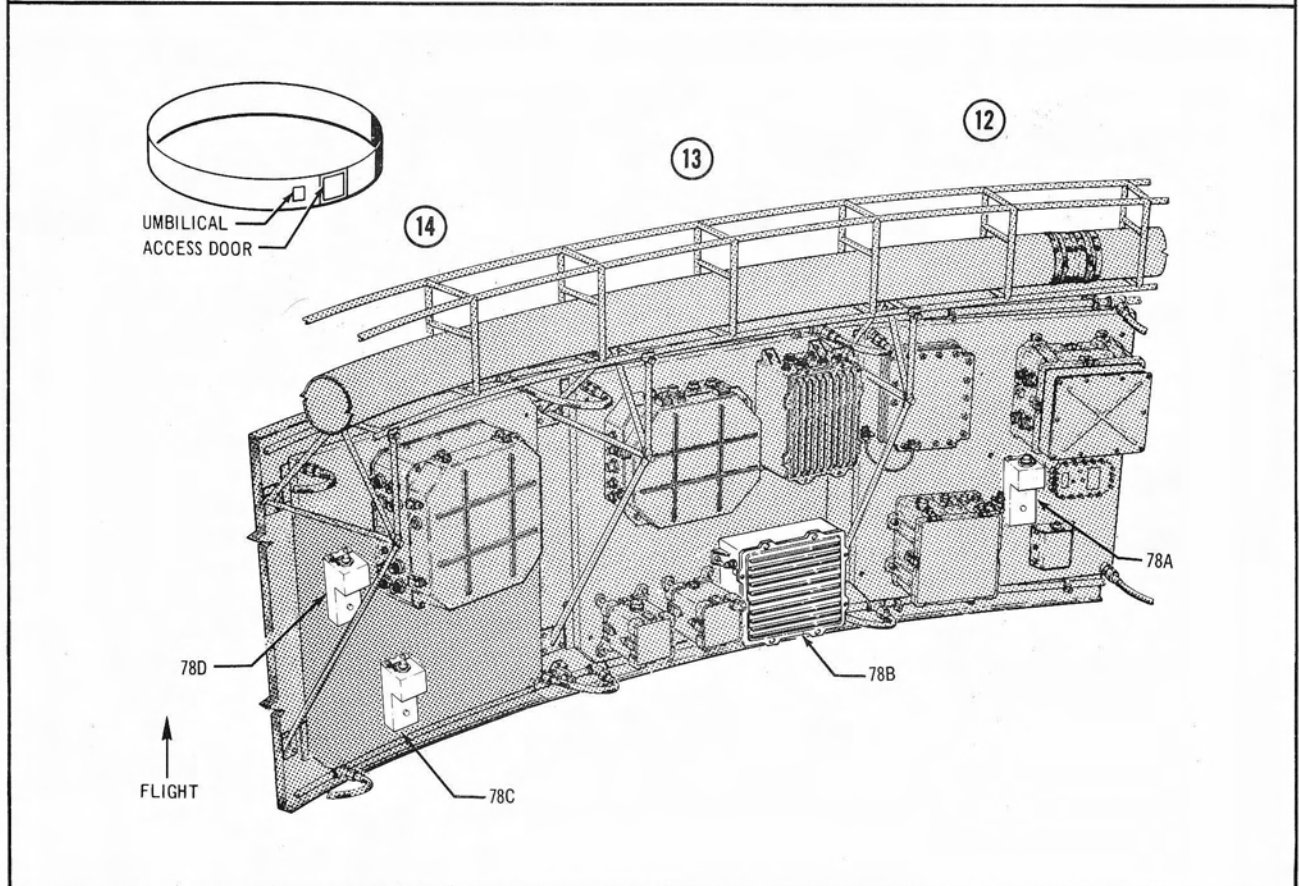
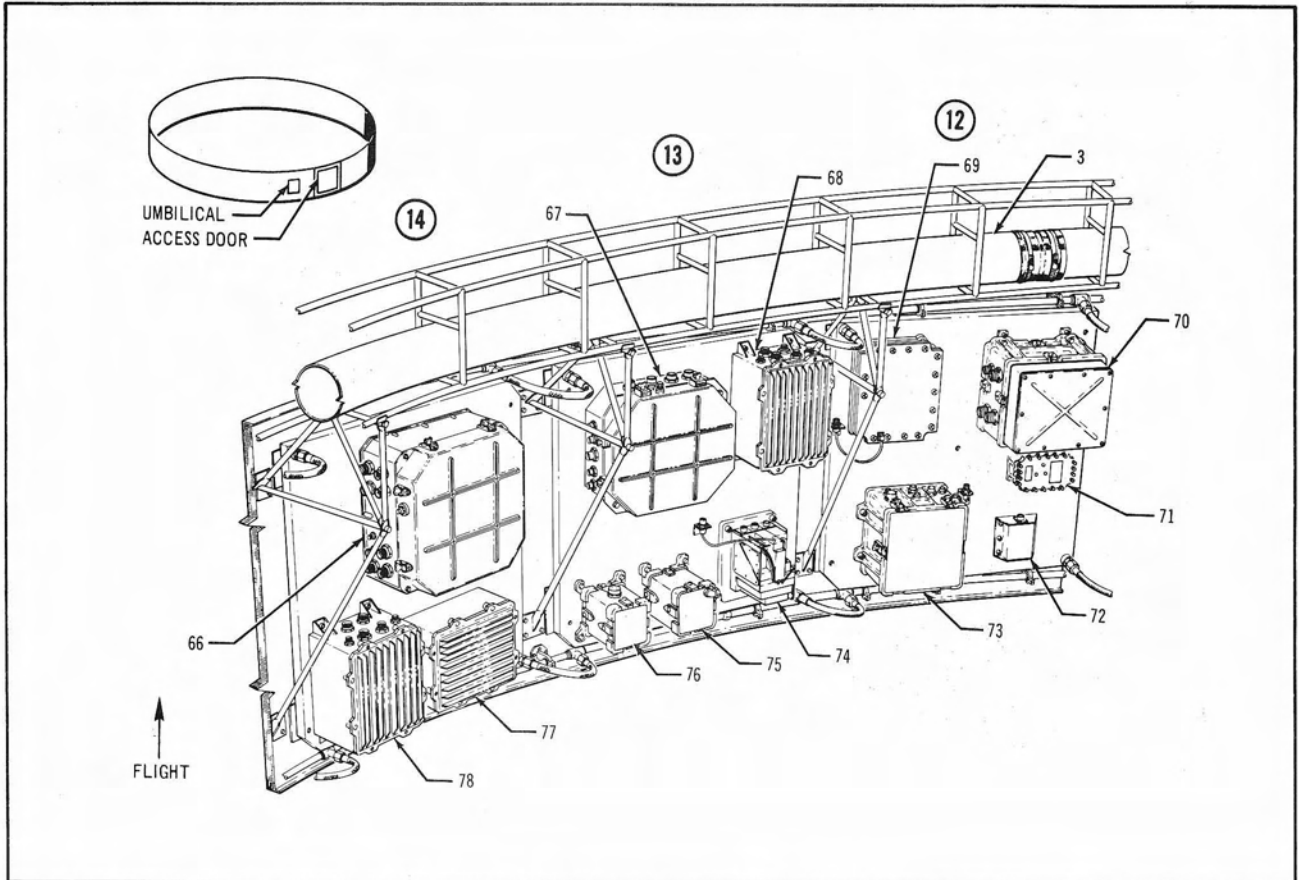
VOLUME I
CONTROL SYSTEM



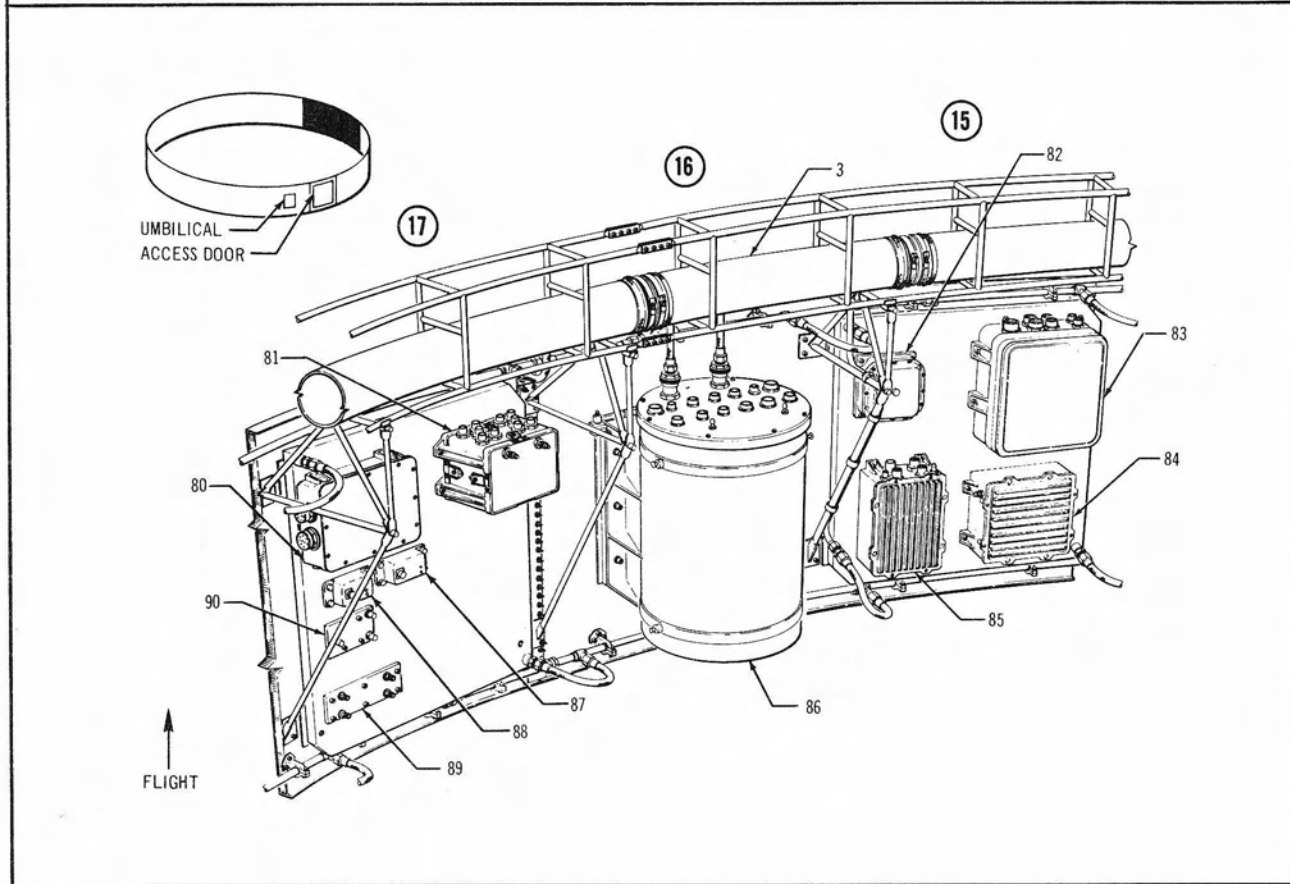
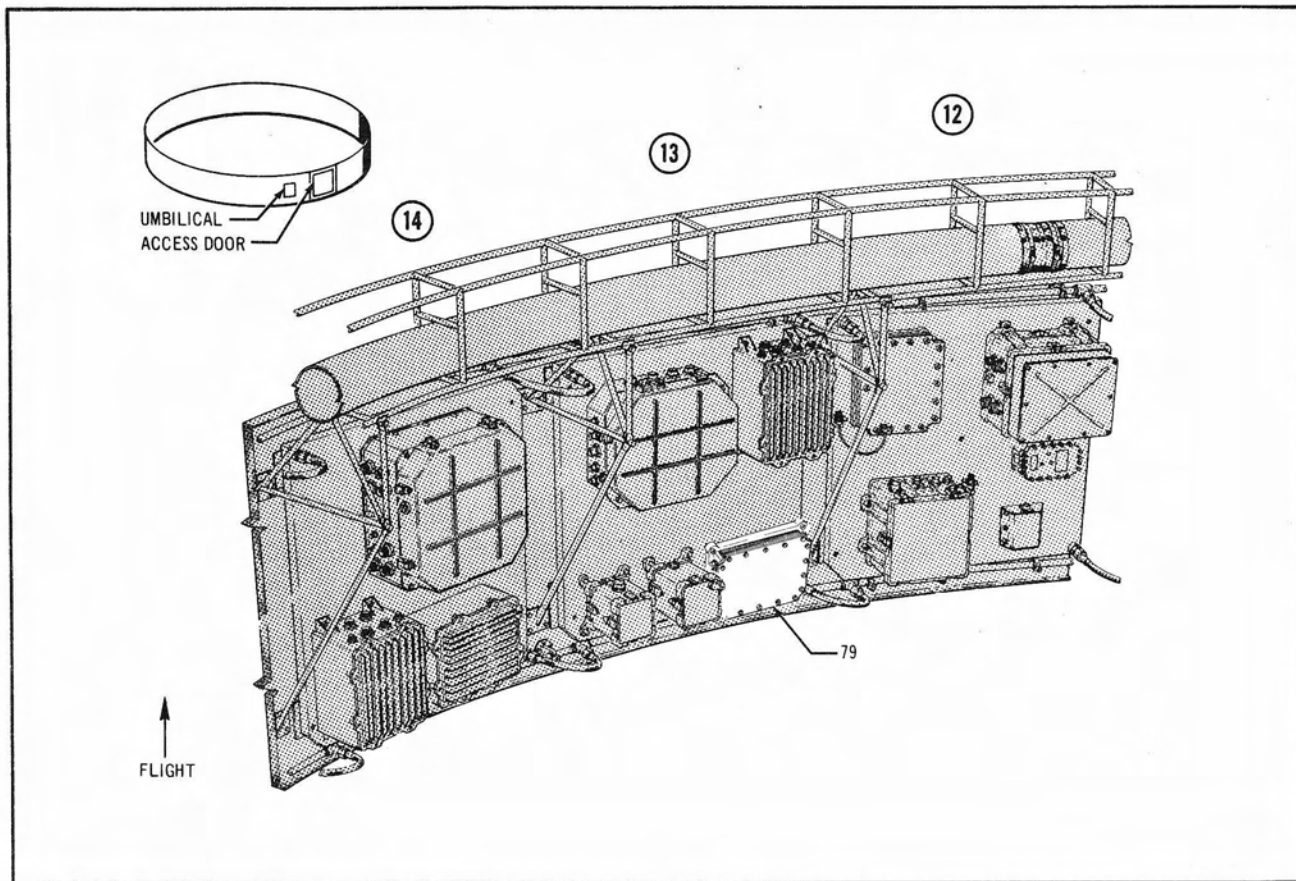


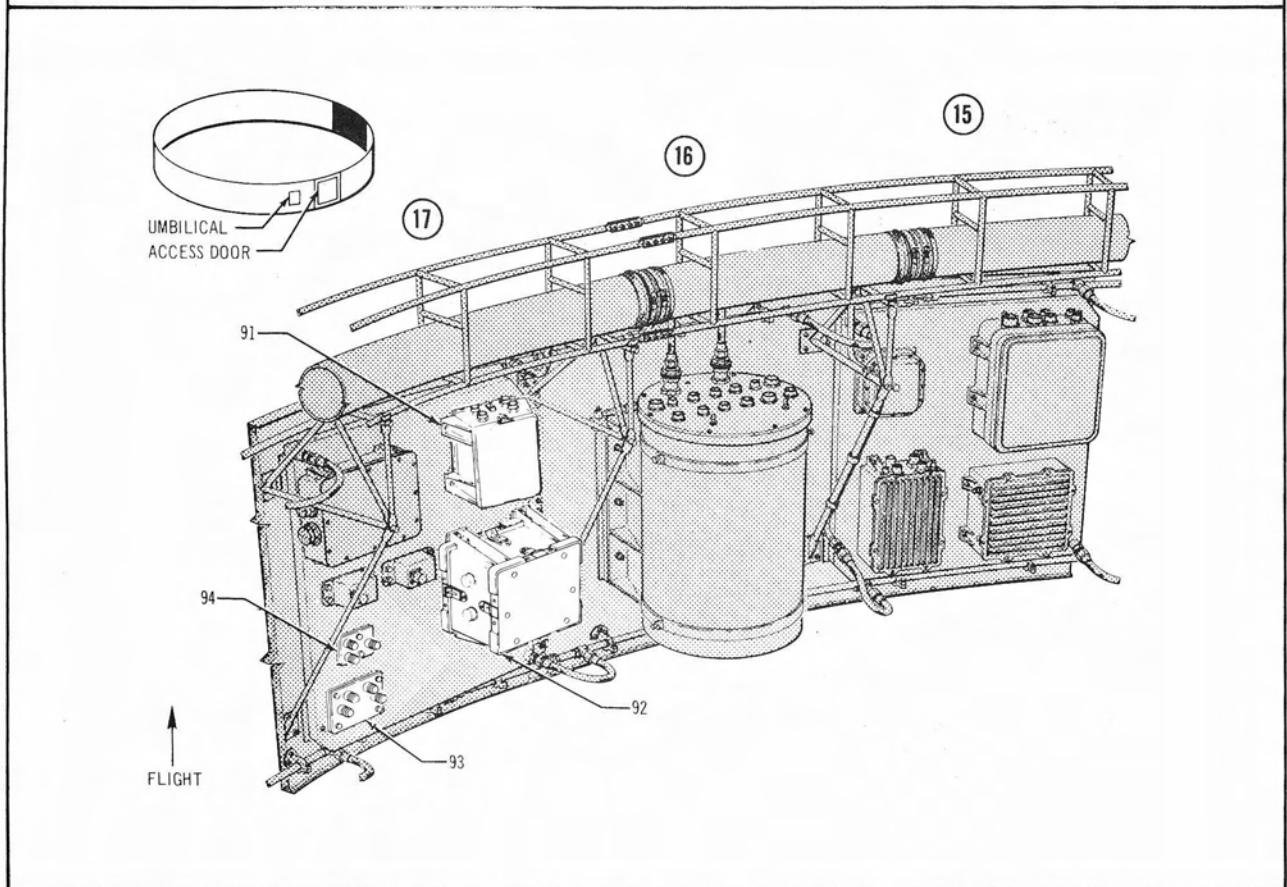
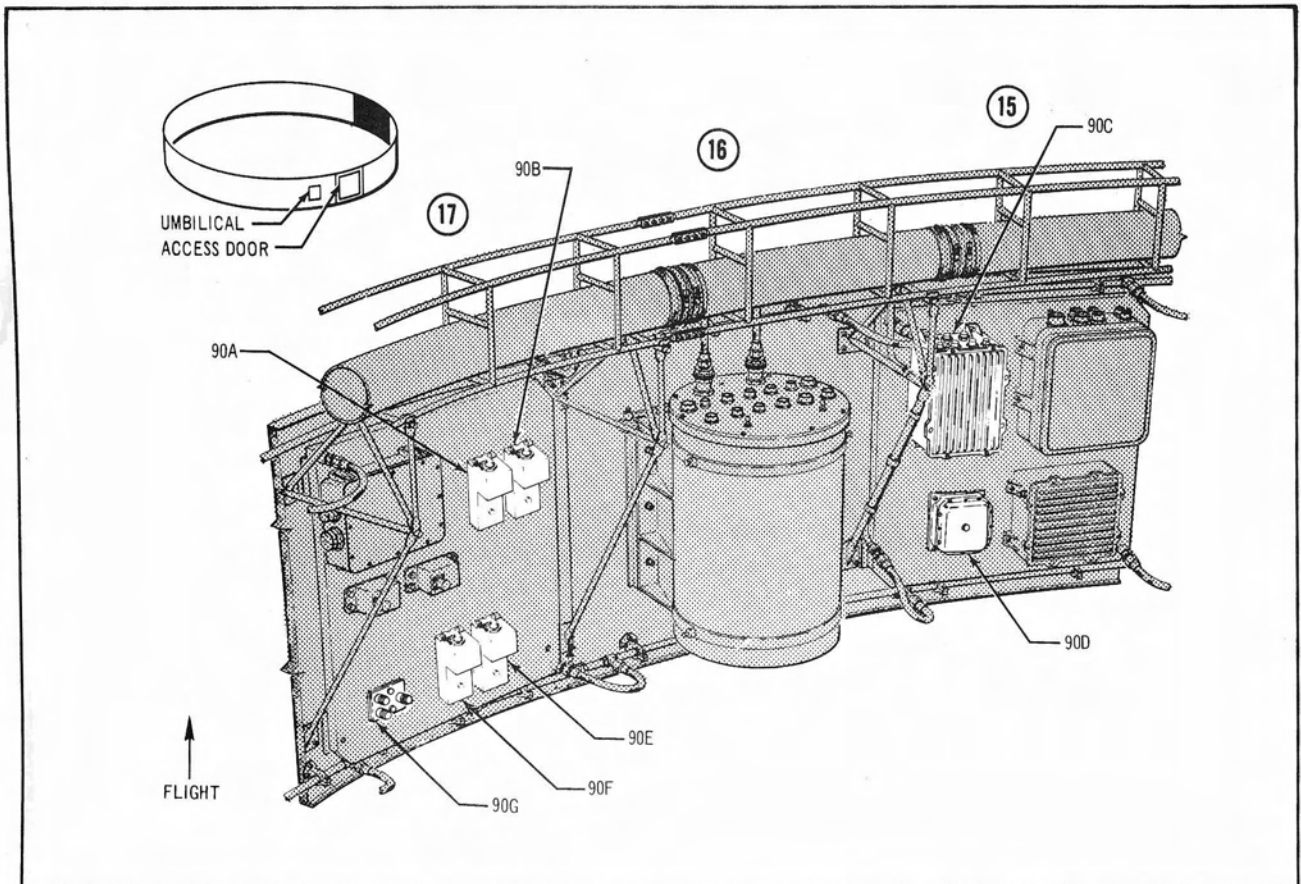
VOLUME I
CONTROL SYSTEM

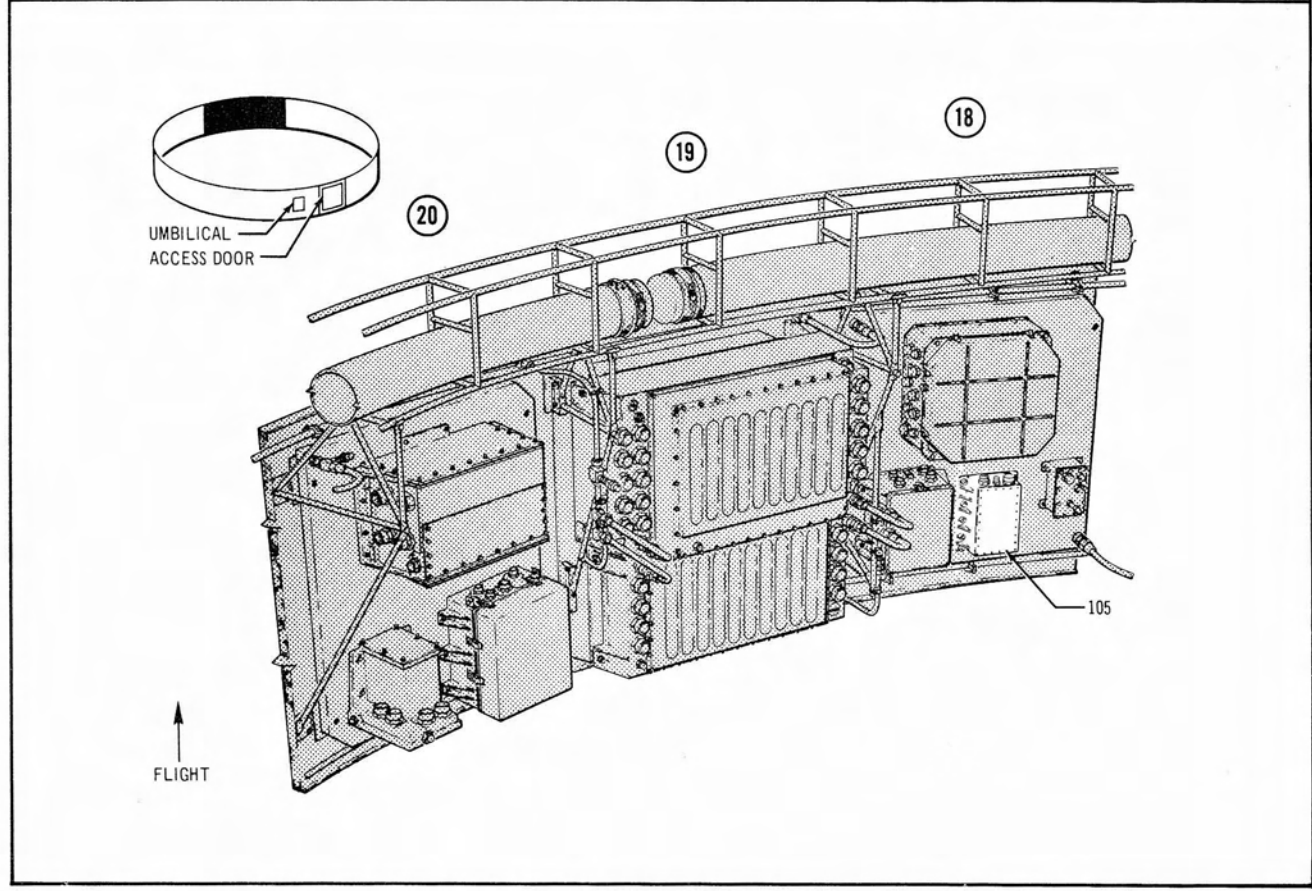
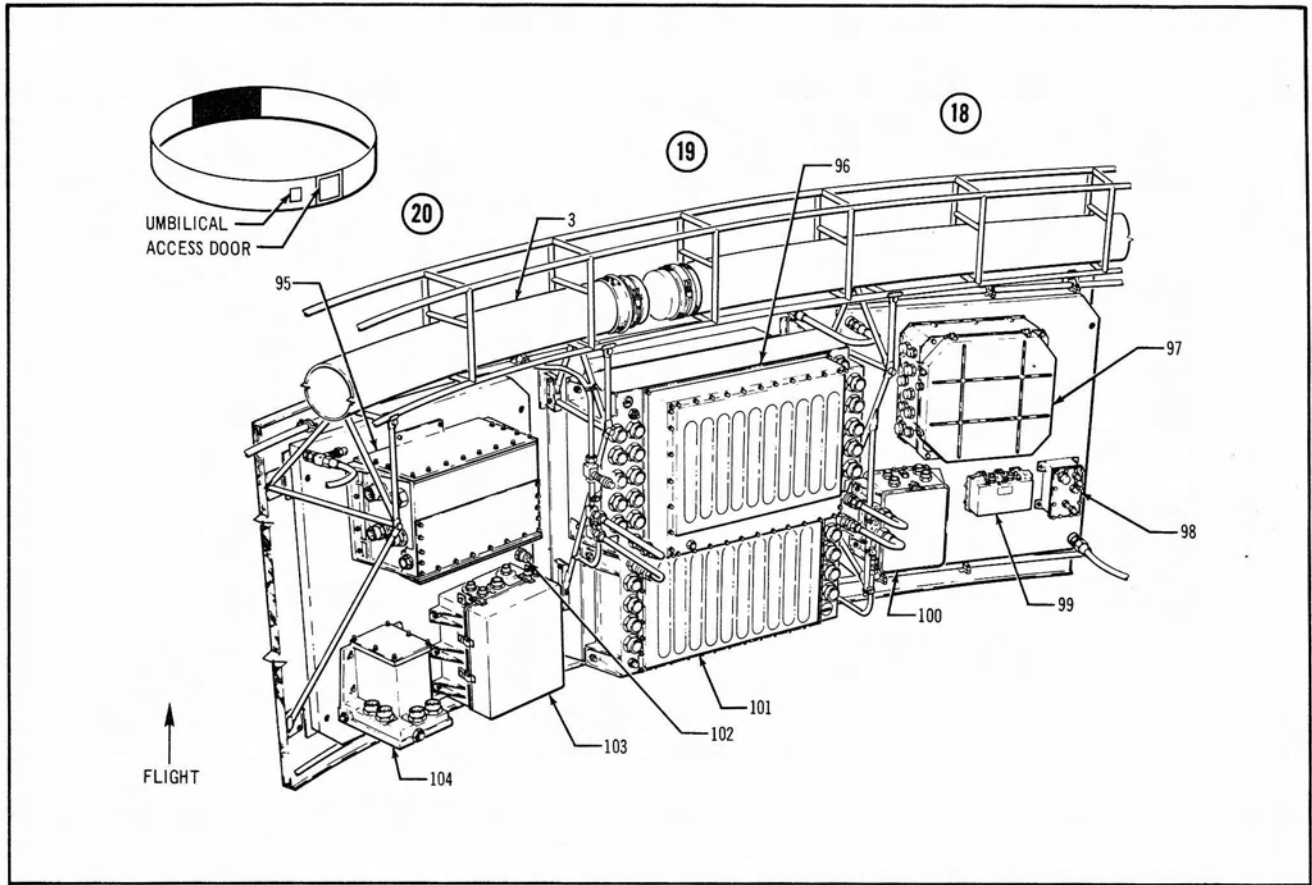


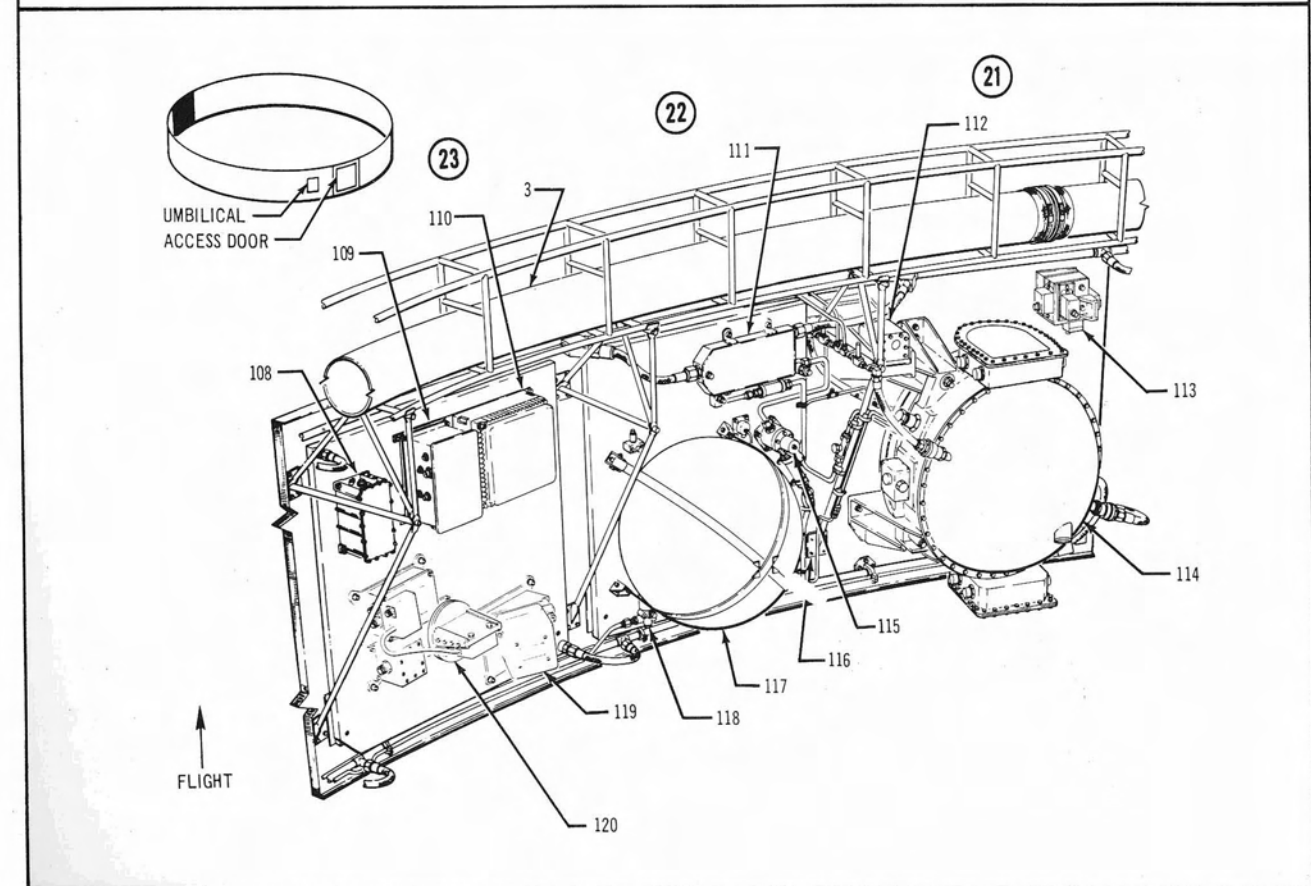
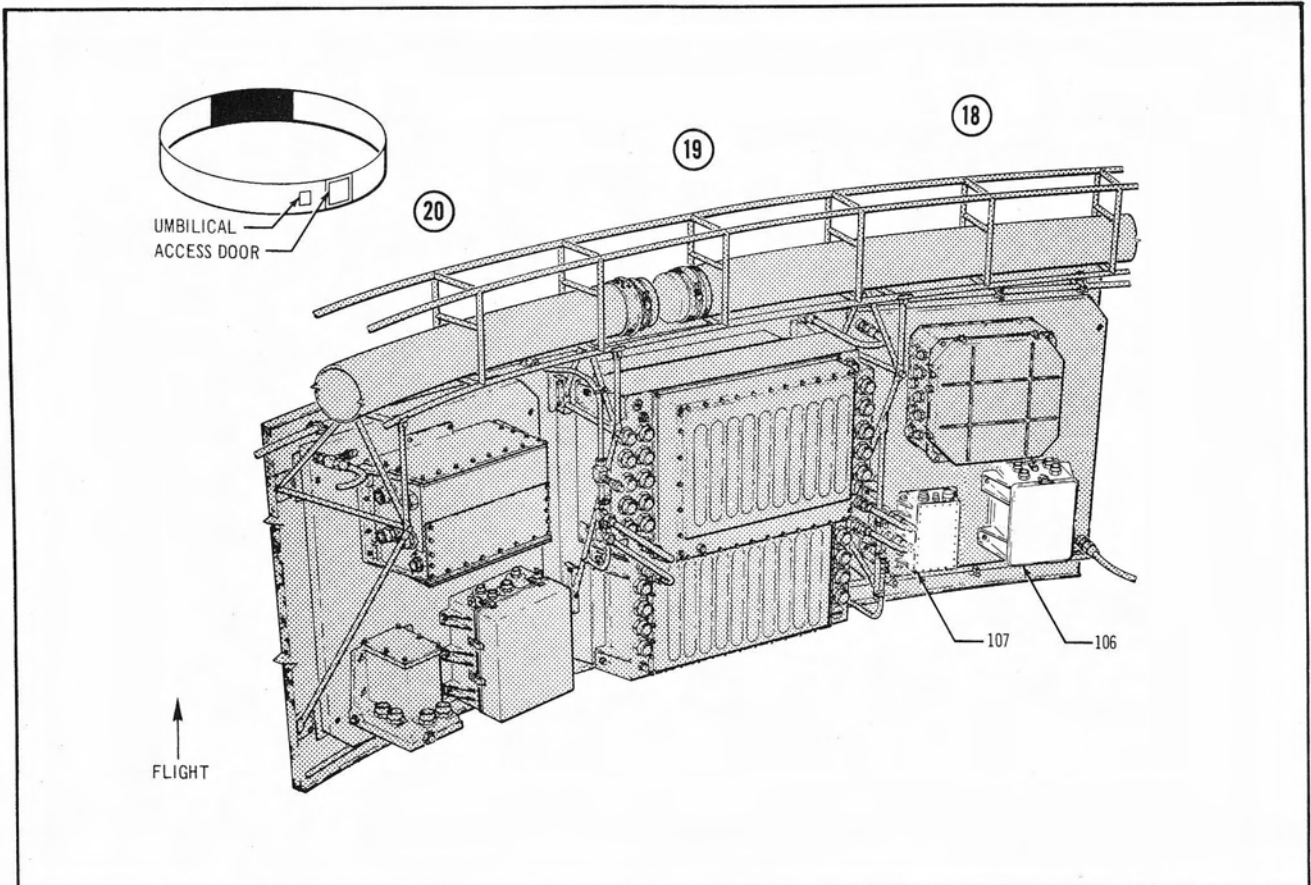


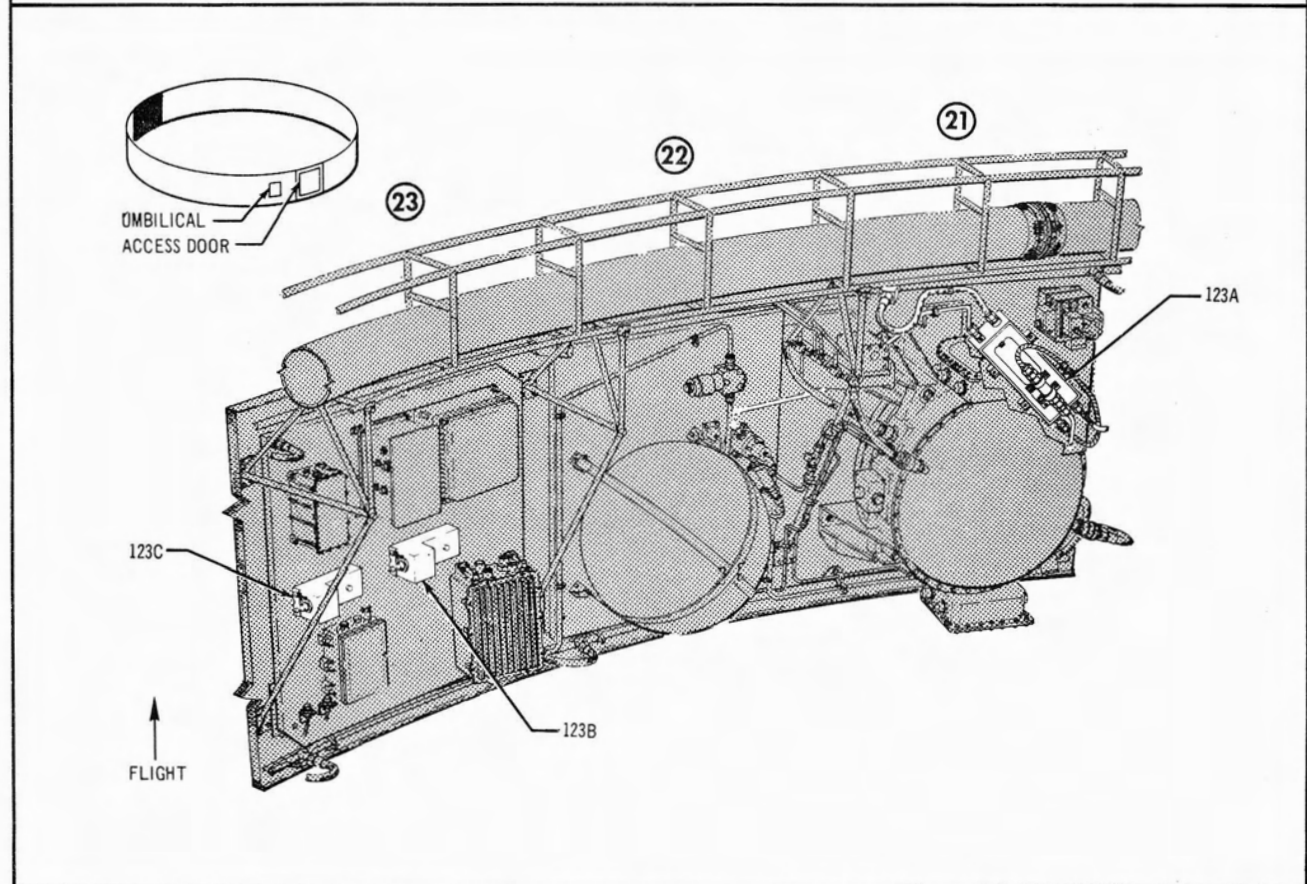
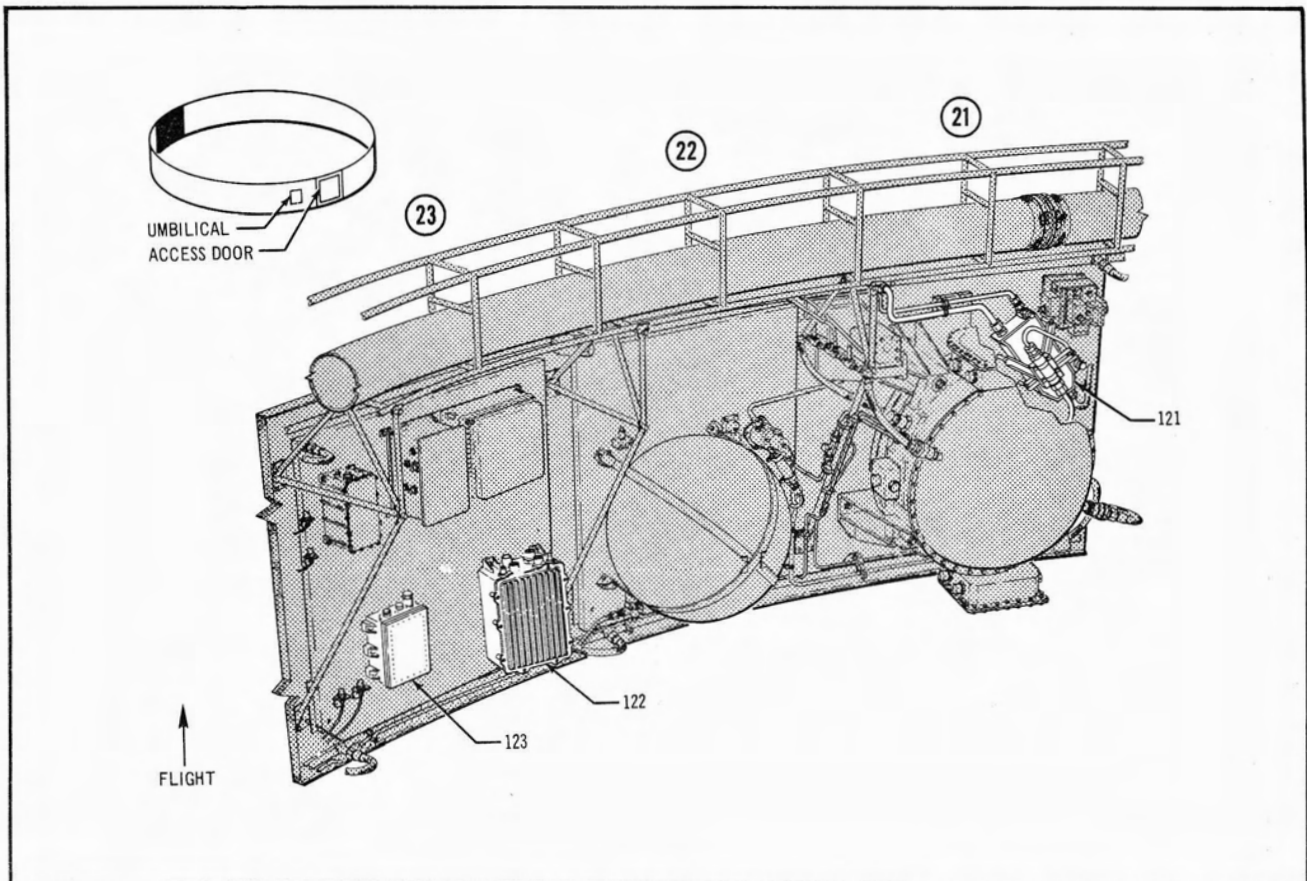
VOLUME I
CONTROL SYSTEM

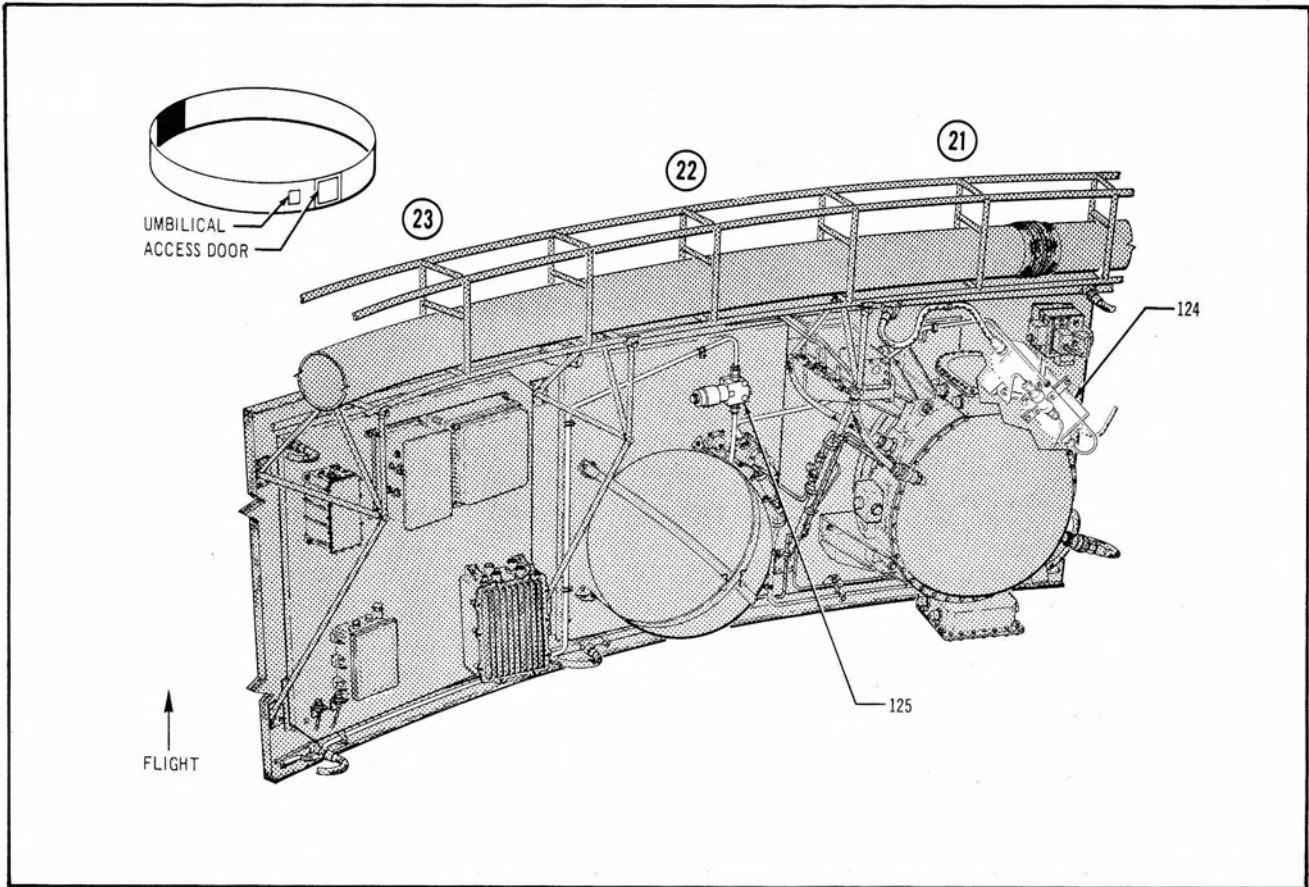


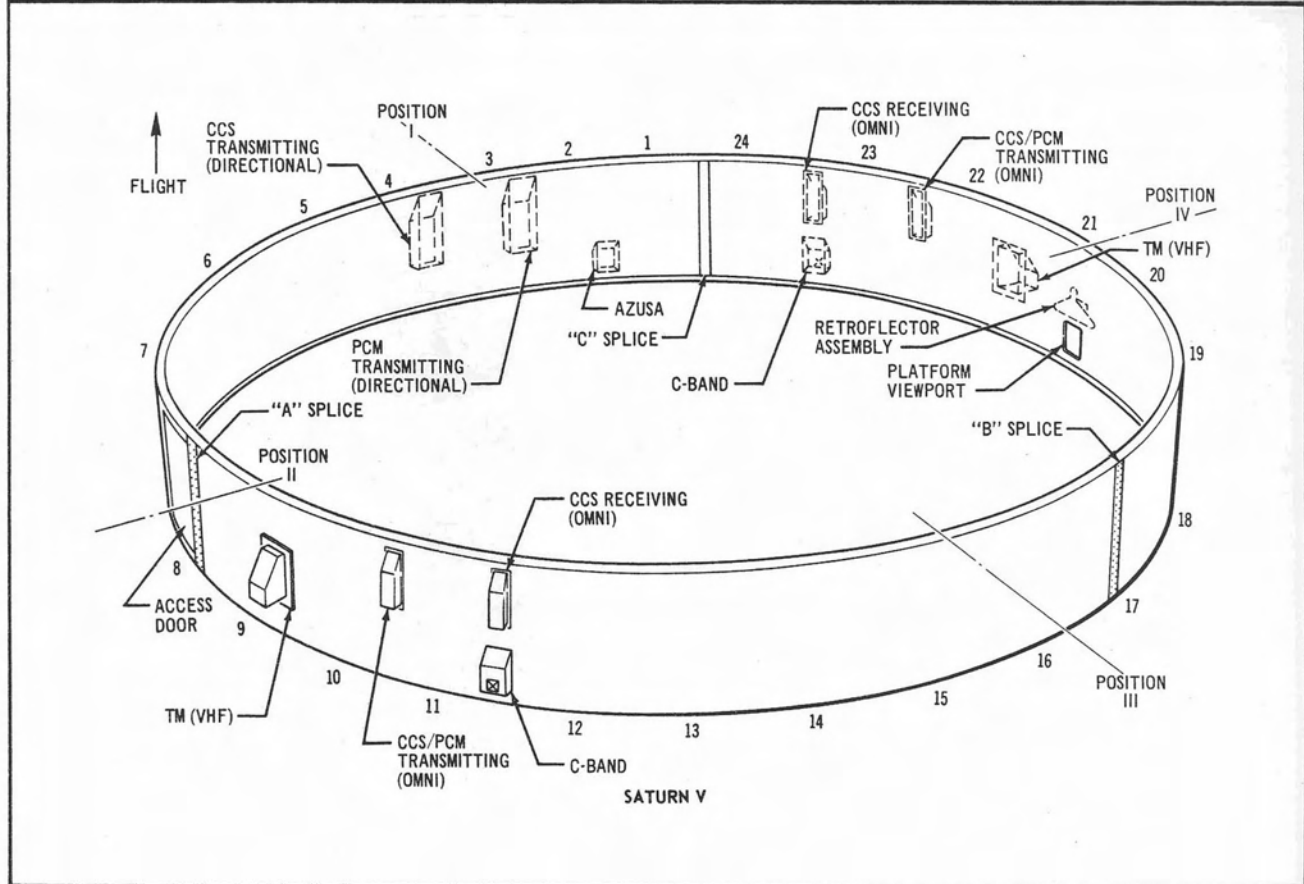
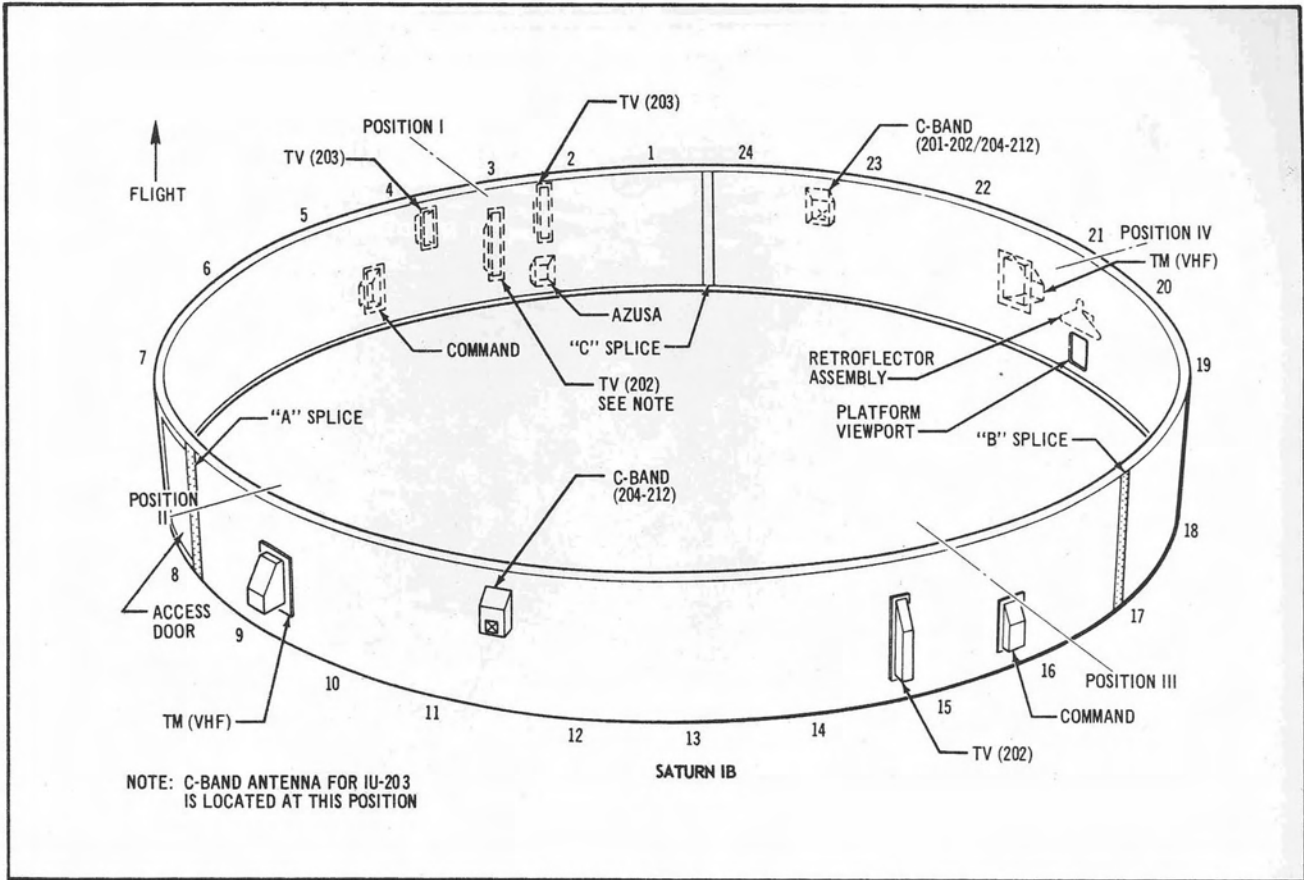












Legend for Instrument Unit Physical Layout Drawings

Index No.	Component Nomenclature	Index No.	Component Nomenclature
1	Measuring Rack A401	26	Battery D10
2	Power Distributor	27	Battery D30
3	Preflight Air/GN ₂ Purge System Flexible Tubing	27A	Water Accumulator
4	Auxiliary Power Distributor	27B	Water Solenoid Valve
5	Measuring Rack A401 or A402	28	Battery D40
6	TV Junction Box	29	Telemetry Power Divider
7	TV Power Divider	30	Coaxial Termination
8	TV Power Amplifier	31	Coaxial Switch
9	TV Transmitter Assembly	32	Battery D20
10	Camera Control Unit (GEC)	32A	Thermal Expansion Chamber
11	56 Volt Power Supply	33	First Stage Pressure Regulator
12	Measuring Rack Selector	34	Methanol-Water Accumulator
13	Source Follower	35	Coolant Pump
14	Electronic Controller Assembly	36	Water Solenoid Valve
15	Control Accelerometer (Pitch)	37	Water Accumulator
16	S-Band Power Amplifier	38	Heat Exchanger Assembly
17	Exciter Units	39	Modulating Flow Control Valve
18	S-Band Power Amplifier	40	50-Cubic-Inch Sphere
19	Camera Control Unit (GEC)	41	Valve, Shutoff, Methanol-Water
20	Camera Control Unit (Kintel)	41A	Umbilical Plate
20A	Thermal Conditioning Panel Heater	42	Hazardous Gas Detection System
20B	Thermal Conditioning Panel Heater	42A	Access Door
21	CCS Transponder	43	Water Solenoid Valve
22	CCS Power Amplifier	44	165-Cubic-Inch Sphere
23	UHF/RF Transmitter Assembly	44A	Coolant Pump (Primary)
24	PCM Coaxial Switch	44B	Coolant Pump (Secondary)
25	CCS Coaxial Switch	45	Slow Speed Multiplexer Assembly
25A	Thermal Conditioning Panel Heater	46	Tape Recorder (Airborne)
25B	Thermal Conditioning Panel Heater	47	Measuring Rack A403
25C	Thermal Conditioning Panel Heater	48	Measuring Distributor
		49	CPl or DPl Multiplexer Assembly

Legend for Instrument Unit Physical Layout Drawings (Cont)

Index No.	Component Nomenclature	Index No.	Component Nomenclature
50	Measuring Rack A402 or A405	74	P1 PCM/RF Transmitter Assembly CT-19B
51	Auxiliary Power Distributor	75	Telemetry Calibrator Power and Control Assembly
52	CP1 or DP1 Multiplexer Assembly	76	Telemetry Calibrator
53	Telemetry RF Coupler	77	Measuring Rack A408
54	F2 RF Transmitter Assembly Model II	78	Measuring Rack A407
55	VSWR Measuring Assembly Model 220	78A	Thermal Conditioning Panel Heater
56	F2 Telemeter Assembly	78B	Measuring Rack A406
57	S1 RF Transmitter Assembly Model II	78C	Thermal Conditioning Panel Heater
58	S1 Telemeter Assembly	78D	Thermal Conditioning Panel Heater
59	Remote Digital Multiplexer J	79	P1 PCM/RF Transmitter Assembly Model II
60	Telemetry RF Coupler Model 451	80	Switch Selector
60A	Thermal Conditioning Panel Heater	81	Remote Digital Submultiplexer
61	VSWR Measuring Assembly Model 225	82	Control-EDS Rate Gyros
61A	Thermal Conditioning Panel Heater	83	Control Signal Processor
62	P1 PCM/RF Transmitter Assembly Model II	84	Measuring Rack A404 or A409
63	Telemetry Calibrator Power and Control Assembly	85	Measuring Rack A403 or A406
64	Telemetry Calibrator	86	Flight Control Computer
65	Telemetry Directional Coupler Model 226	87	EDS Timer No. 2 (20 Second Timer)
66	EDS Distributor	88	EDS Timer No. 1 or 3 (30, 40, or 60 Second Timer)
67	Measuring Distributor	89	Command Directional Coupler
68	Measuring Rack A404	90	Command Power Divider
69	F1 RF Transmitter Assembly	90A	Thermal Conditioning Panel Heater
70	PCM/DDAS Telemeter Assembly	90B	Thermal Conditioning Panel Heater
71	C-Band Transponder	90C	Measuring Rack A403 or A406
72	5-Volt Measuring Voltage Supply	90D	Control-EDS Rate Gyros
73	F1 Telemeter	90E	Thermal Conditioning Panel Heater

Legend for Instrument Unit Physical Layout Drawings (Cont)

Index No.	Component Nomenclature	Index No.	Component Nomenclature
90F	Thermal Conditioning Panel Heater	109	Azusa RI Filter Assembly
90G	CCS Power Divider	110	Azusa Transponder
91	Remote Digital Multiplexer J	111	Gas Bearing Heat Exchanger
92	DDAS/Computer Interface Unit	112	Control Accelerometer (Yaw)
93	CCS Hybrid Ring	113	Force Balance Accelerometers
94	CCS Power Divider	114	ST-124M Inertial Platform Assembly
95	ST-124M Platform Electronic Assembly	115	Gas Bearing Pressure Regulator
96	Launch Vehicle Data Adapter	116	Low Pressure Switch
97	Control Distributor	117	Two-Cubic-Foot Sphere
98	Command Receiver	118	Gas Bearing Solenoid Valve
99	Secure Range Safety Decoder	119	Lateral Accelerometer Slosh, Pitch, and Yaw
100	Remote Digital Multiplexer K	120	Longitudinal Accelerometer Orbital LH ₂ Venting
101	Launch Vehicle Digital Computer	121	Gas Bearing Heat Exchanger
102	Plug Type J-Box Assembly	122	Measuring Rack A669
103	ST-124M Platform AC Power Supply	123	UHF/RF Filter
104	Accelerometer Signal Conditioner	123A	Gas Bearing Heat Exchanger
105	Command Decoder	123B	Thermal Conditioning Panel Heater
106	Remote Digital Multiplexer K	123C	Thermal Conditioning Panel Heater
107	Command Decoder	124	Gas Bearing Heat Exchanger
108	C-Band Transponder	125	Gas Bearing Solenoid Valve

APPENDIX B

WIRING CHARTS AND LOOP SCHEMATICS

The following pages contain loop schematics and wiring charts for the Control System ESE test panels. They are included in this volume as an aid to referencing and locating input/output signals, their associated test panels, and flight hardware connections.

The wiring charts are arranged in the following order

<u>Panel</u>	<u>Connector</u>	<u>Page</u>
Control Accelerometer Panel	J-1	B2
Control Computer Input Substitute Panel	J-1	B2
Control Computer Input Substitute Panel	J-2	B4
DVM Selector Panel	J-1	B5
DVM Selector Panel	J-2	B6
DVM Selector Panel	J-3	B8
EDS/Control Rate Gyro Panel	J-1	B8
Engine Actuator Substitute Panel	J-1	B10
Engine Actuator Substitute Panel	J-2	B11
Engine Actuator Substitute Panel	J-3	B12
Engine Actuator Substitute Panel	J-58	B14
Flight Control Computer Panel	J-1	B15
S-IB Engine Deflection Panel	J-1	B16
S-IVB Engine Deflection Panel	J-1	B17
EDS/Control Rate Gyro Panel	J-2	B18
ESE Ramp Control Panel	J-1	B18
Control Computer Test Panel	J-1	B18A

The loop schematics are arranged in the following order:

Control Accelerometer Panel	B19
EDS/Control Rate Gyro Panel (Sheet 1 of 2)	B21
EDS/Control Rate Gyro Panel (Sheet 2 of 2)	B23
Control Computer Input Substitute Panel (Sheet 1 of 4)	B25
Control Computer Input Substitute Panel (Sheet 2 of 4)	B27
Control Computer Input Substitute Panel (Sheet 3 of 4)	B29
Control Computer Input Substitute Panel (Sheet 4 of 4)	B31
Flight Control Computer Panel	B33
S-IVB Engine Deflection Panel	B35
S-IB Engine Deflection Panel	B37
EDS/Control Rate Gyro-Control Signal Processor- Control Accelerometers-ESE-Vehicle	B39
Flight Control Computer-ESE-Vehicle	B41
Flight Control Computer-SITS-Vehicle	B43
Engine Actuator Substitute Panel-SITS (Sheet 1 of 5)	B45
Engine Actuator Substitute Panel-SITS (Sheet 2 of 5)	B47
Engine Actuator Substitute Panel-SITS (Sheet 3 of 5)	B49
Engine Actuator Substitute Panel-SITS (Sheet 4 of 5)	B51
Engine Actuator Substitute Panel-SITS (Sheet 5 of 5)	B53
ESE Ramp Control Panel	B55
Control Computer Test Panel	B57

Control Accelerometer Panel
Connector J-1

Pin	Signal	Selection Code	Comments
A	+20D210 28 V SAFING BUS		
B	SPARE		
C	+20D110 28 V BUS		
D	20D1R RETURN BUS		
E	+20D410 10 V BUS		
F	20D4R RETURN BUS		
G	CONTROL ACCEL PWR MANUAL OFF	-	28 V PANEL OUTPUT
H	CONTROL ACCEL ON	DI-639	28 V PANEL OUTPUT
J	CONTROL ACCEL OFF	DI-1216	28 V PANEL OUTPUT
K	CONTROL ACCEL ON LAMP	VK32-603	28 V PANEL INPUT
L	YAW SELECT ON	DI-640	28 V PANEL OUTPUT
M	YAW SELECT OFF	DI-1217	28 V PANEL OUTPUT
N	YAW SELECT LAMP	DO-632	28 V PANEL INPUT
P	YAW OUTPUT	VA5-603	0 TO 10 V PANEL INPUT
R	NEGATIVE FORCE COMMAND	DI-643	28 V PANEL OUTPUT
S	NEGATIVE FORCE COMMAND LAMP	DO-635	28 V PANEL INPUT
T	ZERO COMMAND	DI-644	28 V PANEL OUTPUT
U	ZERO COMMAND LAMP	DO-636	28 V PANEL INPUT
V	RAMP SLOW LAMP	DO-420	
W	POSITIVE FORCE COMMAND	DI-642	28 V PANEL OUTPUT
X	POSITIVE FORCE COMMAND LAMP	DO-634	28 V PANEL INPUT
Y	FORCE CURRENT	-	0 TO 10 V PANEL OUTPUT
Z	PITCH SELECT ON	DI-641	28 V PANEL OUTPUT
a	PITCH SELECT OFF	DI-1218	28 V PANEL OUTPUT
b	PITCH SELECT LAMP	DO-633	28 V PANEL INPUT
c	PITCH OUTPUT	VA4-601	0 TO 10 V PANEL INPUT
d	RAMP SLOW ON	DO-420	
e	RAMP SLOW OFF	-	NOT USED
f	+26D810 10 V BUS		
g	26D8R RETURN BUS		
h	SPARE	-	RESERVED CHASSIS GRD
i	SPARE	-	RESERVED SHIELD TERM.

Control Computer Input Substitute Panel
Connector J-1

Pin	Signal	Selection Code	Comments
A	REDUNDANCY CHK NO. 1 POS LAMP	DO-586	28 V PANEL INPUT
B	REDUNDANCY CHK NO. 1 NEG LAMP	DO-585	28 V PANEL INPUT
C	REDUNDANCY CHK NO. 1 NEG	DI-620	28 V PANEL OUTPUT
D	REDUNDANCY CHK NO. 1 POS	DI-621	28 V PANEL OUTPUT
E	REDUNDANCY CHK NO. 2 POS LAMP	DO-588	28 V PANEL INPUT
F	REDUNDANCY CHK NO. 2 NEG LAMP	DO-587	28 V PANEL INPUT
G	REDUNDANCY CHK NO. 2 NEG	DI-622	28 V PANEL OUTPUT
H	REDUNDANCY CHK NO. 2 POS	DI-623	28 V PANEL OUTPUT
J	REDUNDANCY CHK NO. 3 POS LAMP	DO-590	28 V PANEL INPUT
K	REDUNDANCY CHK NO. 3 NEG LAMP	DO-589	28 V PANEL INPUT
L	REDUNDANCY CHK NO. 3 NEG	DI-624	28 V PANEL OUTPUT
M	REDUNDANCY CHK NO. 3 POS	DI-625	28 V PANEL OUTPUT

Control Computer Input Substitute Panel
Connector J-1 (Cont)

Pin	Signal	Selection Code	Comments
N	REDUNDANCY CHK NO. 4 POS LAMP	DO-592	28 V PANEL INPUT
P	REDUNDANCY CHK NO. 4 NEG LAMP	DO-591	28 V PANEL INPUT
R	REDUNDANCY CHK NO. 4 NEG	DI-626	28 V PANEL OUTPUT
S	REDUNDANCY CHK NO. 4 POS	DI-627	28 V PANEL OUTPUT
T	REDUNDANCY CHECK OFF	DI-628	28 V PANEL OUTPUT
U	ATTITUDE CONT JETS SPARE CHAN SEL PITCH	VK25-602	28 V PANEL INPUT
V	S-IVB SPARE CHAN SEL PITCH	VK22-602	28 V PANEL INPUT
W	ATTITUDE CONT JETS SPARE CHAN SEL YAW-ROLL I	VK24-602	28 V PANEL INPUT
X	S-IVB SPARE CHAN SEL YAW	VK23-602	28 V PANEL INPUT
Y	ATTITUDE CONT JETS SPARE CHAN SEL YAW-ROLL II	VK26-602	28 V PANEL INPUT
Z	DS-14 LAMP	-	(SPARE LAMP)
a	COMPARATOR RESET	DI-615	28 V PANEL OUTPUT
b	S-IB BURN SUBSTITUTE LAMP	VK21-602	28 V PANEL INPUT
c	S-IB BURN SUBSTITUTE OFF	DI-1197	28 V PANEL OUTPUT
d	S-IB BURN SUBSTITUTE ON	DI-596	28 V PANEL OUTPUT
e	S-IVB BURN SUBSTITUTE LAMP	VK20-602	28 V PANEL INPUT
f	S-IVB BURN SUBSTITUTE OFF	DI-1199	28 V PANEL OUTPUT
g	S-IVB BURN SUBSTITUTE ON	DI-598	28 V PANEL OUTPUT
h	S-IVB COAST SUBSTITUTE LAMP	DO-567	28 V PANEL INPUT
i	S-IVB COAST SUBSTITUTE OFF	DI-1201	28 V PANEL OUTPUT
j	S-IVB COAST SUBSTITUTE ON	DI-600	28 V PANEL OUTPUT
k	SPACECRAFT CONTROL SUB. LAMP	VK19-602	28 V PANEL INPUT
m	SPACECRAFT CONTROL SUB. OFF	DI-1134	28 V PANEL OUTPUT
n	SPACECRAFT CONTROL SUB. ON	DI-342	28 V PANEL OUTPUT
p	IU GUIDANCE FAILURE SUB. LAMP	DO-343	28 V PANEL INPUT
q	IU GUIDANCE FAILURE SUB. OFF	DI-340	28 V PANEL OUTPUT
r	IU GUIDANCE FAILURE SUB. ON	DI-345	28 V PANEL OUTPUT
s	TEST INPUT A METER	AI-103	0 TO 10 V PANEL INPUT
t	TEST INPUT B METER	AI-104	0 TO 10 V PANEL INPUT
u	S-IB BURN TEST LAMP	DO-565	28 V PANEL INPUT
v	S-IB BURN TEST OFF	DI-1198	28 V PANEL OUTPUT
w	S-IB BURN TEST ON	DI-597	28 V PANEL OUTPUT
x	S-IVB BURN TEST LAMP	DO-566	28 V PANEL INPUT
y	S-IVB BURN TEST OFF	DI-1200	28 V PANEL OUTPUT
z	S-IVB BURN TEST ON	DI-599	28 V PANEL OUTPUT
AA	SWITCH POINT RESET	DI-671	28 V PANEL OUTPUT
BB	SWITCH POINT RESET LAMP	DO-672	28 V PANEL INPUT
CC	RETURN BUS 20D4R		
DD	10V BUS +20D410		
EE	RETURN BUS 20D1R		
FF	RETURN BUS 20D1R		
GG	28 V BUS +20D110		
HH	28 V BUS +20D110		
JJ	RETURN BUS 20D1R		
KK	RETURN BUS 20D1R		
LL	28 V BUS +20D110		
MM	28 V BUS +20D110		
NN	SPARE	-	RESERVED CHASSIS GRD
PP	SPARE	-	RESERVED SHIELD TERM.

Control Computer Input Substitute Panel
Connector J-2

Pin	Signal	Selection Code	Comments
A	S-IVB COAST TEST LAMP	DO-568	28 V PANEL INPUT
B	S-IVB COAST TEST OFF	DI-1202	28 V PANEL OUTPUT
C	S-IVB COAST TEST ON	DI-601	28 V PANEL OUTPUT
D	NOT USED		
E	S-IB MODE INTERRUPT LAMP	DO-577	28 V PANEL INPUT
F	SWITCH POINT NO. 1 LAMP	DO-581	28 V PANEL INPUT
G	SWITCH POINT NO. 1 OFF	DI-1212	28 V PANEL OUTPUT
H	SWITCH POINT NO. 1 ON	DI-616	28 V PANEL OUTPUT
J	SWITCH POINT NO. 2 LAMP	DO-582	28 V PANEL INPUT
K	SWITCH POINT NO. 2 OFF	DI-1213	28 V PANEL OUTPUT
L	SWITCH POINT NO. 2 ON	DI-617	28 V PANEL OUTPUT
M	SWITCH POINT NO. 3 LAMP	DO-583	28 V PANEL INPUT
N	SWITCH POINT NO. 3 OFF	DI-1214	28 V PANEL OUTPUT
P	SWITCH POINT NO. 3 ON	DI-618	28 V PANEL OUTPUT
R	SWITCH POINT NO. 4 LAMP	DO-584	28 V PANEL INPUT
S	SWITCH POINT NO. 4 OFF	DI-1215	28 V PANEL OUTPUT
T	SWITCH POINT NO. 4 ON	DI-619	28 V PANEL OUTPUT
U	SWITCH POINT NO. 5 LAMP	DO-630	28 V PANEL INPUT
V	SWITCH POINT NO. 5 OFF	DI-1230	28 V PANEL OUTPUT
W	SWITCH POINT NO. 5 ON	DI-629	28 V PANEL OUTPUT
X	YAW SELECT LAMP	DO-574	28 V PANEL INPUT
Y	YAW SELECT OFF	DI-1208	28 V PANEL OUTPUT
Z	YAW SELECT ON	DI-607	28 V PANEL OUTPUT
a	ROLL SELECT LAMP	DO-575	28 V PANEL INPUT
b	ROLL SELECT OFF	DI-1209	28 V PANEL OUTPUT
c	ROLL SELECT ON	DI-608	28 V PANEL OUTPUT
d	PITCH SELECT LAMP	DO-576	28 V PANEL INPUT
e	PITCH SELECT OFF	DI-1210	28 V PANEL OUTPUT
f	PITCH SELECT ON	DI-609	28 V PANEL OUTPUT
g	CONTROL ACCELEROMETER LAMP	DO-569	28 V PANEL INPUT
h	CONTROL ACCELEROMETER OFF	DI-1203	28 V PANEL OUTPUT
i	CONTROL ACCELEROMETER ON	DI-602	28 V PANEL OUTPUT
j	ST-124M LAMP	DO-570	28 V PANEL INPUT
k	ST-124M OFF	DI-1204	28 V PANEL OUTPUT
m	ST-124M ON	DI-603	28 V PANEL OUTPUT
n	CONTROL RATE GYRO LAMP	DO-571	28 V PANEL INPUT
p	CONTROL RATE GYRO OFF	DI-1205	28 V PANEL OUTPUT
q	CONTROL RATE GYRO ON	DI-604	28 V PANEL OUTPUT
r	TEST INPUT A LAMP	DO-572	28 V PANEL INPUT
s	TEST INPUT A OFF	DI-1206	28 V PANEL OUTPUT
t	TEST INPUT A ON	DI-605	28 V PANEL OUTPUT
u	TEST INPUT B LAMP	DO-573	28 V PANEL INPUT
v	TEST INPUT B OFF	DI-1207	28 V PANEL OUTPUT
w	TEST INPUT B ON	DI-606	28 V PANEL OUTPUT
x	RAMP LAMP	DO-578	28 V PANEL INPUT
y	RAMP NEGATIVE	DI-611	28 V PANEL OUTPUT
z	RAMP POSITIVE	DI-612	28 V PANEL OUTPUT
AA	ZERO LAMP	DO-579	28 V PANEL INPUT
BB	ZERO	DI-613	28 V PANEL OUTPUT
CC	STEP ENABLE LAMP	DO-580	28 V PANEL INPUT
DD	STEP ENABLE OFF	DI-1229	28 V PANEL OUTPUT
EE	S-IB MODE INTERRUPT OFF	DI-1211	28 V PANEL OUTPUT

Control Computer Input Substitute Panel
Connector J-2 (Cont)

Pin	Signal	Selection Code	Comments
FF	S-IB MODE INTERRUPT ON	DI-610	28 V PANEL OUTPUT
GG	STEP ENABLE ON	DI-614	28 V PANEL OUTPUT
HH	SPARE		
JJ	SPARE		
KK	SPARE		
LL	SPARE		
MM	SPARE		
NN	SPARE	-	RESERVED CHASSIS GND
PP	SPARE	-	RESERVED SHIELD TERM.

DVM Selector Panel
Connector J-1

Pin	Signal	Internal Wiring	
		To	Thru
A	S-IB 1 BY	SW1A6	TB1A
B	S-IB 1 BY	SW1B6	TB1B
C	S-IB 1 MY	SW1A14	TB1C
D	S-IB11 MY	SW1B14	TB1D
E	S-IB 1 ΔIY	SW2A5	TB1E
F	S-IB 1 ΔIY	SW2B5	TB1F
G	S-IB 1 BP	SW1A2	TB1G
H	S-IB 1 BP	SW1B2	TB1N
J	S-IV 1 MP	SW1A10	TB1J
K	S-IB 1 MP	SW1B10	TB1K
L	S-IB 1 ΔIP	SW1A18	TB1L
M	S-1B 1 ΔIP	SW1A18	TB1M
N	S-IB 2 BY	SW1A7	TB1N
P	S-IB 2 BY	SW1B7	TB1P
R	S-IB 2 MY	SW1A15	TB1R
S	S-IB 2 MY	SW1B1S	TB1S
T	S-IB 2 ΔIY	SW2A6	TB1T
U	S-IB 2 ΔIY	SW2B6	TB4U
V	S-IB 2 BP	SW1A3	TB1V
W	S-IB 2 BP	SW1B3	TB1W
X	S-IB 2 MP	SW1A11	TB2A
V	S-IB 2 MP	SW1B11	TB2B
Z	S-IB 2 ΔIP	SW2A2	TB2C
a	S-IB 2 ΔIP	SW2B2	TB2D
b	S-IB 3 BY	SW1A8	TB2E
c	S-IB 3 BY	SW1B8	TB2F
d	S-IB 3 MY	SW1A16	TB2G
e	S-IB 3 MY	SW1B16	TB2H
f	S-IB 3 ΔIY	SW2A7	TB2I
g	S-IB 3 ΔIY	SW2B7	TB2K
h	S-IB 3 BP	SW1A4	TB2L
i	S-IB 3 BP	SW1B4	TB2M
j	S-IB 3 MP	SW1A12	TB2N

DVM Selector Panel
Connector J-1 (Cont)

Pin	Signal	Internal Wiring	
		To	Thru
k	S-IB 3 MP	SW1B12	TB2P
m	S-IB 3 ΔIP	SW2A3	TB2R
n	S-IB 3 ΔIP	SW2B3	TB2S
p	S-IB 4 BY	SW1A9	TB2T
q	S-IB 4 BY	SW1B9	TB2U
r	S-IB 4 MY	SW1A17	TB2V
s	S-IB 4 MY	SW1B17	TB2W
t	S-IB 4 ΔIY	SW2A8	TB3A
u	S-IB 4 ΔIY	SW2B8	TB3B
v	S-IB 4 BP	SW1A5	TB3C
w	S-IB 4 BP	SW1B5	TB3D
x	S-IB 4 MP	SW1A13	TB3E
y	S-IB 4 MP	SW1B13	TB3F
z	S-IB 4 ΔIP	SW2A4	TB3G
AA	S-IB 4 ΔIP	SW2B4	TB3H
BB	S-IVB MY	SW2A10	TB3J
CC	S-IVB MY	SW2B10	TB3K
DD	S-IVB ΔIY	SW2A11	TB3L
EE	S-IVB ΔIY	SW2B11	TB3M
FF	S-IVB MP	SW2A9	TB3N
GG	S-IVB MP	SW2B9	TB3P
HH	S-IVB ΔIP	SW2A12	TB3R
JJ	S-IVB ΔIP	SW2B12	TB3S
KK	SPARE	-	TB3T
LL	SPARE	-	TB3U
MM	SPARE	-	TB3V
NN	SPARE	-	TB3W
PP	SHIELD TERMINATION	-	-

DVM Selector Panel
Connector J-2

Pin	Signal	Internal Wiring	
		To	Thru
A	60 VDC 1Y	SW2A17	TB4A
B	60 VDC 1Y	SW2B17	TB4B
C	60 VDC IP	SW2A13	TB4C
D	60 VDC IP	SW2B13	TB4D
E	60 VDC 2Y	SW2A18	TB4E
F	60 VDC 2Y	SW2B18	TB4F
G	60 VDC 2P	SW2A14	TB4G
H	60 VDC 2P	SW2B14	TB4H
J	60 VDC 3Y	SW2A19	TB4J
K	60 VDC 3Y	SW2B19	TB4K
L	60 VDC 3P	SW2A15	TB4L

DVM Selector Panel
Connector J-1 (Cont)

Pin	Signal	Internal Wiring	
		To	Thru
M	60 VDC 3P	SW2B15	TB4M
N	60 VDC 4Y	SW2A20	TB4N
P	60 VDC 4Y	SW2B20	TB4P
R	60 VDC 4P	SW2A16	TB4R
S	60 VDC 4P	SW2B16	TB4S
T	TEST INPUT A	SW3A6	TB4T
U	TEST INPUT A	SW3B6	TB4U
V	TEST INPUT B	SW3A7	TB4V
W	TEST INPUT B	SW3B7	TB4W
X	SPARE	-	TB5A
Y	SPARE	-	TB5B
Z	SPARE	-	TB5C
a	SPARE	-	TB5D
b	SPARE	-	TB5E
c	SPARE	-	TB5F
d	TORQUER \ddot{Y}	SW3A2	TB5G
e	TORQUER \ddot{Y}	SW3B2	TB5H
f	TORQUER $\phi 1$	SW3A3	TB5J
g	TORQUER $\phi 1$	SW3B3	TB5K
h	TORQUER $\phi 2$	SW3A4	TB5L
i	TORQUER $\phi 2$	SW3B4	TB5M
j	TORQUER $\phi 3$	SW3A5	TB5N
k	TORQUER $\phi 3$	SW3B5	TB5P
m	ϕR	SW3A10	TB5R
n	ϕR	SW3B10	TB5S
p	ϕY	SW3A9	TB5T
q	ϕY	SW3B9	TB5U
r	ϕP	SW3A8	TB5V
s	ϕP	SW3B8	TB5W
t	$\ddot{Y} Y$	SW3A12	TB6A
u	$\ddot{Y} Y$	SW3B12	TB6B
v	$\ddot{Y} P$	SW3A11	TB6C
w	$\ddot{Y} P$	SW3B11	TB6D
x	SPARE	-	TB6E
y	SPARE	-	TB6F
z	SPARE	-	TB6G
AA	SPARE	-	TB6H
BB	SPARE	-	TB6J
CC	SPARE	-	TB6K
DD	SPARE	-	TB6L
EE	SPARE	-	TB6M
FF	SPARE	-	TB6N
GG	SPARE	-	TB6P
HH	SPARE	-	TB6R
JJ	SPARE	-	TB6S
KK	SPARE	-	TB6T
LL	SPARE	-	TB6U
MM	-28 V	SW1C2	UB6V
NN	+28 V	SW1C1	TB6W
PP	SHIELD TERMINATION	-	-

DVM Selector Panel
Connector J-3

Pin	Signal	To	Comments
A	DIGITAL VOLTMETER A INPUT	SW1A1	(SWITCH 1A COMMON)
B	DIGITAL VOLTMETER B INPUT	SW1B1	(SWITCH 1B COMMON)
C	NOT USED		
D	NOT USED		
E	NOT USED		
F	NOT USED		
G	NOT USED		
H	NOT USED		
J	NOT USED		
K	NOT USED		
L	NOT USED		
M	NOT USED		
N	NOT USED		
P	NOT USED		
R	NOT USED		
S	NOT USED		
T	NOT USED		
U	NOT USED		
V	NOT USED		
W	NOT USED		
X	NOT USED		
Y	NOT USED		
Z	NOT USED		
a	NOT USED		
b	NOT USED		
c	NOT USED		
d	NOT USED		
e	NOT USED		
f	NOT USED		
g	NOT USED		
h	NOT USED		
i	NOT USED		

EDS/Control Rate Gyro Panel
Connector J-1

Pin	Signal	Selection Code	Comments
A	+20D210 28 V SAFING BUS		
B	RAMP SLOW OFF	D1-737	28 V PANEL OUTPUT
C	+20D110 28 V BUS		
D	20D1R RETURN BUS		
E	26D8R RETURN BUS		
F	+26D810 10 V BUS		
G	GROUP 3 PITCH	VR13-602	0 TO 10 V PANEL INPUT
H	GROUP 3 ROLL	VR15-602	0 TO 10 V PANEL INPUT
J	GROUP 3 YAW	VR14-602	0 TO 10 V PANEL INPUT
K	GROUP 3 TORQUER	A1-704	0 TO 10 V PANEL INPUT

EDS/Control Rate Gyro Panel
Connector J-1 (Cont)

Pin	Signal	Selection Code	Comments
L	GROUP 3 SELECT LAMP	DO-656	28 V PANEL INPUT
M	GROUP 3 SELECT ON	DI-669	28 V PANEL OUTPUT
N	GROUP 3 SELECT OFF	DI-1225	28 V PANEL OUTPUT
P	GROUP 1 SELECT OFF	DI-1223	28 V PANEL OUTPUT
R	GROUP 1 SELECT ON	DI-667	28 V PANEL OUTPUT
S	GROUP 1 SELECT LAMP	DO-654	28 V PANEL INPUT
T	GROUP 1 TORQUER	AI-072	0 TO 10 V PANEL INPUT
U	GROUP 1 YAW	R8-2	0 TO 10 V PANEL INPUT
V	GROUP 1 ROLL	R12-2	0 TO 10 V PANEL INPUT
W	GROUP 1 PITCH	R13-2	0 TO 10 V PANEL INPUT
X	GROUP 2 SELECT OFF	DI-1224	28 V PANEL OUTPUT
Y	GROUP 2 SELECT ON	DI-668	28 V PANEL OUTPUT
Z	GROUP 2 SELECT LAMP	DO-655	28 V PANEL INPUT
a	GROUP 2 TORQUER	AI-073	0 TO 10 V PANEL INPUT
b	GROUP 2 YAW	VR11-602	0 TO 10 V PANEL INPUT
c	GROUP 2 ROLL	VR12-602	0 TO 10 V PANEL INPUT
d	GROUP 2 PITCH	VR10-602	0 TO 10 V PANEL INPUT
e	MANUAL SYSTEM POWER OFF	-	28 V PANEL OUTPUT
f	SYSTEM POWER ON	DI-660	28 V PANEL OUTPUT
g	SYSTEM POWER OFF	DI-1219	28 V PANEL OUTPUT
h	SYSTEM POWER LAMP	VK36-602	28 V PANEL INPUT
i	GROUP 1 UP-TO-SPEED LAMP	VR28-602	28 V PANEL INPUT
j	GROUP 2 UP-TO-SPEED LAMP	VR29-602	28 V PANEL INPUT
k	GROUP 3 UP-TO-SPEED LAMP	VR30-602	28 V PANEL INPUT
m	COMPARATOR MONITOR RESET	DI-670	28 V PANEL OUTPUT
n	GROUP 1 ROLL	R34-2	0 TO 10 V PANEL INPUT
p	YAW SPARE CHAN ACTIVE LAMP	VR27-602	28 V PANEL INPUT
q	ROLL SPARE CHAN ACTIVE LAMP	VR26-602	28 V PANEL INPUT
r	PITCH SPARE CHAN ACTIVE LAMP	VR25-602	28 V PANEL INPUT
s	YAW AXIS SELECT ON	DI-661	28 V PANEL OUTPUT
t	YAW AXIS SELECT OFF	DI-1220	28 V PANEL OUTPUT
u	YAW AXIS SELECT LAMP	DO-648	28 V PANEL INPUT
v	ROLL AXIS SELECT ON	DI-663	28 V PANEL OUTPUT
w	ROLL AXIS SELECT OFF	DI-1222	28 V PANEL OUTPUT
x	ROLL AXIS SELECT LAMP	DO-650	28 V PANEL INPUT
y	PITCH AXIS SELECT ON	DI-662	28 V PANEL OUTPUT
z	PITCH AXIS SELECT OFF	DI-1221	28 V PANEL OUTPUT
AA	PITCH AXIS SELECT LAMP	DO-649	28 V PANEL INPUT
BB	RAMP POSITIVE	DI-664	28 V PANEL OUTPUT
CC	RAMP SLOW LAMP	DO-659	28 V PANEL INPUT
DD	ZERO TORQUE COMMAND	DI-666	28 V PANEL OUTPUT
EE	ZERO TORQUE COMMAND LAMP	DO-653	28 V PANEL INPUT
FF	RAMP NEGATIVE	DI-665	28 V PANEL OUTPUT
GG	RAMP LAMP	DO-651,652	28 V PANEL INPUT
HH	20D4R RETURN BUS		
JJ	+20D410 10 V BUS		
KK	GROUP 2 ROLL	VR34-602	0 TO 10 V PANEL INPUT
LL	GROUP 3 ROLL	VR35-602	0 TO 10 V PANEL INPUT
MM	RAMP SLOW ON	DI-028	28 V PANEL OUTPUT
NN	SPARE	-	RESERVED CHASSIS GRD
PP	SPARE	-	RESERVED SHIELD TERM.

Engine Actuator Substitute Panel
Connector J-1

Pin	Signal
A	SPARE
B	SPARE
C	SPARE
D	SPARE
E	SPARE
F	SPARE
G	SPARE
H	CONTROL S-IB ENG 1 YAW
J	CONTROL S-IB ENG 1 PITCH
K	CONTROL S-IB ENG 2 YAW
L	CONTROL S-IB ENG 2 PITCH
M	CONTROL S-IB ENG 3 YAW
N	CONTROL S-IB ENG 3 PITCH
P	CONTROL S-IB ENG 4 YAW
R	CONTROL S-IB ENG 4 PITCH
S	CONTROL S-IB ENG 1 YAW
T	CONTROL S-IB ENG 1 PITCH
U	CONTROL S-IB ENG 2 YAW
V	CONTROL S-IB ENG 2 PITCH
W	CONTROL S-IB ENG 3 YAW
X	CONTROL S-IB ENG 3 PITCH
Y	CONTROL S-IB ENG 4 YAW
Z	CONTROL S-IB ENG 4 PITCH
a	MEAS S-IVB ENGINE PITCH
b	MEAS S-IVB ENGINE YAW
c	MEAS S-IVB ENGINE PITCH
d	MEAS S-IVB ENGINE YAW
e	S-IVB ENGINE OFF
f	S-IVB ENGINE ON (DO-111)
g	NOT USED
h	5V I _p
i	+28D810 28V BUS
j	+ RETURN
k	-I _p APS JET
m	NOT USED
n	5V I _{III} OR I _{IV}
p	NOT USED
q	-I _{III} APS JET
r	+ RETURN
s	- I _{IV} APS JET
t	NOT USED
u	5V I _{III} _p
v	28D8R RETURN BUS
w	-I _{III} _p APS JET
x	+RETURN
y	NOT USED
z	5V I _{III} _{IV} OR I _{III} _{II}
AA	NOT USED
BB	-I _{III} _{IV} APS JET
CC	+return
DD	-I _{III} _{II} APS JET

Engine Actuator Substitute Panel
Connector J-1 (Cont)

Pin	Signal
EE	SPARE
FF	SPARE
GG	SPARE
HH	SPARE
JJ	SPARE
KK	SPARE
LL	HARDWIRED TO MM
MM	HARDWIRED TO LL
NN	CHASSIS GROUND
PP	SHIELD TERMINATION

Engine Actuator Substitute Panel
Connector J-2

Pin	Signal
A	- YAW COIL NO. 1 ENG NO.1
B	+ YAW COIL NO. 1 ENG NO.1
C	- YAW COIL NO. 2 ENG NO.1
D	+ YAW COIL NO. 2 ENG NO.1
E	YAW BETA ENG NO.1
F	YAW ENGINE NO.1 POSITION
G	- PITCH COIL NO 1 ENG NO.1
H	+ PITCH COIL NO 1 ENG NO.1
J	- PITCH COIL NO. 2 ENG NO.1
K	+ PITCH COIL NO. 2 ENG NO.1
L	PITCH BETA ENG NO.1
M	PITCH ENGINE NO.1 POSITION
N	- YAW COIL NO. 1 ENG NO.2
P	+ YAW COIL NO. 1 ENG NO.2
R	- YAW COIL NO. 2 ENG NO.2
S	+ YAW COIL NO. 2 ENG NO.2
T	YAW BETA ENG NO.2
U	YAW ENGINE NO.2 POSITION
V	- PITCH COIL NO. 1 ENG NO.2
W	+ PITCH COIL NO. 1 ENG NO.2
X	- PITCH COIL NO. 2 ENG NO.2
Y	+ PITCH COIL NO. 2 ENG NO.2
Z	PITCH BETA ENG NO.2
a	PITCH ENGINE NO.2 POSITION
b	- YAW COIL NO. 1 ENG NO.3
c	+ YAW COIL NO. 1 ENG NO.3
d	- YAW COIL NO. 2 ENG NO.3
e	+ YAW COIL NO. 2 ENG NO.3
f	YAW BETA ENG NO.3
g	YAW ENGINE NO.3 POSITION
h	- PITCH COIL NO. 1 ENG NO.3
i	+ PITCH COIL NO. 1 ENG NO.3
j	- PITCH COIL NO. 2 ENG NO.3
k	+ PITCH COIL NO. 2 ENG NO.3
m	PITCH BETA ENG NO.3
n	PITCH ENGINE NO.3 POSITION

Engine Actuator Panel
Connector J-2 (Cont)

Pin	Signal
p	- YAW COIL NO.1 ENG NO.4
q	+ YAW COIL NO.1 ENG NO.4
r	- YAW COIL NO.2 ENG NO.4
s	+ YAW COIL NO.2 ENG NO.4
t	YAW BETA ENG NO.4
u	YAW ENGINE NO.4 POSITION
v	- PITCH COIL NO.1 ENG NO.4
w	+ PITCH COIL NO.1 ENG NO.4
x	- PITCH COIL NO.2 ENG NO.4
y	+ PITCH COIL NO.2 ENG NO.4
z	PITCH BETA ENG NO.4
AA	PITCH ENGINE NO.4 POSITION
BB	BETA CENTER TAP ENG NO.1
CC	BETA CENTER TAP ENG NO.1
DD	BETA CENTER TAP ENG NO.2
EE	BETA CENTER TAP ENG NO.2
FF	BETA CENTER TAP ENG NO.3
GG	BETA CENTER TAP ENG NO.3
HH	BETA CENTER TAP ENG NO.4
JJ	BETA CENTER TAP ENG NO.4
KK	SPARE
LL	SPARE
MM	J3MM (HARDWIRED)
NN	CHASSIS GROUND
PP	SHIELD TERMINATION

Engine Actuator Substitute Panel
Connector J-3

Pin	Signal
A	POWER ON (DO-103)
B	POWER ON
C	POWER ENABLE LAMP (D1-103)
D	POWER ON
E	POWER ON
F	S-IB ENGINE NO.1 ON
G	S-IB ENGINE NO.2 ON
H	S-IB ENGINE NO.3 ON
J	S-IB ENGINE NO.4 ON
K	S-IVB ENGINE ON
L	S-IVB PITCH ACTUATOR INPUT
M	S-IVB PITCH ACTUATOR REFERENCE
N	S-IVB YAW ACTUATOR INPUT
P	S-IVB YAW ACTUATOR REFERENCE
R	S-IVB YAW ACTUATOR POSITION
S	SPARE
T	SPARE
U	SPARE
V	SPARE
W	S-IVB PITCH ACTUATOR POSITION
X	MEAS S-IB ENG NO.1 YAW

Engine Actuator Substitute Panel
Connector J-3 (Cont)

Pin	Signal
Y	MEAS S-IB ENG NO.1 PITCH
Z	MEAS S-IB ENG NO.2 YAW
a	MEAS S-IB ENG NO.2 PITCH
b	MEAS S-IB ENG NO.3 YAW
c	MEAS S-IB ENG NO.3 PITCH
d	MEAS S-IB ENG NO.4 YAW
e	MEAS S-IB ENG NO.4 PITCH
f	MEAS S-IB ENG NO.1 YAW
g	MEAS S-IB ENG NO.1 PITCH
h	MEAS S-IB ENG NO.2 YAW
i	MEAS S-IB ENG NO.2 PITCH
j	MEAS S-IB ENG NO.3 YAW
k	MEAS S-IB ENG NO.3 PITCH
m	MEAS S-IB ENG NO.4 YAW
n	MEAS S-IB ENG NO.4 PITCH
p	S-IB ENG NO.1 OFF
q	S-IB ENG NO.1 ON (DO-107)
r	S-IB ENG NO.2 OFF
s	S-IB ENG NO.2 ON (DO-108)
t	S-IB ENG NO.3 OFF
u	S-IB ENG NO.3 ON (DO-109)
v	S-IB ENG NO.4 OFF
w	S-IB ENG NO.4 ON (DO-110)
x	SPARE
y	ϕ A
z	ϕ B
AA	ϕ C
BB	SPARE
CC	+6D171 28V BUS
DD	SPARE
EE	SPARE
FF	SPARE
GG	6D1R RETURN BUS
HH	SPARE
JJ	SPARE
KK	SPARE
LL	SPARE
MM	J2 MM HARDWIRE
NN	CHASSIS GROUND
PP	SHIELD TERMINATION

Engine Actuator Substitute Panel
Connector J-58

Pin	Signal
A	φA
B	φB
C	φC
D	SHIELD TERMINATION
E	SPARE
F	SPARE
G	SPARE
H	RETURN TO POWER SUPPLY 1364A12
J	+150 V
K	-150 V
L	-112 V
M	+112 V
N	-5 V
P	SPARE
R	RETURN TO POWER SUPPLY 1364A12
S	SPARE
T	SPARE
U	SPARE
V	SPARE
W	NOT USED
X	RETURN
Y	RETURN
Z	RETURN
a	RETURN
b	RETURN
c	RETURN
d	RETURN
e	RETURN
f	RETURN
g	RETURN
h	RETURN
i	RETURN
j	RETURN
k	RETURN
m	RETURN
n	RETURN
p	RETURN
q	RETURN
r	RETURN
s	RETURN
t	RETURN
u	RETURN
v	RETURN
w	RETURN
x	RETURN
y	RETURN
z	RETURN
AA	RETURN
BB	RETURN
CC	RETURN
DD	RETURN
EE	RETURN

Engine Actuator Substitute Panel
Connector J-58 (Cont)

Pin	Signal
FF	RETURN
GG	RETURN
HH	RETURN
JJ	RETURN
KK	NOT USED
LL	NOT USED
MM	NOT USED
NN	NOT USED
PP	NOT USED

Flight Control Computer Panel
Connector J-1

Pin	Signal	Selection Code	Comments
A	YAW ATTITUDE ERROR	VH70-602	0 TO 10 V PANEL INPUT
B	ROLL ATTITUDE ERROR	VH69-602	0 TO 10 V PANEL INPUT
C	PITCH ATTITUDE ERROR	VH71-602	0 TO 10 V PANEL INPUT
D	YAW ATTITUDE RATE	VR5-602	0 TO 10 V PANEL INPUT
E	ROLL ATTITUDE RATE	VR6-602	0 TO 10 V PANEL INPUT
F	PITCH ATTITUDE RATE	VR4-602	0 TO 10 V PANEL INPUT
G	SYSTEM POWER OFF	DI-1196	28 V PANEL OUTPUT
H	SYSTEM POWER ON	DI-563	28 V PANEL OUTPUT
J	SYSTEM PWR OFF (FCC SAFING)	-	28 V PANEL OUTPUT
K	SYSTEM POWER LAMP	-	28 V PANEL INPUT
L	CONTROL VOLTAGE	VM2-602	0 TO 10 V PANEL INPUT
M	60 V INTERRUPT A OFF	DI-1194	28 V PANEL OUTPUT
N	60 V INTERRUPT A ON	DI-559	28 V PANEL OUTPUT
P	60 V INTERRUPT A LAMP	DO-555	28 V PANEL INPUT
R	60 V INTERRUPT B OFF	DI-1195	28 V PANEL OUTPUT
S	60 V INTERRUPT B ON	DI-560	28 V PANEL OUTPUT
T	60 V INTERRUPT B LAMP	DO-556	28 V PANEL INPUT
U	SPARE		
V	SPARE		
W	SPARE		
X	SPARE		
Y	CAT ZERO	DI-561	28 VOLT OUTPUT
Z	CAT OPERATE	DI-562	28 VOLT OUTPUT
a	CAT ZERO	DO-558	28 VOLT INPUT
b	CAT OPERATE	DO-557	28 VOLT INPUT
c	+20D210 28 V BUS		
d	26D8R RETURN BUS		
e	+26D810 10 V BUS		
f	20D1R RETURN BUS		
g	+20D110 28 V BUS		
h	SPARE	-	RESERVED CHASSIS GND
J	SPARE	-	RESERVED SHIELD TERM.

S-IB Engine Deflection Panel
Connector J-1

Pin	Signal	Selection Code	Comments
A	ENGINE NO.1 YAW	VG2-1	0 TO 10 V PANEL INPUT
B	ENGINE NO.1 PITCH	VG1-1	0 TO 10 V PANEL INPUT
C	ENGINE NO.1 YAW Δ I	VH2-1	0 TO 10 V PANEL INPUT
D	ENGINE NO.1 PITCH Δ I	VH1-1	0 TO 10 V PANEL INPUT
E	ENGINE NO.2 YAW	VG2-2	0 TO 10 V PANEL INPUT
F	ENGINE NO.2 PITCH	VG1-2	0 TO 10 V PANEL INPUT
G	ENGINE NO.2 YAW Δ I	VH2-2	0 TO 10 V PANEL INPUT
H	ENGINE NO.2 PITCH Δ I	VH1-2	0 TO 10 V PANEL INPUT
J	ENGINE NO.3 YAW	VG2-3	0 TO 10 V PANEL INPUT
K	ENGINE NO.3 PITCH	VG1-3	0 TO 10 V PANEL INPUT
L	ENGINE NO.3 YAW Δ I	VH2-3	0 TO 10 V PANEL INPUT
M	ENGINE NO.3 PITCH Δ I	VH1-3	0 TO 10 V PANEL INPUT
N	ENGINE NO.4 YAW	VG2-4	0 TO 10 V PANEL INPUT
P	ENGINE NO.4 PITCH	VG1-4	0 TO 10 V PANEL INPUT
R	ENGINE NO.4 YAW Δ I	VH2-4	0 TO 10 V PANEL INPUT
S	ENGINE NO.4 PITCH Δ I	VH1-4	0 TO 10 V PANEL INPUT
T	YAW 1 NOT ZERO	-	28 V PANEL INPUT
U	PITCH 1 NOT ZERO	-	28 V PANEL INPUT
V	YAW 2 NOT ZERO	-	28 V PANEL INPUT
W	PITCH 2 NOT ZERO	-	28 V PANEL INPUT
X	YAW 3 NOT ZERO	-	28 V PANEL INPUT
Y	PITCH 3 NOT ZERO	-	28 V PANEL INPUT
Z	YAW 4 NOT ZERO	-	28 V PANEL INPUT
a	PITCH 4 NOT ZERO	-	28 V PANEL INPUT
b	SPARE		
c	SPARE		
d	20D2R RETURN BUS		
e	+26D810 28 V BUS		
f	26D8R RETURN BUS		
g	SPARE		
h	SPARE	-	RESERVED CHASSIS GND
i	SPARE	-	RESERVED SHIELD TERM.

S-IVB Engine Deflection Panel
Connector J-1

Pin	Signal	Selection Code	Comments
A	YAW VALVE CURRENT	-	0 TO 10 V PANEL INPUT
B	YAW DEFLECTION	-	0 TO 10 V PANEL INPUT
C	PITCH DEFLECTION	-	0 TO 10 V PANEL INPUT
D	PITCH VALVE CURRENT	-	0 TO 10 V PANEL INPUT
E	I _{II} - I _{IV} RELAY CURRENT	-	0 TO 10 V PANEL INPUT
F	I _p - I _{IIIp} RELAY CURRENT	-	0 TO 10 V PANEL INPUT
G	I _{III} I _{II} - I _{III} I _{IV} RELAY CURRENT	-	0 TO 10 V PANEL INPUT
H	I _{II} - I _{IV} VALVE	-	0 TO 5 V PANEL INPUT
J	I _p VALVE	-	0 TO 5 V PANEL INPUT
K	I _{III} I _p VALVE	-	0 TO 5 V PANEL INPUT
L	I _{III} I _{II} - I _{III} I _{IV} VALVE	-	0 TO 5 V PANEL INPUT
M	20D1R RETURN BUS		
N	SPARE		
P	+20D110 28 V BUS		
R	+26D810 10 V BUS		
S	26D8R RETURN BUS		
T	+24D810 10 V BUS		
U	24D8R RETURN BUS		
V	+10 V SUPPLY		
W	SPARE		
X	SPARE		
Y	SPARE		
Z	SPARE		
a	SPARE		
b	SPARE		
c	SPARE		
d	SPARE		
e	SPARE		
f	SPARE		
g	SPARE		
h	SPARE	-	RESERVED CHASSIS GRD
j	SPARE	-	RESERVED SHIELD TERM.

EDS/Control Rate Gyro Panel
Connector J2 Pin Functions

Pin	Signal	Selection Code	Comments
A	EDS RATE SWITCH YAW GROUP 1 LAMP	VR17-602	28 V PANEL INPUT
B	EDS RATE SWITCH ROLL GROUP 1 LAMP	VR18-602	28 V PANEL INPUT
C	EDS RATE SWITCH PITCH GROUP 1 LAMP	VR16-602	28 V PANEL INPUT
D	EDS RATE SWITCH YAW GROUP 2 LAMP	VR20-602	28 V PANEL INPUT
E	EDS RATE SWITCH ROLL GROUP 2 LAMP	VR21-602	28 V PANEL INPUT
F	EDS RATE SWITCH PITCH GROUP 2 LAMP	VR19-602	28 V PANEL INPUT
G	EDS RATE SWITCH YAW GROUP 3 LAMP	VR23-602	28 V PANEL INPUT
H	EDS RATE SWITCH ROLL GROUP 3 LAMP	VR24-602	28 V PANEL INPUT
J	EDS RATE SWITCH PITCH GROUP 3 LAMP	VR22-602	28 V PANEL INPUT
K	EDS SWITCH POINT OFF	DI-1143	28 V PANEL OUTPUT
L	EDS SWITCH POINT ON	DI-367	28 V PANEL OUTPUT
M	EDS SWITCH POINT GROUP 1 LAMP	VK123-602	28 V PANEL INPUT
N	EDS SWITCH POINT GROUP 2 LAMP	VK124-602	28 V PANEL INPUT
P	EDS SWITCH POINT GROUP 3 LAMP	VK125-602	28 V PANEL INPUT
	Remaining Pins Not Used		

ESE Ramp Control Panel
Connector J1 Pin Functions

Pin	Signal	Selection Code	Comments
A	NOT USED		
B	RAMP SLOW CONT COMP INPUT SUBS	DI-564	28 V PANEL OUTPUT
C	NOT USED		
D	RAMP SLOW CONTROL ACCELEROMETER	DI-595	28 V PANEL OUTPUT
E	NOT USED		
F	RAMP SLOW EDS/CONTROL RATE GYRO	DI-659	28 V PANEL OUTPUT
G	NOT USED		
H	NOT USED		
J	CONT ACCEL FORCE COMMAND	DO-642 DO-643	28 V PANEL INPUT
K	CONT ACCEL NEGATIVE MANUAL	-	28 V PANEL OUTPUT

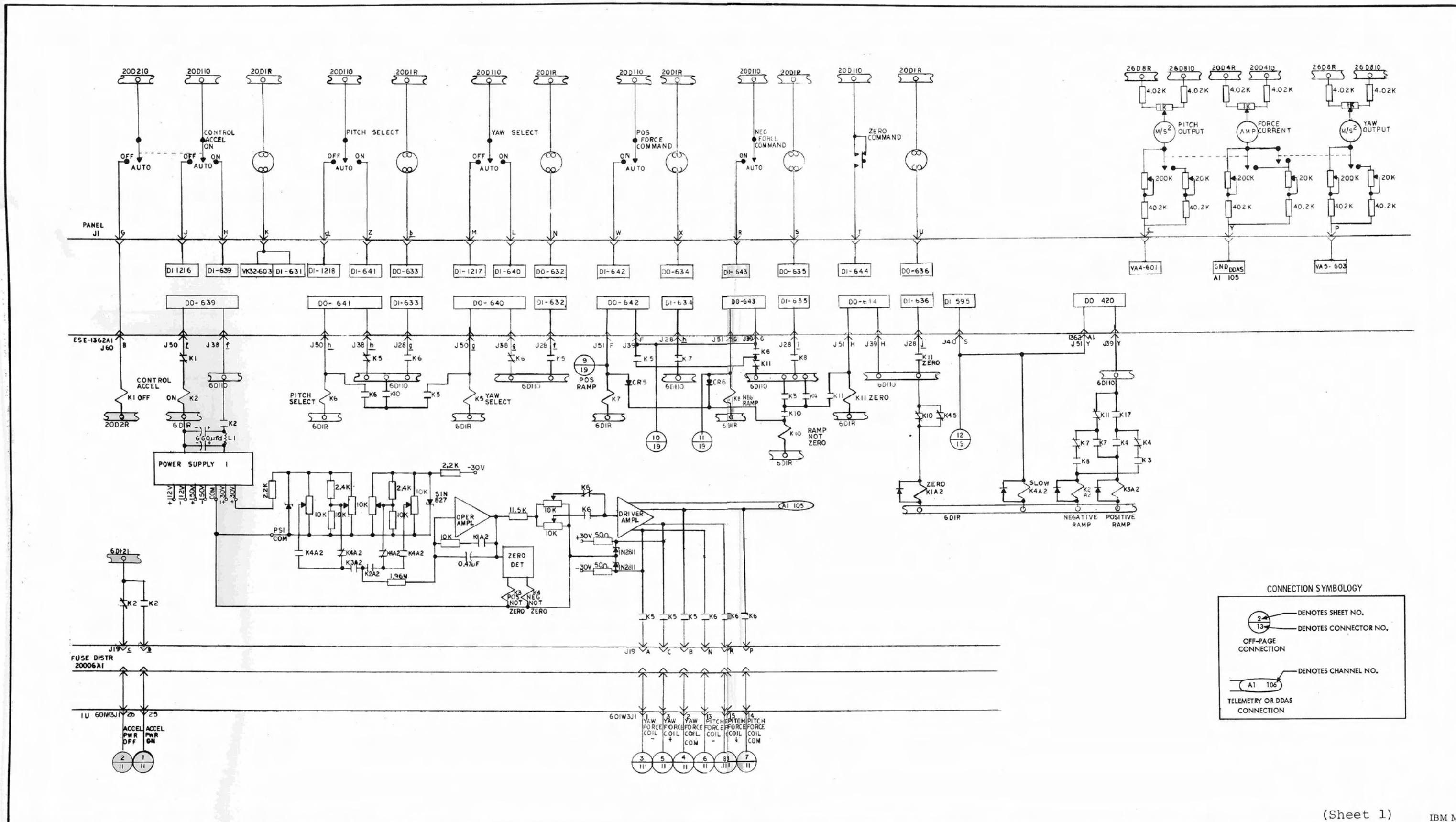
ESE Ramp Control Panel
Connector J1 Pin Functions (Cont)

Pin	Signal	Selection Code	Comments
L	CONT ACCEL POSITIVE MANUAL	-	28 V PANEL OUTPUT
M	EDS/CONT RATE GYRO RAMP COMMAND	DO-664 DO-665	28 V PANEL INPUT
N	EDS/CONT RATE GYRO NEGATIVE MANUAL	-	28 V PANEL OUTPUT
P	EDS/CONT RATE GYRO POSITIVE MANUAL	-	28 V PANEL OUTPUT
Q	NOT USED		
R	CONT COMP INPUT SUBS RAMP	DO-611 DO-612	28 V PANEL INPUT
S	CONT COMP INPUT SUBS NEG MANUAL	-	28 V PANEL OUTPUT
T	CONT COMP INPUT SUBS POS MANUAL	-	28 V PANEL OUTPUT
U	NOT USED		
V	NOT USED		
W	NOT USED		
X	6 DIR RETURN BUS	-	
Y	+6D110 28 V BUS	-	
Z	NOT USED		

Control Computer Test Panel
Connector J1 Pin Functions

Pin	Signal	Selection Code	Comments
A	REDUNDANCY CHECK NO. 5 LAMP	DO-890	28 V PANEL INPUT
B	REDUNDANCY CHECK NO. 5 OFF	DI-893	28 V PANEL OUTPUT
C	REDUNDANCY CHECK NO. 5 ON	DI-887	28 V PANEL OUTPUT
*	NOT USED		
L	RAMP SLOW LAMP	DO-564	28 V PANEL INPUT
*	NOT USED		
R	RAMP SLOW OFF	DI-736	28 V PANEL OUTPUT
S	RAMP SLOW ON	DI-677	28 V PANEL OUTPUT
*	NOT USED		
a	+20D110 28 V BUS	-	
b	20 DIR RETURN BUS	-	
*	NOT USED		

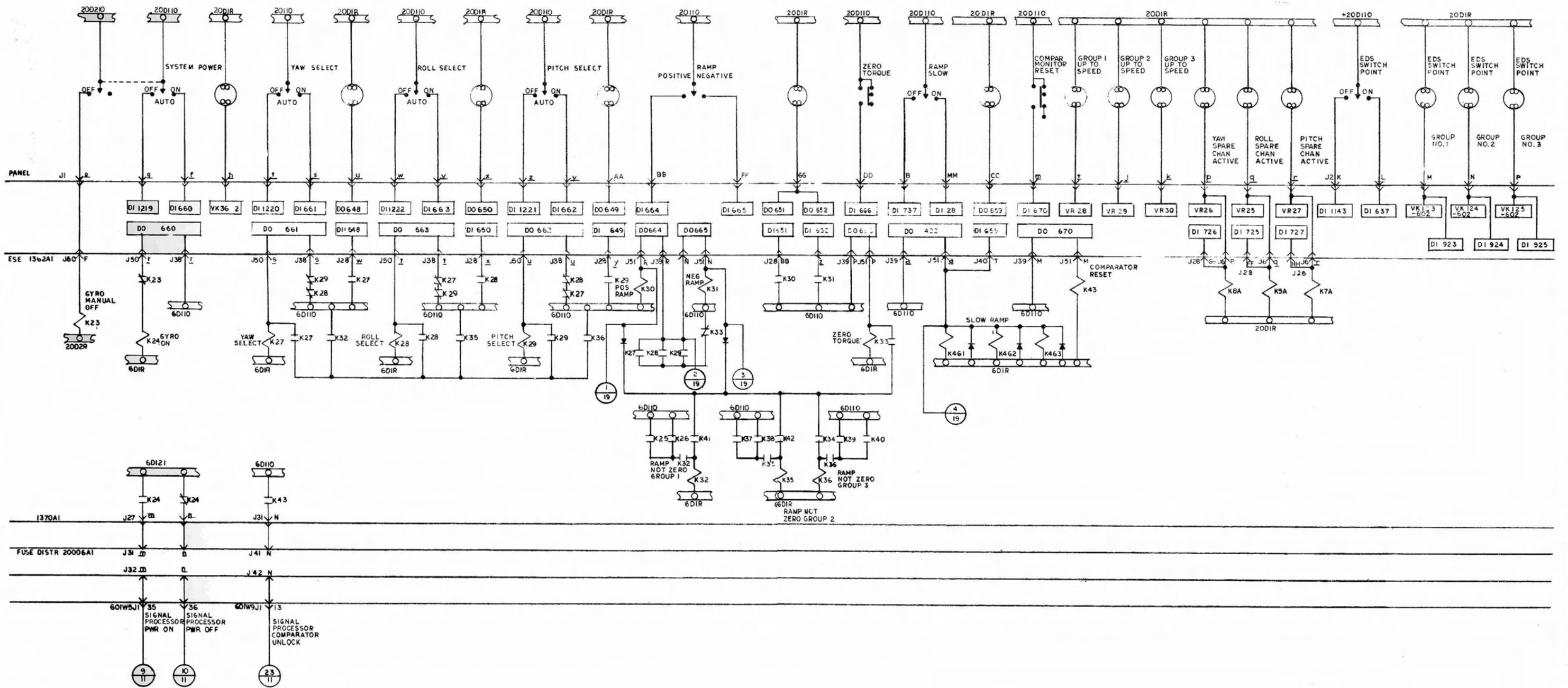
* Pins D through K, M through Q, T through Z, and c through z are spares.

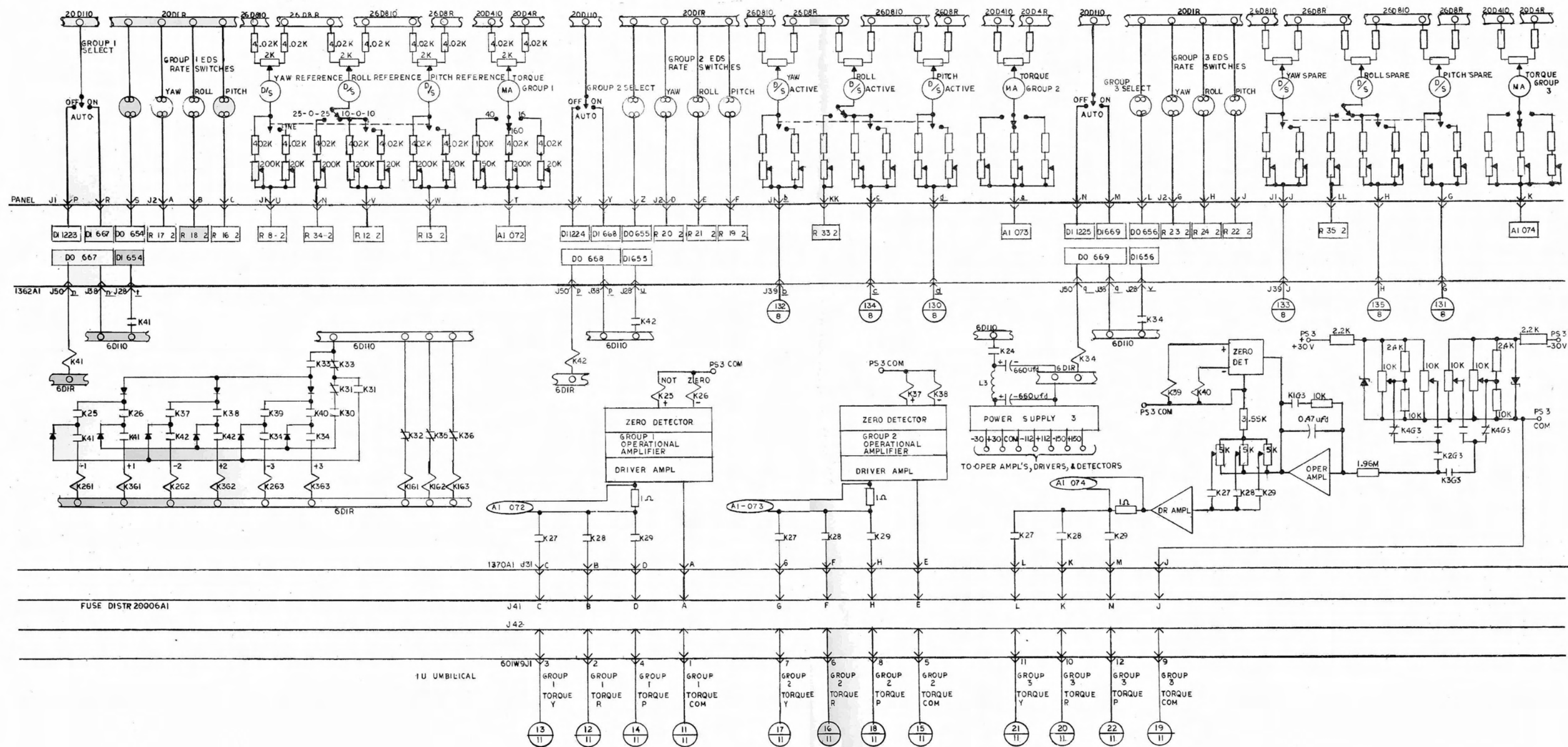


Control Accelerometer Panel

Changed 1 July 1967

B-19/B-20

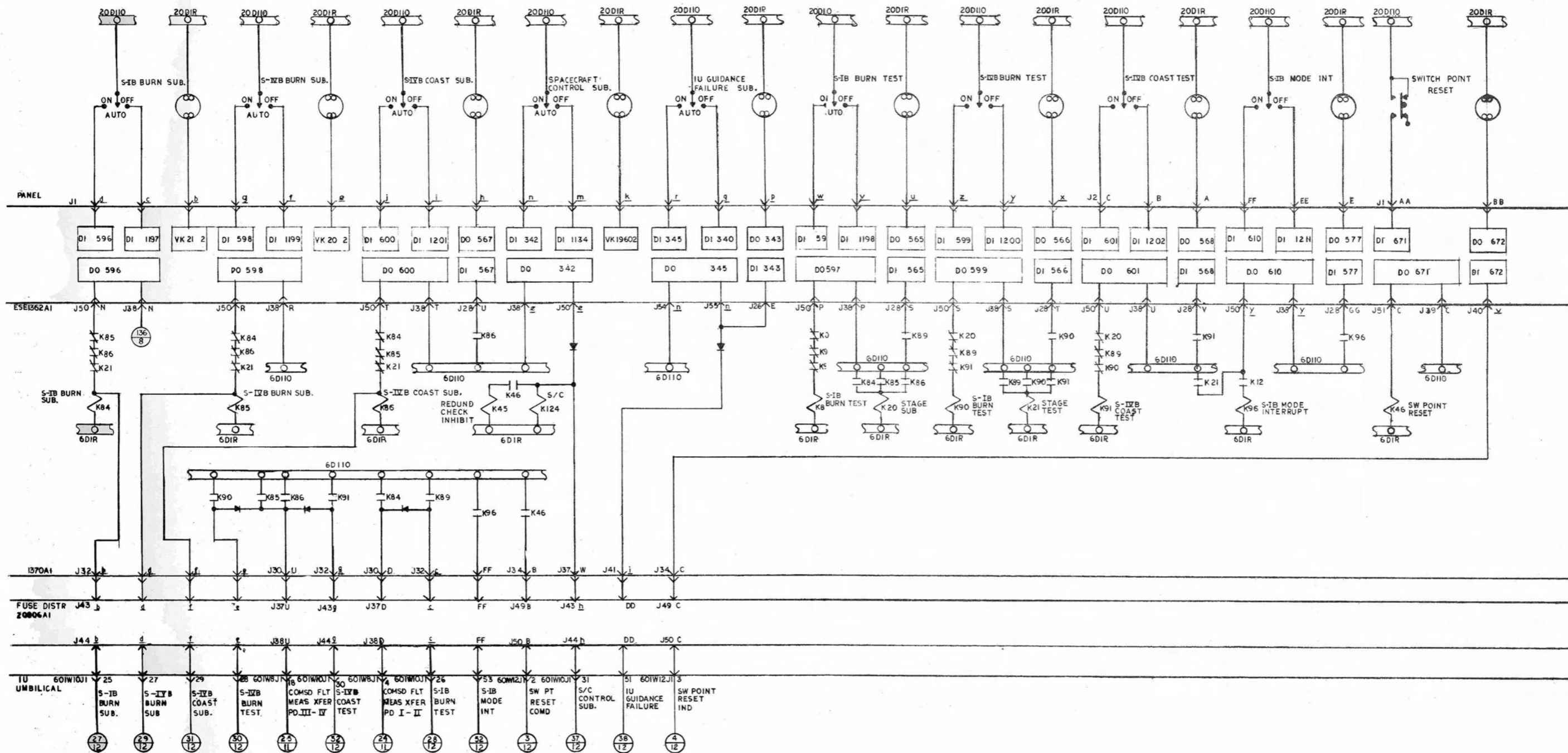


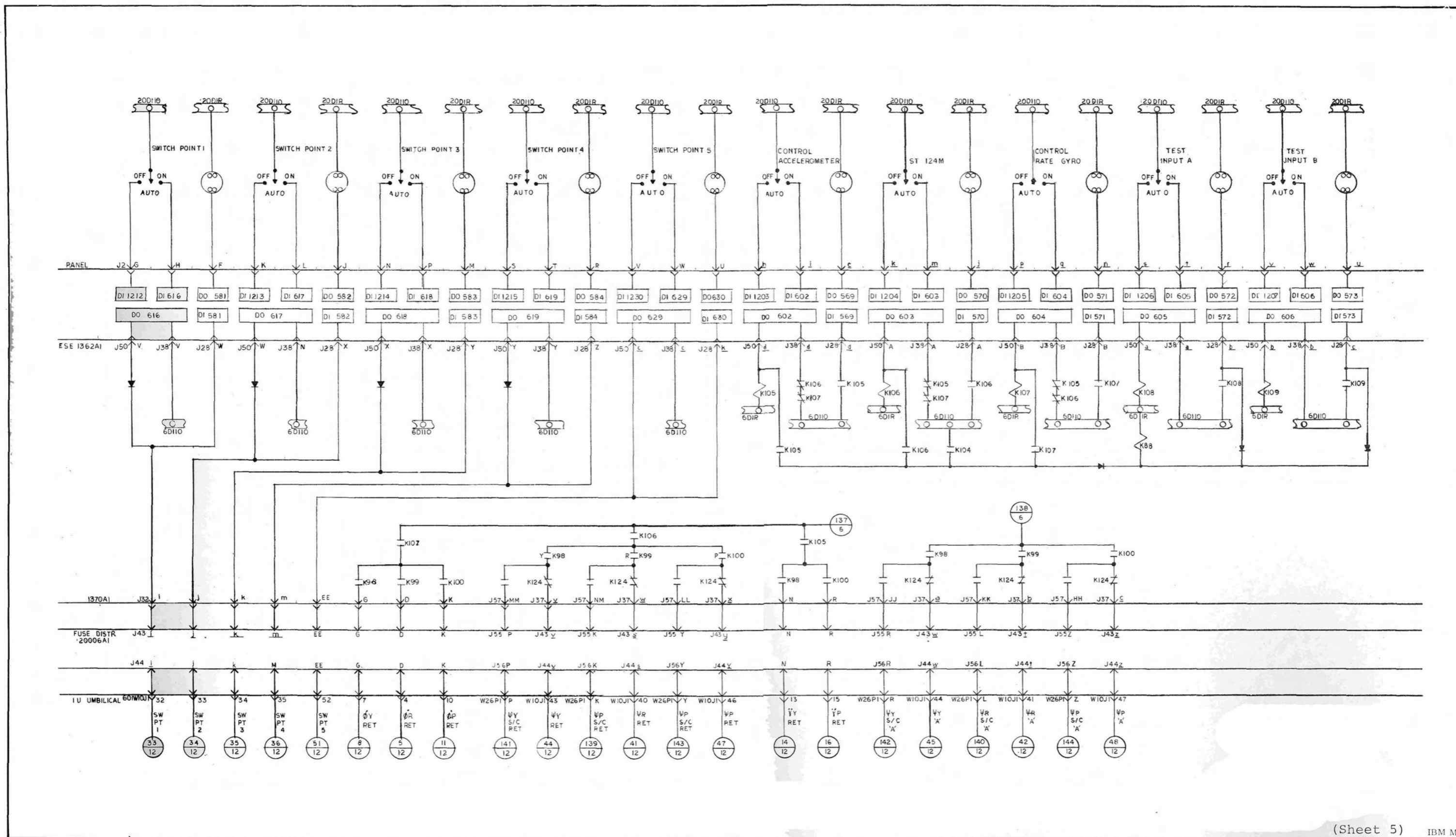


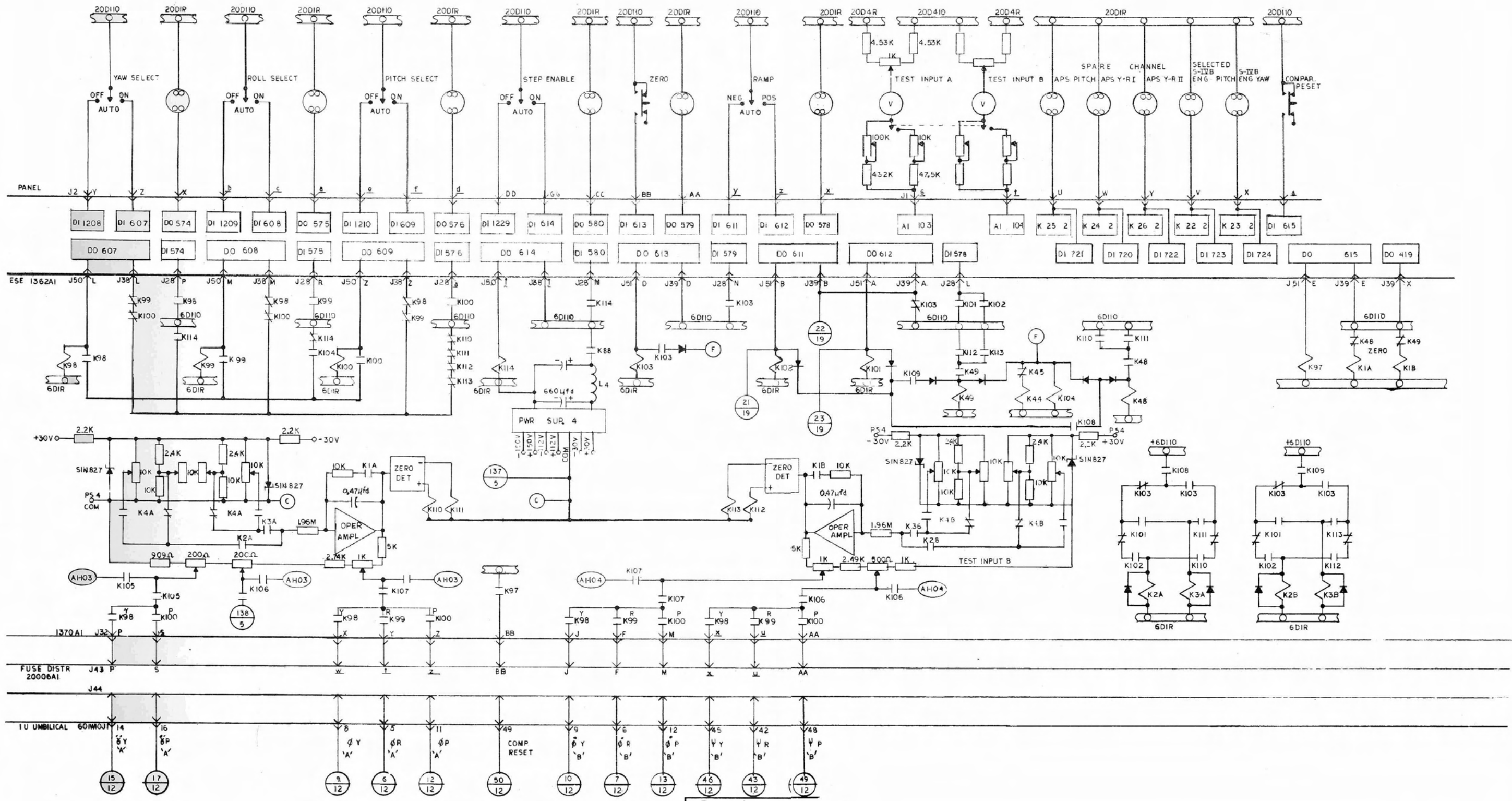
EDS/Control Rate Gyro Panel (Sheet 2)

Changed 1 July 1967

B-23/B-24

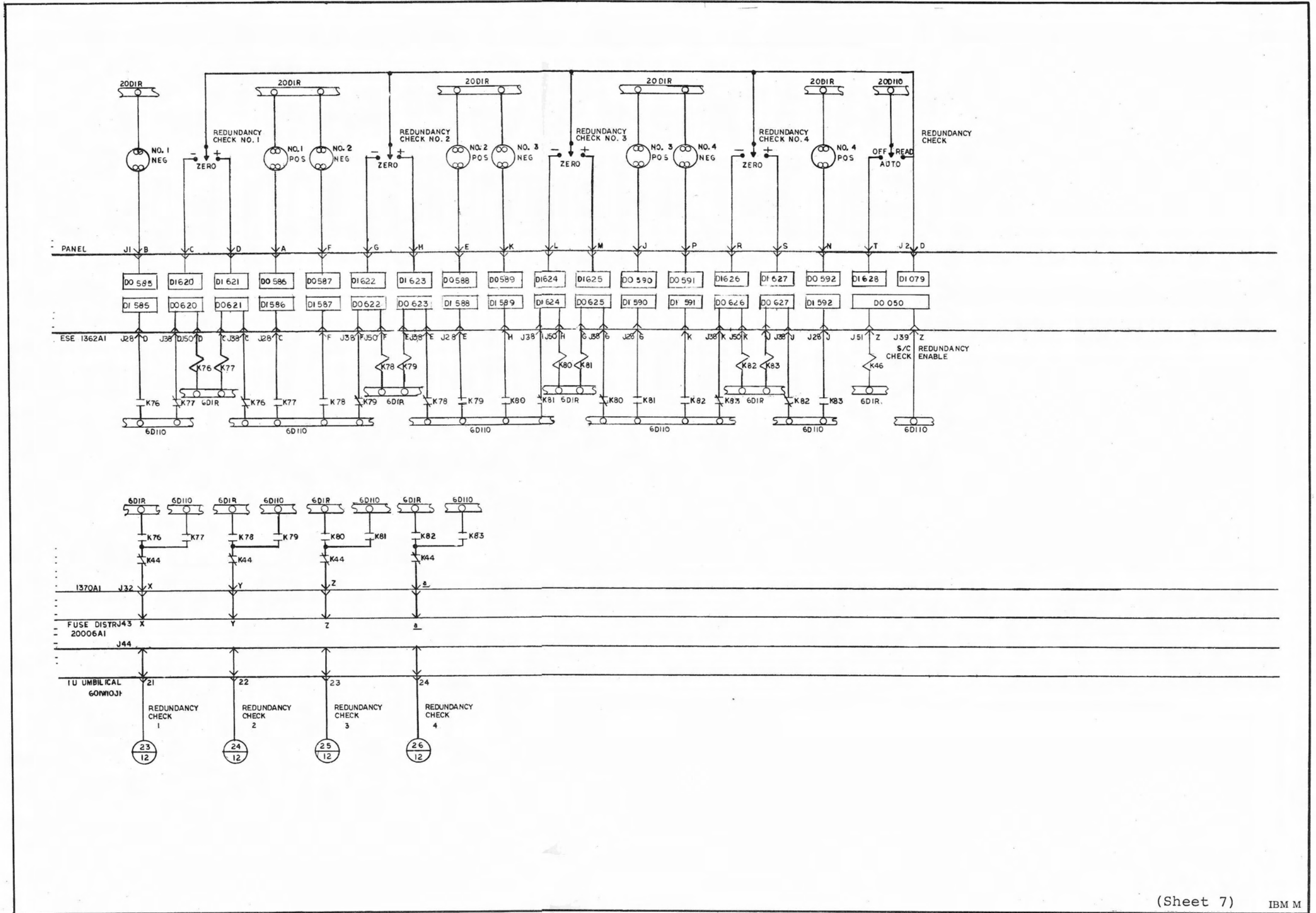


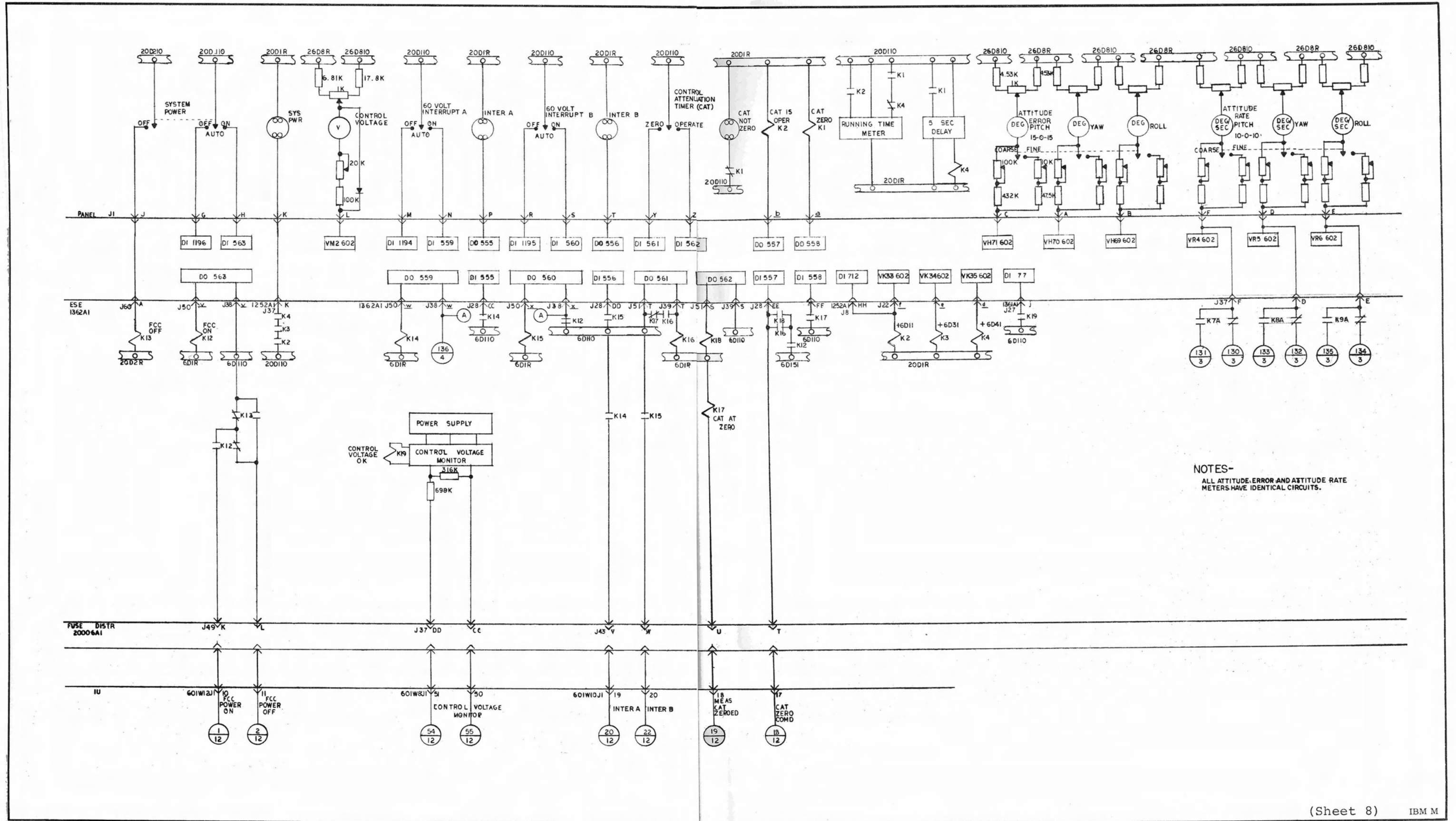




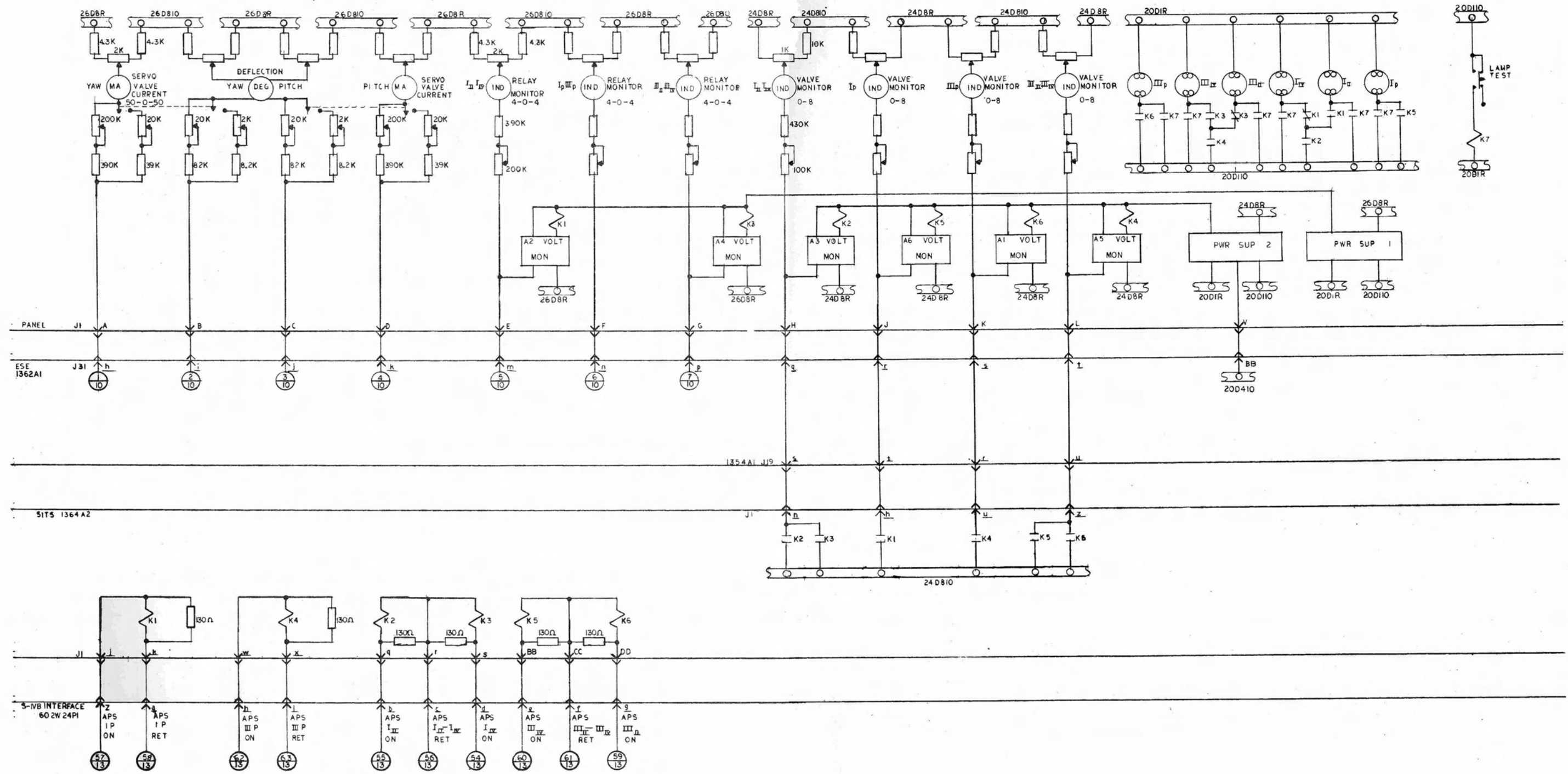
Control Computer Input Substitute Panel (Sheet 3)

Changed 1 July 1967



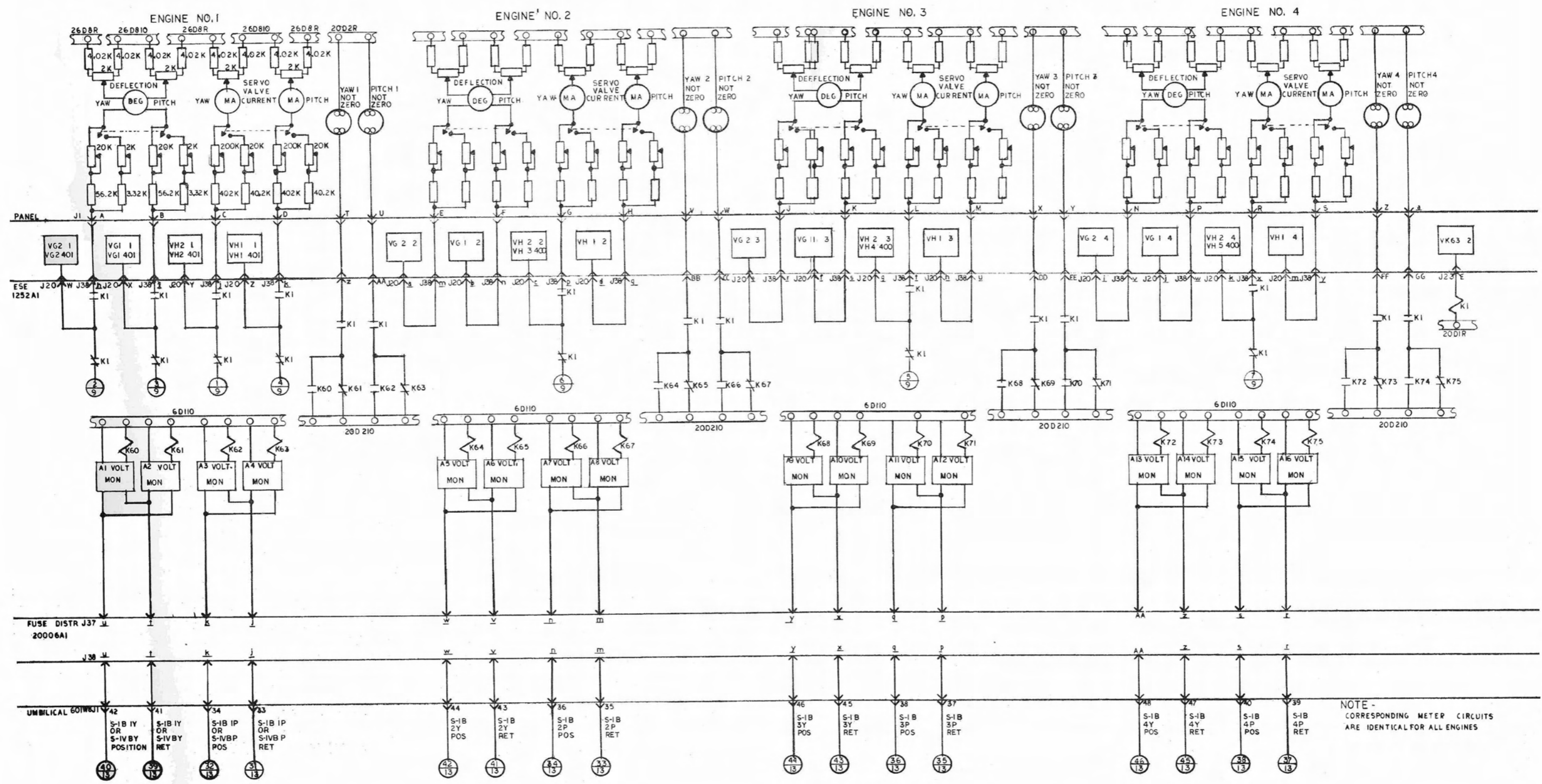


NOTES-
ALL ATTITUDE ERROR AND ATTITUDE RATE METERS HAVE IDENTICAL CIRCUITS.



S-IVB Engine Deflection Panel

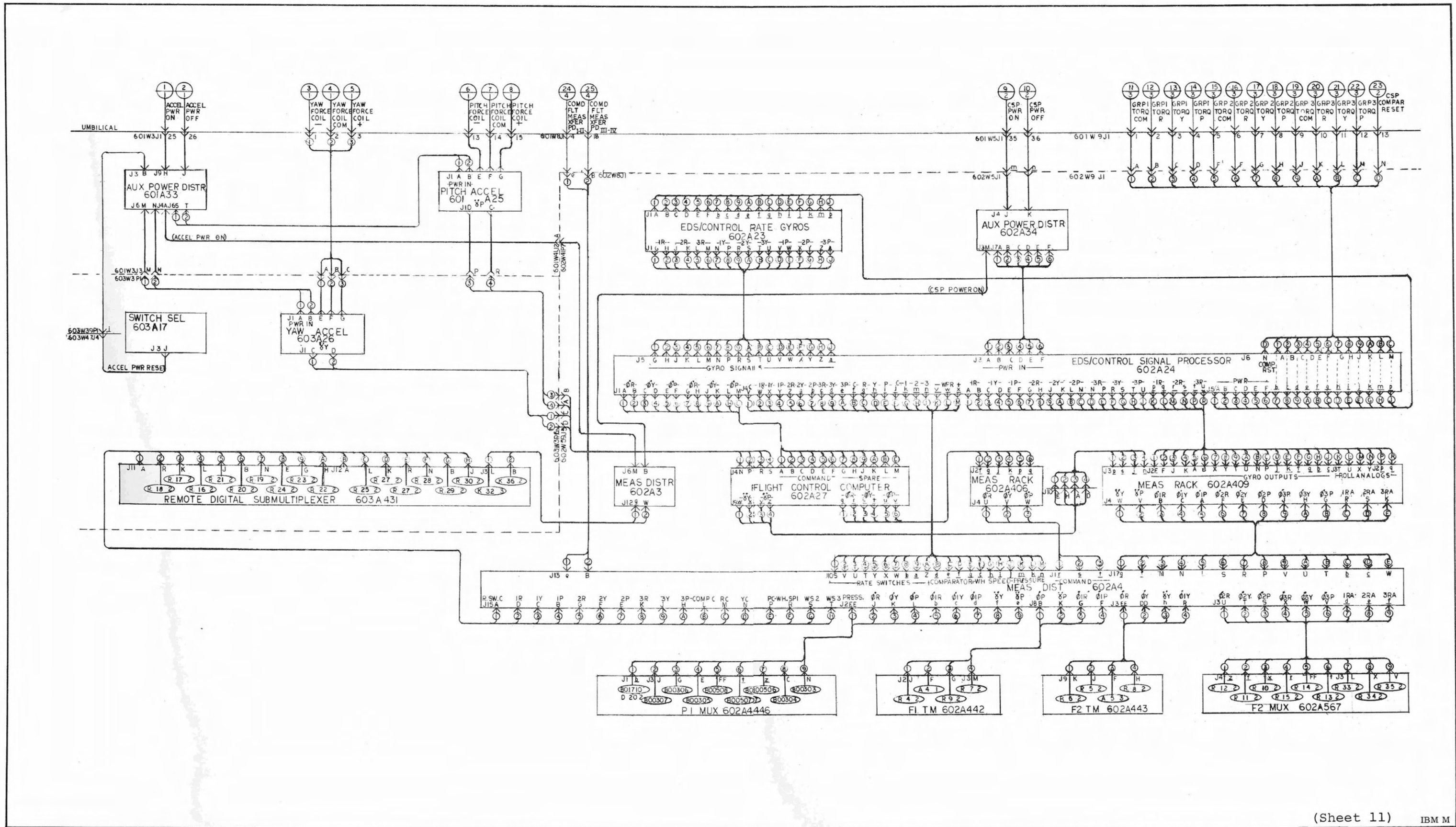
Changed 1 July 1967



S-IB Engine Deflection Panel

Changed 1 July 1967

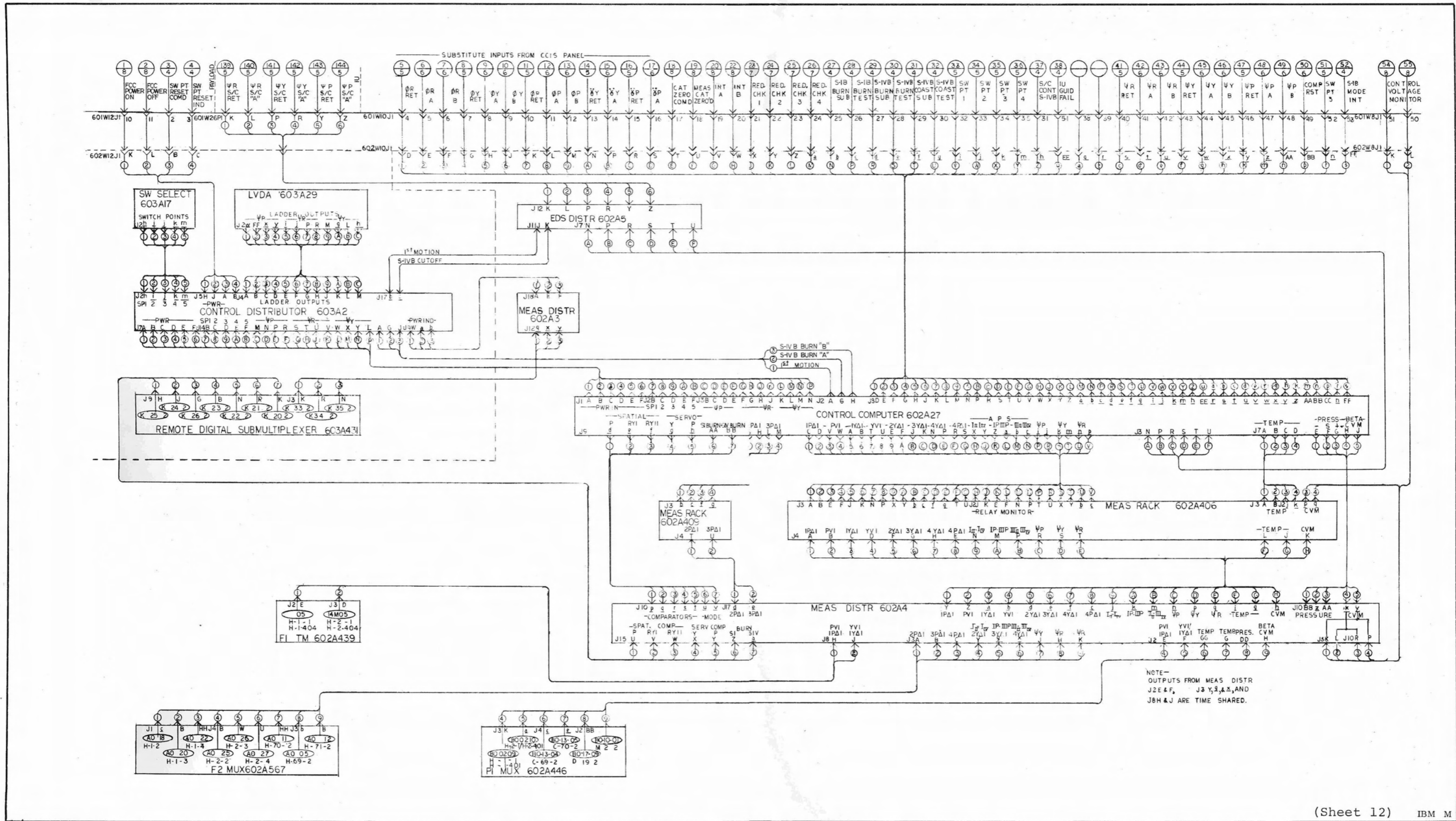
B-37/B-38

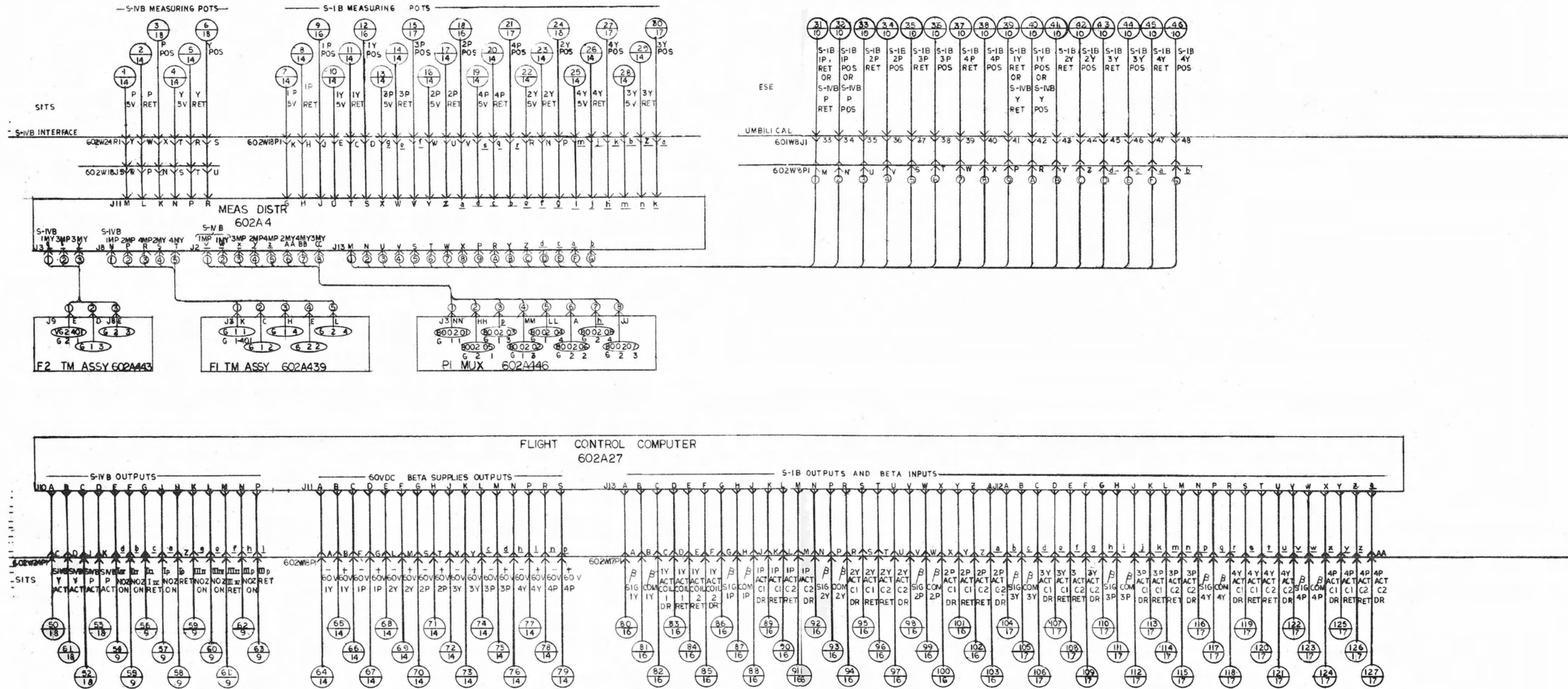


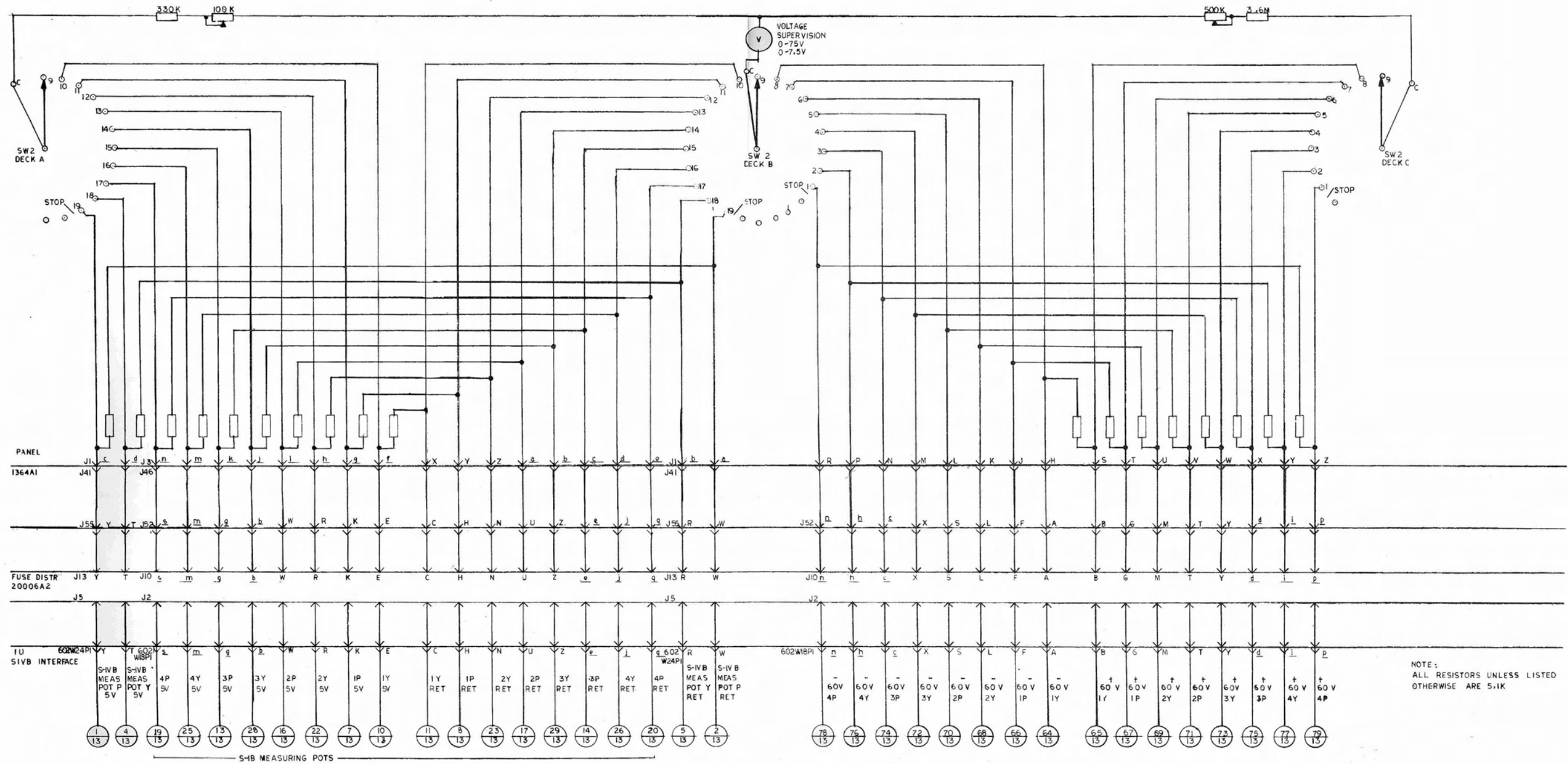
EDS/Control Rate Gyro-Control Signal Processor-
Control Accelerometers-ESE-Vehicle

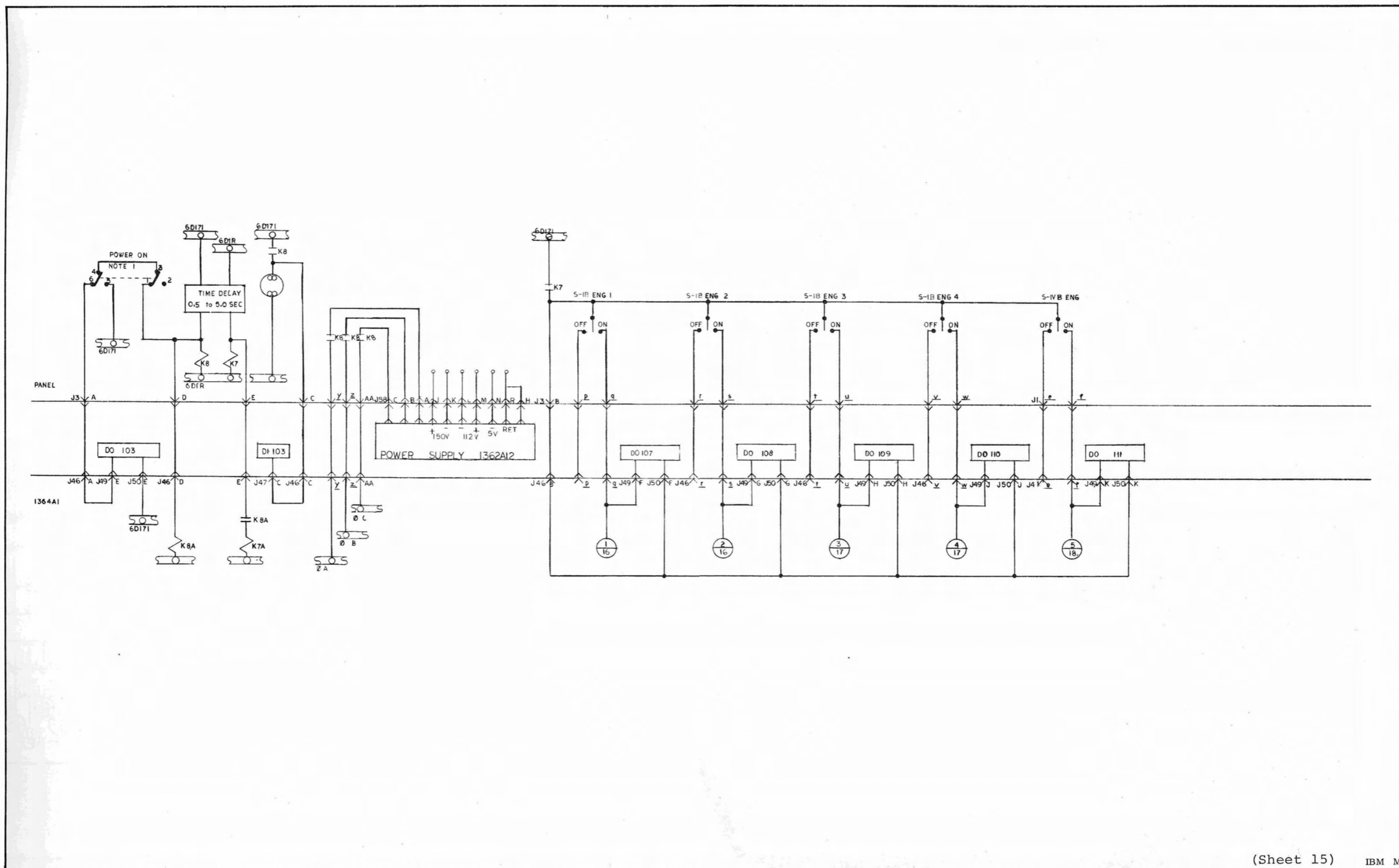
Changed 1 July 1967

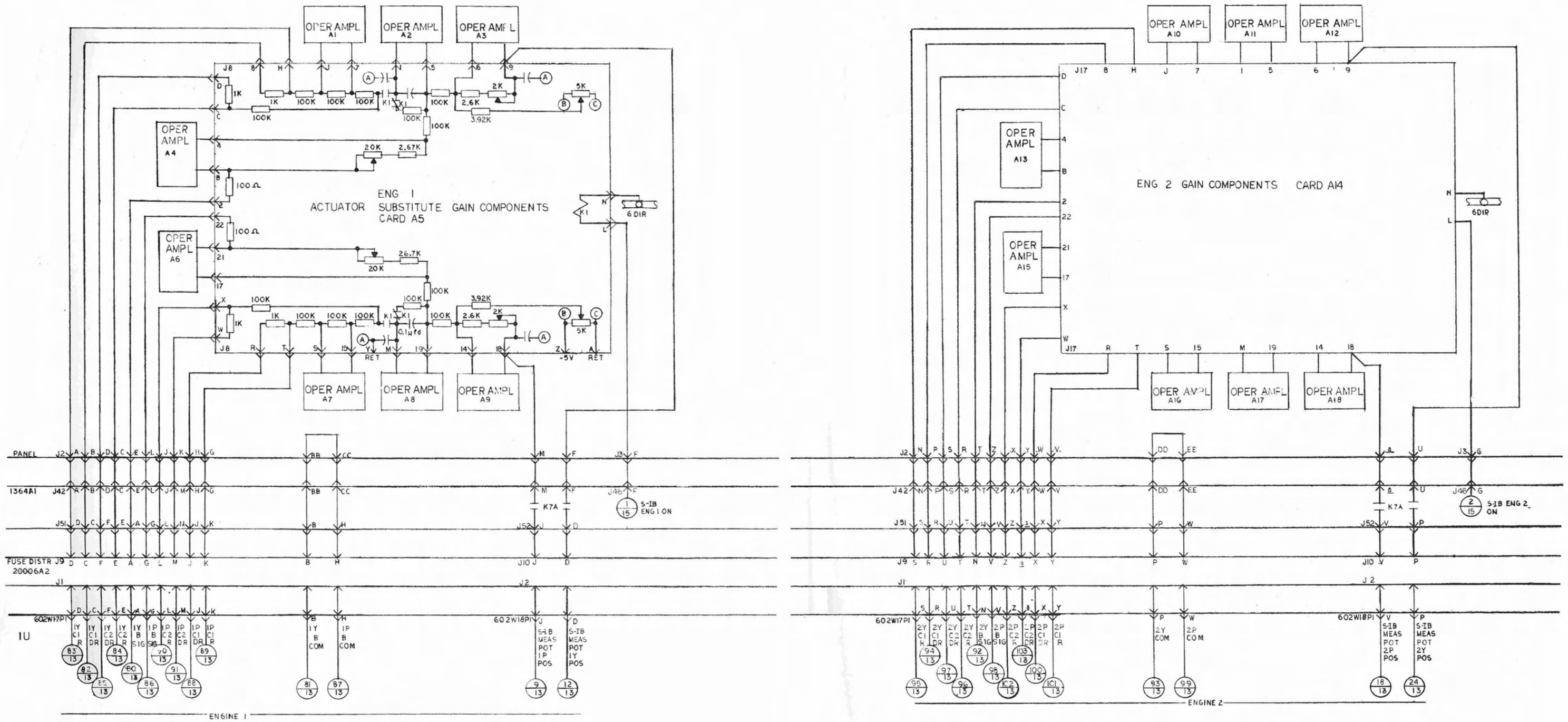
B-39/B-40







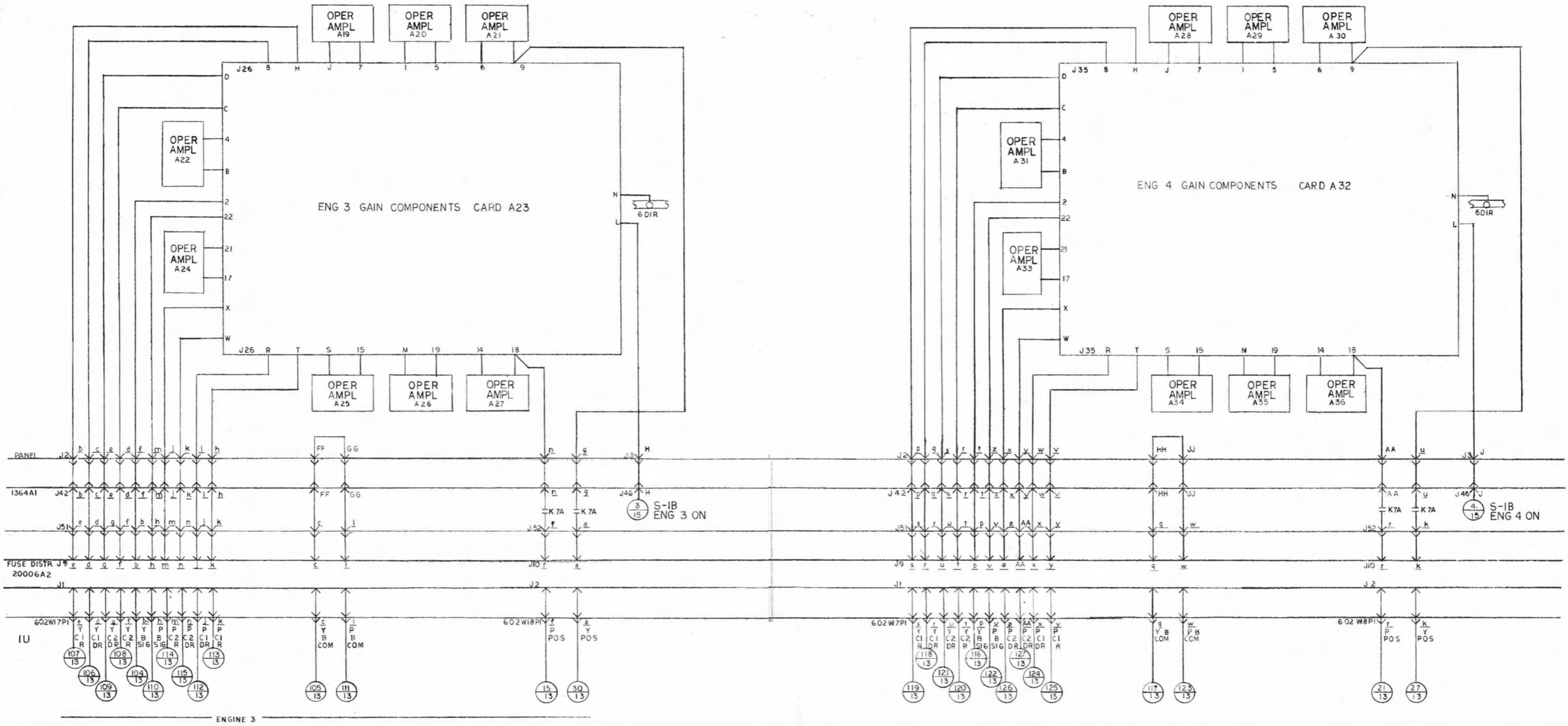


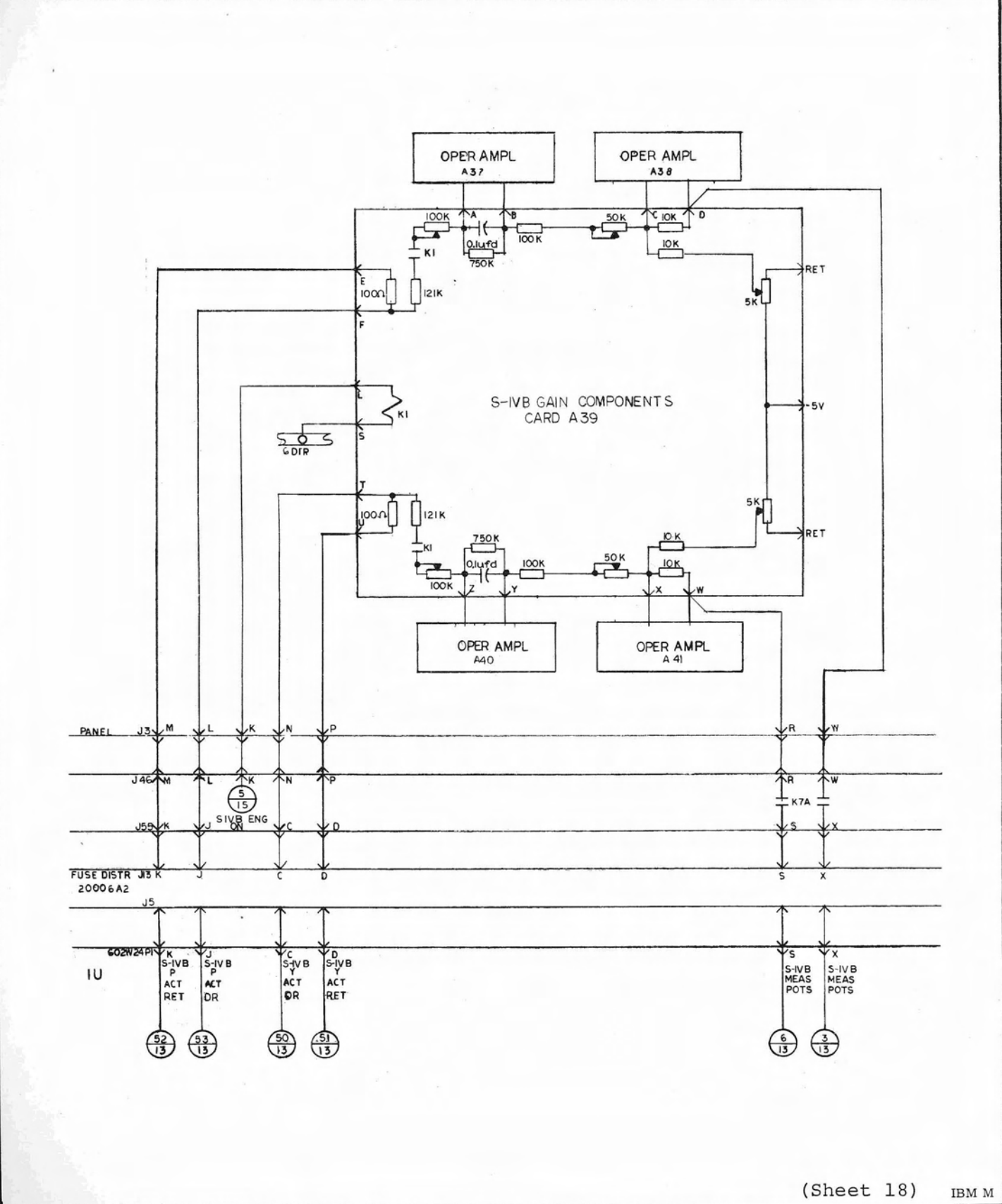


Engine Actuator Substitute Panel-SITS (Sheet 3)

Changed 1 July 1967

B-49/B-50

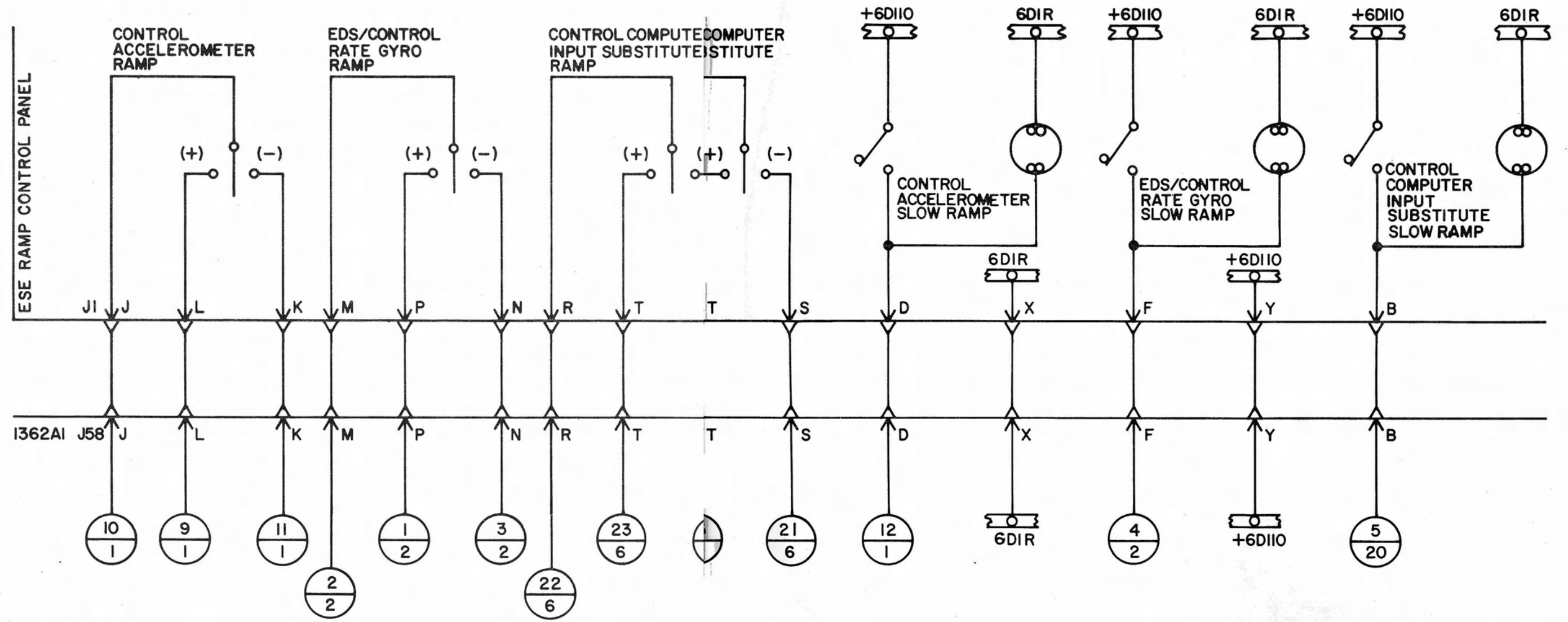




Engine Actuator Substitute Panel-SITS (Sheet 5)

Changed 1 July 1967

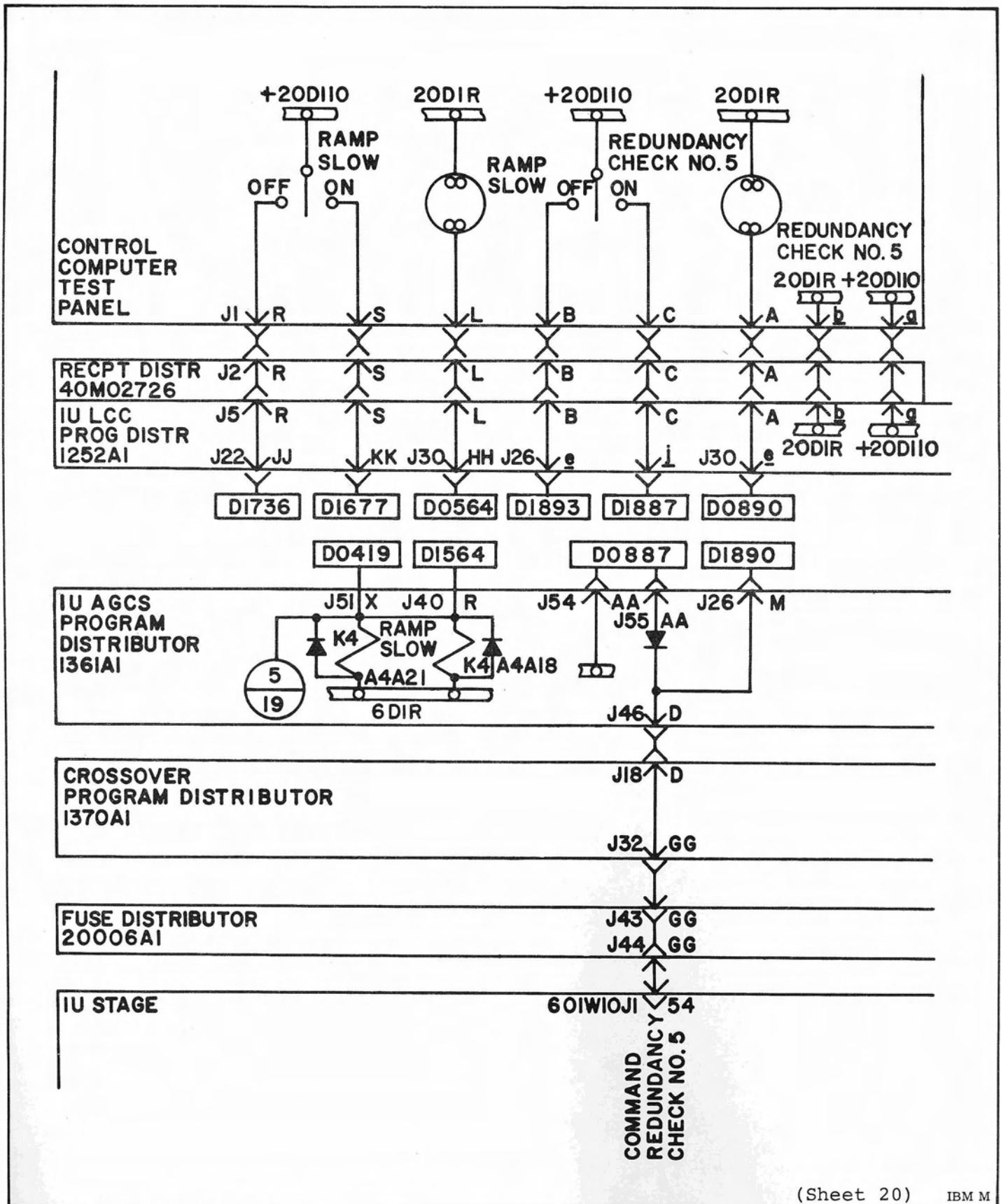
B-53/B-54



ESE Ramp Control Panel

Added 1 July 1967

B-55/B-56



Control Computer Test Panel

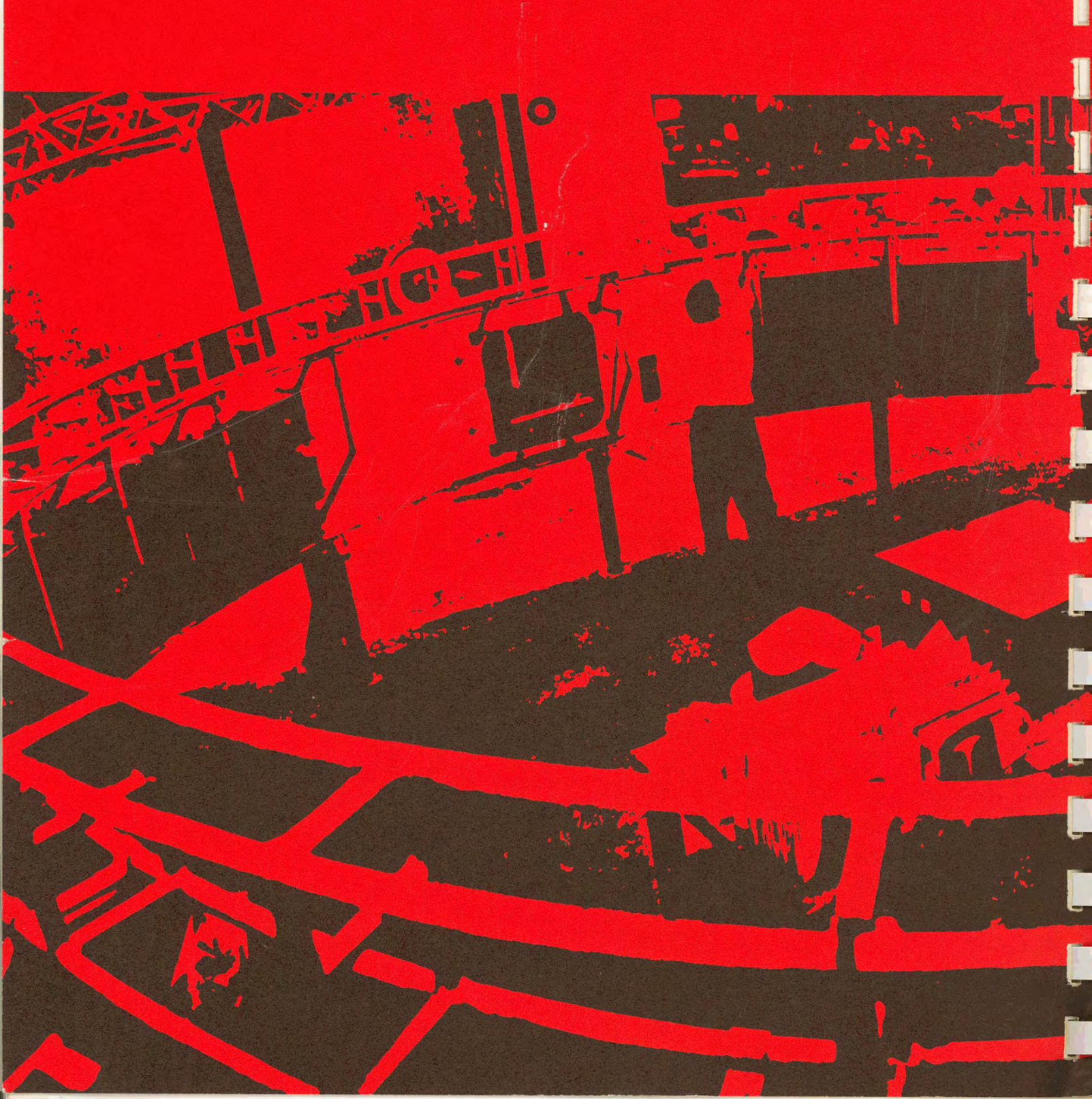
Added 1 July 1967

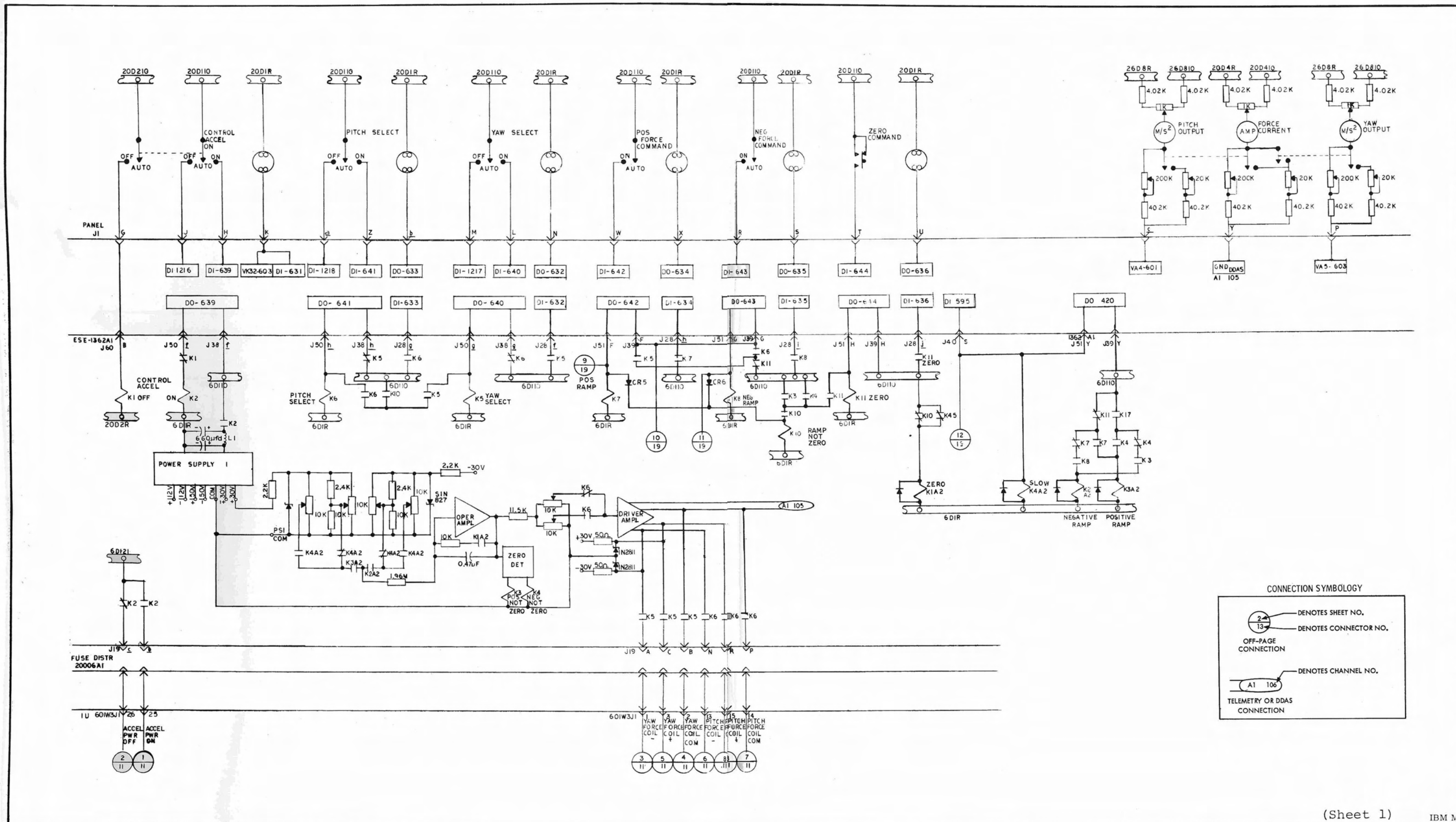
B-57/B-58



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Huntsville, Alabama



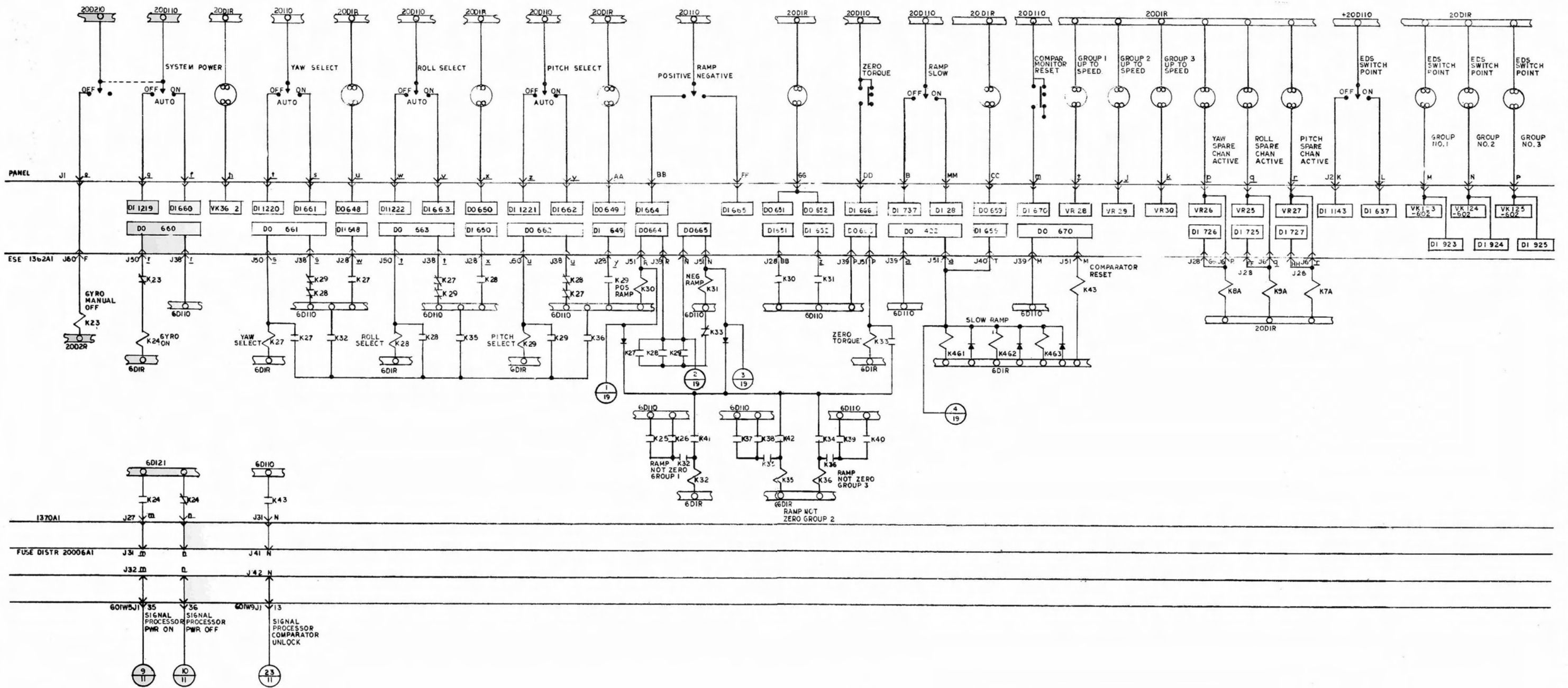


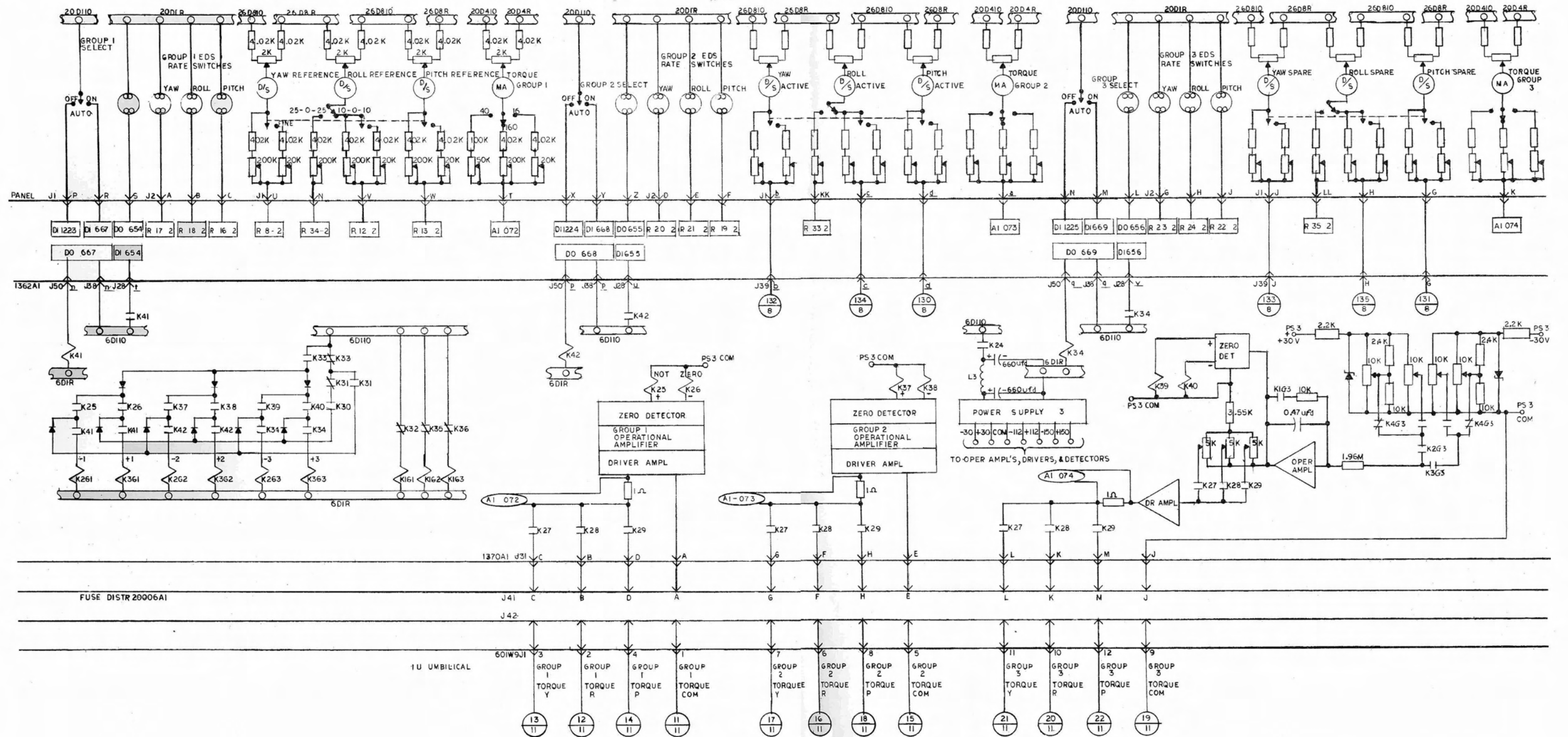
(Sheet 1) IBM M

Control Accelerometer Panel

Changed 1 July 1967

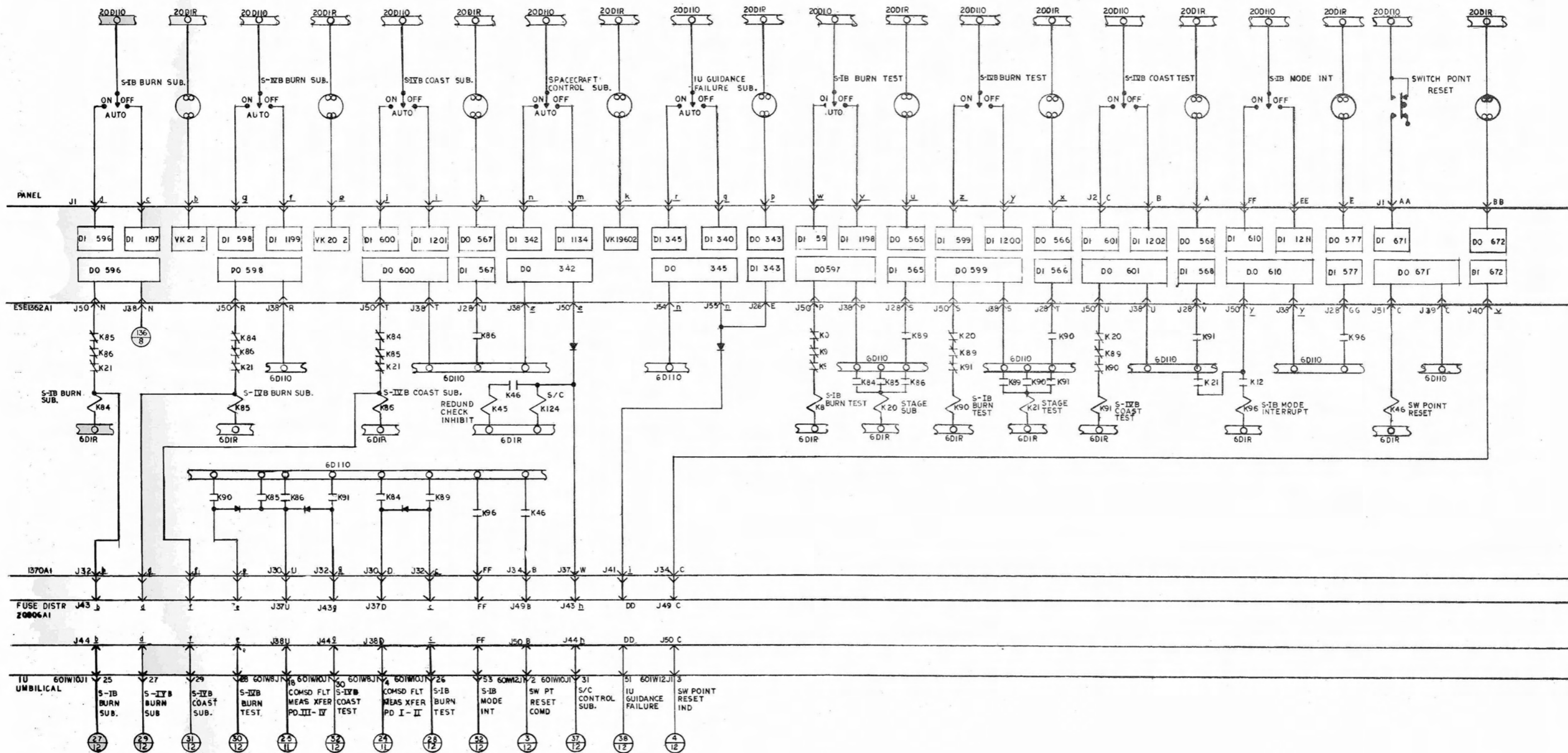
B-19/B-20

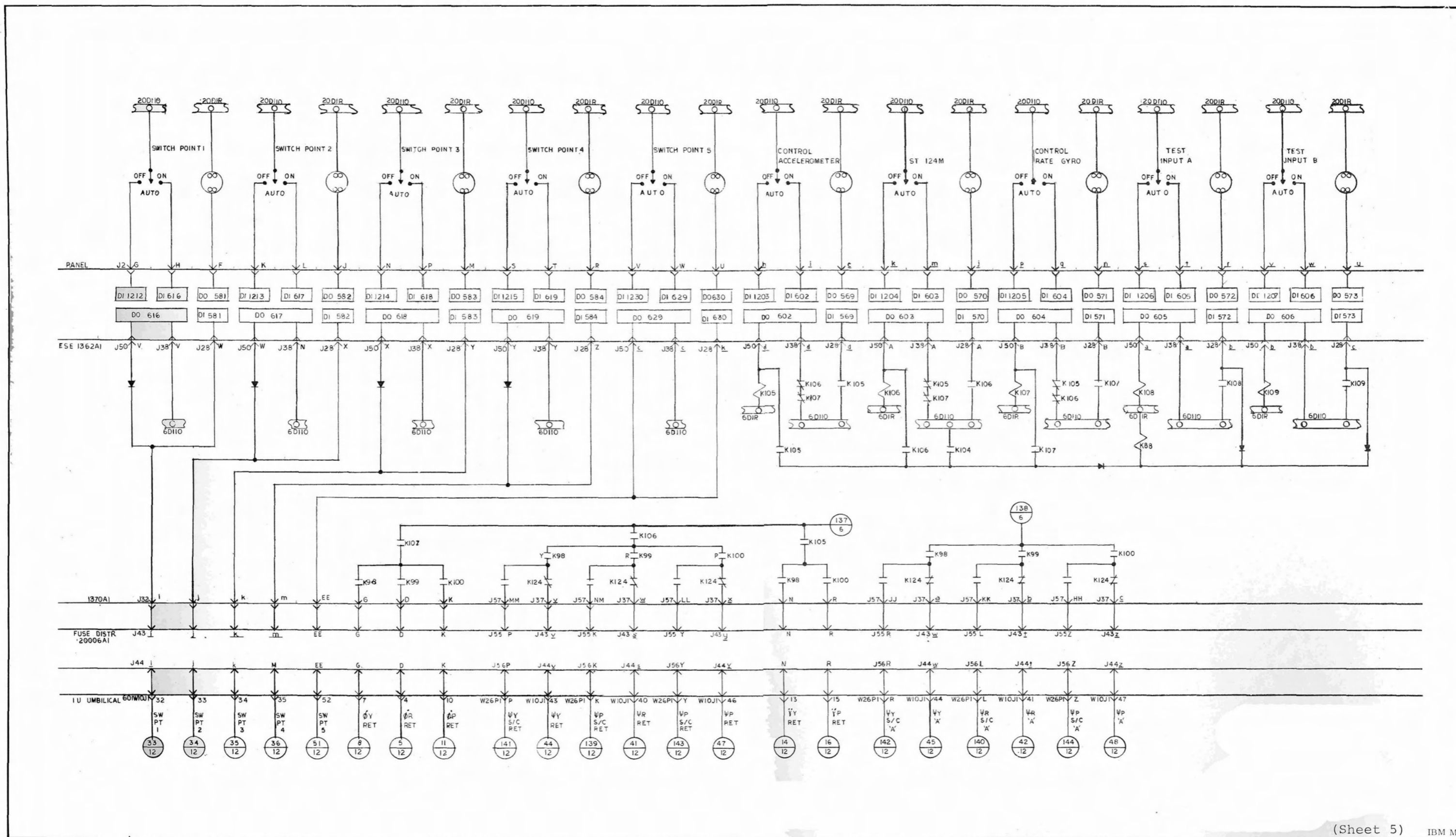




EDS/Control Rate Gyro Panel (Sheet 2)

Changed 1 July 1967



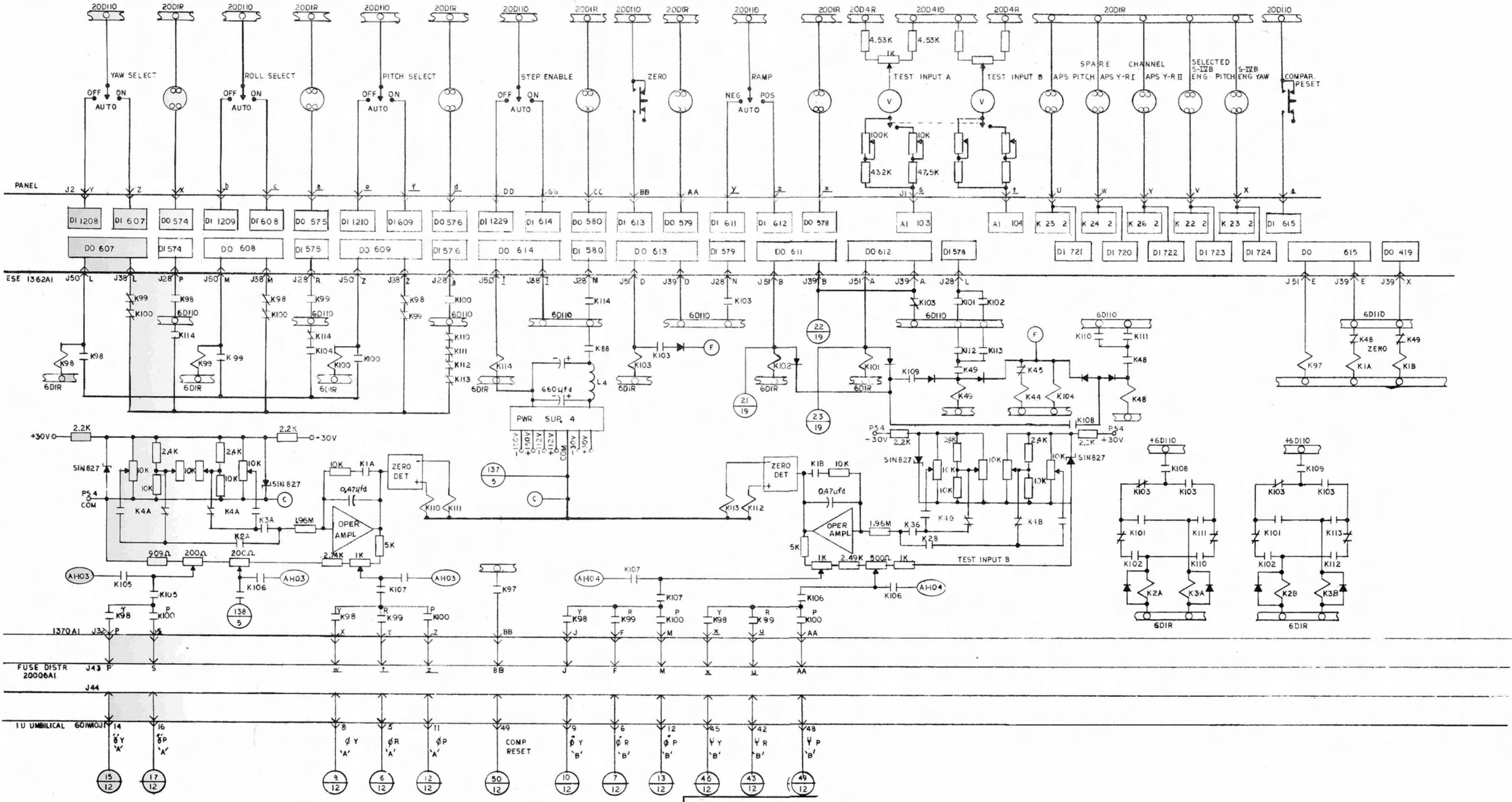


(Sheet 5) IBM M

Control Computer Input Substitute Panel (Sheet 2)

Changed 1 July 1967

B-27/B-28

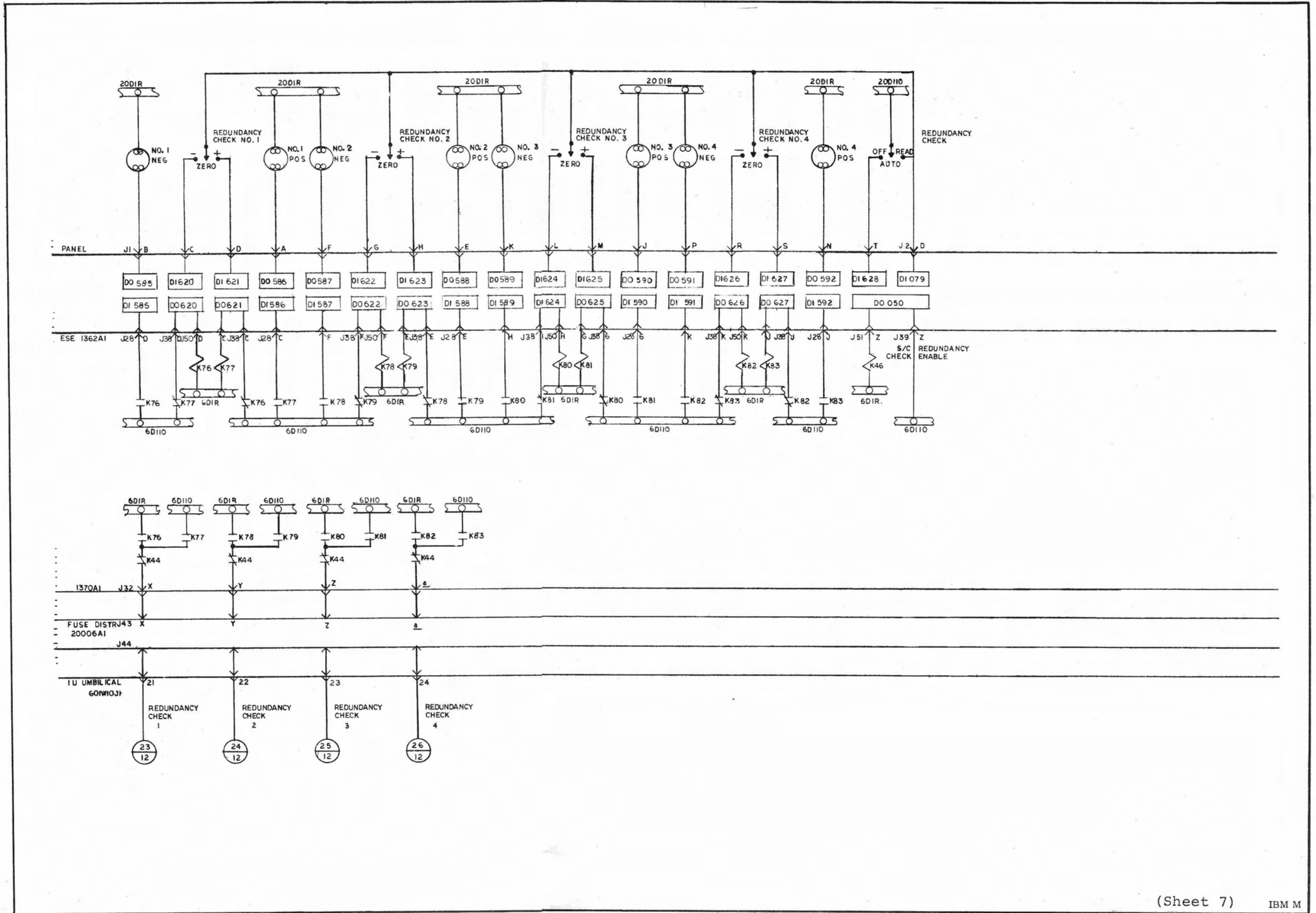


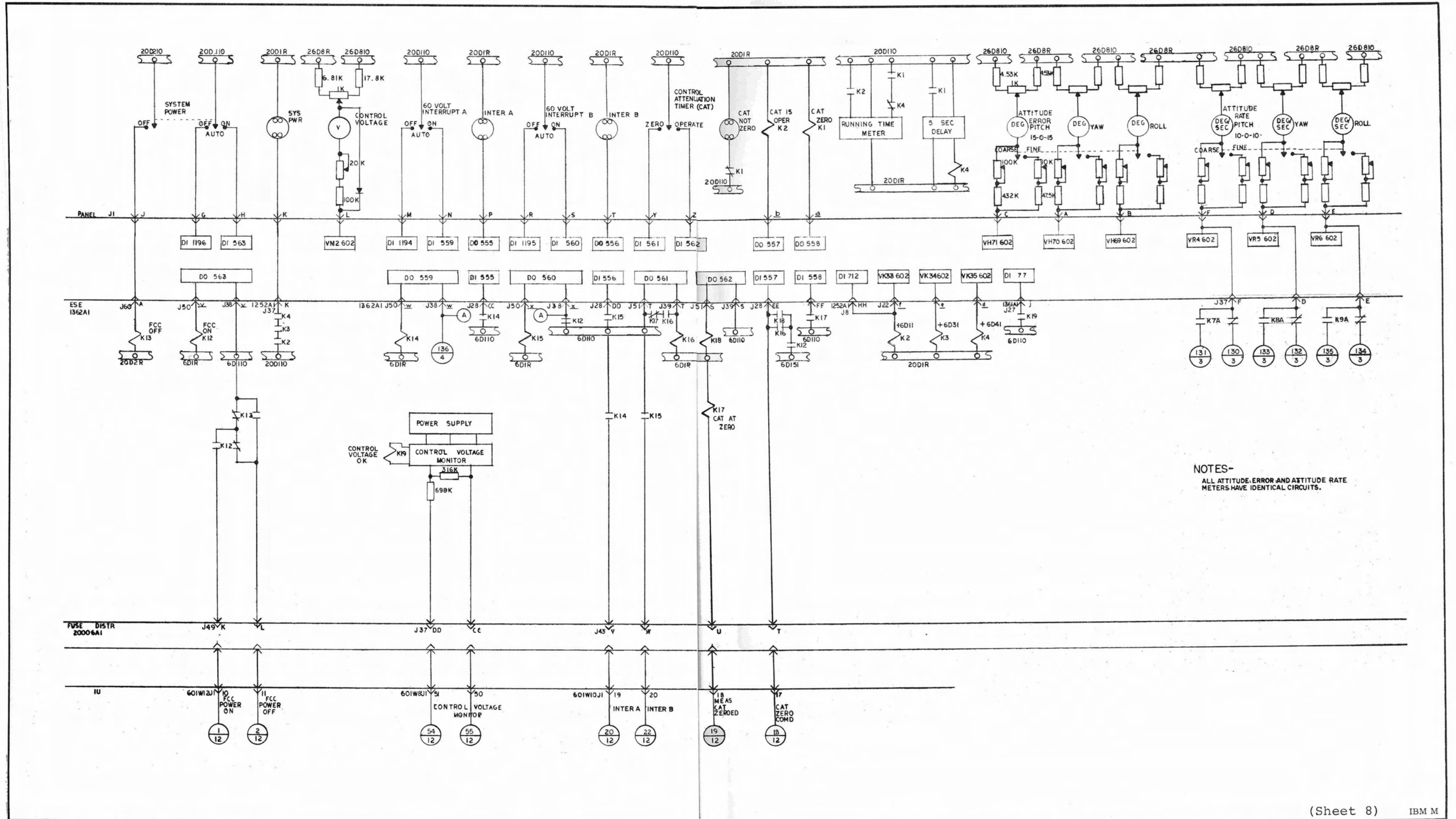
(Sheet 6) IBM M

Control Computer Input Substitute Panel (Sheet 3)

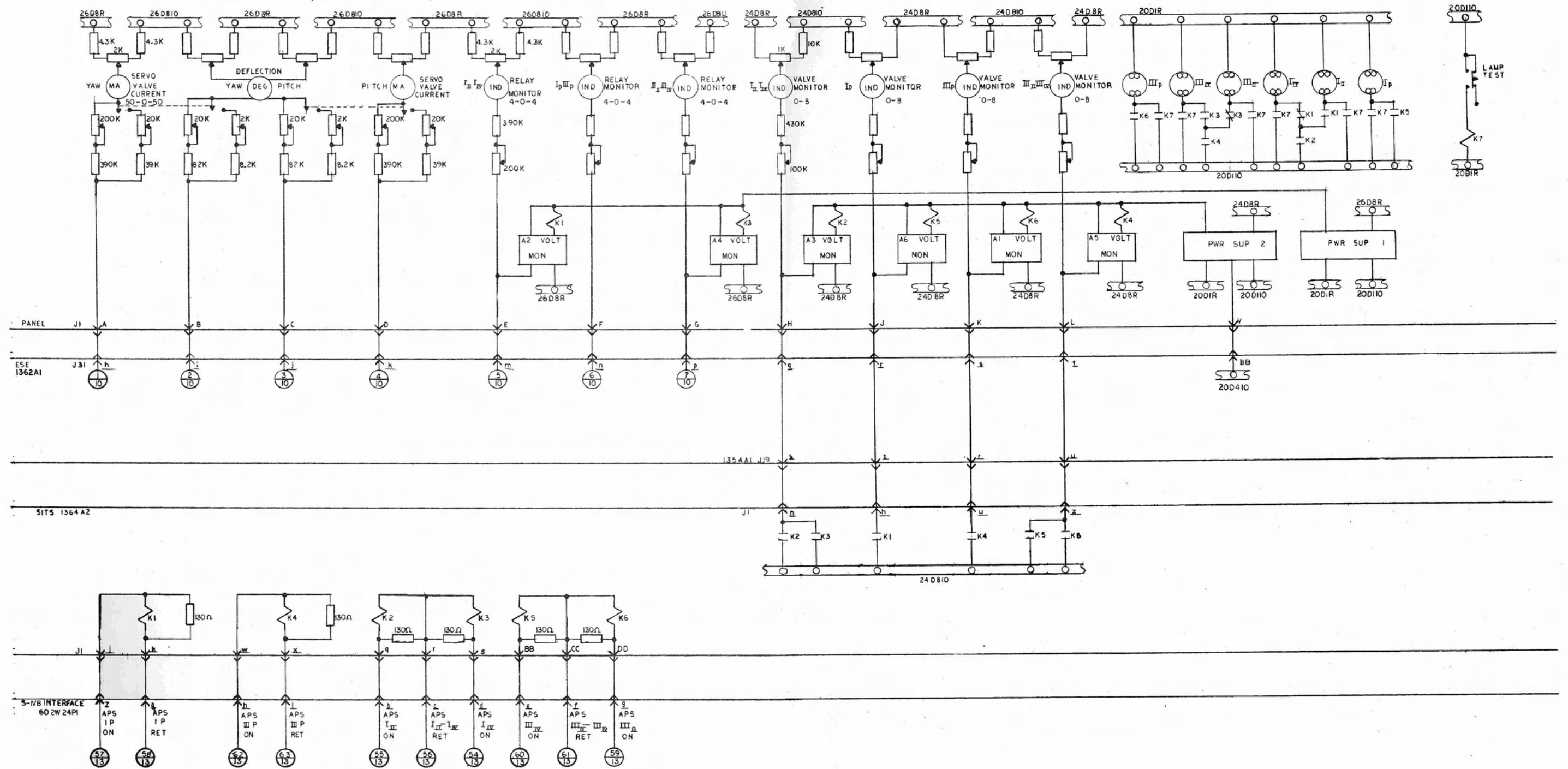
Changed 1 July 1967

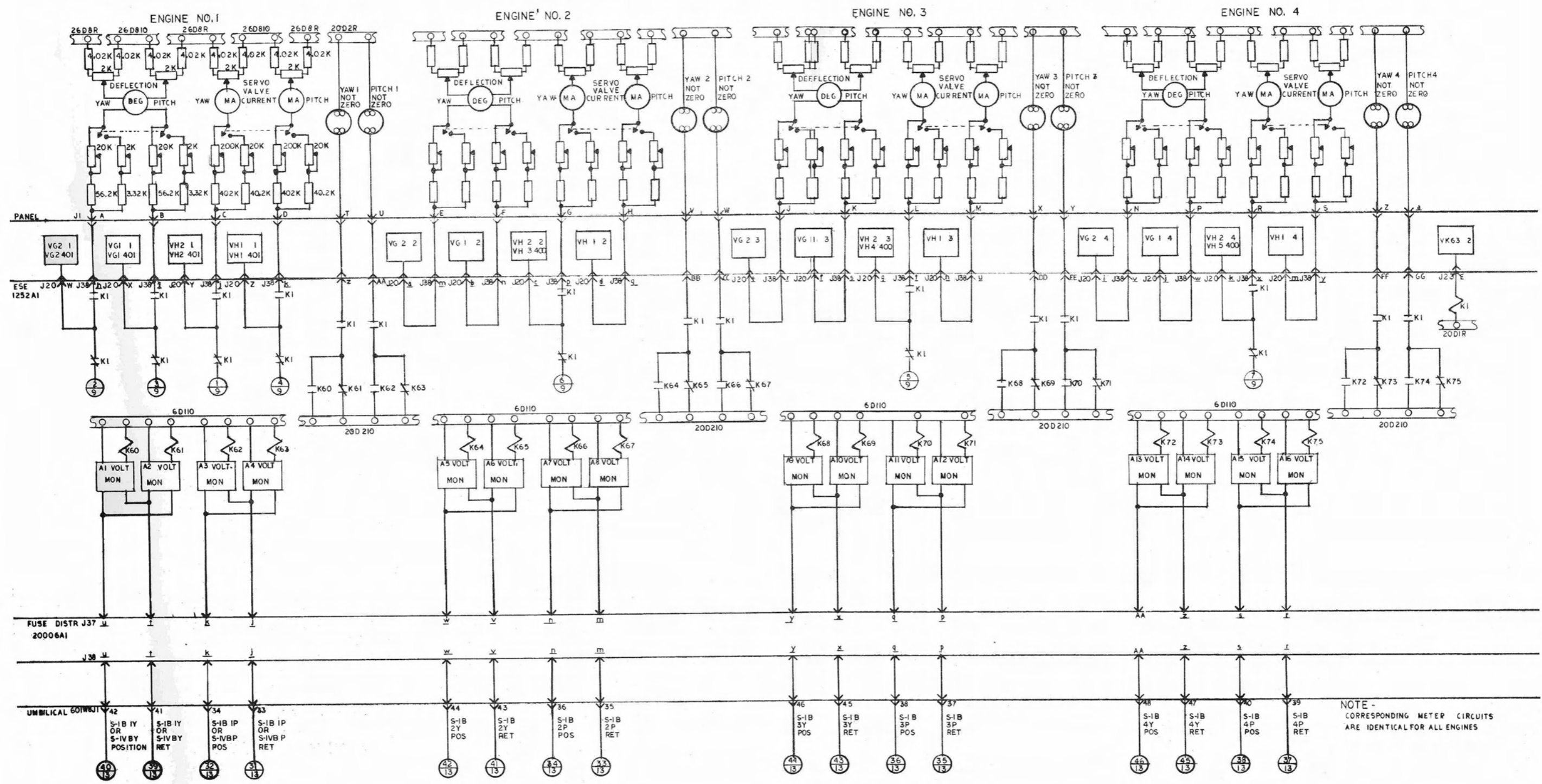
B-29/B-30





NOTES-
ALL ATTITUDE ERROR AND ATTITUDE RATE METERS HAVE IDENTICAL CIRCUITS.



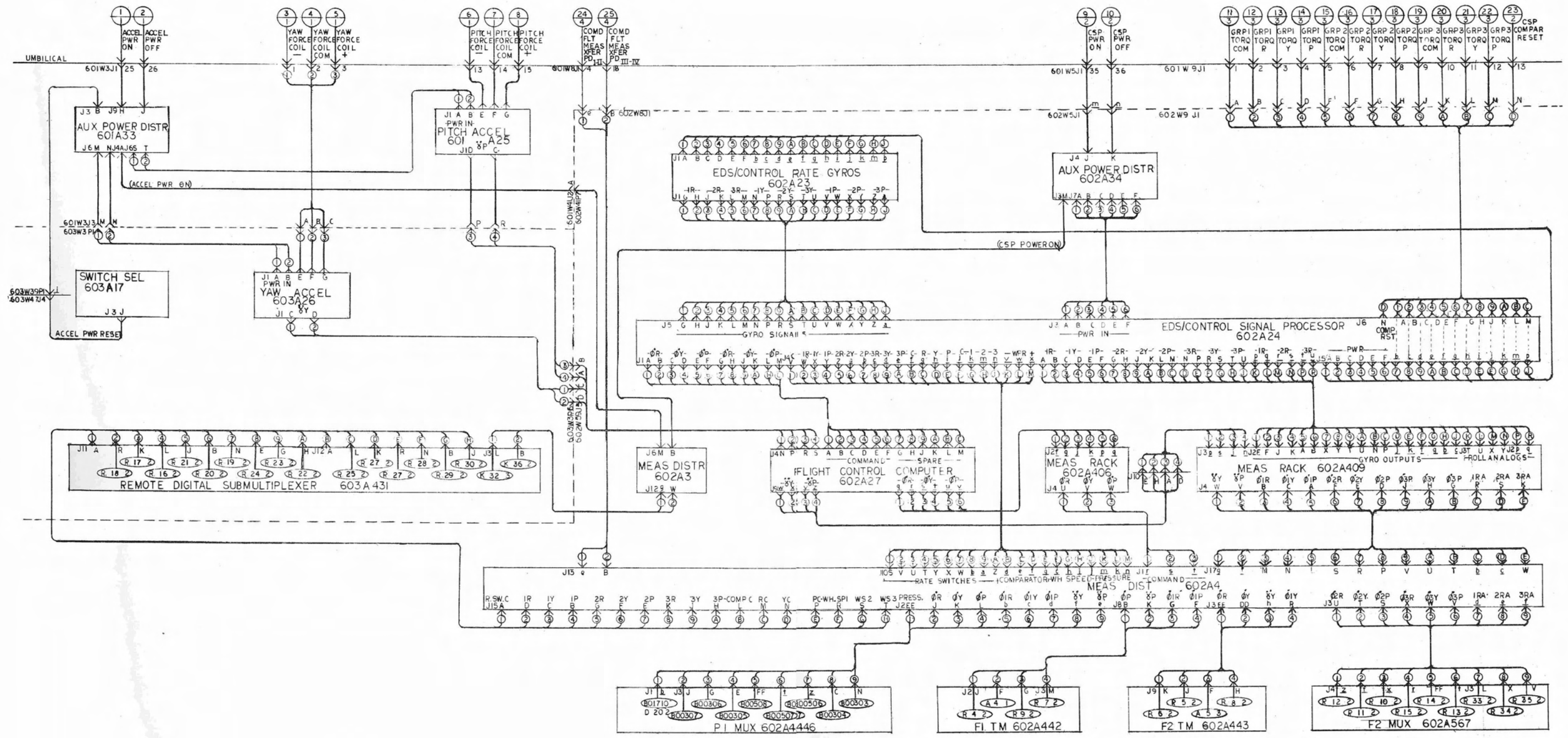


NOTE -
CORRESPONDING METER CIRCUITS
ARE IDENTICAL FOR ALL ENGINES

S-IB Engine Deflection Panel

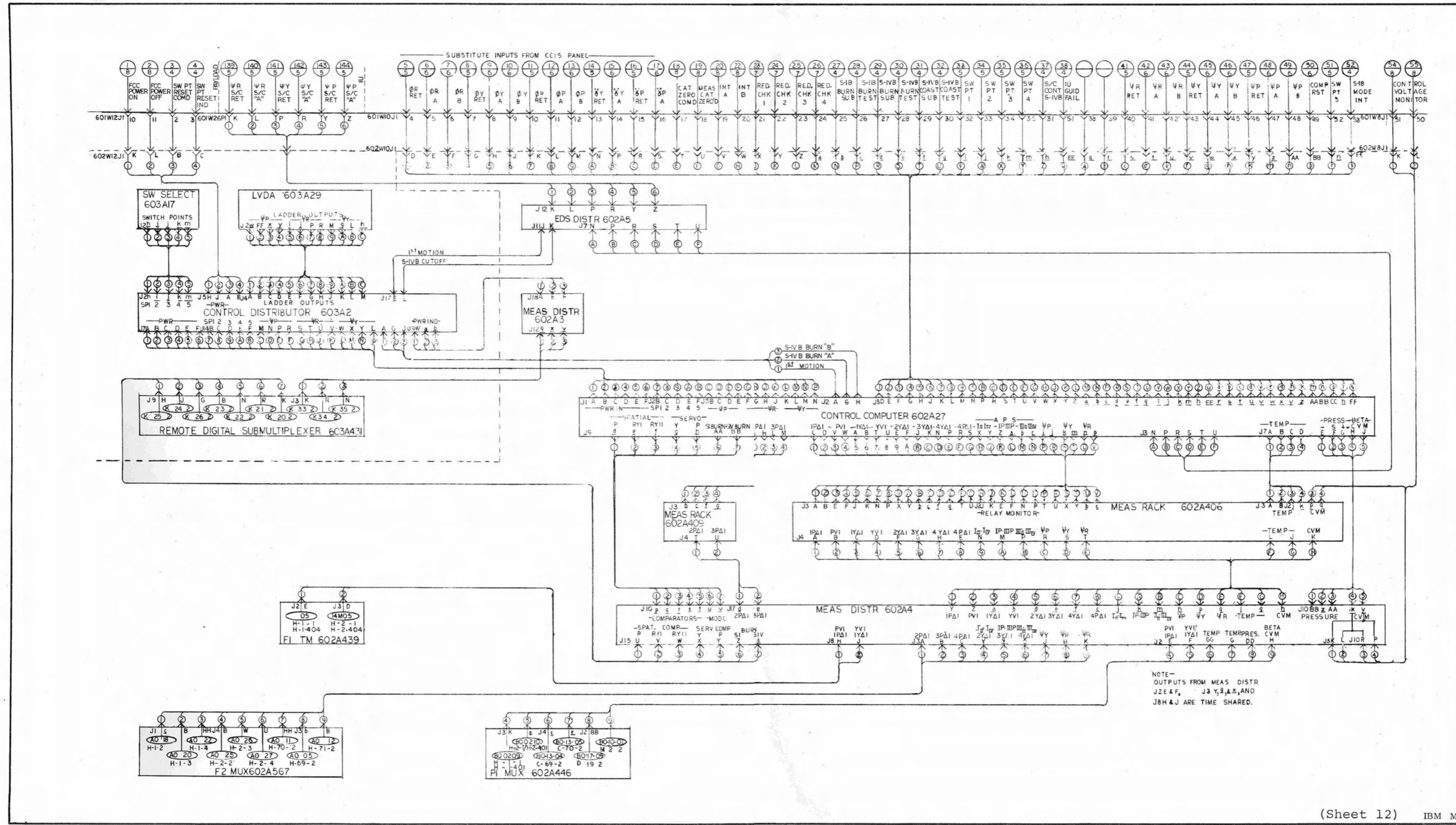
Changed 1 July 1967

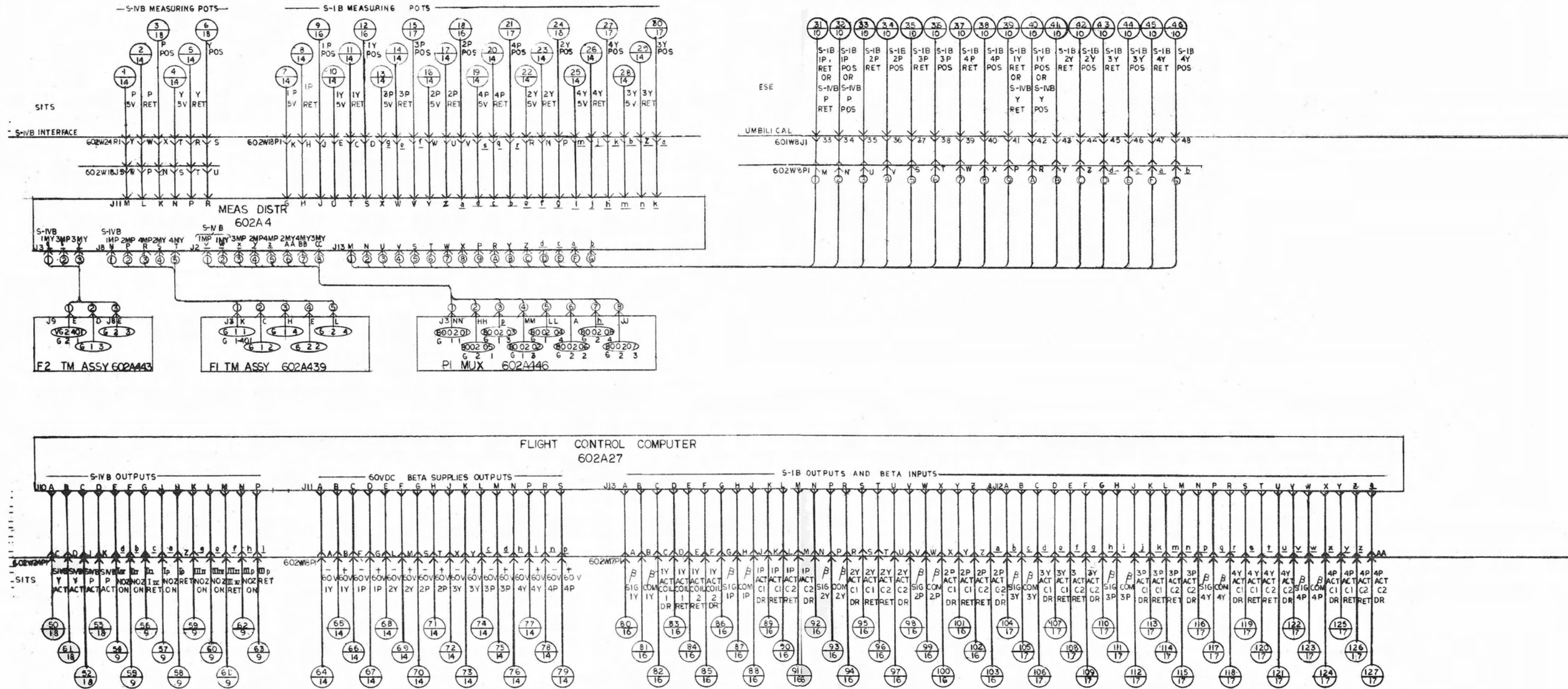
B-37/B-38

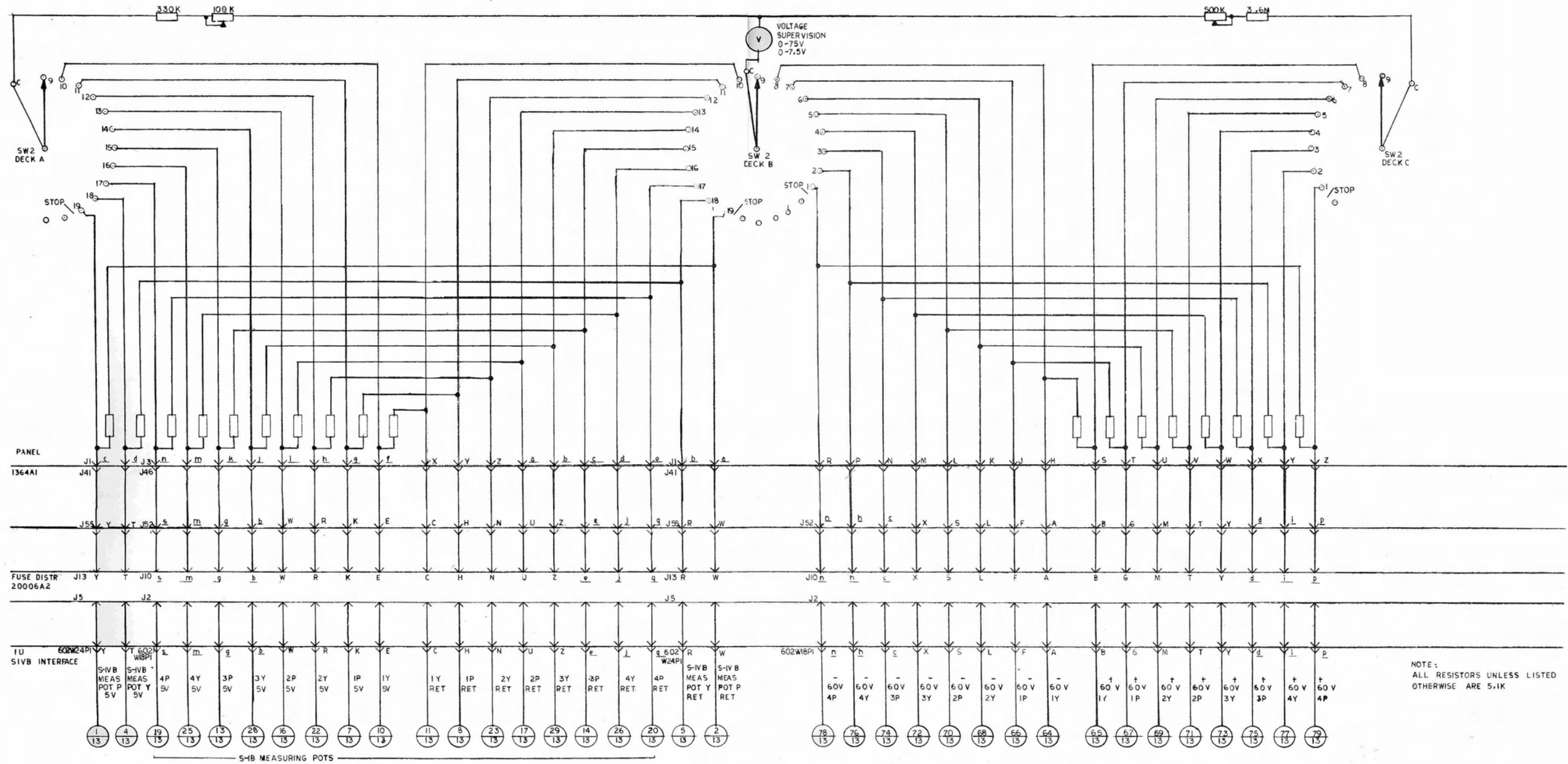


EDS/Control Rate Gyro-Control Signal Processor-
Control Accelerometers-ESE-Vehicle

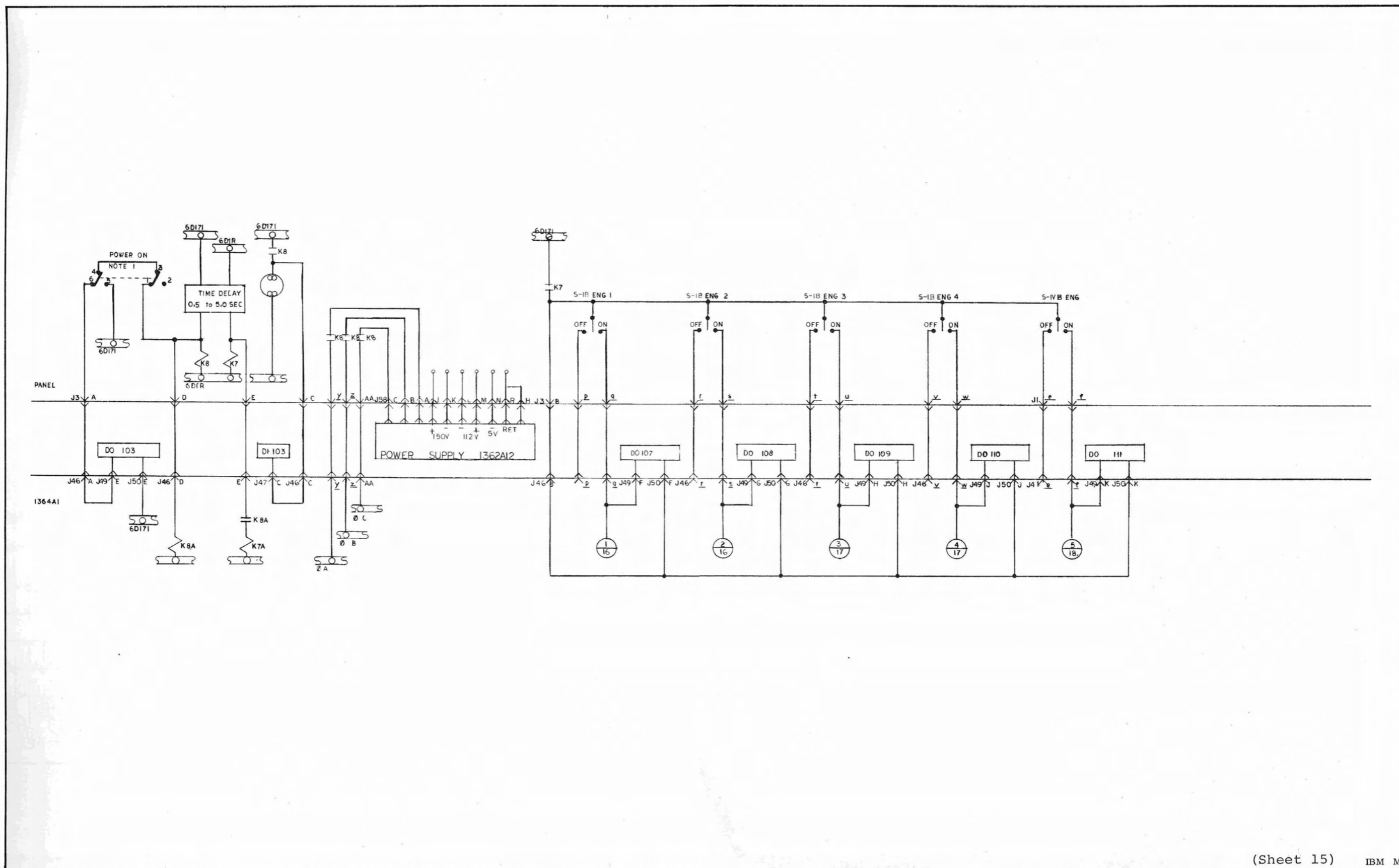
Changed 1 July 1967







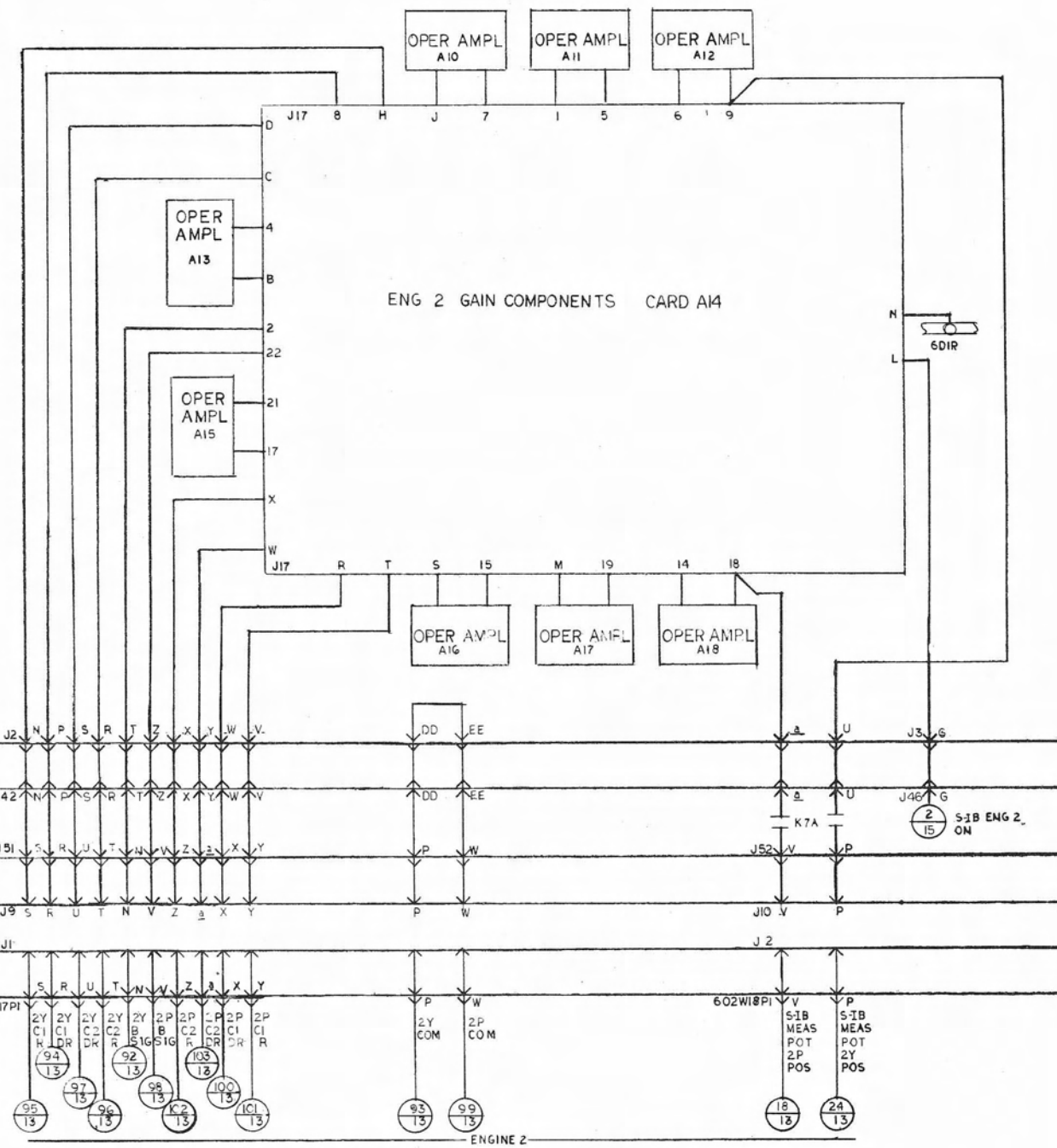
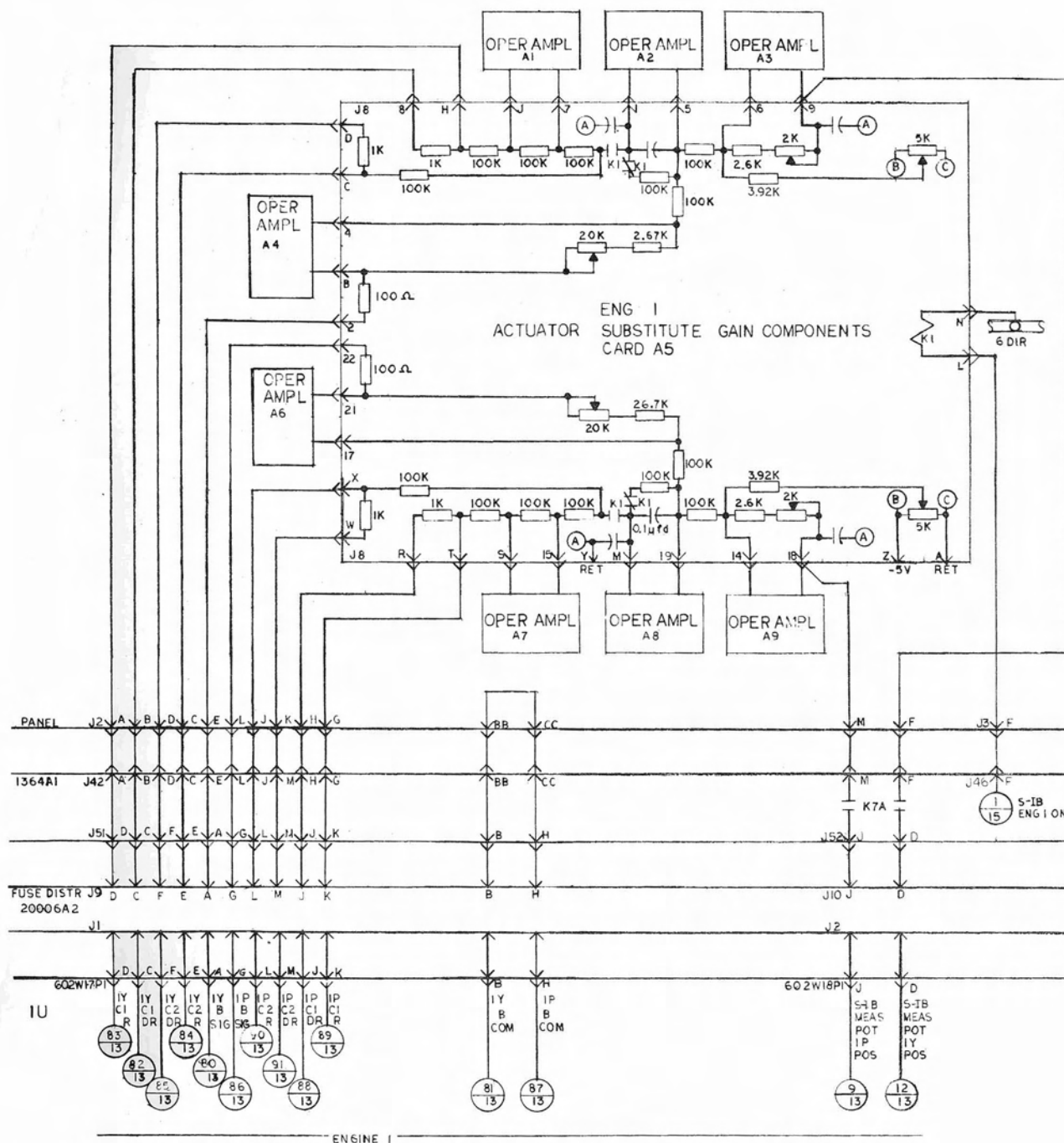
NOTE:
ALL RESISTORS UNLESS LISTED
OTHERWISE ARE 5.1K



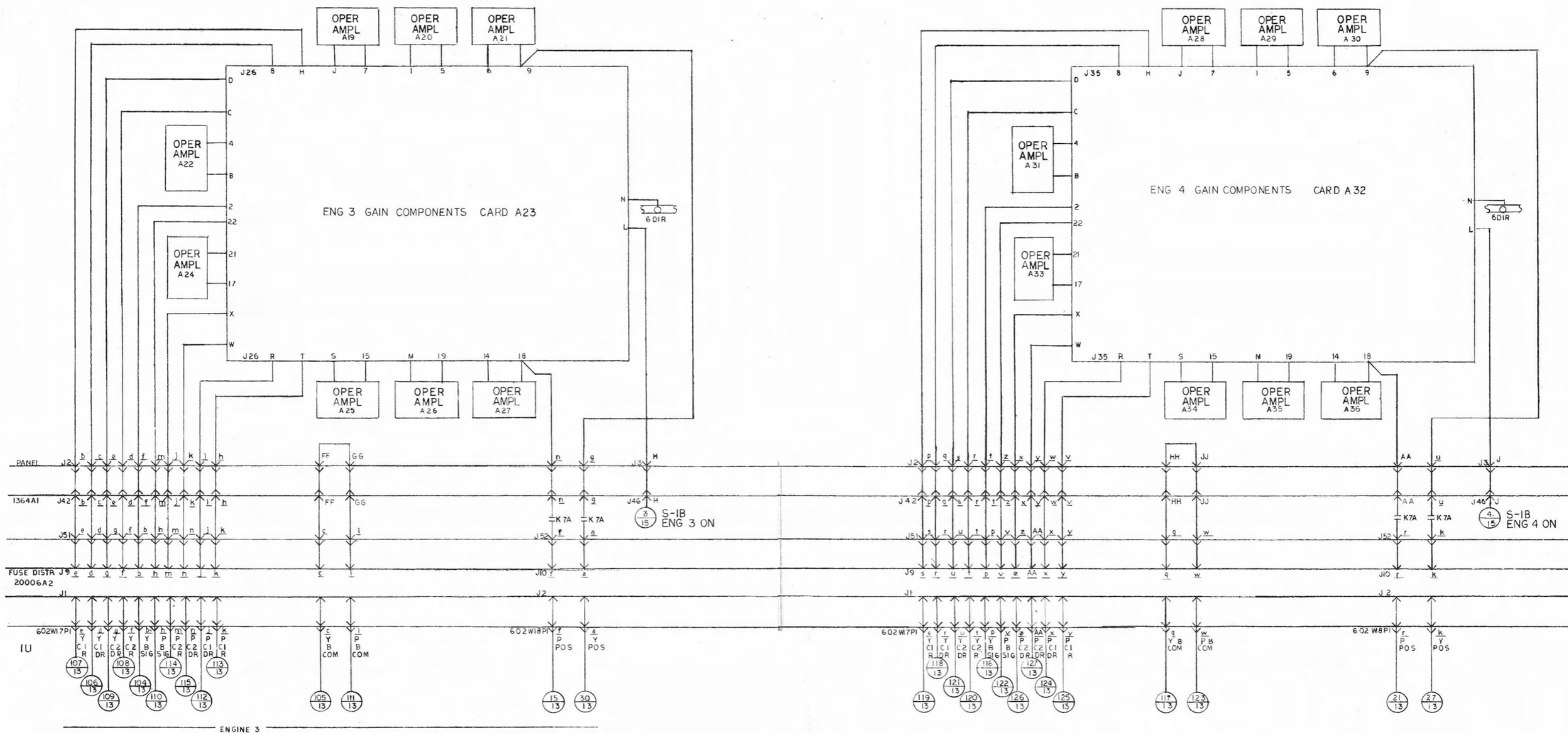
Engine Actuator Substitute Panel-SITS (Sheet 2)

Changed 1 July 1967

B-47/B-48



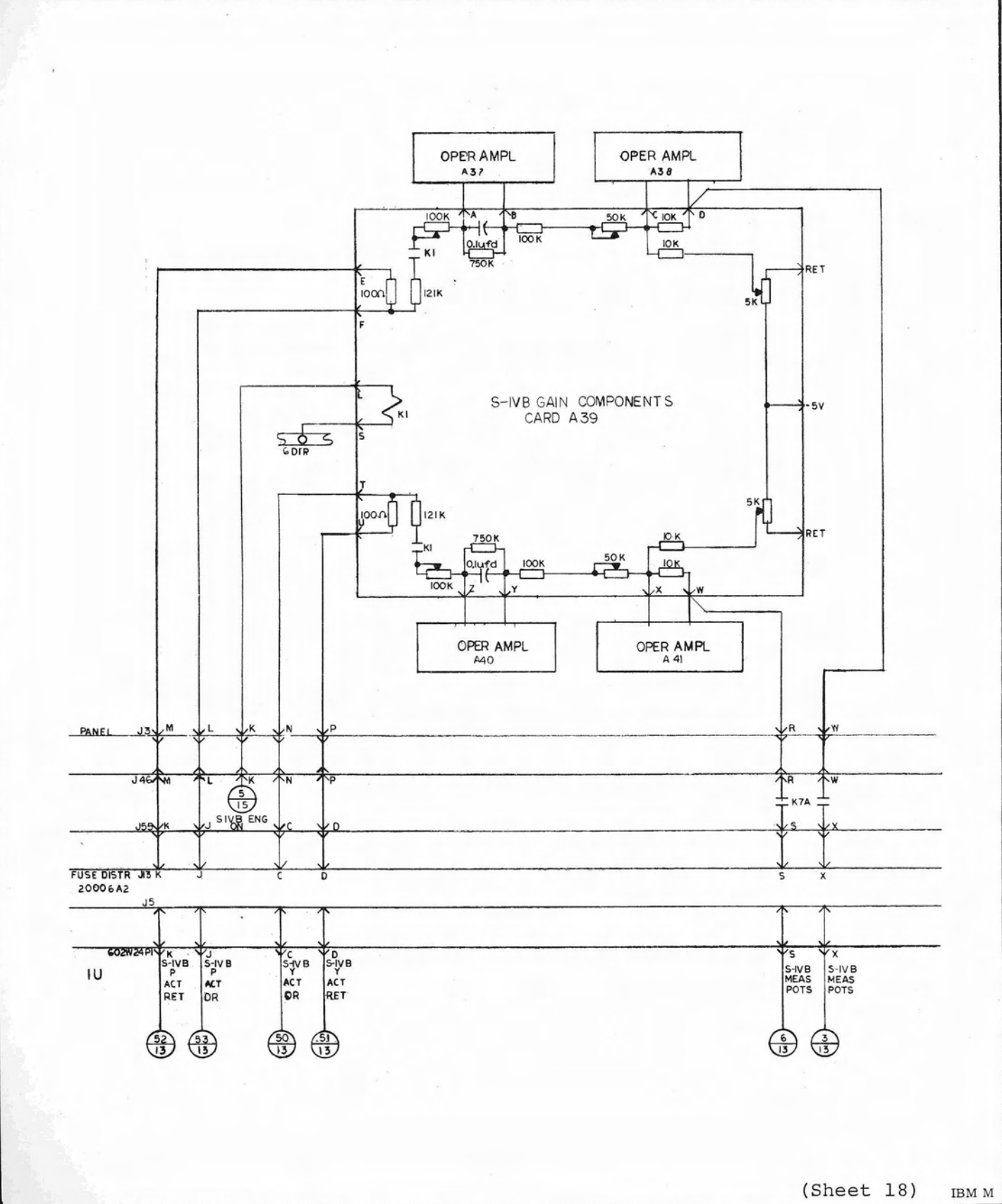
Engine Actuator Substitute Panel-SITS (Sheet 3)



Engine Actuator Substitute Panel-SITS (Sheet 4)

Changed 1 July 1967

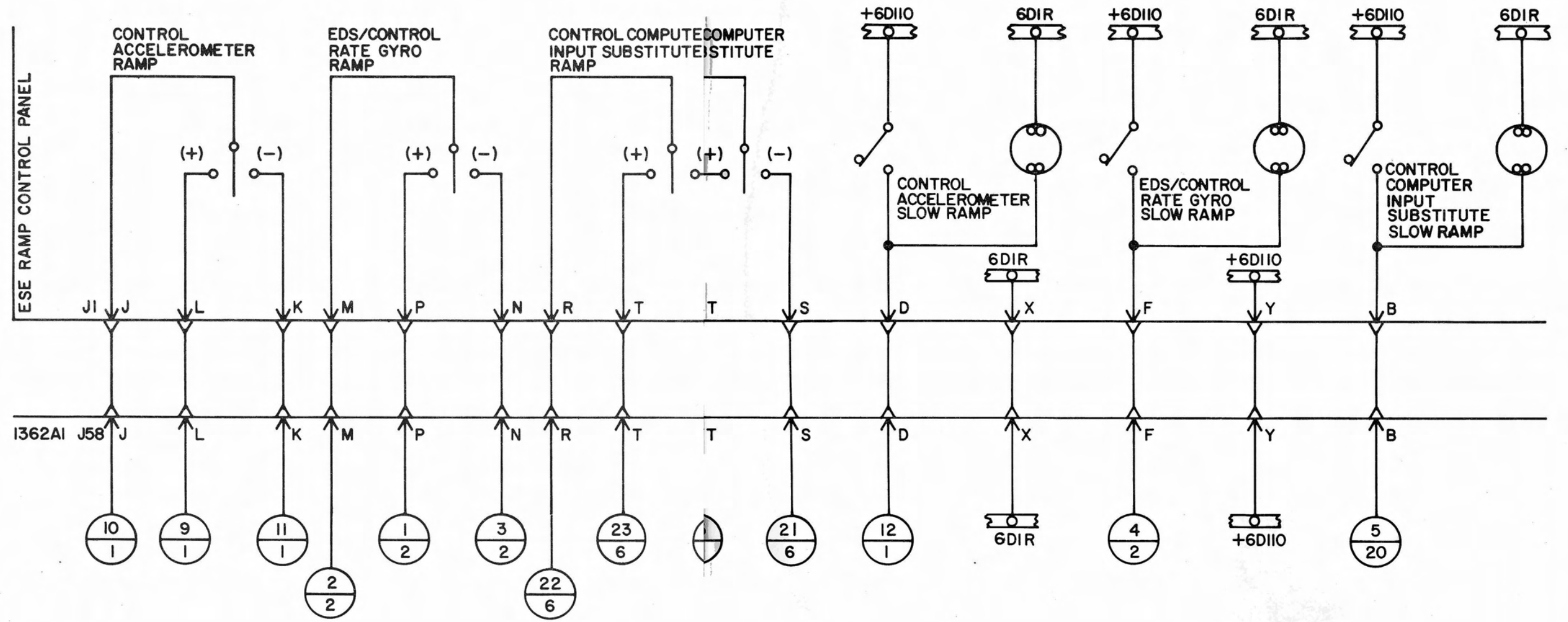
B-51/B-52



Engine Actuator Substitute Panel-SITS (Sheet 5)

Changed 1 July 1967

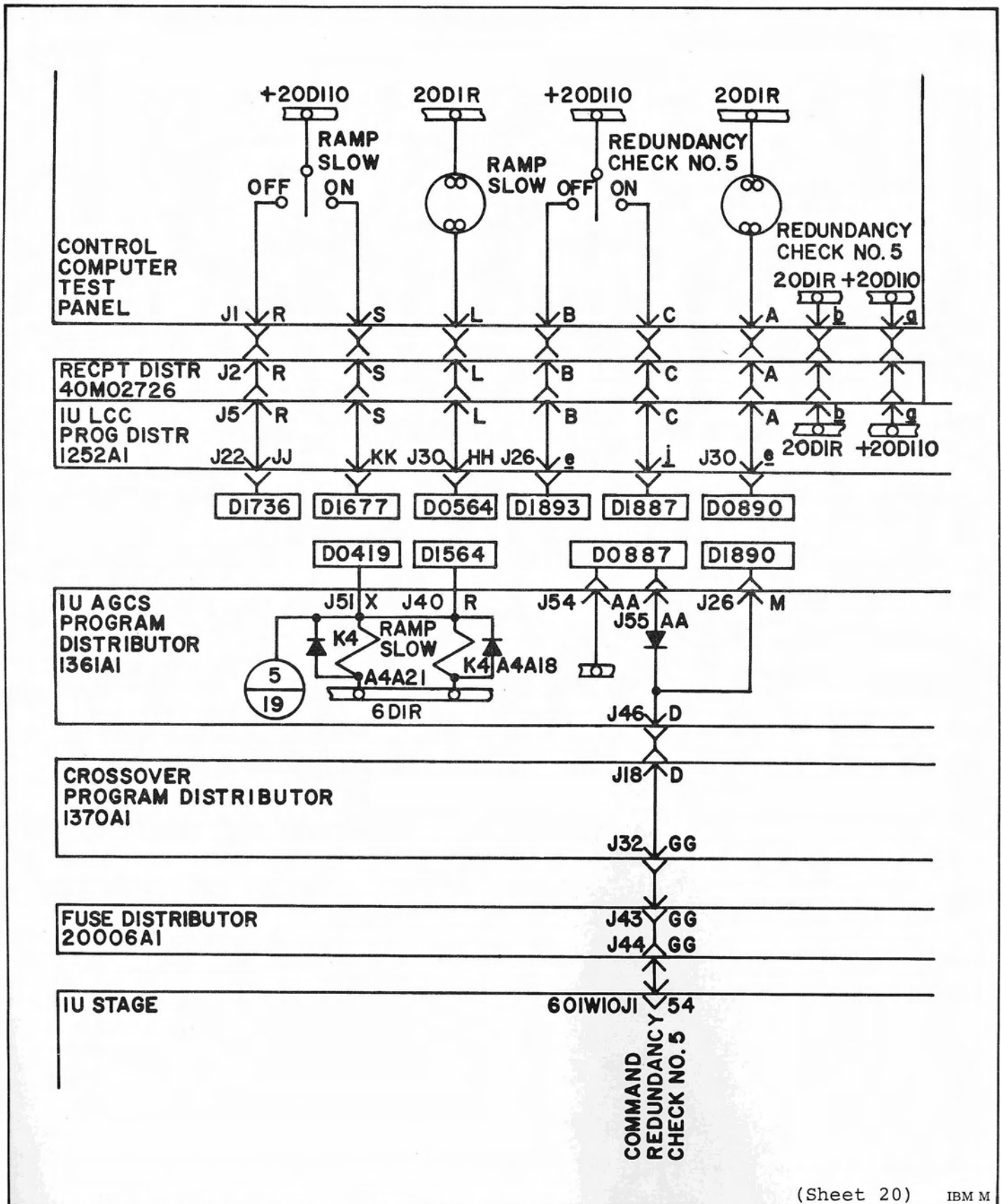
B-53/B-54



ESE Ramp Control Panel

Added 1 July 1967

B-55/B-56



Control Computer Test Panel

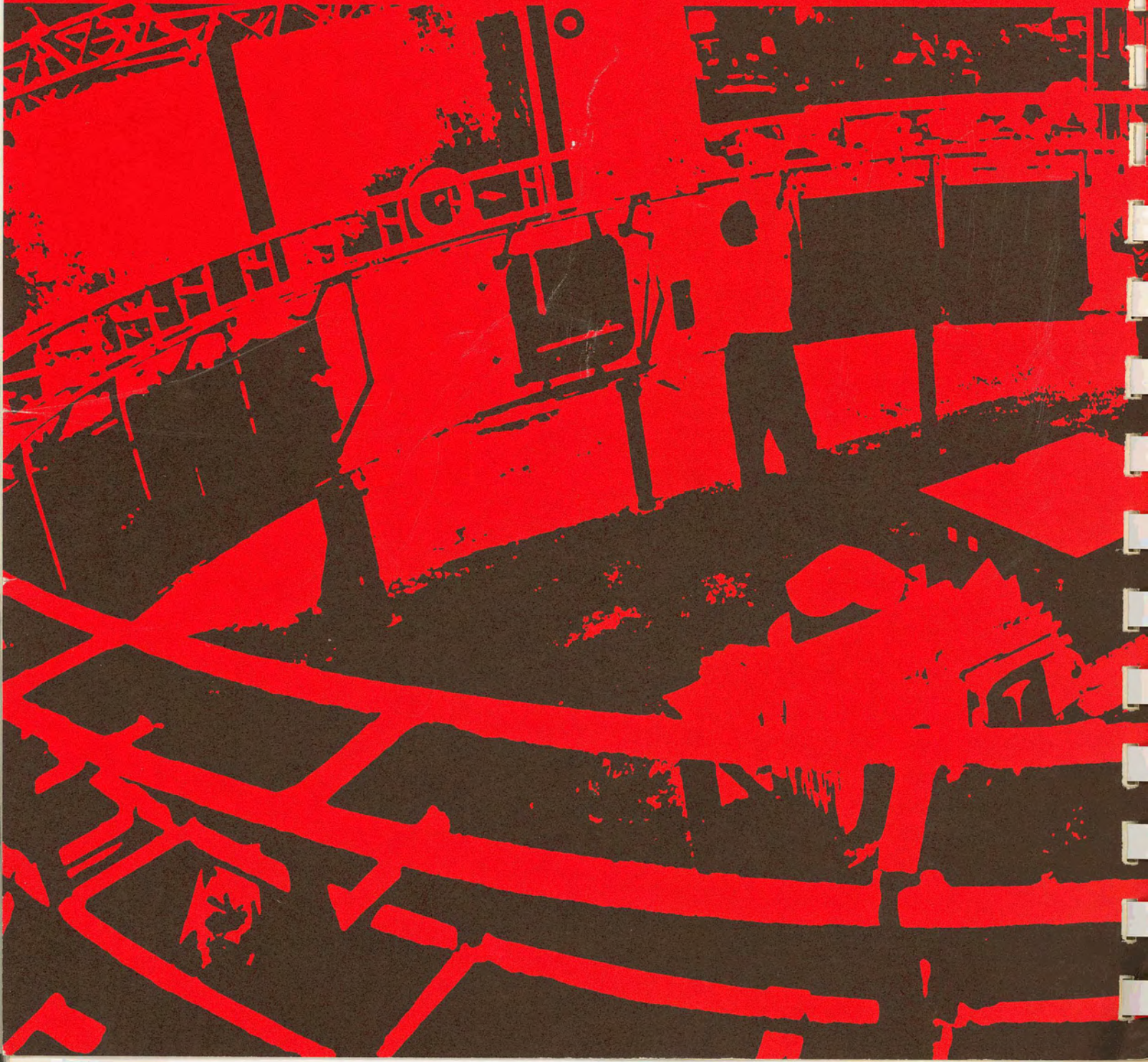
Added 1 July 1967

B-57/B-58



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Huntsville, Alabama



APPENDIX A

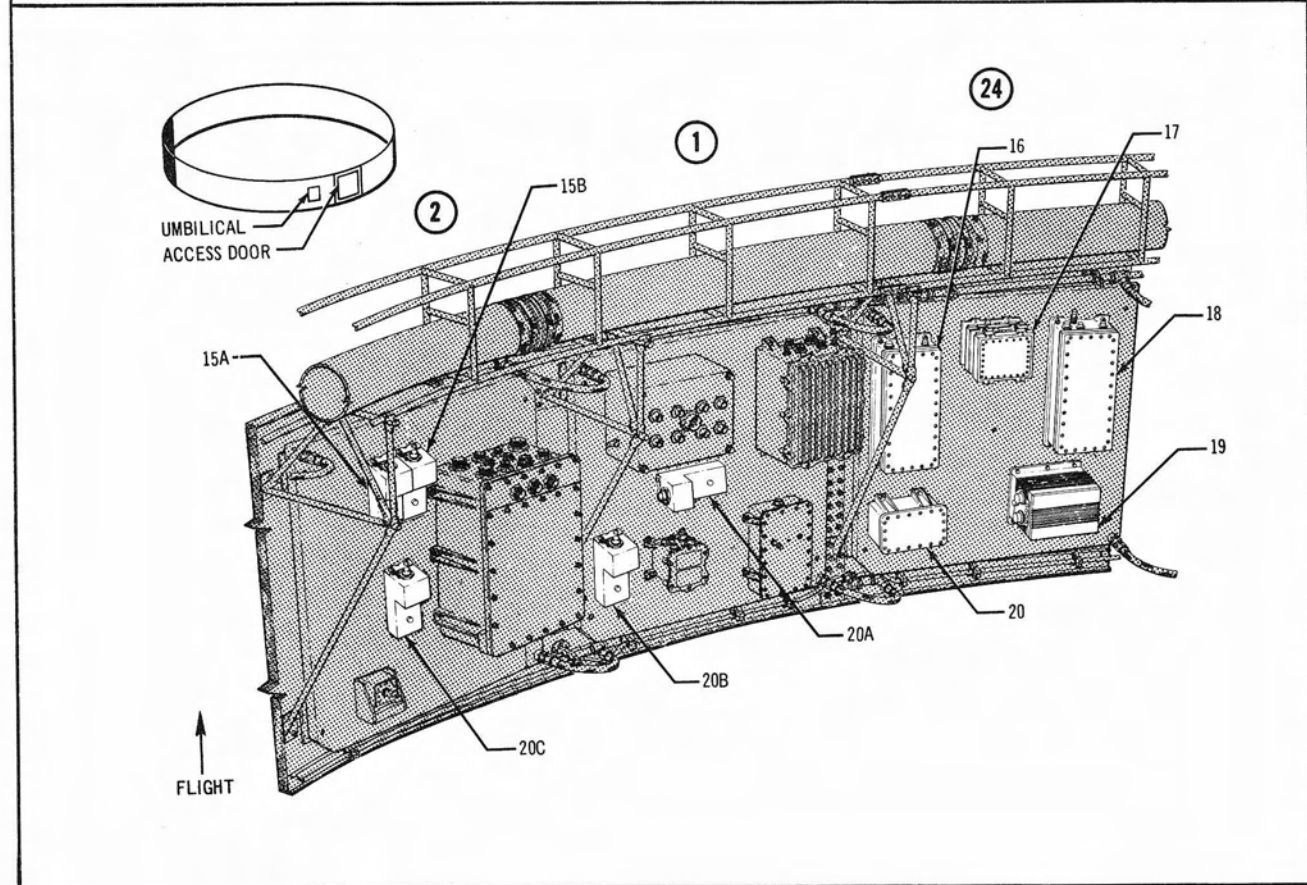
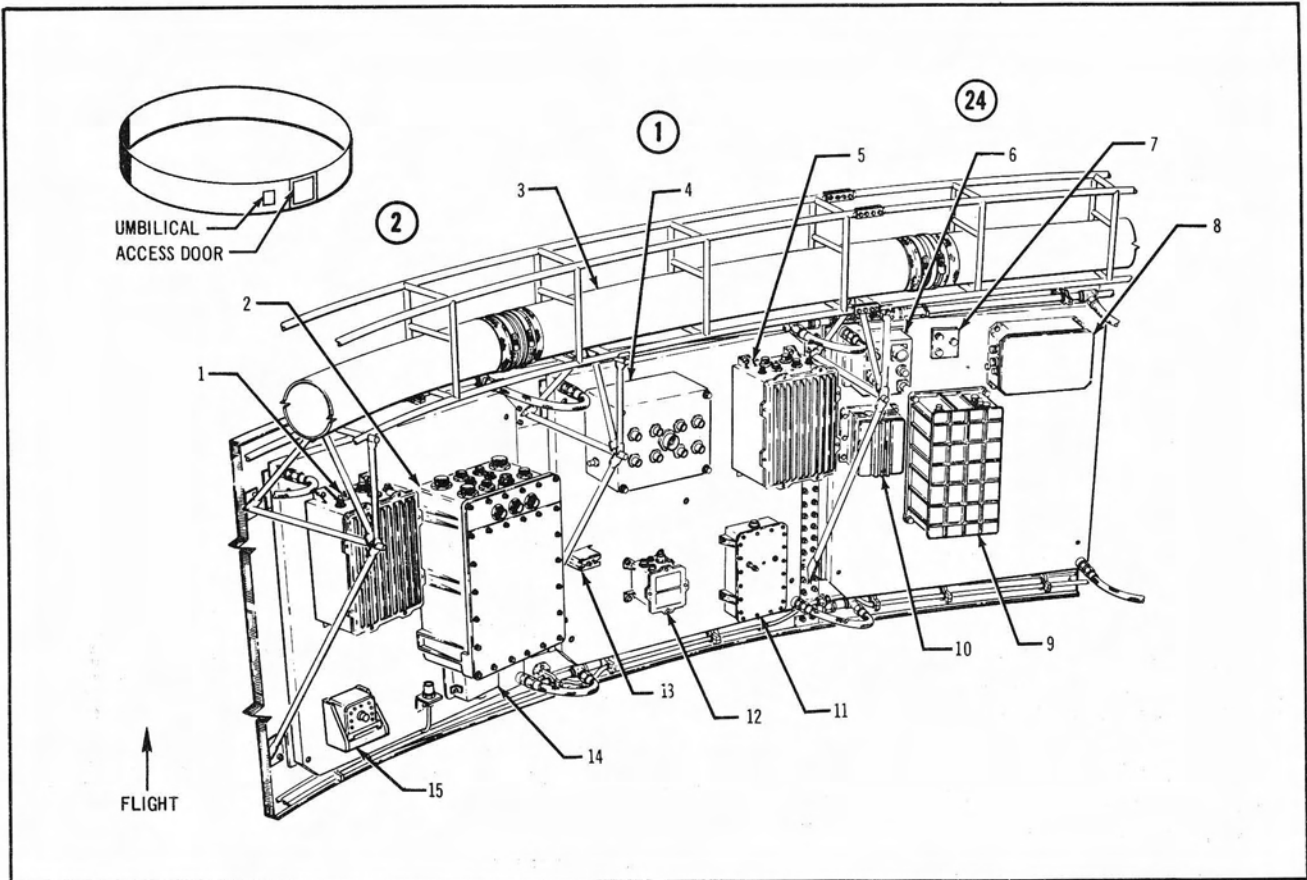
INSTRUMENT UNIT PHYSICAL LAYOUT DRAWINGS

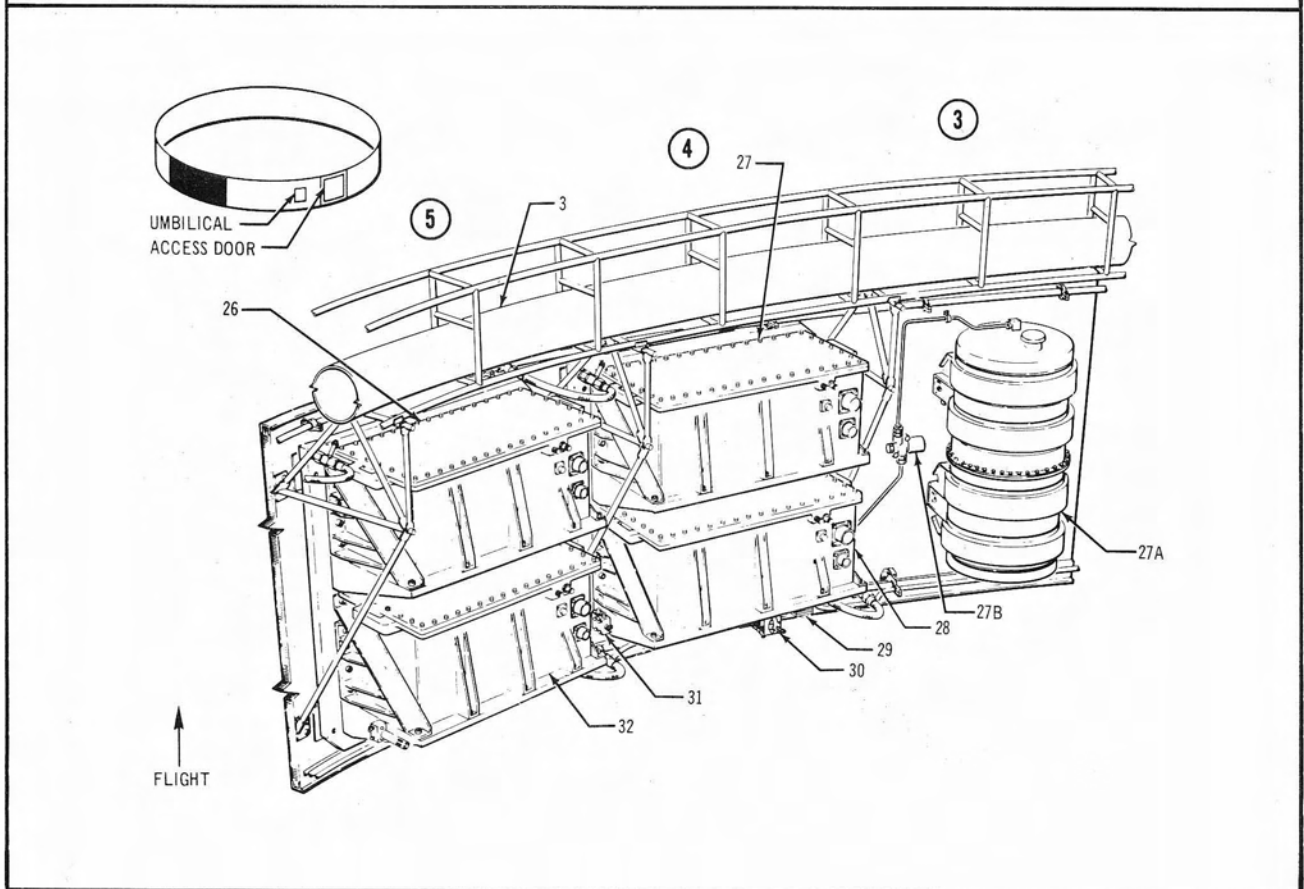
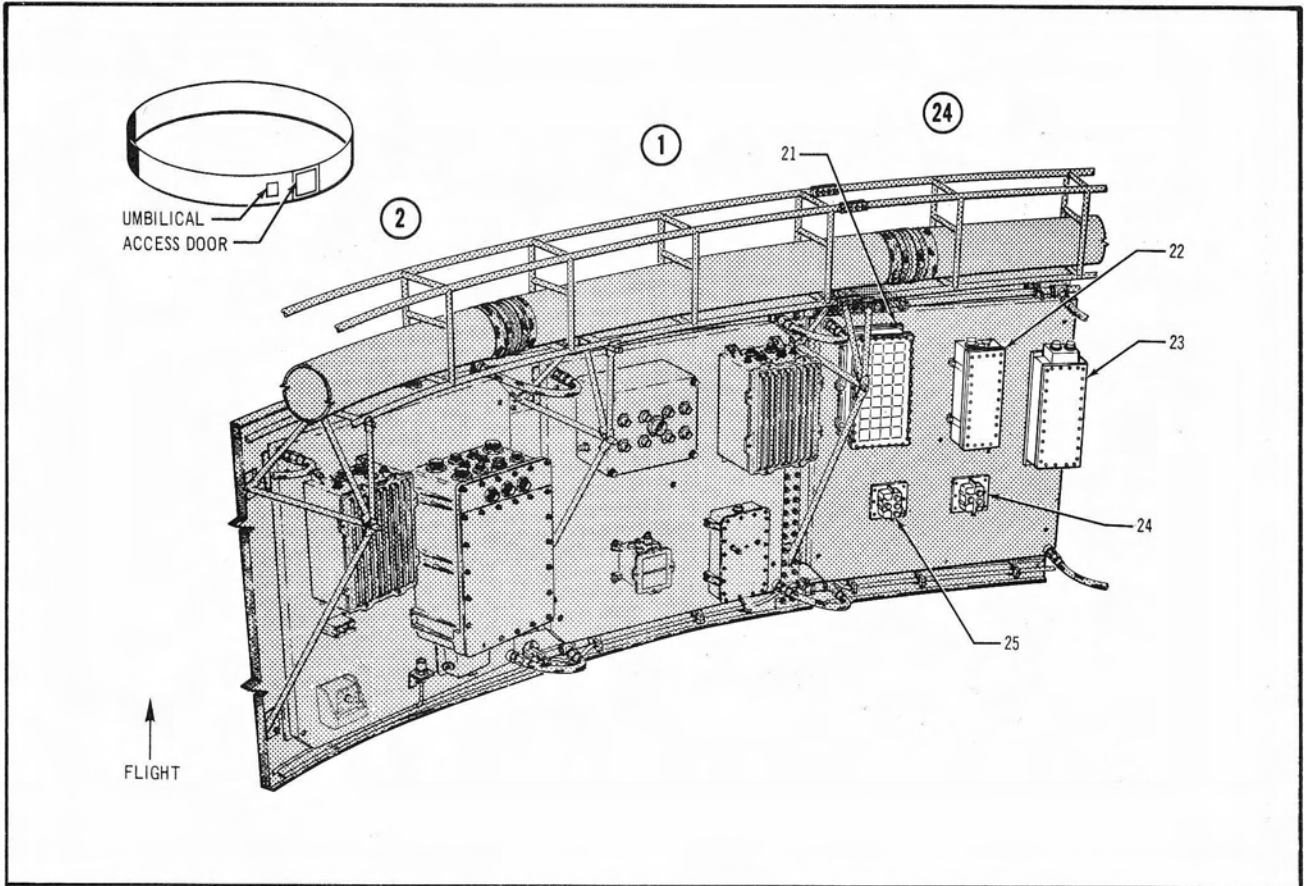
In the following drawings, the flight hardware is not identified by vehicle effectivity. If effectivity information is needed, the IU System Description and Component Data Manual should be consulted.

More than one view of an IU location panel may be shown to illustrate changing configurations. Shaded areas indicate hardware which has not been affected by the change.

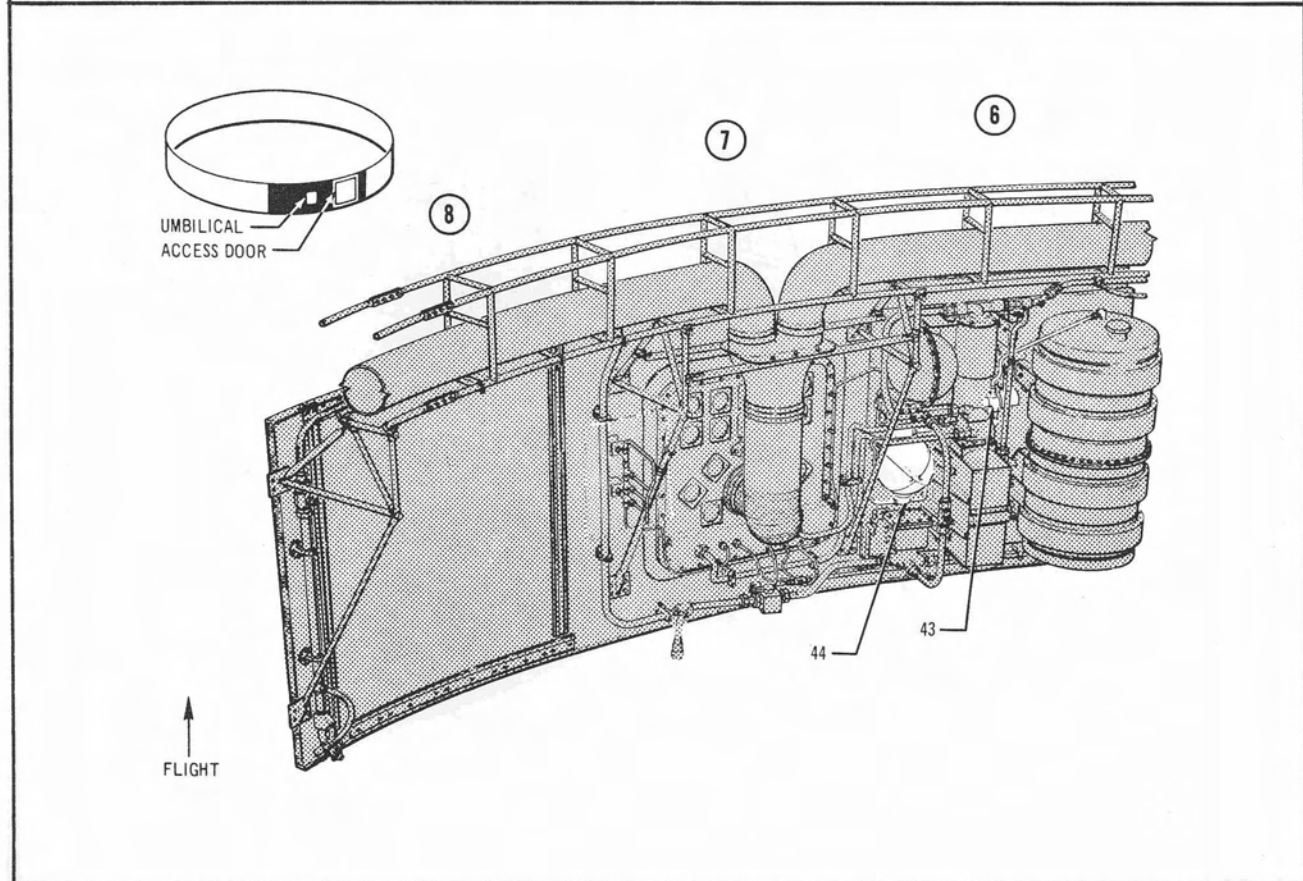
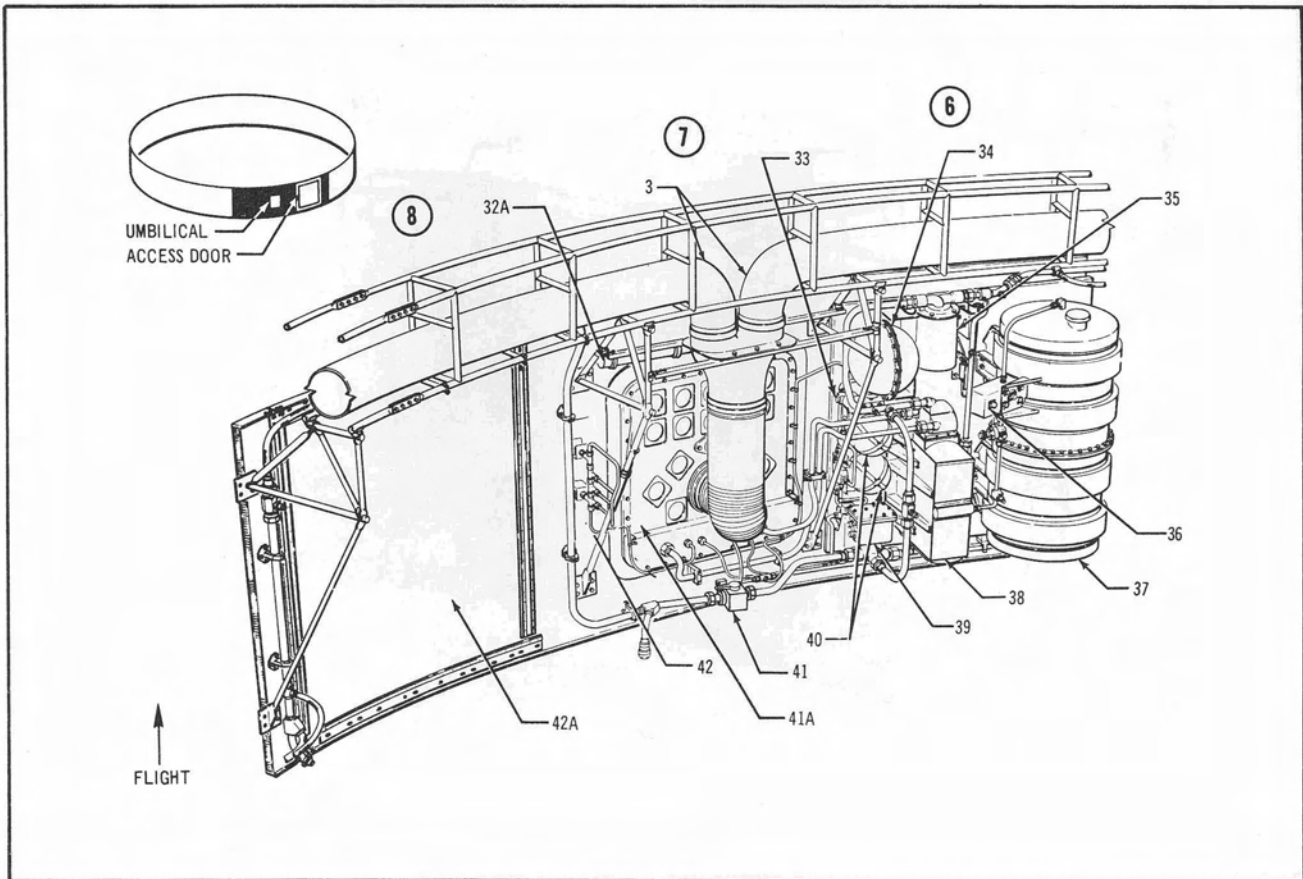
The Instrument Unit physical layout drawings are included as an aid to locating the flight hardware described in this volume.

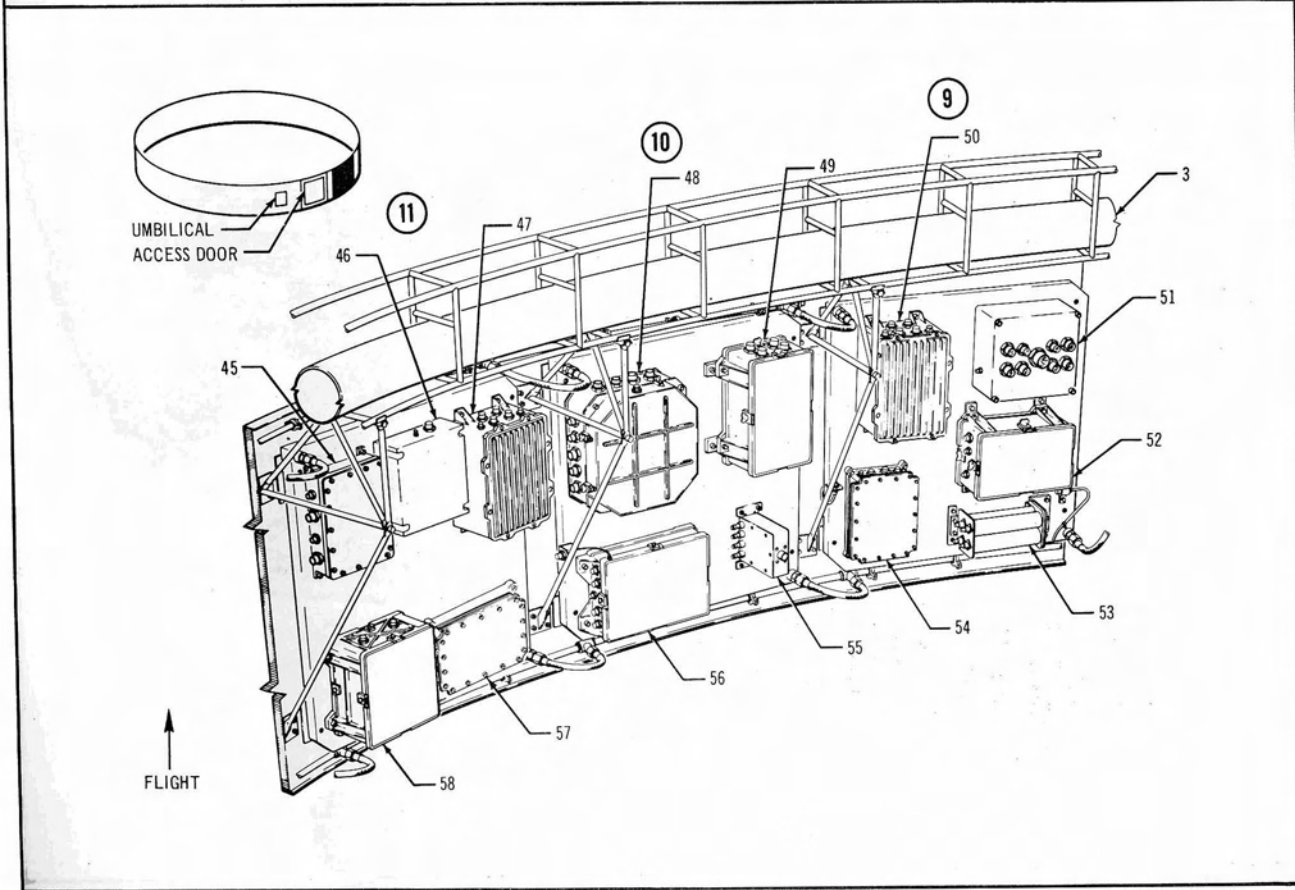
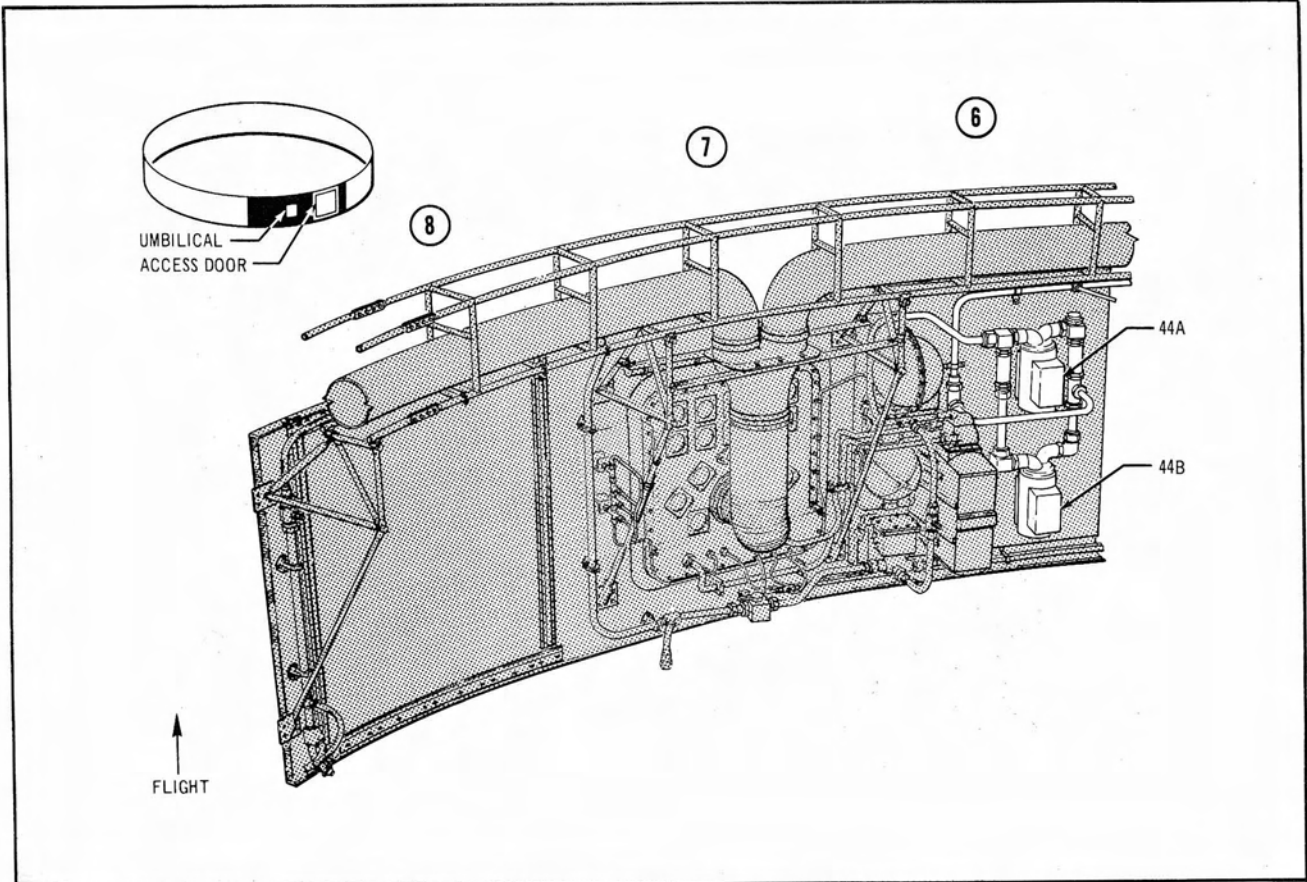
VOLUME I
CONTROL SYSTEM



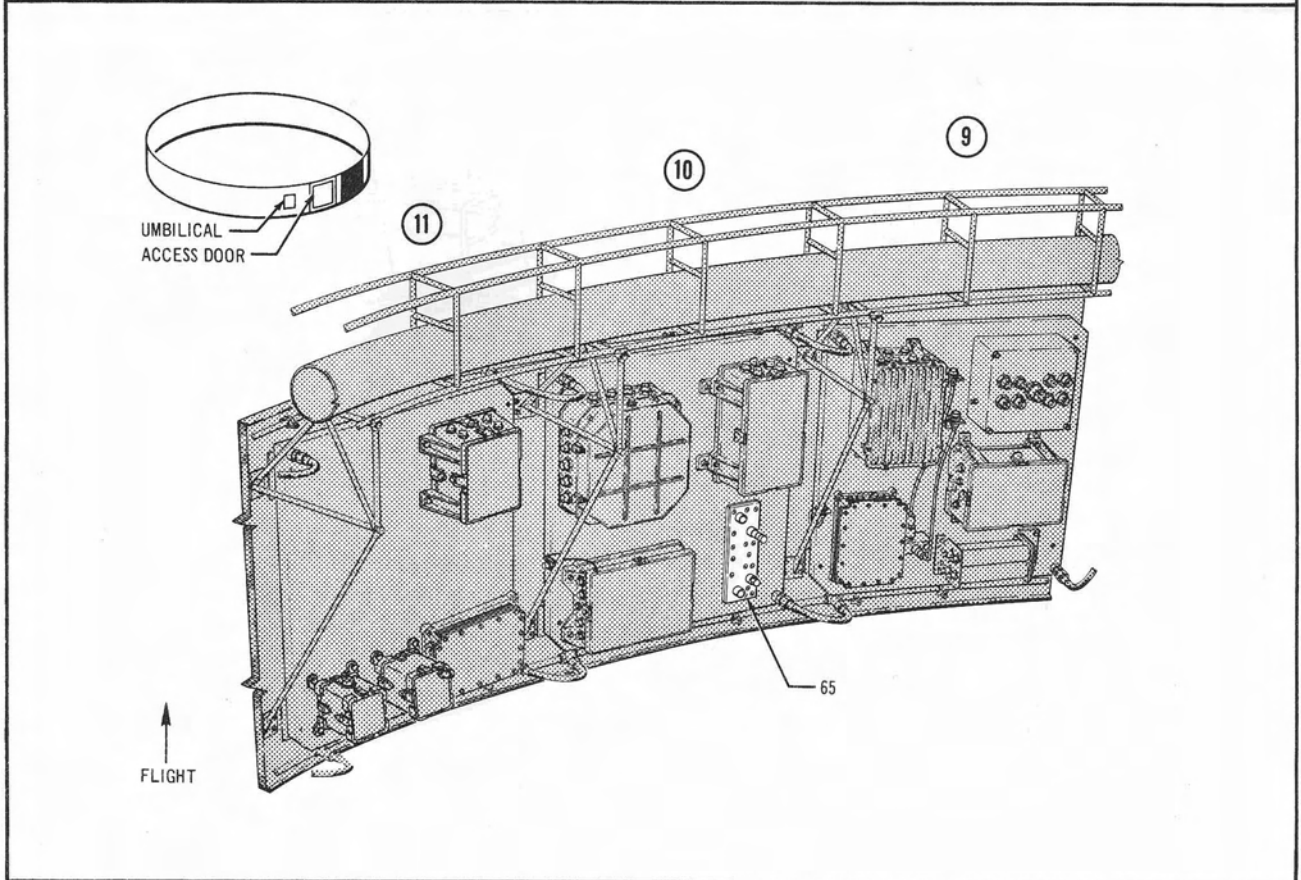
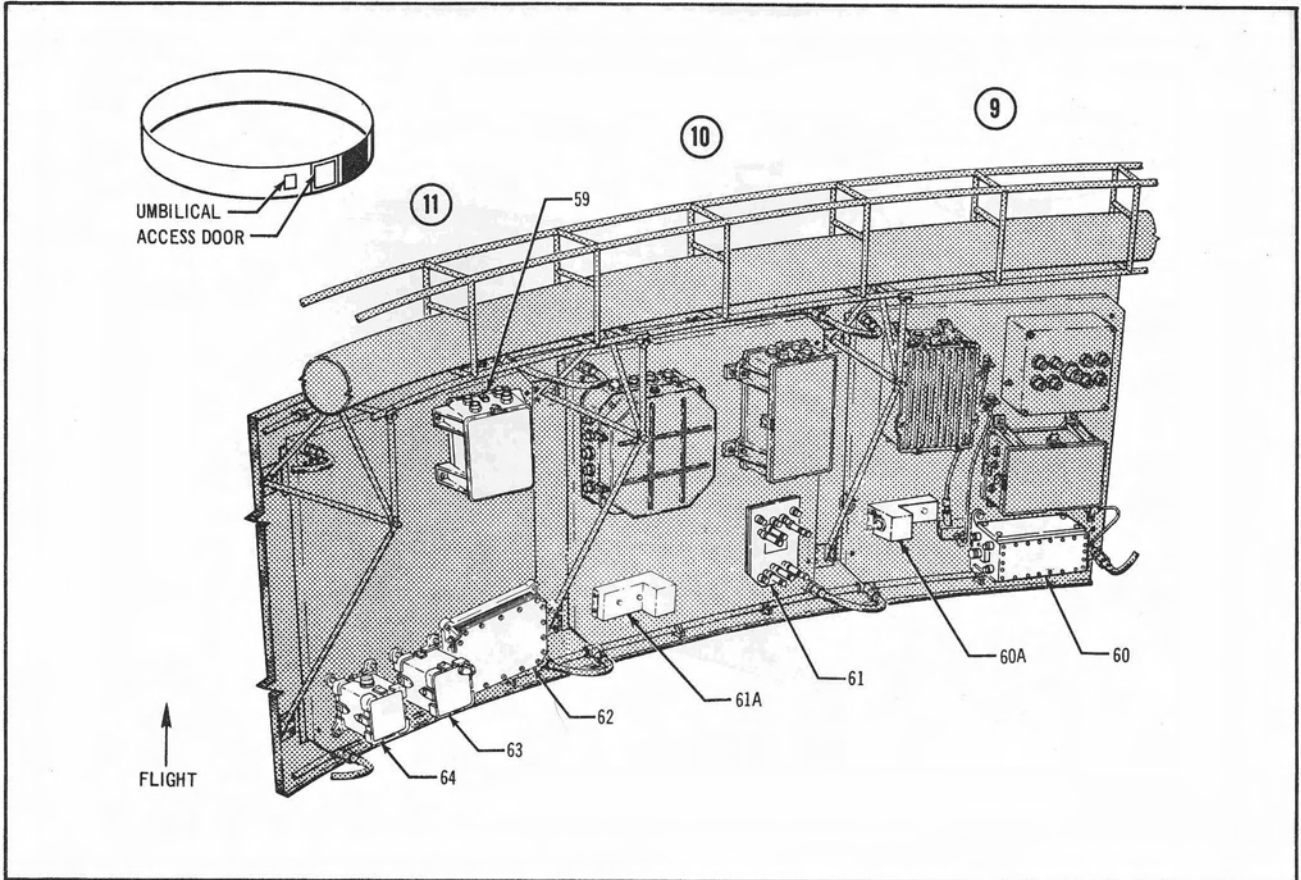


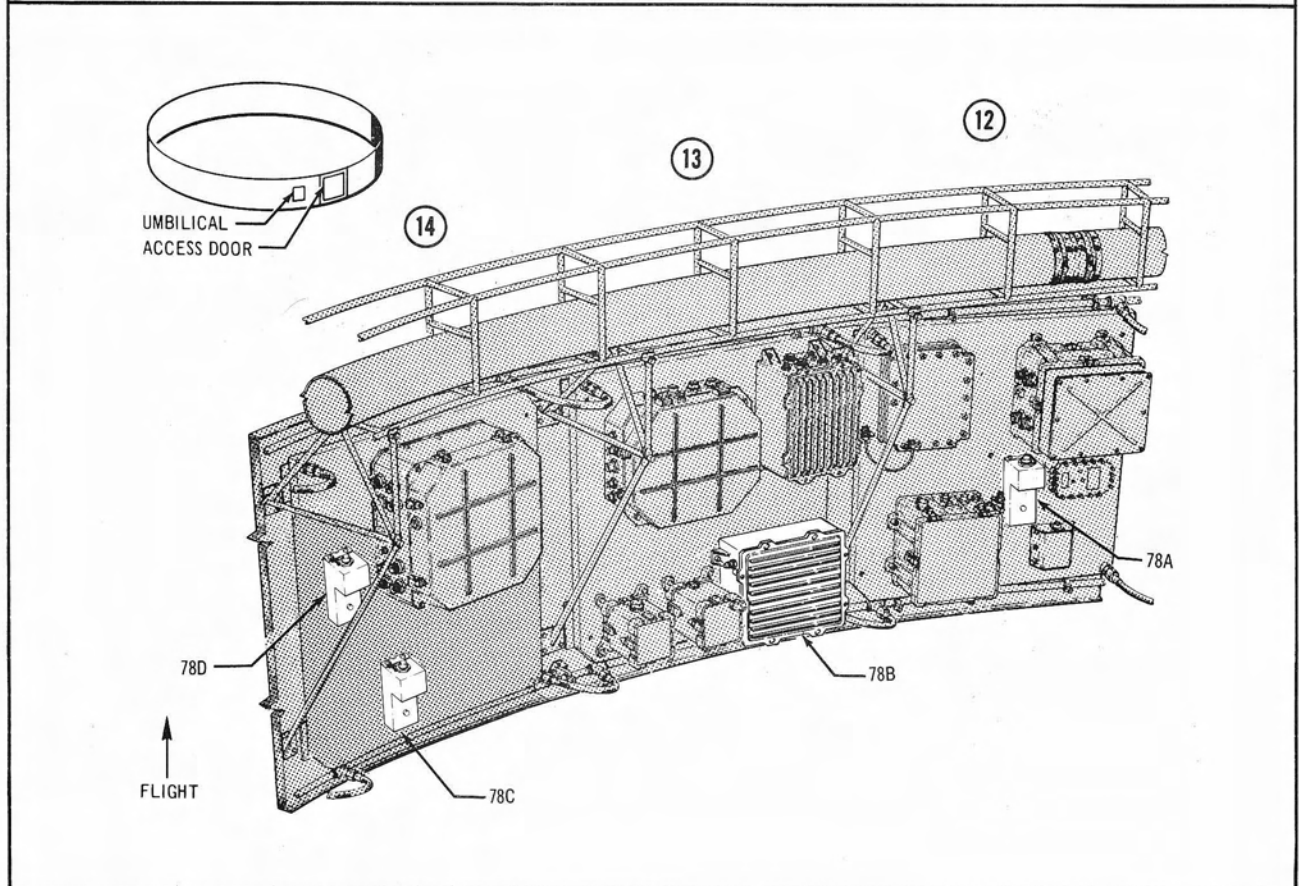
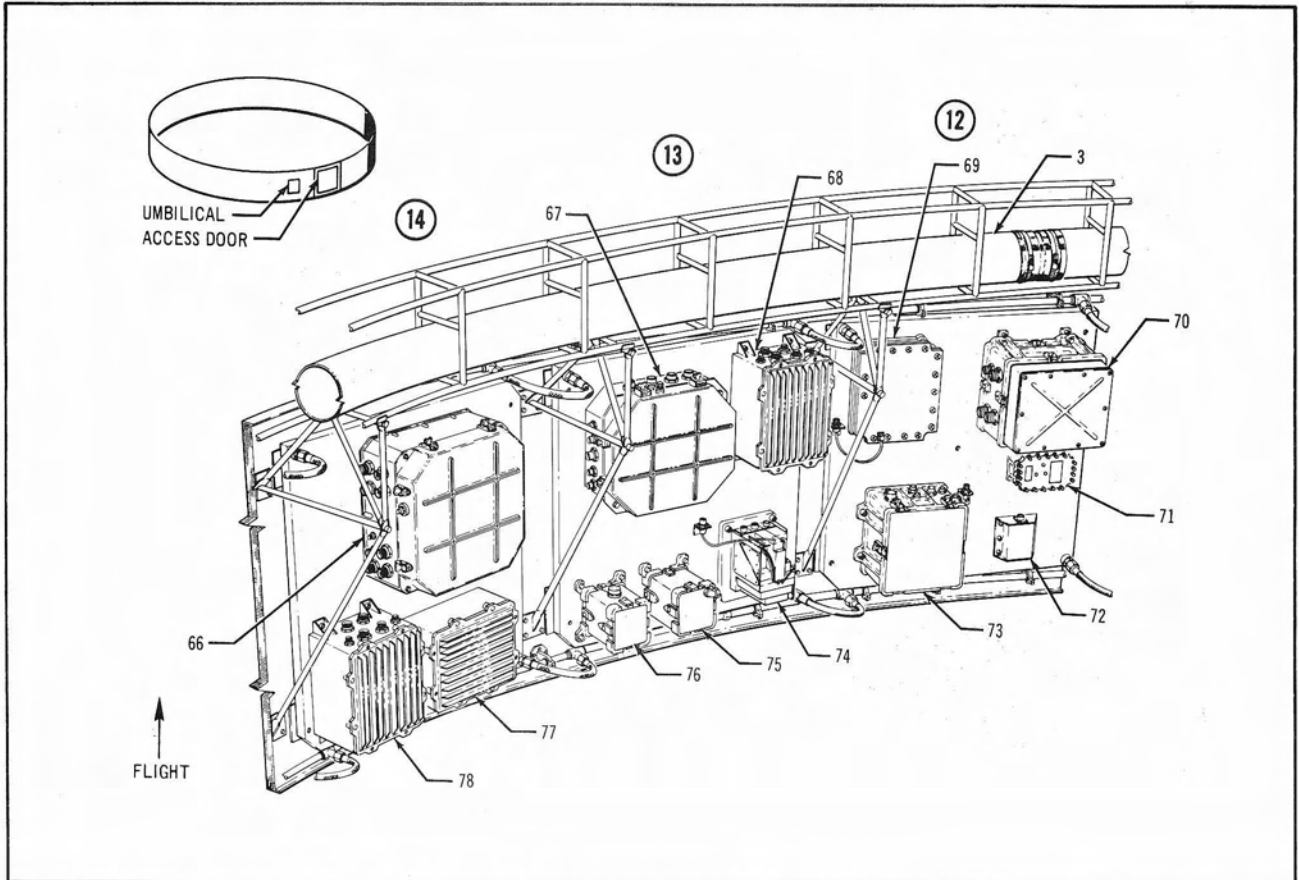
VOLUME I
CONTROL SYSTEM



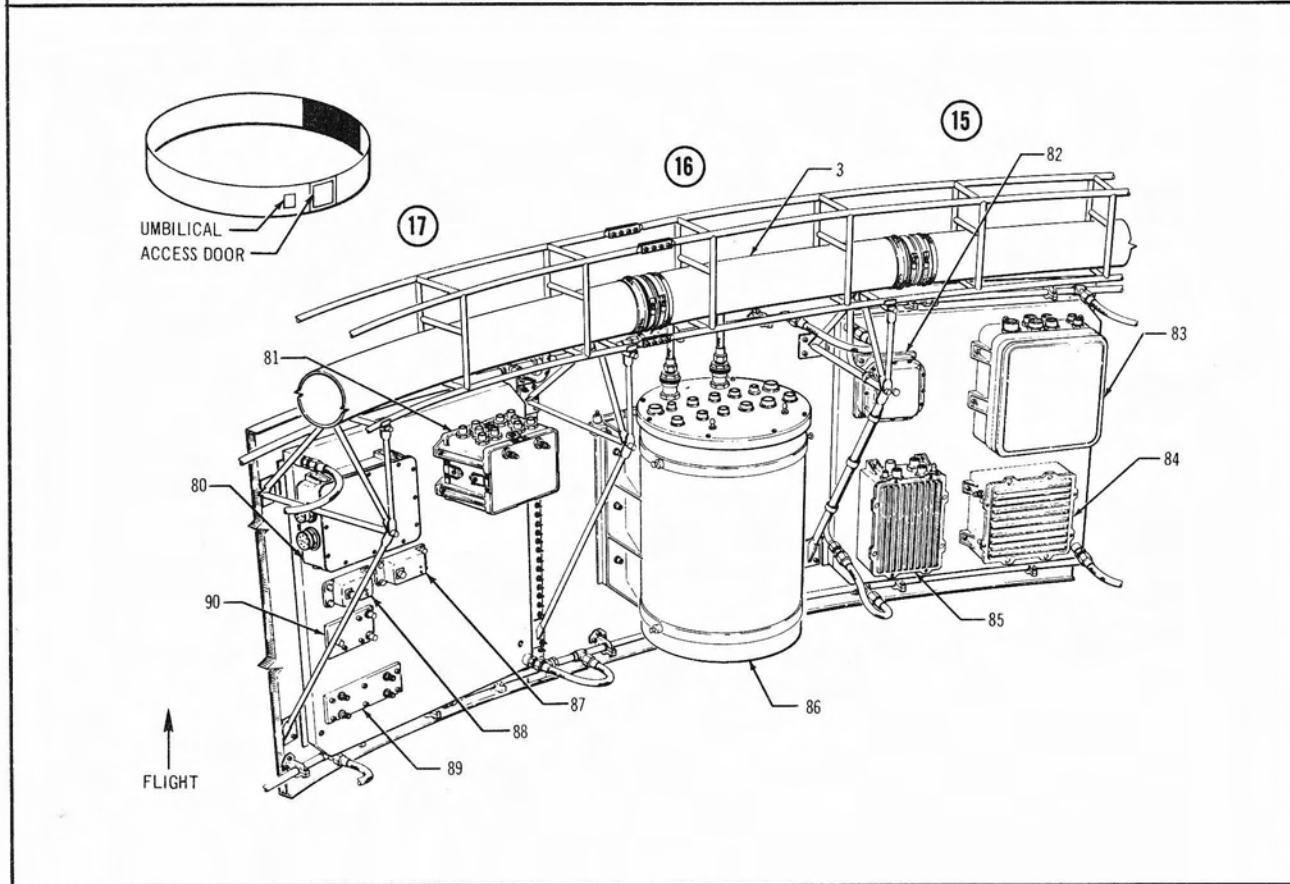
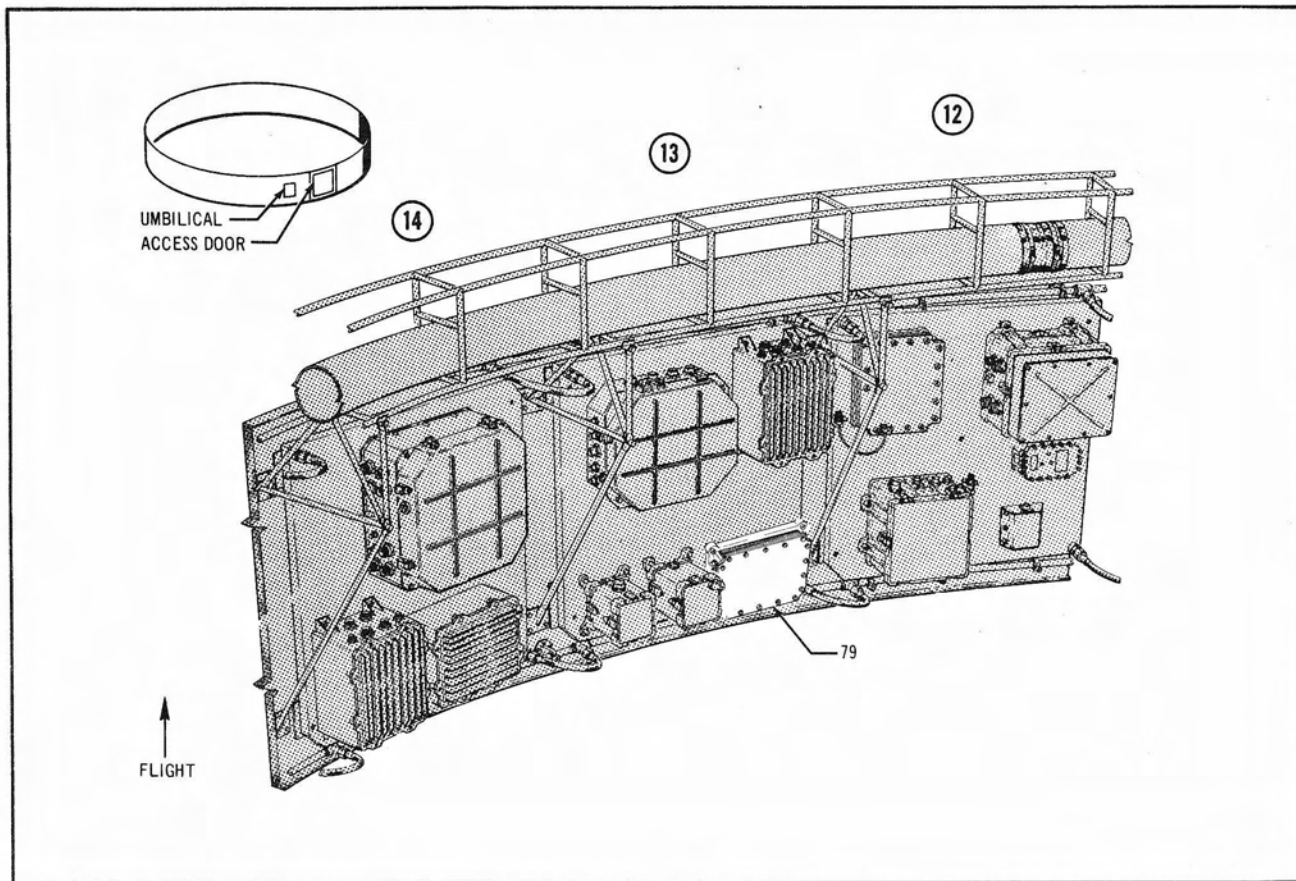


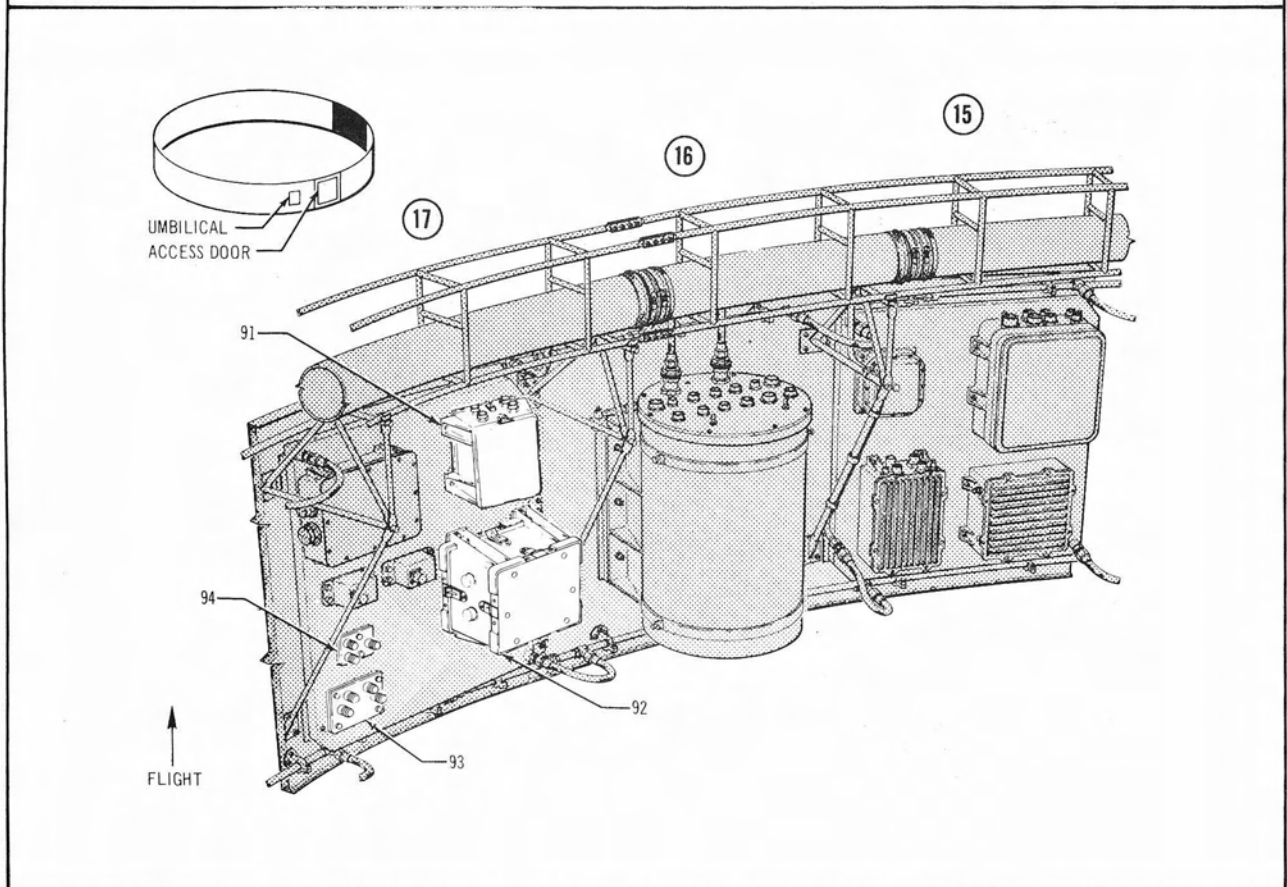
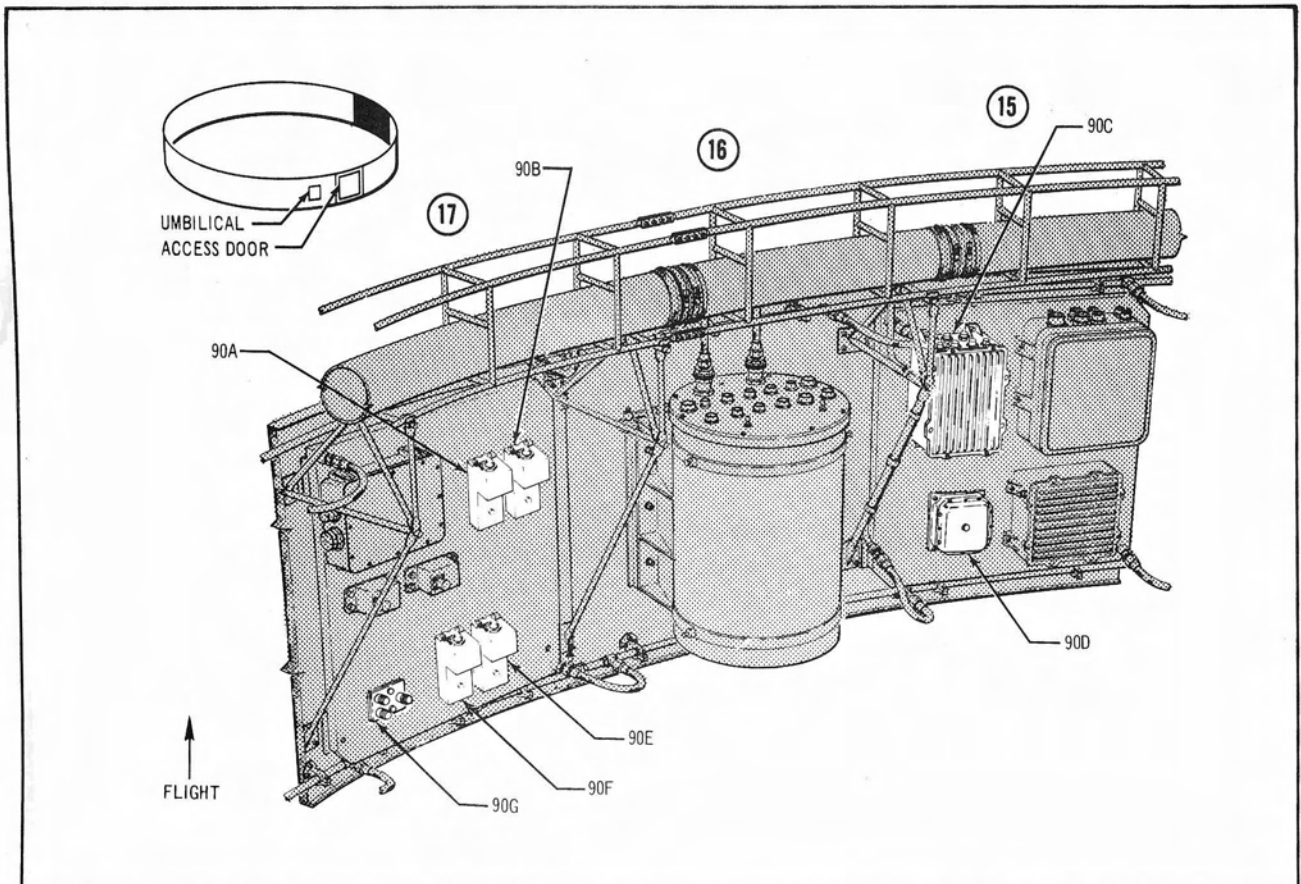
VOLUME I
CONTROL SYSTEM

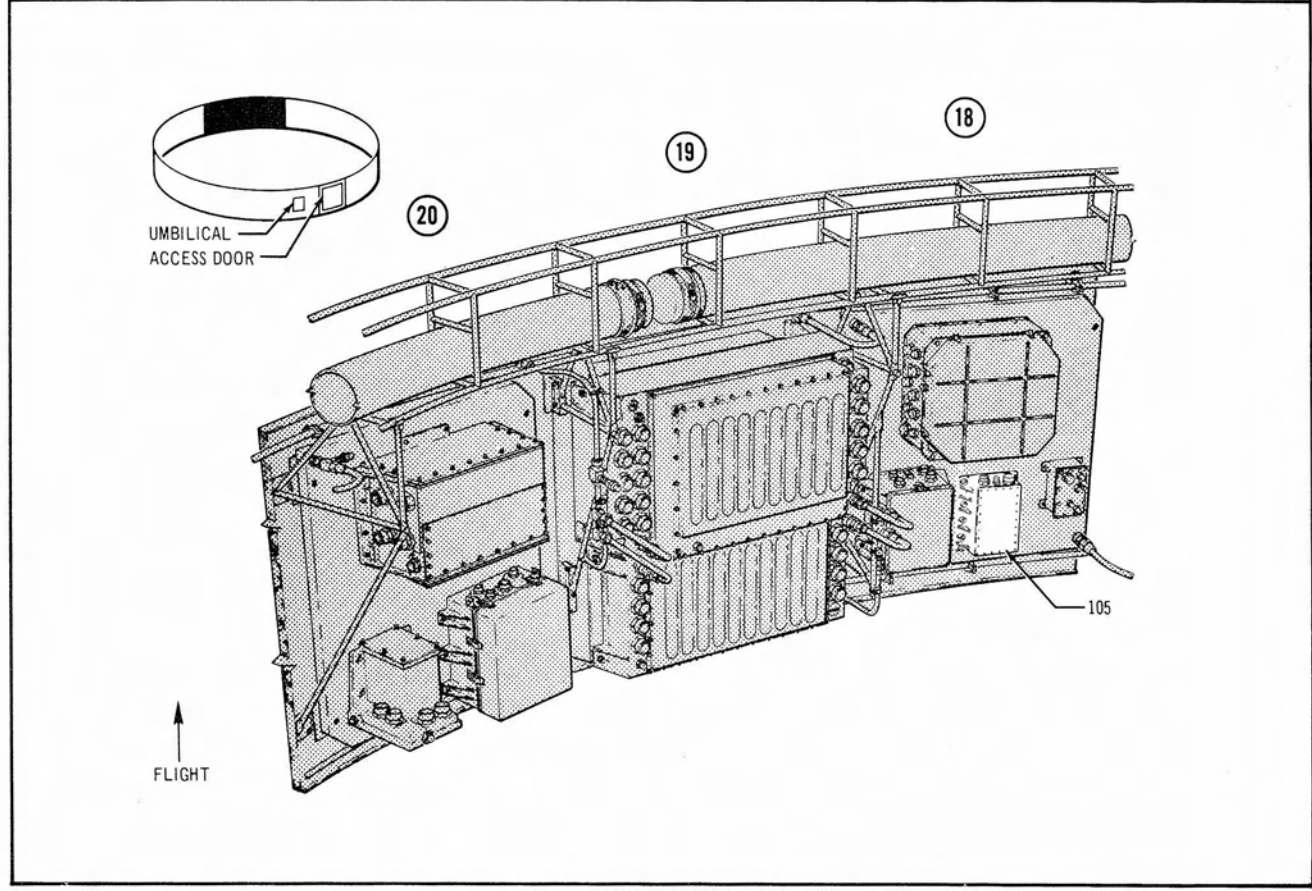
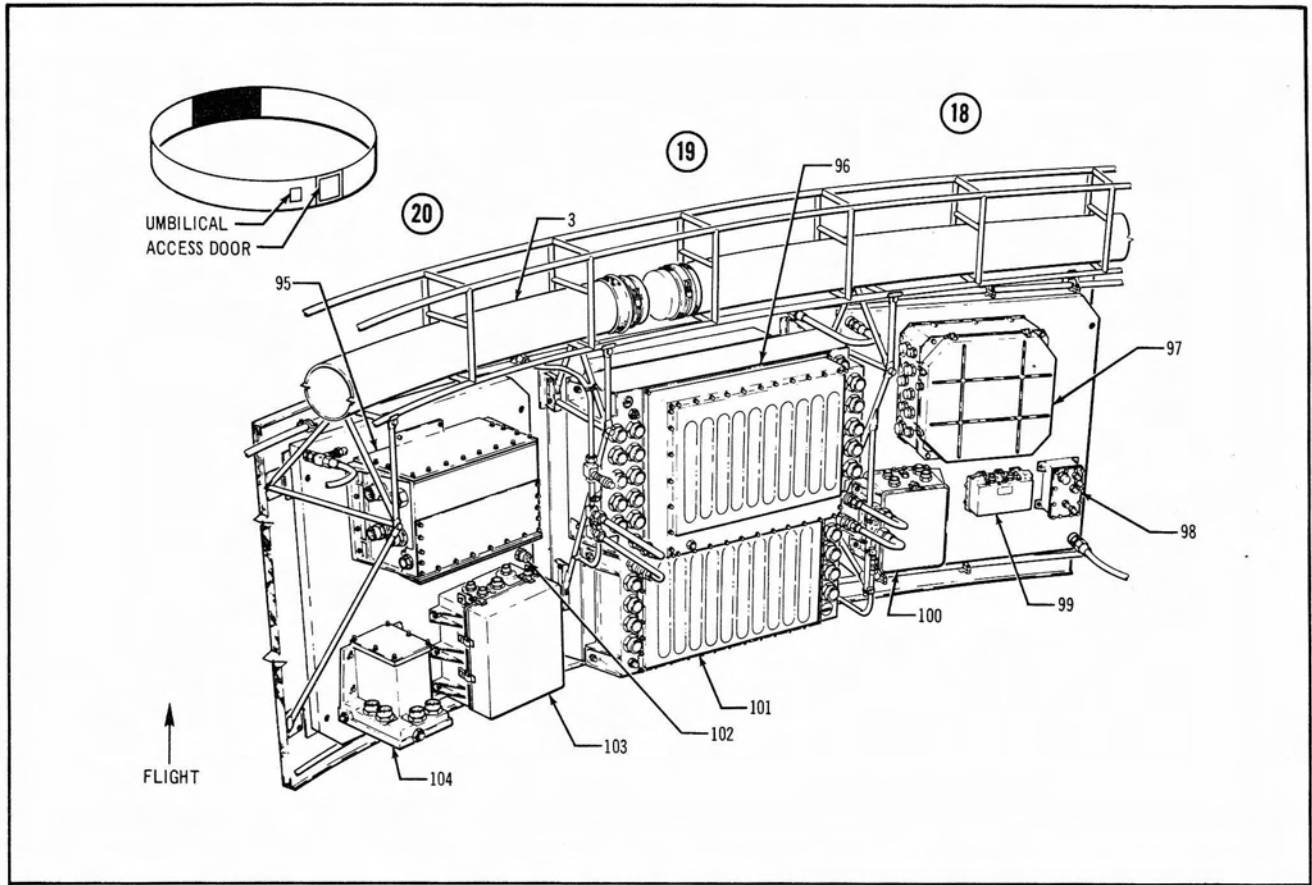


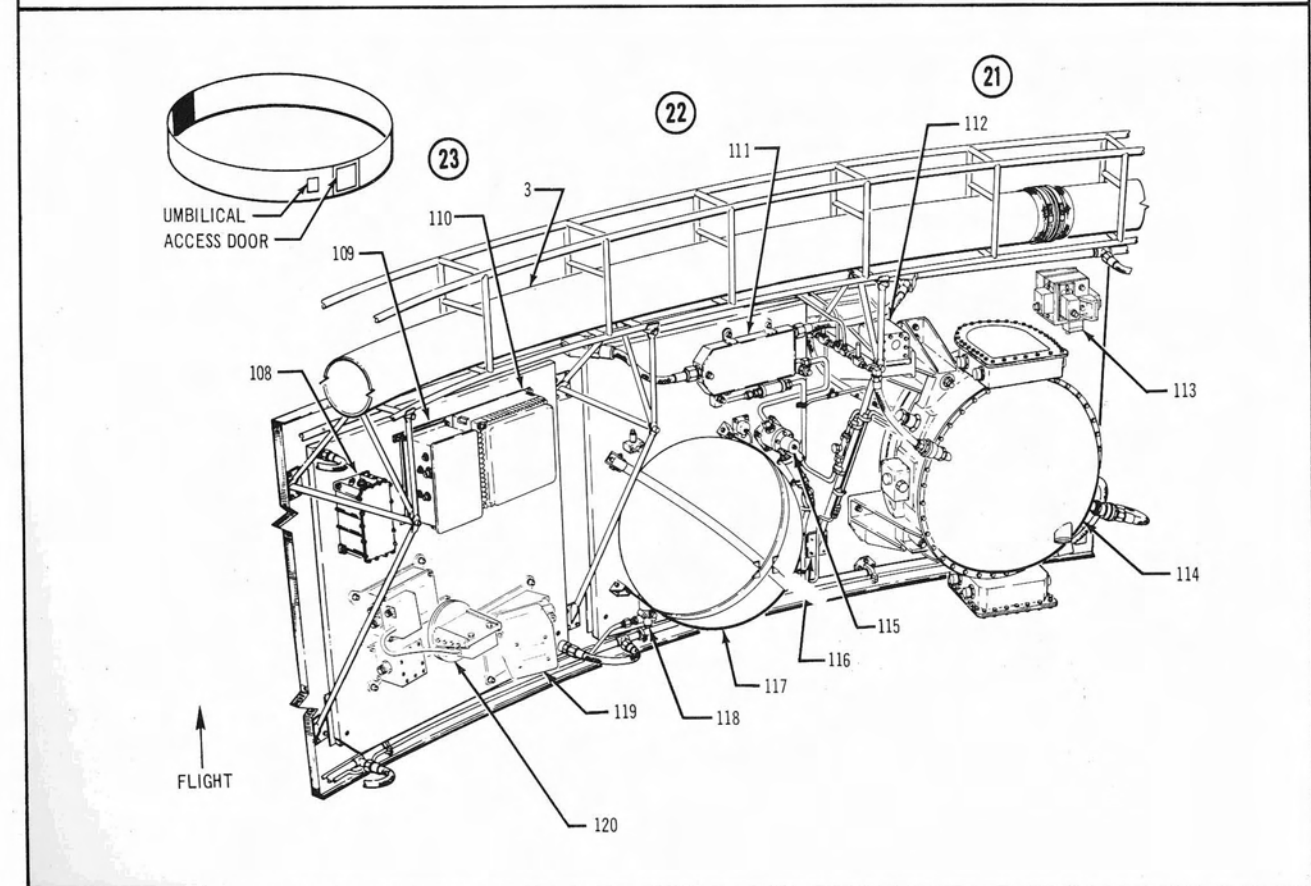
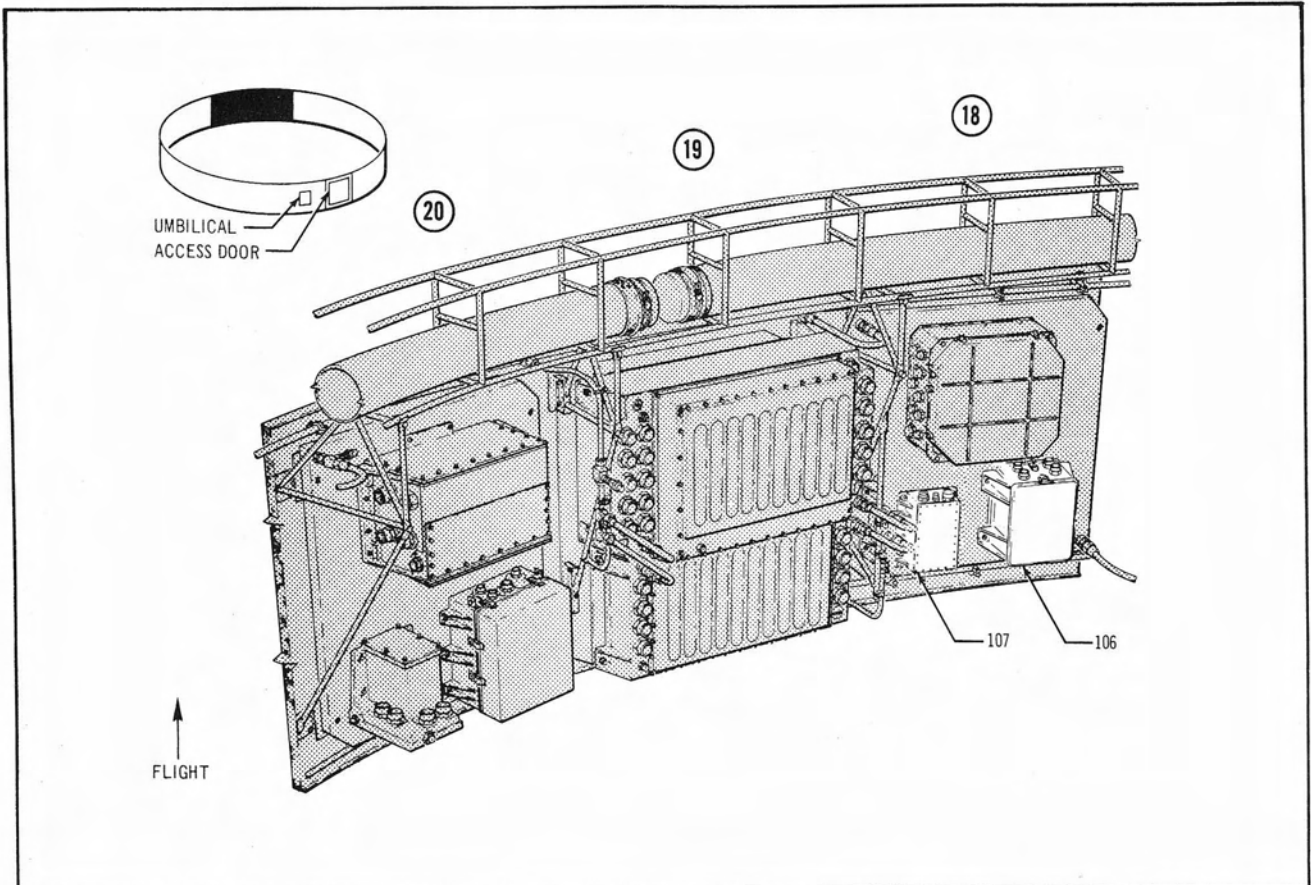


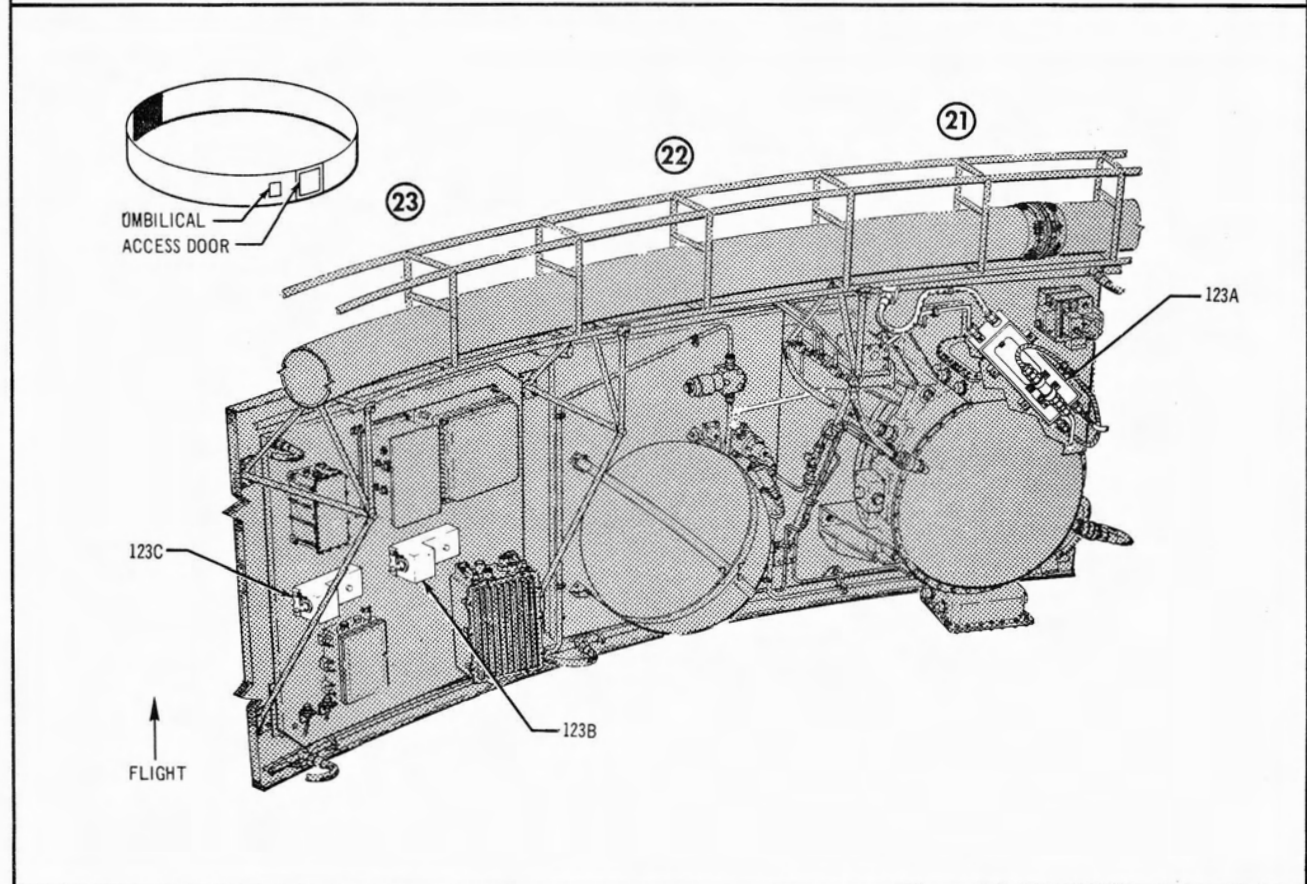
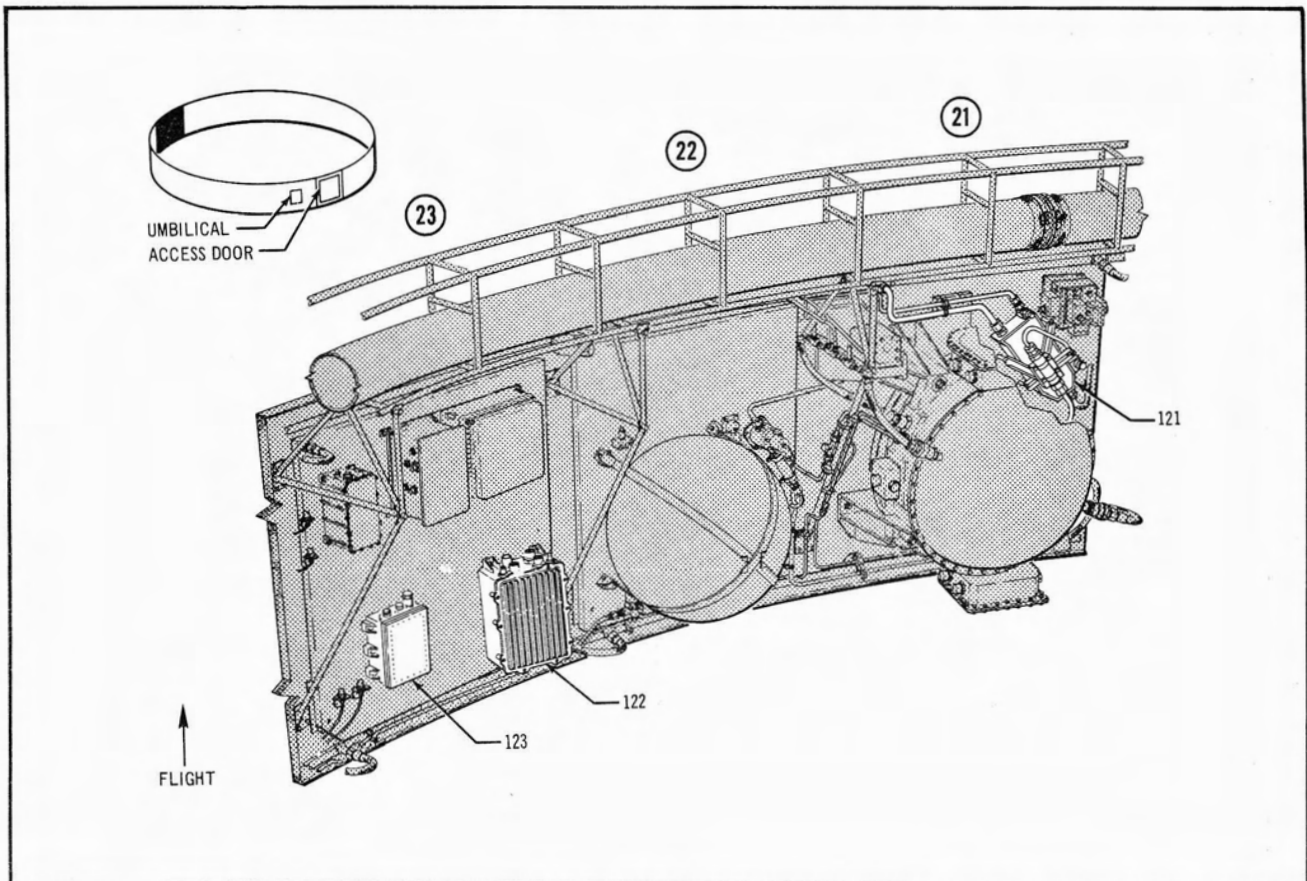
VOLUME I
CONTROL SYSTEM

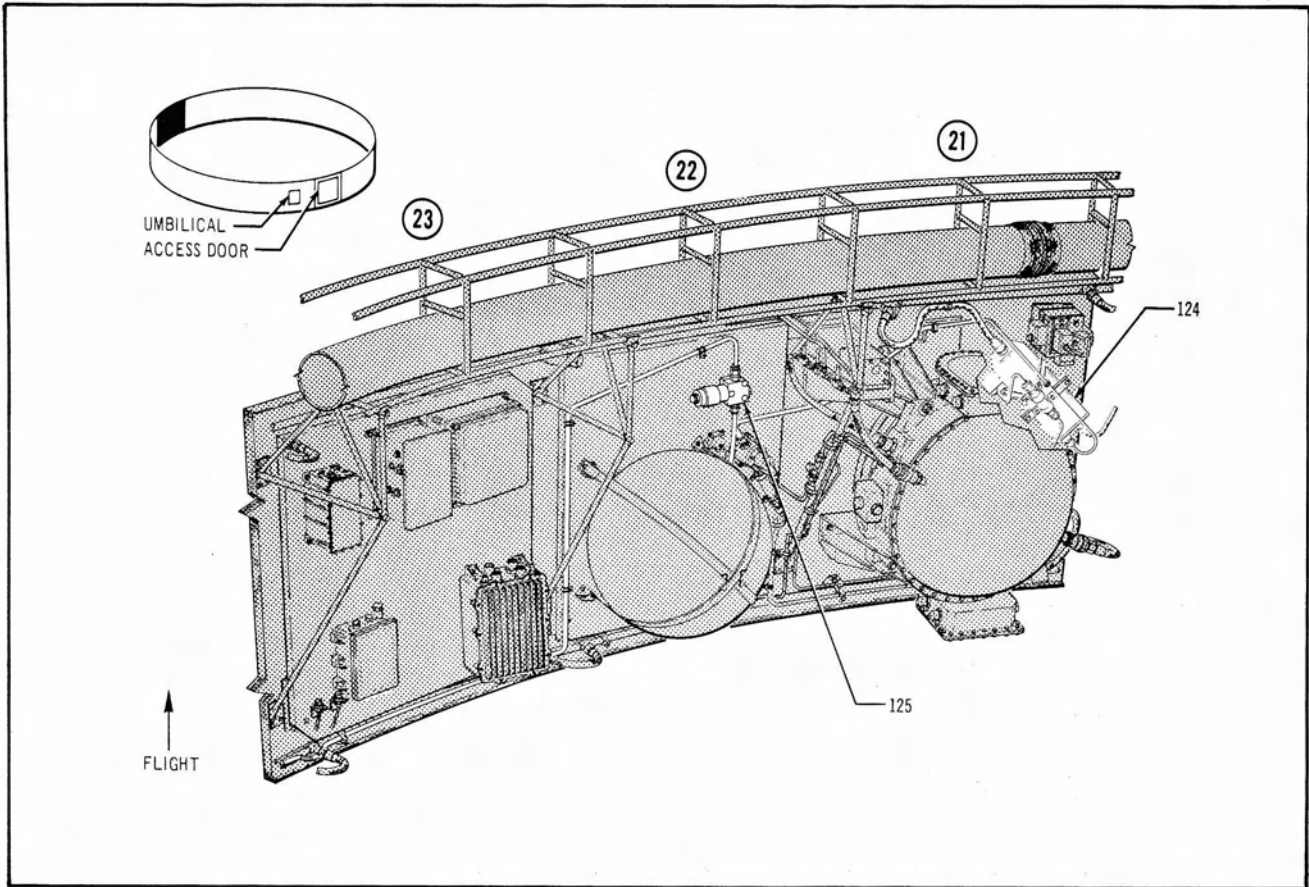


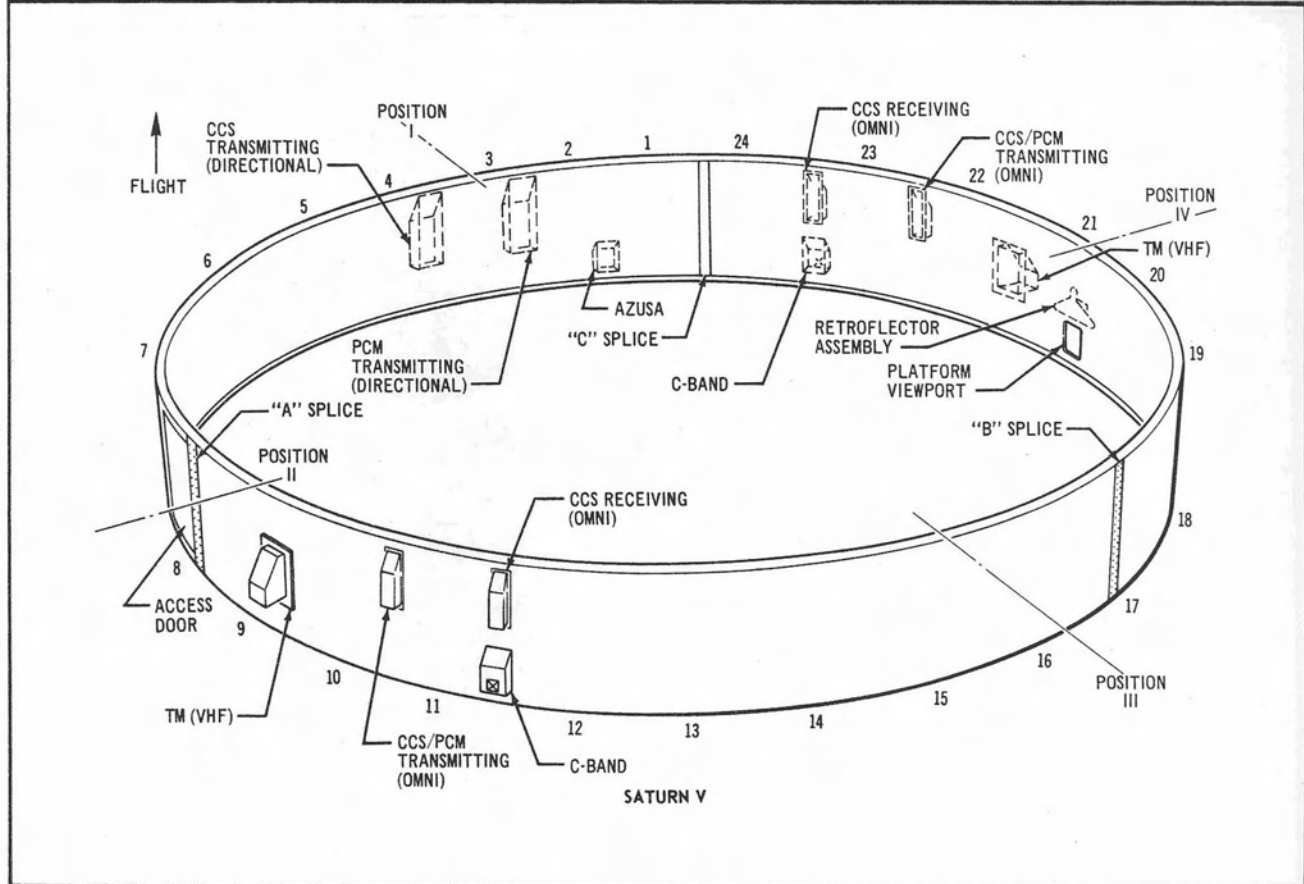
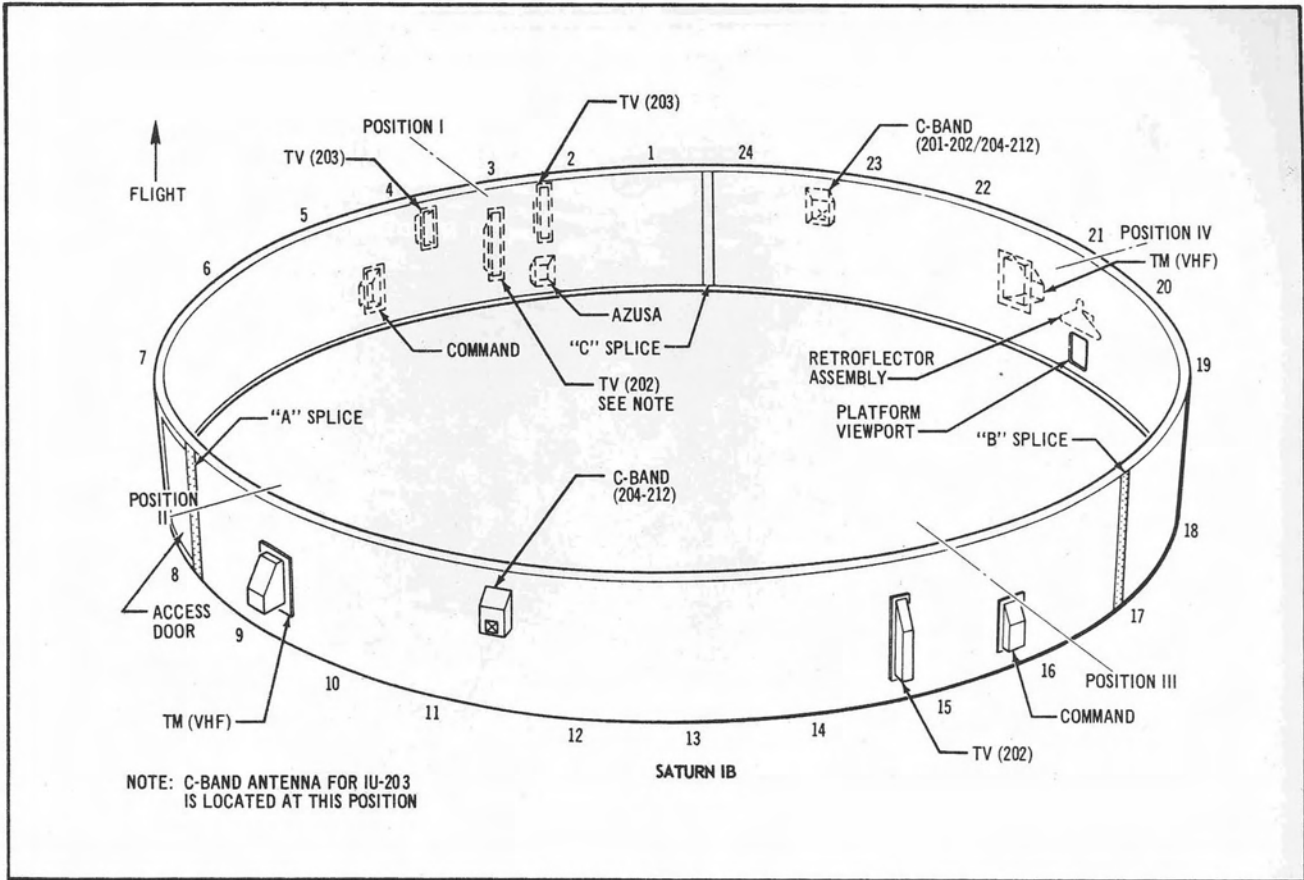












Legend for Instrument Unit Physical Layout Drawings

Index No.	Component Nomenclature	Index No.	Component Nomenclature
1	Measuring Rack A401	26	Battery D10
2	Power Distributor	27	Battery D30
3	Preflight Air/GN ₂ Purge System Flexible Tubing	27A	Water Accumulator
4	Auxiliary Power Distributor	27B	Water Solenoid Valve
5	Measuring Rack A401 or A402	28	Battery D40
6	TV Junction Box	29	Telemetry Power Divider
7	TV Power Divider	30	Coaxial Termination
8	TV Power Amplifier	31	Coaxial Switch
9	TV Transmitter Assembly	32	Battery D20
10	Camera Control Unit (GEC)	32A	Thermal Expansion Chamber
11	56 Volt Power Supply	33	First Stage Pressure Regulator
12	Measuring Rack Selector	34	Methanol-Water Accumulator
13	Source Follower	35	Coolant Pump
14	Electronic Controller Assembly	36	Water Solenoid Valve
15	Control Accelerometer (Pitch)	37	Water Accumulator
16	S-Band Power Amplifier	38	Heat Exchanger Assembly
17	Exciter Units	39	Modulating Flow Control Valve
18	S-Band Power Amplifier	40	50-Cubic-Inch Sphere
19	Camera Control Unit (GEC)	41	Valve, Shutoff, Methanol-Water
20	Camera Control Unit (Kintel)	41A	Umbilical Plate
20A	Thermal Conditioning Panel Heater	42	Hazardous Gas Detection System
20B	Thermal Conditioning Panel Heater	42A	Access Door
21	CCS Transponder	43	Water Solenoid Valve
22	CCS Power Amplifier	44	165-Cubic-Inch Sphere
23	UHF/RF Transmitter Assembly	44A	Coolant Pump (Primary)
24	PCM Coaxial Switch	44B	Coolant Pump (Secondary)
25	CCS Coaxial Switch	45	Slow Speed Multiplexer Assembly
25A	Thermal Conditioning Panel Heater	46	Tape Recorder (Airborne)
25B	Thermal Conditioning Panel Heater	47	Measuring Rack A403
25C	Thermal Conditioning Panel Heater	48	Measuring Distributor
		49	CPl or DPl Multiplexer Assembly

Legend for Instrument Unit Physical Layout Drawings (Cont)

Index No.	Component Nomenclature	Index No.	Component Nomenclature
50	Measuring Rack A402 or A405	74	P1 PCM/RF Transmitter Assembly CT-19B
51	Auxiliary Power Distributor	75	Telemetry Calibrator Power and Control Assembly
52	CP1 or DP1 Multiplexer Assembly	76	Telemetry Calibrator
53	Telemetry RF Coupler	77	Measuring Rack A408
54	F2 RF Transmitter Assembly Model II	78	Measuring Rack A407
55	VSWR Measuring Assembly Model 220	78A	Thermal Conditioning Panel Heater
56	F2 Telemeter Assembly	78B	Measuring Rack A406
57	S1 RF Transmitter Assembly Model II	78C	Thermal Conditioning Panel Heater
58	S1 Telemeter Assembly	78D	Thermal Conditioning Panel Heater
59	Remote Digital Multiplexer J	79	P1 PCM/RF Transmitter Assembly Model II
60	Telemetry RF Coupler Model 451	80	Switch Selector
60A	Thermal Conditioning Panel Heater	81	Remote Digital Submultiplexer
61	VSWR Measuring Assembly Model 225	82	Control-EDS Rate Gyros
61A	Thermal Conditioning Panel Heater	83	Control Signal Processor
62	P1 PCM/RF Transmitter Assembly Model II	84	Measuring Rack A404 or A409
63	Telemetry Calibrator Power and Control Assembly	85	Measuring Rack A403 or A406
64	Telemetry Calibrator	86	Flight Control Computer
65	Telemetry Directional Coupler Model 226	87	EDS Timer No. 2 (20 Second Timer)
66	EDS Distributor	88	EDS Timer No. 1 or 3 (30, 40, or 60 Second Timer)
67	Measuring Distributor	89	Command Directional Coupler
68	Measuring Rack A404	90	Command Power Divider
69	F1 RF Transmitter Assembly	90A	Thermal Conditioning Panel Heater
70	PCM/DDAS Telemeter Assembly	90B	Thermal Conditioning Panel Heater
71	C-Band Transponder	90C	Measuring Rack A403 or A406
72	5-Volt Measuring Voltage Supply	90D	Control-EDS Rate Gyros
73	F1 Telemeter	90E	Thermal Conditioning Panel Heater

Legend for Instrument Unit Physical Layout Drawings (Cont)

Index No.	Component Nomenclature	Index No.	Component Nomenclature
90F	Thermal Conditioning Panel Heater	109	Azusa RI Filter Assembly
90G	CCS Power Divider	110	Azusa Transponder
91	Remote Digital Multiplexer J	111	Gas Bearing Heat Exchanger
92	DDAS/Computer Interface Unit	112	Control Accelerometer (Yaw)
93	CCS Hybrid Ring	113	Force Balance Accelerometers
94	CCS Power Divider	114	ST-124M Inertial Platform Assembly
95	ST-124M Platform Electronic Assembly	115	Gas Bearing Pressure Regulator
96	Launch Vehicle Data Adapter	116	Low Pressure Switch
97	Control Distributor	117	Two-Cubic-Foot Sphere
98	Command Receiver	118	Gas Bearing Solenoid Valve
99	Secure Range Safety Decoder	119	Lateral Accelerometer Slosh, Pitch, and Yaw
100	Remote Digital Multiplexer K	120	Longitudinal Accelerometer Orbital LH ₂ Venting
101	Launch Vehicle Digital Computer	121	Gas Bearing Heat Exchanger
102	Plug Type J-Box Assembly	122	Measuring Rack A669
103	ST-124M Platform AC Power Supply	123	UHF/RF Filter
104	Accelerometer Signal Conditioner	123A	Gas Bearing Heat Exchanger
105	Command Decoder	123B	Thermal Conditioning Panel Heater
106	Remote Digital Multiplexer K	123C	Thermal Conditioning Panel Heater
107	Command Decoder	124	Gas Bearing Heat Exchanger
108	C-Band Transponder	125	Gas Bearing Solenoid Valve

APPENDIX B

WIRING CHARTS AND LOOP SCHEMATICS

The following pages contain loop schematics and wiring charts for the Control System ESE test panels. They are included in this volume as an aid to referencing and locating input/output signals, their associated test panels, and flight hardware connections.

The wiring charts are arranged in the following order

<u>Panel</u>	<u>Connector</u>	<u>Page</u>
Control Accelerometer Panel	J-1	B2
Control Computer Input Substitute Panel	J-1	B2
Control Computer Input Substitute Panel	J-2	B4
DVM Selector Panel	J-1	B5
DVM Selector Panel	J-2	B6
DVM Selector Panel	J-3	B8
EDS/Control Rate Gyro Panel	J-1	B8
Engine Actuator Substitute Panel	J-1	B10
Engine Actuator Substitute Panel	J-2	B11
Engine Actuator Substitute Panel	J-3	B12
Engine Actuator Substitute Panel	J-58	B14
Flight Control Computer Panel	J-1	B15
S-IB Engine Deflection Panel	J-1	B16
S-IVB Engine Deflection Panel	J-1	B17
EDS/Control Rate Gyro Panel	J-2	B18
ESE Ramp Control Panel	J-1	B18
Control Computer Test Panel	J-1	B18A

The loop schematics are arranged in the following order:

Control Accelerometer Panel	B19
EDS/Control Rate Gyro Panel (Sheet 1 of 2)	B21
EDS/Control Rate Gyro Panel (Sheet 2 of 2)	B23
Control Computer Input Substitute Panel (Sheet 1 of 4)	B25
Control Computer Input Substitute Panel (Sheet 2 of 4)	B27
Control Computer Input Substitute Panel (Sheet 3 of 4)	B29
Control Computer Input Substitute Panel (Sheet 4 of 4)	B31
Flight Control Computer Panel	B33
S-IVB Engine Deflection Panel	B35
S-IB Engine Deflection Panel	B37
EDS/Control Rate Gyro-Control Signal Processor- Control Accelerometers-ESE-Vehicle	B39
Flight Control Computer-ESE-Vehicle	B41
Flight Control Computer-SITS-Vehicle	B43
Engine Actuator Substitute Panel-SITS (Sheet 1 of 5)	B45
Engine Actuator Substitute Panel-SITS (Sheet 2 of 5)	B47
Engine Actuator Substitute Panel-SITS (Sheet 3 of 5)	B49
Engine Actuator Substitute Panel-SITS (Sheet 4 of 5)	B51
Engine Actuator Substitute Panel-SITS (Sheet 5 of 5)	B53
ESE Ramp Control Panel	B55
Control Computer Test Panel	B57

Control Accelerometer Panel
Connector J-1

Pin	Signal	Selection Code	Comments
A	+20D210 28 V SAFING BUS		
B	SPARE		
C	+20D110 28 V BUS		
D	20D1R RETURN BUS		
E	+20D410 10 V BUS		
F	20D4R RETURN BUS		
G	CONTROL ACCEL PWR MANUAL OFF	-	28 V PANEL OUTPUT
H	CONTROL ACCEL ON	DI-639	28 V PANEL OUTPUT
J	CONTROL ACCEL OFF	DI-1216	28 V PANEL OUTPUT
K	CONTROL ACCEL ON LAMP	VK32-603	28 V PANEL INPUT
L	YAW SELECT ON	DI-640	28 V PANEL OUTPUT
M	YAW SELECT OFF	DI-1217	28 V PANEL OUTPUT
N	YAW SELECT LAMP	DO-632	28 V PANEL INPUT
P	YAW OUTPUT	VA5-603	0 TO 10 V PANEL INPUT
R	NEGATIVE FORCE COMMAND	DI-643	28 V PANEL OUTPUT
S	NEGATIVE FORCE COMMAND LAMP	DO-635	28 V PANEL INPUT
T	ZERO COMMAND	DI-644	28 V PANEL OUTPUT
U	ZERO COMMAND LAMP	DO-636	28 V PANEL INPUT
V	RAMP SLOW LAMP	DO-420	
W	POSITIVE FORCE COMMAND	DI-642	28 V PANEL OUTPUT
X	POSITIVE FORCE COMMAND LAMP	DO-634	28 V PANEL INPUT
Y	FORCE CURRENT	-	0 TO 10 V PANEL OUTPUT
Z	PITCH SELECT ON	DI-641	28 V PANEL OUTPUT
a	PITCH SELECT OFF	DI-1218	28 V PANEL OUTPUT
b	PITCH SELECT LAMP	DO-633	28 V PANEL INPUT
c	PITCH OUTPUT	VA4-601	0 TO 10 V PANEL INPUT
d	RAMP SLOW ON	DO-420	
e	RAMP SLOW OFF	-	NOT USED
f	+26D810 10 V BUS		
g	26D8R RETURN BUS		
h	SPARE	-	RESERVED CHASSIS GRD
i	SPARE	-	RESERVED SHIELD TERM.

Control Computer Input Substitute Panel
Connector J-1

Pin	Signal	Selection Code	Comments
A	REDUNDANCY CHK NO. 1 POS LAMP	DO-586	28 V PANEL INPUT
B	REDUNDANCY CHK NO. 1 NEG LAMP	DO-585	28 V PANEL INPUT
C	REDUNDANCY CHK NO. 1 NEG	DI-620	28 V PANEL OUTPUT
D	REDUNDANCY CHK NO. 1 POS	DI-621	28 V PANEL OUTPUT
E	REDUNDANCY CHK NO. 2 POS LAMP	DO-588	28 V PANEL INPUT
F	REDUNDANCY CHK NO. 2 NEG LAMP	DO-587	28 V PANEL INPUT
G	REDUNDANCY CHK NO. 2 NEG	DI-622	28 V PANEL OUTPUT
H	REDUNDANCY CHK NO. 2 POS	DI-623	28 V PANEL OUTPUT
J	REDUNDANCY CHK NO. 3 POS LAMP	DO-590	28 V PANEL INPUT
K	REDUNDANCY CHK NO. 3 NEG LAMP	DO-589	28 V PANEL INPUT
L	REDUNDANCY CHK NO. 3 NEG	DI-624	28 V PANEL OUTPUT
M	REDUNDANCY CHK NO. 3 POS	DI-625	28 V PANEL OUTPUT

Control Computer Input Substitute Panel
Connector J-1 (Cont)

Pin	Signal	Selection Code	Comments
N	REDUNDANCY CHK NO. 4 POS LAMP	DO-592	28 V PANEL INPUT
P	REDUNDANCY CHK NO. 4 NEG LAMP	DO-591	28 V PANEL INPUT
R	REDUNDANCY CHK NO. 4 NEG	DI-626	28 V PANEL OUTPUT
S	REDUNDANCY CHK NO. 4 POS	DI-627	28 V PANEL OUTPUT
T	REDUNDANCY CHECK OFF	DI-628	28 V PANEL OUTPUT
U	ATTITUDE CONT JETS SPARE CHAN SEL PITCH	VK25-602	28 V PANEL INPUT
V	S-IVB SPARE CHAN SEL PITCH	VK22-602	28 V PANEL INPUT
W	ATTITUDE CONT JETS SPARE CHAN SEL YAW-ROLL I	VK24-602	28 V PANEL INPUT
X	S-IVB SPARE CHAN SEL YAW	VK23-602	28 V PANEL INPUT
Y	ATTITUDE CONT JETS SPARE CHAN SEL YAW-ROLL II	VK26-602	28 V PANEL INPUT
Z	DS-14 LAMP	-	(SPARE LAMP)
a	COMPARATOR RESET	DI-615	28 V PANEL OUTPUT
b	S-IB BURN SUBSTITUTE LAMP	VK21-602	28 V PANEL INPUT
c	S-IB BURN SUBSTITUTE OFF	DI-1197	28 V PANEL OUTPUT
d	S-IB BURN SUBSTITUTE ON	DI-596	28 V PANEL OUTPUT
e	S-IVB BURN SUBSTITUTE LAMP	VK20-602	28 V PANEL INPUT
f	S-IVB BURN SUBSTITUTE OFF	DI-1199	28 V PANEL OUTPUT
g	S-IVB BURN SUBSTITUTE ON	DI-598	28 V PANEL OUTPUT
h	S-IVB COAST SUBSTITUTE LAMP	DO-567	28 V PANEL INPUT
i	S-IVB COAST SUBSTITUTE OFF	DI-1201	28 V PANEL OUTPUT
j	S-IVB COAST SUBSTITUTE ON	DI-600	28 V PANEL OUTPUT
k	SPACECRAFT CONTROL SUB. LAMP	VK19-602	28 V PANEL INPUT
m	SPACECRAFT CONTROL SUB. OFF	DI-1134	28 V PANEL OUTPUT
n	SPACECRAFT CONTROL SUB. ON	DI-342	28 V PANEL OUTPUT
p	IU GUIDANCE FAILURE SUB. LAMP	DO-343	28 V PANEL INPUT
q	IU GUIDANCE FAILURE SUB. OFF	DI-340	28 V PANEL OUTPUT
r	IU GUIDANCE FAILURE SUB. ON	DI-345	28 V PANEL OUTPUT
s	TEST INPUT A METER	AI-103	0 TO 10 V PANEL INPUT
t	TEST INPUT B METER	AI-104	0 TO 10 V PANEL INPUT
u	S-IB BURN TEST LAMP	DO-565	28 V PANEL INPUT
v	S-IB BURN TEST OFF	DI-1198	28 V PANEL OUTPUT
w	S-IB BURN TEST ON	DI-597	28 V PANEL OUTPUT
x	S-IVB BURN TEST LAMP	DO-566	28 V PANEL INPUT
y	S-IVB BURN TEST OFF	DI-1200	28 V PANEL OUTPUT
z	S-IVB BURN TEST ON	DI-599	28 V PANEL OUTPUT
AA	SWITCH POINT RESET	DI-671	28 V PANEL OUTPUT
BB	SWITCH POINT RESET LAMP	DO-672	28 V PANEL INPUT
CC	RETURN BUS 20D4R		
DD	10V BUS +20D410		
EE	RETURN BUS 20D1R		
FF	RETURN BUS 20D1R		
GG	28 V BUS +20D110		
HH	28 V BUS +20D110		
JJ	RETURN BUS 20D1R		
KK	RETURN BUS 20D1R		
LL	28 V BUS +20D110		
MM	28 V BUS +20D110		
NN	SPARE	-	RESERVED CHASSIS GRD
PP	SPARE	-	RESERVED SHIELD TERM.

Control Computer Input Substitute Panel
Connector J-2

Pin	Signal	Selection Code	Comments
A	S-IVB COAST TEST LAMP	DO-568	28 V PANEL INPUT
B	S-IVB COAST TEST OFF	DI-1202	28 V PANEL OUTPUT
C	S-IVB COAST TEST ON	DI-601	28 V PANEL OUTPUT
D	NOT USED		
E	S-IB MODE INTERRUPT LAMP	DO-577	28 V PANEL INPUT
F	SWITCH POINT NO. 1 LAMP	DO-581	28 V PANEL INPUT
G	SWITCH POINT NO. 1 OFF	DI-1212	28 V PANEL OUTPUT
H	SWITCH POINT NO. 1 ON	DI-616	28 V PANEL OUTPUT
J	SWITCH POINT NO. 2 LAMP	DO-582	28 V PANEL INPUT
K	SWITCH POINT NO. 2 OFF	DI-1213	28 V PANEL OUTPUT
L	SWITCH POINT NO. 2 ON	DI-617	28 V PANEL OUTPUT
M	SWITCH POINT NO. 3 LAMP	DO-583	28 V PANEL INPUT
N	SWITCH POINT NO. 3 OFF	DI-1214	28 V PANEL OUTPUT
P	SWITCH POINT NO. 3 ON	DI-618	28 V PANEL OUTPUT
R	SWITCH POINT NO. 4 LAMP	DO-584	28 V PANEL INPUT
S	SWITCH POINT NO. 4 OFF	DI-1215	28 V PANEL OUTPUT
T	SWITCH POINT NO. 4 ON	DI-619	28 V PANEL OUTPUT
U	SWITCH POINT NO. 5 LAMP	DO-630	28 V PANEL INPUT
V	SWITCH POINT NO. 5 OFF	DI-1230	28 V PANEL OUTPUT
W	SWITCH POINT NO. 5 ON	DI-629	28 V PANEL OUTPUT
X	YAW SELECT LAMP	DO-574	28 V PANEL INPUT
Y	YAW SELECT OFF	DI-1208	28 V PANEL OUTPUT
Z	YAW SELECT ON	DI-607	28 V PANEL OUTPUT
a	ROLL SELECT LAMP	DO-575	28 V PANEL INPUT
b	ROLL SELECT OFF	DI-1209	28 V PANEL OUTPUT
c	ROLL SELECT ON	DI-608	28 V PANEL OUTPUT
d	PITCH SELECT LAMP	DO-576	28 V PANEL INPUT
e	PITCH SELECT OFF	DI-1210	28 V PANEL OUTPUT
f	PITCH SELECT ON	DI-609	28 V PANEL OUTPUT
g	CONTROL ACCELEROMETER LAMP	DO-569	28 V PANEL INPUT
h	CONTROL ACCELEROMETER OFF	DI-1203	28 V PANEL OUTPUT
i	CONTROL ACCELEROMETER ON	DI-602	28 V PANEL OUTPUT
j	ST-124M LAMP	DO-570	28 V PANEL INPUT
k	ST-124M OFF	DI-1204	28 V PANEL OUTPUT
m	ST-124M ON	DI-603	28 V PANEL OUTPUT
n	CONTROL RATE GYRO LAMP	DO-571	28 V PANEL INPUT
p	CONTROL RATE GYRO OFF	DI-1205	28 V PANEL OUTPUT
q	CONTROL RATE GYRO ON	DI-604	28 V PANEL OUTPUT
r	TEST INPUT A LAMP	DO-572	28 V PANEL INPUT
s	TEST INPUT A OFF	DI-1206	28 V PANEL OUTPUT
t	TEST INPUT A ON	DI-605	28 V PANEL OUTPUT
u	TEST INPUT B LAMP	DO-573	28 V PANEL INPUT
v	TEST INPUT B OFF	DI-1207	28 V PANEL OUTPUT
w	TEST INPUT B ON	DI-606	28 V PANEL OUTPUT
x	RAMP LAMP	DO-578	28 V PANEL INPUT
y	RAMP NEGATIVE	DI-611	28 V PANEL OUTPUT
z	RAMP POSITIVE	DI-612	28 V PANEL OUTPUT
AA	ZERO LAMP	DO-579	28 V PANEL INPUT
BB	ZERO	DI-613	28 V PANEL OUTPUT
CC	STEP ENABLE LAMP	DO-580	28 V PANEL INPUT
DD	STEP ENABLE OFF	DI-1229	28 V PANEL OUTPUT
EE	S-IB MODE INTERRUPT OFF	DI-1211	28 V PANEL OUTPUT

Control Computer Input Substitute Panel
Connector J-2 (Cont)

Pin	Signal	Selection Code	Comments
FF	S-IB MODE INTERRUPT ON	DI-610	28 V PANEL OUTPUT
GG	STEP ENABLE ON	DI-614	28 V PANEL OUTPUT
HH	SPARE		
JJ	SPARE		
KK	SPARE		
LL	SPARE		
MM	SPARE		
NN	SPARE	-	RESERVED CHASSIS GND
PP	SPARE	-	RESERVED SHIELD TERM.

DVM Selector Panel
Connector J-1

Pin	Signal	Internal Wiring	
		To	Thru
A	S-IB 1 BY	SW1A6	TB1A
B	S-IB 1 BY	SW1B6	TB1B
C	S-IB 1 MY	SW1A14	TB1C
D	S-IB11 MY	SW1B14	TB1D
E	S-IB 1 ΔIY	SW2A5	TB1E
F	S-IB 1 ΔIY	SW2B5	TB1F
G	S-IB 1 BP	SW1A2	TB1G
H	S-IB 1 BP	SW1B2	TB1N
J	S-IV 1 MP	SW1A10	TB1J
K	S-IB 1 MP	SW1B10	TB1K
L	S-IB 1 ΔIP	SW1A18	TB1L
M	S-1B 1 ΔIP	SW1A18	TB1M
N	S-IB 2 BY	SW1A7	TB1N
P	S-IB 2 BY	SW1B7	TB1P
R	S-IB 2 MY	SW1A15	TB1R
S	S-IB 2 MY	SW1B1S	TB1S
T	S-IB 2 ΔIY	SW2A6	TB1T
U	S-IB 2 ΔIY	SW2B6	TB4U
V	S-IB 2 BP	SW1A3	TB1V
W	S-IB 2 BP	SW1B3	TB1W
X	S-IB 2 MP	SW1A11	TB2A
V	S-IB 2 MP	SW1B11	TB2B
Z	S-IB 2 ΔIP	SW2A2	TB2C
a	S-IB 2 ΔIP	SW2B2	TB2D
b	S-IB 3 BY	SW1A8	TB2E
c	S-IB 3 BY	SW1B8	TB2F
d	S-IB 3 MY	SW1A16	TB2G
e	S-IB 3 MY	SW1B16	TB2H
f	S-IB 3 ΔIY	SW2A7	TB2I
g	S-IB 3 ΔIY	SW2B7	TB2K
h	S-IB 3 BP	SW1A4	TB2L
i	S-IB 3 BP	SW1B4	TB2M
j	S-IB 3 MP	SW1A12	TB2N

DVM Selector Panel
Connector J-1 (Cont)

Pin	Signal	Internal Wiring	
		To	Thru
k	S-IB 3 MP	SW1B12	TB2P
m	S-IB 3 ΔIP	SW2A3	TB2R
n	S-IB 3 ΔIP	SW2B3	TB2S
p	S-IB 4 BY	SW1A9	TB2T
q	S-IB 4 BY	SW1B9	TB2U
r	S-IB 4 MY	SW1A17	TB2V
s	S-IB 4 MY	SW1B17	TB2W
t	S-IB 4 ΔIY	SW2A8	TB3A
u	S-IB 4 ΔIY	SW2B8	TB3B
v	S-IB 4 BP	SW1A5	TB3C
w	S-IB 4 BP	SW1B5	TB3D
x	S-IB 4 MP	SW1A13	TB3E
y	S-IB 4 MP	SW1B13	TB3F
z	S-IB 4 ΔIP	SW2A4	TB3G
AA	S-IB 4 ΔIP	SW2B4	TB3H
BB	S-IVB MY	SW2A10	TB3J
CC	S-IVB MY	SW2B10	TB3K
DD	S-IVB ΔIY	SW2A11	TB3L
EE	S-IVB ΔIY	SW2B11	TB3M
FF	S-IVB MP	SW2A9	TB3N
GG	S-IVB MP	SW2B9	TB3P
HH	S-IVB ΔIP	SW2A12	TB3R
JJ	S-IVB ΔIP	SW2B12	TB3S
KK	SPARE	-	TB3T
LL	SPARE	-	TB3U
MM	SPARE	-	TB3V
NN	SPARE	-	TB3W
PP	SHIELD TERMINATION	-	-

DVM Selector Panel
Connector J-2

Pin	Signal	Internal Wiring	
		To	Thru
A	60 VDC 1Y	SW2A17	TB4A
B	60 VDC 1Y	SW2B17	TB4B
C	60 VDC IP	SW2A13	TB4C
D	60 VDC IP	SW2B13	TB4D
E	60 VDC 2Y	SW2A18	TB4E
F	60 VDC 2Y	SW2B18	TB4F
G	60 VDC 2P	SW2A14	TB4G
H	60 VDC 2P	SW2B14	TB4H
J	60 VDC 3Y	SW2A19	TB4J
K	60 VDC 3Y	SW2B19	TB4K
L	60 VDC 3P	SW2A15	TB4L

DVM Selector Panel
Connector J-1 (Cont)

Pin	Signal	Internal Wiring	
		To	Thru
M	60 VDC 3P	SW2B15	TB4M
N	60 VDC 4Y	SW2A20	TB4N
P	60 VDC 4Y	SW2B20	TB4P
R	60 VDC 4P	SW2A16	TB4R
S	60 VDC 4P	SW2B16	TB4S
T	TEST INPUT A	SW3A6	TB4T
U	TEST INPUT A	SW3B6	TB4U
V	TEST INPUT B	SW3A7	TB4V
W	TEST INPUT B	SW3B7	TB4W
X	SPARE	-	TB5A
Y	SPARE	-	TB5B
Z	SPARE	-	TB5C
a	SPARE	-	TB5D
b	SPARE	-	TB5E
c	SPARE	-	TB5F
d	TORQUER \ddot{Y}	SW3A2	TB5G
e	TORQUER \ddot{Y}	SW3B2	TB5H
f	TORQUER $\phi 1$	SW3A3	TB5J
g	TORQUER $\phi 1$	SW3B3	TB5K
h	TORQUER $\phi 2$	SW3A4	TB5L
i	TORQUER $\phi 2$	SW3B4	TB5M
j	TORQUER $\phi 3$	SW3A5	TB5N
k	TORQUER $\phi 3$	SW3B5	TB5P
m	ϕR	SW3A10	TB5R
n	ϕR	SW3B10	TB5S
p	ϕY	SW3A9	TB5T
q	ϕY	SW3B9	TB5U
r	ϕP	SW3A8	TB5V
s	ϕP	SW3B8	TB5W
t	$\ddot{Y} Y$	SW3A12	TB6A
u	$\ddot{Y} Y$	SW3B12	TB6B
v	$\ddot{Y} P$	SW3A11	TB6C
w	$\ddot{Y} P$	SW3B11	TB6D
x	SPARE	-	TB6E
y	SPARE	-	TB6F
z	SPARE	-	TB6G
AA	SPARE	-	TB6H
BB	SPARE	-	TB6J
CC	SPARE	-	TB6K
DD	SPARE	-	TB6L
EE	SPARE	-	TB6M
FF	SPARE	-	TB6N
GG	SPARE	-	TB6P
HH	SPARE	-	TB6R
JJ	SPARE	-	TB6S
KK	SPARE	-	TB6T
LL	SPARE	-	TB6U
MM	-28 V	SW1C2	UB6V
NN	+28 V	SW1C1	TB6W
PP	SHIELD TERMINATION	-	-

DVM Selector Panel
Connector J-3

Pin	Signal	To	Comments
A	DIGITAL VOLTMETER A INPUT	SW1A1	(SWITCH 1A COMMON)
B	DIGITAL VOLTMETER B INPUT	SW1B1	(SWITCH 1B COMMON)
C	NOT USED		
D	NOT USED		
E	NOT USED		
F	NOT USED		
G	NOT USED		
H	NOT USED		
J	NOT USED		
K	NOT USED		
L	NOT USED		
M	NOT USED		
N	NOT USED		
P	NOT USED		
R	NOT USED		
S	NOT USED		
T	NOT USED		
U	NOT USED		
V	NOT USED		
W	NOT USED		
X	NOT USED		
Y	NOT USED		
Z	NOT USED		
a	NOT USED		
b	NOT USED		
c	NOT USED		
d	NOT USED		
e	NOT USED		
f	NOT USED		
g	NOT USED		
h	NOT USED		
i	NOT USED		

EDS/Control Rate Gyro Panel
Connector J-1

Pin	Signal	Selection Code	Comments
A	+20D210 28 V SAFING BUS		
B	RAMP SLOW OFF	D1-737	28 V PANEL OUTPUT
C	+20D110 28 V BUS		
D	20D1R RETURN BUS		
E	26D8R RETURN BUS		
F	+26D810 10 V BUS		
G	GROUP 3 PITCH	VR13-602	0 TO 10 V PANEL INPUT
H	GROUP 3 ROLL	VR15-602	0 TO 10 V PANEL INPUT
J	GROUP 3 YAW	VR14-602	0 TO 10 V PANEL INPUT
K	GROUP 3 TORQUER	A1-704	0 TO 10 V PANEL INPUT

EDS/Control Rate Gyro Panel
Connector J-1 (Cont)

Pin	Signal	Selection Code	Comments
L	GROUP 3 SELECT LAMP	DO-656	28 V PANEL INPUT
M	GROUP 3 SELECT ON	DI-669	28 V PANEL OUTPUT
N	GROUP 3 SELECT OFF	DI-1225	28 V PANEL OUTPUT
P	GROUP 1 SELECT OFF	DI-1223	28 V PANEL OUTPUT
R	GROUP 1 SELECT ON	DI-667	28 V PANEL OUTPUT
S	GROUP 1 SELECT LAMP	DO-654	28 V PANEL INPUT
T	GROUP 1 TORQUER	AI-072	0 TO 10 V PANEL INPUT
U	GROUP 1 YAW	R8-2	0 TO 10 V PANEL INPUT
V	GROUP 1 ROLL	R12-2	0 TO 10 V PANEL INPUT
W	GROUP 1 PITCH	R13-2	0 TO 10 V PANEL INPUT
X	GROUP 2 SELECT OFF	DI-1224	28 V PANEL OUTPUT
Y	GROUP 2 SELECT ON	DI-668	28 V PANEL OUTPUT
Z	GROUP 2 SELECT LAMP	DO-655	28 V PANEL INPUT
a	GROUP 2 TORQUER	AI-073	0 TO 10 V PANEL INPUT
b	GROUP 2 YAW	VR11-602	0 TO 10 V PANEL INPUT
c	GROUP 2 ROLL	VR12-602	0 TO 10 V PANEL INPUT
d	GROUP 2 PITCH	VR10-602	0 TO 10 V PANEL INPUT
e	MANUAL SYSTEM POWER OFF	-	28 V PANEL OUTPUT
f	SYSTEM POWER ON	DI-660	28 V PANEL OUTPUT
g	SYSTEM POWER OFF	DI-1219	28 V PANEL OUTPUT
h	SYSTEM POWER LAMP	VK36-602	28 V PANEL INPUT
i	GROUP 1 UP-TO-SPEED LAMP	VR28-602	28 V PANEL INPUT
j	GROUP 2 UP-TO-SPEED LAMP	VR29-602	28 V PANEL INPUT
k	GROUP 3 UP-TO-SPEED LAMP	VR30-602	28 V PANEL INPUT
m	COMPARATOR MONITOR RESET	DI-670	28 V PANEL OUTPUT
n	GROUP 1 ROLL	R34-2	0 TO 10 V PANEL INPUT
p	YAW SPARE CHAN ACTIVE LAMP	VR27-602	28 V PANEL INPUT
q	ROLL SPARE CHAN ACTIVE LAMP	VR26-602	28 V PANEL INPUT
r	PITCH SPARE CHAN ACTIVE LAMP	VR25-602	28 V PANEL INPUT
s	YAW AXIS SELECT ON	DI-661	28 V PANEL OUTPUT
t	YAW AXIS SELECT OFF	DI-1220	28 V PANEL OUTPUT
u	YAW AXIS SELECT LAMP	DO-648	28 V PANEL INPUT
v	ROLL AXIS SELECT ON	DI-663	28 V PANEL OUTPUT
w	ROLL AXIS SELECT OFF	DI-1222	28 V PANEL OUTPUT
x	ROLL AXIS SELECT LAMP	DO-650	28 V PANEL INPUT
y	PITCH AXIS SELECT ON	DI-662	28 V PANEL OUTPUT
z	PITCH AXIS SELECT OFF	DI-1221	28 V PANEL OUTPUT
AA	PITCH AXIS SELECT LAMP	DO-649	28 V PANEL INPUT
BB	RAMP POSITIVE	DI-664	28 V PANEL OUTPUT
CC	RAMP SLOW LAMP	DO-659	28 V PANEL INPUT
DD	ZERO TORQUE COMMAND	DI-666	28 V PANEL OUTPUT
EE	ZERO TORQUE COMMAND LAMP	DO-653	28 V PANEL INPUT
FF	RAMP NEGATIVE	DI-665	28 V PANEL OUTPUT
GG	RAMP LAMP	DO-651,652	28 V PANEL INPUT
HH	20D4R RETURN BUS		
JJ	+20D410 10 V BUS		
KK	GROUP 2 ROLL	VR34-602	0 TO 10 V PANEL INPUT
LL	GROUP 3 ROLL	VR35-602	0 TO 10 V PANEL INPUT
MM	RAMP SLOW ON	DI-028	28 V PANEL OUTPUT
NN	SPARE	-	RESERVED CHASSIS GRD
PP	SPARE	-	RESERVED SHIELD TERM.

Engine Actuator Substitute Panel
Connector J-1

Pin	Signal
A	SPARE
B	SPARE
C	SPARE
D	SPARE
E	SPARE
F	SPARE
G	SPARE
H	CONTROL S-IB ENG 1 YAW
J	CONTROL S-IB ENG 1 PITCH
K	CONTROL S-IB ENG 2 YAW
L	CONTROL S-IB ENG 2 PITCH
M	CONTROL S-IB ENG 3 YAW
N	CONTROL S-IB ENG 3 PITCH
P	CONTROL S-IB ENG 4 YAW
R	CONTROL S-IB ENG 4 PITCH
S	CONTROL S-IB ENG 1 YAW
T	CONTROL S-IB ENG 1 PITCH
U	CONTROL S-IB ENG 2 YAW
V	CONTROL S-IB ENG 2 PITCH
W	CONTROL S-IB ENG 3 YAW
X	CONTROL S-IB ENG 3 PITCH
Y	CONTROL S-IB ENG 4 YAW
Z	CONTROL S-IB ENG 4 PITCH
a	MEAS S-IVB ENGINE PITCH
b	MEAS S-IVB ENGINE YAW
c	MEAS S-IVB ENGINE PITCH
d	MEAS S-IVB ENGINE YAW
e	S-IVB ENGINE OFF
f	S-IVB ENGINE ON (DO-111)
g	NOT USED
h	5V I _p
i	+28D810 28V BUS
j	+ RETURN
k	-I _p APS JET
m	NOT USED
n	5V I _{III} OR I _{IV}
p	NOT USED
q	-I _{III} APS JET
r	+ RETURN
s	- I _{IV} APS JET
t	NOT USED
u	5V I _{III} _p
v	28D8R RETURN BUS
w	-I _{III} _p APS JET
x	+RETURN
y	NOT USED
z	5V I _{III} _{IV} OR I _{III} _{II}
AA	NOT USED
BB	-I _{III} _{IV} APS JET
CC	+return
DD	-I _{III} _{II} APS JET

Engine Actuator Substitute Panel
Connector J-1 (Cont)

Pin	Signal
EE	SPARE
FF	SPARE
GG	SPARE
HH	SPARE
JJ	SPARE
KK	SPARE
LL	HARDWIRED TO MM
MM	HARDWIRED TO LL
NN	CHASSIS GROUND
PP	SHIELD TERMINATION

Engine Actuator Substitute Panel
Connector J-2

Pin	Signal
A	- YAW COIL NO. 1 ENG NO.1
B	+ YAW COIL NO. 1 ENG NO.1
C	- YAW COIL NO. 2 ENG NO.1
D	+ YAW COIL NO. 2 ENG NO.1
E	YAW BETA ENG NO.1
F	YAW ENGINE NO.1 POSITION
G	- PITCH COIL NO 1 ENG NO.1
H	+ PITCH COIL NO 1 ENG NO.1
J	- PITCH COIL NO. 2 ENG NO.1
K	+ PITCH COIL NO. 2 ENG NO.1
L	PITCH BETA ENG NO.1
M	PITCH ENGINE NO.1 POSITION
N	- YAW COIL NO. 1 ENG NO.2
P	+ YAW COIL NO. 1 ENG NO.2
R	- YAW COIL NO. 2 ENG NO.2
S	+ YAW COIL NO. 2 ENG NO.2
T	YAW BETA ENG NO.2
U	YAW ENGINE NO.2 POSITION
V	- PITCH COIL NO. 1 ENG NO.2
W	+ PITCH COIL NO. 1 ENG NO.2
X	- PITCH COIL NO. 2 ENG NO.2
Y	+ PITCH COIL NO. 2 ENG NO.2
Z	PITCH BETA ENG NO.2
a	PITCH ENGINE NO.2 POSITION
b	- YAW COIL NO. 1 ENG NO.3
c	+ YAW COIL NO. 1 ENG NO.3
d	- YAW COIL NO. 2 ENG NO.3
e	+ YAW COIL NO. 2 ENG NO.3
f	YAW BETA ENG NO.3
g	YAW ENGINE NO.3 POSITION
h	- PITCH COIL NO. 1 ENG NO.3
i	+ PITCH COIL NO. 1 ENG NO.3
j	- PITCH COIL NO. 2 ENG NO.3
k	+ PITCH COIL NO. 2 ENG NO.3
m	PITCH BETA ENG NO.3
n	PITCH ENGINE NO.3 POSITION

Engine Actuator Panel
Connector J-2 (Cont)

Pin	Signal
p	- YAW COIL NO.1 ENG NO.4
q	+ YAW COIL NO.1 ENG NO.4
r	- YAW COIL NO.2 ENG NO.4
s	+ YAW COIL NO.2 ENG NO.4
t	YAW BETA ENG NO.4
u	YAW ENGINE NO.4 POSITION
v	- PITCH COIL NO.1 ENG NO.4
w	+ PITCH COIL NO.1 ENG NO.4
x	- PITCH COIL NO.2 ENG NO.4
y	+ PITCH COIL NO.2 ENG NO.4
z	PITCH BETA ENG NO.4
AA	PITCH ENGINE NO.4 POSITION
BB	BETA CENTER TAP ENG NO.1
CC	BETA CENTER TAP ENG NO.1
DD	BETA CENTER TAP ENG NO.2
EE	BETA CENTER TAP ENG NO.2
FF	BETA CENTER TAP ENG NO.3
GG	BETA CENTER TAP ENG NO.3
HH	BETA CENTER TAP ENG NO.4
JJ	BETA CENTER TAP ENG NO.4
KK	SPARE
LL	SPARE
MM	J3MM (HARDWIRED)
NN	CHASSIS GROUND
PP	SHIELD TERMINATION

Engine Actuator Substitute Panel
Connector J-3

Pin	Signal
A	POWER ON (DO-103)
B	POWER ON
C	POWER ENABLE LAMP (D1-103)
D	POWER ON
E	POWER ON
F	S-IB ENGINE NO.1 ON
G	S-IB ENGINE NO.2 ON
H	S-IB ENGINE NO.3 ON
J	S-IB ENGINE NO.4 ON
K	S-IVB ENGINE ON
L	S-IVB PITCH ACTUATOR INPUT
M	S-IVB PITCH ACTUATOR REFERENCE
N	S-IVB YAW ACTUATOR INPUT
P	S-IVB YAW ACTUATOR REFERENCE
R	S-IVB YAW ACTUATOR POSITION
S	SPARE
T	SPARE
U	SPARE
V	SPARE
W	S-IVB PITCH ACTUATOR POSITION
X	MEAS S-IB ENG NO.1 YAW

Engine Actuator Substitute Panel
Connector J-3 (Cont)

Pin	Signal
Y	MEAS S-IB ENG NO.1 PITCH
Z	MEAS S-IB ENG NO.2 YAW
a	MEAS S-IB ENG NO.2 PITCH
b	MEAS S-IB ENG NO.3 YAW
c	MEAS S-IB ENG NO.3 PITCH
d	MEAS S-IB ENG NO.4 YAW
e	MEAS S-IB ENG NO.4 PITCH
f	MEAS S-IB ENG NO.1 YAW
g	MEAS S-IB ENG NO.1 PITCH
h	MEAS S-IB ENG NO.2 YAW
i	MEAS S-IB ENG NO.2 PITCH
j	MEAS S-IB ENG NO.3 YAW
k	MEAS S-IB ENG NO.3 PITCH
m	MEAS S-IB ENG NO.4 YAW
n	MEAS S-IB ENG NO.4 PITCH
p	S-IB ENG NO.1 OFF
q	S-IB ENG NO.1 ON (DO-107)
r	S-IB ENG NO.2 OFF
s	S-IB ENG NO.2 ON (DO-108)
t	S-IB ENG NO.3 OFF
u	S-IB ENG NO.3 ON (DO-109)
v	S-IB ENG NO.4 OFF
w	S-IB ENG NO.4 ON (DO-110)
x	SPARE
y	ϕ A
z	ϕ B
AA	ϕ C
BB	SPARE
CC	+6D171 28V BUS
DD	SPARE
EE	SPARE
FF	SPARE
GG	6D1R RETURN BUS
HH	SPARE
JJ	SPARE
KK	SPARE
LL	SPARE
MM	J2 MM HARDWIRE
NN	CHASSIS GROUND
PP	SHIELD TERMINATION

Engine Actuator Substitute Panel
Connector J-58

Pin	Signal
A	φA
B	φB
C	φC
D	SHIELD TERMINATION
E	SPARE
F	SPARE
G	SPARE
H	RETURN TO POWER SUPPLY 1364A12
J	+150 V
K	-150 V
L	-112 V
M	+112 V
N	-5 V
P	SPARE
R	RETURN TO POWER SUPPLY 1364A12
S	SPARE
T	SPARE
U	SPARE
V	SPARE
W	NOT USED
X	RETURN
Y	RETURN
Z	RETURN
a	RETURN
b	RETURN
c	RETURN
d	RETURN
e	RETURN
f	RETURN
g	RETURN
h	RETURN
i	RETURN
j	RETURN
k	RETURN
m	RETURN
n	RETURN
p	RETURN
q	RETURN
r	RETURN
s	RETURN
t	RETURN
u	RETURN
v	RETURN
w	RETURN
x	RETURN
y	RETURN
z	RETURN
AA	RETURN
BB	RETURN
CC	RETURN
DD	RETURN
EE	RETURN

Engine Actuator Substitute Panel
Connector J-58 (Cont)

Pin	Signal
FF	RETURN
GG	RETURN
HH	RETURN
JJ	RETURN
KK	NOT USED
LL	NOT USED
MM	NOT USED
NN	NOT USED
PP	NOT USED

Flight Control Computer Panel
Connector J-1

Pin	Signal	Selection Code	Comments
A	YAW ATTITUDE ERROR	VH70-602	0 TO 10 V PANEL INPUT
B	ROLL ATTITUDE ERROR	VH69-602	0 TO 10 V PANEL INPUT
C	PITCH ATTITUDE ERROR	VH71-602	0 TO 10 V PANEL INPUT
D	YAW ATTITUDE RATE	VR5-602	0 TO 10 V PANEL INPUT
E	ROLL ATTITUDE RATE	VR6-602	0 TO 10 V PANEL INPUT
F	PITCH ATTITUDE RATE	VR4-602	0 TO 10 V PANEL INPUT
G	SYSTEM POWER OFF	DI-1196	28 V PANEL OUTPUT
H	SYSTEM POWER ON	DI-563	28 V PANEL OUTPUT
J	SYSTEM PWR OFF (FCC SAFING)	-	28 V PANEL OUTPUT
K	SYSTEM POWER LAMP	-	28 V PANEL INPUT
L	CONTROL VOLTAGE	VM2-602	0 TO 10 V PANEL INPUT
M	60 V INTERRUPT A OFF	DI-1194	28 V PANEL OUTPUT
N	60 V INTERRUPT A ON	DI-559	28 V PANEL OUTPUT
P	60 V INTERRUPT A LAMP	DO-555	28 V PANEL INPUT
R	60 V INTERRUPT B OFF	DI-1195	28 V PANEL OUTPUT
S	60 V INTERRUPT B ON	DI-560	28 V PANEL OUTPUT
T	60 V INTERRUPT B LAMP	DO-556	28 V PANEL INPUT
U	SPARE		
V	SPARE		
W	SPARE		
X	SPARE		
Y	CAT ZERO	DI-561	28 VOLT OUTPUT
Z	CAT OPERATE	DI-562	28 VOLT OUTPUT
a	CAT ZERO	DO-558	28 VOLT INPUT
b	CAT OPERATE	DO-557	28 VOLT INPUT
c	+20D210 28 V BUS		
d	26D8R RETURN BUS		
e	+26D810 10 V BUS		
f	20D1R RETURN BUS		
g	+20D110 28 V BUS		
h	SPARE	-	RESERVED CHASSIS GND
J	SPARE	-	RESERVED SHIELD TERM.

S-IB Engine Deflection Panel
Connector J-1

Pin	Signal	Selection Code	Comments
A	ENGINE NO.1 YAW	VG2-1	0 TO 10 V PANEL INPUT
B	ENGINE NO.1 PITCH	VG1-1	0 TO 10 V PANEL INPUT
C	ENGINE NO.1 YAW Δ I	VH2-1	0 TO 10 V PANEL INPUT
D	ENGINE NO.1 PITCH Δ I	VH1-1	0 TO 10 V PANEL INPUT
E	ENGINE NO.2 YAW	VG2-2	0 TO 10 V PANEL INPUT
F	ENGINE NO.2 PITCH	VG1-2	0 TO 10 V PANEL INPUT
G	ENGINE NO.2 YAW Δ I	VH2-2	0 TO 10 V PANEL INPUT
H	ENGINE NO.2 PITCH Δ I	VH1-2	0 TO 10 V PANEL INPUT
J	ENGINE NO.3 YAW	VG2-3	0 TO 10 V PANEL INPUT
K	ENGINE NO.3 PITCH	VG1-3	0 TO 10 V PANEL INPUT
L	ENGINE NO.3 YAW Δ I	VH2-3	0 TO 10 V PANEL INPUT
M	ENGINE NO.3 PITCH Δ I	VH1-3	0 TO 10 V PANEL INPUT
N	ENGINE NO.4 YAW	VG2-4	0 TO 10 V PANEL INPUT
P	ENGINE NO.4 PITCH	VG1-4	0 TO 10 V PANEL INPUT
R	ENGINE NO.4 YAW Δ I	VH2-4	0 TO 10 V PANEL INPUT
S	ENGINE NO.4 PITCH Δ I	VH1-4	0 TO 10 V PANEL INPUT
T	YAW 1 NOT ZERO	-	28 V PANEL INPUT
U	PITCH 1 NOT ZERO	-	28 V PANEL INPUT
V	YAW 2 NOT ZERO	-	28 V PANEL INPUT
W	PITCH 2 NOT ZERO	-	28 V PANEL INPUT
X	YAW 3 NOT ZERO	-	28 V PANEL INPUT
Y	PITCH 3 NOT ZERO	-	28 V PANEL INPUT
Z	YAW 4 NOT ZERO	-	28 V PANEL INPUT
a	PITCH 4 NOT ZERO	-	28 V PANEL INPUT
b	SPARE		
c	SPARE		
d	20D2R RETURN BUS		
e	+26D810 28 V BUS		
f	26D8R RETURN BUS		
g	SPARE		
h	SPARE	-	RESERVED CHASSIS GND
i	SPARE	-	RESERVED SHIELD TERM.

S-IVB Engine Deflection Panel
Connector J-1

Pin	Signal	Selection Code	Comments
A	YAW VALVE CURRENT	-	0 TO 10 V PANEL INPUT
B	YAW DEFLECTION	-	0 TO 10 V PANEL INPUT
C	PITCH DEFLECTION	-	0 TO 10 V PANEL INPUT
D	PITCH VALVE CURRENT	-	0 TO 10 V PANEL INPUT
E	I _{II} - I _{IV} RELAY CURRENT	-	0 TO 10 V PANEL INPUT
F	I _p - I _{IIIp} RELAY CURRENT	-	0 TO 10 V PANEL INPUT
G	I _{III} I _{II} - I _{III} I _{IV} RELAY CURRENT	-	0 TO 10 V PANEL INPUT
H	I _{II} - I _{IV} VALVE	-	0 TO 5 V PANEL INPUT
J	I _p VALVE	-	0 TO 5 V PANEL INPUT
K	I _{III} I _p VALVE	-	0 TO 5 V PANEL INPUT
L	I _{III} I _{II} - I _{III} I _{IV} VALVE	-	0 TO 5 V PANEL INPUT
M	20D1R RETURN BUS		
N	SPARE		
P	+20D110 28 V BUS		
R	+26D810 10 V BUS		
S	26D8R RETURN BUS		
T	+24D810 10 V BUS		
U	24D8R RETURN BUS		
V	+10 V SUPPLY		
W	SPARE		
X	SPARE		
Y	SPARE		
Z	SPARE		
a	SPARE		
b	SPARE		
c	SPARE		
d	SPARE		
e	SPARE		
f	SPARE		
g	SPARE		
h	SPARE	-	RESERVED CHASSIS GRD
j	SPARE	-	RESERVED SHIELD TERM.

EDS/Control Rate Gyro Panel
Connector J2 Pin Functions

Pin	Signal	Selection Code	Comments
A	EDS RATE SWITCH YAW GROUP 1 LAMP	VR17-602	28 V PANEL INPUT
B	EDS RATE SWITCH ROLL GROUP 1 LAMP	VR18-602	28 V PANEL INPUT
C	EDS RATE SWITCH PITCH GROUP 1 LAMP	VR16-602	28 V PANEL INPUT
D	EDS RATE SWITCH YAW GROUP 2 LAMP	VR20-602	28 V PANEL INPUT
E	EDS RATE SWITCH ROLL GROUP 2 LAMP	VR21-602	28 V PANEL INPUT
F	EDS RATE SWITCH PITCH GROUP 2 LAMP	VR19-602	28 V PANEL INPUT
G	EDS RATE SWITCH YAW GROUP 3 LAMP	VR23-602	28 V PANEL INPUT
H	EDS RATE SWITCH ROLL GROUP 3 LAMP	VR24-602	28 V PANEL INPUT
J	EDS RATE SWITCH PITCH GROUP 3 LAMP	VR22-602	28 V PANEL INPUT
K	EDS SWITCH POINT OFF	DI-1143	28 V PANEL OUTPUT
L	EDS SWITCH POINT ON	DI-367	28 V PANEL OUTPUT
M	EDS SWITCH POINT GROUP 1 LAMP	VK123-602	28 V PANEL INPUT
N	EDS SWITCH POINT GROUP 2 LAMP	VK124-602	28 V PANEL INPUT
P	EDS SWITCH POINT GROUP 3 LAMP	VK125-602	28 V PANEL INPUT
	Remaining Pins Not Used		

ESE Ramp Control Panel
Connector J1 Pin Functions

Pin	Signal	Selection Code	Comments
A	NOT USED		
B	RAMP SLOW CONT COMP INPUT SUBS	DI-564	28 V PANEL OUTPUT
C	NOT USED		
D	RAMP SLOW CONTROL ACCELEROMETER	DI-595	28 V PANEL OUTPUT
E	NOT USED		
F	RAMP SLOW EDS/CONTROL RATE GYRO	DI-659	28 V PANEL OUTPUT
G	NOT USED		
H	NOT USED		
J	CONT ACCEL FORCE COMMAND	DO-642 DO-643	28 V PANEL INPUT
K	CONT ACCEL NEGATIVE MANUAL	-	28 V PANEL OUTPUT

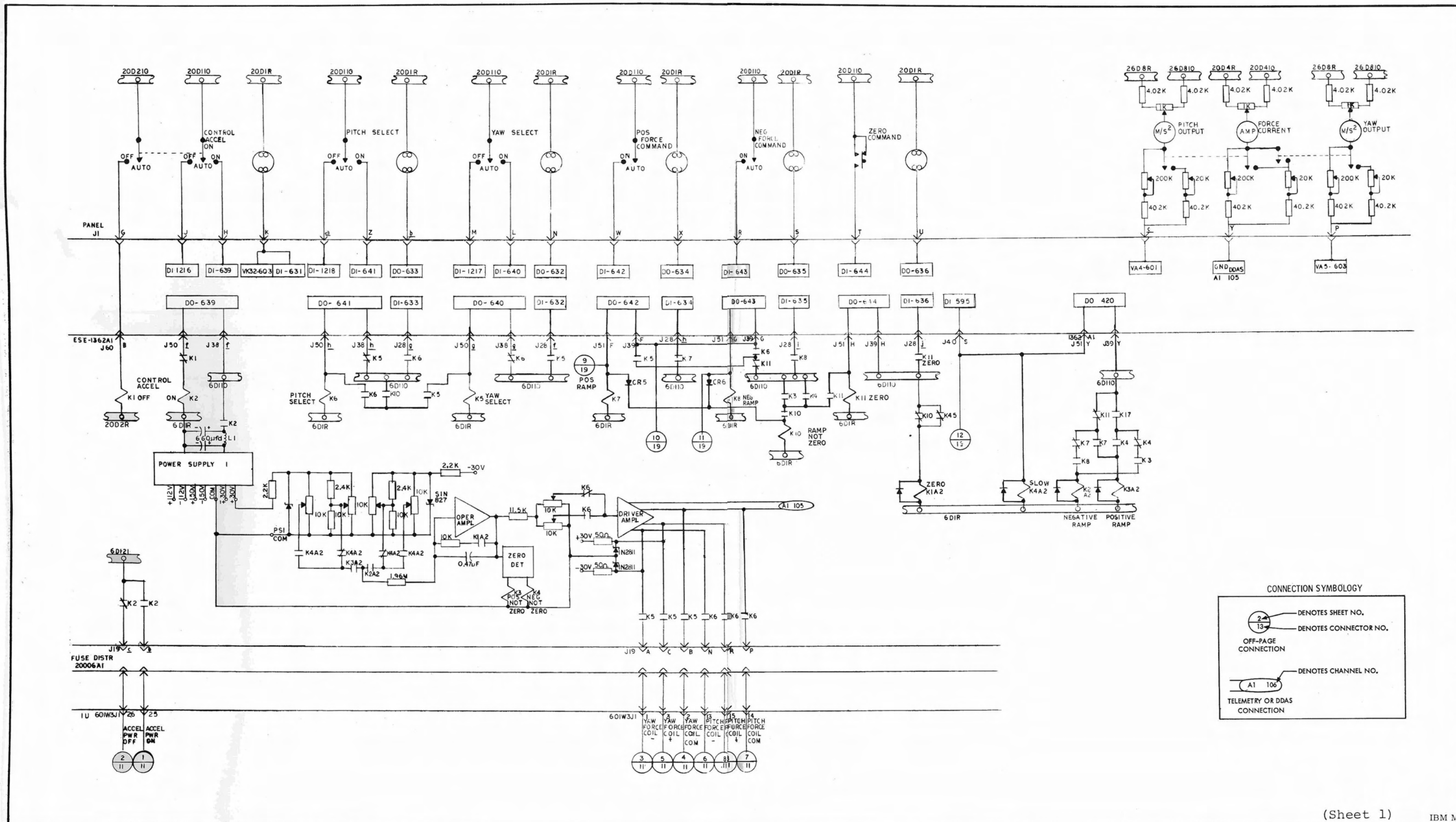
ESE Ramp Control Panel
Connector J1 Pin Functions (Cont)

Pin	Signal	Selection Code	Comments
L	CONT ACCEL POSITIVE MANUAL	-	28 V PANEL OUTPUT
M	EDS/CONT RATE GYRO RAMP COMMAND	DO-664 DO-665	28 V PANEL INPUT
N	EDS/CONT RATE GYRO NEGATIVE MANUAL	-	28 V PANEL OUTPUT
P	EDS/CONT RATE GYRO POSITIVE MANUAL	-	28 V PANEL OUTPUT
Q	NOT USED		
R	CONT COMP INPUT SUBS RAMP	DO-611 DO-612	28 V PANEL INPUT
S	CONT COMP INPUT SUBS NEG MANUAL	-	28 V PANEL OUTPUT
T	CONT COMP INPUT SUBS POS MANUAL	-	28 V PANEL OUTPUT
U	NOT USED		
V	NOT USED		
W	NOT USED		
X	6 DIR RETURN BUS	-	
Y	+6D110 28 V BUS	-	
Z	NOT USED		

Control Computer Test Panel
Connector J1 Pin Functions

Pin	Signal	Selection Code	Comments
A	REDUNDANCY CHECK NO. 5 LAMP	DO-890	28 V PANEL INPUT
B	REDUNDANCY CHECK NO. 5 OFF	DI-893	28 V PANEL OUTPUT
C	REDUNDANCY CHECK NO. 5 ON	DI-887	28 V PANEL OUTPUT
*	NOT USED		
L	RAMP SLOW LAMP	DO-564	28 V PANEL INPUT
*	NOT USED		
R	RAMP SLOW OFF	DI-736	28 V PANEL OUTPUT
S	RAMP SLOW ON	DI-677	28 V PANEL OUTPUT
*	NOT USED		
a	+20D110 28 V BUS	-	
b	20 DIR RETURN BUS	-	
*	NOT USED		

* Pins D through K, M through Q, T through Z, and c through z are spares.

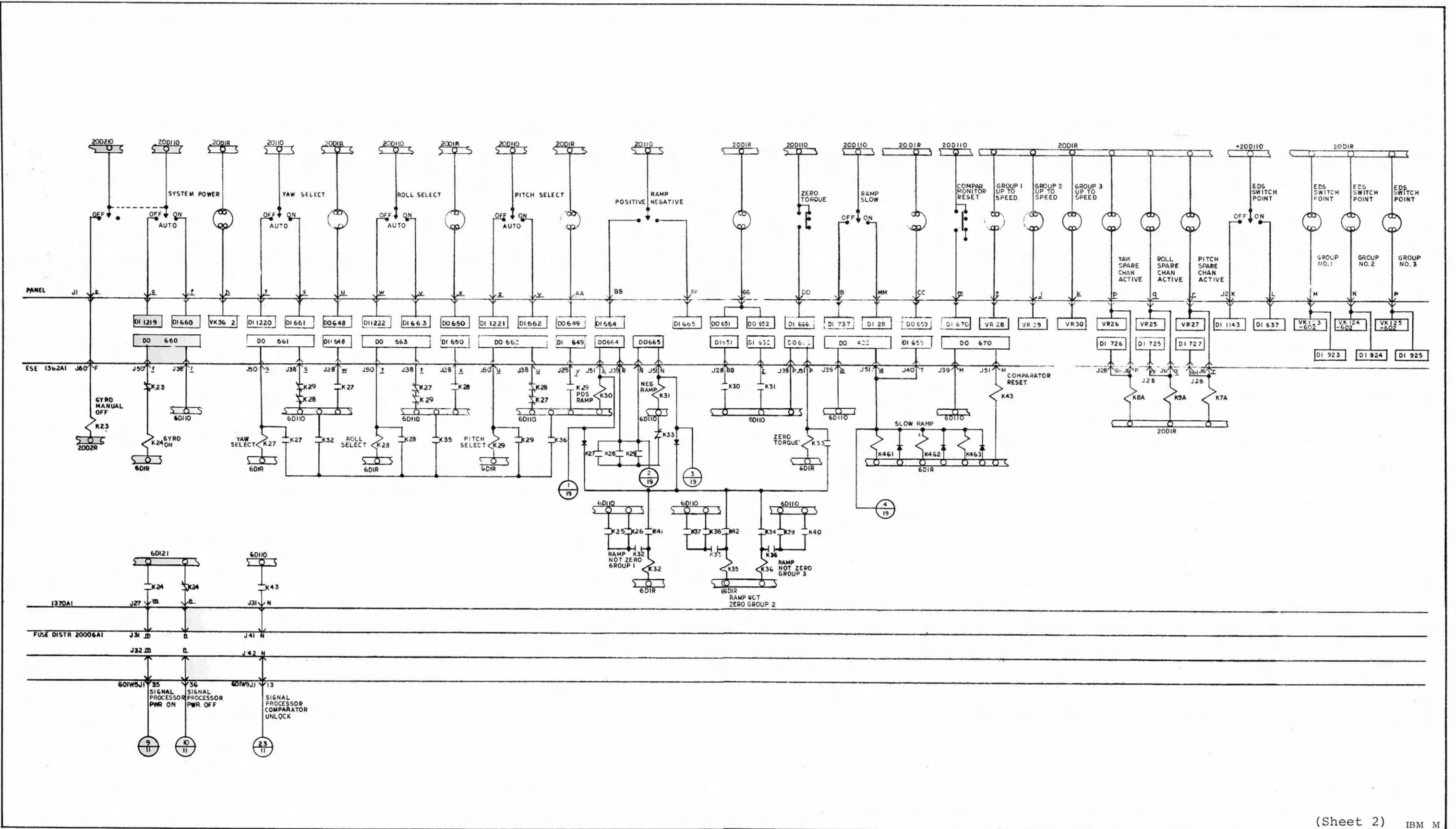


(Sheet 1) IBM M

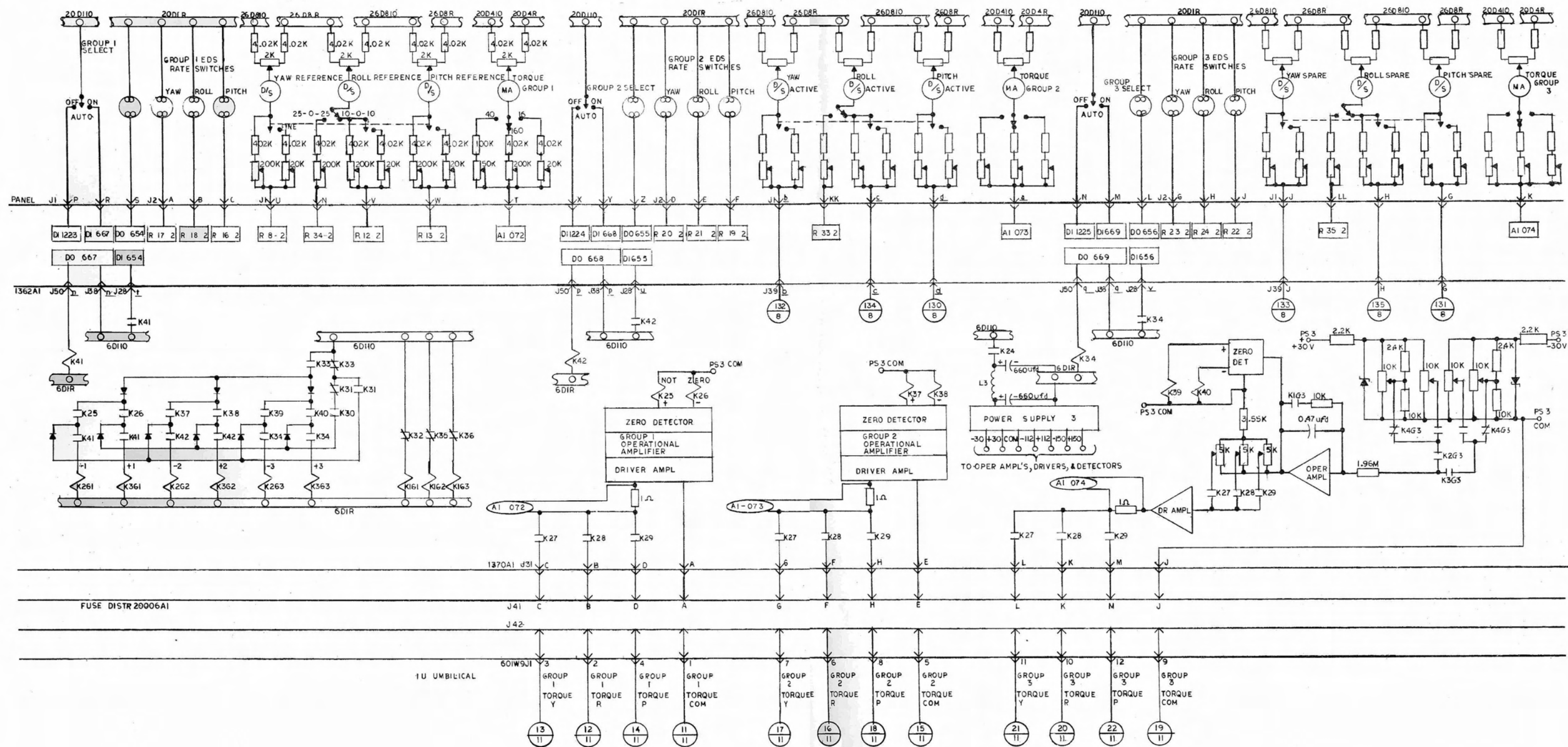
Control Accelerometer Panel

Changed 1 July 1967

B-19/B-20



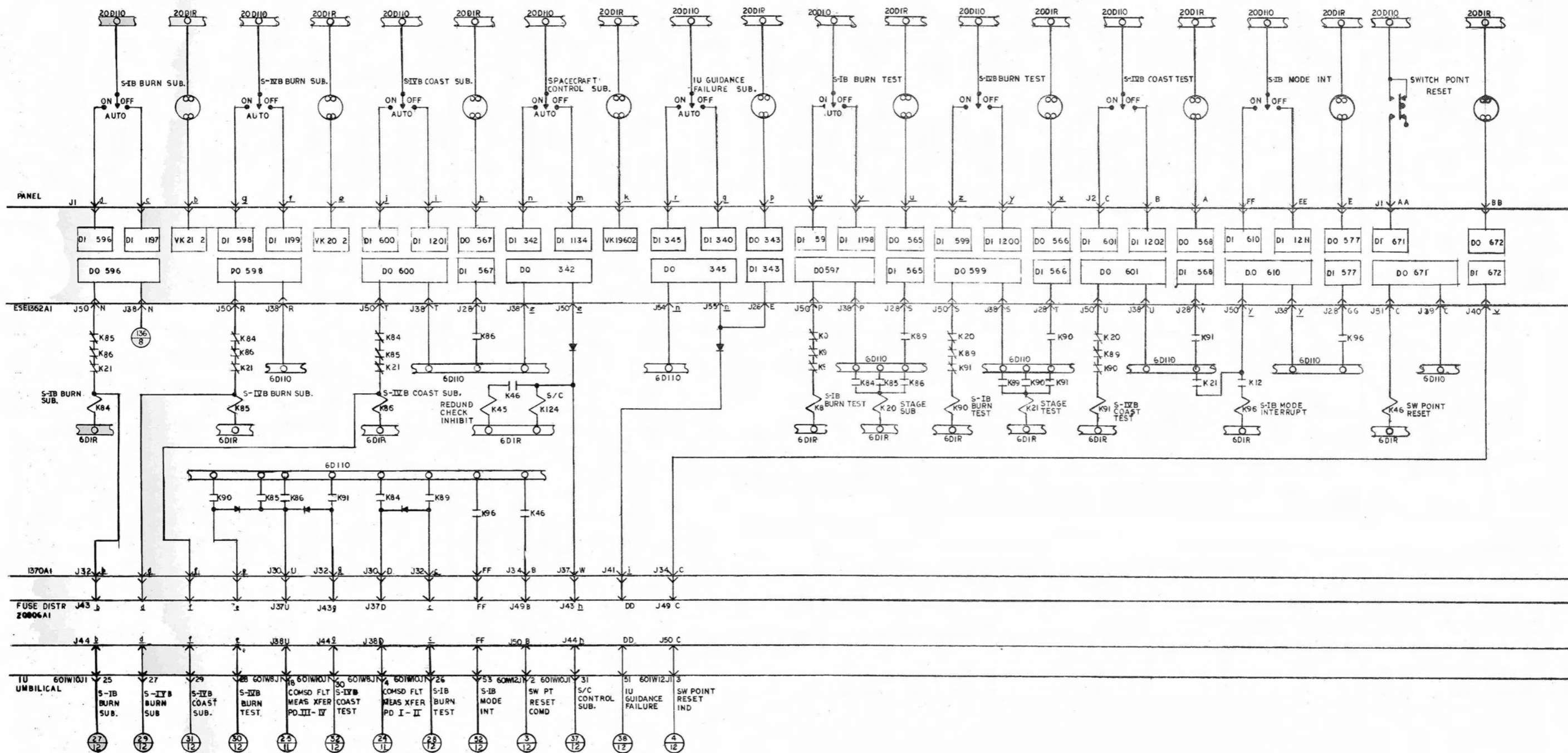
(Sheet 2) IBM M



EDS/Control Rate Gyro Panel (Sheet 2)

Changed 1 July 1967

B-23/B-24

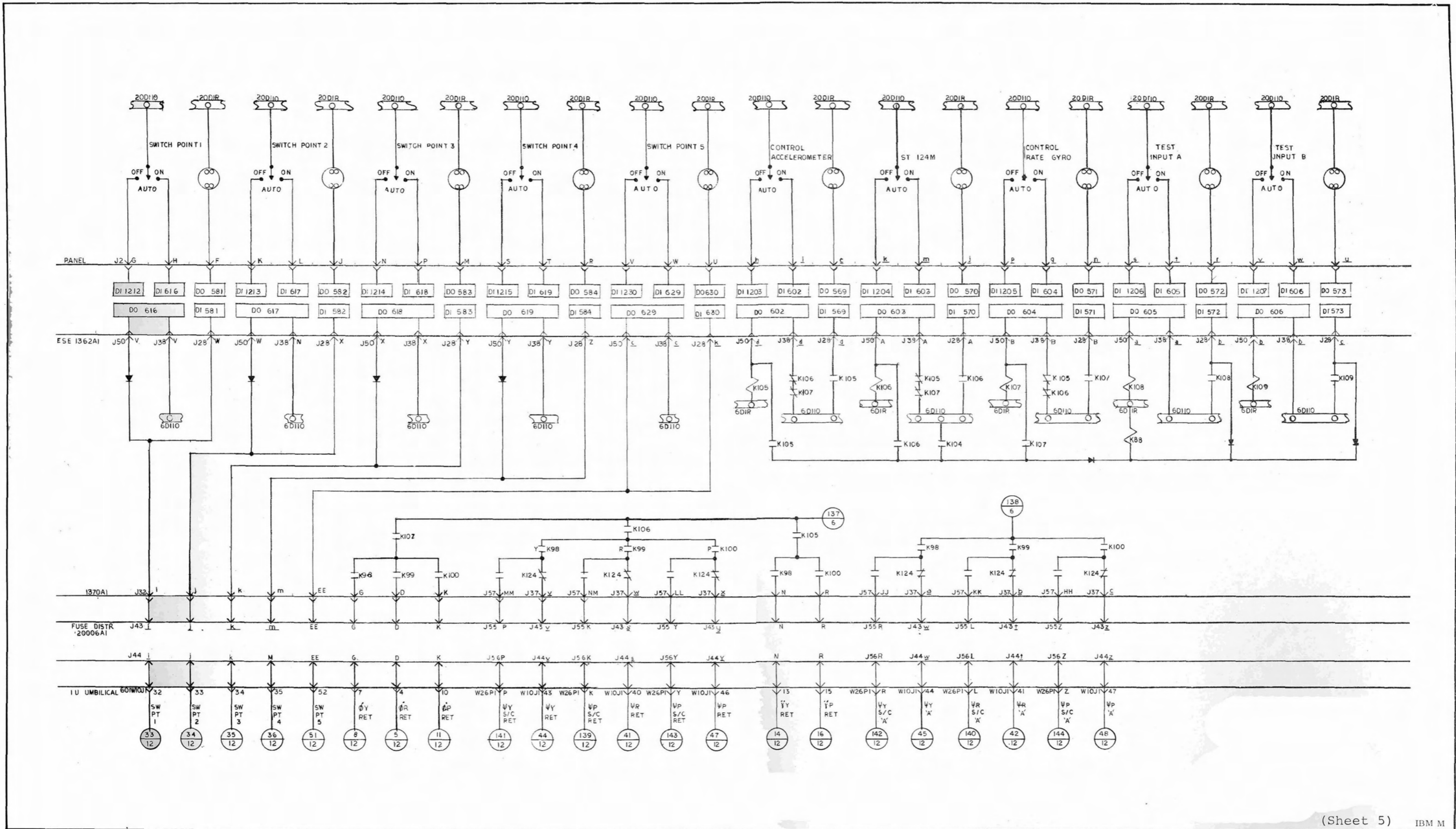


(Sheet 4) IBM M

Control Computer Input Substitute Panel (Sheet 1)

Changed 1 July 1967

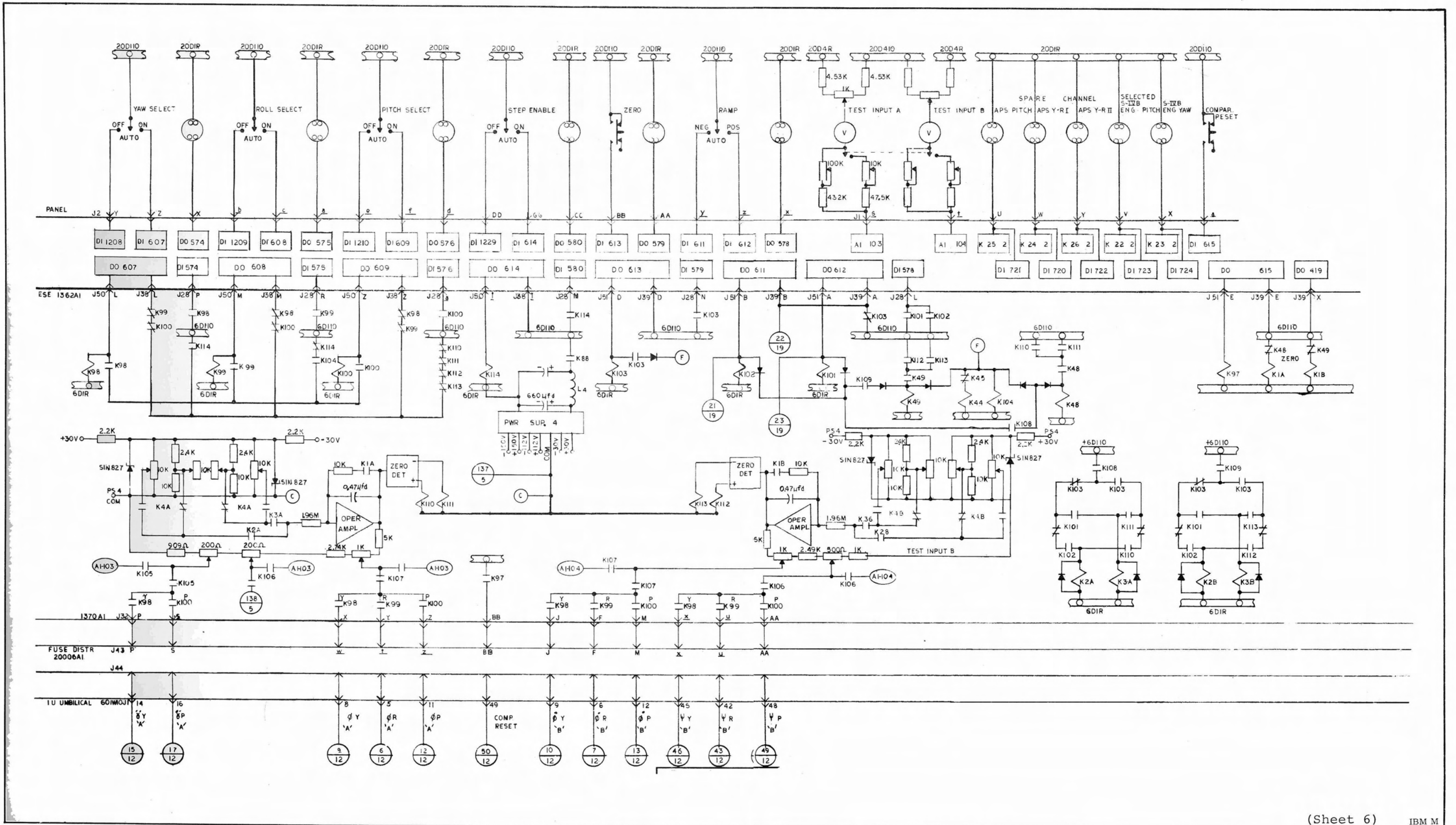
B-25/B-26



Control Computer Input Substitute Panel (Sheet 2)

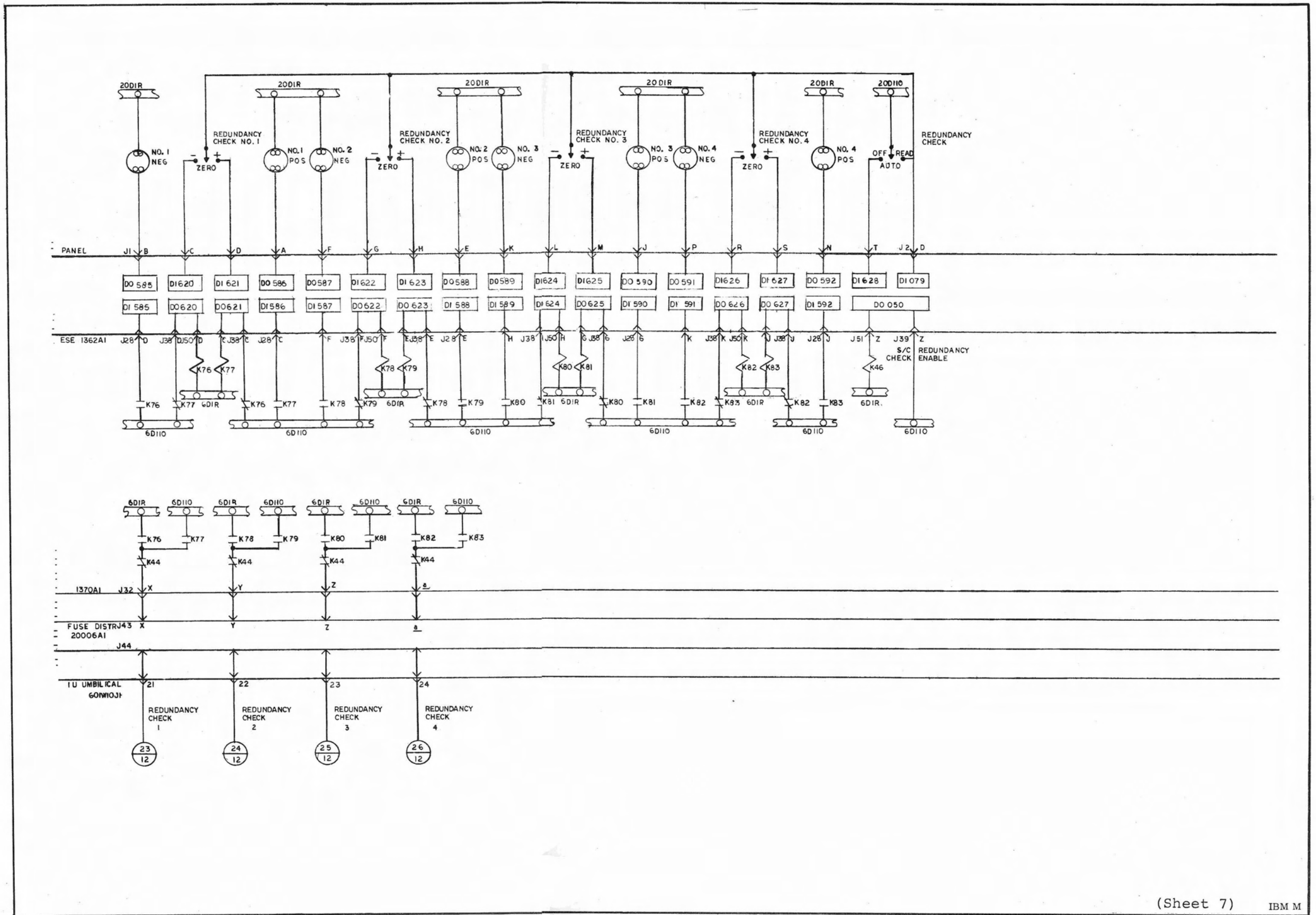
Changed 1 July 1967

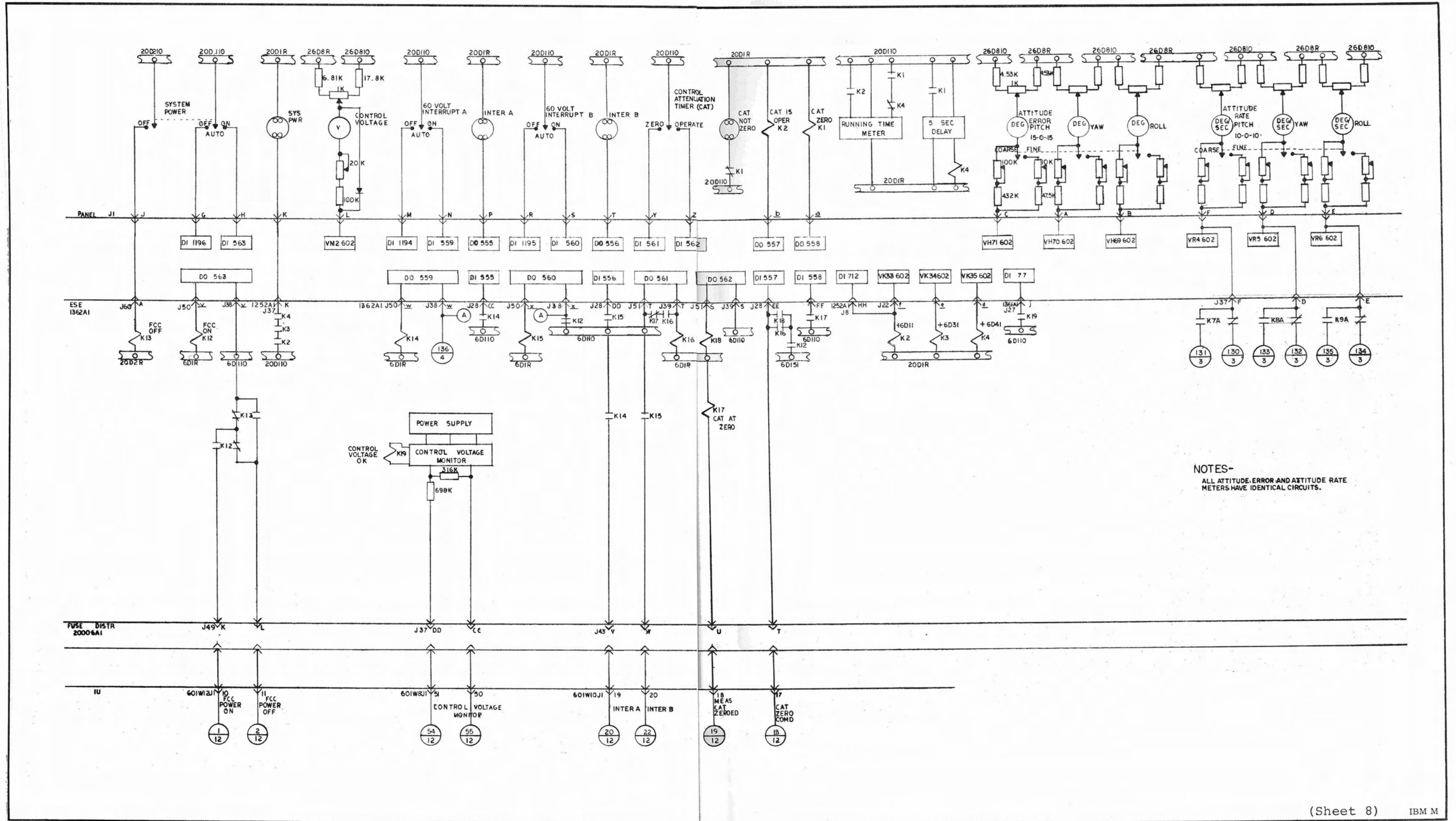
B-27/B-28



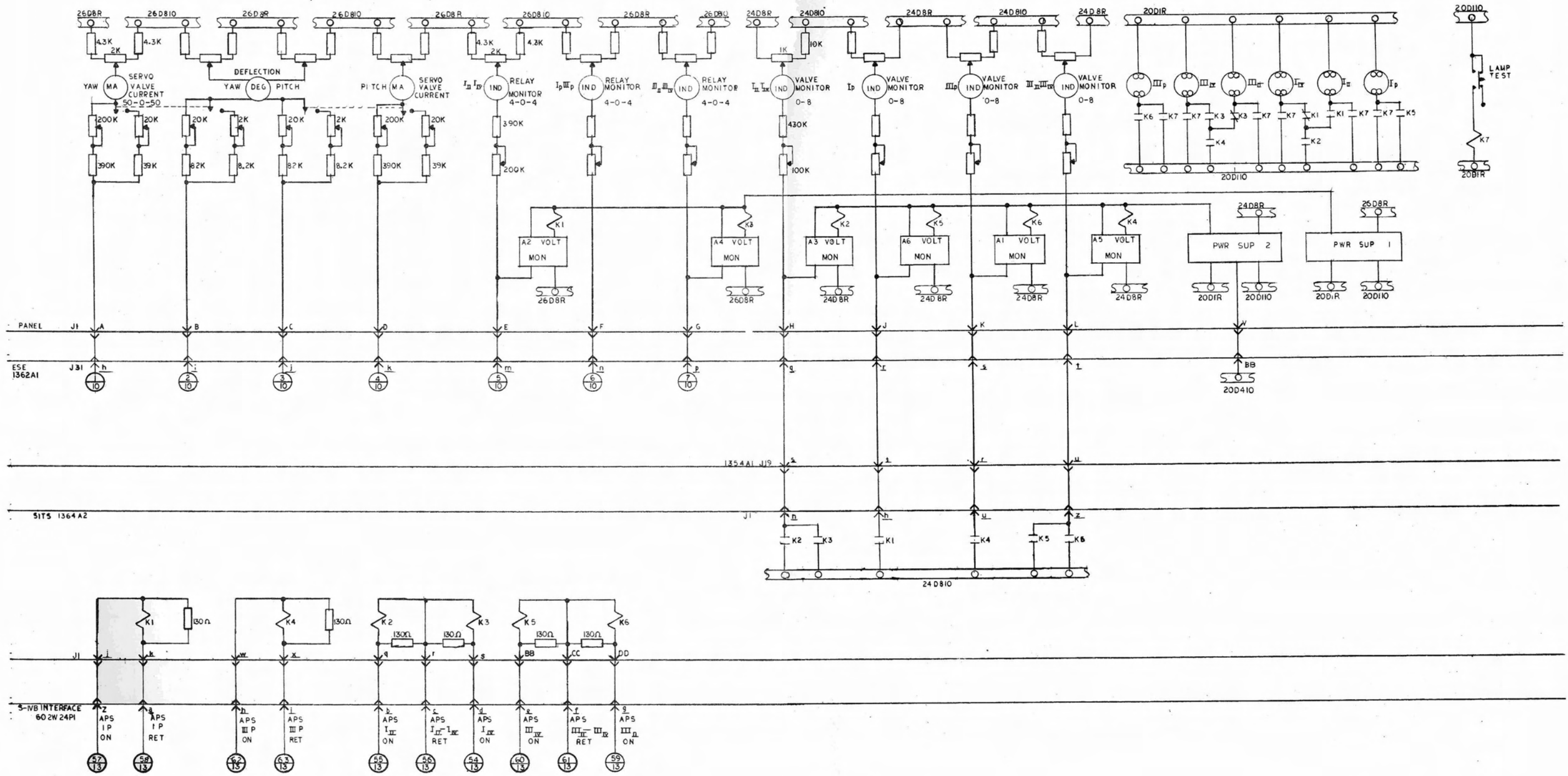
Control Computer Input Substitute Panel (Sheet 3)

Changed 1 July 1967



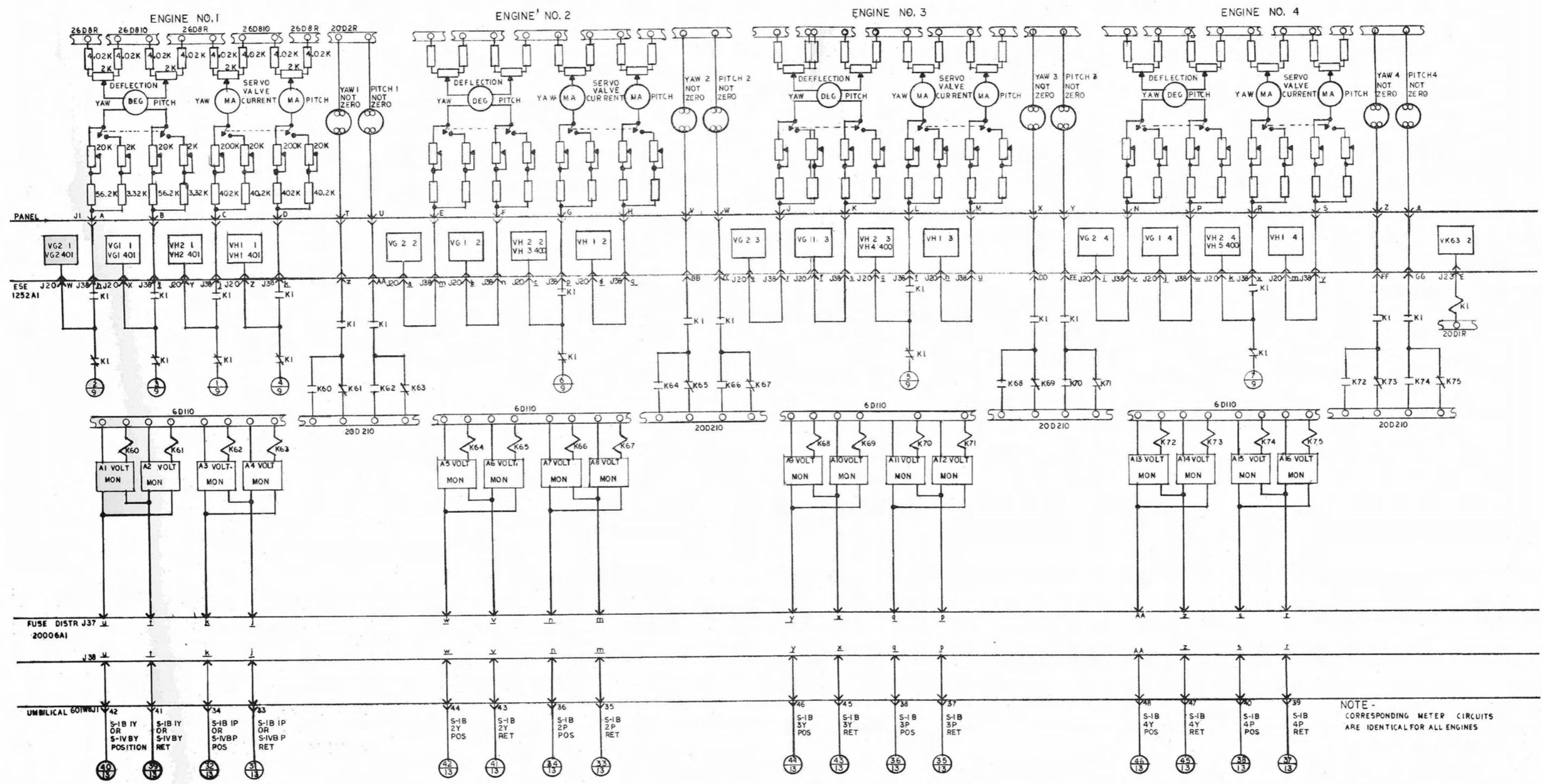


NOTES-
ALL ATTITUDE ERROR AND ATTITUDE RATE METERS HAVE IDENTICAL CIRCUITS.



S-IVB Engine Deflection Panel

Changed 1 July 1967

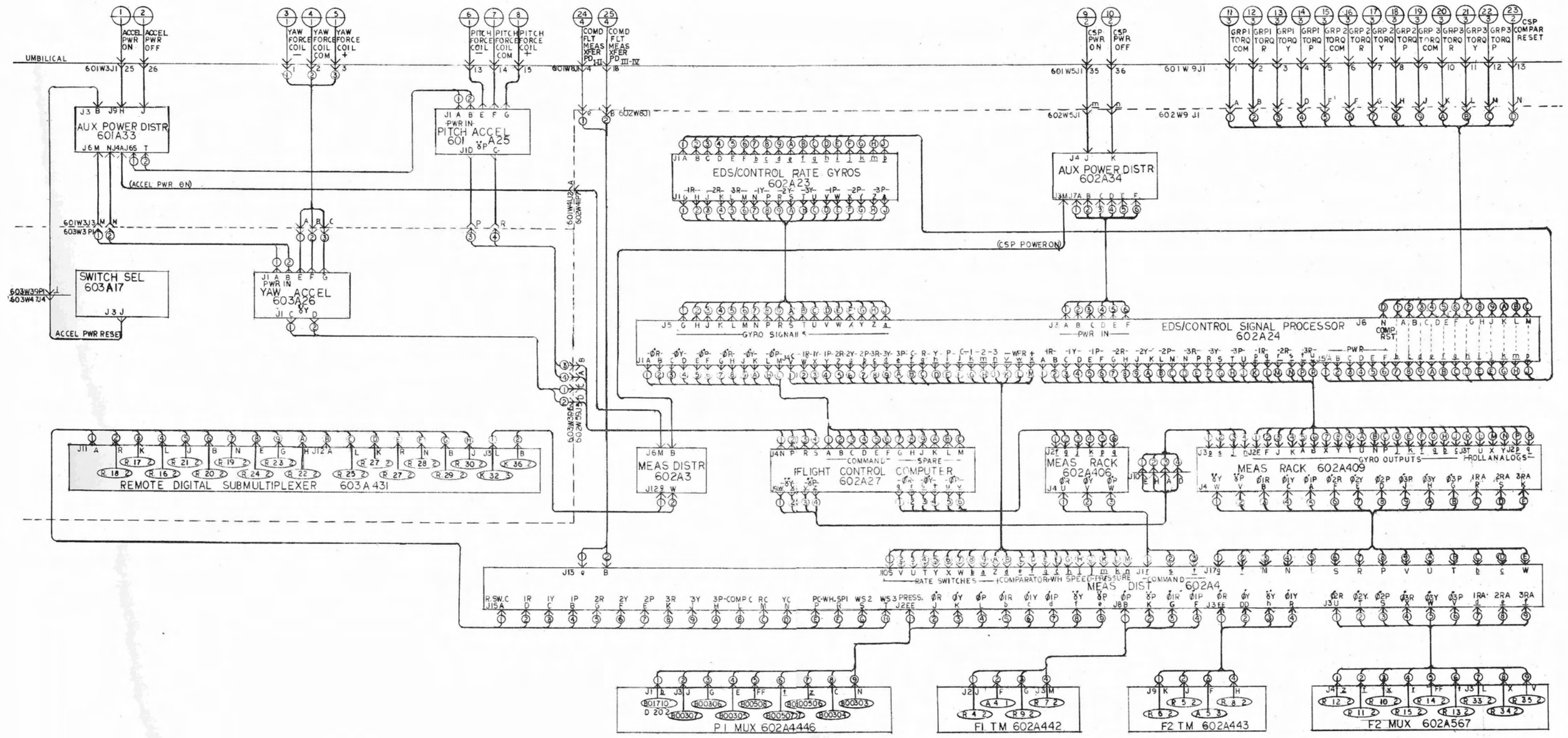


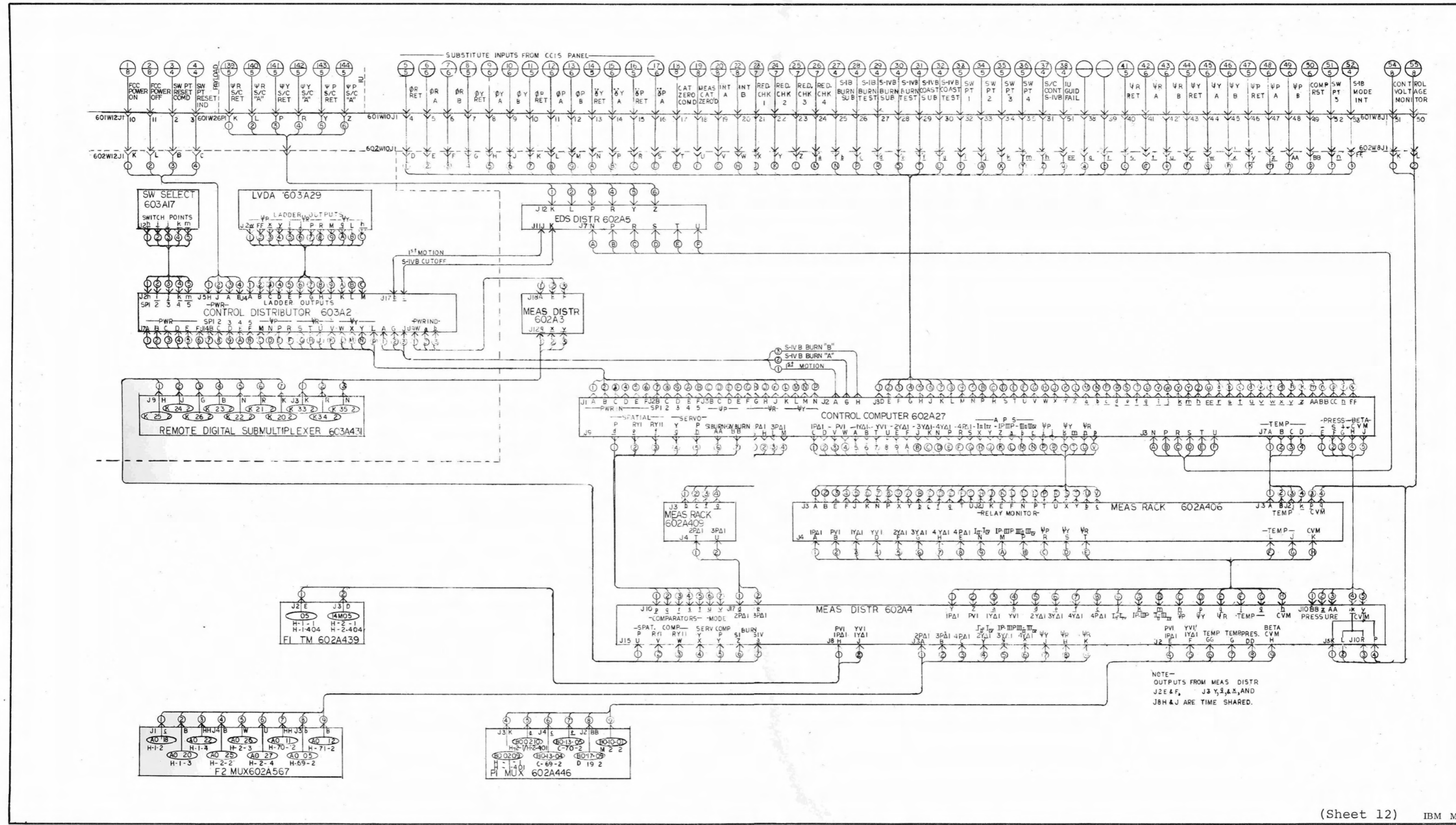
NOTE -
CORRESPONDING METER CIRCUITS
ARE IDENTICAL FOR ALL ENGINES

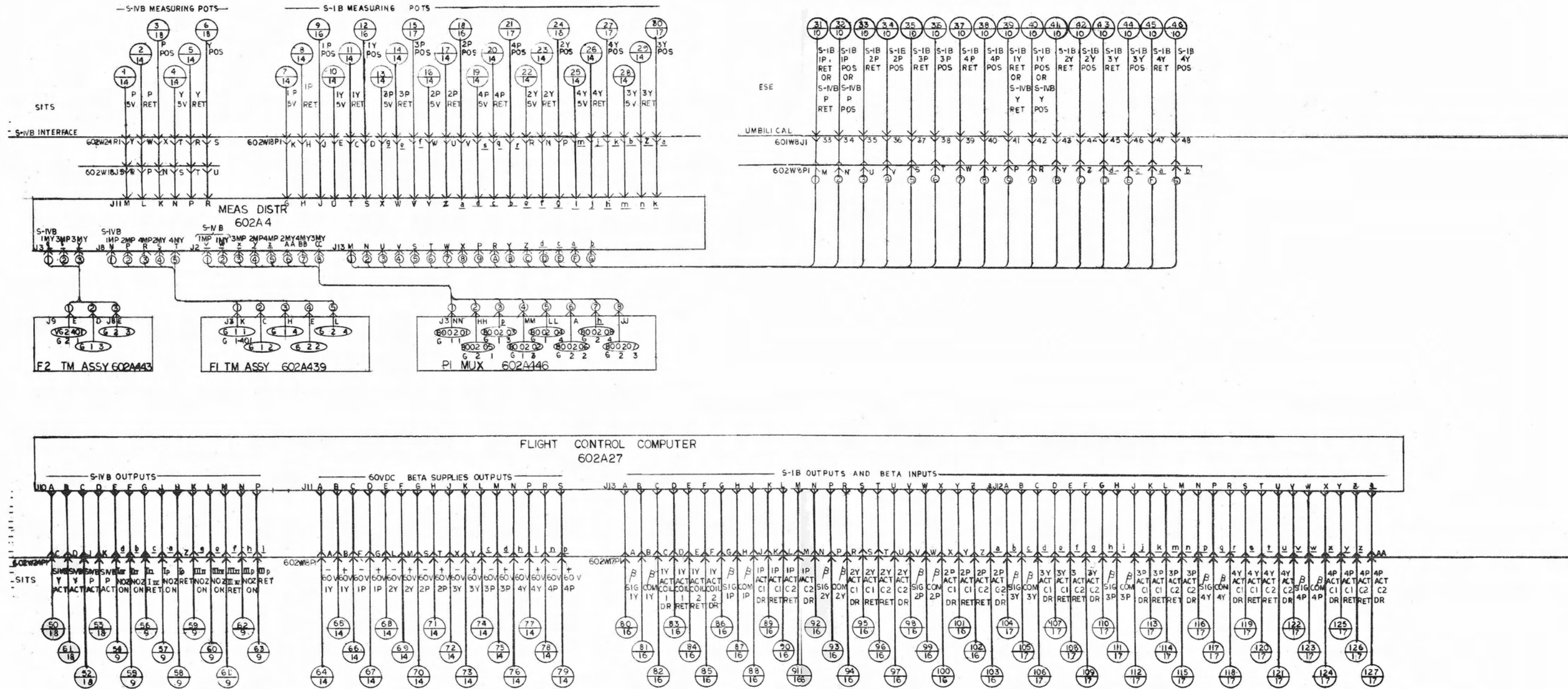
S-IB Engine Deflection Panel

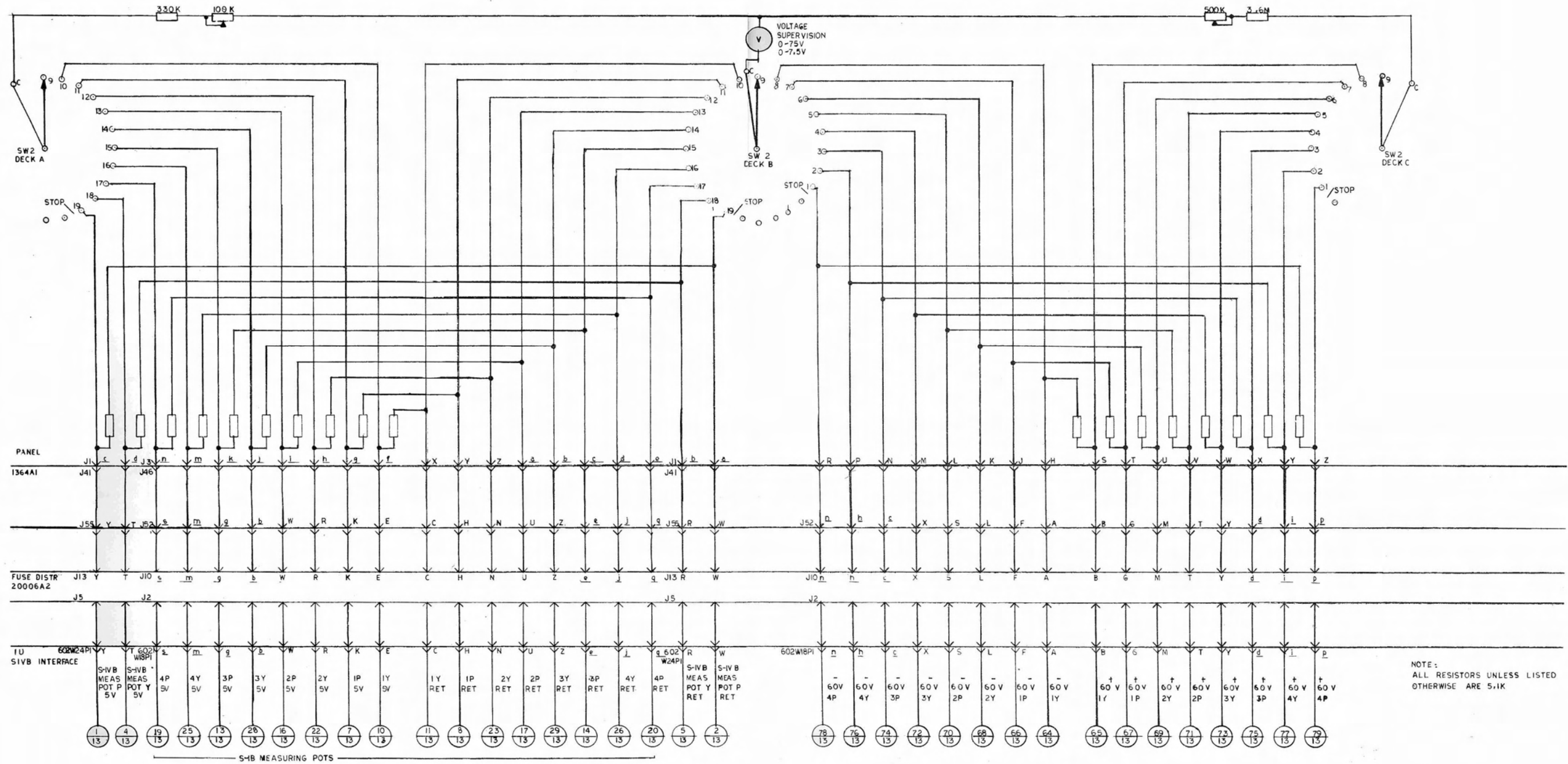
Changed 1 July 1967

B-37/B-38

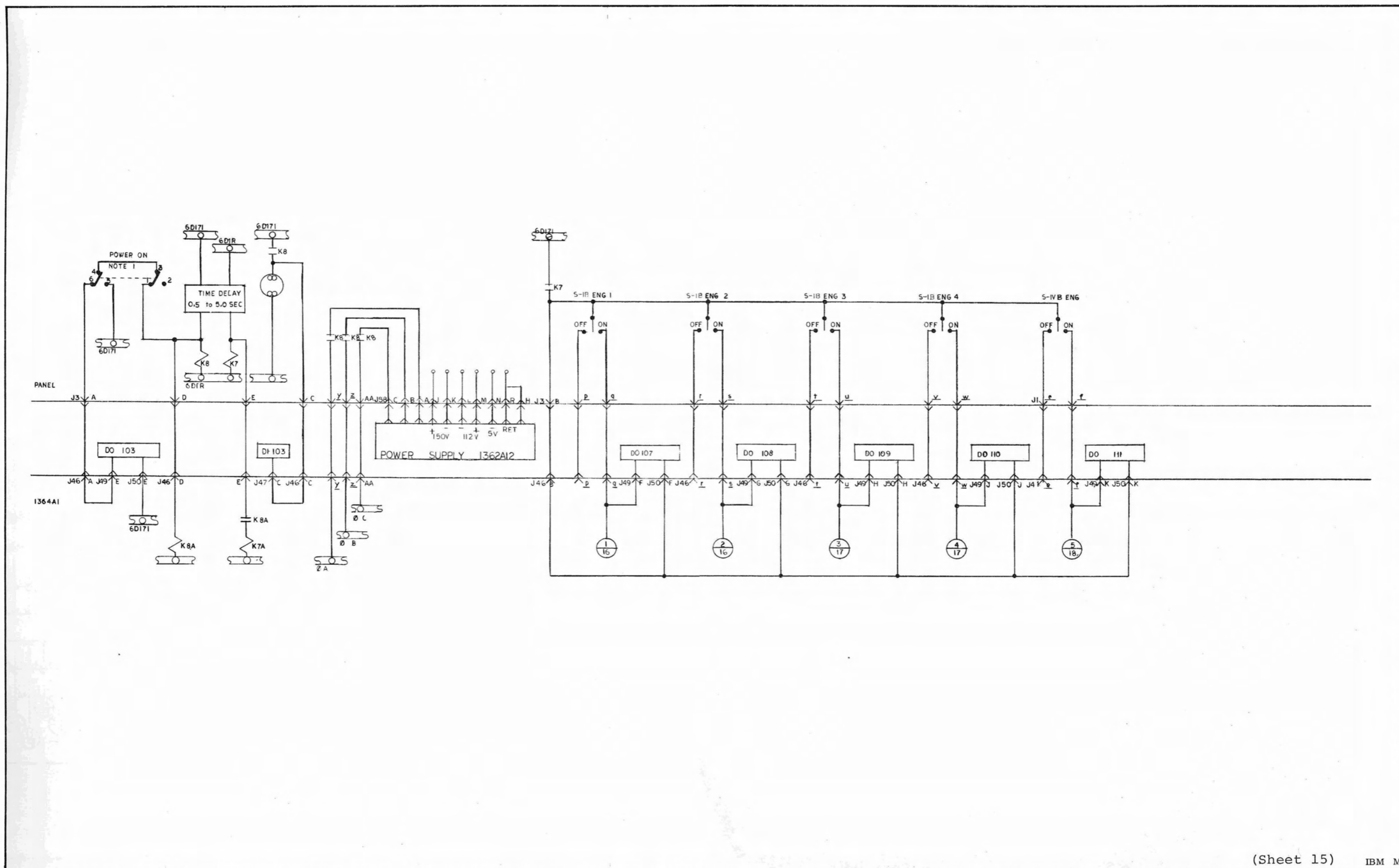


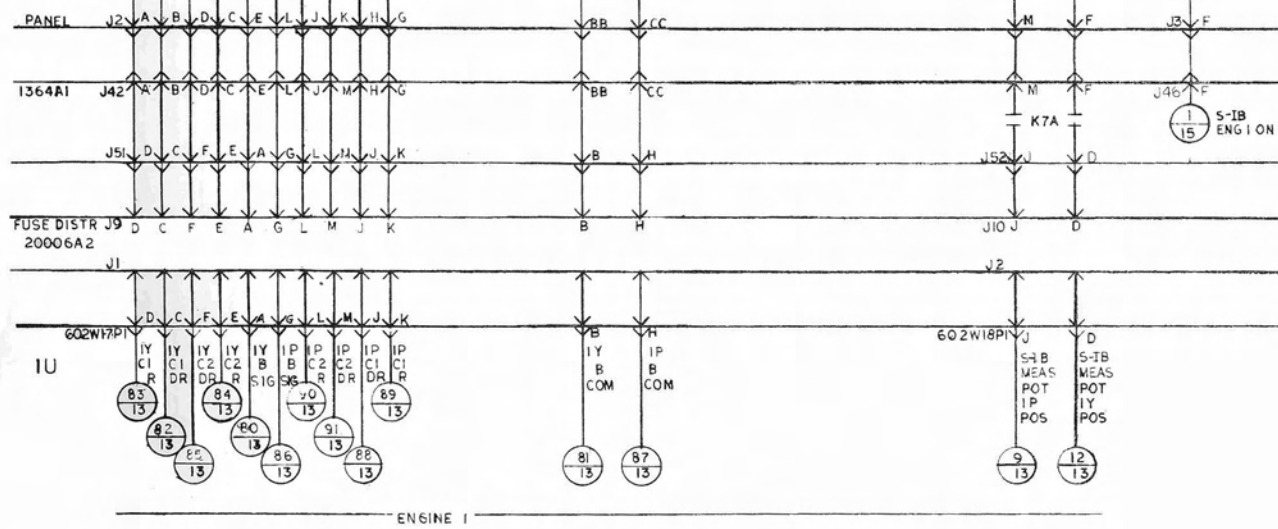
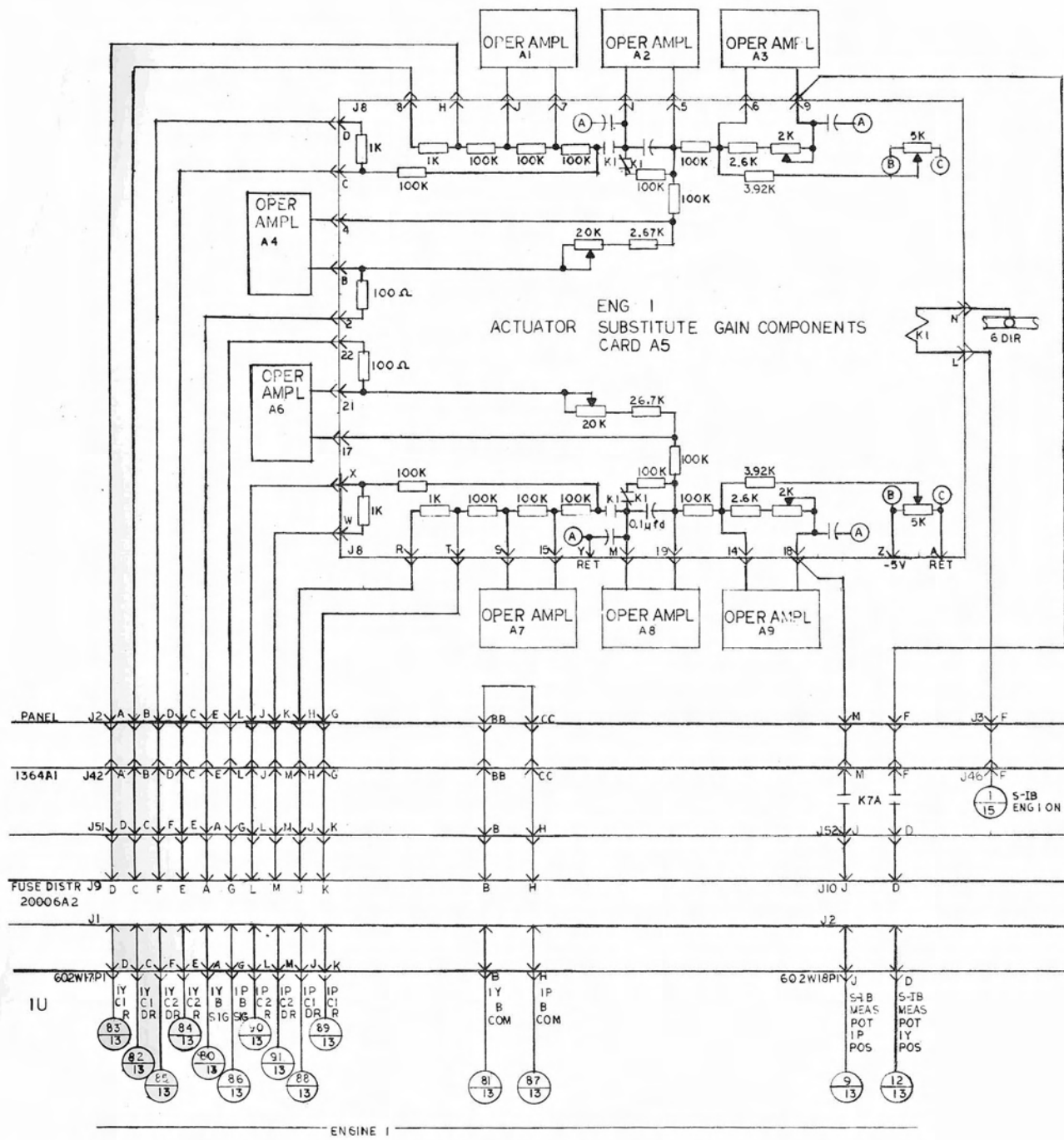




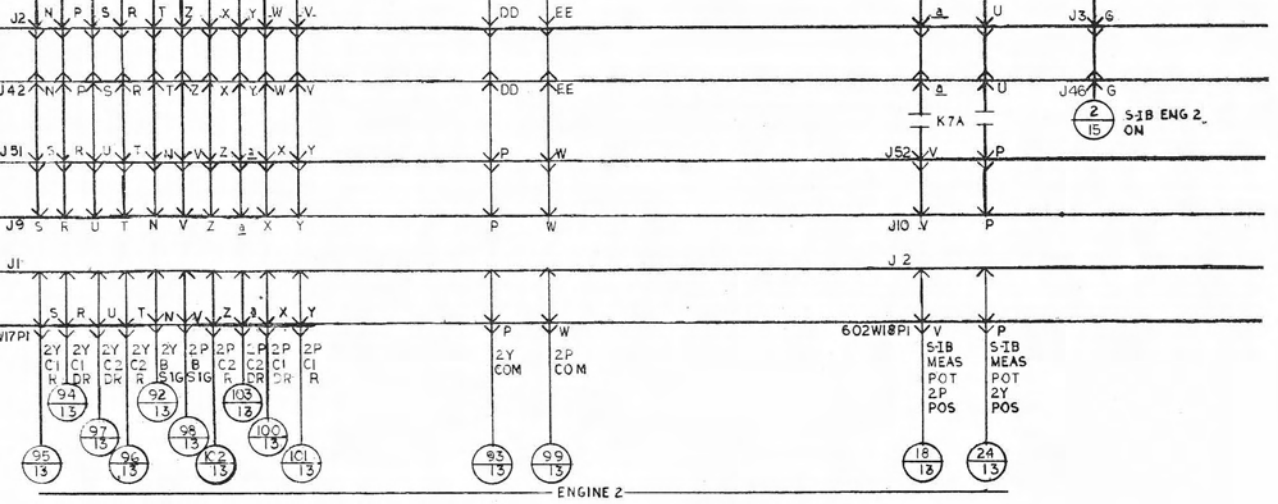
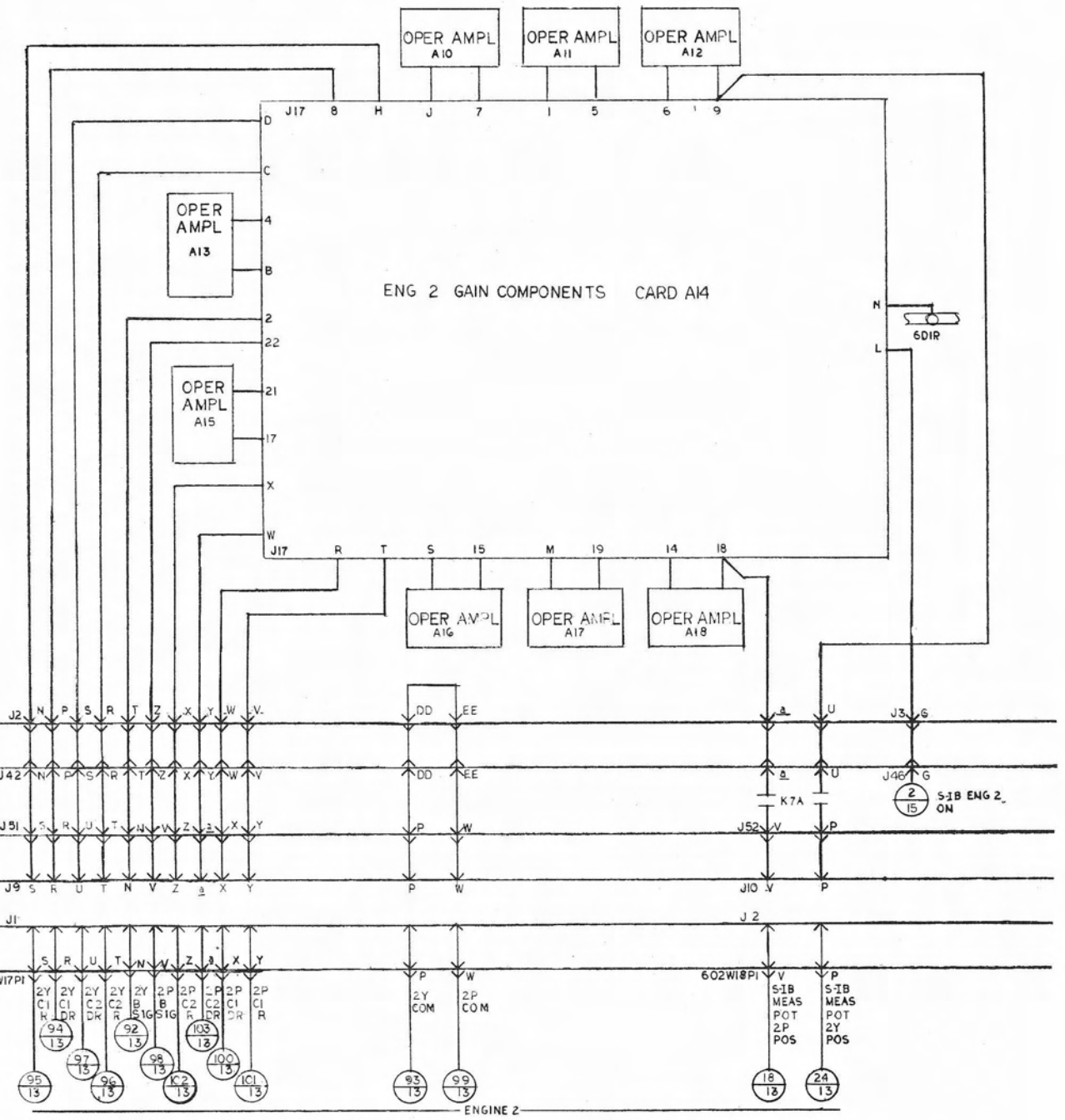


NOTE:
ALL RESISTORS UNLESS LISTED
OTHERWISE ARE 5.1K





ENGINE 1

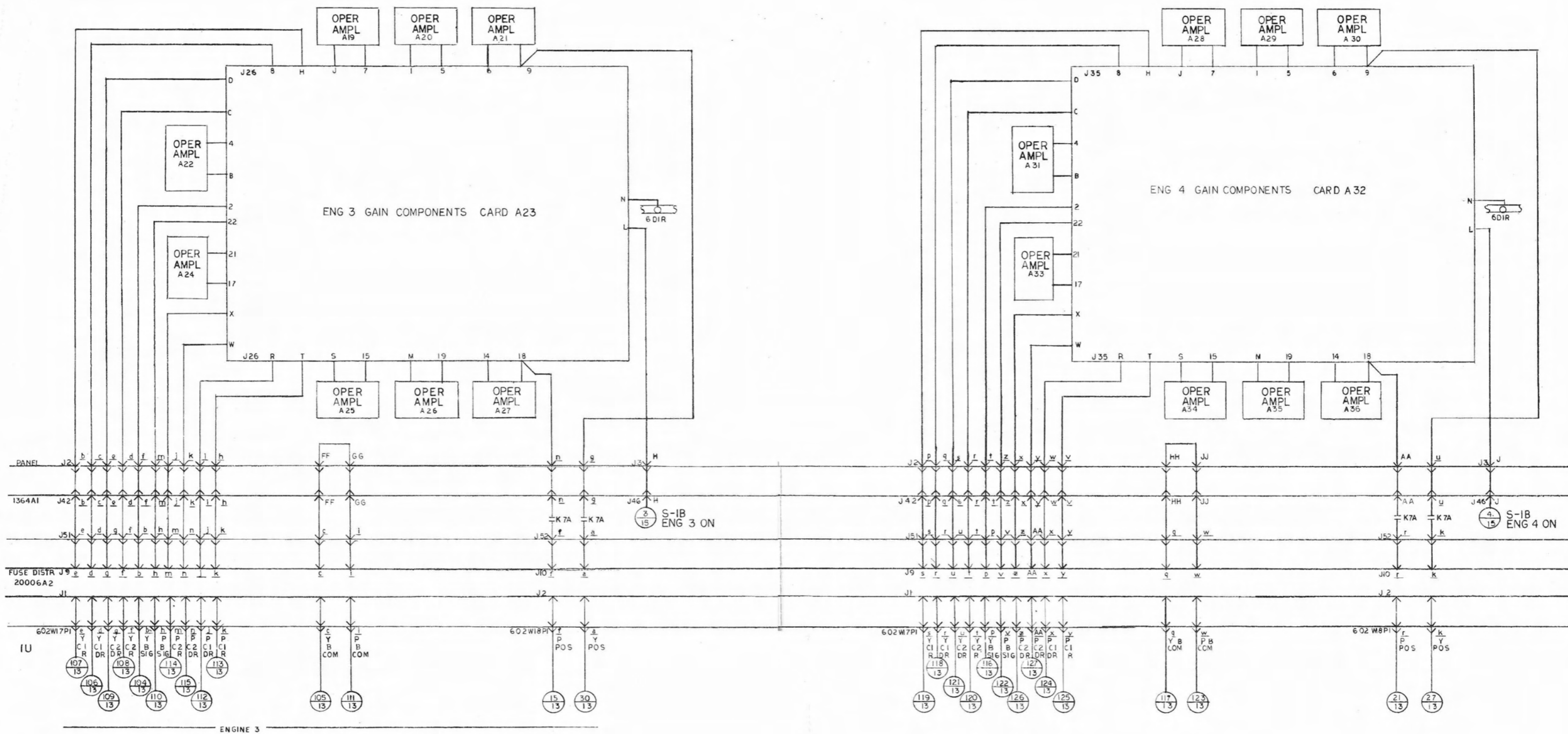


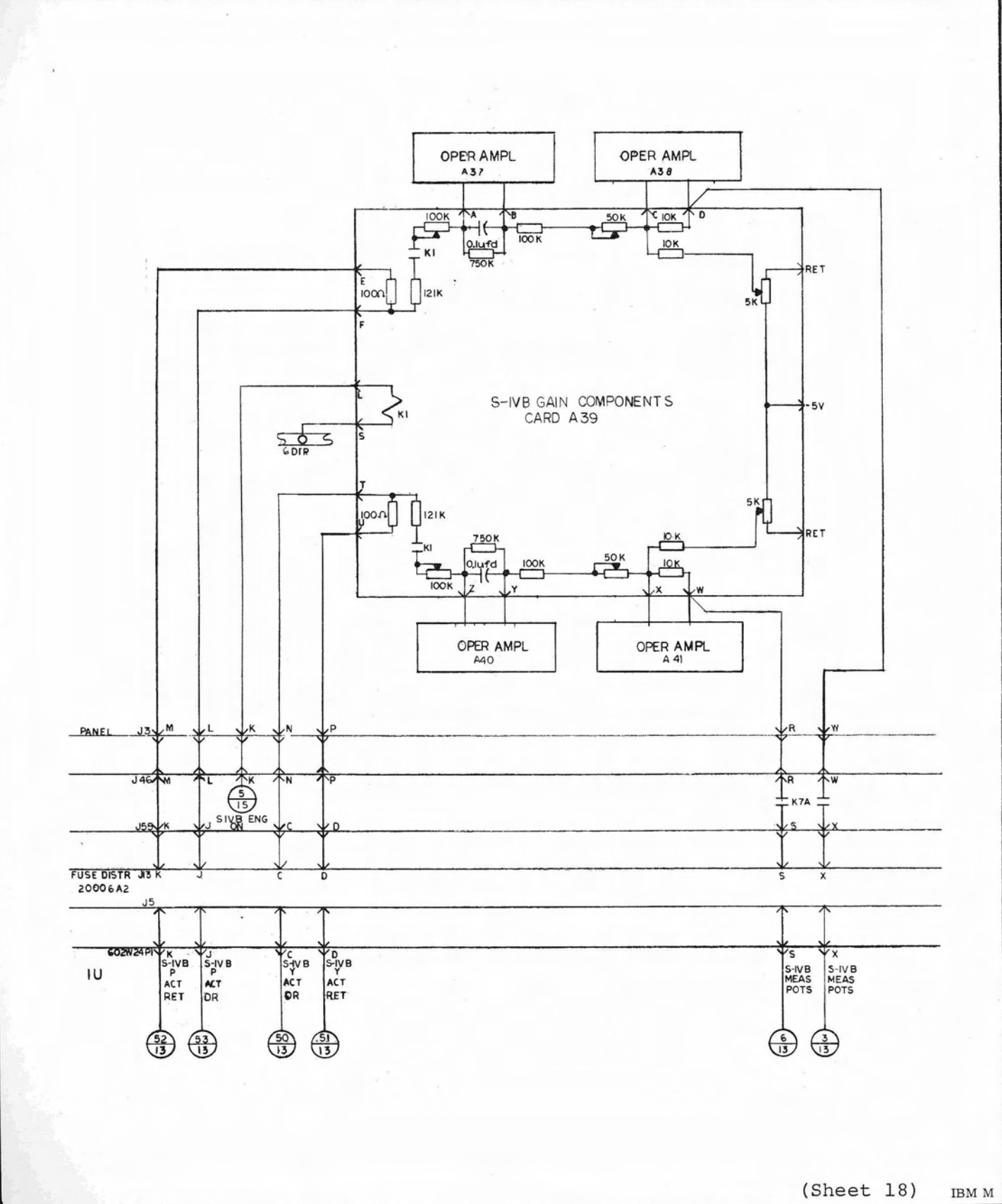
ENGINE 2

Engine Actuator Substitute Panel-SITS (Sheet 3)

Changed 1 July 1967

B-49/B-50

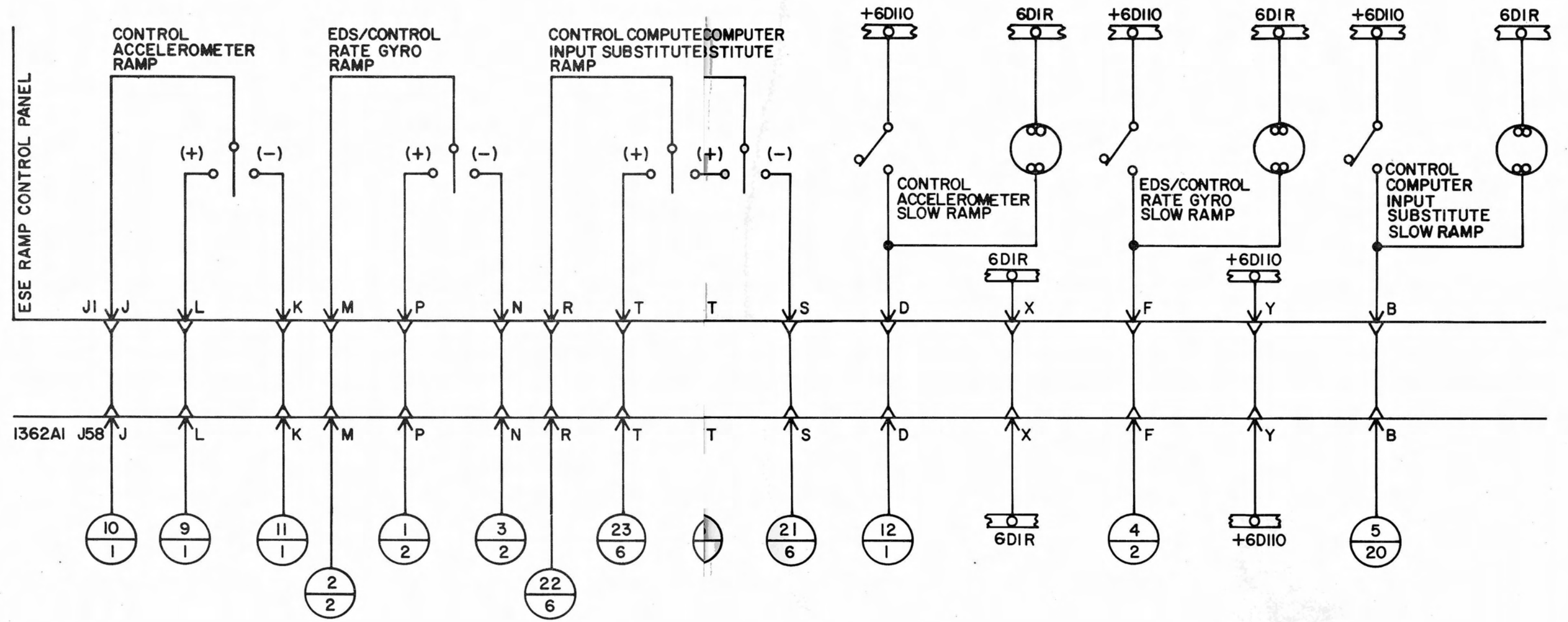




Engine Actuator Substitute Panel-SITS (Sheet 5)

Changed 1 July 1967

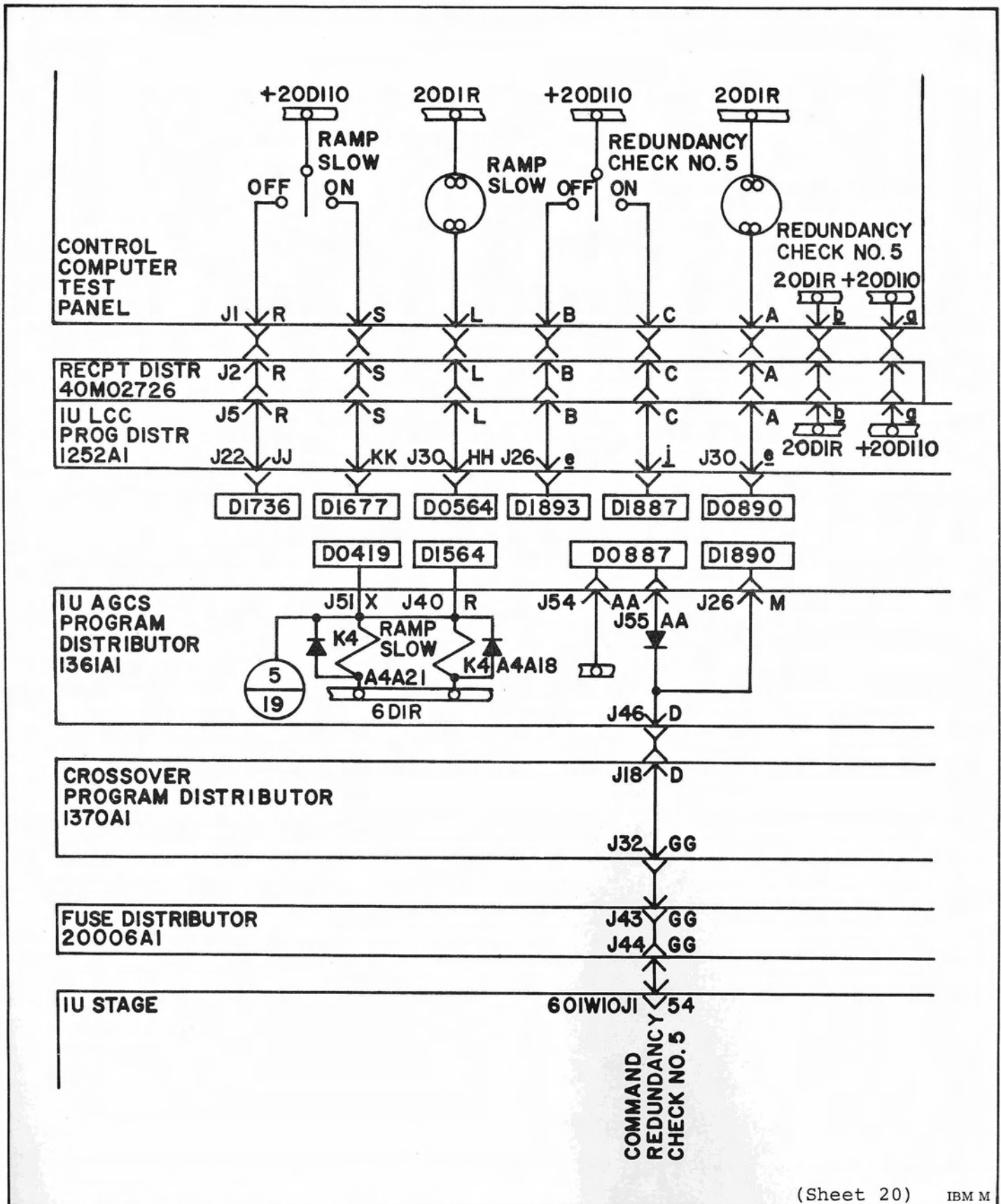
B-53/B-54



ESE Ramp Control Panel

Added 1 July 1967

B-55/B-56



Control Computer Test Panel

Added 1 July 1967

B-57/B-58



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