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Telemetry

SR Fall 1964 "A"

Mayo 14/0

IRIG Channels 3 and 4

In this satellite, the housekeeping data is fed to both channel 3 and channel 4.

For channel 3, low band edge is 680, center frequency is 730, and high band edge is 780.

For channel 4, low band edge is 885, center frequency is 960, and high band edge is 1035.

A sixteen poition electronic commutator provides the following information at the rate of two segments per second:

Segment	Function
1	
2	
3	
4	
5	
6	
7	
8	
9	
10	
11	
12	
13	

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Segment	Function
14	
15	
16	

A more descriptive explanation of these functions follows:

Segment 1

Segment 2

Segments 3, 4 and 5

Segment 6

Segment 7

Segment 10

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Segments 8 thru 13

(First read Command System Description)

	RPI	Reset	Enable	Command On		Execute	Reset
8	D.L. #1	MID	Low	yes	Mid	Mid	MID
				no	Low	Low	
9	D.L. #2	MID	Low	yes	Mid	Mid	MID
				no	Low	Low	
10	D.L. #3	MID	Low	yes	Mid	Mid	MID
				no	Low	Low	
11	D.L. #4	MID	Low	yes	Mid	Mid	MID
				no	Low	Low	
12	Enable/Alternate	High	Low	Low		Low/Mid	High
13	Execute	High	High	High		Low	High

25X1

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Segment 14

Ordnance plug must be in or a mid frequency reading will occur regardless of relay position.

This is a three level indicator, as follows:

Low Frequency: Satellite not separated and separation timer relay in wrong position. Must be manually reset.

Mid Frequency: If satellite not separated separation timer relay is in proper position. If satellite is separated then timer did not operate.

High Frequency: Satellite is separated and timer has operated.

If the battery can pressure is lost, the negative going spike is removed.

Segment 15

The frequency decreases as the temperature rises.

Segment 16

When any tone or combination of tones is being received, the output frequency increases; otherwise the output is a low frequency. The stronger the signal the higher the frequency goes.

IRIG Channels 5, 6, 7, and 8

Channel	Frequency		
	Low	Mid	High
5	1200	1300	1400
6	1575	1700	1825
7	2125	2300	2475
8	2775	3000	3225

Channels 5, 6, and 7 have eight second cycles as follows:

A) 0 volt calibrate - $\frac{1}{2}$ second

B) +5 volt calibrate - $\frac{1}{2}$ second

C) X-Ray data - 7 seconds

The X-Ray detector inputs for these channels are:

Channel 5: 44 - 55A° and 44 - 60A° Detectors

Channel 6: 0.5 - 3A° and Both 2 - 8A° Detectors

Channel 7: 8 - 14A° and 8 - 16A° Detectors

-40 volts polarizing voltage is applied to:

2 - 8A° Detector with magnet, Position J

8 - 16A° Detector with magnet, Position G

44 - 60A° Detector with magnet, Position C

+45 volts polarizing voltage is applied to:

0.5 - 3A° Detector without magnet, Position D

2 - 8A° Detector without magnet, Position F

8 - 14A° Detector with magnet, Position A

44 - 55A° Detector with magnet, Position I

Each channel has its own amplifier, in which there is a phase inversion. For these channels a positive polarization will give a negative excursion from the quiescent level of 2.5 volts. A negative polarization will give a positive excursion.

The sensitivity of the amplifiers for channels 5 and 6 is 1×10^{-11} amperes full scale output (5v), thus experiment sensitivity is 0.5×10^{-11} amperes for a dynamic range of 2.5 volts.

The sensitivity of the amplifier for channel 7 is 1×10^{-12} amperes full scale output (5v), thus experiment sensitivity is $.5 \times 10^{-12}$ amperes for a dynamic range of 2.5 volts.

IRIG Channel 8

This channel has a continuous aspect data output.

There are two aspect detector positions (F. and L.), placed 180° apart on the equator of the satellite.

In position F there is a pulse position aspect detector (PP) and associated amplifier. The pulse position detector has a viewing angle of approximately 130° in azimuth and approximately ±60° in elevation.

The output of this detector is fed to its associated amplifier which has a quiescent level of +5.0 volts and exursions towards zero.

For this detector the information is contained in the pulse position, not the voltage levels.

In detector position L there is a pulse width aspect detector (PW) and associated amplifier. The pulse width detector has a viewing angle of 120° in azimuth and ±60° elevation.

The output of this detector is fed to its associated amplifier which has a quiescent level of 0.0 volts and a sensitivity of 5.0 volts full scale.

Both PP and PW have a regulated +6.3 volts power supply voltage supplied by the satellite.

The outputs of the PP Aspect Amplifier and the PW Aspect Amplifier are fed to the aspect relay. The output of the aspect relay is fed to Channel 8.

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Command System

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The tones used in this system are:

N (0) - 7500 cycles

M (1) - 6750 cycles

I (2) - 3950 cycles

J (3) - 4500 cycles

K (5) - 5250 cycles

L (4) - 6000 cycles

Commands are sent to the system by means of a series of chopped tone pairs.

First the system is addressed. This is accomplished by sending four chopped tone pairs in the following sequence:

NI (02)

NJ (03)

NL (04)

NK (05)

The reception by the satellite of these four tone pairs in the proper sequence will automatically throw the enable relay, and supply +12 volts to the D.L. transmitters.

We now command the desired functions:

Telemetry On, Alternate bands on	JI - (32)
Telemetry Off, Conax valve and antenna string cutter back-up	JK - (35)

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D.L. #1 On	MI - (12)
D.L. #2 On	MJ - (13)
D.L. #3 On	ML - (14)
D.L. #4 On	MK - (15)
Rockets	LI - (42)
0.5 - 3A° Detector On and Pulse width On	LK - (45)
2 - 8A° Detector without magnet On and Pulse Position On	LJ - (43)
Reset and Primary Bands On	NM - (01)

The sending of the telemetry on or telemetry off command will place +12 volts on or remove it from the telemetry system.

The sending of D.L. #1, 2, 3, or 4 "ON" merely establishes relays in the proper position. +12 volts will not be placed on the arms of the relays until the execute command is sent. At this time +12 volts is also applied to 48 minute timer.

The execute command is the "IK" (25) tone pair.

With our existing Digital Command Tone Generator, a maximum of ten tone pairs may be sent in any one series, four address tone pairs, a maximum of five function command tone pairs, and the execute tone pair.

This entire series takes approximately 2 seconds.

After the 48 minute timer, which was activated by the execute relay, times out, an internal reset pulse is generated, returning the command system to reset condition.

If for any reason, during the 48 minute timing period, it is desired to reset the system, tone pair "NM" (01) will perform this function.

If for any reason a satellite is only partially addressed, sending the execute command will reset it.

Note: LI command is the same as IL command.