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INSTRUMENTATION SUMMARY
PGIA AGENA
ATLAS SPACE BOOSTER
AT PMR

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Hq. SAMS0, La., Ca. 90045
Attn: SMSD

PREPARED BY Instrumentation Planning
CR
CHECKED BY T. M. Wooster

APPROVED BY H. R. Macdonald
H. R. Macdonald
APPROVED BY P. J. Lynch
P. J. Lynch

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15 DECEMBER 1960

REVISIONS

NO.	DATE	BY	CHANGE	PAGES AFFECTED
B	15 Dec '60	WK/GW	DELETIONS: (CONTD)	
			Instrumentation at AIR	Section 2
			Tabulations	Sections 7, 8, 9, 10, 12 & 13
B	15 Dec '60	WK/GW	REVISIONS:	
			Portions of Text	
			Illustrations	7
			Instrumentation Composite	8
			Objective Composite	9
			Range Data	10
			Sequence Pen List	11
			IBM Code Key	12
			<i>W</i> <i>PKM</i> 1/27/61 <i>PKL</i>	

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**INSTRUMENTATION SUMMARY
PG-1A AGENA
ATLAS SPACE BOOSTER
AT PMR**

REVISIONS

NO.	DATE	BY	CHANGE	PAGES AFFECTED
C	27 FEB 62	BWH	Company name from Convair to General Dynamics	All revised pages
			Program name change	See above
			Radio guidance system	
			Pneumatics system (LOX tank sensing measurements) (Figure page 7-11)	
			Propellant utilization system (monitor servo valve coil) (Figure 7-6)	
			Illustrations Tabulations updated to reflect instrumentation changes:	7-6, 11, 15
			Instrumentation composite	Section 8
			Objective Composite	Section 9
			Range Data	Section 10
			Sequence Pen Assignments	Section 11
			Redlines	Section 3
			<i>with 27C 13871 ARM 2/1/62</i>	

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REPORT NO. AZC-27-057

27 FEBRUARY 1962

FOREWORD

This report describes the instrumentation planned to support flight testing of the PG-1A missiles utilized in conjunction with the Space program at PMR. The second stage vehicle measurements are transmitted by the second stage vehicle telemetry, and can be found in the Flight Test Directives published prior to each flight.

The instrumentation configuration for this program has been established as a result of the test objectives and systems analyses. Details of the missile areas and associated instrumentation including the satellite vehicle have been summarized in the discussion of missile instrumentation. In order to present a more complete picture of the data which will be available to support analysis and evaluation of the flight test of these missiles, the various external (range) sources of flight test data are discussed in conjunction with the above missile and GSE instrumentation. For a detailed description of the various missile systems, articles, and test program, see the Flight Test Plan for each program. Each data gathering system including the GD/A telemeter, range instrumentation systems, and landline instrumentation system is discussed and may be found in Section 3.

Specific instrumentation configurations and associated parameters for these programs will be found in the individual instrumentation reports which are to be filed in back of this summary report. ©

The tabulation of instrumentation presented in this report will be used by Instrumentation, Design, Operation, and Data Reduction Groups to determine instrumentation, data handling and data reduction requirements. Instrumentation described here reflects current planning.

Measurement requirements have been added, deleted, or modified on the basis of planning changes, instrumentation philosophy, and missile configuration. Measurement characteristics have been examined and, where necessary, readjusted by the original requesting groups. Further GD/A measurement modification will either originate in the Test Planning Group or will be submitted as a recommendation to this group.

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SUMMARY

The instrumentation configuration for the WS 117L program has been established as a result of the test objectives and systems analyses. Details of the missile areas and associated instrumentation including the satellite vehicle have been summarized in the discussion of missile instrumentation. In order to present a more complete picture of the data which will be available to support analysis and evaluation of the flight test of these missiles, the various external (range) sources of flight test data are discussed in conjunction with the above missile and GSE instrumentation. For a detailed description of the various missile systems, articles, and test program, see Report No. AZC-27-027. Each data gathering system including both Convair and LMSD telemeters, range instrumentation systems, landline instrumentation, visual panel presentations, and the closed circuit T.V. system is discussed and may be found in Sections 2 & 3.

In order to clarify the specific measurements, instrumentation location schematics have been included in Section 4 of this report. (See List of Illustrations.)

A complete summary of the 117L program instrumentation for both AMR and PMR is shown in Section 5. The test objectives along with their associated instrumentation for both the AMR and PMR programs may be found in Section 6.

Specific instrumentation configurations and associated parameters for these programs will be found in the individual instrumentation reports which are to be filed in back of this summary report. (Note: D-29 is already included.)

Typical telemetry and landline instrumentation for the PMR flights is shown in Sections 8-11.

Tabulations of the range data requirements can be found in Sections 7 and 12.

A typical instrumentation tabulation of the LMSD second stage vehicle is shown in Section 13. For ease of data reduction and uniformity among test stands at AMR, the majority of sequence recorder assignments have been standardized. These measurements are presented, along with their standard pen number assignments in Appendix A.

For convenience, an instrumentation tabulation code key is included as Appendix B.

PART 1 - DISCUSSION OF WS 117L INSTRUMENTATION AT AMR

I. GENERAL

The XSM-65D missiles utilized in the WS 117L MIDAS program at AMR will be Nos. 29, 45, 75 and 84 of the series "D" Atlas with GE Mod III guidance. The major differences between the instrumentation of these missiles and the "D" R&D missiles are the result of hardware and design changes required to support the heavier load.

The following is a summary of significant differences between the R&D XSM-65D Atlas and the WS 117L Midas missiles listed above.

A. Airframe

1. The thickness of the forward LO₂ tank section skin has been increased for added rigidity.
2. The missile equipment pods have been slightly altered.
3. The nose cone adapter is replaced by a Lockheed supplied satellite adapter.
4. The nose cone separation mechanism is replaced by a Lockheed furnished satellite separation mechanism.

B. Propulsion

No change.

C. Control

1. Flight Control (Autopilot)

- a. Rate gyros have been relocated in a new package to station 675.
- b. Numerous gain changes.
- c. Revised pitch and yaw filter at gyro outputs.
- d. Programmer revisions - addition of two discrete commands and several timing changes.

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No change.

D. Supporting System**1. Pneumatics**

No change.

2. Hydraulics

No change.

3. Electrical

No change.

4. Azusa

No change.

5. Range Safety Command

The destructor will be changed to a new type - the arming switch will be replaced by a D-IOC type arming device - a different RSC battery may be required since firing current will be supplied to the destructor package on the satellite as well as that on the Atlas.

6. High Intensity Photoflash

This subsystem will not be installed.

7. GE Mod II Impact Predictor

No change.

8. Telemeter

No change other than measurements made.

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E. Payload

The XSM-65D re-entry vehicle is replaced by a Lockheed supplied satellite vehicle assumed for trajectory purposes to have a weight of 11,600 pounds.

All of the AMR WS 117L Atlas missiles will be launched from Complex 14. Although some modifications of this complex from the normal "D" Series R&D configuration were required to support the Lockheed Satellite Vehicle, in general, the Atlas provisions are essentially unchanged.

Data on the performance and operation of the WS 117L Atlas missiles tested at AMR will be acquired as in "D" Series R&D testing; via an airborne (telemetry) system, via a landline instrumentation system and from Range (External) Instrumentation.

II. MISSILE AND GSE INSTRUMENTATION

The instrumentation configuration of the telemetry system was based upon a detailed analysis of missile problem areas. The following section summarizes the major problem areas and the measurements associated with each.

A. Airframe

1. Loading

Atlas airframe loading experienced during flight will be a function of the Satellite Vehicle's weight, longitudinal acceleration, Atlas tank pressures, Atlas thrust, aerodynamic "q", and the configuration of the Satellite Vehicle. All of these ^{variables} parameters will be either measured directly or can be calculated and thereby allowing airframe loading to be calculated.

Because the Satellite Vehicle weighs over three times as much as the GE re-entry vehicle carried by WS 107A Atlas missiles, WS 117L Atlas airframe loading will be higher. To compensate for this higher loading, the thickness of the forward LO₂ tank section skin has been increased for added rigidity. The adequacy of this design will be proven by demonstrating that the airframe does not fail during normal flights.

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2. Aerodynamic Heating

Heat resulting from friction and compression of the air molecules in the boundary layer adjacent to the surface of the missile, is transferred to the missile skin. The strength of the stainless steel, which is used as the basic structure of the LO₂ and fuel tanks, is a direct function of its temperature. Theoretical studies indicate that aerodynamic heating during flight along a trajectory that is optimum from a performance viewpoint, would result in the allowable temperature at various points along the LO₂ tank being exceeded. Since it is desirable to fly as close as possible to the optimum trajectory, temperature at certain stations will be extremely near the maximum allowable temperature. Two measurements, (A573T and A604T ,) will be made on all AMR flights to monitor the aerodynamics heating and thus verify proper selection of the missile trajectory.

3. High Frequency Vibration

The performance of many electronic and light mechanical components is influenced heavily by the conditions under which it operates. Included in these environmental conditions is the problem of high frequency vibrations. These vibrations stem from two main sources: the combustion processes of the engines (structural vibration) and aerodynamic pressures impinging upon the equipment (acoustical vibration). Due to the fact that the 117L booster configuration is similar to previous Atlas test vehicles, similar vibrational environments will be faced. Therefore, information gained from Atlas testing is being applied to the 117L program, and no added vibration instrumentation is planned.

4. Bending Mode Instrumentation

A preliminary study of missile stability must, of necessity, be theoretical. By assuming the missile to be a free-free beam, which is being subjected to various static and dynamic loadings, a complete theoretical, dynamic, analysis was performed on the 117L vehicle. The purpose of this analysis was to determine the rate gyro location and autopilot gain settings. The autopilot rate gyros not only sense rigid body angular velocity, as required for missile stabilization, but also detect local angular bending velocities. Since the response of the

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servo system extends well into the spectrum of body bending frequencies, the location and gain of the rate gyro is critical, and care must be taken to insure that the rate gyro and missile bending are de-coupled.

Due to the critical nature of the autopilot location, it is necessary to verify that modal bending is as calculated in the dynamic analysis of the missile. By analyzing the calculated missile bending modes, it was determined that six points of information in each axis, distributed properly along the missile, would completely define the first four bending modes of the missile. To this end then, six locations have been selected on the missile, with two transducers at each location measuring in the X and Y axes. On the Atlas stage, transducers are located at station 1212 on the jettison rail (A6090 and A6190), at station 980 in the upper pod (A6100 and A6200), and at station 670 in the LO₂ tank blister pod (A6110 and A6210). Since the LMSD portion of the missile is essentially a rigid body, measurements are spaced evenly along it at stations 307, 377 and 452. These three measurements are made via the Lockheed telemeter. Convair has officially requested copies of data obtained from the Lockheed measurements and has been assured of receiving them by Lockheed.

5. Fire Detection

A fire detection device (measurement A6221) is installed in the missile thrust section. This system utilizes three silicon solar cells, mounted as a cluster on the booster section Quadrant 2 and 3 stanchion, to provide qualitative data for post-test evaluation. Although sensitive mainly in the infrared region, this system provides a valuable indication of thrust section conflagrations. In order to supplement the solar cell data with actual temperature information, a temperature probe is installed in Quadrant 4 (P671T).

B. Propulsion System

1. Controls Pressure

In the MA2 engine, all booster and vernier engine controls are pneumatically operated. Helium is supplied by the non-jettisoning helium control bottle. This bottle connects directly to the three main

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sections comprising the pneumatics controls pressurization system. These are the booster pneumatic controls manifold, the start and vernier pressurization manifold and the sustainer gas generator reference regulator.

The instrumentation provided in the pneumatic control system monitors the outlet pressure of the regulators (F125P, F288P) mounted on both manifolds. These regulators are the most sensitive and crucial elements in the system. In addition, the gas generator reference regulator (P344P, P26P) and vernier tank pressure (P27P, P30P) are measured. The pressures in these components greatly affect engine performance.

All sustainer engine control valves are hydraulically operated. The actuating pressure, derived from the sustainer hydraulic system, is monitored (H140P). Instrumentation of the overall engine performance will reveal if the various control valves operate properly.

2. Propellant Feed

The propellant feed system consists of the gas generators, turbines and turbopumps. The gas generators burn a mixture of fuel and liquid oxygen. The hot gases generated drive the propellant pump turbines which are geared to the liquid oxygen and fuel turbopumps. At engine start, the LO₂ and fuel start and vernier feed tanks of the integrated start system supply propellants to the gas generators. When the engines bootstrap, the turbopumps feed propellants to the gas generators and refill the start tanks.

The burning rate of propellants in the gas generators is controlled by the liquid oxygen reference regulators. Thus these regulators, set prior to launch, are, in effect, the engine throttles, hence their discharge pressure is monitored (P26P, P344P). The gas generator hot gas pressures (P100P, P339P) are monitored as they indicate the performance of the generators and are, therefore, indicative of turbine driving parameters.

Pump speeds (P83B, P84B, P349B) are the end parameter of this area and are representative of overall propellant feed operation.

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3. Propellant Flow

During the booster and sustainer stages, liquid oxygen and fuel from the main tanks flow through separate turbopumps to each thrust chamber. The pumps increase the propellant pressure to that required for adequate propellant injection. Selected measurements of pressures (P330P, P351P) will provide data sufficient to supplement thrust chamber pressure (P6P) for sustainer engine performance analysis. The sustainer LO₂ turbopump inlet temperature (P530T) is monitored to verify that engine NPSH requirements are satisfied at booster staging. The sensitive and accurate turbopump speed instrumentation (P83B, P84B, P349B) will respond rapidly to varying pump inlet and outlet conditions.

4. Thrust

Thrust calculations will be based on chamber pressure data and engine coefficients obtained during acceptance tests. Analysis of engine thrust decay can be made from chamber pressure (P6P, P28P, P29P, P59P, P60P) and missile acceleration (U101A) measurements.

5. Propellant Utilization

a. Convair PU

The Convair Propellant Utilization System, consisting of modified mercury manometers, senses differential pressure across each tank and, acting as two legs of a capacitance bridge, generates an error signal proportional to the mass of residual propellants. The end result of this servo loop is to position the sustainer main fuel valve. The instrumentation provided (P528D) defines how well the valve position responds to the error signal. The end result of the PU system is the ratio of propellant residuals at sustainer burnout. An indication of this is obtained from measurements U80P and U81P.

b. Convair Propellant Tanking

The Convair loading system utilizes a discrete level sensing device for controlling the quantity of fuel placed aboard the missile. LO₂ is then tanked to a null indication of the bridge when compared to a

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standard mixture ratio. The quantity of propellants tanked can be computed based on station levels converted to an equivalent mass. Tanking tolerances will be obtained by comparing this data with that obtained from corrected load cells.

C. Control System

1. Autopilot

The instrumentation of the autopilot servo loop includes each booster (S252D, S253D, S254D, S255D), sustainer (S256D, S257D), and vernier (S258D, S259D, S260D, S261D) thrust chamber angular displacement from the nominal null position, and the pitch, yaw and roll displacement (S61D, S62D, S63D) and rate (S52R, S53R, S54R) gyro outputs. With this basic instrumentation, a rather complete time history of the autopilot subsystem during flight may be derived. Particular points of interest which will be studied are the rate of amplitude change, frequencies and magnitudes of limit cycle oscillations due to sloshing or other instabilities; the response of the system to transients; the reaction to guidance system steering and sequencing signals; and the correct performance of the roll and pitch-over programs (determined with the aid of external tracking data).

In addition to the determination of the foregoing points, the instrumentation allows the detection of certain random malfunctions which may occur. Through a study of the characteristics induced by the failure of a component, a random malfunction may often be isolated. Studies of this nature utilize an analog computer and tail section test stand. Possible failures are simulated on the computer and the computer output used as an input to the test stand. The response of the servo system is then recorded and compared to the flight data. In this manner, similarities of failure may be noted and the failure point determined.

Instrumentation is also provided so that the overall performance of the flight programmer may be studied. Measurements of the programmer outputs for booster cutoff, sustainer cutoff, vernier cutoff and the pre-arm signal will allow the timing of the programmer to be checked.

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Various other functions of the programmer which are initiated as part of a subroutine, may be determined to have occurred through other planned instrumentation. Nulling the booster engine, activating the sustainer and vernier engine in pitch and yaw, nulling the sustainer, jettisoning the booster package, reactivating the sustainer in pitch and yaw, biasing the vernier engines out to 50° in yaw and nulling them in pitch and yaw, jettisoning the nose cone and firing the retrorockets, all are functions which originate in the programmer, and which can be shown to have occurred through a study of records of presently planned instrumentation.

2. Radio Guidance System

It is felt that the basic design of the Mod III guidance will have been verified before this missile is tested. For this reason the airborne guidance instrumentation will be limited basically to significant input and output functions of major subsystems, but will still permit an evaluation of the overall performance of the guidance system.

An AGC voltage is used in IF amplifiers of both the pulse and rate beacons to stabilize their output voltages. These voltages consist of negative signals that are proportional to the strength of the signals being received at the transponders. Although the measurement of these voltages is useful in determining receiver operation, their main value will be in the investigation of the radio wave propagation effects and airborne antenna characteristics of the redesigned and relocated guidance antenna. This investigation consists of comparing the power of the signal sent from the ground station with the power of the signal at the airborne transponders. For this reason, the AGC voltage measurements are calibrated directly in terms of transponder power input rather than in terms of voltage. One AGC measurement in the pulse beacon (G3V) and two in the rate beacon (G279V, G280V) are planned on this missile. The two rate beacon measurements are required to verify that both the IF sections in the rate beacon functioned properly.

This magnetron current is proportional to the duration, rate and amplitude of the pulses transmitted from the pulse beacon. The current is measured (G4C) by the voltage drop in a section of the magnetron

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cathode resistor. Since the magnetron transmits pulses, the voltage drop is integrated to make it compatible with telemetry. This measurement is a basic performance measurement of the pulse beacon.

A voltage proportional to the power of the signals transmitted from the airborne transponder is also telemetered. This measurement (G82E) is used for over-all transponder evaluation and, in conjunction with ground station data, for radio wave attenuation studies.

To determine proper receipt and decoding of messages, the instrumentation outputs for each pair of decoder relays are tied together in a summing circuit and telemetered (G290X, G291X, G292X, G293X). In addition, two measurements are provided for the steering signals; one for pitch (G287V) and one for yaw (G288V). The telemetered voltages are greater than 1.2 VDC when a positive steering correction is received and less than 1.2 VDC when a negative steering correction is received.

The accuracy of the tracking information obtained by use of the pulse and rate beacons will be determined by comparing it with data from the other tracking systems. No airborne measurements are required for this purpose.

D. Supporting System

1. Main Tank Pressurization

The mode of construction of the main propellant tanks requires that the tanks be pressurized in order to maintain structural integrity. The main tank pressurization system serves this purpose as well as furnishing ullage pressure to insure propellant flow to the turbopumps during flights.

The two sections comprising the tank pressurization system are the first, or booster stage, and the second, or sustainer stage helium supplies. The booster stage helium supply pressurizes the propellant tanks while all the three main engines are firing. At booster engine staging the first stage subsystem drops off leaving the second stage supply to pressurize the oxidizer tank.

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Since the tank ullage pressures are the end results of missile tank pressurization system, they are measured for over-all system performance (F1P, F3P).

2. Hydraulic Systems

There are two independent hydraulic systems on "D" series missiles. One system furnishes hydraulic pressure for booster engine gimbaling prior to staging. The second system provides hydraulic pressure for sustainer main and gas generator propellant valves actuation, and sustainer and vernier engine gimbaling. Instrumentation is provided to monitor the pressure of each system. These measurements (H33P, H140P), in conjunction with the engine position measurements, will establish hydraulic system performance.

3. Electrical Power Supply

The three measurements of the electrical power supply's performance which are planned, when combined with information on the performance of dependent missile systems, will demonstrate to an adequate degree system performance.

The AC and DC power from the battery/inverter is routed first to the power distribution box and from there is distributed to the various missile systems. The AC frequency (E50Q), AC phase A voltage (E51V), and DC voltage (E28V) are picked up for elemetering from the missile system side of the motor driven switching assembly of the power distribution box. It is not planned to measure the phase B and phase C voltages since the electrical loads are essentially balanced and known. Further, a serious overload condition on any one phase will show up on the other two phases of voltage. Current measurements are not planned since the electrical loads are known from systems testing and the currents may be calculated knowing the voltage.

4. Tracking and Command Systems

a. Azusa

Investigation of radio wave propagation effects and airborne antenna characteristics of the Azusa system will be continued on

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this missile. This investigation requires measurement of the power of the signals transmitted from the ground station and the power of the signals received at the airborne transponder. The power of the signals received at the transponder will be measured by telemetering AGC voltage levels (Z3E) which are proportional to and are calibrated in terms of the transponder power input. An Azusa transponder power output measurement (Z2E) is taken to determine over-all transponder operation and, in conjunction with ground station signal strength measurements, to aid in antenna and wave attenuation studies.

b. Range Safety Command

The Range Safety Command System, on this missile, will be used only to provide the capability for either destructing the missile or for manually cutting off the engines. If the missile is cut off manually or destroyed by the range safety officer, verification of proper RSC functioning will be obtained by manual fuel cutoff (MFCO) and destruct instrumentation. The cutoff instrumentation for both receivers is tied together in a summing network so that one measurement (D1V) is sufficient to determine if both sets produced a cutoff signal and whether the signal was the automatic or manual cutoff signal. The destruct instrumentation outputs for both sets are tied in parallel and thus provide an output (D3X) when the destruct relay in one or both sets closes. In addition to these measurements of the RSC outputs, a measurement of RSC received signal strength (D7V) is taken from RSC #1 to verify that the signal at the RSC antenna is strong enough to be properly detected. This measurement provides information useful in determining maximum safe operating range and the optimum time for switching from one down range station to another.

5. Telemetry System

An adequate measure of the performance of telemeter system will be obtained from the characteristics of the various measurements of missile parameters transmitted via the telemeter. In addition the strength of the received signal and its deviation from the center frequency of the RF link will be recorded at each ground receiving station for use in study of transmission problems.

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Two temperature measurements (T68T and T69T) will be telemetered to verify that cooling of the telemeter canisters is adequate.

E. Satellite Vehicle

The evaluation of the satellite vehicle along with its adapter and separation mechanism is the responsibility of Lockheed. The majority of the measurements provided for evaluation of these items are transmitted via the Lockheed telemetry system and will be described in detail in applicable Lockheed reports. A list of the measurements presently planned for the first AMR Midas satellite vehicle has been included in Section 13 of this report for information purposes.

In order to make efficient use of the combined CV-A and LMSD telemetry systems six measurements from the adapter and separation mechanism area are transmitted via the CV-A telemeter. Three of these measurements, (Y20X, Y21X, and Y22X), indicate the status of three explosive bolts within the separation mechanism. These measurements consist merely of two wires each (28 VDC excitation on one) electrically connected by Lockheed in such a manner that the connection will be broken when the bolts are blown.

Two thermocouple (chromel-constantan) measurements (Y17T and Y19T) will also be transmitted via the Convair telemeter. These measurements will be of the magnetic amplifier type and include the use of a reference junction installed on the Atlas. The pickups will be located on the exterior skin of the adapter at Lockheed Stations 495 and 405 respectively (LMSD stations equal CV-A stations plus 6 inches) in the same longitudinal plane on the Atlas skin temperature measurements described previously. (See illustration.)

In order to obtain data on the Lockheed engine environment and the effectiveness to the Atlas LO₂ tank insulating cap a resistance element temperature transducer will be installed on a standoff on top of the LO₂ manhole cover at Convair Station 478, (Y15T).

In addition to the six measurements described above Lockheed has requested Convair to measure certain Atlas parameters for use in Satellite Vehicle

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and adapter evaluation. These measurements have been described elsewhere in this report.

The following is a current list of all measurements Lockheed has requested Convair to transmit via the Atlas telemeter during AMR flights.

LMSD MEASUREMENT NO.	CV-A MEASUREMENT NO.	DESCRIPTION
		<u>Atlas Measurements</u>
CV-1	A 619 O	STA 1212 X AXIS
CV-2	A 609 O	STA 1212 Y AXIS
CV-5	S 53 R	PITCH RATE GYRO SIG
CV-6	S 54 R	ROLL RATE GYRO SIG
CV-7	A 620 O	STA 980 X AXIS
CV-8	A 610 O	STA 980 Y AXIS
CV-9	A 621 O	STA 670 X AXIS
CV-10	A 611 O	STA 670 Y AXIS
CV-12	U 101 A	AXIAL ACCELERATION
CV-13	S 52 R	ROLL RATE GYRO SIG
CV-18	A 573 T	LO ₂ TK @ STA 504
CV-20	Y 15 T	117L ENGINE COMP
		<u>Adapter Measurements</u>
AD-2	Y 19 T	ADAPTER @ STA 399
AD-4	Y 17 T	ADAPTER @ STA 489
AD-6	Y 20 X	EXPLOSIVE BOLT #1
AD-7	Y 21 X	EXPLOSIVE BOLT #2
AD-8	Y 22 X	EXPLOSIVE BOLT #3

F. Miscellaneous Requirements

This section will be supplied at a later date.

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III. DATA GATHERING SYSTEMS

A. Convair R&D Telemeter System

1. General

The R&D telemetry subsystem utilized on WS 117L, XSM-65D boosters is essentially the same as that provided for the WS 107A, XSM-65D R&D missiles.

2. Functional Description of Components

a. Telemeter Package

The telemeter package is a 16 channel FM/ FM package, using Research Development Board (RDB) channels 1 through 13, A, C, and E. The package contains a 100 watt r-f transmitter, frequency multiplexing network, subcarrier oscillators, commutators, inflight calibrator for commutated signals, and a transverter to power the telemeter package using ground or missileborne supplied 28 volt DC.

b. Accessory Package

The accessory package contains the transducer power supply used to provide DC voltage for transducers, and divider networks, and to provide accurate calibration voltages; inflight calibrator for calibration of continuous channels; and signal conditioning networks.

c. Battery Package

The battery package provides two power outputs, 28 and 7 volts, to the transverters in the telemeter package and accessory package. A remotely activated primary battery pack will be utilized.

d. Antenna

There are two telemetering antennas, one located in the forward end of each equipment pod. Each antenna is connected to one of the

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outputs of the "T" coupler which divides the telemeter output equally between the two antennas. Both antennas use a slot radiator. The basic pattern of the antennas, when mounted on the missile approximates that of a loop antenna whose plane coincides with the plane defined by the roll and yaw axes.

3. Utilization of 16 Channel FM/FM Telemetry Package

Information as to the instrumentation requirements furnished to the Data Transmission Group by the Test Planning Group formed the basis for channel assignments. This collection of data was separated into two broad categories for further analysis and assignment (continuous data and sampled data).

A selection was then made of the proper transducers compatible with the requirements of the data requests and the telemetry packages.

Where data requests were for voltage functions, coordination was established with the various design groups to insure that the voltage stimuli supplied were compatible with the telemetry package and/or the utilization of these stimuli for design into the telemetry package would not affect the function of the design group.

A further detailed analysis was then made of the data requests leading to specific channel and commutator segment assignment. Frequency response, types and values of stimuli available, capabilities of the telemetry package and reliability were considered in making specific measurement allocation.

For commutated voltages, channel assignments were made utilizing commutator speeds which will yield a minimum of four samples per cycle which is considered adequate to reconstruct the waveform. In some instances it was necessary to cross connect segments on a commutator to provide desired sampling rate.

A maximum of 27 information (plus synch pulse and 100% calibration using 2-1/2 segments) channels are available from each commutated channel. Of these 27 information channels 3 are used for calibration voltages, one of which may be used for the transducer power supply

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voltage. (See commutation waveform illustration.) One exception to this is channel 11. On this channel voltage, potentiometer and temperature measurements are recorded. Because temperature measurements do not have the same zero and 100 percent calibration levels as voltage and potentiometer measurements it is necessary to use four commutator segments for calibration.

Channel 13 will contain both positive and negative going voltage signals. The negative going voltage signals are biased positively such that -2.4 volts corresponds to 0 volts on the commutated waveform and 0 volts in the negative signal will appear as +.8 volts. In this way the commutated waveform will present all voltages as increasing in a positive voltage direction with an increase in the pulse height.

The table below lists the subcarrier channels used, their center frequencies, frequency deviation, frequency response, and the type of waveform.

Channel	Center Frequency CPS	Deviation %	Frequency Response Flat to 2% CPS	Type
1	400	± 7.5	0 - 6	Continuous
2	560	± 7.5	0 - 8	Continuous
3	730	± 7.5	0 - 11	Continuous
4	960	± 7.5	0 - 14	Continuous
5	1,300	± 7.5	0 - 20	Continuous
6	1,700	± 7.5	0 - 25	Continuous
7	2,300	± 7.5	0 - 35	Continuous
8	3,000	± 7.5	0 - 45	Continuous
9	3,900	± 7.5	0 - 59	Continuous
10	5,400	± 7.5	0 - 81	Continuous
11	7,350	± 7.5	0 - 110	Commutated 2.5 RPS
12	10,500	± 7.5	0 - 160	Continuous
13	14,500	± 7.5	0 - 220	Commutated 5 RPS
A	22,000	± 15	0 - 660	Commutated 10 RPS
C	40,000	± 15	0 - 1200	Commutated 10 RPS
E	70,000	± 15	0 - 2100	Commutated 30 RPS

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- a. No subcarrier oscillators are used for channels 1, 2, and 3; frequencies are generated externally.
- b. Voltage controlled subcarrier oscillators are used for all the other channels.
- c. A ground-based decommutator employing ground gating will be employed with all commutated channels. Each commutator wafer will employ 30 segment pairs.

B. LMSD Telemetry System

Three (3) unitized (UTM) telemeters are used to supply the required flight test data from the LMSD 2nd stage of the WS 117L vehicle.

Telemeter #1 is used only during the ascent phase. Telemeters #2 and #3 are used during both ascent and orbit phases.

An LMSD tabulation by channel for the first AMR MIDAS launch is shown in this report (Section 13) for information purposes. The following tables are to be used in conjunction with the tabulation.

1. Measurement Number and Description**a. Column 1**

Certain switching of the measurements transmitted over the various subcarrier channels is performed between the ascent and orbital flight phases. Where this occurs an asterisk is inserted in column 1 to indicate the measurement or group of measurements switched on during orbital flight.

b. Column 3

An "L" has been inserted in this column to differentiate these measurements from Convair (Atlas) measurements.

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c. Columns 4 thru 8

These columns contain Lockheed's identification code for these measurements. The letter is utilized to indicate the area or system in which the measurement is made. The numbers provide a unique identification for each measurement within a particular area or system. In order to avoid confusion and maintain the integrity of the LMSD coding system the Lockheed letter codes have been utilized in this report even though they differ in definition from Convair system coding.

The letter portion of Lockheed's identification compares approximately to Convair system code as shown below:

<u>LMSD</u>	<u>CVA</u>
A	A or M: Airframe or Miscellaneous
B	P or F: Propulsion or Pneumatics
C	E : Electrical Power Supply
D	S or H : Flight Control or Hydraulics
G	Y : Payload
H	: Tracking Beacon
K	: Environmental
R	Y : Payload
T	T or M: Telemetry or Miscellaneous

d. Column 9

Convair type of measurement code. (See Appendix A for explanation.)

2. Measurement Description, Range, Units

These are utilized in the same manner for the Atlas measurement. (See Appendix A for explanation.)

3. Type of Transducer (Columns 52 thru 61)

Lockheed's coding for transducer type is utilized.

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R - Ruge Associates, Inc.
W - Wiancko Engineering Company
E - Edcliff Instruments
CEC - Consolidated Electrodynamics Corporation
G - Gulton Manufacturing Corporation
BLH - Baldwin Lima Hamilton

4. LMSD Station Number (Columns 67 thru 70)

The LMSD station number less 6 inches is equal to Convair station number.

5. Additional Information**a. ASCENT REAL TIME DATA (MIDAS)**

LMSD Meas. No.	Meas. Type	Xducer	Xmtr.	Chan.	Station
A10	Z Accel. #2	W-A2-1101	#1	12	440
A13	Sep Monitor #1	LMSD1023471	#2	7	388
B6	Comb. Cham. Press.	W-P2-1251	#1	14	440

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b. ORBIT REAL TIME DATA (MIDAS)

LMSD Meas. No.	Meas. Type	Xmtr.	Chan.	Station
H1	Beacon Verification #1	3	12	324
H2	Beacon Verification #2	3	12	324
H3	Beacon Verification #3	3	12	324
H4	Beacon Verification #4	3	13	324
H5	Beacon Signal Level	3	9	324
H6	Beacon Power Level	3	9	324
H8	Beacon Temperature #1	3	9	324
H9	Decoder Temperature	3	9	324
H10	10 Sec. Step Position	3	9	320
H11	100 Sec. Step Position	3	9	320
H12	Time Advance/Retard	3	13	320
H13	Reset Monitor	3	13	325

c. TONE TELL-TALES (MIDAS)

LMSD Code	Meas.	Channel	Tone Oscillator Frequency
H1	Beacon Verification #1	12	183 CPS
H2	Beacon Verification #2	12	244 CPS
H3	Beacon Verification #3	12	293 CPS
H4	Beacon Verification #4	13	183 CPS
H12	Time Advance/Retard	13	244 CPS
H13	Reset Monitor	13	293 CPS

C. Range Instrumentation Systems

1. General

In addition to the internal (missile) data which is received and recorded via RF link from the Convair airborne telemetry system, certain external (range) data is required for complete evaluation of the Atlas missile's flight performance. The availability of external data has been considered during appraisal of the airborne data requirements. This external data will be obtained from applicable ground electronic and optical equipment. Section 7 presents this data in tabular form for 117L missiles from the Atlantic Missile Range.

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The following sections present and briefly describe the data gathering systems which will be utilized in fulfilling the Atlas range requirements for this missile program.

2. Electronic Tracking

a. Azusa Ground Station Data

The Azusa ground station, in conjunction with the airborne Azusa transponder, provides real time direction, slant range, and velocity information. From this information, the x, y, and z position coordinates of the missiles are derived for use in impact prediction and trajectory information. At the ground station a 50 channel CEC oscillograph and a digital voltmeter are used to measure any of 87 ground station parameters. These include such parameters as the AGC voltage levels in each of the seven receivers, antenna servo errors, elevation and azimuth of the direction finding antenna, and measurements that indicate when the airborne transponder is locked on. Presently, the Azusa tracking system is the primary electronic position and velocity system used at AMR and is used to provide impact prediction for missile flights. Used in conjunction with the Type B coherent carrier transponder, its nominal range capability is 300 nautical miles.

b. Mod III Guidance Ground Station Data

The rate measuring subsystem supplies missile range rate, yaw rate and pitch rate to the guidance computer. In order to obtain information concerning ground station performance a number of ground station parameters are instrumented. Among these are transmitted power, AGC level of all three received signals, crystal currents, rate flag, and time.

The position tracking subsystem is used to determine missile azimuth, elevation and range. In addition to these outputs a number of other parameters are recorded. These include automatic frequency control voltage, automatic gain control voltage, crystal current and track flag (loss of three consecutive tracking signals) from a number of major subassembly confidence points.

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c. GE Impact Predictor Ground Station Data

The impact predictor provides, in addition to data similar to that discussed under the guidance section, continuous real time indication on two IP plotters of instantaneous missile impact point, i.e., the point at which the missile would impact if the engines were cut off at that time.

d. Telemetry Receiving Station Data

At each receiving station the video signal outputs of the telemetry receivers are recorded on a single track of a 1/2" magnetic tape along with the appropriate wow and flutter compensation signals and timing information. In addition, recordings of the center frequency of each F/M link and its signal strength at the input to the receiver are made.

e. Range Safety Command Ground Station Data

Two AM/FRW-2 modified transmitters are used at the RSC ground station. A "station guardian" in the master transmitter monitors the output power continuously. An automatic changeover from the master to the standby transmitter occurs when the output power departs from a predetermined condition. Twenty recording channels are used during each mission to verify proper ground system performance. Among the parameters measured are transmitted power output and frequency deviation.

f. Radar Coverage

Mod II, Mod IV and FPS-16 Radars are presently being used at AMR. The Mod II Radars are modified SCR 584 Radars which will be used in conjunction with an S-Band Beacon. This beacon will be installed in the LMSD vehicle. The Mod IV Radar is a short range monopulse automatic precision angle and range tracking radar. The FPS-16 Radar is a precision C-Band, monopulse tracking radar which will provide real time, present position and impact predictor data from launch to burnout. This data will be used as backup to Azusa for Range Safety. All AMR Radars provide selsyn voltages and digital data representing azimuth and elevation angles and slant range.

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In addition, the Mod II and Mod IV Radars provide potentiometer voltages representing slant range, altitude, ground range and X Y ground position while the potentiometer voltages in the FPS-16 represents sine and cosine functions of azimuth elevation angles and slant range.

2. Optical Tracking

a. CZR-1/RC-5 Camera System

The standard fixed metric camera system at AMR uses the CZR-1 and RC-5 cameras. This system is designated as the primary missile tracking system for the first 6,000 feet of the missile trajectory. To obtain space position data from these camera systems, each individual camera of the system gives the direction of a ray in space from the camera to the missile. Thus, a minimum of two cameras must be used to obtain ray intersections and, thereby, the missile position. The exposures of the cameras are synchronized by phasing of the synchronous motors driving the shutter drums. The time of exposure is synchronized between cameras to one millisecond. A timing code is imprinted on the edge of the film.

The error of reduced ribbon frame camera position data for ballistic missiles normally runs better than two feet for coverages from 0 to 6,000 feet altitude. Reduced velocity and acceleration data is better than ± 10 FPS and $\pm 1G$ respectively. The undefined character of the flame image approximately doubles the error during night operation.

b. Cine-Theodolite

The AMR cine-theodolite system is comprised of seven permanent astrodome-tower installations. Utilizing the Askania Kth53, this system provides data on missile position from 0 to 100,000 feet. An optical train projects images of the theodolite azimuth and elevation dials of the optical axis upon the film. The dials are directly readable to $.01^\circ$, with interpolation to $.001^\circ$. Range timing in binary code and a numerical frame count are also recorded on each frame. The reduced data from the theodolite system is accurate to approximately 1 minute of arc.

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c. BC-4 Camera System

The ballistic camera system planned for use at AMR will include sixteen BC-4 cameras. These cameras cover various portions of the trajectory but are probably of greatest importance at missile burnout. These cameras photograph the exhaust flame of the missile, chopped by the camera shutter against a star background to obtain accurate position data. Because of the high inherent accuracy and reliability of the system, the ballistic cameras are used for evaluation and inflight calibration of electronic trajectory measuring systems.

d. Long Range Tracking Techniques

ROTI and IGOR Systems

The ROTI (Recording Optical Tracking Instrument) MKII and IGOR (Intercept Ground Optical Recorder) MKII are both tracking telescopes which are used to provide documentary performance and engineering sequential information at long ranges. Neither system will supply missile position data.

e. Intermediate Focal Length Tracking Telescopes

The purpose for the use of this type optical equipment is to obtain engineering sequential and attitude data at short and medium slant ranges, using motion picture cameras. The AMR IFLTT's include the M-45, the MK-51 Tracking Telescope, and the Sandia Tracking Telescope.

f. Boresight Cameras

Due to inherent inaccuracies in mechanical linkages, corrections are applied to radar recorded azimuth and elevation. The boresight camera is used to make zeroing and tracking corrections to the azimuth and elevation data.

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3. Miscellaneousa. Ionospheric Sounding

A value of electron density (in electrons per cubic centimeter) at vernier burnout altitude is required in order that preflight corrections to the guidance computer can be made. Tabulations of electron density versus altitude have been requested of AMR to be derived from samplings made within 1 hour before, an hour after launch, and continuously during powered flight.

b. Weather Data

All weather data is collected and evaluated by the AMR staff weather officer. A complete surface observation is made at T-time. Upper air soundings are made at the Cape and at various down range stations. The following data has been requested for WS 117L flight tests.

DATA REQ'D.	RANGE REQ'D.	DATA REQ'D.	RANGE REQ'D.
Pressure	0 to 100,000 ft.	Wind Velocity	0 to 100,000 ft.
Temperature	0 to 100,000 ft.	Wind Azimuth	0 to 100,000 ft.
Humidity	0 to 40,000 ft.	Index of Refraction	0 to 80,000 ft.

The sampling rate for the above information will be determined by the weather staff. Accuracies shall be those obtained by standard meteorological practices.

In addition, a log will be made of the surface conditions in the vicinity of each range station. This log will include, in addition to values for each of the above data, a report of cloud coverage and visibility. This record will be made at 15 minute intervals during the countdown.

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D. Landline Instrumentation System

1. General

In addition to the measurements transmitted from the missile via the telemetry system, measurements are also acquired through use of a direct wire or "landline" instrumentation system. The main purpose of this system is to provide various missile parameters in a visual as well as recorded fashion, to facilitate the determining of operational status of various missile and ground systems prior to launch. The data gathered via this system are also utilized to a limited extent for post-test analysis. Instrumentation of GSE is always accomplished via the landline system.

2. Graphic or Strip Chart Recorders

Graphic recorders have either one or two channels of information per recorder. The frequency response is low, and is therefore limited to recording information from slowly varying functions. Information is easily read in real time on graphic recorders due to the data being projected over a wide area. The graphic is the primary recorder utilized for propulsion and pneumatic system red-line parameter display.

3. "Hot Wire" Stylus Recorders

For functions requiring a higher response than is available from a graphic recorder and a real time display as well a "hot wire" stylus recorder is used. Each recorder unit includes provisions to record 8 data channels. The actual recording is accomplished by a "hot wire" stylus passing over a special heat-sensitive paper. The frequency response of this type recorder is flat to 30 cps. Two 8 channel Sanborn recorders will be utilized at complex 14 to display autopilot and guidance parameters necessary for Atlas missile pre-launch checkout. Patch panels are used to facilitate switching of function to be recorded.

4. Oscillograph Recorders

Oscillographs are used to record functions requiring high frequency response but no real time display. A photographic method of simultaneously recording up to 36 channels of information (with timing) on continuously

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moving light-sensitive paper is employed. This is accomplished with movable galvanometers equipped with mirrors which deflect a beam of light to the chart paper. This method provides a good frequency response up to 2,100 cps. Four Mid-Western oscillograph recorders will be available for use in the Complex 14 blockhouse for the MIDAS program.

5. Sequence Recorders

In addition to analog and frequency measurement requirements, there are event type measurement requirements. Eight Esterline-Angus operations recorders will be used for this purpose. Each recorder has 20 pens (including time pens) on a single sheet of moving graph paper. These recorders will be used to monitor (in real time) the activations and de-activations of various portions of the MA-2 engine electrical control system as well as several other sequence functions.

6. Recorder Usage

The above provisions will for the most part be utilized for Atlas missile functions. It has been agreed that Lockheed's requirements can be satisfied by 10 graphic channels, 13 oscillograph channels and 20 sequence recorder channels.

E. Miscellaneous Launch Area Data

1. Weighing System

The Z axis load cell system will provide weight measurements for the missile through the tanking procedure. The total weight of the missile and launching platform rests on four Baldwin-Lima-Hamilton bonded strain gage load cells. The outputs are summed and read out on a digital indicator and printer. The indicator-printer is a null balance servopotentiometer instrument with an accuracy of 0.1% of full scale value. Digital indication is scaled to read directly in pound units of missile weight.

The calibration of the weighing system is accomplished by the Field Standard Weight and Force (FSWF) System. This system is designed to calibrate load cell weighing systems used in conjunction with D series missiles. The FSWF is composed of the secondary standard weighing unit and the hydraulic force unit.

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The secondary standard weighing unit has four strain gage load cells with a matched summing and digital readout unit. The National Bureau of Standards performs periodic calibration of the secondary standard to verify the guaranteed accuracy of the entire unit.

The hydraulic force unit utilizes a common hydraulic pump which feeds four cylinders for loading in either tension or compression (relative to the strain gage load cell unit). The hydraulic cylinder linkages are designed to simulate a vertical loading, such as that imposed by a missile in launch position.

In a field calibration, the FSWF system energizes the hydraulic system to load both the secondary standard load cells and the Z axis load cells. The comparative data difference between the secondary standard and the Z axis load cells is used for the corrected calibration data.

2. Closed Circuit Television

This system is used as a supplement to the Launch Control System and the Landline Instrumentation System in monitoring and controlling missile actions.

The basic closed circuit television configuration and capabilities will be supplied by combined contribution of the following major equipment items or their equivalent. The system described below will apply to all complexes.

a. Cameras and Accessories

- (1) Four remote cameras - RCA #M1-36067
- (2) Three weatherproof housings - RCA #M1-36075 and one explosion and dustproof housing - RCA #M1-36074B
- (3) Three outdoor pan and tilt units - RCA #M1-36098 and one explosionproof pan and tilt unit - RCA #M1-36098E
- (4) Three zoom lens (60-300 mm focal length) and one (30-150 mm focal length). Perkin - Elmer or equal

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3. Visual Panel Presentations

A list of visual meters has been compiled and is presented in the landline tabulation for information purposes in order to provide a more complete picture of the important monitoring devices which will be available to test personnel in their maintenance of blockhouse test control. In order to differentiate these functions from the 1000 series direct line measurements, a M000 series designation will apply to these visual panel presentations.

IV. DATA HANDLING, PROCESSING AND REPORTING REQUIREMENTS

A. Data Handling

Atlas Flight Test Data gathered by the range will be handled according to the nature of the data. In general, the normal data handling procedure is as follows:

1. **Telemetry Records** - AFMTC recorded tapes will be made available to the Flight Test Working Group (FTWG) within one hour after the flight for quick-look analysis. The telemetry tapes recorded at the down range stations will be identified (station number, date, test number) and flown to the Cape. Here they will be copied and distributed as required.

Telemetry tapes from Station Nos. 1 (Cape) and 3 (Grand Bahama Island), will be flown to San Diego for processing within 24 hours after the flight. Tapes from the remaining stations are not normally required by Convair for post-test analysis.

2. **External Data** - Data which is gathered by means external to the missile, i.e., other than the RF telemetry link, is referred to as external data. This is conveniently separable into the categories of landline data, metric data, documentary data, and miscellaneous data.
 - a. **Landline Data** - These are gathered via graphic, Esterline-Angus and oscillograph recorders. The original recordings will be flown to San Diego within 24 hours to aid in the test analysis.
 - b. **Metric Data** - All metric tracking data (including that obtained from film, electronic and optical tracking devices) will be reduced and

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distributed by the range. Tabulated data, IBM cards or tapes will be distributed as required. (See range data tabulation.)

- c. Documentary Data - Sequential and motion picture film will be processed by the Base. Normally, copies will be received at San Diego within 120 hours.

Logs of system operation are kept during countdown operation and missile flights, for certain of the missile systems. These will be copied and sent to San Diego for historical purposes.

- d. Miscellaneous Data - Included in this category are various recordings made to obtain additional information on the electronic missile systems, range safety information, special studies and weather data. Normally, this data will be returned to San Diego for processing and analysis.

B. Data Processing

Processing of the original telemetry tapes, recorded by the range, from Station Nos. 1 and 3 is normally considered sufficient for data analysis.

The recorded telemetry data will be gathered on a 1/2 inch, 7 track tape recorded at 60 inches per second. A typical tape format is as follows:

- | | |
|--------------|---|
| Tracks 1, 7: | Not used |
| Track 2: | LMSD RF #1 (similar to track 3) |
| Track 3: | Video recording of signal from CV-A RF #1, and a 100 KC ($\pm .001\%$) wow and flutter compensation signal. |
| Track 4: | Voice Annotation (overrides entire RDB band and identifies tape), 17 KC ($\pm .1\%$) speedlock range timing (13 bit, 1 PPS; 12 bit, 100 PPS), telemetry trailer timing. |
| Track 5: | LMSD RF #2 (similar to track 3) |
| Track 6: | LMSD RF #3 (similar to track 3) |

The telemetry tapes will be processed by the ICS San Diego and Florida data processing stations. Here the data will be played back in a form suitable for analysis.

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C. Data Reporting

Data Reduction and analysis will be accomplished in conjunction with design and development personnel. Test results will be compiled and published in the following reports:

1. X + 1 hour report: This report will be published, in TWX form, following the flight readiness firing (FRF) and flight launching. AMR responsible. This report contains results of a quick-look inspection at the site.
2. X + 5 hour report: This report, also in TWX form, will be published following the FRF and the flight launching. AMR responsible. Contains qualitative results of quick-look data with preliminary test results and conclusions noted.
3. X + 24 hour report: This report will follow both FRF and flight launchings. Test Evaluation Group responsible. Contains quick-look information on performance levels of the engines and general operation of the systems, as well as noting any malfunctions which may have occurred during the operation. Preliminary test results and conclusions are listed.
4. X + 7 day report: This report will be published following both FRF and flight launchings. AMR responsible. Contains more detailed analysis of missile performance and operation. Problems which have occurred will be investigated more closely in this report.
5. Two Week Report: Formal flight test report published by Test Evaluation Group. This report presents all significant reduced data and summarizes results achieved from the flight. In addition to the reduced data, applicable photographs, system illustrations, and diagrams are shown.

V. OPERATING CONSIDERATIONS

This section will be supplied at a later date.

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DISCUSSION OF INSTRUMENTATION

I. GENERAL

The PG-1A (Notice No. 74) missile for use in the Space programs at PMR will be a Series "D" Atlas with GE Mod II guidance and with the structure modified by increased skin thicknesses on the forward section of the LO₂ tank. The Midas and Samos Satellite Vehicles will vary in weight between 11,300 and 19,100 pounds depending on mission. (A)

The launch complex will be basically a copy of 65-1 with the following major exceptions:

- A. There will be two launch pads, each with a dry flame deflector.
- B. The missile will be stored vertically with a roll-away gantry that will clear the Satellite Vehicle and the Lockheed umbilical tower. (A)
- C. There will be only one APCHE in the blockhouse.
- D. A permanent landline instrumentation system will be installed in the blockhouse.
- E. The launchers will have individual propellant storage facilities capable of high-rate loading, however, the propellant and gas storage capacities will be reduced to support only a single shot operation.

The telemeter to be utilized is a slightly modified D^{70C} IRSS telemeter. This system was selected in lieu of the D series R&D telemetry system, (AMR) in order to simplify design, development, manufacturing, Air Force training and logistic support problems for the AGE. It was felt that Atlas testing will have progressed sufficiently to allow only gross performance/malfunction measurements to be made. (A)

A landline instrumentation system will be installed in the blockhouse to support check-out requirements as well as to provide additional post-test evaluative data.

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II. MISSILE AND AGE INSTRUMENTATION

A. Introduction

The measurements to be transmitted via the IRSS telemeter were selected and coordinated by Instrumentation Planning. Ground rules governing the selection included the following philosophy:

1. Only gross performance and/or gross malfunction of major missile systems is of interest.
2. Utilization of the IRSS telemeter in lieu of the R&D telemeter was predicated upon a BMD directive to keep costs to a minimum. In order to simplify design, development, manufacturing, Air Force training and logistic support problems for AGE it was necessary to keep the configuration of the IRSS telemeter very close to that of the D-IOC, IRSS telemeter.

Seventy-one measurements of missile performance parameters are transmitted via this telemeter. The following is a description of each of the selected measurements. Additional information, i. e. , channel assignment, GD/A installation drawing numbers, etc. , is contained in the tabulations of the IRSS measurements.

B. Airframe

1. Aerodynamic Heating

Aerophysics calculations indicate that temperatures on the forward skin sections of the LOX tank will be near the structural limit because of the extra weight and planned low level trajectories. Seven thermocouple type LOX tank skin temperature measurements (A851T, A852T, A853T, A854T, A855T, A856T, A857T) are provided for this system

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2. Engine Area Temperature

A number of "D" series flights have experienced high temperatures in the engine area. Since the exact heat source has not been established six temperature measurements (A740T, A743T, A745T, A746T, P14T, P671T) are provided to study this and any other unusual conditions that may occur.

3. Adapter Area

Difficulties experienced on 29D and 50D emphasized the need for more measurements in the adapter area and also across the interface between stages. Three measurements (Y147P, Y15T, Y41X) are provided for this area. These measurements provide data on environmental pressure and temperature as well as monitoring the start D timer command signal.

4. Vibration

Direct accelerometers are not provided for airframe analysis. Airframe bending and other dynamics are to a certain degree, reflected in the rate gyro outputs (S52R, S53R, S54R).

5. RCC

The rough combustion cutoff (RCC) accelerometers P14390, P14520, P14530, will be monitored on all boosters with this pickup installed. Refer to Propulsion System Measurements for a complete discussion of these and associated measurements. RCC and holddown periods will be eliminated from all flights utilizing the MA-5 with baffled injectors.

C. Atlas MA-5 Propulsion System

The 1st stage propulsion system analyses can be conveniently divided into the areas of engine controls, propellant feed, propellant flow, engine performance and propellant utilization. Over-all propulsion system operation, and reliability are the prime test criteria.

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1. Engine Controls

The controls helium bottle supplies pressure directly to the booster controls manifold, the start and vernier pressurization manifold and the sustainer gas generator reference regulator. The discharge pressure (F125P, F288P) of the pneumatic regulator incorporated in each manifold is monitored as these regulators are the most sensitive and critical elements in the system. The controls helium bottle pressure (F1291P) is exhibited on the landline recording system to ascertain supply adequacy prior to flight.

All sustainer engine and gas generator control valves are hydraulically actuated by oil pressure derived from the sustainer hydraulic system. The hydraulic system pressure (H140P) is measured as are the positions of the sustainer main LO₂ and fuel valves (P529D, P528D) to obtain information on valve operation.

Aggregate engine operation and additional instrumentation in the propulsion system will aid in determining if the various control valves are operating properly.

The thrust section separation mechanisms are pneumatically actuated. The separation bottle discharge pressure (F1304P) will be monitored on landline recorders to assure proper helium loading.

2. Propellant Feed

At engine start the LO₂ and fuel start tanks supply propellants to the gas generators which produce hot gas to drive the turbines geared to the LO₂ and fuel turbopumps. When the engines bootstrap, the turbopumps feed propellants to the gas generators and refill the start tanks.

The hot gas pressure measurements (P100P, P339P) indicate start and bootstrap operation adequacy, gas generator performance levels, and failure analysis possibilities. The actual start levels are established by hot gas temperatures (P1017T, P1326T) measured via the landline system.

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3. Propellant Flow

During main engine operation LO_2 and fuel from the missile tanks flow through separate turbopumps, which increase propellant pressure, to each thrust chamber.

The fuel (P2P, P4P, P55P) and LOX (P1P, P3P, P56P) pressures into the main engine turbopumps will be monitored to provide information on low pressure propellant ducting integrity, satisfaction of engine interface requirements, and turbopump operation. The sustainer engine fuel pump discharge measurement (P330P) will furnish additional data on turbopump performance.

The rough combustion cutoff (RCC) accelerometers (P1439O, P1452O, P1453O) mounted on the main engine LOX domes will exhibit start transients due to propellant surges, combustion instability and other starting phenomena. In the event the vibration levels exceed preset limits, a rough combustion cutoff (P1438X, P1192X, P1193X) will be generated.

4. Engine Performance

One of the most significant engine performance parameters is thrust. Engine thrust calculations will be based on chamber pressure information (P6P, P59P, P60P, P28P, P29P) and engine coefficients obtained during acceptance tests. An analysis of engine thrust decay can be made from chamber pressure and missile acceleration data.

Over-all engine efficiency is denoted by its specific impulse (I_{sp}), the amount of thrust gained from each pound of propellant in one second of engine operation. I_{sp} can be calculated from missile axial acceleration data alone. This method has proven successful on the Atlas program mainly because of the highly accurate accelerometer which was utilized. On the Space Booster program therefore this same accelerometer (U101A) will be mounted on the Atlas stage and its output monitored continuously during all powered phases of flight to obtain I_{sp} data.

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5. Propellant Utilization System

In order to satisfy range and residual propellant requirements, the liquid oxygen (LO₂) to fuel mass ratio is controlled within tolerance limits. The GD/A PU system consisting of two manometers and a computer comparator canister controls the sustainer main fuel valve (propellant utilization valve) position and the sustainer main LO₂ valve (head suppression valve) through a hydraulic servoloop.

Variable capacitance fuel and LO₂ manometers form one-half a bridge network used to generate an error voltage (U91V) which is used to position the PU valve and the HS valve. Measurements of valve positions (P528D, P529D) will verify valve positions with respect to the input error signal. Missile axial acceleration (U101A) will be monitored for thrust and propellant level correlation.

Independent measurements of propellant levels, expressed as tank head delta pressures (U80P, U81P) provide additional information for residual propellants and over-all system operation.

D. Control System

1. Autopilot

The instrumentation of the autopilot servoloop includes each booster (S252D, S253D, S254D, S255D), sustainer (S256D, S257D), and vernier (S258D, S259D, S260D, S261D) thrust chamber angular displacement from the nominal null position, and the pitch, yaw and roll displacement (S61D, S62D, S63D) and rate (S52R, S53R, S54R) gyro outputs. With this basic instrumentation, a rather complete time history of the autopilot subsystem during flight may be derived.

The missile rate gyro outputs (S52R, S53R, S54R) will be transmitted via continuous channels to facilitate post test simulated flight studies. The displacement gyros (S61D, S62D, S63D) and thrust chamber position (S252D

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through S261D) measurements, although commutated at too slow a rate to be useful in post-test simulated flight studies, will provide gross performance/malfunction information. Particular points of interest which will be studied are the rate of amplitude change, frequencies and magnitudes of limit cycle oscillations due to sloshing or other instabilities; the response of the system to transients; the reaction to guidance system steering and sequencing signals; and the correct performance of the roll and pitch-over programs (determined with the aid of external tracking data).

In addition to the determination of the foregoing points, the instrumentation allows the detection of certain random malfunctions which may occur. Through a study of the characteristics induced by the failure of a component, a random malfunction may often be isolated. Studies of this nature utilize an analog computer and tail section test stand. Possible failures are simulated on the computer and the computer output used as an input to the test stand. The response of the servo system is then recorded and compared to the flight data. In this manner, similarities of failure may be noted and the failure point determined. (A)

Proper functioning of the autopilot programmer will be verified by the time occurrence of the booster cutoff (P616X), staging, sustainer cutoff (P347X), and vernier cutoff (P77X), various gimbaling enabling and gyro gain changes, all of which are detectable in the telemetered measurements. (C)

In addition; (Y41X) Start D Timer signal to the LMSD vehicle is monitored to indicate proper accomplishment of this required command to the Agena vehicle. An axial accelerometer and an associated switch will be employed as a backup to booster staging. The operation of this switch will be monitored by (S359X).

Various other functions of the programmer which are initiated as part of a subroutine, may be determined to have occurred through other planned instrumentation. Nulling the booster engine, activating the sustainer and vernier engine in pitch and yaw, nulling the sustainer, jettisoning the

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booster package, reactivating the sustainer in pitch and yaw, biasing the vernier engines out to 50° in yaw and nulling them in pitch and yaw, and firing the retrorockets; all are functions which originate in the programmer, and which can be shown to have occurred through a study of records of presently planned instrumentation. Refer to Section 3-Area V, Operating Considerations, for a discussion of validation, checkout and red-line measurements made via landline for the Autopilot System.

2. Radio Guidance System

Since the Mod II guidance system used on these vehicles is similar to that flown on other programs, it is felt that its design adequacy has been proven. Therefore airborne guidance instrumentation is limited to significant functions which will permit over-all performance analysis.

The use of Mod II guidance requires that steering signals be monitored by measuring both phase (G79D, G80D) and amplitude (G26V, G27V).

Pulse Beacon (G3V) and Rate Beacon (G279V) AGC measurements are made to indicate signal input levels and thus provide information on antenna characteristics and the propagation of UHF signals.

Magnetron current (G4C) is a basic performance measurement of the pulse beacon since it is dependent upon the duration, rate and amplitude of the transmitted pulses.

Rate beacon power output (G82E) provides data for transponder evaluation and, in conjunction with ground station data, for L-band attenuation studies.

Indirect verification of discrete commands may be obtained by observing the execution of these commands from other vehicle instrumentation (P616X, P347X, P77X).

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E. Supporting Systems

1. Pneumatics System

a. Airborne System

The design of the missile requires the main propellant tanks be pressurized at all times to maintain structural integrity. During flight the main tank pressurization system serves this purpose as well as furnishing ullage pressure to insure propellant flow to the turbopumps. As the tank ullage pressures (F1P, F3P) are the end results of the missile tank pressurization system, they are measured for over-all system performance and missile airframe integrity information. (A)

During the first twenty seconds of flight, the longitudinal modes of the missile structure couple with the natural frequency of the LOX tank pressurization regulator to induce longitudinal pressure oscillations in the missile LOX tank. In conjunction with the higher tank ullage pressures required to support the heavy payloads, these pressure oscillations will allow the differential pressure across the intermediate bulkhead to become negative and cause a bulkhead inversion. A fix has been incorporated in the Atlas pressurization system to overcome these difficulties. The fix consists of a line, incorporating a heat exchanger, conax valve and orifice, running from the missile tank pressurization bottles to the LOX tank regulator sensing line. Helium bleeding through the sensing line will cause a pressure drop of approximately 6.5 between the tank and the regulator so that the regulator will sense 31.5 PSIG while the tank is actually pressurized to 25 PSIG. After twenty seconds of flight the conax valve blows closed and shuts off the sense line bleed. The regulator then increases LOX tank pressure to 31.5 PSIG to meet maximum "Q" conditions. In order to evaluate the performance of this fix, pressure measurements will be installed in the LOX tank sensing line at the regulator (F383P) and at the orifice outlet (C)

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(F384P). A pressure measurement in the PCU LOX tank sensing line at the rise-off disconnect (F1253P), will be used to check out the LOX tank pressure regulator prior to launch.

The amount of helium loaded into the airborne tank pressurization supply will be determined by landline temperature (F1247T) and pressure (F1246P) instrumentation in that supply.

b. Ground Support Equipment

Performance of the pressurization control unit (PCU) will be determined by pressure measurements in the PCU missile fuel (F1047P) and LOX (F1050P) tank sensing lines and the missileborne tank ullage pressures (F1001P, F1003P).

A pressure measurement (F1770P) in the LN₂ storage tank will indicate the presence of transfer pressurization. LN₂ loading into the airborne LN₂ shrouds will be established by a temperature probe (F1894T) in the LN₂ launcher stubup. In addition LN₂/helium heat exchanger performance will be monitored by a temperature measurement (F1895T) in the ground helium line at the launcher stubup.

Checkout of the airborne tank pressurization regulators is accomplished by the dynamic checkout unit. Regulator action is determined by pressure instrumentation in the LOX (F1301P) and fuel (F1302P) ullage simulation tanks.

One of the more critical facility items during a prolonged countdown or extended hold is the ground GN₂ supply. A visual indication of facility GN₂ pressure (F1194P) will be provided.

c. Propellant Loading

Ground support equipment for propellant loading consists of an A. D. Little type system, that is, pressurization of the ground storage

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tanks and appropriate valves to transfer fuel and liquid oxygen to the missile. A liquid oxygen subcooler is used to subcool the liquid oxygen required for topping to maintain the level of liquid oxygen required in the missile.

Ullage pressure (N1300P) in the fuel storage tank and fuel level (N1345P) will be monitored for operation as well as liquid oxygen storage tank ullage pressure (N1360P) and liquid level (N1346P). Pressure (N1361P) in the gaseous oxygen storage cylinder will be monitored for operational requirements.

Discrete level sensors in the missile fuel tank are used to control the fuel loading. Fuel is tanked at a rapid rate until the 95% probe (P1997X) becomes wet. Slow fill to a level between the 100% probe (P1999X) and the overfill probe (P1987X) completes fuel loading. Liquid oxygen is tanked until the error ratio demodulator output (U1091V) reaches a predetermined value. This measurement (U1091V) represents a mass ratio of propellants aboard the missile. A back-up sensor (P1988X) at the 95% level is used as an emergency cutoff to the rapid load portion of liquid oxygen tanking. Liquid oxygen temperature (P1862T) and pressure (P1863P) measurements are taken at the exit of the subcooler to verify subcooler operation and whether topping will maintain the liquid oxygen level.

2. Hydraulic System

There are two independent hydraulic systems, a booster stage system, and a sustainer-vernier stage system. A measurement in the booster system (H33P) reveals if there is adequate hydraulic pressure for booster engine gimbaling prior to staging. Another measurement (H140P) in the sustainer-vernier system will provide data indicating sufficient hydraulic pressure to gimbal the sustainer and vernier engines and actuate the sustainer propellant valves.

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3. Electrical Power Supply

(A) The performance of the battery-inverter electrical power supply is reflected in the measurement of DC voltage (E28V) as well as in the operation of supplied systems such as the guidance set. Measurements of 400 cycle AC Freq (E50Q) and 400 cycle AC Phase A (E51V) will be made for systems and failure analysis.

4. Range Safety Command

One measurement (D110X) is taken to determine whether or not a destruct signal was sent to the destruct box on the missile. The data signal indicates the closing of one or both of the RSC destruct relays.

F. Satellite Vehicle

No measurements are made via the Atlas telemeter. All data are transmitted via the satellite vehicle telemetry system.

III. DATA GATHERING SYSTEMS

A. Modified IRSS Telemeter System

1. General

(A) The IRSS telemetry subsystem utilized on Midas/Samos is modified to the extent of the addition of signal conditioner-commutator package which is required for channel 13. Channel 12 receives the axial string type accelerometer (U101A) output directly. In contrast to the kit form of the IRSS system provided for IOC missiles, the IRSS modified system will be installed on each missile before it leaves the factory.

2. Functional Description of Components

a. Transmitter Package

(C) The transmitter accepts a combined 7 channel signal which modulates the transmitter and is transmitted as a 25 watt fm/fm r-f

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carrier. Removable chassis modules, such as the power amplifier and power converters are bolted to the chassis to facilitate maintenance. Channel 13 in continuous form will be used on 75D.

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b. Signal Converter Packages

The signal converter receives conditioned signals from the signal conditioner and power control unit and combines them into a composite signal which is fed to the transmitter. The signal converter chassis contains plug-in modules including a signal distribution unit, 7 subcarrier oscillator units, a dual and single commutator units, a power converter, and a dual voltage regulator.

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c. Signal Conditioner and Power Control

A signal conditioner and power control packages includes the function of a junction box. It provides electrical matching of transducers to the government furnished signal converter package and controls the power to the telemetry and range safety subsystems.

d. IRSS Battery

The IRSS battery supplies 28 VDC to the IRSS Airborne system with the exception of one range safety command set. The battery is installed in a dry charge state and is activated when filled from a container of electrolyte punctured by a remote control signal. If a hold is ordered after activating the battery, the load may be removed from the battery and reapplied later.

e. Antenna

Slot-type antennas are housed in both the upper and target pods. Each is a rectangular package with rounded top to conform to the pod surface. The wall of the antenna is constructed of laminated and honeycomb fiberglass. The exterior, with the exception of a

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5-inch wide, 41-inch long area across the top, is sprayed with metalized aluminum. The telemeter antenna feed terminal is in the center of the package with the two range safety antenna feed terminals on either side. The target and upper pod telemeter antennas are coupled together and to the transmitter by a T coupler.

3. Utilization of the 7 Channel PAM/FM/FM Telemeter

Voltage subcarrier channels, RDB channels 9 through 15, are utilized, channel 12 receiving the axial accelerometer (U101A) direct. Four of these, channels 9, 10, 11, and 12, are FM/FM or continuous data channels; so defined, since one data signal is continuously used to modulate the subcarrier oscillator. Data of prime importance in which valuable information might be lost if the data were commutated are assigned to these channels.

(A) The three remaining subcarrier channels, RDB channels, 13, 14 and 15, are PAM/FM/FM channels. Three thirty segment pair commutators are utilized for the time division multiplexing. The more rapidly changing functions are assigned to the 10 RPS commutator. In the case of the booster cutoff measurement two pins on opposite sides of the 10 RPS commutator are tied together thus giving a time resolution accuracy of one twentieth of a second. Calibration and synchronization pulses are provided as shown in the waveform schematic. Pin 14 picks up the transducer power supply 80% level. Instrumentation ground is assigned to pin 15. Pin 28 picks up an internal 5 volt DC calibration voltage. Pins 29, 29-1/2 and 30 are tied together to produce a synchronization pulse thus producing a positive location of a pin number in the commutated waveform. All remaining pins which are not used for data are internally grounded. All the pedestal segments are designated by a half number (i. e. , 1-1/2, 2-1/2, etc.).

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The table below lists the subcarrier channels used, their center frequencies, frequency deviation, frequency response, and the type of waveform.

RDB CHANNEL	CENTER FREQUENCY	DEVIATION %	FREQUENCY RESPONSE CPS	TYPE
9	3,900	± 7.5	0 - 59	Continuous
10	5,400	± 7.5	0 - 81	Continuous
11	7,350	± 7.5	0 - 110	Continuous
12	10,500	± 7.5	0 - 160	Continuous
13	14,500	± 7.5	0 - 220	Commutated 10 RPS
14	22,000	± 7.5	0 - 330	Commutated 5 RPS
15	30,000	± 7.5	0 - 450	Commutated 10 RPS

B. LMSC 2nd Stage Telemetry System

Second stage telemetry varies widely between flights so it will not be detailed in this summary. Appropriate LMSC documents specify the telemetry system configuration for individual vehicles.

C. Range Instrumentation System

1. General

Range data gathering instrumentation will be provided at the Pt. Arguello Launch Site (PALC), at Pt. Mugu, at San Nicholas Island from downrange ships, and at Vandenberg Air Force Base (VAFB). Since much of the range instrumentation is similar to that provided at AMR (ref. D Series Summary Report AZC-27-001), only the instrumentation peculiar to PMR will be discussed in detail.

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Section 10 of this report presents a tabulation of range data requested by GD/A.

2. Electronic Tracking Data

a. Mod II Guidance Ground Station Data

Though associated with the Mod II missileborne guidance set, the ground station is similar to the Mod III guidance station at AMR. Therefore, the parameters recorded in both the rate and position measuring subsystems are similar to the AMR requirements.

b. Telemetry Receiving Station Data

At each receiving station the video signal outputs of the telemetry receivers are recorded on magnetic tape along with the appropriate wow and flutter compensation signals, timing information, signal strength, and voice commentary.

c. Cotar Ground Station Data

Two cross-baseline angle-measuring equipment (AME) Cotar sites will utilize the RF radiation of the telemeter transmitter in the missile to measure the direction cosines between the space vectors to the missile from the centerlines of the cross-baseline ground-antenna fields. This information will be used to provide impact prediction information to the Range Safety Officer. In addition, it will be used to provide acquisition data (azimuth and elevation angles) to the instrumentation radars. Copies of the R/S plotting board charts will be utilized in trajectory analysis.

d. Radar Coverage

Radar coverage at PMR will be supplied by Mod II and FPS-16 radars.

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3. Optical

- a. CZR-1 Camera System.
- b. Cine-Theodolite.
- c. Long Range Tracking Telescopes.

4. Miscellaneous

- a. Ionspheric Soundings

A value of electronic density at vernier burnout altitude will be established to enable preflight corrections to the guidance computer.

- b. Weather Data

All weather data is collected and evaluated the PMR staff weather officer. A complete surface observation is made at T-time. Upper air soundings are made at the PAIC and at various downrange stations.

A Rawinsonde system is used to obtain meteorological data. This consists of meteorological sensing elements, a radio transmitter and a balloon as in-flight equipment, and ground direction finder for precise angle measurements. This equipment yields information on environmental temperature, relative humidity, pressure and the magnitude and direction of the wind.

D. Landline Instrumentation System

1. General

In addition to the measurements transmitted from the missile via the telemetry system, measurements are also acquired through use of

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a direct wire or "landline" instrumentation system. The main purpose of this system is to present various missile parameters visually, to permit the determination of the operational status of various missile systems prior to launch. At the same time the data are recorded and are utilized to a limited extent for post-test analysis. Instrumentation of GSE is always accomplished via the landline system.

PALC #1 is to be an IOC (Interim Operational Capability) type site. Landline measurement capabilities have been planned to include primarily functions necessary for initial site system validation, functions needed for checkout when APCHE is not available, and functions necessary for safety of operation.

Space availability in the Launch Operations building is limited and has been a consideration. Duplicate wiring will be installed from each of the two launching pads to termination panels in the Launch Operations building. Patch panels will allow hook-up of either pad to the recording equipment. Also, since validation, checkout, or operational phases will not occur at the same time, the patch panel will allow changes of hook-up and maximum usage of recorders.

2. Recording Capabilities

a. (24) Channels on Strip-Chart Recorders

Graphic, or strip-chart recorders have either one or two channels of information per recorder. The frequency response is low, and is therefore limited to recording information from slowly varying functions. Information is easily read in real time on graphic recorders due to the data being projected over a wide area.

b. (2) - 8 Channel Sanborn-Type Recorders (With Demodulators)

On this type recorder the actual recording is accomplished by a "hot wire" stylus passing over a special heat sensitive paper.

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The "hot wire" recorder is used for functions requiring a higher response than is available from a graphic recorder, and a real time display as well. Flat frequency response may be obtained to 30 cps. The built-in demodulators convert modulated 400 cycle signals to DC signals of proper magnitudes.

c. (2) - 36 Channel Oscillographs (With Direct-Write Capabilities)

Oscillographs are used to record functions requiring higher frequency response. Up to 36 channels (including timing) are photographically recorded on a continuously moving light-sensitive paper. Movable galvanometers equipped with mirrors deflect a beam of light to the chart paper. With the proper galvanometers, frequency response up to around 2000 cps is possible. "Direct-Write" oscillographs are planned for this site to facilitate "quick-look" information and alleviate the need for photo-processing equipment.

d. (6) - 40 Channel Sequence Recorders

These recorders each have 40 pens (including time pens) with 2 sets of 20 pens each recording on separate continuously moving sheets of graph paper. They are used to monitor event-type measurements.

A RCA Time and Events Recorder with a 500 event capability will also be in operation. This recorder has a chart speed of 1/4 inch per second. There are four charts with 125 events on each which advance simultaneously. The charts move only when an event occurs. They will continue to advance as long as events occur at intervals of greater than 0.1 second and less than 0.2 second. Time is printed out when the charts begin to advance. Chart marking is accomplished by the discharge of a condenser through the paper. Certain functions are marked at the beginning and the end of an event, but the majority are marked only at the beginning.

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About 60 of the high interest events on this recorder will be duplicated on the EA sequence recorders to provide better "quick-look" information.

3. Timing

Time correlation will be accomplished by use of the following range timing signals:

- a. 7-digit, 1ppm pulse width time of day code, readout once per 15 minutes. DC level shift 28VDC at 2 amperes. Accuracy of pulse leading edge ± 100 ms.
- b. 13-digit 1pps, pulse width time of day code, readout once per 15 seconds, DC level shift 28VDC at 2 amperes. Accuracy of pulse leading edge ± 1 ms.
- c. 12-digit 20pps, pulse width time of day code, readout once per second, DC level shift 1 volt DC at 50 ma. Accuracy of pulse leading edge ± 1 ms.

Time of day refers to Pacific Standard Time.

The frame pulse for each timing code is "on time" at the lead-edge of the pulse.

IV. DATA HANDLING, PROCESSING AND REPORTING REQUIREMENTS

A. Data Handling

All data will be handled in the following manner:

A data log sheet is prepared for each launch by AFBMD Field Office at VAFB. It is used to record receipt and delivery of launch data by that office. Item

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numbers and nomenclature on the data log sheet are transcribed to labels which are posted to the launch data documents for identification.

All test data will be correlated with systems time and will be annotated for calibration identification and interpretation. An inventory will accompany each shipment. Couriers will be designated as necessary by LMSC and GD/A to deliver flight test data.

Atlas flight test data gathered by the range will be handled according to the nature of the data. In general, the normal data handling procedure is as follows:

1. Telemetry Records - Recorded tapes will be made at the Ground Space Communication Station, GD/A Pad Trailer, MAB Trailer and San Diego. All data will be routed through BMD building 5308 VAFB for control.

- a. Atlas Telemetry Records - GD/A/VAFB will receive a DUB of the Atlas telemetry tape from the GSCS, the pad trailer tape, pad telemetry signal strength, real time analogs from the MAB trailer and a copy of the GD/A/SD tape.

GD/A/SD will receive the MAB trailer tape and signal strength of the same to supplement their own tapes.

P/B analogs, decoder steering command outputs, of Atlas telemetry will be available as a backup from BMD, on request plus 7 hours.

General Dynamics/Astronautics, San Diego, will supply a first stage telemetry analog kit to BMD/VAFB. One copy each of the same will be supplied to LMSC/SV, and GD/A/VAFB. In addition, the first stage gyro and discrete records and a Dub magnetic tape of the first stage TLM will be supplied to GE/VAFB. Telemetry calibrations will be supplied to data users prior to launch.

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- (A)
- b. LMSC Telemetry - In general, Lockheed telemetry tape will be handled in a manner similar to first stage tapes. LMSC/Sunnyvale will furnish GD/A/SD with an Agena TLM Task Force Analog, an Agena TLM Digital Quick Look Kit, a Digital Radar Plot and the Radar and Doppler Tabulations.
2. External Data - Data which is gathered by means external to the missile, i. e. , other than the RF telemetry link, is referred to as external data. This is conveniently separable into the categories of landline data, metric data, documentary data, and miscellaneous data.
- a. Landline Data - These are gathered via graphic, Esterline-Angus and oscillograph recorders. The blockhouse GD/A landline real time records and voice magnetic tape will be available at GD/A/VAFB at T plus 10 hours. Similar Lockheed data will go to LMSC/Sunnyvale by T plus 10 hours.
 - b. Metric Data - Metric tracking data (including that obtained from film, electronic and optical tracking devices) will be distributed by the range. Tabulated data, IBM cards or tapes will be distributed as required. (See range data tabulation.)
 - c. Documentary Data - Sequential and motion picture film will be processed by the Base. Normally, copies will be received at San Diego within 74 hours.

Logs of system operation are kept during countdown operation and missile flights, for certain of the missile systems. These will be sent to GD/A/VAFB.
 - d. Miscellaneous Data - Included in this category are various recordings made to obtain additional information on the electronic missile systems, range safety information, special studies and weather data. This data will be returned to GD/A/VAFB for analysis.

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B. Data Processing

The Atlas telemetry tapes will be processed by the DPS (Data Processing Station) San Diego and PMR data processing stations. LMSC telemetry will be processed at PMR and LMSC/SV. Here the data will be played back in a form suitable for analysis.

Real time display will be available in the San Diego DPS during the time when the GD/A San Diego receiving station can monitor the flight.

At this writing a typical tape format has not been established. A study is in progress between GD/A and VAFB concerning adaptability of equipment involved.

C. Data Reporting

Data Reduction and analysis will be accomplished in conjunction with design and development personnel. Test results will be compiled and published in the following reports: (A)

1. X + 0 to 12 minutes, Commentary on Launch: This report is transmitted by hot line from the Test Director (VAFB) to furnish early information on the progress of the launch.
2. X + 0 to 8 hours, Flash Report: This report is transmitted by TWX from AFBMD/VAFB to AFBMD/WDZT based on inputs from the FTWG. It gives a brief summary of launch operations.
3. X + 24 to 48 hours, Follow-On Launch Report: The follow-on launch report gives more complete information on flight operations and flight results and is transmitted by TWX to AFBMD/WDZT, LMSC/VAFB, LMSC/SV, GD/A/SD and 6594 TW/SV. This report requires input from GD/A/VAFB and LMSC/VAFB.

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4. X + 48 hour report: This report, also in TWX form, will be published following the flight launching. GD/A/SD responsible. Contains qualitative results of quick-look data with preliminary test results and conclusions noted.
5. X + 7 days, Launch Pad Damage Report: This report is prepared by AFBMD/VAFB from inputs received from the FTWG, GD/A/VAFB and LMSC/VAFB.
6. X + 7 to 14 days, Final Launch Report: This report, prepared by the AFBMD/FO Flight Test Evaluation Technical Staff furnished by LMSC, provides a formal documentation and evaluates launch operations and results, pertinent launch data, vehicle history, and other details.

Inputs to the launch report are contributed by GD/A/VAFB and LMSC/VAFB. Launch evaluation is made by correlating actual launch results to criteria prepared by the AFBMD Technical Staff for each launching and incorporated as FTD Appendices for the individual launchings.

7. Two Week Report: Formal Atlas flight test report published by Convair Test Evaluation Group. This report presents all significant reduced data and summarizes results achieved from the flight. In addition to the reduced data, applicable photographs, system illustrations, and diagrams are shown. This report is distributed to AFBMD/WDZT, AFBMD/WDZY, LMSC/VAFB, LMSC/SV, GD/A/VAFB, GD/A/SD, and 6594 TW/SV.

TABLE I

GLOSSARY

AFBMD

Air Force Ballistic Missile Division of Air Research and Development Command

GD/A

Astronautics Division of General Dynamics

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GLOSSARY

FTD	Flight Test Directive (document)
FTWG	Flight Test Working Group
GE	General Electric Corporation
LMSC	Lockheed Missile and Space Co.
SD	San Diego, California
SV	Sunnyvale, California
VAFB	Vandenberg Air Force Base
WDZT	Director of Test and Activation, Inglewood
WDZY	Assistant Deputy Commander Space Division, Inglewood
6595 TW	6595th Aerospace Test Wing

(A)

V. OPERATING CONSIDERATIONS

The purpose of landline operating instrumentation is to present site personnel with information required to enable them to intelligently conduct a missile firing. This is accomplished by supplementing information provided by the launch control system in some cases and providing real time readouts to enable determination of general performance levels during launching operation. A tabulation of "redline" operating measurements is included at the end of this section. This tabulation indicates phase of operation and the limiting values. Should the limits be exceeded during the applicable phase of operation; operation is immediately terminated.

Other "operating considerations" measurements are required to verify proper operation, or to provide information of an unusual condition which could require corrective action or a discontinuance of operation at the discretion of the test conductor. All of

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these measurements with associated parameters are listed in the instrumentation composite tabulation of this report.

The following operating instrumentation is applicable to the Atlas/Agena program.

- A. F1001P LO₂ TANK HELIUM
F1003P FUEL TANK HELIUM

The propellant tanks helium pressures are displayed on strip chart recorders and monitored by an observer to ensure that proper tank pressures are maintained during an FRF or prior to launch. During an FRF, the data from these measurements also indicate the over-all performance of the pressurization system.

- B. F1125P BOOSTER CONTROL PNEUMATIC REG OUT

(A) To verify performance of the control pneumatic regulator and to verify that sufficient pressure is being delivered to the control manifold during an FRF or prior to flight a pressure transducer is plumbed into the line between the regulator and the manifold.

- C. F1246P BOOSTER TANK HELIUM BOTTLE HI
F1291P S CTL HELIUM BOTTLE
(C) F1304P SEPARATION BTL DISCH

To ensure that a sufficient supply of helium is contained in the propellant tanks prior to the launch, the pressures are measured and displayed on strip chart recorders. During an FRF, these measurements provide data on the helium consumption rate and over-all performance of the pressurization system.

The landline measurement of separation bottle discharge pressure (F1304P) has been added as an operational requirement in the interest of personnel safety.

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D. F1288P START TANK PNEUMATIC REG OUT

A pressure transducer is plumbed into the start tank pneumatic regulator discharge line to verify pressurization of the engine propellant tanks and to provide data on control pressurization system operation.

E. P1026P BOOSTER LO₂ REG REFERENCE
P1344P SUSTAINER LO₂ REG REFERENCE

Performance is indicated by a pressure transducer plumbed into the helium line supplying the reference pressure to the regulator. This is displayed on a strip chart recorder and monitored to assure that the regulator is operating correctly during an FRF and prior to launch.

F. P1017T B2 TURBINE INLET
P1326T S TURBINE INLET

Performance of the booster and sustainer propellant feed systems is indicated by measuring the temperatures of the hot gases being produced by the gas generators and delivered to the respective turbines. These measurements utilize resistance-type transducers installed at the inlets to the turbines.

G. P1673T B1 FUEL IGN VLV AMB
P1674T B2 FUEL IGN VLV MAB
P1675T ENGINE CONTROL PNEU MANIFOLD

Thermocouples, mounted on the B1 and B2 igniter fuel valves and the engine control pneumatic manifold, serve as an engine compartment fire detection system during an FRF or during the period immediately following a launch abort.

H. Autopilot

S1122V SERVO TEST SIGNAL
S1107V, S1108V, S1113V, S1114V, S1118V, S1119V, S1128V, S1129V, S1216V,
S1217V ACTUATOR FEEDBACK VOLTAGES

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The servo test signal furnishes data on the input to the servo amplifier loop of the autopilot. The filters are nulled during this test. The actuator feedback voltages when compared to the input signal provides information on engine threshold, frequency response, system continuity, gain and polarity.

S1147V, S1148V, S1149V GYRO AMPLIFIER OUTPUT SIGNALS
S1121V GYRO TEST SIGNAL
S1159V, S1160V, S1161V GYRO NULLING SIGNALS

The gyro amplifier output signals when compared with the gyro test signal provides a check on proper displacement gyro operation. These outputs will also indicate the rate gyros are operable when a form of the "kick test" is performed. In addition, this instrumentation indicates frequency response, system continuity, gain and polarity.

S1173X LOX BLEED VLV CMD
S1048V PROGRAMMER PITCH SIGNAL
S1049V PROGRAMMER ROLL SIGNAL
S1235X PROGRAMMER RUN TIME
S1242X SUS CUTOFF PRGR OTP
S1246X VERNIER COF PRGR OTP
S1381X STAGING DISCRETE
Y1039X INITIATE LMSD SEPAR
Y1040X UNCAGE LMSD GYROS
Y1041X START D TIMER
S1402X PRES V TKS ARMED POS

Confirmation of programmer operation and sequencing is accomplished by running the programmer at 100 times normal speed and monitoring the outputs for voltage level and time of occurrence. The above instrumentation provides this information.

I. Launcher

L1127P HOLDDOWN CYL B1 SIDE
L1128P HOLDDOWN CYL B2 SIDE

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To insure proper missile release from the launcher it is necessary that the hold-down cylinders decay simultaneously within a specified tolerance. Therefore validation of this tolerance is provided by a special blowdown test. These measurements monitor the pressure decay and establish the actual pressure decay tolerance.

M1088X MSL TWO INCH MOTION Q3
M1030X MSL TWO INCH MOTION
M1089X MSL EIGHT INCH MOTION

Microswitches on the launcher indicate missile motion which is used as zero time.

J. PU System

U1091V ERROR RATIO DEMO OTP

The error signal generated by the PU bridge provides information on the residual ratio of the propellants in the tanks and the value of the command signal to the PU valve. This measurement is monitored during tanking as the quantity of LO_2 is controlled by tanking to a null on the PU bridge.

P1528D SUSTAINER MAIN FUEL VALVE

Information on the performance of the PU system during an FRF and prior to launch is obtained by measuring the PU valve. This function is monitored on a strip chart recorder to assure that the valve is operating correctly prior to a launch.

U1107C PU SV AMP OUT

Malfunction analysis isolation of the electronics from the mechanical portion of the PU system is accomplished by monitoring this measurement. Current for PU valve operation should be present at propulsion start, therefore, this

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measurement will enable the launch crew to be assured of PU valve operation prior to actual flight in time to abort if necessary. Measurement P1528D is used to verify operation of the mechanical portions of the PU system.

- K. Proper removal of the second stage umbilical tower is necessary for launch. This action will be observed by visual means. In addition, for detailed analysis, the command signal (N1470X) which initiates this action and the umbilical mast position (N1026D) will be monitored.
- L. The following sequence measurements have been added as landline requirements as an aid to site personnel in conducting missile checkout and launch operations:

<u>MEAS NO.</u>	<u>DESCRIPTION</u>
E1111X	FREQUENCY LOW
E1112X	FREQUENCY HIGH
E1113X	DC LOW VOLTAGE
E1114X	DC HI VOLTAGE
E1115X	AC LOW VOLTAGE
E1116X	AC HI VOLTAGE
E1117X	EXTERNAL POWER
E1118X	INTERNAL POWER
P1928X	LOX READY FOR XFER
P1919X	APS READY
P1960X	LOX 95% (B)
P1961X	LOX OVERFILL (B)
P1964X	LOX 100.2% LVL

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MEAS NO.	DESCRIPTION
P1965X	LOX 100% LVL
P1994X	LOX 90% LVL
P1996X	LOX 99.5% LVL
P1998X	LOX O/FILL EMER COF

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PALC REDLINES -D

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REV-C

SYSTEM	MEAS NO.	TYPE	DESCRIPTION	REV	PHASE OF OPERATION	VALUE	PLUS MINUS TOL	EFFECTIVITY
F	1125	P	B CTL PNEU REG OUT		PRIOR TO V. E. START	SETTING PER 27-20473	25 PSIG	ALL D FLT MISSILES & F
F	1286	P	ST PNEU REG OUT		PRIOR TO V. E. START	SETTING PER 27-20473	25 PSIG	ALL D FLT MISSILES & F
P	1026	P	B LOX REG REF		PRIOR TO V. E. START	SETTING PER 27-20473	10 PSIG	ALL D FLT MISSILES & F
P	1344	P	S LOX REG REF		PRIOR TO V. E. START	SETTING PER 27-20473	20 PSIG	ALL D FLT MISSILES & F
P	1017	T	B2 TURB INLET		PRIOR TO V. E. START	0 DEG F MINIMUM		ALL D FLT MISSILES & F
P	1017	T	B2 TURB IN TEMP		5 SEC AFTER MS START	1400 DEG F MAXIMUM		FRF ONLY
P	1326	T	S TURB INLET		PRIOR TO V. E. START	0 DEG F MINIMUM		ALL D FLT MISSILES & F
P	1326	T	S TURB INLET		5 SEC AFTER MS START	1300 DEG F MAX		FRF ONLY
P	1673	T	B1 FUEL IGN VLV AME		AFTER MAINSTAGE COMPL	150 DEG F MAX		F
P	1674	T	B2 FUEL IGN VLV AMB		AFTER MAINSTAGE COMPL	150 DEG F MAX		F
P	1675	T	ENG CTL PNEU MAN AMB		AFTER MAINSTAGE COMPL	200 DEG F MAX		F
S			LO ₂ TANK HE PRESS.	B	UPPER STAGE MATNG			

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SECTION 4

CONVAIR  ASTRONAUTICS

ILLUSTRATIONS

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FORM NO. A-702-2

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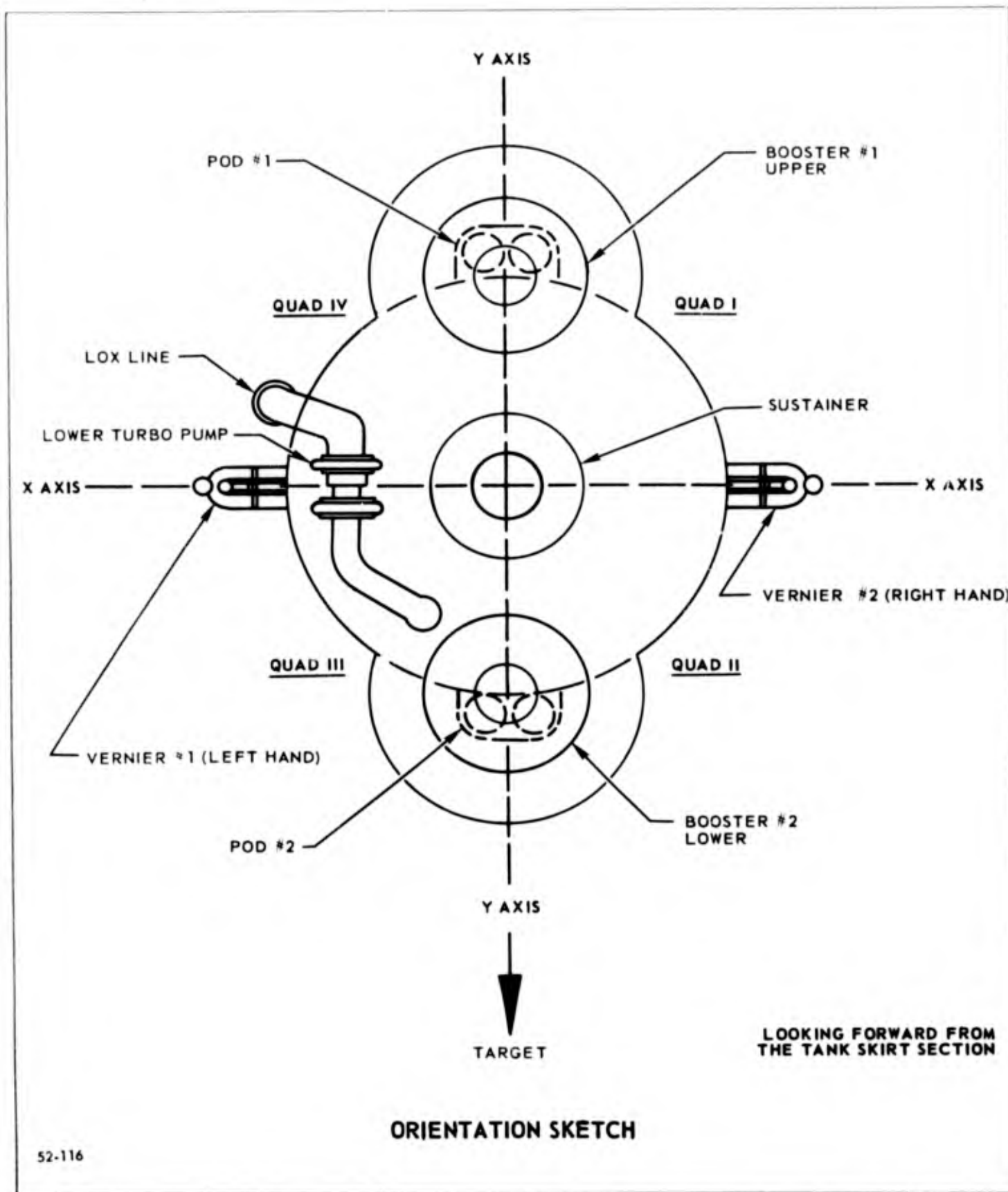
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SECTION 4-1

CONVAIR | ASTRONAUTICS

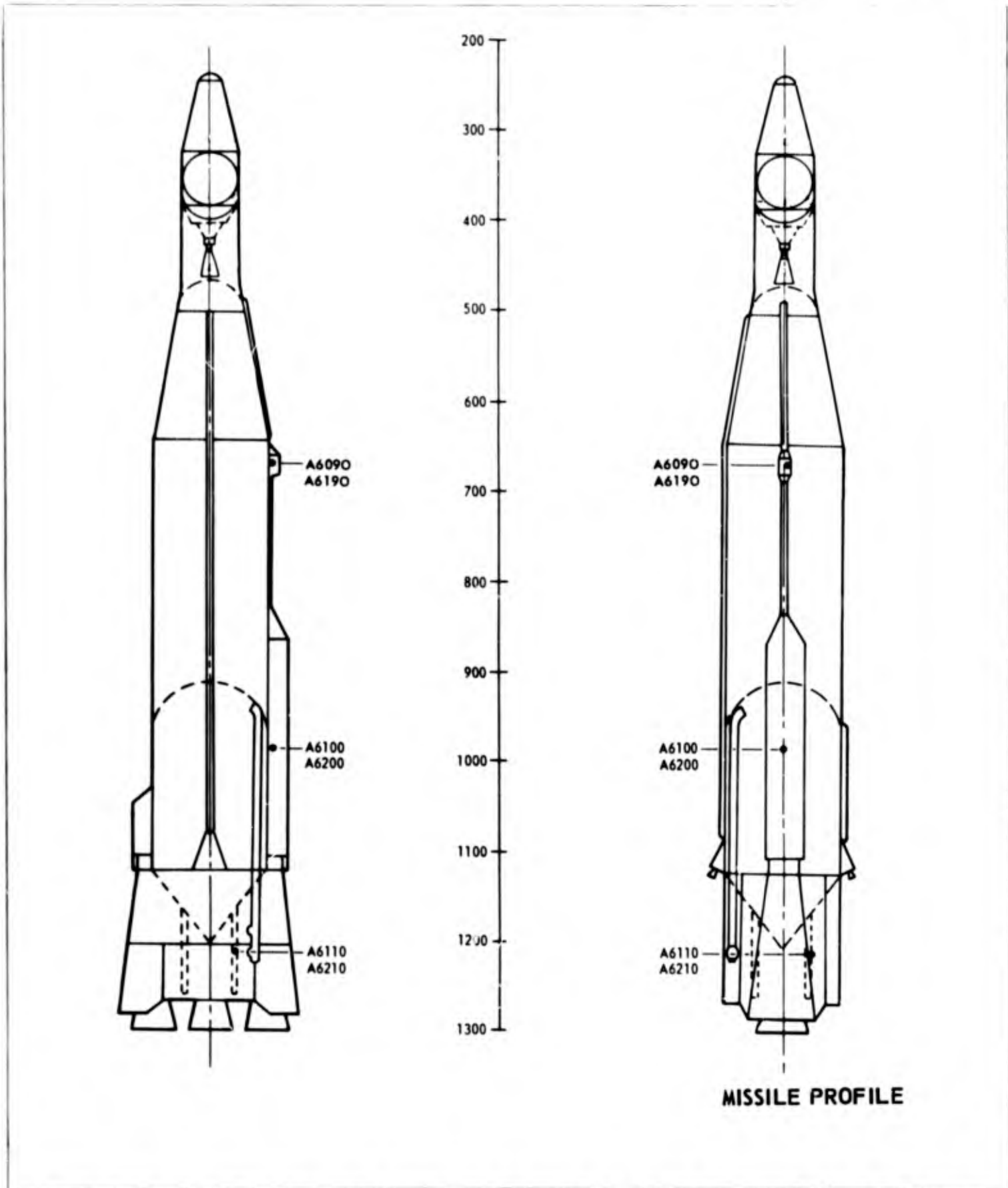


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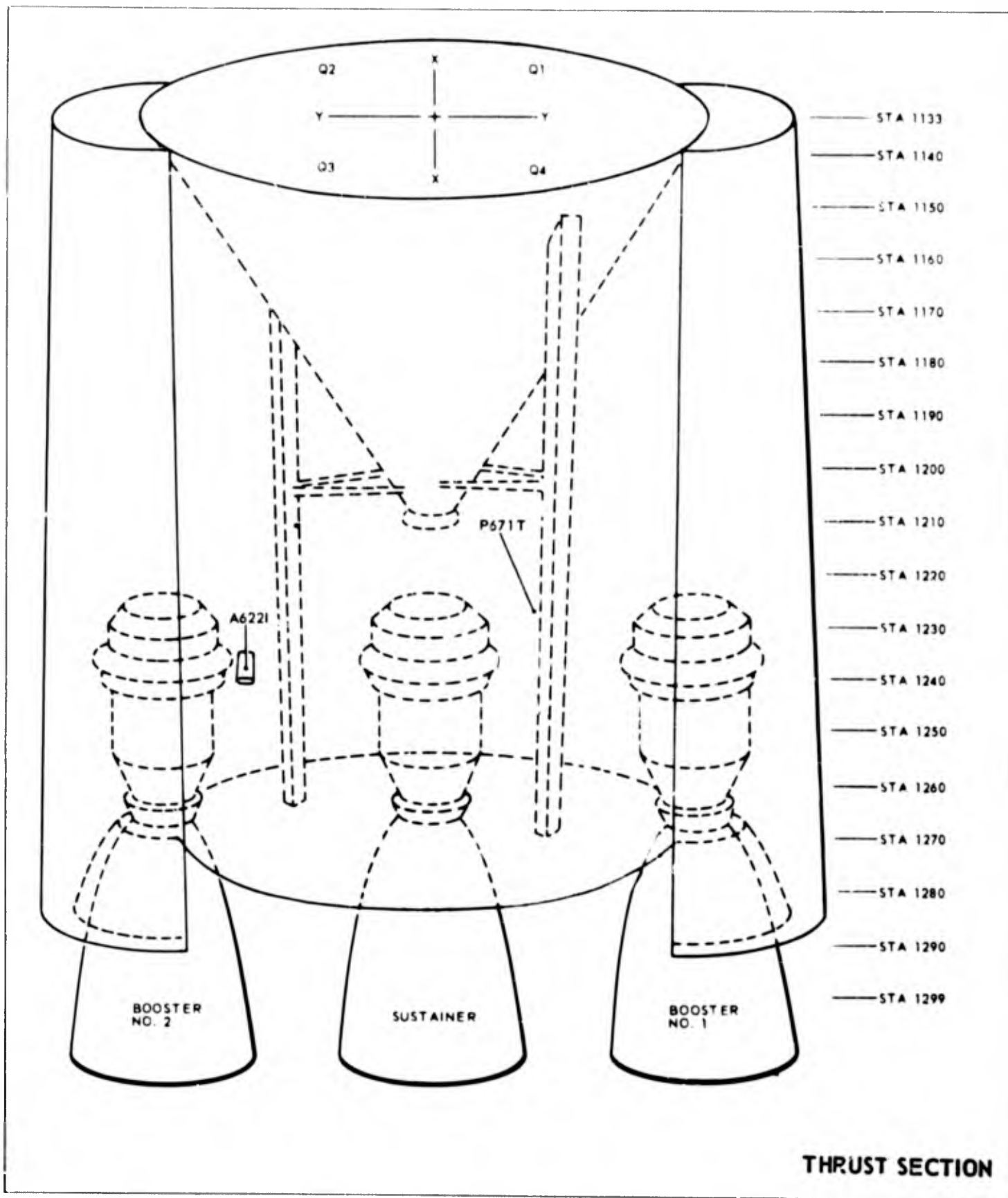
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SECTION 4-3

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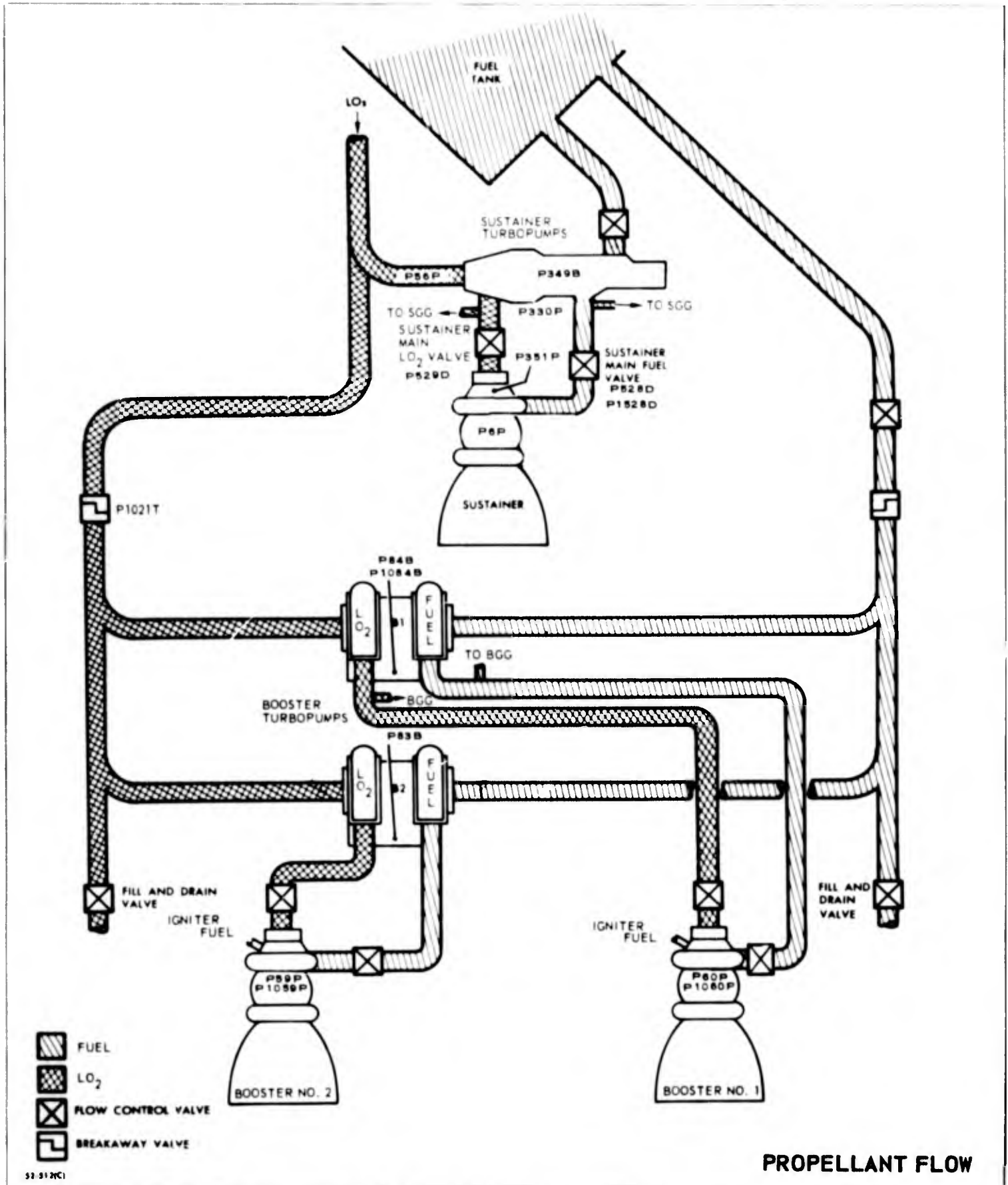


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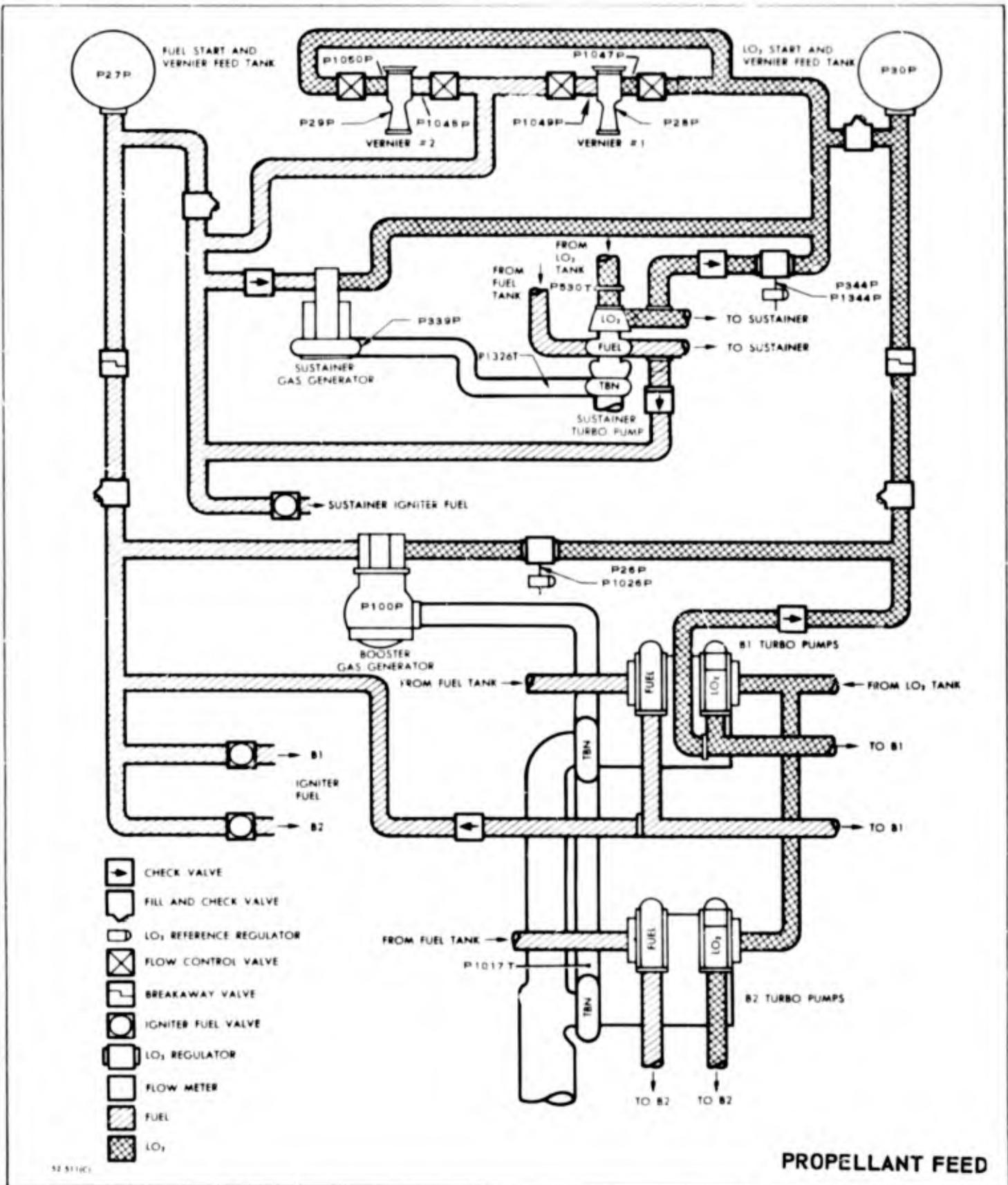
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SECTION 4-5

CONVAIR ASTRONAUTICS

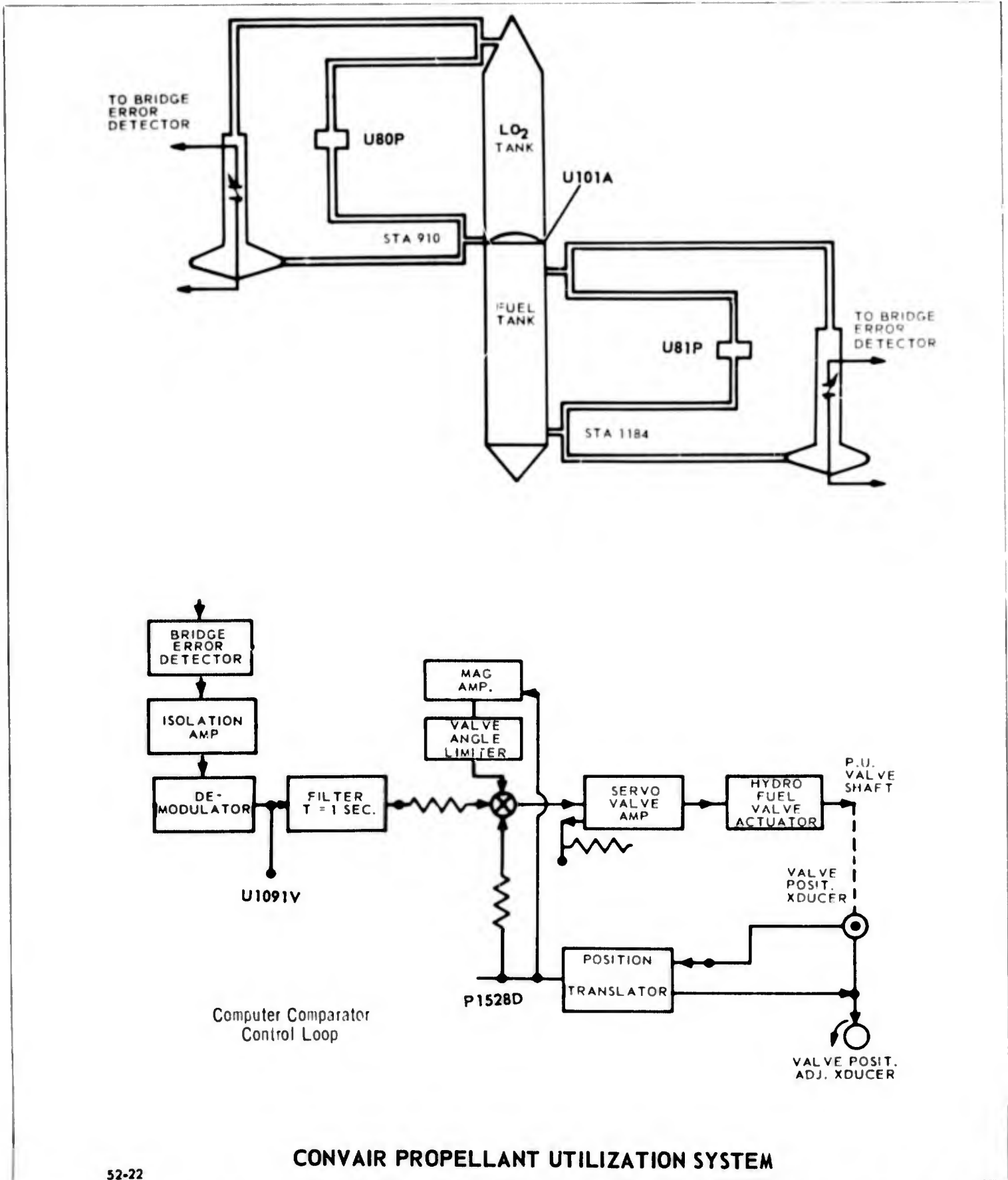


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CONVAIR  ASTRONAUTICS



52-22

CONVAIR PROPELLANT UTILIZATION SYSTEM

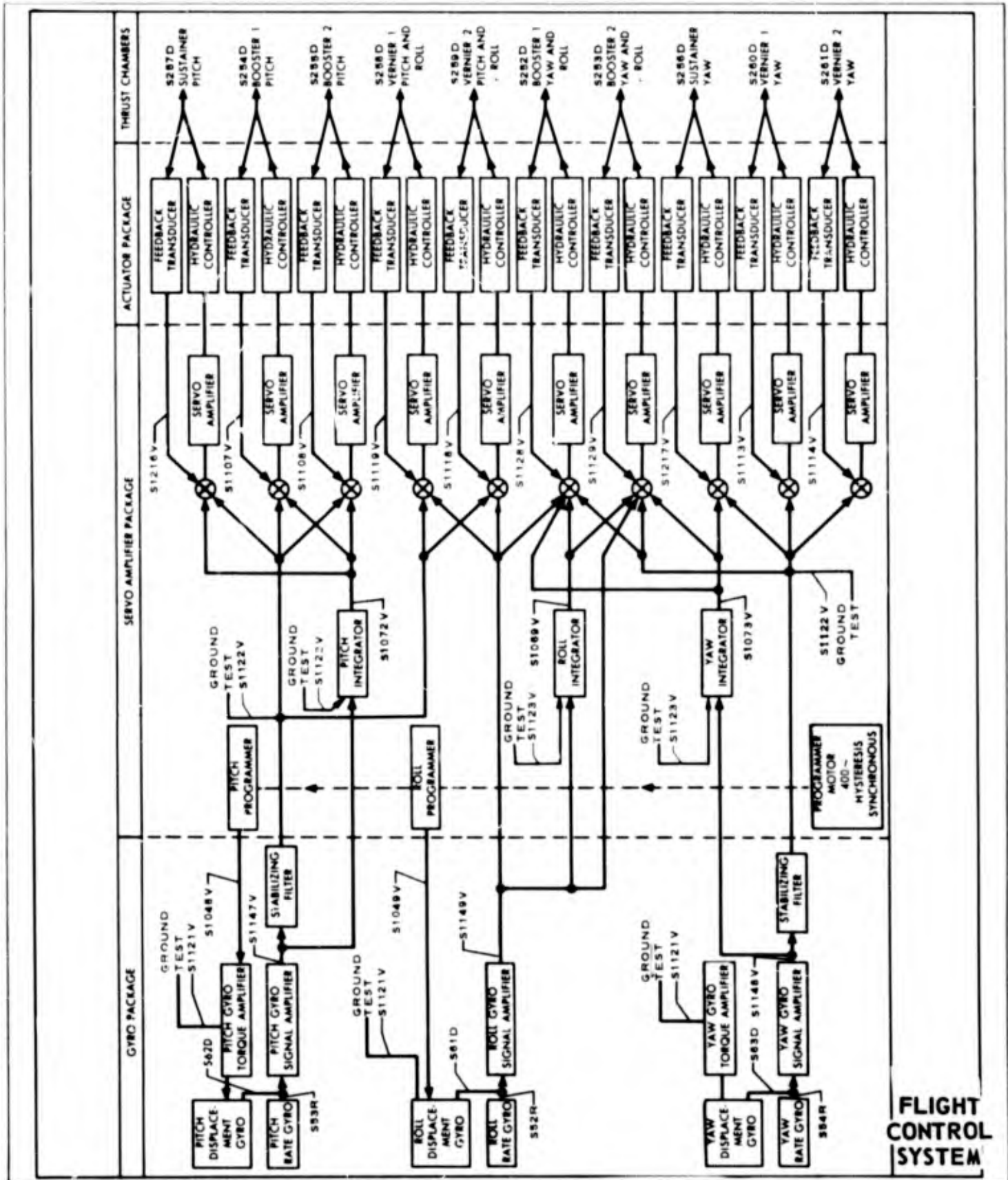
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SECTION 4-7

CONVAIR ASTRONAUTICS



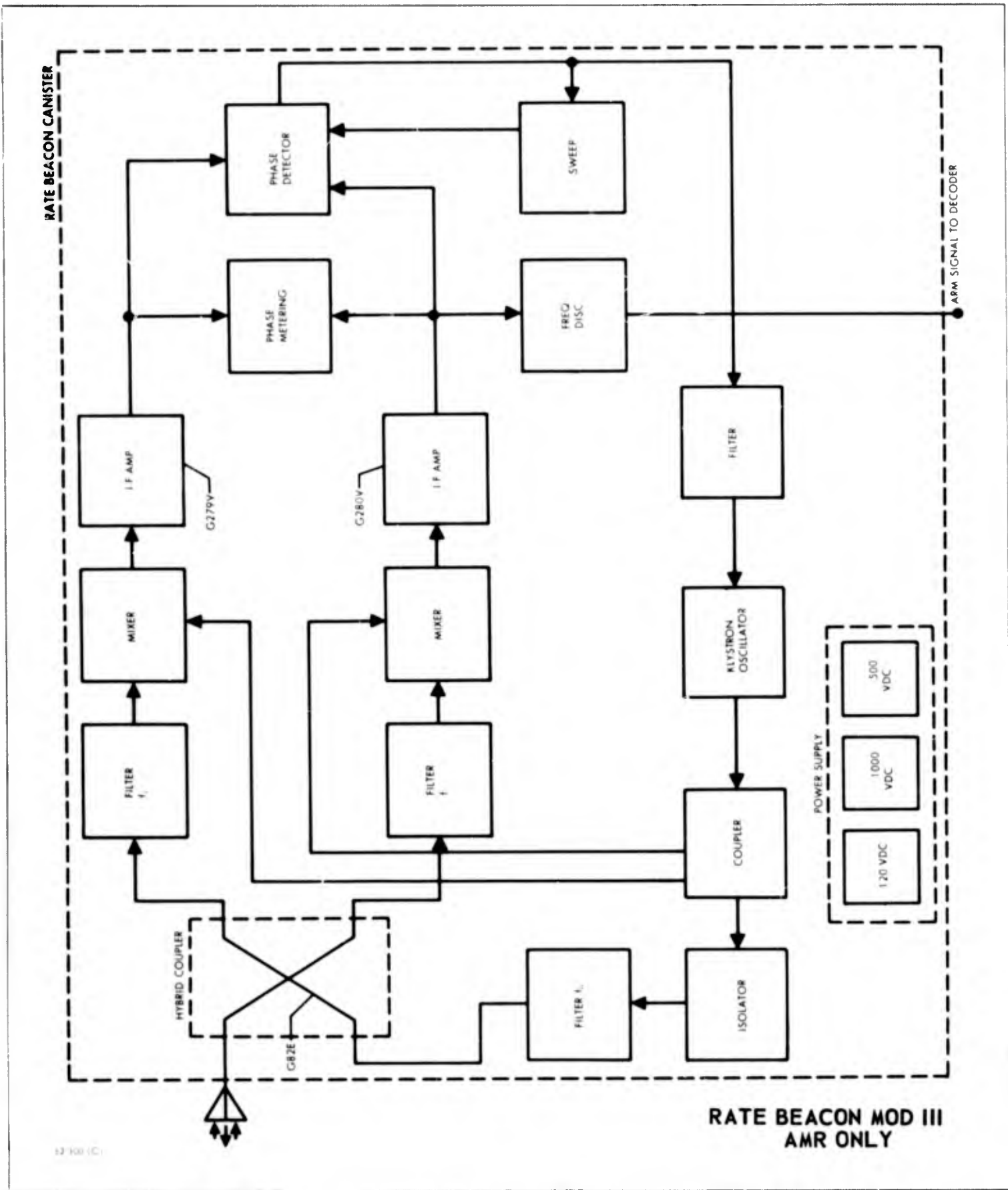
FLIGHT CONTROL SYSTEM

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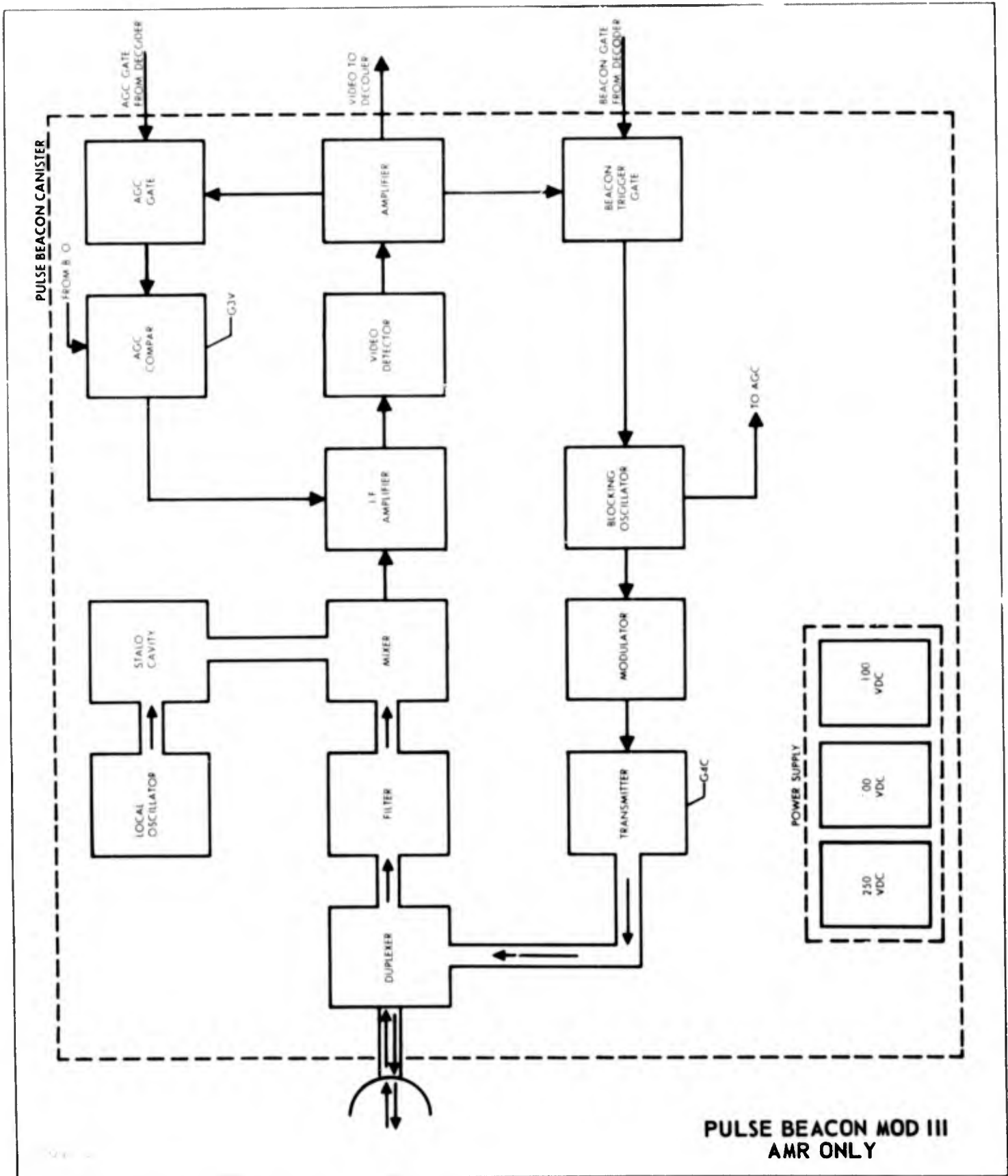
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SECTION 4-9

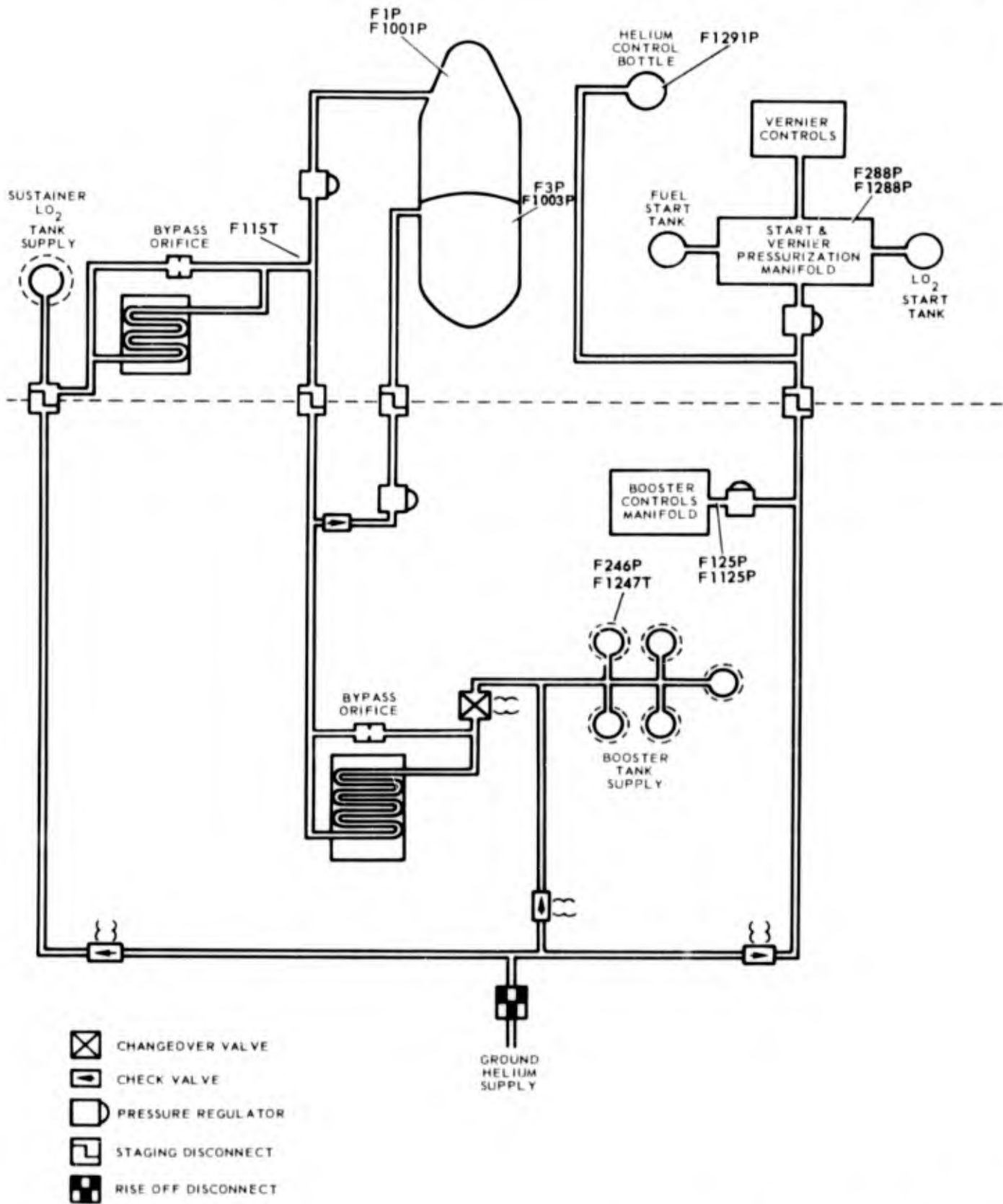
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PULSE BEACON MOD III
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57 234 167

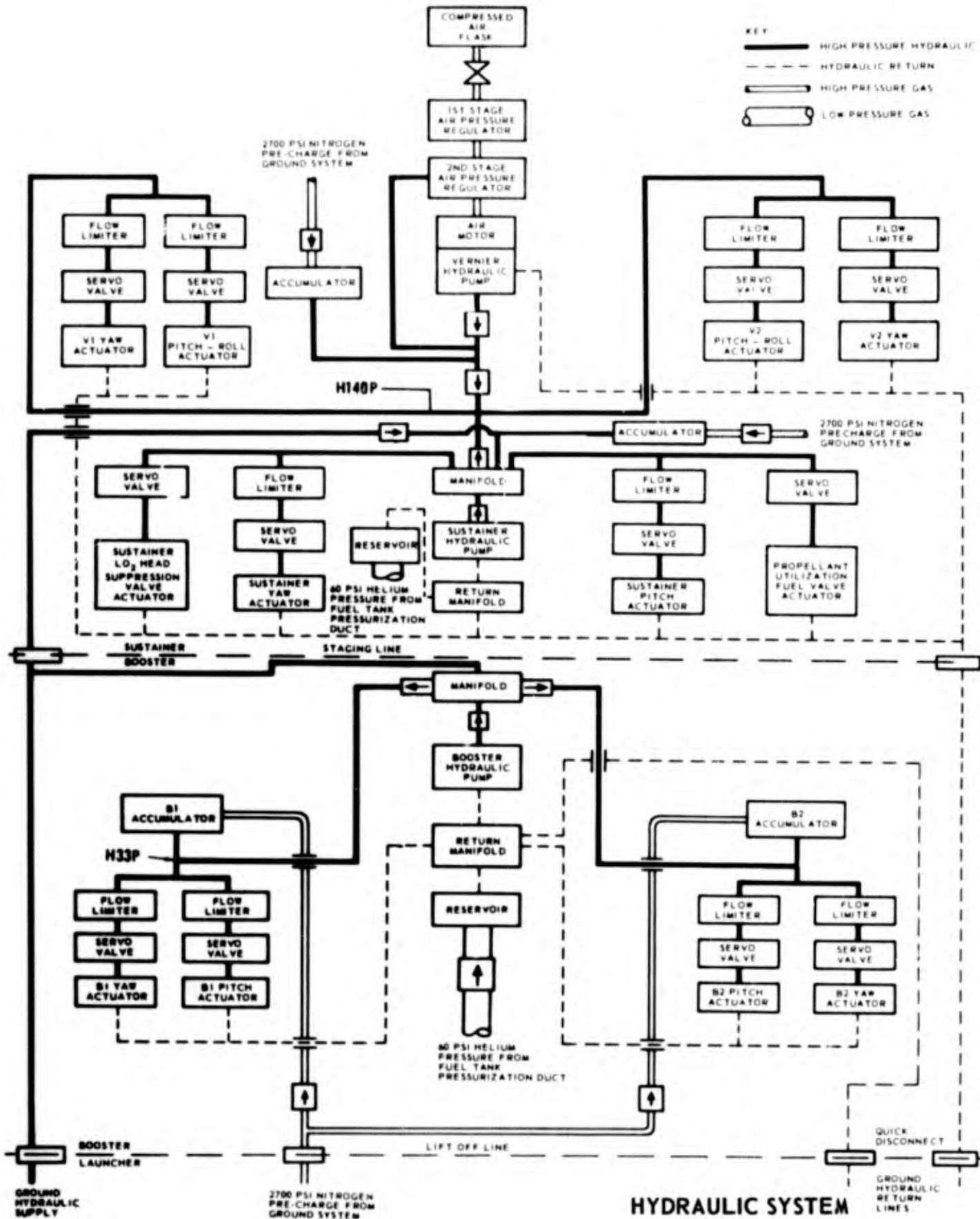
AIRBORNE PNEUMATICS SYSTEM

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REPORT NO. AZC-27-057

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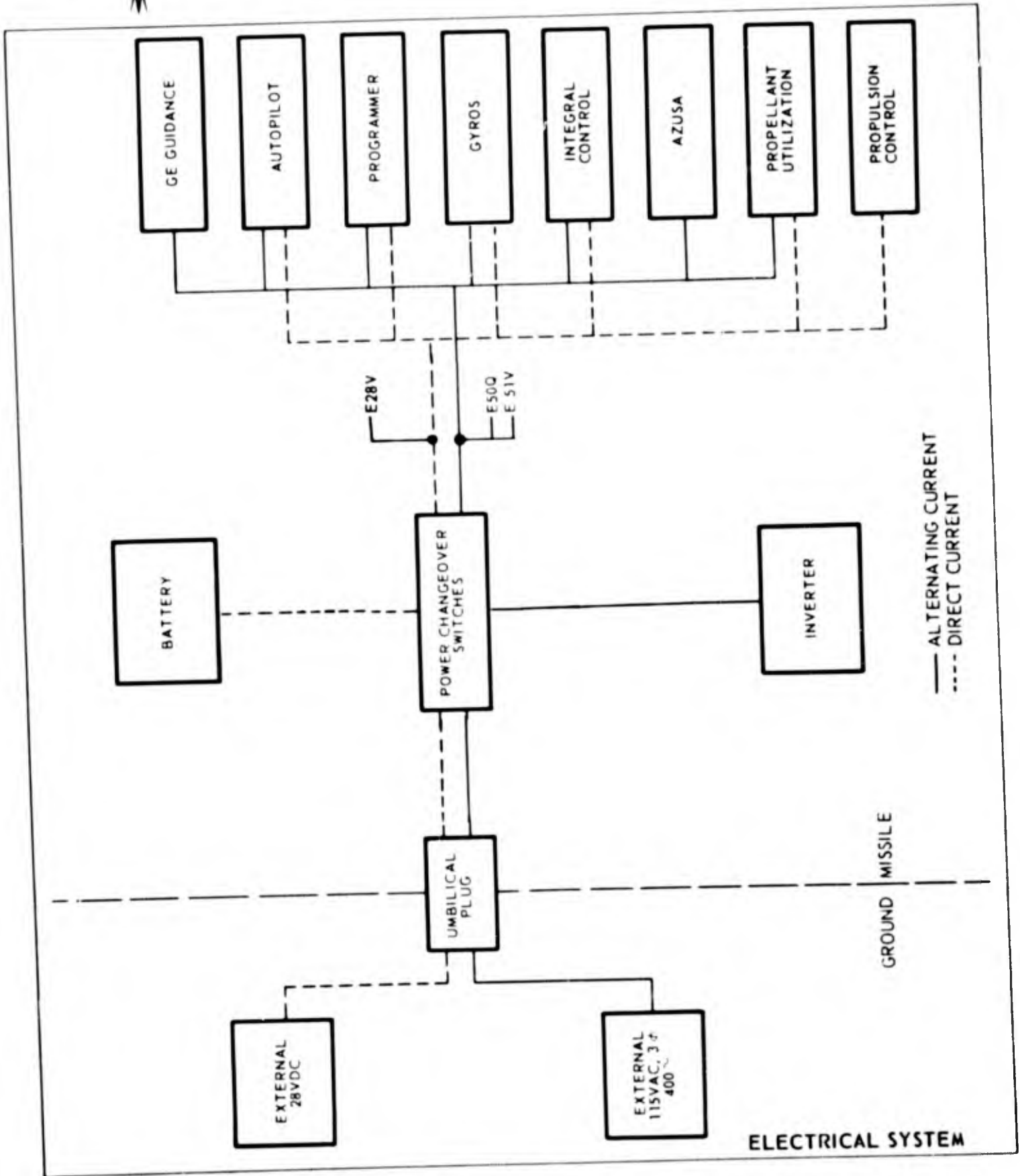


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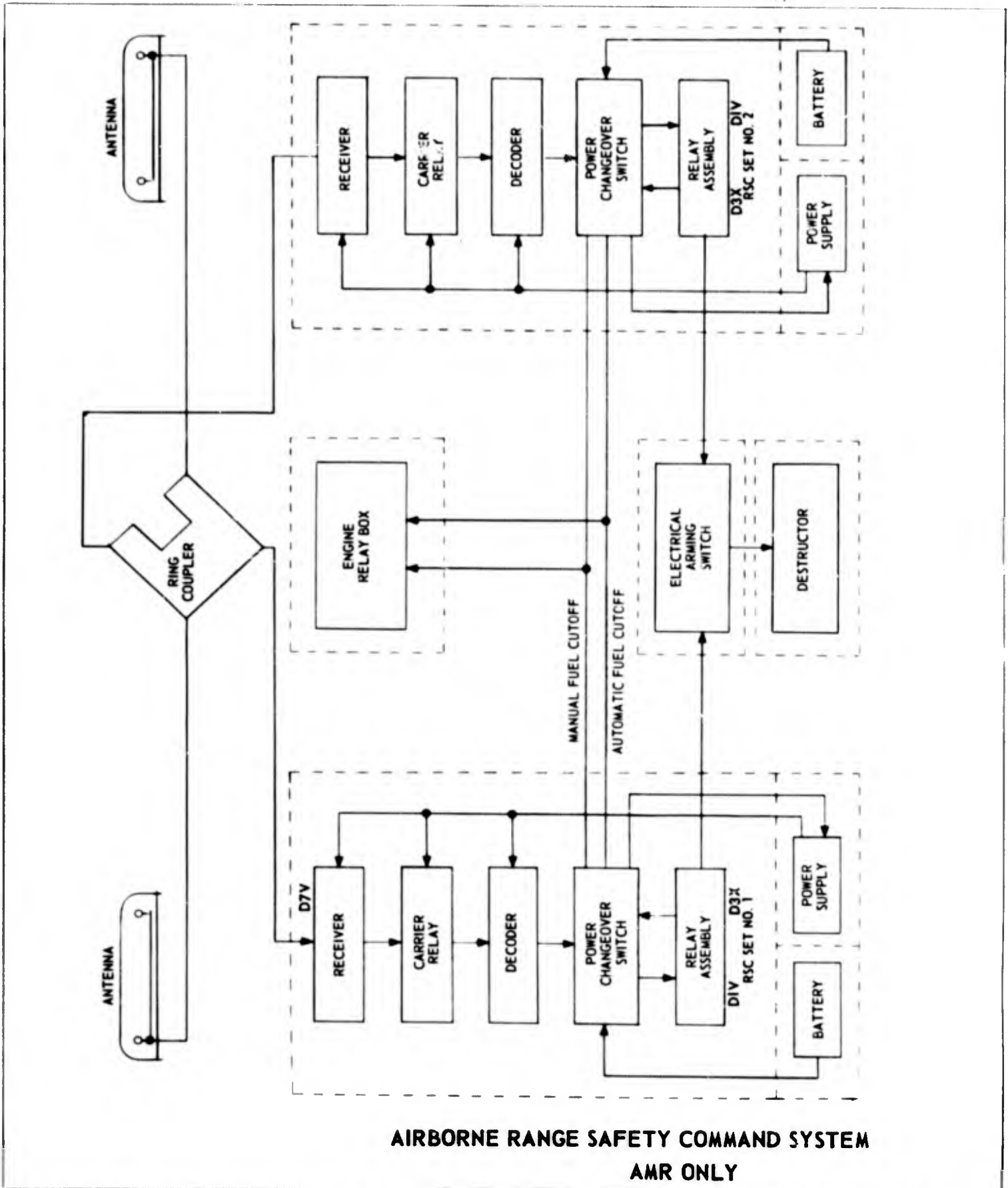


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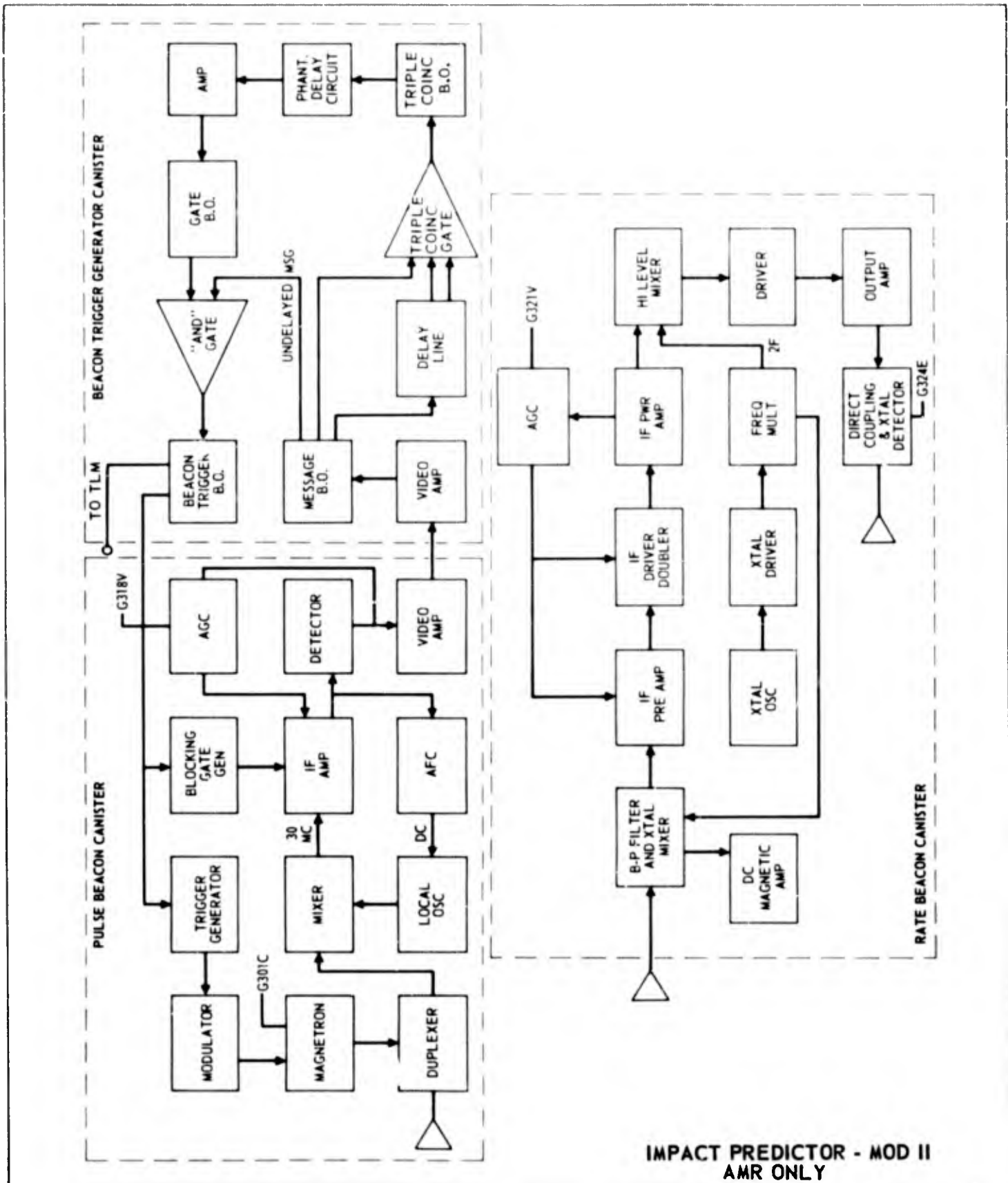
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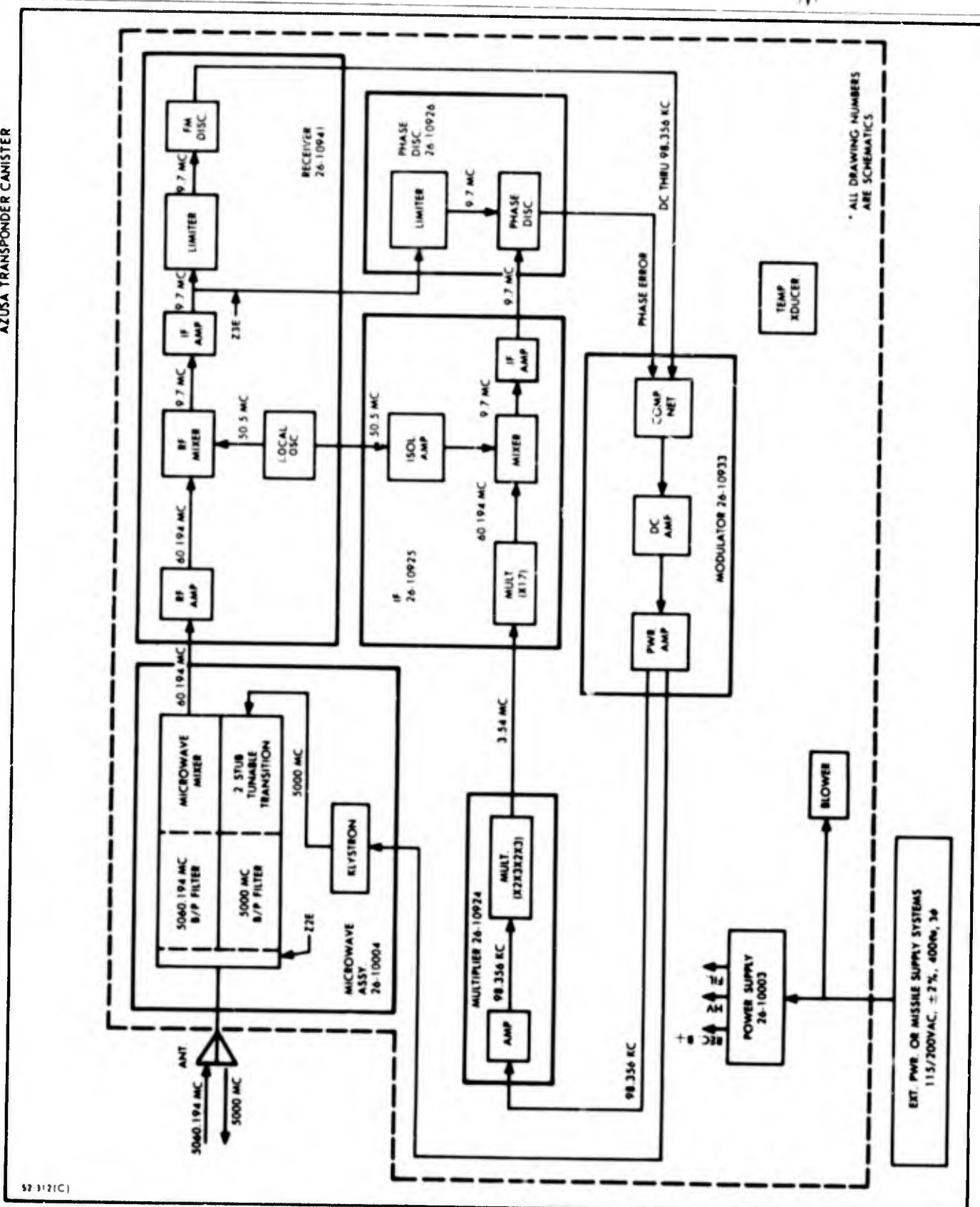
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AZUSA TRANSPONDER CANISTER



* ALL DRAWING NUMBERS ARE SCHEMATICS

52 3121C)

TYPE B COHERENT AZUSA TRANSPONDER AMR ONLY

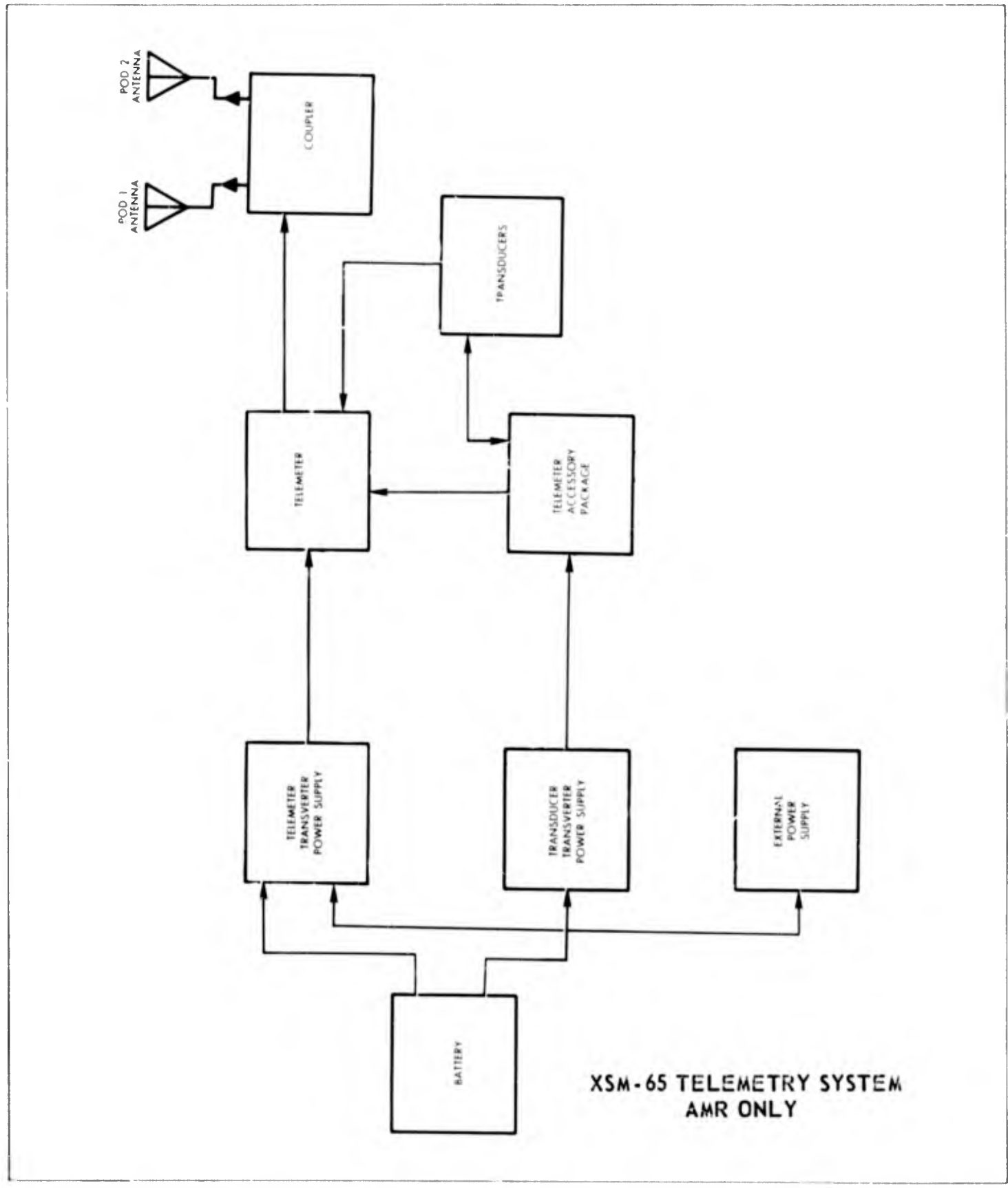
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SECTION 4-17

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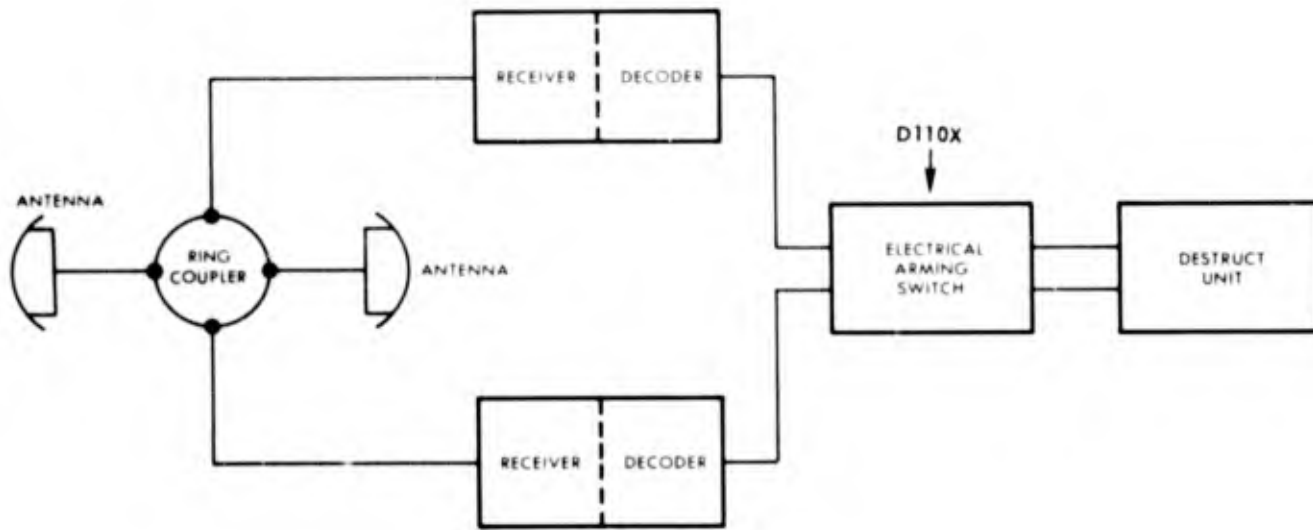
XSM-65 TELEMETRY SYSTEM
AMR ONLY

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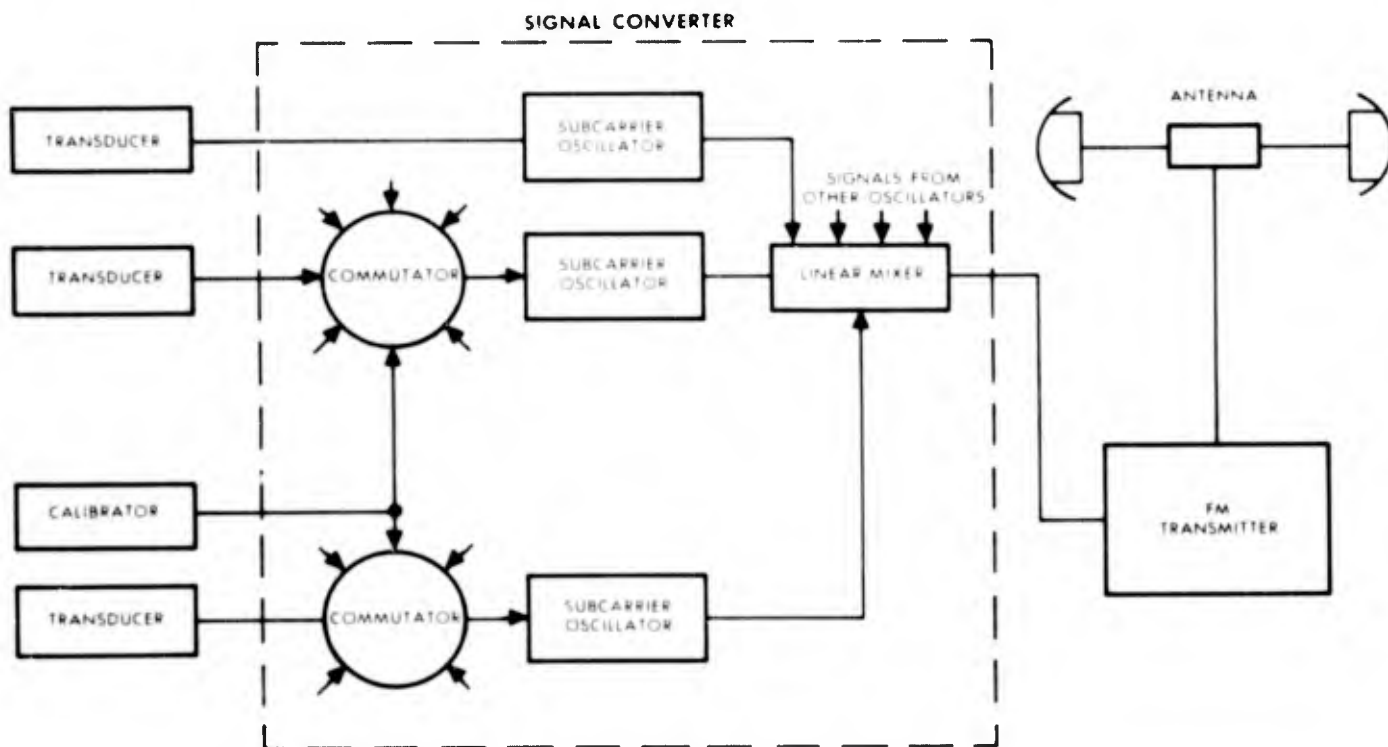
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IRSS RANGE SAFETY COMMAND SYSTEM

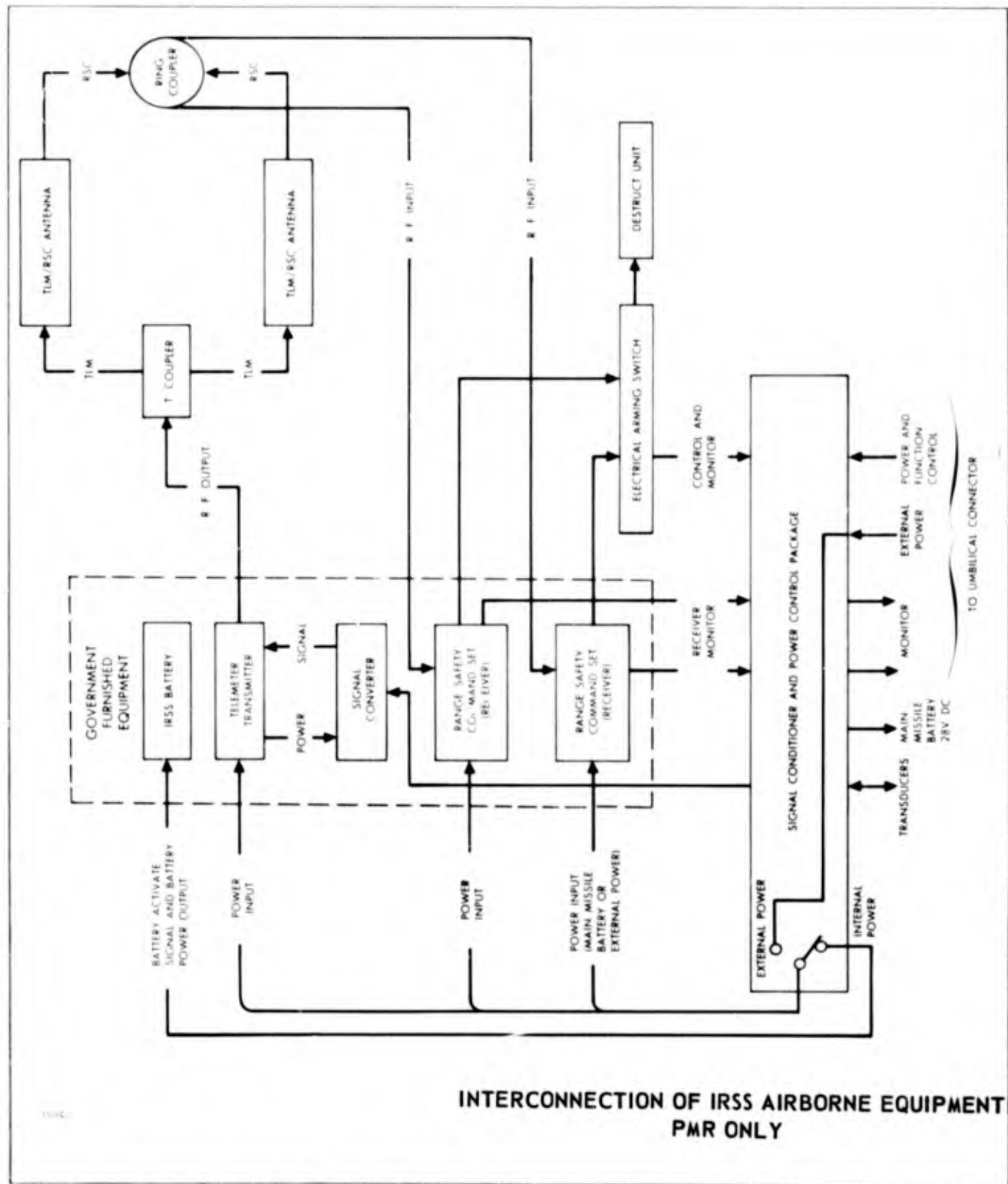


IRSS TELEMETRY SYSTEM
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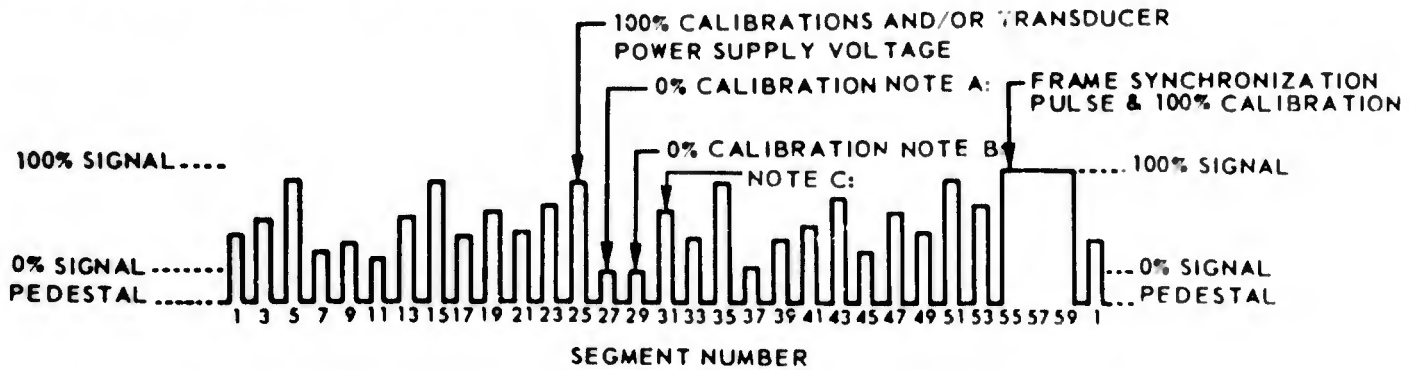


INTERCONNECTION OF IRSS AIRBORNE EQUIPMENT
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~~CONFIDENTIAL~~CONVAIR  ASTRONAUTICS**COMMUTATION WAVEFORM**

2.5, 5, 10 & 30 RPS COMMUTATION RATES (30 RPS COMMUTATOR DESIGN NOT FIXED)

**EFFECTIVITY:** TELEMETER CHANNELS 11, 13, A, C, E

NOTE A: FOR VOLTAGE AND PRESSURE MEASUREMENTS
0% CALIBRATION IS MISSILE GROUND.

NOTE B: 1. PIN 29 IS TIED TO PIN 27 ON ALL
COMMUTATED DATA CHANNELS WITH THE
EXCEPTION OF CHANNEL 11. ON THIS
CHANNEL PIN 27 IS TEMPERATURE
0% CALIBRATION.

2. FOR TEMPERATURE MEASUREMENTS
0% CALIBRATION IS 500 OHMS ABOVE
MISSILE GROUND.

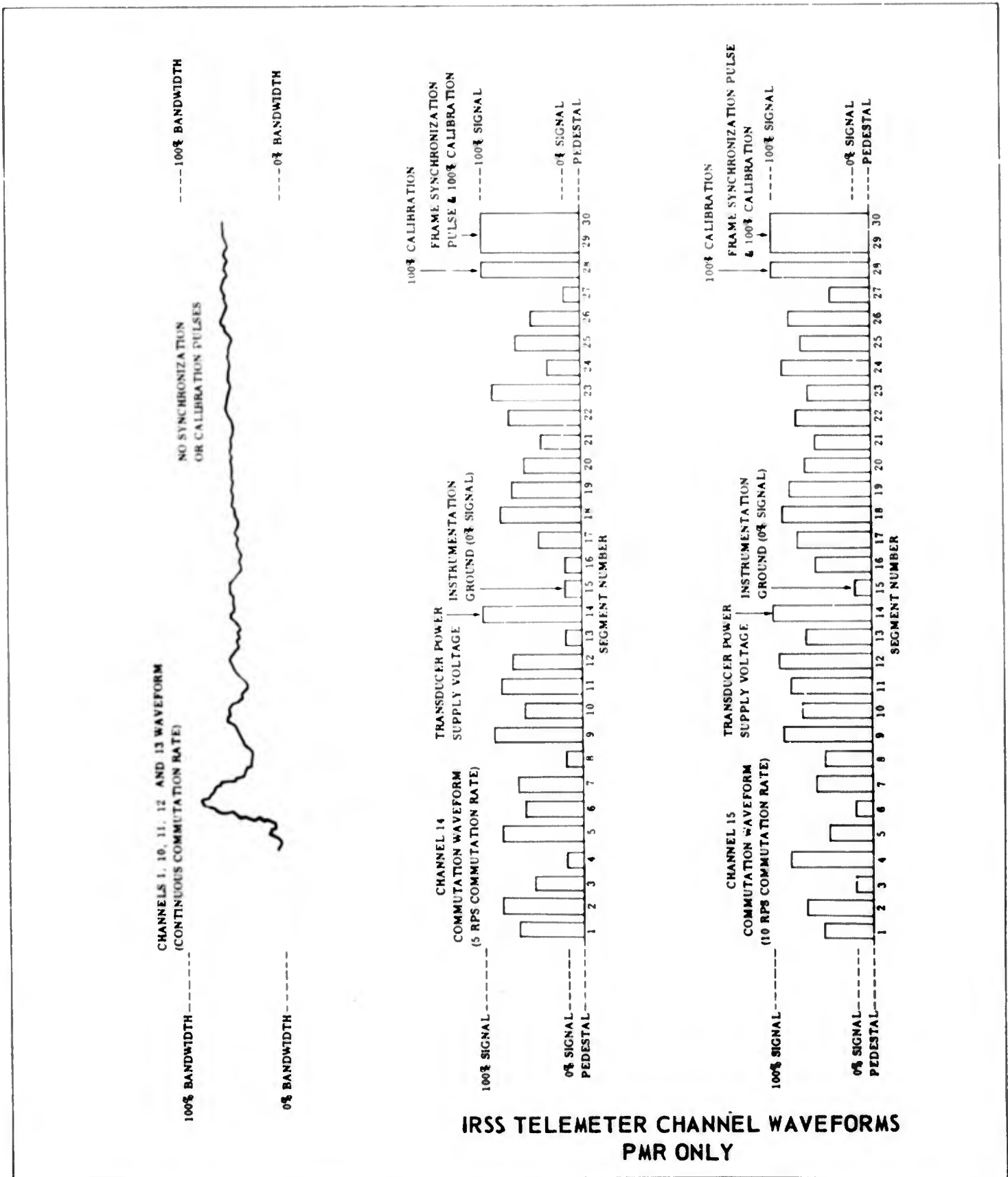
NOTE C: ON CHANNEL 11 ONLY, PIN 25 IS
TEMPERATURE 100% CALIBRATION
..... AND PIN 31 IS 100% TRANSDUCER
CALIBRATION. ON ALL OTHER COMMUTATED
CHANNELS PIN 31 CARRIES MEASUREMENT
DATA.

**COMMUTATED WAVEFORMS
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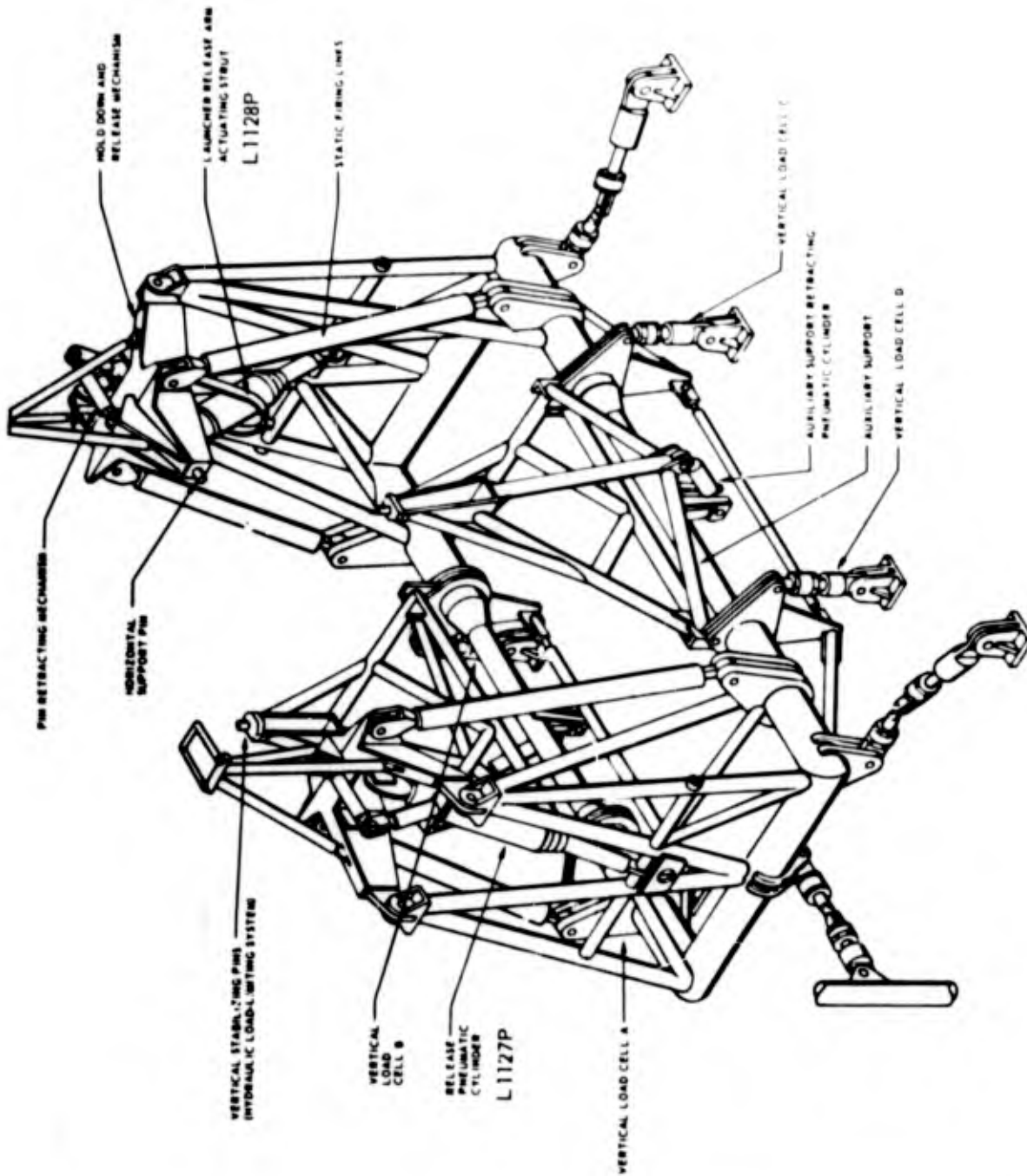
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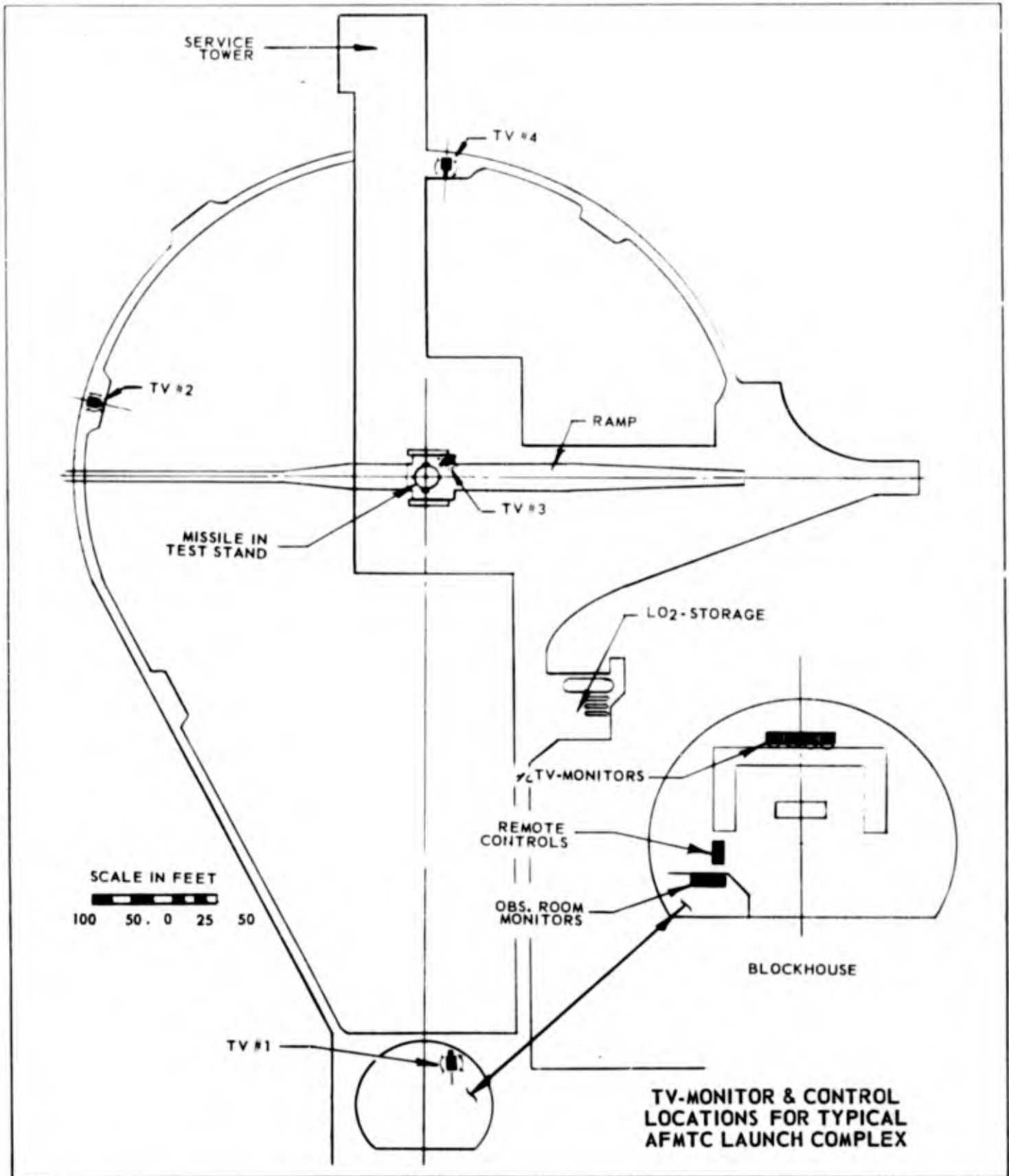


MISSILE LAUNCHER INSTALLATION

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CONVAIR-ASTRONAUTICS

REPORT NO. AZC-27-057
SECTION 5

SERIES COMP MSL PLAN 16 JAN 60 29 45 57 70 75 84 93 01 07 08 10 12 15 18 19 PAGE 001

SYRT E I T E MEAS E P S M NO E	DESCRIPTION	3	4	1	2	3	4	5	6	7	8	9	10	11	12	13	MIS S A I R L E A	
D A 622 I	TH SECT LIGHT QUAD 4 0 0	0	0	0	2	7	0	0	0	0	0	0	0	0	0	0	45321	
D A 609 O	STA 1212 Y AXIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12050	
D A 610 O	STA 980 Y AXIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12051	
D A 611 O	STA 670 Y AXIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12052	
D A 619 O	STA 1212 X AXIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12017	
D A 620 O	STA 980 X AXIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12019	
D A 621 O	STA 670 X AXIS	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	12021	
D A 573 T	L02 TK @ STA 504	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15950	
D A 604 T	L02 TK @ STA 640	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	15952	

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PAGE 002

57 70 75 84 93 01 07 08 10 12 15 18 19

SERIES COMP MSL PLAN 16 JAN 60 29 45

44203
44221

D D 1 V RSC CUTOFF OUTPUT 0 0
D D 7 V #1 RSC RF INPUT/AGC 0 0

D D M138 W COMMAND #1 BATTERY M M
D D M139 W COMMAND #2 BATTERY M M
D D M140 W COMMAND #1 TOTAL M M
D D M141 W COMMAND #2 TOTAL M M
D D M145 W ACCESSORY TOTAL M M

44215
44219
44230

D D 3 X RSC DESTRUCT OUTPUT 0 0
4 D 110 X MSL DESTRUCT SIGNAL 0 0 0 0 0 0 0 0 0 0 0 0
D D 357 X TCC RSINT AND ARMED X X

10

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PAGE 004

57 70 75 84 93 01 07 08 10 12 15 18 19

SERIES COMP MSL PLAN 16 JAN 60 29 45

Item ID	Description	57	70	75	84	93	01	07	08	10	12	15	18	19
D F 3309 D	LO2 ULLAGE VENT	V	V	V	V	V	V	V	V	V	V	V	V	V
D F 1 P	LO2 TANK MELIUM	OX	OX	OX	OX	OX	OX	OX	OX	OX	OX	OX	OX	OX
D F M001 P	LO2 TANK MELIUM													
D F 3 P	FUEL TANK MELIUM	OX	OX	OX	OX	OX	OX	OX	OX	OX	OX	OX	OX	OX
D F M003 P	FUEL TANK MELIUM													
D F M032 P	LN2 PRESSURE													
D F 3047 P	PCU FUEL SENSOR LINE	V	V	V	V	V	V	V	V	V	V	V	V	V
D F 3050 P	PCU LO2 SENSOR LINE	V	V	V	V	V	V	V	V	V	V	V	V	V
D F M093 P	NORM SUP PRESSURE													
D F M054 P	EMERG SUP PRESSURE													
D F M116 P	DIFFERENTIAL PRESS													
D F 125 P	B CTL PNEU REG OUT	OX	OX	OX	OX	OX	OX	OX	OX	OX	OX	OX	OX	OX
D F 194 P	FACILITY GN2 SUPPLY	X	X	X	X	X	X	X	X	X	X	X	X	X
D F 246 P	B TK HE BTL HI													
D F M246 P	OSTR TANK PRESSURE													
D F M248 P	SUST TANK PRESSURE													
D F 288 P	ST PNEU REG OUT	OX	OX	OX	OX	OX	OX	OX	OX	OX	OX	OX	OX	OX
D F 291 P	S CTL HE BTL	X	X	X	X	X	X	X	X	X	X	X	X	X
D F M291 P	SUST CONT PRESSURE													
D F 3301 P	GND LO2 ULLAGE TANK	V	V	V	V	V	V	V	V	V	V	V	V	V
D F 3302 P	GND FUEL ULLAGE TANK	V	V	V	V	V	V	V	V	V	V	V	V	V

41024

41046

21010

21027

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REPORT NO. AZC-27-057
SECTION 5

PAGE 005

57 70 75 84 93 01 07 08 10 12 15 18 19

SERIES COMP MSL PLAN 16 JAN 60 29 45

D F 3770 P LN2 STORAGE TK PRESS	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
D F 247 T B TK HE BOTTLES	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
D F M247 T BSTR TANK TEMP																			
D F M249 T SUST TANK TEMP																			
D F 290 T S CTL HE BOTTLE	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X
D F M290 T SUST CONT TEMP																			
D F 3894 T HE LINE AT STUB UP	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
D F 3895 T LN2 LINE AT STUB UP	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V	V
D F 207 X TCC INTL PNEU P LITE	X																		

30

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REPORT NO. AZC-27-057
SECTION 5

PAGE 007

57 70 75 84 93 01 07 08 10 12 15 18 19

SERIES COMP MSL PLAN 16 JAN 60 29 45

D	G	552	X	D	CONTACT #5	X	X
D	G	553	X	D	CONTACT #6	X	X
D	G	554	X	D	CONTACT #7	X	X

32349

32350

32351

21

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SERIES COMP MSL PLAN		16 JAN 60	29 45	57	70	75	84	93	01	07	08	10	12	15	18	19	PAGE 008
D	H 33 P B1 HYD ACCUMULATOR		0 0														42010
D	H 140 P S/VERN HYD PRESS		0 0														42220
D	H 101 X TCC INTL HYD P LITE		X X														42300
D	H 146 X B HYD H1 PRESS SW		X X														42301
D	H 147 X S HYD H1 PRESS SW		X X														42302
D	H 187 X 85TR OIL EVACUATION		X X														42303
D	H 188 X SUST OIL EVACUATION		X X														42304

7

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CONVAIR-ASTRONAUTICS

REPORT NO. AZC-27-057
SECTION 5

PAGE 011

57 70 75 84 93 01 07 08 10 12 15 16 19

SERIES COMP MSL PLAN 16 JAN 60 29 45

D N 3984 D	LO2 TOPPING VLV POS	V	V	V	V	V	V	V	V	V	V	V	V	V	V	95081
D N 3300 P	FUEL STORAGE TK	V	V	V	V	V	V	V	V	V	V	V	V	V	V	95082
D N 3301 P	PRECHARGE #1 PRESS	V	V	V	V	V	V	V	V	V	V	V	V	V	V	95083
D N 345 P	FUEL STOR TK LIQ LVL	X	X	X	X	X	X	X	X	X	X	X	X	X	X	95084
D N 346 P	LO2 STOR TK LIQ LVL	X	X	X	X	X	X	X	X	X	X	X	X	X	X	95086
D N 347 P	FACIL H2O AT MANIF	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
D N 352 P	HE REG INLET PCU	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
D N 3360 P	LO2 STORAGE TK	V	V	V	V	V	V	V	V	V	V	V	V	V	V	
D N 361 P	GO2 STORAGE TK	X	X	X	X	X	X	X	X	X	X	X	X	X	X	
D N 342 T	POD AIR DUCT															95020
D N 344 T	TRANSFER ROOM															95022
D N 3349 T	ENG COMP HTR DISCH	V	V	V	V	V	V	V	V	V	V	V	V	V	V	95055
D N 353 T	KECO HTR OUTPUT															
D N 343 X	POD AIR DUCT VALVE															95021
D N 354 X	KECO AIRFLOW SAIL SW															95056

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SERIES COMP MSL PLAN		16 JAN 60	29 45	57	70	75	84	93	01	07	08	10	12	15	18	19	PAGE	012
D	P	83 B	B2 PUMP SPEED	O	O												22036	
D	P	84 B	B1 PUMP SPEED	O	O												22035	
D	P	M242 B	PUMP LC SPEED	M	M												22068	
D	P	349 B	S PUMP SPEED	O	O													
D	P	314 C	LO2 TOPPING SIGNAL	X	X												72733	
D	P	M251 D	LC THROTTLE VALVE	M	M													
D	P	528 D	S MAIN FUEL VALVE	O	O												26201	
D	P	529 D	S MAIN LO2 VALVE	O	O												23399	
D	P	M685 H	FUEL IN MISSILE	M	M													
D	P	6 P	S THRUST CHAMBER	OX	OX												25005	
D	P	26 P	B LO2 REG REFERENCE	OX	OX												22006	
D	P	27 P	VERNIER FUEL TANK	O	O												24014	
D	P	28 P	V1 THRUST CHAMBER	O	O												25010	
D	P	29 P	V2 THRUST CHAMBER	O	O												25011	
D	P	30 P	VERNIER LO2 TANK	O	O												24013	
D	P	56 P	S LO2 PUMP INLET	O	O												23404	
D	P	59 P	B2 THRUST CHAMBER	OX	OX												25003	
D	P	60 P	B1 THRUST CHAMBER	OX	OX												25001	

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SERIES COMP MSL PLAN 16 JAN 60 29 45

D P 100 P	B GG COMBUSTION CHM	0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	22010
D P 330 P	S FUEL PUMP DISCH	0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	23406
D P 339 P	S GAS GEN DISCH	0 0	0 0 0 0 0 0 0 0 0 0 0 0 0 0 0	22062
D P 344 P	S LO2 REG REFERENCE	OX OX	X X X X X X X X X X X X X X X	22054
D P 351 P	S LO2 INJ MANIFOLD	0 0		23407
D P M373 P	LO2 STORAGE TANK	M M		
D P M430 P	FUEL STORAGE TANK	M M		
D P 3863 P	LO2 SUBCOOLER OUT		V V V V V V V V V V V V V V V	
D P 3864 P	LO2 TRG DSTR OF FLTR		V V V V V V V V V V V V V V V	
D P 17 T	B2 TBN INLET	X X	X X X X X X X X X X X X X X X	22025
D P 21 T	LO2 AT BREAKAWAY VLV	X X	X X X X X X X X X X X X X X X	23390
D P 326 T	S TURBINE INLET	X X	X X X X X X X X X X X X X X X	22063
D P 530 T	S LO2 PUMP INLET	0 0		23405
D P 671 T	TH SECT AMB QUAD 4	0 0		45320
D P 673 T	B1 FUEL IGN VLV AMB	X X	X X X X X X X X X X X X X X X	24350
D P 674 T	B2 FUEL IGN VLV AMB	X X	X X X X X X X X X X X X X X X	24351
D P 675 T	ENG CTL PNEU MAN	X X	X X X X X X X X X X X X X X X	24352
D P 3862 T	LO2 SUBCOOLER OUT		V V V V V V V V V V V V V V V	
D P 67 X	B2 LO2 VLV CLSD MSW	S S	S S S S S S S S S S S S S S S	72208
D P 68 X	B1 LO2 VLV CLSD MSW	S S	S S S S S S S S S S S S S S S	72207

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D	P 69 X B2 FUEL VLV CLSD MSW	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	72314
D	P 70 X B1 FUEL VLV CLSD MSW	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	72313
D	P 71 X BGG VLV CLOSED MSW	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	72304
D	P 72 X BOOSTER CUTOFF RELAY	OS	OS	0	0	0	0	0	0	0	0	0	0	0	0	0	24001
D	P 73 X V1 PV CLOSED MSW	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	24053
D	P 74 X V2 PV CLOSED MSW	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	24055
D	P 77 X VERNIER CUTOFF RELAY	OS	OS	OS	OS	OS	OS	OS	OS	OS	OS	OS	OS	OS	OS	OS	24201
D	P 137 X ETP PREP COMPLETE LT	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	72036
D	P 143 X GAS GEN IGN LINK BK	S	S	X	X	X	X	X	X	X	X	X	X	X	X	X	72037
D	P 147 X B GG VLV OPEN MSW	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	24006
D	P 154 X TCC B ENGINE COF SW	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	73202
D	P 155 X OBSERVER CUTOFF	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	73210
D	P 157 X B2 TBN OVRSPD TRIP	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	73016
D	P 158 X PREP INCOMPLETE COF	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	73020
D	P 161 X TCC START SWITCH	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	72101
D	P 164 X TCC VERN ENG COF SW	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	73201
D	P 169 X B2 LO2 VLV OPEN MSW	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	72208
D	P 170 X B1 LO2 VLV OPEN MSW	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	72207
D	P 172 X V1 PV OPEN MSW	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	24054
D	P 174 X V2 PV OPEN MSW	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	24056
D	P 192 X B1 ROUGH COMB COF	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	73122
D	P 193 X B2 ROUGH COMB COF	S	S	S	S	S	S	S	S	S	S	S	S	S	S	S	73127

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D	P	194	X	B1 FUEL VLV OPEN MSW	S	S	S	S	S	S	S	S	S	S	S	S	S	S	72313
D	P	195	X	B2 FUEL VLV OPEN MSW	S	S	S	S	S	S	S	S	S	S	S	S	S	S	72314
D	P	198	X	S L02 HSV OPEN MSW	S	S	S	S	S	S	S	S	S	S	S	S	S	S	72223
D	P	199	X	S L02 HSV CLOSED MSW	S	S	S	S	S	S	S	S	S	S	S	S	S	S	24102
D	P	202	X	S FUEL PUV OPEN MSW	S	S	S	S	S	S	S	S	S	S	S	S	S	S	72323
D	P	203	X	S FUEL PUV CLSD MSW	S	S	S	S	S	S	S	S	S	S	S	S	S	S	24103
D	P	311	X	90% FUEL LVL IND	X	X													72730
D	P	335	X	SGG VLV CLSD MSW	S	S													24105
D	P	347	X	S COF RELAY LOCKIN	OS	OS	0	0	0	0	0	0	0	0	0	0	0	0	24101
D	P	438	X	S ROUGH COMB COF	S	S	S	S	S	S	S	S	S	S	S	S	S	S	73132
D	P	441	X	IGNITION STAGE TIMER	S	S													73004
D	P	445	X	B FUEL PRE VLV OPEN	S	S													72015
D	P	446	X	B FUEL PRE VLV CLSD	S	S													72016
D	P	499	X	S GG VLV OPEN MSW	S	S	S	S	S	S	S	S	S	S	S	S	S	S	24106
D	P	566	X	DC GND PWR FAIL COF	S	S													73305
D	P	575	X	PRE START READY	S	S													72039
D	P	577	X	RELEASE SIGNAL	X	X													72360
D	P	580	X	S FUEL PRE VLV CLSD	S	S													72017
D	P	581	X	S FUEL PRE VLV OPEN	S	S													72018
D	P	588	X	S TBN OVERSPEED TRIP	S	S	S	S	S	S	S	S	S	S	S	S	S	S	73017
D	P	592	X	BOOSTER ENG CUTOFF	S	S													73006
D	P	593	X	SUSTAINER ENG CUTOFF	S	S													73134

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D	P	594	X	TCC SUSTAINER COF SW	S	S												73200	
D	P	596	X	PRE-RLS COF DISARM	S	S												72361	
D	P	598	X	VERNIER ENG CUTOFF	S	S												73036	
D	P	608	X	ENG TANKS PRES	S	S												24050	
D	P	609	X	ENG FUEL TK PRESO	S	S												24051	
D	P	610	X	ENG LO2 TK PRESO	S	S												24052	
D	P	611	X	MAIN IGNITION START	S	S												72255	
D	P	612	X	GG IGN LINK PILOT	S	S	S	S	S	S	S	S	S	S	S	S	S	72256	
D	P	613	X	V1 P CHM SWITCH ON	S	S	S	S	S	S	S	S	S	S	S	S	S	72250	
D	P	614	X	V2 P CHM SWITCH ON	S	S	S	S	S	S	S	S	S	S	S	S	S	72251	
D	P	616	X	B FLIGHT LOCKIN	S	S	S	S	S	S	S	S	S	S	S	S	S	72252	
D	P	617	X	MAIN STAGE LIMITER	S	S												73050	
D	P	618	X	B1 FUEL MAN P SW ON	S	S	S	S	S	S	S	S	S	S	S	S	S	72253	
D	P	619	X	B2 FUEL MAN P SW ON	S	S	S	S	S	S	S	S	S	S	S	S	S	72254	
D	P	621	X	IGN STAGE VLVS	S	S	S	S	S	S	S	S	S	S	S	S	S	72257	
D	P	622	X	S FLIGHT LOCKIN	S	S	S	S	S	S	S	S	S	S	S	S	S	72258	
D	P	623	X	S FUEL MAN P SW ON	S	S	S	S	S	S	S	S	S	S	S	S	S	72259	
D	P	624	X	MAIN ENGS COMPLETE	S	S	S	S	S	S	S	S	S	S	S	S	S	72260	
D	P	627	X	MAIN ENG TH COMPLETE	S	S												72261	
D	P	628	X	IGN STAGE LIM COF	S	S	S	S	S	S	S	S	S	S	S	S	S	73052	
D	P	630	X	MAIN STAGE LIM COF	S	S	S	S	S	S	S	S	S	S	S	S	S	73054	
D	P	631	X	LO2 F&D VLV AIRB OPN	X	X												72920	

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SERIES COMP MSL PLAN 16 JAN 60 29 45

D	P	988	X	LO2	95%	LVL	EMER	COF	X	X	73410
D	P	997	X	MSL	FUELED	95%			X	X	72731
D	P	998	X	LO2	0/FILL	EMERG	COF		X	X	73411
D	P	999	X	MSL	FUELED	100%			X	X	72732

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SERIES COMP MSL PLAN 16 JAN 60 29 45

D	S	M207 C	PANEL POWER SUPPLY	M	M	57	70	75	84	93	01	07	08	10	12	15	18	19		
D	S	61 D	ROLL DISPL GYRO SIG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31106
D	S	62 D	PITCH DISPL GYRO SIG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31104
D	S	63 D	YAW DISPL GYRO SIG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31105
D	S	252 D	B1 YAW ROLL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31139
D	S	253 D	B2 YAW ROLL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31145
D	S	254 D	B1 PITCH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31127
D	S	255 D	B2 PITCH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31139
D	S	256 D	SUSTAINER YAW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31102
D	S	257 D	SUSTAINER PITCH	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31177
D	S	258 D	V1 PITCH ROLL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31154
D	S	259 D	V2 PITCH ROLL	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31160
D	S	260 D	V1 YAW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31167
D	S	261 D	V2 YAW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31172
D	S	52 R	ROLL RATE GYRO SIG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31110
D	S	53 R	PITCH RATE GYRO SIG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31108
D	S	54 R	YAW RATE GYRO SIG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	31109
D	S	48 V	PROGRAMMER PITCH SIG	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	31102
D	S	49 V	PROGRAMMER ROLL SIG	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	31103

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SERIES COMP MSL PLAN 16 JAN 60 29 45

D	S	69	V	ROLL INT OUTPUT SIG	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	31120
D	S	72	V	PITCH INT OUTPUT SIG	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	31118
D	S	73	V	YAW INT OUTPUT SIG	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	31119
D	S	107	V	B1 PCH ACTR FEEDBAK	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	31126
D	S	108	V	B2 PCH ACTR FEEDBAK	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	31138
D	S	113	V	V1 YAW ACTR FEEDBACK	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	31166
D	S	114	V	V2 YAW ACTR FEEDBACK	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	31171
D	S	118	V	V2 PCH ACTR FEEDBAK	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	31159
D	S	119	V	V1 PCH ACTR FEEDBAK	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	31153
D	S	121	V	GYRO TEST SIG	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	81001
D	S	122	V	SERVO TEST SIG	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	81002
D	S	123	V	INTEGRATOR TEST SIG	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	81003
D	S	128	V	B1 YAW ACTR FEEDBAK	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	31132
D	S	129	V	B2 YAW ACTR FEEDBAK	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	31144
D	S	147	V	PITCH GYRO AMP OUT	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	31115
D	S	148	V	YAW GYRO AMP OUT	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	31116
D	S	149	V	ROLL GYRO AMP OUT	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	31117
D	S	216	V	S PCH ACTR FEEDBACK	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	31176
D	S	217	V	S YAW ACTR FEEDBACK	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	31181
D	S	M270	V	FINE HEATER-PITCH	M	M															
D	S	M271	V	FINE HEATER-YAW	M	M															

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SERIES COMP MSL PLAN 16 JAN 60 29 45

D T 68 T TM CANISTER OSC 0 0
D T 69 T TM CANISTER RF 0 0

D T M142 M TELEMETER BATTERY M M
D T M143 M TELEMETER TOTAL M M

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SERIES COMP MSL PLAN 16 JAN 60 29 45

D	Y	15	T	117L	ENGINE	COMP	0	0	54002
D	Y	17	T	ADAPTER	@	STA 489	0	0	54004
D	Y	19	T	ADAPTER	@	STA 399	0	0	54006
D	Y	20	X	EXPLOSIVE	BOLT	#1	0	0	54007
D	Y	21	X	EXPLOSIVE	BOLT	#2	0	0	54008
D	Y	22	X	EXPLOSIVE	BOLT	#3	0	0	54009

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SERIES COMP MSL PLAN 16 JAN 60 29 45

44404
44401

D Z 2 E KLYSTRON PWR OUTPUT 0 0
D Z 3 E XPONDR RF INPUT/AGC 0 0

3

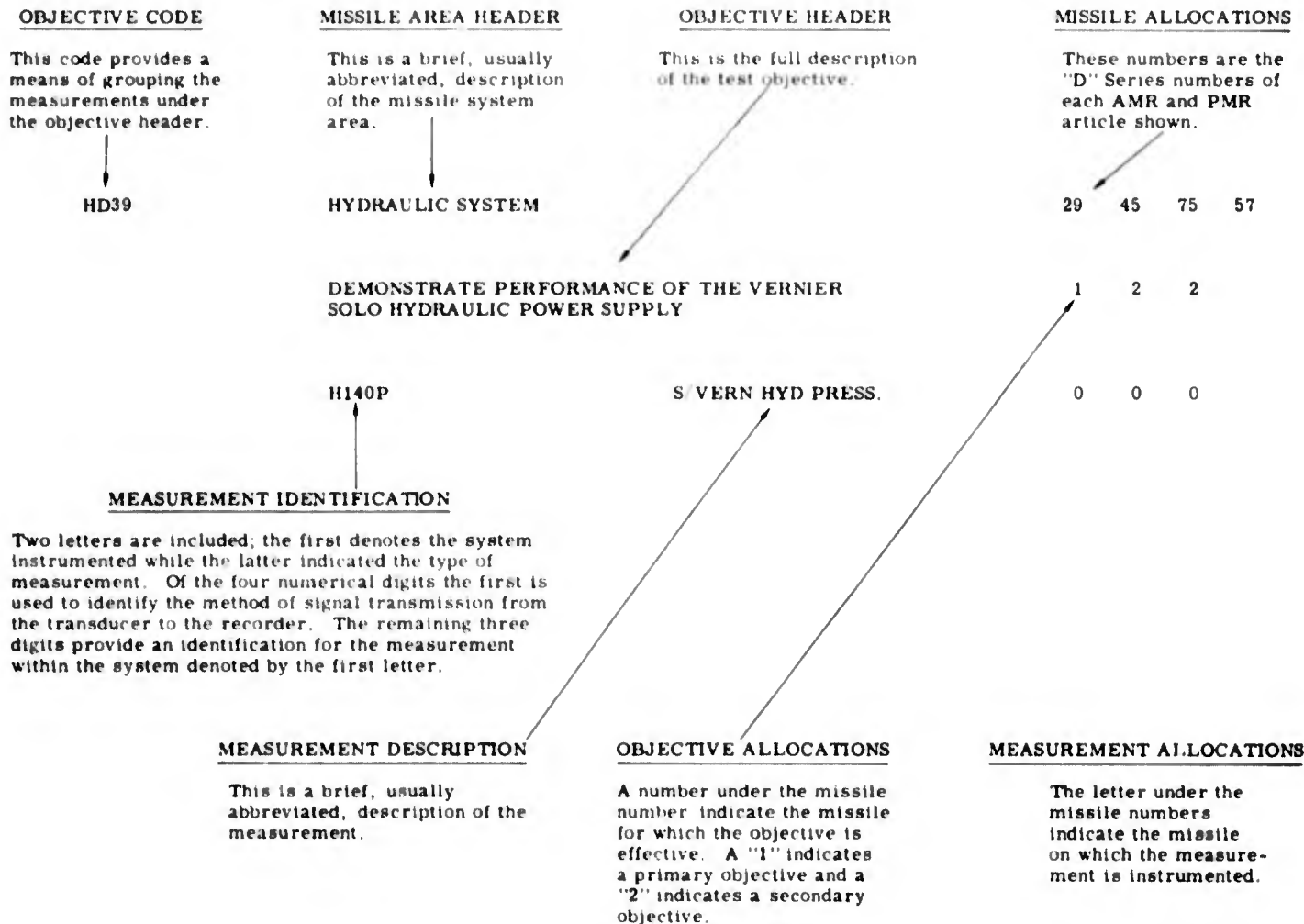
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SECTION 6

AMR AND PMR OBJECTIVE COMPOSITE

This section presents a grouping of the measurements which support each test objective presently scheduled for the WS117L Program. The following is a brief explanation of the format used in this section.



NOTE: For a more detailed explanation of this format and a key to the abbreviations and coding see Appendix B.

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WS-117-L OBJ. COMPOSITE 16 JAN 60 29 45 57 70 75 84 93 01 07 08 10 12 15 18 19

OBJ.

CODE DESCRIPTION 29 45 57 70 75 84 93 01 07 08 10 12 15 18 19

*STRUCTURE

GENERAL

AD13	DEMONSTRATE STRUCTURAL INTEGRITY OF THE AIRFRAME.	1	1
F	1 P L02 TANK HELIUM	U	U
F	3 P FUEL TANK HELIUM	U	U
AD19	DEMONSTRATE THE PERFORMANCE OF THE BOOSTER JETTISON SYSTEM.	2	2
M	26 D JET SECT SEPARATION	U	U
U	101 A AXIAL ACCELERATION	U	U
AD28	OBTAIN DATA ON BENDING MODES	2	2
A	609 O STA 1212 Y AXIS	U	U
A	610 O STA 980 Y AXIS	U	U

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WS-117-L OBJ. COMPOSITE 16 JAN 60 29 45 57 70 75 84 93 01 07 08 10 12 15 18 19

A 611 O STA 670 Y AXIS	0 0
A 619 O STA 1212 X AXIS	0 0
A 620 O STA 980 X AXIS	0 0
A 621 O STA 670 X AXIS	0 0
S 52 R ROLL RATE GYRO SIG	0 0
S 53 R PITCH RATE GYRO SIG	0 0
S 54 R YAW RATE GYRO SIG	0 0
X 0000 X 2ND SIG ILM DATA	0 0

*PROPULSION

GENERAL OPERATION

PD38 MONITOR PERFORMANCE OF THE SUSTAINER, BOOSTER AND VERNIER ENGINES.	2 2
P 83 B B2 PUMP SPEED	2 2
P 84 B B1 PUMP SPEED	2 2
P 349 B S PUMP SPEED	U U
P 528 D S MAIN FUEL VALVE	U U
P 529 D S MAIN LO2 VALVE	U U
P 6 P S THRUST CHAMBER	U U

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P 26 P 8 LO2 REG REFERENCE	0 0
P 27 P VERNIER FUEL TANK	0 0
P 28 P V1 THRUST CHAMBER	0 0
P 29 P V2 THRUST CHAMBER	0 0
P 30 P VERNIER LO2 TANK	0 0
P 56 P 5 LO2 PUMP INLET	0 0
P 59 P B2 THRUST CHAMBER	0 0
P 60 P B1 THRUST CHAMBER	0 0
P 100 P B GG COMBUSTION CHM	0 0
P 330 P 5 FUEL PUMP DISCH	0 0
P 339 P 5 GAS GEN DISCH	0 0
P 144 P 5 LO2 REG REFERENCE	0 0
P 351 P 5 LO2 INJ MANIFOLD	0 0
P 530 T 5 LO2 PUMP INLET	0 0
P 671 T TH SECT AMB QUAD 4	0 0
U 101 A AXIAL ACCELERATION	0 0
X 9129 P PRESSURE VS ALTITUDE	0 0
X 9141 T TEMP VS ALTITUDE	0 0
P072 OBTAIN DATA FOR PROPULSION SYSTEM PERFORMANCE ANALYSIS.	2 2
M 9 A AXIAL ACCELERATION	0 0
P 528 D S MAIN FUEL VALVE	0 0

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P 529 D S MAIN LO2 VALVE	O
P 6 P S THRUST CHAMBER	O
P 28 P V1 THRUST CHAMBER	U
P 29 P V2 THRUST CHAMBER	O
P 56 P S LO2 PUMP INLET	U
P 59 P B2 THRUST CHAMBER	O
P 60 P B1 THRUST CHAMBER	U
P 100 P BGG COMBUSTION CHM	O
P 330 P S FUEL PUMP DISCH	O
P 339 P S GAS GEN DISCH	O
P 72 X BOOSTER CUTOFF RELAY	O
P 77 X VERNIER CUTOFF RELAY	O
P 347 X S COF RELAY LOCKIN	U

PU SYSTEM

UD25 DEMONSTRATE CLOSED LOOP PERFORMANCE OF THE CV PROPELLANT UTILIZATION SYSTEM. /P/	1 1	1 1
P 528 D S MAIN FUEL VALVE	O	O
P 529 D S MAIN LO2 VALVE	U	O
U 101 A AXIAL ACCELERATION	O	O

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U 80 P LO2 TANK HEAD 0 0
 U 81 P FUEL TANK HEAD 0 0
 U 91 V ERROR RATIO DEMAND UP 0 0

UD37 OBTAIN DATA FOR PU SYSTEM PERFORMANCE ANALYSIS. 2 2
 M 9 A AXIAL ACCELERATION 0 0
 P 528 D S MAIN FUEL VALVE 0 0
 P 529 D S MAIN LO2 VALVE 0 0
 U 80 P LO2 TANK HEAD 0 0
 U 81 P FUEL TANK HEAD 0 0
 U 91 V ERROR RATIO DEMAND UP 0 0

*CONTROL SYSTEM

AUTOPILOT

SD:9 DETERMINE THE ABILITY TO PROPERLY EXECUTE PITCH AND ROLL PROGRAMS. 1 1
 1 1
 1 1
 M 12 D PITCH ATTITUDE ANG 0 0
 M 13 D YAW ATTITUDE ANGLE 0 0
 M 14 D MISSILE ROLL ANGLE 0 0

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MS-117-L OBJ. COMPOSITE 16 JAN 60

M	23	D	PITCH ATT ANGLE FINE	0	0
M	24	D	YAW ATT ANGLE FINE	0	0
M	25	D	ROLL ATT ANGLE FINE	0	0
S	61	D	ROLL DISPL GYRO SIG	0	0
S	62	D	PITCH DISPL GYRO SIG	0	0
S	63	D	YAW DISPL GYRO SIG	0	0
S	252	D	B1 YAW ROLL	0	0
S	253	D	B2 YAW ROLL	0	0
S	254	D	B1 PITCH	0	0
S	255	D	B2 PITCH	0	0
S	257	D	SUSTAINER PITCH	0	0
S	258	D	V1 PITCH ROLL	0	0
S	259	D	V2 PITCH ROLL	0	0
S	52	R	ROLL RATE GYRO SIG	0	0
S	53	R	PITCH RATE GYRO SIG	0	0
S	54	R	YAW RATE GYRO SIG	0	0
X	9142	D	MISSILE PITCH	0	0
X	9144	D	MISSILE ROLL	0	0
X	9131	M	MSL X VS Y	0	0
X	9133	M	AZIMUTH VS TIME	0	0
X	9145	N	RAW ALJSA DATA	0	0
S024 DETERMINE ABILITY TO MAINTAIN				1	1

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WS-117-L OBJ. BRKDN COMP. 19 JUN 59 29 45 75 57 84 70

G	292 X D CONTACTS #5 & #6	0	0
G	293 X D CONTACTS #7 & #9	0	0
M	26 D JET SECT SEPARATION	0	0
P	72 X BOOSTER CUTOFF RELAY	0	0
P	77 X VERNIER CUTOFF RELAY	0	0
P	347 X S COF RELAY LOCKIN	0	0
S	62 D PITCH DISPL GYRO SIG	0	0
S	63 D YAW DISPL GYRO SIG	0	0
S	252 D B1 YAW ROLL	0	0
S	253 D B2 YAW ROLL	0	0
S	254 D B1 PITCH	0	0
S	255 D B2 PITCH	0	0
S	256 D SUSTAINER YAW	0	0
S	257 D SUSTAINER PITCH	0	0
S	258 D V1 PITCH ROLL	0	0
S	259 D V2 PITCH ROLL	0	0
S	260 D V1 YAW	0	0
S	261 D V2 YAW	0	0
X	9174 L GE GUIDANCE P, Q & R	0	0

SD32 DEMONSTRATE THAT THE SATELLITE
VEHICLE SEPARATION MECHANISM
IS PROVIDED PROPER EXCITATION
AT THE REQUIRED TIME. 1 1 1 2

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X 0000 X 2ND STG TLM DATA	0	0	0	0
Y 20 X EXPLOSIVE BOLT #1	0	0	0	0
Y 21 X EXPLOSIVE BOLT #2	0	0	0	0
Y 22 X EXPLOSIVE BOLT #3	0	0	0	0

RADIO GUIDANCE GE

GD10 EVALUATE THE ABILITY OF THE AIRBORNE EQUIPMENT TO ACCEPT AND PROPERLY DECODE DISCRETE AND STEERING COMMANDS.	1	1		
---	---	---	--	--

G 287 V D PITCH OUTPUT	0	0		
G 288 V D YAW OUTPUT	0	0		
G 290 X D CONTACTS #1 & #2	0	0		
G 291 X D CONTACTS #3 & #4	0	0		
G 292 X D CONTACTS #5 & #6	0	0		
G 293 X D CONTACTS #7 & #9	0	0		
X 0000 X GE GND STA DATA	0	0		

GD11 EVALUATE THE ACCURACY OF THE RADIO TRACKING PORTION OF THE GROUND EQUIPMENT.	1	1		
---	---	---	--	--

X 9158 A MSL XYZ	0	0		
X 9128 H MSL XYZ VS TIME	0	0		
X 9150 H RANGE SAFETY IP	0	0		

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SD29 DETERMINE THE ABILITY TO
ACCEPT AND EXECUTE GUIDANCE
STEERING, DISCRETE COMMANDS
AND PROGRAMMED SUBROUTINES.

G	287	V	D	PITCH	OUTPUT	0	0
G	288	V	D	YAW	OUTPUT	0	0
G	290	X	D	CONTACTS	#1 & #2	0	0
G	291	X	D	CONTACTS	#3 & #4	0	0
G	292	X	D	CONTACTS	#5 & #6	0	0
G	293	X	D	CONTACTS	#7 & #9	0	0
M	26	D	JET	SECT	SEPARATION	0	0
P	72	X	BOOSTER	CUTOFF	RELAY	0	0
P	77	X	VERNIER	CUTOFF	RELAY	0	0
P	347	X	S	COF	RELAY	LOCKIN	0
S	61	D	ROLL	DISPL	GYRO	SIG	0
S	62	D	PITCH	DISPL	GYRO	SIG	0
S	63	D	YAW	DISPL	GYRO	SIG	0
S	252	D	B1	YAW	ROLL		0
S	253	D	B2	YAW	ROLL	*	0
S	254	D	B1	PITCH			0
S	255	D	B2	PITCH			0
S	256	D	SUSTAINER	YAW			0
S	257	D	SUSTAINER	PITCH			0
S	258	D	V1	PITCH	ROLL		0
S	259	D	V2	PITCH	ROLL		0

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S 260 D V1 YAW	0	0	
S 261 D V2 YAW	0	0	
X 9174 L GE GUIDANCE P 0 W 6 R	0	0	
SU32 DEMONSTRATE THAT THE SATELLITE VEHICLE SEPARATION MECHANISM IS PROVIDED INITIATION SIGNAL AT PROPER TIME.	1	1	2
X 0000 X 2ND SIG ILM DATA	0	0	0
Y 20 X EXPLOSIVE BOLT #1	0	0	
Y 21 X EXPLOSIVE BOLT #2	0	0	
Y 22 X EXPLOSIVE BOLT #3	0	0	
SD47 OBTAIN DATA FOR FLIGHT CONTROL SYSTEM PERFORMANCE ANALYSIS.	2	2	
P 72 X BOOSTER CUTOFF RELAY	0	0	
P 77 X VERNIER CUTOFF RELAY	0	0	
P 347 X S CGF RELAY LOCKIN	0	0	
S 61 D ROLL DISPL GYRO SIG	0	0	
S 62 D PITCH DISPL GYRO SIG	0	0	
S 63 D YAW DISPL GYRO SIG	0	0	
S 252 D B1 YAW ROLL	0	0	
S 253 D B2 YAW ROLL	0	0	
S 254 D B1 PITCH	0	0	
S 255 D B2 PITCH	0	0	

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010

29 49 57 70 75 84 93 01 07 08 10 12 15 16 19

WS-117-L OBJ. COMPOSITE 16 JAN 60

S 256 D SUSTAINER YAW	0
S 257 D SUSTAINER PITCH	0
S 258 D V1 PITCH ROLL	0
S 259 D V2 PITCH ROLL	0
S 260 D V1 YAW	0
S 261 D V2 YAW	0
S 52 R ROLL RATE GYRO SIG	0
S 53 R PITCH RATE GYRO SIG	0
S 54 R YAW RATE GYRO SIG	0
X 9142 D MISSILE PITCH	0
X 9143 D MISSILE YAW	0
X 9144 D MISSILE ROLL	0
X 9131 H MSL X VS Y	0
X 9133 H AZIMUTH VS TIME	0
X 9174 L GE GUIDANCE P, Q & R	0

RADIO GUIDANCE GE

GD10 EVALUATE THE ABILITY OF THE AIRBORNE EQUIPMENT TO ACCEPT AND PROPERLY DECODE DISCRETE AND STEERING COMMANDS.	1 1
G 287 V D PITCH OUTPUT	0 0

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WS-117-L OBJ. COMPOSITE 16 JAN 60

G 288 V D YAW OUTPUT 0 0
 G 290 X D CONTACTS #1 & #2 0 0
 G 291 X D CONTACTS #3 & #4 0 0
 G 292 X D CONTACTS #5 & #6 0 0
 G 293 X D CONTACTS #7 & #9 0 0
 X 0000 X GE GND STA DATA 0 0

GD11 EVALUATE THE ACCURACY OF THE RADIO TRACKING PORTION OF THE GROUND EQUIPMENT.

X 9158 A MSL XYZ 0 0
 X 9178 H MSL XYZ VS TIME 0 0
 X 9150 H RANGE SAFETY IP 0 0
 X 9152 H AZUSA IMPACT POINT 0 0
 X 9154 H RADAR IMPACT POINT 0 0
 X 9155 H TERMINAL TRAJECTORY 0 0
 X 9172 H GE GUIDANCE 0 0
 X 9156 L MSL XYZ & RESULTANT 0 0
 X 9157 L TERMINAL TRAJECTORY 0 0
 X 9174 L GE GUIDANCE P, Q & R 0 0
 X 9145 N RAW AZUSA DATA 0 0

GD21 EVALUATE THE PERFORMANCE AND DETERMINE THE ACCURACY OF THE GROUND AND AIRBORNE EQUIPMENT

1 1
 1 1
 1 1

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012

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WS-117-L OBJ. COMPOSITE 16 JAN 60

IN PROVIDING THE REQUIRED
TRAJECTORY.

1 1
1 1
0 0
0 0
0 0
0 0
0 0
0 0
0 0
0 0
0 0
0 0
0 0

- X 9158 A MSL XYZ
- X 9128 H MSL XYZ VS TIME
- X 9152 H AZUSA IMPACT POINT
- X 9154 H RADAR IMPACT POINT
- X 9155 H TERMINAL TRAJECTORY
- X 9156 L MSL XYZ & RESULTANT
- X 9157 L TERMINAL TRAJECTORY
- X 9145 M RAW AZUSA DATA
- X 0000 X GE GND STA DATA

- GD17 DETERMINE SYSTEM NOISE
CHARACTERISTICS AND INVESTI-
GATE THE EFFECTS OF NOISE ON
SYSTEM OPERATION.
- G 4 C PB MAGNETRON AVERAGE
- G 82 E RB RF OUTPUT
- G 3 V PB AGC
- G 279 V RB AGC NO. 1
- G 280 V RB AGC NO. 2
- X 0000 X GE GND STA DATA

2 3
2 3
2 3
2 3
0 0
0 0
0 0
0 0
0 0
0 0

- GD34 OBTAIN DATA FOR RADIO GUIDANCE
SYSTEM PERFORMANCE ANALYSIS.

2 2
0 0

- G 79 D PITCH PHASE
- G 80 D YAW PHASE

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WS-117-L	OBJ.	BRKDOWN COMP.	19 JUN 59	29 45 75	57 84 70
DD12	DETERMINE PERFORMANCE OF GE/ BURROUGHS IMPACT PREDICTOR. /P/			2 2	
	G	318 V PB-IP AGC		0 0	
	G	321 V RB-IP AGC		0 0	
	X	9150 H RANGE SAFETY IP		0 0	
	X	9152 H AZUSA IMPACT POINT		0 0	
	X	9153 H GE IMPACT POINT		0 0	
	X	9154 H RADAR IMPACT POINT		0 0	
DD11	DETERMINE PERFORMANCE OF AZUSA IMPACT PREDICTOR. /P/			2 2	
	X	9150 H RANGE SAFETY IP		0 0	
	X	9152 H AZUSA IMPACT POINT		0 0	
	X	9153 H GE IMPACT POINT		0 0	
	X	9154 H RADAR IMPACT POINT		0 0	
ZD01	DETERMINE THE PERFORMANCE OF THE AZUSA TRACKING SYSTEM.			2 2	
	X	9128 H MSL XYZ VS TIME		0 0	
	X	9131 H MSL X VS Y		0 0	
	X	9132 H MSL X VS Z		0 0	
	X	9133 H AZIMUTH VS TIME		0 0	
	X	9134 H ELEVATION VS TIME		0 0	
	X	9135 H RANGE VS TIME		0 0	
	X	9172 H GE GUIDANCE		0 0	
	X	9156 L MSL XYZ & RESULTANT		0 0	

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X 9137 L	TERMINAL TRAJECTORY	0	0
X 9136 N	AZUSA LOG SUMMARY	0	0
X 9137 N	AZUSA CEC RECORDING	0	0
X 9139 N	AZUSA EVAL DATA	0	0
X 9145 N	RAW AZUSA DATA	0	0
X 9149 N	AZUSA L.M. RM & RCC	0	0
X 9138 Q	AZUSA CARRIER SIGNLS	0	0
Z 2 E	KLYSTRON PWR OUTPUT	0	0
Z 3 E	XPONDR RF INPUT/AGC	0	0

GENERAL MSL DATA

MD15	DEMONSTRATE COMPATIBILITY OF BLOCKHOUSE AND LAUNCH CONTROL EQUIPMENT.	3	3
X 0000 X	NO SPECIFIC DATA	0	0
WD02	DETERMINE THE ABILITY OF THE CV PROPELLANT LOADING SYSTEM TO PROVIDE PROPELLANT LEVEL INDICATION FOR ACCURATE LOAD- ING CONTROL.	1	1
X 0000 X	LOAD CELL DATA	0	0
MD22	OBTAIN DATA ON ATLAS SYSTEMS FOR GROSS SYSTEMS ANALYSIS.		

1 1 1

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G 279 V RB AGC NO. 1	0 0
G 280 V RB AGC NO. 2	0 0
X 0000 X GE GND STA DATA	0 0 0

*MISCELLANEOUS SYS

PNEUMATICS

FD45 DETERMINE PERFORMANCE OF THE MAIN PROPELLANT TANKS PRESSURIZATION SYSTEM AND THE ENGINE CONTROLS PNEUMATIC SYSTEM.	1 1 1 1 1 1 1 1 1 1
F 1 P LO2 TANK HELIUM	0 0
F 3 P FUEL TANK HELIUM	0 0
F 125 P B CTL PNEU REG OUT	0 0
F 246 P B TK ME BTL HI	0 0
F 288 P ST PNEU REG OUT	0 0
P 26 P B LO2 REG REFERENCE	0 0
P 27 P VERNIER FUEL TANK	0 0
P 30 P VERNIER LO2 TANK	0 0
P 344 P S LO2 REG REFERENCE	0 0

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U15

WS-117-L OBJ. COMPOSITE 16 JAN 60 29 45 57 70 75 84 93 01 07 08 10 12 15 18 19

FD69 OBTAIN DATA FOR PNEUMATICS SYSTEM PERFORMANCE ANALYSIS.

F	1	P	LO2	TANK	HELIUM	0	
F	3	P	FUEL	TANK	HELIUM	0	
F	125	P	B	CTL	PNEU	REG	0
F	288	P	ST	PNEU	REG	OUT	0

HYDRAULIC SYSTEM

HD39 DEMONSTRATE PERFORMANCE OF THE VERNIER SOLO HYDRAULIC POWER SUPPLY.

2 2
 2 2
 2 2

H 140 P S/VERN HYD PRESS

0 0

HD44 DEMONSTRATE PERFORMANCE OF THE BOOSTER AND SUSTAINER/VERNIER HYDRAULIC SYSTEMS.

2 3
 2 3
 2 3

H 33 P B1 HYD ACCUMULATOR

0 0

H 140 P S/VERN HYD PRESS

0 0

HD59 OBTAIN DATA FOR HYDRAULIC SYSTEM PERFORMANCE ANALYSIS.

2 2

H 33 P B1 HYD ACCUMULATOR

0 0

H 140 P S/VERN HYD PRESS

0 0

ELECTRICAL SYSTEM

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29 45 57 70 75 84 93 01 07 08 10 12 15 18 19

WS-117-L OBJ. COMPOSITE 16 JAN 60

ED14 DETERMINE THE PERFORMANCE OF
THE BATTERY-INVERTER
ELECTRICAL POWER SUPPLY
/MANUALLY ACTIVATED BATTERY//

E 50 Q 400 CYCLE AC PWR SUP 0 U
E 28 V MSL SYSTEMS INPUT U U
E 51 V 400 CYCLE AC PHASE A 0 U

ED25 OBTAIN DATA FOR ELECTRICAL
SYSTEM PERFORMANCE ANALYSIS.

E 50 Q 400 CYCLE AC PWR SUP 2 2
E 28 V MSL SYSTEMS DC INPUT 0 U
E 51 V 400 CYCLE AC PHASE A 0 U

TRACKING-COMMAND

DD10 DETERMINE PERFORMANCE OF RANGE
SAFETY COMMAND SYSTEM. /P/

D 1 V RSC CUTOFF OUTPUT 0 0
D 7 V #1 RSC RF INPUT/AGC 0 0
D 3 X RSC DESTRUCT OUTPUT 0 0
X 9122 E RSC RECEIVER SIGNAL 0 0
X 9125 E RSC GND XMTR OUTPUT 0 0
X 9126 I PSC COMBINED FIELD 0 0
X 9127 N RSC COMMANDS U 0
X 9121 Q RSC TRANSMITTER U 0

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017

MS-117-L UBJ. COMPUTE 16 JAN 60 25 45 27 10 15 07 23 04 01 00 10 12 10 10 17

X 9124	Q RSC CARRIER	U	U	
X 9123	X RSC DOWN RANGE AMERS	U	U	
D011	DETERMINE PERFORMANCE OF AZUSA IMPACT PREDIC. % / P/	2	2	
		2	2	
X 9150	H RANGE SAFETY IP	0	0	
X 9152	H AZUSA IMPACT POINT	0	0	
X 9154	H KADAR IMPACT POINT	0	0	
X 9192	H MILS IMPACT POINT	0	0	
Z001	DETERMINE THE PERFORMANCE OF THE AZUSA TRACKING SYSTEM.	2	2	
		2	2	
X 9128	H MSL XYZ VS TIME	U	U	
X 9131	H MSL X VS Y	U	0	
X 9132	H MSL X VS Z	U	0	
X 9133	H AZIMUTH VS TIME	0	0	
X 9134	H ELEVATION VS TIME	0	0	
X 9135	H RANGE VS TIME	0	0	
X 9172	H GE GUIDANCE	0	0	
X 9156	L MSL XYZ & RESULTANT	U	0	
X 9157	L TERMINAL TRAJECTORY	U	0	
X 9136	N AZUSA LOG SUMMARY	U	U	
X 9137	N AZUSA CEC RECORDING	U	U	
X 9139	N AZUSA EVAL DATA	0	0	

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018

29 45 57 70 75 84 93 01 07 08 10 12 15 18 19

MS-117-L OBJ. COMPOSITE 16 JAN 60

X 9145 N RAW AZUSA DATA 0 0
 X 9149 N AZUSA L,M, RM & RCC 0 0
 X 9138 Q AZUSA CARRIER SIGNALS 0 0
 Z 2 E KLYSTRON PWR OUTPUT 0 0
 Z 3 E XPONDR RF INPUT/AGC 0 0

DD23 OBTAIN DATA FROM ALL TRACKING STATIONS FOR PERFORMANCE ANALYSIS. 2
 2
 2
 X 0000 X ALL TRACKING DATA 0

GENERAL MSL DATA

MD15 DEMONSTRATE COMPATIBILITY OF BLOCKHOUSE AND LAUNCH CONTROL EQUIPMENT. 3 3 3 3
 3 3 3 3
 3 3 3 3
 X 0000 X NO SPECIFIC DATA 0 0 0 0

WD02 DETERMINE THE ABILITY OF THE CV PROPELLANT LOADING SYSTEM TO PROVIDE PROPELLANT LEVEL INDICATION FOR ACCURATE LOADING CONTROL. 1 1 1
 1 1 1
 1 1 1
 1 1 1
 1 1 1
 P 1311 X 90% FUEL LVL IND 0 0
 P 1987 X FUEL O/FILL PROBE 0 0
 P 1988 X L02 95% LVL EMER CCF 0 0
 P 1997 X MSL FUELED 95% 0 0

019

WS-117-L OBJ. COMPOSITE 16 JAN 60 29 45 57 70 75 84 93 01 07 08 10 12 15 18 19

P 1998 X L02 O/FILL EMER COF 0 0
 P 1999 X MSL FUELED 100% 0 0
 U 1091 V ERROR RATIO DEMOD DP C 0 0
 X 0000 X LOAD CELL DATA U 0 0

M024 DEMONSTRATE THE ABILITY OF THE ATLAS BOOSTER TO PLACE A SATELLITE VEHICLE AT A PREDETERMINED POSITION AND VELOCITY IN SPACE AS DEFINED BY THE GUIDANCE EQUATIONS. 1 1 1 1 1 1

X 9158 A MSL XYZ 0
 X 9128 H MSL XYZ VS TIME 0
 X 9156 L MSL XYZ & RESULTANT 0

LD17 DEMONSTRATE SATISFACTORY PERFORMANCE OF THE LAUNCHER. 2 2 2 2
 L 1368 D PIN MOTION B1 SIDE 0 0
 L 1369 D PIN MOTION B2 SIDE 0 0
 L 1127 P HOLDDOWN CYL B1 SIDE 0 0 0 0
 L 1128 P HOLDDOWN CYL B2 SIDE 0 0 0 0

TELEMETER

TD13 DETERMINE TEMPERATURE RISE 2 2

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REPORT NO. AZC-27-057
SECTION 6

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CONVAIR-ASTRONAUTICS

020

WS-117-L OBJ. COMPOSITE 16 JAN 60 29 45 57 70 75 84 93 01 07 08 10 12 15 18 19

W'ITHIN THE TELEMETERING
CANISTER.

2 2
2 2
0 0
0 0

T 68 T TH CANISTER OSC

T 69 T TH CANISTER RF

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CONVAIR ASTRONAUTICS

WS-117-L	OBJ. BRKDOWN COMP.	19 JUN 59	29 45 75	57 84 70
	/MISSILES 80, 90, 98, 101, 108, 111/ 1ST ORDER & ON			
	X 0000 X ALL TELEMETERED DATA			0 0 0
	X 0000 X ALL RANGE DATA			0 0 0
MD23	DEMONSTRATE ADEQUACY OF THE ATLAS BOOSTER AND ITS SUB-SYSTEMS. /MISSILES 116, 119, 121, 124, 126, 127, 128, 130, 132, 134, 136, 138, 140, 142, 144, 145, 146, 147, 148, 150, 151 - ALL 1ST ORDER/			1 1 1
	X 9158 A MSL XYZ			0 0 0
	X 9128 H MSL XYZ VS TIME			0 0 0
	X 9156 L MSL XYZ & RESULTANT			0 0 0
	X 0000 X ALL TLM MEASUREMENTS			0 0 0
MD24	DEMONSTRATE THE ABILITY OF THE ATLAS BOOSTER TO PLACE A SATELLITE VEHICLE AT A PREDETERMINED POSITION AND VELOCITY IN SPACE AS DEFINED BY THE GUIDANCE EQUATIONS. /MISSILES 75, 84, 57, 70, 80, 90, 98, 101, 108, 111, 116, 119, 121, 124, 126, 127, 128, 130, 132, 134, 136, 138, 140, 142, 144, 145, 146, 147, 148, 150, 151. ALL 1ST ORDER/	1		1 1 1
	X 9128 H MSL XYZ VS TIME	0		0 0 0
	X 9156 L MSL XYZ & RESULTANT	0		0 0 0
	X 9158 A MSL XYZ	0		0 0 0
LD17	DEMONSTRATE SATISFACTORY	2	2 2	2

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WS-117-L OBJ. BRKDN COMP. 19 JUN 59 29 45 75 57 84 70

PERFORMANCE OF THE LAUNCHER

L 1368 D PIN MOTION B1 SIDE	0	0	0
L 1369 D PIN MOTION B2 SIDE	0	0	0

TELEMETER

TD13 DETERMINE TEMPERATURE RISE WITHIN THE TELEMETERING CANISTER.	2	2
T 68 T TM CANISTER OSC	0	0
T 69 T TM CANISTER RF	0	0

EXTRA

- X 9140 E RADAR RECEIVER SIG
- X 9159 I RF FIELD INTENSITY
- X 9146 L WIND VELOCITY
- X 9148 N REL HUMIDITY VS ALT
- X 9165 N RADAR SYSTEM LOG
- X 9166 N ICM SIGNALS
- X 9167 N INDEX OF REFRACTION
- X 9168 N CLOUD COVERAGE
- X 9169 N DEPTH OF CLOUDS
- X 9170 N VISIBILITY

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SECTION 6-17

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WS-117-L OBJ. BRKDN COMP. 19 JUN 59 29 45 75 57 84 70

- X 9171 N SURFACE CONDITIONS
- X 9160 Q RF CENTER FREQUENCY
- X 9161 Q RF DEVIATION
- X 9164 Q 230.5MC RF XMTR
- X 9173 Q INFORMATION CARRIER
- X 9147 Z WIND AZIMUTH

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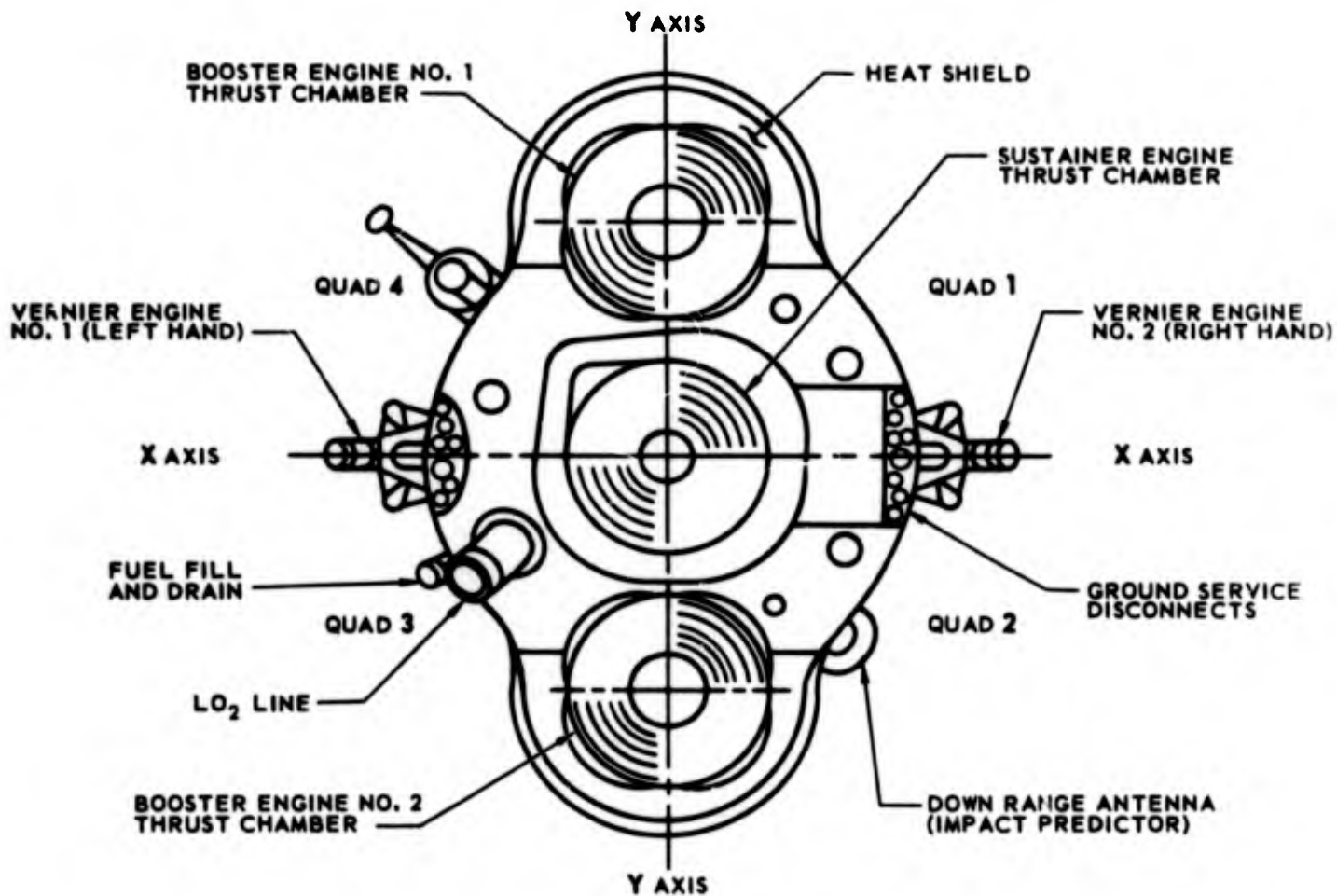
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SECTION 7

ILLUSTRATIONS

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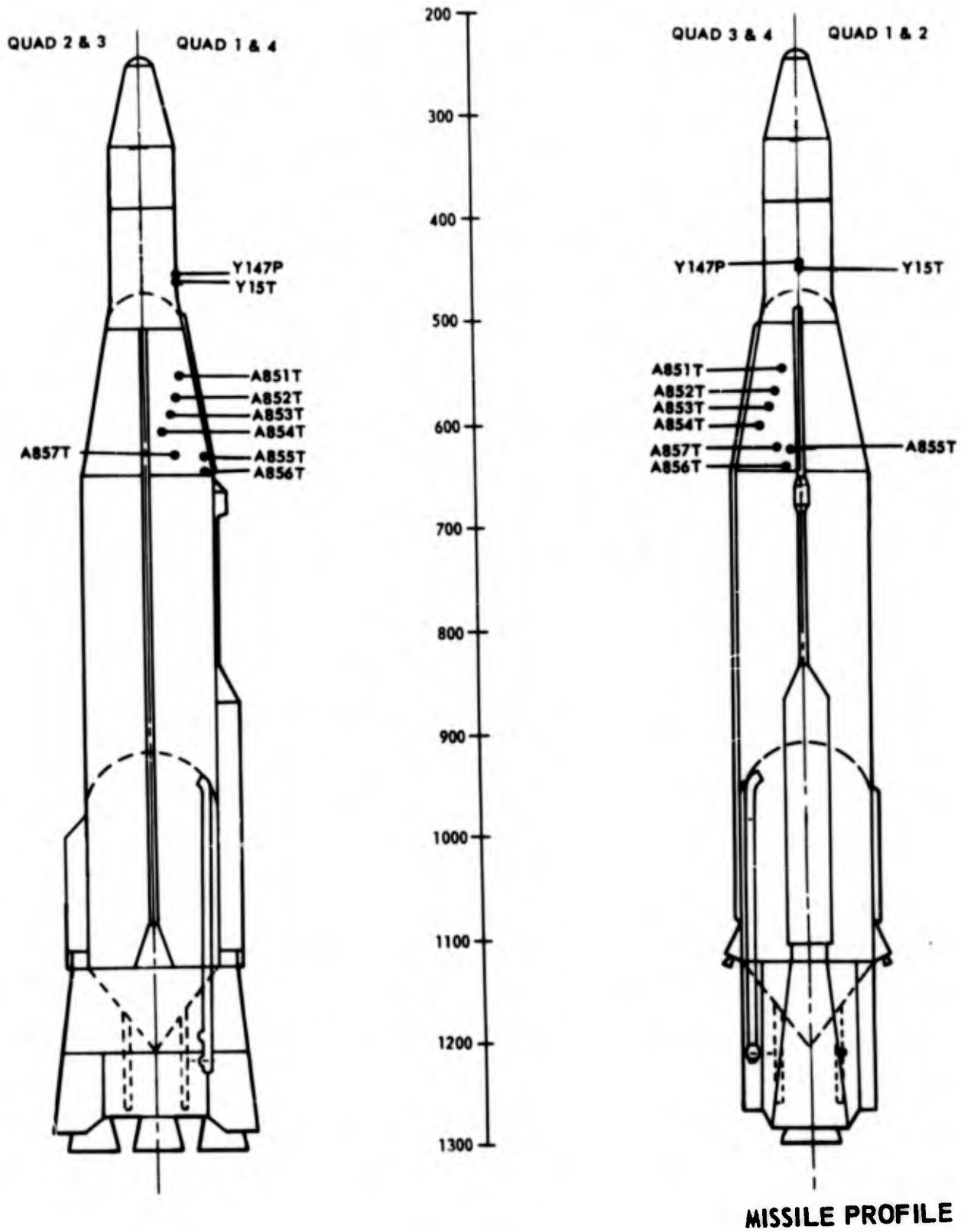


(VIEW LOOKING FWD FROM THE TANK SKIRT SECTION ASSEMBLY POSITION)

ATLAS STAGE ORIENTATION SKETCH

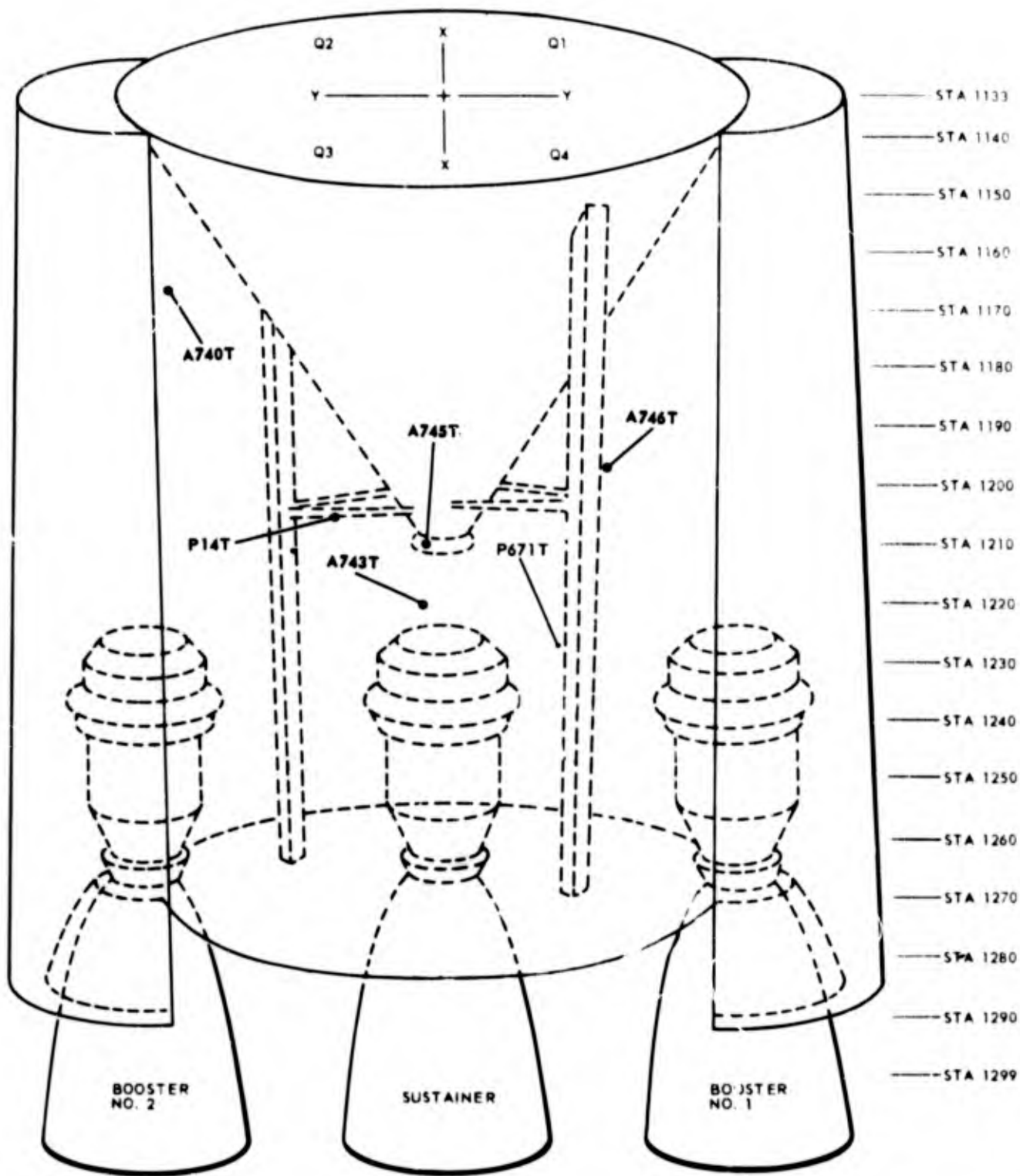
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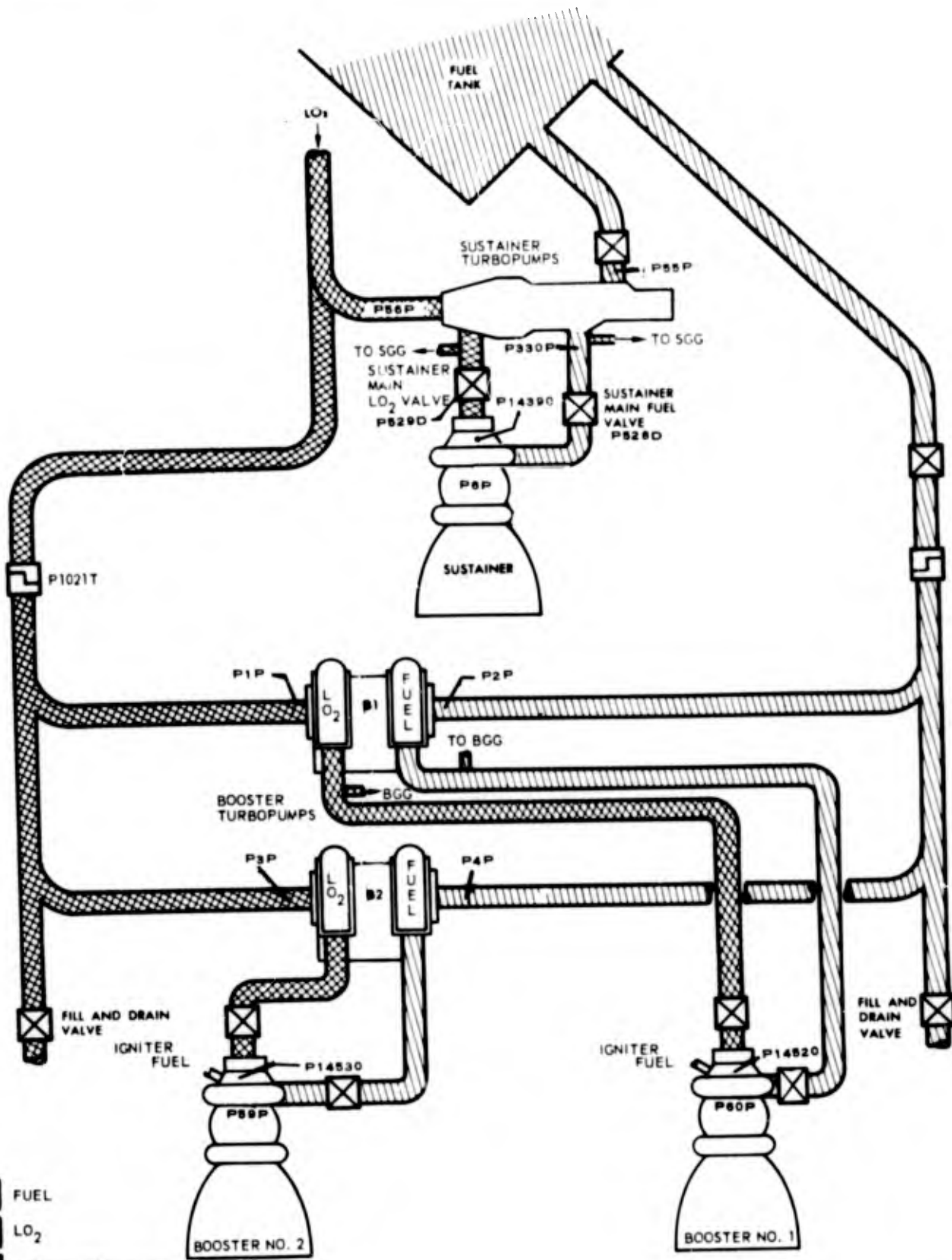
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


THRUST SECTION

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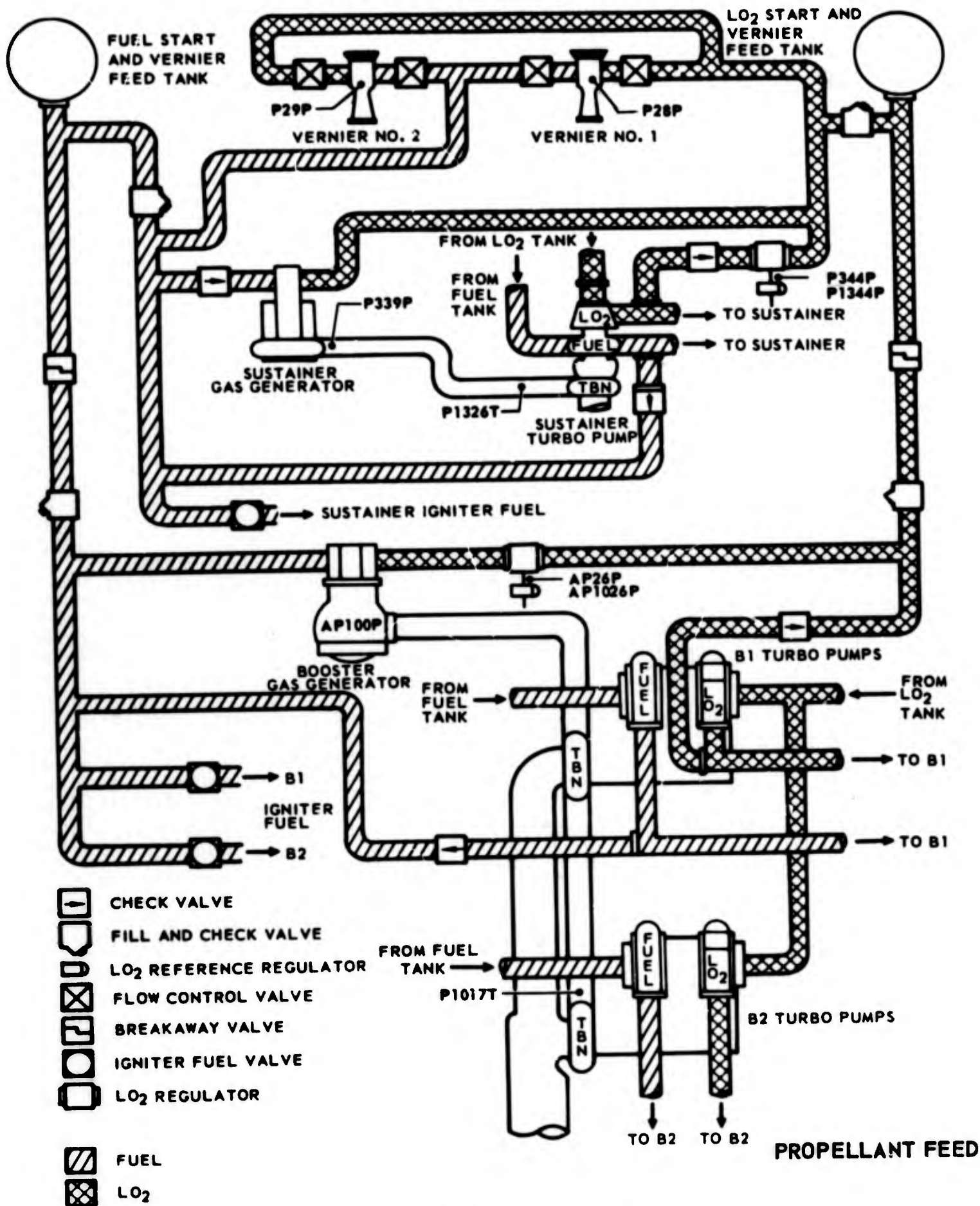


-  FUEL
-  LO₂
-  FLOW CONTROL VALVE
-  BREAKAWAY VALVE

PROPELLANT FLOW

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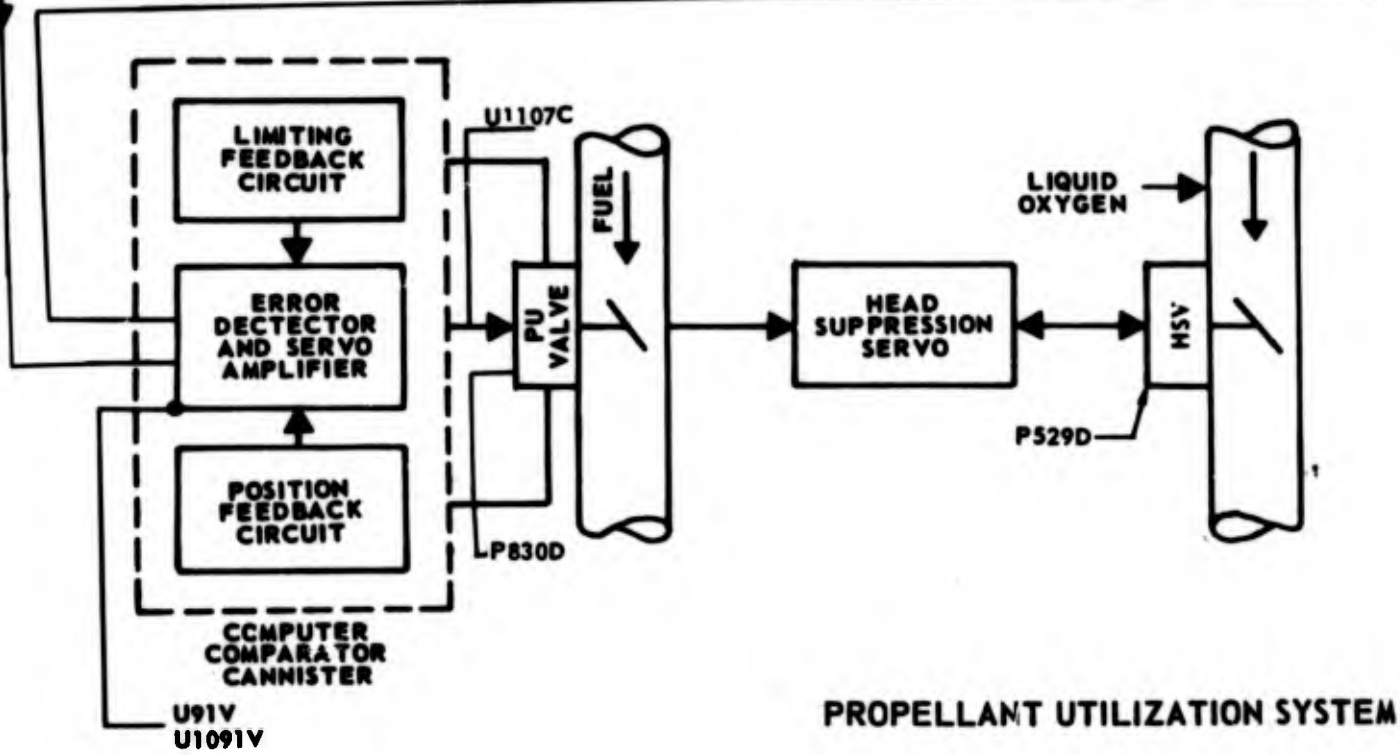
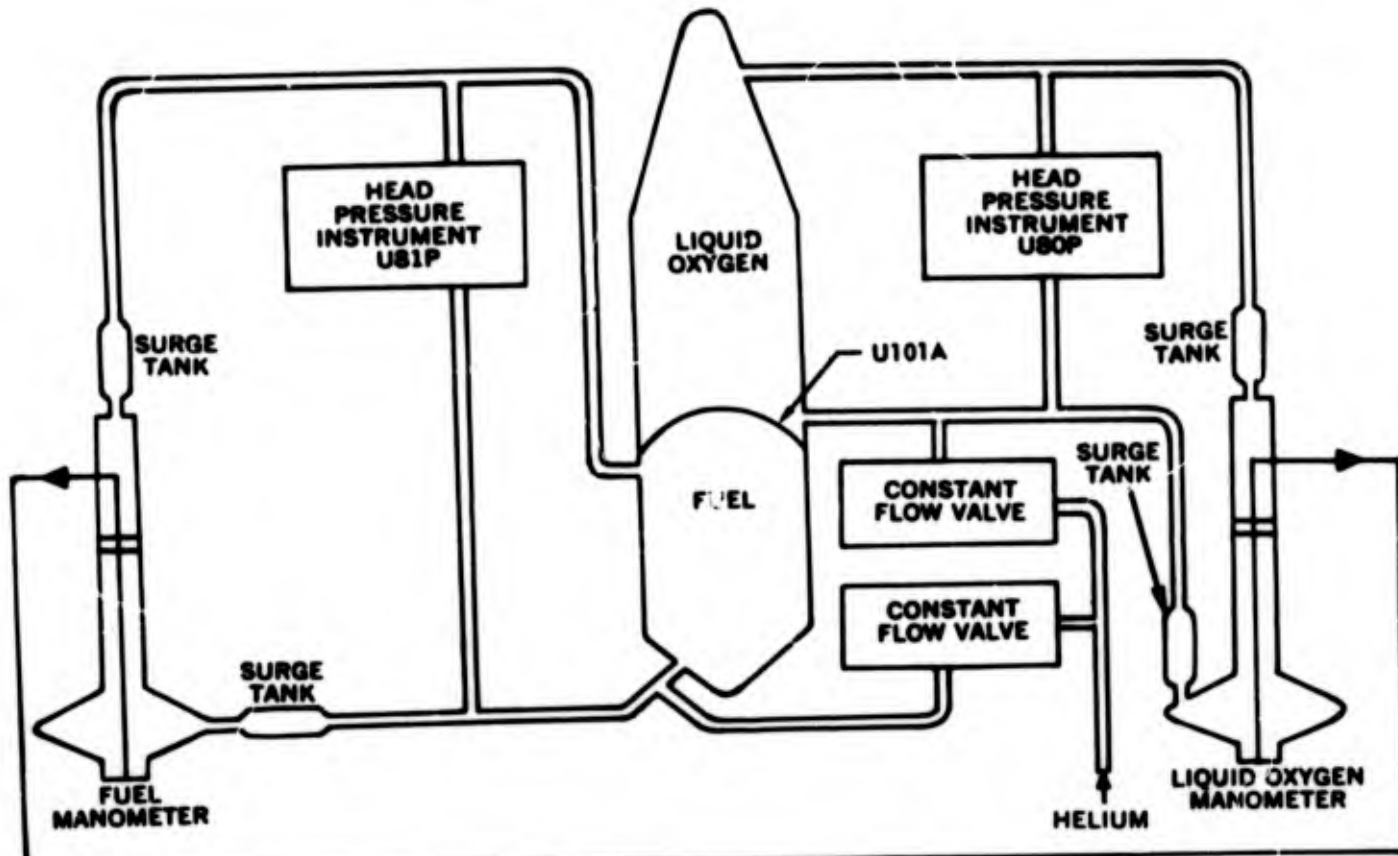
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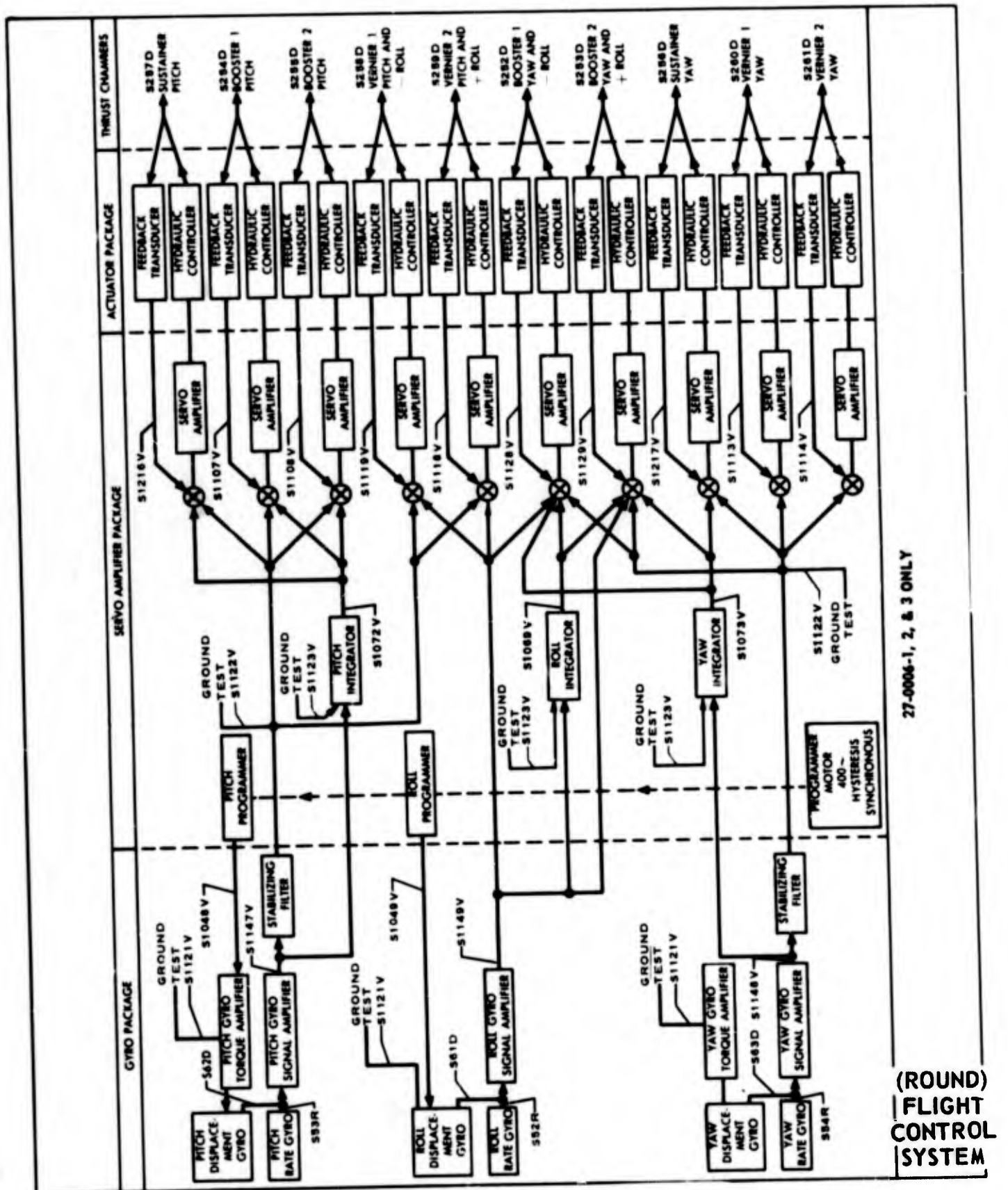
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27 FEBRUARY 1962



PROPELLANT UTILIZATION SYSTEM

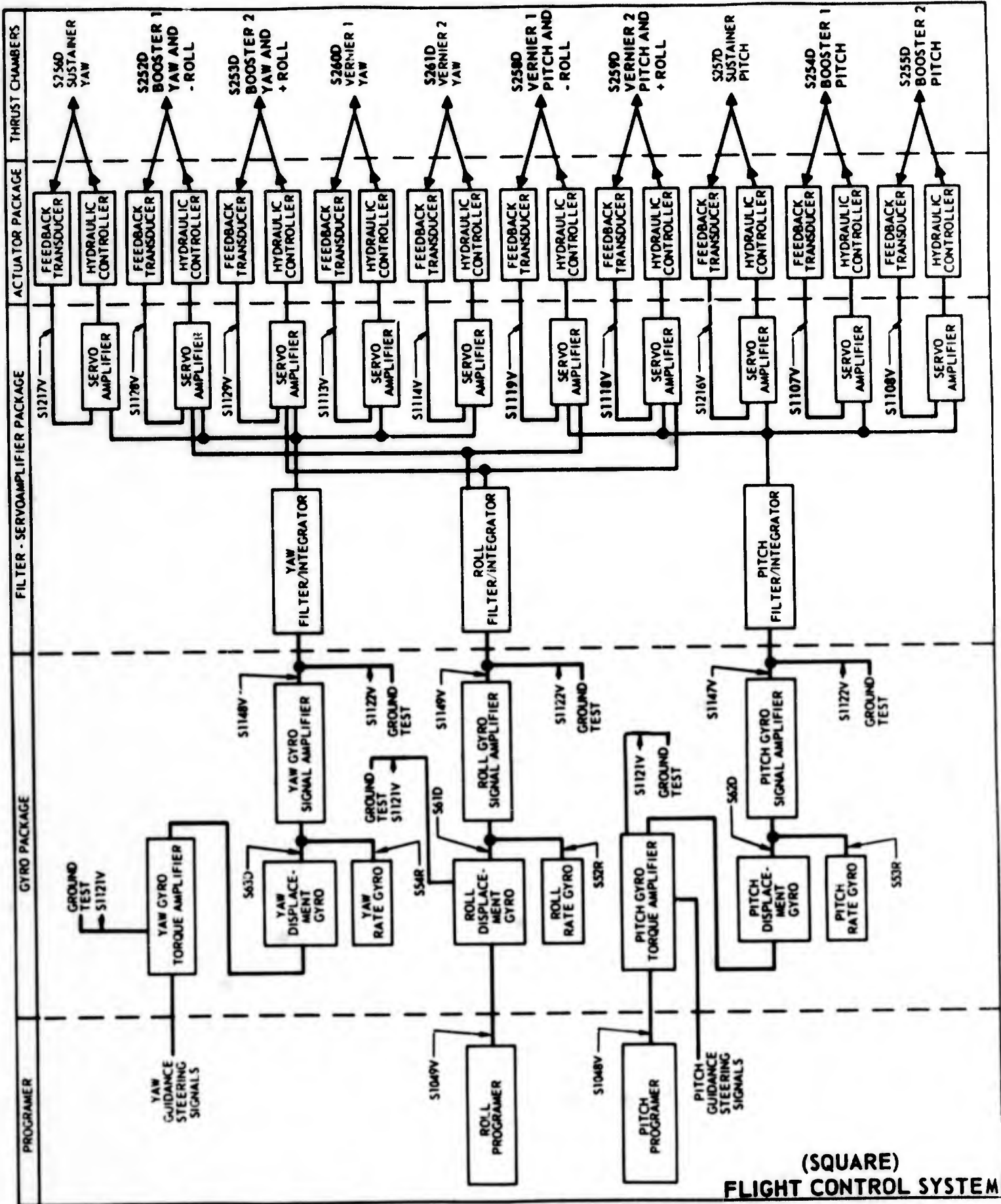
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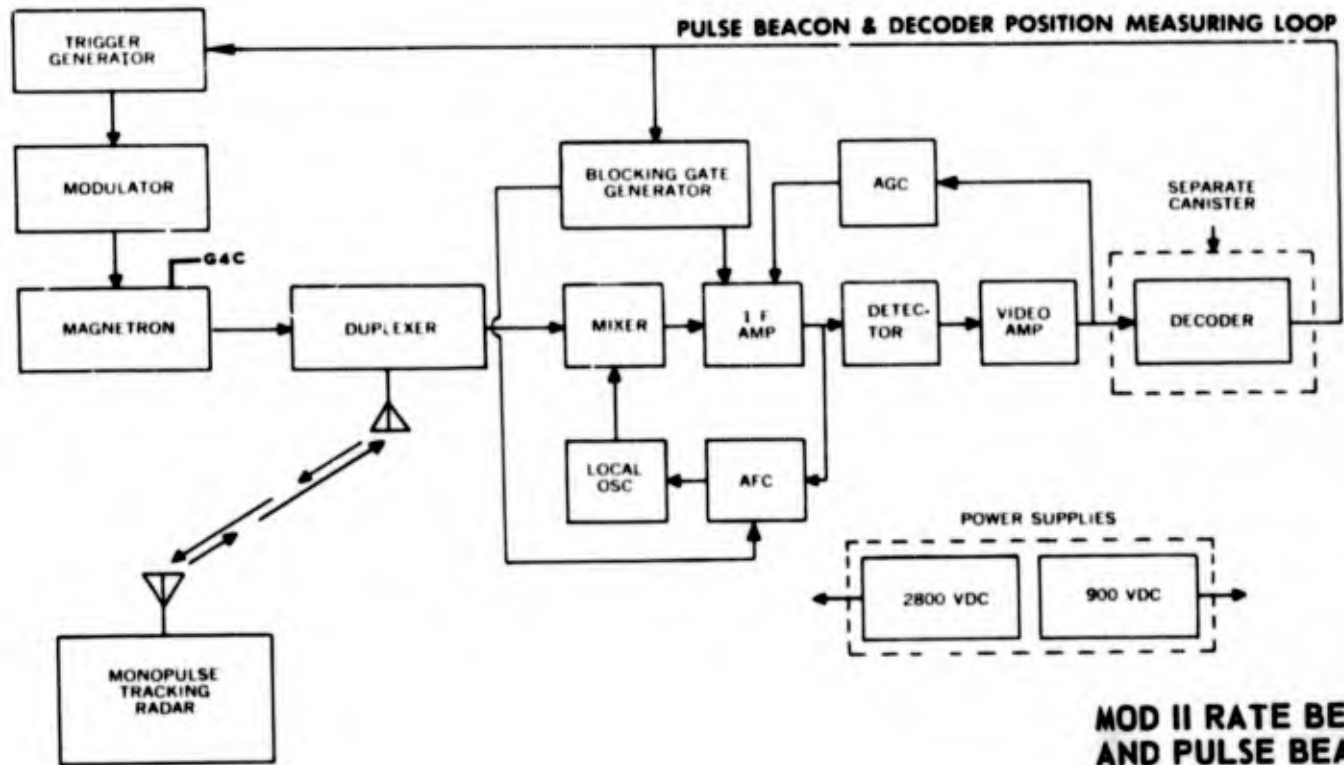
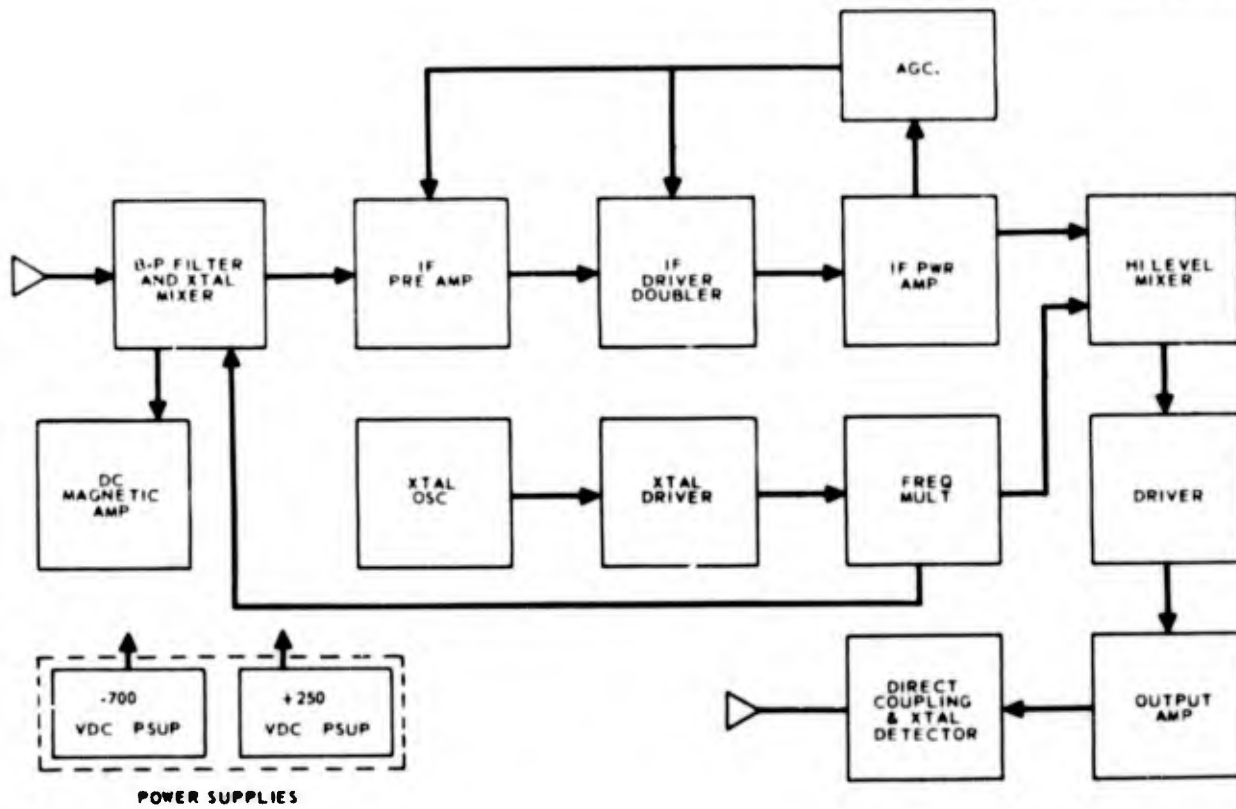


(SQUARE)
FLIGHT CONTROL SYSTEM

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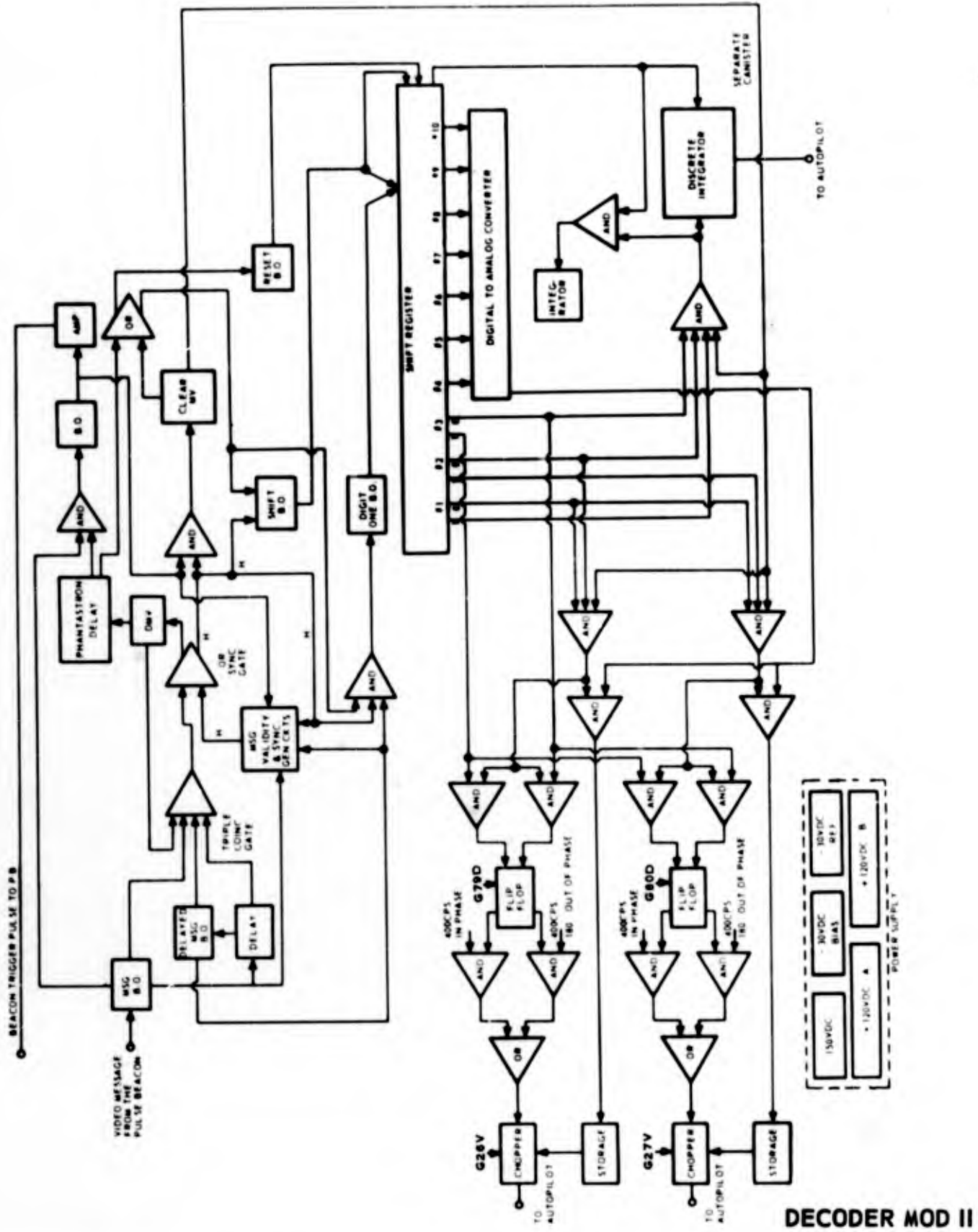
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RATE BEACON MOD II



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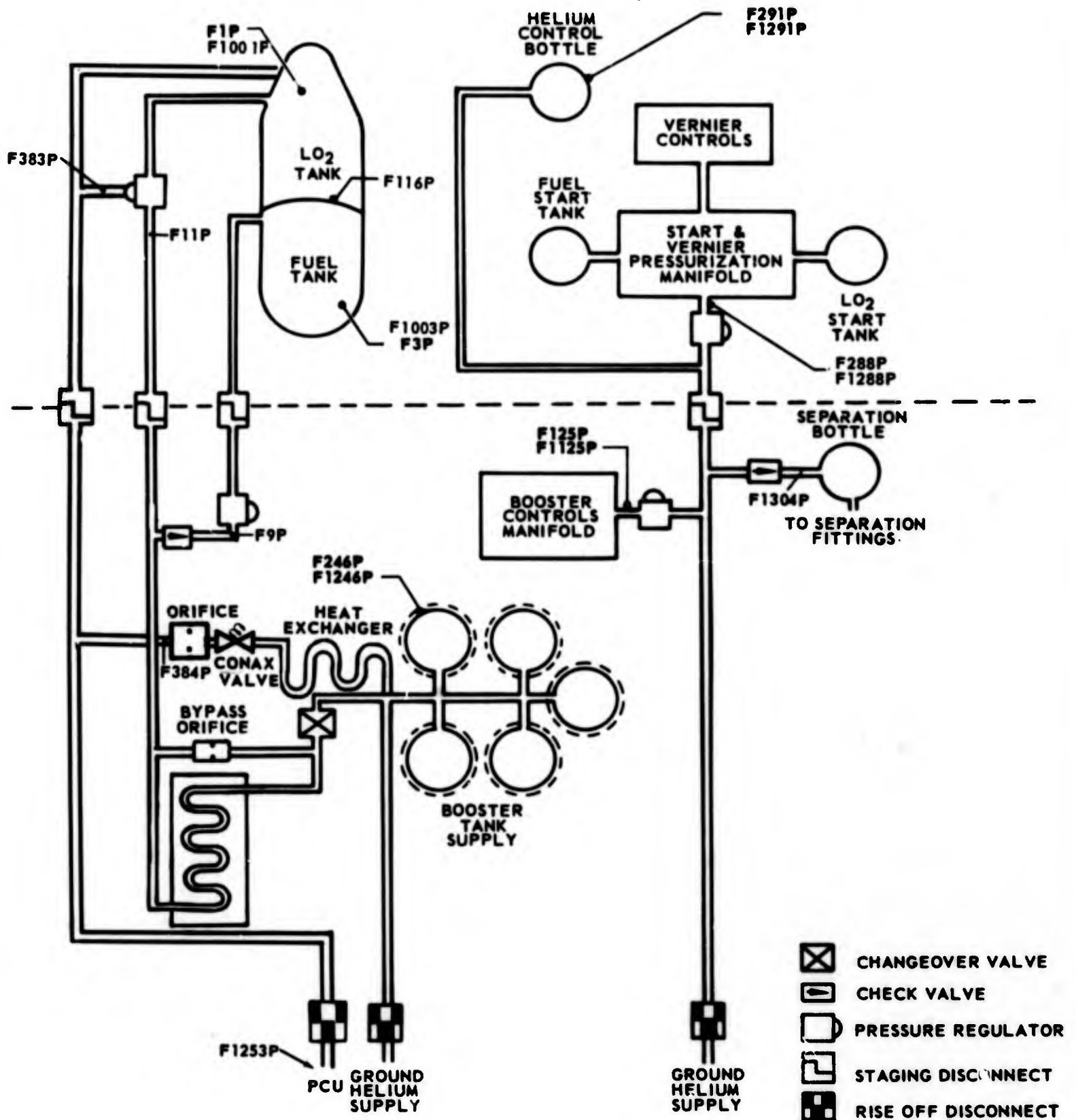
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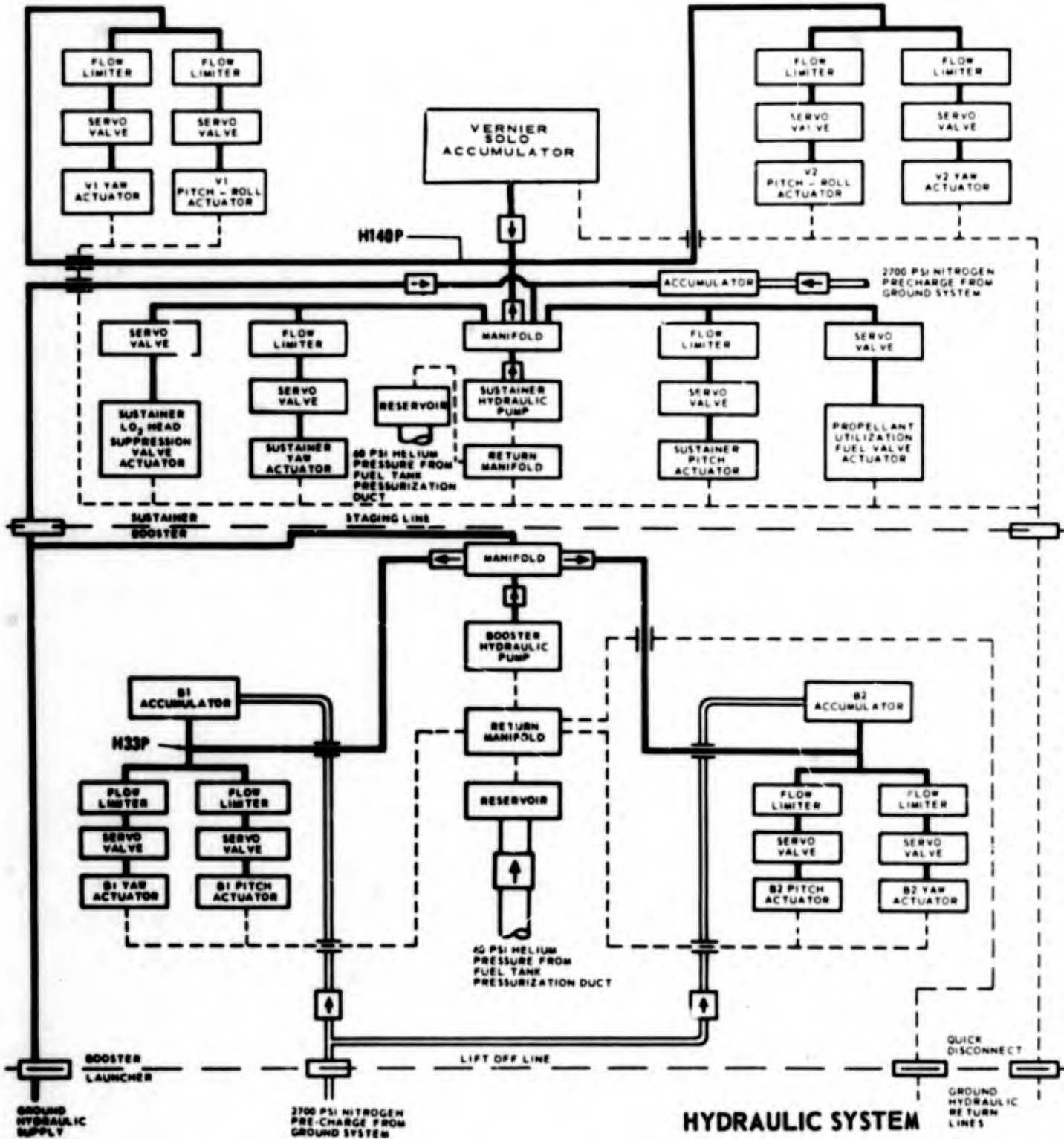
AIRBORNE PNEUMATICS SYSTEM

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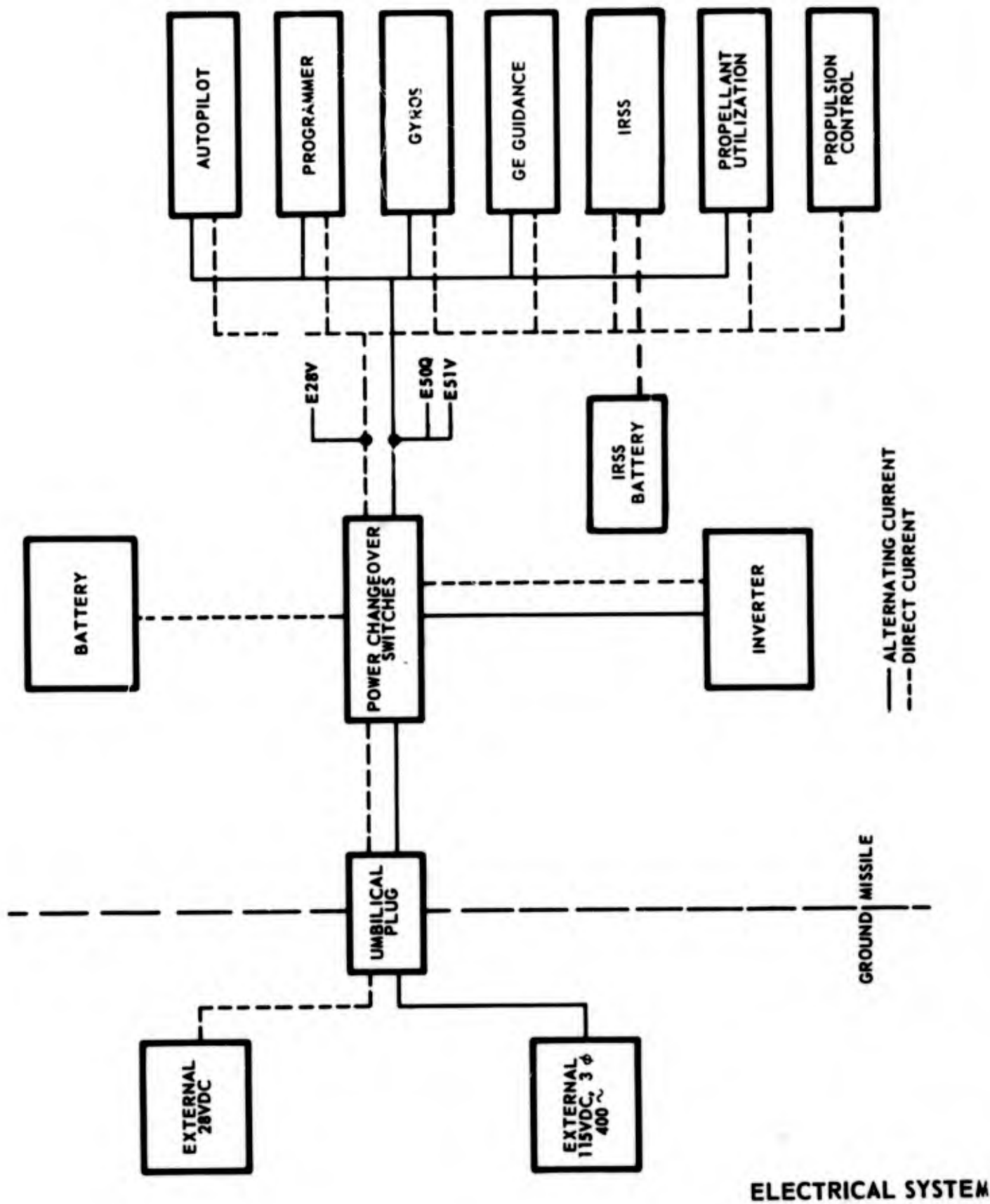
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27 FEBRUARY 1962



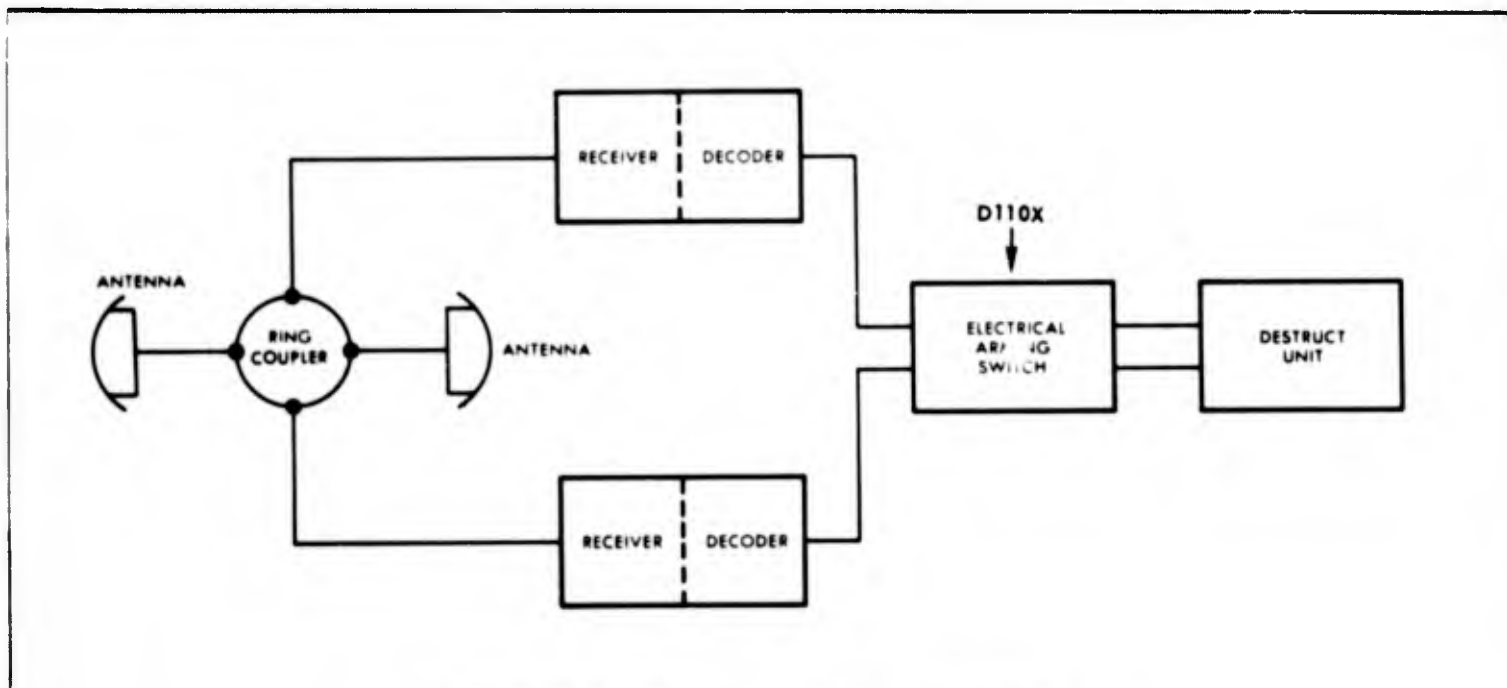
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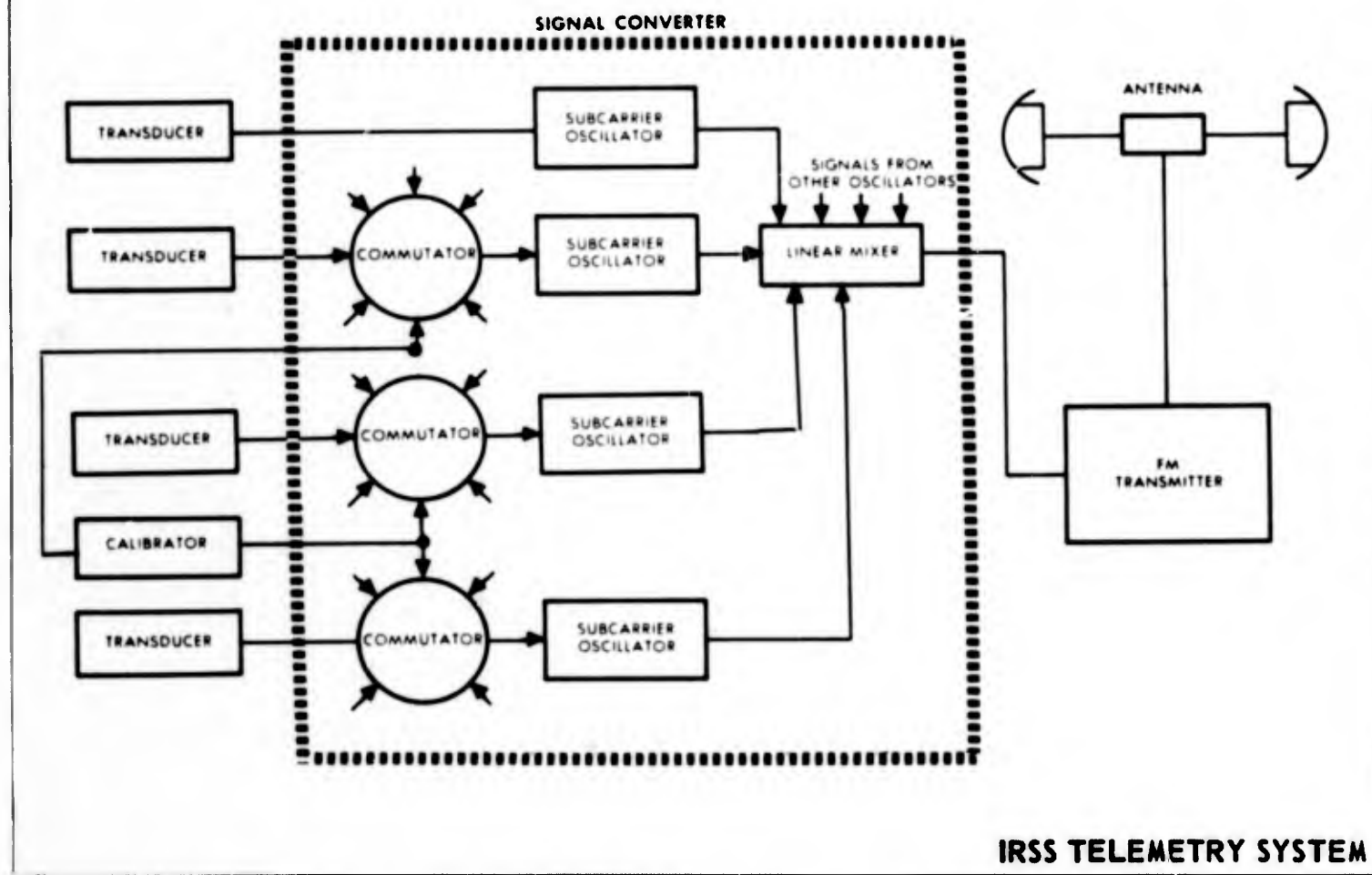


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IRSS RANGE SAFETY COMMAND SYSTEM



IRSS TELEMETRY SYSTEM

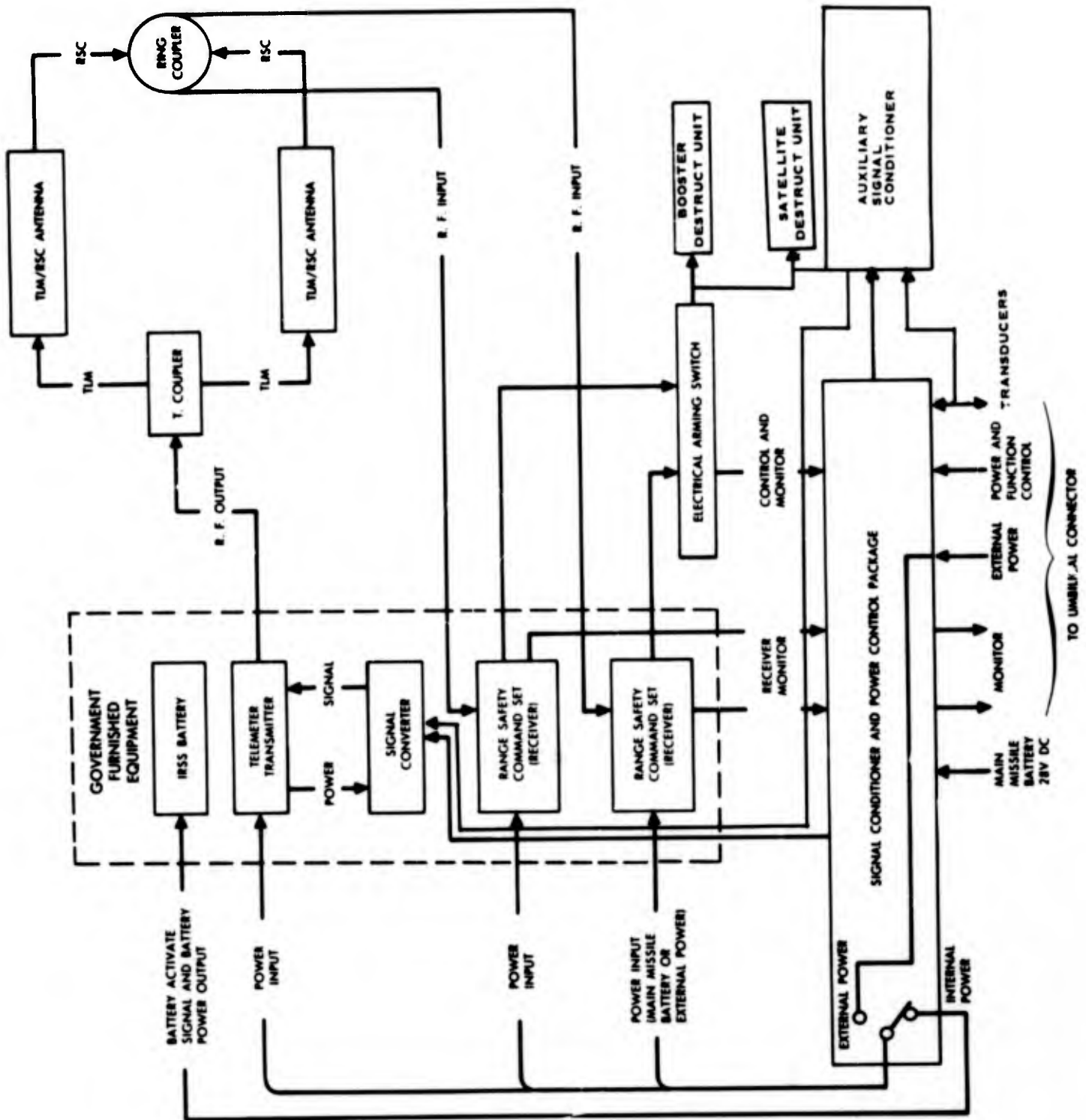
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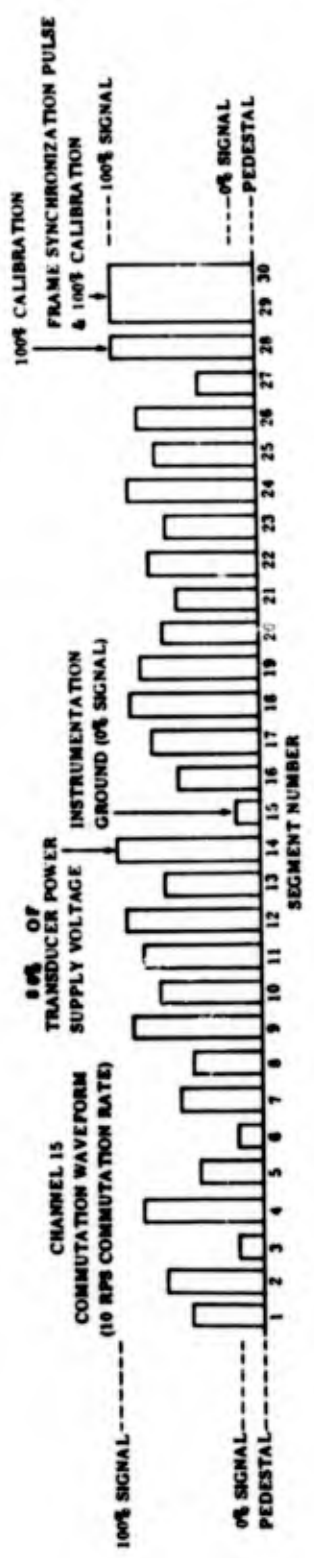
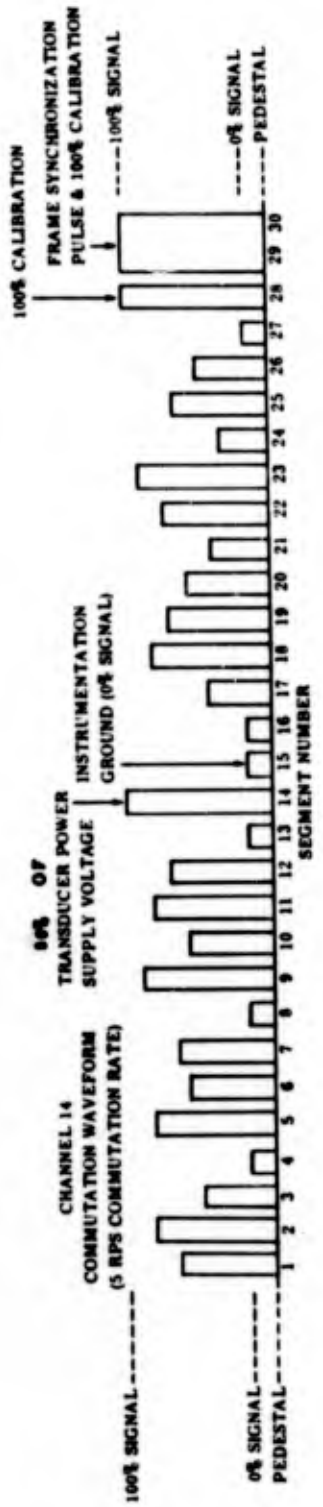
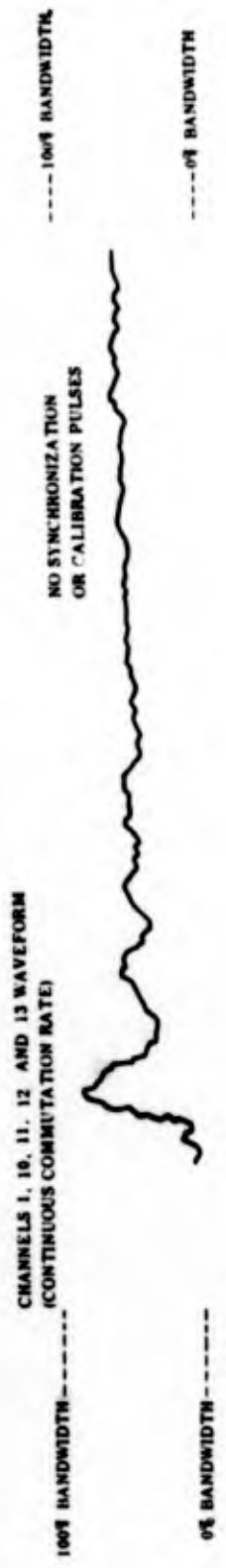


INTERCONNECTION OF IRSS AIRBORNE EQUIPMENT

32 510C1

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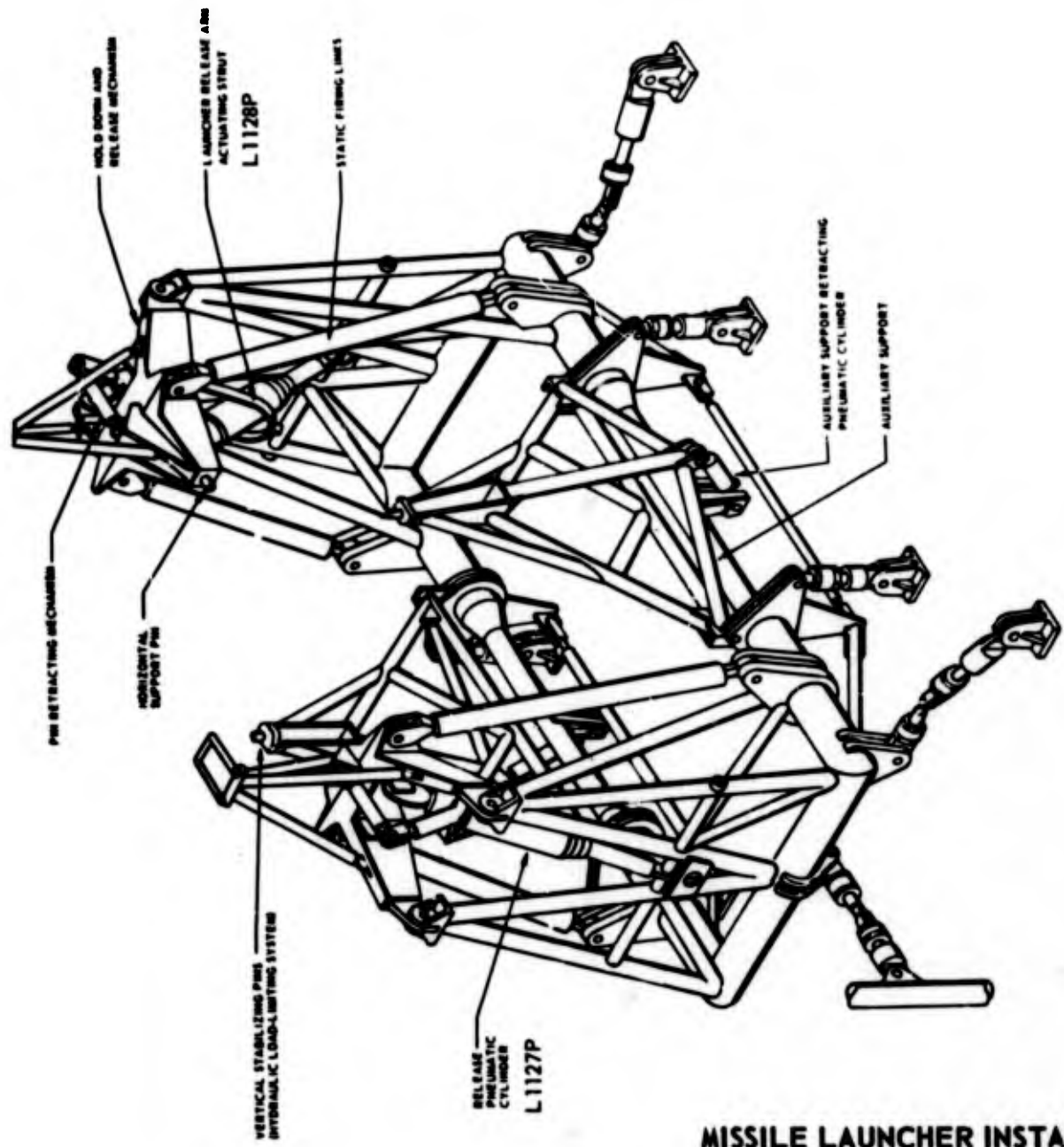
IRSS TELEMETER CHANNEL WAVEFORMS

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15 DECEMBER 1960



MISSILE LAUNCHER INSTALLATION

848 6-1

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GENERAL DYNAMICS | ASTRONAUTICS

27 FEBRUARY 1962

VEHICLE	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	T/M / REC	SUN/CARRIER / TRACK	COMM / FN / CHANNEL	MEASUREMENT RANGE		UNITS OF FUNCTION	ACCURACY	RATE OF CHANGE OR FREQUENCY OF FUNCTION	7508101214151819202428313639484953																
								LOW	HIGH				30	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
P	2	P	B1 FUEL PUMP INLET	1 13 35	0 100	PIA	4% SLO	X	X		X	X	X																
P	3	P	B2 LOX PUMP INLET	1 13 37	0 100	PIA	4% SLO	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
P	4	P	B2 FUEL PUMP INLET	1 13 39	0 100	PIA	4% SLO	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
P	6	P	S THRUST CHAMBER	1 14 6	0 1000	PIA	150	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
P	1026	P	B LOX REG REFERENCE	S	0 800	PIG	16 SLO	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
P	27	P	VERNIER FUEL TANK	1 14 4	0 600	PIA	SLO				X	X	X	X	X	X	X	X	X	X	X	X	X	X					
P	28	P	V1 THRUST CHAMBER	1 15 20	0 400	PIA		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
P	29	P	V2 THRUST CHAMBER	1 15 21	0 400	PIA		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
P	30	P	VERNIER LOX TANK	1 15 24	0 600	PIA	SLO				X	X	X	X	X	X	X	X	X	X	X	X	X	X					
P	55	P	S FUEL PUMP INLET	1 13 41	0 120	PIA	4% SLO	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
P	56	P	S LOX PUMP INLET	1 15 27	0 150	PIA		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
P	59	P	B2 THRUST CHAMBER	1 15 18	0 600	PIA		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
P	60	P	B1 THRUST CHAMBER	1 14 7	0 600	PIA	60	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
P	100	P	B GG COMBUSTION CHM	1 14 5	0 600	PIA	SLO	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
P	1237	P	ENG OXIDIZER TK POK	R	OFF ON	VDC	STP	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
P	330	P	S FUEL PUMP DISCH	1 15 19	0 1500	PIA		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
P	339	P	S GAS GEN DISCH	1 15 3	0 1000	PIA		X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
P	1344	P	S LOX REG REFERENCE	S	0 1000	PIG	3 SLO	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
P	351	P	S LOX INJ MANIFOLD	1 13 3	0 1000	PIA	SLO				X	X	X	X	X	X	X	X	X	X	X	X	X	X					
P	1863	P	LOX SUBCOOLER OUT	0	0 150	PIG	5 SLO	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
P	1864	P	LOX TRG DSTR OF FLTR	0	0 150	PIG	5 SLO	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
P	14	T	ENGINE COMP AMBIENT	1 13 11	0 400	DGF	5% SLO	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
P	14	T	ENGINE COMP AMBIENT	1 15 17	0 400	DGF	5% SLO	X																					
P	1017	T	B2 TBN INLET	S	0 1800	DGF	30 SLO	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
P	1021	T	LOX AT BREAKAWAY VLV	S	M325 M275	DGF	1 SLO	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
P	1326	T	S TURBINE INLET	S	0 1800	DGF	30 SLO	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
P	671	T	TH SECT AMB QUAD 4	1 13 1	0 400	DGF	5% SLO	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
P	1673	T	B1 FUEL IGN VLV AMB	S	0 300	DGF	15 SLO	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
P	1674	T	B2 FUEL IGN VLV AMB	S	0 300	DGF	15 SLO	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
P	1675	T	ENG CTL PNEU MAN AMB	S	0 300	DGF	15 SLO	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					
P	1862	T	LOX SUBCOOLER OUT	0	M320 M270	DGF	.7 SLO	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X	X					

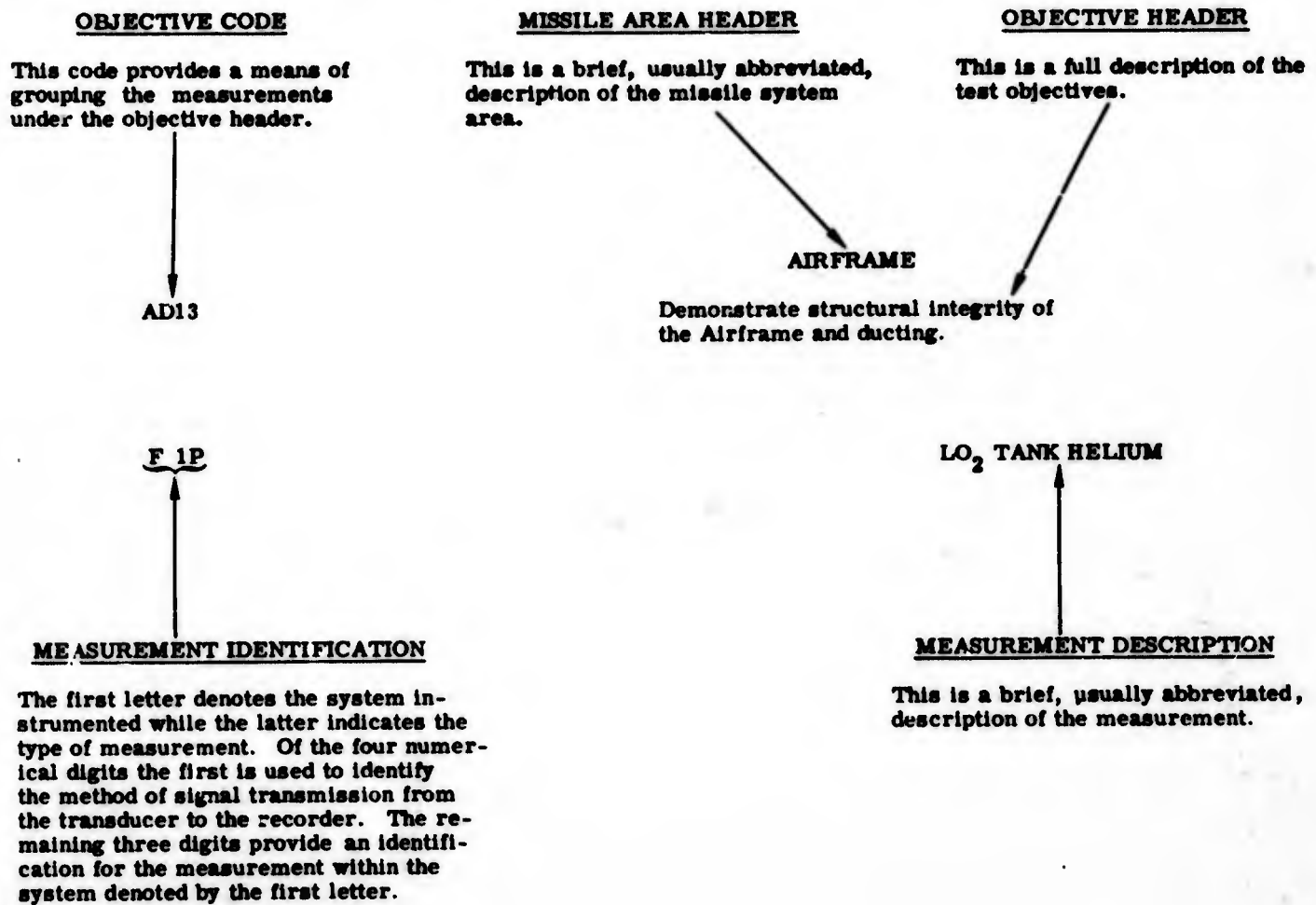
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SECTION 9

SAMOS/MIDAS OBJECTIVE COMPOSITE

This section presents a grouping of the measurements which support each test objective presently scheduled for the SAMOS/MIDAS Program. The following is a brief explanation of the format used in this section.



NOTE: For a more detailed explanation of this format, a key to abbreviations and definition of certain key words see Section 12 of this report.

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OBJ.	CODE	DESCRIPTION	3	8	9	11	12	13	14	15	16	17	18	19	20	21	22
		*MISSILE SYSTEMS AIRFRAME															
	AD13	DEMONSTRATE STRUCTURAL INTEGRITY OF THE AIRFRAME & DUCTING	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
	A	155 T AMB @ HEATER DOOR	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	A	156 T AMB POD NEAR RETRCOV	0														
	A	157 T AMB @ FIREX DOOR 01	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	A	158 T AMB @ FIREX DOOR 02	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	A	851 T LOX TANK SKIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	A	852 T LOX TANK SKIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	A	853 T LOX TANK SKIN	0														
	A	854 T LOX TANK SKIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	A	855 T LOX TANK SKIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	A	856 T LOX TANK SKIN	0														
	A	857 T LOX TANK SKIN	0														
	F	1 P LOX TANK HELIUM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	F	3 P FUEL TANK HELIUM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Y	147 P ADAPTER AREA AMB P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	Y	19 T AGENA ENGINE COMP	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
	AD81	OBTAIN AERODYNAMIC HEATING DATA ON THE CONICAL SECTION OF LOX TANK /STA 587-710/	T														
	A	851 T LOX TANK SKIN	0														
	A	852 T LOX TANK SKIN	0														
	A	853 T LOX TANK SKIN	0														
	A	854 T LOX TANK SKIN	0														
	A	855 T LOX TANK SKIN	0														
	A	856 T LOX TANK SKIN	0														
	A	857 T LOX TANK SKIN	0														

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PROPULSION

PD72	OBTAIN DATA FOR PROPULSION SYSTEM PERFORMANCE ANALYSIS.	T	T	T	T	T	T	T	T	T	T	T	T	T	T
P	328 D S MAIN FUEL VALVE	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P	1 P B1 LOX PUMP INLET	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P	2 P B1 FUEL PUMP INLET	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P	3 P B2 LOX PUMP INLET	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P	4 P B2 FUEL PUMP INLET	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P	6 P S THRUST CHAMBER	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P	27 P VERNIER FUEL TANK	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P	28 P V1 THRUST CHAMBER	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P	29 P B2 THRUST CHAMBER	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P	30 P VERNIER LOX TANK	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P	55 P S FUEL PUMP INLET	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P	56 P S LOX PUMP INLET	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P	59 P B2 THRUST CHAMBER	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P	60 P B1 THRUST CHAMBER	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P	100 P BGG COMBUSTION CHM	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P	330 P S FUEL PUMP DISCH	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P	339 P S GAS GEN DISCH	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P	351 P S LOX INJ MANIFOLD	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P	14 T ENGINE COMP AMBIENT	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P	671 T TH SECT AMB QUAD 4	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P	72 X BOOSTER CUTOFF RELAY	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P	77 X VERNIER CUTOFF RELAY	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P	347 X S COF RELAY LOCKIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P	616 X B FLIGHT LOCKIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0
U	101 A AXIAL ACCELERATION	0	0	0	0	0	0	0	0	0	0	0	0	0	0

PROPELLANT UTILIZATION

UD37	OBTAIN DATA FOR PU SYSTEM PER-	T	T	T	T	T	T	T	T	T	T	T	T	T	T

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PERFORMANCE ANALYSIS.

A	740	T	FUEL	STG	VLV	TWD	GG	0	0	0	0	0	0	0	0	0	0	0	0
A	745	T	AMB	@	S	FUEL	PUMP	0											
A	746	T	AMB	@	V	HYD	SUPPLY	0											
P	528	D	S	MAIN	FUEL	VALVE		0	0	0	0	0	0	0	0	0	0	0	0
P	529	D	S	MAIN	LOX	VALVE		0	0	0	0	0	0	0	0	0	0	0	0
U	101	A	AXIAL	ACCELERATION				0	0	0	0	0	0	0	0	0	0	0	0
U	80	P	LOX	TANK	HEAD			0	0	0	0	0	0	0	0	0	0	0	0
U	81	P	FUEL	TANK	HEAD			0	0	0	0	0	0	0	0	0	0	0	0
U	91	V	ERROR	RATIO	DEMODO	OP		0	0	0	0	0	0	0	0	0	0	0	0

GUIDANCE/FLIGHT CONTROL

SD47 OBTAIN DATA FOR FLIGHT CONTROL SYSTEM PERFORMANCE ANALYSIS. T T T T T T T T T T T T T T T

M	32	X	CONAX	VALVE	COMMAND			0	0	0	0	0	0	0	0	0	0	0	0
P	72	X	BOOSTER	CUTOFF	RELAY		0												
P	77	X	VERNIER	CUTOFF	RELAY		0	0	0	0	0	0	0	0	0	0	0	0	0
P	347	X	S	COF	RELAY	LOCKIN		0	0	0	0	0	0	0	0	0	0	0	0
P	616	X	B	FLIGHT	LOCKIN		0	0	0	0	0	0	0	0	0	0	0	0	0
S	61	D	ROLL	DISPL	GYRO	SIG		0	0	0	0	0	0	0	0	0	0	0	0
S	62	D	PITCH	DISPL	GYRO	SIG		0	0	0	0	0	0	0	0	0	0	0	0
S	63	D	YAW	DISPL	GYRO	SIG		0	0	0	0	0	0	0	0	0	0	0	0
S	252	D	B1	YAW	ROLL		0	0	0	0	0	0	0	0	0	0	0	0	0
S	253	D	B2	YAW	ROLL		0	0	0	0	0	0	0	0	0	0	0	0	0
S	254	D	B1	PITCH			0	0	0	0	0	0	0	0	0	0	0	0	0
S	255	D	B2	PITCH			0	0	0	0	0	0	0	0	0	0	0	0	0
S	256	D	SUSTAINER	YAW			0	0	0	0	0	0	0	0	0	0	0	0	0
S	257	D	SUSTAINER	PITCH			0	0	0	0	0	0	0	0	0	0	0	0	0
S	258	D	V1	PITCH	ROLL		0	0	0	0	0	0	0	0	0	0	0	0	0
S	259	D	V2	PITCH	ROLL		0	0	0	0	0	0	0	0	0	0	0	0	0
S	260	D	V1	YAW			0	0	0	0	0	0	0	0	0	0	0	0	0

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S 261 D B2 YAW	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S 52 R ROLL RATE GYRO SIG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S 53 R PITCH RATE GYRO SIG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S 54 R YAW RATE GYRO SIG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S 701 T SERVO CAN SKIN																	0
S 702 T GYRO CAN SKIN																	0
S 1159 V PCH GYRO NULLING SIG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S 1160 V YAW GYRO NULLING SIG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S 1161 V ROL GYRO NULLING SIG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S 703 V GYRO SUM AMP OUT PCH																	0
S 704 V GYRO SUM AMP OUT YAW																	0
S 705 V GYRO SUM AMP OUT ROL																	0
S 706 V GYRO SUM AMP RES PCH																	0
S 707 V GYRO SUM AMP RES YAW																	0
S 708 V GYRO SUM AMP RES ROL																	0
S 1173 X LOX BLEED VLV CMD	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S 236 X BOOSTER COF DISCRETE																	0
S 241 X SUSTAINER COF DISC																	0
S 245 X VERNIER COF DISCRETE																	0
S 359 X BOOSTER STAGING B/U	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S 1384 X SPIN MOTOR TEST OPT																	0
X 9131 H MSL X VS Y	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
X 9133 H AZIMUTH VS TIME	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

GD34 OBTAIN DATA FOR RADIO GUIDANCE SYSTEM PERFORMANCE ANALYSIS. S S S T T S T T T S T S T T T

G 4 C PB MAGNETRON AVERAGE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G 79 D PITCH PHASE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G 80 D YAW PHASE	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G 82 E RB RF OUTPUT																	0
G 3 V PB AGC	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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G	26 V PITCH ANALOG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G	27 V YAW ANALOG	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G	279 V RB AGC NO. 1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P	72 X BOOSTER CUTOFF RELAY	0															
P	77 X VERNIER CUTOFF RELAY	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P	347 X S COF RELAY LOCKIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
P	616 X B FLIGHT LOCKIN	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
X	9178 N GUID GND STA DATA	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

GD36 DETERMINE THE ACCURACY OF THE GROUND GUIDANCE EQUIPMENT IN PROVIDING THE REQUIRED TRAJECTORY

S	S	S		S		S	S
---	---	---	--	---	--	---	---

G	79 D PITCH PHASE	0	0	0		0		0	0
G	80 D YAW PHASE	0	0	0		0		0	0
G	26 V PITCH ANALOG	0	0	0		0		0	0
G	27 V YAW ANALOG	0	0	0		0		0	0
X	9128 H MSL XYZ VS TIME	0	0	0		0		0	0
X	9156 L MSL XYZ & RESULTANT	0	0	0		0		0	0
X	9178 N GUID GND STA DATA	0	0	0		0		0	0

*SUPPORTING SYSTEMS PNEUMATICS

FD69 OBTAIN DATA FOR PNEUMATICS SYSTEM PERFORMANCE ANALYSIS.

T	T	T	T	T	T	T	T	T	T	T	T	T	T	T	T
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

F	1 P LOX TANK HELIUM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F	3 P FUEL TANK HELIUM	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F	125 P B CTL PNEU REG OUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
F	246 P B TANK HE BOTTLES HI						0	0	0	0	0	0	0	0	0	0	0
F	1253 P PCU LOX TK SNS @ ROD			0	0	0	0	0	0	0	0	0	0	0	0	0	0
F	288 P ST PNEU REG OUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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F 291 P S CTL HE BOTTLE		0	0	0	0	0	0	0	0	0	0	0	0	0
F 323 P LOX TK SNS LN @ REG		0	0											
F 384 P LOX TK BLEED ORFC OT		0	0											
F 247 T B TANK HE BOTTLES									0	0	0			

HYDRAULIC SYSTEM

HD59 OBTAIN DATA FOR HYDRAULIC SYSTEM PERFORMANCE ANALYSIS.	T	T	T	T	T	T	T	T	T	T	T	T	T	T
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

H 33 P B1 HYD ACCUMULATOR	0	0	0	0	0	0	0	0	0	0	0	0	0	0
H 140 P S/VERN HYD PRESS	0	0	0	0	0	0	0	0	0	0	0	0	0	0

ELECTRICAL SYSTEM

ED25 OBTAIN DATA FOR ELECTRICAL SYSTEM PERFORMANCE ANALYSIS.	T	T	T	T	T	T	T	T	T	T	T	T	T	T
--	---	---	---	---	---	---	---	---	---	---	---	---	---	---

E 50 Q 400 CYCLE AC PWR SUP	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E 28 V MSL SYSTEMS DC INPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0
E 51 V 400 CYCLE AC PHASE A	0	0	0	0	0	0	0	0	0	0	0	0	0	0

RANGE SAFETY AND TRACKING

DD26 MONITOR THE RANGE SAFETY COMMAND SYSTEM.	T	T	T	T	T	T	T	T	T	T	T	T	T	T
---	---	---	---	---	---	---	---	---	---	---	---	---	---	---

D 110 X MSL DESTRUCT SIGNAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0
X 9122 E RSC RECEIVER SIGNAL	0	0	0	0	0	0	0	0	0	0	0	0	0	0
X 9125 E RSC GND XMTR OUTPUT	0	0	0	0	0	0	0	0	0	0	0	0	0	0
X 9126 I RSC COMBINED FIELD	0	0	0	0	0	0	0	0	0	0	0	0	0	0
X 9127 N RSC COMMANDS	0	0	0	0	0	0	0	0	0	0	0	0	0	0
X 9121 Q RSC TRANSMITTER	0	0	0	0	0	0	0	0	0	0	0	0	0	0
X 9124 Q RSC CARRIER	0	0	0	0	0	0	0	0	0	0	0	0	0	0

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DD23 OBTAIN DATA FROM ALL TRACKING STATIONS FOR PERFORMANCE ANALYSIS. T T T T T T

X 0000 X ALL TRACKING DATA O O O O O O

MISSILE GENERAL

MD24 DEMONSTRATE THE ABILITY OF THE ATLAS BOOSTER TO PLACE A SATELLITE VEHICLE AT A PREDETERMINED POSITION AND VELOCITY IN SPACE AS DEFINED BY THE GUIDANCE EQUATIONS. P P P P P P

X 9128 H MSL XYZ VS TIME O O O O O O

X 9156 L MSL XYZ & RESULTANT O O O O O O

MD56 THE ATLAS VEHICLE MUST BOOST THE SATELLITE ALONG A PLANNED TRAJECTORY WITH THE AID OF THE GROUND GUIDANCE SYSTEM. P P P P P P P

X 0000 X NO SPECIFIC DATA O O O O O O O

MD57 THE ATLAS VEHICLE MUST SEPARATE FROM THE AGENA VEHICLE AT THE REQUIRED TIME. P P P P P P P

X 0000 X NO SPECIFIC DATA O O O O O O O

MD58 EVALUATE THE PERFORMANCE OF THE ATLAS VEHICLE RELATIVE TO BOOSTING THE SATELLITE VEHICLE ALONG WITH THE AID OF THE GROUND GUIDANCE SYSTEM. S S S S S S S

G 79 D PITCH PHASE O O O O O O O

G 80 D YAW PHASE O O O O O O O

G 26 V PITCH ANALOG O O O O O O O

G 27 V YAW ANALOG O O O O O O O

X 9128 H MSL XYZ VS TIME O O O O O O O

X 9156 L MSL XYZ & RESULTANT O O O O O O O

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X 9178 N GUID GND STA DATA	0	0	0	0	0	0	0	0	0
MD99 EVALUATE THE PERFORMANCE OF THE ATLAS VEHICLE RELATIVE TO SEPARATION OF THE AGENA VEHICLE.	S	S	S	S	S	S	S	S	S
U 101 A AXIAL ACCELERATION	0	0	0	0	0	0	0	0	0
Y 39 X INITIATE LMSC SEPAR	0	0	0	0	0	0	0	0	0
Y 41 X START D TIMER	0	0	0	0	0	0	0	0	0

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SECTION 10

SAMOS/MIDAS RANGE DATA

This section presents a grouping of the data which is gathered externally, to the missile, by the range. Note that this section is presented by Areas of Interest. The following is a brief explanation of the format used in this section.

AREA OF INTEREST

This is a heading, which identifies the area into which the DATA following are grouped.

FLIGHT TRAJECTORY
POSITION

X9128H VEHICLE XYZ VS TIME



DATA DESCRIPTION

This is a brief, usually abbreviated description of the DATA.

DATA IDENTIFICATION

Two letters are included. The first denotes this as external data while the latter indicates the type of measurement. The four numerical digits provide an identification of the measurement.

MEASUREMENT INTERVAL

This provides an indication of the area, either in time or in function units, over which the DATA is to be recorded.

NOTE: Nominal trajectories have been utilized in compiling this information. Interval requirements will change as different trajectories are considered.

0-2000
2000 ft to
Satt. Sep
plus 10 sec

FT

UNITS OF FUNCTION

SAMPLING RATE

This is a statement of the required minimum data sampling rate expressed in data points per second.

REMARKS

This summarizes the method of data presentation as well as other significant details.

TAB/IBM CARDS OR
MAGNETIC TAPE,
AND PLOTTING
BOARD CHARTS

ACCURACY

This expresses the desired accuracy in either plus or minus units of function, or in percent of actual value measured.

CLASS I

10 ft
20 ft

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ATLAS/AGENA B RANGE DATA

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S Y S T E M	T M E N O	T Y P E	DESCRIPTION OF DATA	TRAJECTORY INTERVAL COVERED	SR AA MT PE LI IS NE GC	DATA ACCURACY	PRESENTATION AND OTHER REMARKS
FLIGHT TRAJECTORY							
POSITION							
X	9128	H	VEHICLE XYZ VS TIME	0-2000 FT 2000 FT TO SATT. SEP. PLUS 10 SEC	4 4	CLASS I 10 FT 20 FT	TAB/IBM CARDS OR MAGNETIC TAPE, AND PLOTTING BOARD CHARTS.
				0-2000 FT 2000 FT TO SATT. SEP. PLUS 10 SEC.	4 4	CLASS II 5 FT 10 FT	
X	9150	H	RANGE SAFETY IP	AT FIRST STG IMPACT.	C		COPY OF EACH STANDARD RANGE SAFETY GRAPH.
X	9153	H	GE IMPACT POINT	AT FIRST STG IMPACT.	C	.02% DEG	TAB.
X	9154	H	RADAR IMPACT POINT	AT FIRST STG IMPACT.		.2 % DEG	TAB.
X	9172	H	GE GUIDANCE	SYSTEM OPER- ATION.	2		TAB, IBM CARDS, INFORMA- TION TO INCLUDE SLANT RANGE, AZIMUTH ANGLE, AND ELEVATION ANGLE.
VELOCITY							
X	9156	L	VEH XYZ & RESULTANT	0-2000 FT 2000 FT TO SATT. SEP. PLUS 10 SEC	4 4	CLASS I	TAB, IBM CARDS OR MAGNETIC TAPE, SMOOTHED VELOCITY COMPONENTS CONSISTANT WITH POSITION DATA.
TELEMETRY							
X	9204	Q	SS #1 VIDEO COMP	T-1M TO T-6M	C	CLASS I 0.5 %	SEE TAPE FORMAT SECTION 5-1.
TRACKING							
X	9208	H	COTAR SYSTEM DATA	LIFT-OFF TO SATT. SEP. PLUS 10 SEC		*	X-Z, X-Y PLOTS.
X	9209	N	RADAR RAW DATA	LIFT-OFF TO SATT. SEP. PLUS 10 SEC		*	LOG.
X	9172	H	GE GUIDANCE	LIFT-OFF TO SATT. SEP. PLUS 10 SEC		*	TAB/IBM CARDS OF MAGNETIC TAPE.
X	9210	N	CINE-THEODOLITE DATA	LIFT-OFF TO SATT. SEP. PLUS 10 SEC		*	
WEATHER							

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SECTION 10

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GENERAL DYNAMICS | ASTRONAUTICS

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X 9129 P	PRESUME VS ALTITUDE	SURFACE 0-100,000 FT	CLASSIII 1 MB 5 MB	GRAPH OR TAB. RAWINDSONDE RECORDING TO BE MADE AT LAUNCH.
X 9141 T	TEMP VS ALTITUDE	SURFACE 0-100,000 FT	CLASSIII 5 DGF 5 DGF	GRAPH OR TAB. RAWINDSONDE RECORDING TO BE MADE AT LAUNCH.
X 9146 L	WIND SPEED	SURFACE 0-100,000 FT	CLASSIII 2 KT 2 KT	GRAPH OR TAB. RAWINDSONDE RECORDING TO BE MADE AT LAUNCH, T-6 HRS, AND T-12 HRS.
X 9147 Z	WIND AZIMUTH	SURFACE 0-100,000 FT	CLASSIII 5 DEG 5 DEG	GRAPH OR TAB. RAWINDSONDE RECORDING TO BE MADE AT LAUNCH, T-6 HRS, AND T-12 HRS.
X 9148 N	RELATIVE HUMIDITY	AT LAUNCH POINT 0-100,000 FT	CLASSIII 5% 5%	GRAPH OR TAB. RAWINDSONDE RECORDING TO BE MADE AT LAUNCH.
X 9168 N	CLOUD COVERAGE	AT LAUNCH POINT	.1%	OBSERVATION TO BE MADE AT LAUNCH.
X 9207 N	PRECIPITATION	AT LAUNCH POINT.	.05IN/HR	OBSERVATION TO BE MADE AT LAUNCH.

DOCUMENTARY

X 9176 N	PHOTO COVERAGE	AT LAUNCH	*	AS ESTABLISHED BY CV-A MOTION PICTURE SECTION.
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GEOPHYSICAL

X 9196 N	LAUNCH GEO LOCATION	LAUNCH POINT		ORIGIN-INTERSECTION OF LONGITUDINAL AXIS OF ERECTED VEHICLE AND LAUNCH STAND LOCK PINS AXIS REDUCE TO SEA LEVEL. X AXIS-POS. ALONG PCHOVER AZIMUTH. Y AXIS-POS. 90 DEGREES COUNTER-CLOCKWISE FROM POSITIVE X AXIS. Z AXIS-POSITIVE UPWARD AND NORMAL TO THE CLARKES SPHEROID OF 1866. THIS SYSTEM IS A RECTANGULAR COORDINATE, EARTH-FIXED, RIGHT-HANDED, ORTHOGONAL SYSTEM.
----------	---------------------	--------------	--	---

SYMBOL EXPLANATION

* BEST DATA AVAILABLE.

DATA TAKEN FROM CV-A
PROGRAM REQUIREMENTS
DOCUMENT AZM-27-254 DATED
14 OCTOBER 1960.

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X 9168 N	CLOUD COVERAGE	AT LAUNCH POINT	.1%	OBSERVATION TO BE MADE AT LAUNCH.
X 9207 N	PRECIPITATION	AT LAUNCH POINT.	.05IN/HR	OBSERVATION TO BE MADE AT LAUNCH.
DOCUMENTARY				
X 9176 N	PHOTO COVERAGE	AT LAUNCH	*	AS ESTABLISHED BY CV-A MOTION PICTURE SECTION.
GEOPHYSICAL				
X 9196 N	LAUNCH GEO LOCATION	LAUNCH POINT		ORIGIN-INTERSECTION OF LONGITUDINAL AXIS OF ERECTED VEHICLE AND LAUNCH STAND LOCK PINS AXIS REDUCE TO SEA LEVEL. X AXIS-POS. ALONG PCHOVER AZIMUTH. Y AXIS-POS. 90 DEGREE'S COUNTER-CLOCKWISE FROM POSITIVE X AXIS. Z AXIS-POSITIVE UPWARD AND NORMAL TO THE CLARKES SPHEROID OF 1866. THIS SYSTEM IS A RECTANGULAR COORDINATE, EARTH-FIXED, RIGHT-HANDED, ORTHOGONAL SYSTEM.

SYMBOL EXPLANATION

* BEST DATA AVAILABLE.

DATA TAKEN FROM CV-A PROGRAM REQUIREMENTS DOCUMENT AZM-27-254 DATED 14 OCTOBER 1960.

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APPENDIX A

SAMOS/MIDAS PEN ASSIGNMENTS

For ease of data reduction and clarity of communication, it has been desirable to standardize pen number assignments to the bulk of the sequence (ON-OFF) measurements during Samos/Midas testing. This section presents these standardized measurements and their pen assignments. The measurements listed in this section are not shown elsewhere in this report.

The following is a brief explanation of the format used in this section.

MEASUREMENT IDENTIFICATION

Two letters are included; the first denotes the system instrumented while the latter indicates the type of measurement. Of the four numerical digits the first is used to identify the method of signal transmission to the recorder while the remaining three digits provide an identification for the measurement within the system denoted by the first letter.

P1644X
P1645X
P1143X
P1613X

MEASUREMENT DESCRIPTION

This is a brief, usually abbreviated, description of the measurement*.

ENG TKS PRESSURIZING
ENG TANKS PRES D
GAS GEN IGN LINK BK
V1 P CHM SWITCH ON

PEN NUMBER

This denotes the sequence recorder pen assignment for the measurement.

PEN 1
PEN 2
PEN 3
PEN 4

*NOTE: For a key to abbreviations and coding see Section 12 of this report.

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S	MEAS	Y	T	P	DESCRIPTION	PEN	NO
S	NO	E					
					TIMING	PEN	1
P	1644	X			ENG TKS PRESSURIZING	PEN	2
P	1645	X			ENG TANKS PRES	PEN	3
P	1143	X			GAS GEN IGN LINK BK	PEN	4
P	1613	X			V1 P CHM SWITCH ON	PEN	5
P	1614	X			V2 P CHM SWITCH ON	PEN	6
P	1648	X			V IGNITER LKS INTACT	PEN	7
P	1649	X			M CHM IGN LKS INTACT	PEN	8
P	1068	X			B1 LOX VLV CLSD MSW	PEN	9
P	1170	X			B1 LOX VLV OPEN MSW	PEN	10
P	1067	X			B2 LOX VLV CLSD MSW	PEN	11
P	1169	X			B2 LOX VLV OPEN MSW	PEN	12
P	1621	X			IGN STAGE VALVES	PEN	13
P	1199	X			S LOX HSV CLOSED MSW	PEN	14
P	1198	X			S LOX HSV OPEN MSW	PEN	15
P	1172	X			V1 PV OPEN MSW	PEN	16
P	1077	X			BOOSTER CUTOFF RELAY	PEN	17
P	1347	X			S COF RELAY LOCKIN	PEN	18
S	1242	X			SUS CUTOFF PRGR OTP	PEN	19
					SPARE	PEN	20
					TIMING	PEN	21

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P 1616 X	B FLIGHT LOCK IN	PEN 22
P 1070 X	B1 FUEL VLV CLSD MSW	PEN 23
P 1194 X	B1 FUEL VLV OPEN MSW	PEN 24
P 1069 X	B2 FUEL VLV CLSD MSW	PEN 25
P 1195 X	B2 FUEL VLV OPEN MSW	PEN 26
P 1618 X	B1 FUEL MAN P SW ON	PEN 27
P 1619 X	B2 FUEL MAN P SW ON	PEN 28
P 1622 X	S FLIGHT LOCKIN	PEN 29
P 1203 X	S FUEL PUV CLSD MSW	PEN 30
P 1202 X	S FUEL PUV OPEN MSW	PEN 31
P 1499 X	S GG VLV OPEN MSW	PEN 32
P 1623 X	S FUEL MAN P SW ON	PEN 33
P 1147 X	B GG VLV OPEN MSW	PEN 34
S 1237 X	BOOSTER COF PRGR OTP	PEN 35
P 1624 X	MAIN ENGS COMPLETE	PEN 36
M 1030 X	MSL 2 INCH MOTION Q4	PEN 37
M 1089 X	MSL 8 INCH MOTION	PEN 38
M 1088 X	MSL 2 INCH MOTION Q3	PEN 39
P 1577 X	RELEASE SIGNAL	PEN 40
	TIMING	PEN 41
	SPARE	PEN 42
	SPARE	PEN 43

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	SPARE	PEN 44
	SPARE	PEN 45
	SPARE	PEN 46
	SPARE	PEN 47
	SPARE	PEN 48
P 1689 X	ENG START FAILURE	PEN 49
	SPARE	PEN 50
P 1628 X	IGN STAGE LIM COF	PEN 51
P 1157 X	B2 TBN OVSPEED TRIP	PEN 52
P 1588 X	S TBN OVSPEED TRIP	PEN 53
P 1630 X	MAIN STAGE LIM COF	PEN 54
P 1192 X	B1 ROUGH COMB COF	PEN 55
P 1193 X	B2 ROUGH COMB COF	PEN 56
P 1438 X	S ROUGH COMB COF	PEN 57
P 1828 X	COMMIT STOP CUTOFF	PEN 58
P 1829 X	RELEASE FAILURE COF	PEN 59
	SPARE	PEN 60
	TIMING	PEN 61
F 1987 X	FUEL TK PRES FAILURE	PEN 62
P 1237 P	ENG OXIDIZER TK POK	PEN 63
E 1050 Q	400 CYCLE AC PWRSUP	PEN 64
	SPARE	PEN 65

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	SPARE	PEN 66
P 1311 X	90% FUEL LVL IND	PEN 67
P 1997 X	MSL FUELED 95%	PEN 68
P 1999 X	MSL FUELED 100%	PEN 69
P 1987 X	FUEL OVERFILL PROBE	PEN 70
P 1994 X	LOX 90% LVL	PEN 71
P 1988 X	LOX 95% LVL EMER COF	PEN 72
P 1960 X	LOX 95% /B/	PEN 73
P 1996 X	LOX 99.5% LVL	PEN 74
P 1965 X	LOX 100% LVL	PEN 75
P 1964 X	LOX 100.2% LVL	PEN 76
P 1998 X	LOX O/FILL EMER COF	PEN 77
P 1961 X	LOX OVERFILL /B/	PEN 78
	SPARE	PEN 79
	SPARE	PEN 80
	SPARE	PEN 81
	SPARE	PEN 82
	SPARE	PEN 83
	SPARE	PEN 84
	SPARE	PEN 85
	SPARE	PEN 86
	SPARE	PEN 87

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	SPARE	PEN 88
	SPARE	PEN 89
	SPARE	PEN 90
P 1929 X	APS READY	PEN 91
P 1928 X	LOX READY FOR XFER	PEN 92
E 1111 X	FREQUENCY LOW	PEN 93
E 1112 X	FREQUENCY HIGH	PEN 94
E 1113 X	DC LOW VOLTAGE	PEN 95
E 1114 X	DC HIGH VOLTAGE	PEN 96
E 1115 X	AC LOW VOLTAGE	PEN 97
E 1116 X	AC HIGH VOLTAGE	PEN 98
E 1117 X	EXTERNAL POWER	PEN 99
E 1118 X	INTERNAL POWER	PEN 100
	TIMING	PEN 101
S 1235 X	PROGRAMMER RUN TIME	PEN 102
S 1381 X	STAGING DISCRETE	PEN 103
S 1237 X	BOOSTER COF PRGR OTP	PEN 104
S 1238 X	JETTISON BOOSTER SIG	PEN 105
S 1240 X	PRES V TKS PRGR OTP	PEN 106
Y 1039 X	INITIATE LMSD SEPAR	PEN 107
S 1243 X	SUSTAINER CUTOFF	PEN 108
S 1246 X	VERNIER COF PRG OTP	PEN 109

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ATLAS/AGENA PEN LIST 27 FEB 62

Y 1040 X	UNCAGE LMSD GYROS	PEN 110
Y 1041 X	START D TIMER	PEN 111
P 1072 X	BOOSTER CUTOFF RELAY	PEN 112
P 1347 X	S COF RELAY LOCKIN	PEN 113
P 1077 X	VERNIER CUTOFF RELAY	PEN 114
S 1402 X	PRES V TANK	PEN 115
S 1173 X	LOX BLEED VLV CMD	PEN 116
Y 1038 X	DISARM SEP DESTR MSL	PEN 117
Y 1036 X	START D TIMER AT MSL	PEN 118
Y 1035 X	UNCAGE LM GYRO SIG	PEN 119
Y 1037 X	INITIATE SEP SEQ MSL	PEN 120

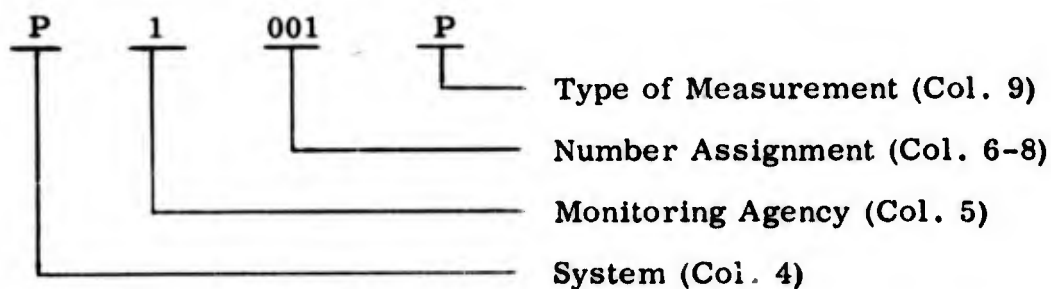
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APPENDIX
INSTRUMENTATION CONFIGURATION
IBM CODE KEY

Master tabulations of all Convair performance measurements applicable to all test articles are maintained by the Test Planning Group. Operational tabulations are compiled from these masters for individual missiles. All instrumentation logs are maintained on IBM punched cards. This facilitates rapid sorting, rearrangement, and tabulation of measurements as required for program preparation and data analysis. Such storage necessitates a systematic classification of the measurements and uniformity in method used to describe the many types of measurements. To achieve this, an extensive coding of the identification, description, and measurement parameters is necessary. The following is an explanation and key for this coding. Each section may be identified in the key by the section heading or the IBM card column number.

I. MEASUREMENT IDENTIFICATION (Col. 4-9)

- A. Each measurement has a unique six-character identification. The first character defines the system within which the measurement exists. The second character defines the monitoring agency. The third, fourth, and fifth characters are number assignments which define a particular measurement within the system defined by the first character. The sixth character defines the type of measurement.



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SYMBOL	SYSTEM (Col. 4)**	TYPE OF MEASUREMENT (Col. 9)
A	Airframe	Acceleration
B	Range Safety Beacon	Rotation Rate
C	APS	Current
D	Range Safety Command	Deflection
E	Electrical	Power
F	Pressurization	Force
G	Guidance (Radio)	*
H	Hydraulic	Position
I	Guidance (Inertial)	Intensity
J	*	*
L	Launcher	Velocity
M	Miscellaneous	Mass
N	Facilities and Site	*
O	*	Vibration
P	Propulsion	Pressure
Q	*	Frequency
R	*	Rate
S	Flight Control System	Strain
T	Telemetry	Temperature
U	Propellant Utilization	*
V	DOVAP Transponder	Voltage
W	*	Time
X	External	Discrete Position
Y	Payload	Acoustical
Z	Azusa Transponder	Azimuth

* Note: Unassigned

** For measurements made via Atlas telemetering system only.

MONITORING AGENCY (Col. 5)

0	Telemetry
1	Direct Line (Captive Test and AFMTC Landline)
3	Checkout and Validation Instrumentation
M	Visual Panel Presentations

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II. MEASUREMENT DESCRIPTION (Col. 10-29)

Commonly used terminology is abbreviated as indicated in the List of Abbreviations at the end of this report.

III. MEASUREMENT RANGE (Col. 35-42)

This represents the desired capability of the measuring system. "M" preceding a number indicates minus quantity. "K" following a number indicates the measurement is thousands of units.

IV. UNITS OF FUNCTION (Col. 43-45)

AMP	Amperes	LBS	Pounds
CPS	Cycles per second	MA	Milliamperes
DB	Decibels	MC	Megacycles
DBM	Decibels above 1 Milliwatts	ME	Milliwatts
DEG	Degrees Angular	MII	Microinches per inch
DGC	Degrees Centigrade	MS	Milliseconds
DGF	Degrees Fahrenheit	MV	Millivolts
DGR	Degrees Rankine	PIA	Pounds per square inch absolute
D/S	Degrees per second	PID	Pounds per square inch differential
E	Watts	PIG	Pounds per square inch gage
F/S	Feet per second	PPS	Pulses per second
FS ²	Feet per second ²	PS	Pounds per second
FTN	Foot ton	PSI	Pounds per square inch
G	Acceleration of Gravity	RPM	Revolutions per minute
GPM	Gallons per minute	RS ²	Radians per second ²
GPS	Gallons per second	SF ²	Slugs feet ²
IN	Inches	SLG	Slugs
INW	Inches of water	SPS	Samples per second
ILB	Inch pounds	UV	Microvolts
IPI	Inches per inch	UA	Microamperes
KC	Kilocycles	VAC	Volts, alternating current
KID	Thousands of pound per square in. differential	VDC	Volts, direct current
KPS	Kilo-pounds	VPK	Peak volts, AC
KPM	Thousands of RPM's	PRV	Phase reversing AC voltage

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V. FREQUENCY RESPONSE REQUIRED (Col. 49-51)

The required response of the measuring system in cycles per second unless otherwise noted or implied.

SLO	Less than 1 cycle per second
400	400 cycles per second
1KC	1 Kilocycle (1000 cycles) per second
2MC	2 Megacycles (2,000,000 cycles) per second
STP	Step Function
UNK	Unknown

VI. TYPE OF TRANSDUCER - ATLAS MEASUREMENTS (Col. 52-61)

*Indicates an "off the shelf" commercial transducer. This is followed by a coded identification of the vendor and the vendor model number if known.

Vendor Code

WK	Wianco Engineering Co.	BLH	Baldwin-Lima Hamilton
MASSA	Massa Laboratories, Inc.	T	Thermo Electric Co., Inc.
R-D	Rocketdyne	WAUGH	Waugh Engineering Co.

Indicates the transducer is the same one as that used for the measurement number immediately following this symbol.

VII. TRANSDUCER SERIAL NUMBER (Col. 62-66)

VIII. TRANSDUCER LOCATION (Col. 67-70)

Station Number (Col. 67-70)

Location by station number to the nearest inch.

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Quadrant Number (Col. 71)

- 1 Quadrant I
- 2 Quadrant II
- 3 Quadrant III
- 4 Quadrant IV
- X XX Axis
- Y YY Axis

FOR LANDLINE AND CAPTIVE TEST

IX. TYPE OF RECORDER (Col. 30-34)

- A AM tape
- D Sanborne type recorder
- E Eput meter, counter
- F FM tape
- G Esterline-Angus-Type-AW Graphic Recorder
- L Panel Light
- M Miscellaneous
- O Oscillograph (CEC)
- P Printer
- R EA Sequence Recorder
- S Strip chart (Brown, Speedomax)
- V Visual panel gage

FOR TELEMETERING ONLY

X. MEASUREMENT CHANNEL ASSIGNMENTS (Col. 30-34, on TLM only)

Telemeter transmitter number (Col. 30)

Subcarrier channel numbers (Col. 31-32)

1-13, A, C, E

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Pin number (Col. 33-34)

Pin number if commutated in telemeter package

Pin number 1 through 60

TYPE OF MEASUREMENT (Col. 76, on TLM only)

- P Primary** - An original measurement with one transducer, the output of which is sent to only one telemetering package.
- M Multiple** - When a measurement is picked up by one transducer but sent over two or more telemetering packages the original measurement is considered primary and the repeated ones considered multiple.

SPECIAL CODING (Col. 76, on TLM only)

- C Installation Drawing/Wiring Diagram**
(Signal available will be shown in tabulation Section 15)
(Output impedance will be shown in tabulation Section 16)

XI. INSTRUMENTATION TEST PLAN

A. Measurement Functions (Col. 31-34)

Functions are assigned two or four digit codes and are classified as (1) Operational Requirements, (2) Post Test Failure Detection Requirements or (3) Test Objectives.

1. Operational Requirements

Operational measurements are those required on a continuing basis for checkout of the missile during the countdown and for safe operation during start, running, and shutdown of a hot firing. These measurements must be presented on a visual display, all others have no such requirement. Operational measurements are indicated by the two digit code (01).

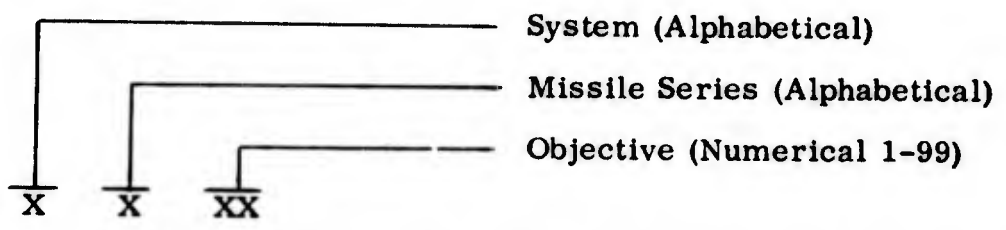
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2. Post Test Failure Detection Requirements

This measurement function includes those measurements which will provide "quick look" type of post test data necessary to detect a possible malfunction. Analysis of this data should indicate an unsafe firing condition. These measurements are indicated by the two digit code (02).

3. Test Objectives

a. Coding System: The coding system for test objectives has been developed to provide a rapid means of identification and handling of a large number of objectives. Coded objectives are listed by system along with the instrumentation required for accomplishment.



b. Letters used to identify the system are identical to those used to identify the system described in Section II of the code key with the following addition:

- o - over-all general objectives, i.e., Reliability, Compatibility
- w - propellant loading

c. Objectives Headers

- (1) The instrumentation test plan presents a tabulation of measurements by test objectives. These test objectives have necessarily been abbreviated to fit the IBM format which limits the entire header to 20 digits.
- (2) Each objective header will contain one of the following five key terms. These terms defined below will establish a standard datum for uniform interpretation of test objectives.

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DEMONSTRATE (DEM) denotes the occurrence of an action or an event during a test. The accomplishment of this type objective requires a qualitative answer. The answer will be derived through the relation of this action or event to some other known information or occurrence. This category of objective implies a minimum of airborne instrumentation, and/or that the information be obtained external to the missile.

DETERMINE (DET) denotes the measuring of performance of any unit or system. This category implies the quantitative investigation of over-all operation which includes, generally, instrumentation for measuring basic inputs and outputs of the unit or system. The information obtained should indicate to what extent the system is operating as designed. The instrumentation should allow performance deficiencies to be isolated to either the system or to the system inputs.

EVALUATE (EVAL) denotes the measuring of over-all performance of any unit or system as well as the performance and/or interaction of its sections or subsystems that are under investigation.

The accomplishment of objectives of this type requires quantitative data on the performance of both unit or system and its sections or subsystems. Instrumentation for this category generally includes measuring basic inputs and outputs of the unit or system as well as basic inputs and outputs of its sections or subsystems. The over-all performance levels of the sections or subsystems will then be analyzed for their contribution toward performance of the unit or system. This category will provide the most detailed information of any of these categories.

OBTAIN DATA (OBTN) denotes gathering engineering information which is to be measured to augment the general knowledge required in the development of the over-all weapon system. This category may also be used for supplemental investigations such as environmental studies, etc. The degree of instrumentation is not implied by this definition; individual objectives will indicate extent of instrumentation required.

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ESTABLISH (ESTB) denotes gathering engineering information for the development of ground procedures and operating techniques. Objectives in this category are not necessarily dependent on analytic studies.

B. Test Block Numbers (Captive only)

Two columns of information are given under each run. These columns indicate which parameters are to be recorded on each test run. The first column gives the measurement priority. The second is used only for priority 1 measurements and gives the measurement category.

C. Priority Symbols (Captive only)

1. These measurements are necessary to ensure safe operation or satisfactory fulfillment of the test objectives. This includes functional readiness indications, the so-called "red line" indications. The test would be authorized to either "hold" or "abort" as applicable for any one of these measurements.
2. These are measurements secondary to any particular test objective. They will contribute additional information toward fulfillment of the test objective but the test would be authorized to "hold" only if the number and nature of the incomplete instrumentation in this category appeared detrimental to accomplishment of the test objective.
3. These are measurements of general information nature. They may supplement the priority 1 and 2 measurements, or they may be of environmental nature in and around the test stand. They will be taken only when manpower and schedules permit. No hold action will be authorized for any of these measurements.

Absence of a priority entry in the first column on any run indicates that the measurement will not be made on that run.

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D. Measurement Categories (Captive only)

- 1A Operations Measurements - Those functions that have to be monitored before and/or during a test. Category "A" measurements will be identified as such irrespective of whether the function has most significance before or during a test.
- 1B Post-Test Inspection Measurements - Those functions that are to be reviewed after a test to determine that systems operated properly and that the test was conducted safely.

SYSTEM EVALUATION MEASUREMENTS

A number of measurements are required for basic systems evaluation. Some of these are already included in categories 1A and 1B as defined above. The rest consist of all other priority 1 measurements.

E. Problem Area (Col. 75-79)

This system of coding is used to group related measurements for easier analysis. Descriptive heading of this coding appear in all tabulations that are presented in this order.

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A

ABT About
AC Alternating Current
ACC Acceleration
ACCEL Accelerometer
ACTR Actuator
ACUM Accumulator
ACY Accessory
ADAPT Adapter
AGC Automatic Gain Control
ALT Alternate
AMB Ambient
AMP Amplifier
ANG Angle
ANT Antenna
APS Accessory Power Supply
ASSY Assembly
ATK Attack
ATT Attitude
AUD Audio
AUX Auxiliary
AVG Average
AX Axis
AZM Azimuth

B

B Booster
B1 Upper Booster
B2 Lower Booster
BAT Battery
BCN Beacon
BGG Booster Gas Generator
BK Break
BLKHD Bulkhead
BLKHS Blockhouse

BLWS Bellows
BO Boil Off
BRG Bearing
BRKT Bracket
B&S Booster & Sustainer
BSTR Booster
BTG Beacon Trigger Generator
BTL Bottle
BYP Bypass

C

C Cycle
CALB Calibrate
CAN Canister
CATH Cathode
CATHFOL Cathode Follower
CAV Cavity
CCT Circuit
CHNL Channel
CHM Chamber
CLS Close
CLOS Closing
CLSD Closed
CMPT Composite
COF Cut Off
COMB Combustion
COMM Commutator
COMP Compartment
CONT Continuous
CONV Converter
COR Corner
CP Contractors Panel
CTL Control
CTR Center
CYL Cylinder

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D

D Decoder
 DBR Doubler
 DC Direct Current
 DCDR Decoder
 DEFL Deflection
 DEFR Deflector
 DEL Delivery
 DEMOD Demodulator
 DESTR Destructor
 DETR Detector
 DI Discrete Integrator
 DIAM Diametric
 DIF Difference
 DIS Discharge
 DISC Discrete
 DISCH Discharge
 DISCON Disconnect
 DISPL Displacement
 DN Down
 DO Drop Out
 DP Pressure Drop
 DRVR Driver
 DSHE Down Stream Heat Exchanger
 DSTR Down Stream
 DT Temperature Drop
 DY Delay

E

EMERG Emergency
 ENG Engine
 ENGAGMT Engagement
 ETO Ethylene Oxide
 ETP Engine Test Panel
 EVCO Electronic Vibration Cutoff
 EXT External

F

FAIL Failure
 FB Feedback
 F & C Fill & Check
 F & D Fill & Drain
 FIN Fine
 FL Flame
 FLDN Fielden
 FLS Flashing Light System
 FLTR Filter
 FOL Follower
 FR Flow Rate
 FREQ Frequency
 FRG Fairing
 FT Flow Totalizer
 FUL Fuel
 FV Fuel Valve
 FWD Forward

G

GEN Generator
 GFST Ground Fuel Start Tank
 GFUT Ground Fuel Ullage Tank
 GG Gas Generator
 GLUT Ground Liquid Oxygen Ullage Tank
 GMBAL Gimbal
 GND Ground
 GN₂ Gaseous Nitrogen
 GOUT Ground Liquid Oxygen Ullage Tank
 GOX Gaseous Oxygen
 GMP Gallons Per Minute
 GRND Ground
 GU Ground Unit

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MTL	Metal	PPS	Pulses Per Second
MULT	Multiplier	PR	Phase Reversing
		PREP	Prepartion
	<u>N</u>	PRES	Pressurizing
NAA	North American Aviation	PRESD	Pressurized
N/C	Nose Cone	PRESS	Pressurization
		PREVLV	Prevalve
	<u>O</u>	PRF	Pulse Repetition Rate
OP	Operation, Optical	PRG	Purge
	Probe, Output	PRGR	Programmer
OPG	Opening	PRIM	Primary
OPN	Open	PROP	Propellant
OPT	Output	PS	Pounds Per Second
ORFC	Orifice	PSUP	Power Supply
OSC	Oscillator	PU	Propellant Utilization
OTBD	Outboard	PUSV	Propellant Utilization
OTP	Output		Servo Valve
OUT	Outlet	PUV	Propellant Utilization Valve
OVBD	Overboard	PV	Propellant Valves
OX	Oxidizer	PWR	Power
OXID	Oxidizer	PWRSUP	Power Supply
			<u>Q</u>
	<u>P</u>	Q	Quadrant
P	Pressure		<u>R</u>
PB	Pulse Beacon		
PB-IP	Pulse Beacon-Impact Predictor	R	Rate Beacon
PCH	Pitch	RAD	Radial
PCP	Pressurization Control Panel	RB	Rate Beacon
PCU	Pressurization Control Unit	RB-IP	Rate Beacon-Impact
PH	Phase		Predictor
PLT	Plate	RCC	Rough Combustion Cut-off
PMP	Pump	RCVR	Receiver
PNEU	Pneumatic	RD	Rocketdyne
POS	Position or Positioner	RDY	Ready

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RECIRC	Recirculate	SNERS	Sensors
REDNDT	Redundant	SNSR	Sensor
RE	Reference	SOL	Solenoid
REFER	Reference	ST	Static
REG	Regulator	ST	Start Tank
REGS	Regulators	STA	Station
REL	Relay	STAB	Stabilizer
RES	Reservoir	STG	Staging
RET	Return	STGTH	Strength
RETR	Retract	STP	Stop
RF	Radio Frequency	STR	Start
RG	Rate Gyro	STRT	Start
RLF	Relief	STRUC	Structure
RLS	Release	SUP	Supply
RNG	Range	SUPP	Suppression
ROL	Roll	SUPT	Support
RSB	Range Safety Beacon	SUR	Surface
RSC	Range Safety Command	SURF	Surface
		SUS	Sustainer
		SV	Servo valve
		SW	Switch
		SYNC	Synchronous
		SYS	System
			<u>T</u>
S	Sustainer	TACH	Tachometer
SA	Servo Amplifier	TANG	Tangential
SAD	Saddle	TAR	Target
SAT	Satisfactory	TBN	Turbine
SC	Subcarrier	T/C	Thermocouple
SDC	Secondary Distribution Center	TCC	Test Conductor's Console
SEC	Second	TEMP	Temperature
SECT	Section	TH	Thrust
SEL	Selector	THST	Thrust
SEP	Separation	TK	Tank
SEQ	Sequence	TLM	Telemeter
SFC	Surface		
SFTY	Safety		
SGG	Sustainer Gas Generator		
SHLD	Shield		
SIG	Signal		

THIS MATERIAL CONTAINS INFORMATION AFFECTING THE NATIONAL DEFENSE OF THE UNITED STATES WITHIN THE MEANING OF THE ESPIONAGE LAWS, TITLE 18, U.S.C., SECTIONS 793 AND 794, THE TRANSMISSION OR REVELATION OF WHICH IN ANY MANNER TO AN UNAUTHORIZED PERSON IS PROHIBITED BY LAW.

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TM Telemeter
 TMR Timer
 TOT Total
 TRIG Trigger
 TSYS Transfer System
 TU Transfer Unit
 TWD Toward

U
 U Upper
 UMBIL Umbilical
 UNREG Unregulated
 USHE Upstream Heat Exchanger

XDUCR Transducer
 XGR Exchange
 XMTR Transmitter
 XPL Explosive
 XPNDR Transponder
 XST Exhaust
 XTAL Crystal
 XVERS Transverse
 XVTR Transverter

YRL Yaw Roll

V
 VDC Volts Direct Current
 V1 Left Vernier
 V2 Right Vernier
 VEL Velocity
 VERN, V Vernier
 VERT Vertical
 VIBN Vibration
 VIH Valve-In-Head
 VLV Valve

W
 WT Weight

X
 XCHANGER Exchanger
 XCIT Excitation
 XDCR Transducer
 XDCRSUP Transducer Supply



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SECTION 13

MISSILE INSTRUMENTATION BY CHANNEL

The Missile Instrumentation Log presented in this section contains the latest available characteristics of the individual measurements. In addition, the telemetering channel assignments are included. Note that this section is listed by channel. The following is a brief explanation of the format of the Missile Instrumentation Log sheet.

VEHICLE	MEASUREMENT DESCRIPTION	MEASUREMENT RANGE	UNITS OF FUNCTION	FREQUENCY RESPONSE	TRANSDUCER LOCATION
A P 29 P	V2 THRUST CHAMBER	0 400	PIA	SLO 7 01737 1	1128 2 P
A F 125 P	B CTL PNEU REG OUT	0 1000	PIA	SLO 7 01731 3	1243 4 P
A F 3 P	FUEL TANK HELIUM	0 100	PIA	SLO 7 01723 13	925 Y P
A P 671 T	TH SECT AMB QUAD 4	100 700	DGF	SLO 7 01684 9	1230 4 P

MEASUREMENT DESCRIPTION
This is a brief, usually abbreviated, description of the measurement.

MEASUREMENT RANGE
Range of interest of the function being measured expressed in "Units of Function."

UNITS OF FUNCTION

FREQUENCY RESPONSE
Denotes the frequency response requirements in cps of the instrumentation system for the measurement.

TRANSDUCER LOCATION
Missile station number and quadrant of transducer installation.

MEASUREMENT IDENTIFICATION
Two letters are included. The first denotes the system instrumented while the latter indicates the type of measurement. The three numerical digits provide an identification of the measurement within the system indicated by the first letter.

TELEMETRY CHANNEL ASSIGNMENT
Indicates the telemeter, subcarrier and pin number for the applicable measurement.

TRANSDUCER IDENTIFICATION

NOTE: For a more detailed explanation of this format and a key to abbreviations and coding see

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SECTION	MISSILE SERIES	MISSILE NO.	SYSTEM	MEASUREMENT NUMBER	TYPE OF MEASUREMENT	DESCRIPTION	TELETYPE NO.	SUB-CARRIER NO.	COMPARISON PIN NO.	MEASUREMENT RANGE		UNITS OR FUNCTION	RATE OF CHANGE OR FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	QUAD	ADDRESS	C A K B C O O B R	DRAWING NUMBER	
										LOW	HIGH										
						COMM RATE CONT	1 0 0														
	L B	35 B				TURBINE SPEED	1 1 1-	12K	30K	RPM						416					
						SPARE	1 2 1-														
						SPARE	1 3 1-														
						SPARE	1 4 1-														
	L A	6 0	Y	ACCEL #3			1 5 1-	M5	5	G					363						
	L A	5 0	X	ACCEL #3			1 6 1-	M5	5	G					363						
	L A	2 0	Y	ACCEL #1			1 7 1-	M5	5	G					313						
	L A	1 0	X	ACCEL #1			1 8 1-	M5	5	G					313						

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METHOD	MISSILE NO.	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TRANSMITTER NO.	SUB-CARRIER NO.	COMPARATOR PIN NO.	MEASUREMENT RANGE		UNITS OF FUNCTION	RATE OF CHANGE OF RESPECT OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	TEMPERATURE	PRESSURE	CURRENT	VOLTAGE
								LOW	HIGH									
				CONN 3A @ 4RPS	1 9 0													
				O CALIBRATION	1 9 1													
	L K	20 T		INTERNAL #27	1 9 3			M100	200	DGF		R- BN-5	310					
				O CALIBRATION	1 9 5													
	L D	30 T		HORIZ SCAN #1 CELL	1 9 7			M100	200	DGF		R- BN-5	324					
	L K	128 T		INTL #19	1 9 9			M100	200	DGF		R- BN-5	310					
	L K	58 T		INTL #29	1 9 11			M100	200	DGF		R- BN-5	310					
	L K	62 T		INTL #35	1 9 13			M100	200	DGF		R- BN-5	310					
	L D	43 T		HYDRAULIC	1 9 15			M100	200	DGF		R- BN-5	414					
	L K	63 T		INTL #36	1 9 17			M100	200	DGF		R- BN-5	310					
	L D	57 T		N2 GAS	1 9 19			M100	200	DGF		R- BN-5	446					
				O CALIBRATION	1 9 21													
				O CALIBRATION	1 9 23													
	L C	2 V		28 VDC REG #1	1 9 25			27	29	VDC			315					
	L C	3 V		28 VDC REG #2	1 9 27			27	29	VDC			315					
				CALIBRATION	1 9 29													
	L D	67 X		N2 SHUTOFF VALVE	1 9 31			ON	OFF				446					
	L K	97 T		INTL #23	1 9 33			M100	200	DGF		R- BN-5	310					
	L K	98 T		INTL #24	1 9 35			M100	200	DGF		R- BN-5	310					
	L K	99 T		INTL #25	1 9 37			M100	200	DGF		R- BN-5	310					
	L K	96 T		INTL #22	1 9 39			M100	200	DGF		R- BN-5	310					
				O CALIBRATION	1 9 41													
				O CALIBRATION	1 9 43													
				O CALIBRATION	1 9 45													

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SECTION	MISSILE SERIAL NO.	SYSTEM	MEASUREMENT NUMBER	TYPE OF MEASUREMENT	DESCRIPTION	TELETYPE NO.	SUB-CARRIER NO.	COMPUTER PIN NO.	MEASUREMENT RANGE		UNITS OF FUNCTION	RATE OF CHANGE OF FUNCTION OR REQUEST OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	ADDRESS	C A M D U O B W	
									LOW	HIGH								
	L B 32 T				OX ID PUMP INLET	1 15 47			30	150	DGF		C- R155- 17	410				
	L K 52 T				HYDRAULIC MOTOR	1 15 40			M100	500	DGF		R- SN-1	420				
	L B 34 T				TURBINE EXHAUST	1 15 51			0	2200	DGF			432				
					0 CALIBRATION	1 15 53												
	L K 61 T				INTERNAL #34	1 15 55			M100	200	DGF		R- BN-4	310				
					0 CALIBRATION	1 15 57												
					SYNC.	1 15 58												
					CONNECTED TO 1-15-58	1 15 59												
					CONNECTED TO 1-15-59	1 15 60												

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SECTION	MISSILE SERIAL NO.	SYSTEM	MEASUREMENT NUMBER	TYPE OF MEASUREMENT	DESCRIPTION	TRANSMITTER NO.	SUBCARRIER NO.	COMMUTATION PIN NO.	MEASUREMENT RANGE		UNITS OF FUNCTION	RATE OF CHANGE OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	QUANTIFICATION	CORRECTION	CIRCUIT CODE	SERIES NUMBER
									LOW	HIGH									
	L A	20 P			FWD COMP	1 16 24	0	15	PIA					333					
					50% CALIBRATION	1 16 25													
					CALIBRATION	1 16 26													
					0 CALIBRATION	1 16 27													
					SYNC.	1 16 28													
					CONNECTED TO 1-16-28	1 16 29													
					CONNECTED TO 1-16-29	1 16 30													

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SECTION	MISSILE SERIAL NO.	ITEM	MEASUREMENT NUMBER	TYPE OF MEASUREMENT	DESCRIPTION	TRANSMITTER NO.	SUB-CARRIER NO.	COMPARATOR PIN NO.	MEASUREMENT RANGE		UNITS OF FUNCTION	RATE OF CHANGE OR FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	QUADRANT	ADDRESS	CARD CODE
									LOW	HIGH								
					COMM 1B @ 10RPS	1 17 0												
					50% CALIBRATION	1 17 1												
	L B	16 X			GAS GEN IGNITER	1 17 2	ON	OFF						426				
	L D	68 D			PITCH ACTUATOR POS	1 17 3	M3	3	DEG					319				
	L B	17 X			FUEL CASE PRESS SM	1 17 4	ON	OFF						417				
	L D	61			GAS JET CHAMBER #1	1 17 5								453				
	L B	18 X			GAS GEN PILOT VALVE	1 17 6	ON	OFF						416				
	L D	62			GAS JET CHAMBER #2	1 17 7								453				
	L B	19 X			OX MANIFOLD PRESS SM	1 17 8	ON	OFF						422				
	L D	63			GAS JET CHAMBER #3	1 17 9								453				
	L B	20 X			V-I-H PILOT VALVE	1 17 10	ON	OFF						421				
	L D	64			GAS JET CHAMBER #4	1 17 11								453				
	L B	21 X			THRUST CHM PRESS SM	1 17 12	ON	OFF						441				
	L D	37 X			INTL ACCEL CAGE SIG	1 17 13	ON	OFF						319				
					50% CALIBRATION	1 17 14												
	L D	46 L			INTEGRATOR OUTPUT	1 17 15	0	6000	F/S					306				
	L B	15 X			MAIN POWER RELAY	1 17 16	ON	OFF						435				
	L D	58 P			N2 REGULATOR PRESS	1 17 17	0	300	PIG					466				
	L B	16 X			CONNECTED TO 1-17-2	1 17 18												
	L D	69 D			YAW ACTUATOR POS	1 17 19	M3	3	DEG					319				
	L B	17 X			CONNECTED TO 1-17-4	1 17 20												
	L D	65			GAS JET CHAMBER #5	1 17 21								453				
	L B	18 X			CONNECTED TO 1-17-6	1 17 22												
	L D	66			GAS JET CHAMBER #6	1 17 23								453				

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SECTION	MISSILE NO.	SYSTEM	MEASUREMENT NUMBER	TYPE OF MEASUREMENT	DESCRIPTION	TELETYPE NO.	SUB-CARRIER NO.	COMPARATOR PIN NO.	MEASUREMENT RANGE		UNITS OF FUNCTION	RATE OF CHANGE OR FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	ADDRESS	U X A B C O D M
									LOW	HIGH							
	L B	19 X			CONNECTED TO 1-17-8	1 17 24											
	L D	60 P			HYDRAULIC	1 17 25			0	4000	PIG		E-2-B-2	414			
	L B	20 X			CONNECTED TO 1-17-10	1 17 26											
					O CALIBRATION	1 17 27											
					SYNC.	1 17 28											
					CONNECTED TO 1-17-28	1 17 29											
					CONNECTED TO 1-17-29	1 17 30											

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SECTION	MISSILE NO.	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELETYPE NO.	SUB-CARRIER NO.	COMPUTER PIN NO.	MEASUREMENT RANGE		UNITS	RATE OF CHANGE OR FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	DRAWING NUMBER
									LOW	HIGH						
	L K 104 0				CONNECTED TO 1-18-23	1 1A 24										
	L K 104 0				CONNECTED TO 1-18-24	1 1A 25										
	L K 104 0				CONNECTED TO 1-18-25	1 1A 26										
	L K 104 0				CONNECTED TO 1-18-26	1 1A 27										
					50% CALIBRATION	1 1A 28										
					CALIBRATION	1 1A 29										
					50% CALIBRATION	1 1A 30										
	L K 105 0				Z VIBRATION #3	1 1A 31			M50	50	G			G- AMT-3 21		301
	L K 105 0				CONNECTED TO 1-18-31	1 1A 32										
	L K 105 0				CONNECTED TO 1-18-32	1 1A 33										
	L K 105 0				CONNECTED TO 1-18-33	1 1A 34										
	L K 105 0				CONNECTED TO 1-18-34	1 1A 35										
	L K 105 0				CONNECTED TO 1-18-35	1 1A 36										
	L K 105 0				CONNECTED TO 1-18-36	1 1A 37										
	L K 105 0				CONNECTED TO 1-18-37	1 1A 38										
	L K 105 0				CONNECTED TO 1-18-38	1 1A 39										
					50% CALIBRATION	1 1A 40										
	L K 106 0				X VIBRATION #2	1 1A 41			M50	50	G			G- A-320		320
	L K 106 0				CONNECTED TO 1-18-41	1 1A 42										
	L K 106 0				CONNECTED TO 1-18-42	1 1A 43										
	L K 106 0				CONNECTED TO 1-18-43	1 1A 44										
	L K 106 0				CONNECTED TO 1-18-44	1 1A 45										
	L K 106 0				CONNECTED TO 1-18-45	1 1A 46										
	L K 106 0				CONNECTED TO 1-18-46	1 1A 47										

This document contains information affecting the national defense of the United States within the meaning of the Espionage Laws, Title 18, USC, Sections 793 and 794. The transmission or the revelation of its contents in any manner to an unauthorized person is prohibited by law.

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CONVAIR  ASTRONAUTICS

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SECTION	MISSILE SERIES	MISSILE NO.	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELEMETRY NO.	SUB-CARRIER NO.	COMPUTER PIN NO.	MEASUREMENT RANGE		UNITS OF FUNCTION	RATE OF CHANGE OR FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	DRAWING NUMBERS
										LOW	HIGH						
						COMM RATE CONT	2 0 0										
	L C	11 0				INVR #1, 400 C FREQ	2 1 1-			400 400	CPS					326	
						SPARE	2 2 1-										
						SPARE	2 3 1-										
						SPARE	2 4 1-										
	L T	36 D				ANG OF ATTACK PITCH	2 5 1-			M45 45	DEG			LMSD		329	
	L B	3 P				GAS GEN CHM	2 6 1-			0 1000	PTG			W- P2-12 51		420	
	L A	13 D				SEPARATION MON #1	2 7 1-			0 4	FT			LMSD		388	
	L 1	14 D				SEPARATION MON #2	2 8 1-			0 4	FT			LMSD		388	
	L A	15 D				SEPARATION MON #3	2 9 1-			0 4	FT			LMSD		388	
	L T	33 D				ANG OF ATTACK YAW	2 10 1-			M45 45	DEG			LMSD		329	
	L A	11 0				X ACCEL #5	2 11 1-			M5 5	G			W- A2-11 01		460	

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SECTION	MISSILE SERIES	MISSILE NO.	SYSTEM	MEASUREMENT NUMBER	TYPE OF MEASUREMENT	DESCRIPTION	TELETYPE NO.	SUB-CARRIER NO.	CONSULTANT PIN NO.	MEASUREMENT RANGE		UNITS OR FUNCTION	RATE OF CHANGE OR FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	QUAD	ADDRESS	C A R B C O D E
										LOW	HIGH								
	L K	149 T				TRIPOD LEG #1	2 12 47			M100	200	DGF		R- RN-5	275				
	L K	150 T				TRIPOD LEG #2	2 12 49			M100	200	DGF		R- RN-5	275				
	L K	153 T				0 CALIBRATION	2 12 51			M100	200	DGF		R- RN-5	275				
						BEARING, PRIM, YOKE	2 12 53			M100	200	DGF							
						0 CALIBRATION	2 12 55												
						0 CALIBRATION	2 12 57												
						SYNC	2 12 58												
						CONNECTED TO 2-12-58	2 12 59												
						CONNECTED TO 2-12-59	2 12 60												

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SECTION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015	1016	1017	1018	1019	102
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SECTION		1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014	1015
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MISSILE INSTRUMENTATION LOG SHEET

REPORT NO. MIDAS 2NDSTG TLM DATE: 9 JUNE 59 PAGE 19

SECTION	MISSILE NO.	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELETYPE NO.	SUB-CARRIER NO.	COMPLIANT PIN NO.	MEASUREMENT RANGE		UNITS OF FUNCTION	RATE OF CHANGE OR FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	DRAWING NUMBER
									LOW	HIGH						
					COMM 3A @ IRDS	2 14 0										
					0 CALIBRATION	2 14 1										
					0 CALIBRATION	2 14 3										
	L C		3 V		28 VDC REG #2	2 14 5			27	29	VDC			315		
					0 CALIBRATION	2 14 7										
	L C		5 V		M28 VDC REGULATED	2 14 9			M28	0	VDC			315		
	L C		15 T		BATTERY #1	2 14 11			M100	200	DGF			315		
	L C		17 T		BATTERY #2	2 14 13			M100	700	DGF			408		
					0 CALIBRATION	2 14 15										
					0 CALIBRATION	2 14 17										
	L C		8 V		115V 2KC 1PH INVR #3	2 14 19			110	120	VAC			318		
	L C		9 V		115V 2KC 1PH INVR #4	2 14 21			110	120	VAC			319		
	L G		1 V		M15 VDC REG LEVEL	2 14 23			M12	M17	VDC			279		
	L C		1 V		28 VDC UNREG VOLT	2 14 25			24	30	VDC			315		
	L C		2 V		28 VDC REG #1	2 14 27			27	29	VDC			315		
					CALIBRATION	2 14 29										
	L G		2 V		DC LEVEL M15 REG	2 14 31			M12	M17	VDC			279		
	L G		3 V		DC LEVEL M4+5 REG	2 14 33					VDC			279		
	L G		6 T		DETECTOR ASSY	2 14 35			M100	700	DGF			270		
	L G		7 T		PRE-AMP #1	2 14 37			30	150				263		
					0 CALIBRATION	2 14 39										
					0 CALIBRATION	2 14 41										
	L G		10 T		RETICLE DC MOTOR	2 14 43			30	150				273		
					0 CALIBRATION	2 14 45										

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SECTION	MISSILE SERIES	MISILE NO.	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELETYPE NO.	SUB-CARRIER NO.	COMPUTER PIN NO.	MEASUREMENT RANGE		UNITS OR FUNCTION	RATE OF CHANGE OR FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	ADDRESS	DRAWING NUMBER
										LOW	HIGH							
	L 6	12 T				PRIMARY MIRROR REAR	2 14 47			30	150					276		
						0 CALIPRATION	2 14 49											
	L 6	14 T				ASWIT-4 DR MOTOR	2 14 51			30	150					297		
						0 CALIBRATION	2 14 53											
						0 CALIBRATION	2 14 55											
						0 CALIBRATION	2 14 57											
						SYNC	2 14 58											
						CONNECTED TO 2-14-58	2 14 59											
						CONNECTED TO 2-14-59	2 14 60											

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MISSILE INSTRUMENTATION LOG SHEET

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SECTION	MISSILE SERIAL NO.	SYSTEM	MEASUREMENT NUMBER	DESCRIPTION	TELEMETRY NO.	SUB-CARRIER NO.	CONVERSION FIN NO.	MEASUREMENT RANGE		UNITS OF FUNCTION	RATE OF CHANGE OF FUNCTION OR FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	GUARD BAND	ADDRESS	CIRCUIT	DRAWING NUMBER
								LOW	HIGH									
				CONN 3B @ IRPS	2 15 0													
				0 CALIBRATION	2 15 1													
				0 CALIBRATION	2 15 3													
				0 CALIBRATION	2 15 5													
				0 CALIBRATION	2 15 7													
				0 CALIBRATION	2 15 9													
	L D	0 D		THRUST MISALIGNMENT	2 15 11			0	30									319
	L D	21 D		MOTOR CONTROL PITCH	2 15 11													310
	L T	33 D		AA YAW ANGLE	2 15 13			M45	45	DEG			LMSD					329
	L T	36 D		AA PITCH ANGLE	2 15 15			M45	45	DEG			LMSD					329
	L D	55 C		PITCH AC CURRENT	2 15 17			0	50	MA								310
	L D	56 C		ROLL YAW AC CURRENT	2 15 19			0	50	MA								310
	L D	35 R		ORBIT PITCH RATE	2 15 21			0	300	D/M								319
	L D	36 C		PITCH WHEEL CURRENT	2 15 23			0	150	MA								310
	L D	32 X		HEATER C INDICATION	2 15 25			ON	OFF									319
	L A	26 X		XPL BOLTS #1+2+3	2 15 27			ON	OFF									475
				CALIBRATION	2 15 29													
	L D	16 R		YAW GYRO TORQUE	2 15 31			0	50	D/M								317
	L D	47 V		PITCH DAMPER DC VOLT	2 15 33			0	30	VDC								310
	L A	52 X		NOSE CONE SFP #1+2+3	2 15 35			ON	OFF									265
	L T	22 V		TLM 200 VDC #3	2 15 37			0	250	VDC								329
	L T	23 V		TLM 20 VDC REG #3	2 15 39			0	20	VDC								329
	L T	24 V		TLM 6+3 VDC #3	2 15 41			0	6+3	VDC								329
	L T	33 D		CONNECTED TO 2-15-13	2 15 43													

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MISSILE INSTRUMENTATION LOG SHEET

REPORT NO. MIDAS 2NDSTG TLM DATE 9 JUNE 59 PAGE 22

SECTION	MISSILE SERIES	MISSILE NO.	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELEMETRY NO.	SUB-CARRIER NO.	COMPUTER PIN NO.	MEASUREMENT RANGE		UNITS OF FUNCTION	RATE OF CHANGE OR FUNCTION	TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	ADDRESS	CODE
										LOW	HIGH							
	LT	36 D				CONNECTED TO 2-15-15 2 15 45												
	LT	34 V				AA YAW SWEEP VOLT #1 2 15 47					3	5	VDC		329			
	LD	22 V				MOTOR CONTR ROLL-YAW 2 15 49					0	1.3	VDC		329			
	LT	37 V				AA PITCH SWEEP V #1 2 15 51					3	5	VDC		329			
	LD	23 R				PITCH GYRO TORO ANG 2 15 53					0	50	D/M		329			
	LT	32 W				TIMER MARKER #2 2 15 55					0	16			329			
						0 CALIBRATION 2 15 57												
						SYNC 2 15 58												
						CONNECTED TO 2-15-58 2 15 59												
						CONNECTED TO 2-15-59 2 15 60												

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SECTION 13

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SECTION	MISSILE SERIES	MISSILE NO.	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELETYPE NO.	SUBCARRIER NO.	COMPUTER PIN NO.	MEASUREMENT RANGE		UNITS OF FUNCTION	RATE OF CHANGE OR FREQUENCY OF FUNCTION	TYPE OF TRANSducer	SERIAL NO.	STATION NO.	DRAWING NUMBER	
										LOW	HIGH							
						COMM RATE CONT		2 16 0										
		L D		31	V	HORZ SCANNER #1 OUT		2 16 1-			0	5	VDC			324		

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SECTION	MISSILE SERIES	MISSILE NO.	SYSTEM	MEASUREMENT NUMBER	TYPE OF MEASUREMENT	DESCRIPTION	TELETYPE NO.	SUB-CARRIER NO.	COMPARATOR PIN NO.	MEASUREMENT RANGE		UNITS OF FUNCTION	RATE OF CHANGE OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	DRAWING NUMBER
										LOW	HIGH						
						COMM 1A @ 10RPS	2 17 0										
						50% CALIBRATION	2 17 1										
						SPARE	2 17 2										
	LA	34 P				SKIN #2	2 17 3	M5	5	PID				W- P2-13 01	263		
	LA	43 P				SKIN #11	2 17 4	M10	10	PID				W- P2-13 01	420		
	LA	31 D				OXID SLOSH #3	2 17 5	0	4	FT				LMSD	365		
	LA	37 P				SKIN #5	2 17 6	M5	5	PID				W- P2-13 01	307		
	LA	44 P				SKIN #12	2 17 7	M10	10	PID				W- P2-13 01	420		
	LA	8 A				Y ACCEL #4	2 17 8	M1	1	G				E- 7-31	480		
	LA	38 P				SKIN #6	2 17 9	M5	5	PID				W- P2-13 01	307		
	LA	45 P				SKIN #13	2 17 10	M10	10	PID				W- P2-13 01	470		
	LA	39 P				SKIN #7	2 17 11	M5	5	PID				W- P2-13 01	340		
	LA	46 P				SKIN #14	2 17 12	M10	10	PID				W- P2-13 01	470		
	LA	40 P				SKIN #8	2 17 13	M5	5	PID				W- P2-13 01	340		
						50% CALIBRATION	2 17 14										
	LA	3 A				X ACCEL #2	2 17 15	M1	1	G				E- 7-31	250		
	LA	41 P				SKIN #9	2 17 16	M5	5	PID				W- P2-13 01	380		
	LA	47 P				SKIN #15	2 17 17	M10	10	PID				W- P2-13 01	480		
	LA	42 P				SKIN #10	2 17 18	M5	5	PID				W- P2-13 01	380		
	LA	48 P				SKIN #16	2 17 19	M10	10	PID				W- P2-13 01	480		
	LA	33 P				SKIN #1	2 17 20	M5	5	PID				W- P2-13 01	263		
	LA	4 A				Y ACCEL #2	2 17 21	M1	1	G				E- 7-31	250		
	LA	35 P				SKIN #3	2 17 22	M5	5	PID				W- P2-13 01	288		
	LA	29 D				OXID SLOSH #1	2 17 23	0	4	FT				LMSD	365		

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SECTION	MISSILE SERIAL NO.	SYSTEM	MEASUREMENT NUMBER	TYPE OF MEASUREMENT	DESCRIPTION	TELETYPE NO.	SUB-CARRIER NO.	COMPUTATION FIN NO.	MEASUREMENT RANGE		UNITS OF FUNCTION	RATE OF CHANGE OR FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	DRAWING NUMBER
									LOW	HIGH						
	L A 36 P				SXIN #4	2 17 24		M5	5	PID			W- P2-13 01	286		
	L A 30 D				OXID SLOSH #2	2 17 25		0	4	FT			LMSD	365		
	L A 7 A				X ACCEL #4	2 17 26		M1	1	G			E- 7-31	480		
					O CALIBRATION	2 17 27										
					SYNC*	2 17 28										
					CONNECTED TO 2-17-28	2 17 29										
					CONNECTED TO 2-17-29	2 17 30										
					COMM 3A * ARPS	2 17 0-										

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MISSILE INSTRUMENTATION LOG SHEET

REPORT NO. MIDAS 2NDSTG TLM DATE 19 JUNE 59

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SECTION	MISSILE SERIES	MISSILE NO.	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELETYPE NO.	SUBCARRIER NO.	COMPUTER FIN NO.	MEASUREMENT RANGE		UNITS OF FUNCTION	RATE OF CHANGE OR RESERVE OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	DRAWING NUMBER
										LOW	HIGH						
						COMM RATE CONT	2 18 0										
				L K 111 0	X VIBN #5		2 18 1-							6- AHT-3 21		301	
						COMM 3B # 6RDS	2 18 0-										

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MISSILE INSTRUMENTATION LOG SHEET

REPORT NO. MIDAS 2NDSTG TLM DATE 19 JUNE 59 PAGE 27

SECTION	MISSILE SERIES	MISSILE NO.	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TRIEMETER NO.	SUB-CARRIER NO.	COMPUTER FIN NO.	MEASUREMENT RANGE		UNITS OF FUNCTION	RATE OF CHANGE OR RESONANCE OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	C U A R D C U C O M
										LOW	HIGH						
						COMM RATE CONT	3 0 0										
	L C	12 0				INVT# 115V 400 C	3 1 1-				370 430	CPS				327	
						SPARE	3 2 1-										
						SPARE	3 3 1-										
						SPARE	3 4 1-										
	L R	44 1				COSMIC RAY MONITOR	3 5 1-									329	
	L K	155 0				VIBRON MTG LUG	3 6 1-			M5	5 6			M- A2-11 01		310	

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REPORT NO. MIDAS 2ND-SIG TLM DATE 19 JUNE 59

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SECTION	MISSILE NO.	SYSTEM	MEASUREMENT NUMBER	DESCRIPTION	TELETYPE NO.	SUB-CARRIER NO.	CONVERTER PIN NO.	MEASUREMENT RANGE		UNITS OF FUNCTION	RATE OF CHANGE OF FUNCTION OR FREQUENCY	TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	ADDRESS	C A B B C O D B
								LOW	HIGH							
				CONN 1A-B @ 4RPS	3	7	0									
				0 CALIBRATION	3	7	1									
	LK	9 T		SKIN #7	3	7	3	0	1200	DGF			327			
	LK	10 T		SKIN #8	3	7	5	0	500	DGF			350			
	LK	11 T		SKIN #9	3	7	7	0	500	DGF			360			
	LK	12 T		SKIN #10	3	7	9	0	500	DGF			430			
	LK	14 T		INTERNAL #2	3	7	11	0	1200	DGF			260			
	LK	40 T		SS/G #4	3	7	13	M100	200	DGF			259			
	LK	41 T		SS/G #5	3	7	15	M100	200	DGF			289			
	LK	17 T		INTERNAL #18	3	7	17	M100	200	DGF			310			
	LK	18 T		INTERNAL #20	3	7	19	M100	500	DGF			310			
	LK	19 T		INTERNAL #26	3	7	21	M100	200	DGF			310			
	LK	42 T		SS/G #6	3	7	23	M100	200	DGF			289			
	LK	8 T		SKIN #6	3	7	25	0	1200	DGF			308			
	LK	34 T		INTERNAL #60	3	7	27	M100	500	DGF			423			
				CALIBRATION	3	7	29									
	LK	21 T		INTERNAL #28	3	7	31	M100	200	DGF			310			
	LC	4 C		28 VDC UNREG CURRENT	3	7	33						315			
	LD	30 T		HORZ SCANNER CELL #1	3	7	35	M100	200	DGF			324			
	LK	24 T		INTERNAL #37	3	7	37	M100	200	DGF			310			
	LK	25 T		INTERNAL #38	3	7	39	M100	200	DGF			310			
	LK	7 T		SKIN #5	3	7	41	0	1200	DGF			289			
	LK	13 T		T/C REFER	3	7	43	M100	300	DGF			260			
	LK	3 T		SKIN #1	3	7	45	0	2200	DGF			251			

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MISSILE INSTRUMENTATION LOG SHEET

REPORT NO. MIDAS 2NDSTG TLM DATE 9 JUNE 59 PAGE 29

SECTION	MISSILE NO.	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELETYPE NO.	SUB-CARRIER NO.	COMPUTER PIN NO.	MEASUREMENT RANGE		UNITS OF FUNCTION	RATE OF CHANGE OR FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	1-4-5-6-7-8-9-10-11-12-13-14-15-16-17-18-19-20-21-22	23-24-25-26-27-28-29-30-31-32-33-34-35-36-37-38-39-40-41-42-43-44-45-46-47-48-49-50-51-52-53-54-55-56-57-58-59-60-61-62-63-64-65-66-67-68-69-70-71-72-73-74-75-76-77-78-79-80-81-82-83-84-85-86-87-88-89-90-91-92-93-94-95-96-97-98-99-100
									LOW	HIGH							
	LK	4 T	SKIN #2		3 7 47				0	2200	DGF			253			
	LK	5 T	SKIN #3		3 7 50				0	2200	DGF			260			
	LK	6 T	SKIN #4		3 7 51				0	1200	DGF			270			
	LD	53 C	PITCH DC CURRENT		3 7 53				0	50	MA			310			
	LD	54 C	ROLL YAW DC CURRENT		3 7 55				0	50	MA			310			
			O CALIBRATION		3 7 57												
			SYNC.		3 7 58												
			CONNECTED TO 3-7-58		3 7 59												
			CONNECTED TO 3-7-59		3 7 60												

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REPORT NO. MIDAS 2NDSTG TLM DATE 19 JUNE 59

SECTION	MISSILE SERIAL	MISSILE NO.	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELETYPE NO.	SUBCARRIER NO.	COMPARATOR PIN NO.	MEASUREMENT RANGE		UNITS	RATE OF CHANGE OR FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO.	STATION P.O.	DRAWING NUMBER
										LOW	HIGH						
	L R	42 X	MMD-A #2	3 B 47	0 12	STP									420		
	L R	43 X	MMD-A #3	3 P 49	0 12	STP									408		
	L C	3 V	28 VDC REG #2	3 R 51	27 29	VDC									315		
	L K	38 T	55/G #7	3 B 53	M100 200	DGF									289		
	L K	39 T	55/G #3	3 B 55	M100 200	DGF									289		
			O CALIBRATION	3 R 57													
			SYNC*	3 R 58													
			CONNECTED TO 3-8-58	3 R 59													
			CONNECTED TO 3-8-59	3 R 60													

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SECTION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013
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SECTION	MISSILE SERIAL NO.	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELETYPE NO.	SUBCARRIER NO.	COMPUTER PIN NO.	MEASUREMENT RANGE		UNITS OF FUNCTION	RATE OF CHANGE OR FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	DRAWING NUMBER
									LOW	HIGH						
					COMM RATE CONT	3 10 0										
	LA 12 0				Y ACCEL #5	3 10 1-			M5	5	G		M- A2-11 01		460	
	LA 9 0				Z ACCEL #1	3 11 1-			M25	25	G		M- A2-11 01		383	
	LH 0				TONE TELL TALES	3 12 1-									324	
	LH 0				TONE TELL TALES	3 13 1-										

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SECTION	MISSILE SERIES	MISSILE NO.	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELETYPE NO.	SUB-CARRIER NO.	COMPARATOR PIN NO.	MEASUREMENT RANGE		UNITS OF FUNCTION	RATE OF CHANGE OR FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	QUADRANT	ADDRESS	DRAWING NUMBER
										LOW	HIGH								
						COMM 3A @ 1RPS	3 14 0												
						0 CALIBRATION	3 14 1												
	L D	48 V				ROLL-YAW-DC VOLT	3 14 3			0	30	VDC				310			
	L D	49 V				PITCH DAMPER AC	3 14 5			0	115	VDC				310			
	L D	50 V				ROLL-YAW AC	3 14 7			0	115	VDC				310			
	L D	13 R				PITCH RATE GYRO	3 14 9									310			
	L D	4 B				PITCH TACH OUTPUT	3 14 0			M2K	2K	RPM				310			
	L D	15 R				ROLL RATE GYRO	3 14 11												
	L D	5 R				ROLL-YAW TACH OUTPUT	3 14 11			M7K	2K	RPM							
						0 CALIBRATION	3 14 13												
	L D	34 X				SS/G TIMER MONITOR	3 14 15			ON	OFF					306			
	L D	70 X				N2 MASTER VALVE	3 14 17			ON	OFF					446			
	L T	11 T				TLM XMTR #2	3 14 19			M100	200	DGF				329			
	L T	12 V				TLM 200 VDC #2	3 14 21			0	250	VDC				329			
	L T	13 V				TLM 20 VDC REG #2	3 14 23			0	20	VDC				329			
	L T	14 V				TLM 6.3 VDC #2	3 14 25			0	6.3	VDC				329			
	L T	15 V				TLM 5 VDC #2	3 14 27			0	20	VDC				329			
						CALIBRATION	3 14 29												
	L D	17				PITCH TL INPUT	3 14 31												
	L D	1 D				PITCH ATTITUDE	3 14 31			M6	6	DEG				319			
	L D	2 D				ROLL ATTITUDE	3 14 33			M6	6	DEG							
	L D	18				ROLL-YAW TL INPUT	3 14 33												
	L D	3 D				YAW ATTITUDE	3 14 35			M6	6	DEG							
	L D	14				PITCH TLI OUTPUT	3 14 35			M6	6	DEG							

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MISSILE INSTRUMENTATION LOG SHEET

REPORT NO. WIDAS 2NDSTG TLM DATE 9 JUNE 50

PAGE 36

SECTION	MISSILE NO.	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELEMETRY NO.	SUBCARRIER NO.	COMPARATOR PIN NO.	MEASUREMENT RANGE		UNITS OF FUNCTION	RATE OF CHANGE OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	DRAWING NUMBER
									LOW	HIGH						
	L D		7		HORZ SCAN #1 ROLL	3 14 37										
	L D		6		HORZ SCAN #1 PITCH	3 14 39										
	L D		16 V		TLM 20 VDC #2	3 14 41			0	30	VDC			329		
	L T		17 T		TLM RF AMP #2	3 14 43			M100	200	DEG			329		
					O CALIBRATION	3 14 45										
	L D		20 V		ROLL YAW TLI OUTPUT	3 14 47			0	1.5	VDC			320		
	L D		14 R		YAW RATE GYRO	3 14 47										
					O CALIBRATION	3 14 49										
	L C		10 V		115V 2KC 1PH INVR #5	3 14 51			114	116	VAC			319		
	L D		51 T		GYRO BLOCK	3 14 53								319		
	L D		52 T		GUIDANCE ELECTRICAL	3 14 55								319		
					O CALIBRATION	3 14 57										
					SYNC	3 14 58										
					CONNECTED TO 3-14-58	3 14 59										
					CONNECTED TO 3-14-59	3 14 60										

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MISSILE INSTRUMENTATION LOG SHEET

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DATE 0 JUNE 59

REPORT NO. MIDAS 2NDSTG TLM

SECTION	MISSILE SERIES	MISSILE NO.	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELEMETRY NO.	SUB-CARRIER NO.	COMPUTER PIN NO.	MEASUREMENT RANGE		UNITS OF FUNCTION	RATE OF CHANGE OF FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	DRAWING NUMBER
										LOW	HIGH						
						COMM RATE CONT	3 15 0										
	L K	113 0	Z VIBRATION #5			SPARE	3 15 1-			M100	100	G		G- A-320		425	
						COMM 2A @ 2.4RPS	3 17 0-										
	L K	110 0	Z VIBRATION #4			COMM 3A @ 6RPS	3 18 1-			M100	100	G		G- A-320		409	
							3 18 0-										

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SECTION 14

APPENDIX A

SERIES D PEN ASSIGNMENTS

For ease of data reduction and clarity of communication, it has been desirable to standardize pen number assignments to the bulk of the sequence (ON-OFF) measurements during "D" series testing. This section presents these standardized measurements and their pen assignments. The measurements listed in this section are not shown elsewhere in this report.

The following is a brief explanation of the format used in this section.

MEASUREMENT IDENTIFICATION

Two letters are included; the first denotes the system instrumented while the latter indicates the type of measurement. Of the four numerical digits the first is used to identify the method of signal transmission to the recorder while the remaining three digits provide an identification for the measurement within the system denoted by the first letter.

PEN NUMBER

This denotes the sequence recorder pen assignment for the measurement.

MEASUREMENT DESCRIPTION

This is a brief, usually abbreviated, description of the measurement.

<u>P 1501 X</u>	IGN STAGE TIMER COF	P11-B	<u>PEN 65</u>
P 1586 X	S IGN FUEL V OPN CTL	P11-E	PEN 66
P 1196 X	SUSTAINER HSV SOL B	P11-P	PEN 67
P 1199 X	S LO ₂ HSV CLSD MSW	<u>P1-H</u>	PEN 68

PICK-UP POINT

This indicates the electrical plug number and pin letter of the pick-up point provided in the electrical control system for this measurement. Small letters are enclosed by slashes in this section to differentiate them from large letters.

*NOTE: For a key to abbreviations and coding see Appendix B

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SERIES D PEN NUMBER 19 JUNE 59

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S	M	T		P	P	
Y	E	Y		L	E	N
S	SO	P	DESCRIPTION	U	N	O
		E		G		
				N		
			TIMING PIP		PEN	1
P	1137	X	ETP PREP COMPLETE LT	P1-H	PEN	4
P	1575	X	PRE START READY	P1-J	PEN	5
P	1161	X	TCC START SWITCH	P1-K	PEN	6
P	1608	X	ENG TANKS PRES	P10-/E/	PEN	7
P	1609	X	ENG FUEL TK PRES	P11-V	PEN	8
P	1610	X	ENG LO2 TK PRES	P11-/K/	PEN	9
P	1441	X	IGNITION STAGE TIMER	P11-W	PEN	10
P	1611	X	MAIN IGNITION START	P11-/C/	PEN	11
P	1612	X	GG IGN LINK PILOT	P11-/E/	PEN	12
P	1073	X	V1 PV CLOSED MSW	P1-N	PEN	13
P	1172	X	V1 PV OPEN MSW	P1-P	PEN	14
P	1074	X	V2 PV CLOSED MSW	P1-R	PEN	15
P	1174	X	V2 PV OPEN MSW	P1-S	PEN	16
P	1613	X	V1 P CHM SWITCH ON	P11-/G/	PEN	17
P	1614	X	V2 P CHM SWITCH ON	P11-/H/	PEN	18
P	1598	X	VERNIER ENG CUTOFF	P11-/W/	PEN	19
			TIMING PIP		PEN	21
P	1621	X	IGN STAGE VLVS	P1-U	PEN	22
P	1068	X	B1 LO2 VLV CLSD MSW	P1-V	PEN	23
P	1170	X	B1 LO2 VLV OPEN MSW	P11-X	PEN	24

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SERIES D PEN NUMBER 19 JUNE 59

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P 1067 X	B2 LO2 VLV CLSD MSW	P1-W	PEN 25
P 1169 X	B2 LO2 VLV OPEN MSW	P11-Z	PEN 26
P 1616 X	B FLIGHT LOCKIN	P14-E	PEN 27
P 1617 X	MAIN STAGE LIMITER	P1-Z	PEN 28
P 1070 X	B1 FUEL VLV CLSD MSW	P1-/E/	PEN 29
P 1194 X	B1 FUEL VLV OPEN MSW	P1-/F/	PEN 30
P 1069 X	B2 FUEL VLV CLSD MSW	P1-/G/	PEN 31
P 1195 X	B2 FUEL VLV OPEN MSW	P1-/H/	PEN 32
P 1071 X	B GG VLV CLOSED MSW	P1-/A/	PEN 33
P 1147 X	B GG VLV OPEN MSW	P1-/B/	PEN 34
P 1618 X	BU FUEL MAN P SW ON	P11-T	PEN 35
P 1619 X	B2 FUEL MAN P SW ON	P11-U	PEN 36
P 1592 X	BOOSTER ENG CUTOFF	P11-/Y/	PEN 37
	TIMING PIP		PEN 41
P 1621 X	IGN STAGE VLVS	P1-U	PEN 42
P 1199 X	S LO2 HSV CLSD MSW	P1-X	PEN 43
P 1198 X	S LO2 HSV OPEN MSW	P11-/A/	PEN 44
P 1622 X	S FLIGHT LOCKIN	P10-S	PEN 45
P 1203 X	S FUEL PUV CLSD MSW	P1-/J/	PEN 46
P 1202 X	S FUEL PUV OPEN MSW	P1-/K/	PEN 47
P 1335 X	SGG VLV CLSD MSW	P1-/C/	PEN 48
P 1499 X	SGG VLV OPEN MSW	P1-/D/	PEN 49

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SERIES D PEN NUMBER 19 JUNE 59

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P 1623 X	S FUEL MAN P SW ON	P11-S	PEN	50
P 1624 X	MAIN ENGS COMPLETE	P1-/M/	PEN	51
P 1596 X	PRE-RLS COF DISARM	P11-/Z/	PEN	52
P 1593 X	SUSTAINER ENG CUTOFF	P11-/X/	PEN	54
P 1627 X	MAIN ENG TH COMPLETE	P11-/P/	PEN	56
	TIMING PIP		PEN	61
P 1072 X	BOOSTER CUTOFF RELAY	P14-P	PEN	62
P 1347 X	S CUTOFF RELAY	P14-M	PEN	63
P 1077 X	VERNIER CUTOFF RELAY	P14-A	PEN	64
P 1154 X	TCC B ENGINE COF SW	P1-/N/	PEN	65
P 1594 X	TCC SUSTAINER COF SW	P1-/P/	PEN	66
P 1164 X	TCC VERN ENG COF SW	P1-/R/	PEN	67
P 1628 X	IGN STAGE LIM COF	P11-/S/	PEN	68
P 1155 X	OBSERVER CUTOFF	P1-/S/	PEN	69
P 1566 X	DC GND PWR FAIL COF	P11-/D/	PEN	70
P 1157 X	B2 TBN OVSPEED TRIP	P11-/U/	PEN	71
P 1588 X	S TBN OVSPEED TRIP	P11-/V/	PEN	72
P 1630 X	MAIN STAGE LIM COF	P11-R	PEN	74
P 1158 X	PREP INCOMPLETE COF	P11-/B/	PEN	75
P 1192 X	B1 ROUGH COMB COF		PEN	76
P 1193 X	B2 ROUGH COMB COF		PEN	77
P 1438 X	S ROUGH COMB COF		PEN	78

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SERIES D PEN NUMBER 19 JUNE 59

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	TIMING PIP		PEN 81
P 1445 X	B FUEL PRE VLV OPEN		PEN 82
P 1446 X	B FUEL PRE VLV CLSD		PEN 83
P 1581 X	S FUEL PRE VLV OPEN		PEN 84
P 1580 X	S FUEL PRE VLV CLSD		PEN 85
P 1686 X	B&SGG LO2 PURGE	P104-A	PEN 93
P 1687 X	B&SGG FUEL PURGE	P104-P	PEN 94
P 1688 X	VERNIER ENGINE PURGE	P104-T	PEN 95
	TIMING PIP		PEN 101

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SECTION 15

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APPENDIX B
WS 117L
IBM CODE KEY

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APPENDIX
INSTRUMENTATION CONFIGURATION
IBM CODE KEY

Master tabulations of all Convair performance measurements applicable to all test articles are maintained by the Test Planning Group. Operational tabulations are compiled from these masters for individual missiles. All instrumentation logs are maintained on IBM punched cards. This facilitates rapid sorting, rearrangement, and tabulation of measurements as required for program preparation and data analysis. Such storage necessitates a systematic classification of the measurements and uniformity in method used to describe the many types of measurements. To achieve this, an extensive coding of the identification, description, and measurement parameters is necessary. The following is an explanation and key for this coding. Each section may be identified in the key by the section heading or the IBM card column number.

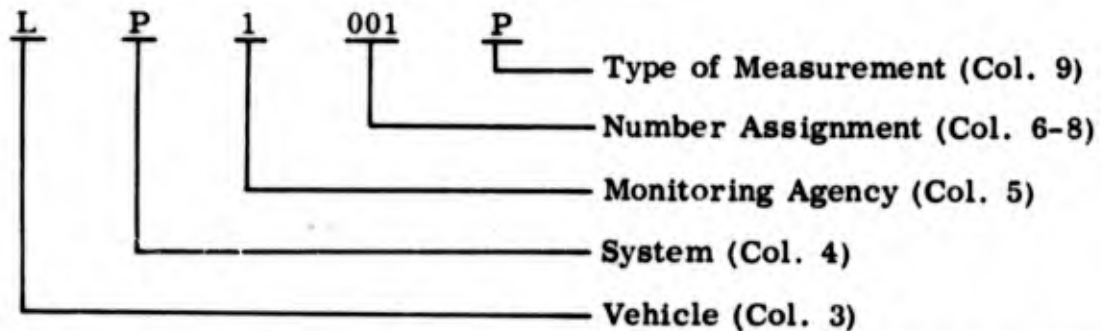
In order to more closely correlate LMSD instrumentation tabulation with Convair's IBM code key, some compromises were necessary. Reference to LMSD telemetry system discussion should be made when using the LMSD tabulation.

I. MISSILE IDENTIFICATION (Col. 3)

This section is used to indicate the vehicle upon which the measurement is made.

II. MEASUREMENT IDENTIFICATION (Col. 4-9)

A. Each measurement has a unique six-character identification. The first character defines the system within which the measurement exists. The second character defines the monitoring agency. The third, fourth, and fifth characters are number assignments which define a particular measurement within the system defined by the first character. The sixth character defines the type of measurement.



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SYMBOL	VEHICLE (Col. 3)	SYSTEM (Col. 4)**	TYPE OF MEASUREMENT (Col. 9)
A		Airframe	Acceleration
B	*	Range Safety Beacon	Rotation Rate
C	Centaur	APS	Current
D	*	Range Safety Command	Deflection
E	*	Electrical	Power
F	*	Pressurization	Force
G	*	Guidance (Radio)	*
H	*	Hydraulic	Position
I	*	Guidance (Inertial)	Intensity
J	JPL 6K Stage	*	*
L	WS 117L 2nd Stage	Launcher	Velocity
M	Mercury Capsule	Miscellaneous	Mass
N	*	Facilities and Site	*
O	*	*	Vibration
P	*	Propulsion	Pressure
Q	*	*	Frequency
R	*	*	Rate
S	*	Flight Control System	Strain
T	*	Telemetry	Temperature
U	*	Propellant Utilization	*
V	Vega 2nd Stage	DOVAP Transponder	Voltage
W	*	*	Time
X	*	External	Discrete Position
Y	*	Payload	Acoustical
Z	*	Azusa Transponder	Azimuth

* Note: Unassigned

** For measurements made via Atlas telemetering system only.

MONITORING AGENCY (Col. 5)

0	Telemetry
1	Direct Line (Captive Test and AFMTC Landline)
3	Checkout and Validation Instrumentation
M	Visual Panel Presentations

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III. MEASUREMENT DESCRIPTION (Col. 10-29)

Commonly used terminology is abbreviated as indicated in the List of Abbreviations at the end of this report.

IV. MEASUREMENT RANGE (Col. 35-42)

This represents the desired capability of the measuring system. "M" preceding a number indicates minus quantity. "K" following a number indicates the measurement is thousands of units.

V. UNITS OF FUNCTION (Col. 43-45)

AMP	Amperes	LBS	Pounds
CPS	Cycles per second	MA	Milliamperes
DB	Decibles	MC	Megacycles
DBM	Decibles above 1 Milliwatts	ME	Milliwatts
DEG	Degrees Angular	MII	Microinches per inch
DGC	Degrees Centigrade	MS	Milliseconds
DGF	Degrees Fahrenheit	MV	Millivolts
DGR	Degrees Rankine	PIA	Pounds per square inch absolute
D/S	Degrees per second	PID	Pounds per square inch differential
E	Watts	PIG	Pounds per square inch gage
F/S	Feet per second	PPS	Pulses per second
FS ²	Feet per second ²	PS	Pounds per second
FTN	Foot ton	PSI	Pounds per square inch
G	Acceleration of Gravity	RPM	Revolutions per minute
GPM	Gallons per minute	RS ²	Radians per second ²
GPS	Gallons per second	SF ²	Slugs feet ²
IN	Inches	SLG	Slugs
INW	Inches of water	SPS	Samples per second
ILB	Inch pounds	UV	Microvolts
IPI	Inches per inch	UA	Microamperes
KC	Kilocycles	VAC	Volts, alternating current
KID	Thousands of pound per square in. differential	VDC	Volts, direct current
KPS	Kilo-pounds	VPK	Peak volts, AC
KPM	Thousands of RPM's	PRV	Phase reversing AC voltage

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VI. FREQUENCY RESPONSE REQUIRED (Col. 49-51)

The required response of the measuring system in cycles per second unless otherwise noted or implied.

SLO	Less than 1 cycle per second
400	400 cycles per second
1KC	1 Kilocycle (1000 cycles) per second
2MC	2 Megacycles (2,000,000 cycles) per second
STP	Step Function
UNK	Unknown

VII. TYPE OF TRANSDUCER - ATLAS MEASUREMENTS (Col. 52-61)

*Indicates an "off the shelf" commercial transducer. This is followed by a coded identification of the vendor and the vendor model number if known.

Vendor Code

WK	Wianco Engineering Co.	BLH	Baldwin-Lima Hamilton
MASSA	Massa Laboratories, Inc.	T	Thermo Electric Co., Inc.
R-D	Rocketdyne	WAUGH	Waugh Engineering Co.

Indicates the transducer is the same one as that used for the measurement number immediately following this symbol.

VIII. TRANSDUCER SERIAL NUMBER (Col. 62-66)**IX. TRANSDUCER LOCATION (Col. 67-70)**Station Number (Col. 67-70)

Location by station number to the nearest inch.

Quadrant Number (Col. 71)

1	Quadrant I
2	Quadrant II
3	Quadrant III
4	Quadrant IV
X	XX Axis
Y	YY Axis

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FOR LANDLINE AND CAPTIVE TEST

X. TYPE OF RECORDER (Col. 30-34)

- A AM tape
- D Sanborne type recorder
- E Eput meter, counter
- F FM tape
- G Esterline-Angus-Type-AW Graphic Recorder
- L Panel Light
- M Miscellaneous
- O Oscillograph (CEC)
- P Printer
- R EA Sequence Recorder
- S Strip chart (Brown, Speedomax)
- V Visual panel gage

FOR TELEMETERING ONLY

XI. MEASUREMENT CHANNEL ASSIGNMENTS (Col. 30-34, on TLM only)

Telemeter transmitter number (Col. 30)

Subcarrier channel numbers (Col. 31-32)

1-13, A, C, E

Pin number (Col. 33-34)

Pin number if commutated in telemeter package

Pin number 1 through 60

TYPE OF MEASUREMENT (Col. 76, on TLM only)

- P Primary - An original measurement with one transducer, the output of which is sent to only one telemetering package.
- M Multiple - When a measurement is picked up by one transducer but sent over two or more telemetering packages the original measurement is considered primary and the repeated ones considered multiple.

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SPECIAL CODING (Col. 76, on TLM only)

- C** Installation Drawing/Wiring Diagram
(Signal available will be shown in tabulation Section 15)
(Output impedance will be shown in tabulation Section 16)

XII. INSTRUMENTATION TEST PLAN**A. Measurement Functions** (Col. 31-34)

Functions are assigned two or four digit codes and are classified as (1) Operational Requirements, (2) Post Test Failure Detection Requirements or (3) Test Objectives.

1. Operational Requirements

Operational measurements are those required on a continuing basis for checkout of the missile during the countdown and for safe operation during start, running, and shutdown of a hot firing. These measurements must be presented on a visual display, all others have no such requirement. Operational measurements are indicated by the two digit code (01).

2. Post Test Failure Detection Requirements

This measurement function includes those measurements which will provide "quick look" type of post test data necessary to detect a possible malfunction. Analysis of this data should indicate an unsafe firing condition. These measurements are indicated by the two digit code (02).

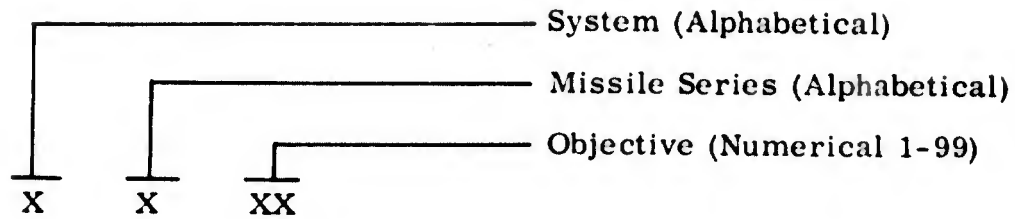
3. Test Objectives

- a. **Coding System:** The coding system for test objectives has been developed to provide a rapid means of identification and handling of a large number of objectives. Coded objectives are listed by system along with the instrumentation required for accomplishment.

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b. Letters used to identify the system are identical to those used to identify the system described in Section II of the code key with the following addition:

- o - overall general objectives, i.e., Reliability, Compatibility
- w - propellant loading

c. Objectives Headers

- (1) The instrumentation test plan presents a tabulation of measurements by test objectives. These test objectives have necessarily been abbreviated to fit the IBM format which limits the entire header to 20 digits.
- (2) Each objective header will contain one of the following five key terms. These terms defined below will establish a standard datum for uniform interpretation of test objectives.

DEMONSTRATE (DEM) denotes the occurrence of an action or an event during a test. The accomplishment of this type objective requires a qualitative answer. The answer will be derived through the relation of this action or event to some other known information or occurrence. This category of objective implies a minimum of airborne instrumentation, and/or that the information be obtained external to the missile.

DETERMINE (DET) denotes the measuring of performance of any unit or system. This category implies the quantitative investigation of overall operation which includes, generally, instrumentation for measuring basic inputs and outputs of the unit or system. The information obtained should indicate to what extent the system is operating as designed. The instrumentation should allow performance deficiencies to be isolated to either the system or to the system inputs.

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EVALUATE (EVAL) denotes the measuring of overall performance of any unit or system as well as the performance and/or interaction of its sections or subsystems that are under investigation.

The accomplishment of objectives of this type requires quantitative data on the performance of both unit or system and its sections or subsystems. Instrumentation for this category generally includes measuring basic inputs and outputs of the unit or system as well as basic inputs and outputs of its sections or subsystems. The overall performance levels of the sections or subsystems will then be analyzed for their contribution toward performance of the unit or system. This category will provide the most detailed information of any of these categories.

OBTAIN DATA (OBTN) denotes gathering engineering information which is to be measured to augment the general knowledge required in the development of the overall weapon system. This category may also be used for supplemental investigations such as environmental studies, ascertaining k factors, ground equipment studies, etc. The degree of instrumentation is not implied by this definition; individual objectives will indicate extent of instrumentation required.

ESTABLISH (ESTB) denotes gathering engineering information for the development of ground procedures and operating techniques. Objectives in this category are not necessarily dependent on analytic studies.

B. Test Block Numbers (Captive only)

Two columns of information are given under each run. These columns indicate which parameters are to be recorded on each test run. The first column gives the measurement priority. The second is used only for priority 1 measurements and gives the measurement category.

C. Priority Symbols (Captive only)

1. These measurements are necessary to ensure safe operation or satisfactory fulfillment of the test objectives. This includes functional readiness indications, the so-called "red line" indications. The test

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would be authorized to either "hold" or "abort" as applicable for any one of these measurements.

2. These are measurements secondary to any particular test objective. They will contribute additional information toward fulfillment of the test objective but the test would be authorized to "hold" only if the number and nature of the incomplete instrumentation in this category appeared detrimental to accomplishment of the test objective.
3. These are measurements of general information nature. They may supplement the priority 1 and 2 measurements, or they may be of environmental nature in and around the test stand. They will be taken only when manpower and schedules permit. No hold action will be authorized for any of these measurements.

Absence of a priority entry in the first column on any run indicates that the measurement will not be made on that run.

D. Measurement Categories (Captive only)

- 1A Operations Measurements - Those functions that have to be monitored before and/or during a test. Category "A" measurements will be identified as such irrespective of whether the function has most significance before or during a test.
- 1B Post-Test Inspection Measurements - Those functions that are to be reviewed after a test to determine that systems operated properly and that the test was conducted safely.

SYSTEM EVALUATION MEASUREMENTS

A number of measurements are required for basic systems evaluation. Some of these are already included in categories 1A and 1B as defined above. The rest consist of all other priority 1 measurements.

E. Problem Area (Col. 75-79)

This system of coding is used to group related measurements for easier analysis. Descriptive heading of this coding appear in all tabulations that are presented in this order.

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A

ABT About
 AC Alternating Current
 ACC Acceleration
 ACCEL Accelerometer
 ACTR Actuator
 ACUM Accumulator
 ACY Accessory
 ADAPT Adapter
 AGC Automatic Gain Control
 ALT Alternate
 AMB Ambient
 AMP Amplifier
 ANG Angle
 ANT Antenna
 APS Accessory Power Supply
 ASSY Assembly
 ATK Attack
 ATT Attitude
 AUD Audio
 AUX Auxiliary
 AVG Average
 AX Axis
 AZM Azimuth

B

B Booster
 B1 Upper Booster
 B2 Lower Booster
 BAT Battery
 BCN Beacon
 BGG Booster Gas Generator
 BK Break
 BLKHD Bulkhead
 BLKHS Blockhouse
 BLWS Bellows
 BO Boil Off
 BRG Bearing

BRKT Bracket
 B&S Booster & Sustainer
 BSTR Booster
 BTG Beacon Trigger
 Generator
 BTL Bottle
 BYP Bypass

C

C Cycle
 CALB Calibrate
 CAN Canister
 CATH Cathode
 CATHFOL Cathode Follower
 CAV Cavity
 CCT Circuit
 CHNL Channel
 CHM Chamber
 CLS Close
 CLOS Closing
 CLSD Closed
 CMPT Composite
 COF Cut Off
 COMB Combustion
 COMM Commutator
 COMP Compartment
 CONT Continuous
 CONV Converter
 COR Corner
 CP Contractors Panel
 CTL Control
 CTR Center
 CYL Cylinder

D

D Decoder

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DBR	Doubler	F & C	Fill & Check
DC	Direct Current	F & D	Fill & Drain
DCDR	Decoder	FIN	Fine
DEFL	Deflection	FL	Flame
DEFR	Deflector	FLDN	Fielden
DEL	Delivery	FLS	Flashing Light System
DEM0D	Demodulator		
DESTR	Destructor	FOL	Follower
DETR	Detector	FR	Flow Rate
DI	Discrete Integrator	FREQ	Frequency
DIAM	Diametric	FRG	Fairing
DIF	Difference	FT	Flow Totalizer
DIS	Discharge	FUL	Fuel
DISC	Discrete	FV	Fuel Valve
DISCH	Discharge	FWD	Forward
DISCON	Disconnect		
DISPL	Displacement		<u>G</u>
DN	Down		
DO	Drop Out	GEN	Generator
DP	Pressure Drop	GFST	Ground Fuel Start Tank
DRVR	Driver		
DSHE	Down Stream Heat Exchanger	GFUT	Ground Fuel Ullage Tank
DSTR	Down Stream	GG	Gas Generator
DT	Temperature Drop	GLUT	Ground Liquid Oxygen Ullage Tank
DY	Delay		
	<u>E</u>	GMBAL	Gimbal
EMERG	Emergency	GND	Ground
ENG	Engine	GN ₂	Gaseous Nitrogen
ENGAGMT	Engagement	GOUT	Ground Liquid Oxygen Ullage Tank
ETO	Ethylene Oxide		
ETP	Engine Test Panel	GOX	Gaseous Oxygen
EVCO	Electronic Vibration Cutoff	GMP	Gallons Per Minute
EXT	External	GRND	Ground
		GU	Ground Unit
			<u>H</u>
	<u>F</u>		
FAIL	Failure	HD	Holddown
FB	Feedback	HE	Helium
		HI	High

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HLDR	Holder	LO	Low
HORZ	Horizontal	LOKIN	Lockin
HPD	Hydraulic Pump Discharge	LOKUP	Lockup
HPP	Hy Pneu Panel	LONG	Longitudinal
HSP	Helium Storage Panel	LO ₂	Liquid Oxygen
HSV	Head Suppression Valve	LT	Light
HT	Heat	LUB	Lube
HTR	Heater	LVL	Level
HYD	Hydraulic		
			<u>M</u>
	<u>I</u>		
IF	Intermediate Frequency	M	Minus
IGN	Ignitor or Ignition	MAG	Magnetron
IN	Inlet	MAN	Manifold
INFO	Information	MANR	Manometer
INJ	Injector or Injection	MC	Megacycles
INST	Instrumentation	MK	Mark
INTERR	Interrogation	MNL	Manual
INTG	Integrating	MON	Monitor
INTGD	Integrated	MOT	Motor
INTL	Internal	MPP	Missile Power Control Panel
INVR	Inverter		
		MSG	Message
		MSL	Missile
		MSW	Microswitch
		MTG	Mounting
JET	Jettison	MTL	Metal
JUNCT	Junction	MULT	Multiplier
			<u>N</u>
	<u>K</u>		
KC	Kilocycles	NAA	North American Aviation
	<u>L</u>	N/C	Nose Cone
L	Launcher		<u>O</u>
L/LFM	Landline FM		
LIM	Limiter	OP	Operational, Optical
LN	Line		Probe, Output
LNG	Long	OPG	Opening
LN ₂	Liquid Nitrogen	OPN	Open

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SECTION 15-13

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OPT	Output	PUV	Propellant Utilization Valve
ORFC	Orifice		
OSC	Oscillator	PV	Propellant Valves
OTBD	Outboard	PWR	Power
OTP	Output	PWRSUP	Power Supply
OUT	Outlet		
OVBD	Overboard		
OX	Oxidizer		<u>Q</u>
OXID	Oxidizer	Q	Quadrant
	<u>P</u>		<u>R</u>
P	Pressure	R	Rate Beacon
PB	Pulse Beacon	RAD	Radial
PB-IP	Pulse Beacon-Impact	RB	Rate Beacon
	Predictor	RB-IP	Rate Beacon-Impact
PCH	Pitch		Predictor
PCP	Pressurization Control	RCC	Rough Combustion Cut-off
	Panel		
PH	Phase	RCVR	Receiver
PLT	Plate	RD	Rocketdyne
PMP	Pump	RDY	Ready
PNEU	Pneumatic	RECIRC	Recirculate
POS	Position or Positioner	REDNDT	Redundant
PPS	Pulses Per Second	RE	Reference
PR	Phase Reversing	REFER	Reference
PREP	Preparation	REG	Regulator
PRES	Pressurizing	REGS	Regulators
PRESD	Pressurized	REL	Relay
PRESS	Pressurization	RES	Reservoir
PREVLV	Prevalve	RET	Return
PRF	Pulse Repetition Rate	RETR	Retract
PRG	Purge	RF	Radio Frequency
PRGR	Programmer	RG	Rate Gyro
PRIM	Primary	RLF	Relief
PROP	Propellant	RLS	Release
PS	Pounds Per Second	RNG	Range
PSUP	Power Supply	ROL	Roll
PU	Propellant Utilization	RSB	Range Safety Beacon
PSUV	Propellant Utilization Servo Valve	RSC	Range Safety Command

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<u>S</u>		<u>T</u>	
S	Sustainer	TACH	Tachometer
SA	Servo Amplifier	TANG	Tangential
SAD	Saddle	TAR	Target
SAT	Satisfactory	TBN	Turbine
SC	Subcarrier	T/C	Thermocouple
SDC	Secondary Distribution Center	TCC	Test Conductor's Console
SEC	Second	TEMP	Temperature
SECT	Section	TH	Thrust
SEL	Selector	THST	Thrust
SEP	Separation	TK	Tank
SEQ	Sequence	TLM	Telemeter
SFC	Surface	TM	Telemeter
SFTY	Safety	TMR	Timer
SGG	Sustainer Gas Generator	TOT	Total
SHLD	Shield	TRIG	Trigger
SIG	Signal	TSYS	Transfer System
SNERS	Sensors	TU	Transfer Unit
SNSR	Sensor		
SOL	Solenoid		<u>U</u>
ST	Static		U
ST	Start Tank	UMBIL	Upper
STA	Station	UNREG	Umbilical
STAB	Stabilizer	USHE	Unregulated
STGTH	Strength		Upstream Heat Exchanger
STP	Stop		
STR	Start		<u>V</u>
STRT	Start		VDC
STRUC	Structure		Volts Direct Current
SUP	Supply	V1	Left Vernier
SUPP	Suppression	V2	Right Vernier
SUPT	Support	VEL	Velocity
SUR	Surface	VERN	Vernier
SURF	Surface	VERT	Vertical
SUS	Sustainer	VIBN	Vibration
SV	Servovalve	VIH	Valve-In-Head
SW	Switch	VLV	Valve
SYNC	Synchronous		
SYS	System		

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WT Weight

X

X Trans
 XCHANGER Exchanger
 XCIT Excitation
 XDCR Transducer
 XDCRSUP Transducer Supply
 XDUCR Transducer
 XGR Exchanger
 XMTR Transmitter
 XPL Explosive
 XPNDR Transponder
 XST Exhaust
 XTAL Crystal
 XVERS Transverse
 XVTR Transverter

Y

YRL Yaw Roll

Z

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stipulated in this memo. CONVAIR-
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GENERAL DYNAMICS CORPORATION

TPL: 2134
26 February 1960

To: All Holders of Report AZC-27-057-29
From: H. R. Macdonald
Subject: Missile 29-D Instrumentation as of 25 February 1960
Reference: (a) Report AZC-27-057-29, Revision A, Instrumentation Configuration,
Series D, Article 29, AMR, dated 5 January 1960

This memo is intended to present those changes in the telemetering configuration of missile 29-D, which have occurred since the publication of Ref. (a). Ref. (a) when corrected in accordance with the changes here presented will show the instrumentation configuration of missile 29-D at the beginning of launch countdown.

1. The following measurements were deleted as Lockheed cannot meet the schedule time to install them. These measurements are located within Lockheed equipment. Convair's task is only to transmit transducer outputs over Atlas telemeter. Since these measurements will not be installed Convair will ground these channel segments to prevent cross-talk:

<u>MEAS. NO.</u>	<u>DESCRIPTION</u>	<u>CHANNEL</u>
<u>DELETE:</u>		
Y 17 T	ADAPTER @ STA 489	1.11.53
Y 19 T	ADAPTER @ STA 399	1.11.47
Y 20 X	EXPLOSIVE BOLT #1	1.A.39
Y 21 X	EXPLOSIVE BOLT #2	1.A.41
Y 22 X	EXPLOSIVE BOLT #3	1.A.53

2. The measurement below was added to instrument the pneumatics separation bottle which has been added for the first time to a WS-117L missile. This measurement will reveal if the bottle was properly pressurized prior to launch and contained sufficient pressure to actuate the staging fittings:

<u>ADD:</u>		
F 304 P	SEPARATION BTL DISCH	1.13.35

3. The following measurement was added to correlate data on engine area environment between the different missiles. The WS-117L missiles have a special airframe configuration due to the different payload, which may be a possible cause of high temperatures:

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GENERAL DYNAMICS CORPORATION

TPL: 2134
26 February 1960
Page 2

Subject: Missile 29-D Instrumentation as of 25 February 1960

ADD:

P 14 T ENGINE COMP AMBIENT 2.11.33

4. The following measurement was deleted during launch countdown by the Flight Test Working Group:

DELETE:

P 29 P V2 THRUST CHAMBER 1.11.5

H. R. Macdonald

H. R. Macdonald
Test Planning

Woe
HRM:TMW:DC:prg

Distribution List for
AZC-27-057

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REPORT NO. AZC-27-057-29

DATE 19 June 1959

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CONVAIR DIVISION OF GENERAL DYNAMICS CORPORATION

INSTRUMENTATION CONFIGURATION

SERIES D ARTICLE 29

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AMR



PREPARED BY W.S. Becker
W. S. Becker
CHECKED BY T.M. Wooster
T. M. Wooster

APPROVED BY H.R. Macdonald
H. R. Macdonald
APPROVED BY P. J. Lynch
P. J. Lynch

REVISIONS

NO.	DATE	BY	CHANGE	PAGES AFFECTED
A	5 Jan '60	WSB	ADDITIONS:	
			F1246P, F1291P, H1101X, H1146X,	ALL TABS
			H1147X, H1187X, H1188X, N1353T,	
			N1354X, P1577X, P1987X, U91V	

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FOREWORD

This report describes the instrumentation provided for the flight of the Series D article number 29 to be tested at the Atlantic Missile Range. It will be the first Midas missile in a series of four to be fired from AFMTC. In addition to the functions that are to be telemetered from the missile, this report includes the operational parameters that are to be recorded via landline. The measurements contained in this report comprise Convair-Astronautics and associated data requirements as evaluated 5 January 1960.

The tabulations will be used by Instrumentation Design, Operations, and Data Reduction Groups to determine instrumentation, data handling and data reduction requirements. Instrumentation tabulated here reflects current planning. Measurement requirements have been added, deleted, or modified on the basis of planning changes, instrumentation philosophy, and missile configurations. Measurement characteristics have been examined and, where necessary, readjusted by the original requesting groups. Further measurement modification will either originate in the Test Planning Group or will be submitted as a recommendation to this group.

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DISCUSSION OF REASONS FOR REVISION "A" CHANGES	4-1	(A)
INSTRUMENTATION TABULATIONS		
Telemetered Instrumentation by Missile Area	8	
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Telemetered Instrumentation by Channel	10	
Missile Instrumentation by Test Objective	11	
Landline Instrumentation	12	

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REASONS FOR REVISION "A" CHANGES

- I. The following measurement is representative of propellant mass ratio error and provides a check on proper operation of the PU computer:

<u>MEAS. NO.</u>	<u>DESCRIPTION</u>	<u>CHANNEL</u>
ADD		
U91V	ERROR RATIO DEMOD OP	1. 13. 43

- II. These measurements, valuable for post test inspection and failure analysis, were added at the request of the site:

ADD

F1246P	B TK HE BOTTLE H1
F1291P	S CTL HE BTL
H1101X	TCC INTL HYD P LIGHT
H1146X	B HYD HI PRESS SW
H1147X	S HYD HI PRESS
H1187X	BSTR OIL EVACUATION
H1188X	SUST OIL EVACUATION
P1577X	RELEASE SIGNAL

- III. The KECO heater unit supplies hot air to the thrust section during LO₂ and LN₂ loading to prevent freeze up during FRF and launch operations. The following measurements are needed to verify the operation of this unit:

ADD

N1353T	KECO HEATER OUTPUT
N1354T	KECO AIRFLOW SAIL SW

- IV. The GE impact predictor has been removed from this missile precluding the requirement for these measurements:

DELETE

G318V	PB-1P AGC	1. 13. 35
G321V	RB-1P AGC	1. 13. 51

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V. There is no longer any requirement for the four vernier propellant inlet pressure measurements:

<u>MEAS. NO.</u>	<u>DESCRIPTION</u>
<u>DELETE</u>	
P1047P	V1 LO ₂ INLET
P1048P	V2 LO ₂ INLET
P1049P	V1 FUEL INLET
P1050P	V2 FUEL INLET

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SECTION 8

MISSILE INSTRUMENTATION BY MISSILE AREA

This section presents a grouping of measurements by Missile Area. Instrumentation of this missile has been established as a result of a detailed analysis of the various missile systems and this section represents the final results of this analysis. The following is a brief explanation of the format used in this section.

MISSILE IDENTIFICATION (TYPICAL)

Series/Missile Number

MEASUREMENT DESCRIPTION

This is a brief, usually abbreviated, description of the measurement.

MISSILE AREA CODE

This code is used to group related measurements for instrumentation planning (IBM sorting).

MISSILE AREA HEADER

This is a brief, usually abbreviated, description of the problem area.

	HYDRAULIC SYSTEM	
D 5 H 33 P	BI HYD ACCUMULATOR	42000
D 5 H 140 P	S/VERN HYD PRESS	42010
	POWER SUPPLY	42220
D 5 E 28 V	MSL SYSTEMS INPUT	43000
D 5 E 50 Q	400 CYCLE AC PWRSUP	43005
		43301

MEASUREMENT IDENTIFICATION

Two letters are included; the first denotes the system instrumented while the latter indicated the type of measurement. Of the four numerical digits the first is used to identify the method of signal transmission from the transducer to the recorder. The remaining three digits provide an identification for the measurement within the system denoted by the first letter.

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SECTION 8

MSL D-29 TLM TEST PLAN 05 JAN 60

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M	S	T	Y	DESCRIPTION	MSL
L	S	NO	E		AREA
				*STRUCTURE	10000
				VIBRATION LOW-FREQ	12000
D29	A	619	O	STA 1212 X AXIS	12017
D29	A	620	O	STA 980 X AXIS	12019
D29	A	621	O	STA 670 X AXIS	12021
D29	A	609	O	STA 1212 Y AXIS	12050
D29	A	610	O	STA 980 Y AXIS	12051
D29	A	611	O	STA 670 Y AXIS	12052
				TEMPERATURES	15000
D29	A	573	T	LO2 TK @ STA 504	15950
D29	A	604	T	LO2 TK @ STA 640	15952

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D29	P	72	X	BOOSTER CUTOFF RELAY	24001
D29	P	30	P	VERNIER LO2 TANK	24013
D29	P	27	P	VERNIER FUEL TANK	24014
D29	P	347	X	S COF RELAY LOCKIN	24101
D29	P	77	X	VERNIER CUTOFF RELAY	24201
				THRUST	25000
D29	P	60	P	B1 THRUST CHAMBER	25001
D29	P	59	P	B2 THRUST CHAMBER	25003
D29	P	6	P	S THRUST CHAMBER	25005
D29	P	28	P	V1 THRUST CHAMBER	25010
D29	P	29	P	V2 THRUST CHAMBER	25011
				PROP. UTILIZATION	26000
D29	U	80	P	LO2 TANK HEAD	26120
D29	U	81	P	FUEL TANK HEAD	26121
D29	U	91	V	ERROR RATIO DEMOD OP	26190
D29	P	528	D	S MAIN FUEL VALVE	26201

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*CONTROL SYSTEM 30000

AUTOPILOT 31000

CONTROL LOOP 31100

D29 S 62 D PITCH DISPL GYRO SIG 31104

D29 S 63 D YAW DISPL GYRO SIG 31105

D29 S 61 D ROLL DISPL GYRO SIG 31106

D29 S 53 R PITCH RATE GYRO SIG 31108

D29 S 54 R YAW RATE GYRO SIG 31109

D29 S 52 R ROLL RATE GYRO SIG 31110

D29 S 254 D B1 PITCH 31127

D29 S 252 D B1 YAW ROLL 31133

D29 S 255 D B2 PITCH 31139

D29 S 253 D B2 YAW ROLL 31145

D29 S 258 D V1 PITCH ROLL 31154

D29 S 260 D V1 YAW 31167

D29 S 261 D V2 YAW 31172

D29 S 257 D SUSTAINER PITCH 31177

D29 S 256 D SUSTAINER YAW 31182

D29 S 259 D V2 PITCH ROLL 31190

RADIO GUIDANCE G E 32000

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			PULSE BEACON	32100
D29	G	3	V PB AGC	32103
D29	G	4	C PB MAGNETRON AVERAGE	32104
			RATE BEACON	32200
D29	G	82	E RB RF OUTPUT	32225
D29	G	279	V RB AGC NO. 1	32233
D29	G	280	V RB AGC NO. 2	32234
			DECODER	32300
D29	G	287	V D PITCH OUTPUT	32335
D29	G	288	V D YAW OUTPUT	32336
D29	G	290	X D CONTACTS #1 & #2	32338
D29	G	291	X D CONTACTS #3 & #4	32339
D29	G	292	X D CONTACTS #5 & #6	32340
D29	G	293	X D CONTACTS #7 & #8	32341

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			*GEN MSL INSTRUMENT	40000
			TANK PRESSURIZATION	41000
D29	F	1 P	L02 TANK HELIUM	41024
D29	F	3 P	FUEL TANK HELIUM	41046
D29	F	246 P	B TK HE BTL HI	41200
			HYDRAULIC SYSTEM	42000
D29	H	33 P	B1 HYD ACCUMULATOR	42010
D29	H	140 P	S/VERN HYD PRESS	42220
			POWER SUPPLY	43000
D29	E	28 V	MSL SYSTEMS INPUT	43005
D29	E	50 Q	400 CYCLE AC PWRSUP	43301
D29	E	51 V	400 CYCLE AC PHASE A	43302
			TRACKING-COMMAND	44000
			RANGE SAFETY CMD	44200
D29	D	1 V	RSC CUTOFF OUTPUT	44203
D29	D	3 X	RSC DESTRUCT OUTPUT	44215
D29	D	7 V	#1 RSC RF INPUT/AGC	44221
			AZUSA TRACKING	44400

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D29	Z	3	E	XPONDR RF INPUT/AGC	44401
D29	Z	2	E	KLYSTRON PWR OUTPUT	44404

GEN MISSILE DATA 45000

D29	M	12	D	PITCH ATTITUDE ANG	45110
D29	M	13	D	YAW ATTITUDE ANGLE	45111
D29	M	14	D	MISSILE ROLL ANGLE	45112
D29	M	26	D	JET SECT SEPARATION	45125
D29	U	101	A	AXIAL ACCELERATION	45127
D29	M	23	D	PITCH ATT ANGLE FINE	45316
D29	M	24	D	YAW ATT ANGLE FINE	45317
D29	M	25	D	ROLL ATT ANGLE FINE	45318
D29	P	671	T	TH SECT AMB QUAD 4	45320
D29	A	622	I	TH SECT LIGHT QUAD 3	45321

TELEMETERING 46000

D29	T	68	T	TM CANISTER AFT OSC	46104
D29	T	69	T	TM CANISTER AFT RF	46105

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PAYLOAD				
				50000
D29	Y	15	T 117L ENGINE COMP	54002
D29	Y	17	T ADAPTER @ STA 489	54004
D29	Y	19	T ADAPTER @ STA 399	54006
D29	Y	20	X EXPLOSIVE BOLT #1	54007
D29	Y	21	X EXPLOSIVE BOLT #2	54008
D29	Y	22	X EXPLOSIVE BOLT #3	54009

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FORM A1336-2

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CONVAIR-ASTRONAUTICS

SECTION 9

SECTION 9

MISSILE INSTRUMENTATION BY SYSTEM

The Missile Instrumentation Log presented in this section contains the latest available characteristics of the individual measurements. In addition, the telemetering channel assignments are included. Note that this section is listed by system. The following is a brief explanation of the format of the Missile Instrumentation Log sheet.

MISSILE IDENTIFICATION (TYPICAL)		MEASUREMENT RANGE		UNITS OF FUNCTION		INSTALLATION DETAILS	
Series / Missile Number	MEASUREMENT DESCRIPTION	Range of interest of the function being measured expressed in "Units of Function."	Function	Drawing Numbers of Mechanical Installation Drawings	Transducer Location	Transducer Identification	Transducer Location
D 5 F 1 P	LO ₂ TANK HELIUM	0 45	PIA	7 01723 11	480 2	27-11608	P
D 5 F 3 P	FUEL TANK HELIUM	0 100	PIA	7 01723 13	925 Y	27-11609	P
D 5 F 125 P	B CTL PNEU REG OUT	0 1000	PIA	7 01731 3	1243 4	27-16500	P
D 5 F 260 P	B TANK HE BOTTLES LO	15 415	PIA	7 01727 1	1238 1	27-11600	P
D 5 F 261 P	S TANK HE BOTTLE LO	15 415	PIA	7 01727 1	1223 2	27-16505	P

MEASUREMENT RANGE

Range of interest of the function being measured expressed in "Units of Function."

UNITS OF FUNCTION

INSTALLATION DETAILS

Drawing Numbers of Mechanical Installation Drawings

TRANSUCER LOCATION

Missile station number and quadrant of transducer installation.

TRANSUCER IDENTIFICATION

Convairstation number of the transducer utilized for the measurement.

FREQUENCY RESPONSE

Denotes the frequency response requirements in cps of the instrumentation system for the measurement.

MEASUREMENT IDENTIFICATION

Two letters are included. The first denotes the system instrumented while the latter indicates the type of measurement. The three numerical digits provide an identification of the measurement within the system indicated by the first letter.

TELEMETRY CHANNEL ASSIGNMENT

Indicates the telemeter, subcarrier and pin number assignment for the applicable measurement.

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CONVAIR-ASTRONAUTICS

MISSILE INSTRUMENTATION LOG SHEET

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SECTION	MISSILE SERIES	MISSILE NO	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELETYPE NO	SUBCARRIER NO	COMPUTER BIN NO	MEASUREMENT RANGE		UNITS OF FUNCTION	RATE OF CHANGE OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO	STATION NO	DRAWING NUMBERS
										LOW	HIGH						
			A			AIRFRAME											
D 29 A	622 T					TH SECT LIGHT QUAD 3 1 A G								27 11596	1	1740 3	P 27-11596
D 29 A	609 O					STA 1212 Y AXIS	1 E 9			M3	3	G	20	27 01237	1	1288 1212 4	P 27-11500
D 29 A	610 O					STA 980 Y AXIS	1 E 3			M3	3	G	20	27 01237	1	1266 980 Y	P 27-11605
D 29 A	611 O					STA 670 Y AXIS	1 E 11			M3	3	G	20	27 01237	1	1279 670 Y	P 27-11501
D 29 A	619 O					STA 1212 X AXIS	1 E 21			M3	3	G	20	27 01237	1	1285 1212 4	P 27-11500
D 29 A	620 O					STA 980 X AXIS	1 E 23			M3	3	G	20	27 01237	1	1291 980 Y	P 27-11605
D 29 A	621 O					STA 670 X AXIS	1 E 1			M3	3	G	20	27 01237	1	1284 670 Y	P 27-11501
D 29 A	573 T					L02 TK @ STA 504	1 11 17			340	740	DGF	SLO	27 11595	9	5170 504 4	P 27-11595
D 29 A	604 T					L02 TK @ STA 640	1 11 21			940	940	DGF	SLO	27 11595	11	5177 640 1	P 27-11595
D						RANGE SAFETY SYSTEM											
D 29 D	1 V					RSC CUTOFF OUTPUT	1 13 7			0	31	VDC	STP				
D 29 D	7 V					#1 RSC RF INPUT/AGC	1 A 7			15	100K	UV	SLO		146	997	P
D 29 D	3 X					RSC DESTRUCT OUTPUT	1 E 95			0	30	VDC	STP				
E						ELECTRICAL POWER SYS											
D 29 E	50 O					400 CYCLE AC PWR SUP	1 1			350	450	CPS	SLO				

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SECTION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012	1013	1014
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SECTION	MISSILE SERIES	MISSILE NO.	SYSTEM	MEASUREMENT NUMBER	TYPE OF MEASUREMENT	DESCRIPTION	TELEMETRY NO.	SUB-CARRIER NO.	COMPUTER PIN NO.	MEASUREMENT RANGE		UNITS OF FUNCTION	RATE OF CHANGE OR FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	DRAWING NUMBER	
										LOW	HIGH							
	D 29 G	201 X	D	CONTACTS #3 & #4	1 13 33	ON	OFF					STP						
	D 29 G	202 X	D	CONTACTS #5 & #6	1 13 45	OFF	ON	VDC				STP						
	D 29 G	203 X	D	CONTACTS #7 & #9	1 13 49	OFF	ON	VDC				STP						
	H					HYDRAULIC SYSTEM												
	D 29 H	33 D	H	R1 HYD ACCUMULATOR	1 11 30	0	3500	PIA				SLO	7 01770	5	2021	1728	1	P 27-11600
	D 29 H	140 D	H	S/VERN HYD PRESS	1 11 43	0	3500	PIA				45	7 01731	9	4855	1191	1	P 27-11601
	M					MISCELLANEOUS												
	D 29 M	17 D	M	PITCH ATTITUDE ANG	1 A 11	M85	85	DEG				2	7 01638	1	515	976	Y	P 27-11603
	D 29 M	13 D	M	YAW ATTITUDE ANGLE	1 A 15	M85	85	DEG				2	7 01638	1	515	976	Y	P 27-11603
	D 29 M	14 D	M	MISSILE ROLL ANGLE	1 A 19	0	359	DEG				2	7 01638	1	515	976	Y	P 27-11603
	D 29 M	23 D	M	PITCH ATT ANGLE FINE	1 A 13	0	90	DEG				2	7 01638	1	515	976	Y	P 27-11603
	D 29 M	24 D	M	YAW ATT ANGLE FINE	1 A 17	0	90	DEG				2	7 01638	1	515	976	Y	P 27-11603
	D 29 M	25 D	M	ROLL ATT ANGLE FINE	1 A 21	0	90	DEG				2	7 01638	1	515	976	Y	P 27-11603
	D 29 M	26 D	M	JET SECT SEPARATION	1 A 23	0	15	FT				STP	7 12052	1	1134	Y	P 27-11604	
	P					PROPULSION SYSTEM												
	D 29 P	83 B	P	B2 PUMP SPEED	1 2	5680	6400	RPM				SLO	7 01237	3	118	1228	4	P 27-17522
	D 29 P	84 B	P	B1 PUMP SPEED	1 A 31	5680	6400	RPM				SLO	7 01237	3	42	1196	4	P
	D 29 P	349 B	P	S PUMP SPEED	1 3	9.9	11.2	KPM				SLO	7 01437	13	CONR4	1234	3	P 27-11611

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SECTION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	DRAWING NUMBERS
									LOW	HIGH									
	D 29 P	528 D	S	MAIN FUEL VALVE	1 A 45	0	90	DEG	SLO	NAA									P
	D 29 P	529 D	S	MAIN LO2 VALVE	1 11 37	0	90	DEG	SLO	NAA									P
	D 29 P	6 P	S	THRUST CHAMBER	1 C 53	0	1000	PIA	SLO										P 27-16504
	D 29 P	26 P	B	LO2 REG REFERENCE	1 C 43	0	600	PIA	SLO										P 27-16500
	D 29 P	27 P	P	VERNIER FUEL TANK	1 C 47	0	1000	PIA	SLO										P 27-16505
	D 29 P	28 P	P	V1 THRUST CHAMBER	1 11 1	0	400	PIA	SLO										P 27-11614
	D 29 P	29 P	P	V2 THRUST CHAMBER	1 11 5	0	400	PIA	SLO										P 27-11614
	D 29 P	30 P	P	VERNIER LO2 TANK	1 13 13	0	1000	PIA	SLO										P 27-16505
	D 29 P	56 P	P	S LO2 PUMP INLET	1 C 7	0	150	PIA	SLO										P 27-16504
	D 29 P	59 P	P	B2 THRUST CHAMBER	1 C 21	0	600	PIA	SLO										P 27-11612
	D 29 P	60 P	P	B1 THRUST CHAMBER	1 C 23	0	600	PIA	SLO										P 27-11612
	D 29 P	100 P	P	BGG COMBUSTION CHM	1 C 13	0	600	PIA	SLO										P 27-16500
	D 29 P	330 P	P	S FUEL PUMP DISCH	1 C 35	0	1500	PIA	SLO										P 27-16504
	D 29 P	339 P	P	S GAS GEN DISCH	1 C 31	0	1000	PIA	SLO										P 27-16504
	D 29 P	344 P	P	S LO2 REG REFERENCE	1 C 39	0	1000	PIA	SLO										P 27-16504
	D 29 P	351 P	P	S LO2 INJ MANIFOLD	1 11 15	0	1000	PIA	SLO										P 27-16504
	D 29 P	530 T	S	LO2 PUMP INLET	1 11 13	M300	M200	DGF	SLO										P 27-11634
	D 29 P	671 T	TH	SECT AMB QUAD 4	1 1 3	100	700	DGF	SLO										P 27-11509
	D 29 P	72 X	X	BOOSTER CUTOFF RELAY	1 B 5	0	2H	VDC	BLP										P
	D 29 P	77 X	X	VERNIER CUTOFF RELAY	1 C 5	0	2H	VDC	STP										P

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SECTION	MISSILE SERIES	MISSILE NO.	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	ISMETER NO.	SUB-CARRIER NO.	COMPUTER PIN NO.	MEASUREMENT RANGE		UNITS OF FUNCTION	RATE OF CHANGE OR FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	DRAWING NUMBERS
										LOW	HIGH						
	D 29 T	69	T			TM CANISTER AFT RF	1 11 23			0	200	DGF	SLO	7 01376	1 3573		
	U					PROPELLANT UTILIZ											
	D 29 U	101	A			AXIAL ACCELERATION	1 12 1-			0	H	G	30	7 01413	5 5917	994 Y	P 27-11597
	D 29 U	80	P			L02 TANK HEAD	1 A 33			0	5	PID	SLO	27 01297	1 5432		
	D 29 U	81	P			FUEL TANK HEAD	1 A 35			0	5	PID	SLO	27 01297	1 5437		
	D 29 U	91	V			ERROR RATIO DEMOD OP	1 13 43			M20	20	VDC	SLO				
	Y					DECOY SYSTEM											
	D 29 Y	15	T			117L ENGINE COMP	1 11 11			M200	200	DGF	10	7 01684	7 13	472 Z	P 27-11597
	D 29 Y	17	T			ADAPTER @ STA 489	1 11 53			0	1400	DGF	10	7 01684	7 5175	489 Y	P 27-11597
	D 29 Y	19	T			ADAPTER @ STA 399	1 11 47			0	1400	DGF	10	7 01684	7 5172	399 Y	P 27-11597
	D 29 Y	20	X			EXPLOSIVE BOLT #1	1 A 39			ON	OFF	STP					
	D 29 Y	21	X			EXPLOSIVE BOLT #2	1 A 41			ON	OFF	STP					
	D 29 Y	22	X			EXPLOSIVE BOLT #3	1 A 53			ON	OFF	STP					
	Z					AZUSA SYSTEM											
	D 29 Z	2 F				KLYSTRON PWR OUTPUT	1 13 31			0	17	F	1		183		

SECTION 10

MISSILE INSTRUMENTATION BY CHANNEL

The Missile Instrumentation Log presented in this section contains the latest available characteristics of the individual measurements. In addition, the telemetering channel assignments are included. Note that this section is listed by channel. The following is a brief explanation of the format of the Missile Instrumentation Log sheet.

MISSILE IDENTIFICATION (TYPICAL)		MEASUREMENT DESCRIPTION		MEASUREMENT RANGE		UNITS OF FUNCTION		INSTALLATION DETAILS	
Series/Missile Number		This is a brief, usually abbreviated, description of the measurement.		Range of interest of the function being measured expressed in "Units of Function."			Drawing Numbers of Mechanical Installation Drawings.		
D 5 P	29 P	V2 THRUST CHAMBER	1 11 5	0 400	PIA	SLO	7 01737 1	1128 2	P 27-11614
D 5 F	125 P	B CTL PNEU REG OUT	1 11 7	0 1000	PIA	SLO	7 01731 3	1243 4	P 27-16500
D 5 F	3 P	FUEL TANK HELIUM	1 11 9	0 100	PIA	SLO	7 01723 13	925 Y	P 27-11509
D 5 P	671 T	TH SECT AMB QUAD 4	1 11 11	100 700	DGF	SLO	7 01684 9	1230 4	P 27-11599

MEASUREMENT IDENTIFICATION	FREQUENCY RESPONSE	TRANSDUCER LOCATION	TRANSDUCER IDENTIFICATION
Two letters are included. The first denotes the system instrumented while the latter indicates the type of measurement. The three numerical digits provide an identification of the measurement within the system indicated by the first letter.	Denotes the frequency response requirements in cps of the instrumentation system for the measurement.	Missile station number and quadrant of transducer installation.	Convairst part number of the transducer utilized for the measurement.

TELEMETRY CHANNEL ASSIGNMENT
Indicates the telemeter, subcarrier and pin number for the applicable measurement.

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MISSILE INSTRUMENTATION LOG SHEET

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CONVAIR-ASTRONAUTICS

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	U 29	F	288	P	5T PNEU REG OUT	1 11 40		0 800	PIA	SLO	7 01720	5	2021	1223 Z				P 27-16505	
	D 29					1 11 51													
	D 29	Y	17	T	ADAPTER @ STA 489	1 11 53		0 1400	DGF	10	7 01684	7	5175	489 Y				P 27-11547	
	U 29				SYNC @ 100% CALIB	1 11 55													
	D 29				CONNECTED TO 1 11 55	1 11 56													
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	D 29				CONNECTED TO 1 11 57	1 11 58													
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CONVAIR-ASTRONAUTICS

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SECTION 10

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THIS DOCUMENT CONTAINS INFORMATION AFFECTING THE NATIONAL DEFENSE OF THE UNITED STATES WITHIN THE MEANING OF THE ESPIONAGE LAWS, TITLE 18, U.S.C., SECTIONS 793 AND 794. THE TRANSMISSION OR THE REVELATION OF ITS CONTENTS IN ANY MANNER TO AN UNAUTHORIZED PERSON IS PROHIBITED BY LAW.

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MISSILE INSTRUMENTATION LOG SHEET

REPORT NO. ZC-27-057-20 DATE 05 JAN 60

SECTION 9

1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	DRAWING NUMBERS	
																		19	20
MISSILE SERIALS	MISSILE NO.	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELEMETRY NO.	SUB-CARRIER NO.	COMPUTER BIN NO.	MEASUREMENT RANGE	UNITS OF FUNCTION	RATE OF CHANGE OF FREQUENCY	TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	U A B C D E F G H I J K L M N O P Q R S T U V W X Y Z	U A B C D E F G H I J K L M N O P Q R S T U V W X Y Z	U A B C D E F G H I J K L M N O P Q R S T U V W X Y Z	U A B C D E F G H I J K L M N O P Q R S T U V W X Y Z	
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THIS DOCUMENT CONTAINS INFORMATION AFFECTING THE NATIONAL DEFENSE OF THE UNITED STATES WITHIN THE MEANING OF THE ESPIONAGE LAWS, TITLE 18, U.S.C., SECTIONS 793 AND 794. THE TRANSMISSION OR THE REVELATION OF ITS CONTENTS IN ANY MANNER TO AN UNAUTHORIZED PERSON IS PROHIBITED BY LAW.

MISSILE INSTRUMENTATION LOG SHEET

REPORT NO. ZC-27-057-29 DATE 05 JAN 60

SECTION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64	65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96	97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112	113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128	129	130	131	132	133	134	135	136	137	138	139	140	141	142	143	144	145	146	147	148	149	150	151	152	153	154	155	156	157	158	159	160	161	162	163	164	165	166	167	168	169	170	171	172	173	174	175	176	177	178	179	180	181	182	183	184	185	186	187	188	189	190	191	192	193	194	195	196	197	198	199	200	201	202	203	204	205	206	207	208	209	210	211	212	213	214	215	216	217	218	219	220	221	222	223	224	225	226	227	228	229	230	231	232	233	234	235	236	237	238	239	240	241	242	243	244	245	246	247	248	249	250	251	252	253	254	255	256	257	258	259	260	261	262	263	264	265	266	267	268	269	270	271	272	273	274	275	276	277	278	279	280	281	282	283	284	285	286	287	288	289	290	291	292	293	294	295	296	297	298	299	300	301	302	303	304	305	306	307	308	309	310	311	312	313	314	315	316	317	318	319	320	321	322	323	324	325	326	327	328	329	330	331	332	333	334	335	336	337	338	339	340	341	342	343	344	345	346	347	348	349	350	351	352	353	354	355	356	357	358	359	360	361	362	363	364	365	366	367	368	369	370	371	372	373	374	375	376	377	378	379	380	381	382	383	384	385	386	387	388	389	390	391	392	393	394	395	396	397	398	399	400	401	402	403	404	405	406	407	408	409	410	411	412	413	414	415	416	417	418	419	420	421	422	423	424	425	426	427	428	429	430	431	432	433	434	435	436	437	438	439	440	441	442	443	444	445	446	447	448	449	450	451	452	453	454	455	456	457	458	459	460	461	462	463	464	465	466	467	468	469	470	471	472	473	474	475	476	477	478	479	480	481	482	483	484	485	486	487	488	489	490	491	492	493	494	495	496	497	498	499	500	501	502	503	504	505	506	507	508	509	510	511	512	513	514	515	516	517	518	519	520	521	522	523	524	525	526	527	528	529	530	531	532	533	534	535	536	537	538	539	540	541	542	543	544	545	546	547	548	549	550	551	552	553	554	555	556	557	558	559	560	561	562	563	564	565	566	567	568	569	570	571	572	573	574	575	576	577	578	579	580	581	582	583	584	585	586	587	588	589	590	591	592	593	594	595	596	597	598	599	600	601	602	603	604	605	606	607	608	609	610	611	612	613	614	615	616	617	618	619	620	621	622	623	624	625	626	627	628	629	630	631	632	633	634	635	636	637	638	639	640	641	642	643	644	645	646	647	648	649	650	651	652	653	654	655	656	657	658	659	660	661	662	663	664	665	666	667	668	669	670	671	672	673	674	675	676	677	678	679	680	681	682	683	684	685	686	687	688	689	690	691	692	693	694	695	696	697	698	699	700	701	702	703	704	705	706	707	708	709	710	711	712	713	714	715	716	717	718	719	720	721	722	723	724	725	726	727	728	729	730	731	732	733	734	735	736	737	738	739	740	741	742	743	744	745	746	747	748	749	750	751	752	753	754	755	756	757	758	759	760	761	762	763	764	765	766	767	768	769	770	771	772	773	774	775	776	777	778	779	780	781	782	783	784	785	786	787	788	789	790	791	792	793	794	795	796	797	798	799	800	801	802	803	804	805	806	807	808	809	810	811	812	813	814	815	816	817	818	819	820	821	822	823	824	825	826	827	828	829	830	831	832	833	834	835	836	837	838	839	840	841	842	843	844	845	846	847	848	849	850	851	852	853	854	855	856	857	858	859	860	861	862	863	864	865	866	867	868	869	870	871	872	873	874	875	876	877	878	879	880	881	882	883	884	885	886	887	888	889	890	891	892	893	894	895	896	897	898	899	900	901	902	903	904	905	906	907	908	909	910	911	912	913	914	915	916	917	918	919	920	921	922	923	924	925	926	927	928	929	930	931	932	933	934	935	936	937	938	939	940	941	942	943	944	945	946	947	948	949	950	951	952	953	954	955	956	957	958	959	960	961	962	963	964	965	966	967	968	969	970	971	972	973	974	975	976	977	978	979	980	981	982	983	984	985	986	987	988	989	990	991	992	993	994	995	996	997	998	999	1000	1001	1002	1003	1004	1005	1006	1007	1008	1009	1010	1011	1012
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CONVAIR-ASTRONAUTICS

SECTION 10

MISSILE INSTRUMENTATION LOG SHEET

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									MEASUREMENT NUMBER	TYPE MEASUREMENT										LOW	HIGH
	MISSILE SERIES	MISSILE NO.	SYSTEM		DESCRIPTION	TELEMETRY NO.	SUB CARRIER NO.	COMPUTER PIN NO.				UNITS OF FUNCTION	RATE OF CHANGE OR RESERVE	TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	QUANTITY	ALPHA	BETA	CHARACTER	DRAWING NUMBERS
	D 20 P	27 P			VERNIER FUEL TANK	1	C 47	0	1000	PIA	SLO	7 01720	3	1551	1223	2				P 27-16505	
	D 20 P					1	C 49														
	D 20 P					1	C 51														
	D 20 P	6 P			S THRUST CHAMBER	1	C 53	0	1000	PIA	SLO	7 01731	5	4622	1228	1				P 27-16504	
	D 20 P				SYNC 6 100% CALIB	1	C 55														
	D 20 P				CONNECTED TO 1 C 55	1	C 56														
	D 20 P				CONNECTED TO 1 C 56	1	C 57														
	D 20 P				CONNECTED TO 1 C 57	1	C 58														
	D 20 P				CONNECTED TO 1 C 58	1	C 59														
	D 20 P				CONNECTED TO 1 C 59	1	C 50														

THIS DOCUMENT CONTAINS INFORMATION AFFECTING THE NATIONAL DEFENSE OF THE UNITED STATES WITHIN THE MEANING OF THE ESPIONAGE LAWS, TITLE 18, U.S.C., SECTIONS 793 AND 794. THE TRANSMISSION OR THE REVELATION OF ITS CONTENTS IN ANY MANNER TO AN UNAUTHORIZED PERSON IS PROHIBITED BY LAW.

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MISSILE INSTRUMENTATION LOG SHEET

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MISSILE INSTRUMENTATION LOG SHEET

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SECTION	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	DRAWING NUMBER																						
																				MISSILE SERIES	MISSILE NO.	SYSTEM	MEASUREMENT NUMBER	TYPE OF MEASUREMENT	DESCRIPTION	TELEMETRY NO.	SUB CARRIER NO.	COMPARATOR PIN NO.	MEASUREMENT RANGE	LOW	HIGH	UNITS	RATE OF CHANGE OR FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	QUANTITY	FUNCTION CODE			
	1	23	4	5	8	9	10	29	30	31	32	33	34	35	38	39	42	43	46	48	49	51	52	53	54	55	56	57	58	59	60	61	62	64	67	70	71	72	73		
	D 20	S	259	D	CONNECTED TO	1 E 17	1	E 47																																	
	D 20	S	253	D	CONNECTED TO	1 E 19	1	E 49																																	
	D 20	A	619	0	CONNECTED TO	1 E 21	1	E 51																																	
	D 20	A	620	0	CONNECTED TO	1 E 23	1	E 53																																	
	D 20				SYNC 6	100% CALIB	1	E 55																																	
	D 20				CONNECTED TO	1 E 55	1	E 56																																	
	D 20				CONNECTED TO	1 E 56	1	E 57																																	
	D 20				CONNECTED TO	1 E 57	1	E 58																																	
	D 20				CONNECTED TO	1 E 58	1	E 59																																	
	D 20	D	3	X	RSC DESTRUCT	OUTPUT	1	E 95						0	30	VDC																									

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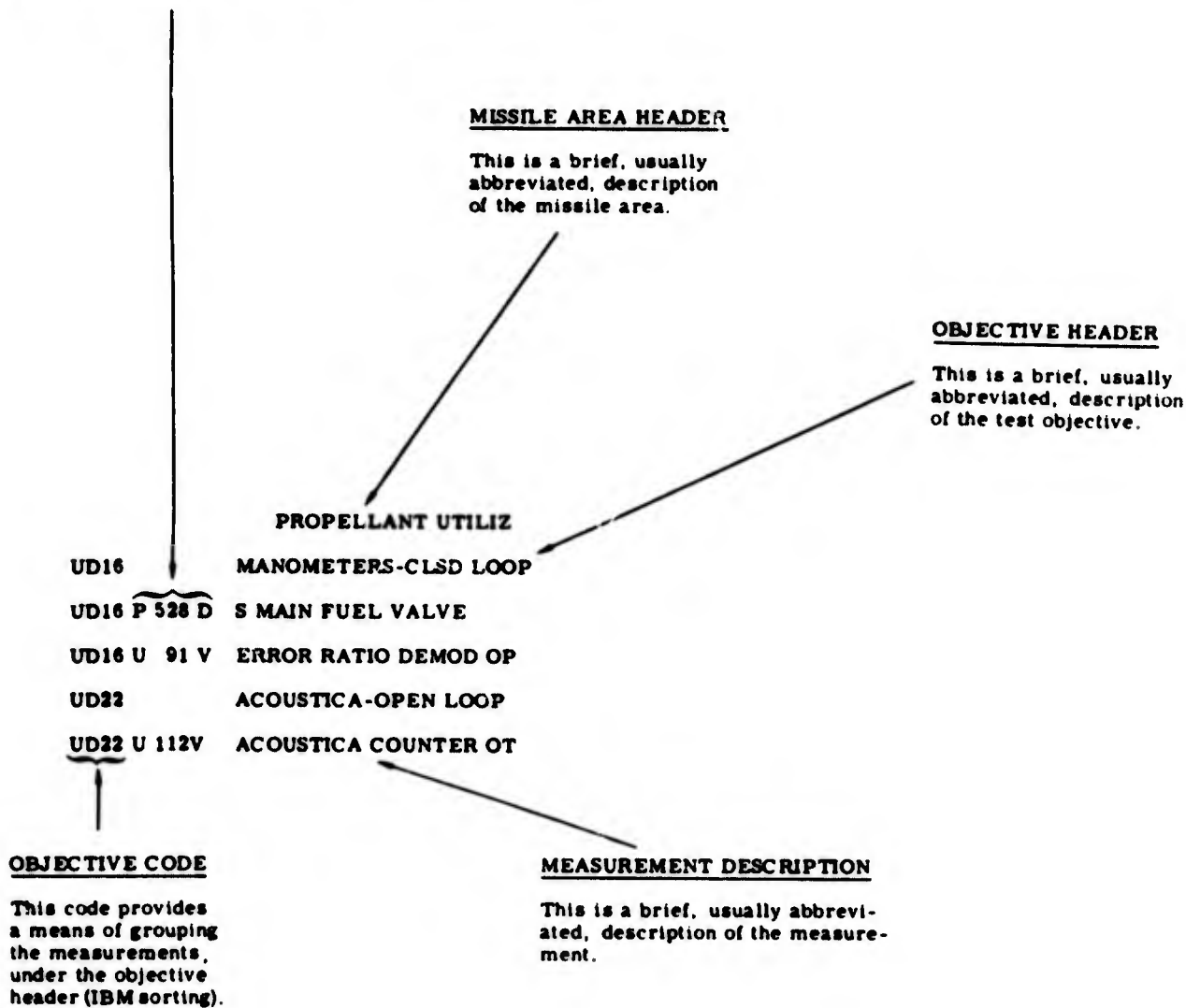
SECTION 11

MISSILE INSTRUMENTATION BY TEST OBJECTIVE

This section presents a grouping of the measurements which support each test objective presently scheduled for this missile. Objectives are assigned missile area codes and are sorted by missile area. The following is a brief explanation of the format used in this section.

MEASUREMENT IDENTIFICATION

Two letters are included; the first denotes the system instrumented while the latter indicated the type of measurement. Of the four numerical digits the first is used to identify the method of signal transmission from the transducer to the recorder. The remaining three digits provide an identification for the measurement within the system denoted by the first letter.



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OBJ.

CODE DESCRIPTION

*STRUCTURE

GENERAL

AD13	DEMONSTRATE STRUCTURAL INTEGRITY OF THE AIRFRAME.
F	1 P LO2 TANK HELIUM
F	3 P FUEL TANK HELIUM
AD19	DEMONSTRATE THE PERFORMANCE OF THE BOOSTER JETTISON SYSTEM.
M	26 D JET SECT SEPARATION
U	101 A AXIAL ACCELERATION
AD28	OBTAIN DATA ON BENDING MODES
A	609 O STA 1212 Y AXIS
A	610 O STA 980 Y AXIS
A	611 O STA 670 Y AXIS
A	619 O STA 1212 X AXIS
A	620 O STA 980 X AXIS
A	621 O STA 670 X AXIS
S	52 R ROLL RATE GYRO SIG

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- S 53 R PITCH RATE GYRO SIG
- S 54 R YAW RATE GYRO SIG
- X 0000 X 2ND STG TLM DATA

*PROPULSION
GENERAL OPERATION

PD38 MONITOR PERFORMANCE OF THE
SUSTAINER, BOOSTER AND VERNIER
ENGINES.

- P 83 B B2 PUMP SPEED
- P 84 B B1 PUMP SPEED
- P 349 B S PUMP SPEED
- P 528 D S MAIN FUEL VALVE
- P 529 D S MAIN LO2 VALVE
- P 6 P S THRUST CHAMBER
- P 26 P B LO2 REG REFERENCE
- P 27 P VERNIER FUEL TANK
- P 28 P V1 THRUST CHAMBER
- P 29 P V2 THRUST CHAMBER
- P 30 P VERNIER LO2 TANK
- P 56 P S LO2 PUMP INLET

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P 59 P B2 THRUST CHAMBER
P 60 P B1 THRUST CHAMBER
P 100 P B GG COMBUSTION CHM
P 330 P S FUEL PUMP DISCH
P 339 P S GAS GEN DISCH
P 344 P S LO2 REG REFERENCE
P 351 P S LO2 INJ MANIFOLD
P 530 T S LO2 PUMP INLET
P 671 T TH SECT AMB QUAD 4
U 101 A AXIAL ACCELERATION
X 9129 P PRESSURE VS ALTITUDE
X 9141 T TEMP VS ALTITUDE

PU SYSTEM

UD25 DEMONSTRATE CLOSED LOOP
PERFORMANCE OF THE CV
PROPELLANT UTILIZATION
SYSTEM. /P/

P 528 D S MAIN FUEL VALVE
P 529 D S MAIN LO2 VALVE
U 101 A AXIAL ACCELERATION

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U 80 P LO2 TANK HEAD
U 81 P FUEL TANK HEAD
U 91 V ERROR RATIO DEMOD OP

*CONTROL SYSTEM

AUTOPILOT

SD19 DETERMINE THE ABILITY TO
PROPERLY EXECUTE PITCH AND
ROLL PROGRAMS.

M 12 D PITCH ATTITUDE ANG
M 13 D YAW ATTITUDE ANGLE
M 14 D MISSILE ROLL ANGLE
M 23 D PITCH ATT ANGLE FINE
M 24 D YAW ATT ANGLE FINE
M 25 D ROLL ATT ANGLE FINE
S 61 D ROLL DISPL GYRO SIG
S 62 D PITCH DISPL GYRO SIG
S 63 D YAW DISPL GYRO SIG
S 252 D B1 YAW ROLL
S 253 D B2 YAW ROLL
S 254 D B1 PITCH

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S 255 D B2 PITCH
S 257 D SUSTAINER PITCH
S 258 D V1 PITCH ROLL
S 259 D V2 PITCH ROLL
S 52 R ROLL RATE GYRO SIG
S 53 R PITCH RATE GYRO SIG
S 54 R YAW RATE GYRO SIG
X 9142 D MISSILE PITCH
X 9144 D MISSILE ROLL
X 9131 H MSL X VS Y
X 9133 H AZIMUTH VS TIME
X 9145 N RAW AZUSA DATA

SD24 DETERMINE ABILITY TO MAINTAIN
ATTITUDE STABILITY THROUGHOUT
POWERED FLIGHT.

M 12 D PITCH ATTITUDE ANG
M 13 D YAW ATTITUDE ANGLE
M 14 D MISSILE ROLL ANGLE
M 23 D PITCH ATT ANGLE FINE
M 24 D YAW ATT ANGLE FINE
M 25 D ROLL ATT ANGLE FINE
S 61 D ROLL DISPL GYRO SIG

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S 62 D PITCH DISPL GYRO SIG
S 63 D YAW DISPL GYRO SIG
S 252 D B1 YAW ROLL
S 253 D B2 YAW ROLL
S 254 D B1 PITCH
S 255 D B2 PITCH
S 256 D SUSTAINER YAW
S 257 D SUSTAINER PITCH
S 258 D V1 PITCH ROLL
S 259 D V2 PITCH ROLL
S 260 D V1 YAW
S 261 D V2 YAW
S 52 R ROLL RATE GYRO SIG
S 53 R PITCH RATE GYRO SIG
S 54 R YAW RATE GYRO SIG

SD29 DETERMINE THE ABILITY TO
ACCEPT AND EXECUTE GUIDANCE
STEERING, DISCRETE COMMANDS
AND PROGRAMMED SUBROUTINES.

G 287 V D PITCH OUTPUT
G 288 V D YAW OUTPUT
G 290 X D CONTACTS #1 & #2

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G 291 X D CONTACTS #3 & #4
G 292 X D CONTACTS #5 & #6
G 293 X D CONTACTS #7 & #9
M 26 D JET SECT SEPARATION
P 72 X BOOSTER CUTOFF RELAY
P 77 X VERNIER CUTOFF RELAY
P 347 X S COF RELAY LOCKIN
S 61 D ROLL DISPL GYRO SIG
S 62 D PITCH DISPL GYRO SIG
S 63 D YAW DISPL GYRO SIG
S 252 D B1 YAW ROLL
S 253 D B2 YAW ROLL
S 254 D B1 PITCH
S 255 D B2 PITCH
S 256 D SUSTAINER YAW
S 257 D SUSTAINER PITCH
S 258 D V1 PITCH ROLL
S 259 D V2 PITCH ROLL
S 260 D V1 YAW
S 261 D V2 YAW
X 9174 L GE GUIDANCE P, Q & R

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SD32 DEMONSTRATE THAT THE SATELLITE
VEHICLE SEPARATION MECHANISM
IS PROVIDED INITIATION SIGNAL
AT PROPER TIME.

- X 0000 X 2ND STG TLM DATA
- Y 20 X EXPLOSIVE BOLT #1
- Y 21 X EXPLOSIVE BOLT #2
- Y 22 X EXPLOSIVE BOLT #3

RADIO GUIDANCE GE

GD10 EVALUATE THE ABILITY OF THE
AIRBORNE EQUIPMENT TO ACCEPT
AND PROPERLY DECODE DISCRETE
AND STEERING COMMANDS.

- G 287 V D PITCH OUTPUT
- G 288 V D YAW OUTPUT
- G 290 X D CONTACTS #1 & #2
- G 291 X D CONTACTS #3 & #4
- G 292 X D CONTACTS #5 & #6
- G 293 X D CONTACTS #7 & #9
- X 0000 X GE GND STA DATA

GD11 EVALUATE THE ACCURACY OF THE
RADIO TRACKING PORTION OF THE
GROUND EQUIPMENT.

- X 9158 A MSL XYZ

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X 9128 H MSL XYZ VS TIME
X 9150 H RANGE SAFETY IP
X 9152 H AZUSA IMPACT POINT
X 9154 H RADAR IMPACT POINT
X 9155 H TERMINAL TRAJECTORY
X 9172 H GE GUIDANCE
X 9156 L MSL XYZ & RESULTANT
X 9157 L TERMINAL TRAJECTORY
X 9174 L GE GUIDANCE P, Q & R
X 9145 N RAW AZUSA DATA

GD21 EVALUATE THE PERFORMANCE AND
DETERMINE THE ACCURACY OF THE
GROUND AND AIRBORNE EQUIPMENT
IN PROVIDING THE REQUIRED
TRAJECTORY.

X 9158 A MSL XYZ
X 9128 H MSL XYZ VS TIME
X 9152 H AZUSA IMPACT POINT
X 9154 H RADAR IMPACT POINT
X 9155 H TERMINAL TRAJECTORY
X 9156 L MSL XYZ & RESULTANT
X 9157 L TERMINAL TRAJECTORY
X 9145 N RAW AZUSA DATA

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D-29 OBJ TEST PLAN

X 0000 X GE GND STA DATA

GD17 DETERMINE SYSTEM NOISE
CHARACTERISTICS AND INVESTI-
GATE THE EFFECTS OF NOISE ON
SYSTEM OPERATION.

G 4 C PB MAGNETRON AVERAGE

G 82 E RB RF OUTPUT

G 3 V PB AGC

G 279 V RB AGC NO. 1

G 280 V RB AGC NO. 2

X 0000 X GE GND STA DATA

GD33 DETERMINE THE ADEQUACY OF THE
AIRBORNE ANTENNA RADIATION
CHARACTERISTICS.

G 4 C PB MAGNETRON AVE

G 82 E RB RF OUTPUT

G 3 V PB AGC

G 279 V RB AGC NO. 1

G 280 V RB AGC NO. 2

X 0000 X GE GND STA DATA

*MISCELLANEOUS SYS

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D-29 OBJ TEST PLAN

PNEUMATICS

FD45 DETERMINE PERFORMANCE OF THE
MAIN PROPELLANT TANKS
PRESSURIZATION SYSTEM AND THE
ENGINE CONTROLS PNEUMATIC
SYSTEM.

- F 1 P LO2 TANK HELIUM
- F 3 P FUEL TANK HELIUM
- F 125 P B CTL PNEU REG OUT
- F 246 P B TK HE BTL HI
- F 288 P ST PNEU REG OUT
- P 26 P B LO2 REG REFERENCE
- P 27 P VERNIER FUEL TANK
- P 30 P VERNIER LO2 TANK
- P 344 P S LO2 REG REFERENCE

HYDRAULIC SYSTEM

HD39 DEMONSTRATE PERFORMANCE OF THE
VERNIER SOLO HYDRAULIC POWER
SUPPLY.

- H 140 P S/VERN HYD PRESS

HD44 DEMONSTRATE PERFORMANCE OF THE

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BOOSTER AND SUSTAINER/VERNIER
HYDRAULIC SYSTEMS.

H 33 P B1 HYD ACCUMULATOR

H 140 P S/VERN HYD PRESS

ELECTRICAL SYSTEM

ED14 DETERMINE THE PERFORMANCE OF
THE BATTERY-INVERTER
ELECTRICAL POWER SUPPLY
/MANUALLY ACTIVATED BATTERY/.

E 50 Q 400 CYCLE AC PWSUP

E 28 V MSL SYSTEMS INPUT

E 51 V 400 CYCLE AC PHASE A

TRACKING-COMMAND

DD10 DETERMINE PERFORMANCE OF RANGE
SAFETY COMMAND SYSTEM. /P/

D 1 V RSC CUTOFF OUTPUT

D 7 V #1 RSC RF INPUT/AGC

D 3 X RSC DESTRUCT OUTPUT

X 9122 E RSC RECEIVER SIGNAL

X 9125 E RSC GND XMTR OUTPUT

X 9126 I RSC COMBINED FIELD

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D-29 OBJ TEST PLAN

- X 9127 N RSC COMMANDS
- X 9121 Q RSC TRANSMITTER
- X 9124 Q RSC CARRIER
- X 9123 X RSC DOWN RANGE XMTRS

DD11 DETERMINE PERFORMANCE OF AZUSA
IMPACT PREDICTOR. /P/

- X 9150 H RANGE SAFETY IP
- X 9152 H AZUSA IMPACT POINT
- X 9154 H RADAR IMPACT POINT
- X 9192 H MILS IMPACT POINT

ZD01 DETERMINE THE PERFORMANCE OF
THE AZUSA TRACKING SYSTEM.

- X 9128 H MSL XYZ VS TIME
- X 9131 H MSL X VS Y
- X 9132 H MSL X VS Z
- X 9133 H AZIMUTH VS TIME
- X 9134 H ELEVATION VS TIME
- X 9135 H RANGE VS TIME
- X 9172 H GE GUIDANCE
- X 9156 L MSL XYZ & RESULTANT
- X 9157 L TERMINAL TRAJECTORY

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- X 9136 N AZUSA LOG SUMMARY
- X 9137 N AZUSA CEC RECORDING
- X 9139 N AZUSA EVAL DATA
- X 9145 N RAW AZUSA DATA
- X 9149 N AZUSA L.M, RM & RCC
- X 9138 Q AZUSA CARRIER SIGNLS
- Z 2 E KLYSTRON PWR OUTPUT
- Z 3 E XPONDR RF INPUT/AGC

GENERAL MSL DATA

MD15 DEMONSTRATE COMPATIBILITY OF
BLOCKHOUSE AND LAUNCH CONTROL
EQUIPMENT.

X 0000 X NO SPECIFIC DATA

WD02 DETERMINE THE ABILITY OF THE
CV PROPELLANT LOADING SYSTEM
TO PROVIDE PROPELLANT LEVEL
INDICATION FOR ACCURATE LOAD-
ING CONTROL.

P 1311 X 90% FUEL LVL IND

P 1987 X FUEL O/FILL PROBE

P 1988 X LO2 95% LVL EMER COF

.....

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D-29 OBJ TEST PLAN

P 1997 X MSL FUELED 95%
P 1998 X LO2 O/FILL EMER COF
P 1999 X MSL FUELED 100%
U 1091 V ERROR RATIO DEMOD DP
X 0000 X LOAD CELL DATA

LD17 DEMONSTRATE SATISFACTORY
PERFORMANCE OF THE LAUNCHER.
L 1368 D PIN MOTION B1 SIDE
L 1369 D PIN MOTION B2 SIDE
L 1127 P HOLDDOWN CYL B1 SIDE
L 1128 P HOLDDOWN CYL B2 SIDE

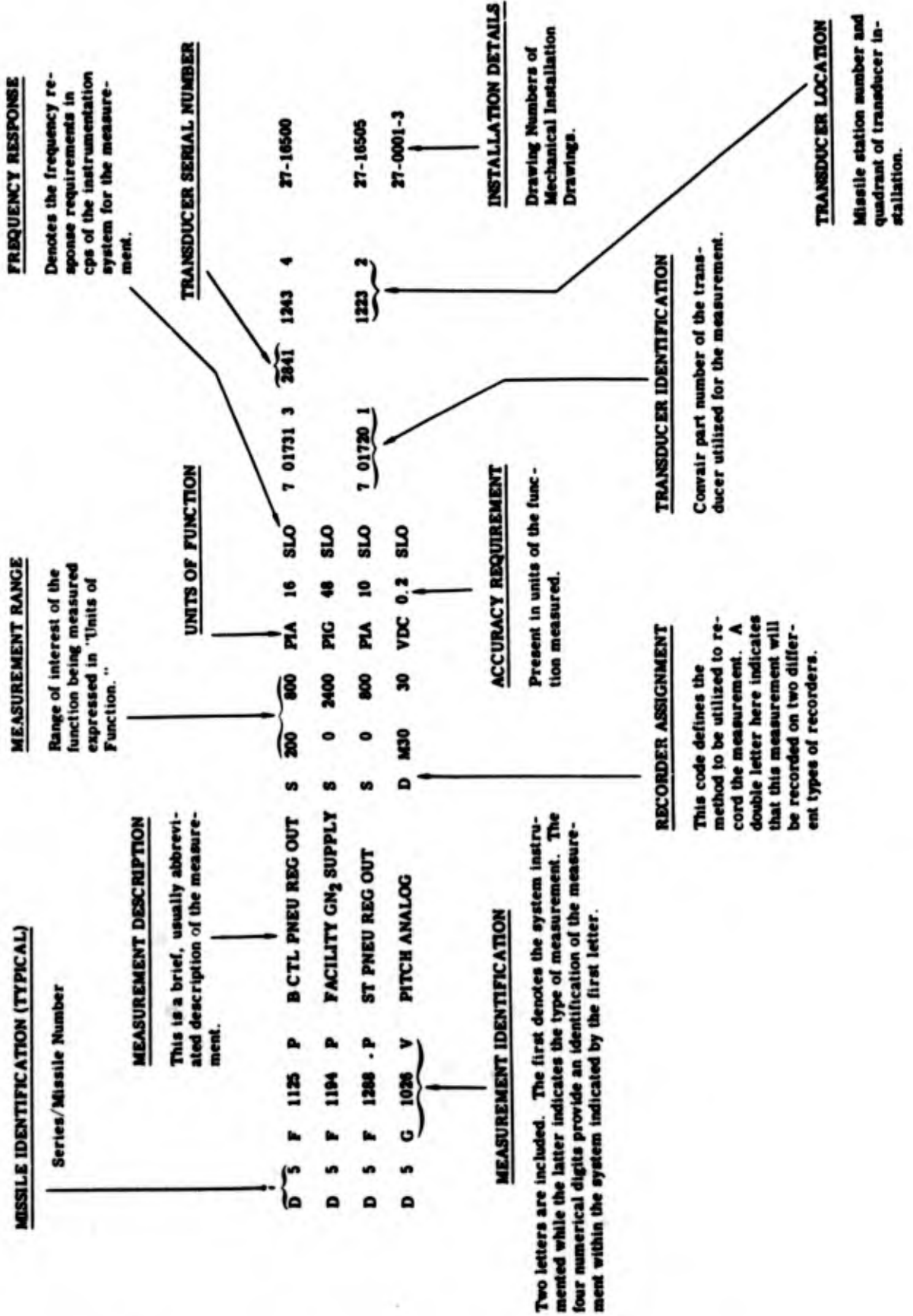
TELEMETER

TD13 DETERMINE TEMPERATURE RISE
WITHIN THE TELEMETERING
CANISTER.
T 68 T TM CANISTER OSC
T 69 T TM CANISTER RF

SECTION 12

LANDLINE INSTRUMENTATION

The Landline Instrumentation presented in this section contains the latest available characteristics of the individual measurements. In addition the type of recordings indicated. The following is a brief explanation of the format of the Landline Instrumentation Log.



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PAGE 1

D29 L/L MASTERS 05 JAN 60

M	R	F	X	S	Q
E	E	A	U	TN	U
AN	C	U	D	AU	A
SU	O	C	EU	TM	R
Y	R	U	RM	IB	A
RB	D	U	IB	OE	N
T	R	I	AE	MR	T
Y	D	I	LR		
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B	D	A			
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D29 L/L MASTERS

27-1650 5

27-1650 5

D 29 F 1291 P	S	CTL ME BTL	S	0 3250	PIA 65	10						
D 29 F M291 P	M	SUST CONT PRESSURE	M	0 4000	PIG		7 01720	5 2945	1222 2			
D 29 F M247 T	M	BSTR TANK TEMP	M	M100 M350	DGF		7 01633	1 39R	1190 2			27-1160 0
D 29 F M249 T	M	SUST TANK TEMP	M	M100 M350	DGF		7 01633	1	1200 2			27-1650 5
D 29 F M290 T	M	SUST CONT TEMP	M	M100 M100	DGF		7 01633	3 75L	1196 3			27-1650 5

PEN 152

27-0001 -3

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D 29 F 1207 X	R	TCC INTL PNEU P LITE	R	OFF ON	VDC	STP						
D 29 G 1026 V	D	PITCH ANALOG	D	M30 30	VDC 0.2	SLO						
D 29 G 1027 V	D	YAW ANALOG	D	M30 30	VDC 0.2	SLO						
D 29 G 1549 X	R	D CONTACT #1	R	OFF ON	VDC	STP					PEN 123	
D 29 G 1550 X	R	D CONTACT #2	R	OFF ON	VDC	STP					PEN 125	
D 29 G 1551 X	R	D CONTACT #3	R	OFF ON	VDC	STP					PEN 129	
D 29 G 1552 X	R	D CONTACT #5	R	OFF ON	VDC	STP					PEN 126	
D 29 G 1553 X	R	D CONTACT #6	R	OFF ON	VDC	STP					PEN 124	
D 29 G 1554 X	R	D CONTACT #7	R	OFF ON	VDC	STP					PEN 127	

D 29 H 1101 X	R	TCC INTL HYD P LITE	R	OFF ON	VDC	STP						
D 29 H 1146 X	R	B HYD HI PRESS SW	R	OFF ON	VDC	STP						
D 29 H 1147 X	R	S HYD HI PRESS SW	R	OFF ON	VDC	STP						

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CONVAIR-ASTRONAUTICS

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D29 L/L MASTERS 05 JAN 60

D 29 H 1187 X	BSTR OIL EVACUATION	R	OFF ON	VDC	STP
D 29 H 1188 X	SUST OIL EVACUATION	R	OFF ON	VDC	STP
D 29 L M006 D	MISSILE ALIGNMENT	M	M50	50 MIN	
D 29 L 1368 D	PIN MOTION B1 SIDE	O	0	5 IN	*1 10
D 29 L 1369 D	PIN MOTION B2 SIDE	O	0	5 IN	*1 10
D 29 L 1.27 P	HOLDDOWN CYL B1 SIDE	O	0	6000	PIG 100
D 29 L 1128 P	HOLDDOWN CYL B2 SIDE	O	0	6000	PIG 100
D 29 M 1030 X	MSL 1/40 INCH MOTION	OR	OFF ON	VDC	STP
D 29 M 1050 X	MSL 1/2 INCH MOTION	OR	OFF ON	VDC	STP
D 29 N 1342 T	POD AIR DUCT	S	0	200	DGF SLO
D 29 N 1344 T	TRANSFER ROOM	S	0	100	DGF SLO
D 29 N 1353 T	KECO MTR OUTPUT		0	250	DGF 10 SLO
D 29 N 1343 X	POD AIR DUCT VALVE	R	OFF ON	VDC	STP
D 29 N 1354 X	KECO AIRFLOW SAIL SW	R	OFF ON	VDC	STP
D 29 P M242 B	PUMP LC SPEED	M	0	100	PCT
D 29 P 1314 C	LO2 TOPPING SIGNAL	R	4	20	MA SLO

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D29 L/L MASTERS 05 JAN 60

D 29 P 1577 X	RELEASE SIGNAL	R	OFF	ON	VDC	STP
D 29 P 1631 X	L02 F6D VLV AIRB OPN	R	OFF	ON	VDC	STP
D 29 P 1632 X	L02 F6D VLV AIRB CLS	R	OFF	ON	VDC	STP
D 29 P 1633 X	L02 F6D VLV GND OPN	R	OFF	ON	VDC	STP
D 29 P 1634 X	L02 F6D VLV GND CLS	R	OFF	ON	VDC	STP
D 29 P 1635 X	FUL F6D VLV AIRB OPN	R	OFF	ON	VDC	STP
D 29 P 1636 X	FUL F6D VLV AIRB CLS	R	OFF	ON	VDC	STP
D 29 P 1637 X	FUL F6D VLV GND OPN	R	OFF	ON	VDC	STP
D 29 P 1636 X	FUL F6D VLV GND CLS	R	OFF	ON	VDC	STP
D 29 P 1987 X	FUEL O/F PROBE	EA	OFF	ON	VDC	STP
D 29 P 1988 X	L02 95% LVL EMER COF	R	OFF	ON		
D 29 P 1997 X	MSL FUELED 95%	R	OFF	ON		
D 29 P 1998 X	L02 0/FILL EMER COF	R	OFF	ON		
D 29 P 1999 X	MSL FUELED 100%	R	OFF	ON		
D 29 S M281 C	PANEL POWER SUPPLY	M	0	400	MA	
D 29 S 1048 V	PROGRAMMER PITCH SIG	D	0	2.7	VAC	.2 SLO
D 29 S 1049 V	PROGRAMMER ROLL SIG	D	0	60	VAC	3 STP
D 29 S 1069 V	ROLL INT OUTPUT SIG	D	M4	4	VAC	.4 5
D 29 S 1072 V	PITCH INT OUTPUT SIG	D	M7	7	VAC	.7 5
D 29 S 1073 V	YAW INT OUTPUT SIG	D	M7	7	VAC	.7 5

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D29 L/L MASTERS 05 JAN 60

D 29 S 1107 V	B1 PCH ACTR FEEDBACK	D	M12 12	VAC 5%	30
D 29 S 1108 V	B2 PCH ACTR FEEDBACK	D	M12 12	VAC 5%	30
D 29 S 1113 V	V1 YAW ACTR FEEDBACK	D	M5 7	VAC 5%	30
D 29 S 1114 V	V2 YAW ACTR FEEDBACK	D	M5 7	VAC 5%	30
D 29 S 1118 V	V2 ROL ACTR FEEDBACK	D	M11 11	VAC 5%	30
D 29 S 1119 V	V1 ROL ACTR FEEDBACK	D	M11 11	VAC 5%	30
D 29 S 1121 V	GYRO TEST SIG	D	M5 5	VAC +1 STP	
D 29 S 1122 V	SERVO TEST SIG	D	M11 11	VAC 5%	30
D 29 S 1123 V	INTEGRATOR TEST SIG	D	M11 11	VAC +2	30
D 29 S 1128 V	B1 YAW ACTR FEEDBACK	D	M12 12	VAC 5%	30
D 29 S 1129 V	B2 YAW ACTR FEEDBACK	D	M12 12	VAC 5%	30
D 29 S 1147 V	PITCH GYRO AMP OUT	D	M10 10	VAC 1	30
D 29 S 1148 V	YAW GYRO AMP OUT	D	M10 10	VAC 1	30
D 29 S 1149 V	ROLL GYRO AMP OUT	D	M10 10	VAC 1	30
D 29 S 1216 V	S PCH ACTR FEEDBACK	D	M10 10	VAC 5%	30
D 29 S 1217 V	S YAW ACTR FEEDBACK	D	M10 10	VAC 5%	30
D 29 S M270 V	FINE HEATER-PITCH	M	0	150 VAC	
D 29 S M271 V	FINE HEATER-YAW	M	0	150 VAC	
D 29 S M272 V	FINE HEATER-ROLL	M	0	150 VAC	
D 29 S M280 V	PANEL POWER SUPPLY	M	0	200 VDC	
D 29 S M176 M	PROGRAM RUN TIME	M	0	999 SEC	

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D29 L/L MASTERS 05 JAN 60

D 29 S M282 W	DECADE EVENT TIMER	M	0	10K	SEC					
D 29 S 1235 X	PROGRAMMER RUN TIME	R	OFF	ON	VDC	STP				PEN 122
D 29 S 1356 X	TCC AUTOPILOT RDY LT	R	OFF	ON	VDC	STP				PEN 150
D 29 T M142 W	TELEMETER BATTERY	M	0	60	MIN					
D 29 T M143 W	TELEMETER TOTAL	M	0	1000	HR					
D 29 U 1091 V	ERROR RATIO DEMOD OP	S	M20	20	VDC	.5	20			
D 29 U M091 V	LO2 TANK LEVEL IND	M	80	105	PCT					

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CONVAIR ASTRONAUTICS
GENERAL DYNAMICS CORPORATION

TPL: 2162
23 March 1960

To: All Holders of Report AZC-27-057
From: T. M. Wooster - Test Planning
Subject: Instrumentation Configuration Report, Series D,
Article 45 (Revision B) dated 16 March 1960

The enclosed revision has been prepared to summarize all the instrumentation changes made since the publication of the original 45-D Report.

It is recommended that this report be physically incorporated in the back of Report AZC-27-057, replacing the superseded pages, where applicable, in order that holders of the document may have a complete instrumentation configuration document for the WSL17-L series under a single cover. In addition sections 8 & 11 have not been revised, therefore the original sections 8 & 11 should be removed and destroyed.

The replaced pages are to be destroyed in accordance with existing security regulations.

T. M. Wooster
T. M. Wooster
Instrumentation Planning

TMW:WSB:prg

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DATE 17 November 1959

NO. OF PAGES 68

CONVAIR (ASTRONAUTICS) DIVISION
GENERAL DYNAMICS CORPORATION

WS-117L

INSTRUMENTATION CONFIGURATION

SERIES D ARTICLE 45

AMR

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COORDINATED BY: W. S. Becker
W. S. Becker

APPROVED BY: H. R. Macdonald
H. R. Macdonald
Test Planning

CHECKED BY: T. M. Wooster
T. M. Wooster
Instrumentation

APPROVED BY: P. J. Lynch
P. J. Lynch
Chief-Field Test Engineering



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REPORT NO. AZC-27-057-45 **CONVAIR-ASTRONAUTICS**

PAGE NO. A

REVISIONS

NO.	DATE	BY	CHANGE	PAGES AFFECTED
A	22 Feb '60	WSB	ADDITIONS:	
			MM144V, NM362D, P14T	ALL TABS
			Reasons for Revision "A" Changes	4-1
A	22 Feb '60	WSB	DELETIONS:	
			FM290T, L1368D, L1369D,	ALL TABS
			M1050X, P1047P, P1048P, P1049P,	
			P1050P	
			<i>WB JW HRM</i>	
B	16 Mar '60	WSB	ADDITIONS:	
			Y29T, Y30T, Y31T, Y32T, Y33T, Y34T,	SECTIONS 9 & 10
			Y35X, Y36X, Y37X, Y38X	
B	16 Mar '60	WSB	DELETIONS:	
			G293X, Y17T, Y19T, Y20X, Y21X, Y22X	SECTIONS 9 & 10
			<i>WB JW HRM</i>	

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CONVAIR-ASTRONAUTICS REPORT NO. AZC-27-057-45

PAGE NO. 1

FOREWORD

This report describes the instrumentation provided for the flight of the Series D article number 45 to be tested at the Atlantic Missile Range. In addition to the functions that are to be telemetered from the missile, it includes the operational parameters that are to be recorded via landline. The measurements contained in this report comprise Convair-Astronautics and associated contractor data requirements as evaluated 22 February 1960.

The tabulations will be used by Instrumentation Design, Operations, and Data Reduction Groups to determine instrumentation, data handling and data reduction requirements. Instrumentation described here reflects current planning. Measurement requirements have been added, deleted, or modified on the basis of planning changes, instrumentation philosophy, and missile configuration. Measurement characteristics have been examined and, where necessary, re-adjusted by the original requesting groups. Further measurement modification will either originate in the Test Planning Group or will be submitted as a recommendation to this group.

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SUMMARY

The instrumentation plans for this missile have been established through a study of program test objectives, system analysis, and operating considerations.

Instrumentation is planned for three basic purposes:

Evaluation - that instrumentation required to support test objectives;

Operating Considerations - consists of redline and design operating limit measurements which provide site personnel with real time data to monitor critical parameters prior to firings and during FRF's and;

Reliability Analysis - which includes instrumentation not covered in the above two categories. Note that all instrumentation is available for reliability analysis.

A discussion of missile instrumentation and associated characteristics has been summarized in Section 2 of Report AZC-27-057 - "WS 117 Summary Report." For a detailed description of the various missile systems, test objectives, and general test program, see Report AZC-27-017 and AZC-27-027.

The specific measurements to be transmitted via telemeter have been tabulated and are listed in Sections 8 through 10 in terms of missile area, instrumentation system and channel assignment. Test objectives for this missile are shown along with the applicable instrumentation in Section 11 of this report.

In addition to the telemetry, the landline instrumentation program for this missile has been included in the form of a master tabulation of landline measurement characteristics (Section 12) to clarify the specific measurements instrumentation. Location schematics have been included in Report AZC-27-057.

For ease of data reduction and uniformity among test stands, the majority of sequence recorder measurements have been standardized. These pen numbers may be found in Report AZC-27-057.

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REASONS FOR REVISION "A" CHANGES

I. Recent flight data indicate high engine area temperatures on certain missiles. Different payload configurations have been advanced as one possible cause of this phenomenon. The following measurement was added to correlate data on engine area environment between the different missiles:

<u>MEAS. NO.</u>	<u>DESCRIPTION</u>	<u>CHANNEL</u>
<u>ADD:</u> P14T	ENGINE COMPARTMENT AMBIENT	1.11.33

II. Provisions for the optical tracking beacon (strobelight) are being made on all AMR complexes. The strobelight utilizes a remotely activated battery which must be monitored during countdown to determine that the system is operative:

<u>ADD:</u> MM144V	STROBELIGHT BATTERY
-----------------------	---------------------

III. Rerouting of the helium charge line to the controls bottle prevents the installation of the temperature probe for the following panel meter presentation:

<u>DELETE:</u> FM290T	SUSTAINER CONTROL BOTTLE
--------------------------	--------------------------

IV. Early D R&D series flights indicated possible launcher malfunctions. Measurements L1368D and L1369D were added at that time to study a suspect area. Subsequent flight successes have eliminated the requirement for this instrumentation:

<u>DELETE:</u> L1368D	PIN MOTION B1 SIDE
L1369D	PIN MOTION B2 SIDE

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V. As of 1 January 1960 all contractors are using missile 2 inch motion as zero time. Thus the requirement to measure 42 inch motion is eliminated:

<u>MEAS. NO.</u>	<u>DESCRIPTION</u>
<u>DELETE:</u>	
M1050X	MISSILE 42 INCH MOTION

VI. There is no longer any requirement for the four vernier propellant inlet pressure measurements:

<u>DELETE:</u>	
P1047P	V1 LO ₂ INLET
P1048P	V2 LO ₂ INLET
P1049P	V1 FUEL INLET
P1050P	V2 FUEL INLET

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REASONS FOR REVISION 'B' CHANGES

Retrorocket malfunction is suspected as a possible cause of the **29-D/AGENA** separation problem. In contrast to D-R&D missiles the D series boosters used in the Midas and Samos programs utilize retrorockets installed by Lockheed in the adapter section. Two rockets are installed; one in quadrant I; and the other 180 degrees from the first, in quadrant III. Tests have shown that if the retrorocket temperature is raised to **300** degrees F the rocket may explode instead of burning as designed when ignition is commanded. Six temperature measurements will therefore be added to the retrorockets on 45-D to study this possibility. The transducers will be mounted on both the forward and aft mounting bands (with respect to the missile) and on the adapter beneath each rocket. These measurements will not only provide verification of the rocket environment but will also allow a crude determination of burning characteristics.

MEAS. NO.

DESCRIPTION

ADD:

Y29T	RR-Q-1 FWD BAND
Y30T	RR-Q-1 AFT BAND
Y31T	ADAPTER SKIN @ RRQ1
Y32T	RR-Q-3 FWD BAND
Y33T	RR-Q-3 AFT BAND
Y34T	ADAPTER SKIN @ RRQ3

In addition to the temperature measurements four breakwires will be added to study retrorocket operation. One possible cause of high temperature is premature jettison of the retrorocket fairing blowout panels. Conversely improper jettison at the initiation of retrorocket would also cause problems. For this reason breakwires will be installed on each blowout panel. To indicate when retrorockets fire a breakwire will also be placed over each nozzle.

ADD:

Y35X	RR-Q-1 NOZZLE WIRE
Y36X	RR-Q-1 BLOWOUT WIRE
Y37X	RR-Q-3 NOZZLE WIRE
Y38X	RR-Q-3 BLOWOUT WIRE

Lockheed has requested that the following measurements be deleted due to

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REASONS FOR REVISION "B" CHANGES

installation difficulties.

<u>MEAS. NO.</u>	<u>DESCRIPTION</u>
<u>DELETE:</u>	
Y17T	ADAPTER @ STA 489
Y19T	ADAPTER @ STA 399
Y20X	EXPLOSIVE BOLT #1
Y21X	EXPLOSIVE BOLT #2
Y22X	EXPLOSIVE BOLT #3

Details of the Revision B changes are presented on the following pages. These changes should be incorporated into the Revision "A" Telemetry tabs so that the current configuration is reflected in one document.

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CONVAIR-ASTRONAUTICS REVISION 'B'

MISSILE 45-D

REPORT NO AZC-27-057-45

DATE 16 MARCH 1960

1	2	3	4	5	6	7	8	9 MEASUREMENT RANGE		10	11	12	13	14	15	16	17
								LOW	HIGH								
ADDITIONS																	
Y	19	T	RR-Q-1 FWD BAND	1	C	1	N50	500	DBF	SLB							
Y	20	T	RR-Q-1 AFT BAND	1	C	11	N50	500	DBF	SLB							
Y	31	T	ADAPTER SKIN @ RR Q1	1	C	41	N50	500	DBF	SLB							
Y	32	T	RR-Q-3 FWD BAND	1	C	45	N50	500	DBF	SLB							
Y	33	T	RR-Q-3 AFT BAND	1	C	49	N50	500	DBF	SLB							
Y	34	T	ADAPTER SKIN @ RR Q3	1	C	51	N50	500	DBF	SLB							
Y	35	X	RR-Q-1 NOZZLE WIRE	1	A	37	OFF	ON									
Y	36	X	RR-Q-1 BLOWOUT WIRE	1	A	43	OFF	ON									
Y	37	X	RR-Q-3 NOZZLE WIRE	1	A	47	OFF	ON									
Y	38	X	RR-Q-3 BLOWOUT WIRE	1	A	49	OFF	ON									
DELECTIONS																	
B	203	X	D CONTACTS #7 & #9	1	13	49	OFF	ON	VDC	STP							
Y	17	T	ADAPTER @ STA 489	1	11	53	0	1400	DBF	10	7	01684	7		489	Y	27-11597
Y	18	T	ADAPTER @ STA 399	1	11	47	0	1400	DBF	10	7	01684	7		399	Y	27-11597
Y	20	X	EXPLOSIVE BOLT #1	1	A	39	ON	OFF									
Y	21	X	EXPLOSIVE BOLT #2	1	A	41	ON	OFF									
Y	22	X	EXPLOSIVE BOLT #3	1	A	53	ON	OFF									

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SECTION 8

MISSILE INSTRUMENTATION BY MISSILE AREA

This section presents a grouping of measurements by Missile Area. Instrumentation of this missile has been established as a result of a detailed analysis of the various missile systems and this section represents the final results of this analysis. The following is a brief explanation of the format used in this section.

VEHICLE

MEASUREMENT DESCRIPTION

MISSILE AREA CODE

This is a brief, usually abbreviated, description of the measurement.

This code is used to group related measurements for instrumentation planning (IBM sorting).

MISSILE AREA HEADER

This is a brief usually abbreviated, description of the missile area.

	HYDRAULIC SYSTEM	
A E 33 P B1	HYD ACCUMULATOR	43000
A E 140 P S/VERN	HYD PRES	43010
	POWER SUPPLY	43230
A E 28 V MSL	SYSTEMS INPUT	43000
A E 50 Q	400 CYCLE AC PWSUP	43006
		43301

MEASUREMENT IDENTIFICATION

Two letters are included; the first denotes the system instrumented while the latter indicated the type of measurement. Of the four numerical digits the first is used to identify the method of signal transmission from the transducer to the recorder. The remaining three digits provide an identification for the measurement within the system denoted by the first letter.

SECTION 9

MISSILE INSTRUMENTATION BY SYSTEM

The Missile Instrumentation Log presented in this section contains the latest available characteristics of the individual measurements. In addition, the telemetering channel assignments are included. Note that this section is listed by system. The following is a brief explanation of the format of the Missile Instrumentation Log sheet.

<u>MISSILE IDENTIFICATION (TYPICAL)</u>		<u>MEASUREMENT DESCRIPTION</u>		<u>MEASUREMENT RANGE</u>		<u>UNITS OF FUNCTION</u>		<u>INSTALLATION DETAILS</u>	
Series/Missile Number									
D 5 F 1 P	LO ₂ TANK HELIUM	1 11 35	0 45	P/A	SLO	7 01723 11	480 2	P	27-11608
D 5 F 3 P	FUEL TANK HELIUM	1 11 9	0 100	P/A	SLO	7 01723 13	925 Y	P	27-11609
D 5 F 125 P	B CTL PNEU REG OUT	1 11 7	0 1000	P/A	SLO	7 01731 3	1243 4	P	27-16500
D 5 F 260 P	B TANK HE BOTTLES LO	1 11 17	15 415	P/A	SLO	7 01727 1	1238 1	P	27-11600
D 5 F 261 P	S TANK HE BOTTLE LO	1 11 21	15 415	P/A	SLO	7 01727 1	1223 2	P	27-16505

MEASUREMENT RANGE
Range of interest of the function being measured expressed in "Units of Function."

UNITS OF FUNCTION
Drawing Numbers of Mechanical Installation Drawings.

INSTALLATION DETAILS
Drawing Numbers of Mechanical Installation Drawings.

MEASUREMENT DESCRIPTION
This is a brief, usually abbreviated, description of the measurement.

MEASUREMENT IDENTIFICATION
Two letters are included. The first denotes the system instrumented while the latter indicates the type of measurement. The three numerical digits provide an identification of the measurement within the system indicated by the first letter.

FREQUENCY RESPONSE
Denotes the frequency response requirements in cps of the instrumentation system for the measurement.

TRANSUCER IDENTIFICATION
Convair part number of the transducer utilized for the measurement.

TRANSUCER LOCATION
Missile station number and quadrant of transducer installation.

TELEMETRY CHANNEL ASSIGNMENT
Indicates the telemeter, subcarrier and pin number assignment for the applicable measurement.

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MISSILE INSTUMENTATION LOG SHEET

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1	2	3	4	5	6	7	8	9		10	11	12	13					14	15	16	17	DRAWING NUMBERS					
								MEASUREMENT RANGE	UNITS OF FUNCTION				TYPE OF TRANSDUCER	SERIAL NO	STATION NO	QUADRANT	CAMB CODE										
VEHICLE	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELEMETRY NO	SUB-CARRIER NO	COMMUTATOR PIN NO	LOW	HIGH		ACCURACY	RATE OF CHANGE OF FREQUENCY OF FUNCTION	23	24	25	26	27	28	29	30	31	32	33	34			
				AIRFRAME																							
A		622	I	TH SECT LIGHT QUAD	3	1	A	9					27	11596	1	113	1240	3							P	27-11596	
A		609	O	STA 1212 Y AXIS	1	E	9	M3	3	G		20	27	01237	1	1441	1212	4							P	27-11500	
A		610	O	STA 980 Y AXIS	1	E	3	M3	3	G		20	27	01237	1	1256	980	Y							P	27-11605	
A		611	O	STA 670 Y AXIS	1	E	11	M3	3	G		20	27	01237	1	1617	670	Y							P	27-11501	
A		619	O	STA 1212 X AXIS	1	E	21	M3	3	G		20	27	01237	1	1433	1212	4							P	27-11500	
A		620	O	STA 980 X AXIS	1	E	23	M3	3	G		20	27	01237	1	1287	980	Y							P	27-11605	
A		621	O	STA 670 X AXIS	1	E	1	M3	3	G		20	27	01237	1	1435	670	Y							P	27-11501	
A		573	T	LOZ TK @ STA 504	1	11	17	340	740	DGF		SLO	27	11595	9										P	27-11595	
A		604	T	LOZ TK @ STA 640	1	11	21	540	940	DGF		SLO	27	11595	11	1016	640	1							P	27-11595	
D				RANGE SAFETY SYSTEM																							
D		1	V	RSC CUTOFF OUTPUT	1	13	7	0	31	VDC		STP														P	
D		7	V	#1 RSC RF INPUT/AGC	1	A	7	15	100K	UV		SLO													P		
D		3	X	RSC DESTRUCT OUTPUT	1	E	95	0	30	VDC		STP													P		
E				ELECTRICAL PWR SYS																							
E		5	O	400 CYCLE AC PWR SUP	1	1		350	450	CPS		SLO													P		
E		28	V	MSL SYSTEMS INPUT	1	13	11	0	30	VDC		SLO													P		
E		51	V	400 CYCLE AC PHASE A	1	A	51	105	125	VAC		CPS				30									P		
F				PNEUMATIC SYSTEM																							
F		1	P	LOZ TANK HELIUM	1	11	35	0	45	PIA		SLO	7	01721	11	3858	900	4							P	27-11707	
F		3	P	FUEL TANK HELIUM	1	11	9	0	100	PIA		SLO	7	01723	11	2650	925	1							P	27-11609	
F		125	P	B CTL PNEU REG OUT	1	11	7	0	1000	PIA		SLO	7	01731	3	4372	1243	4							P	27-16500	
F		246	P	B TK HE BTL HI	1	13	37	0	3500	PIA		SLO	7	01720	5	3066	1238	1							P	27-11600	

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MISSILE INSTRUMENTATION LOG SHEET

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1	2	3	4	5	6	7	8	9		10	11	12	13				14	15	16	17	DRAWING NUMBERS	
								MEASUREMENT RANGE					UNITS OF FUNCTION	ACCURACY	RATE OF CHANGE OR FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER						SERIAL NO.
18	19	20	21	22	23	24	25	26	27	28	29	30					31	32	33	34	35	
	F	288	P	ST PNEU REG OUT	1	11	49	0	800	PIA		SLO	7 01720	1	2724	1222	2					27-16505
	G			RADIO GUIDANCE SYS																		
	G	4	C	PB MAGNETRON AVERAGE	1	13	21	0	2.2	MA		LC										
	G	82	E	RB RF OUTPUT		C	33	0	15	E		SLO										
	G	3	V	PB AGC	1	13	1	M4.8	0	VDC		3						E	2			
	G	279	V	RB AGC NO. 1	1	13	15	0	M7.3	VDC		2.5										
	G	280	V	RB AGC NO. 2	1	13	17	0	M7.3	VDC		2.5										
	G	287	V	D PITCH OUTPUT	1	13	5	0	20	PRV		2.5										
	G	288	V	D YAW OUTPUT	1	13	9	0	20	PRV		2.5										
	G	290	X	D CONTACTS #1 & #2	1	13	3	OFF	ON	VDC		STP										
	G	291	X	D CONTACTS #3 & #4	1	13	33	ON	OFF			STP										
	G	292	X	D CONTACTS #5 & #6	1	13	45	OFF	ON	VDC		STP										
	G	293	X	D CONTACTS #7 & #9	1	13	49	OFF	ON	VDC		STP										
	H			HYDRAULIC SYSTEM																		
	H	33	P	B1 HYD ACCUMULATOR	1	11	39	0	3500	PIA		SLO	7 01720	5	2627	1226	1					27-11600
	H	140	P	S/VERN HYD PRESS	1	11	42	0	3500	PIA		45	7 01731	9	5001	1101	1					27-11601
	M			MISCELLANEOUS																		
	M	12	D	PITCH ATTITUDE ANG	A	11		M85	85	DEG		2	7 01638	1			976	Y				27-11603
	M	13	D	YAW ATTITUDE ANGLE	A	15		M85	85	DEG		2	7 01638	1			976	Y				27-11603
	M	14	D	MISSILE ROLL ANGLE	A	19		0	359	DEG		2	7 01638	1			976	Y				27-11603
	M	23	D	PITCH ATT ANGLE FINE	A	13		0	90	DEG		2	7 01638	1			976	Y				27-11603
	M	24	D	YAW ATT ANGLE FINE	A	17		0	90	DEG		2	7 01638	1			976	Y				27-11603
	M	25	D	ROLL ATT ANGLE FINE	A	21		0	90	DEG		2	7 01638	1			976	Y				27-11603
	M	26	D	JET SECT SEPARATION	A	23		0	15	FT		STP	7 12052	1	51	1134	Y					27-11604
	P			PROPULSION SYSTEM																		

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MISSILE INSTRUMENTATION LOG SHEET

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1	2	3	4	5	6	7	8	9		10	11	12	13				14	15	16	17	DRAWING NUMBERS	
								MEASUREMENT RANGE	MEASUREMENT RANGE				TYPE OF TRANSDUCER	SERIAL NO	STATION NO.	QUADRANT						CAMB CODE
VEHICLE	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELEMETRY NO	SUB-CARRIER NO	COMMUNICATOR PIN NO	LOW	HIGH	UNITS OF FUNCTION	ACCURACY	RATE OF CHANGE OR FREQUENCY OF FUNCTION	13A	13B	13C	13D	42	46	47	50	73	
P	R3	R		R2 PUMP SPEED	1	2		4580	5320	RPM	SLO		7 01237	3	08	1228	4					27-17522
P	R4	R		R1 PUMP SPEED	1	A 31		4580	5320	RPM	SLO		7 01237	3	47	1198	4					27-17522
P	349	R		S PUMP SPEED	1	3		9.9	11.2	KPM	SLO		7 01437	13	CN121	1234	3					27-11611
P	528	D		S MAIN FUEL VALVE	1	A 45		0	90	DEG	SLO		NAA									
P	529	D		S MAIN LO2 VALVE	1	11 37		0	90	DEG	SLO		NAA									
P	6	P		S THRUST CHAMBER	1	C 53		0	1000	PIA	SLO		7 01731	5	5216	1228	1					27-16504
P	76	P		R LO2 REG REFERENCE	1	C 43		0	1000	PIA	SLO		7 01731	5	3797	1243	4					27-16500
P	27	P		VERNIER FUEL TANK	1	C 47		0	1000	PIA	SLO		7 01720	3	2715	1223	2					27-16505
P	28	P		V1 THRUST CHAMBER	1	11 1		0	400	PIA	SLO		7 01737	1	1052	1128	4					27-11614
P	29	P		V2 THRUST CHAMBER	1	11 5		0	400	PIA	SLO		7 01737	1	1063	1128	2					27-11614
P	3	P		VERNIER LO2 TANK	1	13 13		0	1000	PIA	SLO		7 01720	3	2650	1220	4					27-16505
P	56	P		S LO2 PUMP INLET	1	C 7		0	150	PIA	SLO		7 01730	1	229	1231	2					27-16504
P	59	P		R2 THRUST CHAMBER	1	C 21		0	600	PIA	SLO		7 01731	1	3973	1221	3					27-11612
P	6	P		R1 THRUST CHAMBER	1	C 23		0	600	PIA	SLO		7 01731	1	4000	1221	4					27-11612
P	100	P		HGG COMBUSTION CHM	1	C 13		0	600	PIA	SLO		7 01731	1	5245	1243	4					27-16500
P	330	P		S FUEL PUMP DISCH	1	C 35		0	1500	PIA	SLO		7 01731	7	3778	1231	2					27-16504
P	339	P		S GAS GEN DISCH	1	C 31		0	800	PIA	SLO		7 01731	3	4333	1228	2					27-16504
P	344	P		S LO2 REG REFERENCE	1	C 39		0	1000	PIA	SLO		7 01731	5	5106	1243	1					27-16504
P	351	P		S LO2 INJ MANIFOLD	1	11 15		0	1000	PIA	SLO		7 01731	5	5170	1231	2					27-16504
P	14	T		ENGINE COMP AMBIENT	1	11 33		0	400	DGF	SLO		27 12614	1								
P	53	T		S LO2 PUMP INLET	1	11 13		M300	M270	DGF	SLO		7 01649	7	122	1208	3					27-11634
P	671	T		TH SECT AMB QUAD 4	1	11 3		100	700	DGF	SLO		7 01684	9		1230	4					27-11599
P	72	X		BOOSTER CUTOFF RELAY	1	R 5		0	28	VDC	BLP											
P	77	X		VERNIER CUTOFF RELAY	1	C 5		0	28	VDC	STP											
P	347	X		S COF RELAY LOCKIN	1	C 9		0	28	VDC	STP											
S				AUTOPILOT SYSTEM																		
S	61	D		ROLL DISPL GYRO SIG	1	A 1		M3	3	DEG		35										
S	62	D		PITCH DISPL GYRO SIG	1	A 3		M3	3	DEG		35										

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CONVAIR-ASTRONAUTICS

MISSILE INSTRUMENTATION LOG SHEET

MISSILE D45

REPORT NO. AZC-27-057-45

DATE 22 FEB 60

PAGE 4

1	2	3	4	5	6	7	8	9		10	11	12	13				14	15	16	17	DRAWING NUMBERS	
								MEASUREMENT RANGE	TYPE OF TRANSDUCER				SERIAL NO.	STATION NO.	QUADRANT	CARD CODE						
VEHICLE	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELEMETRY NO.	SUB-CARRIER NO.	COMPARATOR PIN NO.	LOW	HIGH	UNITS OF FUNCTION	ACCURACY	RATE OF CHANGE OR FREQUENCY OF FUNCTION	1301	1302	1303	1304	42	44	47	49	73	
S	63	D		YAW DISPL GYRO SIG	1	A	5	M3	3	DEG		35										
S	252	D		B1 YAW ROLL	1	6		M7	7	DEG		10	7 01680	1	434	1212	Y	P				27-11613
S	253	D		B2 YAW ROLL	1	E	19	M7	7	DEG		10	7 01680	1	343	1212	Y	P				27-11613
S	254	D		B1 PITCH	1	7		M7	7	DEG		10	7 01680	1	470	1212	4	P				27-11613
S	255	D		B2 PITCH	1	E	15	M7	7	DEG		10	7 01680	1	367	1212	3	P				27-11613
S	256	D		SUSTAINER YAW	1	4		M4.5	4.5	DEG		6	7 01680	5	258	1210	Y	P				27-11576
S	257	D		SUSTAINER PITCH	1	5		M4.5	4.5	DEG		6	7 01680	3	556	1212	X	P				27-11576
S	258	D		V1 PITCH ROLL	1	E	13	M70	70	DEG		10	27 01205	1	40	1128	X	P				27-11614
S	259	D		V2 PITCH ROLL	1	E	17	M70	70	DEG		10	27 01205	1	42	1128	4	P				27-11614
S	260	D		V1 YAW	1	E	7	M35	35	DEG		10	7 01414	1	99666	1128	4	P				27-11614
S	261	D		V2 YAW	1	E	5	M35	35	DEG		10	7 01414	1	98322	1128	2	P				27-11614
S	52	R		ROLL RATE GYRO SIG	1	10	1-	M8	8	D/S		35										
S	53	R		PITCH RATE GYRO SIG	1	9		M6	6	D/S		35										
S	54	R		YAW RATE GYRO SIG	1	8		M6	6	D/S		35										
T				TELEMETRY																		
T	68	T		TM CANISTER AFT OSC	1	11	19	0	200	DGF		SLO	7 01376	1								
T	69	T		TM CANISTER AFT RF	1	11	23	0	200	DGF		SLO	7 01376	1								
U				PROPELLANT UTILIZ																		
U	101	A		AXIAL ACCELERATION	1	12	1-	0	8	G		30	7 01413	5	5903	994	Y	P				27-11547
U	80	P		LO2 TANK HEAD	1	A	33	0	14.7	PID		SLO	27 01297	1	5804	1036	4	P				27-11709
U	81	P		FUEL TANK HEAD	1	A	35	0	14.7	PID		SLO	27 01297	1	5805	1036	4	P				27-11709
U	91	V		ERROR RADIO DEMOD/OP	1	13	43	M20	20	VDC		SLO										
Y				RE-ENTRY SEPERATION																		
Y	15	T		117L ENGINE COMP	1	11	11	M200	200	DGF		10	7 01684	7	23R	470	Y	P				27-11708
Y	17	T		ADAPTER @ STA 489	1	11	53	0	1400	DGF		10	7 01684	7		489	Y	P				27-11597

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REPORT NO. AZC-27-057-45
SECTION 9

CONVAIR-ASTRONAUTICS

MISSILE INST. MENTATION LOG SHEET

MISSILE D45

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1	2	3	4	5	6	7	8	9		10	11	12	13				14	15		16	17	DRAWING NUMBERS	
								VEHICLE	SYSTEM				MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELEMETRY NO		SUB-CARRIER NO	COMMUTATOR PIN NO				MEASUREMENT RANGE
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
Y	19	T			ADAPTER @ STA 399	1	11	47	0	1400	DGF	10	7	01684	7								27-11597
Y	20	X			EXPLOSIVE BOLT #1	1	A	39	ON	OFF		STP											
Y	21	X			EXPLOSIVE BOLT #2	1	A	41	ON	OFF		STP											
Y	22	X			EXPLOSIVE BOLT #3	1	A	54	ON	OFF		STP											
Z					AZUSA																		
Z	2	E			KLYSTRON PWR OUTPUT	1	13	31	0	12	E	1											
Z	3	F			XPONDR RF INPUT/AGC	1	13	23	M120	0	DHM	3											

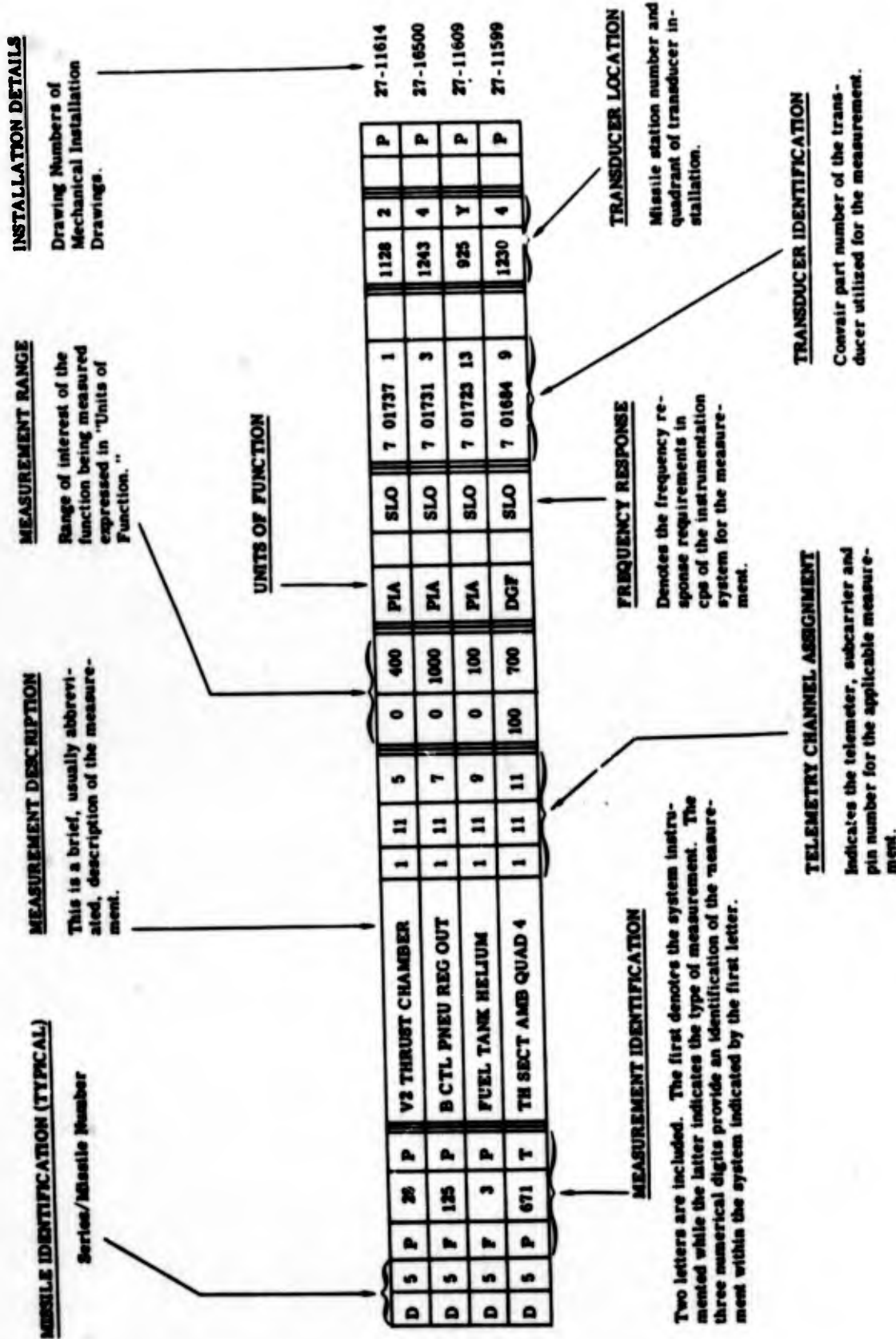
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SECTION 10

MISSILE INSTRUMENTATION BY CHANNEL

The Missile Instrumentation Log presented in this section contains the latest available characteristics of the individual measurements. In addition, the telemetering channel assignments are included. Note that this section is listed by channel. The following is a brief explanation of the format of the Missile Instrumentation Log sheet.



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CONVAIR-ASTRONAUTICS

MISSILE INSTRUMENTATION LOG SHEET

MISSILE D45 REPORT NO. AZC-27-057-45 DATE 22 FEB 60 PAGE 2

1	2	3	4	5	6	7	8	9		10	11	12	13				14	15	16	17
								MEASUREMENT RANGE	LOW				HIGH	TYPE OF TRANSDUCER	SERIAL NO	STATION NO				
VEHICLE SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELETYPE NO	SUB-CARRIER NO	COMMUTATOR PIN NO	MEASUREMENT RANGE	LOW	HIGH	UNITS OF FUNCTION	ACCURACY	RATE OF CHANGE OF FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO	STATION NO	QUADRANT	CARB CODE	DRAWING NUMBERS		
			COMM RATE CONT		1	10	0													
S	52	R	ROLL RATE GYRO SIG		1	10	1-	MR		R	D/S	35								

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CONVAIR-ASTRONAUTICS

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MISSILE INSTRUMENTATION LOG SHEET

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1	2	3	4	5	6	7	8	9		10	11	12	13				14	15	16	17	DRAWING NUMBERS
								MEASUREMENT RANGE	UNITS OF FUNCTION				TYPE OF TRANSDUCER	SERIAL NO	STATION NO	QUANTITY					
VEHICLE SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELEMETRY NO	SUB-CARRIER NO	COMMUNICATOR PIN NO	LOW	HIGH	ACCURACY	RATE OF CHANGE OR FREQUENCY OF FUNCTION	13	14	15	16	17	18	19	20	21	22	
			COMM. RATE 2.5 RPS	1	11	0															
P	28	P	V1 THRUST CHAMBER	1	11	1	0	400	PIA	SLO	7 01737	1	1052	1128	4						27-11614
P	671	T	TH SECT AMB QUAD 4	1	11	3	100	700	DGF	SLO	7 01684	9		1230	4						27-11599
P	29	P	V2 THRUST CHAMBER	1	11	5	0	400	PIA	SLO	7 01737	1	1063	1128	2						27-11614
F	125	P	H CTL PNEU REG OUT	1	11	7	0	1000	PIA	SLO	7 01731	3	4372	1243	4						27-16500
F	3	P	FUEL TANK HELIUM	1	11	9	0	100	PIA	SLO	7 01723	13	2459	925	1						27-11609
Y	15	T	117L ENGINE COMP	1	11	11	M200	200	DGF	10	7 01684	7	238	470	Y						27-11708
P	53	T	S LO2 PUMP INLET	1	11	13	M300	M270	DGF	SLO	7 01649	7	122	1208	3						27-11634
P	351	P	S LO2 INJ MANIFOLD	1	11	15	0	1000	PIA	SLO	7 01731	5	5170	1231	2						27-16504
A	573	T	LO2 TR + STA 504	1	11	17	340	740	DGF	SLO	27 11595	9		564	1						27-11595
T	68	T	TM CANISTER AFT OSC	1	11	19	0	200	DGF	SLO	7 01376	1									
A	64	T	LO2 TR + STA 640	1	11	21	540	940	DGF	SLO	27 11595	11	1016	640	1						27-11595
T	69	T	TM CANISTER AFT RF	1	11	23	0	200	DGF	SLO	7 01376	1									
			CALIBRATION	1	11	25															
			CALIBRATION	1	11	27															
			CALIBRATION	1	11	29															
			100% XDUCE CALIB	1	11	31															
P	14	T	ENGINE COMP AMBIENT	1	11	33	0	400	DGF	SLO	27 12614	1									
F	1	P	LO2 TANK HELIUM	1	11	35	0	45	PIA	SLO	7 01723	11	3858	209	A						27-11707
P	529	D	S MAIN LO2 VALVE	1	11	37	0	90	DEG	SLO	NAA										
H	33	P	S1 HYD ACCUMULATOR	1	11	39	0	3500	PIA	SLO	7 01720	5	2627	1228	1						27-11600
				1	11	41															
F	140	P	S/VERN HYD PRESS	1	11	43	0	3500	PIA	45	7 01731	9	5001	1191	1						27-11601
				1	11	45															
Y	19	T	ADAPTER # STA 309	1	11	47	0	1400	DGF	10	7 01684	7		309	Y						27-11597
F	488	P	ST PNEU REL OUT	1	11	49	0	800	PIA	SLO	7 01720	1	2724	1222	2						27-16505
				1	11	51															
Y	17	T	ADAPTER # STA 489	1	11	53	0	1400	DGF	10	7 01684	7		489	Y						27-11597
			SYNC & 100% CALIB	1	11	55															
			CONNECTED TO 1 11 55	1	11	56															
			CONNECTED TO 1 11 56	1	11	57															
			CONNECTED TO 1 11 57	1	11	58															
			CONNECTED TO 1 11 58	1	11	54															

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REPORT NO. AZC-27-057-45
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CONVAIR-ASTRONAUTICS

MISSILE INSTRUMENTATION LOG SHEET

MISSILE 045 REPORT NO AZC-27-057-45 DATE 22 FEB 60 PAGE 4

1	2	3	4	5	6	7	8	9		10	11	12	13				14	15	16	17	DRAWING NUMBERS	
								MEASUREMENT RANGE	MEASUREMENT RANGE				TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	QUADRANT						CAMB CODE
VEHICLE SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELEMETRY NO.	SUB-CARRIER NO.	COMMUTATOR PIN NO.	LOW	HIGH	UNITS OF FUNCTION	ACCURACY	RATE OF CHANGE OR FREQUENCY OF FUNCTION	01	02	03	04	05	06	07	08	09	10	
			COMM. RATE CONT		1	12	0															
U	101	A	AXIAL ACCELERATION		1	12	1-	0	M	G	30	7	01413	5	5903	994	V	P				27-11597

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MISSILE INSTRUMENTATION LOG SHEET

MISSILE 145

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1	2	3	4	5	6	7	8	9		10	11	12	13	14	15	16	17	DRAWING NUMBERS
								MEASUREMENT RANGE	UNITS OF FUNCTION									
VEHICLE SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELEMETRY NO	SUB-CARRIER NO	COMMUNICATOR PIN NO	LOW	HIGH	ACCURACY	RATE OF CHANGE OR FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO	STATION NO.	QUADRANT	CABLE CODE			
			COMM RATE 10 RPS	1	A													
S	61	D	ROLL DISPL GYRO SIG	1	A	1	M3	3	DEG	35								
S	62	D	PITCH DISPL GYRO SIG	1	A	3	M3	3	DEG	35								
S	63	D	YAW DISPL GYRO SIG	1	A	5	M3	3	DEG	35								
D	7	V	#1 RSC RF INPUT/AGC	1	A	7	15	100K	UV	SLO					907			
A	622	I	TH SECT LIGHT QUAD 3	1	A	9					27 11596	1	113	1240	3		27-11596	
M	12	D	PITCH ATTITUDE ANG	1	A	11	M85	85	DEG	2	7 01638	1		976	Y	P	27-11603	
M	23	D	PITCH ATT ANGLE FINE	1	A	13	0	90	DEG	2	7 01638	1		976	Y	P	27-11603	
M	13	D	YAW ATTITUDE ANGLE	1	A	15	M85	85	DEG	2	7 01638	1		976	Y	P	27-11603	
M	24	D	YAW ATT ANGLE FINE	1	A	17	0	90	DEG	2	7 01638	1		976	Y	P	27-11603	
M	14	D	MISSILE ROLL ANGLE	1	A	19	0	359	DEG	2	7 01638	1		976	Y	P	27-11603	
M	25	D	ROLL ATT ANGLE FINE	1	A	21	0	90	DEG	2	7 01638	1		976	Y	P	27-11603	
M	26	D	JET SECT SEPARATION	1	A	23	0	15	FT	STP	7 12052	1	51	1134	Y	P	27-11604	
			CALIBRATION	1	A	25												
			CALIBRATION	1	A	27												
			CALIBRATION	1	A	29												
P	84	R	#1 PUMP SPEED	1	A	31	4580	5320	RPM	SLO	7 01237	3	47	1106	4	P	27-17522	
U	8	P	LO2 TANK HEAD	1	A	33	0	14.7	PID	SLO	27 01297	1	5804	1036	4	P	27-11709	
U	81	P	FUEL TANK HEAD	1	A	35	0	14.7	PID	SLO	27 01297	1	5806	1036	4	P	27-11709	
				1	A	37												
Y	20	X	EXPLOSIVE BOLT #1	1	A	39	ON	OFF		STP								
Y	21	X	EXPLOSIVE BOLT #2	1	A	41	ON	OFF		STP								
				1	A	43												
P	578	D	S MAIN FUEL VALVE	1	A	45	0	90	DEG	SLO	NAA							
				1	A	47												
				1	A	49												
L	51	V	400 CYCLE AC PHASE A	1	A	51	105	125	VAC	CPS			30					
Y	22	X	EXPLOSIVE BOLT #3	1	A	53	ON	OFF		STP								
			SYNC & 100% CALIB	1	A	55												
			CONNECTED TO	1	A	55	1	A	56									
			CONNECTED TO	1	A	56	1	A	57									
			CONNECTED TO	1	A	57	1	A	58									
			CONNECTED TO	1	A	58	1	A	59									

MISSILE INSTRUMENTATION LOG SHEET

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1	2	3	4	5	6	7	8	9		10	11	12	13	14	15	16	17	DRAWING NUMBERS	
								MEASUREMENT RANGE	LOW										HIGH
VEHICLE SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELETYPE NO.	SUB-CARRIER NO.	COMPARATOR PIN NO.	MEASUREMENT RANGE	LOW	HIGH	UNITS OF FUNCTION	ACCURACY	RATE OF CHANGE OR FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	QUANTITY	CALIB CODE		
							COMM RATE 30 RPS												
A	621	O	STA 670 X AXIS	1	E	1	M3	3	G			20	27 01237	1	1435	670	Y	P	27-11501
A	610	O	STA 980 Y AXIS	1	E	3	M3	3	G			20	27 01237	1	1256	980	Y	P	27-11605
S	261	D	V2 YAW	1	E	5	M35	35	DEG			10	7 01414	1	08422	1128	Y	P	27-11614
S	260	D	V1 YAW	1	E	7	M35	35	DEG			10	7 01414	1	03666	1128	Y	P	27-11614
A	609	O	STA 1212 Y AXIS	1	E	9	M3	3	G			20	27 01237	1	1461	1212	Y	P	27-11500
A	611	O	STA 670 Y AXIS	1	E	11	M3	3	G			20	27 01237	1	1617	670	Y	P	27-11501
S	258	D	V1 PITCH ROLL	1	E	13	M70	70	DEG			10	27 01205	1	40	1128	Y	P	27-11614
S	255	D	B2 PITCH	1	E	15	M7	7	DEG			10	7 01680	1	367	1212	Y	P	27-11613
S	259	D	V2 PITCH ROLL	1	E	17	M70	70	DEG			10	27 01205	1	42	1128	Y	P	27-11614
S	253	D	B2 YAW ROLL	1	E	19	M7	7	DEG			10	7 01680	1	343	1212	Y	P	27-11613
A	619	O	STA 1212 X AXIS	1	E	21	M3	3	G			20	27 01237	1	1433	1212	Y	P	27-11500
A	620	O	STA 980 X AXIS	1	E	23	M3	3	G			20	27 01237	1	1287	980	Y	P	27-11605
			CALIBRATION	1	E	25													
			CALIBRATION	1	E	27													
			CALIBRATION	1	E	29													
A	621	O	CONNECTED TO 1 E 1	1	E	31													
A	610	O	CONNECTED TO 1 E 3	1	E	33													
S	261	D	CONNECTED TO 1 E 5	1	E	35													
S	260	D	CONNECTED TO 1 E 7	1	E	37													
A	609	O	CONNECTED TO 1 E 9	1	E	39													
A	611	O	CONNECTED TO 1 E 11	1	E	41													
S	258	D	CONNECTED TO 1 E 13	1	E	43													
S	255	D	CONNECTED TO 1 E 15	1	E	45													
S	259	D	CONNECTED TO 1 E 17	1	E	47													
S	253	D	CONNECTED TO 1 E 19	1	E	49													
A	619	O	CONNECTED TO 1 E 21	1	E	51													
A	620	O	CONNECTED TO 1 E 23	1	E	53													
			SYNC & 100% CALIB	1	E	55													
			CONNECTED TO 1 E 55	1	E	56													
			CONNECTED TO 1 E 56	1	E	57													
			CONNECTED TO 1 E 57	1	E	58													
			CONNECTED TO 1 E 58	1	E	59													
D	3	X	RSC DESTRUCT OUTPUT	1	E	95		0	30	VDC		STP							

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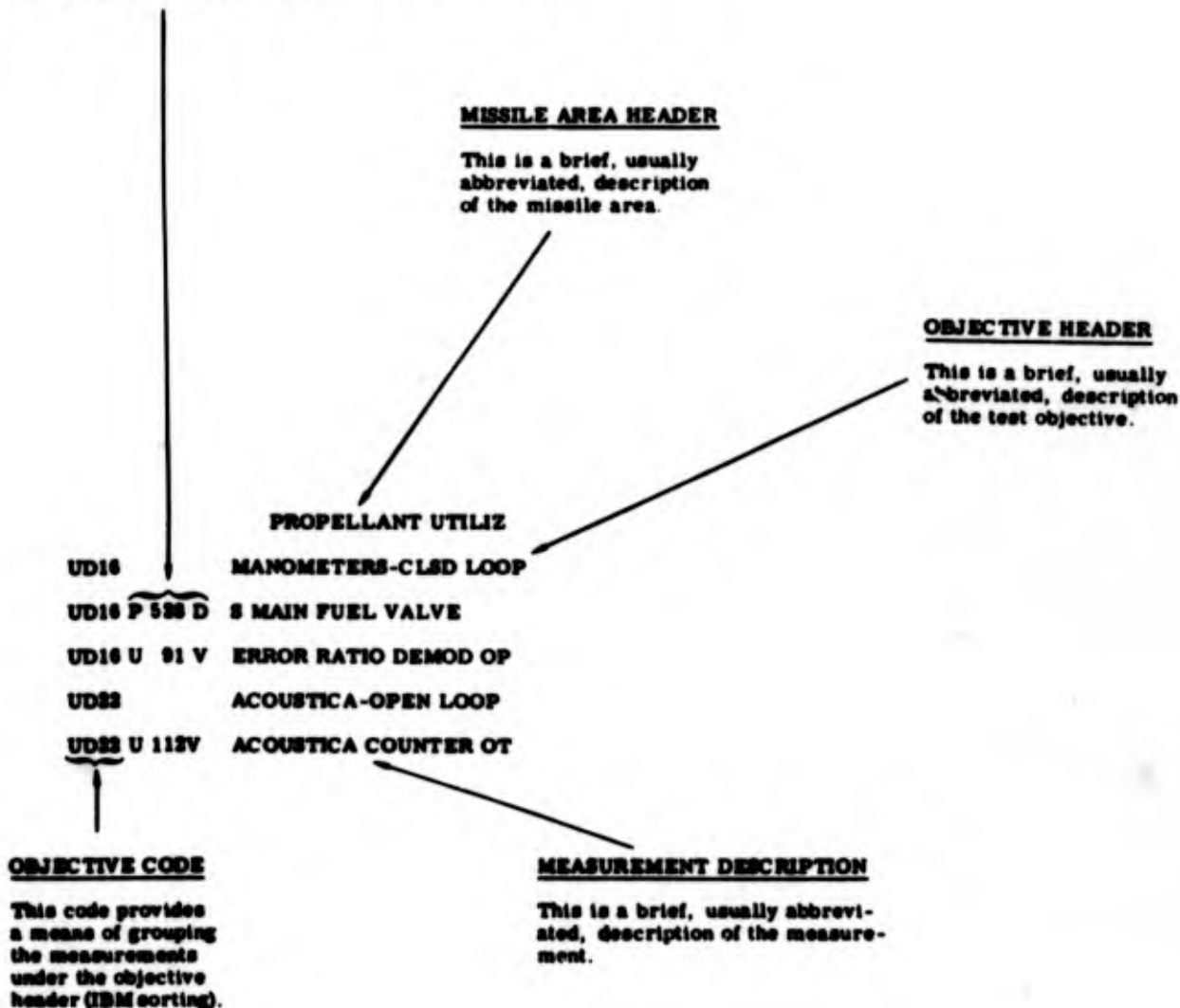
SECTION 11

MISSILE INSTRUMENTATION BY TEST OBJECTIVE

This section presents a grouping of the measurements which support each test objective presently scheduled for this missile. Objectives are assigned missile area codes and are sorted by missile area. The following is a brief explanation of the format used in this section.

MEASUREMENT IDENTIFICATION

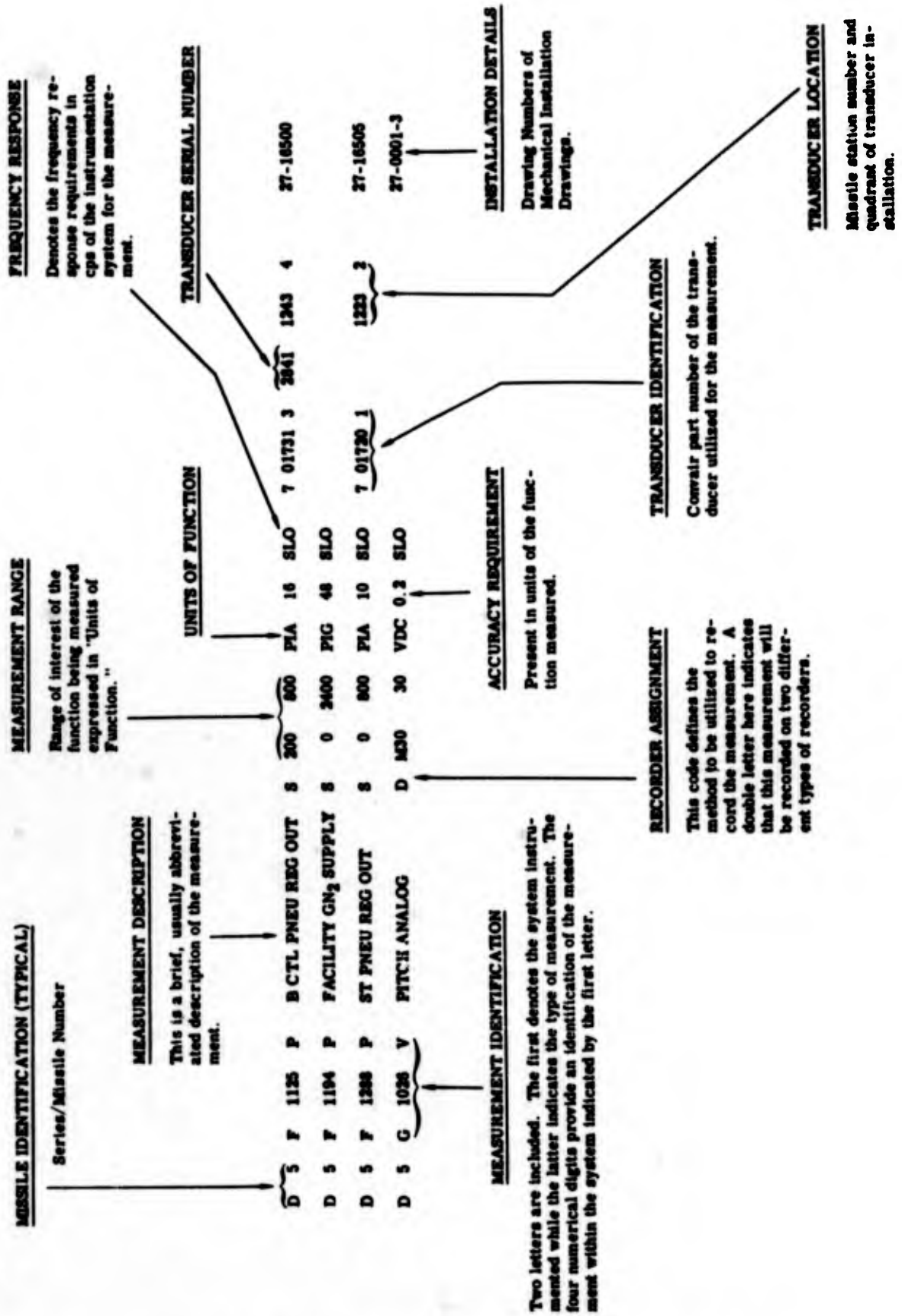
Two letters are included; the first denotes the system instrumented while the latter indicated the type of measurement. Of the four numerical digits the first is used to identify the method of signal transmission from the transducer to the recorder. The remaining three digits provide an identification for the measurement within the system denoted by the first letter.



SECTION 12

LANDLINE INSTRUMENTATION

The Landline Instrumentation presented in this section contains the latest available characteristics of the individual measurements. In addition the type of recordings indicated. The following is a brief explanation of the format of the Landline Instrumentation Log.



D45 L/L MASTERS 22 FEB 60

Q U A D R A N T
 S T N A U D R A
 S N E U R M I B O E N R
 X D U C T Y P O E A E L R
 T U C I B O E A E L R

F A C
 U C N C H
 U C U U R A A
 N T R N O R A N
 I I A I F A N
 T O O C T T O G
 S F N Y S F E F E

R E C O R D E R
 M E A S R A N G E
 T Y P O E E F R

M E A N S U R B T Y
 T S R B Y
 E M E P
 M T R E

DESCRIPTION	OFF	ON	VDC	STP	PEN
D 45 D M138 W COMMAND #1 BATTERY	0	60	MIN		
D 45 D M139 W COMMAND #2 BATTERY	0	60	MIN		
D 45 D M140 W COMMAND #1 TOTAL	0	1000	HR		
D 45 D M141 W COMMAND #2 TOTAL	0	1000	HR		
D 45 D M145 W ACCESSORY TOTAL	0	1000	HR		
D 45 D 1357 X TCC RS INT AND ARMED	R		VDC		151
D 45 E M066 C MISSILE DC AMPS	M	0	200	AMP	
D 45 E M068 C EMERGENCY GENERATOR	M	0	200	AMP	
D 45 E M005 Q MISSILE INT PHASE A	M	396	404	CPS	
D 45 E M029 Q MISSILE EXT PHASE A	M	396	404	CPS	
D 45 E M031 Q PHASE A EXT @ MSL	M	396	404	CPS	
D 45 E M003 V MISSILE INTERNAL DC	M	0	40	VDC	
D 45 E M006 V MISSILE INTERNAL AC	M	110	120	VAC	
D 45 E M022 V MISSILE AC EXT @ MSL	M	110	120	VAC	
D 45 E M023 V MISSILE EXTERNAL AC	M	110	120	VAC	
D 45 E M030 V MISSILE DC EXT @ MSL	M	0	40	VDC	
D 45 E M065 V MISSILE EXTERNAL DC	M	0	40	VDC	

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PAGE 3

DA5 L/L MASTERS 22 FEB 60

D 45 F 1207 X	TCC INTL PNEU P LITE	R	OFF	ON	VDC	STP	PEN 152
D 45 G 1026 V	PITCH ANALOG	D	M30	30	VDC 0.2	SLO	27-0001-3
D 45 G 1027 V	YAW ANALOG	D	M30	30	VDC 0.2	SLO	27-0001-3
D 45 G 1549 X	D CONTACT #1	R	OFF	ON	VDC	STP	PEN 123
D 45 G 1550 X	D CONTACT #2	R	OFF	ON	VDC	STP	PEN 125
D 45 G 1551 X	D CONTACT #3	R	OFF	ON	VDC	STP	PEN 129
D 45 G 1552 X	D CONTACT #5	R	OFF	ON	VDC	STP	PEN 126
D 45 G 1553 X	D CONTACT #6	R	OFF	ON	VDC	STP	PEN 124
D 45 G 1554 X	D CONTACT #7	R	OFF	ON	VDC	STP	PEN 127
D 45 H 1101 X	RCC UNTL HYD P LITE	R	OFF	ON	VDC	STP	PEN 58
C 45 H 1146 X	B HYD HI PRESS SW	R	OFF	ON	VDC	STP	PEN 59
D 45 H 1147 X	S HYD HI PRESS SW	R	OFF	ON	VDC	STP	PEN 60
D 45 H 1187 X	BSTR OIL EVACUATION	R	OFF	ON	VDC	STP	PEN 55
D 45 H 1188 X	SUST OIL EVACUATION	R	OFF	ON	VDC	STP	PEN 57
D 45 L M006 D	MISSILE ALIGNMENT	M	M50	50	MIM		
D 45 L 1127 P	HOLDOWN CYL B1 SIDE	O	O	6000	PIG	100	
D 45 L 1129 P	HOLDOWN CYL B2 SIDE	O	O	6000	PIG	100	
D 45 M M144 V	STROBELIGHT BATTERY	M					

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22 FEB 60

D45 L/L MASTERS

D	45	M	1030	X	MSL TWO INCH MOTION	OR	OFF	ON	VDC	STP	PEN	99
D	45	N	M362	D	36 INCH WATER VALVE	M						
D	45	N	1342	T	POD AIR DUCT	S	0	200	DGF	SLO		
D	45	N	1344	T	TRANSFER ROOM	S	0	100	DGF	SLO		
D	45	N	1353	T	KECO HTR OUTPUT	S	0	250	DGF	10 SLO		
D	45	N	1343	X	POD AIR DUCT VALVE	R	OFF	ON	VDC	STP	PEN 111	
D	45	N	1354	X	KECO AIRFLOW SAIL SW	R	OFF	ON	VDC	STP	PEN 112	
D	45	P	M242	B	PUMP LC SPEED	M	0	100	PCT			
D	45	P	1314	C	L02 TOPPING SIGNAL	R	4	20	MA	SLO		
D	45	P	M251	D	LC THROTTLE VALVE	M	0	FULL				
D	45	P	M685	M	FUEL IN MISSILE	M	0	10K	GAL			
D	45	P	1006	P	S THRUST CHAMBER	O	13	1000	PIG	16 150	7 01731	5 5209 1240 1
D	45	P	1026	P	B L02 REG REFERENCE	S	0	600	PIG	6 SLO	7 01732	3 4324 1243 4
D	45	P	1059	P	B2 THRUST CHAMBER	O	0	600	PIG	6 250	7 01731	1 5244 1220 3
D	45	P	1060	P	B1 THRUST CHAMBER	O	0	600	PIG	6 250	7 01731	1 5151 1220 4
D	45	P	1344	P	S L02 REG REFERENCE	S	0	1000	PIG	7 SLO	7 01732	5 4321 1240 1
D	45	P	M373	P	L02 STORAGE TANK	M	0	50	PIG			
D	45	P	M430	P	FUEL STORAGE TANK	M	0	10	PIG			
D	45	P	1017	T	B2 TURBINE INLET	S	0	1500	DGF	30 SLO	27 01247	1 5544 1206 3
D	45	P	1021	T	L02 AT BREAKAWAY VLV	S	M300	M270	DGF	1 SLO	7 01649	7 171R 1170 4

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27-17523

1 553L 1234 3

D 45 P 1326 T	S	TURBINE INLET	S	0	1500	DGF	30	SLO	27	01247	1	553L	1234	3		
D 45 P 1673 T	S	B1 FUEL IGN VLV AMB	S	40	180	DGF	5	SLO		T/C						PEN 86
D 45 P 1674 T	S	B2 FUEL IGN VLV AMB	S	40	180	DGF	5	SLO		T/C						PEN 53
D 45 P 1675 T	S	ENG CTL PNEU MAN	S	40	180	DGF	5	SLO		T/C						PEN 148
D 45 P 1311 X	R	90% FUEL LVL IND	R	OFF	ON	VDC		STP								PEN 149
D 45 P 1577 X	R	RELEASE SIGNAL	R	OFF	ON	VDC		STP								PEN 146
D 45 P 1631 X	R	LO2 F60 VLV AIRB OPN	R	OFF	ON	VDC		STP								PEN 147
D 45 P 1632 X	R	LO2 F60 VLV AIRB CLS	R	OFF	ON	VDC		STP								PEN 144
D 45 P 1633 X	R	LO2 F60 VLV GND OPN	R	OFF	ON	VDC		STP								PEN 145
D 45 P 1634 X	R	LO2 F60 VLV GND CLS	R	OFF	ON	VDC		STP								PEN 142
D 45 P 1635 X	R	FUL F60 VLV AIRB OPN	R	OFF	ON	VDC		STP								PEN 143
D 45 P 1636 X	R	FUL F60 VLV AIRB CLS	R	OFF	ON	VDC		STP								
D 45 P 1637 X	R	FUL F60 VLV GND OPN	R	OFF	ON	VDC		STP								
D 45 P 1638 X	R	FUL F60 VLV GND CLS	R	OFF	ON	VDC		STP								
D 45 P 1987 X	EA	FUEL O/F PROBE	EA	OFF	ON	VDC		STP								
D 45 P 1988 X	R	LO2 95% LVL EMER COF	R	OFF	ON											PEN 89
D 45 P 1997 X	R	MSL FUELED 95%	R	OFF	ON											PEN 87
D 45 P 1998 X	R	LO2 0/FILL EMER COF	R	OFF	ON											PEN 90
D 45 P 1999 X	R	MSL FUELED 100%	R	OFF	ON											PEN 88

D 45 S M281 C	M	PANEL POWER SUPPLY	M	0	400	MA										
D 45 S 1048 V	D	PROGRAMMER PITCH SIG	D	0	2.7	'JAC	0.2	SLO								

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D45 L/L MASTERS 22 FEB 60

D 45 S 1049 V	PROGRAMMER ROLL SIG	D	0	60	VAC	3	STP
D 45 S 1069 V	ROLL INT OUTPUT SIG	D	M4	4	VAC	4	5
D 45 S 1072 V	PITCH INT OUTPUT SIG	D	M7	7	VAC	7	5
D 45 S 1073 V	YAW INT OUTPUT SIG	D	M7	7	VAC	7	5
D 45 S 1107 V	B1 PCH ACTR FEEDBACK	D	M12	12	VAC	5	30
D 45 S 1108 V	B2 PCH ACTR FEEDBACK	D	M12	12	VAC	5	30
D 45 S 1113 V	V1 YAW ACTR FEEDBACK	D	M5	7	VAC	5	30
D 45 S 1114 V	V2 YAW ACTR FEEDBACK	D	M5	7	VAC	5	30
D 45 S 1118 V	V2 ROL ACTR FEEDBACK	D	M11	11	VAC	5	30
D 45 S 1119 V	V1 ROL ACTR FEEDBACK	D	M11	11	VAC	5	30
D 45 S 1121 V	GYRO TEST SIG	D	M5	5	VAC	1	STP
D 45 S 1122 V	SERVO TEST SIG	D	M11	11	VAC	5	30
D 45 S 1123 V	INTEGRATOR TEST SIG	D	M11	11	VAC	2	30
D 45 S 1128 V	B1 YAW ACTR FEEDBACK	D	M12	12	VAC	5	30
D 45 S 1129 V	B2 YAW ACTR FEEDBACK	D	M12	12	VAC	5	30
D 45 S 1147 V	PITCH GYRO AMP OUT	D	M10	10	VAC	1	30
D 45 S 1148 V	YAW GYRO AMP OUT	D	M10	10	VAC	1	30
D 45 S 1149 V	ROLL GYRO AMP OUT	D	M10	10	VAC	1	30
D 45 S 1216 V	S PCH ACTR FEEDBACK	D	M10	10	VAC	5	30
D 45 S 1217 V	S YAW ACTR FEEDBACK	D	M10	10	VAC	5	30
D 45 S M270 V	FINE HEATER-PITCH	M	0	150	VAC		
D 45 S M271 V	FINE HEATER-YAW	M	0	150	VAC		

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D45 L/L MASTERS 22 FEB 60

D 45 S M272 V	FINE HEATER-ROLL	M	0	150	VAC	
D 45 S M280 V	PANEL POWER SUPPLY	M	0	200	VDC	
D 45 S M176 W	PROGRAM RUN TIME	M	0	999	SEC	
D 45 S M282 W	DECADE EVENT TIMER	M	0	10K	SEC	
D 45 S 1235 X	PROGRAMMER RUN TIME	R	OFF	ON	VDC	STP PEN 122
D 45 S 1356 X	TCC AUTOPILOT RDY LT	R	OFF	ON	VDC	STP PEN 150
D 45 T M142 W	TELEMETER BATTERY	M	0	60	MIN	
D 45 T M143 W	TELEMETER TOTAL	M	0	1000	HR	
D 45 U 1091 V	ERROR RATIO DEMOD OP	S	M20	20	VDC	.5 20
D 45 U M091 V	LO2 TANK LEVEL IND	M	80	105	PCT	

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CONVAIR ASTRONAUTICS
GENERAL DYNAMIC CORPORATION

TPL: 2180
4 April 1960

A14612

To: All Holders of Report AZC-27-057
From: T. M. Wooster - Test Planning
Subject: Instrumentation Configuration Report, Series D,
Article 57, dated 9 February 1960

521-65

The enclosed report has been prepared to reflect the instrumentation configuration (both landline and telemetry) of missile 57-D.

It is recommended that this report be physically incorporated in the back of Report AZC-27-057, in order that holders of the document may have a complete instrumentation configuration document for the SAUCOS/MIDAS PROGRAM under a single cover.

T. M. Wooster
T. M. Wooster
Instrumentation Planning

TMW:WSB:jb

Distribution List
Report AZC-27-057-57

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DATE 9 February 1960

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CONVAIR (ASTRONAUTICS) DIVISION
GENERAL DYNAMICS CORPORATION

WB-117L

INSTRUMENTATION CONFIGURATION

SERIES D ARTICLE 57

PALS



PREPARED BY TEST PLANNING

COORDINATED BY W.S. Becker
W. S. Becker

APPROVED BY H.R. Macdonald
H. R. Macdonald
Test Planning

^(S)
CHECKED BY T.M. Wooster
T. M. Wooster
Instrumentation

APPROVED BY P.J. Lynch
P. J. Lynch
Chief-Field Test
Engineering

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4 August 1960

FOREWORD

This report has been published in accordance with contractual requirements as cited in Convair-Astronautics Report AZM-27-091. It describes the instrumentation released for Missile 57D as of 4 August 1960.

Information presented here will be used by Air Force, Associate Contractors, Design, Operation and Field Test Groups. Measurement modification will either originate in the Instrumentation Section of the Test Planning Group or will be submitted as a recommendation to this group.

(A)

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SUMMARY

The instrumentation plans for this missile have been established through a study of program test objectives, system analysis, and operating considerations.

Instrumentation is planned for three basic purposes:

Evaluation - that instrumentation required to support test objectives:

Operating Considerations - consists of redline and design operating limit measurements which provide site personnel with real time data to monitor critical parameters prior to firings and during FRF's and;

Reliability Analysis - which includes instrumentation not covered in the above two categories. Note that all instrumentation is available for reliability analysis.

A discussion of missile instrumentation and associated characteristics have been summarized in Section 3 of Report AZC-27-057 - "WS 117 Summary Report." For a detailed description of the various missile systems, test objectives, and general test program, see Report AZC-27-035 and AZC-27-027.

The specific measurements to be transmitted via telemeter have been tabulated and are listed in Sections 8 through 10 in terms of missile area, instrumentation system and channel assignment. Test objectives for this missile are shown along with the applicable instrumentation in Section 11 of this report.

In addition to the telemetry, the landline instrumentation program for this missile has been included in the form of a master tabulation of landline measurement characteristics (Section 12) to clarify the specific measurements instrumentation. Location schematics have been included in Report AZC-27-057.

For ease of data reduction and uniformity among test stands, the majority of sequence recorder measurements have been standardized. These pen numbers may be found in Report AZC-27-057.

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REASONS FOR REVISION "A" CHANGES

- I. Recent rough combustion starts have reiterated the necessity of obtaining data for evaluation and reliability analysis of thrust chamber combustion during starts. Three accelerometer landline measurements have been added to PMR articles to indicate any anomalies in the thrust chamber combustion during start. These measurements are recorded on oscillograph to provide high frequency response for complete evaluation. PMR articles will not have the RCC back-up system.

MEAS. NO.

DESCRIPTION

ADD

P 1439 0	S NAA RCC ACCELEROMETER
P 1452 0	B1 NAA RCC ACCELEROMETER
P 1453 0	B2 NAA RCC ACCELEROMETER

- II. The holddown and release system is designed to allow the start of missile motion by synchronously relieving the pneumatic pressure in the two holddown cylinders. The time from the release signal to missile motion can be a maximum of 0.45 seconds (nominally 0.3 to 0.4 seconds). Missile motion is theoretically determined to occur at the instant when the holddown forces equal the net missile thrust. To complete the evaluation, the zero time is established by monitoring the time of occurrence of the release signal.

ADD

P 1577 X	RELEASE SIGNAL
----------	----------------

- III. Recorder assignments, locations and transducer part and serial number information has been supplemented or corrected up to date in this issue of this report.
- IV. The redline measurements are indicated below for information. Parameters indicated by these measurements must remain within prescribed limits. Should these limits be exceeded the test

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4 August 1960

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will be immediately terminated.

<u>MEAS. NO.</u>	<u>DESCRIPTION</u>	<u>PHASE OF OPERATION</u>	<u>VALUE</u>	<u>PLUS To MINUS</u>	<u>EFF</u>
F1125P	B CTL PNEU REG OUT	PRIOR TO VE START	Per 27-20473	25 FIG	FLT & FRF
F1288P	ST PNEU REG OUT	PRIOR TO VE START	" "	25 FIG	FLT & FRF
P1026P	B LO2 REG REF	PRIOR TO VE START	" "	10 FIG	FLT & FRF
P1344P	S LO2 REG REF	PRIOR TO VE START	" "	20 FIG	FLT & FRF
P1017T	B2 TURBINE INLET	PRIOR TO VE START	0 DGF MIN		FLT & FRF
P1017T	B2 TURBINE INLET	5 SEC AFT MS START	1400 DGF MAX		FRF ONLY
P1326T	S TURBINE INLET	PRIOR TO VE START	0 DGF MIN		FLT & FRF
P1326T	S TURBINE INLET	5 SEC AFT MS START	1300 DGF MAX		FRF ONLY
P1673T	B1 FUEL IGN VLV AMB	AFT MAINSTAGE COMP	150 DGF MAX		FRF ONLY
P1674T	B2 FUEL IGN VLV AMB	AFT MAINSTAGE COMP	150 DGF MAX		FRF ONLY
P1675T	ENG CTL PNEU MAN AMB	AFT MAINSTAGE COMP	200 DGF MAX		FRF ONLY

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SECTION 8

MISSILE INSTRUMENTATION BY MISSILE AREA

This section presents a grouping of measurements by Missile Area. Instrumentation of this missile has been established as a result of a detailed analysis of the various missile systems and this section represents the final results of this analysis. The following is a brief explanation of the format used in this section.

<u>VEHICLE</u>	<u>MEASUREMENT DESCRIPTION</u> This is a brief, usually abbreviated, description of the measurement.	<u>MISSILE AREA CODE</u> This code is used to group related measurements for instrumentation planning (IBM sorting).
	<u>MISSILE AREA HEADER</u> This is a brief usually abbreviated, description of the missile area.	
	HYDRAULIC SYSTEM	
A H 33 P B1	HYD ACCUMULATOR	42000
A H 140 P S/VERN	HYD PRESS	42010
	POWER SUPPLY	42220
A E 28 V MBL	SYSTEMS INPUT	43000
A E 50 Q	400 CYCLE AC PWR SUP	43006
		43301

MEASUREMENT IDENTIFICATION

Two letters are included; the first denotes the system instrumented while the latter indicated the type of measurement. Of the four numerical digits the first is used to identify the method of signal transmission from the transducer to the recorder. The remaining three digits provide an identification for the measurement within the system denoted by the first letter.

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SECTION 8

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MSL D-57 TLM TEST PLAN 09 FEB 60

PAGE 001

S Y MEAS S NO	T Y P E	DESCRIPTION	MSL AREA
		*PROPULSION	20000
		CONTROL PRESSURE	21000
✓ F 125	P B	CTL PNEU REG OUT	21010
✓ F 288	P ST	PNEU REG OUT	21027
		PROPELLANT FEED	22000
P 100	P BGG	COMBUSTION CHM	22010
P 339	P S	GAS GEN DISCH	22062
		PROPELLANT FLOW	23000
P 529	D S	MAIN LO2 VALVE	23399
P 56	P S	LO2 PUMP INLET	23404
P 330	P S	FUEL PUMP DISCH	23406
		GENERAL OPERATION	24000
P 72	X	BOOSTER CUTOFF RELAY	24001
P 347	X S	COF RELAY LOCKIN	24101
P 77	X	VERNIER CUTOFF RELAY	24201
		THRUST	25000

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MSL D-57 TLM TEST PLAN 09 FEB 60

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P	60	P	B1 THRUST CHAMBER	25001
P	59	P	B2 THRUST CHAMBER	25003
P	6	P	S THRUST CHAMBER	25005
P	28	P	V1 THRUST CHAMBER	25010
P	29	P	V2 THRUST CHAMBER	25011
			PROPULSION UTILIZATION	
U	80	P	LO2 TANK HEAD	26120
U	81	P	FUEL TANK HEAD	26121
U	91	V	ERROR RATIO DEMOD OP	26120
P	528	D	S MAIN FUEL VALVE	26201

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*CONTROL SYSTEM 30000

AUTOPILOT 31000

CONTROL LOOP 31100

S 62 D PITCH DISPL GYRO SIG 31104

S 63 D YAW DISPL GYRO SIG 31105

S 61 D ROLL DISPL GYRO SIG 31106

S 53 R PITCH RATE GYRO SIG 31108

S 54 R YAW RATE GYRO SIG 31109

S 52 R ROLL RATE GYRO SIG 31110

S 254 D B1 PITCH 31127

S 252 D B1 YAW ROLL 31133

S 255 D B2 PITCH 31139

S 253 D B2 YAW ROLL 31145

S 258 D V1 PITCH ROLL 31154

S 259 D V2 PITCH ROLL 31160

S 260 D V1 YAW 31167

S 261 D V2 YAW 31172

S 257 D SUSTAINER PITCH 31177

S 256 D SUSTAINER YAW 31182

RADIO GUIDANCE G E 32000

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DECODER

32300

G 26 V PITCH ANALOG

32309

G 27 V YAW ANALOG

32310

G 79 D PITCH PHASE

32327

G 80 D YAW PHASE

32328

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MSL D-57 TLM TEST PLAN 09 FEB 60

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		*GEN MSL INSTRUMENT	40000
		TANK PRESSURIZATION	41000
F	1 P	LO2 TANK HELIUM	41024
F	3 P	FUEL TANK HELIUM	41046
		HYDRAULIC SYSTEM	42000
H	33 P	B1 HYD ACCUMULATOR	42010
H	140 P	S/VERN HYD PRESS	42220
		POWER SUPPLY	43000
E	28 V	MSL SYSTEMS INPUT	43005
E	50 Q	400 CYCLE AC PWRSUP	43301
E	51 V	400 CYCLE AC PHASE A	43302
		TRACKING-COMMAND	44000
		RANGE SAFETY CMD	44200
D	110 X	MSL DESTRUCT SIGNAL	44219
M	9 A	AXIAL ACCELERATION	45101

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MISSILE D57 REPORT NO. AZC-27-057-57 DATE 09 FEB 60 PAGE 1

1	2	3	4	5	6	7	8	9		10	11	12	13			14	15		16	17	DRAWING NUMBERS	
								MEASUREMENT RANGE	UNITS OF FUNCTION				TYPE OF TRANSDUCER	SERIAL NO	STATION NO		QUADRANT	CARD CODE				
VEHICLE SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELEMETRY NO	SUBCARRIER NO	COMMUTATOR PIN NO	LOW	HIGH		ACCURACY	RATE OF CHANGE OR FREQUENCY OF FUNCTION											
D			RANGE SAFETY SYSTEM																			
D	110 X		MSL DESTRUCT SIGNAL	1	14	4	0	28	VDC	STP											P	
E			ELECTRICAL POWER SYS																			
E	50 Q		400 CYCLE AC PWSUP	1	1		350	450	CPS	SLO											P	
E	28 V		MSL SYSTEMS INPUT	1	15	16	0	30	VDC	SLO											P	
E	51 V		400 CYCLE AC PHASE A	1	14	2	105	125	VAC	SLO											P	
F			PNEUMATIC SYSTEM																			
F	1 P		LO2 TANK HELIUM	1	14	24	0	45	PIA	SLO	7	01723	11	3068	925	Y					P	27-11640
F	3 P		FUEL TANK HELIUM	1	14	25	0	100	PIA	SLO	7	01723	13	V3705	926	Y					P	27-11593
F	125 P		B CTL PNEU REG OUT	1	14	17	0	1000	PIA	SLO	7	01731	5	4082	1243	4					P	27-11581
F	288 P		ST PNEU REG OUT	1	14	18	0	800	PIG	SLO	7	01731	3	4958	1202	2					P	27-11641
G			RADIO GUIDANCE SYS																			
G	79 D		PITCH PHASE	1	14	11	M1.7	0	VDC												P	
G	80 D		YAW PHASE	1	14	12	M1.7	0	VDC												P	
G	26 V		PITCH ANALOG	1	14	9	0	2.3	VDC												P	
G	27 V		YAW ANALOG	1	14	10	0	2.3	VDC												P	
H			HYDRAULIC SYSTEM																			
H	33 P		B1 HYD ACCUMULATOR	1	14	20	0	3500	PIA	45	7	01731	9	5429	1206	1					P	27-11591
H	140 P		S/VERN HYD PRESS	1	14	21	0	3500	PIA	45	7	01731	9	5656	1191	1					P	27-11592
M			MISCELLANEOUS																			
M	9 A		AXIAL ACCELERATION	1	15	17	0	10	G	2	27	01298	1								P	

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1	2	3	4	5	6	7	8	9		10	11	12	13				14	15	16	17	DRAWING NUMBERS		
								TELETYPE NO.	IN-CARRIER NO.				COMMUNICATOR PIN NO.	MEASUREMENT RANGE	UNITS OF FUNCTION	ACCURACY						RATE OF CHANGE OR FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER
10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32	
PROPULSION SYSTEM																							
P	528	D	S	MAIN FUEL VALVE	1	14	3	0	90	DEG	SLO	NAA										P	
P	529	D	S	MAIN LO2 VALVE	1	14	27	0	90	DEG	SLO	NAA										P	
P	6	P	S	THRUST CHAMBER	1	14	6	0	1000	PIA	150	7 01731	5	4615	1222	1						P	27-11648
P	28	P	V1	THRUST CHAMBER	1	15	20	0	400	PIA		7 01737	1		1228	4						P	27-11577
P	29	P	V2	THRUST CHAMBER	1	15	21	0	400	PIA		7 01737	1		1228	2						P	27-11577
P	56	P	S	LO2 PUMP INLET	1	15	27	0	150	PIA		7 01730	1	241	1222	1						P	27-11648
P	59	P	B2	THRUST CHAMBER	1	15	18	0	600	PIA		7 01731	1	5141	1221	3						P	27-11579
P	60	P	B1	THRUST CHAMBER	1	14	7	0	600	PIA	60	7 01731	1	5266	1221	4						P	27-11579
P	100	P	B88	COMBUSTION CHM	1	14	5	0	700	PIA	SLO	7 01731	1	4840	1243	4						P	27-11581
P	330	P	S	FUEL PUMP DISCH	1	15	19	0	1500	PIA		7 01731	7	4816	1237	1						P	27-11648
P	339	P	S	GAS GEN DISCH	1	15	3	0	1000	PIA		7 01731	3	4498	1222	1						P	27-11648
P	72	X		BOOSTER CUTOFF RELAY	1	15	9	OFF	ON			STP										P	
P	77	X		VERNIER CUTOFF RELAY	1	14	13	OFF	ON			STP										P	
P	347	X	S	COF RELAY LOCKIN	1	14	8	OFF	ON			STP										P	
AUTOPILOT SYSTEM																							
S	61	D	ROLL	DISPL GYRO SIG	1	15	6	M3	3	DEG	15											P	
S	62	D	PITCH	DISPL GYRO SIG	1	15	25	M3	3	DEG	15											P	
S	63	D	YAW	DISPL GYRO SIG	1	15	26	M3	3	DEG	15											P	
S	252	D	B1	YAW ROLL	1	15	2	M5	5	DEG	10	7 01680	1	677	1212	Y						P	27-11580
S	253	D	B2	YAW ROLL	1	15	5	M5	5	DEG	10	7 01680	1	674	1212	Y						P	27-11580
S	254	D	B1	PITCH	1	15	1	M5	5	DEG	10	7 01680	1	444	1212	4						P	27-11580
S	255	D	B2	PITCH	1	15	4	M5	5	DEG	10	7 01680	1	678	1212	3						P	27-11580
S	256	D	SUSTAINER	YAW	1	15	8	M3	3	DEG	6	7 01680	3	422	1210	Y						P	27-11576
S	257	D	SUSTAINER	PITCH	1	15	7	M3	3	DEG	6	7 01680	3	421	1210	X						P	27-11576
S	258	D	V1	PITCH ROLL	1	15	10	M70	70	DEG	10	27 01205	1		1128	4						P	27-11577
S	259	D	V2	PITCH ROLL	1	15	12	M70	70	DEG	10	27 01205	1		1128	2						P	27-11577
S	260	D	V1	YAW	1	15	11	M25	35	DEG	10	7 01414	1		1128	4						P	27-11577

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1	2	3	4	5	6	7	8	9		10	11	12	13				14	15	16	17	DRAWING NUMBER
								MEASUREMENT RANGE					UNITS OF FUNCTION	ACCURACY	RATE OF CHANGE OR FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER					
1	2	3	4	5	6	7	8	9	10	11	12	13				14	15	16	17	18	19
S	261	D	V2	YAW	1	15	13	M25	35	DEG	10	7	01414	1		1126	2	P	27-11577		
S	52	R	ROLL RATE	GYRO SIG	1	9		M8	8	D/S	15							P			
S	53	R	PITCH RATE	GYRO SIG	1	10		M6	6	D/S	15							P			
S	54	R	YAW RATE	GYRO SIG	1	11		M6	6	D/S	15							P			
U			PROPELLANT	UTILIZ																	
U	80	P	LO2 TANK	HEAD	1	15	22	0	5	PID	SLO	27	01297	1				P			
U	81	P	FUEL TANK	HEAD	1	15	23	0	5	PID	SLO	27	01297	1				P			
U	91	V	ERROR RATIO	DEMODO	1	14	19	M20	20	VDC	SLO							P			

12-10000-8 (REV. 12-59)

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SECTION 10
MISSILE INSTRUMENTATION BY CHANNEL

The Missile Instrumentation Log presented in this section contains the latest available characteristics of the individual measurements. In addition, the telemetering channel assignments are included. Note that this section is listed by channel. The following is a brief explanation of the format of the Missile Instrumentation Log sheet.

<u>MISSILE IDENTIFICATION (TYPICAL)</u> Series/Missile Number	<u>MEASUREMENT DESCRIPTION</u> This is a brief, usually abbreviated, description of the measurement.	<u>MEASUREMENT RANGE</u> Range of interest of the function being measured expressed in "Units of Function."	<u>INSTALLATION DETAILS</u> Drawing Numbers of Mechanical Installation Drawings.
D 5 P 29 P	V2 THRUST CHAMBER	400	1128 2 P
D 5 F 125 P	B CTL PNEU REG OUT	1000	1243 4 P
D 5 F 3 P	FUEL TANK HELIUM	100	925 Y P
D 5 P 671 T	TH SECT AMB QUAD 4	700	1230 4 P
			27-11614 P
			27-16500 P
			27-11609 P
			27-11599 P

<u>UNITS OF FUNCTION</u>	<u>FREQUENCY RESPONSE</u> Denotes the frequency response requirements in cps of the instrumentation system for the measurement.	<u>TRANSDUCER LOCATION</u> Missile station number and quadrant of transducer installation.
PIA	SLO	1128 2 P
PIA	SLO	1243 4 P
PIA	SLO	925 Y P
DGF	SLO	1230 4 P

<u>TELEMETRY CHANNEL ASSIGNMENT</u> Indicates the telemeter, subcarrier and pin number for the applicable measurement.	<u>TRANSDUCER IDENTIFICATION</u> Convairstation number of the transducer utilized for the measurement.
1 11 5 0	7 01737 1
1 11 7 0	7 01731 3
1 11 9 0	7 01723 13
1 11 11 100	7 01684 9

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1	2	3	4	5	6	7	8	9		10	11	12	13				14	15	16	17	DRAWING NUMBERS			
								MEASUREMENT RANGE	UNITS OF FUNCTION				ACCURACY	TYPE OF TRANSDUCER	SERIAL NO	STATION NO						QUADRANT	CARD CODE	
VEHICLE	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELEMETRY NO	SUB-CARRIER NO	COMMUNICATOR PIN NO	LOW	HIGH				1253	5455	561758	592041	62	66	67	70	71	73		
				CONN. RATE-5 RPS	1	14	0																	
				CONNECTED TO 1.12	1	14	1																	
E	51	V		400 CYCLE AC PHASE A	1	14	2	105	125	VAC		SLO											P	
P	528	D		S MAIN FUEL VALVE	1	14	3	0	90	DEG		SLO	NAA										P	
D	110	X		MSL DESTRUCT SIGNAL	1	14	4	0	28	VDC		STP											P	
P	100	P		B06 COMBUSTION CHM	1	14	5	0	700	PIA		SLO	7 01731	1	4840	1243	4						P	27-11581
P	6	P		S THRUST CHAMBER	1	14	6	0	1000	PIA		SLO	7 01731	5	4615	1222	1						P	27-11648
P	60	P		B1 THRUST CHAMBER	1	14	7	0	600	PIA		SLO	7 01731	1	5266	1221	4						P	27-11579
P	347	X		S COF RELAY LOCKIN	1	14	8	OFF	ON			STP											P	
G	26	V		PITCH ANALOG	1	14	9	0	2.3	VDC													P	
G	27	V		YAW ANALOG	1	14	10	0	2.3	VDC													P	
G	79	D		PITCH PHASE	1	14	11	M1.7	0	VDC													P	
G	80	D		YAW PHASE	1	14	12	M1.7	0	VDC													P	
P	77	X		VERNIER CUTOFF RELAY	1	14	13	OFF	ON			STP											P	
				XDCR PWR SUP 4 VDC	1	14	14																	
				INSTR GROUND	1	14	15																	
S	52	R		CONNECTED TO 1.9	1	14	16																	
F	125	P		B CTL PNEU REG OUT	1	14	17	0	1000	PIA		SLO	7 01731	5	4062	1243	4						P	27-11581
F	288	P		ST PNEU REG OUT	1	14	18	0	800	PIG		SLO	7 01731	3	4358	1202	2						P	27-11641
U	91	V		ERROR RATIO DEMOD OP	1	14	19	M20	20	VDC		SLO											P	
H	33	P		B1 HYD ACCUMULATOR	1	14	20	0	3500	PIA		SLO	7 01731	9	5429	1206	1						P	27-11591
H	140	P		S/VERN HYD PRESS	1	14	21	0	3500	PIA		SLO	7 01731	9	5656	1191	1						P	27-11592
S	53	R		CONNECTED TO 1.10	1	14	22																	
S	54	R		CONNECTED TO 1.11	1	14	23																	
F	1	P		LO2 TANK HELIUM	1	14	24	0	45	PIA		SLO	7 01723	11	3868	925	Y						P	27-11640
F	3	P		FUEL TANK HELIUM	1	14	25	0	100	PIA		SLO	7 01723	13	V3705	926	Y						P	27-11593
					1	14	26																	
P	529	D		S MAIN LO2 VALVE	1	14	27	0	90	DEG		SLO	NAA										P	
				INTERNAL CALIB 5 VDC	1	14	28																	
				SYNC & CALIBRATION	1	14	29																	
				CONNECTED TO 1 14 29	1	14	30																	

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1	2	3	4	5	6	7	8	9		10	11	12	13			14	15	16	17	DRAWING NUMBERS								
								MEASUREMENT RANGE	UNITS OF FUNCTION				ACCURACY	TYPE OF TRANSDUCER	SERIAL NO						STATION NO	QUADRANT	CARD CODE					
VEHICLE	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELEMETRY NO	SUB CARRIER NO	COMPUTATION PRN NO	LOW	HIGH			RATE OF CHANGE OR FREQUENCY OF FUNCTION																
3	4	5	6	10	29	30	31-32	33-34	35	36	39	42	43	45	46	49	51	52-53	54-55	56-57	58	59-60	62	64	67	70	71	73
				COMM. RATE-10 RPS	1	15	0																					
S	254	D	B1	PITCH	1	15	1	M5	5	DEG	10	7 01680	1	444	1212	4	P											27-11580
S	252	D	B1	YAW ROLL	1	15	2	M5	5	DEG	10	7 01680	1	677	1212	Y	P											27-11580
P	339	P	S	GAS GEN DISCH	1	15	3	0	1000	PIA		7 01731	3	4498	1222	1	P											27-11648
S	255	D	B2	PITCH	1	15	4	M5	5	DEG	10	7 01680	1	678	1212	3	P											27-11580
S	253	D	B2	YAW ROLL	1	15	5	M5	5	DEG	10	7 01680	1	674	1212	Y	P											27-11580
S	61	D		ROLL DISPL GYRO SIG	1	15	6	M3	3	DEG	15																	
S	257	D		SUSTAINER PITCH	1	15	7	M3	3	DEG	6	7 01680	3	421	1210	X	P											27-11576
S	256	D		SUSTAINER YAW	1	15	8	M3	3	DEG	6	7 01680	3	422	1210	Y	P											27-11576
P	72	X		BOOSTER CUTOFF RELAY	1	15	9	OFF	ON		S1P																	
S	258	D	V1	PITCH ROLL	1	15	10	M70	70	DEG	10	27 01205	1		1128	4	P											27-11577
S	260	D	V1	YAW	1	15	11	M25	35	DEG	10	7 01414	1		1128	4	P											27-11577
S	259	D	V2	PITCH ROLL	1	15	12	M70	70	DEG	10	27 01205	1		1128	2	P											27-11577
S	261	D	V2	YAW	1	15	13	M25	35	DEG	10	7 01414	1		1128	2	P											27-11577
				XDCR PWR SUP 4 VDC	1	15	14																					
				INSTR GROUND	1	15	15																					
E	28	V		MSL SYSTEMS INPUT	1	15	16	0	30	VDC	SLO																	
M	9	A		AXIAL ACCELERATION	1	15	17	0	10	G	2	27 01298	1															
P	59	P	B2	THRUST CHAMBER	1	15	18	0	600	PIA		7 01731	1	5141	1221	3	P											27-11579
P	330	P	S	FUEL PUMP DISCH	1	15	19	0	1500	PIA		7 01731	7	4816	1237	1	P											27-11648
P	28	P	V1	THRUST CHAMBER	1	15	20	0	400	PIA		7 01737	1		1228	4	P											27-11577
P	29	P	V2	THRUST CHAMBER	1	15	21	0	400	PIA		7 01737	1		1228	2	P											27-11577
U	80	P		LO2 TANK HEAD	1	15	22	0	5	PID	SLO	27 01297	1															
U	81	P		FUEL TANK HEAD	1	15	23	0	5	PID	SLO	27 01297	1															
P	72	X		CONNECTED TO 1 15 9	1	15	24																					
S	62	D		PITCH DISPL GYRO SIG	1	15	25	M3	3	DEG	15																	
S	63	D		YAW DISPL GYRO SIG	1	15	26	M3	3	DEG	15																	
P	56	P	S	LO2 PUMP INLET	1	15	27	0	150	PIA		7 01730	1	241	1222	1	P											27-11648
				INTERNAL CALIB 5 VDC	1	15	28																					
				SYNC & CALIBRATION	1	15	29																					
				CONNECTED TO 1 15 29	1	15	30																					

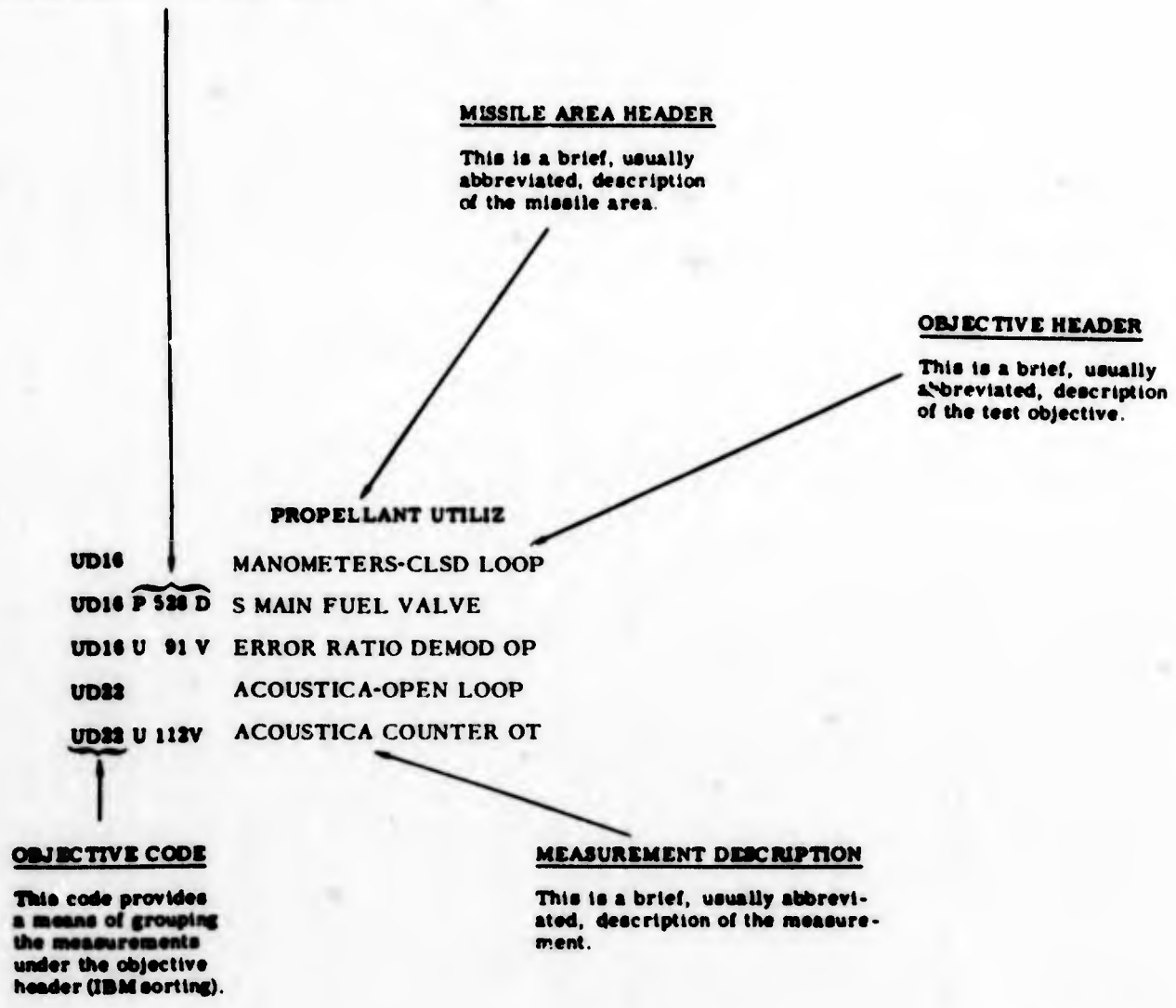
SECTION 11

MISSILE INSTRUMENTATION BY TEST OBJECTIVE

This section presents a grouping of the measurements which support each test objective presently scheduled for this missile. Objectives are assigned missile area codes and are sorted by missile area. The following is a brief explanation of the format used in this section.

MEASUREMENT IDENTIFICATION

Two letters are included; the first denotes the system instrumented while the latter indicated the type of measurement. Of the four numerical digits the first is used to identify the method of signal transmission from the transducer to the recorder. The remaining three digits provide an identification for the measurement within the system denoted by the first letter.



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D-57 OBJ TEST PLAN

OBJ.

CODE DESCRIPTION

*PROPULSION

PD72 OBTAIN DATA FOR PROPULSION
SYSTEM PERFORMANCE ANALYSIS.

M 9 A AXIAL ACCELERATION
P 528 D S MAIN FUEL VALVE
P 529 D S MAIN LO2 VALVE
P 6 P S THRUST CHAMBER
P 28 P V1 THRUST CHAMBER
P 29 P V2 THRUST CHAMBER
P 56 P S LO2 PUMP INLET
P 59 P B2 THRUST CHAMBER
P 60 P B1 THRUST CHAMBER
P 100 P BGG COMBUSTION CHM
P 330 P S FUEL PUMP DISCH
P 339 P S GAS GEN DISCH
P 72 X BOOSTER CUTOFF RELAY
P 77 X VERNIER CUTOFF RELAY
P 347 X S COF RELAY LOCKIN

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D-57 OBJ TEST PLAN

PU SYSTEM

UD37 OBTAIN DATA FOR PU SYSTEM PERFORMANCE ANALYSIS.

M 9 A AXIAL ACCELERATION
P 528 D S MAIN FUEL VALVE
P 529 D S MAIN LO2 VALVE
U 80 P LO2 TANK HEAD
U 81 P FUEL TANK HEAD
U 91 V ERROR RATIO DEMOD OP

*CONTROL SYSTEM

AUTOPILOT

SD32 DEMONSTRATE THAT THE SATELLITE VEHICLE SEPARATION MECHANISM IS PROVIDED INITIATION SIGNAL AT PROPER TIME.

X 0000 X 2ND STG TLM DATA

SD47 OBTAIN DATA FOR FLIGHT CONTROL SYSTEM PERFORMANCE ANALYSIS.

P 72 X BOOSTER CUTOFF RELAY
P 77 X VERNIER CUTOFF RELAY

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D-57 OBJ TEST PLAN

P 347 X S COF RELAY LOCKIN
S 61 D ROLL DISPL GYRO SIG
S 62 D PITCH DISPL GYRO SIG
S 63 D YAW DISPL GYRO SIG
S 252 D B1 YAW ROLL
S 253 D B2 YAW ROLL
S 254 D B1 PITCH
S 255 D B2 PITCH
S 256 D SUSTAINER YAW
S 257 D SUSTAINER PITCH
S 258 D V1 PITCH ROLL
S 259 D V2 PITCH ROLL
S 260 D V1 YAW
S 261 D V2 YAW
S 52 R ROLL RATE GYRO SIG
S 53 R PITCH RATE GYRO SIG
S 54 R YAW RATE GYRO SIG
X 9142 D MISSILE PITCH
X 9143 D MISSILE YAW
X 9144 D MISSILE ROLL
X 9131 H MSL X VS Y

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D-57 OBJ TEST PLAN

X 9133 H AZIMUTH VS TIME

X 9174 L GE GUIDANCE P, Q & R

RADIO GUIDANCE GE

GD34 OBTAIN DATA FOR RADIO GUIDANCE SYSTEM PERFORMANCE ANALYSIS.

G 79 D PITCH PHASE

G 80 D YAW PHASE

G 26 V PITCH ANALOG

G 27 V YAW ANALOG

X 0000 X GE GND STA DATA

GD32 DEMONSTRATE THE CAPABILITY OF THE GENERAL ELECTRIC/BURROUGHS MOD II RADIO GUIDANCE SYSTEM TO PROVIDE STEERING AND DISCRETE COMMANDS TO THE ATLAS BOOSTER THROUGHOUT THE ASCENT GUIDANCE PORTION OF THE FLIGHT AS SPECIFIED BY THE GUIDANCE EQUATIONS.

G 79 D PITCH PHASE

G 80 D YAW PHASE

G 26 V PITCH ANALOG

G 27 V YAW ANALOG

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D-57 OBJ TEST PLAN

P 72 X BOOSTER CUTOFF RELAY

P 77 X VERNIER CUTOFF RELAY

P 347 X S COF RELAY LOCKIN

X 0000 X GE GND STA DATA

GD33 DETERMINE THE ADEQUACY OF THE
AIRBORNE ANTENNA RADIATION
CHARACTERISTICS.

X 0000 X GE GND STA DATA

*MISCELLANEOUS SYS

PNEUMATICS

FD69 OBTAIN DATA FOR PNEUMATICS
SYSTEM PERFORMANCE ANALYSIS.

F 1 P LO2 TANK HELIUM

F 3 P FUEL TANK HELIUM

F 125 P B CTL PNEU REG OUT

F 288 P ST PNEU REG OUT

HYDRAULIC SYSTEM

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D-57 OBJ TEST PLAN

HD59 OBTAIN DATA FOR HYDRAULIC
SYSTEM PERFORMANCE ANALYSIS.

H 33 P B1 HYD ACCUMULATOR

H 140 P S/VERN HYD PRESS

ELECTRICAL SYSTEM

ED25 OBTAIN DATA FOR ELECTRICAL
SYSTEM PERFORMANCE ANALYSIS.

E 50 Q 400 CYCLE AC PWRSUP

E 28 V MSL SYSTEMS DC INPUT

E 51 V 400 CYCLE AC PHASE A

TRACKING-COMMAND

DD23 OBTAIN DATA FROM ALL TRACKING
STATIONS FOR PERFORMANCE
ANALYSIS.

X 0000 X ALL TRACKING DATA

GENERAL MSL DATA

MD15 DEMONSTRATE COMPATIBILITY OF
BLOCKHOUSE AND LAUNCH CONTROL

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D-57 OBJ TEST PLAN

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EQUIPMENT.

X 0000 X NO SPECIFIC DATA

WD02

DETERMINE THE ABILITY OF THE
CV PROPELLANT LOADING SYSTEM
TO PROVIDE PROPELLANT LEVEL
INDICATION FOR ACCURATE LOAD-
ING CONTROL.

U 1091 V ERROR RATIO DEMOD DP

X 0000 X LOAD CELL DATA

LD17

DEMONSTRATE SATISFACTORY
PERFORMANCE OF THE LAUNCHER.

L 1127 P HOLDDOWN CYL B1 SIDE

L 1128 P HOLDDOWN CYL B2 SIDE

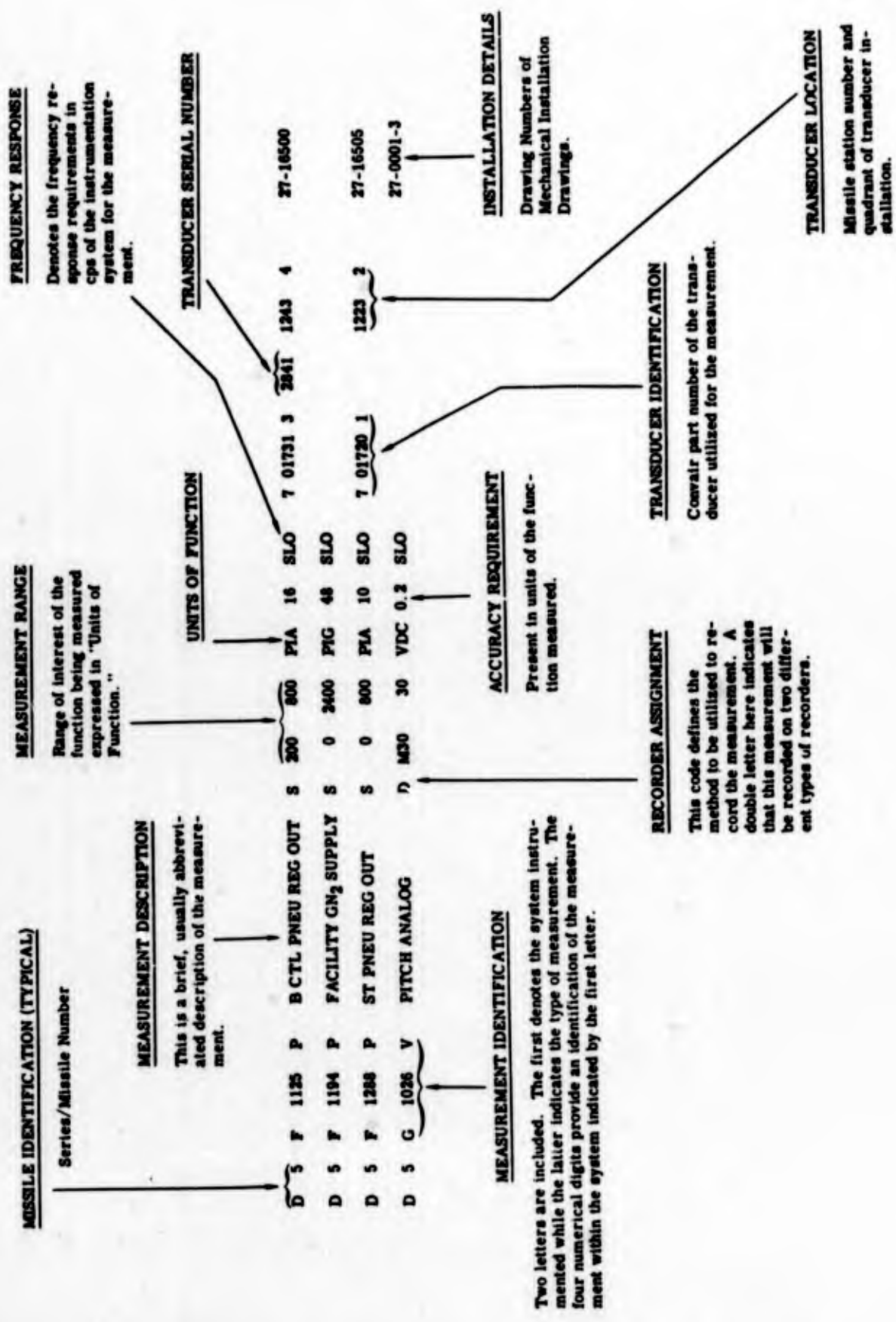
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SECTION 12

LANDLINE INSTRUMENTATION

The Landline Instrumentation presented in this section contains the latest available characteristics of the individual measurements. In addition the type of recordings indicated. The following is a brief explanation of the format of the Landline Instrumentation Log.



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MISSILE INSTRUMENTATION LOG SHEET ~~CONFIDENTIAL~~

MISSILE 570 L/L

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DATE 04 AUG 60

PAGE 1

1	2	3	4	5	6	7	8	9		10	11	12	13				14	15	16	17	DRAWING NUMBERS	
								MEASUREMENT RANGE	UNITS OF FUNCTION				ACCURACY	RATE OF CHANGE OF FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO						STATION NO
VEHICLE SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELEMETRY NO	SUB-CARRIER NO	COMMUNICATOR PIN NO	LOW	HIGH														
F			PNEUMATIC SYSTEM																			
F	3309	D	LO2 ULLAGE VENT VLV	R			OPN	CLS													P	
A	F 1001	P	LO2 TANK HELIUM	S			0	50	PIA	1	SLO	7 01723	11	3445		425					P	27-17585
A	F 1003	P	FUEL TANK HELIUM	S			0	100	PIA	1.5	SLO	7 01723	13	V3210		926					P	27-17585
A	F 3047	P	PCU FUEL SENSOR LINE	S			0	100	PIA	1.5	SLO	7 01723	13	3884							P	
A	F 3050	P	PCU LO2 SENSOR LINE	S			0	50	PIA	3	SLO	7 01723	11	3860							P	
A	F 1125	P	B CTL PNEU REG OUT	S			0	1000	PIA	16	SLO	7 01731	5	5182		1240					P	27-17586
A	F 1194	P	FACILITY GN2 SUPPLY	S			0	2500	PIA	48	SLO	7 01731	9	5423							P	
A	F 1246	P	B TK HE BTL HI	S			0	3500	PIA	105	SLO	7 01731	9	5677		1240					P	27-17587
A	F 1288	P	ST PNEU REG OUT	S			0	800	PIA	16	SLO	7 01720	1	3426		1202					P	27-17588
A	F 1291	P	S CTL HE BTL	S			0	3500	PIA	105	SLO	7 01720	5	1520R		1215					P	27-17588
	F 3301	P	GND LO2 ULLAGE TANK	S			20	30	PIG	.13	SLO										P	
	F 3302	P	GND FUEL ULLAGE TANK	S			55	65	PIG	.23	SLO										P	
A	F 3770	P	LN2 STORAGE TK PRESS	S			0	150	PIA	5	SLO	27 01243	9	14449							P	
A	F 1247	T	B TK HE BOTTLES	S			M400	M250	DGF	2	SLO	7 01633	5	5L		1100					P	27-17587
A	F 3894	T	HE LINE AT STUB UP	S			M320	M275	DGF	4	SLO	7 01649	9	R440							P	
A	F 3895	T	LN2 LINE AT STUB UP	S			M320	M275	DGF	4	SLO	7 01649	9	R431							P	
	H		HYDRAULIC SYSTEM																			
A	H 1033	P	B1 HYD ACCUMULATOR	S			0	3500	PIA	105	SLO	7 01720	5	2933		1206					P	27-17589
A	H 1140	P	SUST/VERN HYD PRESS	S			0	3500	PIA	105	SLO	7 01731	4	5385		1100					P	27-11592
	L		LAUNCHER																			
A	L 1127	P	HOLDDOWN CYL R1 SIDE	O			0	6500	PIA	180	100	7 01498	1	3							P	
A	L 1128	P	HOLDDOWN CYL R2 SIDE	O			0	6500	PIA	180	100	7 01498	3	4							P	
	M		MISCELLANEOUS																			
	M 1030	X	MSL TWO INCH MOTION	OR			ON	OFF	VDC		STP										P	

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MISSILE INSTRUMENTATION LOG SHEET

MISSILE 57D L/L REPORT NO. AZC-27-057-57 DATE 04 AUG 60 PAGE 2

1	2	3	4	5	6	7	8	9		10	11	12	13	14	15	16	17	DRAWING NUMBERS											
								MEASUREMENT RANGE	UNITS OF FUNCTION																				
VEHICLE	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELEMETRY NO.	SUB-CARRIER NO.	COMMUNICATOR PIN NO.	LOW	HIGH	ACCURACY	RATE OF CHANGE OR FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	QUADRANT	CARD CODE													
3	4	5	6	10	29	30	31-32	33-34	35	36	37	42	43	45	46	48	49	51	52-53	54-55-56-57-58	59-60-61	62	66	67	70	71	73		
N				FACILITIES & GSE																									
N	3984	D		LO2 TOPPING VLV POS		S		0	1.5	IN	SLO	87 93900 037	3																P
N	3300	P		FUEL STORAGE TK				0	200	PIA	10 SLO	27 01243 11 14458																	P
N	1345	P		FUEL STOR TK LIQ LEV		S		0	5	PID	15 SLO	7 01402 5 10710																	P
N	1346	P		LO2 STOR TK LIQ LEV				0	5	PID	15 SLO	7 01402 5 10711																	P
N	1347	P		FACIL H2O AT MANIF		S		0	250	PIA	10 40	27 01243 29 5644																	P
N	1352	P		HE REG INLET TO PCU		S		0	1500	PIA	50 SLO	7 01731 7 5552																	P
A	N	3360	P	LO2 STORAGE TK				0	200	PIA	10 SLO	27 01243 11 14455																	P
A	N	1361	P	GO2 STORAGE TK		S		0	1500	PIA	100 SLO	7 01731 9 5606																	P
	N	3349	T	ENG COMP HTR DISCH		S		0	200	DGF	5 SLO	7 01684 13 30009																	P
	P			PROPULSION SYSTEM																									
	P	1439	O	S NAA RCC ACCEL		O		0	200	G	5 10K																		P
	P	1452	O	B1 NAA RCC ACCEL		O		0	200	G	5 2K																		P
	P	1453	O	B2 NAA RCC ACCEL		O		0	200	G	5 2K																		P
A	P	1026	P	B LO2 REG REFERENCE		S		0	800	PIA	16 SLO	7 01732 3 5588	1240	4														P	27-17586
A	P	1344	P	S LO2 REG REFERENCE		S		0	1000	PIA	3 SLO	7 01732 5 5654	1200	4														P	27-11648
	P	3863	P	LO2 SUBCOOLER OUT		S		0	150	PIA	5 SLO	27 01243 9 14446																	P
	P	3864	P	LO2 TPG DSTR OF FLTR		S		0	150	PIA	5 10	27 01243 9 14443																	P
A	P	1017	T	B2 TURBINE INLET		S		0	1800	DGF	30 SLO	27 01247 3 7	1208	4														P	27-17501
A	P	1021	T	LO2 AT BREAKAWAY VLV		S		M325	M275	DGF	1 SLO	7 01649 9 R185	1169	4														P	27-16502
A	P	1326	T	S TURBINE INLET		S		0	1800	DGF	30 SLO	27 01247 3 2	1180	1														P	27-17523
A	P	1673	T	B1 FUEL IGN VLV AMB		S		0	300	DGF	15 SLO	T/ CWIRE	1220	1														P	27-16512
A	P	1674	T	B2 FUEL IGN VLV AMB		S		0	300	DGF	15 SLO	T/ CWIRE	1220	2														P	27-16512
A	P	1675	T	ENG CTL PNE J MAN AMB		S		0	300	DGF	15 SLO	T/ CWIRE	1220	3														P	27-16512
	P	3862	T	LO2 SUBCOOLER OUT		S		M320	M275	DGF	7 SLO	7 01649 9																P	

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1	2	3	4	5	6	7	8	9		10	11	12	13				14	15	16	17	
								TELEMETER NO	SUB-CARRIER NO				COMPUTATOR PIN NO	MEASUREMENT RANGE		UNITS OF FUNCTION					ACCURACY
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
P	1143	X		GAS GEN IGN LINK BK	R			OFF	ON	VDC		STP	PEN	4							P
P	1577	X		RELEASE SIGNAL	R			OFF	ON	VDC		STP	PEN	31							P
P	1644	X		ENG TKS PRESSURIZING	R			OFF	ON	VDC		STP	PEN	2							P
P	1645	X		ENG TANKS PRES D	R			OFF	ON	VDC		STP	PEN	3							P
P	1648	X		V IGNITER LKS INTACT	R			OFF	ON	VDC		STP	PEN	7							P
P	1649	X		M CHM IGN LKS INTACT	R			OFF	ON	VDC		STP	PEN	8							P
P	1689	X		ENG START FAILURE	R			OFF	ON	VDC		STP	PEN	42							P
P	1828	X		COMMIT STOP CUTOFF	R			OFF	ON	VDC		STP	PEN	51							P
P	1829	X		RELEASE FAILURE COF	R			OFF	ON	VDC		STP	PEN	52							P
S				AUTOPILOT SYSTEM																	
S	1048	V		PROGRAMMER PITCH SIG	D			0	2.7	VAC	.2	SLO									P
S	1049	V		PR GRAMMER ROLL SIG	D			0	60	VAC	3	STP									P
S	1069	V		RO L INT OUTPUT SIG	D			M4	4	VAC	.4	5									P
S	1072	V		PITCH INT OUTPUT SIG	D			M7	7	VAC	.7	5									P
S	1073	V		YAW INT OUTPUT SIG	D			M7	7	VAC	.7	5									P
S	1107	V		B1 PCH ACTR FEEDBACK	D			M12	12	VAC	5%	30									P
S	1108	V		B2 PCH ACTR FEEDBACK	D			M12	12	VAC	5%	30									P
S	1113	V		V1 YAW ACTR FEEDBACK	D			M5	7	VAC	5U	30									P
S	1114	V		V2 YAW ACTR FEEDBACK	D			M5	7	VAC	5%	30									P
S	1118	V		V2 ROL ACTR FEEDBACK	D			M11	11	VAC	5%	30									P
S	1119	V		V1 ROL ACTR FEEDBACK	D			M11	11	VAC	5%	30									P
S	1121	V		GYRO TEST SIG	D			M5	5	VAC	.1	STP									P
S	1122	V		SERVO TEST SIG	D			M11	11	VAC	5%	30									P
S	1123	V		INTEGRATOR TEST SIG	D			M11	11	VAC	.2	30									P
S	1128	V		B1 YAW ACTR FEEDBACK	D			M12	12	VAC	5%	30									P
S	1129	V		B2 YAW ACTR FEEDBACK	D			M12	12	VAC	5%	30									P
S	1147	V		PITCH GYRO AMP OUT	D			M10	10	VAC	1	30									P
S	1148	V		YAW GYRO AMP OUT	D			M10	10	VAC	1	30									P
S	1149	V		ROLL GYRO AMP OUT	D			M10	10	VAC	1	30									P
S	1216	V		S PCH ACTR FEEDBACK	D			M10	10	VAC	5U	30									P

FORM 12-3 (REV. 12-63)

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MISSILE INSTRUMENTATION LOG SHEET

MISSILE 57D L/L

REPORT NO. AZC-27-057-57

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1	2	3	4	5	6	7	8	9				10	11	12	13	14	15	16	17	DRAWING NUMBERS
								MEASUREMENT RANGE		UNITS OF FUNCTION	ACCURACY									
VEHICLE SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELEMETRY NO.	SUB-CARRIER NO.	COMPUTER PIN NO.	LOW	HIGH												
3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23
	S	1217	V	S	YAW ACTR FEEDBACK	D		M10	10	VAC	5%	30								P
	S	1235	X		PROGRAMMER RUN TIME	R		OFF	ON	VDC		STP								P
	U				PROPELLANT UTILIZ															
	U	1091	V		ERROR RATIO DEMOD OP	O		M20	20	VDC	.5	20								P

FORM 1000-2 (REV. 12-57)

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DATE 12 JUN 1967
NO. OF PAGES 20

CONVAIR (ASTRONAUTICS) DIVISION
GENERAL DYNAMICS CORPORATION

WS-117L

INSTRUMENTATION CONFIGURATION

SERIES D ARTICLE 70

PALS



PREPARED BY TEST PLANNING

COORDINATED BY W.S. Becker
W. S. Becker

APPROVED BY H.R. Macdonald
H. R. Macdonald
Test Planning

^{WR}
CHECKED BY T.M. Wooster
T. M. Wooster
Instrumentation

APPROVED BY P.J. Lynch
P. J. Lynch
Chief-Field Test
Engineering



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REPORT NO. AZC-27-057-70

PAGE NO. 1

12 October 1960

CONVAIR-ASTRONAUTICS

FOREWORD

This report has been published in accordance with contractual requirements as cited in Convair-Astronautics Report AZM-27-091. It describes the instrumentation released for Missile 70D as of 12 October 1960.

Information presented here will be used by Air Force, Associate Contractors, Design, Operation, and Field Test Groups. Measurement modification will either originate in the Instrumentation Planning Group or will be submitted as a recommendation to this group.

| (A)

THIS MATERIAL CONTAINS INFORMATION AFFECTING THE NATIONAL DEFENSE OF THE UNITED STATES WITHIN THE MEANING OF THE ESPIONAGE LAWS, TITLE 18, U.S.C., SECTIONS 793 AND 794, THE TRANSMISSION OR REVELATION OF WHICH IN ANY MANNER TO AN UNAUTHORIZED PERSON IS PROHIBITED BY LAW.

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| (A)

12 October 1960

REASONS FOR REVISION "A" CHANGES

This measurement has been added to correlate engine area temperature between missiles.

<u>MEAS. NO.</u>	<u>DESCRIPTION</u>	<u>CHANNEL</u>
<u>ADD</u>		
P 14 T	ENGINE COMP AMBIENT	1. 15. 17

- II. The commutated data from M9A is incomplete when compared with continuous data. Measurement U101A is needed to obtain higher quality data for more accurate information on changes of acceleration. This is a Vibratron, vibrating string accelerometer. It has been very reliable and the level of confidence is high based on D-R & D experience. Data from this measurement is used to determine specific impulse, amount of residuals time of and acceleration at booster staging, sustainer cutoff and retrorocket firing. From a dynamic standpoint this measurement will provide information on coupling between pressure oscillations in the Atlas tanks and the first longitudinal mode.

<u>ADD</u>		
U101A	AXIAL ACCELERATION	1. 12
<u>DELETE</u>		
M 9 A	AXIAL ACCELERATION	1. 15. 17

- III. Difficulties as experienced on 29 & 50D emphasize the need for adequate instrumentation in the adapter area and across the interface between stages. The following instrumentation was added to provide additional data to study any unusual event or condition that might occur.

<u>ADD</u>		
Y 147 P	ADAPTER AREA AMB P	1. 14. 1
Y 15 T	AGENA ENGINE COMP	1. 14. 26
Y 41 X	START D TIMER	1. 14. S

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DETAIL CHANGE SHEET REV A

MISSILE																																				
1	2	3	4	5	6	7	8	9		10	11	12	13				14	15	16	17																
								TELEMETRY NO.	SUB-CARRIER NO.				COMPUTATOR PIN NO.	MEASUREMENT RANGE	UNITS OF FUNCTION	ACCURACY					RATE OF CHANGE OR FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	QUADRANT	CARD CODE										
VEHICLE	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION				LOW	HIGH												DRAWING NUMBERS															
1	4	5	8	9	10	29	30	31	32	33	34	35	36	37	42	43	46	48	49	51	52	53	54	55	56	57	58	59	61	62	64	67	70	71	73	
ADDITIONS																																				
P	14	T		ENGINE COMP AMBIENT	1	15	17	0	400	DGF		SLO																								
U	101	A		AXIAL ACCELERATION	1	12		0	8	G		SLO																								
Y	147	P		ADAPTER AREA AMB P	1	14	1	0	10	P:A		60	7	01225																						
Y	15	T		AGENA ENGINE COMP	1	14	26	M200	200	DGF		SLO	7	01684																						
Y	41	X		START D TIMER	1	14	5	ON	OFF	VDC		BLP																								
DELETIONS																																				
M	9	A		AXIAL ACCELERATION	1	15	17																													

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1	2	3	4	5	6	7	8	9		10	11	12	13			14	15	16	17	DRAWING NUMBERS
								MEASUREMENT RANGE	UNITS OF FUNCTION				ACCURACY	DATE OF CHANGE OR FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER					
VEHICLE SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELEMETRY NO.	SUB-CARRIER NO.	COMMUNICATOR PIN NO.	LOW	HIGH												
3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
P			PROPULSION SYSTEM																	
P	528	D	S MAIN FUEL VALVE	1	14	3	0	90	DEG		SLO		NAA							P
P	529	D	S MAIN LO2 VALVE	1	14	27	0	90	DEG		SLO		NAA							P
P	100	P	BGG COMBUSTION CHM	1	14	5	0	700	PIA		SLO	7 01731	1	4840	1243	4			P	27-11581
P	6	P	S THRUST CHAMBER	1	14	6	0	1000	PIA		150	7 01731	5	4615	1222	1			P	27-11648
P	28	P	V1 THRUST CHAMBER	1	15	20	0	400	PIA			7 01737	3	1054	1228	4			P	27-11577
P	29	P	V2 THRUST CHAMBER	1	15	21	0	400	PIA			7 01737	3	1049	1228	2			P	27-11577
P	56	P	S LO2 PUMP INLET	1	15	27	0	150	PIA			7 01730	1	241	1222	1			P	27-11648
P	59	P	B2 THRUST CHAMBER	1	15	18	0	600	PIA			7 01731	1	5141	1221	3			P	27-11579
P	60	P	B1 THRUST CHAMBER	1	14	7	0	600	PIA		60	7 01731	1	5266	1221	4			P	27-11579
P	330	P	S FUEL PUMP DISCH	1	15	19	0	1500	PIA			7 01731	7	4816	1237	1			P	27-11648
P	339	P	S GAS GEN DISCH	1	15	3	0	1000	PIA			7 01731	3	4498	1222	1			P	27-11648
P	72	X	BOOSTER CUTOFF RELAY	1	15	9	OFF	ON											P	
P	77	X	VERNIER CUTOFF RELAY	1	14	13	OFF	ON											P	
P	347	X	S COP RELAY LOCKIN	1	14	8	OFF	ON											P	
S			AUTOPILOT SYSTEM																	
S	61	D	ROLL DISPL GYRO SIG	1	15	6	M3	3	DEG						122				P	
S	62	D	PITCH DISPL GYRO SIG	1	15	25	M3	3	DEG						122				P	
S	63	D	YAW DISPL GYRO SIG	1	15	26	M3	3	DEG						122				P	
S	252	D	B1 YAW ROLL	1	15	2	M5	5	DEG			7 01680	1	677	1212	Y			P	27-11580
S	253	D	B2 YAW ROLL	1	15	5	M5	5	DEG			7 01680	1	674	1212	Y			P	27-11580
S	254	D	B1 PITCH	1	15	1	M5	5	DEG			7 01680	1	444	1212	4			P	27-11580
S	255	D	B2 PITCH	1	15	4	M5	5	DEG			7 01680	1	678	1212	3			P	27-11580
S	256	D	SUSTAINER YAW	1	15	8	M3	3	DEG			6	7 01680	3	422	1210	Y		P	27-11576
S	257	D	SUSTAINER PITCH	1	15	7	M3	3	DEG			6	7 01680	3	421	1210	X		P	27-11576
S	258	D	V1 PITCH ROLL	1	15	10	M70	70	DEG			10	27 01205	1	145	1128	4		P	27-11577
S	259	D	V2 PITCH ROLL	1	15	12	M70	70	DEG			10	27 01205	1	102	1128	2		P	27-11577

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1	2	3	4	5	6	7	8	9		10	11	12	13				14	15	16	17	DRAWING NUMBERS	
								TELEMETRY NO.	SUB-CARRIER NO.				COMPUTATION PIN NO.	MEASUREMENT RANGE	UNITS OF FUNCTION	ACCURACY						RATE OF CHANGE OR FREQUENCY OF FUNCTION
VEHICLE	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION				LOW	HIGH													
		260	D	V1 YAW	1	12	11	0	20	DEG		10	7 01414	1	07660	1128	4	P			27-11577	
		261	D	V2 YAW	1	13	13	0	20	DEG		10	7 01414	1	07690	1128	2	P			27-11577	
		52	R	ROLL RATE GYRO SIG	1	9		M6	6	D/S		15			122						P	
		53	R	PITCH RATE GYRO SIG	1	10		M6	6	D/S		15			122						P	
		54	R	YAW RATE GYRO SIG	1	11		M6	6	L/S		15			122						P	
				PROPELLANT UTILIZ																		
		80	F	L02 TANK HEAD	1	19	22	0	5	PID		SLO	27 01297	1								P
		81	P	FUEL TANK HEAD	1	19	24	0	5	PID		SLO	27 01297	1								P
		91	V	ERROR RATIO DEMONSTR	1	14	19	M20	20	VDC		SLO			0001							P

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1	2	3	4	5	6	7	8	9		10	11	12	13	14	15	16	17	DRAWING NUMBERS
								MEASUREMENT RANGE	LOW									
VEHICLE	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELEMETRY NO.	SUB-CARRIER NO.	COMMUTATOR PIN NO.	LOW	HIGH	UNITS OF FUNCTION	ACCURACY	RATE OF CHANGE OF FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	QUADRANT	CARD CODE	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
				COMM. RATE CNT	1	0	0											
E	50	Q		400 CYCLE AC PWRSUP	1	1		350	450	CP		10						P
					1	2												
					1	3												
					1	4												
					1	5												
					1	6												
					1	7												
					1	8												
S	52	R		ROLL RATE GYRO SIG	1	9		48	8	D/S		15		122				P
S	53	R		PITCH RATE GYRO SIG	1	10		46	6	D/S		15		122				P
S	54	R		YAW RATE GYRO SIG	1	11		46	6	D/S		15		122				P

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1	2	3	4	5	6	7	8	9	10	11	12	13				14	15	16	17	DRAWING NUMBER								
												TYPE	OF	SERIAL NO	STATION NO													
VEHICLE	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELEMETRY NO	SUB-CARRIER NO	COMPUTATOR PIN NO	MEASUREMENT RANGE	UNITS OF FUNCTION	ACCURACY	RATE OF CHANGE OF FREQUENCY OF FUNCTION	TRANSUCER																
1	4	5	8	10	29	30	31-32	33-34	35	36	37	42	43	45	46	48	49	51	52-53	54-55	56-57	58-60	62	64	67	70	71	73
				COMM. RATE-12 RPS	1	15	2																					
		254	D	B1 PITCH	1	15	1	M5	3	DEG	10	7	01680	1	444	1212	4	P										27-11580
		252	D	B1 YAW ROLL	1	15	2	M5	3	DEG	10	7	01680	1	677	1212	Y	P										27-11580
		339	P	S GAS GEN DISCH	1	15	3	0	1000	PIA		7	01731	3	4498	1222	1	P										27-11648
		255	D	B2 PITCH	1	15	4	M5	3	DEG	10	7	01680	1	678	1212	3	P										27-11580
		253	D	B2 YAW ROLL	1	15	5	M5	3	DEG	10	7	01680	1	674	1212	Y	P										27-11580
		61	D	ROLL DISPL GYRO SIG	1	15	6	M3	3	DEG	15				122													
		257	D	SUSTAINER PITCH	1	15	7	M3	3	DEG	6	7	01680	3	421	1210	X	P										27-11576
		256	D	SUSTAINER YAW	1	15	8	M3	3	DEG	6	7	01680	3	422	1210	Y	P										27-11576
		72	X	BOOSTER CUTOFF RELAY	1	15	9	OFF	ON																			
		258	D	V1 PITCH ROLL	1	15	10	M70	70	DEG	10	27	01205	1	145	1128	4	P										27-11577
		260	D	V1 YAW	1	15	11	0	90	DEG	10	7	01414	1	07660	1128	4	P										27-11577
		259	D	V2 PITCH ROLL	1	15	12	M70	70	DEG	10	27	01205	1	102	1128	2	P										27-11577
		261	D	V2 YAW	1	15	13	0	90	DEG	10	7	01414	1	07690	1128	2	P										27-11577
				XDCR PWR SUP 4 VDC	1	15	14																					
				INSTR GROUND	1	15	15																					
		23	V	MSL SYSTEMS INPUT	1	15	16	0	30	VDC	SLO				0001													
		9	A	AXIAL ACCELERATION	1	15	17	0	10	C	2	27	01298	1	8													
		59	P	B2 THRUST CHAMBER	1	15	18	0	600	PIA		7	01731	1	5141	1221	3	P										27-11579
		330	P	S FUEL PUMP DISCH	1	15	19	0	1500	PIA		7	01731	7	4816	1237	1	P										27-11648
		28	F	V1 THRUST CHAMBER	1	15	20	0	400	PIA		7	01737	3	1024	1228	4	P										27-11577
		29	F	V2 THRUST CHAMBER	1	15	21	0	400	PIA		7	01737	3	1049	1228	2	P										27-11577
		80	P	LO2 TANK HEAD	1	15	22	0	5	PIU	SLO	27	01297	1														
		31	P	FUEL TANK HEAD	1	15	23	0	5	PIU	SLO	27	01297	1														
		72	X	CONNECTED TO 1 15 9	1	15	24																					
		52	D	PITCH DISPL GYRO SIG	1	15	25	M3	3	DEG	15				122													
		63	D	YAW DISPL GYRO SIG	1	15	26	M3	3	DEG	15				122													
		56	F	S LO2 PUMP INLET	1	15	27	0	100	PIA		7	01730	1	241	1222	1	P										27-11648
				INTERNAL CALIB 5 VDC	1	15	28																					
				SYNC & CALIBRATION	1	15	29																					
				CONNECTED TO 1 15 29	1	15	30																					

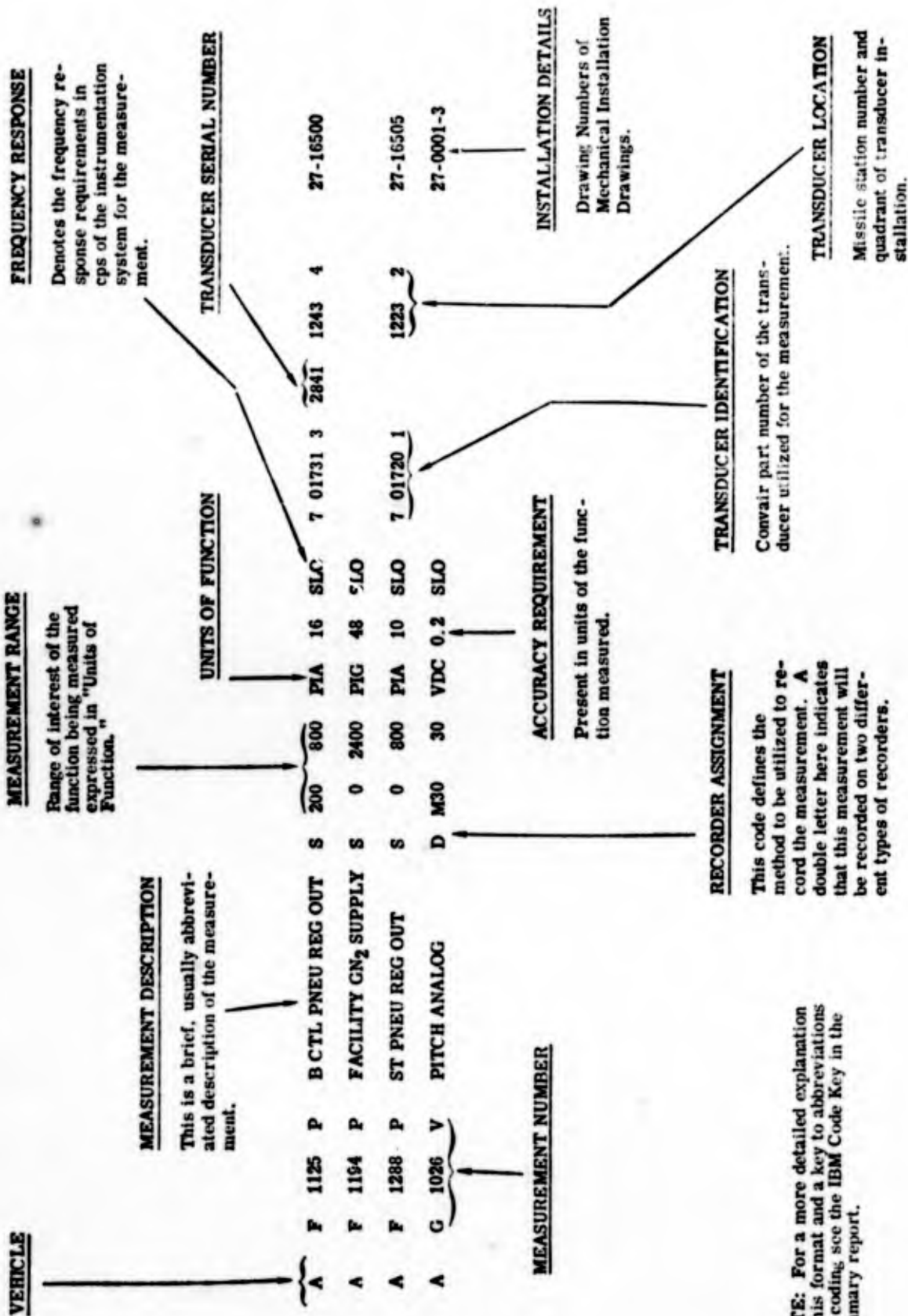
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SECTION 10

LANDLINE INSTRUMENTATION

The Landline Instrumentation presented in this section contains the latest available characteristics of the individual measurements. In addition the type of recordings indicated.



NOTE: For a more detailed explanation of this format and a key to abbreviations and coding see the IBM Code Key in the Summary report.

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1	2	3	4	5	6	7	8	9		10	11	12	13					14	15	16	17	DRAWING NUMBERS	
								RECORDER	TRACK				CHANNEL	MEASUREMENT RANGE	UNITS OF FUNCTION	ACCURACY	RATE OF CHANGE OR FREQUENCY OF FUNCTION						TYPE OF TRANSDUCER
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24
F PNEUMATIC SYSTEM																							
F	3309	D		LO2 ULLAGE VENT VLV		R		OPN	CLS														P
F	1001	P		LO2 TANK HELIUM		S		0	50	PIG	1	SLO	7	01723	11	3445							P
F	1003	P		FUEL TANK HELIUM		S		0	75	PIG	1.5	SLO	7	01723	13	V3210							P
F	3047	P		PCU FUEL SENSOR LINE		S		0	50	PIG	1.5	SLO											P
F	3050	P		PCU LO2 SENSOR LINE		S		0	100	PIG	3	SLO											P
F	1125	P		B CTL PNEU REG OUT		S		0	800	PIG	16	SLO	7	01731	5	5182							P
F	1194	P		FACILITY GN2 SUPPLY		S		0	2400	PIG	48	SLO											P
F	1246	P		B TK HE BTL HI		S		0	3500	PIG	105	SLO	7	01731	9	5677							P
F	1288	P		ST PNEU REG OUT		S		0	800	PIG	16	SLO	7	01720	1	3526							P
F	1291	P		S CTL HE BTL		S		0	3500	PIG	105	SLO	7	01720	5	1520R							P
F	3301	P		GND LO2 ULLAGE TANK		S		20	30	PIG	.13	SLO											P
F	3302	P		GND FUEL ULLAGE TANK		S		55	65	PIG	.23	SLO											P
F	3770	P		LN2 STORAGE TK PRESS		S		0	100	PIG	5	SLO											P
F 1247 T B TK HE BOTTLES S M330 M250 DGF 2 SLO 7 01633 5 5L P																							
F 3894 T HE LINE AT STUB UP S M320 M270 DGF 4 SLO P																							
F 3895 T LN2 LINE AT STUB UP S M320 M270 DGF 4 SLO P																							
H HYDRAULIC SYSTEM																							
H	1033	P		B1 HYD ACCUMULATOR		S		0	3500	PIG	105	SLO	7	01720	5	2999							P
H	1140	P		SUST/VERN HYD PRESS		S		0	3500	PIG	105	SLO	7	01731	9	5385							P
L LAUNCHER																							
L	1127	P		HOLDDOWN CYL B1 SIDE		O		0	6000	PIG	180	100	7	01498	1								P
L	1128	P		HOLDDOWN CYL B2 SIDE		O		0	6000	PIG	180	100	7	01498	1								P
M MISCELLANEOUS																							
M	1030	X		MSL TWO INCH MOTION		OR		ON	OFF	VDC		STP											P

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1	2	3	4	5	6	7	8	9		10	11	12	13				14	15		16	17	DRAWING NUMBERS
								MEASUREMENT RANGE	UNITS OF FUNCTION				ACCURACY	RATE OF CHANGE OR FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO		STATION NO	QUADRANT			
VEHICLE SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	RECORDER	TRACK	CHANNEL	LOW	HIGH														
N			FACILITIES & GSE																			
N	3984	D	LO2 TOPPING VLV POS		S		0	1.5	IN			SLO									P	
N	3300	P	FUEL STORAGE TK				0	200	PIG		10	SLO									P	
N	1361	P	GO2 STORAGE TK		S		0	3000	PIG		100	SLO									P	
N	1345	P	FUEL STOR TK LIQ LEV		S		0	5	PID		.15	SLO									P	
N	1346	P	LO2 STOR TK LIQ LEV				0	5	PID		.15	SLO									P	
N	1347	P	FACIL H2O AT MANIF		S		0	250	PIG		10	40									P	
N	1352	P	HE REG INLET TO PCU		S		0	1500	PIG		50	SLO									P	
N	3360	P	LO2 STORAGE TK				0	200	PIG		10	SLO									P	
N	3349	T	ENG COMP HTR DISCH		S		0	200	DGF		5	SLO									P	
P			PROPULSION SYSTEM																			
P	1439	O	S NAA RCC ACCEL		O		0	200	G		5	10K									P	
P	1452	O	B1 NAA RCC ACCEL		O		0	200	G		5	2K									P	
P	1453	O	B2 NAA RCC ACCEL		O		0	200	G		5	2K									P	
P	1026	P	B LO2 REG REFERENCE		S		0	600	PIG		16	SLO	7	01732	3	5588	1243	4			P	
P	1344	P	S LO2 REG REFERENCE		S		0	1000	PIG		3	SLO	7	01732	5	5654	1240	1			P	
P	3863	P	LO2 SUBCOOLER OUT		S		0	125	PIG		5	SLO									P	
P	3864	P	LO2 TPG DSTR OF FLTR		S		0	125	PIG		5	10									P	
P	1017	T	B2 TURBINE INLET		S		0	1500	DGF		30	SLO	27	01244	3	7	1202	3			P	
P	1021	T	LO2 AT BREAKAWAY VLV		S		M325	M275	DGF		1	SLO	7	01649	7	R185	1170	4			P	
P	1326	T	S TURBINE INLET		S		0	1500	DGF		30	SLO		T/C		2	1234	3			P	
P	1673	T	B1 FUEL IGN VLV AMB		S		0	300	DGF		15	SLO									P	
P	1674	T	B2 FUEL IGN VLV AMB		S		0	300	DGF		15	SLO									P	
P	1675	T	ENG CTL PNEU MAN AMB		S		0	300	DGF		15	SLO									P	
P	3862	T	LO2 SUBCOOLER OUT		S		M320	M270	DGF		.7	SLO									P	

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CONVAIR-ASTRONAUTICS

SECTION 10

13 JUNE 1960

MISSILE INSTRUMENTATION LOG SHEET

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1	2	3	4	5	6	7	8	9		10	11	12	13				14	15		16	17	DRAWING NUMBERS
								RECORD	TRACK				MEASUREMENT RANGE	UNITS OF FUNCTION	ACCURACY	TYPE OF TRANSDUCER		SERIAL NO	STATION NO			
VEHICLE SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	RECORD	TRACK	CHANNEL	LOW	HIGH	UNITS OF FUNCTION	ACCURACY	RATE OF CHANGE OF FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO	STATION NO	QUADRANT	CARD CODE	DRAWING NUMBERS					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	
P	1143	X	GAS GEN IGN LINK BK	R			OFF	ON	VDC		STP	PEN	4								P	
P	1577	X	RELEASE SIGNAL	R			OFF	ON	VDC		STP	PEN	31								P	
P	1644	X	ENG TKS PRESSURIZING	R			OFF	ON	VDC		STP	PEN	2								P	
P	1645	X	ENG TANKS PRES	R			OFF	ON	VDC		STP	PEN	3								P	
P	1648	X	V IGNITER LKS INTACT	R			OFF	ON	VDC		STP	PEN	7								P	
P	1649	X	M CHM IGN LKS INTACT	R			OFF	ON	VDC		STP	PEN	8								P	
P	1689	X	ENG START FAILURE	R			OFF	ON	VDC		STP	PEN	42								P	
P	1828	X	COMMIT STOP CUTOFF	R			OFF	ON	VDC		STP	PEN	51								P	
P	1829	X	RELEASE FAILURE COF	R			OFF	ON	VDC		STP	PEN	52								P	
S			AUTOPILOT SYSTEM																			
S	1048	V	PROGRAMMER PITCH SIG	D			0	2.7	VAC	.2	SLO										P	
S	1049	V	PRPGRAMMER ROLL SIG	D			0	60	VAC	3	STP										P	
S	1069	V	ROLL INT OUTPUT SIG	D			M4	4	VAC	.4	5										P	
S	1072	V	PITCH INT OUTPUT SIG	D			M7	7	VAC	.7	5										P	
S	1073	V	YAO INT OUTPUT SIG	D			M7	7	VAC	.7	5										P	
S	1107	V	B1 PCH ACTR FEEDBACK	D			M12	12	VAC	5%	30										P	
S	1108	V	B2 PCH ACTR FEEDBACK	D			M12	12	VAC	5%	30										P	
S	1113	V	V1 YAW ACTR FEEDBACK	D			M5	7	VAC	5%	30										P	
S	1114	V	V2 YAW ACTR FEEDBACK	D			M5	7	VAC	5%	30										P	
S	1118	V	V2 ROL ACTR FEEDBACK	D			M11	11	VAC	5%	30										P	
S	1119	V	V1 RUL ACTR FEEDBACK	D			M11	11	VAC	5%	30										P	
S	1121	V	GYRO TEST SIG	D			M5	5	VAC	.1	STP										P	
S	1122	V	SERVO TEST SIG	D			M11	11	VAC	5%	30										P	
S	1123	V	INTEGRATOR TEST SIG	D			M11	11	VAC	.2	30										P	
S	1128	V	B1 YAW ACTR FEEDBACK	D			M12	12	VAC	5%	30										P	
S	1129	V	B2 YAW ACTR FEEDBACK	D			M12	12	VAC	5%	30										P	
S	1147	V	PITCH GYRO AMP OUT	D			M10	10	VAC	1	30										P	
S	1148	V	YAW GYRO AMP OUT	D			M10	10	VAC	1	30										P	
S	1149	V	ROLL GYRO AMP OUT	D			M10	10	VAC	1	30										P	
S	1216	V	S PCH ACTR FEEDBACK	D			M10	10	VAC	50	30										P	

107 7001.2 (REV. 12 59)

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CONVAIR-ASTRONAUTICS

MISSILE INSTRUMENTATION LOG SHEET

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1	2	3	4	5	6	7	8	9		10	11	12	13	14	15	16	17	DRAWING NUMBERS
								MEASUREMENT RANGE	UNIT OF FUNCTION									
VEHICLE	SYSTEM	MANUFACTURER	MODEL	DESCRIPTION	TRACK	CHANNEL	LOW	HIGH	UNITS	ACCURACY	RATE OF CHANGE OR FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO	STATION NO	QUADRANT	CARD CODE		
S	1217	V	S	YAW ACIR FEEDBACK	0		M10	10	VAC	5%	30						P	
S	1239	A		PROGRAMMER / TIME	R		OFF	ON	VDC		STP						P	
U				PROPELLANT UTILIZ														
U	1091	V		ERROR RATIO DEMOD OP	0		M20	20	VDC	0.5	20						P	

19 5000 2 (REV. 10 59)

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DATE 28 September 1960
NO. OF PAGES 20

CONVAIR (ASTRONAUTICS) DIVISION
GENERAL DYNAMICS CORPORATION

SAMOS

INSTRUMENTATION CONFIGURATION

SERIES D ARTICLE 75

PMR



PREPARED BY TEST PLANNING

CO-ORDINATED BY

W. S. Becker
W. S. Becker

APPROVED BY

H. R. Macdonald
H. R. Macdonald
Test Planning

CHECKED BY

T. M. Wooster
T. M. Wooster
Instrumentation

APPROVED BY

P. J. Lynch
P. J. Lynch
Chief-Field Test Engineering



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CONVAIR-ASTRONAUTICS

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PAGE NO. 1

26 September 1960

FOREWORD

This report has been published in accordance with contractual requirements as cited in Convair-Astronautics Report AZM-27-091. It describes the instrumentation released for Missile 75-D as of 26 September 1960.

Information presented here will be used by Air Force, Associate Contractors, Design, Operation, and Field Test Groups. Measurement modification will either originate in the Instrumentation Planning Group or will be submitted as a recommendation to this group.

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26 September 1980

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26 September 1960

SUMMARY

The instrumentation configuration for this missile has been established through a study of program test objectives, systems analysis, and operating considerations. A discussion of missile instrumentation and associated characteristics has been summarized in Report AZC-27-057. For a detailed description of the various missile systems, test objectives, and general test program see Report AE60-0272.

The specific measurements to be transmitted via telemeter have been tabulated and are listed in Sections 8 and 9 in terms of instrumentation systems and telemeter channel assignments.

In addition to the telemetry, the landline instrumentation program for this missile has been included in this report in the form of a master tabulation of landline measurement characteristics, (Section 10).

To clarify specific measurements, instrumentation location schematics have been included in Report AZC-27-057, Section 7.

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SECTION 8
MISSILE INSTRUMENTATION BY SYSTEM

The Missile Instrumentation Log presented in this section contains the latest available characteristics of the individual measurements. In addition, the telemetering channel assignments are included. Note that this section is listed by system.

VEHICLE	MEASUREMENT NUMBER	TELEMETRY CHANNEL ASSIGNMENT	MEASUREMENT DESCRIPTION	MEASUREMENT RANGE	UNITS OF FUNCTION	INSTALLATION DETAILS
A F 1 P	1	11 35	LO ₂ TANK HELIUM	0 45	P/A SLO	480 2 P 27-11608
A F 3 P	1	11 9	FUEL TANK HELIUM	0 100	P/A SLO	925 Y P 27-11609
A F 125 P	1	11 7	B CTL PNEU REG OUT	0 1000	P/A SLO	1243 4 P 27-16500
A F 260 P	1	11 17	B TANK HE BOTTLES LO	15 415	P/A SLO	1238 1 P 27-11600
A F 261 P	1	11 21	S TANK HE BOTTLE LO	15 415	P/A SLO	1223 2 P 27-16505

MEASUREMENT RANGE
Range of interest of the function being measured expressed in "Units of Function."

UNITS OF FUNCTION

INSTALLATION DETAILS
Drawing Numbers of Mechanical Installation Drawings.

MEASUREMENT DESCRIPTION
This is a brief, usually abbreviated, description of the measurement.

MEASUREMENT NUMBER

TELEMETRY CHANNEL ASSIGNMENT
Indicates the telemeter, subcarrier and pin number assignment for the applicable measurement.

FREQUENCY RESPONSE
Denotes the frequency response requirements of the instrumentation system for the measurement.

TRANSUCER IDENTIFICATION
Convair part number of the transducer utilized for the measurement.

TRANSUCER LOCATION
Missile station number and quadrant of transducer in-stallation.

NOTE: For a more detailed explanation of this format and a key to abbreviations and coding see the IBM Code Key in the Summary report.

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26 SEPTEMBER 1960

MISSILE INSTRUMENTATION LOG SHEET

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1	2	3	4	5	6	7	8	9		10	11	12	13	14	15	16	17	DRAWING NUMBERS
								MEASUREMENT RANGE	UNITS OF FUNCTION									
VEHICLE	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELEMETRY NO.	SUB-CARRIER NO.	COMMUNICATOR PIN NO.	LOW	HIGH		ACCURACY	RATE OF CHANGE OR FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	QUADRANT	CABLE CODE	
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19
	D			RANGE SAFETY SYSTEM														
	D	110	X	MSL DESTRUCT SIGNAL	1	14	4	0	28	VDC	STP							
	E			ELECTRICAL POWER SYS														
	E	50	Q	400 CYCLE AC PWR SUP	1	1		350	450	CPS	SLO							
	E	28	V	MSL SYSTEMS INPUT	1	15	16	0	30	VDC	SLO							
	E	51	V	400 CYCLE AC PHASE A	1	14	2	105	125	VAC	SLO							
	F			PNEUMATIC SYSTEM														
	F	1	P	LO2 TANK HELIUM	1	14	24	0	45	PIA	SLO	7 01723	11	3161	925	Y	P	27-17805
	F	3	P	FUEL TANK HELIUM	1	14	25	0	100	PIA	SLO	7 01723	13	3223	926	Y	P	27-17805
	F	125	P	B CTL PNEU REG OUT	1	14	17	0	1000	PIA	SLO	7 01731	5		1243	A	P	27-17806
	F	288	P	ST PNEU REG OUT	1	14	18	0	800	PIA	SLO	7 01731	3	4394	1202	Z	P	27-11641
	G			RADIO GUIDANCE SYS														
	G	79	D	PITCH PHASE	1	14	11	M1.7	0	VDC								
	G	80	D	YAW PHASE	1	14	12	M1.7	0	VDC								
	G	26	V	PITCH ANALOG	1	14	9	0	2.3	VDC								
	G	27	V	YAW ANALOG	1	14	10	0	2.3	VDC								
	H			HYDRAULIC SYSTEM														
	H	33	P	B1 HYD ACCUMULATOR	1	14	20	0	3500	PIA	45	7 01731	9	3727	1201	1	P	27-17809
	H	140	P	S/VERN HYD PRESS	1	14	21	0	3500	PIA	45	7 01731	9	3440	1101	1	P	27-11892
	M			PROPULSION SYSTEM														

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1	2	3	4	5	6	7	8	9		10	11	12	13				14	15	16	17	DRAWING NUMBERS			
								MEASUREMENT RANGE	UNITS OF FUNCTION				TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	QUADRANT						CARD CODE		
VEHICLE	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELEMETRY NO.	SUB-CARRIER NO.	COMMUNICATOR PIN NO.	LOW	HIGH		ACCURACY	RATE OF CHANGE OR FREQUENCY OF FUNCTION	1253	5455	5457	5458	5459	62	66	67	70	71	73	
P	528	D	S	MAIN FUEL VALVE	1	14	3	0	90	DEG	SLO		NAA										P	
P	529	D	S	MAIN LO2 VALVE	1	14	27	0	90	DEG	SLO		NAA										P	
P	6	P	S	THRUST CHAMBER	1	14	6	0	1000	PIA	150	7	01731	5	4382	1222	1						P	27-11648
P	28	P	V1	THRUST CHAMBER	1	15	20	0	400	PIA		7	01737	3	1217	1228	4						P	27-11577
P	29	P	V2	THRUST CHAMBER	1	15	21	0	400	PIA		7	01737	3	1370	1228	2						P	27-11577
P	96	P	S	LO2 PUMP INLET	1	15	27	0	150	PIA		7	01730	1	400	1222	1						P	27-11648
P	59	P	B2	THRUST CHAMBER	1	15	18	0	600	PIA		7	01731	1	6410	1221	3						P	27-11579
P	60	P	B1	THRUST CHAMBER	1	14	7	0	600	PIA	60	7	01731	1	6280	1221	4						P	27-11579
P	100	P	BGG	COMBUSTION CHM	1	14	5	0	700	PIA	SLO	7	01731	1		1243	4						P	27-17586
P	330	P	S	FUEL PUMP DISCH	1	15	19	0	1500	PIA		7	01731	7	5604	1237	1						P	27-11648
P	339	P	S	GAS GEN DISCH	1	15	3	0	1000	PIA		7	01731	3	5585	1222	1						P	27-11648
P	14	T		ENGINE COMP AMBIENT	1	15	17	0	400	DGF	SLO												P	
P	72	X		BOOSTER CUTOFF RELAY	1	15	9	OFF	ON			STP											P	
P	77	X		VERNIER CUTOFF RELAY	1	14	13	OFF	ON			STP											P	
P	347	X		S COF RELAY LOCKIN	1	14	8	OFF	ON			STP											P	
S				AUTOPILOT SYSTEM																				
S	61	D		ROLL DISPL GYRO SIG	1	15	6	M3	3	DEG	15												P	
S	62	D		PITCH DISPL GYRO SIG	1	15	25	M3	3	DEG	15												P	
S	63	D		YAW DISPL GYRO SIG	1	15	26	M3	3	DEG	15												P	
S	292	D	B1	YAW ROLL	1	15	2	M5	5	DEG	10	7	01680	1	451	1212	Y						P	27-11580
S	293	D	B2	YAW ROLL	1	15	5	M5	5	DEG	10	7	01680	1	520	1212	Y						P	27-11580
S	294	D	B1	PITCH	1	15	1	M5	5	DEG	10	7	01680	1	526	1212	A						P	27-11580
S	295	D	B2	PITCH	1	15	4	M5	5	DEG	10	7	01680	1	527	1212	3						P	27-11580
S	296	D		SUSTAINER YAW	1	15	8	M3	3	DEG	6	7	01680	3	548	1210	Y						P	27-11576
S	297	D		SUSTAINER PITCH	1	15	7	M3	3	DEG	6	7	01680	3	489	1210	X						P	27-11576
S	298	D	V1	PITCH ROLL	1	15	10	M70	70	DEG	10	27	01205	1	264H	1128	A						P	27-11577
S	299	D	V2	PITCH ROLL	1	15	12	M70	70	DEG	10	27	01205	1	210	1128	2						P	27-11577
S	260	D	V1	YAW	1	15	11	M25	35	DEG	10	7	01414	1	07661	1128	A						P	27-11577

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MISSILE INSTRUMENTATION LOG SHEET

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1	2	3	4	5	6	7	8	9		10	11	12	13					14	15	16	17	DRAWING NUMBERS		
								TELEMETRY NO.	SUB-CARRIER NO.				COMMUTATOR PIN NO.	MEASUREMENT RANGE	UNITS OF FUNCTION	ACCURACY	RATE OF CHANGE OF FREQUENCY OF FUNCTION						TYPE OF TRANSDUCER	SERIAL NO.
VEHICLE	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION				LOW	HIGH															
S	261	D	V2	YAW	1	15	13	M25	35	DEG	10	7	01414	1	07663	1128	2							27-11577
S	52	R		ROLL RATE GYRO SIG	1	9		M8	8	D/S	15													
S	53	R		PITCH RATE GYRO SIG	1	10		M6	6	D/S	15													
S	54	R		YAW RATE GYRO SIG	1	11		M6	6	D/S	15													
U				PROPELLANT UTILIZ																				
U	101	A		AXIAL ACCELERATION	1	12		0	8	G	SLO													
U	80	P		LO2 TANK HEAD	1	15	22	0	5	PID	SLO	27	01297	3	14807	1036	A							27-11709
U	81	P		FUEL TANK HEAD	1	15	23	0	5	PID	SLO	27	01297	3	14816	1036	A							27-11709
U	91	V		ERROR RATIO DEMOD OP	1	14	19	M20	20	VDC	SLO													
Y				2ND STAGE INTS 2/04																				
Y	147	P		ADAPTER AREA AMB P	1	14	1	0	10	PIA	SLO													
Y	15	T		AGENA ENGINE COMP	1	14	26	M200	200	DGF	SLO													
Y	41	X		START D TIMER	1	14	5	ON	OFF	VDC	BLP													

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SECTION 9

MISSILE INSTRUMENTATION BY CHANNEL

The Missile Instrumentation Log presented in this section contains the latest available characteristics of the individual measurements. In addition, the telemetering channel assignments are included. Note that this section is listed by channel.

<u>VEHICLE</u>	<u>MEASUREMENT DESCRIPTION</u> This is a brief, usually abbreviated, description of the measurement.	<u>MEASUREMENT RANGE</u> Range of interest of the function being measured expressed in "Units of Function."	<u>INSTALLATION DETAILS</u> Drawing Numbers of Mechanical Installation Drawings.
A P 29	V2 THRUST CHAMBER	0 400	1128 2 P
A F 125	B CTL PNEU REG OUT	0 1000	1243 4 P
A F 3	FUEL TANK HELIUM	0 100	925 Y P
A P 671	TH SECT AMB QUAD 4	100 700	1230 4 P

<u>UNITS OF FUNCTION</u>	<u>FREQUENCY RESPONSE</u> Denotes the frequency response requirements of the instrumentation system for the measurement.	<u>TRANSDUCER LOCATION</u> Missile station number and quadrant of transducer installation.
P I A	S L O	7 01737 1
P I A	S L O	7 01731 3
P I A	S L O	7 01723 13
D G F	S L O	7 01684 9

<u>TELEMETRY CHANNEL ASSIGNMENT</u> Indicates the telemeter, subcarrier and pin number for the applicable measurement.	<u>TRANSDUCER IDENTIFICATION</u> Convairstation part number of the transducer utilized for the measurement.
1 11 5	27-11614
1 11 7	27-16500
1 11 9	27-11609
1 11 11	27-11599

NOTE: For a more detailed explanation of this format and a key to abbreviations and coding see the IBM Code Key in the Summary report.

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26 SEPTEMBER 1960

MISSILE INSTRUMENTATION LOG SHEET

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1	2	3	4	5	6	7	8	9		10	11	12	13				14	15	16	17	DRAWING NUMBERS
								MEASUREMENT RANGE	UNITS OF FUNCTION				TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	QUADRANT					
VEHICLE	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELEMETRY NO.	SUB-CARRIER NO.	COMPUTATOR PIN NO.	LOW	HIGH	ACCURACY	RATE OF CHANGE OR FREQUENCY OF FUNCTION										
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	
				COMM. RATE CONT	1	0	0														
E	50	0		ADD CYCLE AC PWR SUP	1	1		350	450		CPS	SLO									
S	52	R		ROLL RATE GYRO SIG	1	9		M8	8		D/S	15									
S	53	R		PITCH RATE GYRO SIG	1	10		M6	6		D/S	15									
S	54	R		YAW RATE GYRO SIG	1	11		M6	6		D/S	15									
U	101	A		AXIAL ACCELERATION	1	12		0	8		G	SLO									

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1	2	3	4	5	6	7	8	9		10	11	12	13			14	15	16	17	DRAWING NUMBERS
								MEASUREMENT RANGE	UNITS OF FUNCTION				ACCURACY	TYPE OF TRANSDUCER	SERIAL NO.					
WHOLE	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	ELEMENT NO.	SUB-CARRIER NO.	COMMUNICATOR 774 NO.	LOW	HIGH											
				CONN. RATE-5 RPS	1	14	0													
Y	147	P		ADAPTER AREA AMB P	1	14	1	0	10	PIA	SLO									
E	91	V		400 CYCLE AC PHASE A	1	14	2	105	125	VAC	SLO									
Y	41	X		START D TIMER	1	14	5	ON	OFF	VDC	BLP									
P	528	D		S MAIN FUEL VALVE	1	14	3	0	90	DEG	SLO	NAA								
D	110	X		MSL DESTRUCT SIGNAL	1	14	4	0	28	VDC	STP									
P	100	P		BGG COMBUSTION CHM	1	14	5	0	700	PIA	SLO	7 01731	1		1243	A				27-17586
P	6	P		S THRUST CHAMBER	1	14	6	0	1000	PIA	SLO	7 01731	5	A382	1222	1				27-11648
P	60	P		B1 THRUST CHAMBER	1	14	7	0	800	PIA	SLO	7 01731	1	A280	1221	A				27-11579
P	347	X		S COF RELAY LOCKIN	1	14	8	OFF	ON		STP									
G	26	V		PITCH ANALOG	1	14	9	0	2.3	VDC										
G	27	V		YAW ANALOG	1	14	10	0	2.3	VDC										
G	79	D		PITCH PHASE	1	14	11	M1.7	0	VDC										
G	80	D		YAW PHASE	1	14	12	M1.7	0	VDC										
P	77	X		VERNIER CUTOFF RELAY	1	14	13	OFF	ON		STP									
				XDCR PWR SUP & VDC	1	14	14													
				INSTR GROUND	1	14	15													
S	52	R		CONNECTED TO 1.9	1	14	16													
F	125	P		B CTL PNEU REG OUT	1	14	17	0	1000	PIA	SLO	7 01731	5		1243	A				27-17586
F	288	P		ST PNEU REG OUT	1	14	18	0	800	PIA	SLO	7 01731	3	A384	1202	2				27-11641
U	91	V		ERROR RATIO DEMOD OP	1	14	19	M20	20	VDC	SLO									
H	33	P		B1 HYD ACCUMULATOR	1	14	20	0	3500	PIA	AS	7 01731	9	5727	1201	1				27-17589
H	140	P		S/VERM HYD PRESS	1	14	21	0	3500	PIA	AS	7 01731	9	5440	1191	1				27-11592
S	53	R		CONNECTED TO 1.10	1	14	22													
S	54	R		CONNECTED TO 1.11	1	14	23													
F	1	P		LO2 TANK HELIUM	1	14	24	0	45	PIA	SLO	7 01723	11	3161	925	Y				27-17585
F	3	P		FUEL TANK HELIUM	1	14	25	0	100	PIA	SLO	7 01723	13	3223	926	Y				27-17585
Y	15	T		AGENA ENGINE COMP	1	14	26	M200	200	DGF	SLO									
P	529	D		S MAIN LO2 VALVE	1	14	27	0	90	DEG	SLO	NAA								
				INTERNAL CALIB 5 VDC	1	14	28													
				SYNC & CALIBRATION	1	14	29													
				CONNECTED TO 1 14 29	1	14	30													

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SECTION 9

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MISSILE INSTRUMENTATION LOG SHEET

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1	2	3	4	5	6	7	8	9		10	11	12	13				14	15	16	17	DRAWING NUMBERS
								MEASUREMENT RANGE	UNITS OF FUNCTION				TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	QUADRANT					
VEHICLE	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELETYPE NO.	SUB-CARRIER NO.	COMPUTATOR PIN NO.	LOW	HIGH	ACCURACY	RATE OF CHANGE OR FREQUENCY OF FUNCTION	52 53	54 55 56 57 58	59 60 61	62	66	67	70	71	72	
				COMM. RATE-10 RPS	1	15	0														
S	254	D		B1 PITCH	1	15	1	M5	5	DEG	10	7 01680	1	526	1212	A	P				27-11580
S	252	D		B1 YAW ROLL	1	15	2	M5	5	DEG	10	7 01680	1	451	1212	Y	P				27-11580
P	329	P		S GAS GEN DISCH	1	15	3	0	1000	PIA		7 01731	3	5585	1222	1	P				27-11648
S	255	D		B2 PITCH	1	15	4	M5	5	DEG	10	7 01680	1	527	1212	3	P				27-11580
S	253	D		B2 YAW ROLL	1	15	5	M5	5	DEG	10	7 01680	1	520	1212	Y	P				27-11580
S	61	D		ROLL DISPL GYRO SIG	1	15	6	M3	3	DEG	15										
S	257	D		SUSTAINER PITCH	1	15	7	M3	3	DEG	6	7 01680	3	489	1210	X	P				27-11576
S	256	D		SUSTAINER YAW	1	15	8	M3	3	DEG	6	7 01680	3	548	1210	Y	P				27-11576
P	72	X		BOOSTER CUTOFF RELAY	1	15	9	OFF	ON			STP									
S	258	D		V1 PITCH ROLL	1	15	10	M70	70	DEG	10	27 01205	1	264M	1128	4	P				27-11577
S	260	D		V1 YAW	1	15	11	M25	35	DEG	10	7 01414	1	07661	1128	4	P				27-11577
S	259	D		V2 PITCH ROLL	1	15	12	M70	70	DEG	10	27 01205	1	210	1128	2	P				27-11577
S	261	D		V2 YAW	1	15	13	M25	35	DEG	10	7 01414	1	07663	1128	2	P				27-11577
				XDCR PWR SUP & VDC	1	15	14														
				INSTR GROUND	1	15	15														
E	28	V		MSL SYSTEMS INPUT	1	15	16	0	30	VDC		SLO									
P	14	T		ENGINE COMP AMBIENT	1	15	17	0	400	DGF		SLO									
P	59	P		B2 THRUST CHAMBER	1	15	18	0	400	PIA		7 01731	1	6410	1221	3	P				27-11579
P	330	P		S FUEL PUMP DISCH	1	15	19	0	1500	PIA		7 01731	7	8604	1227	1	P				27-11648
P	28	P		V1 THRUST CHAMBER	1	15	20	0	400	PIA		7 01737	3	1217	1228	4	P				27-11577
P	29	P		V2 THRUST CHAMBER	1	15	21	0	400	PIA		7 01737	3	1370	1228	2	P				27-11577
U	80	P		LO2 TANK HEAD	1	15	22	0	5	PID		SLO	27 01297	3	14807	1036	4	P			27-11709
U	81	P		FUEL TANK HEAD	1	15	23	0	5	PID		SLO	27 01297	3	14816	1036	4	P			27-11709
P	72	X		CONNECTED TO 1 15 9	1	15	24														
S	62	D		PITCH DISPL GYRO SIG	1	15	25	M3	3	DEG	15										
S	63	D		YAW DISPL GYRO SIG	1	15	26	M3	3	DEG	15										
P	86	P		S LO2 PUMP INLET	1	15	27	0	150	PIA		7 01730	1	400	1222	1	P				27-11648
				INTERNAL CALIB S VDC	1	15	28														
				SYNC & CALIBRATION	1	15	29														
				CONNECTED TO 1 15 29	1	15	30														

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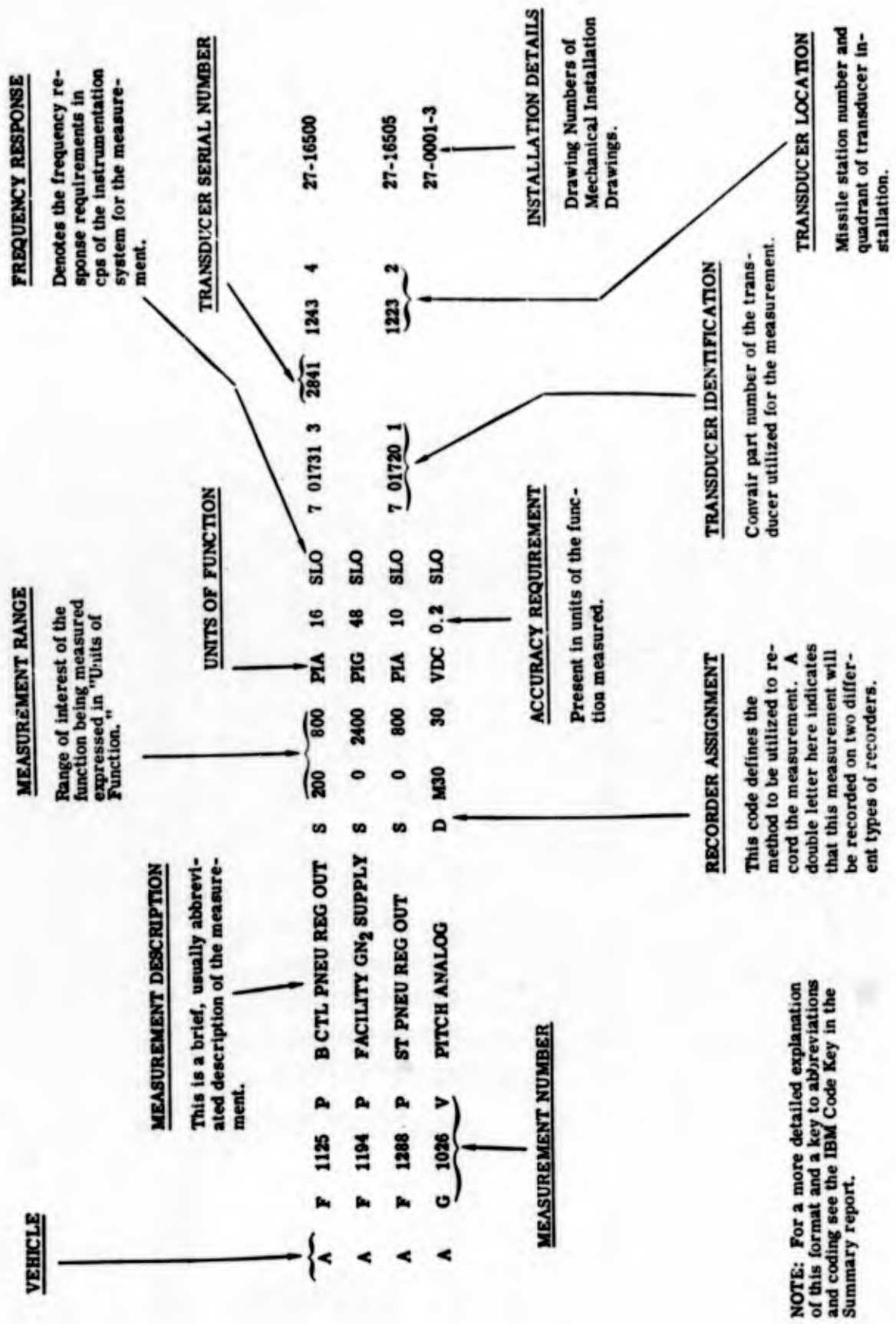
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SECTION 10

LANDLINE INSTRUMENTATION

The Landline Instrumentation presented in this section contains the latest available characteristics of the individual measurements. In addition the type of recordings indicated.



NOTE: For a more detailed explanation of this format and a key to abbreviations and coding see the IBM Code Key in the Summary report.

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1	2	3	4	5	6	7	8	9		10	11	12	13				14	15	16	17	DRAWING NUMBERS	
								MEASUREMENT RANGE	UNITS OF FUNCTION				TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	QUADRANT						CUB CODE
VEHICLE SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	RECORDER TRACK	CHANNEL	LOW	HIGH	ACCURACY	RATE OF CHANGE OR FREQUENCY OF FUNCTION													
PNEUMATIC SYSTEM																						
F	3309	D	LO2 ULLAGE VENT VLV		R	OPN	CLS														P	
F	1001	P	LO2 TANK HELIUM		S	0	50	PIG	1	SLO	7 01723	11	4189	925	Y						P	27-17585
F	1003	P	FUEL TANK HELIUM		S	0	100	PIG	1.5	SLO	7 01723	13	3933	926	Y						P	27-17585
F	3047	P	PCU FUEL SENSOR LINE		S	0	100	PIG	1.5	SLO	7 01723	13									P	
F	3050	P	PCU LO2 SENSOR LINE		S	0	50	PIG	3	SLO	7 01723	11									P	
F	1125	P	B CTL PNEU REG OUT		S	0	1000	PIG	16	SLO	7 01731	5	5182	1240	4						P	27-17586
F	1194	P	FACILITY GN2 SUPPLY		S	0	2400	PIG	48	SLO	7 01731	9									P	
F	1246	P	B TK HE BTL HI		S	0	3500	PIG	105	SLO	7 01731	9	5081	1240	1						P	27-17587
F	1288	P	ST PNEU REG OUT		S	0	800	PIG	16	SLO	7 01720	1	2936	1202	2						P	27-17588
F	1291	P	S CTL HE BTL		S	0	3500	PIG	105	SLO	7 01720	5	3102	1215	2						P	27-17588
F	3301	P	GND LO2 ULLAGE TANK		S	20	30	PIG	.13	SLO											P	
F	3302	P	GND FUEL ULLAGE TANK		S	55	65	PIG	.23	SLO											P	
F	3770	P	LN2 STORAGE TK PRESS		S	0	150	PIG	5	SLO	27 01243	9									P	
HYDRAULIC SYSTEM																						
F	1247	T	B TK HE BOTTLES		S	M400	M250	DGF	2	SLO	7 01633	5	52L	1190	1						P	27-17587
F	3894	T	HE LINE AT STUB UP		S	M320	M270	DGF	4	SLO	7 01649	9									P	
F	3895	T	LN2 LINE AT STUB UP		S	M320	M275	DGF	4	SLO	7 01649	9									P	
LAUNCHER																						
L	1127	P	HOLDDOWN CYL B1 SIDE		O	0	6000	PIG	180	100	7 01498	1									P	
L	1128	P	HOLDDOWN CYL B2 SIDE		O	0	6000	PIG	180	100	7 01498	1									P	
MISCELLANEOUS																						
M	1030	X	MSL TWO INCH MOTION		OR	ON	OFF	VDC	STP	PEN	99										P	

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CONVAIR-ASTRONAUTICS

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1	2	3	4	5	6	7	8	9		10	11	12	13				14	15	16	17	DRAWING NUMBERS
								RECORDER	TRACK				CHANNEL	MEASUREMENT RANGE	UNITS OF FUNCTION	ACCURACY					
VEHICLE	SYSTEM	MEASUREMENT NUMBER	TITLE MEASUREMENT	DESCRIPTION	RECORDER	TRACK	CHANNEL	LOW	HIGH	UNITS OF FUNCTION	ACCURACY	RATE OF CHANGE OR FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	QUADRANT	CAMB CODE	DRAWING NUMBERS			
P	1143	X		GAS GEN IGN LINK BK	R			OFF	ON	VDC		STP	PEN	4				P			
P	1577	X		RELEASE SIGNAL	R			OFF	ON	VDC		STP	PEN	31				P			
P	1644	X		ENG TKS PRESSURIZING	R			OFF	ON	VDC		STP	PEN	2				P			
P	1645	X		ENG TANKS PRES	R			OFF	ON	VDC		STP	PEN	3				P			
P	1648	X		V IGNITER LKS INTACT	R			OFF	ON	VDC		STP	PEN	7				P			
P	1649	X		M CHM IGN LKS INTACT	R			OFF	ON	VDC		STP	PEN	8				P			
P	1689	X		ENG START FAILURE	R			OFF	ON	VDC		STP	PEN	42				P			
P	1828	X		COMMIT STOP CUTOFF	R			OFF	ON	VDC		STP	PEN	51				P			
P	1829	X		RELEASE FAILURE COF	R			OFF	ON	VDC		STP	PEN	52				P			
S				AUTOPILOT SYSTEM																	
S	1048	V		PROGRAMMER PITCH SIG	D			0	2.7	VAC	.2	SLO						P			
S	1049	V		PROGRAMMER ROLL SIG	D			0	60	VAC	3	STP						P			
S	1069	V		ROLL INT OUTPUT SIG	D			M4	4	VAC	.4	5						P			
S	1072	V		PITCH INT OUTPUT SIG	D			M7	7	VAC	.7	5						P			
S	1073	V		YAW INT OUTPUT SIG	D			M7	7	VAC	.7	5						P			
S	1107	V		B1 PCH ACTR FEEDBACK	D			M12	12	VAC	5%	30						P			
S	1108	V		B2 PCH ACTR FEEDBACK	D			M12	12	VAC	5%	30						P			
S	1113	V		V1 YAW ACTR FEEDBACK	D			M5	7	VAC	5%	30						P			
S	1114	V		V2 YAW ACTR FEEDBACK	D			M5	7	VAC	5%	30						P			
S	1118	V		V2 ROL ACTR FEEDBACK	D			M11	11	VAC	5%	30						P			
S	1119	V		V1 ROL ACTR FEEDBACK	D			M11	11	VAC	5%	30						P			
S	1121	V		GYRO TEST SIG	D			M5	5	VAC	.1	STP						P			
S	1122	V		SERVO TEST SIG	D			M11	11	VAC	5%	30						P			
S	1123	V		INTEGRATOR TEST SIG	D			M11	11	VAC	.2	30						P			
S	1128	V		B1 YAW ACTR FEEDBACK	D			M12	12	VAC	5%	30						P			
S	1129	V		B2 YAW ACTR FEEDBACK	D			M12	12	VAC	5%	30						P			
S	1147	V		PITCH GYRO AMP OUT	D			M10	10	VAC	1	30						P			
S	1148	V		YAW GYRO AMP OUT	D			M10	10	VAC	1	30						P			
S	1149	V		ROLL GYRO AMP OUT	D			M10	10	VAC	1	30						P			
S	1216	V		S PCH ACTR FEEDBACK	D			M10	10	VAC	5%	30						P			

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CONVAIR (ASTRONAUTICS) DIVISION
GENERAL DYNAMICS CORPORATION

MIDAS

INSTRUMENTATION CONFIGURATION

SERIES D ARTICLE 97

PMR



PREPARED BY TEST PLANNING

CO-ORDINATED BY W.S. Becker
W. S. Becker

APPROVED BY H.R. Macdonald
H. R. Macdonald
Test Planning

^(SB)
CHECKED BY T.M. Wooster
T. M. Wooster
Instrumentation

APPROVED BY H.R. Macdonald
FOR P. J. Lynch 18 OCT '60
Chief-Field Test Engineering



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REVISIONS

NO.	DATE	BY	CHANGE	PAGES AFFECTED
A	24 Apr '61	GAW	ADDITIONS:	ALL TABS
			F1304P, F1067X, F1068X, F1069X, F1070X,	
			F1077X, F1147X, F1157X, F1169X, F1170X,	
			F1172X, F1174X, F1192X, F1193X, F1194X,	
			F1195X, F1198X, F1199X, F1202X, F1203X,	
			F1438X, F1499X, F1588X, F1613X, F1588X,	
			F1613X, F1614X, F1616X, F1618X, F1619X,	
			F1621X, F1622X, F1624X, F1628X, F1630X	
			DESCRIPTION OF REVISION "A" CHANGES	1-1
			<i>GAW W SB HRM CM</i>	

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REPORT NO. AZC-27-057-97

PAGE NO. 1

24 APRIL 1961

FOREWORD

This report has been published in accordance with contractual requirements as cited in Convair-Astronautics Report AZM-27-091. It describes the instrumentation released for Missile 97-D as of 24 April 1961.

Information presented here will be used by Air Force, Associate Contractors, Design, Operation, and Field Test Groups. Measurement modification will either originate in the Instrumentation Planning Group or will be submitted as a recommendation to this group.

(A)

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DESCRIPTION OF REVISION "A" CHANGES	1-1
TABULATIONS	
Telemetered Measurements by System	8
Telemetered Measurements by Channel	9
Landline Instrumentation	10

(A)

DESCRIPTION OF REVISION "A" CHANGES

The instrumentation configuration for this missile has been established through a study of program test objectives, systems analysis, and operating considerations. A discussion of missile instrumentation and associated characteristics has been summarized in Report AZC-27-057. For a detailed description of the various missile systems, test objectives, and general test program see Report AE60-0273.

The specific measurements to be transmitted via telemeter have been tabulated and are listed in Sections 8 and 9 in terms of instrumentation systems and telemeter channel assignments.

In addition to the telemetry, the landline instrumentation program for this missile has been included in this report in the form of a master tabulation of landline measurement characteristics, (Section 10).

To clarify specific measurements, instrumentation location schematics have been included in Report AZC-27-057, Section 7.

The checkout and validation sequence measurements added on Missile 97-D are included in the revision of the summary Report AZC-27-057, dated 15 December 1960.

Measurement F1304P, SEPARATION BTL DISCH has been added to increase the safety of personnel by monitoring the pressure of the helium bottle.

CONVAIR-ASTRONAUTICS

SECTION 8
MISSILE INSTRUMENTATION BY SYSTEM

The Missile Instrumentation Log presented in this section contains the latest available characteristics of the individual measurements. In addition, the telemetering channel assignments are included. Note that this section is listed by system.

VEHICLE	MEASUREMENT NUMBER	TELEMETRY CHANNEL ASSIGNMENT	MEASUREMENT DESCRIPTION	MEASUREMENT RANGE	UNITS OF FUNCTION	INSTALLATION DETAILS	TRANSUCER IDENTIFICATION	TRANSUCER LOCATION
A F 1	P	1	LO ₂ TANK HELIUM	0 45	PIA	480 2	27-11608	P
A F 3	P	1	FUEL TANK HELIUM	0 100	PIA	925 Y	27-11609	P
A F 125	P	1	B CTL PNEU REG OUT	0 1000	PIA	1243 4	27-16500	P
A F 260	P	1	B TANK HF. BOTTLES LO	15 415	PIA	1238 1	27-11600	P
A F 261	P	1	S TANK HE BOTTLE LO	15 415	PIA	1223 2	27-16505	P

VEHICLE

MEASUREMENT RANGE
Range of interest of the function being measured expressed in "Units of Function."

MEASUREMENT DESCRIPTION
This is a brief, usually abbreviated, description of the measurement.

UNITS OF FUNCTION

INSTALLATION DETAILS
Drawing Numbers of Mechanical Installation Drawings.

TRANSUCER LOCATION
Missile station number and quadrant of transducer in-stallation.

FREQUENCY RESPONSE
Denotes the frequency response requirements of the instrumentation system for the measurement.

MEASUREMENT NUMBER

TELEMETRY CHANNEL ASSIGNMENT
Indicates the telemeter, subcarrier and pin number assignment for the applicable measurement.

TRANSUCER IDENTIFICATION

Convair part number of the transducer utilized for the measurement.

NOTE: For a more detailed explanation of this format and a key to abbreviations and coding see the IBM Code Key in the Summary report.

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MISSILE INSTRUMENTATION LOG SHEET

MISSILE		REPORT NO.		DATE		PAGE														
97D		AZC-27-057-97		24 APR 61		2														
1	2	3	4	5	6	7	8	9		10	11	12	13			14	15	16	17	DRAWING NUMBERS
								MEASUREMENT RANGE	UNITS OF FUNCTION				ACCURACY	TYPE OF TRANSDUCER	SERIAL NO.					
VEHICLE	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELEMETRY NO.	SUB-CARRIER NO.	COMMUTATOR PIN NO.	LOW	HIGH	UNITS OF FUNCTION	ACCURACY	RATE OF CHANGE OR FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	QUADRANT	CARD CODE			
P	529	D	S	MAIN LO2 VALVE	1	14	27	0	90	DEG	2	SLO	NAA							
P	6	P	S	THRUST CHAMBER	1	14	6	0	1000	PIA		150	7 01731	5 6026B	1222	1	P		27-11648	
P	28	P	V1	THRUST CHAMBER	1	15	20	0	400	PIA			7 01737	3 1165S	1228	4	P		27-11577	
P	29	P	V2	THRUST CHAMBER	1	15	21	0	400	PIA			7 01737	3 1371S	1228	2	P		27-11577	
P	56	P	S	LO2 PUMP INLET	1	15	27	0	150	PIA			7 01730	1 264G	1222	1	P		27-11648	
P	59	P	B2	THRUST CHAMBER	1	15	18	0	600	PIA			7 01731	1 6681B	1221	3	P		27-11579	
P	60	P	B1	THRUST CHAMBER	1	14	7	0	600	PIA		60	7 01731	1 6673B	1221	4	P		27-11579	
P	100	P	BGG	COMBUSTION CHM	1	14	5	0	600	PIA		SLO	7 01731	1 6447B	1243	4	P		27-17586	
P	330	P	S	FUEL PUMP DISCH	1	15	19	0	1500	PIA			7 01731	7 5742B	1237	1	P		27-11648	
P	339	P	S	GAS GEN DISCH	1	15	3	0	1000	PIA			7 01731	3 5543B	1222	1	P		27-11648	
P	14	T	ENGINE	COMP AMB	1	15	17	0	400	DGF		5% SLO								
P	72	X	BOOSTER	CUTOFF RELAY	1	15	9	OFF	ON			STP								
P	77	X	VERNIER	CUTOFF RELAY	1	14	13	OFF	ON			STP								
P	347	X	S	COF RELAY LOCKIN	1	14	8	OFF	ON			STP								
S				AUTOPILOT SYSTEM																
S	61	D	ROLL	DISPL GYRO SIG	1	15	6	M3	3	DEG		15			36					
S	62	D	PITCH	DISPL GYRO SIG	1	15	25	M3	3	DEG		15			36					
S	63	D	YAW	DISPL GYRO SIG	1	15	26	M3	3	DEG		15			36					
S	252	D	B1	YAW ROLL	1	15	2	M5	5	DEG		10	7 01680	1 566B	1212	Y	P		27-11580	
S	253	D	B2	YAW ROLL	1	15	5	M5	5	DEG		10	7 01680	1 1300B	1212	Y	P		27-11580	
S	254	D	B1	PITCH	1	15	1	M5	5	DEG		10	7 01680	1 1265B	1212	4	P		27-11580	
S	255	D	B2	PITCH	1	15	4	M5	5	DEG		10	7 01680	1 1302B	1212	3	P		27-11580	
S	256	D	SUSTAINER	YAW	1	15	8	M3	3	DEG		6	7 01680	3 1138B	1210	Y	P		27-11576	
S	257	D	SUSTAINER	PITCH	1	15	7	M3	3	DEG		6	7 01680	3 1140B	1210	X	P		27-11576	
S	258	D	V1	PITCH ROLL	1	15	10	M70	70	DEG		10	27 01205	1 99M	1128	4	P		27-11577	
S	259	D	V2	PITCH ROLL	1	15	12	M70	70	DEG		10	27 01205	1 172M	1128	2	P		27-11577	
S	260	D	V1	YAW	1	15	11	M25	35	DEG		10	7 01414	1 08337	1128	4	P		27-11577	
S	261	D	V2	YAW	1	15	13	M25	35	DEG		10	7 01414	1 08313	1128	2	P		27-11577	

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1	2	3	4	5	6	7	8	9		10	11	12	13				14	15		16	17	DRAWING NUMBERS
								MEASUREMENT RANGE					UNITS OF FUNCTION	ACCURACY	TYPE OF TRANSDUCER	SERIAL NO.		STATION NO.	QUADRANT			
VEHICLE	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELEMETRY NO.	SUB-CARRIER NO.	COMMUNICATOR PIN NO.	LOW	HIGH								13-13			13-14	13-15	13-16
S		52	R	ROLL RATE GYRO SIG	1	9		M9	8	D/S	15						36				P	
S		53	R	PITCH RATE GYRO SIG	1	10		M6	6	D/S	15						36				P	
S		54	R	YAW RATE GYRO SIG	1	11		M6	6	D/S	15						36				P	
U				PROPELLANT UTILIZ																		
U		101	A	AXIAL ACCELERATION	1	12		0	8	G	.05 SLO		7 01413		5 00302		950	4			P	27-11605
U		80	P	LO2 TANK HEAD	1	15 22		0	5	PID	.5 SLO		27 01297		3 14952		1036	4			P	27-11709
U		81	P	FUEL TANK HEAD	1	15 23		0	5	PID	.5 SLO		27 01297		3 14941		1036	4			P	27-11709
U		91	V	ERROR RATIO DEMOD OP	1	14 19		M20	20	VDC	.5 SLO										P	
Y				PAYLOAD																		
Y		147	P	ADAPTER AREA AMB P	1	14 1		0	10	PIA	0.5 60		7 01225		1 229		490	Y			P	27-11889
Y		15	T	AGENA ENGINE COMP	1	14 26		M100	200	DGF	5% SLO		7 01684		7		490	Y			P	27-11889
Y		41	X	START D TIMER	1	14 95		ON	OFF	VDC	BLP										P	

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SECTION 9

MISSILE INSTRUMENTATION BY CHANNEL

The Missile Instrumentation Log presented in this section contains the latest available characteristics of the individual measurements. In addition, the telemetering channel assignments are included. Note that this section is listed by channel.

VEHICLE	MEASUREMENT DESCRIPTION	MEASUREMENT RANGE	INSTALLATION DETAILS
A P 29 P	V2 THRUST CHAMBER	1 11 5 0 400 PIA SLO 7 01737 1 1128 2 P	27-11614
A F 125 P	B CTL PNEU REG OUT	1 11 7 0 1000 PIA SLO 7 01731 3 1243 4 P	27-16500
A F 3 P	FUEL TANK HELIUM	1 11 9 0 100 PIA SLO 7 01723 13 925 Y P	27-11609
A P 671 T	TH SECT AMB QUAD 4	1 11 11 100 700 DGF SLO 7 01684 9 1230 4 P	27-11599

VEHICLE

MEASUREMENT DESCRIPTION
This is a brief, usually abbreviated, description of the measurement.

MEASUREMENT RANGE
Range of interest of the function being measured expressed in "Units of Function."

INSTALLATION DETAILS
Drawing Numbers of Mechanical Installation Drawings.

UNITS OF FUNCTION

FREQUENCY RESPONSE
Denotes the frequency response requirements of the instrumentation system for the measurement.

TRANSDUCER LOCATION
Missile station number and quadrant of transducer installation.

TRANSDUCER IDENTIFICATION
Convair part number of the transducer utilized for the measurement.

TELEMETRY CHANNEL ASSIGNMENT
Indicates the telemeter, subcarrier and pin number for the applicable measurement.

NOTE: For a more detailed explanation of this format and a key to abbreviations and coding see the IBM Code Key in the Summary report.

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1	2	3	4	5	6	7	8	9		10	11	12	13	14	15	16	17	DRAWING NUMBERS	
								MEASUREMENT RANGE	UNITS OF FUNCTION										
VEHICLE	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELEMETRY NO.	SUB-CARRIER NO.	COMPARATOR PIN NO.	LOW	HIGH	ACCURACY	RATE OF CHANGE OR FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.	QUADRANT	CARD CODE			
				COMM. RATE-5 RPS	1	14	0												
Y	147	P		ADAPTER AREA AMB P	1	14	1	0	10	PIA	0.5	60	7 01225	1	229	490	Y	P	27-11889
E	51	V		400 CYCLE AC PHASE A	1	14	2	105	125	VAC	1.0	SLO						P	
P	528	D		S MAIN FUEL VALVE	1	14	3	0	90	DEG	2	SLO	NAA					P	
D	110	X		MSL DESTRUCT SIGNAL	1	14	4	0	28	VDC		STP						P	
P	100	P		BGG COMBUSTION CHM	1	14	5	0	600	PIA		SLO	7 01731	1	6447B	1243	4	P	27-17586
P	6	P		S THRUST CHAMBER	1	14	6	0	1000	PIA		150	7 01731	5	6026B	1222	1	P	27-11648
P	60	P		B1 THRUST CHAMBER	1	14	7	0	600	PIA		60	7 01731	1	6673B	1221	4	P	27-11579
P	347	X		S COF RELAY LOCKIN	1	14	8	OFF	ON			STP						P	
G	26	V		PITCH ANALOG	1	14	9	0	2.3	VDC								P	
G	27	V		YAW ANALOG	1	14	10	0	2.3	VDC								P	
G	79	D		PITCH PHASE	1	14	11	M1.7	0	VDC								P	
G	80	D		YAW PHASE	1	14	12	M1.7	0	VDC								P	
P	77	X		VERNIER CUTOFF RELAY	1	14	13	OFF	ON			STP						P	
				XDCR PWR SUP 4 VDC	1	14	14												
				INSTR GROUND	1	14	15												
S	52	R		CONNECTED TO 1.9	1	14	16												
F	125	P		B CTL PNEU REG OUT	1	14	17	0	1000	PIA		SLO	7 01731	5	4837B	1243	4	P	27-17586
F	288	P		ST PNEU REG OUT	1	14	18	0	800	PIA		SLO	7 01731	3	3870B	1202	2	P	27-11641
U	91	V		ERROR RATIO DEMOD OP	1	14	19	M20	20	VDC	.5	SLO						P	
H	33	P		B1 HYD ACCUMULATOR	1	14	20	0	3500	PIA		45	7 01731	9	5309B	1201	1	P	27-17589
H	140	P		S/VERN HYD PRESS	1	14	21	0	3500	PIA		45	7 01731	9	7017B	1191	1	P	27-11592
S	53	R		CONNECTED TO 1.10	1	14	22												
S	54	R		CONNECTED TO 1.11	1	14	23												
F	1	P		LO2 TANK HELIUM	1	14	24	0	45	PIA		SLO	7 01723	11	3173C	925	Y	P	27-17585
F	3	P		FUEL TANK HELIUM	1	14	25	0	100	PIA		SLO	7 01723	13	3897C	926	Y	P	27-17585
Y	15	T		AGENA ENGINE COMP	1	14	26	M100	200	DGF	5%	SLO	7 01684	7		490	Y	P	27-11889
P	529	D		S MAIN LO2 VALVE	1	14	27	0	90	DEG	2	SLO	NAA					P	
				INTERNAL CALIB 5 VDC	1	14	28												
				SYNC & CALIBRATION	1	14	29												
				CONNECTED TO 1.14	1	14	30												
Y	41	X		START D TIMER	1	14	95	ON	OFF	VDC		BLP						P	

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1	2	3	4	5	6	7	8	9		10	11	12	13				14	15	16	17	DRAWING NUMBERS
								MEASUREMENT RANGE	UNITS OF FUNCTION				TYPE OF TRANSDUCER	SERIAL NO	STATION NO.	QUADRANT					
VEHICLE	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	TELETYPE NO	SUB-CARRIER NO	COMMUNICATOR PIN NO	LOW	HIGH	ACCURACY	RATE OF CHANGE OR FREQUENCY OF FUNCTION	52 53	54 55 56 57 58	59 60 61	62	64	67	70	71	73	
				COMM. RATE-10 RPS	1	15	0														
S	254	D		B1 PITCH	1	15	1	M5	5	DEG	10	7	01680	1	12658	1212	4	P		27-11580	
S	252	D		B1 YAW ROLL	1	15	2	M5	5	DEG	10	7	01680	1	5668	1212	Y	P		27-11580	
P	339	P		S GAS GEN DISCH	1	15	3	0	1000	PIA		7	01731	3	55438	1222	1	P		27-11648	
S	255	D		B2 PITCH	1	15	4	M5	5	DEG	10	7	01680	1	13028	1212	3	P		27-11580	
S	253	D		B2 YAW ROLL	1	15	5	M5	5	DEG	10	7	01680	1	13008	1212	Y	P		27-11580	
S	61	D		ROLL DISPL GYRO SIG	1	15	6	M3	3	DEG	15				36					P	
S	257	D		SUSTAINER PITCH	1	15	7	M3	3	DEG	6	7	01680	3	11408	1210	X	P		27-11576	
S	256	D		SUSTAINER YAW	1	15	8	M3	3	DEG	6	7	01680	3	11388	1210	Y	P		27-11576	
P	72	X		BOOSTER CUTOFF RELAY	1	15	9	OFF	ON											P	
S	258	D		V1 PITCH ROLL	1	15	10	M70	70	DEG	10	27	01205	1	93H	1128	4	P		27-11577	
S	260	D		V1 YAW	1	15	11	M25	35	DEG	10	7	01414	1	08337	1128	4	P		27-11577	
S	259	D		V2 PITCH ROLL	1	15	12	M70	70	DEG	10	27	01205	1	172H	1128	2	P		27-11577	
S	261	D		V2 YAW	1	15	13	M25	35	DEG	10	7	01414	1	08313	1128	2	P		27-11577	
				XDCR PWR SUP 4 VDC	1	15	14														
				INSTR GROUND	1	15	15														
E	28	V		MSL SYSTEMS INPUT	1	15	16	0	30	VDC	1.0	SLO								P	
P	14	T		ENGINE COMP AMB	1	15	17	0	400	DGF	5%	SLO								P	
P	59	P		B2 THRUST CHAMBER	1	15	18	0	600	PIA		7	01731	1	66818	1221	3	P		27-11579	
P	330	P		S FUEL PUMP DISCH	1	15	19	0	1500	PIA		7	01731	7	57428	1237	1	P		27-11648	
P	28	P		V1 THRUST CHAMBER	1	15	20	0	400	PIA		7	01737	3	1165S	1228	4	P		27-11577	
P	29	P		V2 THRUST CHAMBER	1	15	21	0	400	PIA		7	01737	3	1371S	1228	2	P		27-11577	
U	80	P		LO2 TANK HEAD	1	15	22	0	5	PID	.5	SLO	27	01297	3	14952	1036	4	P	27-11709	
U	81	P		FUEL TANK HEAD	1	15	23	0	5	PID	.5	SLO	27	01297	3	14941	1036	4	P	27-11709	
P	72	X		CONNECTED TO 1 15 9	1	15	24														
S	62	D		PITCH DISPL GYRO SIG	1	15	25	M3	3	DEG	15				36					P	
S	63	D		YAW DISPL GYRO SIG	1	15	26	M3	3	DEG	15				36					P	
P	56	P		S LO2 PUMP INLET	1	15	27	0	150	PIA		7	01730	1	2646	1222	1	P		27-11648	
				INTERNAL CALIB 5 VDC	1	15	28														
				SYNC 6 CALIBRATION	1	15	29														
				CONNECTED TO 1 15 29	1	15	30														

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1	2	3	4	5	6	7	8	9				10	11	12	13				14	15	16	17	DRAWING NUMBERS																	
								MEASUREMENT RANGE		UNITS OF FUNCTION	ACCURACY				RATE OF CHANGE OR FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO	STATION NO						QUADRANT	CARD CODE															
VEHICLE	SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	RECORDER	TRACK	CHANNEL	LOW	HIGH			43	44	45					46	47	48	49	50			51	52	53	54	55	56	57	58	59	60	61	62	63	64	65
E				ELECTRICAL POWER SYS																																				
E	1050	Q		400 CYCLE AC PWRSUP	R			350	450	CPS	0.5	SLO		PEN	64																							P		
E	1003	V		BATTERY OUTPUT	O			15	35	VDC	.6	SLO																										P		
F				PNEUMATIC SYSTEM																																				
F	1001	P		LO2 TANK HELIUM	S			0	50	PIG	1	SLO	7 01723	11	5019		925	Y																				P	27-17585	
F	1003	P		FUEL TANK HELIUM	S			0	100	PIG	1.5	SLO	7 01723	13	3193		926	Y																				P	27-17585	
F	1047	P		PCU FUEL SENSOR LINE	O			0	100	PIG	1.5	SLO	7 01723	13	5223																							P		
F	1050	P		PCU LO2 SENSOR LINE	O			0	50	PIG	3	SLO	7 01723	11	3876																							P		
F	1125	P		B CTL PNEU REG OUT	S			0	1000	PIG	16	SLO	7 01731	5	4746		1240	4																				P	27-17586	
F	1194	P		FACILITY GN2 SUPPLY	O			0	2400	PIG	48	SLO	7 01731	9	5175																							P		
F	1246	P		B TK HE BTL HI	S			0	3500	PIG	105	SLO	7 01731	9	6934		1240	1																				P	27-17587	
F	1288	P		ST PNEU REG OUT	S			0	800	PIG	16	SLO	7 01720	1	5817		1202	2																				P	27-17588	
F	1291	P		S CTL HE BTL	S			0	3500	PIG	105	SLO	7 01720	5	2602		1215	2																				P	27-17588	
F	1301	P		GND LO2 ULLAGE TANK	S			20	30	PIG	.13	SLO																										P		
F	1302	P		GND FUEL ULLAGE TANK	S			55	65	PIG	.23	SLO																											P	
F	1304	P		SEPARATION BTL DISCH	S			0	3500	PIA	28	SLO	7 01731	9	5749																							P		
F	1770	P		LN2 STORAGE TK PRESS	S			0	150	PIG	5	SLO	27 01243	9	15703																							P		
F	1247	T		B TK HE BOTTLES	S			M400	M250	DGF	2	SLO	7 01633	5	99L		1190	1																				P	27-17587	
F	1894	T		HE LINE AT STUB UP	O			M320	M270	DGF	4	SLO	7 01649	9	R430																							P		
F	1895	T		LN2 LINE AT STUB UP	O			M320	M275	DGF	4	SLO	7 01649	9	R441																								P	
F	1985	X		GND LO2 TK VENT OPEN	R			OFF	ON	VDC		STP		PEN	42																							P		
F	1986	X		GND LO2 TK VENT CLSD	R			OFF	ON	VDC		STP		PEN	43																								P	
F	1987	X		FUEL TK PRES FAILURE	R			OFF	ON	VDC		STP		PEN	62																								P	
H				HYDRAULIC SYSTEM																																				
H	1033	P		B1 HYD ACCUMULATOR	S			0	3500	PIG	105	SLO	7 01720	5	5648		1206	1																				P	27-17589	

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1	2	3	4	5	6	7	8	9		10	11	12	13				14	15		16	17		
								RECORDER	TRACK				CHANNEL	MEASUREMENT RANGE	UNITS OF FUNCTION	ACCURACY		RATE OF CHANGE OR FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER			SERIAL NO.	STATION NO.
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22		
H	1140	P		SUST/VERN HYD PRESS		S		0	3500	PIG	105	SLO	7	01731	9	6642	1190	1			P	27-11592	
L				LAUNCHER																			
L	1127	P		HOLDDOWN CYL B1 SIDE		O		0	6000	PIG	180	100	7	01498	1	9534						P	
L	1128	P		HOLDDOWN CYL B2 SIDE		O		0	6000	PIG	180	100	7	01498	1	2340						P	
M				MISCELLANEOUS																			
M	1030	X		MSL TWO INCH MOTION		OR		ON	OFF	VDC		STP			PEN	37						P	
N				FACILITIES																			
N	1984	D		LO2 TOPPING VLV POS		S		0	1.5	IN		SLO	87	93900	037	17H						P	
N	1300	P		FUEL STORAGE TK		S		0	200	PIG	10	SLO	27	01243	11	15696						P	
N	1345	P		FUEL STOR TK LIQ LEV		O		0	5	PID	.15	SLO	27	01367	1	10937						P	
N	1346	P		LO2 STOR TK LIQ LEV		O		0	5	PID	.15	SLO	27	01367	1	10938						P	
N	1347	P		FACIL H2O AT MANIF		O		0	250	PIG	10	40	27	01243	29	7883B						P	
N	1382	P		HE REG INLET TO PCU		S		0	1500	PIG	50	SLO	7	01731	7	4920						P	
N	1360	P		LO2 STORAGE TK		S		0	200	PIG	10	SLO	27	01243	11	15692						P	
N	1361	P		GO2 STORAGE TK		O		0	3000	PIG	100	SLO	7	01731	9	5449						P	
N	1349	T		ENG COMP HTR DISCH		S		0	200	DGF	5	SLO	7	01684	13	409						P	
P				PROPULSION SYSTEM																			
P	1439	O		S NAA RCC ACCEL		O		0	200	G	5	10K		NAA								P	
P	1452	O		B1 NAA RCC ACCEL		O		0	200	G	5	2K		NAA								P	
P	1453	O		B2 NAA RCC ACCEL		O		0	200	G	5	2K		NAA								P	
P	1026	P		B LO2 REG REFERENCE		S		0	800	PIG	16	SLO	7	01732	3	5601	1240	4				P	27-17586
P	1237	P		ENG OXIDIZER TK POK		R									PEN	63						P	

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SECTION 9

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1	2	3	4	5	6	7	8	9		10	11	12	13				15	16	17	DRAWING NUMBERS
								MEASUREMENT RANGE	UNITS OF FUNCTION				ACCURACY	TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.				
VEHICLE SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	RECORDER TRACK CHANNEL	LOW	HIGH														
P	1364	P	S	LO2 REG REFERENCE	S	0	1000	PIG	3	SLO	7	01732	5	5665	1200	4	P	27-11648		
P	1863	P	O	LO2 SUBCOOLER OUT	O	0	150	PIG	5	SLO	27	01243	9	15705			P			
P	1864	P	O	LO2 TPG DSTR OF FLTR	O	0	150	PIG	5	10	27	01243	9	14447			P			
P	1017	T	S	B2 TURBINE INLET	S	0	1800	DGF	30	SLO	27	01247	3	67L	1208	4	P	27-17501		
P	1021	T	S	LO2 AT BREAKAWAY VLV	S	M325	M275	DGF	1	SLO	7	01649	7	753R	1169	4	P	27-16502		
P	1326	T	S	S TURBINE INLET	S	0	1800	DGF	30	SLO	27	01247	3	8	1180	1	P	27-17523		
P	1673	T	S	B1 FUEL IGN VLV AMB	S	0	300	DGF	15	SLO	FE/CN			1220	1	P	27-16512			
P	1674	T	S	B2 FUEL IGN VLV AMB	S	0	300	DGF	15	SLO	FE/CN			1220	2	P	27-16512			
P	1675	T	S	ENG CTL PNEU MAN AMB	S	0	300	DGF	15	SLO	FE/CN			1220	3	P	27-16512			
P	1862	T	O	LO2 SUBCOOLER OUT	O	M320	M270	DGF	.7	SLO	7	01649	11	R54			P			
P	1143	X	R	GAS GEN IGN LINK BK	R	OFF	ON	VDC		STP	PEN	4					P			
P	1311	X	R	90% FUEL LVL IND	R	OFF	ON	VDC		STP	PEN	71					P			
P	1577	X	R	RELEASE SIGNAL	R	OFF	ON	VDC		STP	PEN	40					P			
P	1644	X	R	ENG TKS PRESSURIZING	R	OFF	ON	VDC		STP	PEN	2					P			
P	1645	X	R	ENG TANKS PRES	R	OFF	ON	VDC		STP	PEN	3					P			
P	1648	X	R	V IGNITER LKS INTACT	R	OFF	ON	VDC		STP	PEN	7					P			
P	1649	X	R	M CHM IGN LKS INTACT	R	OFF	ON	VDC		STP	PEN	8					P			
P	1689	X	R	ENG START FAILURE	R	OFF	ON	VDC		STP	PEN	49					P			
P	1828	X	R	COMMIT STOP CUTOFF	R	OFF	ON	VDC		STP	PEN	58					P			
P	1829	X	R	RELEASE FAILURE COF	R	OFF	ON	VDC		STP	PEN	59					P			
P	1987	X	R	FUEL OVER FILL PROBE	R	OFF	ON	VDC		STP	PEN	70					P			
P	1988	X	R	LO2 95% LVL EMER COF	R	OFF	ON	VDC		STP	PEN	73					P			
P	1997	X	R	MSL FUELED 95%	R	OFF	ON	VDC		STP	PEN	68					P			
P	1999	X	R	MSL FUELED 100%	R	OFF	ON	VDC		STP	PEN	80					P			
S				AUTOPILOT SYSTEM																
S	1048	V	D	PROGRAMMER PITCH SIG	D	0	2.7	VAC	.2	SLO							P			
S	1049	V	D	PROGRAMMER ROLL SIG	D	0	60	VAC	3	STP							P			
S	1107	V	D	B1 PCH ACTR FEEDBACK	D	M12	12	VAC	5%	30							P			
S	1108	V	D	B2 PCH ACTR FEEDBACK	D	M12	12	VAC	5%	30							P			

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1	2	3	4	5	6	7	8	9		10	11	12	13				14	15	16	17	DRAWING NUMBERS	
								MEASUREMENT RANGE	UNITS OF FUNCTION				ACCURACY	RATE OF CHANGE OR FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO						STATION NO
VEHICLE SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	RECORDER	TRACK	CHANNEL	LOW	HIGH														
S	1113	V	V1 YAW ACTR FEEDBACK	D			M5	7	VAC	5%	30										P	
S	1114	V	V2 YAW ACTR FEEDBACK	D			M5	7	VAC	5%	30											P
S	1118	V	V2 PCH ACTR FEEDBACK	D			M11	11	VAC	5%	30											P
S	1119	V	V1 PCH ACTR FEEDBACK	D			M11	11	VAC	5%	30											P
S	1121	V	GYRO TEST SIG	D			M5	5	VAC	.1	STP											P
S	1122	V	SERVO TEST SIG	D			M11	11	VAC	5%	30											P
S	1123	V	INTEGRATOR TEST SIG	D			M11	11	VAC	.2	30											P
S	1128	V	B1 YAW ACTR FEEDBACK	D			M12	12	VAC	5%	30											P
S	1129	V	B2 YAW ACTR FEEDBACK	D			M12	12	VAC	5%	30											P
S	1147	V	PITCH GYRO AMP OUT	D			M10	10	VAC	1	30											P
S	1148	V	YAW GYRO AMP OUT	D			M10	10	VAC	1	30											P
S	1149	V	ROLL GYRO AMP OUT	D			M10	10	VAC	1	30											P
S	1216	V	S PCH ACTR FEEDBACK	D			M10	10	VAC	5%	30											P
S	1217	V	S YAW ACTR FEEDBACK	D			M10	10	VAC	5%	30											P
S	1235	X	PROGRAMMER RUN TIME	R			OFF	ON	VDC		STP											P
S	1237	X	BOOSTER COF PRGR OTP	R			OFF	ON	VDC		STP											P
S	1238	X	JETTISON BOOSTER SIG	R			OFF	ON	VDC		STP											P
S	1240	X	PRES V TKS PRGR OTP	R			OFF	ON	VDC		STP											P
S	1242	X	SUS CUTOFF PRGR OTP	R			OFF	ON	VDC		STP											P
S	1246	X	VERNIER COF PRG OTP	R			OFF	ON	VDC		STP											P
S	1381	X	STAGING DISCRETE	R			OFF	ON	VDC		STP											P
U			PROPELLANT UTILIZ																			
U	1091	V	ERROR RATIO DEMOD OP	O			M20	20	VDC	.5	20											P
Y			PAYLOAD																			
Y	1039	X	INITATE LMSD SEPAR	R			OFF	ON	VDC		STP											P
Y	1040	X	UNCAGE LMSD GYROS	R			OFF	ON	VDC		STP											P
Y	1041	X	START D TIMER	R			OFF	ON	VDC		STP											P

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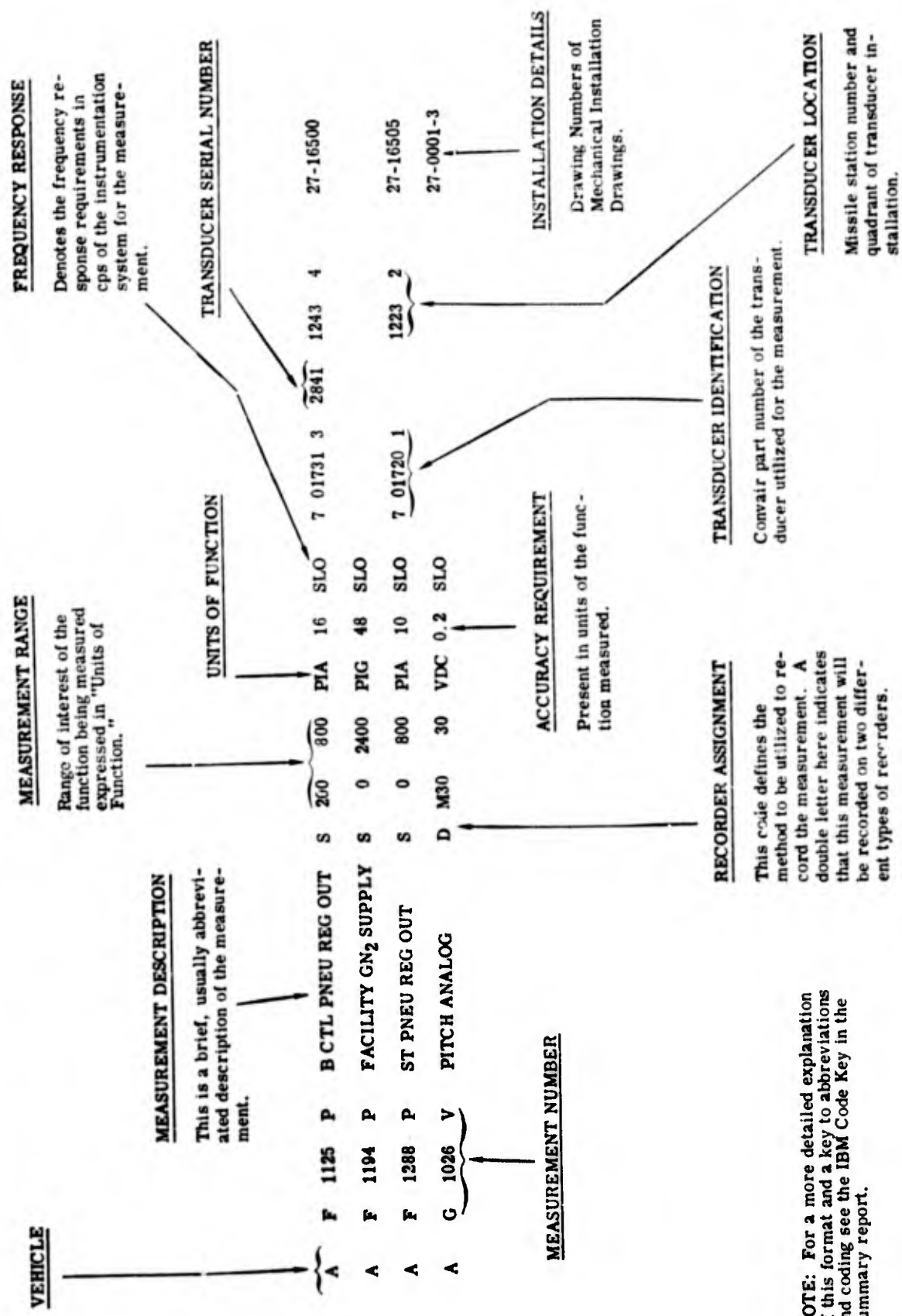
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SECTION 10

LANDLINE INSTRUMENTATION

The Landline Instrumentation presented in this section contains the latest available characteristics of the individual measurements. In addition the type of recordings indicated.



NOTE: For a more detailed explanation of this format and a key to abbreviations and coding see the IBM Code Key in the Summary report.

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1	2	3	4	5	6	7	8	9		10	11	12	13				14	15	16	17	DRAWING NUMBERS
								MEASUREMENT RANGE	UNITS OF FUNCTION				ACCURACY	DATE OF CHANGE OR FREQUENCY OF FUNCTION	TYPE OF TRANSDUCER	SERIAL NO					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22
E																					
E	1050	Q							350	450	CPS	0.5	SLO		PEN	59					P
E	1003	V							15	35	VDC	.6	SLO								P
F																					
F	1001	P							0	50	PIG	1	SLO	7 01723	11			925	Y	P	27-17585
F	1003	P							0	100	PIG	1.5	SLO	7 01723	13			926	Y	P	27-17585
F	3047	P							0	100	PIG	1.5	SLO	7 01723	13						P
F	3050	P							0	50	PIG	3	SLO	7 01723	11						P
F	1125	P							0	1000	PIG	16	SLO	7 01731	5			1240	4	P	27-17586
F	1194	P							0	2400	PIG	48	SLO	7 01731	9						P
F	1246	P							0	3500	PIG	105	SLO	7 01731	9			1240	1	P	27-17587
F	1288	P							0	800	PIG	16	SLO	7 01720	1			1202	2	P	27-17588
F	1291	P							0	3500	PIG	105	SLO	7 01720	5			1215	2	P	27-17588
F	3301	P							20	30	PIG	.13	SLO								P
F	3302	P							55	65	PIG	.23	SLO								P
F	3770	P							0	150	PIG	5	SLO	27 01243	9						P
F	1247	T							M400	M250	DGF	2	SLO	7 01633	5			1190	1	P	27-17587
F	3894	T							M320	M270	DGF	4	SLO	7 01649	9						P
F	3895	T							M320	M275	DGF	4	SLO	7 01649	9						P
F	3985	X							OFF	ON	VDC		STP		PEN	32					P
F	3986	X							OFF	ON	VDC		STP		PEN	33					P
F	1987	X							OFF	ON	VDC		STP		PEN	55					P
H																					
H	1033	P							0	3500	PIG	105	SLO	7 01720	5			1206	1	P	27-17589
H	1140	P							0	3500	PIG	105	SLO	7 01731	9			1190	1	P	27-11592

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1	2	3	4	5	6	7	8	9		10	11	12	13				14	15	16	17	18	
								MEASUREMENT RANGE	LOW				HIGH	TYPE OF TRANSDUCER	SERIAL NO.	STATION NO.						QUANTITY
VEHICLE SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION	RECORDER TRACK CHANNEL	MEASUREMENT RANGE	LOW	HIGH	UNITS OF FUNCTION	ACCURACY	SERIAL NO.	STATION NO.	QUANTITY	CARD CODE	REMARKS								
L			LAUNCHER																			
L	1127	P	HOLDDOWN CYL B1 SIDE		O		0 6000	PIG	180 100		7 01498	1										
L	1128	P	HOLDDOWN CYL B2 SIDE		O		0 6000	PIG	180 100		7 01498	1										
M			MISCELLANEOUS																			
M	1030	X	MSL TWO INCH MOTION		OR		ON OFF	VDC	STP		PEN 99											
N			FACILITIES																			
N	3984	D	LO2 TOPPING VLV POS		S		0 1.5	IN	SLO		87 93900 037											
N	3300	P	FUEL STORAGE TK		S		0 200	PIG	10 SLO		27 01243 11											
N	1345	P	FUEL STOR TK LIQ LEV		S		0 5	PID	.15 SLO		7 01402 5											
N	1346	P	LO2 STOR TK LIQ LEV		S		0 5	PID	.15 SLO		7 01402 5											
N	1347	P	FACIL H2O AT MANIF		S		0 250	PIG	10 40		27 01243 29											
N	1352	P	HE REG INLET TO PCU		S		0 1500	PIG	50 SLO		7 01731 7											
N	3360	P	LO2 STORAGE TK		S		0 200	PIG	10 SLO		27 01243 11											
N	1361	P	GO2 STORAGE TK		S		0 3000	PIG	100 SLO		7 01731 9											
N	3349	T	ENG COMP HTR DISCH		S		0 200	DGF	5 SLO		7 01684 13											
P			PROPULSION SYSTEM																			
P	1439	O	S NAA RCC ACCEL		O		0 200	G	5 10K													
P	1452	O	B1 NAA RCC ACCEL		O		0 200	G	5 2K													
P	1453	O	B2 NAA RCC ACCEL		O		0 200	G	5 2K													
P	1026	P	B LO2 REG REFERENCE		S		0 800	PIG	16 SLO		7 01732 3								1240	4	P	27-17586
P	1237	P	ENG OXIDIZER TK P OK		R						PEN 56											
P	1344	P	S LO2 REG REFERENCE		S		0 1000	PIG	3 SLO		7 01732 5								1200	4	P	27-11648

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1	2	3	4	5	6	7	8	9		10	11	12	13				14	15	16	17	DRAWING NUMBERS
								REORDER	TRACK				CHANNEL	MEASUREMENT RANGE	UNITS OF FUNCTION	ACCURACY					
	VEHICLE SYSTEM	MEASUREMENT NUMBER	TYPE MEASUREMENT	DESCRIPTION				LOW	HIGH												
	S	1114	V	V2 YAW ACTR FEEDBACK	D			M5	7	VAC		30									P
	S	1118	V	V2 ROL ACTR FEEDBACK	D			M11	11	VAC		30									P
	S	1119	V	V1 ROL ACTR FEEDBACK	D			M11	11	VAC		30									P
	S	1121	V	GYRO TEST SIG	D			M5	5	VAC		STP									P
	S	1122	V	SERVO TEST SIG	D			M11	11	VAC		30									P
	S	1123	V	INTEGRATOR TEST SIG	D			M11	11	VAC		30									P
	S	1128	V	B1 YAW ACTR FEEDBACK	D			M12	12	VAC		30									P
	S	1129	V	B2 YAW ACTR FEEDBACK	D			M12	12	VAC		30									P
	S	1147	V	PITCH GYRO AMP OUT	D			M10	10	VAC		30									P
	S	1148	V	YAW GYRO AMP OUT	D			M10	10	VAC		30									P
	S	1149	V	ROLL GYRO AMP OUT	D			M10	10	VAC		30									P
	S	1216	V	S PCH ACTR FEEDBACK	D			M10	10	VAC		30									P
	S	1217	V	S YAW ACTR FEEDBACK	D			M10	10	VAC		30									P
	S	1235	X	PROGRAMMER RUN TIME	R			OFF	ON	VDC		STP									P
	S	1237	X	BOOSTER COF PRGR OTP	R			OFF	ON	VDC		STP		PEN 62							P
	S	1238	X	JETTISON BOOSTER SIG	R			OFF	ON	VDC		STP		PEN 65							P
	S	1240	X	PRES V TKS PRGR OTP	R			OFF	ON	VDC		STP		PEN 69							P
	S	1242	X	SUS CUTOFF PRGR OTP	R			OFF	ON	VDC		STP		PEN 63							P
	S	1246	X	VERNIER COF PRG OTP	R			OFF	ON	VDC		STP		PEN 64							P
	S	1381	X	STAGING DISCRETE	R			OFF	ON	VDC		STP		PEN 70							P
				PROPELLANT UTILIZ																	
	U	1091	V	ERROR RATIO DEMOD OP	O			M20	20	VDC		20									P
	Y			2ND STAGE INTERFACE																	
	Y	1039	X	INITATE LMSD SEPAR	R			OFF	ON	VDC		STP		PEN 66							P
	Y	1040	X	UNCAGE LMSD GYROS	R			OFF	ON	VDC		STP		PEN 68							P
	Y	1041	X	START D TIMER	R			OFF	ON	VDC		STP		PEN 67							P

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