50X1

170 SERIES

PAYLOAD OPERATIONS MANUAL

POM 11-71

NAVAL RESEARCH LABORATORY

170 SERIES
TABLE OF CONTENTS

I.1. R. F. SYSTEM

R.F. SYSTEM

I R.F. SYSTEM DESCRIPTION

The R.F. System employed in these payloads is designed to improve:

a. Transmitters -

(1) Better frequency stability

(2) Lower incidental A.M. and F.M.

(3) Higher R.F. efficiency and output power level

(4) Lower spurious responses and unwanted harmonics

(5) More stable modulation

(6) Short and open circuit protection

(7) Better E.M.I. characteristics

b. A.M. Command Receivers

(1) Preselector bandwidth

(2) More linear A.G.C. characteristics

(3) Better E.M.I. characteristics

(a) Housekeeping Telemetry Transmitter -

This unit is a Phase Modulated (P.M.) transmitter operating at a fundamental frequency in the band from 136 to 138 MHz. The transmitter modulator accepts digital or analog voltages and provides an output carrier of 0.25W at a modulation index from 0.5 to 1.5. The input ± D.C. power lines are isolated from ground, and both supplies are internally regulated. The regulators provide a constant R.F. output with voltage inputs of ±11

to ±15 V.D.C. Any transmitter power variation will be due to temperature change (-10 to + 60°C) and will be less than 1 dB. The transmitter output is protected against short and open circuit conditions by a ferrite isolator (block diagram Figure 1).

(b) Command Receiver (A.M.) -

The command receiver is a fixed tuned 142.XXX, single conversion, superheterodyne receiver designed for use on a rocket launched, earth orbital satellite with a minimum mission life of two years. The command receiver will demodulate an amplitude modulated carrier at this frequency and provide an audio output that is representative of the original amplitude modulation. Considerable effort has been made to make this unit immune to E.M.I. and R.F.I. Exceptionally sharp R.F. selectivity is accomplished by using an input crystal filter. The crystal filter is a 6-pole design with an input and output impedance of 50 ohms. It has a -3 dB bandwidth of 35 KHz, -60 dB bandwidth of 0.5 MHz, and -80 dB bandwidth of 1MHz. The crystal filter exhibits greater than -100 dB rejection of all other out-of-band signals. The in-band-loss is approximately

5 dB. The receiver has a sensitivity of -105 dBm for 10 dB $\frac{S + N}{N}$ (signal-plus-noise to noise ratio) with a dynamic range of -105 dBm to -50 dBm. The output voltage into 100 ohms is 6.0 $\pm$1.5V p-p, can operate on a positive or negative D.C. supply, and draws 18 mA stand-by current (Block Diagram Figures 2 and 3).

(c) Antenna Design Description -

The telemetry and command systems employ a common antenna system consisting of four $\lambda/4$ elements mounted on the northern hemisphere of the spacecraft. These elements are fed in a turnstile arrangement to produce essentially omni directional radiation characteristics. The radiation from the south pole of the spacecraft towards earth is essentially right-hand circularly polanized for telemetry and left-hand circular for command.

II R. F. SYSTEM SUMMARY

The TM and Command Receiver Block Diagrams can be seen in Figures 5 and 6. From the Effective Radiated Power (ERP) measurements tabulated below, coupled with the antenna patterns in Figures 7, 8, 9, various R. F. Link calculations can be made with respect to look angle. In the following, only zenith and horizon will be considered since these are the worst and best cases for signal strength.

TYPICAL E.R.P.

System	Measured R.F. Output in dBm	Measured ERP Ref. to Eθ (dBm) θ = 120°	θ = 180°
TM	23.7	23.7	22
Command Receiver	-102 (Input)		

170 SERIES LINK CALCULATION (UP-LINK) TM

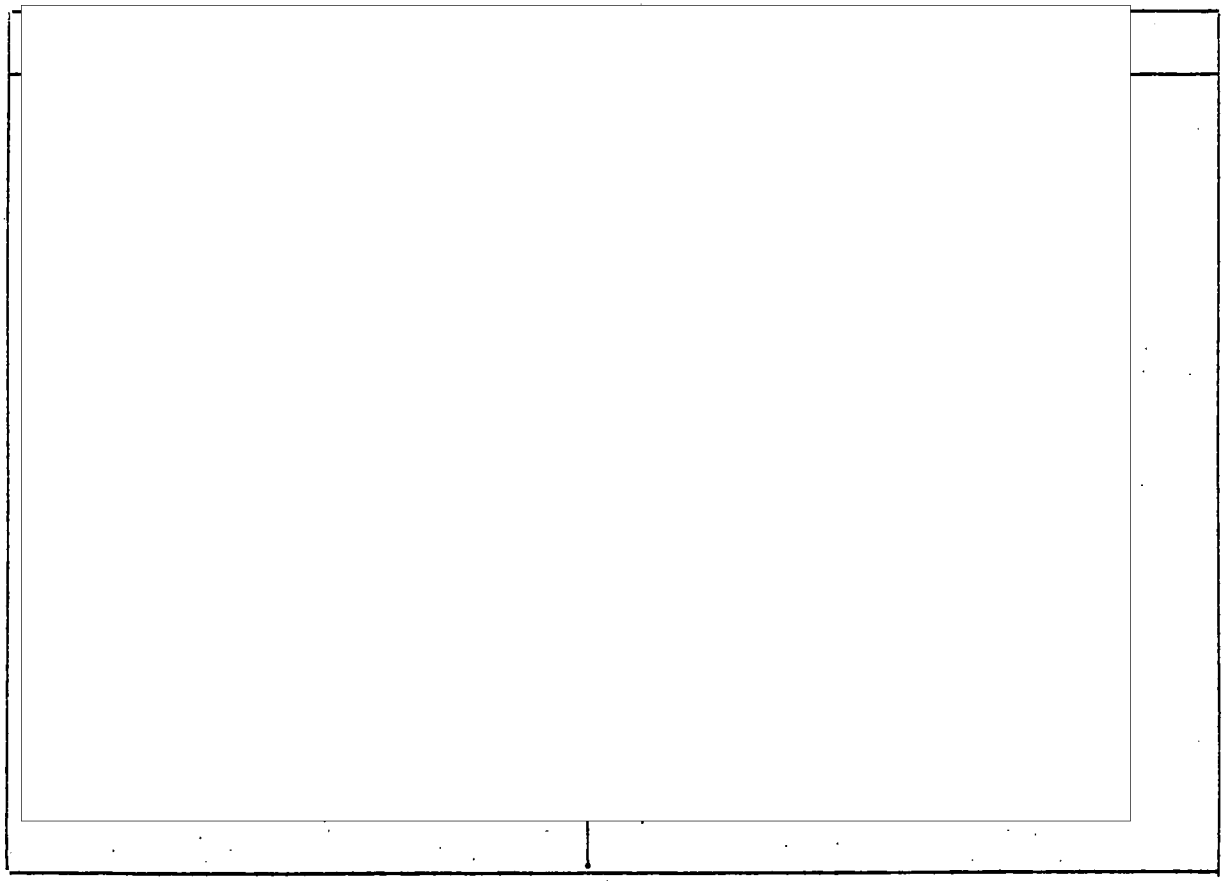
Cir. Orbit 4/3 earth R

527 N.Mi. - To Zenith P_L = 135.2 dB

2210 N.Mi. - To Horizon P_L = 147.8 dB

Rec. Sen. @ Peak - R_S = -102 dBm

Radiated Power - K = +57.5 dBm



170 SERIES LINK CALCULATION (DOWN-LINK) TM

E.R.P. = Horizon +23.5 dBm

Zenith +22 dBm

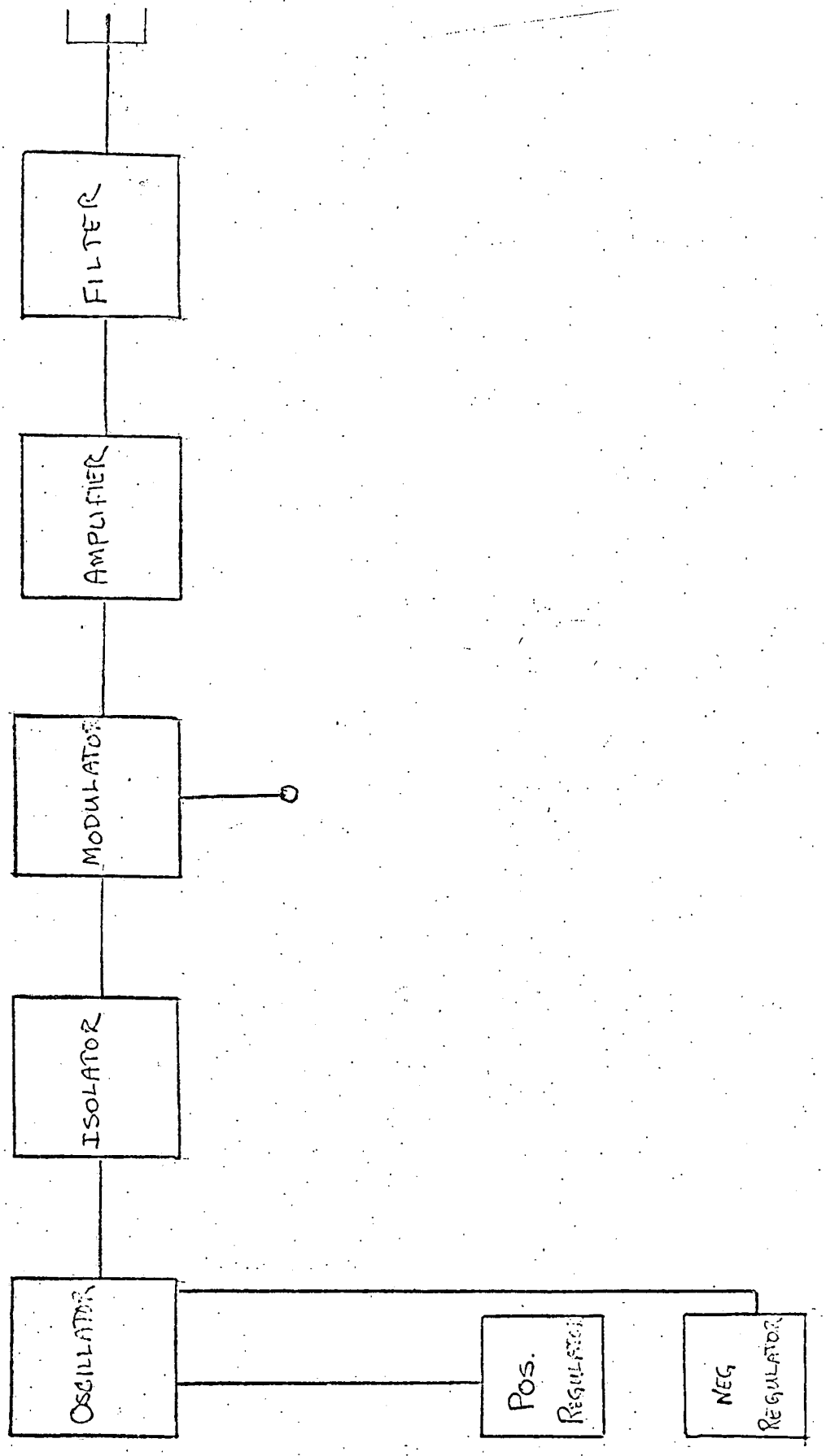
Note: Linear Polarization EΘ (Horizontal)

Orbit - 527 N.Mi. Circular d1 = 527 N.Mi. P_L = -134.8 dB

d2 = 2210 N.Mi. P_L = -147.6 dB

Note

FIG 1 TM TRANSMITTER



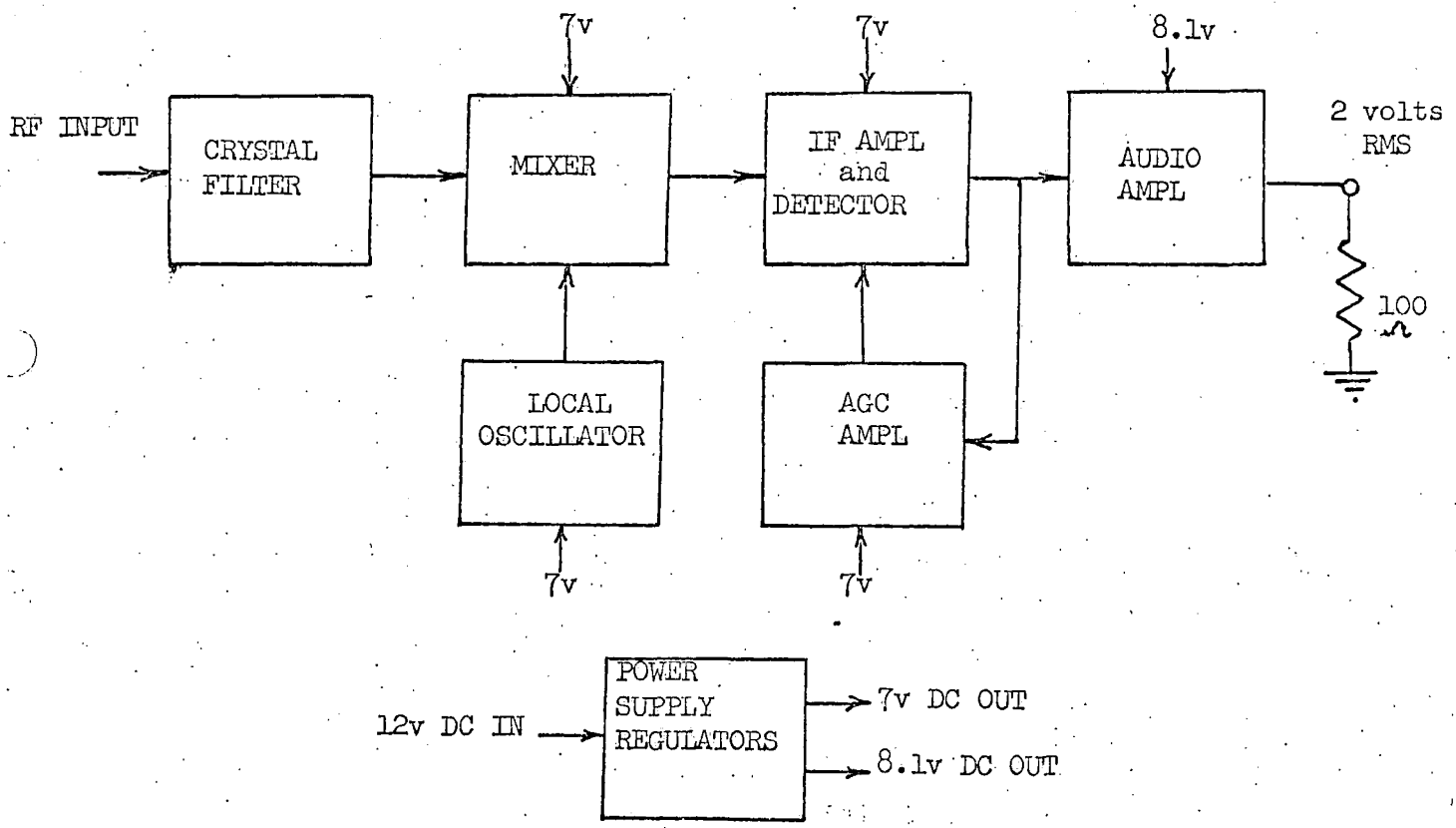


FIGURE 2 - VHF AM COMMAND RECEIVER, BLOCK DIAGRAM

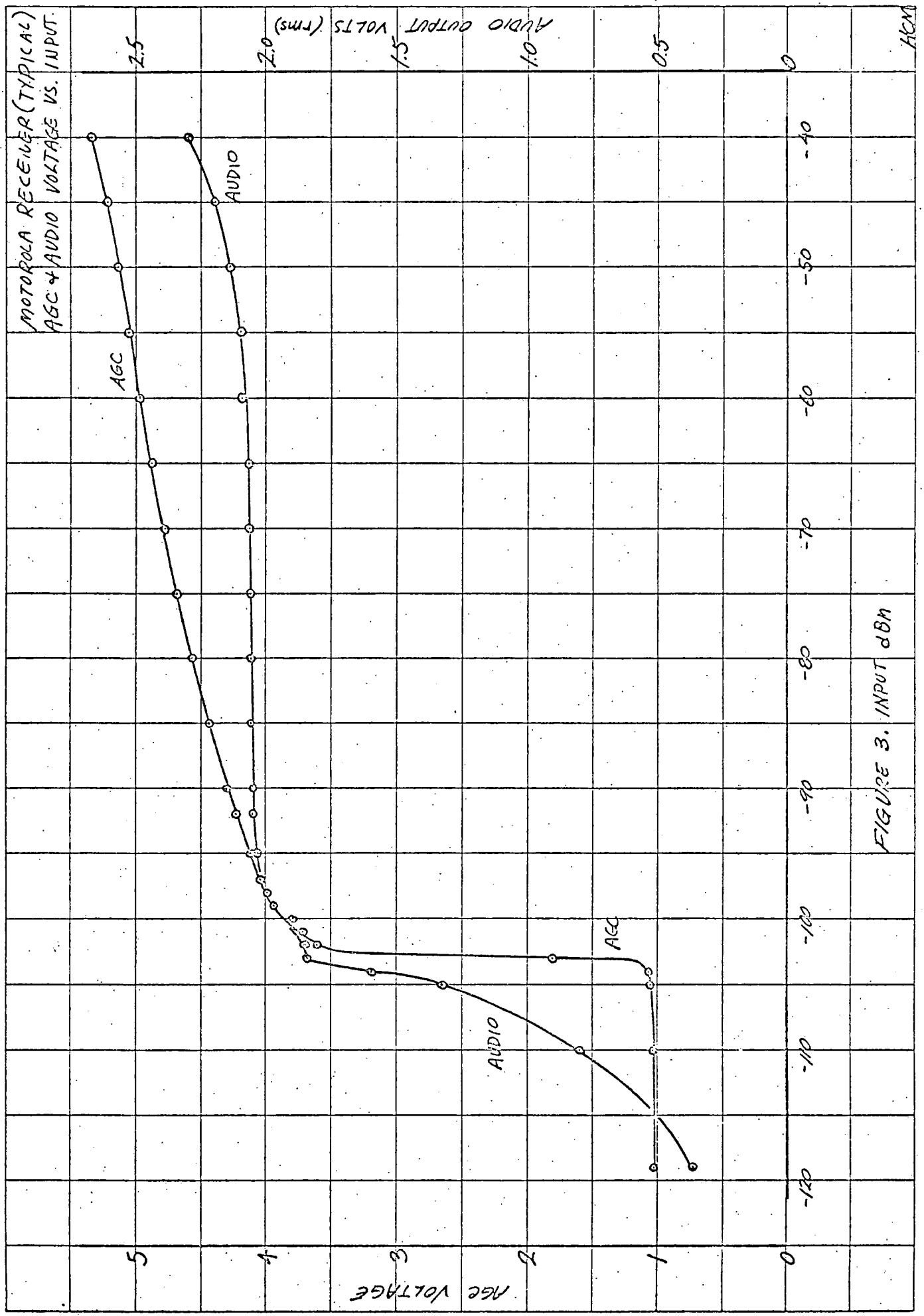


FIGURE 3.

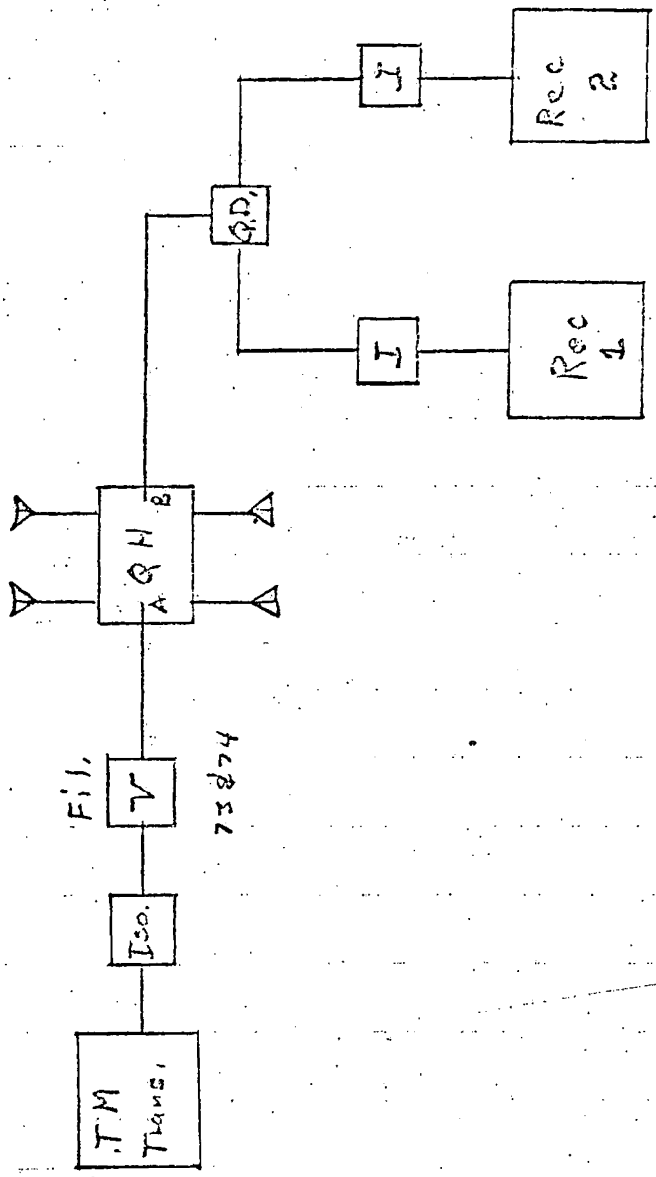


Fig. 5 TM & Command Rec. Block Diagram

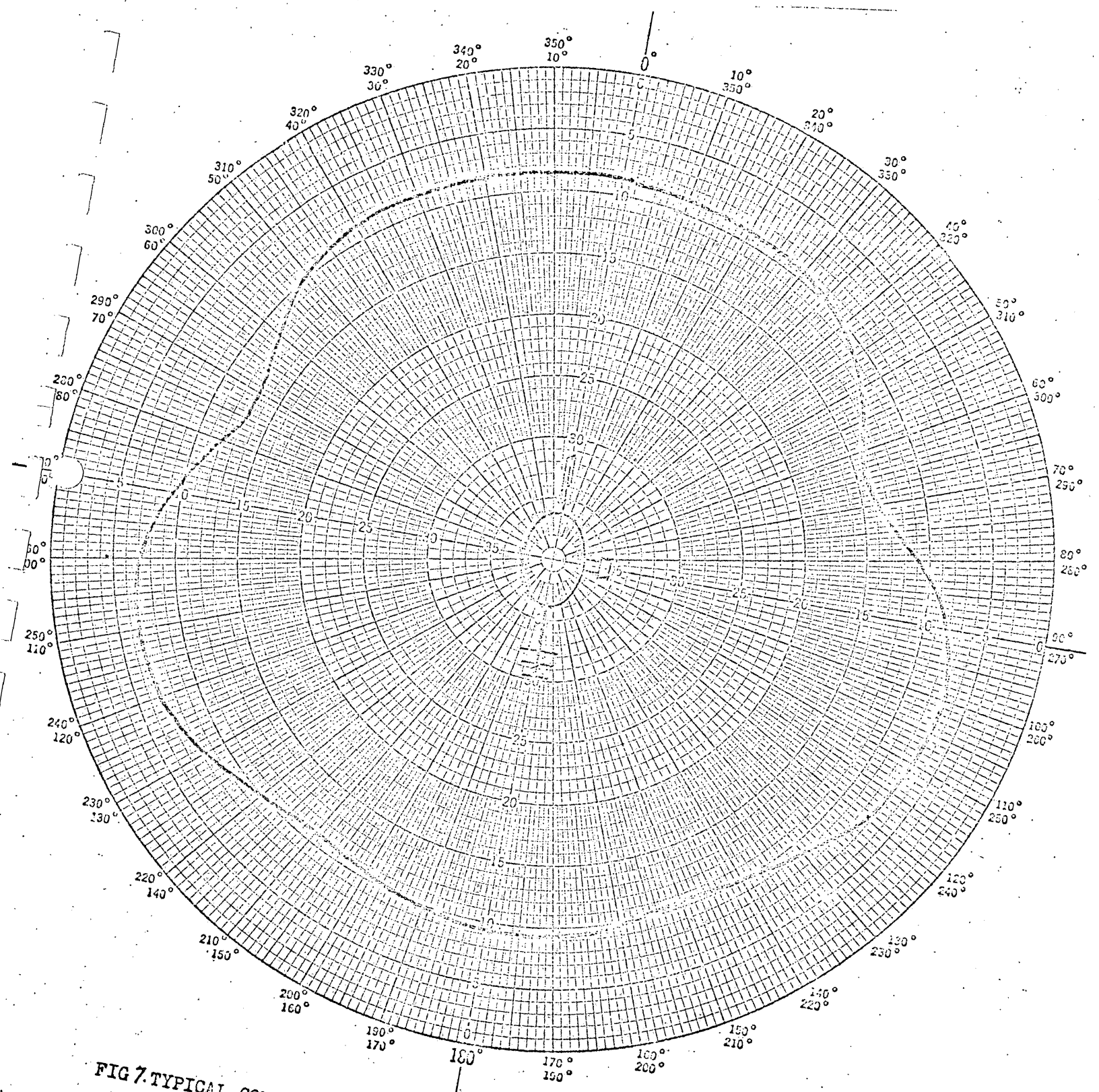


FIG 7. TYPICAL COMMAND RECEIVER ANTENNA PATTERN

lar Chart No. 1270 $\phi = 30°$, $E\phi$ POLARIZATION
ITIFIC-ATLANTA, INC.
ATLANTA, GEORGIA

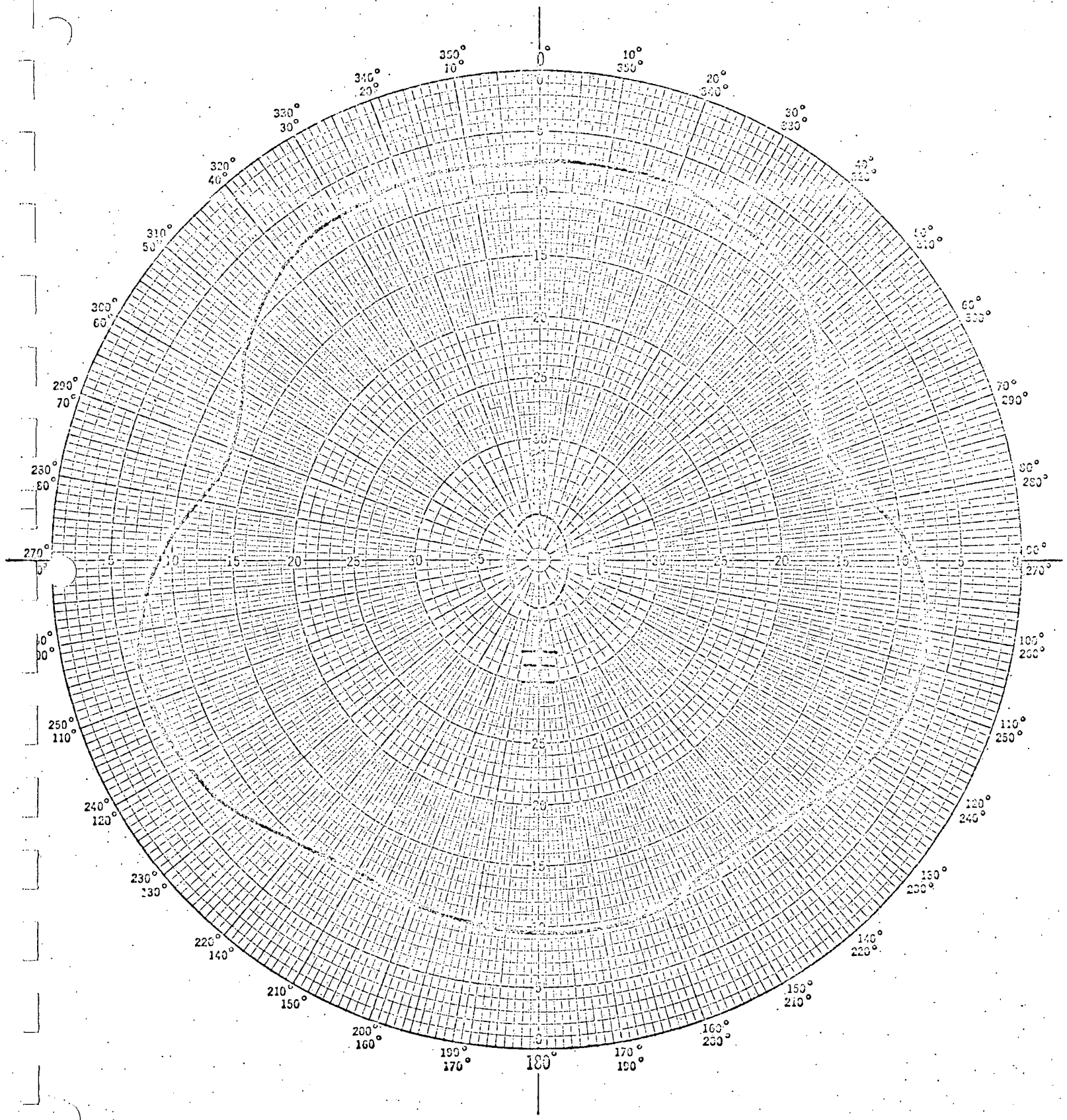


FIG. 8. TYPICAL TELEMETRY TRANSMITTER ANTENNA PATTERN

Polar Chart No. 127D ϕ = 30° , Eϕ POLARIZATION, ALL NUMBERS BELOW 30 DBI ERP

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ATLANTA, GEORGIA

I.2. COMMAND SYSTEM

I.3. MEMORY SYSTEM

170 SERIES DIGITAL TELEMETRY AND MEMORY SYSTEM OPERATION

The 170 Series PCM Telemetry System performs very similar to the 160 Series System. The major changes to the system are in the areas of increased redundancy. The system performs three main functions: samples and encodes realtime telemetry data, samples and formats telemetry data for storage in the satellite memory, and provides the necessary control for reading this data out of the memory and formatting it for transmission over one of the payload R.F. down-links (Figure 1).

The PCM Encoder is formatted into a main frame of 128 words consisting of 8 subframes of 16 words each. The encoder samples 56 single-ended, high level (0 to 5.00^{v}) analog channels and 16 differential high level analog channels, converting each sample to an eight-bit binary coded word. The system also samples 308 discrete inputs as 38 eight-bit words. The 110 samples along with sync words constitute a major frame. The real-time major frame format is detailed in Figure 3 .

The encoder provides all the necessary timing and control signals to sequentially store the last 8 eight-bit words of any preselected minor frame or subframe in the accompanying satellite memory. The subframe to be stored is selected by forming a binary coded word with the subframe select 1, 2, and 3 commands and the subframe reset command. The system has four sampling rates once every frame, 4 frames, 32 frames or 64 frames where a frame is 2.56 seconds. The encoder functional time periods are given in Figure 2 . The Mem A1 Sample, Mem A0 Sample, Mem B1 Sample, and

Mem BO Sample commands are used to control the states of the command code flip-flops that are used to control the sample rate according to the following table:

F_B	F_A	Sample Rate/Frame
0	0	1
0	1	4
1	0	32
1	1	64

The encoder will continue to sample at this rate and store data in the memory until 512 samples (the memory capacity) have been stored. The encoder senses the last address output from the memory and inhibits further storage until the memory has been read out.

The encoder maintains the memory in a standby condition until it receives an external read-command. The encoder will start the readout of the memory at the beginning of the next major frame after receipt of this command. Encoder outputs labeled PCM realtime and memory will contain memory data during memory readout. The transition from realtime data to memory data is coherent when the memory is read out. The clock, clock phase, frame sync and subframe sync remain the same during a memory readout. The exact format is shown in Figure 4 . During readout, words 6 thru 15 are replaced with a 4-bit flag word, a 12-bit word containing the contents of the memory address register for the block of each eight eight-bit words that were stored. The remaining eight 8-bit words will be the stored sample. The entire 512 samples will be read out four (4) times. At the

completion of the fourth readout, the encoder will return to its realtime mode of operation. At this time, the encoder will initiate a fifth memory readout with the purpose of restoring a test pattern of alternate 1's and 0's. This fifth readout will not be inserted into the output data channels. Its purpose is to place a test pattern into memory which will be read out of all locations that have not had data stored into them. This will be the case when a read command is received prior to the encoder's storing the complete 512 samples into memeory. The test pattern serves as a diagnostic aid in the event of system malfunction.

The entire system can be operated at two commandable bit rates, 400 bps or 1600 bps. All memory data sampling is referenced to the 400 bps rate, e.e., the 2.56 sec frame rate, and will not change at the higher bit rate (Figure 2). Example, at a sample rate of 32 frames, it will take 11.65 hours to fill the memory at either a 400 bps or 1600 bps realtime data rate.

All memory samples can be related to an exact Greenwich mean time by use of the PCM system absolute timer. The timer consists of an eight-bit vernier timer and a 16-bit absolute timer forming a 24-bit time word. The vernier timer is driven at the main frame rate of 2.56 sec. and is displayed in every main frame in word 1-3. When the vernier time reaches a count of 255, the contents of the 16-bit absolute timer will be displayed in words 1-4 and 1-5. The normal data in words 1-4 and 1-5, the cell monitors will not be displayed at this time. The PCM timer system is easily synchronized to GMT since the entire system is synchronous. The timer can

be reset to zero by using the PCM timer reset command at a precise GMT setting or the system can be synchronized by recording GMT at precisely the moment the vernier timer increments. Once a time reference between GMT and the vernier timer is established, all memory samples can be tied to an exact time in the orbit, as the absolute time and vernier time are stored in the very first sample stored into memory, and all succeeding samples are spaced at exact time intervals from the absolute time and vernier time increments. On the first sample of eight eight-bit words stored in the memory, the first three words are replaced with a 24-bit time word(8bit vernier time and 16-bit absolute time) This is true regardless of the subframe being stored.

At the completion of the four memory readouts and the load test pattern, the first memory sample is taken and the 24 bits of time are atored. At the instant the data is shifted into memory, words 8, 9, and 10 of the particular subframe being stored will display the contents of the 24 bit time that is loaded into memory. The previous system in the 160 Series had to wait to acquire sync with the incrementing 16-bit absolute timer before storing its first sample. This was necessary as we were storing only 16 bits of time. On this system, since we store the contents of the venier timer, it is not necessary to wait for the 16-bit absolute timer to increment. Once the system has loaded the test pattern, the system goes directly into the sampling mode.

The main encoder of this system was designed such that any random failure it might suffer would be a soft failure and would not be catastrophic.

The system has redundant commandable oscillators, A/D converters, power regulators, master timer and multiplexers, and output serizlizers and code converters. The distributed data buss is designed such that the digital multiplexer gates are isolated from each other so that a single bit failure in any one word will not affect any other word. The strobe signals and timing to the gate is such that no more than four words analog or digital would be lost by a single component failure in the worst case. In addition to the PCM encoder being redundant, much of the telemetry data is also available on a back-up analog system.

The PCM system's 32K memory system is not a redundant system. A single component failure in a critical circuit would be catastrophic, but would not jeprodize the mission or make its operational use difficult as would the main encoder.

The encoder system has four data outputs, two realtime all the time and two that have realtime data interleaved with stored data. Two are NRZ-L and two are bi phase-L coded. Figure 1 shows the various combinations of possible downlink routing. The only data routed to Irig CH 12 is NRZ-L and can only be 400 bps due to the frequency response of CH 12. If the higher bit rate of 1.6 Kbps is selected, a different downlink other than subcarrier CH 12 must be selected. When the system is commanded into the Mod. digital mode, there will be no analog data present. The modulation will be bi phase-L PCM data as it will on any alternate downlink. The selectable modulation and downlinks allows the system to remain operational in the event of a modulator failure by selecting an alternate link.

All data is binary coded with a scale factor of 255 equal to an input voltage of 5.080 volts. The data is aligned LSB first. The subframe sync is the complement of the main frame sync and uses the unique recycling code as the method of subframe sync.

The ground station equipment used for "quck look" of the PCM telemetry data consists of either Data Control Systems model 4002 or 4004 decoms. The major difference between the 4002 and the 4004 is that an external Bit sync is necessary with the 4004. Word selectors for stripping out both analog and digital words have been designed by NRL and tailored to meet all NRL spacecraft requirements. The words to be displayed are thumbwheel selectable by word and frame. Figures 3 show the entire PCM telemetry format. Each word is labeled by the frame and word position in the frame, i.e., 7-14, frame 7 and word 14. The entire format is programmed on a plastic card that controls the 4002 and the 4004. The programming of the 4002 and the 4004 is different; therefore, a red card is used to identify the 4004 and a white card for the 4002. Both units can be programmed to accept data either MSB aligned or LSB aligned. All units will be supplied programmed for LSB operation. When programmed for LSB operation, the thumbwheel settings must be advanced by one for each word for words 0-14 and for words 15 both the frame and the word must be advanced by 1. Figure 3 denotes this with an asterisk. The difference in the thumbwheel settings for LSB or MSB programming for the 4002 or 4004 represents an operational nuisance. Once the decom is programmed and the

proper thumbwheel settings are known for each word in the format, they will not change; but it is important to remember this if the card programming is changed or decoms changed for any reason.

TRL POM ENCODER

Functional Time Periods

	DATA RATE 400 bps	DATA RATE 1600 bps
Clock Frequency	819.20 khz	819.20 khz
Clock	204.80 khz	204.80 khz
Bit Time	2.5 ms	625.0 ms
Word Time	20.0 ms	5.0 ms
Subframe Time	320.0 ms	80.0 ms
Frame Time	2.56 sec	640.0 ms

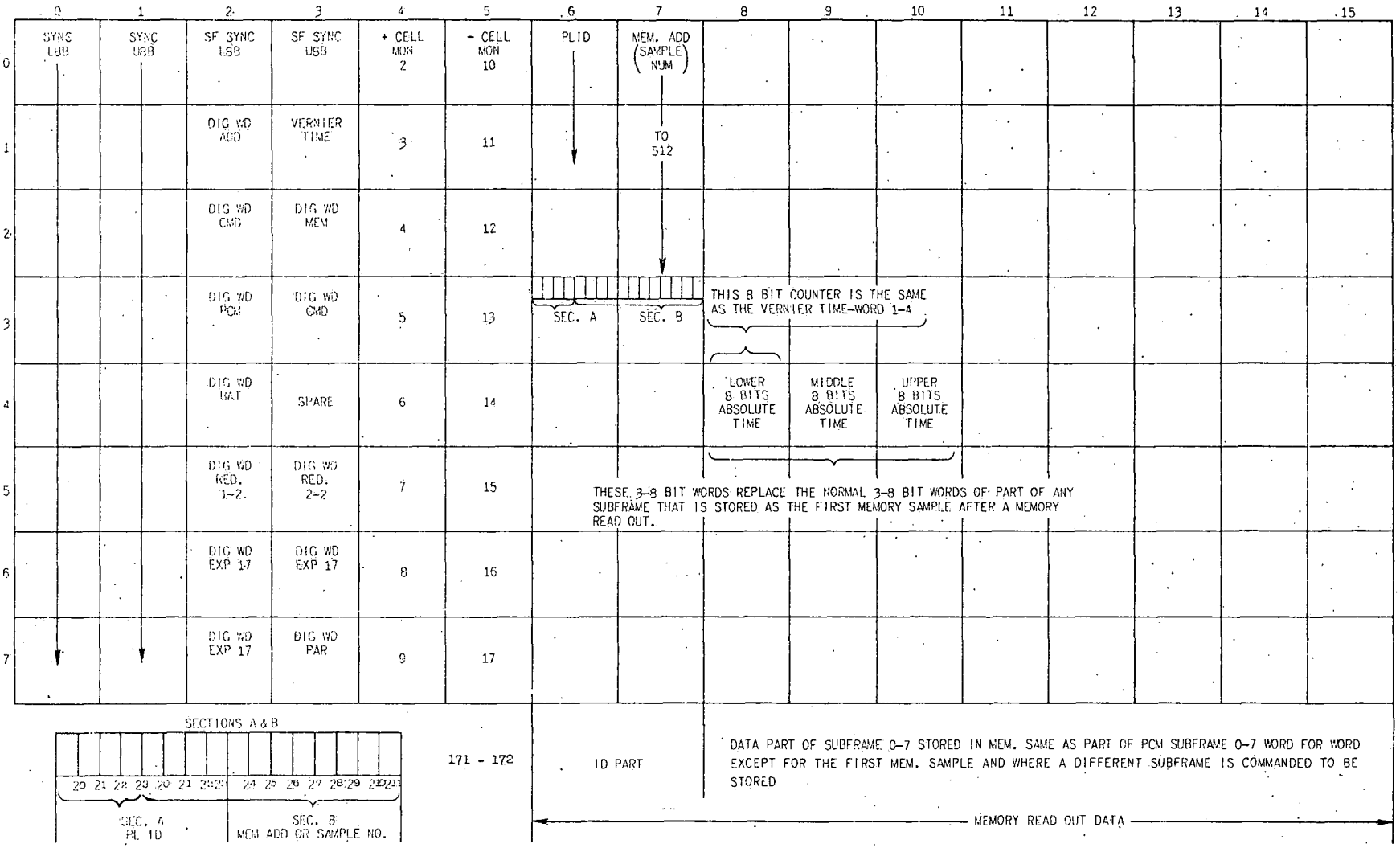
MEMORY STORAGE TIMES (Memory Storage is referenced to the 400 bps DATA RATE at all times)

ONE SAMPLE = Eight - 8 bit words

MEMORY CAPACITY = 512 Samples

SAMPLE RATE:	EVERY FRAME	1,310.72 sec	(21.8453 m ; 0.364 hr)
	EVERY 4 FRAMES	5,242.88 sec	(87.3813 m ; 1.4563 hr)
	EVERY 32 FRAMES	41,943.04 sec	(699.0506 m ; 11.6508 hr)
	EVERY 64 FRAMES	83,886.08 sec	(1398.1013 m ; 23.3016 hr)
TEST PATTERN LOAD TIME		163.84 sec (2.7306m)	40.96 sec (0.6826m)
MEMORY READOUT TIME			
	ONE READOUT	163.84 sec (2.7306m)	40.96 sec (0.6826m)
	FOUR READOUTS	655.36 sec (10.9224m)	163.84 sec (2.7306m)

Figure 2



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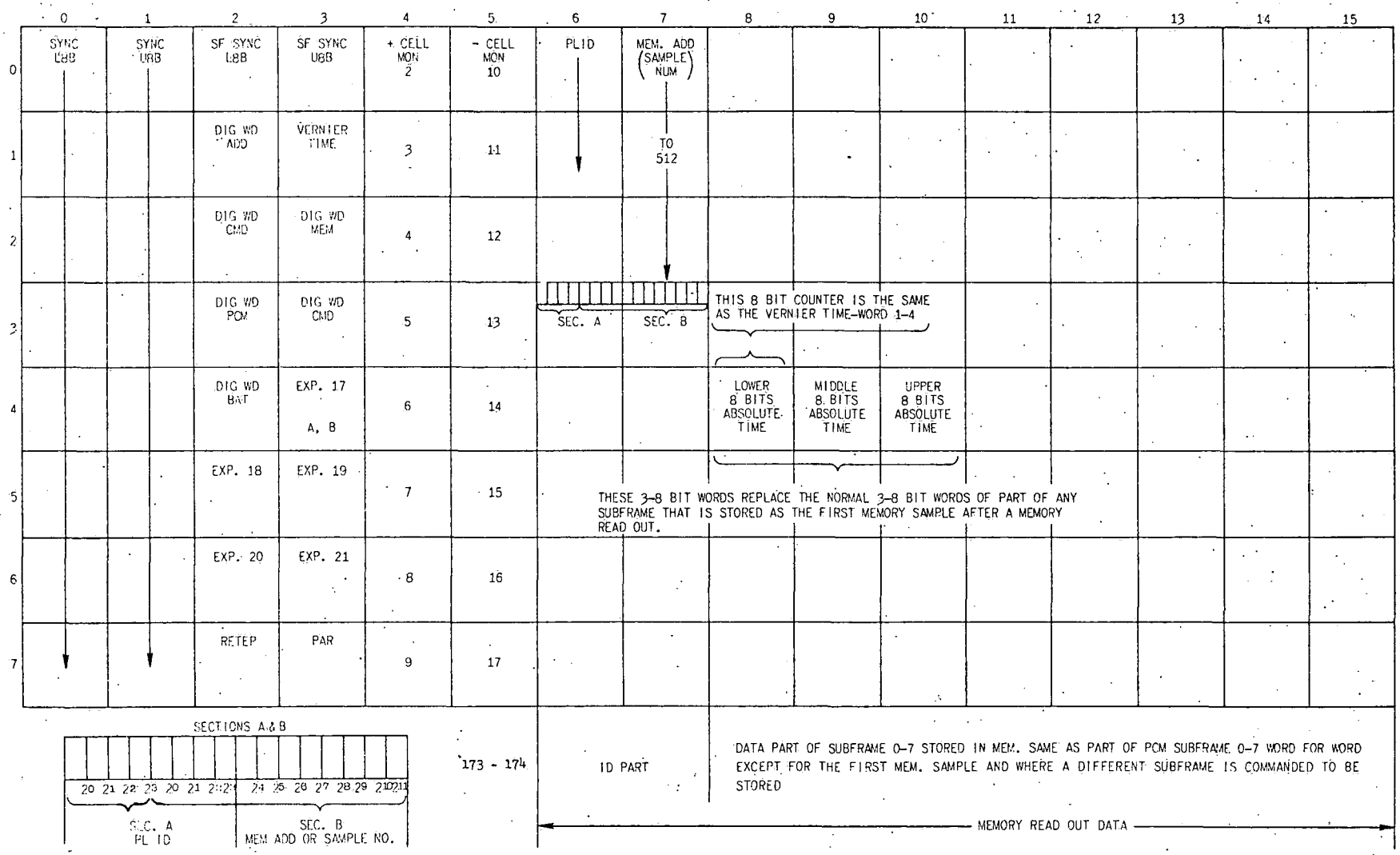

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	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	SYNC L6B 1110 1011	SYNC U8B 1001 0000	SF SYNC L8B 0001 0100	SF SYNC U8B 0110 1111	+ CELL MON. 2	- CELL MON. 10	DIG WD EXP 1	DIG WD EXP 2	+ BATT V ABSTIM	- BATT V ABSTIM	RW TACH ABSTIM	MAG X	MAG Y	MAG Z	DIG WD ADCOLE A	DIG WD ADCOLE B
1			DIGITAL WORD ADD	VERNIER TIME	+ CELL 3	11	DIG WD EXP 3	DIG WD EXP 4	5V CAL	REC 1- AGC	REC 2- AGC	BOOM LENGTH	+ CELL MON 1	- CELL MON 18	DIG WD SPRO	DIG WD SPRO
2			DIG WD CMD	DIG WD MEM	4	12	5 A, B	6 A, B	TEMP 19 SCP	TEMP 24 BAT BYP	PRESS TH 1 CONTROL	PRESS TH 2 CONTROL	DL TIMER CMD 1	DL TIMER CMD 2	DIG WD BOOM CTL	DIG WD RW CTL
3			DIG WD PCM	DIG WD CMD	5	13	7 A, B	8 A, B	+ SEC V MON	- SEC V MON	TEMP 2 PKG.	TEMP 15 SCP 1	TEMP 3 + SEC BATT	TEMP 4 - SEC BATT	DIG WD THRUSTER CTL	SPARE
4			DIG WD BAT	SPARE	6	14	9 A, B	10 A, B	+ BAT V	- BAT V	TEMP + BAT T 25	TEMP - BAT T 26	+ CHG 1	+ DISC 1	- CHG 1	- DISC 1
5			RED DIG WD SAME AS 1-2	RED DIG WD SAME AS 2-2	7	15	11 A, B	12	TEMP + BAT T 25	TEMP - BAT T 26	TEMP 10 HC 1	TEMP 16 SCP 2	TEMP 20 S TUBE	TEMP 21 BAT 3	TEMP 22 CHG CTL	TEMP 23 V CTL
6			DIG WD EXP 17	DIG WD EXP 17	8	16	13 A, B	14 A, B	TEMP 8 SKIN 1	TEMP 9 SKIN 2	TEMP 17 INNER SC 2	TEMP 12 B BAND	TEMP 13 INR. SC 1 NON STD	TEMP 14 OUTR. SC NON STD	+ SC CHG 1 MON	- SC CHG 1 MON
7			DIG WD EXP 17	DIG WD PAR	9	17	15 A, B	16	TEMP 5 TANK	TEMP 6 NOZ 1	TEMP 7 RW 2	TEMP 18 BB SC 2	TEMP 11 DL BOOM	TEMP 1 PCM PK	PRESS TH 2 PLENUM	PRESS TH 1 PLENUM

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	SYNC L8B 1110 1011	SYNC U8B 1001 0000	SF SYNC L8B 0001 0100	SF SYNC U8B 0110 1111	+ CELL MON. 2	- CELL MON. 10	DIG WD EXP 1	DIG WD EXP 2	+ BATT V ABSTIM	- BATT V ABSTIM	RW TACH ABSTIM	MAG X	MAG Y	MAG Z	DIG WD ADCOLE A	DIG WD ADCOLE B
1			DIGITAL WORD ADD	VERNIER TIME	+ CELL 3	11	DIG WD EXP 3	DIG WD EXP 4	5V CAL	REC 1- AGC	REC 2- AGC	BOOM LENGTH	+ CELL MON 1	- CELL MON 18	DIG WD SPRO	DIG WD SPRO
2			DIG WD CMD	DIG WD MEM	4	12	5 A, B	6 A, B	TEMP 19 SCP	TEMP 24 BAT BYP	PRESS TH 1 CONTROL	PRESS TH 2 CONTROL	DL TIMER CMD 1	DL TIMER CMD 2	DIG WD BOOM CTL	DIG WD RW CTL
3			DIG WD PCM	DIG WD CMD	5	13	7 A, B	8 A, B	+ SEC V MON	- SEC V MON	TEMP 2 PKG.	TEMP 15 SCP 1	TEMP 3 + SEC BATT	TEMP 4 - SEC BATT	DIG WD THRUSTER CTL	SPARE
4			DIG WD BAT	EXP 17 A, B	6	14	9 A, B	10	+ BAT V	- BAT V	TEMP + BAT T 25	TEMP - BAT T 26	+ CHG 1	+ DISC 1	- CHG 1	- DISC 1
5			EXP 18	EXP 19	7	15	11 A, B	12	TEMP + BAT T 25	TEMP - BAT T 26	TEMP 10 HC 1	TEMP 16 SCP 2	TEMP 20 S TUBE	TEMP 21 BAT 3	TEMP 22 CHG CTL	TEMP 23 V CTL
6			EXP 20	EXP 21	8	16	13 A, B	14 A, B	TEMP 8 SKIN 1	TEMP 9 SKIN 2	TEMP 17 INNER SC 2	TEMP 12 B BAND	TEMP 13 INR. SC 1 NON STD	TEMP 14 OUTR. SC NON STD	+ SC CHG 1 MON	- SC CHG 1 MON
7			RETEP	PAR	9	17	15 A, B	16	TEMP 5 TANK	TEMP 6 NOZ 1	TEMP 7 RW 2	TEMP 18 BB SC 2	TEMP 11 DL BOOM	TEMP 1 PCM PK	PRESS TH 2 PLENUM	PRESS TH 1 PLENUM

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I.4. POWER SUPPLY SYSTEM

170 SERIES POM
POWER SUPPLY SYSTEM

1. The power supply system consists of power source and power conditioning. The power source is composed of rechargeable batteries and solar cell array. The power conditioning consists of charge control, voltage control, battery select, trickle charger, battery bypass, battery bypass voltage control, battery bypass inhibit logic and undervoltage system.

2. Power Source -

a. Battery - There are two battery packs; primary and secondary.

Number of cells - 18

Cell capacity - 5 ampere hours (F-size)

Cell type - Cylindrical - nickel - cadmium employing polypropolene separators

Cell resistance - .01 ohms

Maximum charging rate - .85 amps

Maximum permissible cell voltage - 1.55 volts

Nominal pack voltage - ±12v

Maximum voltage excursion - ±10v to ±14v

Typical voltage excursion - ±11v to ±13v

Maximum depth of discharge (PLUS) - 9.5%

The primary battery pack has a cylindrical form factor (7" DIAM x 6" HIGH), weighs 12.5 lbs. and is located in the lower support tube. The secondary pack has a rectangular form factor (6.5" x 4.5" x 8" HIGH), weighs 14.3 lbs. and is located on the top honeycomb. Each pack is instrumented with two to three temp. sensors.

b. Solar cell array - The solar cell array consists of 40 body mounted panels and one paddle.

Type	No. of Panels	Strings per Panel	Cells per String	Cell Size (CM)
Small Trapezoid	16	2	32	1 x 2
Large Trapezoid	20	3	32	1 x 2
Rectangular Belly Band	4	2	32	2 x 2
Rectangular Paddle	1	12	32	2 x 2
Total Strings	1 x 2 2 x 2	92 20		

Each string of 2 x 2 cm cells develops 110 ma; each string of 1 x 2 cm cells develops 50 ma. The strings are assigned to the plus or minus side of the line to produce the following:

CONDITION	ma per String	+12 v		-12 v		TOTAL	
		MA	WATTS	MA	WATTS	MA	WATTS
Available power, min. sun	50 & 110	710	8.52	530	6.36	1240	14.88
Available power, max. sun	50 & 110	800	9.6	620	7.44	1420	17.04
Peak power (min sun)	50 & 110	1230	14.76	980	11.76	2210	26.52
Max Peak power (min sun)*	60 & 120	1476	17.71	1176	14.11	2652	31.82
Typical load (TM & RW)		383	4.6	238	2.86	621	7.45
Typical load (TM &RW & EXP.)		724	8.69	509	6.1	1234	14.8

* If solar cells run cool, their output could increase from 50 to 60 ma and 110 to 120 ma.

3. Power conditioning system -

This system controls the maximum charge rate of the battery, the maximum line voltage, provides a solar cell only mode of operation (battery bypass) and unloads the line and selects the secondary battery in the event of low voltage. Monitors are provided for Solar cell current, primary battery charge and discharge current, primary battery individual cell voltage, secondary battery voltage, line voltage, battery temp, solar cell temp, charge control and voltage control heat sink temp.

a. Parameters -

Max charge rate (LO charge) - 200 ma

Max charge rate (HI charge) - 850 ma

Max voltage (Batt Byp Off) - ± 13.8 volts

Max voltage (Batt byp On) - ± 13.0 volts

Undervoltage activation - ± 9 volts

b. Charge Control - This system is designed to limit the maximum charge rate to the primary battery. Two command selectable charge rates limit the current to 200 ma (Lo Charge) or 850 ma (Hi Charge). See curves Nos. 7 and 8. The low charge rate is recommended for the max sun orbit. The operation is as follows: Consider max sun, low charge. The solar cells will supply the current to the load and charge the battery. When the charge rate equals 150 ma, the charge control will start shunting current into the charge control heat sink. This is a proportional control - the higher the charge rate the higher the shunt current. When the charge rate equals 200 ma, the shunt current will be saturated at 900 ma. In

minimum sun, the high charge rate is used. When the charge rate equals 800 ma, the charge control starts shunting current into the charge control heat sink. Since the maximum possible solar cell current is 1.47 amps (+ side), it is not possible to saturate the charge control in the high charge mode. Note the following about the charge control system:

(1) The charge current monitor provides the control signal to the charge control.

(2) The charge current monitor receives its power from the HK sensors ON-OFF relay and therefore, the HK sensors must be on for charge control to operate.

(3) The charge current monitor is provided on the primary battery only; therefore, when secondary battery is selected, there will be no automatic charge control. The charge current into the secondary battery will have to be controlled by adjusting the load.

(4) The charge control on the plus and minus side of the line operate independently.

c. Voltage Control - This system is designed to limit the line voltage to $\pm$ 13.8 volts. It is turned on at the same time as the charge control. When the line voltage reaches 13 volts, the voltage control starts shunting current into the voltage control heat sink. At 13.8 volts, the voltage control is saturated and approximately 1 amp is flowing in the shunt. Note the following about the voltage control:

(1) The voltage sensor provides the control signal to the voltage control.

(2) The voltage sensor receives its power from the HK sensors ON-OFF relay and therefore, the HK sensors must be on for the voltage control to operate.

(3) The voltage control will operate on the primary or secondary battery.

(4) The voltage control is on the line during Battery Bypass operation but will not conduct since the Battery Bypass voltage control is set for a lower voltage.

d. Battery Bypass - This system provides a solar cell only mode of operation, where the battery is taken off the line. A bank of capacitors provides a low impedance source and a shunt regulator (Battery Bypass voltage control) controls the voltage between 12.5 and 13 volts. The Battery Bypass enable provides an alternate method of putting the battery back on the line. Both of these ON commands require ordnance enable. Since a high current load could cause the line voltage to drop, a circuit is provided to inhibit the thruster heaters on command, if either the Battery Bypass or the Battery Bypass Enable relays are on. Also, if the Battery Bypass or the Battery Bypass Enable on commands are sent while the heaters are on, the heaters will be automatically turned off. The following table summarizes the Battery Bypass operation.

Please note as per Jim Winkler that Batt Bypass and Batt Bypass enable are in series. The battery is not Truly bypassed unless you have both. This would then explain the underlined sentence in the above para.

Condition -	Battery Bypass	Battery Bypass Enable	Thruster Heaters
Normal-Battery on line	OFF	OFF	ON or OFF as desired
Normal-battery on line	OFF	ON	Cannot be turned on
Battery on line; capacitor bank on line; Battery Bypass voltage control limits line voltage to 13 volts	ON	OFF	Cannot be turned on
Battery off line (on trickle charge); capacitor bank on line; voltage control limits voltage to 13 volts *	ON	ON	Cannot be turned on

* Obviously, if the spacecraft moves into eclipse, all power will be removed from the line.

e. Battery Select - A relay is provided for each side of the line and can be commanded individually to select Primary Plus Battery or Primary Minus Battery and Secondary Plus Battery or Secondary Minus Battery. Four trickle charge circuits are provided to charge each stack when it is off line. The trickle charge rate is 30 ma. The battery, which is on line, is charged directly from the line. Note that in the dark, the battery with the highest potential will charge the other side.

f. Undervoltage System - If either the plus or minus line voltage drops to 9 volts or below, this system will generate a signal which turns off the Reaction Wheel, and the thruster heaters selects both secondary batteries, and resets the experiment. The primary batteries can then be monitored using the cell monitor system on PCM TM. If the plus or the minus batteries are OK, they can be commanded back on the line individually. If not OK, they can be allowed to trickle charge at the 30 ma rate. If the undervoltage circuit is malfunctioning, it can be commanded off.

g. Cell Monitor - In addition to telemetering the total voltage of the primary battery, each individual cell is monitored in both the primary positive and negative package. A 16 Channel differential input commutator that is controlled by the PCM telemetry system monitors the cells of the primary pack placing the data in Words 4 and 5 of each PCM frame. The differential amplifiers for the plus pack and the minus pack both have a gain of 3; thus, the maximum cell voltage when monitored will be 3×1.55^{V}. The cell monitor commutator and it's associated electronics have been designed such that no single component failure can cause it to load or short out a cell in the pack. The remaining two cells in the pack are monitored directly and appear on Words 1-12 and 1-13 of the PCM system. The individual cells are monitored so that it can be determined, whether or not an individual cell might be losing capacity or the entire pack might be down.

I.5. REACTION WHEEL SYSTEM

REACTION WHEEL SUBSYSTEM

1. The "Reaction Wheel" is a motor driven flywheel that provides the third axis of stability to the payload. While the gravity gradient boom provides roll and pitch stability, the Reaction Wheel provides yaw stability required for thrusting and satellite pointing.

2. The Reaction Wheel Subsystem consists of the "Reaction Wheel", a "Power Amplifier" and a 'Control' unit. The Reaction Wheel is a 400 Hz motor driven flywheel with a tachometer attached to the rotor shaft. The "Power Amplifier" provides the 400 Hz AC power to the "Reaction Wheel" under the supervision of the "Control" unit. The 'Control' unit measures the angular speed of the Reaction Wheel motor from information derived from the Reaction Wheel tachometer, decides whether the speed is less than or greater than a preprogrammed value and then commands the 'Power Amplifier' to deliver power to the "Reaction Wheel" motor if the speed is too low or not to deliver power if the speed is too high.

3. The electronic units of the subsystem, i.e., the control unit and power amplifier are completely redundant. Furthermore, the Primary Control Unit can control the Secondary Power Amplifier and the Secondary Control Unit can control the Primary Power Amplifier. There is only one "Reaction Wheel."

4. The status of the Reaction Wheel Subsystem located on Channel 7, Segments 29, 30, 31, and 32, of the analog telemetry are as follows:

a. Segment 29 indicates whether the subsystem is ON or OFF and in what direction the sheel will rotate if the system is turned on.

b. Segment 30 indicates which control unit and which power amplifier is in use.

c. Segment 31 indicates whether the Digital Speed Monitor (See PCM) is ON or OFF.

d. Segment 32 gives an analog value of the speed (See RW Tachgraph)

5. A more complete view of the status of the 'Reaction Wheel' Subsystem can be obtained from Words 0-10, 7-10, 2-15, 1-15, and 1-14, of the PCM format.

a. Word 0-10 contains the same information that Channel 7, Segment 32 of the analog telemetry contains, i.e., Reaction Wheel Speed (See RW Tach Curve). Nominal speed is 800-1000 RPM, any other speed should sound an alarm.

b. Word 7-10 contains the temperature of the Reaction Wheel bearings (See RW Bearing Temperature Curve). If this information indicates that the bearings are $5^{o}C$ warmer than the immediate surroundings, action should be taken to determine if there is bearing wear and methods of preventing further wear.

c. Word 2-15 contains the commanded status of the subsystem.

(1) Bit 1 (LSB) indicates that the Digital Speed Monitor (Words 1-15 and 1-14 and Bit 6 of Word 2-15 are capable of giving true information) is ON or OFF.

(2) Bit 2 indicates if the Reaction Wheel Subsystem is ON or OFF.

(3) Bit 3 indicates the direction that the wheel should rotate in, if the subsystem is ON.

(4) Bit 4 is NOT used.

(5) Bit 5 indicates which control unit is in use.

(6) Bit 6 indicates the actual direction of rotation of the wheel (if the following conditions are met: 1. The Reaction Wheel Subsystem is ON and, 2. The Speed Monitor is ON). Bits 3 and 6 of Word 2-15 should be identical. The only normal case when they can differ (given that the subsystem and speed monitor are ON) is if the wheel were rotating in one direction and the command to change the direction of rotation was sent. Bit 3 would change upon receipt of the command and Bit 6 would only change when the wheel had stopped rotating in the original direction and started rotating in the new direction.

(7) Bit 7 is NOT used.

(8) Bit 8 indicates which power amp is in use. NB This information is only accurate when the Reaction Wheel Subsystem is ON.

Words 1-14 and 1-15 contain the deviation of the reaction wheel speed from the desired preprogrammed speed and a random reset pattern.

a. Word 1-15, Bit 6 contains the sign of the deviation while Bits 5

through Bit 1 contain the MSB of the deviation through the least significant bit of deviation available in this Word. That is, Bit 5 of Word 1-15 contains the MSB or Bit 14 of the deviation and Bit 1 of Word 1-15 contains Bit 10 of the deviation.

b. Word 1-15 contains Bit 9 of the deviation through Bit 2 of the deviation in Bit 8, the MSB,of Word 1-14 through Bit 1 of Word 1-14. Bit 1 of the deviation or the least significant bit of the deviation is not sent back.

c. Conditions a. and b. are only valid when a Reset Pattern is not present. A Reset Pattern appears below where a

Light = 1 No light = 0

(Word 1-15 Bits 6 through 1) 100111

(Word 1-14 Bits 8 through 1) 00101011

When a Reset Pattern occurs, it may be ignored unless there is a gross change from the nominal speed. If a gross change in speed occurs and a continuous Reset Pattern or any other non-changing pattern occurs, a failure within the Reaction Wheel Subsystem has occurred.

I.6. GRAVITY GRADIENT SYSTEM

170 SERIES POM
GRAVITY GRADIENT SYSTEM

1. The Gravity Gradient system consists of two redundant micro-thrusters, a 60 foot extendable boom, and a magnetically anchored eddy-current damper.

2. Thruster System - The Thruster System provides very low thrust for payload station keeping. There are two redundant systems: Thruster 1, and Thruster 2. These two systems share a common spherical tank five inches in diameter which contains one (1) lb of anhydrous ammonia. Each thruster system consists of a pulse valve, a plenum, a control pressure transducer, a potentiometric transducer, a controlled orifice, a latch valve, a porour plug and a nozzle. Temperature sensors are provided for the tank and the two nozzles. A high intensity heater is provided for each nozzle to improve the specific impulse of the fuel. A control circuit compares the output of the control x-ducer to one of two command selectable levels and controls the opening and closing of the pulse valve.

a. Parameters -

Thrust levels: LO Thrust - 10 micro-lbs
LO Thrust with heat - 10 micro-lbs
HI Thrust - 35 micro-lbs
HI Thrust with heat - 32 micro-lbs

Pressure x-ducers (control & potentiometric) - 50 PSI full scale = 5 volts

Control Pressure x-ducer power - .48 watts (20 ma @ 24 v)

Control Levels: LO Thrust - Pulse valve opens at 2v (20 PSI)
Pulse valve closes at 2.3v (23 PSI)
HI Thrust - Pulse valve opens at 4v (40 PSI)
Pulse valve closes at 4.3v (43 PSI)

Heater Power LO Thrust - 4 watts (166 ma @ 24v)
HI Thrust - 5 watts (208 ma @ 24v)

Pulse Valve Power - 3 watts (125 ma @ 24v)

Latch Valve Power - 8 watts (333 ma @ 24v)

Thruster 1 nozzle is located on Panel 12 and faces forward.

Thruster 2 nozzle is located on Panel 6 and faces Aft.

b. List of Command -

(1) Thruster 1 ON; Thruster 1 Heater ON:
Thruster 1 Latch Valve OPEN - 0010JL*

(2) Thruster 2 ON: Thruster 2 Heater ON:
Thruster 2 Latch Valve OPEN - 0110JL*

(3) Thruster 1, 2, OFF;
Thruster 1, 2, Latch Valve CLOSED - 0111JL*

(4) Thruster 1, 2, Heaters OFF - 0101JL*

(5) Low Thrust - 0001JL*

(6) High Thrust - 0000JL*

(7) Thruster Manual Cycle - 0011JL*

* Ordnance Enable required.

c. Operation (Refer to enclosed drawing "Thruster Functional Diagram") - When the system is first turned on, the latch valve opens and a relay applies power to the control x-ducer, the control electronics and the power gate for

the pulse valve. The output of the comparator is clamped for 30 milliseconds to allow the control x-ducer to stabilize and prevent the pulse valve from opening. The x-ducer output is less than the reference (no pressure in plenum) so the comparator turns on. After 30 ms., the clamp is released and the pulse valve opens. Liquid or gaseous ammonia flows into the plenum. This pressure is sensed by the control x-ducer and its output rises. When the output equals the reference voltage, the comparator turns off closing the pulse valve. This all occurs in approximately 20 ms for liquid service and as high as 150 ms for gas service. The pressure in the plenum is now allowed to bleed off through the porous plug and nozzle providing micro-pounds of thrust. After approximately 40 to 120 seconds, the pressure in the plenum has decreased to the lower trip point of the comparator (hysterisis equals approximately 0.3 volts or 3 PSI.) and the comparator turns on, opening the pulse valve and starting the cycle again. Note that the 30 ms clamp only occurs when power is first applied to the system. The Thruster ON command is also applied to the Thruster Heater Relay (as long as the Battery Bypass logic does not inhibit it) which turns on the heater. If it is not desired to have the heater on, the Thruster Heater OFF command must be sent. This turns off both heaters. Commanding High or Low thrust changes the reference of the comparator and allows the pressure to be high or low. (See Parameters, Section 2a.). The thrusters OFF Command turns off both thrusters and closes both latching valves.

3. Gravity Gradient Boom - A sixty foot extendable boom with a magnetically anchored eddy-current damper mounted at the end provides gravity gradient stability in two axis (pitch and roll). A reaction wheel (discussed in another Section) provides stability in the third axis (yaw). The boom can be retracted to a 20 foot length (defined as the "mid Position") which is optimum for a pitch axis change from "up" to "down". A boom control circuit applies power to the boom motor; senses when the boom reaches the "mid" position, and turns the boom motor off. Full retract and full extension switches are provided to interrupt boom power. The boom motor drives a potentiometer, the output of which is the analog of boom length.

a. Parameters -

Boom Mechanism Manufacturer - Spar Aerospace

Boom Length - 60'

Boom "mid" Length - 20'

Boom Motor - Manufacturer - Clifton

Type - 28v DC

Current - 150 to 250 ma @ 12v

Stall Current - 830 ma @ 12v

Extension Voltage - +12v

Retraction Voltage - -12v

Boom Motor Filter- 2 Section PI Filter

Boom Element - Silver coated, beryllium cooper, $\frac{1}{2}$" Diam, interlocked bi-stem

b. Commands -

Boom Motor ON; GG Boom Release	1100JK*
Boom Motor OFF	1101JK
Boom Motor IN	1110JK
Boom Motor OUT	1010JK

* Ordnance Enable required

c. Operation - Once the payload has separated from the vehicle, an ordnance arm switch actuates and enables the GG Boom release command to be sent. The boom motor "out" command is sent. The GG Boom Release command, when issued, actuates a relay which applies power to two double bridge wire bolt cutters. These cutters release the clamp holding the damper in place. The clamp, in turn, releases the GG Boom Release switches which apply power to the motor and begin to drive the boom out. The boom length indicator can be monitored during the extension. When the boom extends past the "mid" position, the boom control circuit, which employs a comparator, will reset and be ready to actuate when the boom is retracted. The boom will continue to extend and at 60 feet, the full extension switch will actuate and interrupt power to the motor. The boom motor "off" command can now be sent.

When it is desired to perform the pitch-flip maneuver, the boom "in" command is sent followed by the boom "on" command. The boom will retract to the "mid" position. At that time, the comparator, using the boom length indicator potentiometer and a fixed reference, will generate a boom "off" command. Since in a pitch-flip maneuver the next step is to re-extend

the boom, the boom "out" command is sent. After a given coast period, the boom "on" command is sent and the boom extends to 60 feet again. If, at the "mid" position, it is desired to fully retract the boom, the boom "on" command can be sent. When full retract position is reached, the full retract switch will interrupt the power to the motor.

I.7. ORDNANCE SYSTEM

170 SERIES ORDNANCE SYSTEM

1. There are eight double bridge wire cutters.

They are as follows:

1. TM ANT REL CUT 1
2. TM ANT REL CUT 2
3. DL BOOM REL CUT 1
4. DL BOOM REL CUT 2
5. GG BOOM REL CUT 1
6. GG BOOM REL CUT 2
7. DL BOOM ARRAY CUT 1
8. DL BOOM ARRAY CUT 2

2. Sequence of events - There are two banks of switches. Each one has an "ordnance arm" switch which puts +12v to the ordnance box after separation. A single "ant release sep switch" mechanically coupled with one of the ord arm switches dumps a charged capacitor into the driver of the ordnance separation timer start circuit. This timer has a duration of five minutes minimum. When it times out, it dumps the charge of a capacitor into the drivers of two relays. Each relay fires one bridge wire in the TM ANT REL CUT, DL BOOM REL CUT and the DL BOOM ARRAY CUT. This will release the TM antennas and the DL BOOM. The DL boom array uses 16 sec. delay cutters and will release after the DL boom is deployed

and locked in place. One other bridge wire in each cutter is fired by two relays which are actuated by command. If the timer circuit works, this command will not be necessary. A final relay operated by command fires the GG Boom release cutters. All commands require ordnance enable.

I.8. THERMAL SYSTEM

Satellite Thermal Design

A thermal study and design is made on NRL satellites to provide a suitable temperature environment for the electronic components and external surfaces of the satellite structure in orbit. Analytical methods have been devised and used in making this thermal study.

The thermal design of the satellite is performed "in house" with the use of six computer programs. Temperature predictions are based on a mathematical model which consists of a series of interconnected isothermal nodes. This model represents the geometry, heat transfer paths and thermal characteristics of the flight payload. The relationship between nodes regarding thermal conduction and radiative interchange is determined and an energy balance for each node of the thermal model is developed and solved by the main heat transfer program. Other programs which determine thermal input, shading, radiative interchange, etc. are used to support the main program.

The internal temperature of the satellite is generally restricted to 0° and $40^{\circ}C$. This can usually be achieved by passive temperature control whereby all thermal precautions are made during prelaunch. Using passive means for controlling the temperature of the satellite increases reliability since there is no dependence on mechanical components, thermal power, and thermo-electric devices.

The principal means of controlling the spacecraft temperatures are by the absorbed and emitted radiation energy and internal power. Most important consideration in establishing shell temperature is the solar absorbitivity (α) and emissivity (ϵ) of the shell. As a result passive thermal control can be achieved by thermal coatings and finishes, and the selection and optimization of conduction paths.

Materials and methods commonly used for temperature control of NRL satellites are thermal control points, special finishes, aluminized and silverized teflon for low α/ϵ values, interference coatings (black mirror) for high α/ϵ values, silicon monoxide coatings, thermal tapes, thermal grease at mechanical interfaces, and super insulation.

In future applications active temperature control may be required for some components. As a result investigations are being conducted in the use and application of louvers, heat pipes, thermal electric devices, and phase change materials.

A thermal vacuum facility is available for thermally testing satellites in a space environment. By using a motion simulator and solar simulation tests can be programmed to simulate both the maximum and minimum sun orbital conditions. These tests can be used to check out satellite components under a thermal vacuum environment and to confirm or corroborate temperature predictions of the mathematical model. They are useful in determining thermal time constants in transient heating and temperature gradients in the satellite.

170 Series - Thermal Design

The 170 Series satellites, except as noted later, have the same basic configuration as Exp 162 launched in Sept. 1969. Except for several specific problem areas such as the battery pack and solar panels Exp 162 satellite temperatures were in the designed operating range. The main honeycomb mounting panel and associated electronic equipment temperatures varied between 13°C and 42°C during minimum and maximum sun orbits. As a result no major changes in multiface satellite thermal design were made in the 170 Series satellites.

Passive means have been used in controlling the temperature of the multiface satellite. This is achieved by proper selection of thermal coatings and finishes and optimizing conduction paths. In the 170 Series this has been accomplished by the proper area ratio of silicon monoxide coated and polished aluminum surfaces. Optimization of conduction paths was achieved by using thermal grease and Berlon at critical interfaces. Several exterior changes and additions have been made to the 170 Series satellites. The exterior configuration of the satellites is similar to Exp 162 except for the installation of a 7" x 25" solar paddle on the top shell and the addition of 4 solar panels on the equatorial band and 4 small trapezoid solar panels on the bottom shell. These additions to the external configuration will have some effect on the average maximum, minimum temperatures of the satellite; however, a complete thermal study using a mathematical model would be required to determine the actual effect. Preliminary basic calculations and thermal analysis were made and it was decided that this study would not be necessary.

The following special thermal control procedures were used on the 170 Series satellites.

1. Exp 171, 172, 173 Battery Packs - Ceramic discs were cemented to the bottom of each cell with Berlon to provide a high conductance path to the heat sink surface. Thermal grease was used at all joints.

Exp 174 Battery Pack - Cell mounting plate was anodized and ceramic disc omitted.

2. Solar Panels - The following steps were taken to lower operating temperature of solar cells.

a. External surface of substrate was coated with Dow Corning Thermal Control Coating to lower solar absorptance.

b. Inside surface of panel was painted with 3M Black Velvet Coating to increase internal radiation.

c. Thermal grease was used between mounting flange and satellite skin to increase thermal conductivity.

3. RF Boom - Antenna Assembly - Driven Element. This package will tend to run cold. To neutralize the effect of gold plating on exterior surfaces during the maximum sun orbit the nylon antenna spacer plate attached to the bottom surface of the package was painted with Dow Corning Thermal Control Coating.

4. RF Packages - Thermal grease applied to joint between package and honeycomb mounting panel.

BY_____ DATE_____ SUBJECT EXP 171 SHEET NO. 1 OF 6
CHKD. BY_____ DATE_____ TEMPERATURE SENSORS JOB NO._____

SUB COMM INPUT	GROUP	FUNCTION	COMMENT	FIGURE
1	7	PCM. PKG. TEMP.		
2	3	PKG. TEMP.		
3	3	+ SECONDARY BATTERY TEMP.		3
4	3	- SECONDARY BATTERY TEMP.		3
5	7	THRUSHTER TANK TEMP.		
6	7	" 1 NOZ. "		
7	-	" 2 NOZ. "		
8	6	UPPER FRAME TEMP 1		1, 4
9	6	UPPER FRAME TEMP 2		1
10	5	HONEYCOMB TEMP.	ABOVE PRIMARY BATTERY PK.	3
11	7	DL BOOM TEMP.	LOCATED ON HYBRID ENCLOSURE	7
12	6	EQUATORIAL BAND TEMP		2
13	6	SOLAR PANEL TEMP 1	LOCATED ON SOLAR CELL	1, 4
14	6	SOLAR PANEL TEMP 2		1, 4
15	3	SOLAR PADDLE TEMP 1	LOCATED ON SIDE FACING MAG. BOOM	5, 7
16	5	PLATE ON MTG FLANGE		1, 2, 3
17	6	SOLAR PANEL TEMP 3		1, 4
18	7	SOLAR PANEL TEMP 1 EQ. BAND		1, 2, 6
19	2	SOLAR PADDLE TEMP 2		5, 6
20	5	SUPPORT TUBE TEMP	ADJACENT TO BATTERY PK.	3
21	5	BATTERY TEMP 3	BOTTOM OF CELL	3
22	5	CH CON H.S. TEMP		
23	6	VOLT CON. H.S. TEMP		
24	2	BATT. BYP " "		

TEMP (MAIN FRAME)

A	(4)(5)	+BATTERY TEMP.		3
B	(4)(5)	- BATTERY TEMP.		3

BY_____ DATE_____ SUBJECT EXP 171 SHEET NO. 2 OF 6

CHKD. BY_____ DATE_____ TEMPERATURE SENSOR LOCATION JOB NO._____

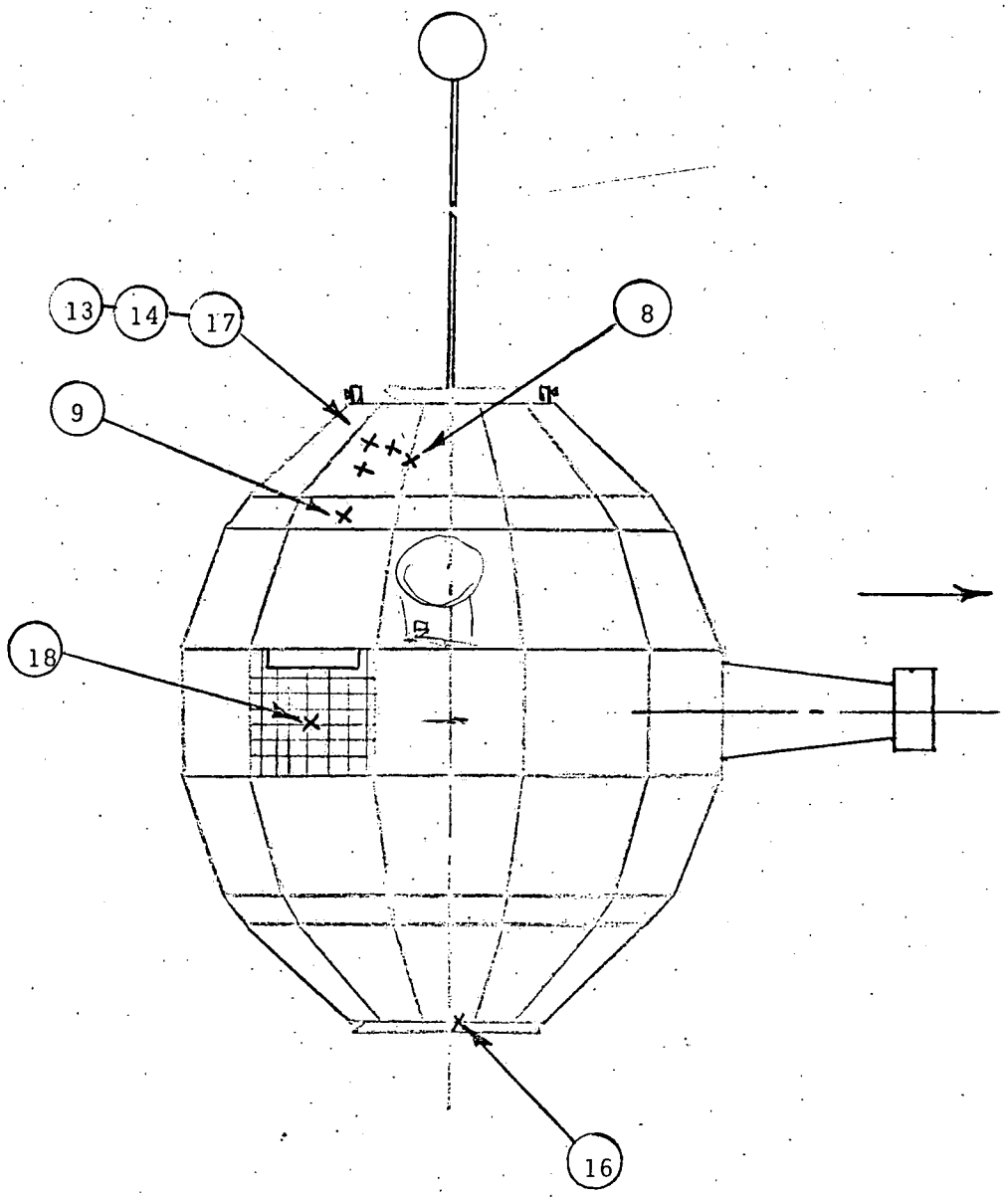


FIG 1

SOLAR PADDLE & RF BOOM
OMITTED FROM THIS VIEW

BY_____ DATE_____ SUBJECT EXP 171 SHEET NO. 3 OF 6

CHKD. BY_____ DATE_____ TEMPERATURE SENSOR LOCATION JOB NO._____

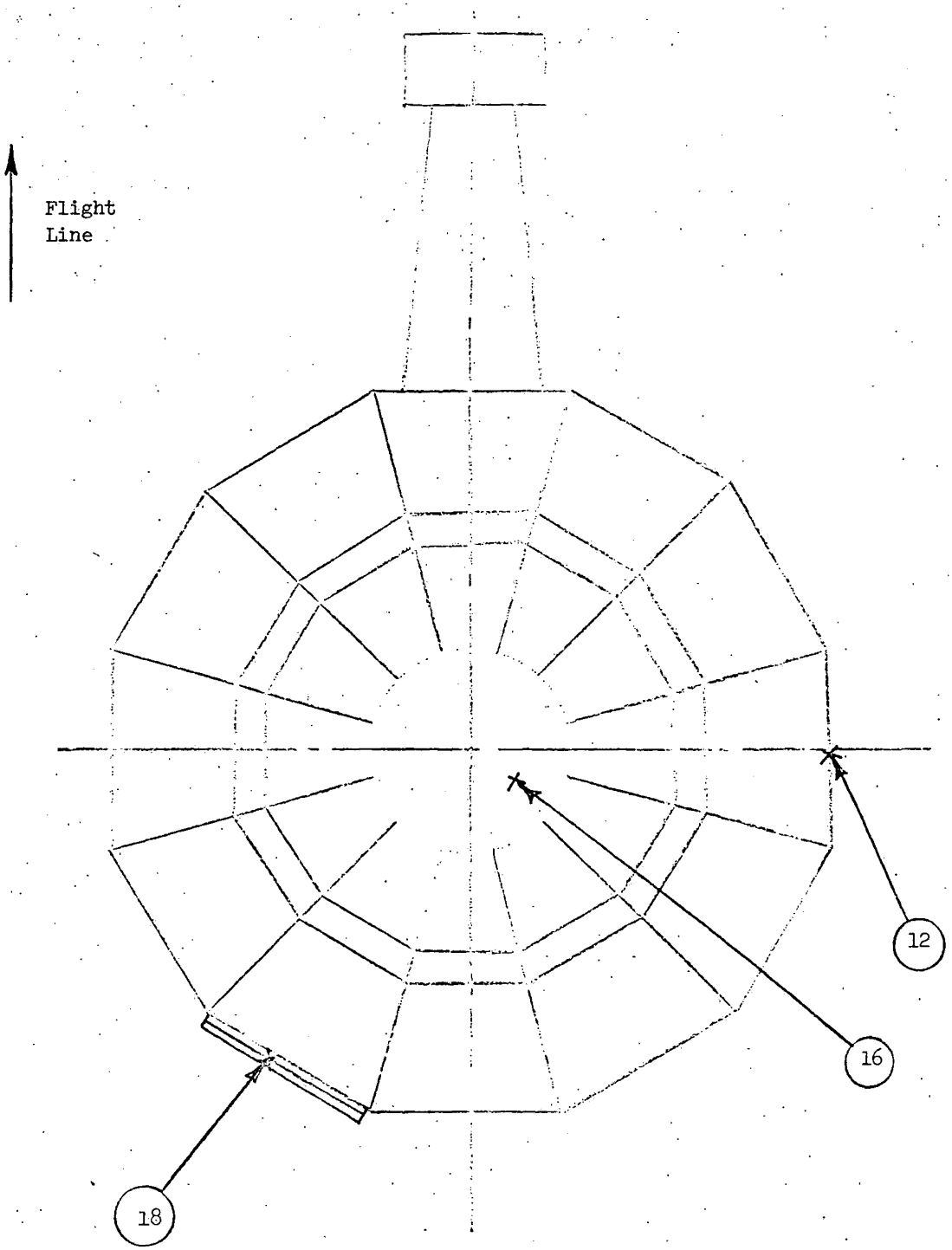


Fig. 2

Lower Skin

BY_____ DATE_____ SUBJECT EXP 171 BATTERY PACKS TEMPERATURE SENSOR LOCATION SHEET NO. 4 OF 6

CHKD. BY_____ DATE_____ JOB NO._____

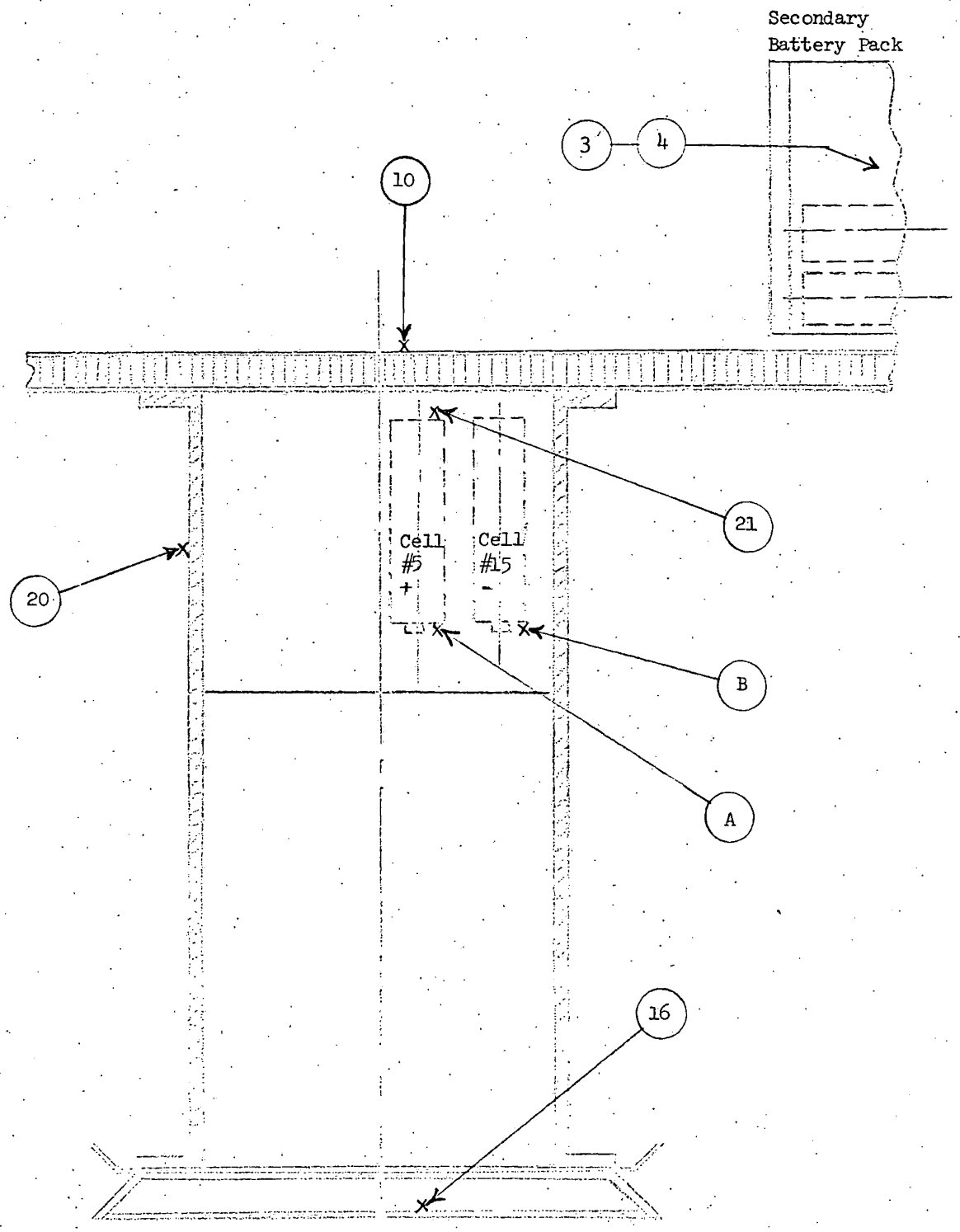


Fig. 3

BY_____DATE_____ SUBJECT SOLAR PANELS SHEET NO. 5 OF 6
CHKD. BY_____DATE_____ TEMPERATURE SENSOR LOCATIONS JOB NO._____
EXP 171

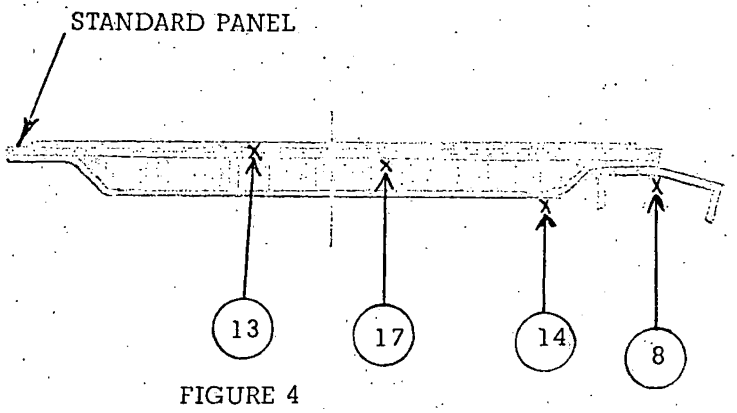
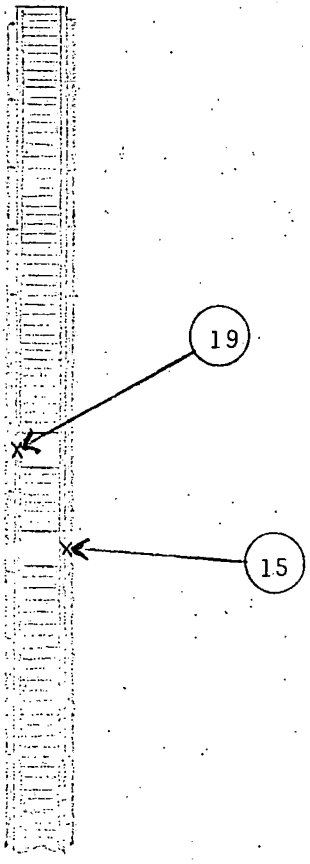
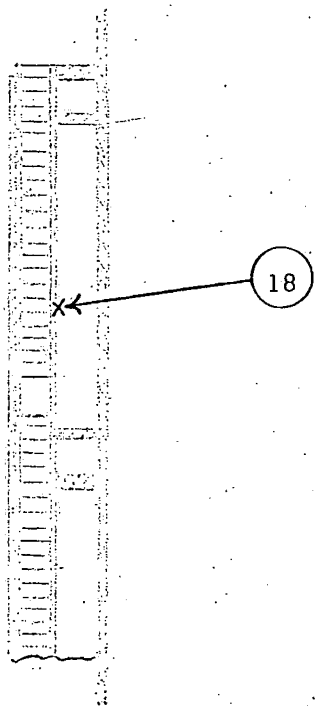


FIGURE 4



SOLAR PADDLE
FIG 5



EQUATORIAL BAND PANEL
FIG 6

BY_____ DATE_____ SUBJECT EXP 172 SHEET NO. 1 OF 6

CHKD. BY_____ DATE_____ TEMPERATURE SENSORS JOB NO. _____

SUB COMM INPUT	GROUP	FUNCTION	COMMENT	FIGURE
1	7	PCM. PKG. TEMP.		
2	3	PKG. TEMP.		
3	3	+ SECONDARY BATTERY TEMP.		3
4	3	- SECONDARY BATTERY TEMP.		3
5	7	THRUSTER TANK TEMP.		
6	7	" 1 NOZ. "		
7	-	" 2 NOZ. "		
8	6	UPPER FRAME TEMP 1		1, 4
9	6	UPPER FRAME TEMP 2		1
10	5	HONEYCOMB TEMP.	ABOVE PRIMARY BATTERY PK.	3
11	7	DL BOOM TEMP.	LOCATED ON HYBRID ENCLOSURE	7
12	6	EQUATORIAL BAND TEMP		2
13	6	SOLAR PANEL TEMP 1	LOCATED ON SOLAR CELL	1, 4
14	6	SOLAR PANEL TEMP 2		1, 4
15	3	SOLAR PADDLE TEMP 1	LOCATED ON SIDE FACING MAG. BOOM	5, 7
16	5	PLATE ON MTG FLANGE		1, 2, 3
17	6	SOLAR PANEL TEMP 3		1, 4
18	7	SOLAR PANEL TEMP 1 EQ. BAND		1, 2, 6
19	2	SOLAR PADDLE TEMP 2		5, 6
20	5	SUPPORT TUBE TEMP	ADJACENT TO BATTERY PK.	3
21	5	BATTERY TEMP 3	BOTTOM OF CELL	3
22	5	CH CON H.S. TEMP.		
23	6	VOLT CON. H.S. TEMP.		
24	2	BATT. BYP. " "		

TEMP (MAIN FRAME)

A	(4) (5)	+ BATTERY TEMP.		3
B	(4) (5)	- BATTERY TEMP.		3

BY_____ DATE_____ SUBJECT EXP 172 SHEET NO. 2 OF 6

CHKD. BY_____ DATE_____ TEMPERATURE SENSOR LOCATION JOB NO._____

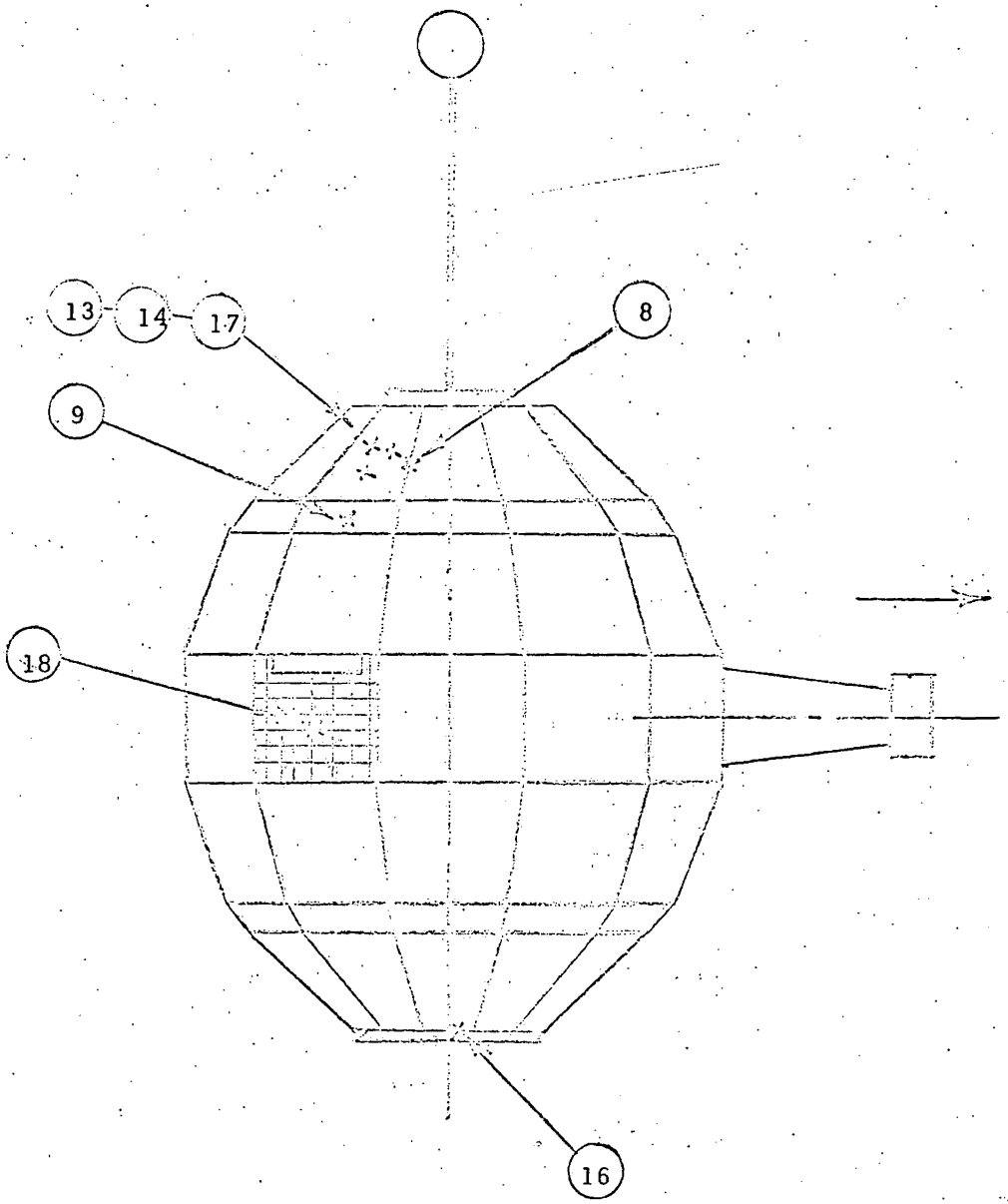


FIG 1

SOLAR PADDLE & RF BOOM
OMITTED FROM THIS VIEW

BY_____ DATE_____ SUBJECT EXP 172 SHEET NO. 3 OF 6

CHKD. BY_____ DATE_____ TEMPERATURE SENSOR JOB NO._____

LOCATION

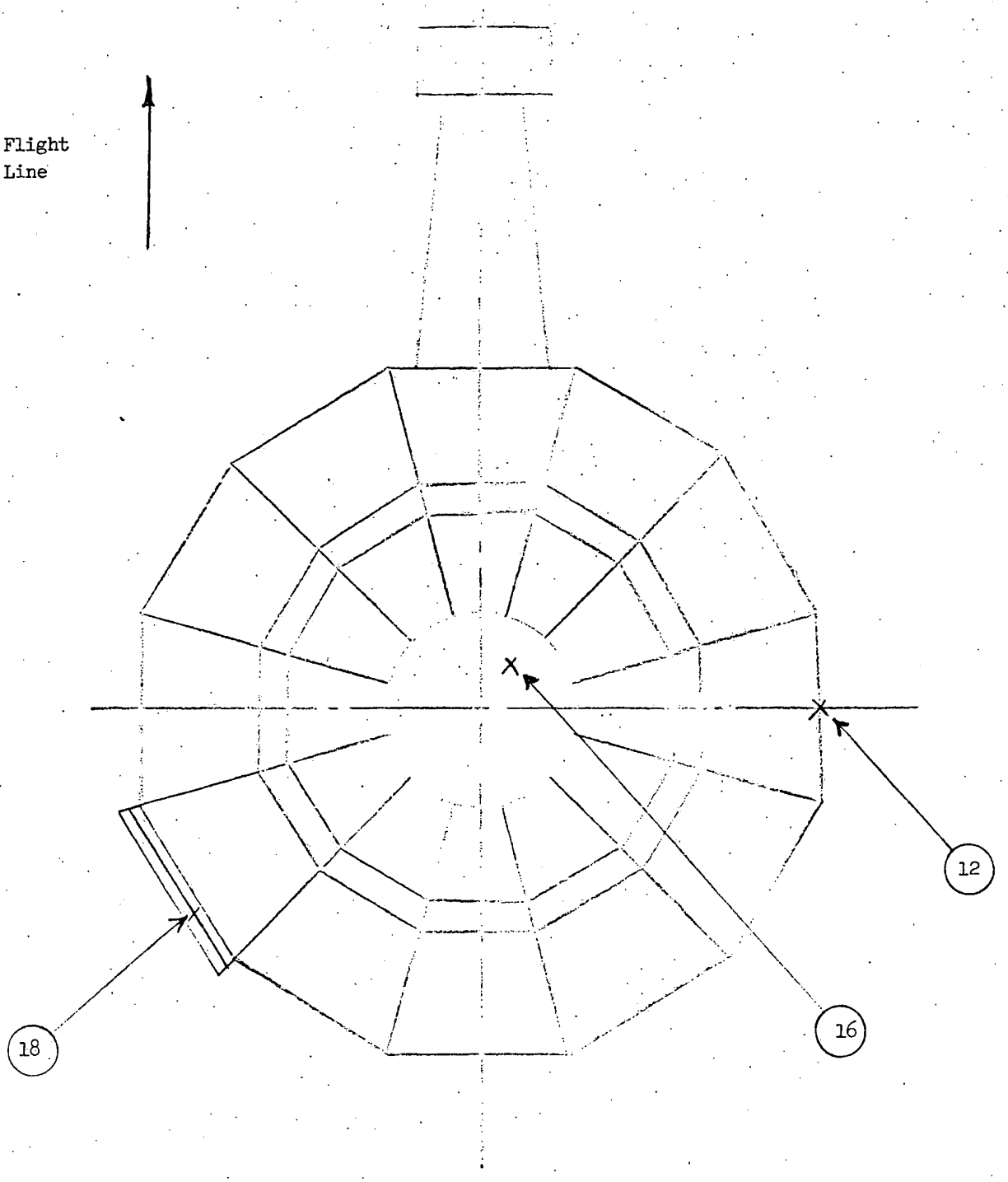


Fig. 2
Lower Skin

BY_____ DATE_____ SUBJECT EXP 172 BATTERY PACKS SHEET NO. 4 OF 6
CHKD. BY_____ DATE_____ TEMPERATURE SENSOR JOB NO._____
LOCATION

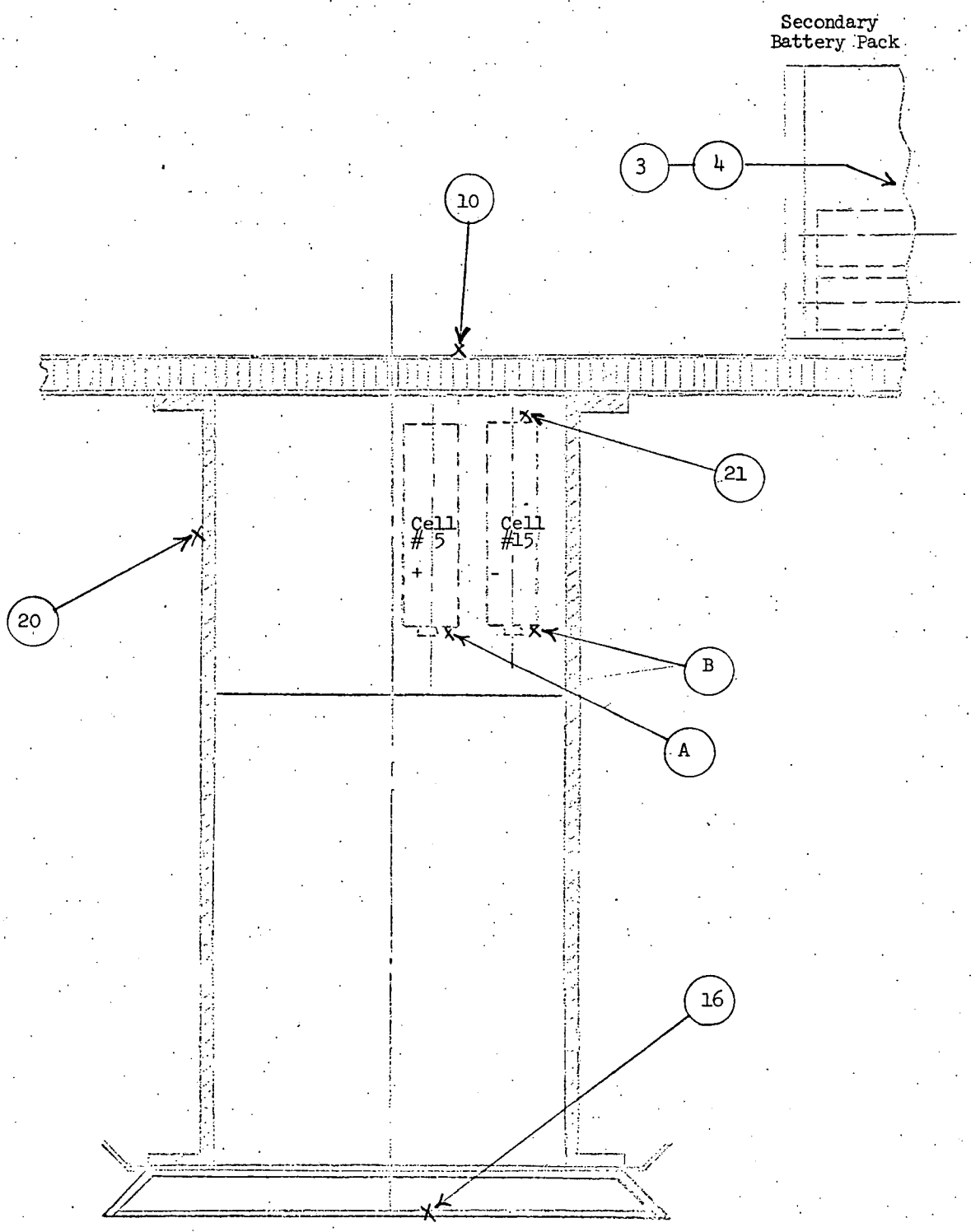


Fig. 3

BY_____ DATE_____ SUBJECT SOLAR PANELS SHEET NO. 5 OF 6

CHKD. BY_____ DATE_____ TEMPERATURE SENSOR LOCATIONS JOB NO._____

EXP 172

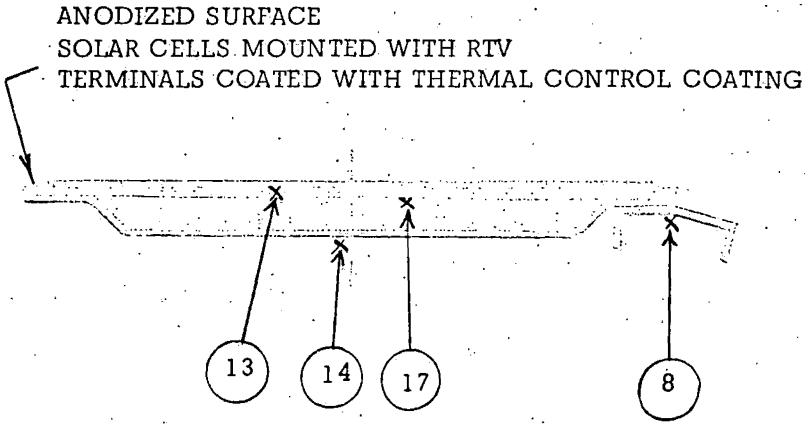
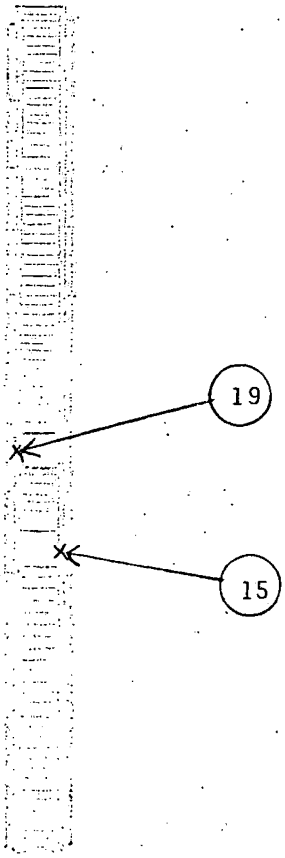
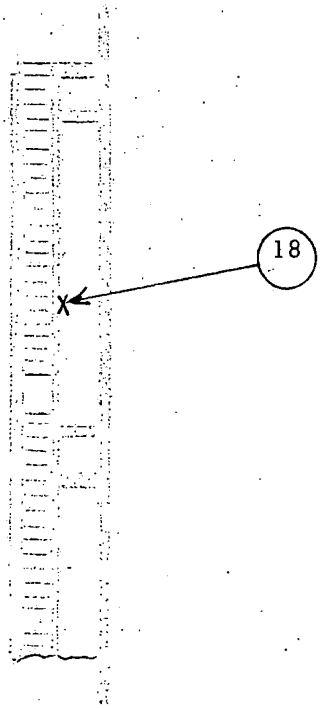


FIG 4



SOLAR PADDLE
FIG 5



EQUATORIAL BAND PANEL
FIG 6

BY _____ DATE _____ SUBJECT EXP 173 SHEET NO. 1 OF 6
CHKD. BY _____ DATE _____ TEMPERATURE SENSORS JOB NO. _____

SUB COMM INPUT	GROUP	FUNCTION	COMMENTS	FIGURE
1	7	PCM. PKG. TEMP		
2	3	PKG. TEMP.		
3	3	+ SECONDARY BATTERY TEMP.		3
4	3	- SECONDARY BATTERY TEMP.		3
5	7	THRUSTER TANK TEMP.		
6	7	" 1 NOZ. "		
7	-	" 2 NOZ. "		
8	6	UPPER FRAME TEMP 1		1, 4
9	6	UPPER FRAME TEMP 2		1
10	5	HONEYCOMB TEMP.	ABOVE PRIMARY BATTERY PK.	3
11	7	DL BOOM TEMP.	LOCATED ON HYBRID ENCLOSURE	7
12	6	EQUATORIAL BAND TEMP		2
13	6	SOLAR PANEL TEMP 1	LOCATED ON SOLAR CELL	1, 4
14	6	SOLAR PANEL TEMP 2		1, 4
15	3	SOLAR PADDLE TEMP 1	LOCATED ON SIDE FACING MAG. BOOM	5, 7
16	5	PLATE ON MTG FLANGE		1, 2, 3
17	6	SOLAR PANEL TEMP 3		1, 4
18	7	SOLAR PANEL TEMP 1 EQ. BAND		1, 2, 6
19	2	SOLAR PANEL TEMP 2 EQ. BAND	ON SOLAR CELL	1, 2, 6
20	5	SUPPORT TUBE TEMP	ADJACENT TO BATTERY PK.	3
21	5	BATTERY TEMP 3	BOTTOM OF CELL	3
22	5	CH CON H.S. TEMP		
23	6	VOLT CON. H.S. TEMP.		
24	2	BATT BYP. " "		

TEMP (MAIN FRAME)

A	(4)(5)	+ BATTERY TEMP.		3
B	(4)(5)	- BATTERY TEMP.		3

BY _____ DATE _____ SUBJECT EXP 173 SHEET NO. 2 OF 6
CHKD. BY _____ DATE _____ TEMPERATURE SENSOR LOCATION JOB NO. _____

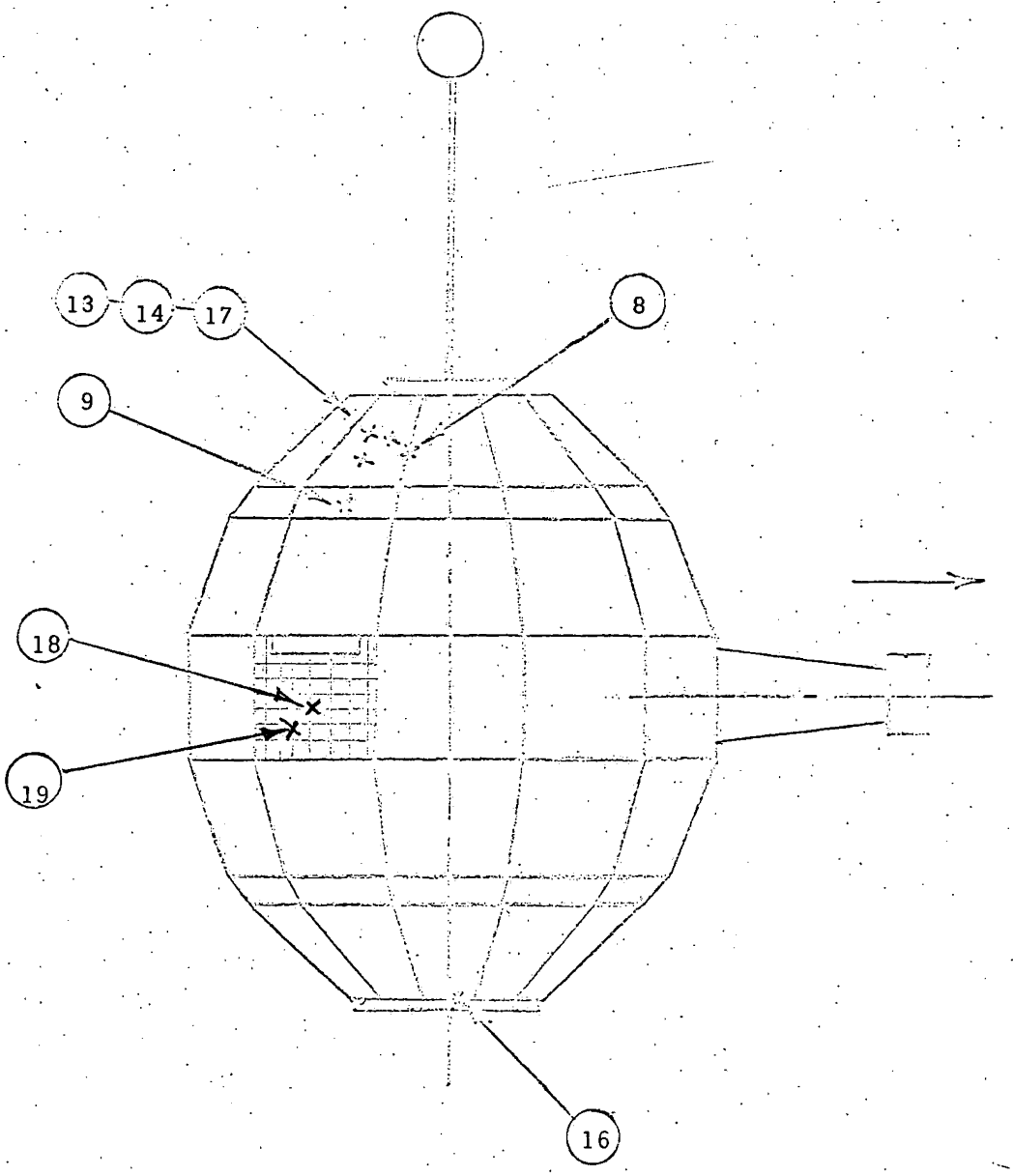


FIG 1

SOLAR PADDLE & RF BOOM
OMITTED FROM THIS VIEW

BY_____ DATE_____ SUBJECT EXP 173 SHEET NO. 3 6
CHKD. BY_____ DATE_____ TEMPERATURE SENSOR LOCATION JOB NO.

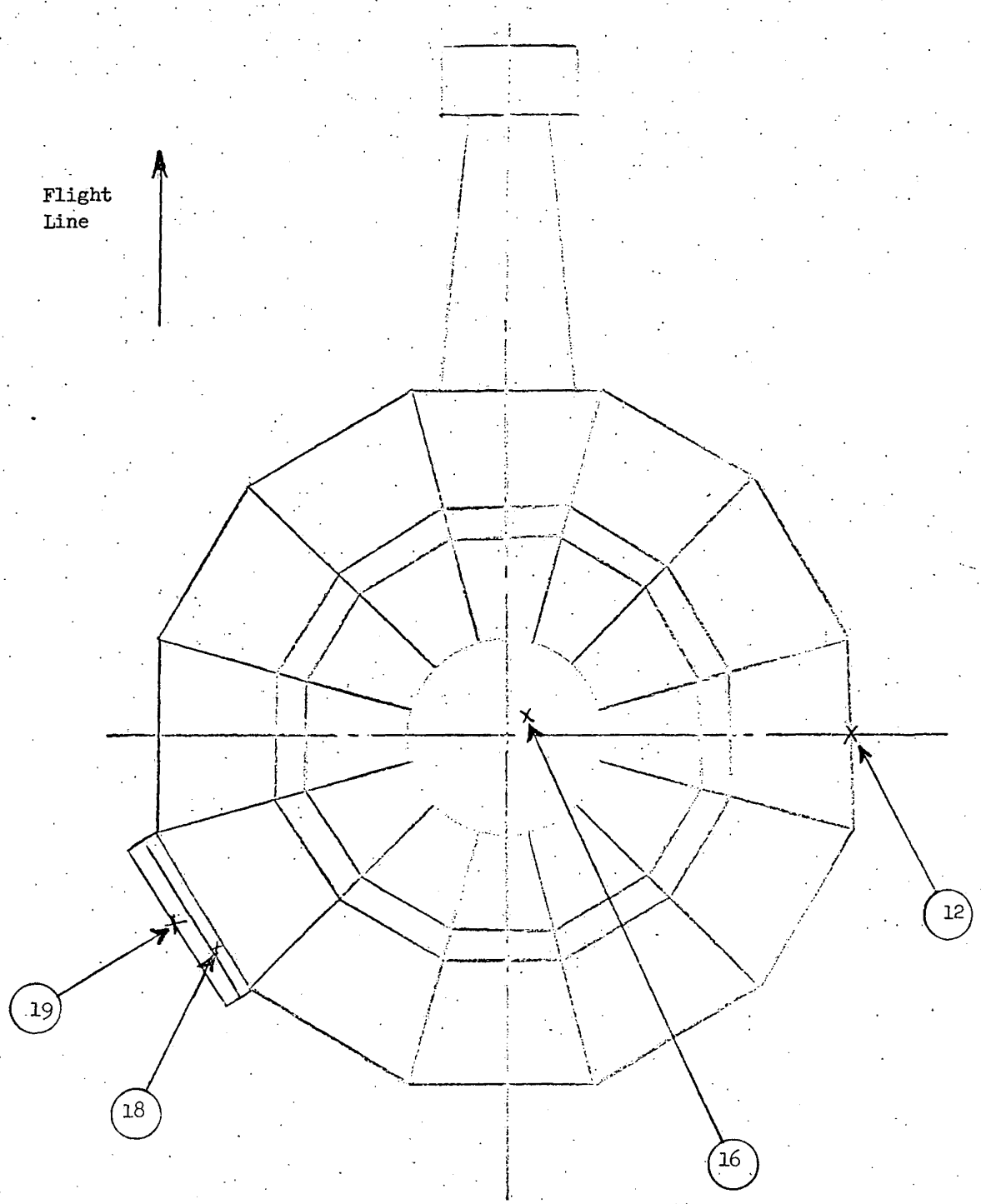


Fig. 2
Lower Skin

CHKD. BY_____ DATE_____ | SUBJECT EXP 173 BATTERY PACKS TEMPERATURE SENSOR LOCATION | SHEET NO. 4 OF 6 JOB NO._____

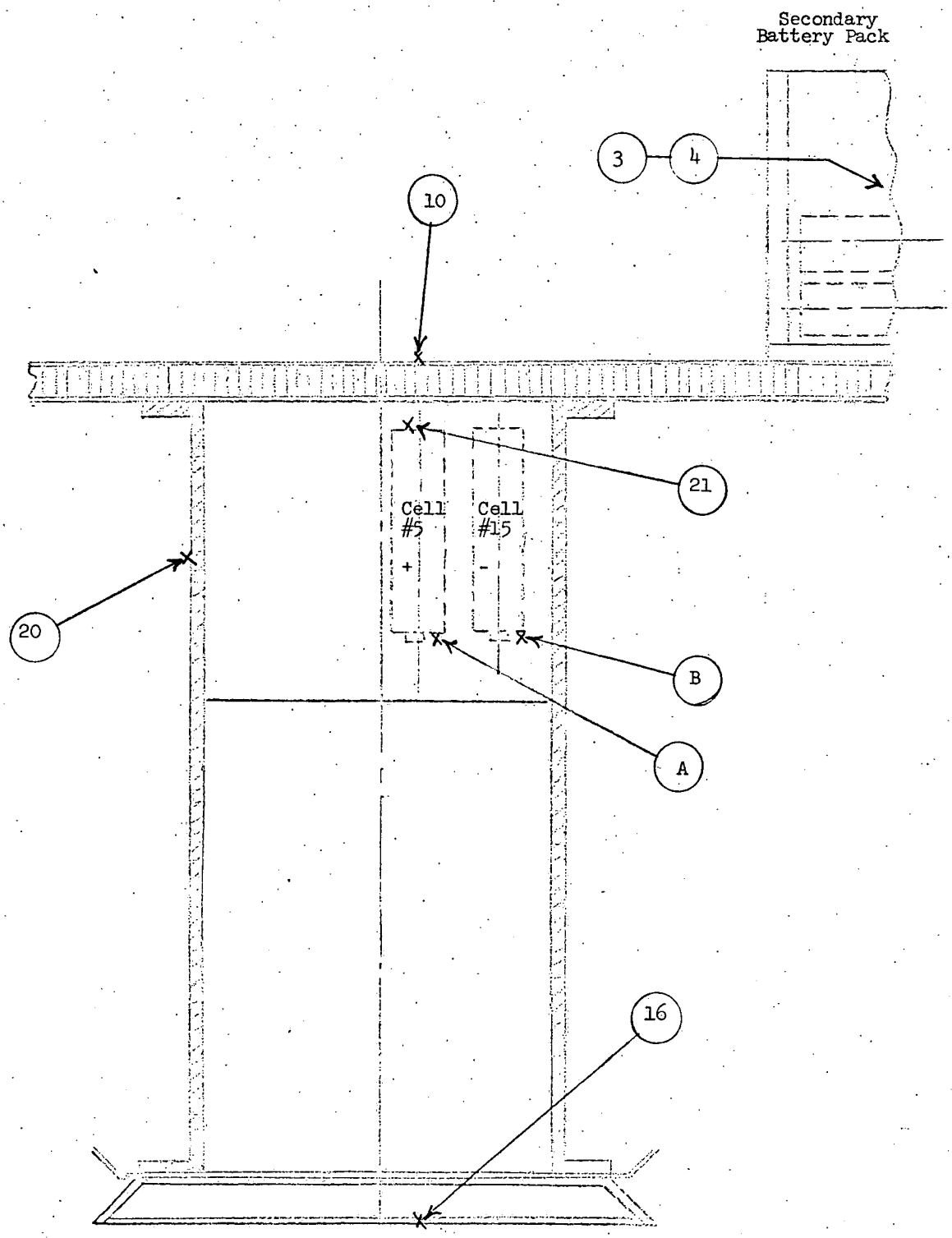


Fig. 3

TEMPERATURE SENSOR LOCATIONS
EXP 173

ANODIZED SURFACE
SOLAR CELLS MOUNTED WITH BERLON
TERMINALS COATED WITH THERMAL CONTROL COATING

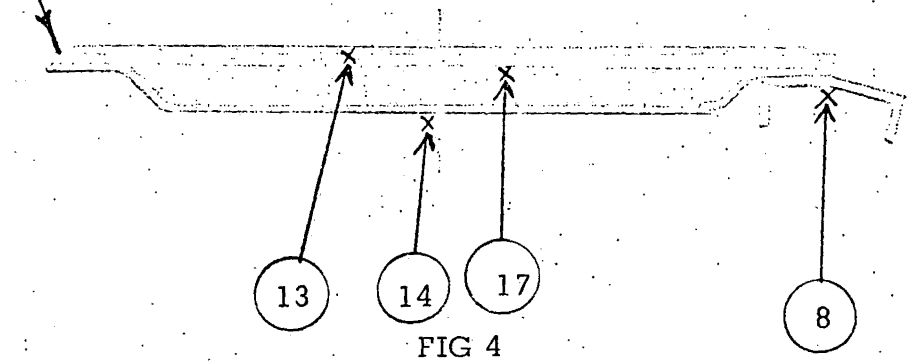
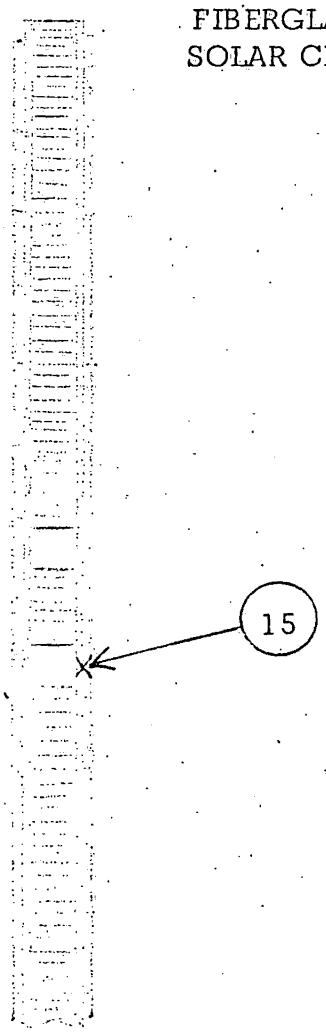
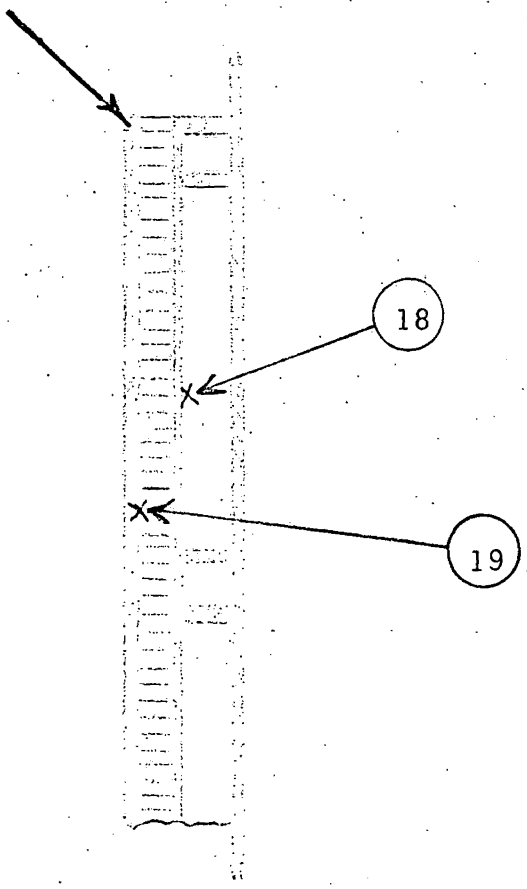


FIG 4

FIBERGLASS SURFACE
SOLAR CELLS MOUNTED WITH RTV



SOLAR PADDLE
FIG 5



EQUATORIAL BAND PANEL
FIG 6

DATE

CHKD. BY DATE

TEMPERATURE SENSORS

JOB NO.

SUB COMM INPUT	GROUP	FUNCTION	COMMENT	FIGURE
1	7	PCM. PKG. TEMP.		
2	3	PKG. TEMP.		
3	3	+ SECONDARY BATTERY TEMP		3
4	3	- SECONDARY BATTERY TEMP.		3
5	7	THRUSTER TANK TEMP.		
6	7	" 1 NOZ. "		
7	-	" 2 NOZ. "		
8	6	UPPER FRAME TEMP 1		1, 4
9	6	UPPER FRAME TEMP 2		1
10	5	HONEYCOMB TEMP.	ABOVE PRIMARY BATTERY PK.	3
11	7	DL BOOM TEMP.	LOCATED ON HYBRID ENCLOSURE	7
12	6	EQUATORIAL BAND TEMP		2
13	6	SOLAR PANEL TEMP 1	LOCATED ON SOLAR CELL	1, 4
14	6	SOLAR PANEL TEMP 2		1, 4
15	3	SOLAR PADDLE TEMP 1	LOCATED ON SIDE FACING MAG. BOOM	5, 7
16	5	PLATE ON MTG FLANGE		1,2,3
17	6	SOLAR PANEL TEMP 3		1,4
18	7	SOLAR PANEL TEMP 1 EQ. BAND		1,2,6
19	2	SOLAR PANEL TEMP 2 EQ. BAND	ON SOLAR CELL	1, 2, 6
20	5	SUPPORT TUBE TEMP	ADJACENT TO BATTERY PK.	3
21	5	BATTERY TEMP 3	BOTTOM OF CELL	3
22	5	CH CON H.S. TEMP		
23	6	VOLT CON " "		
24	2	BATT. BYP. " "		

TEMP (MAIN FRAME)

A	(4) (5)	+ BATTERY TEMP		3
B	(4) (5)	- BATTERY TEMP		3

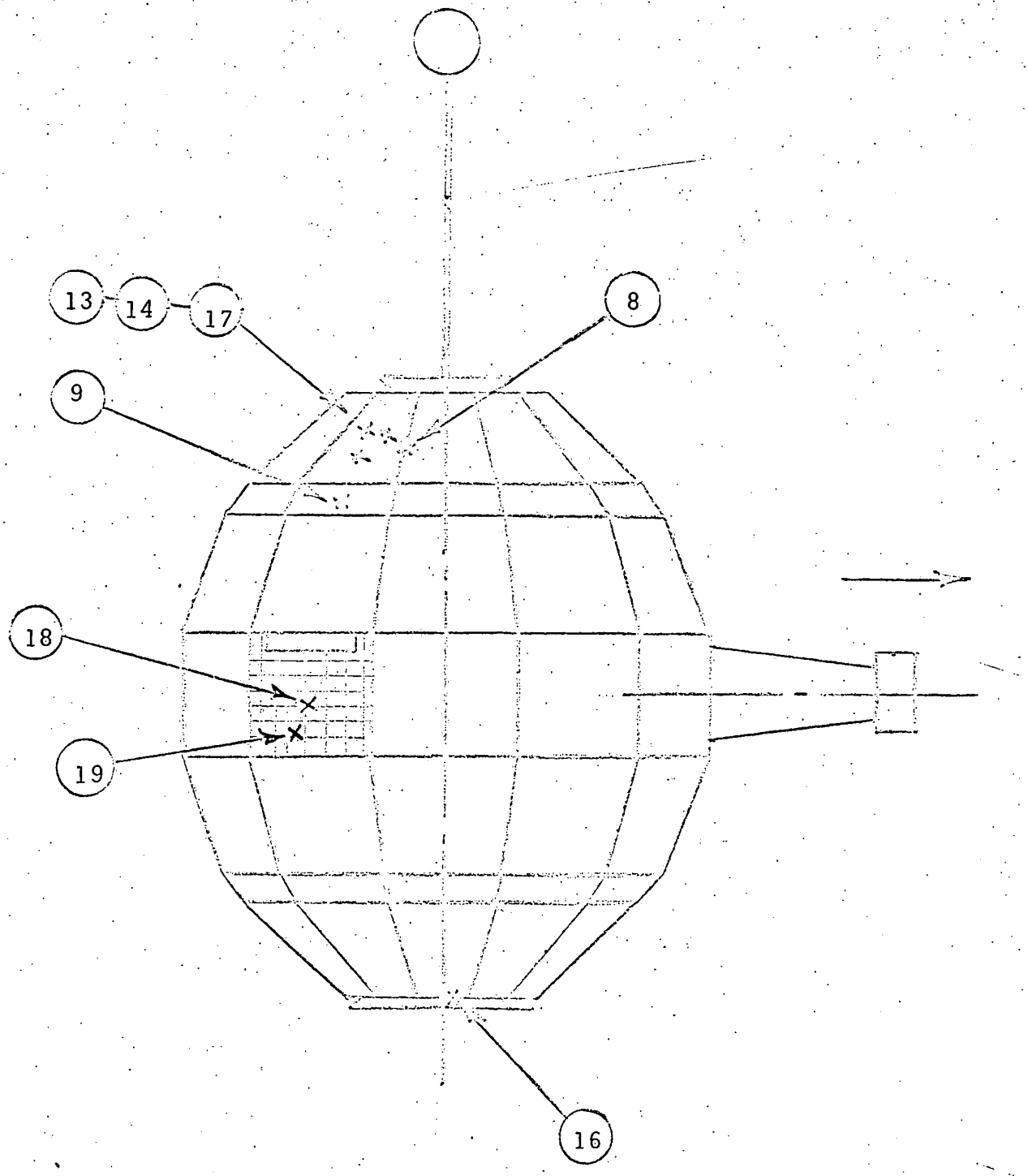


FIG 1

SOLAR PADDLE & RF BOOM
OMITTED FROM THIS VIEW

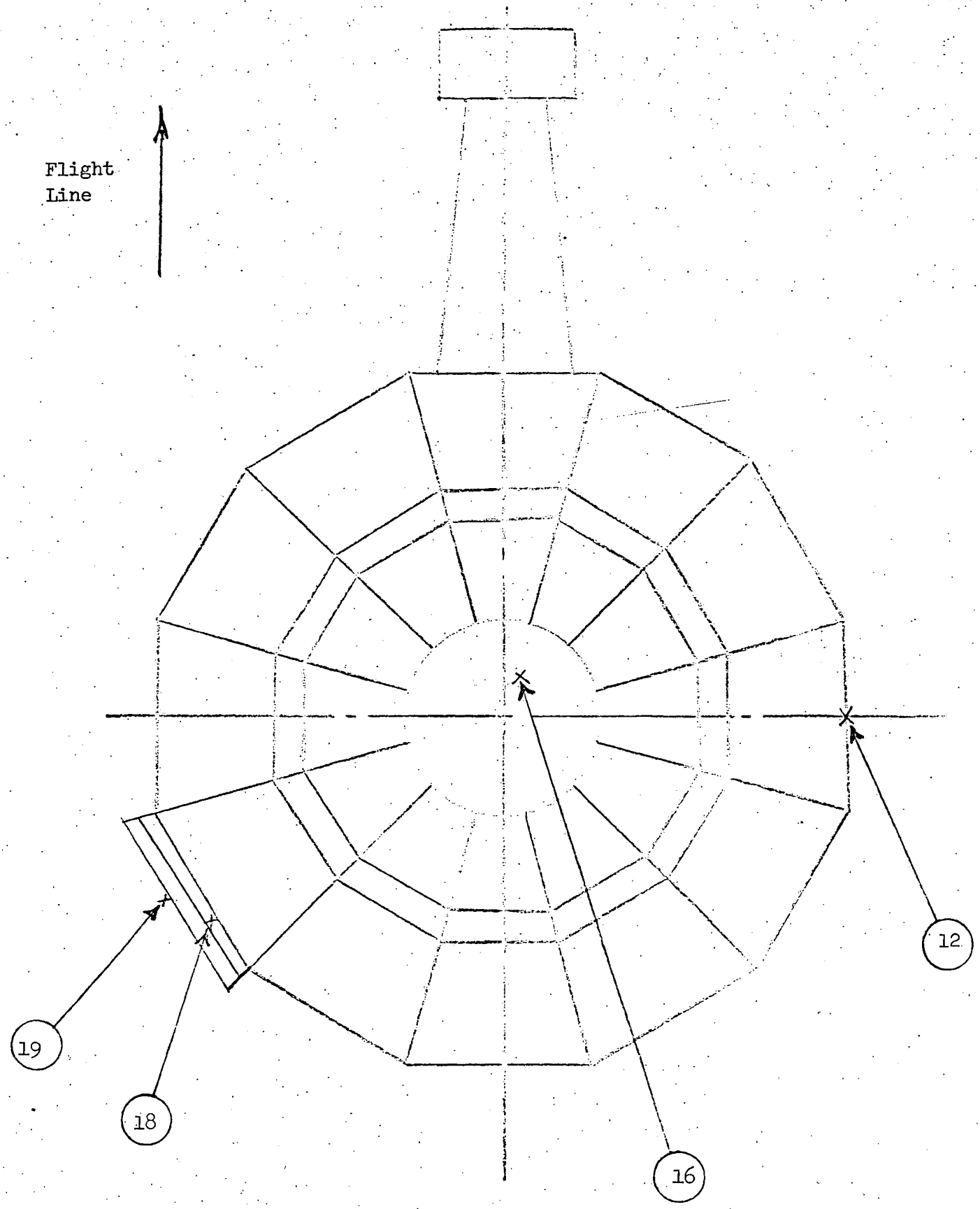


Fig. 2
Lower Skin

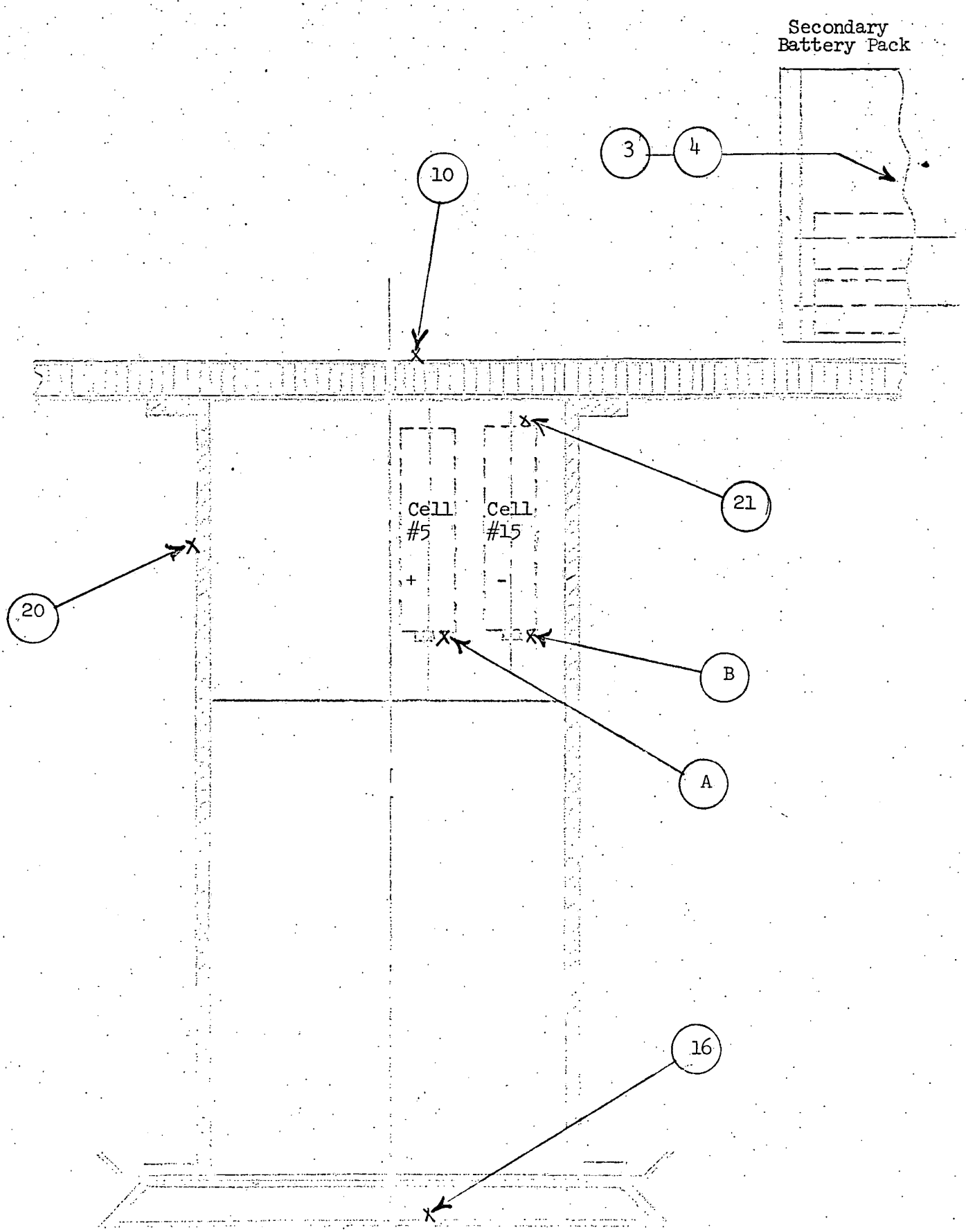


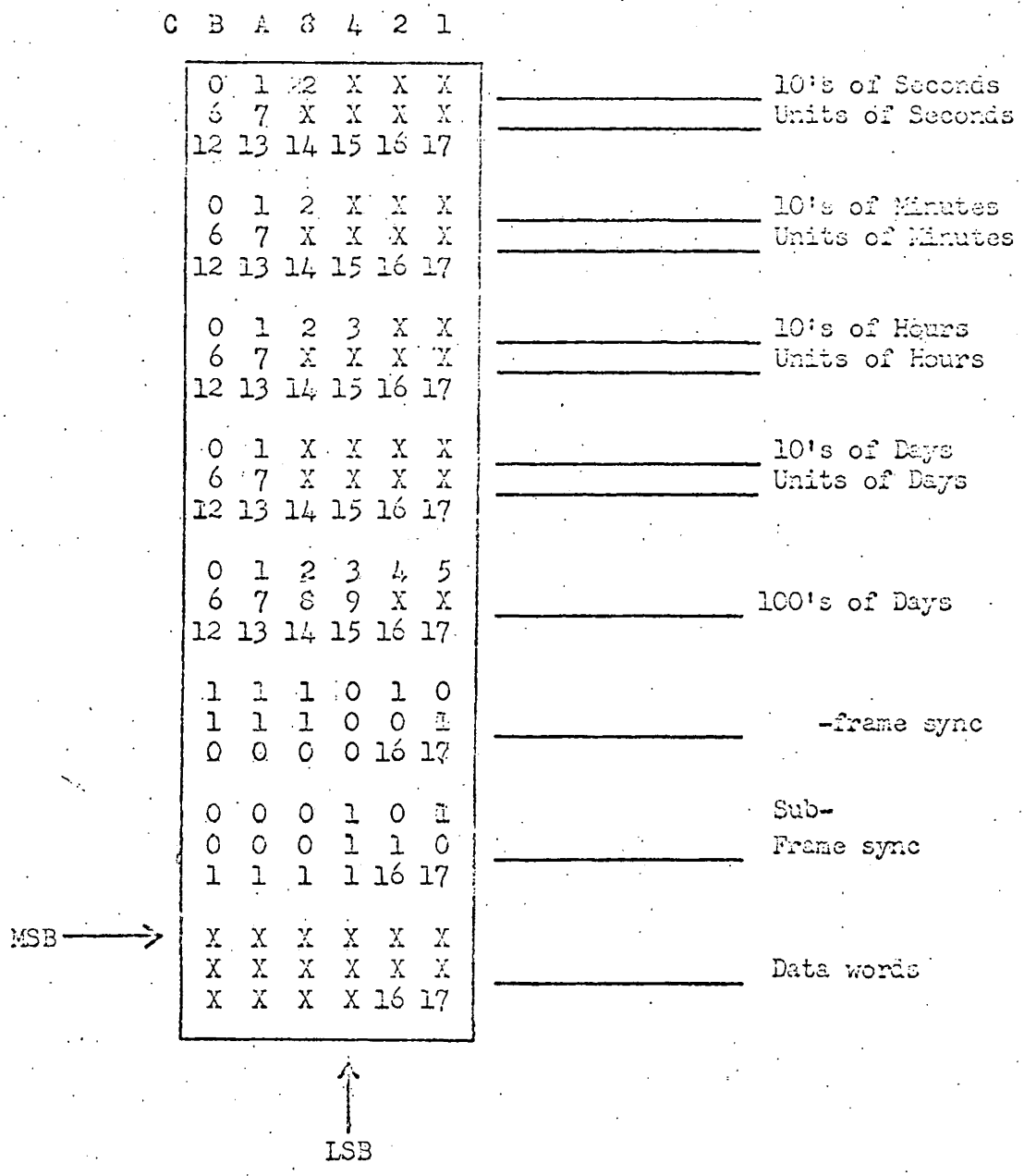
Fig. 3

I.9. [redacted] 3.3(b)(1)

I.10. QUICK LOOK DISPLAY

II.1. TELEMETRY FORMATS

170 Series Programs Magnetic Tape Format



Frame Content:

Five time words followed by sub-frame sync, frame sync, twelve eight bit data words, frame sync, fourteen data words, frame sync, fourteen data words---to a totallof sixty nine sixteen bit words. per magnetic tape record.

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	SYNC L8B 1110 1011	SYNC U8B 1001 0000	SF SYNC L8B 0001 0100	SF SYNC U8B 0110 1111	+ CELL MON. 2	- CELL MON. 10	DIG WD EXP 1	DIG WD EXP 2	+ BATT V ABSTIM	- BATT V ABSTIM	RW TACH ABSTIM	MAG X	MAG Y	MAG Z	DIG WD ADCOLE A	DIG WD ADCOLE B
1			DIGITAL WORD ADD	VERNIER TIME	+ CELL 3	11	DIG WD EXP 3	DIG WD EXP 4	5V CAL	REC 1- AGC	REC 2- AGC	BOOM LENGTH	+ CELL MON 1	- CELL MON 18	DIG WD SPRO	DIG WD SPRO
2			DIG WD CMD	DIG WD MEM	4	12	5 A, B	6 A, B	TEMP 19 SCP	TEMP 24 BAT BYP	PRESS TH 1 CONTROL	PRESS TH 2 CONTROL	DL TIMER CMD 1	DL TIMER CMD 2	DIG WD BOOM CTL	DIG WD RW CTL
3			DIG WD PCM	DIG WD CMD	5	13	7 A, B	8 A, B	+ SEC V MON	- SEC V MON	TEMP 2 PKG.	TEMP 15 SCP 1	TEMP 3 + SEC BATT	TEMP 4 - SEC BATT	DIG WD THRUSTER CTL	SPARE
4			DIG WD BAT	SPARE	6	14	9 A, B	10 A, B	+ BAT V	- BAT V	TEMP + BAT T 25	TEMP - BAT T 26	+ CHG 1	+ DISC 1	- CHG 1	- DISC 1
5			RED DIG WD SAME AS 1-2	RED DIG WD SAME AS 2-2	7	15	11 A, B	12	TEMP + BAT T 25	TEMP - BAT T 26	TEMP 10 HC 1	TEMP 16 SCP 2	TEMP 20 S TUBE	TEMP 21 BAT 3	TEMP 22 CHG CTL	TEMP 23 V CTL
6			DIG WD EXP 17	DIG WD EXP 17	8	16	13 A, B	14 A, B	TEMP 8 SKIN 1	TEMP 9 SKIN 2	TEMP 17 INNER SC 2	TEMP 12 B BAND	TEMP 13 INR. SC 1 NON STD	TEMP 14 OUTR. SC NON STD	+ SC CHG 1 MON	- SC CHG 1 MON
7			DIG WD EXP 17	DIG WD PAR	9	17	15 A, B	16	TEMP 5 TANK	TEMP 6 NOZ 1	TEMP 7 RW 2	TEMP 18 BB SC 2	TEMP 11 DL BOOM	TEMP 1 PCM PK	PRESS TH 2 PLENUM	PRESS TH 1 PLENUM

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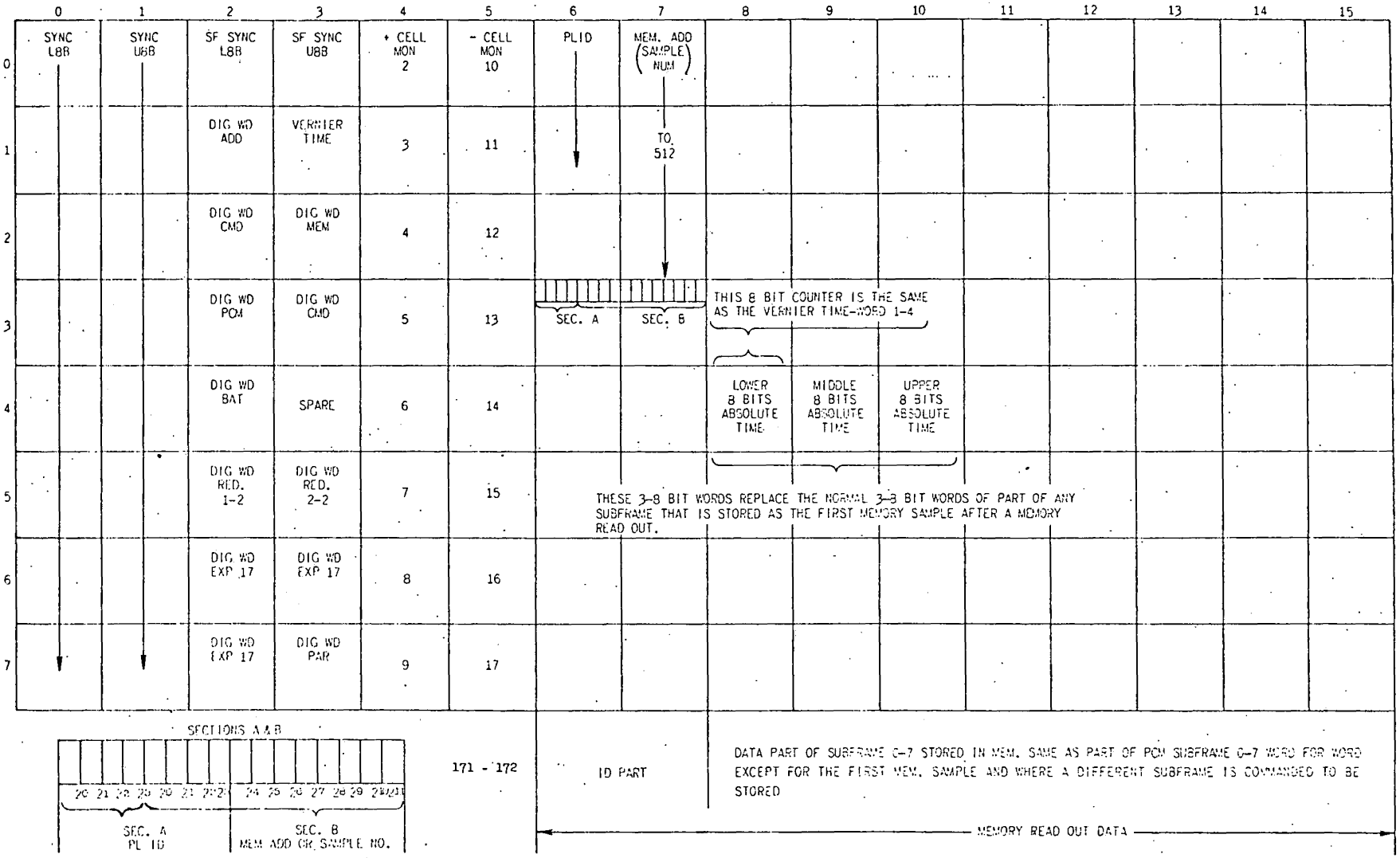
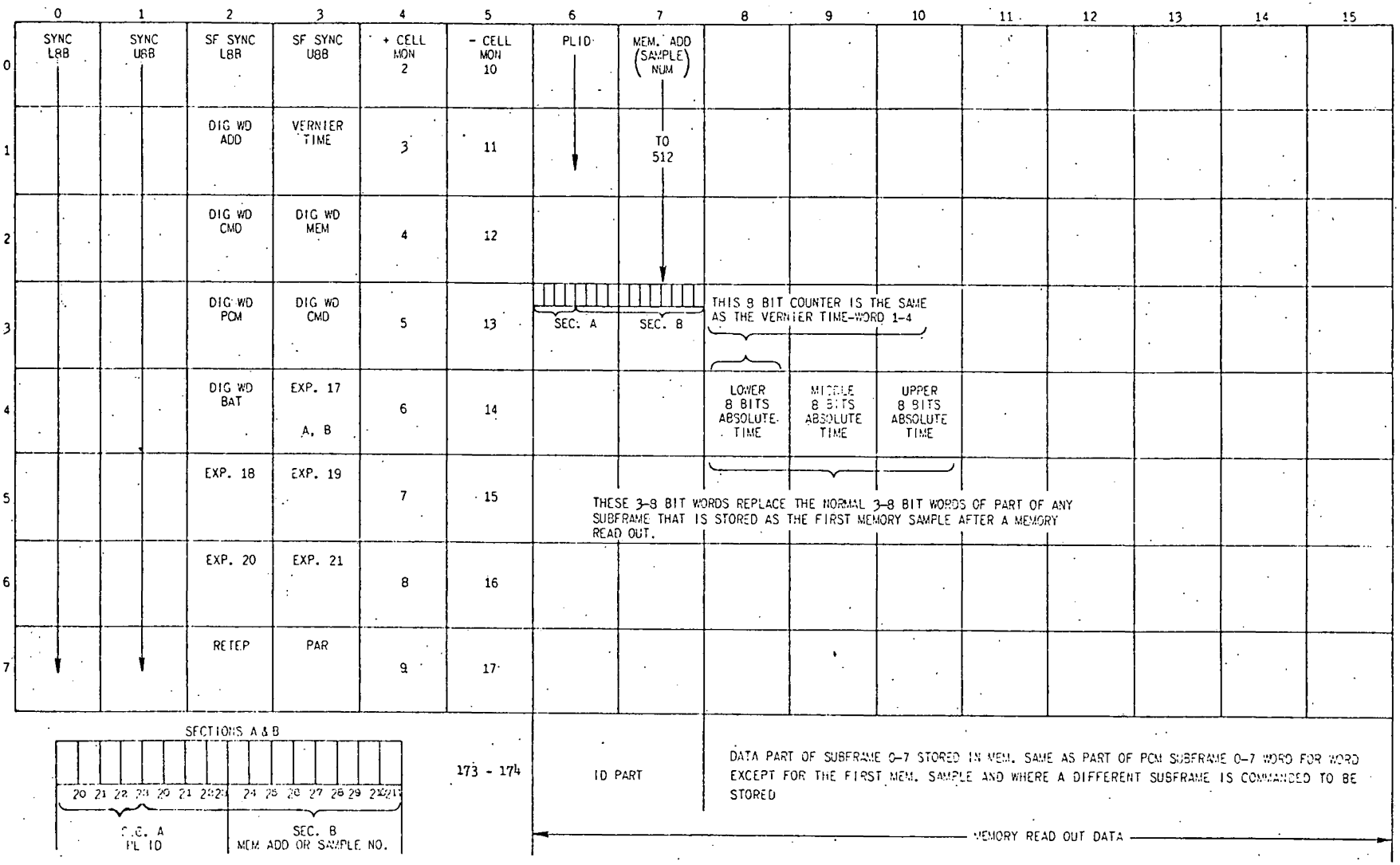
C05027392

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0	SYNC L8R 1110 1011	SYNC U8B 1001 0000	SF SYNC L8R 0001 0100	SF SYNC U8B 0110 1111	+ CELL MON. 2	- CELL MON. 10	DIG WD EXP 1	DIG WD EXP 2	+ BATT V ABSTIM	- BATT V ABSTIM	RW TACH ABSTIM	MAG X	MAG Y	MAG Z	DIG WD ADCOLE A	DIG WD ADCOLE B
1			DIGITAL WORD ADD	VERNIER TIME	+ CELL 3	11	DIG WD EXP 3	DIG WD EXP 4	5V CAL	REC 1- AGC	REC 2- AGC	BOOM LENGTH	+ CELL MON 1	- CELL MON 18	DIG WD SPRO	DIG WD SPRO
2			DIG WD CMD	DIG WD MEM	4	12	5 A, B	6 A, B	TEMP 19 SCP	TEMP 24 BAT BYP	PRESS TH 1 CONTROL	PRESS TH 2 CONTROL	DL TIMER CMD 1	DL TIMER CMD 2	DIG WD BOOM CTL	DIG WD RW CTL
3			DIG WD PCM	DIG WD CMD	5	13	7 A, B	8 A, B	+ SEC V MON	- SEC V MON	TEMP 2 PKG.	TEMP 15 SCP 1	TEMP 3 + SEC BATT	TEMP 4 - SEC BATT	DIG WD THRUSTER CTL	SPARE
4			DIG WD BAT	EXP 17 A, B	6	14	9 A, B	10	+ BAT V	- BAT V	TEMP + BAT T 25	TEMP - BAT T 26	+ CHG 1	+ DISC 1	- CHG 1	- DISC 1
5			EXP 18	EXP 19	7	15	11 A, B	12	TEMP + BAT T 25	TEMP - BAT T 26	TEMP 10 HC 1	TEMP 16 SCP 2	TEMP 20 S TUBE	TEMP 21 BAT 3	TEMP 22 CHG CTL	TEMP 23 V CTL
6			EXP 20	EXP 21	8	16	13 A, B	14 A, B	TEMP 8 SKIN 1	TEMP 9 SKIN 2	TEMP 17 INNER SC 2	TEMP 12 B BAND	TEMP 13 INR. SC 1 NON STD	TEMP 14 OUTR. SC NON STD	+ SC CHG 1 MON	- SC CHG 1 MON
7			RETEP	PAR	9	17	15 A, B	16	TEMP 5 TANK	TEMP 6 NOZ 1	TEMP 7 RW 2	TEMP 18 BB SC 2	TEMP 11 DL BOOM	TEMP 1 PCM PK	PRESS TH 2 PLENUM	PRESS TH 1 PLENUM

Approved for Release: 2024/06/06 C05027392

C05027392





II.2. PCM ANALOG INPUTS

170 SERIES POM PCM ANALOG INPUTS

FUNCTION		LOCATION ENCODER SF	ENCODER WD	DECOM SF	DECOM WD		CURVE NO.
PLUS 5 VOLT CALIBRATE		1	8	1	9		
RECEIVER 1 AGC		1	9	1	10		14
RECEIVER 2 AGC		1	10	1	11		14
TIMER COMMAND 1 IND		2	12	2	13		
TIMER COMMAND 2 IND		2	13	2	14		
PLUS VOLTAGE SENSOR		0	8	0	9		3
MINUS VOLTAGE SENSOR		0	9	0	10		3
PLUS VOLTAGE SENSOR		4	8	4	9		3
MINUS VOLTAGE SENSOR		4	9	4	10		3
PLUS SEC VOLTAGE MON		3	8	3	9		4
MINUS SEC VOLTAGE MON		3	9	3	10		3
PLUS SOLAR CELL CUR MON		6	14	6	15		5
PLUS CHARGE CUR MON		4	12	4	13		6
PLUS DISCHARGE CUR MON		4	13	4	14		6
MINUS SOLAR CELL CUR MON		6	15	7	0		5
MINUS CHARGE CUR MON		4	14	4	15		6
MINUS DISCHARGE CUR MON		4	15	5	0		6
CELL 1		1	12	1	13		
CELL 2		0	4	0	5		
CELL 3		1	4	1	5		
CELL 4		2	4	2	5		
CELL 5		3	4	3	5		
CELL 6		4	4	4	5		
CELL 7		5	4	5	5		
CELL 8		6	4	6	5		
CELL 9		7	4	7	5		
CELL 10		0	5	0	6		
CELL 11		1	5	1	6		
CELL 12		2	5	2	6		
CELL 13		3	5	3	6		
CELL 14		4	5	4	6		
CELL 15		5	5	5	6		
CELL 16		6	5	6	6		
CELL 17		7	5	7	6		
CELL 18		1	13	1	14		

PRIM. PLUS

PRIM. MINUS

170 SERIES POM PCM ANALOG INPUTS (Cont'd)

FUNCTION		LOCATION ENCODER SF	LOCATION ENCODER WD	LOCATION DECOM SF	LOCATION DECOM WD	COMMENT	CURVE NO.
RW TACHOMETER		0	10	0	11		12
BOOM LENGTH INDICATOR		1	11	1	12		11
X AXIS MAGNETOMETER		0	11	0	12	—	
Y		0	12	0	13	—	
Z		0	13	0	14	—	
THRUSTER 1 PRESS (CONTROL)		2	10	2	11		9
1 (POT)		7	15	0	0		9
2 (CONTROL)		2	11	2	12		9
2 (POT)		7	14	7	15		9
PCM PACKAGE TEMP	T1	7	13	7	14		1
PACKAGE TEMP	T2	3	10	3	11		1
PLUS SEC.BATT TEMP	T3	3	12	3	13		1
MINUS SEC. BATT TEMP	T4	3	13	3	14		1
THRUSTER TANK TEMP	T5	7	8	7	9		1
THRUSTER 1 NOZ. TEMP	T6	7	9	7	10		1
THRUSTER 2 NOZ. TEMP	T7	-	-	-	-	NOT MONITORED	1
UPPER SKIN TEMP NO. 1	T8	6	8	6	9		1
UPPER SKIN TEMP. NO.2	T9	6	9	6	10		1
HONEY COMB TEMP	T10	5	10	5	11		1
DL BOOM TEMP.	T11	7	12	7	13		1
BELLY BAND TEMP.	T12	6	11	6	12		1
SOLAR CELL PANEL TEMP. NO.1	T13	6	12	6	13		2
SOLAR CELL PANEL TEMP. NO. 2	T14	6	13	6	14		1
SOLAR CELL PADDLE TEMP. No. 1	T15	3	11	3	12		1
LOWER PLATE TEMP.	T16	5	11	5	12		1
SOLAR CELL PANEL TEMP. NO. 3	T17	6	10	6	11		2
BB SOLAR CELL PANEL TEMP. NO.1	T18	7	11	7	12		1
SOLAR CELL PADDLE TEMP. NO. 2	T19	2	8	2	9		1
SUPPORT TUBE TEMP.	T20	5	12	5	13		1
PRIM.BATT. TEMP. NO. 3	T21	5	13	5	14		1
CHARGE CONTROL H.S. TEMP	T22	5	14	5	15		1
VOLT	T23	5	15	6	0		1
BATT. BYP.	T24	2	9	2	10		1
PRIM PLUS BATT TEMP.	T25	5	8	5	9		1
PRIM MINUS BATT TEMP.	T26	5	9	5	10		1
RW BEARING TEMP	T27	7	10	7	11		13
PRIM PLUS BATT TEMP.	T25	4	10	4	11		1
PRIM MINUS BATT TEMP.	T26	4	11	4	12		1

II.3. COMMAND SYSTEM

II.4. PCM DIGITAL INPUTS

170 SERIES POM
PCM TM DIGITAL INPUTS

FUNCTION	LOCATION		LOGIC STATE		
	ENCODER SF WD BIT	DECOM SF WD BIT	1	0	
ADDRESS 1A	1 2 1	1 3 1	RESET or DIG "1"	ADDRESS or DIG "0"	
2A	2	2			
3A	3	3			
4A	4	4			
1B	5	5			
2B	6	6			
3B	7	7			
4B	8	8			
CMD ENABLE	2 2 1	2 3 1	OFF	ON	
BACK UP CMD SYSTEM	2	2	ON	OFF	
DL ENABLE ON-OFF	3	3	OFF	ON	
RESET TIMER ON-OFF	4	4	ON	OFF	
DL SYSTEM ON-OFF	5	5	ON	OFF	
BACKUP DL SYSTEM	6	6	ON	OFF	
EXECUTE ON-OFF	7	7	OFF	ON	
EXECUTE BACK UP	8	8	ON	OFF	
PCM TIMING CHAIN A-B	3 2 1	3 3 1	A ✓	B	1
PCM MTPLX A-B	2	2 ✓	A	B ✓	1
MEMORY ON-OFF	3	3 ✓	ON ✓	OFF ✓	1
PCM POWER A-B	4	4 ✓	A ✓	B	1
PCM DATA SEL ON-OFF	5	5 ✓	ON	OFF	1
PCM TO DL ON-OFF	6	6	ON	OFF	1
	7	7			
	8	8			
CHARGE/VOLT CON ON-OFF	4 2 1	4 3 1	ON	OFF	1
CHARGE CON HI-LO	2	2	HI	LO	1
BATT BYP ON-OFF	3	3	ON	OFF	1
BATT BYP ENAB ON-OFF	4	4	ON	OFF	1
PRIM-SEC PLUS BATT SEL	5	5	PRIM	SEC	1
PRIM-SEC MINUS BATT SEL	6	6	PRIM	SEC	1
UNDERVOLTAGE ON-OFF	7	7	ON	OFF	1
	8	8			
SUBFRAME 1 SEL	2 3 1	2 4 1	ON	OFF	
SUBFRAME 2 SEL	2	2	ON	OFF	

170 SERIES POM PCM TM DIGITAL INPUTS (Con't)

FUNCTION	LOCATION ENCODER SF WD BIT	LOCATION DECOM SF WD BIT	LOGIC STATE 1	LOGIC STATE 0	
SUB FRAME 3 SEL	3	3	ON	OFF	
PCM BIT RATE FAST-SLO	4	4	SLO	FAST	
MEMORY A1 - A0 SAMPLE	2 3 5	2 4 5	A1	A0	
MEMORY B1 - B0 SAMPLE	6	6	B1	B0	
PCM A/D A-B	7	7	A	B	
PCM OSC A-B	8	8	A	B	
ORDNANCE ENABLE ON-OFF	3 3 1	3 4 1	ON	OFF	
ALT. ORD. ENABLE ON-OFF	2	2	ON	OFF	
HK SENSORS ON-OFF	3	3	ON	OFF	
ANALOG TM ON-OFF	4	4	ON	OFF	
TIMER 20-50 MIN	5	5	50 MIN	20 MIN	
PL ID BIT 1	6	6			171 000
PL ID BIT 2	7	7			172 100
PL ID BIT 3	8	8			173 010
BOOM ON-OFF	2 14 1	2 15 1	ON	OFF	174 110
BOOM IN-OUT	2	2	OUT	IN	
BOOM FULL RETRACT IND	3	3	RET	$\overline{\text{RET}}$	
BOOM MID IND	4	4	$\overline{\text{MID}}$	MID	
BOOM FULL EXTENSION IND	5	5	EXT	$\overline{\text{EXT}}$	
BOOM TIP MASS RELEASE IND	6	6	REL	$\overline{\text{REL}}$	
DL BOOM RELEASE IND	7	7	REL	$\overline{\text{REL}}$	
	8	8			
THRUSTER 1 ON-OFF	3 14 1	3 15 1	ON	OFF	
THRUSTER 2 ON-OFF	2	2	ON	OFF	
TH 1 HEATER ON-OFF	3	3	ON	OFF	
TH 2 HEATER ON-OFF	4	4	ON	OFF	
THRUSTER HI-LO	5	5	LO	HI	
	6	6			
	7	7			
	8	8			
RW SPEED MON. ON-OFF	2 15 1	3 0 1	ON	OFF	
RW ON-OFF	2	2	ON	OFF	
RW FWD-REV	3	3	REV	FWD	
RW PRIM-SEC POWER AMP	4	4	PRIM	SEC	
RW PRIM-SEC CONTROL	5	5	SEC	PRIM	
RW FWD-REV IND	6	6	REV	FWD	
	7	7			
	8	8			

II.5. DATA REDUCTION TABLES

A1A109

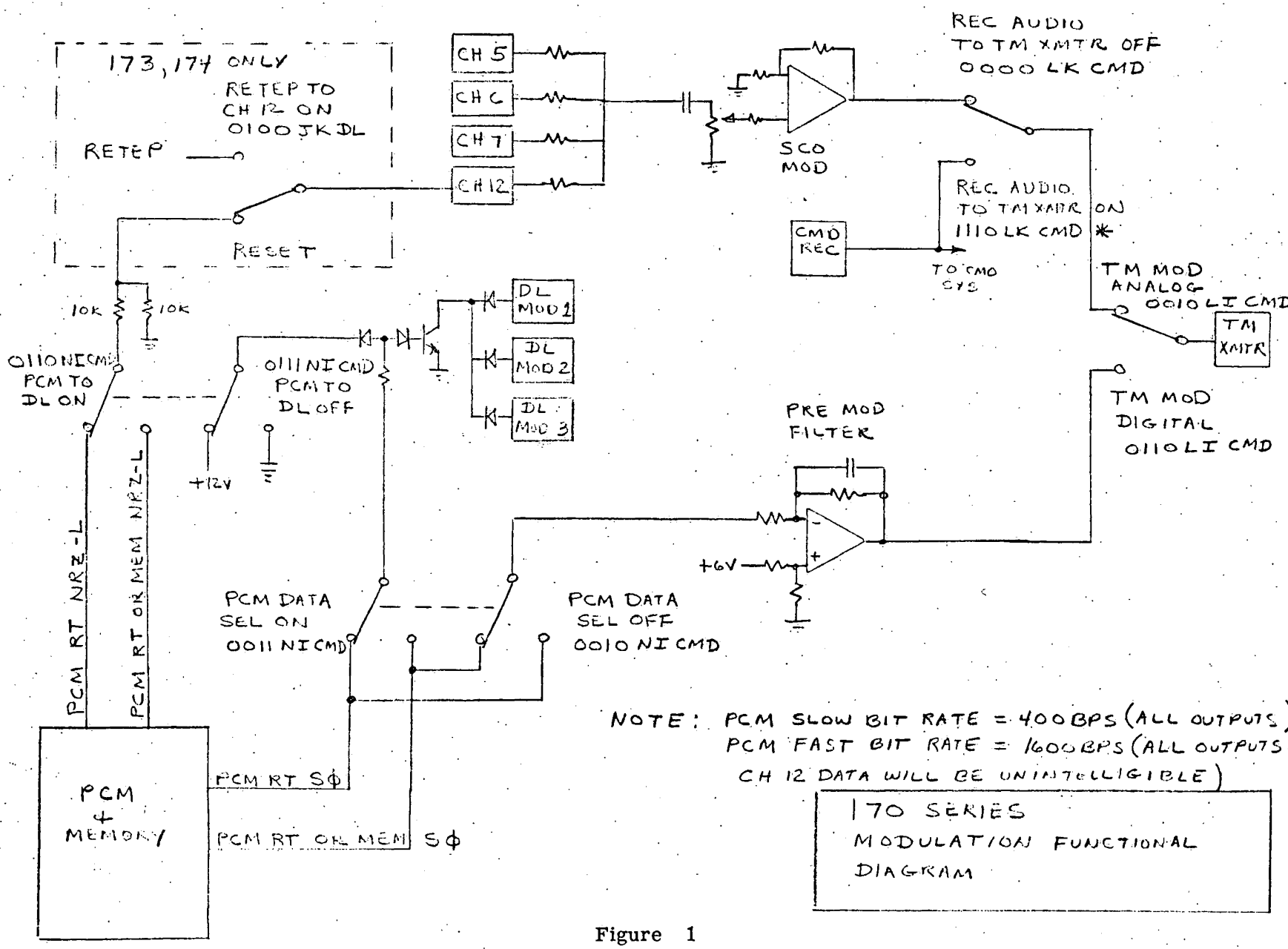
170 SERIES POM DATA REDUCTION TABLES

CURVE NO.		1	2	3	4 ✓	5 ✓	6	9	12	✓ 13
%	VOLTS	STD TEMP SENSOR	INST S.C. TEMP SENSOR	+VOLT SEC -BATT	SEC +BATT	± S.C. I MON	+CH DISCH I MON	THRUST PRESS	TW TACH	RW BEARING TEMP
		°C	°C	VOLTS	VOLTS	AMPS	AMPS	PSI	RPS	°C
0	0			10.00		0	0	0	0	
2	.1	153		10.08		.03	.02	1	.6	
4	.2	119		10.16		.06	.04	2	1.2	
6	.3	101		10.24		.09	.06	3	1.7	
8	.4	89		10.32		.12	.08	4	1.9	
10	.5	81	99.7	10.40		.15	.10	5	2.3	70
12	.6	73		10.48		.18	.12	6	2.6	62.8
14	.7	67		10.56		.21	.14	7	3.0	57
16	.8	62		10.64		.24	.16	8	3.4	52.2
18	.9	58		10.72		.27	.18	9	3.7	48
20	1.0	54	70.7	10.80		.30	.20	10	4.0	44
22	1.1	50		10.88		.33	.22	11	4.4	40
24	1.2	47		10.96		.36	.24	12	4.7	37
26	1.3	44		11.04		.39	.26	13	5.0	34.2
28	1.4	41		11.12		.42	.28	14	5.5	31.5
30	1.5	38	54	11.20		.45	.30	15	5.9	29
32	1.6	36		11.28		.48	.32	16	6.3	26.5
34	1.7	34		11.36		.51	.34	17	6.7	24
36	1.8	31		11.44		.54	.36	18	7.0	21.8
38	1.9	29		11.52		.57	.38	19	7.4	19.5
40	2.0	27	41.6	11.60		.60	.40	20	7.8	17.2
42	2.1	25		11.68		.63	.42	21	8.2	15
44	2.2	23		11.76		.66	.44	22	8.6	13
46	2.3	21		11.84		.69	.46	23	9.0	11
48	2.4	19		11.92		.72	.48	24	9.4	8.8
50	2.5	17	31.1	12.00		.75	.50	25	9.8	6.8
52	2.6	15		12.08		.78	.52	26	10.3	5
54	2.7	14		12.16		.81	.54	27	10.7	3
56	2.8	12		12.24		.84	.56	28	11.1	1
58	2.9	10		12.32	8.10	.87	.58	29	11.5	-1.5

170 SERIES POM DATA REDUCTION TABLES

CURVE NO.	1	2	3	4 /	5 /	6	9	12	13
%	VOLTS	STD TEMP SENSOR	INST S.C. TEMP SENSOR	+VOLT SEC -BATT	SEC +BATT	+S.C. I MON	+CH DISCH I MON	THRUST PRESS	RW TACH	RW BEARING TEMP
		°C	°C	VOLTS	VOLTS	AMPS	AMPS	PSI	RPS	°C
60	3.0	8	21.6	12.40	8.40	.90	.60	30	11.9	-4
62	3.1	7		12.48	8.70	.93	.62	31	12.5	-7.2
64	3.2	5		12.56	8.95	.96	.64	32	13.0	
66	3.3	3		12.64	9.20	.99	.66	33	13.5	
68	3.4	1		12.72	9.45	1.02	.68	34	14.0	
70	3.5	-1	12.1	12.80	9.80	1.05	.70	35	14.4	
72	3.6	-2		12.88	10.05	1.08	.72	36	14.9	
74	3.7	-4		12.96	10.30	1.11	.74	37	15.4	
76	3.8	-6		13.04	10.55	1.14	.76	38	15.9	
78	3.9	-8		13.12	10.90	1.17	.78	39	16.4	
80	4.0	-10	2.0	13.20	11.15	1.20	.80	40	16.9	
82	4.1	-12		13.28	11.40	1.23	.82	41	17.5	
84	4.2	-14		13.36	11.70	1.26	.84	42	18.1	
86	4.3	-17		13.44	12.00	1.29	.86	43	18.7	
88	4.4	-19		13.52	12.25	1.32	.88	44	19.3	
90	4.5	-22	-10.2	13.60	12.50	1.35	.90	45	19.9	
92	4.6	-25		13.68	12.77	1.38	.92	46	20.6	
94	4.7	-28		13.76	13.05	1.41	.94	47	21.3	
96	4.8	-32		13.84	13.32	1.44	.96	48	22	
98	4.9	-36		13.92	13.60	1.47	.98	49		
100	5.0			14.00	13.90	1.50	1.0	50		

II.6. TABLE OF CURVES



NOTE: PCM SLOW BIT RATE = 400 BPS (ALL OUTPUTS)
PCM FAST BIT RATE = 1600 BPS (ALL OUTPUTS - CH 12 DATA WILL BE UNINTELLIGIBLE)

170 SERIES
MODULATION FUNCTIONAL
DIAGRAM

Figure 1

Approved for Release: 2024/06/06 C05027392

170 SERIES COMMAND SYSTEM TONE PAIRS

PAYLOAD	171	172	173	174
ADDRESS	PL, PI, PK, PJ	QK, QL, QI, QJ	RJ, RK, RI, RL	SL, SJ, SI, SK
Address Complement	ML, MI, MK, MJ	MK, ML, MI, MJ	MJ, MK, MI, ML	ML, MJ, MI, MK
Command Enable	PN	QN	RN	SN
Execute	KI	KI	KI	KI
DL Reset	MQ	MP	MS	MR
Advance	NK	NK	NK	NK
Backup Enable	NJ	NJ	NJ	NJ
Command Reset	MN	MN	MN	MN

Approved for Release: 2024/06/06 C05027392

EXP NO. 171-172 COMMANDS 10/15/71

TONE PAIR →	MTX BOX 1 LK(DL)	MTX BOX 2 JL(DL)	MTX BOX 1 LI(DL)	MTX BOX 2 JK(DL)	MTX BOX 1 JI(CMD)
0000	DL1 1	DL16 # 1	1	DL CONV ON 1	PCM TM ON PCM POWER A 1
0001	DL2 2	DL11 # 2	2	DL CONV BYP * # 2	PCM TM OFF 2
0011	DL3 3	DL9 # 3	DL CONV BYP * 3	DL CONV 1 SEL 3	PCM OSC A 3
0010	DL4 4	DL10 # 4	DL17 ENABLE 4	DL CONV 2 SEL 4	PCM OSC B 4
0110	DL5 5	DL13 # 5	DL17 GRP 1 5	SLM ON 5	PCM A-D A 5
0111	DL6 6	DL14 # 6	DL17 GRP 2 6	6	PCM A-D B 6
0101	DL7 7	DL12 # 7	DL17 GRP 3 7	ADJ.THRESH.ON 7	MEMORY READ OUT 7
0100	DL8 8	DL15 # 8	DL17 GRP 4 8	8	PCM POWER B 8
1100	DL9 9	DL3 # 9	DL17 (1-3) 9	DL MOD 1 OFF * 9	PCM MTPLX A 9
1101	DL10 10	DL4 # 10	DL17 (4-6) 10	DL MOD 2 OFF * 10	PCM MTPLX B 10
1110	DL11 11	DL2 # 11	DL17 (7-9) 11	DL MOD 3 OFF * 11	PCM TIMING CHAIN A 11
1010	DL12 12	DL7 # 12	DL17 (10-12) 12	DL MODS ON * 12	PCM TIMING CHAIN B 12
1001	DL13 13	DL5 # 13	DL17 (13-15) 13	BU DL SYS ON 13	MEM A 1 SAMP 13
1000	DL14 14	DL6 # 14	DL17 (16-18) 14	BU DL SYS OFF 14	MEM AO SAMP 14
1011	DL15 15	DL8 # 15	DL17 (19-20) 15	20 MIN TIMER 15	MEM B1 SAMP 15
1111	DL16 16	DL1 # 16	TIMER CMD 1 16	TIMER CMD 2 16	MEM BO SAMP 16

* - ORDNANCE ENABLE

\# - BACK UP CMD

SAMPLE RATE MATRIX

SAMPLE RATE	FB	FA
1	0	0
4	0	1
32	1	0
64	1	1

Approved for Release: 2024/06/06 C05027392
C05027392

EXP NO. 173-174 COMMANDS 10/15/71

TONE PAIR →	MTX BOX 1 LK(DL)	MTX BOX 2 JL(DL)	MTX BOX 1 LI(DL)	MTX BOX 2 JK(DL)	MTX BOX 1 JI(CMD)
0000	DL1 1	DL16 # 1	1	DL CONV ON 1	PCM TM ON PCM POWER A 1
0001	DL2 2	DL11 # 2	2	DL CONV BYP # * 2	PCM TM OFF 2
0011	DL3 3	DL9 # 3	3	DL CONV 1 SEL 3	PCM OSC A 3
0010	DL4 4	DL10 # 4	DL CONV BYP * 4	DL CONV 2 SEL 4	PCM OSC B 4
0110	DL5 5	DL13 # 5	DL 17 5	SLM ON 5	PCM A-D A 5
0111	DL6 6	DL14 # 6	DL 18 6	6	PCM A-D B 6
0101	DL7 7	DL12 # 7	DL 19 7	ADJ.THRESH.ON 7	MEMORY READ OUT 7
0100	DL8 8	DL15 # 8	DL 20 8	RETEP TO CH 12 ON 8	PCM POWER B 8
1100	DL9 9	DL3 # 9	DL 21 9	DL MOD 1 OFF * 9	PCM MTPLX A 9
1101	DL10 10	DL4 # 10	RETEP ON 10	DL MOD 2 OFF * 10	PCM MTPLX B 10
1110	DL11 11	DL6 # 11	11	DL MOD 3 OFF * 11	PCM TIMING CHAIN A 11
1010	DL12 12	DL7 # 12	12	DL MODS ON * 12	PCM TIMING CHAIN B 12
1001	DL13 13	DL5 # 13	13	BU DL SYS ON 13	MEM A1 SAMP 13
1000	DL14 14	DL2 # 14	14	BU DL SYS OFF 14	MEM AO SAMP 14
1011	DL15 15	DL8 # 15	15	20 MIN TIMER 15	MEM B1 SAMP 15
1111	DL16 16	DL1 # 16	TIMER CMD 1 16	TIMER CMD 2 16	MEM BO SAMP 16

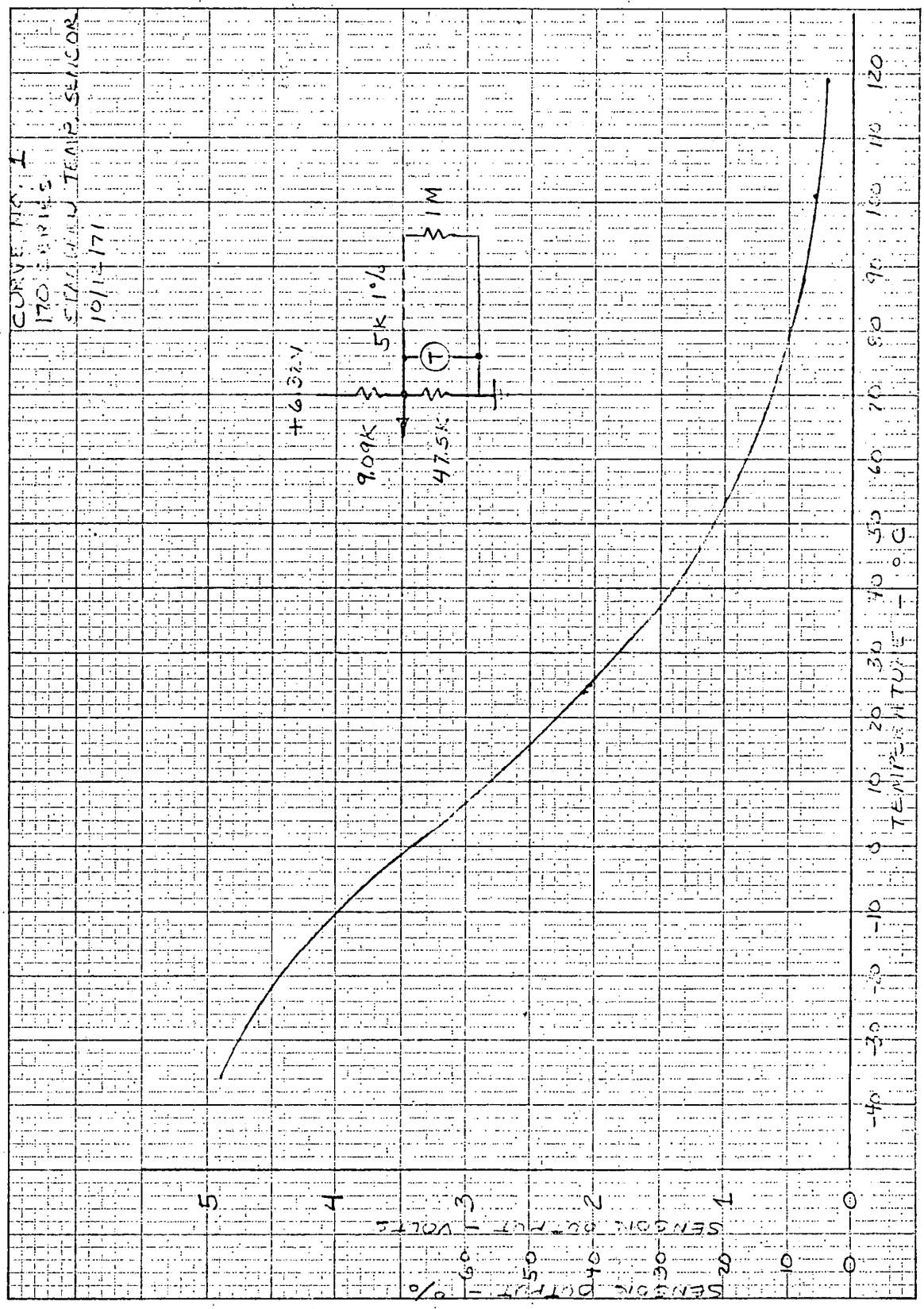
* - ORDNANCE ENABLE

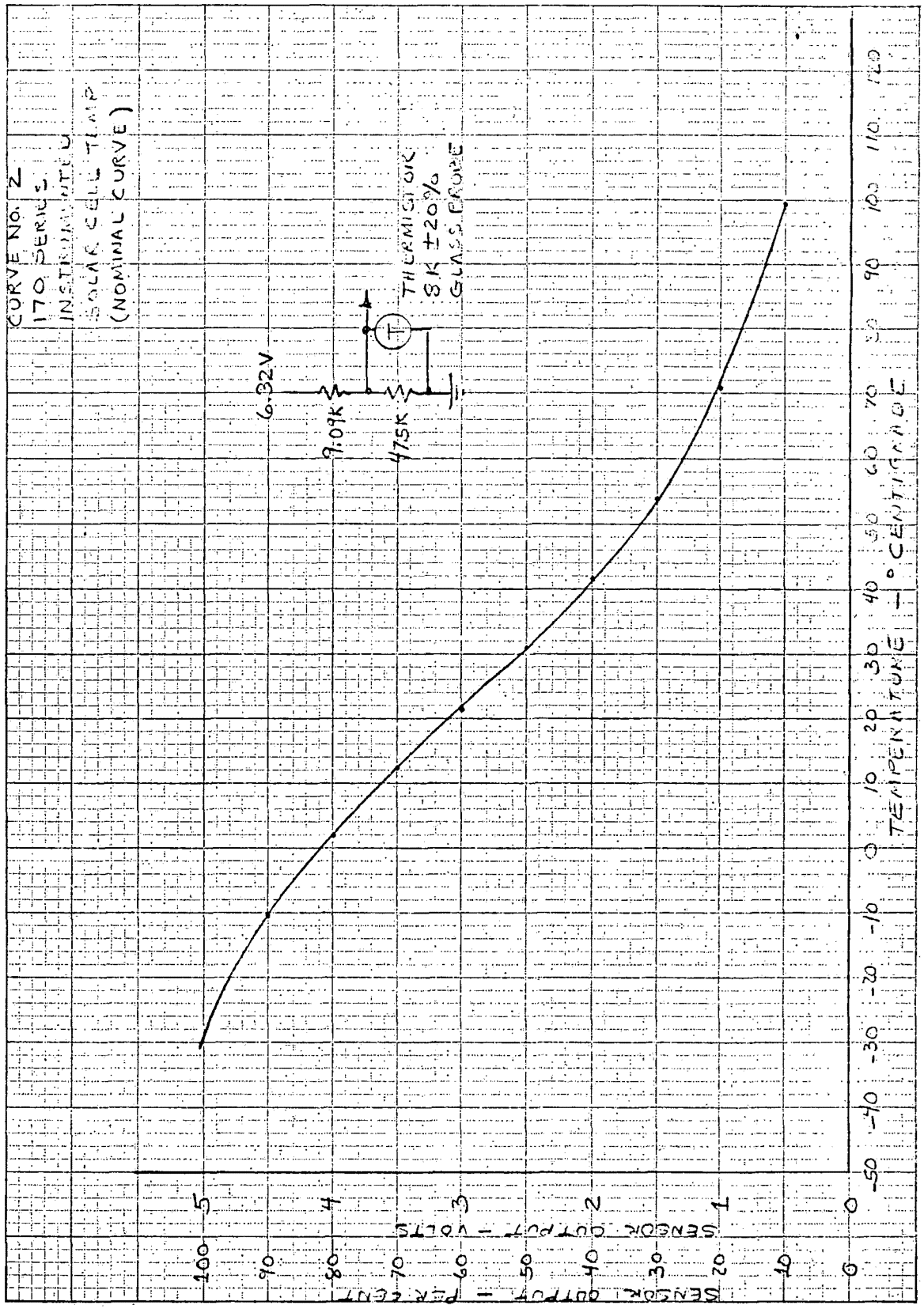
\# - BACK UP CMD

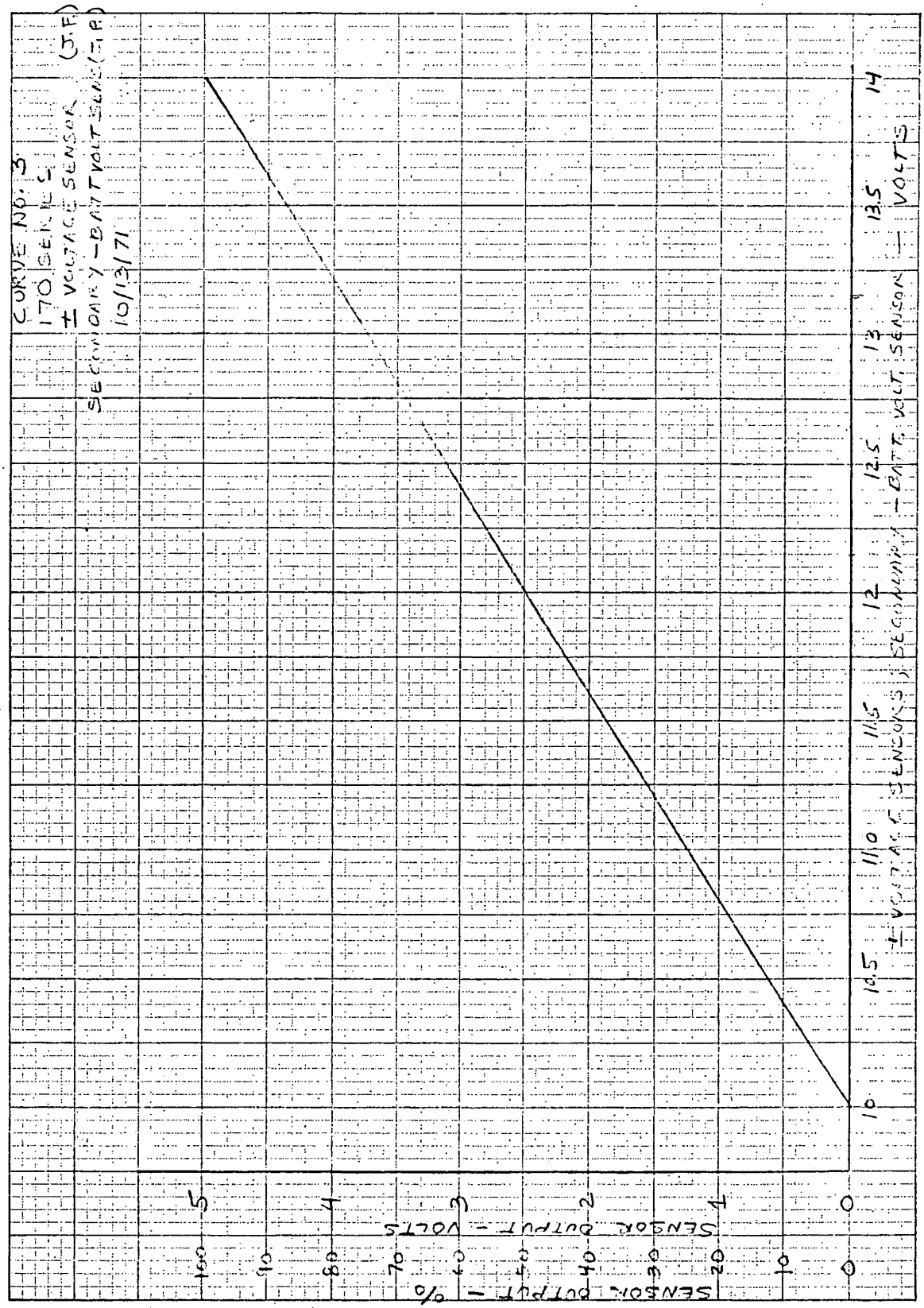
Approved for Release: 2024/06/06 C05027392

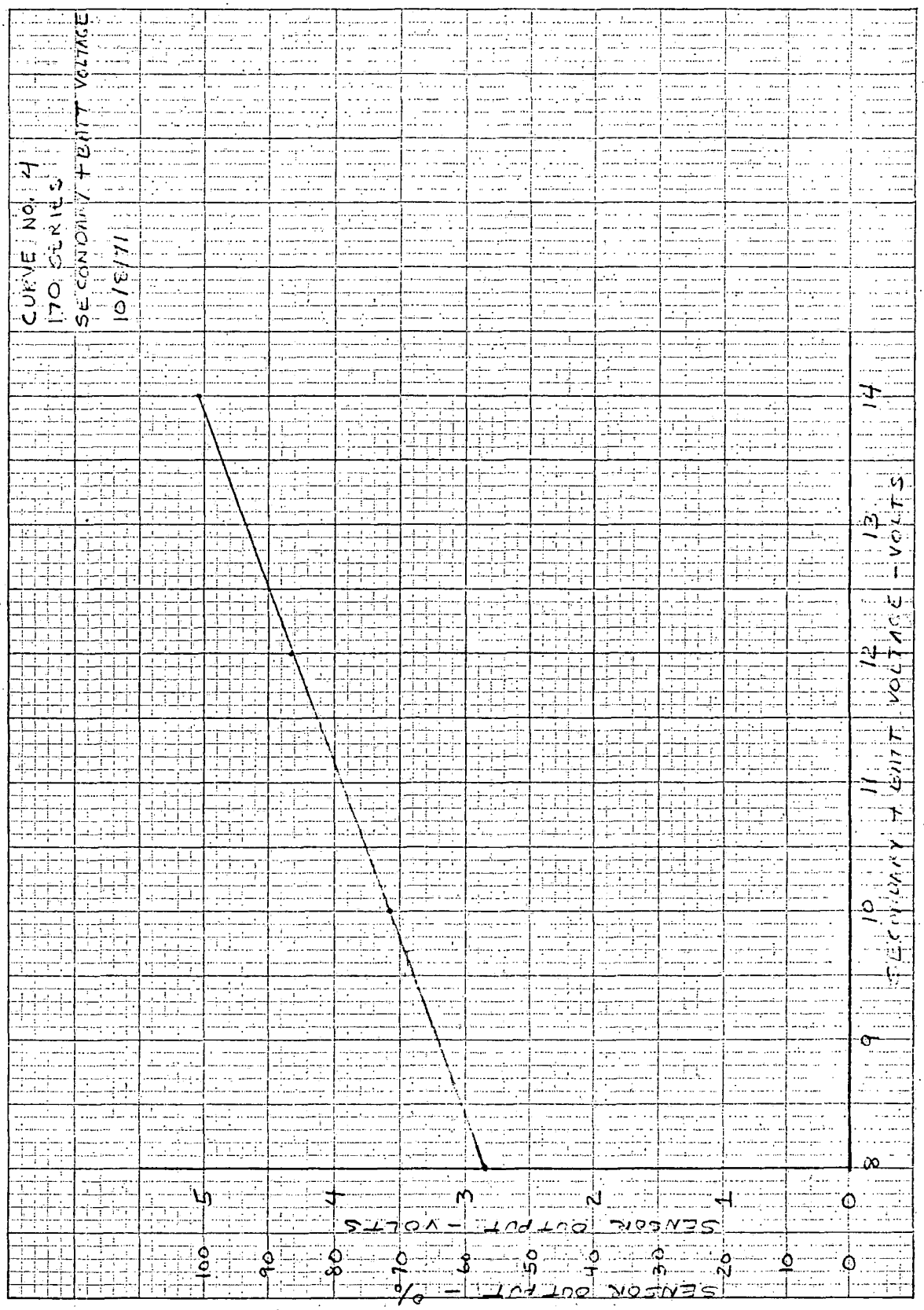
170 SERIES POM

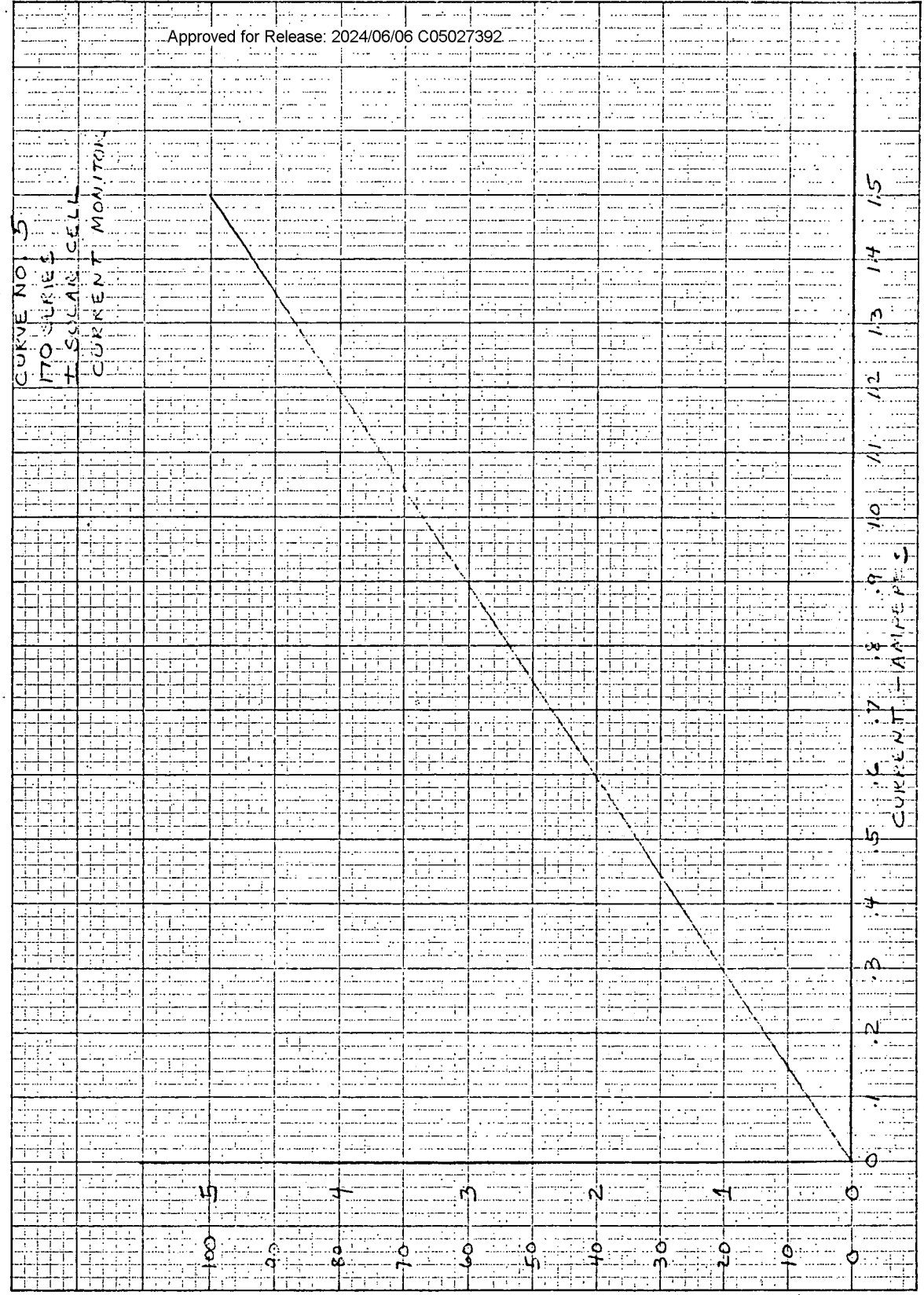
TABLE OF CURVES



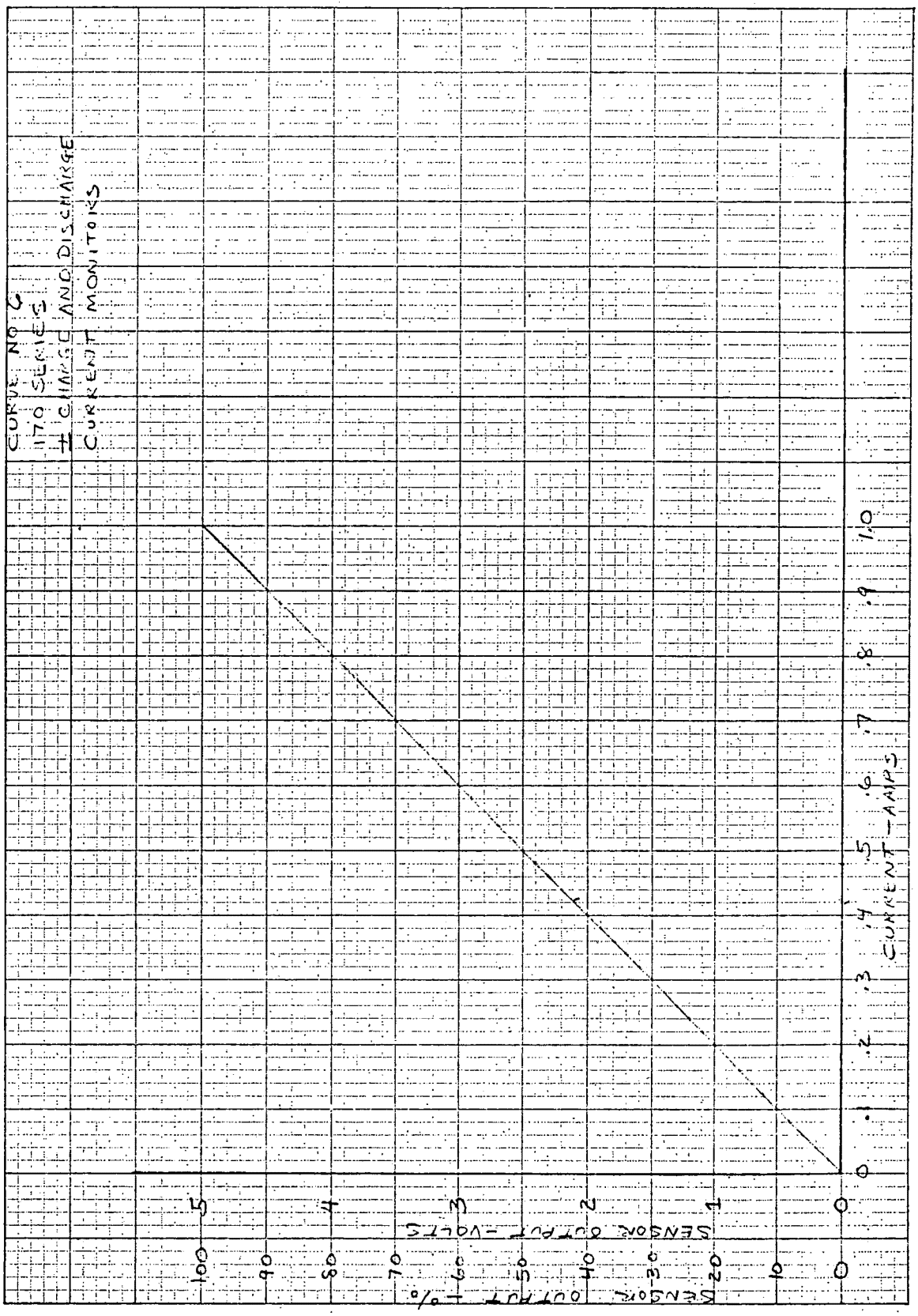


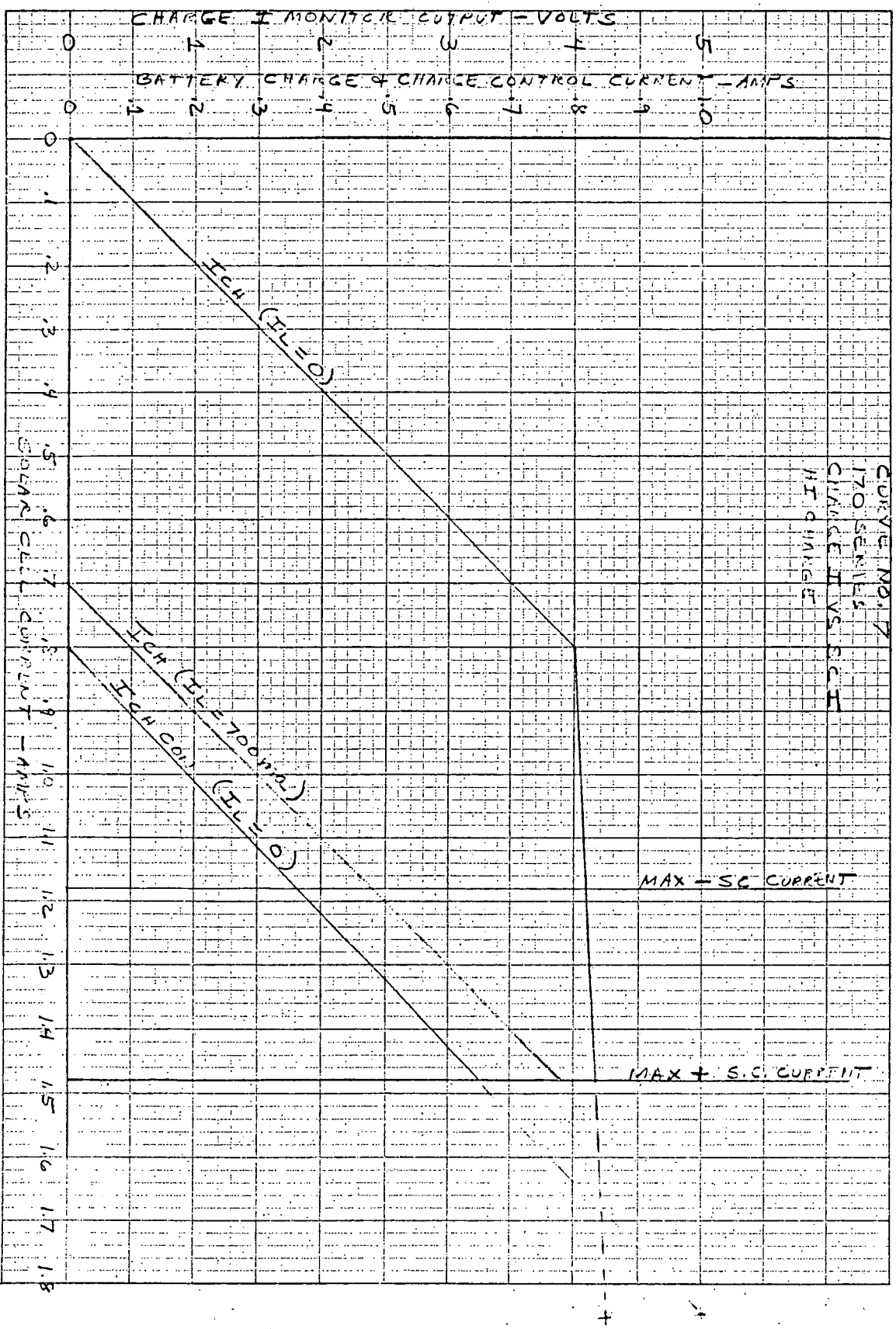


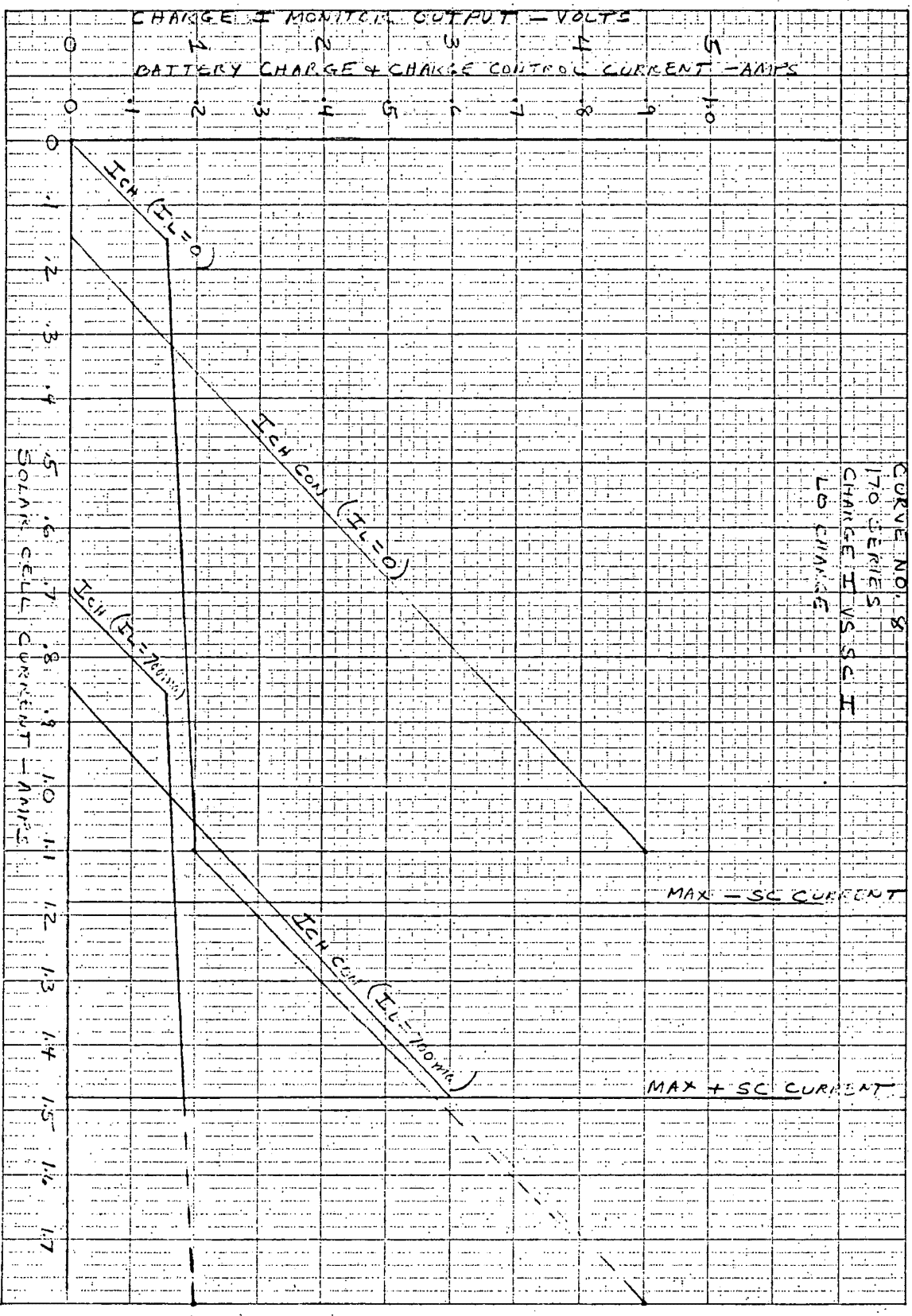


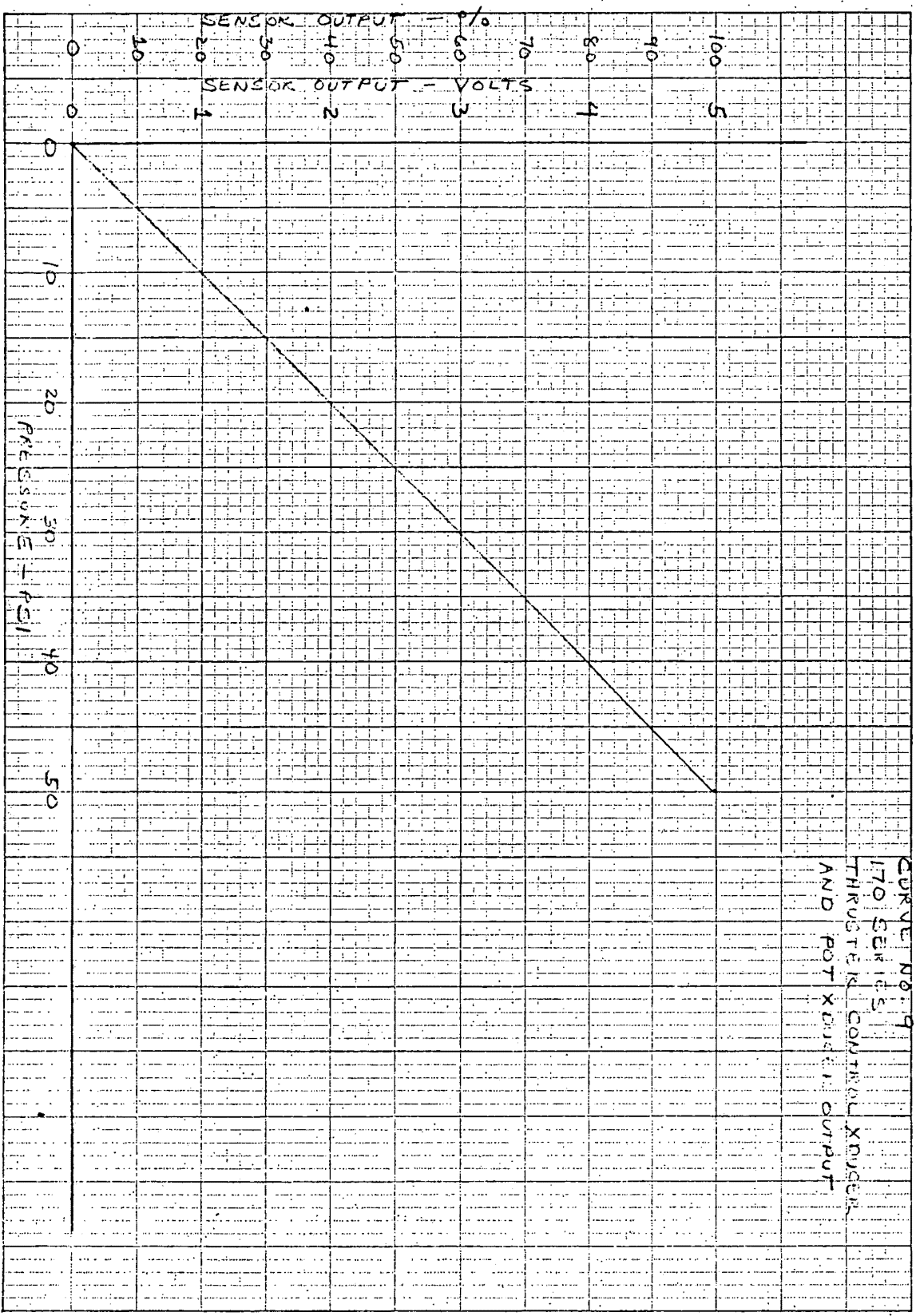


KEUFFEL & ESSER CO.
5 X 5 TO ½ INCH
7 X 10 INCHES
46 0860
MADE IN U.S.A.



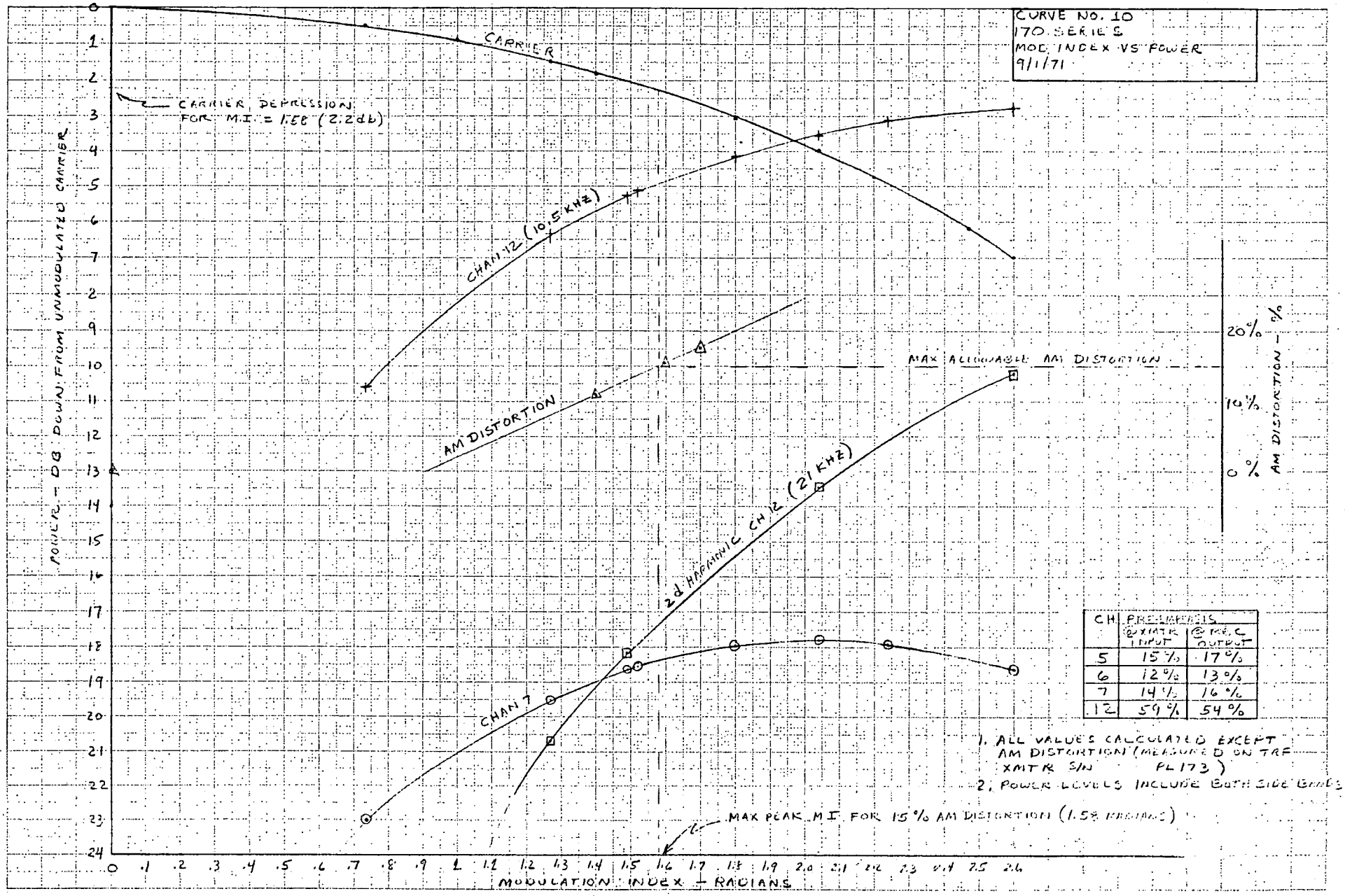






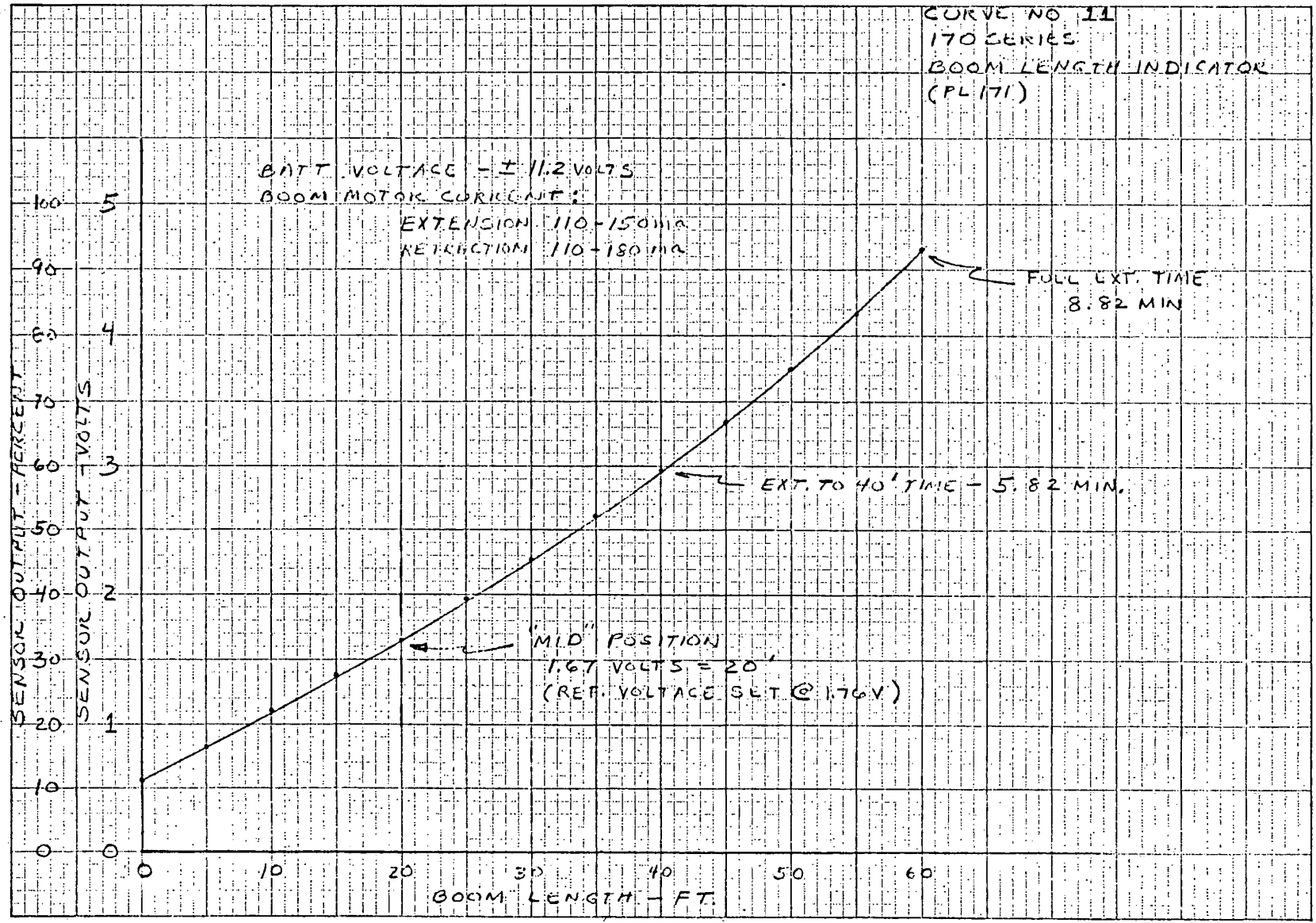
CURVE NO: 9
170 SERIES
THRUSTER CONTROL XDUCER
AND POT XDUCER OUTPUT

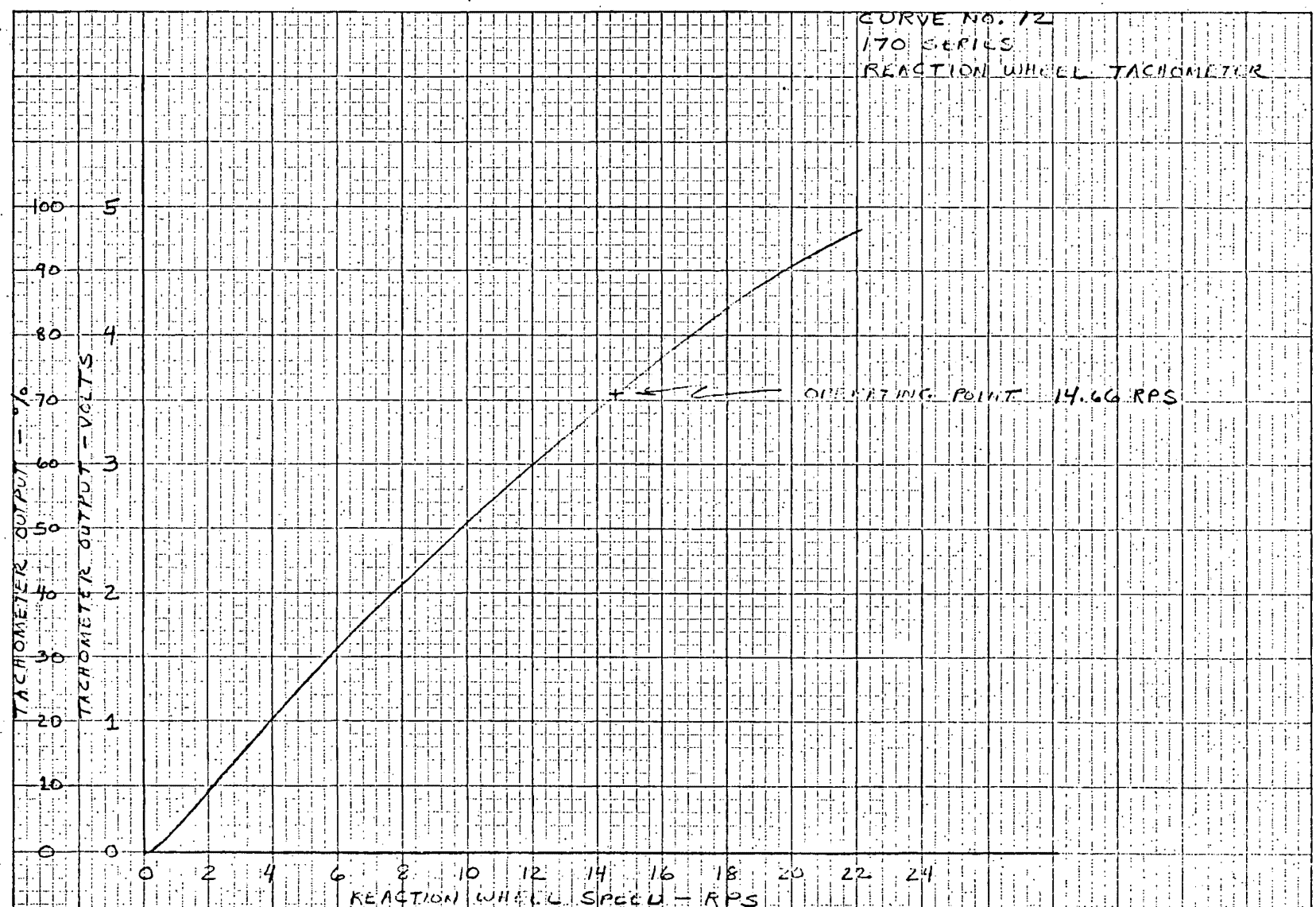
5 X 5 TO ½ INCH
7 X 10 INCHES
KEUFFEL & ESSER CO.
4G 0360
MADE IN U.S.A.

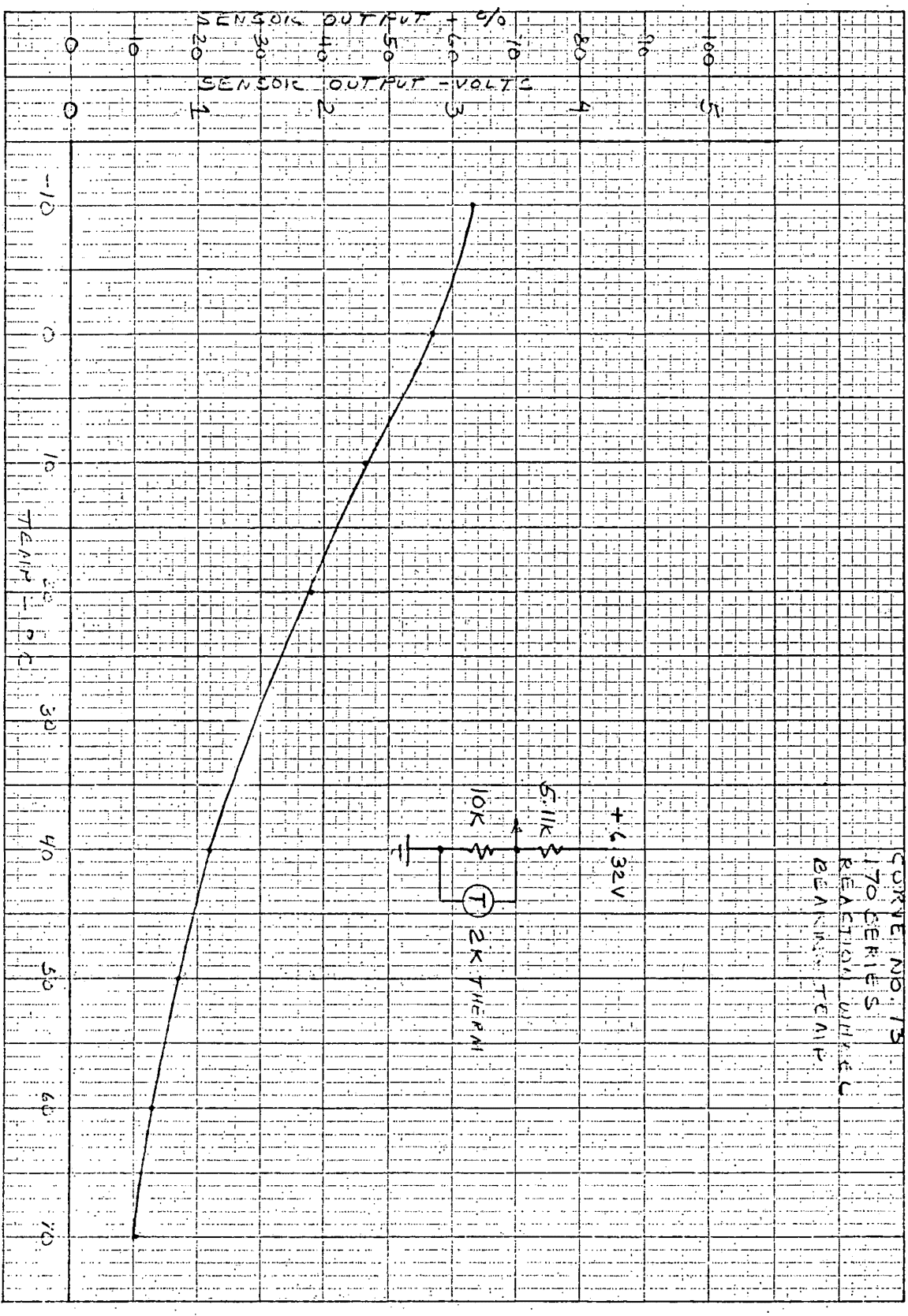


CH	PRELIMINARIES @ XMTR INPUT	@ M&C OUTPUT
5	15%	17%
6	12%	13%
7	14%	16%
12	59%	54%

1. ALL VALUES CALCULATED EXCEPT AM DISTORTION (MEASURED ON TRF XMTR S/N PL173)
2. POWER LEVELS INCLUDE BOTH SIDE BANDS







5 X 5 TO ½ INCH 46 0860
7 X 10 INCHES
KEUFFEL & ESSER CO.
MADE IN U.S.A.

CURVE NO 14
170 SERIES
RECEIVER AGC

SENSOR OUTPUT = %

SENSOR OUTPUT = VOLTS

100 90 80 70 60 50 40 30 20 10 0

5 4 3 2 1 0

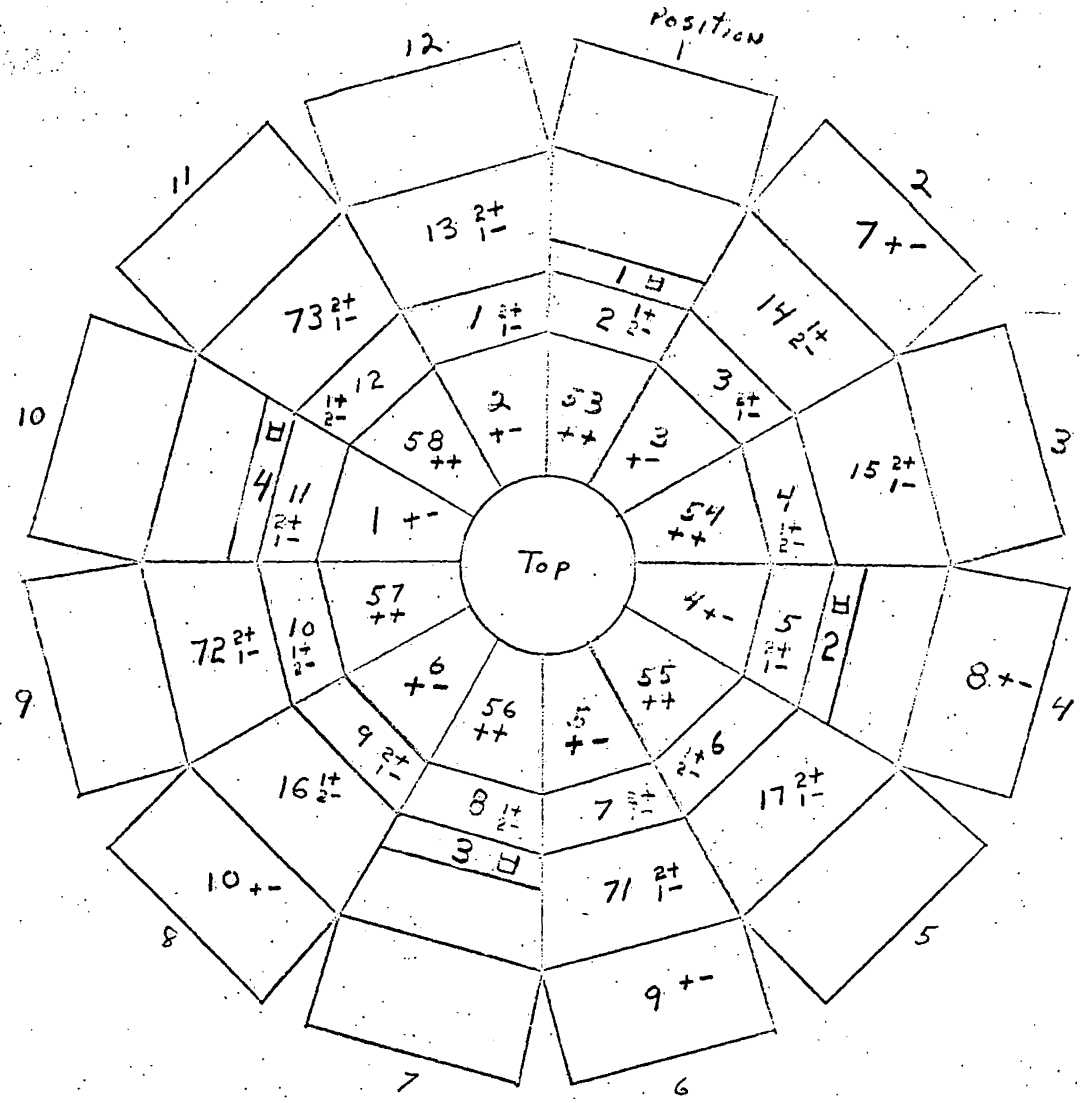
-110 -100 -90 -80 -70 -60 -50 -40 1 PORT SENS.
-117 -107 -97 -87 -77 -67 -57 -47 4 PORT SENS.

dBm

II.7. PANEL IDENTIFICATION

BY Shubert DATE 10-18-71 SUBJECT PL 171 SHEET NO. ____ OF ____

CHKD. BY ____ DATE ____ Panel Positions JOB NO. ____

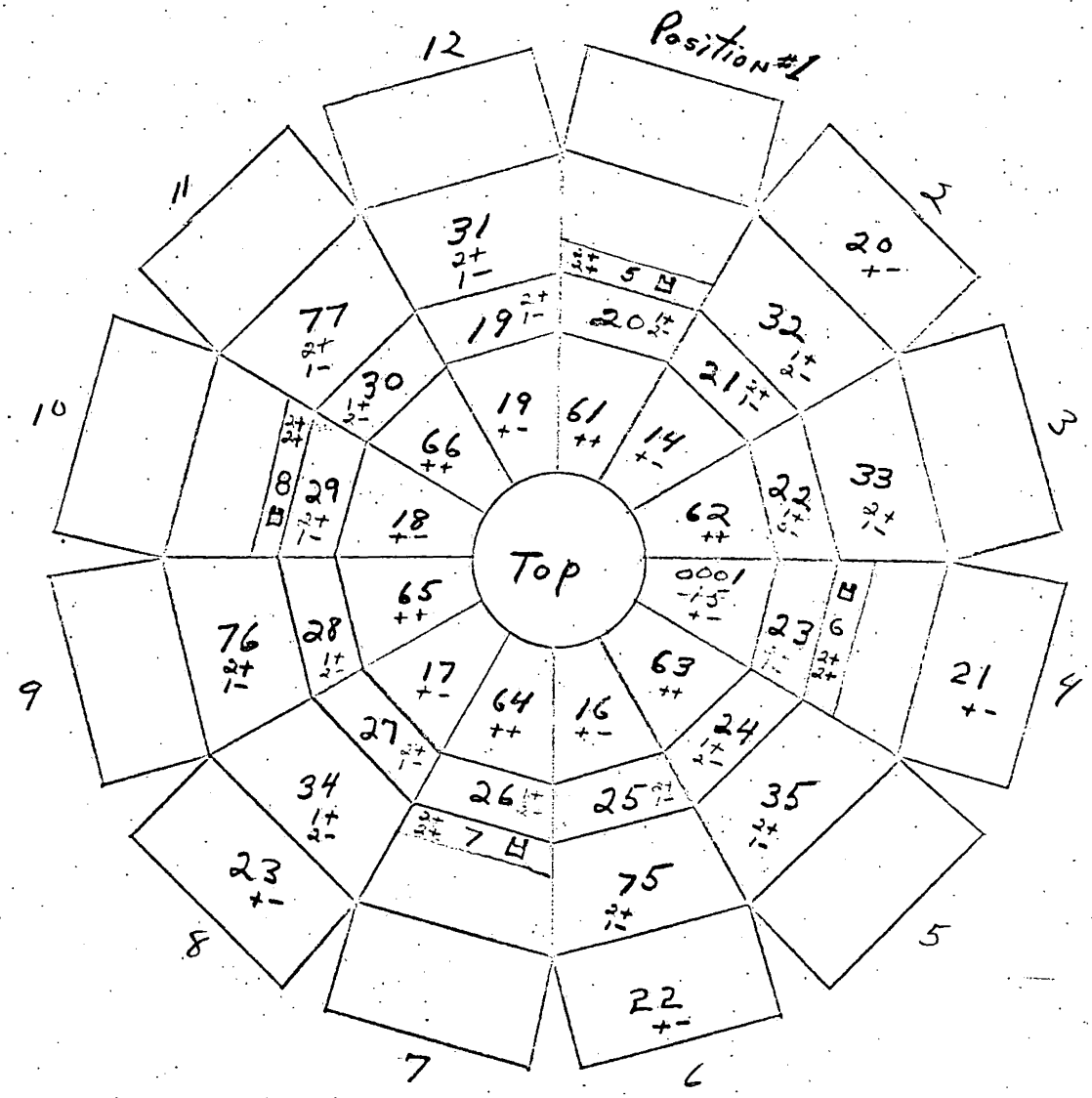


Paddle #1 Brown Dot

BY _____ DATE 10-23 SUBJECT PL 122 Panel Positions SHEET NO. _____ OF _____

CHKD. BY _____ DATE _____ JOB NO. _____

Jon Hyland

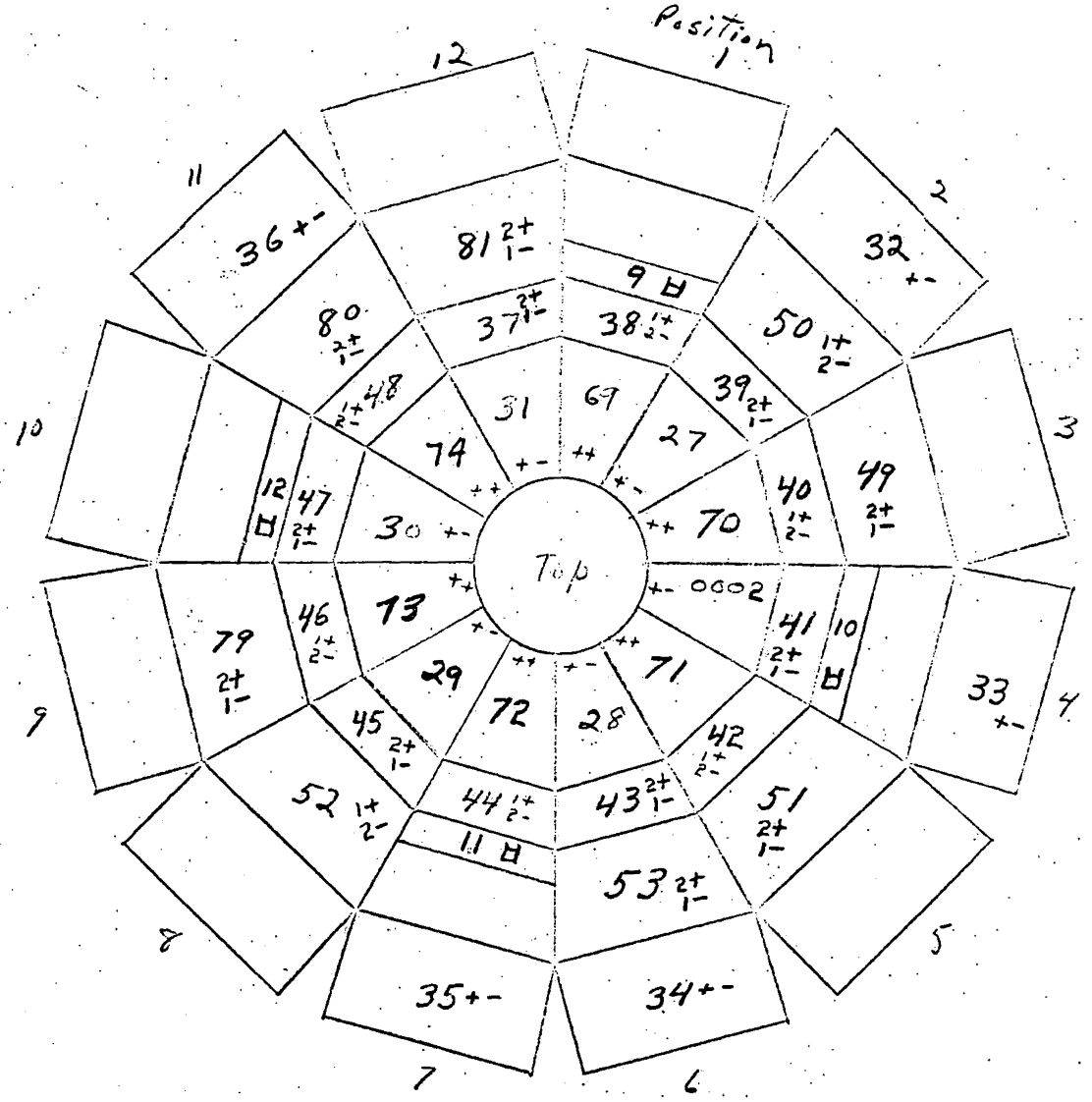


BY _____ DATE _____ SUBJECT PL 173

CHKD. BY Highland DATE _____ Plans / Positions

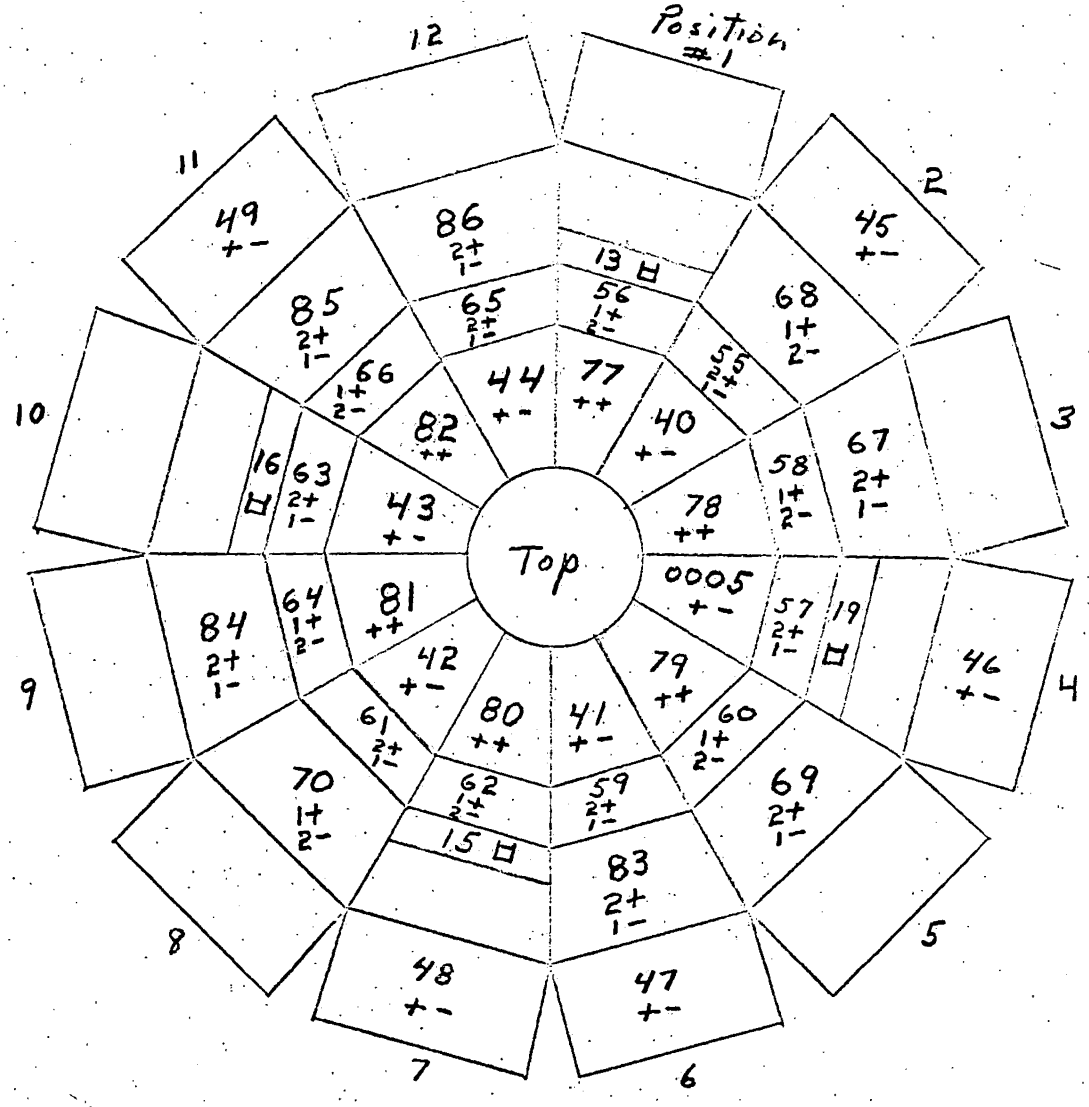
SHEET NO. _____ OF _____

JOB NO. _____



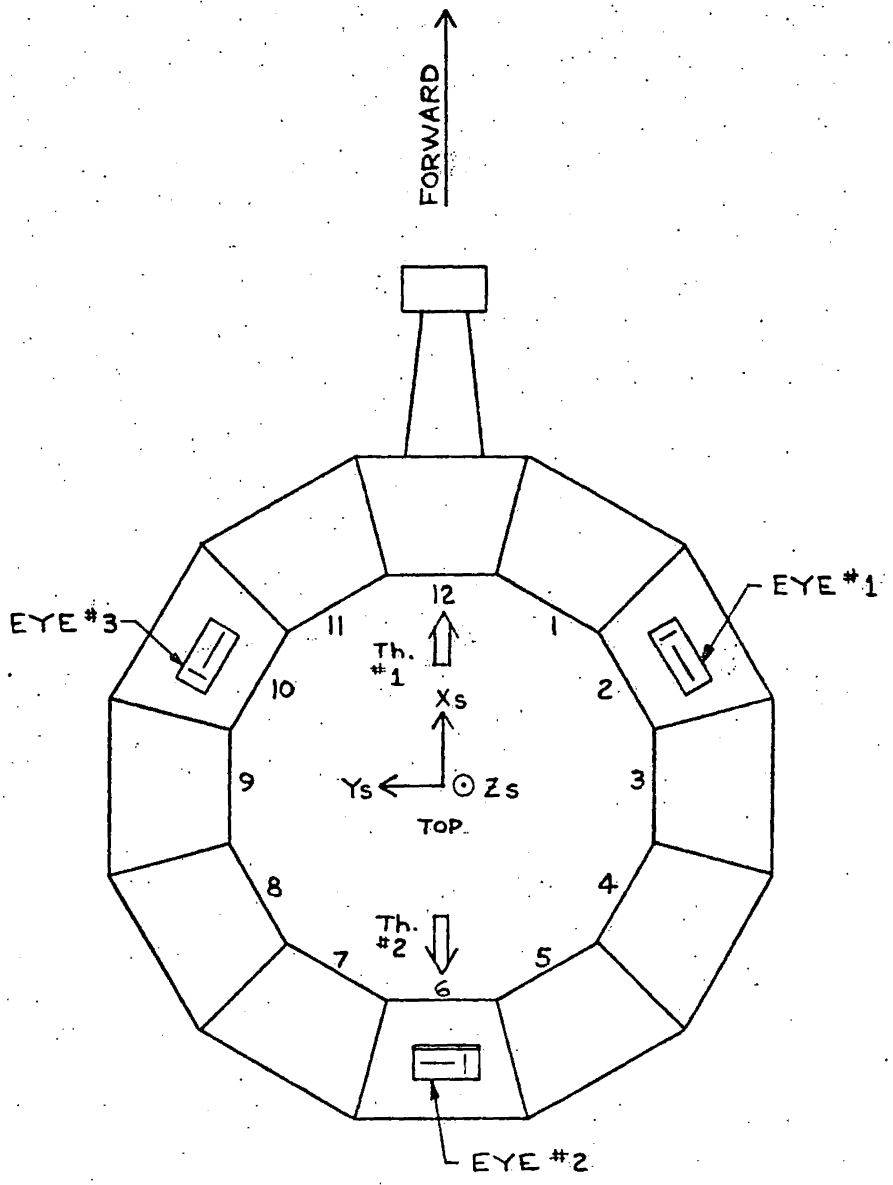
Pellet = 3 orange Dot

BY _____ DATE _____ SUBJECT PL 174 SHEET NO. _____
CHKD. BY _____ DATE _____ Panel Position JOB NO. _____
Shepherd



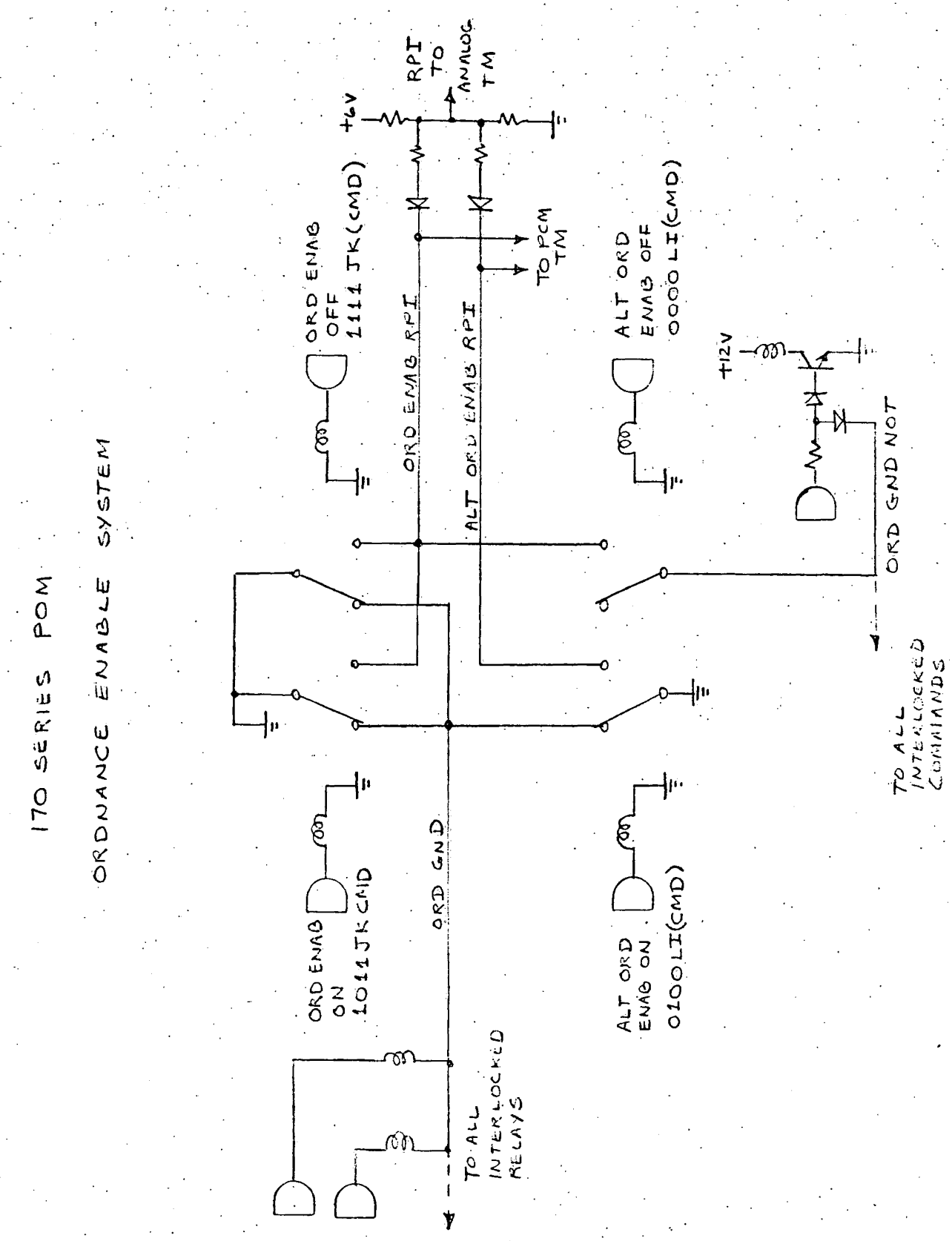
Paddle #4 Yellow Dot

II.8. FUNCTIONAL DIAGRAMS

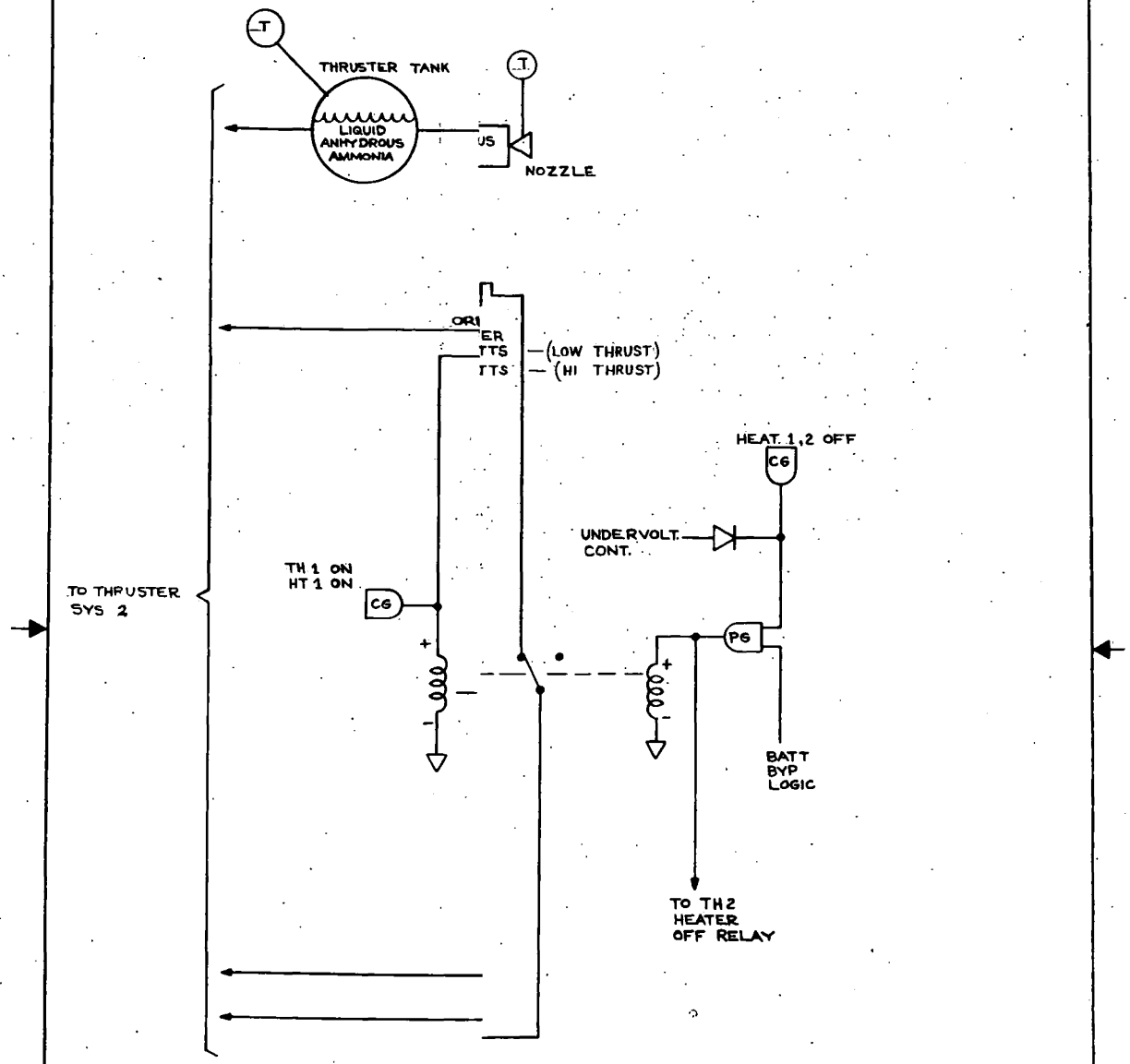


CMD FORWARD – MOMENTUM VECTOR OF WHEEL POINTS TO FLAT #9 (ie WHEEL TURNS CW LOOKING FROM SIDE OF CONNECTOR)

CMD BACKWARD – CONVERSE OF ABOVE



REVISIONS					
LTR	PT. NO.	BY	DESCRIPTION	DATE	APPROVED



PART NO.	DESCRIPTION	SPECIFICATION	QTY REQD

PARTS LIST

ENGINEER WINKLER DATE 10/71
BLDG. 59 RM. TEL. 2611
DRAWN K.D. DATE 10/71 CHECKED DATE
DESIGN
SECTION DATE
BRANCH DATE
APPROVED BY DATE
APPROVED BY DATE

NAVAL RESEARCH LABORATORY
SATELLITE TECHNIQUES BRANCH
WASHINGTON, D.C. 20390

EXPERIMENT #171
THRUSTER FUNCTIONAL DIAGRAM

SIZE	CODE IDENT NO.	DWG. NO.
D	81995	171-36

SCALE 1/1 SHEET OF

170 SERIES DDP-116 PROGRAMS

F170R - Raw data is presented in octal or binary on the CRT and/or the Line Printer in the standard frame format.

F170P - Processed PCM data is presented on the line Printer in the standard frame format.

F170C - Processed PCM data is presented on the CRT in the standard frame format.

F170MS - Processed memory data is presented on the CRT and/or the Line Printer.

F170CS - Processed command system data is presented on the CRT and/or the Line Printer. Included are: address indicators, PCM control (word 2-2), PCM status (word 3-2), battery/power control (wrod 4-2), battery/power control (word 4-2), osciallator and A/D (word 2-3).

F170ES - Processed experiment data is presented on CRT and/or the Line Printer.

F170PS - Processed power system data is presented on the CRT and/or the Line Printer. Included are: cell voltages, 5 volt calibrate, voltage sensors, battery temperatures, charge currents, discharge currents, sec volt monitors, and battery power control (word 4-2).

F170S - Processed reaction wheel, boom, and thrusters data is presented on the CRT and/or the Line Printer.

F170M1 - Raw group sync data is channelled; PCM to mag tape one, MRO to mag tape two.

F170M2 - Compares two tape generated by F170M1 above. Compares data sent to memory with data acutually in memory.

PLOT - FORTRAN plot subroutine allows line printer plotting of any word or bit in data stream. Limites and plot character to be determined by the user. TCT time is printed with plot. Plot image is Cols. 21 - 120.

PLOT - FORTRAN M Plot fram words or bits vs. time.

PSD-PLOT 70 - Plot frame words or bits vs. time

PLOT - FORTRAN G Plot frame words or bits vs. time

F170AS - List attitude system vs. time.

F170T - List temperatures vs. time.

F170 H - Health program to check payload.

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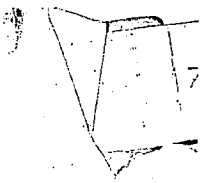
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16
1 8	9 16	17 24	25 32	33 40	41 48	49 56	57 64	65 72	73 80	81 88	89 96	97 104	105 112	113 120	121 128
subframe sync		frame sync													
11101011	10010000	00010100	01101111	+ cell 2	− cell 10	Exp 1	Exp 2	+ Volt Sensor	− Volt Sensor	RW Tach out	Mag x out	Mag y out	Mag z out	Adcole bits 1a - 7a	Adcole bits 1b - 7b
0-0	0-1	0-2	0-3	0-4	0-5	0-6	0-7	0-8	0-9	0-10	0-11	0-12	0-13	0-14	0-15
17	18	19	20	21	22	23	24	25	26	27	28	29	30	31	32
129 236	137 144	145 152	153 160	161 168	169 176	177 184	185 192	193 200	201 208	209 216	217 224	225 232	233 240	241 248	249 256
subframe sync															
		Add Ind 1	Vernier Time	+ cell 3	− cell 11	Exp 3	Exp 4	5V Cal	Rec 1 Agc	Rec 1 Agc	Boom Length	+ cell 1	− cell 18	RW Speed	RW Speed
1-0	1-1	1-2	1-3	1-4	1-5	1-6	1-7	1-8	1-9	1-10	1-11	1-12	1-13	1-14	1-15
33	34	35	36	37	38	39	40	41	42	43	44	45	46	47	48
257 264	265 272	273 280	281 288	289 296	297 304	305 312	313 320	321 328	329 336	337 344	345 352	353 360	361 368	369 376	377 384
subframe sync															
		Command Control	Memory Control	+ cell 4	− cell 12	Exp 5	Exp 6	T19 SCP Temp	T24 Batbyp Temp	Control 1 press x ducer	Control 2 press x ducer	DL Timer CMD1	DL Timer CMD2	Boom Control	RW Control
2-0	2-1	2-2	2-3	2-4	2-5	2-6	2-7	2-8	2-9	2-10	2-11	2-12	2-13	2-14	2-15
49	50	51	52	53	54	55	56	57	58	59	60	61	62	63	64
385 392	393 400	401 408	409 416	417 424	425 432	433 440	441 448	449 456	457 464	465 472	473 480	481 488	489 496	497 504	505 512
subframe sync															
		PCM Status Control	Payload Status	+ cell 5	− cell 13	Exp 7	Exp 8	+ Sec Volt Mon	− Sec Volt Mon	T2 Pktmp Temp	T15 SCP1 Temp	T3+Sec Bat Temp	T4−Sec Bat Temp	Thrusters Control	Spare
3-0	3-1	3-2	3-3	3-4	3-5	3-6	3-7	3-8	3-9	3-10	3-11	3-12	3-13	3-14	3-15
65	66	67	68	69	70	71	72	73	74	75	76	77	78	79	80
513 520	521 528	529 536	537 544	545 552	553 560	561 568	569 576	577 584	585 592	593 600	601 608	609 616	617 624	625 632	633 640
subframe sync															
		Power Control		+ cell 6	− cell 14	Exp 9	Exp 10	+ Volt Sensor	− Volt Sensor	+ Batt Temp	− Batt Temp	+ Charge I Mon	+ Discharge I Mon	− Charge I Mon	− Discharge I Mon
4-0	4-1	4-2	4-3	4-4	4-5	4-6	4-7	4-8	4-9	4-10	4-11	4-12	4-13	4-14	4-15
81	82	83	84	85	86	87	88	89	90	91	92	93	94	95	96
641 648	649 656	657 664	665 672	673 680	681 688	689 696	697 704	705 712	713 720	721 728	729 736	737 744	745 752	753 760	761 768
subframe sync															
				+ cell 7	− cell 15	Exp 11	Exp 12	+ Batt Temp	− Batt Temp	T10 HCI Temp	T16SCP2 Temp	T20suptube Temp	T21 Batt3 Temp	T22 chcon Temp	T23Vcon Temp
5-0	5-1	5-2	5-3	5-4	5-5	5-6	5-7	5-8	5-9	5-10	5-11	5-12	5-13	5-14	5-15
97	98	99	100	101	102	103	104	105	106	107	108	109	110	111	112
769 776	777 784	785 792	793 800	801 808	809 816	817 824	825 832	833 840	841 848	849 856	857 864	865 872	873 880	881 888	889 896
subframe sync															
		Exp 17-1	Exp 17-2	+ cell 8	− cell 16	Exp 13	Exp 14	T8 Skin 1 Temp	T9 Skin 2 Temp	T17 Inner SCI Temp	T12 BB Temp	T13 Inner SCI Temp	T14 out sc Temp	SCI Mon	− SCI Mon
6-0	6-1	6-2	6-3	6-4	6-5	6-6	6-7	6-8	6-9	6-10	6-11	6-12	6-13	6-14	6-15
113	114	115	116	117	118	119	120	121	122	123	124	125	126	127	128
897 904	905 912	913 920	921 928	929 936	937 944	945 952	953 960	961 968	969 976	977 984	985 992	993 1000	1001 1008	1009 1016	1017 1024
subframe sync															
		Exp 17-3	Exp 17-4	+ cell 9	− cell 17	Exp 15	Exp 16	T5 Tank Temp	T6-1 Nozzle Temp	RW Temp	T18 BBSC2 Temp	T11 DLBoom Temp	T1 PCM Pk Temp	Th2 Tank Press x ducer	Th1 Tank Press x ducer
7-0	7-1	7-2	7-3	7-4	7-5	7-6	7-7	7-8	7-9	7-10	7-11	7-12	7-13	7-14	7-15



III.1. F170 R

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PCM  VTIM 123 BIRD 171   HKSR ON   OREN ON   DLSS OFF      303 13 35 33        F170R     REV   000000 SAMPLE   000001
215 009 040 246 188 188 063 063 094 104 000 069 089 243 000 000
215 009 255 123 186 189 063 063 249 044 000 026 186 185 255 255
215 009 029 200 187 187 063 063 255 130 000 000 048 202 228 105
215 009 159 012 186 186 063 063 215 139 127 255 139 140 240 255
215 009 251 255 188 188 063 063 094 104 140 140 000 094 000 073
215 009 255 029 187 188 063 063 140 140 137 000 127 138 130 130
215 009 254 255 188 188 063 063 092 091 123 113 091 124 016 000
215 009 255 255 189 189 063 063 139 255 092 097 255 137 109 103
PCM  VTIM 124 BIRD 171   HKSR ON   OREN ON   DLSS OFF      303 13 35 35        F170R     REV   000000 SAMPLE   000002
215 009 040 246 188 188 063 063 094 104 000 069 088 243 000 000
215 009 255 124 186 189 063 063 249 044 000 026 187 185 255 255
215 009 029 200 187 187 063 063 255 130 000 000 048 202 228 105
215 009 159 012 186 186 063 063 214 139 127 255 139 140 240 255
215 009 251 255 188 188 063 063 094 104 140 140 000 094 000 071
215 009 255 029 188 188 063 063 140 140 137 000 127 138 130 130
215 009 254 255 188 188 063 063 092 091 123 113 091 124 016 000
215 009 255 255 189 188 063 063 139 255 092 097 255 137 109 103
PCM  VTIM 125 BIRD 171   HKSR ON   OREN ON   DLSS OFF      303 13 35 38        F170R     REV   000000 SAMPLE   000003
215 009 040 246 188 188 063 063 094 104 000 069 088 243 000 000
215 009 255 125 186 189 063 063 249 044 000 026 187 185 255 255
215 009 029 200 187 187 063 063 255 130 000 000 048 202 228 105
215 009 159 012 186 186 063 063 215 139 127 255 139 140 240 255
215 009 251 255 188 188 063 063 094 105 140 140 000 094 000 071
215 009 255 029 187 188 063 063 140 140 137 000 127 138 130 130
215 009 254 255 188 187 063 063 092 091 123 113 091 124 016 000
215 009 255 255 188 189 063 063 139 255 092 097 255 137 109 103
PCM  VTIM 126 BIRD 171   HKSR ON   OREN ON   DLSS OFF      303 13 35 40        F170R     REV   000000 SAMPLE   000004
215 009 040 246 188 188 063 063 094 105 000 069 088 243 000 000
215 009 255 126 186 189 063 063 249 045 000 026 187 185 255 255
215 009 029 200 187 187 063 063 255 130 000 000 048 202 228 105
215 009 159 012 186 186 063 063 215 139 127 255 139 140 240 255
215 009 251 255 188 188 063 063 094 105 140 140 000 094 000 071
215 009 255 029 187 188 063 063 140 140 137 000 127 138 130 130
215 009 254 255 188 188 063 063 092 091 123 113 091 123 016 000
215 009 255 255 188 188 063 063 139 255 092 097 255 137 110 103
PCM  VTIM 127 BIRD 171   HKSR ON   OREN ON   DLSS OFF      303 13 35 43        F170R     REV   000000 SAMPLE   000005
215 009 040 246 188 188 063 063 094 105 000 069 088 243 000 000
215 009 255 127 186 189 063 063 249 044 000 026 186 185 255 255
215 009 029 200 187 187 063 063 255 130 000 000 048 202 228 105
215 009 159 012 186 186 063 063 215 139 127 255 139 140 240 255
215 009 251 255 188 188 063 063 094 105 140 140 000 094 000 071
215 009 255 029 187 188 063 063 140 140 137 000 127 138 130 130
215 009 254 255 188 188 063 063 092 091 123 113 091 123 016 001
215 009 255 255 188 189 063 063 139 255 092 097 255 137 109 103
PCM  VTIM 128 BIRD 171   HKSR ON   OREN ON   DLSS OFF      303 13 35 45        F170R     REV   000000 SAMPLE   000006
215 009 040 246 188 188 063 063 094 105 000 069 088 243 000 000
215 009 255 128 186 189 063 063 249 044 000 026 187 185 255 255
215 009 029 200 187 187 063 063 255 130 000 000 048 202 228 105
215 009 159 012 186 186 063 063 215 139 127 255 139 140 240 255
215 009 251 255 188 188 063 063 094 105 140 140 000 092 000 071
215 009 255 029 187 188 063 063 140 140 137 000 127 138 130 130
215 009 254 255 188 188 063 063 092 091 123 113 091 123 016 000
215 009 255 255 188 188 063 063 139 255 092 097 255 137 109 103
PCM  VTIM 129 BIRD 171   HKSR ON   OREN ON   DLSS OFF      303 13 35 48        F170R     REV   000000 SAMPLE   000007
215 009 040 246 188 188 063 063 094 105 000 069 088 243 000 000
215 009 255 129 186 189 063 063 249 044 000 026 187 185 255 255
215 009 029 200 187 187 063 063 255 130 000 000 048 202 228 105
215 009 159 012 186 186 063 063 214 139 127 255 139 140 240 255
215 009 251 255 188 188 063 063 094 105 140 140 000 092 000 073
215 009 255 029 187 188 063 063 140 140 137 000 127 138 130 130
215 009 254 255 188 188 063 063 092 091 123 113 091 123 016 000
215 009 255 255 188 188 063 063 139 255 092 097 255 137 109 103
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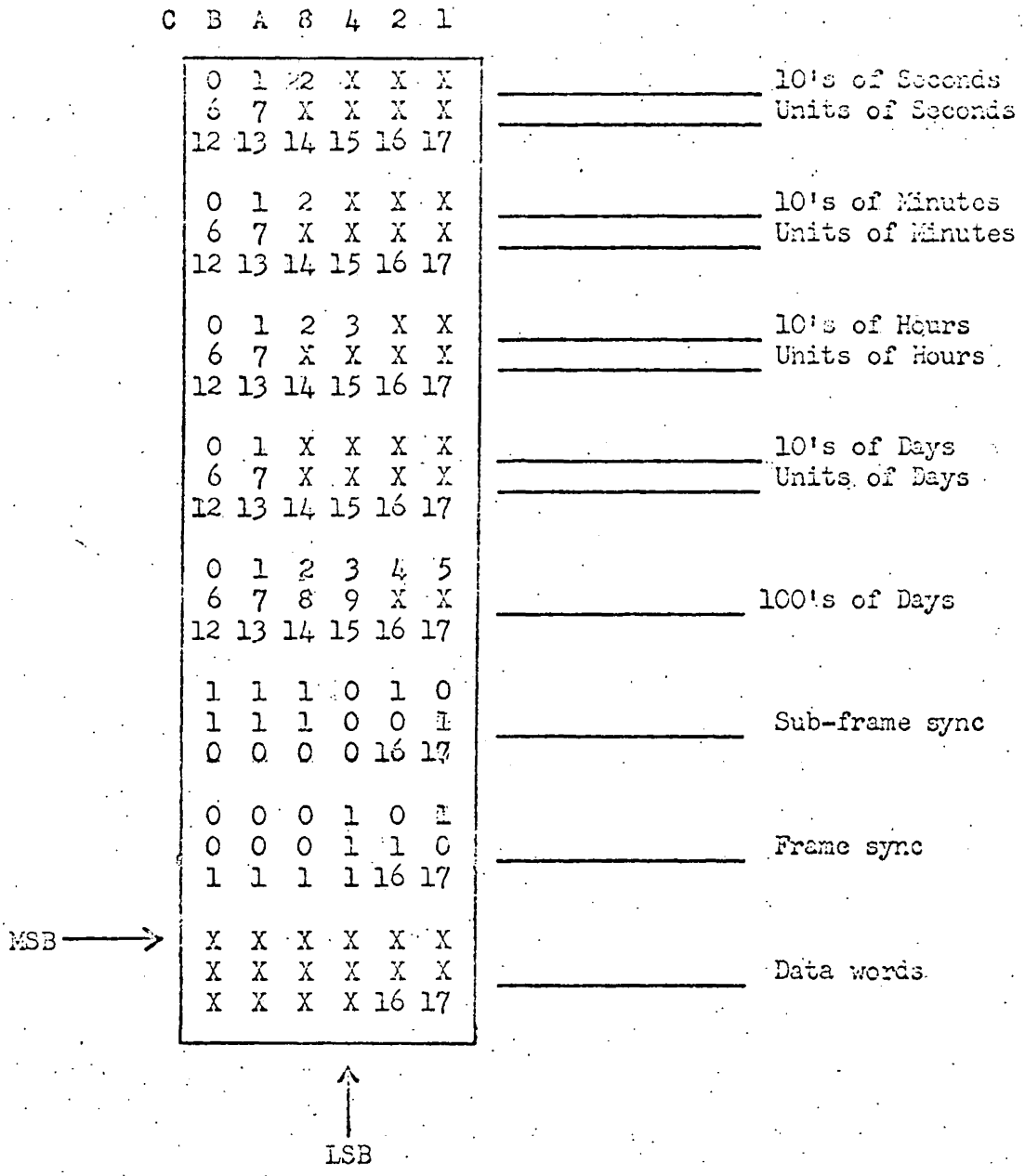
Approved for Release: 2024/06/06 C05027392

DEC	OCT	BIN	DEC	OCT	BIN	DEC	OCT	BIN	DEC	OCT	BIN
000	000	00000000	064	100	01000000	128	200	10000000	192	300	110000
001	001	00000001	065	101	01000001	129	201	10000001	193	301	110000
002	002	00000010	066	102	01000010	130	202	10000010	194	302	110000
003	003	00000011	067	103	01000011	131	203	10000011	195	303	110000
004	004	00000100	068	104	01000100	132	204	10000100	196	304	110001
005	005	00000101	069	105	01000101	133	205	10000101	197	305	110001
006	006	00000110	070	106	01000110	134	206	10000110	198	306	110001
007	007	00000111	071	107	01000111	135	207	10000111	199	307	110001
008	010	00001000	072	110	01001000	136	210	10001000	200	310	110010
009	011	00001001	073	111	01001001	137	211	10001001	201	311	110010
010	012	00001010	074	112	01001010	138	212	10001010	202	312	110010
011	013	00001011	075	113	01001011	139	213	10001011	203	313	110010
012	014	00001100	076	114	01001100	140	214	10001100	204	314	110011
013	015	00001101	077	115	01001101	141	215	10001101	205	315	110011
014	016	00001110	078	116	01001110	142	216	10001110	206	316	110011
015	017	00001111	079	117	01001111	143	217	10001111	207	317	110011
016	020	00010000	080	120	01010000	144	220	10010000	208	320	110100
017	021	00010001	081	121	01010001	145	221	10010001	209	321	110100
018	022	00010010	082	122	01010010	146	222	10010010	210	322	110100
019	023	00010011	083	123	01010011	147	223	10010011	211	323	110100
020	024	00010100	084	124	01010100	148	224	10010100	212	324	110101
021	025	00010101	085	125	01010101	149	225	10010101	213	325	110101
022	026	00010110	086	126	01010110	150	226	10010110	214	326	110101
023	027	00010111	087	127	01010111	151	227	10010111	215	327	110101
024	030	00011000	088	130	01011000	152	230	10011000	216	330	110110
025	031	00011001	089	131	01011001	153	231	10011001	217	331	110110
026	032	00011010	090	132	01011010	154	232	10011010	218	332	110110
027	033	00011011	091	133	01011011	155	233	10011011	219	333	110110
028	034	00011100	092	134	01011100	156	234	10011100	220	334	110111
029	035	00011101	093	135	01011101	157	235	10011101	221	335	110111
030	036	00011110	094	136	01011110	158	236	10011110	222	336	110111
031	037	00011111	095	137	01011111	159	237	10011111	223	337	110111
032	040	00100000	096	140	01100000	160	240	10100000	224	340	111000
033	041	00100001	097	141	01100001	161	241	10100001	225	341	111000
034	042	00100010	098	142	01100010	162	242	10100010	226	342	111000
035	043	00100011	099	143	01100011	163	243	10100011	227	343	111000
036	044	00100100	100	144	01100100	164	244	10100100	228	344	111001
037	045	00100101	101	145	01100101	165	245	10100101	229	345	111001
038	046	00100110	102	146	01100110	166	246	10100110	230	346	111001
039	047	00100111	103	147	01100111	167	247	10100111	231	347	111001
040	050	00101000	104	150	01101000	168	250	10101000	232	350	111010
041	051	00101001	105	151	01101001	169	251	10101001	233	351	111010
042	052	00101010	106	152	01101010	170	252	10101010	234	352	111010
043	053	00101011	107	153	01101011	171	253	10101011	235	353	111010
044	054	00101100	108	154	01101100	172	254	10101100	236	354	111011
045	055	00101101	109	155	01101101	173	255	10101101	237	355	111011
046	056	00101110	110	156	01101110	174	256	10101110	238	356	111011
047	057	00101111	111	157	01101111	175	257	10101111	239	357	111011
048	060	00110000	112	160	01110000	176	260	10110000	240	360	111100
049	061	00110001	113	161	01110001	177	261	10110001	241	361	111100
050	062	00110010	114	162	01110010	178	262	10110010	242	362	111100
051	063	00110011	115	163	01110011	179	263	10110011	243	363	111100
052	064	00110100	116	164	01110100	180	264	10110100	244	364	111101
053	065	00110101	117	165	01110101	181	265	10110101	245	365	111101
054	066	00110110	118	166	01110110	182	266	10110110	246	366	111101
055	067	00110111	119	167	01110111	183	267	10110111	247	367	111101
056	070	00111000	120	170	01111000	184	270	10111000	248	370	111110
057	071	00111001	121	171	01111001	185	271	10111001	249	371	111110
058	072	00111010	122	172	01111010	186	272	10111010	250	372	111110
059	073	00111011	123	173	01111011	187	273	10111011	251	373	111110
060	074	00111100	124	174	01111100	188	274	10111100	252	374	111111
061	075	00111101	125	175	01111101	189	275	10111101	253	375	111111
062	076	00111110	126	176	01111110	190	276	10111110	254	376	111111
063	077	00111111	127	177	01111111	191	277	10111111	255	377	111111

170 Series Programs Magnetic Tape Format



Frame Content:

Five time words followed by subframe sync, frame sync, twelve eight bit data words, subframe sync, fourteen data words, subframe sync, fourteen data words---to a total of sixty nine sixteen bit words per magnetic tape record.

III.2. F170 P

		000000		303 15 43 47				+CM2	001.23	-C10	001.23	EXP1	000077	EXP2	000077
BLEN	000076	RWTP	0.0315	RWTO	000000	MAGX	1.3400	MAGY	1.7600	MAGZ	*****	AB1A	000000	AB1B	000000
					000068	VTIM	000057	+CM3	001.21	+C11	001.24	EXP3	000077	EXP4	000077
5VCL	*****	R1AG	*****	R2AG	0.0200		000026	CEL1	001.21	CL18	001.21	SPR0	000377	SPR1	000377
					000076	MEMD	000310	+CM4	001.22	+C12	001.22	EXP5	000077	EXP6	000077
T19S	-040.9	T24B	0028.7	TH1P	000102	TH2P	000000	DLT1	000000	DLT2	000000	BBS7	000228	RW15	000105
					000237		000015	+CM5	001.22	+C13	001.22	EXP7	000077	EXP8	000077
+SVM	*****	-SVM	2.7400	T2PK	0030.5	T15S	-040.9	T3+B	0021.1	T4-B	0020.7	THHH	000245		000255
					000363		000377	+CM6	001.22	+C14	001.23	EXP9	000077	EX10	000077
+VSR	1.5200	-VSR	1.8200	+BTM	0.0211	-BTM	0.0215	+CIM	0.0000	+DIM	0.5031	-CIM	0.0000	-DIM	0.3549
					000104		000114	+CM7	0012.2	+C15	0012.3	EX11	000077	EX12	000077
+BAT	0021.1	-BAT	0021.5	T10H	0024.3	T16S	0130.0	T20S	0029.5	T21B	0023.1	T22C	0028.7	T23V	0028.7
				E171	000377	E172	000377	+CM8	001.22	+C16	001.22	EX13	000077	EX14	000077
T8S1	0045.0	T9S2	0045.5	T171	0032.5	T12B	0035.0	T13I	0046.3	T140	0032.0	+SCM	0.0624	-SCM	0.0002
				E173	000377	E174	000377	+CM9	001.23	+C17	001.23	EX15	000077	EX16	000077
T5TK	002.23	N1TP	-04.09	T72N	004.55	T18B	004.45	T11B	000255	T1PP	002.47	TH2P	000114	TH1P	000098
		000001		303 15 43 50				+CM2	001.23	-C10	001.23	EXP1	000077	EXP2	000077
BLEN	000076	RWTP	0.0315	RWTO	000000	MAGX	1.3400	MAGY	1.7800	MAGZ	*****	AB1A	000000	AB1B	000000
					000068	VTIM	000058	+CM3	001.21	+C11	001.24	EXP3	000077	EXP4	000077
5VCL	*****	R1AG	*****	R2AG	0.0200		000026	CEL1	001.21	CL18	001.21	SPR0	000377	SPR1	000377
					000076	MEMD	000310	+CM4	001.22	+C12	001.22	EXP5	000077	EXP6	000077
T19S	-040.9	T24B	0028.7	TH1P	000102	TH2P	000000	DLT1	000000	DLT2	000000	BBS7	000228	RW15	000105
					000237		000015	+CM5	001.22	+C13	001.22	EXP7	000077	EXP8	000077
+SVM	*****	-SVM	2.7400	T2PK	0030.5	T15S	-040.9	T3+B	0021.1	T4-B	0020.7	THHH	000245		000255
					000363		000377	+CM6	001.22	+C14	001.23	EXP9	000077	EX10	000077
+VSR	1.5200	-VSR	1.8200	+BTM	0.0211	-BTM	0.0215	+CIM	0.0000	+DIM	0.4992	-CIM	0.0000	-DIM	0.3627
					000104		000114	+CM7	0012.2	+C15	0012.3	EX11	000077	EX12	000077
+BAT	0021.5	-BAT	0021.5	T10H	0024.3	T16S	0130.0	T20S	0029.5	T21B	0023.1	T22C	0028.7	T23V	0028.7
				E171	000377	E172	000377	+CM8	001.22	+C16	001.22	EX13	000077	EX14	000077
T8S1	0045.0	T9S2	0045.5	T171	0032.5	T12B	0035.0	T13I	0046.3	T140	0032.0	+SCM	0.0624	-SCM	0.0002
				E173	000377	E174	000377	+CM9	001.23	+C17	001.23	EX15	000077	EX16	000077
T5TK	002.27	N1TP	-04.09	T72N	004.55	T18B	004.45	T11B	000255	T1PP	002.47	TH2P	000114	TH1P	000098
		000002		303 15 43 52				+CM2	001.23	-C10	001.23	EXP1	000077	EXP2	000077
BLEN	000076	RWTP	0.0315	RWTO	000000	MAGX	1.3400	MAGY	1.7600	MAGZ	*****	AB1A	000000	AB1B	000000
					000068	VTIM	000059	+CM3	001.21	+C11	001.23	EXP3	000077	EXP4	000077
5VCL	*****	R1AG	*****	R2AG	0.0200		000026	CEL1	001.21	CL18	001.21	SPR0	000377	SPR1	000377
					000076	MEMD	000310	+CM4	001.22	+C12	001.22	EXP5	000077	EXP6	000077
T19S	-040.9	T24B	0028.7	TH1P	000101	TH2P	000000	DLT1	000000	DLT2	000000	BBS7	000228	RW15	000105
					000237		000015	+CM5	001.22	+C13	001.22	EXP7	000077	EXP8	000077
+SVM	*****	-SVM	2.7400	T2PK	0030.5	T15S	-040.9	T3+B	0021.1	T4-B	0020.7	THHH	000245		000255
					000363		000377	+CM6	001.22	+C14	001.23	EXP9	000077	EX10	000077
+VSR	1.5200	-VSR	1.8000	+BTM	0.0211	-BTM	0.0215	+CIM	0.0000	+DIM	0.5031	-CIM	0.0000	-DIM	0.3588
					000104		000114	+CM7	0012.2	+C15	0012.3	EX11	000077	EX12	000077
+BAT	0021.1	-BAT	0021.9	T10H	0024.3	T16S	0130.0	T20S	0029.5	T21B	0023.1	T22C	0028.7	T23V	0028.7
				E171	000377	E172	000377	+CM8	001.22	+C16	001.22	EX13	000077	EX14	000077
T8S1	0045.0	T9S2	0045.5	T171	0032.5	T12B	0035.0	T13I	0046.3	T140	0032.0	+SCM	0.0624	-SCM	0.0002
				E173	000377	E174	000377	+CM9	001.23	+C17	001.23	EX15	000077	EX16	000077
T5TK	002.23	N1TP	-04.09	T72N	004.55	T18B	004.45	T11B	000255	T1PP	002.47	TH2P	000114	TH1P	000098
		000003		303 15 43 55				+CM2	001.23	-C10	001.23	EXP1	000077	EXP2	000077
BLEN	000076	RWTP	0.0315	RWTO	000000	MAGX	1.3400	MAGY	1.7600	MAGZ	*****	AB1A	000000	AB1B	000000
					000068	VTIM	000060	+CM3	001.21	+C11	001.23	EXP3	000077	EXP4	000077
5VCL	*****	R1AG	*****	R2AG	0.0200		000026	CEL1	001.21	CL18	001.21	SPR0	000377	SPR1	000377
					000076	MEMD	000310	+CM4	001.22	+C12	001.22	EXP5	000077	EXP6	000077
T19S	-040.9	T24B	0028.7	TH1P	000101	TH2P	000000	DLT1	000000	DLT2	000000	BBS7	000228	RW15	000105
					000237		000015	+CM5	001.22	+C13	001.22	EXP7	000077	EXP8	000077
+SVM	*****	-SVM	2.7400	T2PK	0030.5	T15S	-040.9	T3+B	0021.1	T4-B	0020.7	THHH	000245		000255
					000363		000377	+CM6	001.22	+C14	001.23	EXP9	000077	EX10	000077
+VSR	1.5200	-VSR	1.8200	+BTM	0.0211	-BTM	0.0215	+CIM	0.0000	+DIM	0.5031	-CIM	0.0000	-DIM	0.3549
					000104		000114	+CM7	0012.2	+C15	0012.3	EX11	000077	EX12	000077
+BAT	0021.1	-BAT	0021.5	T10H	0024.3	T16S	0130.0	T20S	0029.5	T21B	0023.1	T22C	0028.7	T23V	0028.7
				E171	000377	E172	000377	+CM8	001.22	+C16	001.22	EX13	000077	EX14	000077
T8S1	0045.0	T9S2	0045.5	T171	0032.5	T12B	0035.0	T13I	[illegible]	[illegible]	[illegible]	[illegible]			

171
Processed
Therm.
vac
chamber

F170P CRT DISPLAY

SPED	OFF	STAT	ON	FORS	REVS
PRSC	PRIM	CONT	PRIM	DIRT	FORN
SPCT	SLOW	SPRO	021845		
RET1	0.0006	RWTO	008.50		
-VSR	07.990		+VSR	07.990	
BCIO	OUT	BFRI	NRET	BMID	NMID
BFEI	NEXT	BMTR	REL	DLRI	NREL
PTC1	33.320	PTC2	33.320		
PTT1	33.320	PTT2	33.320		
BLEN	050.19	BTEM	000.06		
+DIM	0.6630	-DIM	0.6630		
+CIM	0.6630	BCOF	ON		
-CIM	0.6630	OREB	ON		
-PBS	SECD	+PBS	PRIM		
PCM	VTIM	170	P170S		
SAMPLE	00000	BIRD	173		
HKSR	OFF	OREN	OFF	REV	
DLSS	OFF	316 19 11 28		000000	

Boom, Thrusters, Reaction Wheel

170 Series Programs

170 SERIES DDP-116 RAW/PROCESSED TABLES

5 NOV 71

PROCESS AMPS 5 NOV 71

PD(n)= UD(n)*40

000	0.0000	050	0.2000	100	0.4000	150	0.6000	200	0.8000
001	0.0040	051	0.2040	101	0.4040	151	0.6040	201	0.8040
002	0.0080	052	0.2080	102	0.4080	152	0.6080	202	0.8080
003	0.0120	053	0.2120	103	0.4120	153	0.6120	203	0.8120
004	0.0160	054	0.2160	104	0.4160	154	0.6160	204	0.8160
005	0.0200	055	0.2200	105	0.4200	155	0.6200	205	0.8200
006	0.0240	056	0.2240	106	0.4240	156	0.6240	206	0.8240
007	0.0280	057	0.2280	107	0.4280	157	0.6280	207	0.8280
008	0.0320	058	0.2320	108	0.4320	158	0.6320	208	0.8320
009	0.0360	059	0.2360	109	0.4360	159	0.6360	209	0.8360
010	0.0400	060	0.2400	110	0.4400	160	0.6400	210	0.8400
011	0.0440	061	0.2440	111	0.4440	161	0.6440	211	0.8440
012	0.0480	062	0.2480	112	0.4480	162	0.6480	212	0.8480
013	0.0520	063	0.2520	113	0.4520	163	0.6520	213	0.8520
014	0.0560	064	0.2560	114	0.4560	164	0.6560	214	0.8560
015	0.0600	065	0.2600	115	0.4600	165	0.6600	215	0.8600
016	0.0640	066	0.2640	116	0.4640	166	0.6640	216	0.8640
017	0.0680	067	0.2680	117	0.4680	167	0.6680	217	0.8680
018	0.0720	068	0.2720	118	0.4720	168	0.6720	218	0.8720
019	0.0760	069	0.2760	119	0.4760	169	0.6760	219	0.8760
020	0.0800	070	0.2800	120	0.4800	170	0.6800	220	0.8800
021	0.0840	071	0.2840	121	0.4840	171	0.6840	221	0.8840
022	0.0880	072	0.2880	122	0.4880	172	0.6880	222	0.8880
023	0.0920	073	0.2920	123	0.4920	173	0.6920	223	0.8920
024	0.0960	074	0.2960	124	0.4960	174	0.6960	224	0.8960
025	0.1000	075	0.3000	125	0.5000	175	0.7000	225	0.9000
026	0.1040	076	0.3040	126	0.5040	176	0.7040	226	0.9040
027	0.1080	077	0.3080	127	0.5080	177	0.7080	227	0.9080
028	0.1120	078	0.3120	128	0.5120	178	0.7120	228	0.9120
029	0.1160	079	0.3160	129	0.5160	179	0.7160	229	0.9160
030	0.1200	080	0.3200	130	0.5200	180	0.7200	230	0.9200
031	0.1240	081	0.3240	131	0.5240	181	0.7240	231	0.9240
032	0.1280	082	0.3280	132	0.5280	182	0.7280	232	0.9280
033	0.1320	083	0.3320	133	0.5320	183	0.7320	233	0.9320
034	0.1360	084	0.3360	134	0.5360	184	0.7360	234	0.9360
035	0.1400	085	0.3400	135	0.5400	185	0.7400	235	0.9400
036	0.1440	086	0.3440	136	0.5440	186	0.7440	236	0.9440
037	0.1480	087	0.3480	137	0.5480	187	0.7480	237	0.9480
038	0.1520	088	0.3520	138	0.5520	188	0.7520	238	0.9520
039	0.1560	089	0.3560	139	0.5560	189	0.7560	239	0.9560
040	0.1600	090	0.3600	140	0.5600	190	0.7600	240	0.9600
041	0.1640	091	0.3640	141	0.5640	191	0.7640	241	0.9640
042	0.1680	092	0.3680	142	0.5680	192	0.7680	242	0.9680
043	0.1720	093	0.3720	143	0.5720	193	0.7720	243	0.9720
044	0.1760	094	0.3760	144	0.5760	194	0.7760	244	0.9760
045	0.1800	095	0.3800	145	0.5800	195	0.7800	245	0.9800
046	0.1840	096	0.3840	146	0.5840	196	0.7840	246	0.9840
047	0.1880	097	0.3880	147	0.5880	197	0.7880	247	0.9880
048	0.1920	098	0.3920	148	0.5920	198	0.7920	248	0.9920
049	0.1960	099	0.3960	149	0.5960	199	0.7960	249	0.9960
250	1.0000								

PROCESS VOLTS 5 NOV 71

PD(n) = UD(n)*200

000	0.0000	050	1.0000	100	2.0000	150	3.0000	200	4.0000
001	0.0200	051	1.0200	101	2.0200	151	3.0200	201	4.0200
002	0.0400	052	1.0400	102	2.0400	152	3.0400	202	4.0400
003	0.0600	053	1.0600	103	2.0600	153	3.0600	203	4.0600
004	0.0800	054	1.0800	104	2.0800	154	3.0800	204	4.0800
005	0.1000	055	1.1000	105	2.1000	155	3.1000	205	4.1000
006	0.1200	056	1.1200	106	2.1200	156	3.1200	206	4.1200
007	0.1400	057	1.1400	107	2.1400	157	3.1400	207	4.1400
008	0.1600	058	1.1600	108	2.1600	158	3.1600	208	4.1600
009	0.1800	059	1.1800	109	2.1800	159	3.1800	209	4.1800
010	0.2000	060	1.2000	110	2.2000	160	3.2000	210	4.2000
011	0.2200	061	1.2200	111	2.2200	161	3.2200	211	4.2200
012	0.2400	062	1.2400	112	2.2400	162	3.2400	212	4.2400
013	0.2600	063	1.2600	113	2.2600	163	3.2600	213	4.2600
014	0.2800	064	1.2800	114	2.2800	164	3.2800	214	4.2800
015	0.3000	065	1.3000	115	2.3000	165	3.3000	215	4.3000
016	0.3200	066	1.3200	116	2.3200	166	3.3200	216	4.3200
017	0.3400	067	1.3400	117	2.3400	167	3.3400	217	4.3400
018	0.3600	068	1.3600	118	2.3600	168	3.3600	218	4.3600
019	0.3800	069	1.3800	119	2.3800	169	3.3800	219	4.3800
020	0.4000	070	1.4000	120	2.4000	170	3.4000	220	4.4000
021	0.4200	071	1.4200	121	2.4200	171	3.4200	221	4.4200
022	0.4400	072	1.4400	122	2.4400	172	3.4400	222	4.4400
023	0.4600	073	1.4600	123	2.4600	173	3.4600	223	4.4600
024	0.4800	074	1.4800	124	2.4800	174	3.4800	224	4.4800
025	0.5000	075	1.5000	125	2.5000	175	3.5000	225	4.5000
026	0.5200	076	1.5200	126	2.5200	176	3.5200	226	4.5200
027	0.5400	077	1.5400	127	2.5400	177	3.5400	227	4.5400
028	0.5600	078	1.5600	128	2.5600	178	3.5600	228	4.5600
029	0.5800	079	1.5800	129	2.5800	179	3.5800	229	4.5800
030	0.6000	080	1.6000	130	2.6000	180	3.6000	230	4.6000
031	0.6200	081	1.6200	131	2.6200	181	3.6200	231	4.6200
032	0.6400	082	1.6400	132	2.6400	182	3.6400	232	4.6400
033	0.6600	083	1.6600	133	2.6600	183	3.6600	233	4.6600
034	0.6800	084	1.6800	134	2.6800	184	3.6800	234	4.6800
035	0.7000	085	1.7000	135	2.7000	185	3.7000	235	4.7000
036	0.7200	086	1.7200	136	2.7200	186	3.7200	236	4.7200
037	0.7400	087	1.7400	137	2.7400	187	3.7400	237	4.7400
038	0.7600	088	1.7600	138	2.7600	188	3.7600	238	4.7600
039	0.7800	089	1.7800	139	2.7800	189	3.7800	239	4.7800
040	0.8000	090	1.8000	140	2.8000	190	3.8000	240	4.8000
041	0.8200	091	1.8200	141	2.8200	191	3.8200	241	4.8200
042	0.8400	092	1.8400	142	2.8400	192	3.8400	242	4.8400
043	0.8600	093	1.8600	143	2.8600	193	3.8600	243	4.8600
044	0.8800	094	1.8800	144	2.8800	194	3.8800	244	4.8800
045	0.9000	095	1.9000	145	2.9000	195	3.9000	245	4.9000
046	0.9200	096	1.9200	146	2.9200	196	3.9200	246	4.9200
047	0.9400	097	1.9400	147	2.9400	197	3.9400	247	4.9400
048	0.9600	098	1.9600	148	2.9600	198	3.9600	248	4.9600
049	0.9800	099	1.9800	149	2.9800	199	3.9800	249	4.9800
250	5.0000	251	5.0200	252	5.0400	253	5.0600	254	5.0800
255	5.1000								

PROCESS PSI 5 NOV 71

PD(n)=UD(n)*196/10

000	00.000	050	00.980	100	01.960	150	02.940	200	03.920
001	00.019	051	00.999	101	01.979	151	02.959	201	03.939
002	00.039	052	01.019	102	01.999	152	02.979	202	03.959
003	00.058	053	01.038	103	02.018	153	02.998	203	03.978
004	00.078	054	01.058	104	02.038	154	03.018	204	03.998
005	00.098	055	01.078	105	02.058	155	03.038	205	04.018
006	00.117	056	01.097	106	02.077	156	03.057	206	04.037
007	00.137	057	01.117	107	02.097	157	03.077	207	04.057
008	00.156	058	01.136	108	02.116	158	03.096	208	04.076
009	00.176	059	01.156	109	02.136	159	03.116	209	04.096
010	00.196	060	01.176	110	02.156	160	03.136	210	04.116
011	00.215	061	01.195	111	02.175	161	03.155	211	04.135
012	00.235	062	01.215	112	02.195	162	03.175	212	04.155
013	00.254	063	01.234	113	02.214	163	03.194	213	04.174
014	00.274	064	01.254	114	02.234	164	03.214	214	04.194
015	00.294	065	01.274	115	02.254	165	03.234	215	04.214
016	00.313	066	01.293	116	02.273	166	03.253	216	04.233
017	00.333	067	01.313	117	02.293	167	03.273	217	04.253
018	00.352	068	01.332	118	02.312	168	03.292	218	04.272
019	00.372	069	01.352	119	02.332	169	03.312	219	04.292
020	00.392	070	01.372	120	02.352	170	03.332	220	04.312
021	00.411	071	01.391	121	02.371	171	03.351	221	04.331
022	00.431	072	01.411	122	02.391	172	03.371	222	04.351
023	00.450	073	01.430	123	02.410	173	03.390	223	04.370
024	00.470	074	01.450	124	02.430	174	03.410	224	04.390
025	00.490	075	01.470	125	02.450	175	03.430	225	04.410
026	00.509	076	01.489	126	02.469	176	03.449	226	04.429
027	00.529	077	01.509	127	02.489	177	03.469	227	04.449
028	00.548	078	01.528	128	02.508	178	03.488	228	04.468
029	00.568	079	01.548	129	02.528	179	03.508	229	04.488
030	00.588	080	01.568	130	02.548	180	03.528	230	04.508
031	00.607	081	01.587	131	02.567	181	03.547	231	04.527
032	00.627	082	01.607	132	02.587	182	03.567	232	04.547
033	00.646	083	01.626	133	02.606	183	03.586	233	04.566
034	00.666	084	01.646	134	02.626	184	03.606	234	04.586
035	00.686	085	01.666	135	02.646	185	03.626	235	04.606
036	00.705	086	01.685	136	02.665	186	03.645	236	04.625
037	00.725	087	01.705	137	02.685	187	03.665	237	04.645
038	00.744	088	01.724	138	02.704	188	03.684	238	04.664
039	00.764	089	01.744	139	02.724	189	03.704	239	04.684
040	00.784	090	01.764	140	02.744	190	03.724	240	04.704
041	00.803	091	01.783	141	02.763	191	03.743	241	04.723
042	00.823	092	01.803	142	02.783	192	03.763	242	04.743
043	00.842	093	01.822	143	02.802	193	03.782	243	04.762
044	00.862	094	01.842	144	02.822	194	03.802	244	04.782
045	00.882	095	01.862	145	02.842	195	03.822	245	04.802
046	00.901	096	01.881	146	02.861	196	03.841	246	04.821
047	00.921	097	01.901	147	02.881	197	03.861	247	04.841
048	00.940	098	01.920	148	02.900	198	03.880	248	04.860
049	00.960	099	01.940	149	02.920	199	03.900	249	04.880
250	04.900	251	04.919	252	04.939	253	04.958	254	04.978
255	04.998								

PD(n)=UD(n)*47

000	00.000	050	02.350	100	04.700	150	07.050	200	09.400
001	00.047	051	02.397	101	04.747	151	07.097	201	09.447
002	00.094	052	02.444	102	04.794	152	07.144	202	09.494
003	00.141	053	02.491	103	04.841	153	07.191	203	09.541
004	00.188	054	02.538	104	04.888	154	07.238	204	09.588
005	00.235	055	02.585	105	04.935	155	07.285	205	09.635
006	00.282	056	02.632	106	04.982	156	07.332	206	09.682
007	00.329	057	02.679	107	05.029	157	07.379	207	09.729
008	00.376	058	02.726	108	05.076	158	07.426	208	09.776
009	00.423	059	02.773	109	05.123	159	07.473	209	09.823
010	00.470	060	02.820	110	05.170	160	07.520	210	09.870
011	00.517	061	02.867	111	05.217	161	07.567	211	09.917
012	00.564	062	02.914	112	05.264	162	07.614	212	09.964
013	00.611	063	02.961	113	05.311	163	07.661	213	10.011
014	00.658	064	03.008	114	05.358	164	07.708	214	10.058
015	00.705	065	03.055	115	05.405	165	07.755	215	10.105
016	00.752	066	03.102	116	05.452	166	07.802	216	10.152
017	00.799	067	03.149	117	05.499	167	07.849	217	10.199
018	00.846	068	03.196	118	05.546	168	07.896	218	10.246
019	00.893	069	03.243	119	05.593	169	07.943	219	10.293
020	00.940	070	03.290	120	05.640	170	07.990	220	10.340
021	00.987	071	03.337	121	05.687	171	08.037	221	10.387
022	01.034	072	03.384	122	05.734	172	08.084	222	10.434
023	01.081	073	03.431	123	05.781	173	08.131	223	10.481
024	01.128	074	03.478	124	05.828	174	08.178	224	10.528
025	01.175	075	03.525	125	05.875	175	08.225	225	10.575
026	01.222	076	03.572	126	05.922	176	08.272	226	10.622
027	01.269	077	03.619	127	05.969	177	08.319	227	10.669
028	01.316	078	03.666	128	06.016	178	08.366	228	10.716
029	01.363	079	03.713	129	06.063	179	08.413	229	10.763
030	01.410	080	03.760	130	06.110	180	08.460	230	10.810
031	01.457	081	03.807	131	06.157	181	08.507	231	10.857
032	01.504	082	03.854	132	06.204	182	08.554	232	10.904
033	01.551	083	03.901	133	06.251	183	08.601	233	10.951
034	01.598	084	03.948	134	06.298	184	08.648	234	10.998
035	01.645	085	03.995	135	06.345	185	08.695	235	11.045
036	01.692	086	04.042	136	06.392	186	08.742	236	11.092
037	01.739	087	04.089	137	06.439	187	08.789	237	11.139
038	01.786	088	04.136	138	06.486	188	08.836	238	11.186
039	01.833	089	04.183	139	06.533	189	08.883	239	11.233
040	01.880	090	04.230	140	06.580	190	08.930	240	11.280
041	01.927	091	04.277	141	06.627	191	08.977	241	11.327
042	01.974	092	04.324	142	06.674	192	09.024	242	11.374
043	02.021	093	04.371	143	06.721	193	09.071	243	11.421
044	02.068	094	04.418	144	06.768	194	09.118	244	11.468
045	02.115	095	04.465	145	06.815	195	09.165	245	11.515
046	02.162	096	04.512	146	06.862	196	09.212	246	11.562
047	02.209	097	04.559	147	06.909	197	09.259	247	11.609
048	02.256	098	04.606	148	06.956	198	09.306	248	11.656
049	02.303	099	04.653	149	07.003	199	09.353	249	11.703
250	11.750	251	11.797	252	11.844	253	11.891	254	11.938
255	11.985								

PD(n) = (UD(n)*200)/297

000	000.00	050	000.36	100	000.72	150	001.08	200	001.44
001	000.00	051	000.36	101	000.72	151	001.08	201	001.44
002	000.02	052	000.38	102	000.74	152	001.08	202	001.44
003	000.02	053	000.38	103	000.74	153	001.10	203	001.46
004	000.02	054	000.38	104	000.74	154	001.10	204	001.46
005	000.04	055	000.40	105	000.76	155	001.12	205	001.46
006	000.04	056	000.40	106	000.76	156	001.12	206	001.48
007	000.06	057	000.40	107	000.76	157	001.12	207	001.48
008	000.06	058	000.42	108	000.78	158	001.14	208	001.50
009	000.06	059	000.42	109	000.78	159	001.14	209	001.50
010	000.08	060	000.44	110	000.78	160	001.14	210	001.50
011	000.08	061	000.44	111	000.80	161	001.16	211	001.52
012	000.08	062	000.44	112	000.80	162	001.16	212	001.52
013	000.10	063	000.46	113	000.82	163	001.16	213	001.52
014	000.10	064	000.46	114	000.82	164	001.18	214	001.54
015	000.10	065	000.46	115	000.82	165	001.18	215	001.54
016	000.12	066	000.48	116	000.84	166	001.18	216	001.54
017	000.12	067	000.48	117	000.84	167	001.20	217	001.56
018	000.12	068	000.48	118	000.84	168	001.20	218	001.56
019	000.14	069	000.50	119	000.86	169	001.22	219	001.56
020	000.14	070	000.50	120	000.86	170	001.22	220	001.58
021	000.16	071	000.50	121	000.86	171	001.22	221	001.58
022	000.16	072	000.52	122	000.88	172	001.24	222	001.60
023	000.16	073	000.52	123	000.88	173	001.24	223	001.60
024	000.18	074	000.54	124	000.88	174	001.24	224	001.60
025	000.18	075	000.54	125	000.90	175	001.26	225	001.62
026	000.18	076	000.54	126	000.90	176	001.26	226	001.62
027	000.20	077	000.56	127	000.92	177	001.26	227	001.62
028	000.20	078	000.56	128	000.92	178	001.28	228	001.64
029	000.20	079	000.56	129	000.92	179	001.28	229	001.64
030	000.22	080	000.58	130	000.94	180	001.30	230	001.64
031	000.22	081	000.58	131	000.94	181	001.30	231	001.66
032	000.22	082	000.58	132	000.94	182	001.30	232	001.66
033	000.24	083	000.60	133	000.96	183	001.32	233	001.68
034	000.24	084	000.60	134	000.96	184	001.32	234	001.68
035	000.26	085	000.60	135	000.96	185	001.32	235	001.68
036	000.26	086	000.62	136	000.98	186	001.34	236	001.70
037	000.26	087	000.62	137	000.98	187	001.34	237	001.70
038	000.28	088	000.64	138	000.98	188	001.34	238	001.70
039	000.28	089	000.64	139	001.00	189	001.36	239	001.72
040	000.28	090	000.64	140	001.00	190	001.36	240	001.72
041	000.30	091	000.66	141	001.02	191	001.36	241	001.72
042	000.30	092	000.66	142	001.02	192	001.38	242	001.74
043	000.30	093	000.66	143	001.02	193	001.38	243	001.74
044	000.32	094	000.68	144	001.04	194	001.40	244	001.74
045	000.32	095	000.68	145	001.04	195	001.40	245	001.76
046	000.32	096	000.68	146	001.04	196	001.40	246	001.76
047	000.34	097	000.70	147	001.06	197	001.42	247	001.78
048	000.34	098	000.70	148	001.06	198	001.42	248	001.78
049	000.36	099	000.70	149	001.06	199	001.42	249	001.78
250	001.80	251	001.80	252	001.80	253	001.82	254	001.82
255	001.82								

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PD(n)=UD(n)*5 if UD(n) less than 198

PD(n) = (UD(n)-196)/2+UD(n)*5 if UD(n) greater than 197

000	000.00	050	002.50	100	005.00	150	007.50	200	010.10
001	000.05	051	002.55	101	005.05	151	007.55	201	010.15
002	000.10	052	002.60	102	005.10	152	007.60	202	010.25
003	000.15	053	002.65	103	005.15	153	007.65	203	010.30
004	000.20	054	002.70	104	005.20	154	007.70	204	010.40
005	000.25	055	002.75	105	005.25	155	007.75	205	010.45
006	000.30	056	002.80	106	005.30	156	007.80	206	010.55
007	000.35	057	002.85	107	005.35	157	007.85	207	010.60
008	000.40	058	002.90	108	005.40	158	007.90	208	010.70
009	000.45	059	002.95	109	005.45	159	007.95	209	010.75
010	000.50	060	003.00	110	005.50	160	008.00	210	010.85
011	000.55	061	003.05	111	005.55	161	008.05	211	010.90
012	000.60	062	003.10	112	005.60	162	008.10	212	011.00
013	000.65	063	003.15	113	005.65	163	008.15	213	011.05
014	000.70	064	003.20	114	005.70	164	008.20	214	011.15
015	000.75	065	003.25	115	005.75	165	008.25	215	011.20
016	000.80	066	003.30	116	005.80	166	008.30	216	011.30
017	000.85	067	003.35	117	005.85	167	008.35	217	011.35
018	000.90	068	003.40	118	005.90	168	008.40	218	011.45
019	000.95	069	003.45	119	005.95	169	008.45	219	011.50
020	001.00	070	003.50	120	006.00	170	008.50	220	011.60
021	001.05	071	003.55	121	006.05	171	008.55	221	011.65
022	001.10	072	003.60	122	006.10	172	008.60	222	011.75
023	001.15	073	003.65	123	006.15	173	008.65	223	011.80
024	001.20	074	003.70	124	006.20	174	008.70	224	011.90
025	001.25	075	003.75	125	006.25	175	008.75	225	011.95
026	001.30	076	003.80	126	006.30	176	008.80	226	012.05
027	001.35	077	003.85	127	006.35	177	008.85	227	012.10
028	001.40	078	003.90	128	006.40	178	008.90	228	012.20
029	001.45	079	003.95	129	006.45	179	008.95	229	012.25
030	001.50	080	004.00	130	006.50	180	009.00	230	012.35
031	001.55	081	004.05	131	006.55	181	009.05	231	012.40
032	001.60	082	004.10	132	006.60	182	009.10	232	012.50
033	001.65	083	004.15	133	006.65	183	009.15	233	012.55
034	001.70	084	004.20	134	006.70	184	009.20	234	012.65
035	001.75	085	004.25	135	006.75	185	009.25	235	012.70
036	001.80	086	004.30	136	006.80	186	009.30	236	012.80
037	001.85	087	004.35	137	006.85	187	009.35	237	012.85
038	001.90	088	004.40	138	006.90	188	009.40	238	012.95
039	001.95	089	004.45	139	006.95	189	009.45	239	013.00
040	002.00	090	004.50	140	007.00	190	009.50	240	013.10
041	002.05	091	004.55	141	007.05	191	009.55	241	013.15
042	002.10	092	004.60	142	007.10	192	009.60	242	013.25
043	002.15	093	004.65	143	007.15	193	009.65	243	013.30
044	002.20	094	004.70	144	007.20	194	009.70	244	013.40
045	002.25	095	004.75	145	007.25	195	009.75	245	013.45
046	002.30	096	004.80	146	007.30	196	009.80	246	013.55
047	002.35	097	004.85	147	007.35	197	009.85	247	013.60
048	002.40	098	004.90	148	007.40	198	009.95	248	013.70
049	002.45	099	004.95	149	007.45	199	010.00	249	013.75
250	013.85	251	013.90	252	014.00	253	014.05	254	014.15
255	014.20								

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000	0000.0	050	0055.9	100	0027.5	150	0007.5	200	-010.2
001	0128.1	051	0055.1	101	0027.1	151	0007.1	201	-010.7
002	0126.2	052	0054.3	102	0026.7	152	0006.7	202	-011.2
003	0124.3	053	0053.5	103	0026.3	153	0006.3	203	-011.7
004	0122.4	054	0052.7	104	0025.9	154	0005.9	204	-012.2
005	0120.5	055	0051.9	105	0025.5	155	0005.5	205	-012.7
006	0118.6	056	0051.1	106	0025.1	156	0005.1	206	-013.2
007	0116.7	057	0050.3	107	0024.7	157	0004.7	207	-013.7
008	0114.8	058	0049.5	108	0024.3	158	0004.3	208	-014.2
009	0112.9	059	0048.7	109	0023.9	159	0003.9	209	-014.7
010	0111.0	060	0047.9	110	0023.5	160	0003.6	210	-015.2
011	0109.1	061	0047.1	111	0023.1	161	0003.3	211	-015.7
012	0107.2	062	0046.3	112	0022.7	162	0003.0	212	-016.2
013	0105.3	063	0045.5	113	0022.3	163	0002.7	213	-016.7
014	0103.4	064	0045.0	114	0021.9	164	0002.4	214	-017.2
015	0101.5	065	0044.5	115	0021.5	165	0002.1	215	-017.7
016	0099.6	066	0044.0	116	0021.1	166	0001.8	216	-018.2
017	0097.7	067	0043.5	117	0020.7	167	0001.5	217	-018.7
018	0095.8	068	0043.0	118	0020.3	168	0001.2	218	-019.2
019	0093.9	069	0042.5	119	0019.9	169	0000.9	219	-019.7
020	0092.0	070	0042.0	120	0019.5	170	0000.6	220	-020.2
021	0090.1	071	0041.5	121	0019.1	171	0000.3	221	-020.7
022	0088.2	072	0041.0	122	0018.7	172	0000.0	222	-021.2
023	0086.3	073	0040.5	123	0018.3	173	-000.3	223	-021.7
024	0084.4	074	0040.0	124	0017.9	174	-000.6	224	-022.3
025	0082.5	075	0039.5	125	0017.5	175	-000.9	225	-022.9
026	0080.6	076	0039.0	126	0017.1	176	-001.2	226	-023.5
027	0078.7	077	0038.5	127	0016.7	177	-001.5	227	-024.1
028	0076.8	078	0038.0	128	0016.3	178	-001.8	228	-024.7
029	0074.9	079	0037.5	129	0015.9	179	-002.1	229	-025.3
030	0073.0	080	0037.0	130	0015.5	180	-002.4	230	-025.9
031	0071.1	081	0036.5	131	0015.1	181	-002.7	231	-026.5
032	0070.3	082	0036.0	132	0014.7	182	-003.0	232	-027.1
033	0069.5	083	0035.5	133	0014.3	183	-003.3	233	-027.7
034	0068.7	084	0035.0	134	0013.9	184	-003.6	234	-028.3
035	0067.9	085	0034.5	135	0013.5	185	-003.9	235	-028.9
036	0067.1	086	0034.0	136	0013.1	186	-004.2	236	-029.5
037	0066.3	087	0033.5	137	0012.7	187	-004.5	237	-030.1
038	0065.5	088	0033.0	138	0012.3	188	-004.8	238	-030.7
039	0064.7	089	0032.5	139	0011.9	189	-005.1	239	-031.3
040	0063.9	090	0032.0	140	0011.5	190	-005.4	240	-031.9
041	0063.1	091	0031.5	141	0011.1	191	-005.7	241	-032.5
042	0062.3	092	0031.0	142	0010.7	192	-006.2	242	-033.1
043	0061.5	093	0030.5	143	0010.3	193	-006.7	243	-033.7
044	0060.7	094	0030.0	144	0009.9	194	-007.2	244	-034.3
045	0059.9	095	0029.5	145	0009.5	195	-007.7	245	-034.9
046	0059.1	096	0029.1	146	0009.1	196	-008.2	246	-035.5
047	0058.3	097	0028.7	147	0008.7	197	-008.7	247	-036.1
048	0057.5	098	0028.3	148	0008.3	198	-009.2	248	-036.7
049	0056.7	099	0027.9	149	0007.9	199	-009.7	249	-037.3
250	-037.9	251	-038.5	252	-039.1	253	-039.7	254	-040.3
255	-040.9								

170 Series programs

000	-00.10	050	008.18	100	030.54	150	045.54	200	054.54
001	-00.10	051	008.64	101	030.84	151	045.84	201	054.69
002	-00.10	052	009.10	102	031.14	152	046.14	202	054.84
003	-00.10	053	009.56	103	031.44	153	046.44	203	054.99
004	-00.10	054	010.02	104	031.74	154	046.74	204	055.14
005	-00.10	055	010.48	105	032.04	155	047.04	205	055.29
006	-00.10	056	010.94	106	032.34	156	047.34	206	055.44
007	-00.10	057	011.40	107	032.64	157	047.64	207	055.59
008	-00.10	058	011.86	108	032.94	158	047.94	208	055.74
009	-00.10	059	012.32	109	033.24	159	048.24	209	055.89
010	-00.10	060	012.78	110	033.54	160	048.54	210	056.04
011	-00.10	061	013.24	111	033.84	161	048.69	211	056.19
012	-00.10	062	013.70	112	034.14	162	048.84	212	056.34
013	-00.10	063	014.16	113	034.44	163	048.99	213	056.49
014	-00.10	064	014.62	114	034.74	164	049.14	214	056.64
015	-00.10	065	015.08	115	035.04	165	049.29	215	056.79
016	-00.10	066	015.54	116	035.34	166	049.44	216	056.94
017	-00.10	067	016.00	117	035.64	167	049.59	217	057.09
018	-00.10	068	016.46	118	035.94	168	049.74	218	057.24
019	-00.10	069	016.92	119	036.24	169	049.89	219	057.39
020	-00.10	070	017.38	120	036.54	170	050.04	220	057.54
021	-00.10	071	017.84	121	036.84	171	050.19	221	057.69
022	-00.10	072	018.30	122	037.14	172	050.34	222	057.84
023	-00.10	073	018.76	123	037.44	173	050.49	223	057.99
024	-00.10	074	019.22	124	037.74	174	050.64	224	058.14
025	-00.10	075	019.68	125	038.04	175	050.79	225	058.26
026	-00.10	076	020.14	126	038.34	176	050.94	226	058.38
027	-00.10	077	020.60	127	038.64	177	051.09	227	058.50
028	-00.10	078	021.06	128	038.94	178	051.24	228	058.62
029	-00.10	079	021.52	129	039.24	179	051.39	229	058.74
030	-00.10	080	021.98	130	039.54	180	051.54	230	058.86
031	-00.10	081	022.44	131	039.84	181	051.69	231	058.98
032	-00.10	082	022.90	132	040.14	182	051.84	232	059.10
033	000.36	083	023.36	133	040.44	183	051.99	233	059.22
034	000.82	084	023.82	134	040.74	184	052.14	234	059.34
035	001.28	085	024.28	135	041.04	185	052.29	235	059.46
036	001.74	086	024.74	136	041.34	186	052.44	236	059.58
037	002.20	087	025.20	137	041.64	187	052.59	237	059.70
038	002.66	088	025.66	138	041.94	188	052.74	238	059.82
039	003.12	089	026.12	139	042.24	189	052.89	239	059.94
040	003.58	090	026.58	140	042.54	190	053.04	240	060.06
041	004.04	091	027.04	141	042.84	191	053.19	241	060.18
042	004.50	092	027.50	142	043.14	192	053.34	242	060.30
043	004.96	093	027.96	143	043.44	193	053.49	243	060.42
044	005.42	094	028.42	144	043.74	194	053.64	244	060.54
045	005.88	095	028.88	145	044.04	195	053.79	245	060.66
046	006.34	096	029.34	146	044.34	196	053.94	246	060.78
047	006.80	097	029.64	147	044.64	197	054.09	247	060.90
048	007.26	098	029.94	148	044.94	198	054.24	248	061.02
049	007.72	099	030.24	149	045.24	199	054.39	249	061.14
250	061.26	251	061.38	252	061.50	253	061.62	254	061.74
255	061.86								

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WORD NUMBER	BIT	LABEL	DESCRIPTION	DECOM
0-0	-	SFS1	sub frame sync 1	1
0-1	-	SFS2	sub frame sync 2	2
0-2	-	FSS1	frame sync 1	3
0-3	-	FSS2	frame sync 2	4
0-4	-	+CM2	+ cell 2	5
0-5	-	-C10	- cell 10	6
0-6	(1)	EXP1	experiment 1	7
0-7	(1)	EXP2	experiment 2	8
0-8	-	+VSR	+volt sensor	9
0-9	-	-VSR	-volt sensor	10
0-10	-	RWTO	reaction wheel tachometer	11
0-11	-	MAGX	x axis magnetometer	12
0-12	-	MAGY	y axis magnetometer	13
0-13	-	MAGZ	z axis magnetometer	14
0-14	-	AB1A	*adcole bits 1a-7a	15
0-15	-	AB1B	*adcole bits 1b-7b	16
1-0	-	SFS3	sub frame sync 3	17
1-1	-	SFS4	sub frame sync 4	18
1-2	-	ADI1	address indicator 1	19
1-2	1	AND1	40d 1a	
1-2	2	AND2	40d 2a	
1-2	3	AND3	40d 3a	
1-2	4	AND4	40d 4a	
1-2	5	AND5	40d 1b	
1-2	6	AND6	40d 2b	
1-2	7	AND7	40d 3b	
1-2	8	AND8	40d 4b	
1-3	-	VTIM	PCM vernier time	20
1-4	-	+CM3	+ cell 3	21
1-5	-	-C11	- cell 11	22
1-6	(1)	EXP3	experiment 3	23
1-7	(1)	EXP4	experiment 4	24
1-8	-	5VCL	5 volt calibrate	25
1-9	-	R1AG	agc receiver 1	26
1-10	-	R2AG	agc receiver 2	27
1-11	-	BLEN	boom length	28
1-12	-	+CM1	+ cell 1	29
1-13	-	-C18	- cell 18	30
1-14	-	RWS1	reaction wheel speed	31
1-15	-	RWS2	reaction wheel speed	32
1-14/15	-	SPRO	reaction wheel speed	
1-15	15	SPCT	reaction wheel speed control	
2-0	-	SFS5	sub frame sync 5	33
2-1	-	SFS6	sub frame sync 6	34
2-2	1	CMDE	command enable	35
2-2	2	CEBU	command enable backup	
2-2	3	DLEN	data link enable	
2-2	4	TRST	timer reset	
2-2	5	DLSS	data link system	
2-2	6	DLSB	data link system backup	
2-2	7	EXEC	execute	
2-2	8	EXBU	execute backup	

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WORD NUMBER	BIT	LABEL	DESCRIPTION	DECOM
2-3	-	MEMD	memory control	36
2-3	1,2,3	MSUB	memory subframe	
2-3	4	MCLK	memory clock frequency	
2-3	5,6	MRTE	memory rate	
2-3	7	ANDI	a-d indicator	
2-3	8	OSCL	oscillator	
2-4	-	+CM4	+ cell 4	37
2-5	-	-C12	- cell 12	38
2-6	(1)	EXP5	experiment 5	39
2-7	(1)	EXP6	experiment 6	40
2-8	-	T19S	t19 scp temperature	41
2-9	-	T24B	t24 battery bypass temperature	42
2-10	-	PTC1	control 1 pressure transducer	43
2-11	-	PTC2	control 2 pressure transducer	44
2-12	-	DLT1	dl timer cmd1	45
2-13	-	DLT2	dl timer cmd2	46
2-14	-	BCON	boom control	47
2-14	1	BCOF	boom on-off	
2-14	2	BCIO	boom in-out	
2-14	3	BFRI	boom full retract indicator	
2-14	4	BMIN	boom mid indicator	
2-14	5	BFEI	boom full extension indicator	
2-14	6	BTMR	boom tip mass release indicator	
2-14	7	DLRI	dl boom release indicator	
2-14	8			
2-15	-	RWCT	reaction wheel control	48
2-15	1	SPED	speed on-off reaction wheel	
2-15	2	STAT	reaction wheel on-off	
2-15	3	FORS	forward-reverse reaction wheel	
2-15	4	PRSC	primary-secondary power amplifier	
2-15	5	CONT	control primary-secondary	
2-15	6	DIRT	forward-reverse indicator	
2-15	7			
2-15	8			
3-0	-	SFS7	subframe sync 7	49
3-1	-	SFS8	subframe sync 8	50
3-2	-	PCMS	pcm status	51
3-2	1	TMCH	PCM timing chain	
3-2	2	MODC	multiplexer	
3-2	3	PCMM	memory on-off	
3-2	4	PCMR	pcm power register	
3-2	5			
3-2	6	PCMD	pcm data link on-off	
3-2	7	TSFM	time of first memory sample	
3-2	8			
3-4	-	+CM5	cell 5	53
3-5	-	-C13	- cell 13	54
3-6	(1)	EXP7	experiment 7	55
3-7	(1)	EXP8	experiment 8	56

WORD NUMBER	BIT	LABEL	DESCRIPTION	DECOM
3-8	-	+ SVM	+ sec volt monitor	57
3-9	-	-SVM	- sec volt monitor	58
3-10	-	T2PK	t2 peak temperature	59
3-11	-	T15S	t15 scpl temperature	60
3-12	-	T3+B	t3 battery temperature +sec	61
3-13	-	T4-B	t4 battery temperature -sec	62
3-14	-	THCO	thrusters control	63
3-14	1	THR1	thruster 1 on-off	
3-14	2	THR2	thruster 2 on-off	
3-14	3	TH1H	Thruster 1 heater on-off	
3-14	4	TH2H	thruster 2 heater on-off	
3-14	5	THHL	thruster hi-lo	
3-14	6			
3-14	7			
3-14	8			
3-15	-	SPA2	spare 2	64
4-0	-	SFS9	sub frame sync 9	65
4-1	-	SF10	sub frame sync 10	66
4-2	-	BACT	battery control	67
4-2	1	CCOF	charge control on-off	
4-2	2	CCHL	charge control hi-low	
4-2	3	BBOF	battery bypass on-off	
4-2	4	BBEN	battery bypass enable on-off	
4-2	5	P+BS	primary-secondary plus battery select	
4-2	6	P-BS	primary-secondary minus battery selec	
4-2	7	UNVO	undervoltage on-off	
4-2	8			
4-3				68
4-4	-	+ CM6	+ cell 6	69
4-5	-	-C14	- cell 14	70
4-6	(1)	EXP9	experiment 9	71
4-7	(1)	EX10	experiment 10	72
4-8	-	+VSR	+ volt sensor	73
4-9	-	-VSR	- volt sensor	74
4-10	-	+BTM	+ battery temperature	75
4-11	-	-BTM	- battery temperature	76
4-12	-	+ CIM	+ charge current monitor	77
4-13	-	+DIM	+ discharge current monitor	78
4-14	-	-CIM	- charge current monitor	79
4-15	-	-DIM	- discharge current monitor	80
5-0	-	SF11	sub frame sync 11	81
5-1	-	SF12	sub frame sync 12	82
5-2				83
5-3				84
5-4	-	+CM7	+ cell 7	85
5-5	-	-C15	- cell 15	86
5-6	(1)	EX11	experiment 11	87
5-7	(1)	EX12	experiment 12	88
5-8	-	+ BAT	+ battery temperature	89
5-9	-	-BAT	- battery temperature	90
5-10	-	T10H	T10 hcl temperature	91
5-11	-	T16S	t16 scp 2 temperature	92
5-12	-	T20S	t20 scp tube temperature	93

WORD NUMBER	BIT	LABEL	DESCRIPTION	DECOM
5-13	-	T21B	t21 battery 3 temperature	94
5-14	-	T22C	t22 ch con temperature	95
5-15	-	T23V	t23v con temperature	96
6-0	-	SF13	sub frame sync 13	97
6-1	-	SF14	sub frame sync 14	98
6-2	(2)	E171	experiment 17-1	99
6-3	(2)	E172	experiment 17-2	100
6-4	-	+CM8	+ cell 8	101
6-5	-	-C16	- cell 16	102
6-6	(1)	EX13	experiment 13	103
6-7	(1)	EX14	experiment 14	104
6-8	-	T8S1	t8 skin 1 temperature	105
6-9	-	T9S2	t9 skin 2 temperature	106
6-10	-	T17I	t17 inner sc2 temperature	107
6-11	-	T12B	t12 bb temperature	108
6-12	-	T13I	t13 inner sc1 temperature	109
6-13	-	T140	t14 out sc temperature	110
6-14	-	+SCM	+ sci monitor	111
6-15	-	-SCM	- sci monitor	112
7-0	-	SF15	sub frame sync 15	113
7-1	-	SF16	sub frame sync 16	114
7-2	(2)	E173	experiment 17-3	115
7-3	(2)	E174	experiment 17-4	116
7-4	-	+CM9	+ cell 9	117
7-5	-	-C17	- cell 17	118
7-6	(1)	EX15	experiment 15	119
7-7	(1)	EX16	experiment 16	120
7-8	-	T5TK	t5 tank temperature	121
7-9	-	N1TP	nozzle 1 temperature	122
7-10	-	RWTP	reaction wheel temperature	123
7-11	-	T18B	t18 bb sc2 temperature	124
7-12	-	BTEM	boom temperature	125
7-13	-	T1PP	t1 pcm pk temperature	126
7-14	-	PTT1	tank 1 pressure transducer	127
7-15	-	PTT2	tank 2 pressure transducer	128
3-3	-	PLST	playload status	52
3-3	1	OREN	ordance enable on-off	
3-3	2	AOEN	altitude ordance enable on-off	
3-3	3	HKSR	housekeeping sensors on-off	
3-3	4	ATMS	analog tm on-Off	
3-3	5	TIMR	timer 20-50 min	
3-3	6,7,8	BIRD	spacecraft id	

170 STANDARD LABELS 25 OCT 71

(1) Experiments 1 thru 16:

Bit	Label	DESCRIPTION
1	OPTA	option a on-off
2	OPTB	option b on-off
3	PAR	PAR on-off
4	EXPN	expn on-off
5	OPX1	option x1 on-off
6	OPX2	option x2 on-off
7		
8		

(2) Experiment 17:

WORD NUMBER	BIT	LABEL	DESCRIPTION	DECOM
6-2	1	E7-1	exl7-1	99
6-2	2	E7-2	exl7-2	
6-2	3	E7-3	exl7-3	
6-2	4	E7-4	exl7-4	
6-2	5	E7-5	exl7-5	
6-2	6	E7-6	exl7-6	
6-2	7	E7-7	exl7-7	
6-2	8	E7-8	exl7-8	
6-3	1	E7-9	exl7-9	100
6-3	2	E710	exl7-10	
6-3	3	E711	exl7-11	
6-3	4	E712	exl7-12	
6-3	5	E713	exl7-13	
6-3	6	E714	exl7-14	
6-3	7	E715	exl7-15	
6-3	8	E716	exl7-16	
7-2	1	E717	exl7-17	115
7-2	2	E718	exl7-18	
7-2	3	E719	exl7-19	
7-2	4	E720	exl7-20	
7-2	5	E7G4	exl7 group 4	
7-2	6	E7G3	exl7 group 3	
7-2	7	E7G2	exl7 group 2	
7-2	8	E7G1	exl7 group 1	

(2) Experiment 17 (cont.)

WORD NUMBER	BIT	LABEL	DESCRIPTION	DECOM
7-3	-	SLMA	thdt	116
	1	SLM1	slm1 on-off	
	2	SLM3	slm3 on-off	
	3	SLM2	slm2 on-off	
	4	AJX2	adj x2 on-off	
	5	AJX3	adj x3 on-off	
	6	ADJ	adj on-off	
	7	AJL3	adj l3 on-off	
	8	AJL2	adj l2 on-off	

III.3. F170 C

III.4. F170 MS

SAMPLE 000000 315 12 18 26 MRO
P/L 172 REV 5432 SUBF 0 FREQ 1600 RATE 01 ABS TIME CNTR 000 013 127 RESET TIME 310 01 00 00

+VSR	-VSR	RWTO	MAGX	MAGY	MAGZ	A31A	A31B	MCTR	ABS TIME
05.969	00.611	000.00	3.8800	1.9600	1.2400	000 2	000	000	310 03 27 24.80
22.600	24.800	358.00	0.0194	0.0070	0.0044	000 2	000	001	310 03 27 25.44
00.223	00.179	035.47	0.3802	0.0097	0.0062	000 2	000	002	310 03 27 26.08
05.311	05.828	655.12	6.5464	0.0283	0.0463	000 2	000	003	310 03 27 26.72
05.311	05.781	655.21	6.5464	0.3920	0.2480	000 2	000	004	310 03 27 27.36
00.223	00.187	655.15	6.5464	0.0283	0.0463	000 2	000	005	310 03 27 28.00
00.227	00.183	655.09	6.5464	0.0287	0.0463	000 2	000	006	310 03 27 28.64
00.223	00.179	655.12	6.5464	0.0283	0.0463	000 2	000	007	310 03 27 29.28

SAMPLE 000001 315 12 18 31 MRO SUBFRAME 1

SVCL	R1AG	R2AG	BLEN	+CM1	-C1B	RWS1	RWS2	MCTR	ABS TIME
0.5311	0.5781	0.0895	038800	196.00	124.00	000000	000000	016	310 03 27 29.92
2.2400	2.4600	3.6400	000194	000.70	000.44	000000	000000	017	310 03 27 30.56
0.0223	0.0183	0.3488	003802	000.98	000.62	000000	000000	018	310 03 27 31.20
0.5264	0.5828	6.5515	065464	002.83	004.63	000000	000000	019	310 03 27 31.84
0.5311	0.5828	6.5506	065464	038.80	024.80	000000	000000	020	310 03 27 32.48
0.0227	0.0183	6.5518	065464	002.83	004.63	002424	002424	021	310 03 27 33.12
0.0223	0.0183	6.5515	065464	002.83	004.63	000000	000000	022	310 03 27 33.76
0.0223	0.0179	6.5506	065464	002.83	004.63	000000	000000	023	310 03 27 34.40

SAMPLE 000002 315 12 18 36 MRO SUBFRAME 2

T19S	T24B	PTC1	PTC2	DLT1	DLT2	ECON	RWCT	MCTR	ABS TIME
0531.1	0578.1	00.885	38.800	019600	012400	000000	000000	032	310 03 27 35.04
2240.0	2460.0	36.200	00.194	000070	000044	000000	000000	033	310 03 27 35.68
0022.3	0017.9	03.508	03.802	000097	000062	000000	000000	034	310 03 27 36.32
0526.4	0582.8	65.515	65.464	000283	000463	000000	000000	035	310 03 27 36.96
0531.1	0578.1	65.509	65.464	003920	002480	000000	000000	036	310 03 27 37.60
0022.3	0017.9	65.521	65.464	000283	000463	002424	002424	037	310 03 27 38.24
0022.7	0018.3	65.506	65.464	000287	000463	000000	000000	038	310 03 27 38.88
0022.7	0018.3	65.518	65.464	000283	000463	000000	000000	039	310 03 27 39.52

SAMPLE 000003 315 12 18 41 MRO SUBFRAME 3

+SVM	-SVM	T2PK	T15S	T3+B	T4-B	THHH	SPA2	MCTR	ABS TIME
05.311	05.828	0089.0	*****	1960.0	1240.0	000000	000000	048	310 03 27 40.16
22.400	24.600	*****	0019.4	0007.0	0004.4	000000	000000	049	310 03 27 40.80
00.223	00.179	0348.8	0380.2	0009.8	0006.2	000000	000000	050	310 03 27 41.44
05.264	05.781	-002.7	-007.2	0028.3	0046.3	000000	000000	051	310 03 27 42.08
05.311	05.828	-001.8	-007.2	0392.0	0248.0	000000	000000	052	310 03 27 42.72
00.223	00.179	-002.7	-007.2	0028.3	0046.3	002424	001300	053	310 03 27 43.36
00.223	00.179	-001.8	-007.2	0028.3	0046.3	000000	000000	054	310 03 27 44.00
00.223	00.183	-002.7	-007.2	0028.3	0046.3	000000	000000	055	310 03 27 44.64

SAMPLE 000004 315 12 18 46 MRO SUBFRAME 4

+VSR	-VSR	+BTM	-BTM	+CIM	+DIM	-CIM	-DIM	MCTR	ABS TIME
05.311	05.828	0089.5	*****	1.9600	1.2400	0.0000	0.0000	064	310 03 27 45.28
22.200	24.600	*****	0019.4	0.0070	0.0044	0.0000	0.0000	065	310 03 27 45.92
00.223	00.183	0352.8	0380.2	0.0098	0.0062	0.0000	0.0000	066	310 03 27 46.56
05.311	05.781	-002.4	-007.2	0.0283	0.0463	0.0000	0.0000	067	310 03 27 47.20
05.311	05.828	-002.4	-007.2	0.3920	0.2480	0.0000	0.0000	068	310 03 27 47.84
00.231	00.183	-002.1	-007.2	0.0283	0.0463	0.1300	0.1300	069	310 03 27 48.48
00.223	00.183	-002.7	-007.2	0.0283	0.0463	0.0000	0.0000	070	310 03 27 49.12
00.223	00.179	-001.8	-007.2	0.0283	0.0463	0.0000	0.0000	071	310 03 27 49.76

SAMPLE 000005 315 12 18 52 MRO SUBFRAME 5

+BAT	-BAT	T10H	T16S	T20S	T21B	T22C	T23V	MCTR	ABS TIME
0526.4	0582.8	0089.5	*****	1960.0	1240.0	0000.0	0000.0	080	310 03 27 50.40
2260.0	2480.0	*****	0019.4	0007.0	0004.4	0000.0	0000.0	081	310 03 27 51.04
0022.3	0018.3	0354.7	0380.2	0009.8	0006.2	0000.0	0000.0	082	310 03 27 51.68
0531.1	0582.8	-002.1	-007.2	0028.3	0046.3	0000.0	0000.0	083	310 03 27 52.32
0531.1	0578.1	-003.0	-007.2	0392.0	0248.0	0000.0	0000.0	084	310 03 27 52.96
0022.3	0017.9	-002.1	-007.2	0028.3	0046.3	0130.0	0130.0	085	310 03 27 53.60
0023.1	0018.3	-002.7	-007.2	0028.3	0046.3	0000.0	0000.0	086	310 03 27 54.24
0022.3	0018.3	-002.7	-007.2	0028.3	0046.3	0000.0	0000.0	087	310 03 27 54.88

SAMPLE 000006 315 12 18 57 MRO SUBFRAME 6

T8S1	T9S2	T17I	T12B	T13I	T14O	+SCM	-SCM	MCTR	ABS TIME
1175.0	0230.3	0031.5	0560.0	*****	*****	1.0043	0.0231	096	310 03 27 55.52
*****	0980.0	1240.0	0002.8	0013.2	0013.0	1.0248	0.0250	097	310 03 27 56.16
-037.9	0056.7	0123.4	0054.8	0018.3	0018.1	1.0043	0.0247	098	310 03 27 56.80
1175.0	0230.3	0045.5	0076.8	-003.3	-002.7	1.0248	0.0231	099	310 03 27 57.44
1175.0	0230.3	0045.5	0074.9	0732.0	0724.0	1.2240	1.0000	100	310 03 27 58.08
-037.9	0056.7	0045.5	0076.8	-003.3	-002.7	1.0615	6.5271	101	310 03 27 58.72
-037.9	0056.7	0045.5	0076.8	-003.3	-002.7	0.9920	0.9240	102	310 03 27 59.36
-037.9	0056.7	0045.5	0076.8	-003.3	-002.7	1.0842	0.4621	103	310 03 28 00.00

$LO R,G,S,0,0,0 316 18 47 28

SAMPLE 000007 315 12 18 46 MRO SUBFRAME 7

T5TK	N1TP	RWTP	T18B	BTEM	T1PP	PTT2	PTT1	MCTR	ABS TIME
0531.1	0582.8	0089.5	*****	1960.0	1240.0	00.000	00.000	064	310 02 28 00.64
2220.0	2460.0	*****	0019.4	0007.0	0004.4	00.000	00.000	065	310 02 28 01.28
0022.3	0018.3	0352.8	0380.2	0009.8	0006.2	00.000	00.000	066	310 02 28 01.92
0531.1	0578.1	-002.4	-007.2	0028.3	0046.3	00.000	00.000	067	310 02 28 02.56
0531.1	0582.8	-002.4	-007.2	0392.0	0248.0	00.000	00.000	068	310 02 28 03.20
0023.1	0018.3	-002.1	-007.2	0028.3	0046.3	01.300	01.300	069	310 02 28 03.84
0022.3	0018.3	-002.7	-007.2	0028.3	0046.3	00.000	00.000	070	310 02 28 04.48
0022.3	0017.9	-001.8	-007.2	0028.3	0046.3	00.000	00.000	071	310 02 28 05.12

RATE = 01 FREQ = 1600 RESET TIME 000 00 00 00

VERNIER COUNTER																							
000	000	00	00	00.00	064	000	00	02	43.84	128	000	00	05	27.68	192	000	00	08	11.52
001	000	00	00	02.56	065	000	00	02	46.40	129	000	00	05	30.24	193	000	00	08	14.08
002	000	00	00	05.12	066	000	00	02	48.96	130	000	00	05	32.80	194	000	00	08	16.64
003	000	00	00	07.68	067	000	00	02	51.52	131	000	00	05	35.36	195	000	00	08	19.20
004	000	00	00	10.24	068	000	00	02	54.08	132	000	00	05	37.92	196	000	00	08	21.76
005	000	00	00	12.80	069	000	00	02	56.64	133	000	00	05	40.48	197	000	00	08	24.32
006	000	00	00	15.36	070	000	00	02	59.20	134	000	00	05	43.04	198	000	00	08	26.88
007	000	00	00	17.92	071	000	00	03	01.76	135	000	00	05	45.60	199	000	00	08	29.44
008	000	00	00	20.48	072	000	00	03	04.32	136	000	00	05	48.16	200	000	00	08	32.00
009	000	00	00	23.04	073	000	00	03	06.88	137	000	00	05	50.72	201	000	00	08	34.56
010	000	00	00	25.60	074	000	00	03	09.44	138	000	00	05	53.28	202	000	00	08	37.12
011	000	00	00	28.16	075	000	00	03	12.00	139	000	00	05	55.84	203	000	00	08	39.68
012	000	00	00	30.72	076	000	00	03	14.56	140	000	00	05	58.40	204	000	00	08	42.24
013	000	00	00	33.28	077	000	00	03	17.12	141	000	00	06	00.96	205	000	00	08	44.80
014	000	00	00	35.84	078	000	00	03	19.68	142	000	00	06	03.52	206	000	00	08	47.36
015	000	00	00	38.40	079	000	00	03	22.24	143	000	00	06	06.08	207	000	00	08	49.92
016	000	00	00	40.96	080	000	00	03	24.80	144	000	00	06	08.64	208	000	00	08	52.48
017	000	00	00	43.52	081	000	00	03	27.36	145	000	00	06	11.20	209	000	00	08	55.04
018	000	00	00	46.08	082	000	00	03	29.92	146	000	00	06	13.76	210	000	00	08	57.60
019	000	00	00	48.64	083	000	00	03	32.48	147	000	00	06	16.32	211	000	00	09	00.16
020	000	00	00	51.20	084	000	00	03	35.04	148	000	00	06	18.88	212	000	00	09	02.72
021	000	00	00	53.76	085	000	00	03	37.60	149	000	00	06	21.44	213	000	00	09	05.28
022	000	00	00	56.32	086	000	00	03	40.16	150	000	00	06	24.00	214	000	00	09	07.84
023	000	00	00	58.88	087	000	00	03	42.72	151	000	00	06	26.56	215	000	00	09	10.40
024	000	00	01	01.44	088	000	00	03	45.28	152	000	00	06	29.12	216	000	00	09	12.96
025	000	00	01	04.00	089	000	00	03	47.84	153	000	00	06	31.68	217	000	00	09	15.52
026	000	00	01	06.56	090	000	00	03	50.40	154	000	00	06	34.24	218	000	00	09	18.08
027	000	00	01	09.12	091	000	00	03	52.96	155	000	00	06	36.80	219	000	00	09	20.64
028	000	00	01	11.68	092	000	00	03	55.52	156	000	00	06	39.36	220	000	00	09	23.20
029	000	00	01	14.24	093	000	00	03	58.08	157	000	00	06	41.92	221	000	00	09	25.76
030	000	00	01	16.80	094	000	00	04	00.64	158	000	00	06	44.48	222	000	00	09	28.32
031	000	00	01	19.36	095	000	00	04	03.20	159	000	00	06	47.04	223	000	00	09	30.88
032	000	00	01	21.92	096	000	00	04	05.76	160	000	00	06	49.60	224	000	00	09	33.44
033	000	00	01	24.48	097	000	00	04	08.32	161	000	00	06	52.16	225	000	00	09	36.00
034	000	00	01	27.04	098	000	00	04	10.88	162	000	00	06	54.72	226	000	00	09	38.56
035	000	00	01	29.60	099	000	00	04	13.44	163	000	00	06	57.28	227	000	00	09	41.12
036	000	00	01	32.16	100	000	00	04	16.00	164	000	00	06	59.84	228	000	00	09	43.68
037	000	00	01	34.72	101	000	00	04	18.56	165	000	00	07	02.40	229	000	00	09	46.24
038	000	00	01	37.28	102	000	00	04	21.12	166	000	00	07	04.96	230	000	00	09	48.80
039	000	00	01	39.84	103	000	00	04	23.68	167	000	00	07	07.52	231	000	00	09	51.36
040	000	00	01	42.40	104	000	00	04	26.24	168	000	00	07	10.08	232	000	00	09	53.92
041	000	00	01	44.96	105	000	00	04	28.80	169	000	00	07	12.64	233	000	00	09	56.48
042	000	00	01	47.52	106	000	00	04	31.36	170	000	00	07	15.20	234	000	00	09	59.04
043	000	00	01	50.08	107	000	00	04	33.92	171	000	00	07	17.76	235	000	00	10	01.60
044	000	00	01	52.64	108	000	00	04	36.48	172	000	00	07	20.32	236	000	00	10	04.16
045	000	00	01	55.20	109	000	00	04	39.04	173	000	00	07	22.88	237	000	00	10	06.72
046	000	00	01	57.76	110	000	00	04	41.60	174	000	00	07	25.44	238	000	00	10	09.28
047	000	00	02	00.32	111	000	00	04	44.16	175	000	00	07	28.00	239	000	00	10	11.84
048	000	00	02	02.88	112	000	00	04	46.72	176	000	00	07	30.56	240	000	00	10	14.40
049	000	00	02	05.44	113	000	00	04	49.28	177	000	00	07	33.12	241	000	00	10	16.96
050	000	00	02	08.00	114	000	00	04	51.84	178	000	00	07	35.68	242	000	00	10	19.52
051	000	00	02	10.56	115	000	00	04	54.40	179	000	00	07	38.24	243	000	00	10	22.08
052	000	00	02	13.12	116	000	00	04	56.96	180	000	00	07	40.80	244	000	00	10	24.64
053	000	00	02	15.68	117	000	00	04	59.52	181	000	00	07	43.36	245	000	00	10	27.20
054	000	00	02	18.24	118	000	00	05	02.08	182	000	00	07	45.92	246	000	00	10	29.76
055	000	00	02	20.80	119	000	00	05	04.64	183	000	00	07	48.48	247	000	00	10	32.32
056	000	00	02	23.36	120	000	00	05	07.20	184	000	00	07	51.04	248	000	00	10	34.88
057	000	00	02	25.92	121	000	00	05	09.76	185	000	00	07	53.60	249	000	00	10	37.44
058	000	00	02	28.48	122	000	00	05	12.32	186	000	00	07	56.16	250	000	00	10	40.00
059	000	00	02	31.04	123	000	00	05	14.88	187	000	00	07	58.72	251	000	00	10	42.56
060	000	00	02	33.60	124	000	00	05	17.44	188	000	00	08	01.28	252	000	00	10	45.12
061	000	00	02	36.16	125	000	00	05	20.00	189	000	00	08	03.84	253	000	00	10	47.68
062	000	00	02	38.72	126	000	00	05	22.56	190	000	00	08	06.40	254	000	00	10	50.24
063	000	00	02	41.28	127	000	00	05	25.12	191	000	00	08	08.96	255	000	00	10	52.80

RATE = 01 FREQ = 1600 RESET TIME 000 00 00 00

MID	ORDER COUNTER																			
000	000	00	00	00.00	064	000	11	39	03.04	128	000	23	18	06.08	192	001	10	57	09.12
001	000	00	10	55.36	065	000	11	49	58.40	129	000	23	29	01.44	193	001	11	08	04.48
002	000	00	21	50.72	066	000	12	00	53.76	130	000	23	39	56.80	194	001	11	18	59.84
003	000	00	32	46.08	067	000	12	11	49.12	131	000	23	50	52.16	195	001	11	29	55.20
004	000	00	43	41.44	068	000	12	22	44.48	132	001	00	01	47.52	196	001	11	40	50.56
005	000	00	54	36.80	069	000	12	33	39.84	133	001	00	12	42.88	197	001	11	51	45.92
006	000	01	05	32.16	070	000	12	44	35.20	134	001	00	23	38.24	198	001	12	02	41.28
007	000	01	16	27.52	071	000	12	55	30.56	135	001	00	34	33.60	199	001	12	13	36.64
008	000	01	27	22.88	072	000	13	06	25.92	136	001	00	45	28.96	200	001	12	24	32.00
009	000	01	38	18.24	073	000	13	17	21.28	137	001	00	56	24.32	201	001	12	35	27.36
010	000	01	49	13.60	074	000	13	28	16.64	138	001	01	07	19.68	202	001	12	46	22.72
011	000	02	00	08.96	075	000	13	39	12.00	139	001	01	18	15.04	203	001	12	57	18.08
012	000	02	11	04.32	076	000	13	50	07.36	140	001	01	29	10.40	204	001	13	08	13.44
013	000	02	21	59.68	077	000	14	01	02.72	141	001	01	40	05.76	205	001	13	19	08.80
014	000	02	32	55.04	078	000	14	11	58.08	142	001	01	51	01.12	206	001	13	30	04.16
015	000	02	43	50.40	079	000	14	22	53.44	143	001	02	01	56.48	207	001	13	40	59.52
016	000	02	54	45.76	080	000	14	33	48.80	144	001	02	12	51.84	208	001	13	51	54.88
017	000	03	05	41.12	081	000	14	44	44.16	145	001	02	23	47.20	209	001	14	02	50.24
018	000	03	16	36.48	082	000	14	55	39.52	146	001	02	34	42.56	210	001	14	13	45.60
019	000	03	27	31.84	083	000	15	06	34.88	147	001	02	45	37.92	211	001	14	24	40.96
020	000	03	38	27.20	084	000	15	17	30.24	148	001	02	56	33.28	212	001	14	35	36.32
021	000	03	49	22.56	085	000	15	28	25.60	149	001	03	07	28.64	213	001	14	46	31.68
022	000	04	00	17.92	086	000	15	39	20.96	150	001	03	18	24.00	214	001	14	57	27.04
023	000	04	11	13.28	087	000	15	50	16.32	151	001	03	29	19.36	215	001	15	08	22.40
024	000	04	22	08.64	088	000	16	01	11.68	152	001	03	40	14.72	216	001	15	19	17.76
025	000	04	33	04.00	089	000	16	12	07.04	153	001	03	51	10.08	217	001	15	30	13.12
026	000	04	43	59.36	090	000	16	23	02.40	154	001	04	02	05.44	218	001	15	41	08.48
027	000	04	54	54.72	091	000	16	33	57.76	155	001	04	13	00.80	219	001	15	52	03.84
028	000	05	05	50.08	092	000	16	44	53.12	156	001	04	23	56.16	220	001	16	02	59.20
029	000	05	16	45.44	093	000	16	55	48.48	157	001	04	34	51.52	221	001	16	13	54.56
030	000	05	27	40.80	094	000	17	06	43.84	158	001	04	45	46.88	222	001	16	24	49.92
031	000	05	38	36.16	095	000	17	17	39.20	159	001	04	56	42.24	223	001	16	35	45.28
032	000	05	49	31.52	096	000	17	28	34.56	160	001	05	07	37.60	224	001	16	46	40.64
033	000	06	00	26.88	097	000	17	39	29.92	161	001	05	18	32.96	225	001	16	57	36.00
034	000	06	11	22.24	098	000	17	50	25.28	162	001	05	29	28.32	226	001	17	08	31.36
035	000	06	22	17.60	099	000	18	01	20.64	163	001	05	40	23.68	227	001	17	19	26.72
036	000	06	33	12.96	100	000	18	12	16.00	164	001	05	51	19.04	228	001	17	30	22.08
037	000	06	44	08.32	101	000	18	23	11.36	165	001	06	02	14.40	229	001	17	41	17.44
038	000	06	55	03.68	102	000	18	34	06.72	166	001	06	13	09.76	230	001	17	52	12.80
039	000	07	05	59.04	103	000	18	45	02.08	167	001	06	24	05.12	231	001	18	03	08.16
040	000	07	16	54.40	104	000	18	55	57.44	168	001	06	35	00.48	232	001	18	14	03.52
041	000	07	27	49.76	105	000	19	06	52.80	169	001	06	45	55.84	233	001	18	24	58.88
042	000	07	38	45.12	106	000	19	17	48.16	170	001	06	56	51.20	234	001	18	35	54.24
043	000	07	49	40.48	107	000	19	28	43.52	171	001	07	07	46.56	235	001	18	46	49.60
044	000	08	00	35.84	108	000	19	39	38.88	172	001	07	18	41.92	236	001	18	57	44.96
045	000	08	11	31.20	109	000	19	50	34.24	173	001	07	29	37.28	237	001	19	08	40.32
046	000	08	22	26.56	110	000	20	01	29.60	174	001	07	40	32.64	238	001	19	19	35.68
047	000	08	33	21.92	111	000	20	12	24.96	175	001	07	51	28.00	239	001	19	30	31.04
048	000	08	44	17.28	112	000	20	23	20.32	176	001	08	02	23.36	240	001	19	41	26.40
049	000	08	55	12.64	113	000	20	34	15.68	177	001	08	13	18.72	241	001	19	52	21.76
050	000	09	06	08.00	114	000	20	45	11.04	178	001	08	24	14.08	242	001	20	03	17.12
051	000	09	17	03.36	115	000	20	56	06.40	179	001	08	35	09.44	243	001	20	14	12.48
052	000	09	27	58.72	116	000	21	07	01.76	180	001	08	46	04.80	244	001	20	25	07.84
053	000	09	38	54.08	117	000	21	17	57.12	181	001	08	57	00.16	245	001	20	36	03.20
054	000	09	49	49.44	118	000	21	28	52.48	182	001	09	07	55.52	246	001	20	46	58.56
055	000	10	00	44.80	119	000	21	39	47.84	183	001	09	18	50.88	247	001	20	57	53.92
056	000	10	11	40.16	120	000	21	50	43.20	184	001	09	29	46.24	248	001	21	08	49.28
057	000	10	22	35.52	121	000	22	01	38.56	185	001	09	40	41.60	249	001	21	19	44.64
058	000	10	33	30.88	122	000	22	12	33.92	186	001	09	51	36.96	250	001	21	30	40.00
059	000	10	44	26.24	123	000	22	23	29.28	187	001	10	02	32.32	251	001	21	41	35.36
060	000	10	55	21.60	124	000	22	34	24.64	188	001	10	13	27.68	252	001	21	52	30.72
061	000	11	06	16.96	125	000	22	45	20.00	189	001	10	24	23.04	253	001	22	03	26.08
062	000	11	17	12.32	126	000	22	56	15.36	190	001	10	35	18.40	254	001	22	14	21.44
063	000	11	28	07.68	127	000	23	07	10.72	191	001	10	46	13.76	255	001	22	25	16.80

RATE = 01 FREQ = 1600 RESET TIME 000 00 00 00

HI ORDER COUNTER

000	000	00	00	00.00
001	001	22	36	12.16
002	003	21	12	24.32
003	005	19	48	36.48
004	007	18	24	48.64
005	009	17	01	00.80
006	011	15	37	12.96
007	013	14	13	25.12
008	015	12	49	37.28
009	017	11	25	49.44
010	019	10	02	01.60
011	021	08	38	13.76
012	023	07	14	25.92
013	025	05	50	38.08
014	027	04	26	50.24
015	029	03	03	02.40
016	031	01	39	14.56
017	033	00	15	26.72
018	034	22	51	38.88
019	036	21	27	51.04
020	038	20	04	03.20
021	040	18	40	15.36
022	042	17	16	27.52
023	044	15	52	39.68
024	046	14	28	51.84
025	048	13	05	04.00
026	050	11	41	16.16
027	052	10	17	28.32
028	054	08	53	40.48
029	056	07	29	52.64
030	058	06	06	04.80
031	060	04	42	16.96
032	062	03	18	29.12
033	064	01	54	41.28
034	066	00	30	53.44
035	067	23	07	05.60
036	069	21	43	17.76
037	071	20	19	29.92
038	073	18	55	42.08
039	075	17	31	54.24
040	077	16	08	06.40
041	079	14	44	18.56
042	081	13	20	30.72
043	083	11	56	42.88
044	085	10	32	55.04
045	087	09	09	07.20
046	089	07	45	19.36
047	091	06	21	31.52
048	093	04	57	43.68
049	095	03	33	55.84
050	097	02	10	08.00
051	099	00	46	20.16
052	100	23	22	32.32
053	102	21	58	44.48
054	104	20	34	56.64
055	106	19	11	08.80
056	108	17	47	20.96
057	110	16	23	33.12
058	112	14	59	45.28
059	114	13	35	57.44
060	116	12	12	09.60
061	118	10	48	21.76
062	120	09	24	33.92
063	122	08	00	46.08
064	124	06	36	58.24
065	126	05	13	10.40
066	128	03	49	22.56
067	130	02	25	34.72
068	132	01	01	46.88
069	133	23	37	59.04
070	135	22	14	11.20
071	137	20	50	23.36
072	139	19	26	35.52
073	141	18	02	47.68
074	143	16	38	59.84
075	145	15	15	12.00
076	147	13	51	24.16
077	149	12	27	36.32
078	151	11	03	48.48
079	153	09	40	00.64
080	155	08	16	12.80
081	157	06	52	24.96
082	159	05	28	37.12
083	161	04	04	49.28
084	163	02	41	01.44
085	165	01	17	13.60
086	166	23	53	25.76
087	168	22	29	37.92
088	170	21	05	50.08
089	172	19	42	02.24
090	174	18	18	14.40
091	176	16	54	26.56
092	178	15	30	38.72
093	180	14	06	50.88
094	182	12	43	03.04
095	184	11	19	15.20
096	186	09	55	27.36
097	188	08	31	39.52
098	190	07	07	51.68
099	192	05	44	03.84
100	194	04	20	16.00
101	196	02	56	28.16
102	198	01	32	40.32
103	200	00	08	52.48
104	201	22	45	04.64
105	203	21	21	16.80
106	205	19	57	28.96
107	207	18	33	41.12
108	209	17	09	53.28
109	211	15	46	05.44
110	213	14	22	17.60
111	215	12	58	29.76
112	217	11	34	41.92
113	219	10	10	54.08
114	221	08	47	06.24
115	223	07	23	18.40
116	225	05	59	30.56
117	227	04	35	42.72
118	229	03	11	54.88
119	231	01	48	07.04
120	233	00	24	19.20
121	234	23	00	31.36
122	236	21	36	43.52
123	238	20	12	55.68
124	240	18	49	07.84
125	242	17	25	20.00
126	244	16	01	32.16
127	246	14	37	44.32
128	248	13	13	56.48
129	250	11	50	08.64
130	252	10	26	20.80
131	254	09	02	32.96
132	256	07	38	45.12
133	258	06	14	57.28
134	260	04	51	09.44
135	262	03	27	21.60
136	264	02	03	33.76
137	266	00	39	45.92
138	267	23	15	58.08
139	269	21	52	10.24
140	271	20	28	22.40
141	273	19	04	34.56
142	275	17	40	46.72
143	277	16	16	58.88
144	279	14	53	11.04
145	281	13	29	23.20
146	283	12	05	35.36
147	285	10	41	47.52
148	287	09	17	59.68
149	289	07	54	11.84
150	291	06	30	24.00
151	293	05	06	36.16
152	295	03	42	48.32
153	297	02	19	00.48
154	299	00	55	12.64
155	300	23	31	24.80
156	302	22	07	36.96
157	304	20	43	49.12
158	306	19	20	01.28
159	308	17	56	13.44
160	310	16	32	25.60
161	312	15	08	37.76
162	314	13	44	49.92
163	316	12	21	02.08
164	318	10	57	14.24
165	320	09	33	26.40
166	322	08	09	38.56
167	324	06	45	50.72
168	326	05	22	02.88
169	328	03	58	15.04
170	330	02	34	27.20
171	332	01	10	39.36
172	333	23	46	51.52
173	335	22	23	03.68
174	337	20	59	15.84
175	339	19	35	28.00
176	341	18	11	40.16
177	343	16	47	52.32
178	345	15	24	04.48
179	347	14	00	16.64
180	349	12	36	28.80
181	351	11	12	40.96
182	353	09	48	53.12
183	355	08	25	05.28
184	357	07	01	17.44
185	359	05	37	29.60
186	361	04	13	41.76
187	363	02	49	53.92
188	365	01	26	06.08
189	367	00	02	18.24
190	368	22	38	30.40
191	370	21	14	42.56
192	372	19	50	54.72
193	374	18	27	06.88
194	376	17	03	19.04
195	378	15	39	31.20
196	380	14	15	43.36
197	382	12	51	55.52
198	384	11	28	07.68
199	386	10	04	19.84
200	388	08	40	32.00
201	390	07	16	44.16
202	392	05	52	56.32
203	394	04	29	08.48
204	396	03	05	20.64
205	398	01	41	32.80
206	400	00	17	44.96
207	401	22	53	57.12
208	403	21	30	09.28
209	405	20	06	21.44
210	407	18	42	33.60
211	409	17	18	45.76
212	411	15	54	57.92
213	413	14	31	10.08
214	415	13	07	22.24
215	417	11	43	34.40
216	419	10	19	46.56
217	421	08	55	58.72
218	423	07	32	10.88
219	425	06	08	23.04
220	427	04	44	35.20
221	429	03	20	47.36
222	431	01	56	59.52
223	433	00	33	11.68
224	434	23	09	23.84
225	436	21	45	36.00
226	438	20	21	48.16
227	440	18	58	00.32
228	442	17	34	12.48
229	444	16	10	24.64
230	446	14	46	36.80
231	448	13	22	48.96
232	450	11	59	01.12
233	452	10	35	13.28
234	454	09	11	25.44
235	456	07	47	37.60
236	458	06	23	49.76
237	460	05	00	01.92
238	462	03	36	14.08
239	464	02	12	26.24
240	466	00	48	38.40
241	467	23	24	50.56
242	469	22	01	02.72
243	471	20	37	14.88
244	473	19	13	27.04
245	475	17	49	39.20
246	477	16	25	51.36
247	479	15	02	03.52
248	481	13	38	15.68
249	483	12	14	27.84
250	485	10	50	40.00
251	487	09	26	52.16
252	489	08	03	04.32
253	491	06	39	16.48
254	493	05	15	28.64
255	495	03	51	40.80

Approved for Release: 2024/06/06 C05027392

III.5. F170 CS

F170CS COMMAND SYSTEM
PREPARED AT NRL BY MCGINTY

2 NOV 71

INA=0, INPUT GROUP SYNC, OUTPUT MT1
INA=1,INPUT GROUP SYNC, OUTPUT MT2
INA=2, INPUT MT1
INA=3, INPUT MT2
INA=4, INPUT GROUP SYNC; PCM OUTPUT TO MAG TAPE UNIT 1,
MRO OUTPUT TO MAG TAPE UNIT 2.

SPECIAL DECOM TO LPR/CRT
WILL PRINT/DISPLAY : DECOM NUMBER, RAW DATA, PROCESSED DATA

"TNUM" = NUMBER OF DECOMS
"TCOM" = TABLE OF DECOMS
PRINTER
DIGIT=0, NORMAL PRINT
DIGIT=3, SPECIAL DECOM PRINT

CRT
PAGE=0, NORMAL DISPLAY
PAGE=8, SPECIAL DECOM DISPLAY

DECOM (16,64)
WORD NUMBER 1-9 1 R1AG RECEIVER 1 AGC
DECOM 201,8,CRT/DPR/LPR,VOLT,0
WORD NUMBER 1-10 2 R2AG RECEIVER 2 AGC
DECOM 209,8,CRT/DPR/LPR,VOLT,0
WORD NUMBER 1-2 3 AD(XX) ADDRESS INDICATOR A AND B
DECOM 145,8,CRT/DPR/LPR,RAW,0
WORD NUMBER 2-2 4 PCM CONTROL
CMDE - COMMAND ENABLE. CMBU - COMMAND ENABLE BACKUP.
DLEN - DL ENABLE. TMRS - TIMER RESET. DLSY - DL SYSTEM.
DLBU - DL SYSTEM BACKUP. EXEQ - EXECUTE. EXBU - EXECUTE BACKUP.
DECOM 273,8,CRT/DPR/LPR,RAW,0
WORD NUMBER 3-2 5 PCM CONTROL
TIMC - TIMING CHAIN. REGR - REGISTER. MODC - MODULATION CONTROL.
PCMR - PCM REG. PCMM - PCM MEM. PCDL - PCM DL. TSFM - TSFM.
DECOM 401,8,CRT/DPR/LPR,RAW,0
WORD NUMBER 4-2 6 BATTERY CONTROL
CHCT - CHARGE CONTROL. CHIL - CONROL HI/LO. BABY - BATTERY PYPASS.
BBEN - BATTERY BYPASS ENABLE. +BSL - + BATTERY SELECT.
-BSL - - BATTERY SELECT. UNVS - UNDER VOLTAGE ON/OFF.
DECOM 529,8,CRT/DPR/LPR,RAW,0
WORD NUMBER 2-3 7 A-D A-D
DECOM 287,1,CRT/DPR/LPR,RAW,0
WORD NUMBER 2-3 8 OSC OSC
DECOM 288,1,CRT/DPR/LPR,RAW,0
WORD NUMBER 1-3 1 9 VTIM PCM VERNIER TIME DECIMAL
DECOM 153,8,CRT/LPR/DPR,RAW,0
WORD NUMBER 10 HKSR HOUSKEEPING SENSOR (0=OFF, 1=ON)
DECOM 411,1,CRT/LPR/DPR,RAW,0
WORD NUMBER 3-3 5 11 OREN ORDANCE ENABLE (0=OFF, 1=ON)
DECOM 277,1,CRT/LPR/DPR,RAW,0
WORD NUMBER 2-2 6 12 DLSS DL SYSTEM (0=OFF, 1=ON)

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*    F170CS     COMMAND SYSTEM



      DECOM                    409,1,CRT/LPR/DPR,RAW,0
*      WORD NUMBER    2-7      13              MEMORY ADDRESS COUNTER
     DECOM                     313,8,CRT/LPR/DPR,RAW,0
*      WORD NUMBER    0-7      14              MEMORY ADDRESS COUNTER
     DECOM                      57,8,CRT/LPR/DPR,RAW,0
*      WORD NUMBER    7-7      15              MEMORY ADDRESS COUNTER
     DECOM                     953,8,CRT/LPR/DPR,RAW,0
*      WORD NUMBER    5-7      16              MEMORY ADDRESS COUNTER
     DECOM                     697,8,CRT/LPR/DPR,RAW,0
*      WORD NUMBER    3-3      17    BIRD      SPACECRAFT IDNADD 171)
      DECOM          415,2,CRT/LPR/DPR,RAW,0
        SIZE TCOM(64)
     TEXT   S1(2,6)SAMPLE"REV"
      TEXT     DIG(2,4)0"1"
*     STANDARD DATA HEADER
       TEXT  HT(7,4)VTIM"BIRD"PCM"MRO"HKSR"OREN"DLSS"
      TEXT ON(2,3)OFF"ON"
*    CRT BUFFER
       SIZE   M(40)
      TEXT    OFF(2,4)ON"OFF"
      TEXT  A(2,4)B"A"
       TEXT      MEM(2,4)PCM"MRO"
        TEXT  AGC(2,4)R1AG"R2AG"
      TEXT    AD(8,4)AND1"AND2"AND3"AND4"AND5"AND6"AND7"AND8"
      TEXT  COM(8,4)CMDE"CEBU"DLEN"TRST"DLSS"DLSB"EXEC"EXBU"
       TEXT    PCMS(8,4)TMCH"MODC"PCMM"PCMR"    "PCMD"TSFM"
      TEXT     BA(8,4)CCOF"CCHL"BBOF"BBEN"P+BS"P-BS"UNVO"
       TEXT    E2(2,4)F170CS"REV"
    TEXT   PS(2,4)SECD"PRIM"
      TEXT    HI(2,4)LOW"HI"
       PROCESS VOLT
      PD(N)=UD(N)*200
       ENDP
      PROCESS   RAW
      PD(N)=UD(N)
      ENDP
*      START OF PROGRAM
      START
*      RESET SAMPLE COUNTER
        SA=1
*      DETERMINE MAG TAPE UNIT AND CONFIG
      IF  (INA.EQ.1.OR.INA.EQ.3)GOTO DOG1
      CONFIG          MT,1,BIN,HI,AS3,FR,1
     GOTO DOG3
DOG1 CONFIG          MT,2,BIN,HI,AS3,FR,1
DOG3  IF  (INA.EQ.2.OR.INA.EQ.3)GOTO IN9
*  GROUP SYNC INPUT
      CONFIG                    GRP,1,0,0,16,8,'165620,16,8,'012157
     INPUT=1
SID21    IF  (INPUT.NE.1) GOTO IN9
       INPUT (GRP)TERM
*     OUTPUT TO MAG TAPE
    IF  (INA.EQ.4)GOTO SY1
*    INA NOT EQUAL 4
     GOTO SY4
```

```
CEBJ OFF DLEN ON TRST ON DLSS OFF DLSB OFF EXEC ON EXBU ON SFRM 001 BRCT OFF SCTA A1 SCTB B1
ANDI PRI OSCL PRI TMCH A RGST B MODC ON PCMR A PCMM P+M PCMD OFF TSFM ON MSDS ON CHCT ON
CCHL HI BATB OFF BTBE OFF +BAT PRI -BAT SEC UVOL ON ATCS OFF
296 18 07 03
BIRD 172 VTIM 123 TYPE P+M OREN OFF HKSR OFF DLSS ON
ADN1 RESET ADN2 ADDRS ADN3 ADDRS ADN4 ADDRS ADN5 ADDRS ADN6 ADDRS ADN7 ADDRS ADN8 RESET AGC1 135 AGC2266 CMDE ON
CEBJ OFF DLEN ON TRST ON DLSS ON DLSB ON EXEC OFF EXBU OFF SFRM 006 BRCT OFF SCTA A0 SCTB B1
ANDI PRI OSCL PRI TMCH B RGST A MODC OFF PCMR B PCMM P+M PCMD ON TSFM ON MSDS ON CHCT ON
CCHL HI BATB ON BTBE OFF +BAT SEC -BAT PRI UVOL OFF ATCS OFF
296 18 07 05
BIRD 173 VTIM 124 TYPE P+M OREN OFF HKSR OFF DLSS OFF
ADN1 RESET ADN2 RESET ADN3 RESET ADN4 RESET ADN5 RESET ADN6 RESET ADN7 RESET ADN8 ADDRS AGC1 235 AGC2006 CMDE OFF
CEBJ OFF DLEN OFF TRST ON DLSS OFF DLSB OFF EXEC ON EXBU ON SFRM 004 BRCT OFF SCTA A0 SCTB B1
ANDI PRI OSCL PRI TMCH A RGST B MODC OFF PCMR B PCMM P+M PCMD ON TSFM ON MSDS OFF CHCT ON
CCHL HI BATB OFF BTBE ON +BAT PRI -BAT SEC UVOL OFF ATCS OFF
296 18 07 06
BIRD 174 VTIM 125 TYPE P+M OREON OFF HKSR OFF DLSS OFF
ADN1 ADDRS ADN2 ADDRS ADN3 RESET ADN4 ADDRS ADN5 RESET ADN6 RESET ADN7 ADDRS ADN8 ADDRS AGC1 055 AGC2102 CMDE OFF
CEBJ ON DLEN OFF TRST ON DLSS OFF DLSB OFF EXEC OFF EXBU OFF SFRM 006 BRCT OFF SCTA A0 SCTB B1
ANDI PRI OSCL PRI TMCH B RGST A MODC ON PCMR A PCMM P+M PCMD OFF TSFM OFF MSDS OFF CHCT ON
CCHL LO BATB ON BTBE ON +BAT SEC -BAT SEC UVOL OFF ATCS ON
296 18 07 07
BIRD 171 VTIM 112 TYPE P+M OREN ON HKSR OFF DLSS ON
ADN1 RESET ADN2 RESET ADN3 RESET ADN4 RESET ADN5 RESET ADN6 RESET ADN7 RESET ADN8 RESET AGC1 123 AGC2055 CMDE ON
CEBJ OFF DLEN ON TRST OFF DLSS ON DLSB ON EXEC OFF EXBU OFF SFRM 007 BRCT OFF SCTA A1 SCTB B1
ANDI PRI OSCL PRI TMCH B RGST B MODC OFF PCMR B PCMM P+M PCMD OFF TSFM OFF MSDS OFF CHCT ON
CCHL HI BATB OFF BTBE ON +BAT PRI -BAT PRI UVOL ON ATCS ON
296 18 07 09
BIRD 176 VTIM 115 TYPE PCM OREN ON HKSR OFF DLSS ON
ADN1 RESET ADN2 RESET ADN3 ADDRS ADN4 RESET ADN5 RESET ADN6 ADDRS ADN7 RESET ADN8 ADDRS AGC1 130 AGC2045 CMDE ON
CEBJ ON DLEN ON TRST OFF DLSS ON DLSB OFF EXEC ON EXBU ON SFRM 007 BRCT OFF SCTA A0 SCTB B0
ANDI PRI OSCL PRI TMCH B RGST B MODC ON PCMR A PCMM PCM PCMD OFF TSFM OFF MSDS OFF CHCT OFF
CCHL HI BATB ON BTBE OFF +BAT PRI -BAT SEC UVOL OFF ATCS OFF
296 18 07 10
BIRD 177 VTIM 120 TYPE P+M OREN ON HKSR OFF DLSS ON
ADN1 RESET ADN2 RESET ADN3 RESET ADN4 RESET ADN5 ADDRS ADN6 ADDRS ADN7 ADDRS ADN8 ADDRS AGC1 366 AGC2347 CMDE ON
CEBJ OFF DLEN OFF TRST ON DLSS ON DLSB ON EXEC ON EXBU ON SFRM 002 BRCT OFF SCTA A1 SCTB B0
ANDI SEC OSCL PRI TMCH B RGST A MODC ON PCMR A PCMM P+M PCMD ON TSFM OFF MSDS ON CHCT ON
CCHL LO BATB OFF BTBE ON +BAT SEC -BAT SEC UVOL ON ATCS ON
296 18 07 11
BIRD 174 VTIM 127 TYPE PCM OREN ON HKSR OFF DLSS ON
ADN1 ADDRS ADN2 RESET ADN3 RESET ADN4 RESET ADN5 ADDRS ADN6 ADDRS ADN7 ADDRS ADN8 RESET AGC1 340 AGC2116 CMDE ON
CEBJ ON DLEN OFF TRST OFF DLSS ON DLSB ON EXEC OFF EXBU OFF SFRM 007 BRCT OFF SCTA A1 SCTB B1
ANDI SEC OSCL PRI TMCH A RGST B MODC ON PCMR A PCMM PCM PCMD ON TSFM ON MSDS ON CHCT ON
CCHL LO BATB ON BTBE ON +BAT PRI -BAT PRI UVOL ON ATCS ON
296 18 07 13
BIRD 178 VTIM 121 TYPE P+M OREN OFF HKSR OFF DLSS ON
ADN1 ADDRS ADN2 RESET ADN3 RESET ADN4 ADDRS ADN5 RESET ADN6 RESET ADN7 RESET ADN8 RESET AGC1 364 AGC2326 CMDE ON
CEBJ ON DLEN OFF TRST ON DLSS ON DLSB ON EXEC OFF EXBU OFF SFRM 006 BRCT OFF SCTA A1 SCTB B1
ANDI SEC OSCL PRI TMCH A RGST B MODC ON PCMR B PCMM P+M PCMD OFF TSFM ON MSDS ON CHCT OFF
CCHL LO BATB OFF BTBE ON +BAT SEC -BAT SEC UVOL ON ATCS OFF
296 18 07 14
BIRD 178 VTIM 115 TYPE PCM OREN OFF HKSR OFF DLSS OFF
ADN1 ADDRS ADN2 RESET ADN3 RESET ADN4 ADDRS ADN5 RESET ADN6 ADDRS ADN7 ADDRS ADN8 ADDRS AGC1 031 AGC2133 CMDE ON
CEBJ ON DLEN OFF TRST ON DLSS OFF DLSB OFF EXEC OFF EXBU OFF SFRM 004 BRCT ON SCTA A0 SCTB B1
ANDI SEC OSCL PRI TMCH A RGST A MODC ON PCMR A PCMM PCM PCMD ON TSFM OFF MSDS ON CHCT OFF
CCHL HI BATB ON BTBE OFF +BAT PRI -BAT PRI UVOL ON ATCS ON
296 18 07 15
BIRD 175 VTIM 124 TYPE P+M OREN OFF HKSR OFF DLSS OFF
ADN1 RESET ADN2 RESET ADN3 ADDRS ADN4 RESET ADN5 RESET ADN6 ADDRS ADN7 ADDRS ADN8 RESET AGC1 223 AGC2141 CMDE OFF
CEBJ OFF DLEN OFF TRST ON DLSS OFF DLSB ON EXEC OFF EXBU ON SFRM 000 BRCT ON SCTA A0 SCTB B0
ANDI SEC OSCL PRI TMCH B RGST B MODC ON PCMR B PCMM P+M PCMD OFF TSFM ON MSDS OFF CHCT ON
CCHL LO BATB OFF BTBE ON +BAT PRI -BAT PRI UVOL ON ATCS OFF
296 18 07 17
BIRD 175 VTIM 120 TYPE P+M OREN ON HKSR OFF DLSS ON
ADN1 ADDRS ADN2 ADDRS ADN3 RESET ADN4 RESET ADN5 RESET ADN6 ADDRS ADN7 ADDRS ADN8 RESET AGC1 235 AGC2311 CMDE ON
CEBJ ON DLEN ON TRST OFF DLSS ON DLSB ON EXEC ON EXBU OFF SFRM 000 BRCT OFF SCTA A0 SCTB B1
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COMMAND - FI70CS

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
		MON ADDRESS D	V. TIME A						REC 1 AGC A	REC 2 AGC A					
		MON COMMAND D	MON MEMORY D									MON DL TIMER CMD 1 A	MON DL TIMER CMD 2 A	MON BOOM CTL D	MON RW CTL D
		MON POV D	MON COMMAND D											MON THRUSTER CTL D	
		MON BATTERY D						+ BAT A	- BAT A	+ BAT TEMP A	- BAT TEMP A	+ CG I A	+ DISCG I A	- CG I A	- DISCG I A

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III.6. F170 ES

```
*      170 EXPERIMENT SYSTEM   F170ES
*
*        PREPARED AT NRL BY MCGINTY
*
*
*      3  NOV 71
*
*              INA=0, INPUT GROUP SYNC, OUTPUT MT1
*              INA=1,INPUT GROUP SYNC, OUTPUT MT2
*              INA=2, INPUT MT1
*              INA=3, INPUT MT2
*              INA=4, INPUT GROUP SYNC; PCM OUTPUT TO MAG TAPE UNIT 1,
*          SPECIAL DECOM TO LPR/CRT
*         WILL PRINT/DISPLAY : DECOM NUMBER, RAW DATA, PROCESSED DATA
*
*            "TNUM" = NUMBER OF DECOMS
*            "TCOM" = TABLE OF DECOMS
*            PRINTER
*            DIGIT=0, NORMAL PRINT
*            DIGIT=3, SPECIAL DECOM PRINT
*            PAGE=0, NORMAL DISPLAY
*            PAGE=8, SPECIAL DECOM DISPLAY
*                                          MRO OUTPUT TO MAG TAPE UNIT 2.
*       PURPOSE - TO OUTPUT MESSAGE LABEL AND PROCESSED DATA TO
*                   CRT/LPR - 170 EXPERIMENT  STSTEM
*
        DECOM   (16,64)
*       WORD NUMBER   0-6   1   1     EXP1      EXPERIMENT 1 DIGITAL
        DECOM                      49,8,CRT/LPR/DPR,RAW,0
*       WORD NUMBER   0-7   2   2     EXP2      EXPERIMENT 2 DIGITAL
        DECOM                      57,8,CRT/LPR/DPR,RAW,0
*       WORD NUMBER   1-6   3   3     EXP3      EXPERIMENT 3 DIGITAL
        DECOM                     177,8,CRT/LPR/DPR,RAW,0
*       WORD NUMBER   1-7   4   4     EXP4      EXPERIMENT 4 DIGITAL
        DECOM                     185,8,CRT/LPR/DPR,RAW,0
*       WORD NUMBER   2-6   5   5     EXP5      EXPERIMENT 5 DIGITAL
        DECOM                     305,8,CRT/LPR/DPR,RAW,0
*       WORD NUMBER   2-7   6   6     EXP6      EXPERIMENT 6 DIGITAL
        DECOM                     313,8,CRT/LPR/DPR,RAW,0
*       WORD NUMBER   3-6   7   7     EXP7      EXPERIMENT 7 DIGITAL
        DECOM                     433,8,CRT/LPR/DPR,RAW,0
*       WORD NUMBER   3-7   8   8     EXP8      EXPERIMENT 8 DIGITAL
        DECOM                     441,8,CRT/LPR/DPR,RAW,0
*       WORD NUMBER   4-6   9   9     EXP9      EXPERIMENT 9 DIGITAL
        DECOM                     561,8,CRT/LPR/DPR,RAW,0
*       WORD NUMBER   4-7  10   10    EX10      EXPERIMENT 10 DIGITAL
        DECOM                     569,8,CRT/LPR/DPR,RAW,0
*       WORD NUMBER   5-6  11   11    EX11      EXPERIMENT 11 DIGITAL
        DECOM                     689,8,CRT/LPR/DPR,RAW,0
*       WORD NUMBER   5-7  12   12    EX12      EXPERIMENT 12 DIGITAL
        DECOM                     697,8,CRT/LPR/DPR,RAW,0
*       WORD NUMBER   6-6  13   13    EX13      EXPERIMENT 13 DIGITAL
        DECOM                     817,8,CRT/LPR/DPR,RAW,0
*       WORD NUMBER   6-7  14   14    EX14      EXPERIMENT 14 DIGITAL
        DECOM                     825,8,CRT/LPR/DPR,RAW,0
*       WORD NUMBER   7-6  15   15    EX15      EXPERIMENT 15   DIGITAL
        DECOM                     945,8,CRT/LPR/DPR,RAW,0
```

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*     170 EXPERIMENT SYSTEM   F170ES



*     WORD NUMBER   7-7  16  16    EX16      EXPERIMENT 16 DIGITAL
      DECOM                    953,8,CRT/LPR/DPR,RAW,0
*     WORD NUMBER   6-2  17  17    E171      EXPERIMENT 17-1
      DECOM                    785,8,CRT/LPR/DPR,RAW,0
*     WORD NUMBER   6-3  18  18    E172      EXPERIMENT 17-2
      DECOM                    793,8,CRT/LPR/DPR,RAW,0
*     WORD NUMBER   7-2  19   19   E173      EXPERIMENT 71-3
      DECOM                    913,8,CRT/LPR/DPR,RAW,0
*     WORD NUMBER   7-3  20  20    E174      EXPERIMENT 17-4
      DECOM                    921,8,CRT/LPR/DPR,RAW,0
*     WORD NUMBER   1-3   1  21    VTIM      PCM VERNIER TIME DECIMAL
    DECOM          153,8,CRT/LPR/DPR,RAW,0
*     WORD NUMBER   3-3   2  22    BIRD      SPACECRAFT ID (ADD 171)
      DECOM                    415,2,CRT/LPR/DPR,RAW,0
*     WORD NUMBER   3-2   3  23    (MRO,PCM) TYPE OF DATA (0=PCM,1=MRO)
      DECOM                    405,1,CRT/LPR/DPR,RAW,0
*     WORD NUMBER   3-3   4  24    HKSR      HOUSEKEEPING SENSOR (0=OFF, 1=ON)
      DECOM                    411,1,CRT/LPR/DPR,RAW,0
*     WORD NUMBER   3-3   5  25    OREN      ORDANCE ENABLE (0=OFF, 1=ON)
      DECOM                    277,1,CRT/LPR/DPR,RAW,0
*     WORD NUMBER   2-2   6  26    DLSS      DL SYSTEM (0=OFF, 1=ON)
      DECOM                    409,1,CRT/LPR/DPR,RAW,0
*     WORD NUMBER   2-7       27             MEMORY ADDRESS COUNTER
     DECOM                      313,8,CRT/LPR/DPR,RAW,0
*     WORD NUMBER   0-7       28             MEMORY ADDRESS COUNTER
     DECOM                       57,8,CRT/LPR/DPR,RAW,0
      WORD NUMBER   7-7       29             MEMORY ADDRESS COUNTER
     DECOM                      953,8,CRT/LPR/DPR,RAW,0
*     WORD NUMBER   5-7       30             MEMORY ADDRESS COUNTER
     DECOM                      697,8,CRT/LPR/DPR,RAW,0
        SIZE TCOM(64)
      SIZE   MT(8)
     TEXT   S1(2,6)SAMPLE"REV"
*     STANDARD DATA HEADER
       TEXT  HT(7,4)VTIM"BIRD"PCM"MRO"HKSR"OREN"DLSS"
      TEXT ON(2,3)OFF"ON"
*    CRT BUFFER
       SIZE  M2(160)
      SIZE M(20)
      TEXT  E1(21,4)EXP1"EXP2"EXP3"EXP4"EXP5"EXP6"EXP7"EXP8"EXP9"EX10"
    TEXTC EX11"EX12"EX13"EX14"EX15"EX16"E171"E172"E173"SLXA"SLXA"
       TEXT   E2(2,4)F170ES"REV"
     TEXT  E4(8,4)OPTA"OPTB"RPAREXPN"OPX1"OPX2"SLMA" "
     TEXT  E5(2,3)ON"OFF"
      TEXT   T7(24,4)E7-1"E7-9"E717"E7-2"E710"E718"E7-3"E711"E719"
    TEXTC E7-4"E712"E720"E7-5"E713"E7G4"E7-6"E714"E7G3"E7-7"E715"E7G2"
      TEXTC E7-8"E716"E7G1"
     TEXT E6(9,4)SLM1"SLM3"SLM2"AJX2"AJX3"ADJ"AJL3"AJL2"AJL4"
      PROCESS   RAW
      PD(N)=UD(N)
      ENDP
       START OF PROGRAM
      START
*      RESET SAMPLE COUNTER
        SA=1
*      DETERMINE MAG TAPE UNIT AND CONFIG
      IF (INA.EQ.1.OR.INA.EQ.3)GOTO DOG1
```

```
MRO   VTIM 187 BIRD 174    HKSR OFF    OREN OFF    DLSS ON        320 14 42 12        F170ES     REV     000000 SAMPLE    000006
EXP1   000375  EXP2   000273    EXP3   000224    EXP4   000025    EXP5  000235    EXP6  000235    EXP7   000012    EXP8 000274
EXP9   000254  EX10   000236    EX11   000371    EX12   000373    EX13  000332    EX14  000353    EX15   000246    EX16 000062
E171   000045  E172   000300    E173   000253    SLMA   000305
       EXP1 EXP2 EXP3 EXP4 EXP5 EXP6 EXP7 EXP8 EXP9 EX10 EX11 EX12 EX13 EX14 EX15 EX16
OPTA OFF  OFF  OFF  ON   OFF  OFF  ON   OFF  OFF  OFF  OFF  OFF  OFF  OFF  OFF  ON    E7-1 ON    E7-9 OFF   E717 OFF
OPTB OFF  ON   ON   ON   ON   ON   ON   ON   ON   ON   OFF  OFF  OFF  OFF  ON   ON    E7-2 ON    E710 OFF   E718 ON
PAR  OFF  OFF  ON   ON   ON   ON   ON   OFF  OFF  ON   OFF  OFF  ON   OFF  OFF  OFF   E7-3 OFF   E711 ON    E719 OFF
EXPN OFF  OFF  OFF  OFF  OFF  OFF  ON   OFF  ON   OFF  OFF  OFF  OFF  ON   ON   OFF   E7-4 ON    E712 ON    E720 ON
OP1  OFF  OFF  ON   ON   OFF  OFF  OFF  OFF  OFF  OFF  OFF  OFF  OFF  OFF  ON   ON    E7-5 ON    E713 ON    E7G4 OFF
OP2  OFF  ON   OFF  OFF  OFF  OFF  ON   OFF  OFF  OFF  ON   ON   ON   ON   OFF  ON    E7-6 OFF   E714 ON    E7G3 ON
SLM  SLM1 SLM3 SLM2 SLM2 AJX2 AJX3 ADJ  AJL3 AJL2                                     E7-7 ON    E715 ON    E7G2 OFF
     OFF  OFF  ON   ON   ON   OFF  ON   OFF                                           E7-8 OFF   E716 ON    E7G1 OFF
PCM   VTIM 052 BIRD 172    HKSR OFF    OREN ON     DLSS OFF       320 14 42 14        F170ES     REV     000000 SAMPLE    000007
EXP1   000327  EXP2   000266    EXP3   000001    EXP4   000177    EXP5  000032    EXP6  000016    EXP7   000162    EXP8 000057
EXP9   000030  EX10   000175    EX11   000014    EX12   000374    EX13  000147    EX14  000370    EX15   000167    EX16 000177
E171   000057  E172   000167    E173   000254    SLMA   000137
       EXP1 EXP2 EXP3 EXP4 EXP5 EXP6 EXP7 EXP8 EXP9 EX10 EX11 EX12 EX13 EX14 EX15 EX16
OPTA OFF  OFF  ON   ON   ON   ON   ON   ON   ON   ON   ON   OFF  ON   OFF  ON   ON    E7-1 ON    E7-9 ON    E717 OFF
OPTB OFF  ON   ON   OFF  ON   ON   OFF  ON   ON   OFF  ON   OFF  OFF  OFF  OFF  OFF   E7-2 ON    E710 OFF   E718 ON
PAR  ON   OFF  ON   OFF  ON   ON   OFF  OFF  ON   OFF  ON   OFF  OFF  OFF  OFF  OFF   E7-3 OFF   E711 OFF   E719 OFF
EXPN OFF  OFF  ON   OFF  OFF  ON   OFF  ON   OFF  OFF  ON   OFF  ON   OFF  OFF  OFF   E7-4 ON    E712 OFF   E720 ON
OP1  ON   ON   ON   OFF  OFF  OFF  ON   OFF  OFF  OFF  OFF  OFF  ON   OFF  ON   OFF   E7-5 OFF   E713 ON    E7G4 OFF
OP2  OFF  OFF  ON   OFF  ON   OFF  ON   OFF  ON   OFF  OFF  OFF  OFF  ON   OFF  OFF   E7-6 OFF   E714 OFF   E7G3 OFF
SLM  SLM1 SLM3 SLM2 SLM2 AJX2 AJX3 ADJ  AJL3 AJL2                                     E7-7 OFF   E715 OFF   E7G2 ON
     ON   OFF  ON   OFF  OFF  OFF  OFF  OFF                                           E7-8 OFF   E716 OFF   E7G1 ON
MRO   VTIM 093 BIRD 172    HKSR ON     OREN ON     DLSS OFF       320 14 42 17        F170ES     REV     000000 SAMPLE    000008
EXP1   000156  EXP2   000267    EXP3   000165    EXP4   000116    EXP5  000022    EXP6  000327    EXP7   000377    EXP8 000337
EXP9   000126  EX10   000217    EX11   000306    EX12   000302    EX13  000276    EX14  000223    EX15   000342    EX16 000047
E171   000152  E172   000004    E173   000317    SLMA   000047
       EXP1 EXP2 EXP3 EXP4 EXP5 EXP6 EXP7 EXP8 EXP9 EX10 EX11 EX12 EX13 EX14 EX15 EX16
OPTA ON   OFF  ON   ON   ON   OFF  OFF  OFF  ON   OFF  OFF  OFF  OFF  OFF  OFF  ON    E7-1 ON    E7-9 ON    E717 OFF
OPTB OFF  ON   OFF  OFF  ON   OFF  OFF  OFF  OFF  ON   OFF  OFF  ON   ON   OFF  ON    E7-2 OFF   E710 ON    E718 OFF
PAR  OFF  OFF  OFF  ON   ON   ON   OFF  ON   ON   ON   ON   ON   OFF  ON   OFF  OFF   E7-3 OFF   E711 ON    E719 ON
EXPN ON   OFF  OFF  ON   OFF  OFF  OFF  OFF  OFF  ON   ON   ON   OFF  OFF  ON   ON    E7-4 ON    E712 ON    E720 ON
OP1  OFF  ON   ON   OFF  ON   ON   OFF  OFF  ON   OFF  ON   ON   OFF  ON   ON   ON    E7-5 OFF   E713 ON    E7G4 OFF
OP2  OFF  OFF  OFF  OFF  ON   OFF  OFF  OFF  OFF  OFF  OFF  ON   OFF  ON   ON   OFF   E7-6 ON    E714 OFF   E7G3 OFF
SLM  SLM1 SLM3 SLM2 SLM2 AJX2 AJX3 ADJ  AJL3 AJL2                                     E7-7 OFF   E715 ON    E7G2 OFF
     ON   ON   OFF  ON   ON   OFF  OFF  OFF                                           E7-8 ON    E716 ON    E7G1 OFF
MRO   VTIM 193 BIRD 174    HKSR ON     OREN ON     DLSS ON        320 14 42 19        F170ES     REV     000000 SAMPLE    000009
EXP1   000101  EXP2   000202    EXP3   000277    EXP4   000133    EXP5  000345    EXP6  000020    EXP7   000024    EXP8 000261
EXP9   000055  EX10   000315    EX11   000177    EX12   000056    EX13  000327    EX14  000222    EX15   000317    EX16 000133
E171   000146  E172   000347    E173   000317    SLMA   000344
       EXP1 EXP2 EXP3 EXP4 EXP5 EXP6 EXP7 EXP8 EXP9 EX10 EX11 EX12 EX13 EX14 EX15 EX16
OPTA ON   OFF  OFF  ON   OFF  ON   ON   OFF  ON   OFF  ON   ON   OFF  OFF  OFF  ON    E7-1 ON    E7-9 OFF   E717 OFF
OPTB OFF  ON   ON   OFF  OFF  ON   ON   ON   ON   OFF  OFF  ON   OFF  ON   OFF  OFF   E7-2 OFF   E710 OFF   E718 OFF
PAR  ON   ON   OFF  ON   OFF  ON   ON   OFF  OFF  ON   OFF  OFF  ON   ON   ON   ON    E7-3 OFF   E711 OFF   E719 ON
EXPN ON   ON   OFF  OFF  ON   OFF  OFF  OFF  ON   ON   OFF  ON   OFF  OFF  ON   OFF   E7-4 ON    E712 ON    E720 ON
OP1  ON   ON   OFF  OFF  ON   ON   ON   ON   OFF  OFF  OFF  OFF  ON   ON   OFF  OFF   E7-5 ON    E713 ON    E7G4 OFF
OP2  ON   ON   OFF  ON   OFF  ON   OFF  ON   OFF  OFF  OFF  OFF  OFF  ON   OFF  ON    E7-6 OFF   E714 OFF   E7G3 OFF
SLM  SLM1 SLM3 SLM2 SLM2 AJX2 AJX3 ADJ  AJL3 AJL2                                     E7-7 OFF   E715 OFF   E7G2 OFF
     OFF  OFF  OFF  ON   ON   OFF  ON   OFF                                           E7-8 ON    E716 OFF   E7G1 OFF
PCM   VTIM 009 BIRD 171    HKSR ON     OREN ON     DLSS OFF       320 14 42 22        F170ES     REV     000000 SAMPLE    000010
EXP1   000344  EXP2   000174    EXP3   000311    EXP4   000253    EXP5  000147    EXP6  000164    EXP7   000322    EXP8 000047
EXP9   000236  EX10   000001    EX1@1  000117    EX12   000271    EX13  000203    EX14  000270    EX15   000265    EX16 000175
E171   000107  E172   000027    E173   000357    SLMA   000147
       EXP1 EXP2 EXP3 EXP4 EXP5 EXP6 EXP7 EXP8 EXP9 EX10 EX11 EX12 EX13 EX14 EX15 EX16
OPTA OFF  ON   OFF  OFF  ON   ON   OFF  ON   OFF  ON   ON   OFF  OFF  OFF  OFF  ON    E7-1 ON    E7-9 ON    E717 OFF
OPTB OFF  OFF  OFF  ON   OFF  OFF  OFF  ON   ON   ON   OFF  ON   ON   ON   ON   OFF   E7-2 OFF   E710 ON    E718 OFF
PAR  OFF  OFF  ON   OFF  OFF  OFF  ON   OFF  ON   ON   ON   OFF  ON   OFF  OFF  OFF   E7-3 ON    E711 ON    E719 OFF
EXPN ON   OFF  ON   ON   ON   OFF  OFF  ON   OFF  ON   ON   OFF  ON   OFF  OFF  OFF   E7-4 ON    E712 OFF   E720 ON
OP1  ON   OFF  OFF  OFF  ON   ON   ON   ON   OFF  ON   OFF  OFF  ON   OFF  ON   OFF   E7-5 ON    E713 ON    E7G4 OFF
OP2  OFF  OFF  ON   ON   OFF  OFF  ON   OFF  OFF  ON   OFF  ON   ON   ON   OFF  OFF   E7-6 OFF   E714 OFF   E7G3 OFF
SLM  SLM1 SLM3 SLM2 SLM2 AJX2 AJX3 ADJ  AJL3 AJL2                                     E7-7 OFF   E715 OFF   E7G2 OFF
     ON   OFF  OFF  ON   ON   OFF  OFF  ON                                            [illegible]
```

EXPERIMENTS - COMPUTER PRO. F170ES

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0							EXP. 1 D	EXP. 2 D								
1			ADDRESS MON D	V. TIME A			EXP. 3 D	EXP. 4 D								
2			COMMAND CONTROL MON D	MEMORY D			EXP. 5 D	EXP. 6 D					DL TIMER CMD 1 D	DL TIMER CMD 2 D		
3			PCM CONTROL MON D	COMMAND CONTROL MON D			EXP. 7 D	EXP. 8 D								
4			MON BAT D	EXP. 17 AB			EXP. 9 D	EXP. 10 D								
5			EXP. 18	EXP. 19			EXP. 11 D	EXP. 12 D								
6			EXP. 20	EXP. 21			EXP. 13 D	EXP. 14 D								
7			RETEP	PAR			EXP. 15 D	EXP. 16 D					TEMP 11 DL BOOM A			

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III.7. F170 PS

POWER SYSTEM PROCESSED DATA

POWER SYSTEM PROCESSED DATA
POWER SYSTEM PROCESSED DATA

19 OCT 71

PREPARED AT NRL BY [redacted] 3.3(b)(1)

INA=0, INPUT GROUP SYNC, OUTPUT MT1
INA=1,INPUT GROUP SYNC, OUTPUT MT2
INA=2, INPUT MT1
INA=3, INPUT MT2
INA=4, INPUT GROUP SYNC; PCM OUTPUT TO MAG TAPE UNIT 1,
MRO OUTPUT TO MAG TAPE UNIT 2.

PDS

PURPOSE - TO OUTPUT POWER SYSTEM PROCESSED DATA.

64 16-BIT WORDS

```
DECOM   (16,64)
WORD NUMBER   1-12  1   1    +CL1       + CELL 1 MONITOR
DECOM                 225,8,CRT/LPR/DPR,LINZ,4,2,0,3,3
WORD NUMBER   0-4   2   2    +CM2       + CELL 2 MONITOR
DECOM                  33,8,CRT/LPR/DPR,LINZ,4,2,0,3,3
WORD NUMBER   1-4   3   3    +CM3       + CELL 3 MONITOR
DECOM                 161,8,CRT/LPR/DPR,LINZ,4,2,0,3,3
WORD NUMBER   2-4   4   4    +CM4       + CELL 4 MONITOR
DECOM                 289,8,CRT/LPR/DPR,LINZ,4,2,0,3,3
WORD NUMBER   3-4   5   5    +CM5       + CELL 5 MONITOR
DECOM                 417,8,CRT/LPR/DPR,LINZ,4,2,0,3,3
WORD NUMBER   4-4   6   6    +CM6       + CELL 6 MONITOR
DECOM                 545,8,CRT/LPR/DPR,LINZ,4,2,0,3,3
WORD NUMBER   5-4   7   7    +CM7       + CELL 7 MONITOR
DECOM                 673,8,CRT/LPR/DPR,LINZ,4,2,0,3,3
WORD NUMBER   6-4   8   8    +CM8       + CELL 8 MONITOR
DECOM                 801,8,CRT/LPR/DPR,LINZ,4,2,0,3,3
WORD NUMBER   7-4   9   9    +CM9       + CELL 9 MONITOR
DECOM                 929,8,CRT/LPR/DPR,LINZ,4,2,0,3,3
WORD NUMBER   0-5  10  10    -C10       - CELL 2 MONITOR
DECOM                  41,8,CRT/LPR/DPR,LINZ,4,2,0,3,3
WORD NUMBER   1-5  11  11    -C11       - CELL 11 MONITOR
DECOM                 169,8,CRT/LPR/DPR,LINZ,4,2,0,3,3
WORD NUMBER   2-5  12  12    -C12       - CELL 12 MONITOR
DECOM                 297,8,CRT/LPR/DPR,LINZ,4,2,0,3,3
WORD NUMBER   3-5  13  13    -C13       - CELL 13 MONITOR
DECOM                 425,8,CRT/LPR/DPR,LINZ,4,2,0,3,3
WORD NUMBER   4-5  14  14    -C14       - CELL 14 MONITOR
DECOM                 553,8,CRT/LPR/DPR,LINZ,4,2,0,3,3
WORD NUMBER   5-5  15  15    -C15       - CELL 15 MONITOR
DECOM                 681,8,CRT/LPR/DPR,LINZ,4,2,0,3,3
WORD NUMBER   6-5  16  162   -C16       - CELL 16 MONITOR
DECOM                 809,8,CRT/LPR/DPR,LINZ,4,2,0,3,3
WORD NUMBER   7-5  17 17     -C17       - CELL 17 MONITOR
DECOM                 937,8,CRT/LPR/DPR,LINZ,4,2,0,3,3
WORD NUMBER   1-13 18  18    -C18       - CELL 18 MONITOR
DECOM                 233,8,CRT/LPR/DPR,LINZ,4,2,0,3,3
```

```
*      POWER SYSTEM  PROCESSED DATA


     DECOM                          531,1,CRT/LPR/DPR,RAW,0
*    WORD NUMBER 4-2-4  20  20      BBEN      BATTERY BYPASS ENABLE
     DECOM                          532,1,CRT/LPR/DPR,RAW,0
*    WORD NUMBER 4-2-5  21  21      P+BS      PRI-SEC + BATTERY SELECT
     DECOM                          533,1,CRT/LPR/DPR,RAW,0
*    WORD NUMBER 4-2-6  22  22      P-BS      PRI-SEC - BATTERY SELECT
     DECOM                          534,1,CRT/LPR/DPR,RAW,0
*    WORD NUMBER 4-2-1  23  23      CCOF      CHARGE CONTROL ON-OFF
     DECOM                          529,1,CRT/LPR/DPR,RAW,0
*    WORD NUMBER 4-2-2  24  24      CCHL      CHARGE CONTROL HI-LO
     DECOM                          530,1,CRT/LPR/DPR,RAW,0
*    WORD NUMBER   1-8  25  25      5VCL      5 VOLT CALIBRATE
     DECOM                          193,8,CRT/LPR/DPR,VOLT,0
*    WORD NUMBER   4-8   1  26      +VSR      + VOLT SENSOR
     DECOM                          577,8,CRT/LPR/DPR,LOLT,0
*    WORD NUMBER   4-9   2  27      -VSR      - VOLT SENSOR
     DECOM                          585,8,CRT/LPR/DPR,LOLT,0
*    WORD NUMBER   4-10  3  28      +BTM      + BATTERY TEMPERATURE
     DECOM                          593,8,CRT/LPR/DPR,CURVE,0
*    WORD NUMBER   4-11 4   29      -BTM      - BATTERY TEMPERATURE
     DECOM                          601,8,CRT/LPR/DPR,CURVE,0
*    WORD NUMBER   4-12 5   30      +CIM      + CHARGE CURRENT MONITOR
     DECOM                          609,8,CRT/LPR/DPR,AMPS,0
*    WORD NUMBER   4-13 6   31      +DIM      + DISCHARGE CURRENT MONITOR
     DECOM                          617,8,CRT/LPR/DPR,AMPS,0
     WORD NUMBER   4,14 7   32      -CIM      - CHARGE CURRENT MONITOR
     DECOM                          625,8,CRT/LPR/DPR,AMPS,0
*    WORD NUMBER   4-15 8   33      -DIM      - DISCHARGE CURRENT MONITOR
     DECOM                          633,8,CRT/LPR/DPR,AMPS,0
*    WORD NUMBER   3-8  9   34      +SVM      +SEC VOLT MONITOR OUTPUT
     DECOM                          449,8,CRT/LPR/DPR,LOLT,0
*    WORD NUMBER   3-9  10  35      -SVM      -SEC VOLT MONITOR OUTPUT
     DECOM                          457,8,CRT/LPR/DPR,LOLT,0
*    WORD NUMBER 3-12   11  36      T3+B      T3 + SEC BATTERY TEM
     DECOM                          481,8,CRT/LPR/DPR,CURVE,0
*    WORD NUMBER 3-13   12  37      T4-B      T4 - SEC BATTERY TEMPERATURE
     DECOM                          489,8,CRT/LPR/DPR,CURVE,0
*    WORD NUMBER   1-3   1  38      VTIM      PCM VERNIER TIME DECIMAL
   DECOM          153,8,CRT/LPR/DPR,RAW,0
*    WORD NUMBER   3-3   2  39      BIRD      SPACECRAFT ID (ADD 171)
     DECOM                          415,2,CRT/LPR/DPR,RAW,0
*    WORD NUMBER   3-2   3  40      (MRO,PCM) TYPE OF DATA (0=PCM,1=MRO)
     DECOM                          405,1,CRT/LPR/DPR,RAW,0
*    WORD NUMBER   3-3   4  41      HKSR      HOUSEKEEPING SENSOR (0=OFF, 1=ON)
     DECOM                          411,1,CRT/LPR/DPR,RAW,0
*    WORD NUMBER   3-3   5  42      OREN      ORDANCE ENABLE (0=OFF, 1=ON)
     DECOM                          277,1,CRT/LPR/DPR,RAW,0
*    WORD NUMBER   2-2   6  43      DLSS      DL SYSTEM (0=OFF, 1=ON)
     DECOM                          409,1,CRT/LPR/DPR,RAW,0
*    WORD NUMBER   2-7      44                MEMORY ADDRESS COUNTER
   DECOM                          313,8,CRT/LPR/DPR,RAW,0
*    WORD NUMBER   0-7      45                MEMORY ADDRESS COUNTER
   DECOM                          57,8,CRT/LPR/DPR,RAW,0
*    WORD NUMBER   7-7      46                MEMORY ADDRESS COUNTER
   DECOM                          953,8,CRT/LPR/DPR,RAW,0
*    WORD NUMBER   5-7      47                MEMORY ADDRESS COUNTER
```

+CM1	001.24	+CM2	001.25	+CM3	001.24	+CM4	001.24	+CM5	001.24	+CM6	001.25	+CM7	001.24	+CM8	001.25
+CM9	001.26	-C10	001.25	-C11	001.26	-C12	001.24	-C13	001.24	-C14	001.25	-C15	001.25	-C16	001.24
-C17	001.25	-C18	001.23												
+VSR	04.418	-VSR	04.888	+BTM	0011.9	-BTM	0011.9	+CIM	0.0000	+DIM	0.3666	-CIM	0.0000	-DIM	0.2847
+SVM	10.058	-SVM	06.533	T3+B	0012.3	T4-B	0011.9	5VCL	4.9800	BBOF	OFF	BBEN	ON	P+BS	ON
P-BS	ON	CCOF	ON	CCHL	HI	170 POWER SYSTEM				SAMPLE	000000		303 13 37 44		
+CM1	001.24	+CM2	001.25	+CM3	001.24	+CM4	001.24	+CM5	001.24	+CM6	001.25	+CM7	001.24	+CM8	001.25
+CM9	001.25	-C10	001.25	-C11	001.26	-C12	001.24	-C13	001.24	-C14	001.25	-C15	001.25	-C16	001.24
-C17	001.25	-C18	001.23												
+VSR	04.418	-VSR	04.888	+BTM	0011.9	-BTM	0011.9	+CIM	0.0000	+DIM	0.3666	-CIM	0.0000	-DIM	0.2769
+SVM	10.058	-SVM	06.533	T3+B	0012.3	T4-B	0011.9	5VCL	4.9800	BBOF	OFF	BBEN	ON	P+BS	ON
P-BS	ON	CCOF	ON	CCHL	HI	170 POWER SYSTEM				SAMPLE	000001		303 13 37 46		
+CM1	001.24	+CM2	001.25	+CM3	001.24	+CM4	001.24	+CM5	001.24	+CM6	001.25	+CM7	001.24	+CM8	001.25
+CM9	001.25	-C10	001.25	-C11	001.26	-C12	001.24	-C13	001.24	-C14	001.25	-C15	001.25	-C16	001.24
-C17	001.25	-C18	001.23												
+VSR	04.418	-VSR	04.888	+BTM	0011.9	-BTM	0011.9	+CIM	0.0000	+DIM	0.3666	-CIM	0.0000	-DIM	0.2769
+SVM	10.058	-SVM	06.533	T3+B	0011.9	T4-B	0011.9	5VCL	4.9800	BBOF	OFF	BBEN	ON	P+BS	ON
P-BS	ON	CCOF	ON	CCHL	HI	170 POWER SYSTEM				SAMPLE	000002		303 13 37 49		
+CM1	001.24	+CM2	001.25	+CM3	001.24	+CM4	001.24	+CM5	001.24	+CM6	001.25	+CM7	001.24	+CM8	001.25
+CM9	001.25	-C10	001.25	-C11	001.26	-C12	001.24	-C13	001.24	-C14	001.25	-C15	001.25	-C16	001.24
-C17	001.25	-C18	001.23												
+VSR	04.418	-VSR	04.935	+BTM	0011.9	-BTM	0011.9	+CIM	0.0000	+DIM	0.3666	-CIM	0.0000	-DIM	0.2769
+SVM	09.447	-SVM	06.533	T3+B	0012.3	T4-B	0011.9	5VCL	4.9800	BBOF	OFF	BBEN	ON	P+BS	ON
P-BS	ON	CCOF	ON	CCHL	HI	170 POWER SYSTEM				SAMPLE	000003		303 13 37 51		
+CM1	001.24	+CM2	001.25	+CM3	001.24	+CM4	001.24	+CM5	001.24	+CM6	001.25	+CM7	001.24	+CM8	001.25
+CM9	001.26	-C10	001.25	-C11	001.26	-C12	001.24	-C13	001.24	-C14	001.25	-C15	001.25	-C16	001.24
-C17	001.25	-C18	001.23												
+VSR	04.418	-VSR	04.935	+BTM	0011.9	-BTM	0011.9	+CIM	0.0000	+DIM	0.3666	-CIM	0.0000	-DIM	0.2769
+SVM	10.058	-SVM	06.533	T3+B	0012.3	T4-B	0011.9	5VCL	4.9800	BBOF	OFF	BBEN	ON	P+BS	ON
P-BS	ON	CCOF	ON	CCHL	HI	170 POWER SYSTEM				SAMPLE	000004		303 13 37 54		
+CM1	001.24	+CM2	001.25	+CM3	001.24	+CM4	001.24	+CM5	001.24	+CM6	001.25	+CM7	001.24	+CM8	001.25
+CM9	001.25	-C10	001.25	-C11	001.26	-C12	001.24	-C13	001.24	-C14	001.25	-C15	001.25	-C16	001.24
-C17	001.25	-C18	001.23												
+VSR	04.418	-VSR	04.935	+BTM	0011.9	-BTM	0011.9	+CIM	0.0000	+DIM	0.3627	-CIM	0.0000	-DIM	0.2769
+SVM	10.058	-SVM	06.533	T3+B	0011.9	T4-B	0011.9	5VCL	4.9800	BBOF	OFF	BBEN	ON	P+BS	ON
P-BS	ON	CCOF	ON	CCHL	HI	170 POWER SYSTEM				SAMPLE	000005		303 13 37 57		
+CM1	001.24	+CM2	001.25	+CM3	001.24	+CM4	001.24	+CM5	001.24	+CM6	001.25	+CM7	001.24	+CM8	001.25
+CM9	001.25	-C10	001.25	-C11	001.26	-C12	001.24	-C13	001.24	-C14	001.25	-C15	001.25	-C16	001.24
-C17	001.25	-C18	001.23												
+VSR	04.371	-VSR	04.935	+BTM	0011.9	-BTM	0011.9	+CIM	0.0000	+DIM	0.3627	-CIM	0.0000	-DIM	0.2769
+SVM	10.058	-SVM	06.533	T3+B	0012.3	T4-B	0011.9	5VCL	4.9800	BBOF	OFF	BBEN	ON	P+BS	ON
P-BS	ON	CCOF	ON	CCHL	HI	170 POWER SYSTEM				SAMPLE	000006		303 13 37 59		
+CM1	001.24	+CM2	001.25	+CM3	001.24	+CM4	001.24	+CM5	001.24	+CM6	001.25	+CM7	001.24	+CM8	001.25
+CM9	001.25	-C10	001.25	-C11	001.26	-C12	001.24	-C13	001.24	-C14	001.25	-C15	001.25	-C16	001.24
-C17	001.25	-C18	001.23												
+VSR	04.371	-VSR	04.935	+BTM	0011.9	-BTM	0011.9	+CIM	0.0000	+DIM	0.3627	-CIM	0.0000	-DIM	0.2847
+SVM	10.058	-SVM	06.533	T3+B	0012.3	T4-B	0011.9	5VCL	4.9800	BBOF	OFF	BBEN	ON	P+BS	ON
P-BS	ON	CCOF	ON	CCHL	HI	170 POWER SYSTEM				SAMPLE	000007		303 13 38 02		
+CM1	001.24	+CM2	001.25	+CM3	001.24	+CM4	001.24	+CM5	001.24	+CM6	001.25	+CM7	001.24	+CM8	001.25
+CM9	001.25	-C10	001.25	-C11	001.26	-C12	001.24	-C13	001.24	-C14	001.25	-C15	001.25	-C16	001.24
-C17	001.25	-C18	001.23												
+VSR	04.371	-VSR	04.888	+BTM	0011.9	-BTM	0011.9	+CIM	0.0000	+DIM	0.3588	-CIM	0.0000	-DIM	0.2847
+SVM	10.058	-SVM	06.533	T3+B	0012.3	T4-B	0011.9	5VCL	4.9800	BBOF	OFF	BBEN	ON	P+BS	ON
P-BS	ON	CCOF	ON	CCHL	HI	170 POWER SYSTEM				SAMPLE	000008		303 13 38 04		
+CM1	001.24	+CM2	001.25	+CM3	001.24	+CM4	001.24	+CM5	001.24	+CM6	001.25	+CM7	001.24	+CM8	001.25
+CM9	001.25	-C10	001.25	-C11	001.26	-C12	001.24	-C13	001.24	-C14	001.25	-C15	001.25	-C16	001.24
-C17	001.25	-C18	001.23												
+VSR	04.371	-VSR	04.888	+BTM	0011.9	-BTM	0011.9	+CIM	0.0000	+DIM	0.3627	-CIM	0.0000	-DIM	0.2847
+SVM	10.058	-SVM	06.533	T3+B	0011.9	T4-B	0011.9	5VCL	4.9800	BBOF	OFF	BBEN	ON	P+BS	ON
P-BS	ON	CCOF	ON	CCHL	HI	170 POWER SYSTEM				SAMPLE	000009		303 13 38 07		
+CM1	001.24	+CM2	001.25	+CM3	001.24	+CM4	001.24	+CM5	001.24	+CM6	001.25	+CM7	001.24	+CM8	001.25
+CM9	001.25	-C10	001.25	-C11	001.26	-C12	001.24	-C13	001.24	-C14	001.25	-C15	001.25	-C16	001.24
-C17	001.25	-C18	001.23												
+VSR	04.418	-VSR	04.888	+BTM	0011.9	-BTM	0012.3	+CIM	0.0000	+DIM	0.3627	-CIM	0.0000	-DIM	0.2847

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F17OPS CRT DISPLAY

+CM1	001.32	+CM2	001.30
+CM3	001.30	+CM4	001.30
+CM5	001.30	+CM6	001.30
+CM7	001.30	+CM8	001.30
+CM9	001.32	-C10	001.28
-C11	001.30	-C12	001.28
-C13	001.26	-C14	001.30
-C15	001.30	-C16	001.30
-C17	001.28	-C18	C01.30
+VSR	05.499	-VSR	05.969
+BTM	0059.1	-BTM	0059.9
+CIM	0.0000	+DIM	0.0000
-CIM	0.0000	-DIM	0.0000
+SVM	09.400	-SVM	0.0000
T3+B	0059.1	T4-B	0058.3
5VCL	5.0400	BBOF	OFF
BBEN	OFF	P+BS	OFF
P-BS	OFF	CCOF	OFF
CCHL	LO	F17OPS	
SAMPLE	000000	312 14 16 58	

POWER - COMPUTER PRO. F170PS

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0					CELL 2 A	CELL 10 A										
1			MON ADDRESS D	V. TIME A	CELL 3 A	CELL 11 A							CELL 1 A	CELL 19 A		
2			MON COMMAND D	MEM D	CELL 4 A	CELL 12 A				TEMP 24 BAT BYP A						
3			MEM D	MON HK D	CELL 5 A	CELL 13 A			MON + SEC V A	MON - SEC V A			TEMP 3 + SEC BAT A	TEMP 4 - SEC BAT A		
4			MON BAT CONTROL D		CELL 6 A	CELL 14 A			MON + BAT V A	MON - BAT V A	TEMP 25 + BAT A	TEMP 26 - BAT A	MON + CG 1 A	MON + BISCG 1 A	MON - CG 1 A	MON - BISCG 1
5					CELL 7 A	CELL 15 A			TEMP 25 + BAT A	TEMP 26 - BAT A						
6					CELL 8 A	CELL 16 A									MON + SC CG 1 A	MON - SC CG 1 A
7					CELL 9 A	CELL 17 A										

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III.8. F170 S

F170S REATION WHEEL/BOOM/THRUSTERS SYSTEM I124

27 OCT 71

3.3(b)(1)

PREPARED AT NRL BY [redacted]

INA=0, INPUT GROUP SYNC, OUTPUT MT1
INA=1,INPUT GROUP SYNC, OUTPUT MT2
INA=2, INPUT MT1
INA=3, INPUT MT2
INA=4, INPUT GROUP SYNC; PCM OUTPUT TO MAG TAPE UNIT 1,
MRO OUTPUT TO MAG TAPE UNIT 2.

SPECIAL DECOM TO LPR/CRT

WILL PRINT/DISPLAY : DECOM NUMBER, RAW DATA, PROCESSED DATA
"TNUM" = NUMBER OF DECOMS
"TCOM" = TABLE OF DECOMS
PRINTER
DIGIT=0, NORMAL PRINT
DIGIT=3, SPECIAL DECOM PRINT

CRT
PAGE=0, NORMAL DISPLAY
PAGE=1, BOOM
PAGE=8, SPECIAL DECOM DISPLAY

*** SELECTED DECOM TEST

DECOM (16,64)

WORD NUMBER	2-15	1	1	SPED	SPEED ON/OFF (1,0)
DECOM			377,1,CRT/LPR/DPR,RAW,0		
WORD NUMBER	2-15		2	STAT	REACTION WHEEL ON/OFF (1,0)
DECOM			378,1,CRT/LPR/DPR,RAW,0		
WORD NUMBER	2-15		3	FORS	FORWARD/REVERSE (1,0)
DECOM			379,1,CRT/LPR/DPR,RAW,0		
WORD NUMBER	2-15		4	PRSC	PRIMARY/SECONDARY (1,0)
DECOM			380,1,CRT/LPR/DPR,RAW,0		
WORD NUMBER	2-15		5	CONT	CONTROL PRIMARYOSECONDARY (0,1)
DECOM			381,1,CRT/LPR/DPR,RAW,0		
WORD NUMBER	2-15		6	DIRT	DIRECTION PRIMARY/SECONDARY (1,0)
DECOM			382,1,CRT/LPR/DPR,RAW,0		
WORD NUMBER	1-14,15		7	SPRO	REACTION WHEEL SPEED
DECOM			242,15,CRT/LPR/DPR,RAW,0		
WORD NUMBER	1-15-15		8	SPCT	REATION WHELL SPEED CONTROL
DECOM			248,1,CRT/LPR/DPR,RAW,0		
WORD NUMBER	0-9		9	RWTP	REACTION WHEEL TEMPERATURE
DECOM			977,8,CRT/LPR/DPR,CURVE,0		
WORD NUMBER	0-10		10	RWTO	REACTION WHEEL TACH OUT
DECOM			081,8,CRT/LPR/DPR,TACH,0		
WORD NUMBER	4-8		11	+VSR	+ VOLT SENSOR
DECOM			577,8,CRT/LPR/DPR,LOLT,0		
WORD NUMBER	4-9		12	-VSR	- VOLT SENSOR
DECOM			585,8,CRT/LPR/DPR,LOLT,0		

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      WORD NUMBER   4-    Approved for Release: 2024/06/06 C05027392
      DECOM                    617,8,CRT/LPR/DPR,AMPS,0
*     WORD NUMBER   4-15     14    -DIM      - DISCHARGE CURRENT MONITOR
      DECOM                    633,8,CRT/LPR/DPR,AMPS,0
*     WORD NUMBER   4-12     15    +CIM      + CHARGE CURRENT MONITOR
      DECOM                    609,8,CRT/LPR/DPR,AMPS,0
      WORD NUMBER   4,14     16    -CIM      - CHARGE CURRENT MONITOR
      DECOM                    625,8,CRT/LPR/DPR,AMPS,0
*     WORD NUMBER   3-3-2     17   OREB       ORDANCE ENABLE BACKUP
      DECOM                    410,1,CRT/LPR/DPR,RAW,0
*     WORD NUMBER   2-3       18   MSUB       MEMORY SUBFRAME
      DECOM                    281,3,CRT/LPR/DPR,RAW,0
*     WORD NUMBER   2-3       19   MCLK       MEMORY CLOCK FREQ
      DECOM                    284,1,CRT/LPR/DPR,RAW,0
*     WORD NUMBER   2-3       20   MRTE       MEMORY SAMPLE RATE
      DECOM                    285,2,CRT/LPR/DPR,RAW,0
*     WORD NUMBER   4-2-5     21   +PBS       PRIMARY/SECONDARY + BATTERY SELECT
      DECOM                    533,1,CRT/LPR/DPR,RAW,0
*     WORD NUMBER   4-2-6     22   -PBS       PRIMARY /SECONDARY -BATTERY SELECT
      DECOM                    534,1,CRT/LPR/DPR,RAW,0
*     WORD NUMBER   1-3   1   23   VTIM       PCM VERNIER TIME DECIMAL
    DECOM          153,8,CRT/LPR/DPR,RAW,0
*     WORD NUMBER   3-3   2   24   BIRD       SPACECRAFT ID (ADD 171)
      DECOM                    415,2,CRT/LPR/DPR,RAW,0
*     WORD NUMBER   3-2   3   25   (MRO,PCM) TYPE OF DATA (0=PCM,1=MRO)
      DECOM                    405,1,CRT/LPR/DPR,RAW,0
*     WORD NUMBER   3-3   4   26   HKSR       HOUSEKEEPING SENSOR (0=OFF, 1=ON)
      DECOM                    411,1,CRT/LPR/DPR,RAW,0
*     WORD NUMBER   3-3   5   27   OREN       ORDANCE ENABLE (0=OFF, 1=ON)
      DECOM                    277,1,CRT/LPR/DPR,RAW,0
*     WORD NUMBER   2-2   6   28   DLSS       DL SYSTEM (0=OFF, 1=ON)
      DECOM                    409,1,CRT/LPR/DPR,RAW,0
*     WORD NUMBER   2-7       29              MEMORY ADDRESS COUNTER
    DECOM                      313,8,CRT/LPR/DPR,RAW,0
*     WORD NUMBER   0-7       30              MEMORY ADDRESS COUNTER
    DECOM                        57,8,CRT/LPR/DPR,RAW,0
*     WORD NUMBER   7-7       31              MEMORY ADDRESS COUNTER
    DECOM                      953,8,CRT/LPR/DPR,RAW,0
*     WORD NUMBER   5-7       32              MEMORY ADDRESS COUNTER
    DECOM                      697,8,CRT/LPR/DPR,RAW,0
*     WORD NUMBER   7-12     33   BTEM       BOOM TEMPATURE
      DECOM                    993,8,CRT/LPR/DPR,CURVE,0
*     WORD NUMBER   1-11      34   BLEN       BOOM LENGTH
      DECOM                    217,8,CRT/LPR/DPR,RAW,1
*     WORD NUMBER   2-10  1   35   PTC1       CONTROL 1 PRESSURE TRANSDUCER
      DECOM          337,8,CRT/LPR/DPR,PSI,0
*     WORD NUMBER   3-1-1-2   36   PTC2       CONTROL 2 PRESSURE TRANSDUCER
```

```
*    WORD NUMBER   1-11          34     BLEN        BOOM LENGTH
     DECOM                      217,8,CRT/LPR/DPR,RAW,1
*    WORD NUMBER   2-10   1      35     PTC1        CONTROL 1 PRESSURE TRANSDUCER
     DECOM         337,8,CRT/LPR/DPR,PSI,0
*    WORD NUMBER   2-11   2      36     PTC2        CONTROL 2 PRESSURE TRANSDUCER
     DECOM         345,8,CRT/LPR/DPR,PSI,0
*    WORD NUMBER   7-4    3      37     PTT1        TANK 1 PRESSURE TRANSDUCER
     DECOM        1009,8,CRT/LPR/DPR,PSI,0
*    WORD NUMBER   7-5    4      38     PTT2        TANK 2 PRESSURE TRANSDUCER
     DECOM        1017,8,CRT/LPR/DPR,PSI,0
*    WORD NUMBER   2-14-1        39     BCOF        BOOM (ON=1, OFF=0)
     DECOM         369,1,CRT/LPR/DPR,RAW,0
*    WORD NUMBER   2-14-2        40     BCIO        BOOM  (IN=0, OUT=1)
     DECOM         370,1,CRT/LPR/DPR,RAW,0
*    WORD NUMBER   2-14-3        41     BFRI        BOOM FULL RETRACT (RET=1, NRET=0)


*    F170S    REATION WHEEL/BOOM/THRUSTERS    SYSTEM    I124
```

```
PCM  VTIM 067 BIRD 171   HKSR ON   OREN OFF  DLSS OFF      303 13 44 04        F170S     REV   000000 SAMPLE   000001
SPED ON   STAT OFF  FORS REVS PRSC PRIM CONT PRIM DIRT FORN SPCT SLOW SPRO 032767 RWTP 0.0320 RWTO 000.00
BLEN 000026   BTEM 651.27 PTC1 00.000 PTC2 00.000 PTT1 21.560 PTT2  20.188
+VSR 04.700 -VSR 05.170 +DIM 0.2418 -DIM 0.1794 +CIM 0.0000 -CIM 0.0000 OREB OFF  +PBS  SECD -PBS SECD
BCOF OFF  BCID IN   BFRI RET  BMIN MID  BFEI NEXT BMTR REL  DLRI REL
PCM  VTIM 068 BIRD 171   HKSR ON   OREN OFF  DLSS OFF      303 13 44 07        F170S     REV   000000 SAMPLE   000002
SPED ON   STAT OFF  FORS REVS PRSC PRIM CONT PRIM DIRT FORN SPCT SLOW SPRO 032767 RWTP 0.0320 RWTO 000.00
BLEN 000026   BTEM 651.27 PTC1 00.000 PTC2 00.000 PTT1 21.560 PTT2  20.188
+VSR 04.700 -VSR 05.123 +DIM 0.2418 -DIM 0.1755 +CIM 0.0000 -CIM 0.0000 OREB OFF  +PBS  SECD -PBS SECD
BCOF OFF  BCID IN   BFRI RET  BMIN MID  BFEI NEXT BMTR REL  DLRI REL
PCM  VTIM 069 BIRD 171   HKSR ON   OREN OFF  DLSS OFF      303 13 44 10        F170S     REV   000000 SAMPLE   000003
SPED ON   STAT OFF  FORS REVS PRSC PRIM CONT PRIM DIRT FORN SPCT SLOW SPRO 032767 RWTP 0.0320 RWTO 000.00
BLEN 000026   BTEM 651.27 PTC1 00.000 PTC2 00.000 PTT1 21.560 PTT2  20.188
+VSR 04.700 -VSR 05.170 +DIM 0.2418 -DIM 0.1716 +CIM 0.0000 -CIM 0.0000 OREB OFF  +PBS  SECD -PBS SECD
BCOF OFF  BCID IN   BFRI RET  BMIN MID  BFEI NEXT BMTR REL  DLRI REL
PCM  VTIM 070 BIRD 171   HKSR ON   OREN OFF  DLSS OFF      303 13 44 12        F170S     REV   000000 SAMPLE   000004
SPED ON   STAT OFF  FORS REVS PRSC PRIM CONT PRIM DIRT FORN SPCT SLOW SPRO 032767 RWTP 0.0320 RWTO 000.00
BLEN 000026   BTEM 651.27 PTC1 00.000 PTC2 00.000 PTT1 21.560 PTT2  20.188
+VSR 04.700 -VSR 05.123 +DIM 0.2418 -DIM 0.1716 +CIM 0.0000 -CIM 0.0000 OREB OFF  +PBS  SECD -PBS SECD
BCOF OFF  BCID IN   BFRI RET  BMIN MID  BFEI NEXT BMTR REL  DLRI REL
PCM  VTIM 071 BIRD 171   HKSR ON   OREN OFF  DLSS OFF      303 13 44 15        F170S     REV   000000 SAMPLE   000005
SPED ON   STAT OFF  FORS REVS PRSC PRIM CONT PRIM DIRT FORN SPCT SLOW SPRO 032767 RWTP 0.0320 RWTO 000.00
BLEN 000026   BTEM 651.27 PTC1 00.000 PTC2 00.000 PTT1 21.560 PTT2  20.188
+VSR 04.700 -VSR 05.170 +DIM 0.2418 -DIM 0.1716 +CIM 0.0000 -CIM 0.0000 OREB OFF  +PBS  SECD -PBS SECD
BCOF OFF  BCID IN   BFRI RET  BMIN MID  BFEI NEXT BMTR REL  DLRI REL
PCM  VTIM 072 BIRD 171   HKSR ON   OREN OFF  DLSS OFF      303 13 44 17        F170S     REV   000000 SAMPLE   000006
SPED ON   STAT OFF  FORS REVS PRSC PRIM CONT PRIM DIRT FORN SPCT SLOW SPRO 032767 RWTP 0.0325 RWTO 000.00
BLEN 000026   BTEM 651.27 PTC1 00.000 PTC2 00.000 PTT1 21.560 PTT2  20.188
+VSR 04.700 -VSR 05.170 +DIM 0.2418 -DIM 0.1716 +CIM 0.0000 -CIM 0.0000 OREB OFF  +PBS  SECD -PBS SECD
BCOF OFF  BCID IN   BFRI RET  BMIN MID  BFEI NEXT BMTR REL  DLRI REL
PCM  VTIM 073 BIRD 171   HKSR ON   OREN OFF  DLSS OFF      303 13 44 20        F170S     REV   000000 SAMPLE   000007
SPED ON   STAT OFF  FORS REVS PRSC PRIM CONT PRIM DIRT FORN SPCT SLOW SPRO 032767 RWTP 0.0325 RWTO 000.00
BLEN 000026   BTEM 651.27 PTC1 00.000 PTC2 00.000 PTT1 21.560 PTT2  20.188
+VSR 04.700 -VSR 05.170 +DIM 0.2418 -DIM 0.1716 +CIM 0.0000 -CIM 0.0000 OREB OFF  +PBS  SECD -PBS SECD
BCOF OFF  BCID IN   BFRI RET  BMIN MID  BFEI NEXT BMTR REL  DLRI REL
PCM  VTIM 074 BIRD 171   HKSR ON   OREN OFF  DLSS OFF      303 13 44 22        F170S     REV   000000 SAMPLE   000008
SPED ON   STAT OFF  FORS REVS PRSC PRIM CONT PRIM DIRT FORN SPCT SLOW SPRO 032767 RWTP 0.0325 RWTO 000.00
BLEN 000026   BTEM 651.27 PTC1 00.000 PTC2 00.000 PTT1 21.560 PTT2  20.188
+VSR 04.700 -VSR 05.170 +DIM 0.2418 -DIM 0.1716 +CIM 0.0000 -CIM 0.0000 OREB OFF  +PBS  SECD -PBS SECD
BCOF OFF  BCID IN   BFRI RET  BMIN MID  BFEI NEXT BMTR REL  DLRI REL
PCM  VTIM 075 BIRD 171   HKSR ON   OREN OFF  DLSS OFF      303 13 44 25        F170S     REV   000000 SAMPLE   000009
SPED ON   STAT OFF  FORS REVS PRSC PRIM CONT PRIM DIRT FORN SPCT SLOW SPRO 032767 RWTP 0.0325 RWTO 000.00
BLEN 000026   BTEM 651.27 PTC1 00.000 PTC2 00.000 PTT1 21.560 PTT2  20.188
+VSR 04.653 -VSR 05.170 +DIM 0.2418 -DIM 0.1716 +CIM 0.0000 -CIM 0.0000 OREB OFF  +PBS  SECD -PBS SECD
BCOF OFF  BCID IN   BFRI RET  BMIN MID  BFEI NEXT BMTR REL  DLRI REL
PCM  VTIM 076 BIRD 171   HKSR ON   OREN OFF  DLSS OFF      303 13 44 28        F170S     REV   000000 SAMPLE   000010
SPED ON   STAT OFF  FORS REVS PRSC PRIM CONT PRIM DIRT FORN SPCT SLOW SPRO 032767 RWTP 0.0325 RWTO 000.00
BLEN 000026   BTEM 651.27 PTC1 00.000 PTC2 00.000 PTT1 21.560 PTT2  20.188
+VSR 04.653 -VSR 05.170 +DIM 0.2379 -DIM 0.1716 +CIM 0.0000 -CIM 0.0000 OREB OFF  +PBS  SECD -PBS SECD
BCOF OFF  BCID IN   BFRI RET  BMIN MID  BFEI NEXT BMTR REL  DLRI REL
PCM  VTIM 077 BIRD 171   HKSR ON   OREN OFF  DLSS OFF      303 13 44 30        F170S     REV   000000 SAMPLE   000011
SPED ON   STAT OFF  FORS REVS PRSC PRIM CONT PRIM DIRT FORN SPCT SLOW SPRO 032767 RWTP 0.0325 RWTO 000.00
BLEN 000026   BTEM 651.27 PTC1 00.000 PTC2 00.000 PTT1 21.560 PTT2  20.188
+VSR 04.653 -VSR 05.170 +DIM 0.2379 -DIM 0.1716 +CIM 0.0000 -CIM 0.0000 OREB OFF  +PBS  SECD -PBS SECD
BCOF OFF  BCID IN   BFRI RET  BMIN MID  BFEI NEXT BMTR REL  DLRI REL
PCM  VTIM 078 BIRD 171   HKSR ON   OREN OFF  DLSS OFF      303 13 44 33        F170S     REV   000000 SAMPLE   000012
SPED ON   STAT OFF  FORS REVS PRSC PRIM CONT PRIM DIRT FORN SPCT SLOW SPRO 032767 RWTP 0.0325 RWTO 000.00
BLEN 000026   BTEM 651.27 PTC1 00.000 PTC2 00.000 PTT1 21.560 PTT2  20.188
+VSR 04.653 -VSR 05.170 +DIM 0.2379 -DIM 0.1716 +CIM 0.0000 -CIM 0.0000 OREB OFF  +PBS  SECD -PBS SECD
BCOF OFF  BCID IN   BFRI RET  BMIN MID  BFEI NEXT BMTR REL  DLRI REL
PCM  VTIM 079 BIRD 171   HKSR ON   OREN OFF  DLSS OFF      303 13 44 35        F170S     REV   000000 SAMPLE   000013
SPED ON   STAT OFF  FORS REVS PRSC PRIM CONT PRIM DIRT FORN SPCT SLOW SPRO 032767 RWTP 0.0325 RWTO 000.00
BLEN 000026   BTEM 651.27 PTC1 00.000 PTC2 00.000 PTT1 21.560 PTT2  20.188
+VSR 04.653 -VSR 05.170 +DIM 0.2379 -DIM 0.1755 +CIM 0.0000 -CIM 0.0000 OREB OFF  +PBS  SECD -PBS SECD
```


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C05027392

THRUSTER

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0																
1			ADD D	V. TIM A						REC 1 AGC A	REC 2 AGC A					
2			CMD D	MEM D							PRES TH 1 CTL A	PRES TH 2 CTL A				
3			PCM D	PCM D											THRUS CTL D	
4			BAT D						+ BAT V A	- BAT V A	+ BAT TEMP A	- BAT TEMP A	+ CG I A	+ DISCG I A	- CG I A	- DISCG I A
5																
6																
7									TEMP 5 TANK A	T6 NOZ. 1 A					PRES TH 2 PLEN. A	PRES TH 1 PLEN. A

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RW

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0											RW. TAC. OUT A					
1			ADD D	V TIME A						REC 1 AGC A	REC 2 AGC A				SPRO D	SPRO D
2			HK D	HK D												RW CONTRO D
3			MEM D	COMMAND D												
4			BAT D						+ BAT V A	- BAT V A	+ BAT TEMP A	- BAT TEMP A	+ CG I A	+ DSCG I A	- CG I A	- DISCG A
5																
6																
7											RW TEMP A					

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BOOM

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0																
1			ADD D	V TIM A					5V CAL A			BOOM LENGTH A				
2			CMD D	MEM D											MON BOOM CTL D	
3			PCM D	CMD D												
4			BAT D						+ BAT A	- BAT A	+ BAT TEMP A	- BAT TEMP A	+ CG I A	+ DISCG I A	- CG I A	- DISCG A
5																
6																
7													DL BOOM TEMP A			

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III.9. FORTRAN PLOT M

PLOT - FORTRAN LINE PRINTER PLOT SUBROUTINE

PLOT - FORTRAN LINE PRINTER PLOT SUBROUTINE
PLOT - FORTRAN LINE PRINTER PLOT SUBROUTINE

3.3(b)(1)

PREPARED AT NRL BY [redacted]

I PURPOSE TO UTILIZE THE LINE PRINTER AS A PLOTTER

II METHOD

THE "PLOT" SUBROUTINE UTILIZES THE INPUTS: MODE(SUBROUTINE ACT CURRENT DATA VALUE, LOWER LIMIT, UPPER LIMIT, AND CURRENT SYNBO TO CLEAR PLOT IMAGE, STORE A POINT, OR PLOT CURRENT POINTS.

THE "MODE" VARIABLE: EQUAL ZERO, CLEAR PRINT/PLOT BUFFER TO SPECIFIED SYMBOL; EQUAL ONE, ENTER CURRENT SYMBOL IN PRINT/PLOT BUFFER WITHOUT PRINTING; EQUAL TWO, ENTER CURRENT SYMBOL IN PRINT/PLOT BUFFER AND PRINT.

THE VALUE PER PRINT CHARACTER POSITION IS DETERMINED BY SUBSTRACTING THE LOWER LIMIT FROM THE UPPER LIMIT AND DIVIDING THE RESULT BT 100(THE MAXIMUM NUMBER OF PRINT POSITIONS). IF THE RESULTING SIGN IS NEGATIVE, THE SIGN IS CHANGED TO POSIT

THE POSITION OF THE CURRENT SYNBOL IN THE PRINT BUFFER LINE IS DETERMINED BY FIRST; SUBTRACTING THE CURRENT VALUE FROM THE UPPER LIMIT, SECOND; DIVIDING THE RESULT BY THE VALUE PER PRINT CHARACTER AND ADDING ONE. THE RESULT IS USED TO PLACE THE SYMBOL IN PROPER POSITION IN THE PRINT/PLOT BUFFER.

III USE

THE PLOT SUBROUNINE MAY BE USED BY A FORTRAN PROGRAM VIA:

CALL PLOT(MODE,Y,R,Z,S)

MODE - EQUAL ZERO, CLEAR PRINT/PLOT BUFFER WITH CHARACTER SPECIFIED BY "S".
EQUAL ONE, PLACE CURRENT SYMBOL "S" IN PROPER
EQUAL TWO, PLACE CURRENT SYMBOL "S" IN PRINT/ BUFFER AND PRINT.

Y CURRENT VALUE OF DATA

R UPPER LIMIT

Z LOWER LIMIT

S SYMBOL

IV PLOT IMAGE

THE PLOT IMAGE IS ONE HUNDRED CHARACTER POSITIONS FROM 21-120. POSITIONS 1-20 CONTAIN TCT TIME.

```
      COMMON ITCT(9)



      COMMON ITCT(9)
      DIMENSION REC(450)
      DIMENSION          JTCT(9),KTCT(9)
      INTEGER REC
      DATA S1,S2,S3,S4,S5,S6/1H ,1HX,1HO,1H$,1H*,1H+/
      REWIND 6
C     PRINT LIMITS
      WRITE(4,25)
25    FORMAT(1X,46HLIMITS? CURRENT=+-1@ ASPECT ANGLE=0-5 DEGREES@,
     152H=VOLT SENSOR=10.03,-14.10@ -VOLT SENSOR=9.88,-13.95@,
     218HTANK PRESSURE=8,16)
23    CALL BMTR(REC,1,450,IEOF,IPAR,IEOT)
      IF(IEOF)45,45,55
55    CALL WEOF(2)
      CALL WEOF(2)
      REWIND 6
      WRITE(4,824)
824   FORMAT1X,41HTCT TIME, CURRENT, ANGLE, VOLTS, PRESSURE)
455    READ(6,16)(ITCT(I),I=1,9),
     1           IC,IP,IAA,IBB,IS,IZ,ITP,AX,AAA,AS,AT,ATP
      WRITE(4,16)(ITCT(I),I=1,9),
     1           IC,IP,IAA,IBB,IS,IZ,ITP,AX,AAA,AS,AT,ATP
      GO TO 455
45    MQ=27
      MZ=12
      MP=29
      MR=37
      DO 166 MA=6,411,45
C   PICK UP TCT TIME
      DO 93 IX=1,9
93    ITCT(IX)=0
      K=8
      L=9
      MX=MA-5
      DO 94 IX=1,4
      CALL BIT(REC(MX),3,6,ITCT(K),13,16)
      CALL BIT(REC(MX),9,12,ITCT(L),13,15)
      MX=MX+1
      L=L-2
94    K=K-2
      CALL BIT(REC(MX),11,12,ITCT(1),15,16)
C    CLEAR PLOT BUFFER
      MODE=0
      S=S1
      CALL PLOT(MODE,Y,R,Z,S)
C    + AND -     CHARGE CURRENT
      R=-1.
      Z=1.
      MODE=1
      S=S2
      IC=0
      IP=0
      CALL BIT(REC(MQ),9,16,IC,9,16)
```

```
      COMMON ITCT(9)



      CALL BIT(REC(MQ),1,08,IP,9,16)
      IF(IC)4,3,4
3     AX=-IP
      GO TO 5
4     AX=IC
5     AX=AX*.0039
      Y=AX
      CALL PLOT(MODE,Y,R,Z,S)
C     ASPECT ANGLE
      R=-5.
      Z=0.
      S=S3
      IAA=0
      IBB=0
      CALL BIT(REC(MZ),9,16,IAA,9,16)
      CALL BIT(REC(MZ),1,08,IBB,9,16)
      AAA=IAA-IBB
      AAA=AAA/25.
      Y=AAA
      CALL PLOT(MODE,Y,R,Z,S)
C     VOLT SENSOR
      R=10.
      Z=13.
      S=S4
      IS=0
      IZ=0
      CALL BIT(REC(MP),9,16,IS,9,16)
      CALL BIT(REC(MP),1,08,IZ,9,16)
      AT=IZ
      AT=(AT*1635./1000.+10035./10.)/100.0
      Y=AT
      CALL PLOT(MODE,Y,R,Z,S)
      S=S5
8     AS=IS
      AS=(AS*1635./1000.+9885.0/10.)/100.0
      Y=AS
      CALL PLOT(MODE,Y,R,Z,S)
C     SPIN AND ATT TANK PRESSURE
      R=10.
      Z=14.
      S=S6
      MODE=2
      ITP=0
      CALL BIT(REC(MR),9,16,ITP,9,16)
      ATP=ITP
      ATP=(ATP*8173./969.+0./969.)/100.
      Y=ATP
      CALL PLOT(MODE,Y,R,Z,S)
      WRITE(6,16)(ITCT(I),I=1,9),
     1           IC,IP,IAA,IBB,IS,IZ,ITP,AX,AAA,AS,AT,ATP
16    FORMAT(1X,3I1,3(1X,2I1),2X,
     1       7(I3,2X),F11.4,2X,F8.1,2X,F9.2,2X,F9.2,2X,F9.2)
      MQ=MQ+45
```

```
      COMMON ITCT(9)


      MZ=MZ+45
      MP=MP+45
      MR=MR+45
166   CONTINUE
      GO TO 23
      STOP
      END
$0
```

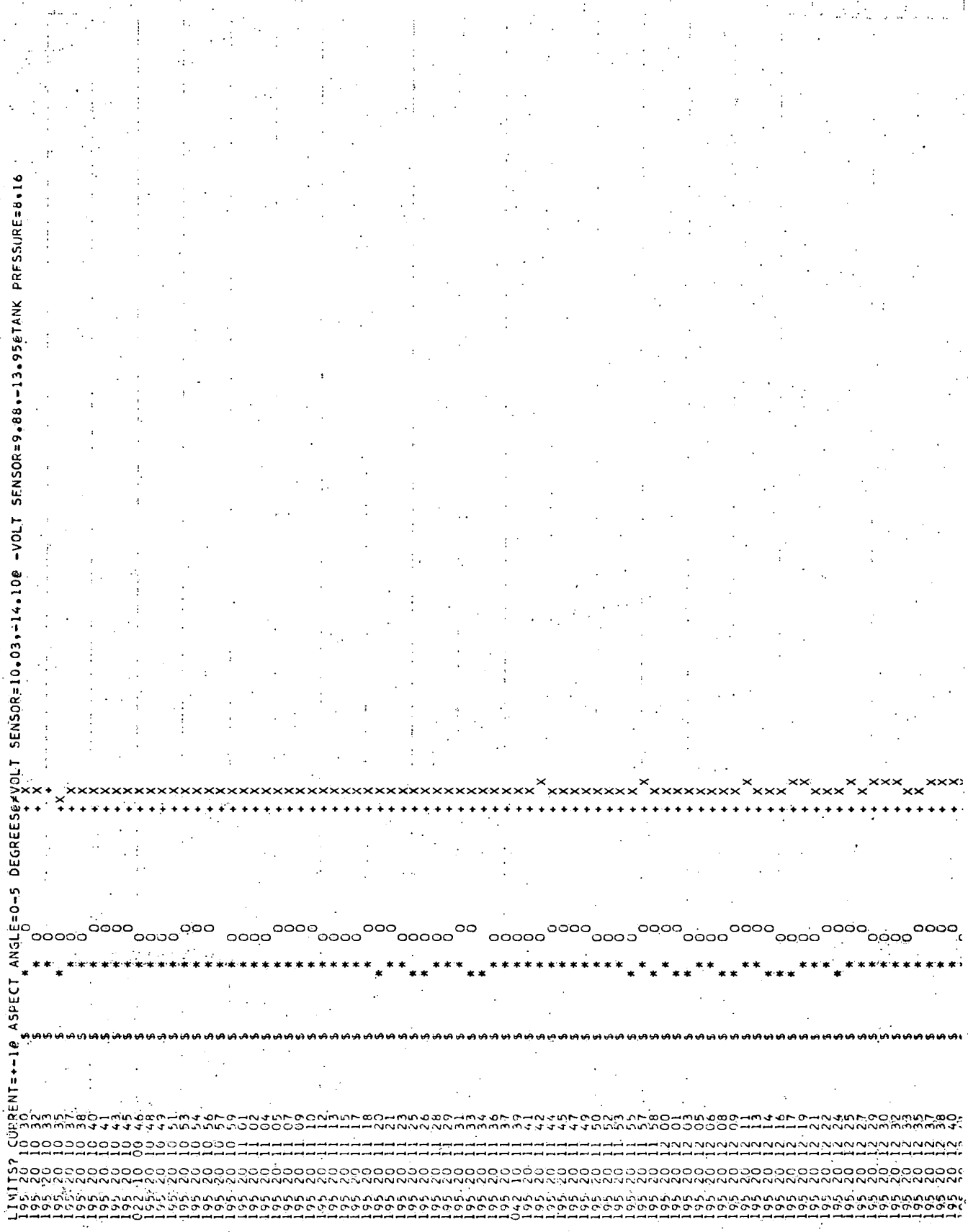
VI PLOT SUBROUTINE LISTING

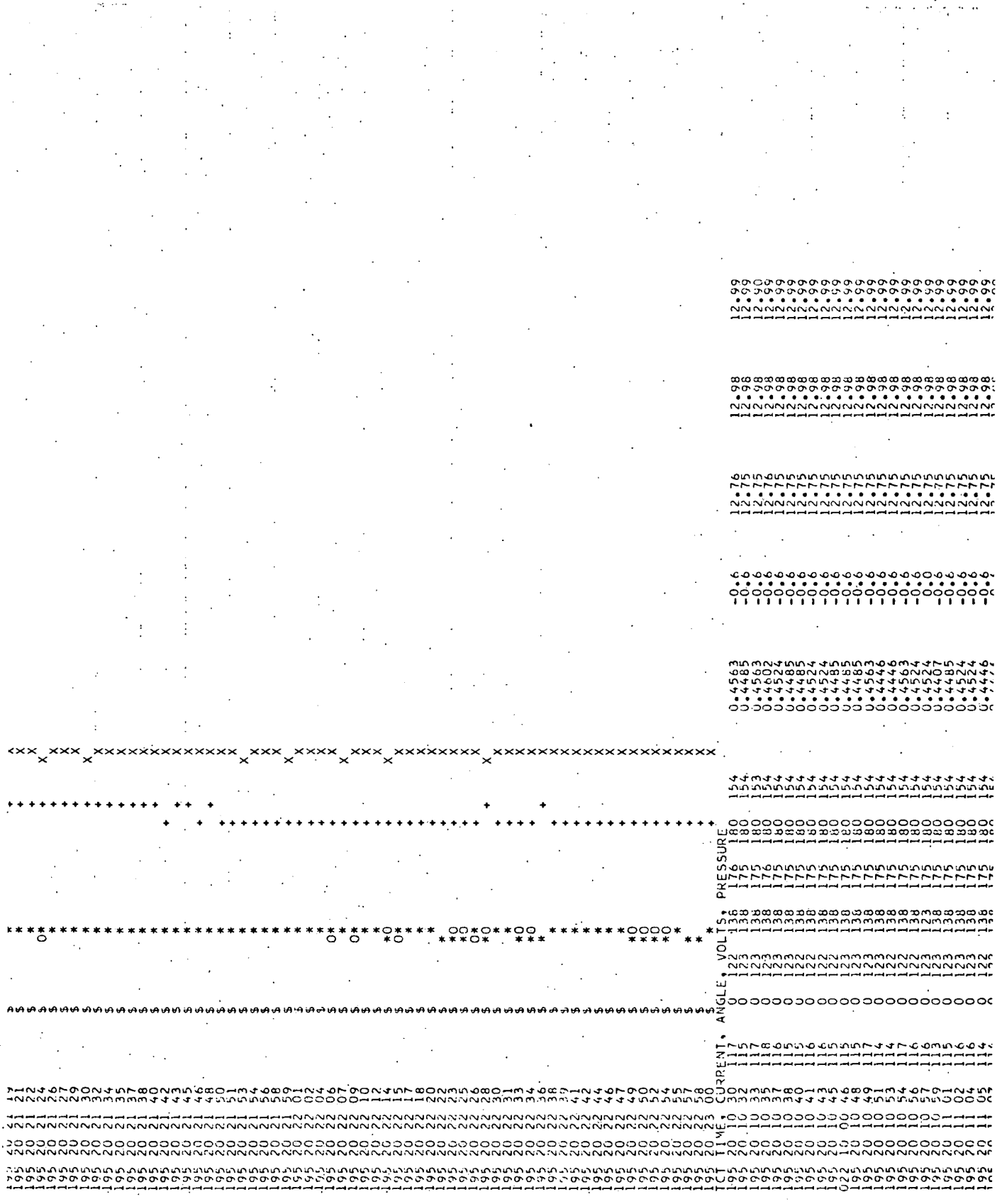

```
C     SUBROUTINE  -  PLOT A LINE ON THE LINE PRINTER
```

```
C     SUBROUTINE  -  PLOT A LINE ON THE LINE PRINTER
C     SUBROUTINE  -  PLOT A LINE ON THE LINE PRINTER
C     16 SEPT 71
C                                                          3.3(b)(1)
C     PREPARED AT NRL BY [redacted]
C
C     PURPOSE  -  TO PROVIDE A ROUTINE TO USE THE LINE PRINTER
C                 AS A PLOTTER, MULTIPLE  SYMBOLS
C
C     USE  -   CALL PLOT(MODE,Y,R,Z,S)
C
C                  MODE = 0 - CLEAR PRINT BUFFER TO DESIRED SYMBOL
C                       = 1- ENTER A SYMBOL IN PLACE IN PRINT BUFFER
C                  = 2 - ENTER A SYMBOL AND PLOT POINTS
C
C                  Y = CURRENT DATA VALUE
C                  R= UPPER LIMIT
C                  Z= LOWER LIMIT
C                  S= CURRENT SYMBOL
C
      SUBROUTINE PLOT(MODE,Y,R,Z,S)
C     PRINT LINE BUFFER
      COMMON ITCT(9)
      DIMENSION AP(100)
C     DETERMINE INCREMENTS PER PRINT CHAR
      SA=(R-Z)/100.0
C     CHANGE SIGN IF MINUS
      IF(SA)1,2,2
1     SA=-(SA)
C     WHAT MODE
2     IF(MODE-1)3,4,4
C     SYMBOL MODE- SUBTRACT CURRENT VALUE FROM UPPER LIMIT
4     AY=Z-Y
C     CHANGE SIGN  IF NEGATIVE
      IF(AY)6,7,7
6     AY=-(AY)
C     DETERMINE POSITON OF CURRENT SYMBOL IN PRINT BUFFER LINE
7     IY=AY/SA+1.
      IF(IY-100)78,78,77
77    IY=100
C     PLACE CURRENT SYMBOL IN PLACE IN PRINT BUFFER
78    AP(IY)=S
C     CHECK MODE FOR PLOT
      IF(MODE-1)9,9,8
C     MODE=28 PLOT
8     WRITE(4,10)
     1          (ITCT(I),I=1,9),(AP(K),K=1,100)
10    FORMAT(1X,3I1,3(1X,2I1),8X,100A1)
      GO TO 9
C     CLEAR PRINT BUFFER TO CURRENT SYMBOL
3     DO 11 I=1,100
      AP(I)=S
11    CONTINUE
```

```
C     SUBROUTINE - PLOT A LINE ON THE LINE PRINTER


9     RETURN
      END
$0
```





III.10. PDS PLOT 70

PLOT 70

This plot program allows the operator to select from one to five pieces of data from the series 170 PCM data stream and plot those data simultaneously on the line printer. These data may be complete 8-bit data words or single bit digital indicators.

In the case of data words, 1) the processed data value is presented on the left side of the line printer paper, 2) the raw data value is plotted on a 50 division plot area and 3) the vernier time associated with that data value is presented on the right side of the paper.

In the case of single bit plotting, the bit is presented on the left side of the plot area if it is zero with a deflection to the right if the bit is a one. The vernier time is also presented with each data sample.

During the plotting, raw data is placed on digital magnetic tape if the program is being operated in real time. The program may also be operated from digital magnetic tape playback. The selected data may be changed at any time as may the upper and lower limits of the plot area for each piece of data.

01< 3> ?; 05 PLOT70 PAYLOAD 171 REV 0000 SAMPLF 000001

	PLT1	PLT2	PLT3	PLT4	PLT5
DECOM STATEMENT	028	048	123	000	000
LOWER LIMITS	00	00	00	00	00
UPPER LIMITS	05	05	05	00	00
BIT NUMBER	00	00	00	00	00

TCT TIME	PLOT1	PLOT2	PLOT3	PLOT4	PLOT5							VERNIER TIME
VALUE PER DIV.	0.100	0.100	0.100	0.000	0.000							
01< 3> ?; 05	00000	00000	00187	00000	00000	2				3		000
303 15 43 47	00026	00105	00455	00000	00000		1	3	2		@	057
303 15 43 50	00026	00105	00455	00000	00000		1	3	2			058
303 15 43 52	00026	00105	00455	00000	00000		1	3	2			059
303 15 43 55	00026	00105	00455	00000	00000		1	3	2			060
303 15 43 58	00026	00105	00455	00000	00000		1	3	2			061
303 15 44 00	00026	00105	00455	00000	00000		1	3	2			062
303 15 44 03	00026	00105	00455	00000	00000		1	3	2			063
303 15 44 05	00026	00105	00455	00000	00000		1	3	2			064
303 15 44 08	00026	00105	00455	00000	00000		1	3	2			065
303 15 44 10	00026	00105	00455	00000	00000		1	3	2			066
303 15 44 13	00026	00105	00455	00000	00000		1	3	2			067
303 15 44 15	00026	00105	00455	00000	00000		1	3	2			068
303 15 44 18	00026	00105	00455	00000	00000		1	3	2			069
303 15 44 21	00026	00105	00455	00000	00000		1	3	2			070
303 15 44 23	00026	00105	00455	00000	00000		1	3	2			071
303 15 44 26	00026	00105	00455	00000	00000		1	3	2			072
303 15 44 28	00026	00105	00455	00000	00000		1	3	2			073
303 15 44 31	00026	00105	00455	00000	00000		1	3	2			074
303 15 44 33	00026	00105	00455	00000	00000		1	3	2			075
303 15 44 36	00026	00105	00455	00000	00000		1	3	2			076
303 15 44 39	00026	00105	00455	00000	00000		1	3	2			077
303 15 44 41	00026	00105	00455	00000	00000		1	3	2			078
303 15 44 44	00026	00105	00455	00000	00000		1	3	2			079
303 15 44 46	00026	00105	00455	00000	00000		1	3	2			080
303 15 44 49	00026	00105	00455	00000	00000		1	3	2			081
303 15 44 51	00026	00105	00455	00000	00000		1	3	2			082
303 15 44 54	00026	00105	00455	00000	00000		1	3	2			083
303 15 44 56	00026	00105	00455	00000	00000		1	3	2			084
303 15 44 59	00026	00105	00455	00000	00000		1	3	2			085
303 15 45 02	00026	00105	00455	00000	00000		1	3	2			086
303 15 45 04	00026	00105	00455	00000	00000		1	3	2			087
303 15 45 07	00026	00105	00455	00000	00000		1	3	2			088
303 15 45 09	00026	00105	00455	00000	00000		1	3	2			089
303 15 45 12	00026	00105	00455	00000	00000		1	3	2			090
303 15 45 14	00026	00105	00455	00000	00000		1	3	2			091
303 15 45 17	00026	00105	00455	00000	00000		1	3	2			092
303 15 45 19	00026	00105	00463	00000	00000		1	3	2			093
303 15 45 22	00026	00105	00463	00000	00000		1	3	2			094
303 15 45 25	00026	00105	00463	00000	00000		1	3	2			095
303 15 45 27	00026	00105	00463	00000	00000		1	3	2			096
303 15 45 30	00026	00105	00463	00000	00000		1	3	2			097
303 15 45 32	00026	00105	00463	00000	00000		1	3	2			098
303 15 45 35	00026	00105	00463	00000	00000		1	3	2			099
303 15 45 37	00026	00105	00463	00000	00000		1	3	2			100
303 15 45 40	00026	00105	00463	00000	00000		1	3	2			101
303 15 45 43	00026	00105	00463	00000	00000		1	3	2			102
303 15 45 45	00026	00105	00463	00000	00000		1	3	2			103
303 15 45 48	00026	00105	00463	00000	00000		1	3	2			104
303 15 45 50	00026	00105	00463	00000	00000		1	3	2			105
303 15 45 53	00026	00105	00463	00000	00000		1	3	2			106
303 15 45 55	00026	00105	00463	00000	00000		1	3	2			107
303 15 45 58	00026	00105	00463	00000	00000		1	3	2			108

III.11. FORTRAN PLOT G

User Instructions for PLOT1 Subroutine

The user must have his own main routine for feeding points to the Plot1 subroutine. The plot program has the capability of plotting 1 to 5 variables on any desired horizontal scale versus time on the Y-axis, with time increasing from the top of the page to the bottom. A maximum of 52 samples per variable can be passed at a time. When all samples are plotted, control will be returned to the main routine. Each time that the main routine has control it must assign new values to the variables or terminate.

The following cards must be in the main routine or calling routine:

col 7

```
COMMON/PLOT/IDAY,IHR,IMN,ISC,IRATE,IDVSOR,IXANS(5,52)
IPASS=0
```

NOVAR=the number of variables to be plotted, (1-5), and not to be confused with the number of samples.

IRATE=(i.e. 256), the sampling rate. times a constant to eleminate significant digits being in the decimal portion of the rate.

IDVSOR=the constant used to determine IRATE and will enable the plot routine to keep track of the decimal point.

IDAY=starting day

IHR=starting hour

IMN=starting minute

ISC=starting second

All variables passed to the plot routine are integer format. The order that the variables are passed in the common and the call are extremely critical and, if the program doesn't bomb as a result of variables being out of order, will give very questionable results.

One other card that the user must have in his calling program is:

col 7

```
CALL PLOT1(NOVAR,IPASS)
```

This card will be inserted in the calling program after the input variables are initialized and before it loops back to initialize the variables again.

Once the variables IDAY,IHR,IMN,ISC are initialized the user doesn't have to worry about them. PLOT1 will automatically update them. The only thing the user might do is to test to see if a termination point has been reached.

The array IXANS(I,J) contains the points to be plotted in the following manner:

I denotes the variable.

J denotes the sample of variable I and the value of J will be plotted.

The PLOT1 routine will expect to read in 5 data cards the first time that it is called and will be as follows:

CARD ONE

It will contain the units that the user wants assigned to the x-axis. The first variable on the card will be the absolute number of units(subract 1 if scale passes through, begins with, or ends with the origin), and has to be in columns 1-6 and may or may not have a decimal point in it but if no decimal point the value must be right adjusted(be safe-always put a decimal point in). The second variable will be the minimun value of the x-axis in columns 7-12 and, again, may or may not have a decimal point.

CARD TWO

It will be the 4 character namos that the users wishes to assign to the variables that are to be plotted. All five names are read in in consecutive columns.

col 1

uuuuvvvvwwwwxxxxyyyyzzzz

CARD THREE

It will contain the heading that the users wishes to appear at the top of the page. Anything that the users puts in column 1-52 will appear on the plot.

CARD FOUR

Will be the title that user wants displayed along the vertical axis and is the same format as card three.

CARD FIVE

Will be the title that user wants displayed along the horizontal axis and is the same format as card three.

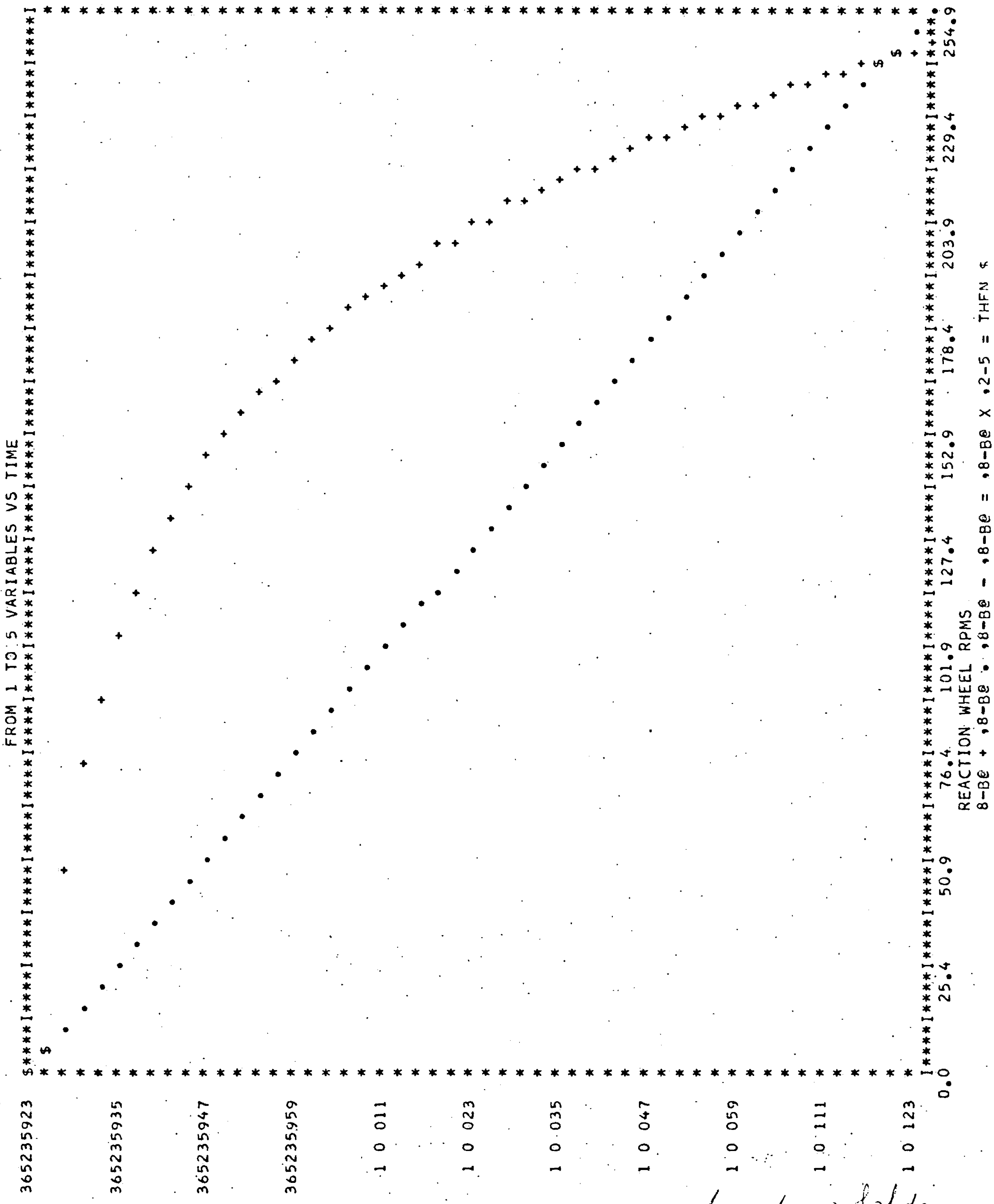
If the title cards are not desired, blank cards must be inserted.

The plot routine will identify the symbol used for each variable at the bottom of the page by the name that was input on card two.

For further explaination or if particular questions arise contact [redacted] Bldg 59 Room 320 ext 2635.

3.3(b)(1)

11/02/71



III.12. F170 M1 - F170 M2

III.13. F170 AS

ATTITUDE - F170AS

	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
0										MON RW TEMP A	MON RW TAC A	MON MAG X A	MON MAG Y A	MON MAG Z A	MON ADCOLE A D	MON ADCOLE B D
1			MON ADDRESS D	V. TIME A								BOOM LENGTH A			MON SPR 0 D	MON SPR 0 D
2			MON COMMAND D	MON MEMORY D							MON TH 1 CTL A	MON TH 2 CTL A			MON BOOM CTL D	MON RW CTL D
3			MON DCM D	MON COMMAND D											MON THRUSTER CONTROL D	
4			MON BAT CTL D													
5																
6																
7									TEMP 5 TANK A	TEMP 6 NOZ. 1 A	TEMP RW A				MON TH 2 PR PLENUM A	MON TH 1 PR PLENUM A

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III.14. F170 T

TEMP

0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
			V TIME A					5V CAL A							
								TEMP 19 S.C.P. A	TEMP 24 BAT BYP A						
										TEMP 2 PKG A	TEMP 15 SCP 1 A	TEMP 3 + SEC BAT A	TEMP 4 - SEC BAT A		
										TEMP 25 + BAT A	TEMP 26 - BAT A				
								TEMP 25 + BAT A	TEMP 26 - BAT A	TEMP 10 HC 1 A	TEMP 16 SCP 2 A	TEMP 20 S. TUBE A	TEMP 21 BAT 3 A	TEMP 22 CG CTL. A	TEMP 23 V CTL A
								TEMP 8 SKIN 1 A	TEMP 9 SKIN 2 A	TEMP 17 IN. S.C. 2 A	TEMP 12 B. BAND A	TEMP 13 IN. S.C. 1 A	TEMP 14 O.S.C. A		
								TEMP 5 TANK A	TEMP 6 NOZ. 1 A	TEMP RW A	TEMP 18 BB SC 2 A	TEMP 11 DL BOOM A	TEMP 1 POM PK A		

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III.15. F170 H