

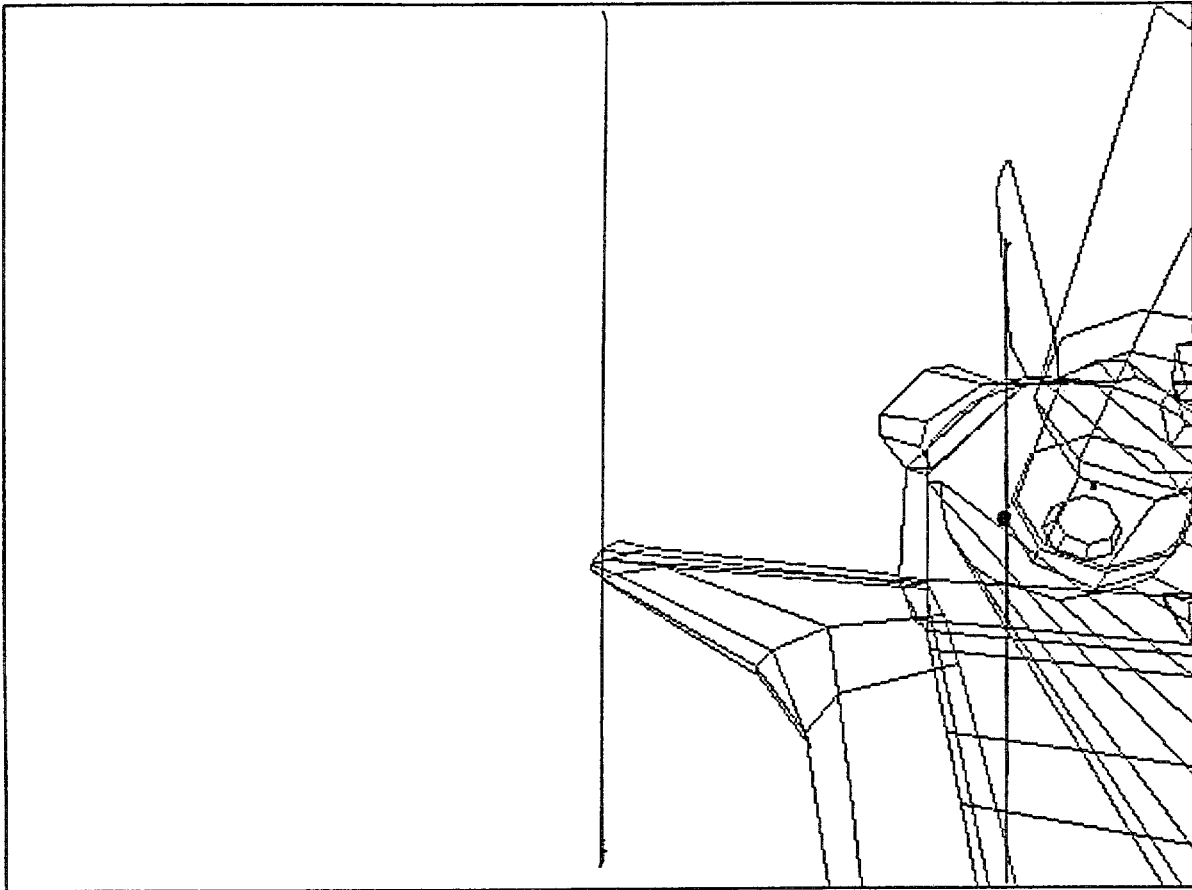
**TITLE**

COMPUTING KU BETA LIMIT USING THE RMU VIEWING PROGRAM

**PROCEDURE**

- A. Locate a camera at the position of the Ku-band antenna.  
 $X = 565.8$   $Y = 134.4$   $Z = 443.9$   
The camera should be pointing straight back along the -X axis with the pan and tilt angles reading 0.0.
- B. Pan the camera left  $23^\circ$  (pan = -23). This action results in the camera tilt axis corresponding to the Ku-band alpha axis.
- C. Move the camera in tilt until the view that shows the payload extending farthest left is found.
- D. From the view obtained in the procedure above, estimate the number of degrees from the center of the picture (measured positively to the right and negatively to the left) which will just touch the nearest part of the payload. This estimate is the beta limit that will just barely allow the Ku-band to illuminate the payload.
- E. Bias the number found in the above procedure by an appropriate margin ( $10^\circ$  suggested) and use this as the beta limit.

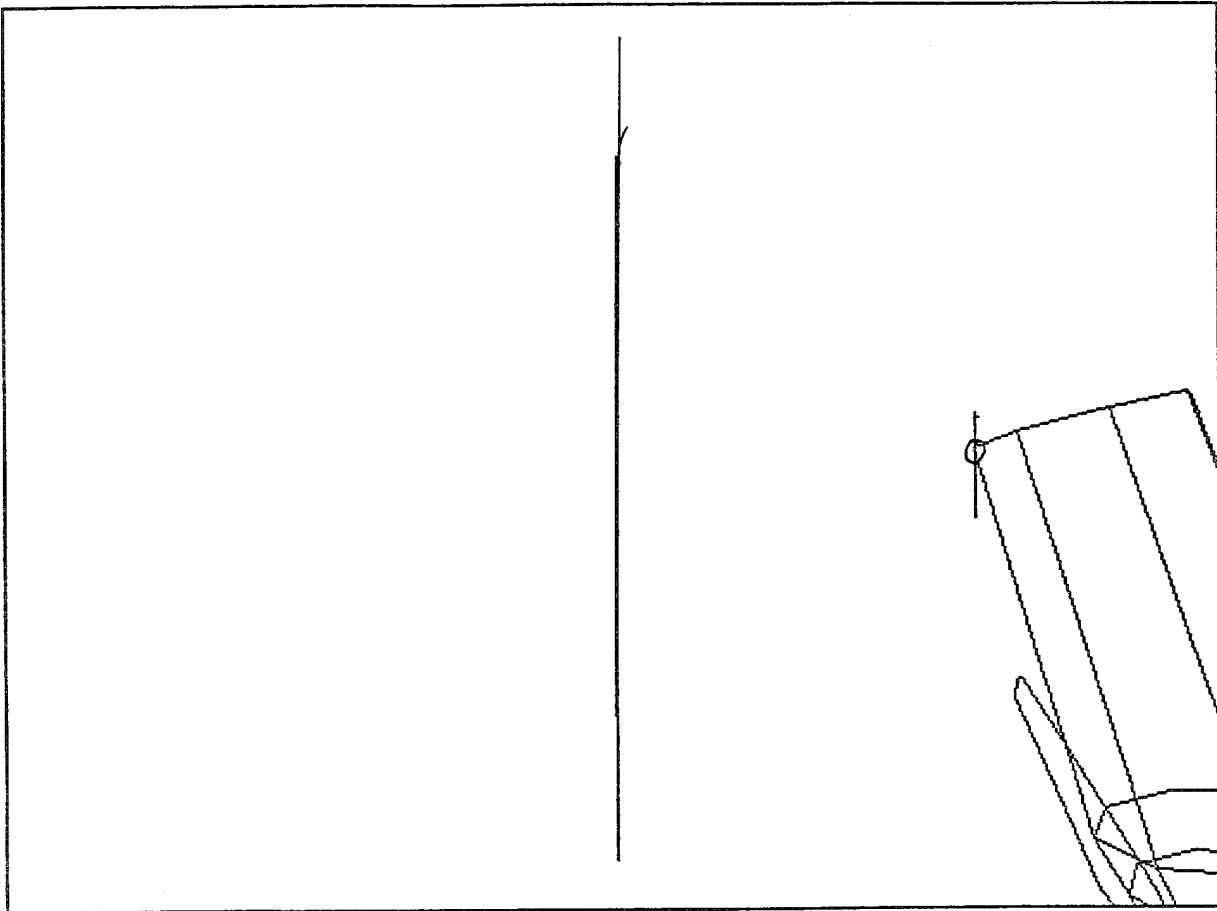
Example outputs from the RMU program are shown in figure 3.71-1 and figure 3.71-2.



Thu Jan 23 14:46:10 1986

CAMERA SELECT	ONE	PAN	-23.0	TILT	.0
VIEW PT	583.8	134.4	443.9	ZOOM	1.0
LOOK TO	1000.0	134.4	443.9	HFOV	81.1
LIGHT	583.8	134.4	443.9	VFOV	60.8
GRAPHICS	5111		LEVEL C		none ( )
ARM SELECTED	PORT		SWING OUT	19.48	
ELBOW CAMERA	WEDGE	25.00	PAN	.0	TILT .0
POR_POS X	-1333.92	POR_ATT P		60.00	
POR_POS Y	-110.36	POR_ATT Y		270.00	
POR_POS Z	-460.65	POR_ATT R		.00	
SHY	.00	WRP		.00	
- SHP	.00	WRY		.00	
*+ ELP	.00	WRR		.00	

**Figure 3.71-1. Example from RMU program: +27.72°**



Fri Jan 24 12:31:35 1986

CAMERA SELECT	ONE	PAN	-23.0	TILT	40.0
VIEW PT	583.8	134.4	443.9	ZOOM	1.0
LOOK TO	1000.0	134.4	443.9	HFOV	81.1
LIGHT	583.8	134.4	443.9	VFOV	60.8
GRAPHICS	5111		LEVEL C		none ( )
ARM SELECTED	PORT		SWING OUT	19.48	
ELBOW CAMERA	WEDGE	25.00	PAN	.0	TILT .0
POR_POS X	-1327.97	POR_ATT P		60.00	
POR_POS Y	-108.80	POR_ATT Y		270.00	
POR_POS Z	-456.25	POR_ATT R		.00	
SHY	.00	WRP		10.00	
SHP	10.00	WRY		.00	
ELP	-20.00	WRR		.00	

**Figure 3.71-2. Example from RMU program: +23.97°**

**TITLE**

KU-BAND COVERAGE PERCENTAGES

**PURPOSE**

This information is presented for use in assessing the available coverage as a function of beta limit and attitude.

**PROCEDURE**

A. Ku-band percentages

The following percentages are trajectory independent. The percentage of the sphere around the orbiter where Ku-band is available is shown in the chart.

<u>Mode</u>	<u>Beta</u>	<u>Coverage</u>	
		<u>Radiators deployed, %</u>	<u>Radiators stowed, %</u>
BM	90 (skin)	64.6	68.7
BM	21	60.3	64.6
BM	0	58.8	62.8
B	2	43.9	47.9
B	4	44.9	49.1
B	6	46.0	50.1
B	8	47.0	51.2
B	10	47.9	52.2
B	12	48.9	53.1
B	14	49.8	54.0
B	15	50.0	54.4
B	16	50.6	54.9
B	18	51.4	55.7
B	20	52.2	56.5
B	22	53.0	57.3
B	24	53.8	58.0
B	26	54.4	58.7
B	28	55.1	59.3
BM	-90 (mask)	55.2	55.2

legend

BM = Beta + mask

B = Beta only

B. Ku-band coverage for typical attitudes and inclinations

The following coverage numbers are for typical beta modes and limits and typical orbits and inclinations. The STS 51-E and STS 41-G ephemerides were used as typical 28° and 57° inclination orbits, respectively. Two TDRS's at 41 and 171 were assumed.

All coverage numbers are for beta+mask 21° with radiators stowed.

	Coverage	
	<u>% for 28° inclination</u>	<u>% for 57° inclination</u>
Nose down bay +VV	56.8	59.0
Nose up bay +VV	70.0	73.4
Nose forward bay down	52.0	54.7
Tail forward bay down	53.4	54.2

## TITLE

KU-BAND PROTECTION BOX

### CAUTION

This procedure is governed by FCOH procedure 3.1 and is not to be changed in real time without review and approval of the Flight Director or changed permission without review and approval at the FOIG.

## PURPOSE

This procedure provides the steps needed to build, modify, delete and manage the Ku-band protection box process in the Systems Management (SM) major function on the shuttle.

## COMMAND RESTRICTIONS/CONSTRAINTS

These commands are valid in SM OPS 2 and 4.

Time constraints, crew coordination requirements: The protection boxes must be enabled before the crew exits the airlock during an EVA. The boxes must be enabled before the Ku-band system can be used in cases where the Ku-band could radiate hardware that should not be radiated.

## GENERAL

The SM Antenna Management (AM) software includes the capability for inhibiting output from the Ku-band Traveling Wave Tube (TWT) when the antenna is pointing into any of four designated roll (azimuth)/pitch (elevation) boxes. The SM monitors the actual roll and pitch angles of the Ku-band system. Once the angles are within the designated box, the SM inhibits the Ku-band TWT. After the angles are no longer inside the box, the SM enables the TWT. There is a command to enable or inhibit each of the four RF Protection Boxes. This capability allows for more Ku-band downlink during EVA activities and when there is hardware in or around the orbiter that should not be radiated.

## PROCEDURES

A RF protection box is made up of two roll/pitch pairs that represent a box in which the TWT will be inhibited. There are two different types of RF Protection boxes. The users must be careful to put the roll angles in the proper order or they may have a box that does not represent the designated area. This procedure is dependent on the INCO/COMM Console Handbook procedure for building TMBUs (SCP 3.16). The following procedure details the steps needed to build, edit, or delete the Table Maintenance Block Update (TMBU) commands used to define each box in the SM.

- A. Build, edit EVA protection box TMBUs

SEQ	Initiator	Action	Comments
1	COMM SPT or INST	<p>Verify that the roll/pitch pairs that define the boxes are valid.</p> $+90^\circ \geq \text{Pitch2 (V92H0172C)} > \text{Pitch1 (V92H0171C)} \geq -90^\circ$ <p>(V92H0890C) (V92H0889C)            (V92H0894C) (V92H0893C)            (V92H0898C) (V92H0897C)</p> <p>and</p> $\text{Roll1 (V92H0169C)} \neq \text{Roll 2 (V92H0170C)}$ <p>(V92H0887C) (V92H0888C)            (V92H0891C) (V92H0892C)            (V92H0895C) (V92H0896C)</p> <p>and</p> $+180^\circ \geq \text{Roll1} \geq -180^\circ \text{ and } +180^\circ \geq \text{Roll2} \geq -180^\circ.$	There are up to four boxes available
2	COMM SPT or INST	<p>Use the TMBU program to enter the MSIDs and their associated values. For the box to protect the under side (“belly box”) of the orbiter, make Roll1 &gt; Roll2. For a box to protect above or to the sides of the orbiter, make Roll2 &gt; Roll1. See the example of the antenna display with the two types of boxes displayed (Figure 3.77-1)</p>	INCO has agreed to use only DSMs 12346 through 12350. The agreement is documented in the FCOH

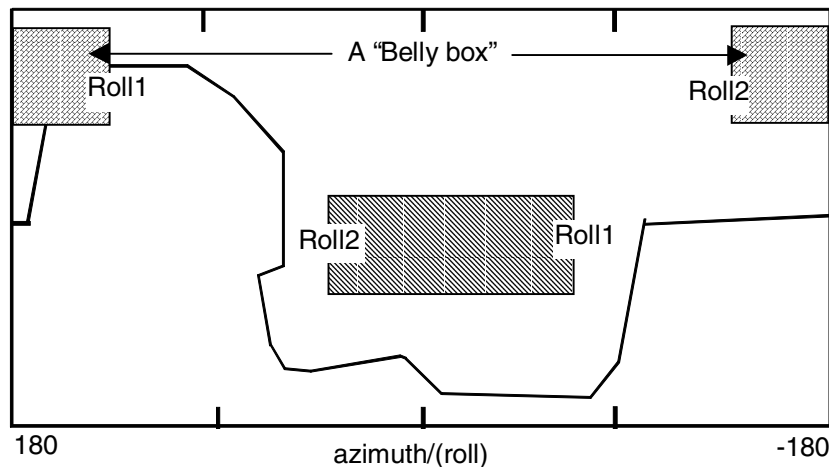


Figure 3.77-1. Example of the two types of protection boxes

- B. Delete RF Protection box TMBUs.  
Use the TMBU SCP to delete the RF Protection box commands.
- C. Build, edit, and delete time executable commands to enable/inhibit the RF Protection boxes  
These commands can be built to execute in the future. Use the INCO SCP for building TECs.
- D. RF Protection Box Features

1. RADAR Mode - RF Protect Boxes will not inhibit the TWT when the Ku Band is in RADAR mode. Once GNC SPEC 33 ITEM 2 is executed the RF Protect Boxes are no longer used by SM AM. A second SPEC 33 ITEM 2 must be executed to start use of the RF Protect Box inhibits.
2. "Acq in the Box" – If handover to a new TDRS satellite occurs inside one of the RF Protection boxes but outside the BETA limit there is the possibility that the Ku band will see the TDRS forward link before the RF Protection Box can inhibit the TWT. This is a race condition between the Ku band processor and the SM flight software. The following procedures will be used to prevent inadvertent RF radiation into enabled RF protection boxes.
  - A. Build and uplink a TEC (14032 –Ku TWTA –OFF) or send it in real-time to inhibit the TWT before handover to the TDRS that will "Acq in the Box".
  - B. Build and uplink a TEC (14031 –Ku TWTA –ON) to enable the TWT about 3 minutes after handover to the new TDRS. This will allow for enough time for the Ku Band antenna to get to the proper location, which will allow the RF Protect boxes to do their job. The 3 minutes also allows for a search operation to complete.

The TWT could be enabled via real-time command once the Ku band has started tracking TDRS.



**TITLE**

KSC/MCC FLIGHT RECORDER STATUS REPORTING

**PURPOSE**

To prepare KSC/MCC ground crews for post-mission recorder dumps and data analysis. This is for non-DOD flights only.

**PROCEDURES**

- A. Lead INST should copy this procedure to the DF24\Fltinfo\Sts\_futr\Sts-XX directory for the appropriate flight, naming it something like XX report.doc (where XX represents the flight number) before launch.
- B. OPS Recorders, Solid State Recorders, and payload recorder - For each recorder, report the location and type of all data not dumped and verified; fill in the tables using MS Word. Add relevant comments (such as weak FM signal for postlanding dump) to the tables.

Refer to Figure 3.81-1 for OPS Recorders (2 pages)

Refer to Figure 3.81-2 for Solid State Recorders (2 pages)

Refer to Figure 3.81-3 for Payload Recorder

- C. MADS recorder or OEX recorder - Report the location (pass sequence, percent tape), GMT (and/or MET), and type of data (cal, ascent, DTO XXX, deploy, etc.) recorded for the entire tape.

Refer to Figure 3.81-4 for MADS

Refer to Figure 3.81-5 for OEX

- D. E-mail a copy of the filled out tables to the following:
  - 1. Peter.Johnson-1@kmail.ksc.nasa.gov
  - 2. Patricia.R.Hart@usago.ksc.nasa.gov
  - 3. Miller, John D.; Recorder Subsystem Manager, NASA/JSC

Phone contact is no longer required now that we e-mail the report.

For any complications, contact the KSC INST personnel (Pete Johnson) at 9-1-321-861-3863.





STS- SSR 1 Flight Recorder Status –Contact Sarah Murray@ (281)483-4061

FROM		TO		DATA INFO			
POS	GMT	POS	GMT	Orbit or Entry	DATA RATE	dumped via SSR1?	dumped via SSR2?*
The following slot definitions were left on the SSR by INCO							
Auto-stop CLEAR? _____ or ENABLED at POSITION _____							

\*Data that were dumped and verified as good at MCC are available from ODRC and are not included in this report. All other data are assumed to be good, unless otherwise specified.

**Figure 3.81-2. Flight solid state recorder status sheet**

STS- SSR 2 Flight Recorder Status –Contact Sarah Murray@ (281)483-4061

FROM		TO		DATA INFO			
POS	GMT	POS	GMT	Orbit or Entry	DATA RATE	dumped via SSR1?	dumped via SSR2?*
The following slot definitions were left on the SSR by INCO							
Auto-stop CLEAR? _____ or ENABLED at POSITION _____							

\*Data that were dumped and verified as good at MCC are available from ODRC and are not included in this report. All other data are assumed to be good, unless otherwise specified.

**Figure 3.81-2. Flight solid state recorder status sheet (concluded)**

STS- PLR Flight Recorder Status –Contact Sarah Murray@ (281)483-4061

FROM			TO			DATA INFO			
TRK	%TP	GMT	TRK	%TP	GMT	TYPE	DATA RATE	RCD in/sec	dumped ?*

\*Data that were dumped and verified as good at MCC are available from ODRC and are not included in this report. All other data are assumed to be good, unless otherwise specified.

**Figure 3.81-3. Flight PL recorder status sheet**

STS- MADS RECORDER ACTIVITY LOG –Contact Sarah Murray@ (281)483-4061

MADS COMMANDS (X) - click on box							SEQ	%TP	TEMP	EVENT
GMT	PCM ON	PCM OFF	W/B ON	W/B OFF	CAL ON	CAL OFF				
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
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	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				
	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>				

Figure 3.81-4. MADS recorder status sheet





## TITLE

POSTFLIGHT RECORDS

## PURPOSE

The following guidelines are established to ensure that data accumulated during real-time flight operations is retained in a fashion that minimizes space requirements while ensuring that sufficient information is readily accessible to allow a particular flight to be researched if necessary.

## GENERAL

In general all data accumulated during a flight should be retained if it could conceivably be useful in recreating events. The more important data should be stored in their original form using office storage facilities. The less important data should be microfiched before storage.

## PROCEDURE

Retain the following data for each flight in their original paper form using office storage areas:

- A. The postflight report, to include flight overview data such as crewmember names, launch/landing dates and times, vehicle, altitude(s), inclination, landing site, and the prime manifest or mission objective(s). The report should include a summary of mission accomplishments, a summary of Comm/Inst systems performance, lessons learned, action items to work, recommendations for improvement, etc. Include a copy of the mission manning roster.
- B. The INCO premission planning memo.
- C. The INCO, RF Comm, Inst and Data Comm shift handover sheets.
- D. The final flight anomaly report.
- E. SPAN chits of interest.
- F. The as-flown summary Flight Plan and Execute packages.

All command histories collected on the workstation are to be backed up to a floppy or tape. This backup will be maintained by the workstation systems administrator or designate in an archive of command histories. No hard copies of the command history will be generated unless a section of the archived files is needed to complete postflight reports.

Approximately 2 weeks after landing the following data should be microfiched and the microfiche retained in the office. The originals can be discarded.

- G. All console logs (INCO, Data COMM, RF COMM, and INSTRUMENTATION), to include hard copies of useful data normally retained in these logs
- H. Anomaly log writeups and associated data
- I. MEWS/PIRT plots

The individual systems experts within the section should maintain anomaly information on their systems, including any closeout information issued by the project postflight.

Flight Data File checklists unique to a previous flight can generally be discarded; however, checklists that may be useful references for similar upcoming flights (e.g., SpaceHab) should be forwarded to the lead INCO for that flight.

## TITLE

GPC DUMPS (REAL TIME OR PLAYBACK)/TFL COMPATIBILITY

### CAUTION

This procedure is governed by FCOH procedure 3.1 and is not to be changed in real time without review and approval of the Flight Director or changed permission without review and approval at the FOIG.

## PURPOSE

To define a standard set of procedures to be used by INCO/DATACOMM personnel when retrieving general purpose computer (GPC) memory dumps via real-time downlink or OPS/Solid-State recorder playback. INCO/INST personnel will also use this section in order to ensure that a particular TFL is compatible with a given GPC Memory Dump.

## GENERAL

During a mission, the crew may be required to dump the memory of a particular GPC or set of GPC's to the MCC and/or an OPS/Solid-State recorder. The following paragraphs contain the procedures to be used for real-time and recorder playbacks of GPC dumps.

## GPC HARDWARE DUMP CONSTRAINTS

A GPC hardware dump must be preceded by an active valid downlist format. If the dump is not preceded by a valid format, the FEP's will not be able to process the dump because the GPC dump takes on the format characteristics of the previous format. GPC hardware dumps are normally not a problem because a new computer is assigned to the major function (SM) or as the prime downlister (G&N redundant set) prior to dumping a failed GPC. However, in the case of a BFS failure during ascent, when time does not allow the selection of a new BFS GPC, a dump should not be attempted.

## REAL-TIME GPC DUMPS

Nominally, the crew will dump the GPC memory during TDRS AOS and the memory dump will be received real time. If, however, the real-time dump was corrupted by data hits, the INCO may be requested to dump the recorded data. Recorder positioning will have to be accomplished in advance to meet this request if OPS recorders are being flown instead of Solid-State recorders.

The following procedures must be observed to ensure a good playback of the GPC memory data.

1. Check to see that the active TFL has the bandwidth to support the type of dump to be performed. Refer to table 3.83-1 or the Payload Management Flight Software Requirements (FSR) to find a list of GPC dump types and the standard formats that will support them. If a nonstandard format is being used, compare the available bandwidth (downlist data rate) for the appropriate major function with the required bandwidth listed in table 3.83-1. If the active TFL cannot support the dump, another will have to be loaded.
2. The goal is to provide a good, solid downlink with no dropouts. To ensure that no dropouts occur, Ku blockage (or antenna switches, in the absence of Ku-band) should be avoided by using antenna predictions. The actual dump may take from approximately 1.5 to 18.2 minutes, depending on the type of dump, major function, and rate, so you need to know the length of the dump. DPS will be able to supply this information to INCO. See table 3.83-1 for times.

3. Have an OPS/Solid-State recorder running to back up the real-time downlink. If using an OPS recorder, make sure that a track turnaround will not occur during the GPC dump. Approximately 55 percent of a track is required for a software dump (recorded at 15 IPS) and 25 percent is required for a hardware dump. Note the recorder, track, % tape, and GMT of when the dump was started and completed. If using a Solid State recorder, note the recorder, position, and GMT of when the dump was started and completed. Protect the dump on the recorder until confirmation of the receipt of a good dump on the ground is received. To protect this data on a Solid State Recorder, assign a queue that encompasses the entire GPC dump with an off-nominal dump rate.

### RECORDER PLAYBACKS OF GPC DUMPS

The real-time dump procedures in the previous section must have been followed to ensure a successful recorder playback of the GPC dump.

- A. The data processing system (DPS) officer or DPS support will contact INCO or DATACOMM to request a dump of the recorder with the GPC dump data.
- B. Nominally the GPC dump(s) will be played back through Ku-band to avoid FM antenna switches. If FM is to be used, select a probable dump site and run an antenna plot to determine the extent of FM antenna switches during the pass. There must be a period of at least 1.5 minutes playback time with no switches during the actual GPC dump. If multiple dumps are on a recorder, these times apply to each dump.
- C. The following is for Ops Recorders only: If the playback is required ASAP, position the recorder % tape past the end of the GPC dump data. (Note that you could also position the recorder before the start of the dump and play back the data forward.)
- D. DATACOMM should notify the data flow engineer (DFE) prior to the recorder playback that a GPC dump is contained in the recorder playback.
- E. When the recorder dump is started, confirm (by checking the snapshot GMT in the dump FEP) that a GPC dump will be covered. (The GMT should cover from before the start of the dump until after the end of the dump.)
- F. Monitor the data dropouts using the valid frames per second and percent total frames parameters. If numerous dropouts are encountered, the playback should be redumped. The main goal is to play back the data with no dropouts. A dump FEP report is also available to verify the quality of the dump.
- G. DATACOMM will coordinate the playback of the GPC dump from the dump FEP, via the playback FEP, to the DPS application. DATACOMM will notify DPS support of the number of times the recorder was dumped, the quality, etc. DPS will decide which recorder dump(s) to process if more than one exists.
- H. DFE will communicate with DATACOMM and DPS support on INSTR COORD to coordinate the start of playback. DATACOMM will monitor the playback on the dump FEP display.

### HOW THE GPC MEMORY DUMP TIMES WERE CALCULATED

Consider a DPS request to do a complete software dump of the SM 2 GPC main memory data because SM 2 failed on orbit. The current TFL is 161, which has a downlist data rate that will support the SM 2 GPC dump. In nearly all cases, the entire contents of the GPC are dumped by specifying a starting address of "0" and dumping all 262,144 half words; however, any partial addresses within the GPC downlist may be dumped. Therefore, a complete GPC main memory consists of 262,144 16-bit words and is brought down at a rate of 25 frames per OI major frame per second. A GPC dump frame is captured every four OI minor frames. Therefore, 50 GPC dump frames are captured every 2 OI major frames occurring every 2 seconds.

To determine the frame length (the number of 16-bit words per frame) in each dump frame, first divide the bandwidth (downlist data rate) by 25 frames per second. The result will represent bits per frame. Divide this value by 16 bits per word to end up with words per frame. Continuing with the above example, the bandwidth is 19.2 kbps, and when divided by 25 frames per second and then by 16 bits per word, the result is 48 words per frame. The frame lengths have all been predetermined and placed in table 3.83-1.

Next, consider the overhead in each frame. Overhead includes the GPC data cycle header, frame header, checksum word, and the additional words added to the header to identify the dump as main memory or mass memory. The GPC data cycle header consists of six 16-bit words. These words are located in words 1 through 6 of frames 0 and 25 and contain the sync word, frame counter, format ID, vehicle ID, GPC ID, mission ID, and GMT (12 words per 50-frame cycle). The frame header consists of two 16-bit words located in words 1 and 2 of frames 1 to 24 and 26 to 49 (p6 words per cycle). Since the frame header is a subset of the data cycle header, words 1 and 2 are the same in all frames. To identify the main memory data, six additional 16-bit words are added to the headers in each frame. These words are located in words 7 through 12 of the data cycle header and in words 3 through 8 of the frame header (300 words per cycle). One checksum word per frame equals 50 per cycle.

$$50 + 300 + 96 + 12 = 458 \text{ overhead words per cycle.}$$

The next step is to subtract the number of overhead words per 50 GPC dump frames from the total number of words per 50 GPC dump frames to determine the number of words available for dump data per 50 GPC dump frames. Multiply 48 words per frame by 50 GPC dump frames. The result is 2400 words per 50 GPC dump frames. Subtract from this the overhead, 13 cycle header, main memory identifier, and checksum words from each frame 0 and 25, 9 frame header, main memory identifier, and checksum words from each frame 1 to 24 and 25 to 49, for a total of 458 overhead words. Subtracting 458 overhead words from 2400 total words results in 1942 total available words per every 50 GPC dump frames for dump data. To determine how many major frames will be brought down before all 262,144 GPC memory words are captured in the dump, divide 262,144 words by 1942 available dump words per every 50 GPC dump frames to derive 134.98661 frames. In actuality, one frame in this result represents two OI major frames, since it takes two OI major frames to capture 50 GPC dump frames.

The time can be calculated in two parts. Since it takes 2 seconds for two major frames to come down through the return link, multiply 134 (which is the number of frames from the value 134.98661 completely filled with dump data) by 2 seconds to derive 268 seconds. The fraction 0.98661 may be converted into the number of minor frames filled with dump data in the last two major OI frames filled with dump data. Multiply 1942 dump words by 0.98661. This result is equal to 1916 words filled with dump data in the last two major frames.

To determine the number of minor frames filled up by 1916 words, start with the following equation:

$$N = M(n - 9) + y(n - 13)$$

where N = the number of words filled with dump data in the last two OI major frames, M = the number of minor frames filled with dump data in the last two OI major frames, and n = the frame length. The expression (n - 9) represents the number of available words in the minor dump frames 1 to 24 and 26 to 49, and the expression (n - 13) represents the number of available words in the minor frame(s) 0 and/or 25. The variable y will be a 1 or a 2, depending on whether the 26th minor dump frame has been filled with dump data. In this case, since 0.98661 > 0.5, then at least the 26th minor dump frame, which is in the second OI major frame, has been filled with dump data. From here solve for the variable M

$$M = [(N - y(n - 13))/(n - 9)]$$

Using the numbers derived thus far from the example's calculations, solve for M

$$M = [(1916 - 2(48 - 13))/(48 - 9)]$$

$$M = 47.333 \text{ minor frames}$$

Approximately 48 minor dump frames are filled with dump data in the last two OI major frames, and frame 49 is filled with fill data. Data are selected to fill the unused data locations at the end of the dump to complete the current data cycle. Since 1 GPC minor dump frame occurs every 4 OI minor frames, and 25 GPC dump minor frames occur every OI major frame per second, then a GPC minor dump frame occurs every 40 milliseconds. Multiply 48 minor dump frames by 0.04 seconds to derive 1.89 seconds. This is the time it takes to dump the last 48 minor dump frames. Therefore, the total time it takes to dump the complete SM 2 GPC main memory equals 269.89 seconds (268 seconds plus 1.89 seconds) or 4 minutes 30 seconds. The dump times have all been predetermined and placed in table 3.83-1.

#### **REFERENCES**

Computer Program Development Specification (CPDS), volume 1, book 4, SS-P-0002-140.

**Table 3.83-1. GPC memory dump times and formats**

HIGH DATA RATE

	Bandwidth (kb)	WDS/FRM	Time required min:sec	Toggle Buffer	Compatible TFL's
OPS 0	12.8	32	7:39	4	All HDR TFL's 161, 163, 172, 179, 180, 184,185, 192, 203, 205, 206, 211,129, 164, 171, 166, 201
GNC Ops 1 (Ascent)	51.2	128	1:29	1	129, 160, 164, 166, 171, 172,180, 201
GNC OPS 2 (Orbit)	44.8	112	1:42	1	129, 160, 161, 163, 164, 166,171, 172, 173, 179, 180, 184,185, 192, 201, 203, 205, 206,211
GNC Ops 3 (Entry)	51.2	128	1:29	1	129, 160, 164, 166, 171, 172,180, 201
SM Ops 2 & 4 (Orbit)	19.2	48	4:30	2	161, 163, 172, 179, 180, 184,185, 192, 203, 205, 206, 211
BFS	12.8	32	7:39	5	129, 164, 166, 171, 201
PASS HISAM	44.8	112	1:42	1	129, 160, 161, 163, 164, 166,171, 172, 173, 179, 180, 184, 185, 192, 201
BFS HISAM	12.8	32	7:39	5	129, 164, 166, 171, 201

LOW DATA RATE

OPS 0	6.4	16	25:33	4	All LDR TFL's 100, 101, 103, 106, 110 102, 105, 118, 119
GNC Ops 1 (Ascent)	25.6	64	3:12	1	102, 105, 118, 119
GNC Ops 2 (Orbit)	22.4	56	3:44	1	100, 101, 102, 103, 105, 106,110, 118, 119
GNC Ops 3 (Entry)	25.6	64	3:12	1	102, 105, 118, 119
SM Ops 2 & 4 (Orbit)	9.6	24	11:47	2	100, 101, 103, 106, 110
BFS	6.4	16	25:33	5	102, 105, 118, 119

PASS HISAM LDR HISAM dumps cannot be performed.

BFS HISAM LDR HISAM dumps cannot be performed.

## TITLE

SEQUENTIAL STILL VIDEO (SSV) CONFIGURATION

## PURPOSE

This procedure outlines the steps to be performed by INST for the configuration of the SSV for downlink video.

## CREW CONFIGURATION (Performed per P/TV Gen., Section 12)

CCTV DNK:	IN SEL	-NTSC (Nominal)
CC DNK:	IN SEL	-Y/C
PICTURE QUALITY:	MODE	-3 (Nominal)
OUTPUT FRAME RATE:	OUT RATE	-1 through 8 (per Flight Plan)
POWER SELECTION:	PWR	-ON

## INSTRUMENTATION PROCEDURE

1. Verify correct Decommutator Format Load (DFL) to the Payload Data Interleaver (PDI). This allows data to flow from the SSV to the PDI Toggle Buffer.
2. Verify on INST MNGT display, the PDI DECOM LOCK has attained Bit, Word, Frame, and Accuracy (BWFA).
3. Verify correct Telemetry Format Load (TFL) and Fetch Point Memory (FPM) are loaded to conduct SSV operations.
4. Contact DFE informing him, "Downlinking SSV Data"
5. Verify on DOWNLINK FEP (FEP STATUS) display the following items:
  - (a) MAINFRAME OI has correct SYNC, VAL, and FMT
  - (b) WINDOWS does **not** have SYNC and VAL. SSV is PDI Type 4, block data, hence no FEP processing.
  - (c) WINDOWS has correct TYPE and FMT.
6. On the DOWNLINK FEP (FEP STATUS), depress PDIS. Verify SYNC and VAL are illuminated for the proper DFL. PDIS processes the PDI Type 4, block data.
7. Power ON the SSV Base Band (BB) Video Monitor
8. Switch the SSV "Blank/Active" toggle switch to the "Blank" position.
9. Power ON the SSV CPU and Monitor.
10. At prompt, type (not case sensitive):
  - C
  - RTN key
  - SBYT1
  - RTN key
  - RTN key
11. Verify that the CPU is receiving an SSV image by checking SSV Monitor to display:



```
*** De-framer Status ***
Reset done:      Received
Clock:          Clk/Data Locked
Frame:          Locked
Dfail:          Received
Start of frame: Received
Data polarity:  Inverted
Fill Frame:     Not Receiving

*** De-framer telemetry ***
Status byte 1 = 10 Status byte 2 = ff8c
Status byte 3 = 0  Status byte 4 = 64
VCID = 38  Output Rate Select: 4

*** Video Digitizer and Encoder Telemetry ***
Video input:    Composite
Compression Mode: 3  Q value: 50

Re-writing Q tables before each frame
Hit Enter to exit....
End of Bt858 / Display Init (brkinnt1)
```

Figure 3.84-1. SSV Receiving Image

12. If SSV ground monitor is **not** receiving SSV image, it will display the following:

```
*** De-framer Status ***
Reset done:      Received
Clock:          No Clock  Clock Search:  Searching
```

Figure 3.84-2. SSV Not Receiving either Clock or Image

13. Coordinate with RF COMM or INCO for proper SSV input. Verify "Good" video on SSV BB Video Monitor.

14. Switch the SSV "Blank/Active" toggle switch to the "Active" position. The "Active" position forwards the video on to *Houston TV* for TV RF Channel Distribution.

#### POWER DOWN PROCEDURE

1. Contact and inform DFE that "SSV Ops are complete".
2. Switch the SSV "Blank/Active" toggle switch to the "Blank" position.
3. Power OFF the SSV Base Band (BB) Monitor.
4. Power OFF the SSV CPU and Monitor.

## BASIC TROUBLESHOOTING

1. PDI DECOM does not indicate SSV status of "BWFA".
  - a. Verify TFL/DFL loads used onboard matches the "Output Rate Select" on the SSV console display.
  - b. Write a Flight Note requesting the crew to perform the following onboard SSV Items:
    - (1) Verify PDI Cable configuration per the "Photo TV" FDF Section 12 Diagrams.
    - (2) Verify Unit is powered "On" by the unit "PWR" LED.
    - (3) Check and correct the "Out Rate" switch for the proper setting, per the Flight Plan.
2. PDI DECOM indicates good SSV input signal (BWFA), but no ground SSV picture.
  - a. Have DFE verify processing of PDI SSV Type 4 Block Data.
  - b. Verify SSV Console display is showing good "Clock/Data Locked"
  - c. Verify VCID = 38.
  - d. Have INCO or RF COMM verify that the onboard video source configuration is good.
  - e. Have INCO or RF COMM source onboard SSV Unit to the orbiter CCTV Test Pattern, if possible to verify SSV Unit and interfaces are operational.
3. BB Monitor is showing good video, although *Houston TV* not receiving SSV:
  - a. Verify that the SSV "Blank/Active" toggle switch to the "Active" position.
4. SSV Video is consistently coming in ratty or off color:
  - a. Verify appropriate DECOM indicates "BWFA".
  - b. Verify downlink TLM is not taking "many" data dropouts.
    - (1) Check SSV Display for a good VCID = 38. If VCID = 0, SSV ground equipment is not locked-up to the orbiter equipment.
    - (2) Downlink TLM verification can be accomplished by contacting "Comm Control" on the "OST-1" internal loop or by use of phone x34455.
  - c. Contact Lead Engineer as describe in Step "6".
5. SSV picture quality is poor:
  - a. Have RF COMM or INCO verify the onboard configuration is good with cameras used in proper lighting.
  - b. Verify downlink TLM is not taking many data dropouts.
  - c. Check SSV Console Display for a Compression Mode Selection of 3 and a "Q" value of 50 % or higher. If mode selection is of a lower number, inform Flight Director to ask crew to take SSV "Mode" to a number of 3 or greater. Crew should not select "Mode 6", or a TLM test pattern with no video output will result.
6. Contact Technical Expert for irresolvable SSV equipment problems.
  - a. During non-critical SSV Ops, do not power cycle SSV Equipment to attempt system recovery.
  - b. Contact the SSV Lead Engineer Doug Holland @ Pager # 281-434-5542, anytime during flight to resolve equipment anomalies.

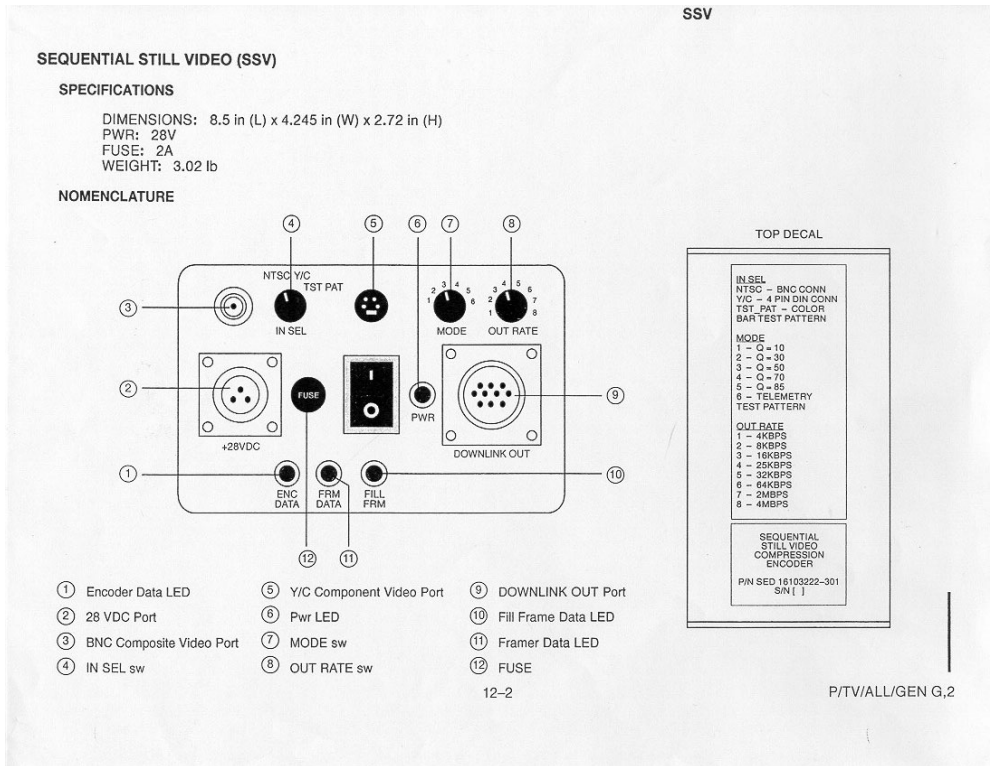


Figure 3.84-3. SSV Front Plate

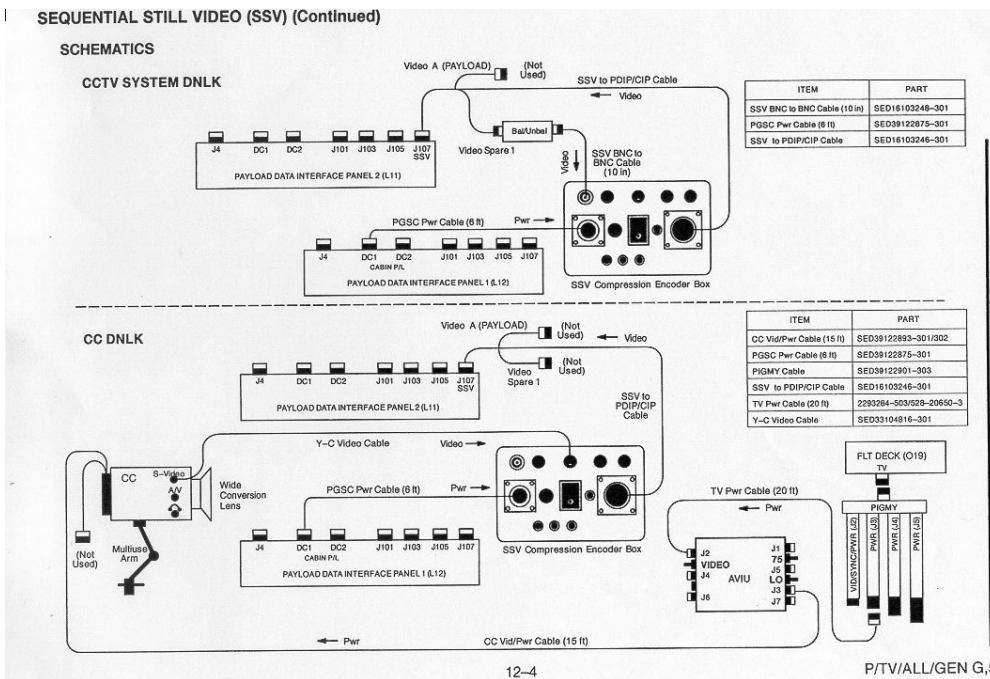


Figure 3.84-4. Example of SSV interfaces hookup from the Generic Photo TV Flight Data File

## TITLE

MULTICALS AND CALIBRATION DATA CHANGES IN THE MCC

## PURPOSE

Describe how to select a different series curve and how to verify which curve is selected in the Front End Processor (FEP) for measurements with multiple series actual Calibration (CAL) data (multicals). Explain how to view the CAL coefficients for each Measurement Stimulus Identification (MSID) and CAL series in the FEP, verify that the CAL data for each MSID and series is correct, change the CAL data in the FEP during real-time operations, note how CAL data is changed in the Operational Data Reduction Complex (ODRC) host, and enter special CAL coefficients in the FEP.

## GENERAL

Refer to Systems Brief 49 for details on telemetry data processing.

The FEP is initialized by the MOD Reconfiguration (recon) group, with the proper CAL's installed for each flight. The INCO CAL lead receives an electronic document from the MOD recon group, containing the COMM CAL's in the CAL MOD data set for each flight. The lead RFCOMM for each flight should ensure that a copy of that document, as well as documentation on late CAL changes, is inserted into the console CAL notebook and that the CAL's installed in the FEP match the CAL's in the document.

## VIEWING RAW DATA IN THE FEP

A snapshot value of a telemetry parameter in the FEP may be viewed in raw PCM counts via the telemetry services parameter report. The parameter may also be viewed dynamically (with real-time updates).

### A. Starting telemetry services

1. Select **Master** Display Navigation (DNAV) Menu.
2. Select **Global Apps**.
3. Select **Telemetry Services**.
4. Select **DLRT-Downlink Real Time**.
5. After a minute, the **Select Vehicle** window will appear.
6. Select the first button (**Orbiter with PLBD closed**).

### B. Selecting a parameter to be viewed (snapshot)

1. From telemetry services, select **Parameter Readout**.
2. Select **Define Parameter Readout** and fill in the blanks as follows:

Parameter	<u>V75T2517A</u>	Data Type	Display Format
Sample Number	<u>1</u>	◆Raw	◆HEX
		◇Processed	◇Predefined

3. Select **OK**, and select **OK** on the worry box.

- C. Viewing the parameter report (Figure 3.92-1)
  - 1. From telemetry services, select **Parameter Readout**.
  - 2. Select **View Parameter Readout Report**.
  - 3. Select a single line from the list provided and view as follows:

Parameter Report

Shuttle OI/GPC

SITE ID:	MILA	DISCIPLINE:	inco	ONBOARD TIME:	339:05:00:35.334
PARAMETER:	V75T2517A			SUBCOM:	OI
PARAMETER DESCRIPTION:		RCDR OPS 1 HEAD TEMPERATURE			
ATTRIBUTE:	2/D	DATASET ID:	192		
DATA TYPE:	AMU				
OVERRIDE VALUE:	N/A				
CALIBRATION CHANGE:		NO			
OFFSCALE CHECKING:		YES			
OFFSCALE HIGH:	2.5000000E+02				
OFFSCALE LOW:	0.0000000E+00				

=====

SAM	RAW VAL(hex)	CONVERTED VAL(predef)	PROCESSED VALUE(hex)	PROCESSED VAL(predef)
1	B0	1.7600000E+02	40 58 4E D5 BF B1 8F B9	9.7231796E+01

**Figure 3.92-1. Parameter Report (abbreviated)**

- D. Viewing a dynamic parameter readout:
  - 1. With a parameter already selected for viewing as in step B, from telemetry services, select **Enable Dynamic Parameters**, select the appropriate parameter, select **Enable**, and **OK**.
  - 2. From telemetry services, select **Dynamic Parameter Readout**. Parameter value will be either raw or processed, as selected in step B.

### SELECTION OF CAL CURVES

There are multiple actual CAL curves (multicals) in the FEP for S-band transponder 1(2) automatic gain control (AGC) uplink signal strength, S-band transponder 1(2) RF power output, S-band power amplifier 1(2) RF power output, and Ku-band radar/comm AGC uplink signal strength. Each orbiter LRU is assigned a serial number, and each sensor on these LRU's is calibrated separately in each operational mode. Each CAL curve for a multical MSID is assigned a series number in the CAL MOD data set. The series number is assigned by the SASCB according to the request of the Flight Control discipline that owns the MSID. This assigned series number and the requirements for console CAL selection must be coordinated so that the correct CAL curve will be loaded in the FEP for the selected mode. The FEP and ODRC provide auto-CAL selection, based on algorithms provided by INCO. Alternate CAL series may not be selected for an auto-selected CAL because it will automatically revert to the CAL specified in the algorithm. If there is a failure (including an invalid or unspecified combination of data) in telemetry driving the autocal, no CAL will be applied, which yields a raw (uncalibrated) data curve.

The CAL coefficients currently stored for a parameter in the FEP may be viewed via the telemetry services parameter calibration report. If desired, an alternative CAL series may be manually selected for a multical not included in an autocal series.

- A. Start telemetry services (list A under GENERAL section, page 3.92-1).
- B. Viewing a parameter calibration report (Figure 3.92-2)
  - 1. From telemetry services, select **Calibration Change**.
  - 2. Select **Parameter Calibration Reports**.
  - 3. Select **View Parameter CAL Report**.
  - 4. Enter the MSID filter (e.g., V74E) and select **Filter**.
  - 5. Select a single MSID from the list provided and **OK**.
  - 6. Select curve number button.
  - 7. Select curve number or **ALL** and **OK**, and view as follows:

Parameter Calibration Report  
Shuttle OI/GPC

GMT : 332:20:58:40.306

PARAMETER: V74E2508A                      DISCIPLINE: NONE

NUMBER OF CURVES: 2                      CURRENT CURVE: 2

CURVE NUMBER: 2

	ORIGINAL	PERMANENT	TEMPORARY
Coeff 0	0.000000000000000E+00		
Coeff 1	2.000000000000000E-02		
Coeff 2	0.000000000000000E+00		
Coeff 3	0.000000000000000E+00		
Coeff 4	0.000000000000000E+00		
Coeff 5	0.000000000000000E+00		
Coeff 6	0.000000000000000E+00		
Coeff 7	0.000000000000000E+00		
Coeff 8	0.000000000000000E+00		

**Figure 3.92-2. Parameter Calibration Report**

- C. Selecting a different group CAL series
  - 1. From telemetry services, select **Calibration Change**.
  - 2. Select **Select Group CAL Curves**.
  - 3. Select desired CAL group and curve number button.
  - 4. Select curve number and **OK** (and **OK** in the worry box).
  - 5. Verify the desired series CAL coefficients are selected in the FEP using the parameter calibration report. The coefficients in the FEP for each series can be verified against the

SASCB-approved CAL by comparison with data in the MCC recon group's CAL document, which should be in the CAL book that is kept at the RF COMM console during a flight.

6. After the desired CAL curve series number is selected and verified, check end item response.
- D. Selecting a different CAL series for a single parameter:
1. From telemetry services, select **Calibration Change**.
  2. Select **Select Parameter CAL Curve**.
  3. Enter the MSID search filter (e.g., V74E) and select **Filter**.
  4. Select a single parameter and **OK**.
  5. Select curve number button.
  6. Select curve number and **OK** (and **OK** in the worry box).
  7. Verify the desired series CAL coefficients are selected in the FEP using the parameter calibration report. The coefficients in the FEP for each series can be verified against the SASCB-approved CAL by comparison with data in the MCC recon group's CAL document, which should be in the CAL book that is kept at the RF COMM console during a flight.
  8. After the desired CAL curve series number is selected and verified, check end item response.

#### AUTO-SELECTED CAL SERIES FOR COMM

A cal computation display is provided with the INCO management display to show which cal curve is being selected by the FEP. A description of the cal comp is provided at the end of this section. The data for cal comp is supplied by the FEP via a Status Data Message (SDM).

A. S-BD XPNDR AGC 1/2 (V74E4080A/V74E4081A) multicals

There are five series of actual signal strength CAL data for each S-BD transponder (XPNDR) line replaceable unit (LRU). The calibrated XPNDR AGC data will be displayed on the S-BD XPNDR display and the COMM MANAGEMENT display in engineering units (dBm). Each actual CAL curve for a transponder mode is assigned a designated series number in the FEP as follows:

Series 1 = TDRS (high freq)

Series 2 = STDN LO

Series 3 = STDN HI

Series 4 = SGLS (low pwr)

Series 5 = TDRS (low freq)

The FEP defaults to series 1 (TDRS mode, high frequency) when it is initialized. The appropriate series CAL curve must be selected by the FEP to match the active mode of the S-BD XPNDR in order to get an accurate uplink signal strength reading.

On COMM MANAGEMENT, the AGC value should read between -100 and -122 dBm for TDRS mode and between -45 and -100 dBm for all other modes (STDN HI/LO and SGLS). The following table gives the auto CAL series selection criteria for V74E4080A/V74E4081A:

SERIES	V74X4786E	V74X4787E	V74X4788E	V74X4789E	V74X4793E	V74X4792E
1	1	0	0	0	1	0
2	0	1	0	0	X	X
3	0	0	1	0	X	X
4	0	0	0	1	X	X
5	1	0	0	0	0	1

B. S-BD PM XPNDR 1/2 RF POWER (V74E4088A/V74E4089A) and S-BD PWR AMP 1/2 RF POWER (V74E4512A/V74E4513A) multicals

There are two series of actual CAL data for each of these four MSID's. Each MSID represents a measurement from a different LRU. Series 1 represents the high-frequency CAL data and series 2 represents the low-frequency CAL data for each LRU because both the XPNDR and PA must be configured to the same frequency. The FEP defaults to series 1 (high freq) when it is initialized. The appropriate series CAL curve must be selected by the FEP to match the frequency mode of the S-BD XPNDR to get an accurate power output reading.

The XPNDR RF power output can be monitored in engineering units (watts) on the S-BAND PM XPNDR display; XPNDR POWER OUT should read between 3 and 5 W.

The S-BD PM PWR AMP RF power output can be monitored in engineering units (watts) on the S-BAND ANTENNA display when the S-BD PM system is in a high power (STDN HIGH or TDRS) mode; PA POWER OUT should read between 100 and 160 W.

The following table gives the auto CAL series selection criteria for V74E4088A/V74E4089A and V74E4512A/V74E4513A:

SERIES	V74X4793E	V74X4792E
1	1	0
2	0	1

C. KU-BD RADAR/COMM AGC (V74E2508A) multical selection

There are two series of actual CAL data for Ku-band uplink AGC. Series 1 is the CAL curve for the COMM mode, and series 2 is the CAL curve for the RADAR mode. The FEP defaults to series 1 (COMM mode) at initialization. The appropriate series CAL curve must be selected by the FEP to match the mode of the Ku-BD system in order to get an accurate uplink signal strength reading.

The Ku-BD can be configured to either one of two modes for RF power output, NARROW BEAM and WIDE BEAM. These two modes would require two CAL curves for MSID V74E2511A, KU-BD COMM & RADAR POWER. However, the WIDE BEAM mode will never be used operationally during a shuttle mission because of an incompatibility with TDRS. Therefore, only NARROW BEAM CAL data will be documented. There are no requirements for multical selection for this MSID.

On COMM MANAGEMENT, the Ku-BD AGC should read between -88 and -120 dBm in COMM mode and between 0 and 5 V in RADAR mode.



The following table gives the auto CAL series selection criteria for V74E2508A:

SERIES	V74X4818E	V74X4807E	V74S2420E	V74S2419E
1	X	X	0	0
2	0	0	X	X

**CAL COMP FOR INCO MANAGEMENT DISPLAY**

All multical curve series numbers currently in use by the D/L FEP are contained within a multi-sample status data message (SDM) parameter: M21F1115F - Integer - 4 Bytes.

CAL COMP	paragraph
Ku RADAR/COMM AGC	<----A.
S-Band U/L AGC	<----B.
S-Band PWR	<----C.

MSID	Sample	Nomenclature
V74E2508A	18	Ku RADAR/COMM AGC
V74E4080A	19	S-Bd XPNDR U/L AGC 1
V74E4081A	20	S-Bd XPNDR U/L AGC 2
V74E4088A	21	S-Bd XPNDR RF PWR 1
V74E4089A	22	S-Bd XPNDR RF PWR 2
V74E4512A	23	S-Bd PA RF PWR 1
V74E4513A	24	S-Bd PA RF PWR 2

A. Ku RADAR/COMM AGC CAL series: output MSID = KU\_AGC

KU_AGC	4 char alpha (green)
Sample 18	
1	COMM (green)
2	RADAR (green)
any other	ERR (green)

B. S-Bd U/L AGC CAL series: output MSID = SB\_AGC

SB_AGC	4 char alpha (green)	
Sample 19	Sample 20	
1 and	1	TDRSS HI FREQ (green)
2 and	2	STDN LO (green)
3 and	3	STDN HI (green)
4 and	4	SGLS (green)
5 and	5	TDRSS LO FREQ (green)
any other		ERR (green)

C. S-Bd PWR CAL series: output MSID = SB\_PWR

SB_PWR	4 char alpha (green)			
Sample 21	Sample 22	Sample 23	Sample 24	
1 and	1 and	1 and	1	HI FREQ (green)
2 and	2 and	2 and	2	LO FREQ(green)
any other				ERR (green)

## CAL COEFFICIENT CHANGES IN THE MCC

### NOTE

CAL coefficients should be changed in this manner during a flight ONLY if the available coefficients are not accurate; i.e., if a discrepancy is found in the coefficient(s) and if an AR is being submitted on this anomalous condition (or if it is a know problem, with a CAL alteration used as the workaround).

Special S-BD PM XPNDR AGC CAL coefficients are used in the SMS for V74E4080A and V74E4081A. The signal strength measurements displayed in the MCC should be in the proper range but will not track the linearity of the data from the SMS, although the INCO group, along with the COMM training group, has elected not to update the CAL for simulations. The following procedure may be used to change the coefficients on any CAL. This procedure or generic equivalent can be found in the FCOH.

### CAUTION

If a CAL alteration is made permanent during a flight or SIM, it will remain in the altered state until altered again. Make sure all permanent CAL updates are correct, either via approved procedures or by letter or FAX from reconfiguration.

- A. Start telemetry services (list A under GENERAL section, page 3.92-1).
- B. Altering CAL coefficients
  1. From telemetry services, select **Calibration Change**.
  2. Select **Alter Parameter CAL Coefficients**.
  3. Select MSID desired for changing coefficient and **OK**.
  4. Select the desired CAL curve number and "temporary" or "permanent."
  5. Enter the new coefficient values.
  6. Select **OK** (and **OK** in the worry box).
  7. Verify the desired series CAL coefficients are selected in the FEP using the parameter calibration report.
  8. After the desired CAL coefficients are verified, check end item response.
  9. Notify WSS that a CAL was manually altered, identify the CAL, and ask them to update the database for all downlink FEP's per the CAL change.

### SUMMARY

Automatic CAL changes are performed by the FEP and by the ODRC. Flight Controllers can make multical selections via the FEP telemetry services calibration change display. Manual CAL coefficient changes permission should be temporary unless approved as permanent. Real-time changes during the mission should be PERMANENT. Send copies of the changes and the time of change to SPAN, MER, and Ground Controller (GC).

The Mission Operations Handbook (MOH) procedures for FEP telemetry services are as follows:

MOH, vol. 2, COP 18.16, Telemetry Calibration Changes in the FEP

MOH, vol. 2, COP 18.23, Telemetry Parameter Readout From the FEP

Further information and details on how to make CAL data changes in the old MCC can also be found in the following MOH procedures:

MOH, vol. 2, COP 15.7, Stream Processing Table Changes  
MOH, vol. 2, COP 16.7, Calibration  
MOH, vol. 3, COP 12.7, Parameter Calibration Display  
MOH, vol. 3, COP 12.8, Parameter Calibration Changes  
MOH, vol. 3, COP 12.9, Telemetry Parameter Readouts From MOC

## **REFERENCES**

Flight Control Operations Handbook (FCOH), vol. I, Shuttle OPS, JSC-22438.

MCC Level B & C Requirements for Shuttle, vol. I, SDPC Software, JSC-11028.

MCC Level B & C Requirements for Shuttle, vol. XIV, RDCS, JSC-11028.

Mission Control Center Operations Handbook (MOH), vols. II and III, RSOC 86-0055.

Shuttle Calibration Data Book, vol. VIII, FOD Calibration Data, JSC-16486-xx.

Shuttle Data Integration Plan (DIP), vols. I, II, and III, JSC-18206.

STS Calibration Handling Handbook, JSC-22438.

JSC Correspondence, DF2-95-11, Autocal Selection

**TITLE**

PAYLOAD INTERROGATOR AND S-BAND PM/FM FREQUENCY CONSTRAINTS

CAUTION

This procedure is governed by FCOH procedure 3.1 and is not to be changed in real time without review and approval of the Flight Director or changed permission without review and approval at the FOIG.

**GENERAL**

The payload interrogator (PI) is functionally a ground station that can support a space/ground link system (SGLS), STDN, or deep space network (DSN) spacecraft. Because the orbiter is a spacecraft that can operate in either the STDN/TDRS or SGLS mode, the potential of interference between the orbiter and the PI is very real.

The following is a list of PI channels and corresponding S-band PM frequencies known to be compatible (tables 3.96-1 to 3.96-3). Figure 3.96-1 illustrates the frequency spectrum and shows the frequencies of the PI and S-band PM/FM systems.

The FM system transmits in the exact center of the band and can thus interfere with the PI reception on any PI channel. The interference will be much worse when the FM is on the upper hemi and may be negligible when the FM is on the lower hemi. TV modulation is worse than OPS recorder dumps.

COMPATIBLE PI CHANNELS AND S-BAND FREQUENCIES

PI CHANNEL	S-BAND PM FREQUENCY
001-407	HIGH
408-433	DO NOT USE
434-882	LOW
900-909	HIGH
910-919	LOW

\* Channels 649,650,651,652, and 653 are to be used in Low Power Transmit Mode only.

UNASSIGNED CHANNELS: 000, 802-849

NOTE: When one changes channels, if the PI is ON, it will sweep through the intervening channels as the thumbwheels are turned or as the commands are sent. If the commands are sent from the ground, it is recommended that a two-stage MRTC or SPC (with "times in the past" loaded) be used or that the PI be turned OFF before changing frequency.

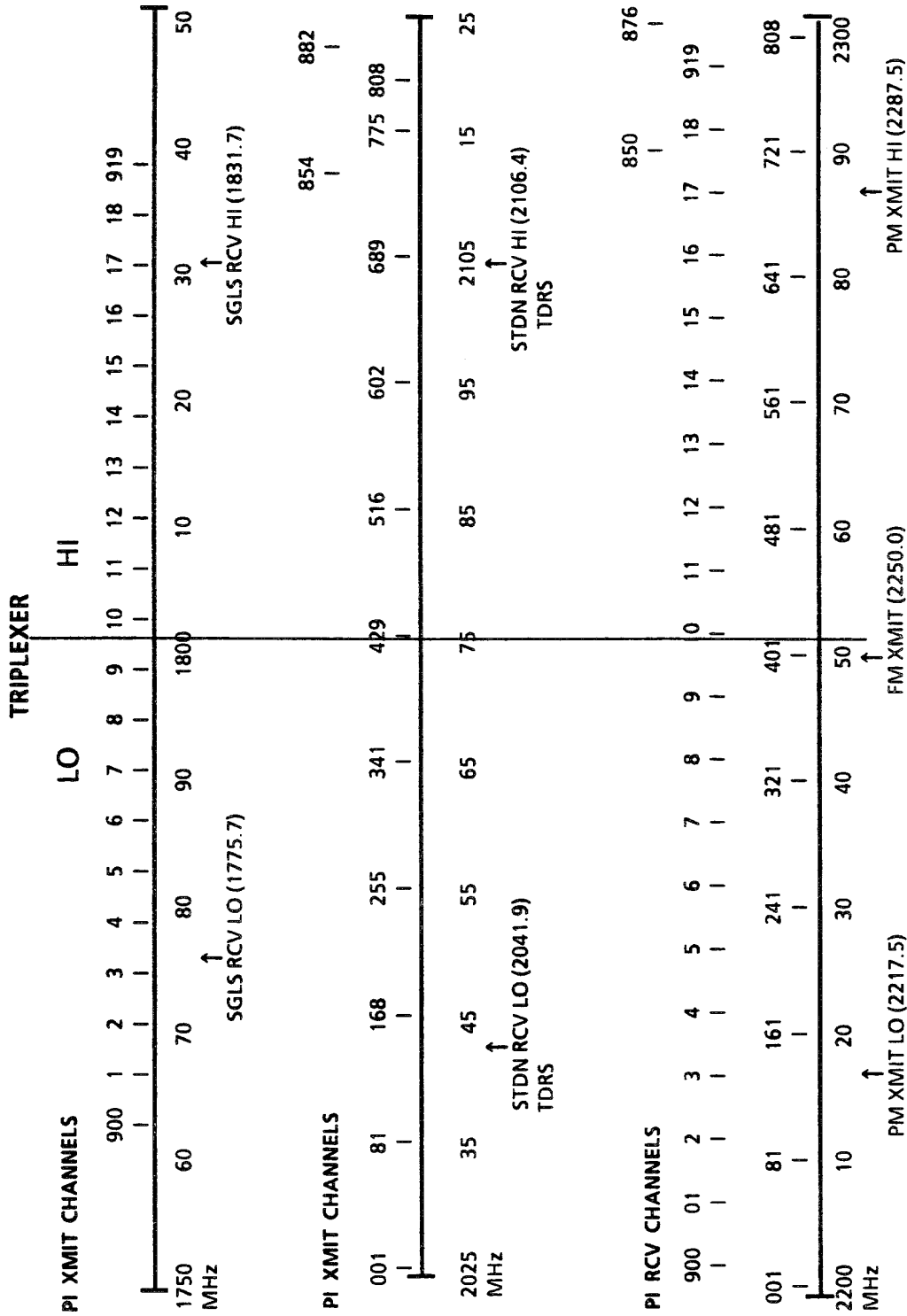


Figure 3.96-1. Space shuttle S-band spectrum

**Table 3.96-1. STDN channel and frequency assignment**

CHANNEL	TRANSMIT 221/240	RECEIVE 0.125 MHz (Intervals)
0	2025.718229	2199.875
1	2025.833400	2200.000
2	2025.948504	2200.125
3	2026.063608	2200.250
4	2026.178712	2200.375
5	2026.293816	2200.500
6	2026.408920	2200.625
7	2026.524024	2200.750
8	2026.639128	2200.875
9	2026.754232	2201.000
10	2026.869336	2201.125
11	2026.984440	2201.250
12	2027.099544	2201.375
13	2027.214648	2201.500
14	2027.329752	2201.625
15	2027.444856	2201.750
16	2027.559960	2201.875
17	2027.675064	2202.000
18	2027.790168	2202.125
19	2027.905272	2202.250
20	2028.020376	2202.375
21	2028.135480	2202.500
22	2028.250584	2202.625
23	2028.365688	2202.750
24	2028.480792	2202.875
25	2028.595896	2203.000
26	2028.711000	2203.125
27	2028.826104	2203.250
28	2028.941208	2203.375
29	2029.056312	2203.500
30	2029.171416	2203.625
31	2029.286520	2203.750
32	2029.401624	2203.875
33	2029.516728	2204.000
34	2029.631832	2204.125
35	2029.746936	2204.250
36	2029.862040	2204.375
37	2029.977144	2204.500
38	2030.092248	2204.625
39	2030.207352	2204.750
40	2030.322456	2204.875
41	2030.437560	2205.000
42	2030.552664	2205.125
43	2030.667768	2205.250
44	2030.782872	2205.375
45	2030.897976	2205.500
46	2031.013080	2205.625
47	2031.128184	2205.750

**Table 3.96-1. STDN channel and frequency assignment (continued)**

CHANNEL	TRANSMIT 221/240	RECEIVE 0.125 MHz (Intervals)
48	2031.243288	2205.875
49	2031.358392	2206.000
50	2031.473496	2206.125
51	2031.588600	2206.250
52	2031.703704	2206.375
53	2031.818808	2206.500
54	2031.933912	2206.625
55	2032.049016	2206.750
56	2032.164120	2206.875
57	2032.279224	2207.000
58	2032.394328	2207.125
59	2032.509432	2207.250
60	2032.624536	2207.375
61	2032.739640	2207.500
62	2032.854744	2207.625
63	2032.969848	2207.750
64	2033.084952	2207.875
65	2033.200056	2208.000
66	2033.315160	2208.125
67	2033.430264	2208.250
68	2033.545368	2208.375
69	2033.660472	2208.500
70	2033.775576	2208.625
71	2033.890680	2208.750
72	2034.005784	2208.875
73	2034.120888	2209.000
74	2034.235992	2209.125
75	2034.351096	2209.250
76	2034.466200	2209.375
77	2034.581304	2209.500
78	2034.696408	2209.625
79	2034.811512	2209.750
80	2034.926616	2209.875
81	2035.041720	2210.000
82	2035.156824	2210.125
83	2035.271928	2210.250
84	2035.387032	2210.375
85	2035.502136	2210.500
86	2035.617240	2210.625
87	2035.732344	2210.750
88	2035.847448	2210.875
89	2035.962552	2211.000
90	2036.077656	2211.125
91	2036.192760	2211.250
92	2036.307864	2211.375
93	2036.422968	2211.500
94	2036.538072	2211.625
95	2036.653176	2211.750

**Table 3.96-1. STDN channel and frequency assignment (continued)**

CHANNEL	TRANSMIT 221/240	RECEIVE 0.125 MHz (Intervals)
96	2036.768280	2211.875
97	2036.883384	2212.000
98	2036.998488	2212.125
99	2037.113592	2212.250
100	2037.228696	2212.375
101	2037.343800	2212.500
102	2037.458904	2212.625
103	2037.574008	2212.750
104	2037.689112	2212.875
105	2037.804216	2213.000
106	2037.919320	2213.125
107	2038.034424	2213.250
108	2038.149528	2213.375
109	2038.264632	2213.500
110	2038.379736	2213.625
111	2038.494840	2213.750
112	2038.609944	2213.875
113	2038.725048	2214.000
114	2038.840152	2214.125
115	2038.955256	2214.250
116	2039.070360	2214.375
117	2039.185464	2214.500
118	2039.300568	2214.625
119	2039.415672	2214.750
120	2039.530776	2214.875
121	2039.645880	2215.000
122	2039.760984	2215.125
123	2039.876088	2215.250
124	2039.991192	2215.375
125	2040.106296	2215.500
126	2040.221400	2215.625
127	2040.336504	2215.750
128	2040.451608	2215.875
129	2040.566712	2216.000
130	2040.681816	2216.125
131	2040.796920	2216.250
132	2040.912024	2216.375
133	2041.027128	2216.500
134	2041.142232	2216.625
135	2041.257336	2216.750
136	2041.372440	2216.875
137	2041.487544	2217.000
138	2041.602648	2217.125
139	2041.717752	2217.250
140	2041.832856	2217.375
*141	2041.947960	2217.500

\*The orbiter S-PM uses these if frequencies in TDRS and STDN LOW FREQ mode.



**Table 3.96-1. STDN channel and frequency assignment (continued)**

CHANNEL	TRANSMIT 221/240	RECEIVE 0.125 MHz (Intervals)
142	2042.063064	2217.625
143	2042.178168	2217.750
144	2042.293272	2217.875
145	2042.408376	2218.000
146	2042.523480	2218.125
147	2042.638584	2218.250
148	2042.753688	2218.375
149	2042.868792	2218.500
150	2042.983896	2218.625
151	2043.099000	2218.750
152	2043.214104	2218.875
153	2043.329208	2219.000
154	2043.444312	2210.125
155	2043.559416	2219.250
156	2043.674520	2219.375
157	2043.789624	2219.500
158	2043.904728	2219.625
159	2044.019832	2219.750
160	2044.134936	2219.875
161	2044.250040	2220.000
162	2044.365144	2220.125
163	2044.480248	2220.250
164	2044.595352	2220.375
165	2044.710456	2220.500
166	2044.825560	2220.625
167	2044.940664	2220.750
168	2045.055768	2220.875
169	2045.170872	2221.000
170	2045.285976	2221.125
171	2045.401080	2221.250
172	2045.516184	2221.375
173	2045.631288	2221.500
174	2045.746392	2221.625
175	2045.861496	2221.750
176	2045.976600	2221.875
177	2046.091704	2222.000
178	2046.206808	2222.125
179	2046.321912	2222.250
180	2046.437016	2222.375
181	2046.552120	2222.500
182	2046.667224	2222.625
183	2046.782328	2222.750
184	2046.897432	2222.875
185	2047.012536	2223.000
186	2047.127640	2223.125
187	2047.242744	2223.250
188	2047.357848	2223.375
189	2047.472952	2223.500

**Table 3.96-1. STDN channel and frequency assignment (continued)**

CHANNEL	TRANSMIT 221/240	RECEIVE 0.125 MHz (Intervals)
190	2047.588056	2223.625
191	2047.703160	2223.750
192	2047.818264	2223.875
193	2047.933368	2224.000
194	2048.048472	2224.125
195	2048.163576	2224.250
196	2048.278680	2224.375
197	2048.393784	2224.500
198	2048.508888	2224.625
199	2048.623992	2224.750
200	2048.739096	2224.875
201	2048.854200	2225.000
202	2048.969304	2225.125
203	2049.084408	2225.250
204	2049.199512	2225.375
205	2049.314616	2225.500
206	2049.429720	2225.625
207	2049.544824	2225.750
208	2049.659928	2225.875
209	2049.775032	2226.000
210	2049.890136	2226.125
211	2050.005240	2226.250
212	2050.120344	2226.375
213	2050.235448	2226.500
214	2050.350552	2226.625
215	2050.465656	2226.750
216	2050.580760	2226.875
217	2050.695864	2227.000
218	2050.810968	2227.125
219	2050.926072	2227.250
220	2051.041176	2227.375
221	2051.156280	2227.500
222	2051.271384	2227.625
223	2051.386488	2227.750
224	2051.501592	2227.875
225	2051.616696	2228.000
226	2051.731800	2228.125
227	2051.846904	2228.250
228	2051.962008	2228.375
229	2052.077112	2228.500
230	2052.192216	2228.625
231	2052.307320	2228.750
232	2052.422424	2228.875
233	2052.537528	2229.000
234	2052.652632	2229.125
235	2052.767736	2229.250
236	2052.882840	2229.375
237	2052.997944	2229.500

**Table 3.96-1. STDN channel and frequency assignment (continued)**

CHANNEL	TRANSMIT 221/240	RECEIVE 0.125 MHz (Intervals)
238	2053.113048	2229.625
239	2053.228152	2229.750
240	2053.343256	2229.875
241	2053.458360	2230.000
242	2053.573464	2230.125
243	2053.688568	2230.250
244	2053.803672	2230.375
245	2053.918776	2230.500
246	2054.033880	2230.625
247	2054.148984	2230.750
248	2054.264088	2230.875
249	2054.379192	2231.000
250	2054.494296	2231.125
251	2054.609400	2231.250
252	2054.724504	2231.375
253	2054.839608	2231.500
254	2054.954712	2231.625
255	2055.069816	2231.750
256	2055.184920	2231.875
257	2055.300024	2232.000
258	2055.415128	2232.125
259	2055.530232	2232.250
260	2055.645336	2232.375
261	2055.760440	2232.500
262	2055.875544	2232.625
263	2055.990648	2232.750
264	2056.105752	2232.875
265	2056.220856	2233.000
266	2056.335960	2233.125
267	2056.451064	2233.250
268	2056.566168	2233.375
269	2056.681272	2233.500
270	2056.796376	2233.625
271	2056.911480	2233.750
272	2057.026584	2233.875
273	2057.141688	2234.000
274	2057.256792	2234.125
275	2057.371896	2234.250
276	2057.487000	2234.375
277	2057.602104	2234.500
278	2057.717208	2234.625
279	2057.832312	2234.750
280	2057.947416	2234.875
281	2058.062520	2235.000
282	2058.177624	2235.125
283	2058.292728	2235.250
284	2058.407832	2235.375
285	2058.522936	2235.500

**Table 3.96-1. STDN channel and frequency assignment (continued)**

CHANNEL	TRANSMIT 221/240	RECEIVE 0.125 MHz (Intervals)
286	2058.638040	2235.625
287	2058.753144	2235.750
288	2058.868248	2235.875
289	2058.983352	2236.000
290	2059.098456	2236.125
291	2059.213560	2236.250
292	2059.328664	2236.375
293	2059.443768	2236.500
294	2059.558872	2236.625
295	2059.673976	2236.750
296	2059.789080	2236.875
297	2059.904184	2237.000
298	2060.019288	2237.125
299	2060.134392	2237.250
300	2060.249496	2237.375
301	2060.364600	2237.500
302	2060.479704	2237.625
303	2060.594808	2237.750
304	2060.709912	2237.875
305	2060.825016	2238.000
306	2060.940120	2238.125
307	2061.055224	2238.250
308	2061.170328	2238.375
309	2061.285432	2238.500
310	2061.400536	2238.625
311	2061.515640	2238.750
312	2061.630744	2238.875
313	2061.745848	2239.000
314	2061.860952	2239.125
315	2061.976056	2239.250
316	2062.091160	2239.375
317	2062.206264	2239.500
318	2062.321368	2239.625
319	2062.436472	2239.750
320	2062.551576	2239.875
321	2062.666680	2240.000
322	2062.781784	2240.125
323	2062.896888	2240.250
324	2063.011992	2240.375
325	2063.127096	2240.500
326	2063.242200	2240.625
327	2063.357304	2240.750
328	2063.472408	2240.875
329	2063.587512	2241.000
330	2063.702616	2241.125
331	2063.817720	2241.250
332	2063.932824	2241.375
333	2064.047928	2241.500

**Table 3.96-1. STDN channel and frequency assignment (continued)**

CHANNEL	TRANSMIT 221/240	RECEIVE 0.125 MHz (Intervals)
334	2064.163032	2241.625
335	2064.278136	2241.750
336	2064.393240	2241.875
337	2064.508344	2242.000
338	2064.623448	2242.125
339	2064.738552	2242.250
340	2064.853656	2242.375
341	2064.968760	2242.500
342	2065.083864	2242.625
343	2065.198968	2242.750
344	2065.314072	2242.875
345	2065.429176	2243.000
346	2065.544280	2243.125
347	2065.659384	2243.250
348	2065.774488	2243.375
349	2065.889592	2243.500
350	2066.004696	2243.625
351	2066.119800	2243.750
352	2066.234904	2243.875
353	2066.350008	2244.000
354	2066.465112	2244.125
355	2066.580216	2244.250
356	2066.695320	2244.375
357	2066.810424	2244.500
358	2066.925528	2244.625
359	2067.040632	2244.750
360	2067.155736	2244.875
361	2067.270840	2245.000
362	2067.385944	2245.125
363	2067.501048	2245.250
364	2067.616152	2245.375
365	2067.731256	2245.500
366	2067.846360	2245.625
367	2067.961464	2245.750
368	2068.076568	2245.875
369	2068.191672	2246.000
370	2068.306776	2246.125
371	2068.421880	2246.250
372	2068.536984	2246.375
373	2068.652088	2246.500
374	2068.767192	2246.625
375	2068.882296	2246.750
376	2068.997400	2246.875
377	2069.112504	2247.000
378	2069.227608	2247.125
379	2069.342712	2247.250
380	2069.457816	2247.375
381	2069.572920	2247.500

**Table 3.96-1. STDN channel and frequency assignment (continued)**

CHANNEL	TRANSMIT 221/240	RECEIVE 0.125 MHz (Intervals)
382	2069.688024	2247.625
383	2069.803128	2247.750
384	2069.918232	2247.875
385	2070.033336	2248.000
386	2070.148440	2248.125
387	2070.263544	2248.250
388	2070.378648	2248.375
389	2070.493752	2248.500
390	2070.608856	2248.625
391	2070.723960	2248.750
392	2070.839064	2248.875
393	2070.954168	2249.000
394	2071.069272	2249.125
395	2071.184376	2249.250
396	2071.299480	2249.375
397	2071.414584	2249.500
398	2071.529688	2249.625
399	2071.644792	2249.750
400	2071.759896	2249.875
*401	2071.875000	2250.000
402	2071.990104	2250.125
403	2072.105208	2250.250
404	2072.220312	2250.375
405	2072.335416	2250.500
406	2072.450520	2250.625
407	2072.565624	2250.750
408	2072.680728	2250.875
409	2072.795832	2251.000
410	2072.910936	2251.125
411	2073.026040	2251.250
412	2073.141144	2251.375
413	2073.256248	2251.500
414	2073.371352	2251.625
415	2073.486456	2251.750
416	2073.601560	2251.875
417	2073.716664	2252.000
418	2073.831768	2252.125
419	2073.946872	2252.250
420	2074.061976	2252.375
421	2074.177080	2252.500
422	2074.292184	2252.625
423	2074.407288	2252.750
424	2074.522392	2252.875
425	2074.637496	2253.000
426	2074.752600	2253.125
427	2074.867704	2253.250

\*The orbiter S-FM transmits on this PI receive frequency.

**Table 3.96-1. STDN channel and frequency assignment (continued)**

CHANNEL	TRANSMIT 221/240	RECEIVE 0.125 MHz (Intervals)
428	2074.982808	2253.375
429	2075.097912	2253.500
430	2075.213016	2253.625
431	2075.328120	2253.750
432	2075.443224	2253.875
433	2075.558328	2254.000
434	2075.673432	2254.125
435	2075.788536	2254.250
436	2075.903640	2254.375
437	2076.018744	2254.500
438	2076.133848	2254.625
439	2076.248952	2254.750
440	2076.364056	2254.875
441	2076.479160	2255.000
442	2076.594264	2255.125
443	2076.709368	2255.250
444	2076.824472	2255.375
445	2076.939576	2255.500
446	2077.054680	2255.625
447	2077.169784	2255.750
448	2077.284888	2255.875
449	2077.399992	2256.000
450	2077.515096	2256.125
451	2077.630200	2256.250
452	2077.745304	2256.375
453	2077.860408	2256.500
454	2077.975512	2256.625
455	2078.090616	2256.750
456	2078.205720	2256.875
457	2078.320824	2257.000
458	2078.435928	2257.125
459	2078.551032	2257.250
460	2078.666136	2257.375
461	2078.781240	2257.500
462	2078.896344	2257.625
463	2079.011448	2257.750
464	2079.126552	2257.875
465	2079.241656	2258.000
466	2079.356760	2258.125
467	2079.471864	2258.250
468	2079.586968	2258.375
469	2079.702072	2258.500
470	2079.817176	2258.625
471	2079.932280	2258.750
472	2080.047384	2258.875
473	2080.162488	2259.000
474	2080.277592	2259.125
475	2080.392696	2259.250

**Table 3.96-1. STDN channel and frequency assignment (continued)**

CHANNEL	TRANSMIT 221/240	RECEIVE 0.125 MHz (Intervals)
476	2080.507800	2259.375
477	2080.622904	2259.500
478	2080.738008	2259.625
479	2080.853112	2259.750
480	2080.968216	2259.875
481	2081.083320	2260.000
482	2081.198424	2260.125
483	2081.313528	2260.250
484	2081.428632	2260.375
485	2081.543736	2260.500
486	2081.658840	2260.625
487	2081.773944	2260.750
488	2081.889048	2260.875
489	2082.004152	2261.000
490	2082.119256	2261.125
491	2082.234360	2261.250
492	2082.349464	2261.375
493	2082.464568	2261.500
494	2082.579672	2261.625
495	2082.694776	2261.750
496	2082.809880	2261.875
497	2082.924984	2262.000
498	2083.040088	2262.125
499	2083.155192	2262.250
500	2083.270296	2262.375
501	2083.385400	2262.500
502	2083.500504	2262.625
503	2083.615608	2262.750
504	2083.730712	2262.875
505	2083.845816	2263.000
506	2083.960920	2263.125
507	2084.076024	2263.250
508	2084.191128	2263.375
509	2084.306232	2263.500
510	2084.421336	2263.625
511	2084.536440	2263.750
512	2084.651544	2263.875
513	2084.766648	2264.000
514	2084.881752	2264.125
515	2084.996856	2264.250
516	2085.111960	2264.375
517	2085.227064	2264.500
518	2085.342168	2264.625
519	2085.457272	2264.750
520	2085.572376	2264.875
521	2085.687480	2265.000
522	2085.802584	2265.125
523	2085.917688	2265.250



**Table 3.96-1. STDN channel and frequency assignment (continued)**

CHANNEL	TRANSMIT 221/240	RECEIVE 0.125 MHz (Intervals)
524	2086.032792	2265.375
525	2086.147896	2265.500
526	2086.263000	2265.625
527	2086.378104	2265.750
528	2086.493208	2265.875
529	2086.608312	2266.000
530	2086.723416	2266.125
531	2086.838520	2266.250
532	2086.953624	2266.375
533	2087.068728	2266.500
534	2087.183832	2266.625
535	2087.298936	2266.750
536	2087.414040	2266.875
537	2087.529144	2267.000
538	2087.644248	2267.125
539	2087.759352	2267.250
540	2087.874456	2267.375
541	2087.989560	2267.500
542	2088.104664	2267.625
543	2088.219768	2267.750
544	2088.334872	2267.875
545	2088.449976	2268.000
546	2088.565080	2268.125
547	2088.680184	2268.250
548	2088.795288	2268.375
549	2088.910392	2268.500
550	2089.025496	2268.625
551	2089.140600	2268.750
552	2089.255704	2268.875
553	2089.370808	2269.000
554	2089.485912	2269.125
555	2089.601016	2269.250
556	2089.716120	2269.375
557	2089.831224	2269.500
558	2089.946328	2269.625
559	2090.061432	2269.750
560	2090.176536	2269.875
561	2090.291640	2270.000
562	2090.406744	2270.125
563	2090.521848	2270.250
564	2090.636952	2270.375
565	2090.752056	2270.500
566	2090.867160	2270.625
567	2090.982264	2270.750
568	2091.097368	2270.875
569	2091.212472	2271.000
570	2091.327576	2271.125
571	2091.442680	2271.250

**Table 3.96-1. STDN channel and frequency assignment (continued)**

CHANNEL	TRANSMIT 221/240	RECEIVE 0.125 MHz (Intervals)
572	2091.557784	2271.375
573	2091.672888	2271.500
574	2091.787992	2271.625
575	2091.903096	2271.750
576	2092.018200	2271.875
577	2092.133304	2272.000
578	2092.248408	2272.125
579	2092.363512	2272.250
580	2092.478616	2272.375
581	2092.593720	2272.500
582	2092.708824	2272.625
583	2092.823928	2272.750
584	2092.939032	2272.875
585	2093.054136	2273.000
586	2093.169240	2273.125
587	2093.284344	2273.250
588	2093.399448	2273.375
589	5093.514552	2273.500
590	2093.629656	2273.625
591	2093.744760	2273.750
592	2093.859864	2273.875
593	2093.974968	2274.000
594	2094.090072	2274.125
595	2094.205176	2274.250
596	2094.320280	2274.375
597	2094.435384	2274.500
598	2094.550488	2274.625
599	2094.665592	2274.750
600	2094.780696	2274.875
601	2094.895800	2275.000
602	2095.010904	2275.125
603	2095.126008	2275.250
604	2095.241112	2275.375
605	2095.356216	2275.500
606	2095.471320	2275.625
607	2095.586424	2275.750
608	2095.701528	2275.875
609	2095.816632	2276.000
610	2095.931736	2276.125
611	2096.046840	2276.250
612	2096.161944	2276.375
613	2096.277048	2276.500
614	2096.392152	2276.625
615	2096.507256	2276.750
616	2096.622360	2276.875
617	2096.737464	2277.000
618	2096.852568	2277.125
619	2096.967672	2277.250

**Table 3.96-1. STDN channel and frequency assignment (continued)**

CHANNEL	TRANSMIT 221/240	RECEIVE 0.125 MHz (Intervals)
620	2097.082776	2277.375
621	2097.197880	2277.500
622	2097.312984	2277.625
623	2097.428088	2477.750
624	2097.543192	2277.875
625	2097.658296	2278.000
626	2097.773400	2278.125
627	2097.888504	2278.250
628	2098.003608	2278.375
629	2098.118712	2278.500
630	2098.233816	2278.625
631	2098.348920	2278.750
632	2098.464024	2278.875
633	2098.579128	2279.000
634	2098.694232	2279.125
635	2098.809336	2279.250
636	2098.924440	2279.375
637	2099.039544	2279.500
638	2099.154648	2279.625
639	2099.269752	2279.750
640	2099.384856	2279.875
641	2099.499960	2280.000
642	2099.615064	2280.125
643	2099.730168	2280.250
644	2099.845272	2280.375
645	2099.960376	2280.500
646	2100.075480	2280.625
647	2100.190584	2280.750
648	2100.305688	2280.875
*649	2100.420792	2281.000
*650	2100.535896	2281.125
*651	2100.651000	2281.250
*652	2100.766104	2281.375
*653	2100.881208	2281.500
654	2100.996312	2281.625
655	2101.111416	2281.750
656	2101.226520	2281.875
657	2101.341624	2282.000
658	2101.456728	2282.125
659	2101.571832	2282.250
660	2101.686936	2282.375
661	2101.802040	2282.500
662	2101.917144	2282.625
663	2102.032248	2282.750
664	2102.147352	2282.875

\*Channels 649, 650, 651, 652, and 653 are to be used in the Low-Power Transmit Mode only. Use of these channels in High-Power Transmit Mode will cause the PI to lock on itself.

**Table 3.96-1. STDN channel and frequency assignment (continued)**

CHANNEL	TRANSMIT 221/240	RECEIVE 0.125 MHz (Intervals)
665	2102.262456	2283.000
666	2102.377560	2283.125
667	2102.492664	2283.250
668	2102.607768	2283.375
669	2102.722872	2283.500
670	2102.837976	2283.625
671	2102.953080	2283.750
672	2103.068184	2283.875
673	2103.183288	2284.000
674	2103.298392	2284.125
675	2103.413496	2284.250
676	2103.528600	2284.375
677	2103.643704	2284.500
678	2103.758808	2284.625
679	2103.873912	2284.750
680	2103.989016	2284.875
681	2104.104120	2285.000
682	2104.219224	2285.125
683	2104.334328	2285.250
684	2104.449432	2285.375
685	2104.564536	2285.500
686	2104.679640	2285.625
687	2104.794744	2285.750
688	2104.909848	2285.875
689	2105.024952	2286.000
690	2105.140056	2286.125
691	2105.255160	2286.250
692	2105.370264	2286.375
693	2105.485368	2286.500
694	2105.600472	2286.625
695	2105.715576	2286.750
696	2105.830680	2286.875
697	2105.945784	2287.000
698	2106.060888	2287.125
699	2106.175992	2287.250
700	2106.291096	2287.375
*701	2106.406200	2287.500
702	2106.521304	2287.625
703	2106.636408	2287.750
704	2106.751512	2287.875
705	2106.866616	2288.000
706	2106.981720	2288.125
707	2107.096824	2288.250
708	2107.211928	2288.375
709	2107.327032	2288.500
710	2107.442136	2288.625

\*The orbiter S-PM uses these frequencies in TDRS and STDN HIGH FREQ mode.

**Table 3.96-1. STDN channel and frequency assignment (continued)**

CHANNEL	TRANSMIT 221/240	RECEIVE 0.125 MHz (Intervals)
711	2107.557240	2288.750
712	2107.672344	2288.875
713	2107.787448	2289.000
714	2107.902552	2289.125
715	2108.017656	2289.250
716	2108.132760	2289.375
717	2108.247864	2289.500
718	2108.362968	2289.625
719	2108.478072	2289.750
720	2108.593176	2289.875
721	2108.708280	2290.000
722	2108.823384	2290.125
723	2108.938488	2290.250
724	2109.053592	2290.375
725	2109.168696	2290.500
726	2109.283800	2290.625
727	2109.398904	2290.750
728	2109.514008	2290.875
729	2109.629112	2291.000
730	2109.744216	2291.125
731	2109.859320	2291.250
732	2109.974424	2291.375
733	2110.089528	2291.500
734	2110.204632	2291.625
735	2110.319736	2291.750
736	2110.434840	2291.875
737	2110.549944	2292.000
738	2110.665048	2292.125
739	2110.780152	2292.250
740	2110.895256	2292.375
741	2111.010360	2292.500
742	2111.125464	2292.625
743	2111.240568	2292.750
744	2111.355672	2292.875
745	2111.470776	2293.000
746	2111.585880	2293.125
747	2111.700984	2293.250
748	2111.816088	2293.375
749	2111.931192	2293.500
750	2112.046296	2293.625
751	2112.161400	2293.750
752	2112.276504	2293.875
753	2112.391608	2294.000
754	2112.506712	2294.125
755	2112.621816	2294.250
756	2112.736920	2294.375
757	2112.852024	2294.500
758	2112.967128	2294.625

**Table 3.96-1. STDN channel and frequency assignment (continued)**

CHANNEL	TRANSMIT 221/240	RECEIVE 0.125 MHz (Intervals)
759	2113.082232	2294.750
760	2113.197336	2294.875
761	2113.312440	2295.000
762	2113.427544	2295.125
763	2113.542648	2295.250
764	2113.657752	2295.375
765	2113.772856	2295.500
766	2113.887960	2295.625
767	2114.003064	2295.750
768	2114.118168	2295.875
769	2114.233272	2296.000
770	2114.348376	2296.125
771	2114.463480	2296.250
772	2114.578584	2296.375
773	2114.693688	2296.500
774	2114.808792	2296.625
775	2114.923896	2296.750
776	2115.039000	2296.875
777	2115.154104	2297.000
778	2115.269208	2297.125
779	2115.384312	2297.250
780	2115.499416	2297.375
781	2115.614520	2297.500
782	2115.729624	2297.625
783	2115.844728	2297.750
784	2115.959832	2297.875
785	2116.074936	2298.000
786	2116.190040	2298.125
787	2116.305144	2298.250
788	2116.420248	2298.375
789	2116.535352	2298.500
790	2116.650456	2298.625
791	2116.765560	2298.750
792	2116.880664	2298.875
793	2116.995768	2299.000
794	2117.110872	2299.125
795	2117.225976	2299.250
796	2117.341080	2299.375
797	2117.456184	2299.500
798	2117.571288	2299.625
799	2117.686392	2299.750
800	2117.801496	2299.875
801	2117.916600	2300.000
802	2118.031704	2300.125
803	2118.146808	2300.250
804	2118.261912	2300.375
805	2118.377016	2300.500
806	2118.492120	2300.625

**Table 3.96-1. STDN channel and frequency assignment (continued)**

CHANNEL	TRANSMIT 221/240	RECEIVE 0.125 MHz (Intervals)
807	2118.607291	2300.750
808	2118.722396	2300.875
809	2118.837500	2301.000
810	2118.952604	2301.125

Transmit/Receive frequencies for channels 811-848  
are random and therefore should not be used.

**Table 3.96-2. NASA/DSN channel and frequency assignments**

Channel	Transmit, MHz	Receive, MHz
849	2108.537808	2289.814814
*850		2290.185185
*851		2290.555556
*852		2290.925926
*853		2291.296296
854	2110.243056	2291.666667
855	2110.584105	2292.037037
856	2110.925154	2292.407407
857	2111.266204	2292.777778
858	2111.607253	2293.148148
859	2111.948303	2293.518519
860	2112.289352	2293.888889
861	2112.630401	2294.259259
862	2112.971451	2294.629630
863	2113.312500	2295.000000
864	2113.653549	2295.370370
865	2113.994599	2295.740741
866	2114.335648	2296.111111
867	2114.676697	2296.481481
868	2115.017747	2296.851852
869	2115.358796	2297.222222
870	2115.699846	2297.592593
871	2116.040895	2297.962963
872	2116.381944	2298.333333
873	2116.722994	2298.703704
874	2117.064043	2299.074074
875	2117.405092	2299.444444
876	2117.746142	2299.814815
877	2118.087191	2300.186018
878	2118.428241	2300.556389
879	2118.769290	2300.926759
880	2119.110339	2301.297129
881	2119.451389	2301.667500
882	2119.792438	2302.037871
883	2120.133487	2302.408241

Transmit/receive ratio: 205/256

\*Channels 850, 851, 852, and 853 are TX "Inhibit" channels, and produce 3.2 mW transmit power maximum, "0 output" minimum.

Transmit/receive frequencies for channels 884-898 are random and therefore should not be used.



**Table 3.96-3. DOD/SGLS channel and frequency assignments**

Channel	Transmit Orbiter to DOD Payloads, MHz (4.004 MHz Intervals)	Receive DOD Payloads To Orbiter, MHz (5 MHz Intervals)
899	1759.717	1197.500
900	1763.721	2202.500
901	1767.725	2207.500
902	1771.729	2212.500
*903	1775.733	2217.500
904	1779.736	2222.500
905	1783.740	2227.500
906	1787.744	2232.500
907	1791.748	2237.500
908	1795.752	2242.500
909	1799.756	2247.500
910	1803.760	2252.500
911	1807.764	2257.500
912	1811.768	2262.500
913	1815.772	2267.500
914	1819.775	2272.500
915	1823.779	2277.500
916	1827.783	2282.500
**917	1831.787	2287.500
918	1835.791	2292.500
919	1839.795	2297.500
920	1843.799	2302.500

Transmit/receive ratio: 205/256

Transmit/receive frequencies for channels 921-999 are random and therefore should not be used.

\*The orbiter S-PM uses these frequencies in SGLS LOW FREQ mode.

\*\*The orbiter S-FM uses these frequencies in SGLS HIGH FREQ mode.

**TITLE**

THERMAL PARAMETERS

**GENERAL**

The following is a summary of those temperature limits and operating limits relevant to INCO. LRU's that are not listed either have no known usage limit (assuming nominal cooling system operation) and/or are not instrumented with temperature sensors.

Parameter	MSID	Minimum operating temp, °F	Maximum operating temp, °F
Ops 1 Temp	V75T2517A	40	120 <sup>a</sup>
Ops 2 Temp	V75T2617A	40	120 <sup>a</sup>
PLR Temp	V75T2717A	40	120 <sup>a</sup>

<sup>a</sup>SODB limit = 127° F - 7° F transducer error = 120° F.

1. Class 0 (↑↓) indication appears on "S76 COMM" (recorders Ops 1, Ops 2, PL temp) for ≥115° F. There is no SM alert.
2. Actual degradation is not catastrophic. 140° F temperature is the bite trip level.
3. At upper temperature limits, tape lifetime is shortened. Tape speeds above 60 ips should be avoided
4. ACTION: Reduce recorder usage at 115° F. Stop the recorder at 120° F.

Parameter	MSID	Minimum operating temp, °F	Maximum operating temp, °F
TVC Ovtemp	V74X0847E	32	113c

<sup>c</sup>Video degradation may occur beginning at 113°. Some hardware damage may occur at 130° F.

1. Class 3 SM Alert "S76 COMM" message occurs for any television camera (TVC) sensed at <sup>3</sup>113° F by VSU (synchronous mode). Crew sees CAM OVERTEMP = YES on S76 COMM.
2. Ground will see temperature flash on monitor.
3. ACTION: Power off camera at 113° F. Crew will probably be required to power off cabin cameras due to switch configuration.
4. Camera heaters maintain a minimum temperature of 39° F. Minimum nonoperating temperature = -4° F.

Parameter	MSID	Minimum operating temp, °F	Maximum operating temp, °F
MADS Shelf Temp 1 (PCMU)	V78T9606A	20	140
MADS Shelf Temp 2 (WB)	V78T9607A	20	140
<ol style="list-style-type: none"> <li>1. Strain gauge duty cycling can be used for temperature control.</li> <li>2. Exceeding maximum temperature can result in component damage.</li> <li>3. A shelf temperature of 100° F is required at entry initiation to ensure no overheating.</li> <li>4. <u>ACTION</u>: Turn off/on strain gauge signal conditioners (SGSC's) or WB/PCM as required to stay within limits.</li> </ol>			

Parameter	MSID	Minimum operating temp, °F	Maximum operating temp, °F
S-Band Power Amp Collector 1	V74T4514A	35	230 <sup>a</sup>
S-Band Power Amp Collector 2	V74T4515A	35	230
<p><sup>a</sup>Except for TWT 1 in serial number 307 (on OV103), power amplifier assembly where the maximum collector temperature is 260° F due to the sensor location.</p> <ol style="list-style-type: none"> <li>1. Class 3 SM alert "S76 PA 2(1) TEMP" message occurs for temperatures exceeding 260°.</li> <li>2. The onboard software limits must be reset to 230° by TMBU in order to reflect acceptable operating limits. The exception to this is when TWT 1 serial number 307 power amplifier assembly is manifested.</li> </ol>			

System	MSID	Minimum operating temp, °F	Maximum operating temp, °F
EVA/ATC XCEIVER	N/A	N/A	120
<p>There is no limit on continuous transmitter (XMTR) use with proper cooling.</p>			

Parameter	MSID	Minimum survival temp, °F	Minimum turn on temp, °F	Minimum operating temp, °F	Maximum operating temp, °F	Maximum survival temp, °F
DEA XMTR	V74T2497A	-60	5	5	171	195
DEA RCVR	V74T2961A	-60	5	5	156	195
A-AXIS GIMBAL	V74T2965A	-60	-60	5	150	180
B-AXIS GIMBAL	V74T2969A	-60	-60	5	166	180
ANTENNA FEED	V74T2963A	-60	-60	5	186	245
GYRO PACK	V74T2967A	-60	-30	5	155	180

1. Class 3 SM Alert "S76 COMM" message occurs for either XMTR >171° F, GMBL A >150° F, or GMBL B >166° F.
2. Power off the system (SM Alert) or go to STANDBY as appropriate to limit high temperatures. Antenna heater circuit breaker can be opened if required.
3. Measurement accuracy of 1.7 percent full scale (5° F) is factored into these numbers.

## TITLE

S-BAND REAL-TIME DOWNLINK DATA RECOVERY USING FM SYSTEM

### CAUTION

This procedure is governed by FCOH procedure 3.1 and is not to be changed in real time without review and approval of the Flight Director or changed permission without review and approval at the FOIG.

## GENERAL

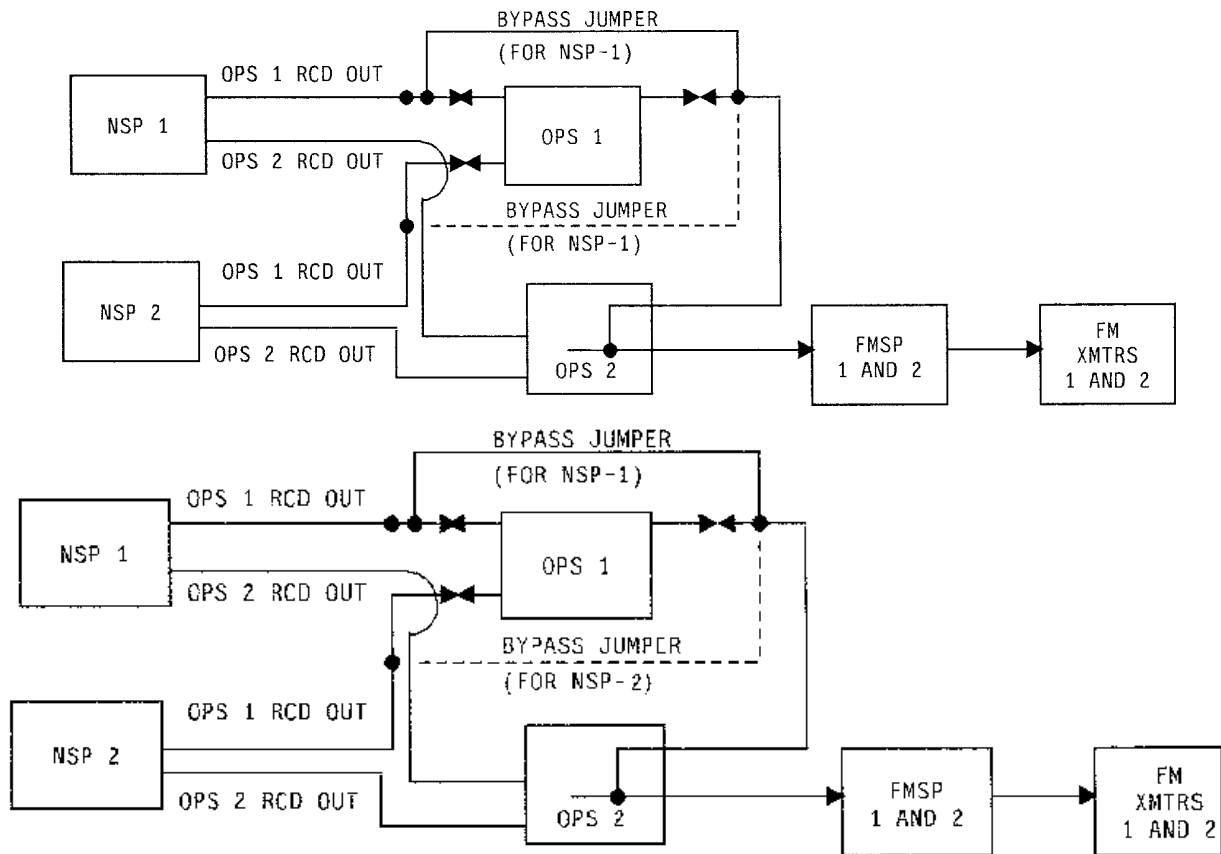
Two in-flight maintenance (IFM) procedures exist to recover the S-band downlink for the STDN using the FM signal processor and FM transmitter, one for vehicles with OPS Recorders installed and one for vehicles with SSRs installed. Use of one of these procedures would be considered if transponder downlink capability had failed. It results in loss of the OPS 1 recorder and requires that different NSP's be used for real-time and recorder dump modes if OPS recorders are flown. If SSR's are flown, it results in the loss of one SSR (either one can be bypassed) and only requires that FM modes be changed to switch between real-time data and recorder dumps. In both procedures, NSP real-time data will not be downlinked while a recorder dump is taking place.

## COMMAND RESTRICTIONS/CONSTRAINTS

1. These commands are valid in all major modes and all OPS modes.
2. Vehicle, LRU/hardware version constraints: The appropriate IFM to be worked and corresponding MCC actions depend on whether OPS recorders or SSRs are installed on board
3. Time constraints, crew coordination requirements: After the IFM is completed, commands must be executed exactly as outlined in this SCP.

## PROCEDURE FOR OPS RECORDERS

- A. INCO should confirm (via other procedures) that one or both transponders have lost downlink capability, and that the IFM procedure should be performed.
- B. Request that the crew implement the IFM (2 hours estimated), and specify which NSP to select.
- C. The IFM procedure has the crew install a jumper from the input connector of the OPS 1 recorder to the output connector of the OPS 1 recorder. This jumper places the selected NSP recorder output (now used for real-time data) in parallel with the OPS 2 recorder dump data output. The NSP now providing real-time data is selectable in the IFM procedure. The recorder is not selectable.



D. In order to dump the OPS 2 recorder, the NSP's will have to be switched to avoid interference. Assuming that NSP 1 is selected for real-time data (as shown above with a solid line for the bypass jumper), the following procedure can be used:

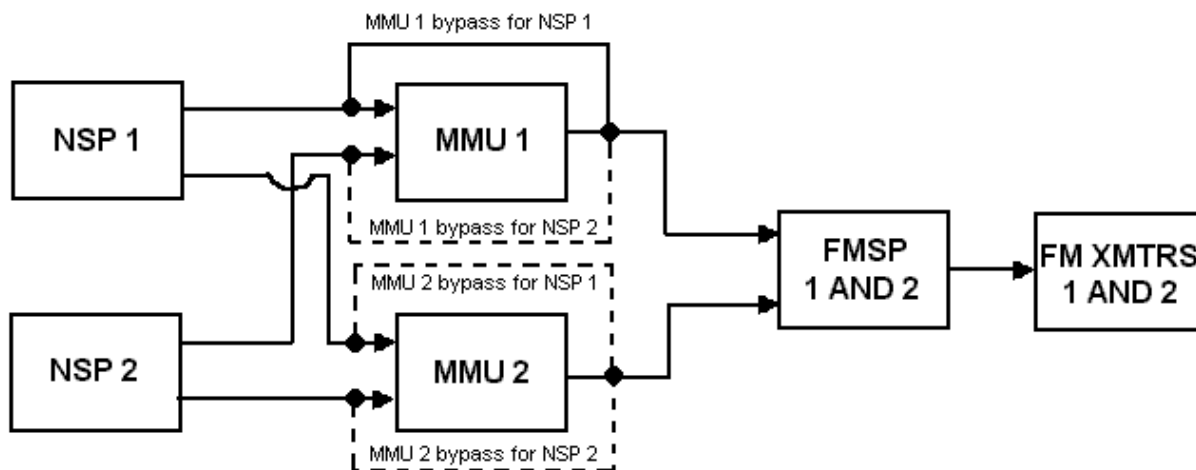
1. At AOS verify: NSP 1 - ON  
OPS 2 - RCD
2. Verify good real-time data via FM (assumes one or both transponder downlinks have been lost).
3. To begin the dump:  
 CMD OPS 2 STOP (4451)  
 CMD OPS 2 SPEED 2 (4427)  
 CMD NSP 2 ON (lose real-time data) (4762)  
 CMD OPS 2 PB SERIAL (4454-FWD)  
 (4453-REV)
4. Verify good dump data.
5. When dump complete:  
 CMD OPS 2 STOP (4451)  
 CMD NSP 1 ON (regain real-time data) (4760)

CMD SPEED IF REQUIRED  
CMD OPS 2 RCD SERIAL (4452 NO VOICE)  
(4450 WITH VOICE)

- E. If NSP's cannot be switched during crew sleep periods (because of the SM 'BCE STRG X' message and alert), it is advisable to operate with only dump data available.

### PROCEDURE FOR SOLID STATE RECORDERS

- A. INCO should confirm (via other procedures) that one or both transponders have lost downlink capability, and that the IFM procedure should be performed.
- B. Request that the crew implement the IFM (2 hours estimated), and specify which NSP to select and which MMU(SSR) to bypass.
- C. The IFM procedure has the crew install a jumper from the input connector of either SSR to the output connector of the SSR. This jumper connects the selected NSP's recorder output (now used for real-time data) to the selected SSR's FM dump data output. Select the FM source for the bypassed SSR, and realtime telemetry will be downlinked at AOS



- D. In order to dump the SSR that is not bypassed, select the FM source for that SSR and begin the dump. Real-time data will be lost when the FM source is changed to the other SSR. Assuming that NSP 1 is selected to downlink real-time data by bypassing MMU1 (as shown above with a solid line for the bypass jumper), the following procedure can be used:
  1. At AOS verify: NSP 1 –ON  
FM DATA MODE –SSR 1
  2. Verify good real-time data via FM (assumes one or both transponder downlinks have been lost).
  3. To begin the dump:  
CMD FM MMU 2 (lose real-time data) (4727)  
CMD SSR 2 PBQ 1024 (assumes all ques are defined at 1024 kbps) (9315)
  4. Verify good dump data.

5. When dump complete:

CMD FM MMU 1 (regain real-time data) (4728)



## TITLE

INTEGRATED LOAD CHECKOUT (ILC) SUPPORT PROCEDURE AND SHUTTLE MISSION  
SIMULATOR (SMS) - MCC LOAD CHECKOUT

## PURPOSE

To define a standard set of procedures for performing the ILC and SMS-MCC load checkout.

## GENERAL INFORMATION

The ILC is used to check out new MOC, workstation and SMS loads. The purpose of the test is to verify that the data pack inputs, new parameters, telemetry format loads (TFLs), decom format loads (DFLs), commands, workstation tools, and onboard software have been incorporated correctly. There is a form at the end of this procedure that should be copied and filled out for each ILC performed.

## PROCEDURE

- A. Verify the telemetry displays and computations
  - 1. Call up each display from DNAV and verify that the correct data is shown.
  - 2. Write anomaly reports (ARs) for all problems found. Make copies of the ARs for the lead INCO and workstation group administrator (GA). Turn in the originals to the ground controller (GC) in the white FCR.
- B. Verify Command
  - 1. Check both the hardware and software command panels for proper configuration for flight.
  - 2. Verify the uplink by sending representative commands as time permits.
  - 3. Verify that the two-stage uplink works properly by uplinking a load. Check the uplink verify displays.
  - 4. Verify any new command types or op codes by uplinking those commands.
  - 5. Write ARs as required. Make copies for the lead INCO and the GA.
- C. Verify TFL/DFL and PSP/PI configurations
  - 1. Build and uplink the TFLs for the flight. Verify the telemetry to show that the TFLs function correctly.
  - 2. Verify proper operations of the PSP and PI configurations.
  - 3. Build and uplink the DFLs for the flight. Verify with the customer that the DFLs are processing the data correctly.
  - 4. Verify proper rendezvous RADAR operations (if required for flight).
  - 5. Write ARs as required. Make copies for the lead INCO and the GA.
- D. Verify /checkout SMS/NSS updates as required by the training team.

How to use the checkout form

This form is to be used to help INCO and the backroom with an SMS-MCC load checkout. The major areas covered are:

- Console software configuration
- Orbiter (SMS and onboard software)
- Ground processing software
- Payload configuration

If any problems are observed, place a note with a number beside the appropriate line and write up a detailed description on another sheet of paper.

FLIGHT # \_\_\_\_\_ Vehicle # \_\_\_\_\_ Load # \_\_\_\_\_ Runs ASC \_\_\_\_\_  
 Workstation # \_\_\_\_\_ Date \_\_\_/\_\_\_/\_\_\_ ORB \_\_\_\_\_  
 ENT \_\_\_\_\_

Orbiter displays

Name	✓	Name	✓	Name	✓	Name	✓
comm mgmt		recorder mgmt		command		oimon2_status	
inco mgmt		bfs nsp		fm config		oimon2	
inst mgmt		a/e event		ku comm		ptc	
A/E comm mgmt		gnc nsp		ku radar		dsc_lcc	
A/E inco mgmt		nsp config		ku mech		oiu	
A/E inst mgmt		comsec		radar comm		ssor	
antman(WAMS)		cctv		power amp		pirt	
sb antenna		stdn antenna		transponder		elog	
tdrs comm		cmd error		bio med		rt plot	
dsc status		mads/oex		raw data		plr mgmt	
mdm dsc		pdi		psp		ops 2 mgmt	
pi		comm bypass		comm event		ops 1 mgmt	
pcmmu event		alpha beta		world map		bfs_ant	
gcil_bit		dump report					

Command Server displays

Name	✓	Name	✓
cmd trk history		uplink verify	
rf_cmd_build		inst_cmd_build	
cmd buffers			

Cmd Panel Configs

Name	✓
Ascent/Entry	
Orbit	

Command Type	✓	Command Type	✓
general payload		TFL	
RTCs		DFL	
MSPC		TMBU (BFS)	
SPC		TMBU (SM)	
TEC		TDRS State Vec.	
PSP config		Orb State Vector	

Down List windows	✓
OI	
BFS	
SM	
GNC	
PDI decom 1	
PDI decom 2	
PDI decom 3	
PDI decom 4	

What TFLs were checked?

What DFL/FPMs were checked?

TFL	✓	TFL	✓
129		161	
102		103	

DCM	FMT	SRC	✓	DCM	FMT	SRC	✓
1				1			
2				2			
3				3			
4				4			
FPM				FPM			

Which PI channels were tested?

PI 1				
PI 2				

Which PSP configurations were tested?

Config #					
Status Word 1					
2					
3					
Frame sync 1					
2					

Which downlist formats were seen?

SM	✓	GNC	✓	BFS	✓
24		21		12	
25		22		13	
26		23			
64		32			
		62			

Ground site and TDRS interface checks

	GSTDN	TDRS					SGLS
		275	171	174	41	47	
Command							
Telemetry							
Recorder Dumps							

Attach copies of any ARs written and turn this checklist in to the lead INCO.

**TITLE**

GPC VARIABLES FOR USE IN INCO/COMM/INST TROUBLESHOOTING

**PURPOSE**

To provide the High-Order Assembly Language (HAL) names of pertinent flight software variables to allow for real-time troubleshooting of flight software problems by memory dump.

**GENERAL**

INCO/COMM/INST personnel are responsible for many functions on the orbiter that have extensive flight software support, such as telemetry format load, command uplink, antenna management, and payload communications management. If a problem in one of these areas is traced to flight software, the following variables contain status information that can be used to troubleshoot problems. These data can be transmitted to the ground by using variable parameter downlist in the appropriate major function or by asking DPS to perform a GPC memory dump. In general, a GPC memory dump is used to recover data quickly on a single occurrence of an anomaly, and a variable parameter downlist is used to monitor a process over a period of time. The intent is to gather as much data in real time as possible to allow the software community to spot problem areas and recommend workarounds.

To perform a GPC memory dump, INCO/COMM/INST should request DPS to perform a real-time memory dump. When the dump is made, INCO should ask DPS to hard copy their memory dump display and generate an MER request with hard copy attached for IBM analysis.

If it is desired to monitor a parameter over a period of time, INCO/COMM/INST should request DPS to place the variables in the variable downlist of the appropriate major function. Variable downlist parameters are on the DPS overview display. DPS SUPPORT can assist you in looking up GPC memory addresses for these HAL names.

**UPLINK COMMAND TWO-STAGE PROCESS AND ERROR CHECKING**

<b>HAL NAME</b>	<b>NOTES</b>
CDUV_IND	SYS S/W (Major function of GPC)
CDUV_GPC_ID	SYS S/W (Individual GPC ID)
CDU2_STAGE_COUNTER	SYS S/W (Number of words in buffer)
CDUV_TWO_STAGE_BUFF	SYS S/W (The two-stage buffer)
CDUB_GPC_VAL_WORD	SYS S/W (GPC validity word)
CDUV_CURRENT_NSP	SYS S/W (Current selected NSP)
CDUV_BYPASS_INDEX	SYS S/W (Bypass status)
CDUE_APPL_PROCEED	SYS S/W (Indicates whether each major function GNC, SM, or PL is ready to process uplink)
CDUV_NSP_VEHICLE_ILOAD	SYS S/W Vehicle ID

**UPLINK COMMAND SM SPC BUFFER**

<b>HAL NAME</b>	<b>NOTES</b>
CDCV_NBR_SPC	SYS S/W (Use only from SM computer; indicates number of SPCs)
CDCV_SPC_BUFF	SYS S/W (Use only from SM computer; is the SPC buffer)



CSSV_SPOB_D120201	SM2	(PF2 MDM output buffer for antenna electronics number 2)
CSMV_TDRS_VIS	SM2	(TM constant (can be updated by TMBU), which describes how many degrees above the horizon the TDRS must be to be in view)
ANTENNA CONTROL - KU BAND		
<b>HAL NAME</b>	<b>NOTES</b>	
CSMV_KUBAND_BIAS_MATRIX	SM2	(Ku-band antenna bias matrix. There are nine elements in the array; each is 32 bits (two words) long)
CSMV_KUBAND_UL_CMD_WRD	SM2	(First word of the SM GPC Ku signal processor serial I/O. It is altered by Ku antenna OP code loads to configure the Ku band)
UPLINK CONTROL		
<b>HAL NAME</b>	<b>NOTES</b>	
CZ1B_D_UL_CNTL	SYS S/W	(Set by SPEC 1 item entries X8000 = Inhibit X4000 = Enable X2000 = Auto)
CZ1B_D_UL_CNTL_SM	SYS S/W	(Is a combination of CZ1B_D_UL_CNTL as set by SPEC 1 and CSMB_SITE_IN_VIEW as set by antenna management. It is the same as CZ1B_D_UL_CNTL, except that bit 4 is on when a site is in view. Thus, if UL CONTROL is in auto and a site is in view, CZ1B_D_UL_CNTL_SM should equal X3000)
PCMMU BYPASS ELEMENTS		
<b>HAL NAME</b>	<b>NOTES</b>	
CSAS_ERT_DL	SM2	(Contains the full table used to drive the 12 PMU bypass discrettes. Analyze this table when multiple ambiguous element bypass indications are on)
PAYLOAD SIGNAL PROCESSOR SUPPORT		
<b>HAL NAME</b>	<b>NOTES</b>	
CSPV_CON_CONFIG_MSG	SM2	(10 copies of the structure contain the 10 prestored PSP configuration messages)

PCMMU/PDI (TFL/DFL LOAD) SUPPORT

HAL NAME	NOTES
CSLV_PPCOMM_LOAD_REJ_IND	SM2 (If the SM uplink process rejects a load format or the TFL/DFL does not load properly, this flag is set to the item in the load that failed. If this is set to 11, it means that the entire load was rejected. When an element of a load is rejected, no further elements of the load are attempted)
CSLB_PPCOMM_UPLNK_ACT_FLG	SM2 (Indicates that an uplink TFL/DFL operation is being processed)
CSLB_PPCOMM_UPLNK_ERROR_FLG	SM2 (Indicates that an uplink TFL/DFL opcode operation failed)
CSLB_PPCOMM_SPEC_ACT_FLG	SM2 (Indicates that crew has requested a TFL/DFL operation)
CSLV_ITEM_NO	SM2 (The item number selected by TFL/DFL uplink opcode or by crew entry on SPEC 62. Examples are PDI decom select or PDI format select)
CSLV_ITEM_VAL	SM2 (The item value selected by uplink or crew; for example, formats 4 or 161)
CSLB_PMU_TFL_IN_PROG_FLG	SM2 (Indicates TFL in progress)
CSLB_PDI_DFL_FPL_IN_PROG_FLG	SM2 (Indicates DFL or FPM load in progress)
CSLV_DFL_FPL_DIR_INDEX	SM2 (If a request DFL or FPM is in the directory, this should be the index for that format in the directory)
CSLV_TFL_DIR_INDEX	SM2 (Same as above except for TFLs)
CVAV_TDIR_MM_DIR	SM2 (I-loaded director of TFLs available on the MMU)
CVAV_DDIR_DIRECTOR	SM2 (I-loaded directory of DFLs available on the MMU)
CVAV_FDIR_DIRECTORY	SM2 (I-loaded directory of FPLs available on the MMU)
CVAV_TDIR_NUM_FMT	SM2 (Total number of TFLs available in directory)
SPC_ERROR_FLG	SM2 (Indicates that the TFL/DFL process (SPCPPCOMM) has found an error while attempting to perform a SPEC 62 or TFL/DFL uplink operation. Examples would be TFL/DFL/FPM not in directory, attempting to select a nonexistent decom or FPM, etc.)
SPC_ITEM_TYPE_TBL	SM2 (Table used for program routing internal to SPCPPCOMM - TFL/DFL processor)
CSLB_SEL_FMT_RAM_FLG	SM2 (Indicates SPCPPCOMM has determined that a request has been made to load the LDR RAM)



CSLB_INVALID_FLG	SM2	(Set by SPCPPCOMM - Indicates that an uplink or SPEC 62 request has failed a prerequisite check prior to starting a TFL/DFL operation) Bit 1 = TFL not in directory; bit 2 = DECOM/FPM not legal; bit 3 = DFL/FPM FMT ID not in directory; bit 4 = invalid input source)
CVDV_INPUT_SEL	SM2	(Set by SPCPPCOMM - Indicates the switch matrix source selected for the next switch matrix load operation)
CVDV_DECOM_SEL	SM2	(Set by SPCPPCOMM - Indicates the decom selected for the next DFL)
CVDV_FORMAT_SEL	SM2	(Set by SPCPPCOMM - Indicates the next DFL or FPM format to be loaded in the next DFL operation)
CVLV_LOADED_FRM_LGTH	SM2	(For TFLs where the GPC can output LDR frames for HDR telemetry (to make bandwidth available to payloads); this indicator is on if the GPCs are putting out LDR frames)

\*\*\*\*\*  
\* FLIGHT SOFTWARE MODULES THAT AFFECT INCO/COMM/INST \*  
\*\*\*\*\*

APPLICATION SOFTWARE

SSMANTMG - MAIN ANTENNA MANAGEMENT MODULE

SULUPLINK - SM UPLINK PROCESSOR

SAFACO - PCMMU DATA ACQUISITION BY SM

CSAERT - COMPOOL CONTAINING PCMMU I/O ELEMENT BYPASSES

SPSPSPCYCLIC - PSP PROCESSOR

SAM - ANTENNA DISPLAY KEYBOARD PROCESSOR

SLSSPEC - SPEC 62 PROCESSOR

SPCPPCOMM - PERFORMS PCMMU/PDI/PSP I/O REQUESTS FROM SPEC 62 OR UPLINK

CSLFORMAT - ACTUALLY READS MASS MEMORY AND WRITES ON PL1 OR IP BUS FOR  
PCMMU/PDI TFL/DFL BY REQUEST FROM SPCPPCOMM

PMQTECPOLL - PERFORMS TEC CYCLIC PROCESSING

SYSTEM SOFTWARE

DUPNSP - NSP UPLINK MESSAGE PROCESSOR

DUPSPC - STORED PROGRAM COMMAND CYCLIC PROCESSOR

AIESIP - SYSTEM INTERFACE PROCESSOR - MAIN DRIVER FOR OPERATING SYSTEM  
SCHEDULES NSP I/O

DUMULK - DUMMY PROCESS THAT RUNS UNTIL UPLINK COMMANDS ARE READY TO PROCESS

CDULNK - COMPOOL FOR UPLINK

DUP2STGEXEC - UPLINK TWO-STAGE LOAD PROCESSOR

DLALIGHT - MANAGES SM ALERT LIGHT/TONE

**TITLE**

PARAMETERS LISTED ACCORDING TO MDM AND DSC

**GENERAL**

The following is intended to provide a summary listing of INCO parameters or commands as a function of multiplexer/demultiplexer (MDM) and dedicated signal conditioner (DSC). Specific parameters for a particular flight/vehicle can be found in the appropriate computer listings.

MDM	DSC
OA1  DSC OA1, OM3, OP1 BITE DSC OA 1/2/3 power on	OA1  None
OA2  DSC OA2 BITE MADS shelf temps (2)	OA2  None
OA3  DSC OA3, OP2 BITE MADS BITE's (5) MADS WB mode	OA3  None
OF1  DSC OF1 BITE SSR 1 (28) Ku-band temps (2) PCMMU 1 GPC, PGM, RPC-A PCMMU 2 RPC-A OPS 1 recorder power (2) Payload recorder (30) COMSEC power (2) PDI power (1) OEX/MADS recorder (6)  MTU 1 (Inform DPS) PCMMU 1/2 select (BFS auto TFL uncertain)	OF1  Ku-band temps (2) PCMMU 1 FMT GPC, PGM Payload recorder temp MADS percent tape MADS recorder tape MTN

MDM	DSC
<p>OF2</p> <p>DSC OF2 BITE SSR 2 (28) OEX PCT tape ECG (2) PI (42) PSP BIT/FRM (4) PCMMU 2 GPC, PGM, RPC-B OPS 2 recorder (4) OPS 1 recorder (30) COMSEC power (2)</p>	<p>OF2</p> <p>OPS 1 temp OPS 2 temp PCMMU 2 FMT GPC, PGM</p>
<p>OF3</p> <p>DSC OF3 BITE Ku-band (14) Ku-band temp (4) S-band PM (87) S-band FM (6) UHF AGC (4) SSOR (5) COMSEC (14) Payload recorder power (2) OPS 2 power (1) PCMMU 1 RPC-C PDI power (1) GCIL active</p>	<p>OF3</p> <p>Ku-band XMTR temp Ku-band RCVR temp Ku-band A gimbal temp Biomed CH 1 switch pos. (6) Biomed CH 2 switch pos. (6)</p>
<p>OF4</p> <p>DSC OM1, OM2 BITE Biomed CH 1 switch pos. (6) Biomed CH 2 switch pos. (6) CTV (25) UHF (7) SSOR (2) Ku-band (9) S-band PL (10) S-band PM (15) S-band FM (10) MDM OA 1/2/3 power on DSC OL/OR 1/2 power (2) OPS 2 recorder (28) GCIL power (2) COMSEC (3)</p>	<p>OF4</p> <p>None</p>

MDM	DSC
PF1  Ku-band control words S-band antenna selects PM/FM to antenna ELEC 1 GCIL DCDR A CMD's Ku-band status words OPS 1 recorder CMD's Payload recorder CMD's MADS/OEX/OARE CMD's PSP 1 CMD's/CONFIGURATION OIU 1 temp SSR 1 CMD's	
PF2  CCTV CMD's except VCU power S-band antenna selects PM/FM to antenna ELEC 2 GCIL DCDR B CMD's OPS 2 recorder CMD's PSP 2 CMD's/CONFIGURATION OIU 2 temp SSR 2 CMD's	
	OL1, OL2  None
	OM1  None
	OM2  MADS temp (2) Ku-band gimbal temp
	OR1, OR2  None

**TITLE**

POSTLANDING ANTENNA POINTING TO TDRS

**PURPOSE**

To document the postlanding antenna selection from various landing sites and runways to TDRS. This data will be useful in antenna selection to TDRS while landing at any of these sites in the event of BFS navigation problems.

**PROCEDURE**

Prior to landing, get the landing site and runway from the FDO. Look up the site and associated runway in table 3.103-1 to determine proper antenna for on final through postlanding.

Note: The data in table 3.103-1 were computed assuming a spherical Earth. This assumption will cause errors less than 1°.

**Table 3.103-1. Postlanding TDRS antenna selections**

Site	Rwy	TDRS W W 174 antenna	TDRS E W 41 antenna	TDRS SP W 171 antenna	TDRS ST W 62 antenna	TBD
Arlanda, Sweden	1	--	URA	--	--	
	19	--	URF	--	--	
Amberly, Aus	15	ULF	--	ULF	--	
	33	ULA	--	ULA	--	
Amilcar, Cabral	2	--	URA	--	URA	
	20	--	URF	--	URF	
Banjul, Gambia	14	--	URA	--	URA	
	32	--	ULF	--	ULF	
Ben Guerir, Mor	18	--	URF	--	URF	
	36	--	ULA	--	ULA	
Bermuda	12	--	ULF	--	URF	
	30	--	ULA	--	ULA	
Cherry Point, NC	32	--	ULA	--	ULA	
	23	--	ULA	--	ULA	
Darwin, Aus	11	ULF	--	ULF	--	
	29	ULA	--	ULA	--	
Diego Garcia	31	--	--	--	--	
	13	--	--	--	--	
Dover, DE	1	--	URA	--	URA	
	19	--	ULF	--	ULF	
	32	--	ULA	--	ULA	
	14	--	ULF	--	ULF	
Dyess, TX	16	URA	ULF	URA	ULF	
	34	ULF	ULA	ULF	ULA	
Easter Isle, Chile	10	URA	ULF	URA	ULF	
	28	URF	ULA	URF	ULA	

Table 3.103-1. Postlanding TDRS antenna selections (continued)

Site	Rwy	TDRS W W 174 antenna	TDRS E W 41 antenna	TDRS SP W 171 antenna	TDRS ST W 62 antenna	TBD
Edwards, CA	4	URA	URF	URA	URA	
	22	URF	ULA	URF	URF	
	17	URA	ULF	URA	URA	
	35	ULF	ULA	ULF	ULF	
	5	URA	URF	URA	URA	
	23	URF	ULA	URF	URF	
	15	URA	ULF	URA	URA	
	33	ULF	ULA	ULF	ULF	
	18	URF	ULF	URF	URF	
	36	ULA	ULA	ULA	ULA	
Ellsworth, SD	13	URA	ULF	URA	ULF	
	31	ULF	ULA	ULF	ULA	
Esenboga, TKY	3	--	URA	--	--	
	21	--	URF	--	--	
Fairford, Eng	9	--	URA	--	URA	
	27	--	ULF	--	ULF	
Grissom, Indiana	5	--	URF	--	URF	
	23	--	ULA	--	ULA	
Gt. Cnty, WA	14	URA	--	URA	ULF	
	32	ULF	--	ULF	ULA	
Guam	6	URF	--	URF	--	
	24	ULA	--	ULA	--	
Hao, Fr Poly	12	URA	--	URA	ULF	
	30	URF	--	URF	ULA	
Hoedspruit	18	--	URF	--	--	
	36	--	ULA	--	--	
Honolulu, Haw	8	URA	--	URA	--	
	26	ULF	--	ULF	--	
Kennedy, FL	15	--	ULF	--	ULF	
	33	--	ULA	--	ULA	
King Khalid, Saudi	15	--	--	--	--	
	33	--	--	--	--	
Kinshasa, Zaire	6	--	URA	--	URA	
	24	--	URF	--	URF	
Koln Bonn, WGer	14	--	URA	--	URA	
	32	--	ULF	--	ULF	
Lajea, Azores	15	--	URF	--	URF	
	33	--	ULA	--	ULA	
Las Palmas	3	--	URA	--	URA	
	21	--	URF	--	URF	
Lincoln, NB	17	URA	ULF	URA	ULF	
	35	ULF	ULA	ULF	ULA	
Moron, Spain	2	--	URA	--	URA	
	20	--	URF	--	URF	

**Table 3.103-1. Postlanding TDRS antenna selections (concluded)**

Site	Rwy	TDRS W W 174 antenna	TDRS E W 41 antenna	TDRS SP W 171 antenna	TDRS ST W 62 antenna	TBD
Mt Home, Idaho	12	URA	ULF	URA	URF	
	30	ULF	ULA	ULF	ULA	
Myrtle Beach, SC	17	--	ULF	--	ULF	
	35	--	ULA	--	ULA	
Nassau, Bah	14	--	ULF	--	ULF	
	32	--	ULA	--	ULA	
Northrup, NM	5	URA	URF	URA	URF	
	23	URF	ULA	URF	ULA	
	17	URA	ULF	URA	ULF	
	35	ULF	ULA	ULF	ULA	
Oceana, VA	5	--	URF	--	URF	
	23	--	ULA	--	ULA	
Orlando, FL	18	--	ULF	--	ULF	
	36	--	ULA	--	ULA	
Otis	14	--	ULF	--	ULF	
	32	--	ULA	--	ULA	
Pease	16	--	ULF	--	ULF	
	34	--	ULA	--	ULA	
Plattsburg, NY	17	--	ULF	--	ULF	
	35	--	ULA	--	ULA	
Roberts/Mon	4	--	URA	--	URA	
	22	--	URF	--	URF	
Rota, Spain	28	--	ULF	--	ULF	
	10	--	URA	--	URA	
Suda Bay, Crete	11	--	URA	--	--	
	29	--	ULF	--	--	
Westover, MA	5	--	URF	--	URF	
	23	--	ULA	--	ULA	
Wright-Patt, OH	5	--	URF	--	URF	
	23	--	ULA	--	ULA	
Zaragosa, Spain	12	--	URA	--	URA	
	30	--	ULF	--	ULF	

-- Denotes TDRS below horizon (cannot "see" runway).



**TITLE**

MINIMUM-RANGE CALCULATIONS FOR RF-SENSITIVE PAYLOADS

**PURPOSE**

To provide a method for calculating the "safe" range for payloads sensitive to RF emissions from the Ku-band, S-band PM, and payload interrogator.

**PROCEDURES**

Table 3.104-1 provides the RF transmission frequencies for the S-band PM and payload interrogator, and the Ku-band antenna. This table can be used to determine the orbiter antennas with transmitting frequencies which may be hazardous to payload systems. The procedures provided in A, B, and C can then be used to determine the minimum "safe" range for a given RF sensitivity. For payloads within the payload bay envelope, figure 3.104-1 provides the field intensity as a function of position within the bay. The Ku-band antenna curve plotted in figure 3.104-1 is a composite curve showing "worst case" or maximum field intensity for a full range of Ku-band antenna attitudes and operation modes with masking enabled.

**Table 3.104-1. RF transmission frequencies for the S-band and payload interrogator**

Transmitter	Antenna <sup>(1)</sup>	Carrier Freq (fc)	Modulation
S-band PM (network transponder)	S-band quad	2217.5 OR 2287.5 MHz	PSK, PM
Payload Interrogator STDN (NASA) <sup>(2)</sup>	S-band payload	2025.8334 to 2117.9166 MHz	PM
DSN (NASA) <sup>(3)</sup>	S-band payload	2110.2431 to 2119.7924 MHz	PM
SGLS (DOD) <sup>(4)</sup>	S-band payload	1763.721 to 1839.795 MHz	PM
Ku-band	Ku-band Return link Radar ranging	15.0034 GHz  13.883 GHz <sup>(5)</sup>	QPSK, FM  Pulsed carrier pulse rates:  268,3000, 7000 PPS Pulse width - 66.4 μs max. 122.0 hs min.

Notes:

- (1) Cargo bay radiation levels defined in figure 3.105-1.
- (2) 801 selectable channels over indicated frequency range.
- (3) 29 selectable channels over indicated frequency range.
- (4) 20 selectable channels over indicated frequency range.
- (5) Passive tracking uses frequency diversity technique employing center frequencies of 13.779, 13.831, 13.935, and 13.987 GHz. Active tracking uses 13.883 GHz only.

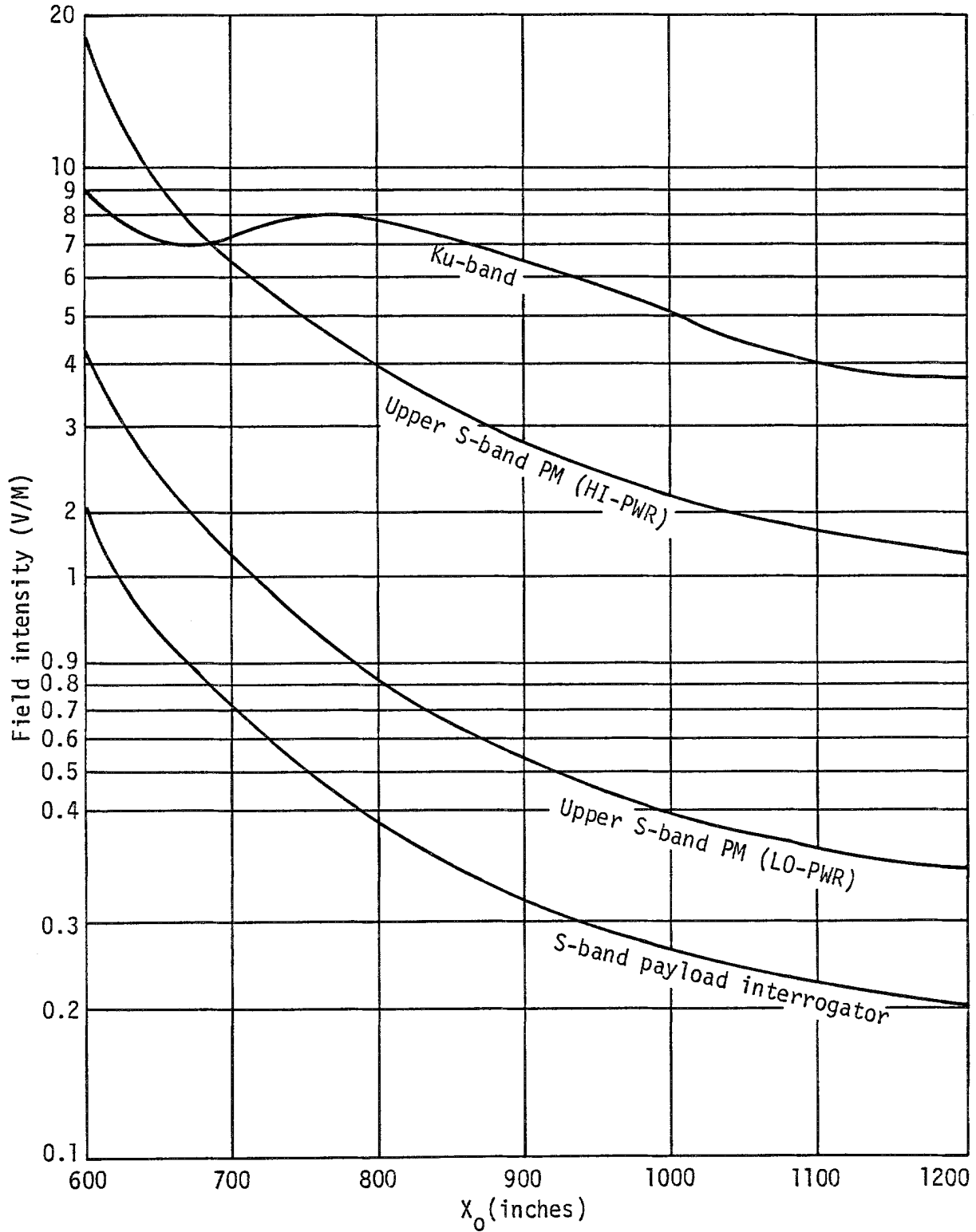


Figure 3.104-1. Maximum field intensities on payload envelope

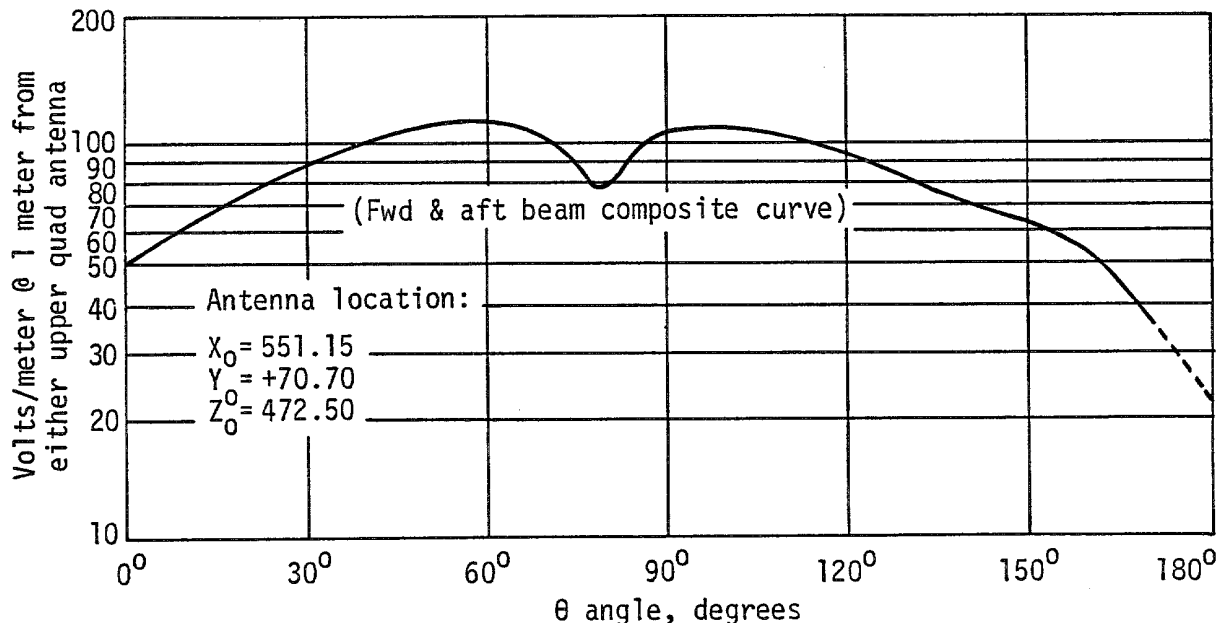
A. S-band PM

1. From figure 3.104-2, determine the angular region of interest. (The portion of the curve located to the right of the point of inflection at  $q = 78^\circ$  should be used for all payloads positioned aft of the antenna location at  $X_0 = 551.15$ , and above the X, Y plane passing through  $Z_0 = 472.50$ . For payloads located forward of the antenna and above the X, Y plane through  $Z_0 = 472.50$ , the left portion of the curve should be used. In both cases,  $q$  is referenced to the X, Y plane forward of the antenna location).
2. Select the greatest field strength value (VOLTS/METER @ 1 METER) within the region of interest.
3. IF the antenna is in the high power mode; step 4.  
  
IF the antenna is in the low power mode, multiply this value by 0.158 (-16 dB); step 4.
4. For a given payload sensitivity, substitute this value in equation 1 to obtain the minimum "safe" range.

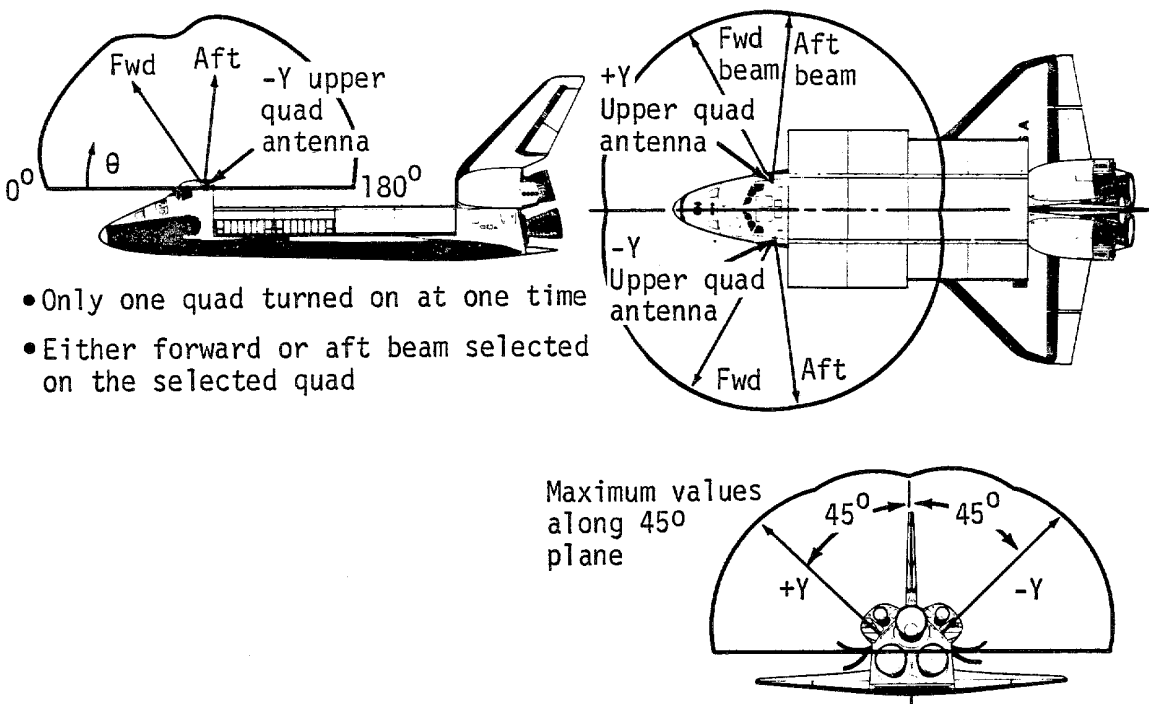
$$\text{RANGE (METERS)} = \frac{\text{VOLTS/METER @ 1 METER}}{\text{SENSITIVITY (VOLTS/METER)}} \quad (\text{EQUATION 1})$$

B. S-band payload interrogator

1. From figure 3.104-3, determine the angular region of interest. (The plane of figure 3.105-3 should be rotated  $\pm 90^\circ$  about the boresight to select the region of interest for payloads not located along the vehicle centerline.)
2. Select the greatest field strength value (VOLTS/METER @ 1 METER) within the region of interest.
3. IF the antenna is in the high power mode; step 4.  
  
IF the antenna is in the medium power mode, multiply this value by 0.316 (-10 dB); step 4.  
  
IF the antenna is in the low power mode, multiply this value by 0.071 (-23 dB); step 4.
4. For a given payload sensitivity, substitute this value in equation 1 to obtain the minimum "safe" range.



a. S-band PM, upper quad antennas, maximum field intensities



b. S-band network transponder, upper quad antennas, beam configuration

Figure 3.104-2. S-band PM

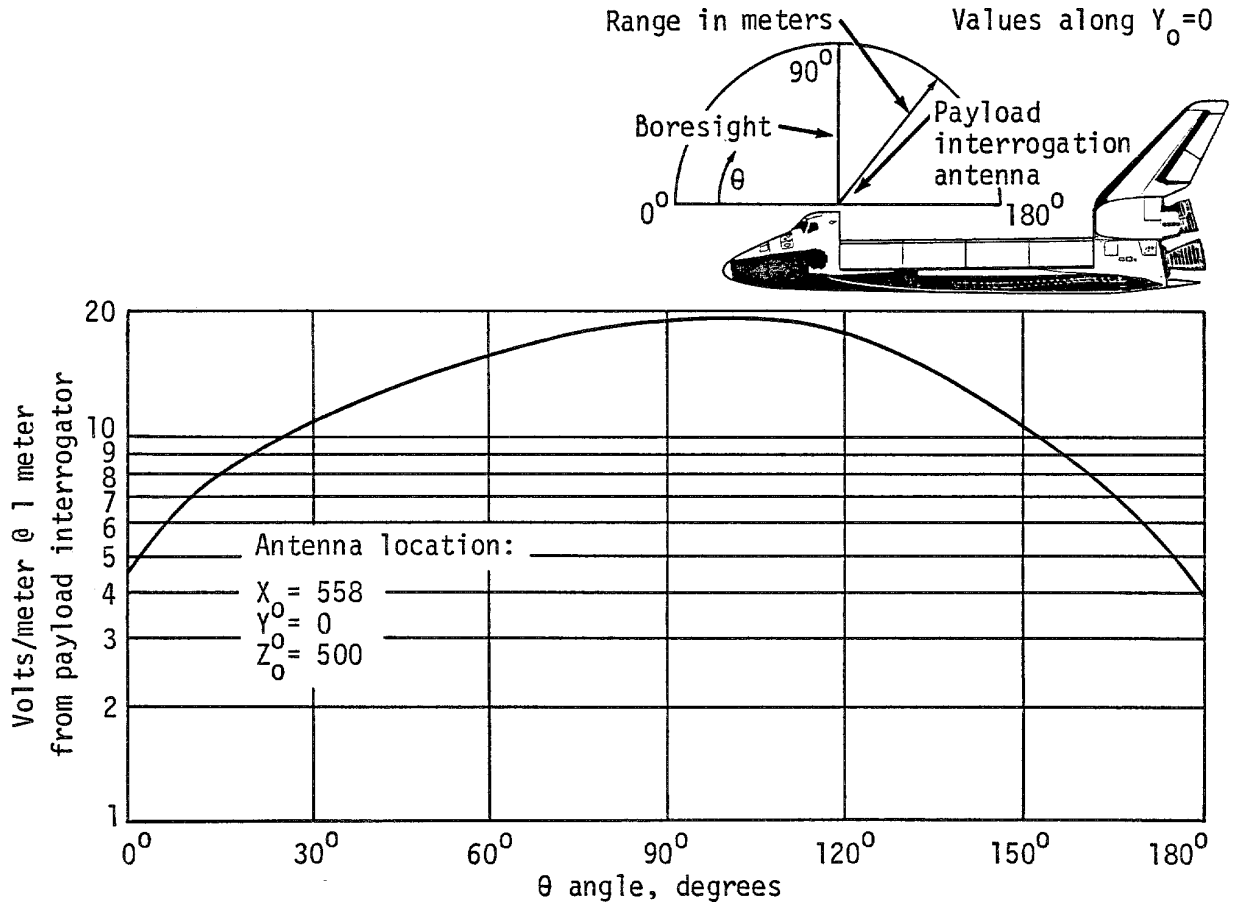
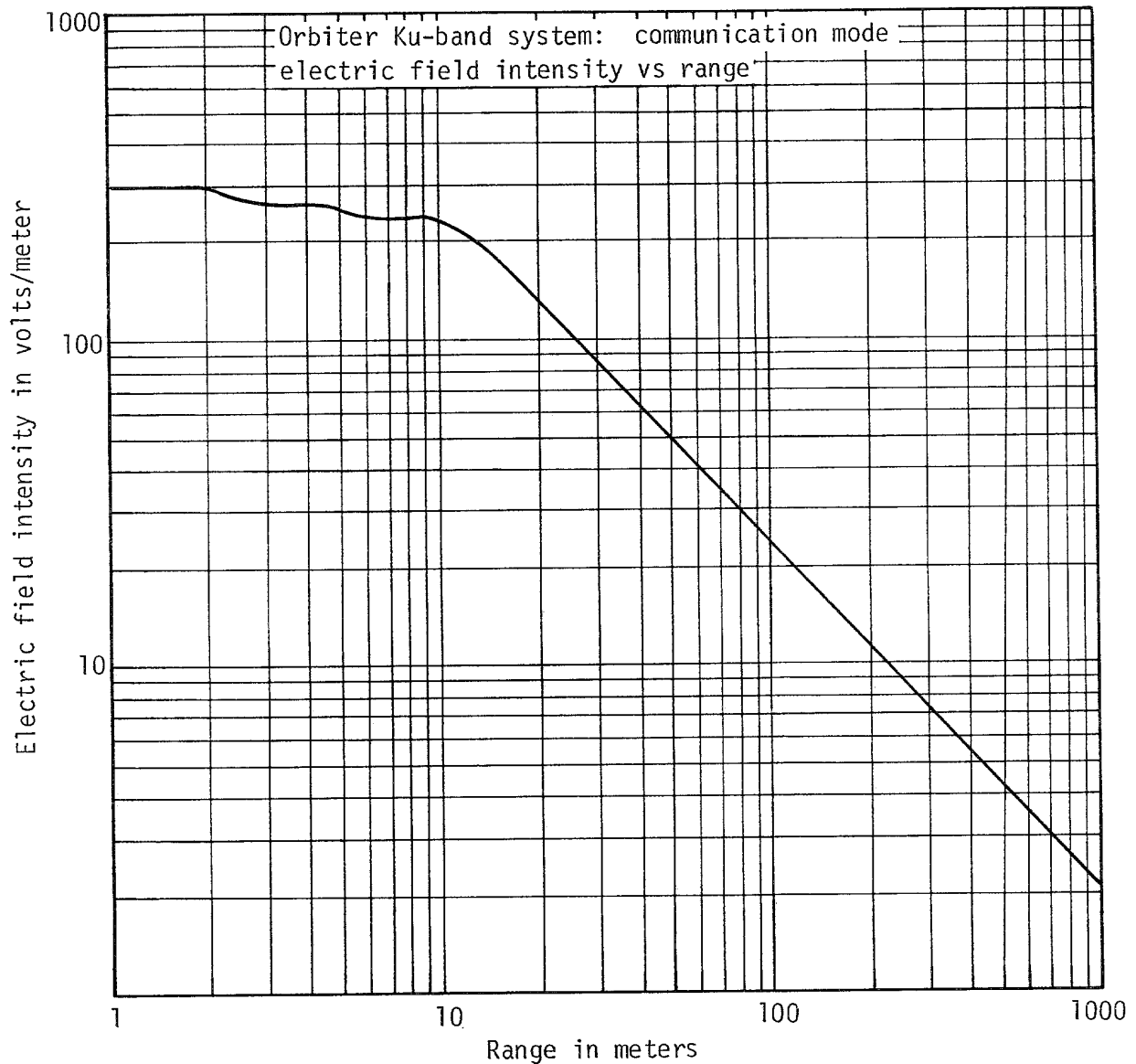


Figure 3.104-3. S-band payload interrogator, maximum field intensities

C. Ku-band

1. Communication Mode - Using figure 3.104-4, locate the payload sensitivity along the vertical axis. Move this point horizontally until intersecting the curve. The horizontal coordinate of this point corresponds to the minimum "safe" range (in METERS) for a payload positioned directly within the Ku-band beam.

Radar Mode - Using figure 3.104-5, locate the payload sensitivity along the vertical axis. Move this point horizontally until intersecting the appropriate power level curve. The horizontal coordinate of this point corresponds to the minimum "safe" range (in METERS) for a payload positioned directly within the Ku-band beam.



**Figure 3.104-4. Communication mode electric field intensity vs. range**

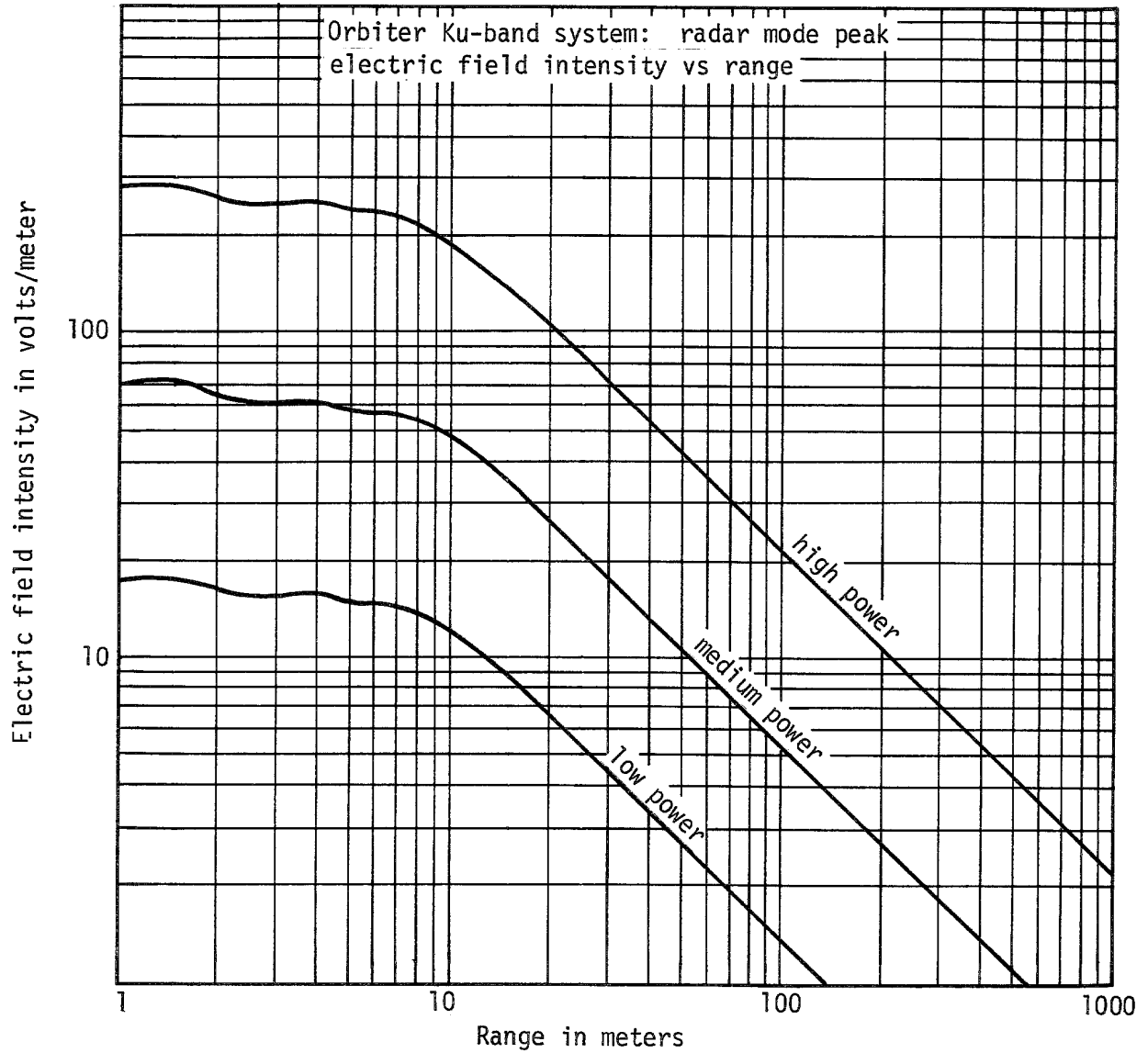


Figure 3.104-5. Radar mode peak electric field intensity vs. range



## TITLE

EMCC DOCUMENTATION ENGINEER DUTIES AND RESPONSIBILITIES

## PURPOSE

To define a standard set of procedures to be used by the EMCC Documentation Engineer (EDE) when preparing the EMCC documentation for mission support.

## GENERAL

Before each mission, the EDE is required to ensure that the EMCC documentation is up to date and ready for EMCC activation. The documentation for EMCC is an important supplement to the EMCC. The documents provide essential recorded knowledge to the EMCC INCO and other flight controllers. The flight control team uses this information to control and monitor orbiter systems to ensure the safe return of the crew and vehicle.

## EMCC DOCUMENTATION

At 3 weeks prior to each flight, the EDE should start preparing the documentation for EMCC support. This should allow enough time for the EDE to gather documents and work any unforeseen problems in retrieving the data for the documents. Once all the documents have been retrieved, the EDE should confirm EMCC documentation readiness with the lead INCO for the flight.

The EMCC Preparation Checklist (Figure 3.105-1) is a checklist of all documentation required for EMCC support. The EDE is responsible for verifying that material listed in the documentation portion of the checklist is flight ready. Flight ready, in this case, means the documentation is correct, complete, up to date, and in the designated location. The following is a brief synopsis on each document listed.

RTC listing hard copy - Hard copies made on console of all prebuilt RTCs to be used during the specific flight. Typically obtained several weeks prior to launch during a mission-specific simulation.

Loads listing hard copy - Hard copies made on console of all prebuilt loads to be used during the specific flight. Typically obtained several weeks prior to launch during a mission-specific simulation.

Orbiter Instrumentation Program and Components List (IPCL) (STS89-0887, vols. I, II, and III) - Obtain a copy from the DF technical librarian. The IPCL provides Shuttle Program information and direction to design, wiring, installation, test, and operational groups.

Space Shuttle Systems Handbook (JSC-11174, Secs. 16 and 17) - Schematic drawings of the orbiter communication and instrumentation systems.

INCO/COMM Systems Brief (JSC-18611) - Provides a detailed description of the orbiter communication and instrumentation equipment.

INCO/COMM Console Handbook (JSC-12829) - A set of display briefs and procedures on the use and applications of numerous INCO displays and working tools and, in addition, INCO malfunction procedures.

SSP EMCC Activation and Operations Procedures (532-CAP-EMCC) - A set of procedures for activating EMCC from startup to breakdown of the software and hardware components.

DOCUMENTATION STORAGE

It is the EDE's responsibility to provide a designated location to store the EMCC documentation. The EDE needs to ensure that all INCOs are aware of the present storage location before each flight.

STS - _____	DF24 EMCC PREPARATION CHECKLIST
-------------	---------------------------------

Documentation

- RTC listing hard copy
- Loads listing hard copy
- Orbiter IPCL (STS89-0887, vols. I, II, and III)
- Space Shuttle Systems Handbook (JSC-11174, secs. 16 and 17)
- INCO/COMM Systems Brief (JSC-18611)
- INCO/COMM Console Handbook (JSC-12829)
- EMCC Activation and Operations Procedures (532-CAP-EMCC)
- Other - Flight specific \_\_\_\_\_

EDE: \_\_\_\_\_

Date: \_\_\_\_\_

EMCC Document Location: Bldg **4N** Room **1010** Near the door in the INCO library

**Figure 3.105-1. EMCC Preparation Checklist**

## TITLE

INCO DUTIES AND RESPONSIBILITIES RELATIVE TO EMERGENCY MISSION CONTROL CENTER (EMCC) PREPARATION, ACTIVATION, AND OPERATION

## PURPOSE

This SCP consists of several procedures to be used by the INCO to execute the following EMCC tasks.

- Permission Preparation - Ensure DF24 permission preparedness
- EMCC Activation - Participate in the activation of EMCC
- EMCC Operation - Function as an INCO in the EMCC

EMCC background and history are also presented to aid the reader in understanding where the EMCC has been and how it fits into MOD thought today. In addition, a checklist is included to help the INCO ensure permission preparation is complete.

## BACKGROUND

When activated, the EMCC is located in the launch control center (LCC) at the Kennedy Space Center (KSC). The EMCC is expected to serve as backup to the MCC in the event that orbiter support capabilities are lost or severely curtailed during a mission. In its activated form, the EMCC provides essential operation capabilities necessary to allow relocated members of the MCC to communicate with the crew, monitor orbiter systems, and interact with all the supporting network elements. The EMCC is expected to support completion of essential mission objectives and provide the flight control team with the data and the means to guide the crew through entry to a safe wheel stop. Note that the EMCC DOES NOT have the capabilities, nor is it intended, to support ascent.

Prior to activation, the EMCC consists of detailed contingency procedures, trained flight controllers and stockpiled documentation.

The division of work and responsibility, on a network-wide scale, and the complex plan for a smooth transition from MCC to EMCC orbiter control are contained in a document issued by GSFC (532-CAP-EMCC). The document accurately presents the big picture and is excellent preparatory reading for anyone involved with the EMCC. The DF24 EMCC Documentation Engineer (EDE) maintains a current copy of the 532-CAP-EMCC document along with the rest of the EMCC documents.

## HISTORY

This section presents a brief history regarding the origin, evolution, and philosophy of the EMCC, which may be helpful in understanding current MOD thought.

Originally, the EMCC was intended to provide two-way, voice-only support to the orbiter. The flight control team, in place at JSC, would communicate with the crew via voice only. The priorities began with "voicing" up deorbit target and state vector and ended with assisting the crew with sticky malfunctions. Any systems advice given to the crew was based on data voiced down by the crew themselves. This approach to the EMCC placed a great degree of confidence in the autonomous capabilities of the orbiter and crew.

The emergence of the TDRSS and the eruption of the terrorist threat in the early eighties brought about the desire to relocate the EMCC to the NASA Ground Terminal (NGT) located at the White Sands Ground Terminal (WSGT). This type of response protects for the entire loss of JSC due to explosion, severe weather, etc. On the down side, relocating the flight control team raises manning questions and complicates the overall response effort. At this point, flight controllers were still dependent upon data voiced down from the crew and capable of voice-only response.

Early application of the original Real Time Data System (RTDS) to EMCC needs greatly improved the insight of the flight control team. Originally the RTDS was based on the Loral ADS-100 telemetry processor. The ADS-100 distributed data over an RS-422 serial link to two COMPAQ portable computers. Although this system offered a precedent-setting capability - near-real-time, raw data - it did not offer access to anything other than a few uncalibrated parameters.

The transition from the ADS-100 to the Loral System 500 (SYS-500) telemetry processor ushered in a significant growth of orbiter system insight for the EMCC team. The SYS-500, for the first time, supported conversion to engineering units, limit sensing, and several display modes. The increased complexity that accompanied the improvements of the SYS-500 ushered in the need for an additional EMCC team member dedicated to operating the equipment. With the addition of the Telemetry Processor Engineer (TPE), the INCO was relieved of the hardware operating duties and expected only to fulfill flight controller responsibilities. The TPE was supplied by DF24 because of the strong ties between our orbiter systems and the operation of the SYS-500.

STS-50 marked the latest major change in the evolution of the EMCC. Driven by a desire to decrease the expense of maintaining the capability while improving the quality of activated support, MOD and the Space Shuttle Program office relocated the EMCC to the Launch Control Center (LCC) at KSC. This significant change in the EMCC greatly improves and simplifies the support that will be provided. It is the EMCC at KSC that is the focus of this SCP.

### **PREMISSION PREPARATION**

The preparation for each mission includes obtaining appropriate training for each FCR operator and assuring the collection of documentation is flight-ready. As a preparation aid, a sample checklist is included within the documentation section.

### **FLIGHT CONTROLLER TRAINING**

The type, scope, and size of the EMCC flight controller training effort is directly driven by the manning scheme. Prior to STS-41, the EMCC would have been manned by a dedicated, assigned "fourth team" (or in some cases a fifth team). In this case, "team" refers only to FCR operators and one TPE. To eliminate the impact of retaining another dedicated flight control team, a "next-on" approach was chosen by MOD management. The next-on concept does not rely on a dedicated team, rather it uses one of the two teams not on console at any given time (handovers excluded). In the event of EMCC activation, the most rested team would implement the activation plan and man the EMCC. Note that any team assigned to a flight (including planning) could be called on to fly the entry at the EMCC.

In support of the "next-on" manning scheme, all FCR operators (at positions assigned to EMCC) must have had the opportunity to receive training. The INCO's assigned to a flight should become comfortable with the KSC LCC display, voice, and command capabilities. Actual operation of the LCC consoles will not be required premission training. A KSC engineer will be sitting at each EMCC position to assist.

### **DOCUMENTATION**

- An assigned DF24 section member will assemble the following documentation in a designated location. The individual will inform the lead INCO when the task of collecting the documentation is complete. RTC listing
- Loads listing
- Orbiter IPCL (STS89-0887, vols. I, II, and III)
- Space Shuttle Systems Handbook (JSC-11174, secs. 16 and 17)

- INCO/COMM Systems Brief (JSC-18611)
- INCO/COMM Console Handbook (JSC-12829)
- SSP EMCC Activation and Operations Procedures (532-CAP-EMCC)
- Telemetered and Recorded Data Format Requirements (NSTS-10784)
- Flight-specific other \_\_\_\_\_

The blank checklist at the end of this SCP can be copied and used by the INCO to verify preparations for the EMCC are complete prior to each mission.

### **PERSONAL GEAR**

Each INCO is responsible for gathering the appropriate personal gear (1 small duffel bag containing toiletries and change of clothes, not to exceed 12 lb) and making any additional personal arrangements prior to flight. You could be deployed to the EMCC as a major hurricane bears down on the Houston area. Remember that any INCO assigned to a flight is fair game!

### **BEEPERS**

The rapid response expected from the EMCC requires that all team members be notified of an activation as soon as possible. To facilitate quick notification, the INCO's assigned to a mission will all be expected to carry their beepers whenever they are off console. Beepers will be issued several days prior to each mission and should be returned to the issuer as soon as possible after landing.

### **EMCC ACTIVATION**

The timeline below shows the expected sequence of events. Keep in mind that this example assumes the INCO has prepared his/her personal items ahead of time and is easily reached via telephone/beeper.

### **EMCC Activation and Deploy Timeline**

1. MOD Director, FD or MMT declares an EMCC activation
2. FD or FCR Operators contact on coming FCR team.

3. On-coming INCO proceeds ASAP, with personal gear, to JSC building 4N to collect EMCC documentation (rm 1010 on right hand top self next to door, in white binders with red labels)
4. The Crew is informed
5. The Network is informed
6. JSC Transportation moves documentation packing crates to bldg 4 loading dock
7. INCO packs documentation in crates
8. KSC configures facilities for arrival of EMCC flight control team
9. JSC transportation moves all documentation to Ellington field
10. INCO takes personal gear to Ellington, hanger 990 for airlift to KSC
11. EMCC team is flown to KSC
12. EMCC FC team establishes voice communications with the crew and regains control over the mission.

**EMCC OPERATION**

The INCO deployed on the EMCC team will be operating in a very different environment. Preparedness can only benefit from realistic expectations. In that light, the following section contains some reminders and hints regarding the EMCC environment the INCO will be expected to operate in.

One overriding principal to remember is that the EMCC is not expected to REPLACE the MCC.

The EMCC DOES support command capability.

Flight data file books are the FAO's responsibility, do not worry about them.

Voice

The LCC uses a reconfigurable voice loop system. The console to be used by INCO will be set up in the following manner. Technicians can repatch loops upon request. KSC will supply headsets. Reference section 3.4 of the 532-CAP-EMCC document for additional information.

Loops available at "INCO" console

<b>Loop name</b>	<b>Loop default capability</b>
A/G-1	M
A/G-2	M
UHF	M
Prime Ops	TM
Site/TN Coord	TM
Flight Director Circuit	M
EMCC Flight Director	TM
FAO/PLO	TM
GC	TM
FDO/GPO	TM
PROP/GNC	TM

Loop name	Loop default capability
DPS/MMACS	TM
EGIL/EECOM	TM
Weather Net	TM
INCO	TM

M = monitor only TM = talk/listen/monitor

#### Command

The LCC does support commanding. See section 4.15, Real-time Uplink Commanding, of the 532-CAP-EMCC document for details.

#### Displays

A wide variety of COMM and INST displays are available. Although KSC draws a different line between COMM and INST, their displays are quite inclusive. In addition to the displays listed and described below, strip chart recorders (SCR's) are also available for trend analysis. The SCRs are not located at the consoles, but are close by in the LCC. A printer located at each console supports quick generation of hard copies. Each display is driven by a program resident and running in the console. The displays are identified by their program names below. A KSC engineer will assist you with display activation, interpretation, and operation.

Note: The following descriptions and figures are included for INFORMAL REFERENCE ONLY. Actual display content/format may change.

#### VWA40

This display is used by KSC during the launch count. TACAN and RALT data is included for the NAVAIDS folks who share the console with COMM during launch. This display does not support command.

#### VAA19

Primary display used during TCDT. Includes command capability for S-band PM, S-band FM, and CCTV.

#### VAA24

A subprogram of VAA19, VAA15, VAA11, VAA12, and VAA06. This display is used to configure command routing.

#### VAA11

The S-band FM system displayed schematically.

#### VAA12

The S-band PM system displayed schematically.

#### VAA06

The ONLY P/L system display. Shows PDI, PSP, and PI status and configuration.

#### VAA15

Contains Ku-band data.

#### VWA16



A new Ku-band and TAGS display.

VWQ13

Displays detailed PDI configuration and status. Also supports command for the PDI.

SWQ01

PCMMU, OPS recorder, P/L recorder, MADS recorder, MTU, PDI, and MADS PCM/FDM data is shown on this display.

VWQ11

This display contains PCMMU BSR, MDM WRAP/BITE, DSC BITE, and MTU data.

VWQ05, VWQ15 and VWQ16

Displays OPS and P/L recorder data. Also supports command to the recorders.

VWQ14 and VWQ17

Contains detailed OEX and MADS telemetry and command

#### Documentation

Instrumentation channelization data will be available at KSC.

#### **REFERENCES**

532-CAP-EMCC Document    SSP EMCC Activation and Operations Procedures, Sept. 1997

STS-_____	DF24 EMCC PREPARATION CHECKLIST	OV-10_____
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DOCUMENTATION

- \_\_\_\_\_ RTC listing
- \_\_\_\_\_ Loads listing
- \_\_\_\_\_ Orbiter IPCL (STS89-0887, vols. I, II, and III)
- \_\_\_\_\_ Space Shuttle Systems Handbook (JSC-11174, secs. 16 and 17)
- \_\_\_\_\_ INCO/COMM Systems Brief (JSC-18611)
- \_\_\_\_\_ INCO/COMM Console Handbook (JSC-12829)
- \_\_\_\_\_ SSP EMCC Activation and Operations Procedures (532-CAP-EMCC)
- \_\_\_\_\_ Telemetered and Recorded Data Format Requirements (NSTS-10784)
- \_\_\_\_\_ Flight-specific other \_\_\_\_\_

PERSONAL GEAR

- \_\_\_\_\_ 1 small duffel bag containing toiletries and change of clothes, not to exceed 12 lb

BEEPER

- \_\_\_\_\_ Beeper

**Figure 3.107-1. EMCC Preparation Checklist**



148: 1411/57 SB046A  
SM SA 0123 0123 E123  
VAA19  
11/50 AINT101 VAA19  
\*\*PROGRAM MESSAGE\*\*

NEW 2000/02/23/88 JSC IN PROGRESS  
1AB 2AB 3AB 4AB 5AB 6AB VAA19  
P123456

HAS BEEN INITIATED IN TOB T2 AT B300

CONTROL SYSTEM

CONTROL-PNL  
SALVO CMDS  
ANTENNA SW-OFF  
APM QUAD SEL-\*\*\*  
SWITCH SCAN-LLF  
FM HENI SEL-\*\*\*  
SWITCH SCAN-GPC

NSP-OFF  
BIT SYNC-UNLOCKED  
FRM SYNC-UNLOCKED  
BITE-GO  
DATA SRCE-\*\*\*  
DATA RATE-X\*-R\*\*  
CODING-X\*\*\*-R\*\*\*  
RCDR VOICE-\*\*\*  
PSS VOICE-OFF

PRE AMP-OFF  
HEATER-1 ON-2 ON  
FREQ-\*\*\*  
PMR AMP-OFF  
STANDBY-10FF-20FF  
-0.2WATTS (REFL)  
0.1WATTS  
\*\*\*VSWR  
-13.2F TEMP 1  
-13.2F TEMP 2

XPNDR-OFF  
MODE-\*\*\*  
FREQ-\*\*\*  
XMIT/RCV-\*\*\*  
ROUTE-VIA PA  
PHASE-UNLOCKED  
XPND-NON COHER  
RTNPK-DISABLE  
SPREADING-ENABLE  
RANGING-ENABLE  
0.00 LOOP STRS  
-1 CNT AGC  
2.73 WATTS

CONTROL-PNL  
OI XMTR-OFF  
0.07 WATTS  
OFM SF SRCE-OFF

COMMAND PROCESSING  
MODE-MANUAL  
G/MF-DATA BANK  
TYPE-SINGLE STAGE  
GCIL-UNKNWN-INACTV  
GCIL P/S-10FF-20FF

INVALID  
INTRO  
TERMINATE  
FM SKEL  
TV SKEL  
UH F SKL

CONTROL SYSTEM  
CONTROL-PNL  
VCU PMR-OFF  
SYNC-NORM-B  
CAM TEMP-OK  
D/L-ENABLE  
CAM-\*\*\*  
ALC-\*\*\*  
GAM-NORMAL  
CAMERA PMR  
AUDIO MAUX  
INPUT SEL  
OUTPUT SEL  
SR F PAN/T  
S S FOCUS  
S S C ZOOM  
S S R PAN  
S S D TILT  
S S A ALC  
S S B GAMMA

CONTROL SYSTEM  
XCVR AGC  
296.8-0FF -133DB  
259.7-0FF -128DB  
279.0-0FF -133DB  
243.0-0FF -128DB  
SQLCH-OFF PA-OFF

CONTROL SYSTEM  
DL FMT-X INVAL  
UL GPC-3 \*\*\*  
NSP 1+2  
DATA-BYPASS  
DISC-BYPASS

Figure 3.107-3. VAA19

P12345

```

173:1412/19 SB046A
SM SA 0123 0123 E123 1AB 2AB 3AB 4AB 5AB 6AB VAA19 /VAA24
VAA19
12/10 AINT101 VAA19
**PROGRAM MESSAGE**

```

```

HAS BEEN INITIATED IN TCB T2 AT B300

```

```

TERMINATE
AND RETURN

```

```

*****

```

```

CMD MODE 0
MANUAL 0
DUPLINK AO
DUPLINK BO
DLDB A 0
DLDB B 0
AO GCIL BO
ON 0
OFF 1
REVERT TO PNL RESET
OGCIL ACTIVE

```

```

GPC/MF
GPC 1
GPC 2
GPC 3
GPC 4
GPC 5
ALL GPCs
BFS
GN&C
SM
P/L
DATA BNK

```

Figure 3.107-4. VAA24

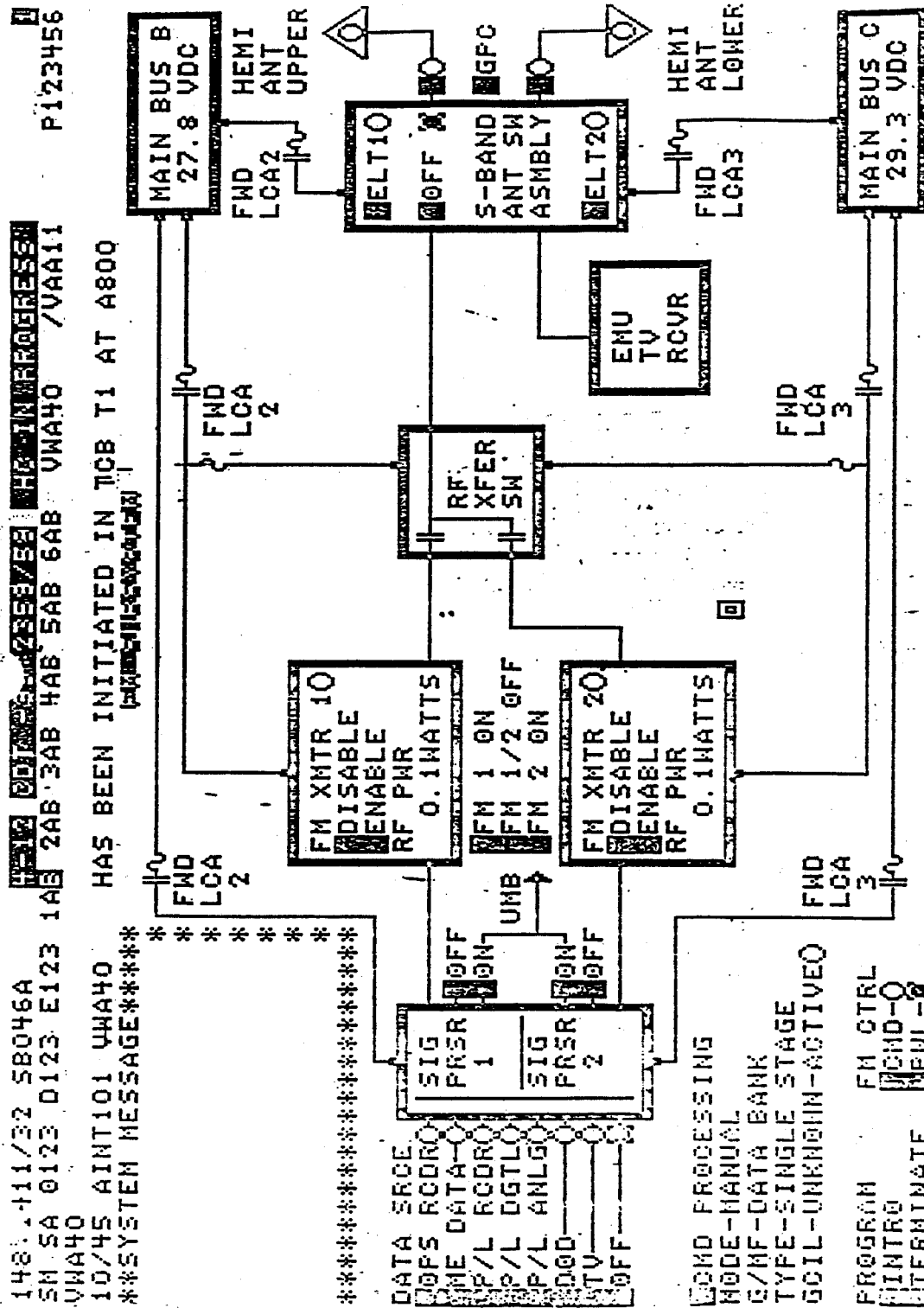


Figure 3.107-5. VAA11

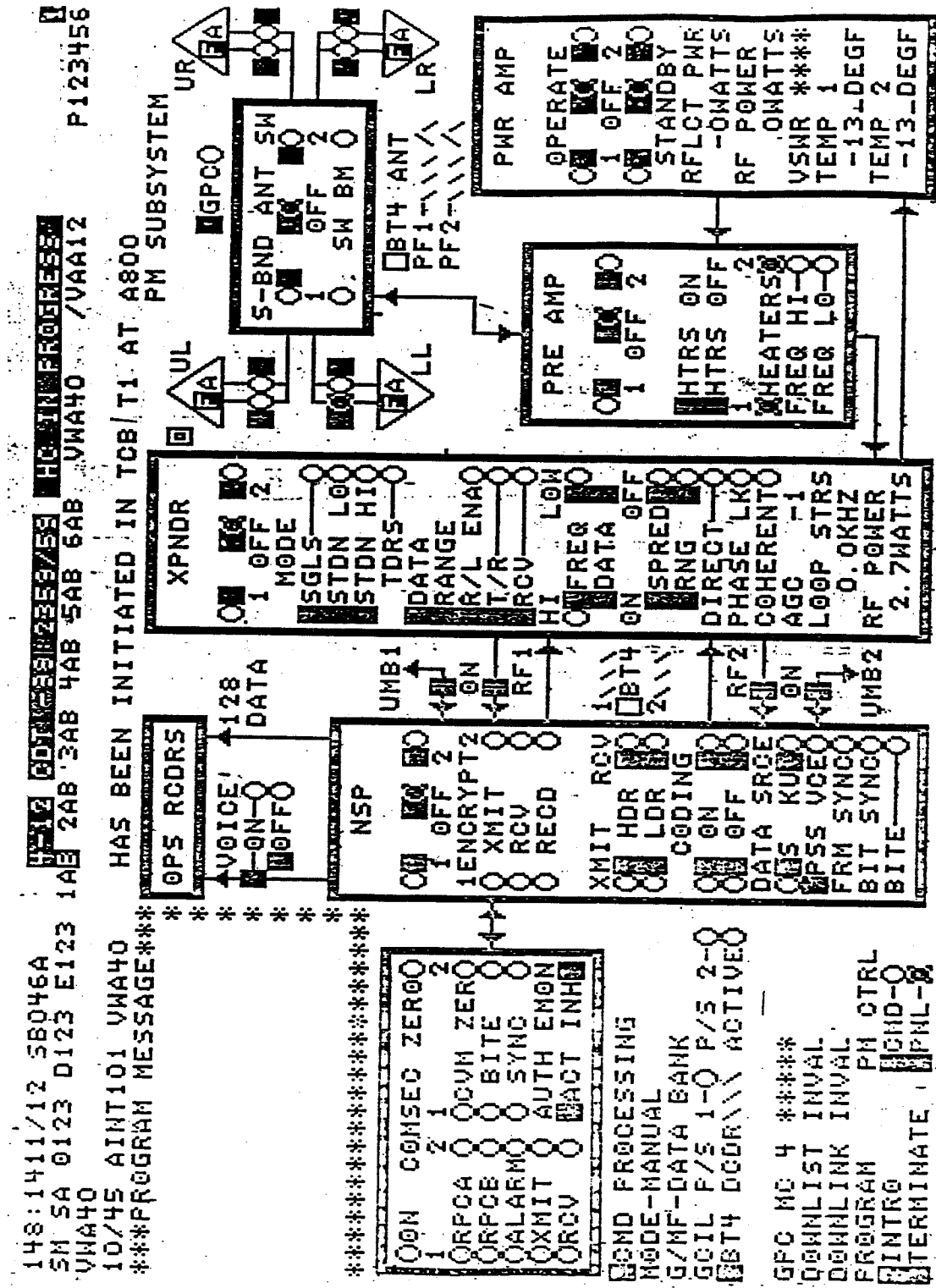


Figure 3.107-6. VAA12

1 :1413/12 SB046A  
EM 5A 0123 D123 E123 1AB 2AB 3AB 4AB 5AB 6AB VAA06  
13/05 CFR01097 RESU SUCCESSFUL - PROC VAA06 (T2) EXECUTION RESUMED  
P1234E

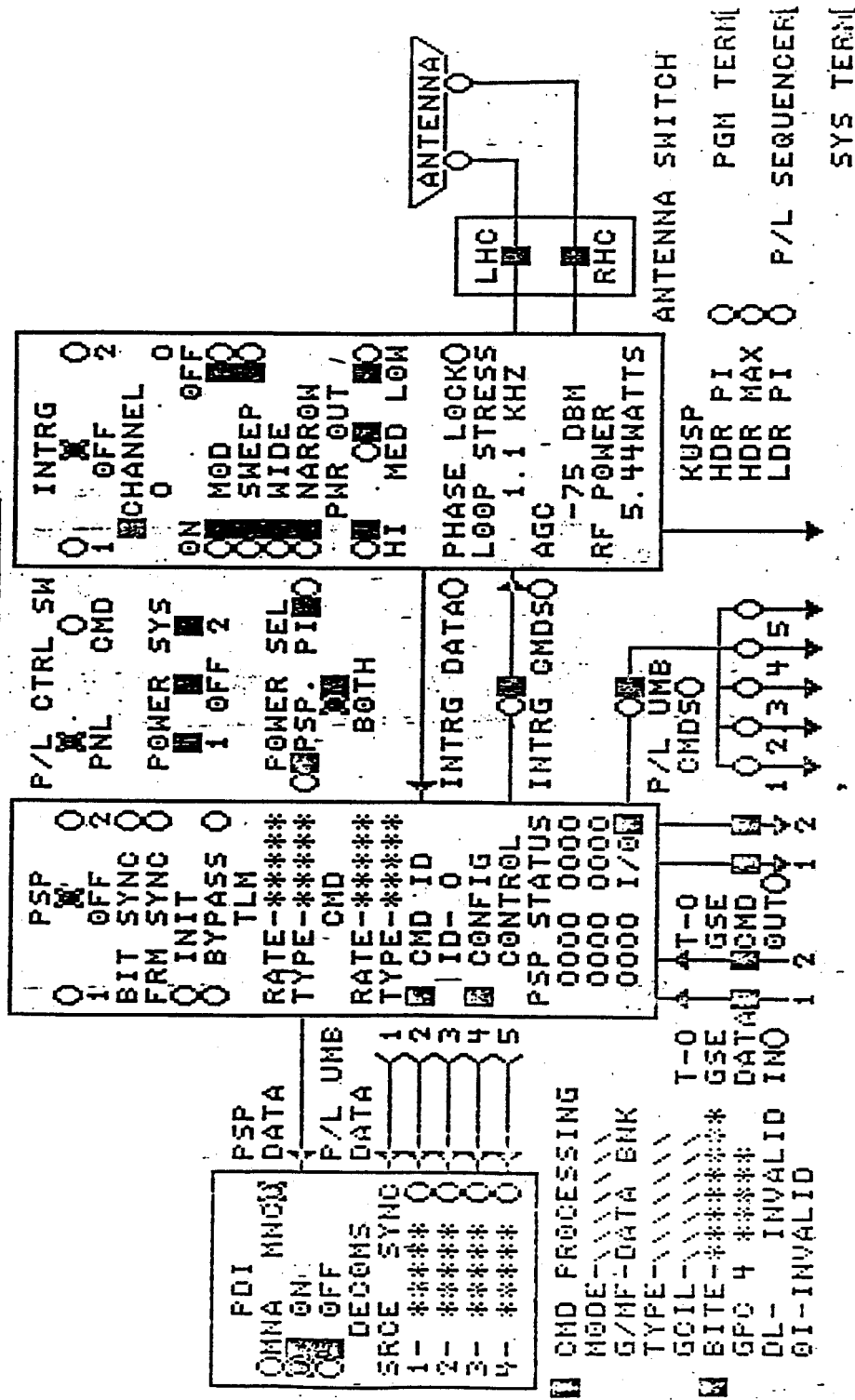


Figure 3.107-7. VAA06





146 1414/05 5B046A 0239/58 HD IN PROGRESS P12345E  
SM SA 0123 D123 E123 1AB 2AB 3AB 4AB 5AB 6AB VWA16  
VWA16  
13/54 CFR01097 RESU SUCCESSFUL - PROC VWA16 (T3) EXECUTION RESUMED

**DEPLOY/STW**  
STW/DPLY: STW 0102  
24 DEPO: 02 DEP 0102  
ANT SW: 0 GND 0 STW

**BOOM STON ENA** 01 02  
ANT SEL: 0 GPC DESO  
0 GPC 0 MAN 0 AUT 0  
INT STB: 0 ON 0 OFF  
SRCH INI: 0 ON 0 OFF  
TWTA 0 ON 0 OFF  
OPERATE 0 SEARCH  
ODETECT 0 TRACK  
TDRS 0 EASTO 0 WESTO  
ROLL/AZ 0 PITCH/VEL  
0.000 0.000  
DES PNTG ANGLES  
0.000 0.000  
SM2 DES PNTG ANGLES  
0.000 0.000  
DES BETA ACT BETA  
0.000 0.000  
MASK SEL 0B 0B+0  
RF PWR 0.00 VOLTS  
XMTR 306 GMB A 306  
RCVR 306 GMB B 306  
GYRO 306 ANT 306

**DEPLOY/STW**  
PWR: 0 ON 0 OFF 0 STBY  
MODE: 0 COMM  
SP SPEC 0 ON 0 OFF  
P ACQ 0 ON 0 OFF  
0 BSC 0V 0 ON  
CMD 0 ON 0 OFF  
SCAN WARN  
AGC 0.00 VOLTS

**DEPLOY/STW**  
MODE \*\*\*  
G/MF D BK  
GCIL 0 ON-A-OFF  
GCIL 0 ON-B-OFF  
GCIL 0P/S1 0P/S2  
0 BT4 0 ACTO

**DEPLOY/STW**  
GPC 2 GNC9 DL  
D/L INVAL  
0 I INVAL  
NSP DATA BYPASS  
DISC BYPASS

**DEPLOY/STW**  
HDR CH3: 0 OPL MAX  
0 OPL INT 0 OPL DIG  
0 TV 0 OPL ANLG  
0 OFF  
LDR CH2: 0 OPL RCDR  
0 OPL INT 0 OPL DIG  
0 OP RCD 0 OFF  
FND LK MD 01 02  
MOD: 0 ON 0 OFF  
0 AUTO  
DATA PRESENT  
FND LK FR SYNC  
CMD MD SYNC  
FAILSAFE 0 DISABLE  
0 S/KU-SALVO

**DEPLOY/STW**  
MODE  
01-TXT 03-SCHEM  
02-MAP 04-PHOTO  
PAPER 7 TEMP  
0 OKAY 0 LOW  
0 JAM 0 NORMAL  
0 EMPTY 0 OVER  
0 DEVL 0 NOT RESET

**DEPLOY/STW**  
PAGE READY  
PARTIAL FULL  
ADVANCE  
0 COMSEC 30  
0A-RPC 0 ALARM  
0C-RPC 0 RCV FULL  
148: 1413/55 MSG/PRMP ERROR - REF PG-A

**DEPLOY/STW**  
OPNL 0 CMD  
S I/O VIA:  
OULINK 0 LDB  
TEXEC S I/O  
01 02 0 FR/SYNC  
0 BIT SYNC  
SOURCE 0 KU 0 S

**DEPLOY/STW**  
CTL PNL PWR BTH  
INTG \* CHNL \*\*\* KHZ  
OPHASE LOCK DBM  
LPSTR \*.\* \* N  
AGC \*.\* \* N  
RF PWR \*.\* \* N  
PHR 0 ON 0 OFF

Figure 3.107-9. VWA16



114:1510/39 5V24A1  
SM SA 0123 D123 E123

NOES GDT - 28 288788 HD IN PROGRESS  
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28 29 30 31 32 33 34 35 36 37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60 61 62 63 64 65 66 67 68 69 70 71 72 73 74 75 76 77 78 79 80 81 82 83 84 85 86 87 88 89 90 91 92 93 94 95 96 97 98 99 100

114:1510/39 5V24A1  
SM SA 0123 D123 E123

01 ↑ 129 GPC ↑ 44 48 LDB ↑  
VWQ13 **RELOAD DATA INTERLEAVER** VDQ43

<b>POWER</b>	GOOD	<b>DECOM</b>	29	<b>H</b>	24	<b>B</b>	16	<b>H</b>	8	<b>FRFTY</b>	1	GOOD
BITE	ON	FORMAT	0		0		0		0	DECOM	2	GOOD
RPC-A	ON	INPUT	FAIL		FAIL		FAIL		FAIL	DECOM	3	GOOD
RPC-C	ON	BIT RATE	FAIL		FAIL		FAIL		FAIL	DECOM	4	GOOD
SW SCN	ON	BIT SYNC	FAIL		FAIL		FAIL		FAIL	TOG BUF		GOOD
GCIL	PNL	WD SYNC	FAIL		FAIL		FAIL		FAIL	DATARAM		GOOD
POWER CONTROL		MF SYNC	FAIL		FAIL		FAIL		FAIL	F P MEM		GOOD
<input type="checkbox"/> PDI ON		<b>PORT</b>	GOOD		GOOD		GOOD		GOOD	MTU IRIG		GOOD
<input type="checkbox"/> PDI OFF		NO RESP	GOOD		GOOD		GOOD		GOOD	1.152MHZ		GOOD
		INDATAVL	GOOD		GOOD		GOOD		GOOD	<b>VRWF</b>		GOOD
		<b>FETCH FT NEW</b>	FORMAT		0							

**DEV EQUIVALENTS**

- DEU  MF
- PDI I/O RESET
- DECOM 1  2  3  4  FPM
- FORMAT
- INPUT 0  1  2  3  4  5  PSP

MENU   
OVERVIEW

Figure 3.107-11. VWQ13

114:1501/18 5V24A1 (H099 BOT-SEC-888/58) H0 IN PROGRESS  
SM SA 0123 0123 E123 1AB 2AB 3AB 4AB 5AB 6AB SAQ04 /SWQ01  
P123456

SWQ01		INSTRUMENT OVERVIEW DISPLAY		SDQ01	3
WRITER 01 129 GPC 44 48 LDB	EXT TANK TUMBLE SAFE	ET 01 PMR 0-5 PSIG	1:OFF2:OFF 0.00 0.00	CH PRESS LH-RH	A -11.3 -11.3
PCMMU 1 SW 1 RPC AC	BITE GOOD	TEMP (DF)	N/C -4.0F N/C -4.0F	B -11.3 -11.3	
MDM WRAP GOOD	BITE GOOD	I/T -4.0F I/T -4.0F	FT1-301.0F FT2-301.0F	C -11.3 -11.3	
DSC DATA GOOD	BITE GOOD	LH2		OFF: <input type="checkbox"/> CAL OPTIONS	
OP51:OPS2:P/L :MADS	:FAIL	VF 11.9V	-0.1V 0V	<b>BUS STATUS</b>	
MODE : : :PAS2	: : :400	/A 11.9V	-0.1V P/	ESS1BC ON	
TRACK : : :OFF	: : :	VI 11.9V	-0.1V EV	ESS2CA ON	
MOTION : : :	: : :	L 77.7F	84.2F N	ESS3AB ON	
DIR : : :	: : :	101	101	MAIN A ON	
SPEED : : :	: : :	100 P 1 2 1 2	100.15	MAIN B ON	
TEMP 1: 2: 3:	GMT 114 15 1 19	100 S 1 2 1 2	99.85	CB AB1 ON	
TEMP2 GOOD	MET 114 15 1 19	98 1 2 1 2	98	CB AB2 ON	
TEMP3 GOOD	FREQ DIF GOOD	5 1 1 1	5	CB AB3 ON	
TEMP4 GOOD	CMD CHNL GOOD	LL 1 2 3 4		CB BC1 ON	
TEMP5 GOOD	WRAP GOOD	RET SYS SW M	DOD PMR	CB BC2 ON	
DECOM 1 0 0 0	PARITY GOOD	SEL 1 51 52	12345	CB BC3 ON	
INPUT 0 0 0 0	FMT 29 24 16	LCH 1		CB CA1 ON	
FMT 29 24 16	NO RESP GOOD	LCH 2		CB CA2 ON	
BSYNC	IN DATA GOOD	LCH 3		CB CA3 ON	
FSYNC	TEMP1 79	LCH 4			
PCM BITE FAIL	TEMP2 80	LCH 5			
FDM1 MUX OFF	TEMP3 77				
FDM2 MUX OFF					

MENU

Figure 3.107-12. SWQ01

300: 1/20/46 SV26RA  
SM SA' 0123 D123 E123 1AB 2AB 3AB 4AB 5AB 6AB 7VWR11

01. ↑ 129 LDB ↑  
PCMNU RPC  
PCM 1 OFF A C  
PCM 2 ON A B  
SW SCAN 2  
COMMAND OFF  
FORMAT 129 FIXED  
SW SCAN FIXED

VWQ11  
01 PCM DATA PATH AND MTU DISPLAY VDQ37

01 PCM DATA PATH AND MTU DISPLAY VDQ37		0	
MASTER TIMING UNIT	2	PCM: CONTROL	
GMT 300 17 20 46 V	GOOD	PCM 1 ON	
MET 300 17 20 46 NV	GOOD	PCM 2 ON	
SEL SW SCAN	2	COMMAND OFF	
BITE	GOOD	DEU EQUIV CMD	
OSC	GOOD	DEU MF	
AMP1	GOOD	PCM GPC FIX	
AMP2	GOOD	PCM GPC PGM	
FRQ DIF	GOOD	FMT SELECT	
TEMP1	GOOD	FMT LOAD	
TEMP2	GOOD	I/O RESET	
VOLT1	GOOD	PROMPT	
VOLT2	GOOD	MTU OSC CHG	
CMD CHA	GOOD		
CMD CHB	GOOD		
CMD CHC	GOOD		
IRIG B	GOOD		
DIV 1	GOOD		
DIV 2	GOOD		
DIV 3	GOOD		
UPDATING	NO		
MDM		PCM: CONTROL	
WRAP	GOOD	PCM 1 ON	
OF1	GOOD	PCM 2 ON	
OF2	GOOD	COMMAND OFF	
OF3	GOOD	FORMAT 129 FIXED	
OF4	GOOD	SW SCAN FIXED	
OA1	GOOD		
OA2	GOOD		
OA3	GOOD		
PDI	FAIL		
SIGNAL CONDITIONERS		DEU EQUIV CMD	
DATA BITE	GOOD	DEU MF	
OF1	GOOD	PCM GPC FIX	
OF2	GOOD	PCM GPC PGM	
OF3	GOOD	FMT SELECT	
OA1	GOOD	FMT LOAD	
OA2	GOOD	I/O RESET	
OA3	GOOD	PROMPT	
OM1	GOOD	MTU OSC CHG	
OM2	GOOD		
OL1	FAIL		
OL2	FAIL		
OR1	FAIL		
OR2	FAIL		
FRCS	FAIL		
1 POWER		DISPLAYS	
2 MTU	GOOD	MENU	
3 FETCH PAR	GOOD	OVERVIEW	
4 128 ONLK	GOOD		
5 64 ONLK	GOOD		
6 128 PAR	GOOD		
7 128 CNTR	GOOD		
8 64 PAR/CNT	GOOD		
9 RCDR DATA	GOOD		
10 IN DATA VAL	GOOD		
11 01 RAM PAR	FAIL		
12 PDI RAM PAR	GOOD		
13 TOGL BUFFER	GOOD		
14 GPC RESF	GOOD		
15 MDM RESF	FAIL		

Figure 3.107-13. VWQ11

300: 1/23/50 SV26RA **END COURSE 253/53** **WORLDWIDE PROGRESS** **1**  
SM SA 0123 D123 E123 1AB 2AB 3AB 4AB 5AB 6AB SAQ06 /VMQ15 P123456\*

VMQ15 REORDER VDQ39 3

POWER  OPS-1 OFF  OPS-2 OFF  OPS1 OPS2 P/L  
 BITE  FAIL  STBY 0 0  
 MODE  STBY 0 0  
 TRACK 0 0  
 TAPE OFF FWD FWD  
 MOTION OFF 24 OFF OFF OFF OFF NONE  
 DIR SPEED 24 OFF OFF OFF OFF NONE  
 BOT EOT FULL RESET DELAY RUN TEMP  
 EXEC SELECTION  
 INTG TEST SETUP RCDR SELECTION  
 OPS1  OPS2  P/L

<input type="checkbox"/> UPLINK <input checked="" type="checkbox"/> <b>MODE</b>	
<input type="checkbox"/> OPS-1 OFF FAIL STBY 0 0 OFF FWD 24 OFF OFF OFF OFF NONE CONT 2	<input checked="" type="checkbox"/> OPS-2 OFF FAIL STBY 0 0 OFF FWD 1 OFF OFF OFF OFF NONE CONT 1
<input checked="" type="checkbox"/> OPS-1 RCD SER A RCD EIU STOP STANDEY ERASE PB SER PB EIU	<input checked="" type="checkbox"/> OPS-2 RCD SER A STOP STANDBY ERASE PB SER
SPD 1 <input type="checkbox"/> 2 <input type="checkbox"/> 3 <input type="checkbox"/> 4 <input type="checkbox"/> RCD SER A <input type="checkbox"/> RCD SER B <input type="checkbox"/> RCD PRL <input type="checkbox"/> STOP <input type="checkbox"/> STANDBY <input type="checkbox"/> ERASE <input type="checkbox"/> PB SER FWD <input type="checkbox"/> PB PRL REV <input type="checkbox"/>	

**OVERVIEW**  
 RCDR TEST   
 MENU   
 OVERVIEW

Figure 3.107-14. VMQ15

300:1/22/10 SV26RA  
SM SA 0123 D123 E123

1AB 2AB 3AB 4AB 5AB 6AB SAR06 /VNRQ14  
~~COINTEGRATED~~  
~~MONITOR~~

5/22/10 SV26RA  
SM SA 0123 D123 E123

P123456  
3

VNRQ14 ANALOG V0042

01 ↑ 129 LOB ↑

RECORDER	STATUS	CONTROL
BITE FAIL MODE PASS 2 % TAPE 100 MOTION OFF	PCM1 BITE FAIL FDM 1 FAIL MUX1 FAIL MUX2 FAIL MUX3 FAIL MUX4 FAIL MODE CAL CAL SHELF TEMP V78T9607A1 72	RECORDER PB FWD ON PB REV ON PASS 3 ON PCM FWR ON WB/ACIP ON FDM AUTO CAL
		<input type="checkbox"/> OFF <input type="checkbox"/> OFF <input type="checkbox"/> OFF <input type="checkbox"/> OFF <input type="checkbox"/> OFF <input type="checkbox"/> OFF

MENU   
OVERVIEW

Figure 3.107-15. VNRQ14



**TITLE**

INCO SYSTEMS POWERDOWN OPTIONS

**GENERAL**

This document lists the INCO systems that may be considered for powerdown during a power saving mode outside the realm of a Procedural Group Powerdown.

<u>LRU</u>	<u>Power usage (W)</u>	<u>Consequences</u>	<u>Powerdown procedure</u>
FM System	81.1	Typically powered down during a Group B Priority Powerdown. Used mostly in support of Ops Recorder dumps and for TV downlink	Group B Group C
Ops Rcdr and P/L Rcdr	17 (STBY) 56 (RECORD)	If an Ops Recorder is powered down, then the other recorder is used as both the AOS and LOS recorder. Another option is to forfeit the AOS data and record only for LOS periods. However, this action risks losing data during hits to the orbiter return link. If the Payload Recorder is powered down, then payload data being captured on the payload recorder will be lost. (Mission dependent)	Group C-(P/L and Ops 2 Rcdr) Group 3A-(P/L Rcdr) Group 5-(Ops 2 Rcdr)
UHF XCVR	25 (RCV) 35 (KEY)	Do not consider powering off if another voice link is already lost. If powered off, then single fault tolerant on the voice loops. If no capability exists on the ground to command the vehicle out of this situation, will have to depend on the crew to power UHF back on in this case	
PA	160 (KEY)		
MADS/OEX Rcdr	59 (STBY and POWER ON)	Other than ascent and entry phases, the MADS recorder is typically powered down. Occasionally, DTO's have requirements for MADS recorder - data collection, and whether these requirements are to be adhered to will need to be decided on a mission-by-mission basis. The OEX recorder is generally used to record on orbit during crew exercise periods. Whether these requirements are adhered to will be made on a mission-to-mission basis	Group B Group C
OV-102 SCM only	85		
Total in Record	1023		
OV-103 MCM only	20.7		
Total in Rcd Cont.	602		
OV-104 MCM only	20.7		
Total in Rcd Cont.	349		
OV-105 MCM only	20.7		
Total in Rcd Cont.	500		

<u>LRU</u>	<u>Power usage (W)</u>	<u>Consequences</u>	<u>Powerdown procedure</u>
TIPS	100 (STBY) 200 (PRINTING)	The TIPS may be managed real time for required uplinks. Powering on and off the box requires crew actions	Group B Group C
PDI	27	During missions in which there are no P/L data telemetry processing requirements through the PDI, it may be powered off. However, when the PDI is powered off, it will mask PCMMU element bypass checks on several SM GPC tables because these tables will be bypassed	Group C
PSP	32	Mission payload requirements will determine the need for allowing the PSP to be powered down. Potential loss of command and/or telemetry link to specific payloads	Group C
PI	98	See PSP references. Do not power down during phases of flight for which the PI is required to support RF payload operations	Group C
ERPCL	139	The ERPCL should not be powered down whenever it is mission required to support RF payload operations	
PCMMU	68	Do not power off the operating PCMMU. Without an operating PCMMU, no telemetry will be received or be recoverable on the ground. Voice will still be available	
OI MDM	41-47	Do not power down any OI MDM's	Group 7- DSC OP1 and 2
OI DSC	9-32	Do not power down any OI DSC's	
Poweramp	11(STBY) 387(OPERATE)	Do not power off the operating PA. The other PA is placed in off except during high activity periods. The PA is used in TDRS and STDN HI modes for S-band return link amplification	
Transponder	59(Direct mode) 41(TDRS mode)	Do not power off the operating Transponder since it is the onboard transmitter and receiver for the forward and return link S-band signals	
Preamp	20	Do not power off the operating Preamp since it is needed for S-band forward link amplification in TDRS and STDN HI modes	
Antenna Switch Elec.	0.6	Do not power off the operating Antenna Electronics	
NSP	29	Do not power off the operating NSP. If the NSP is powered off, the only available comm link will be voice through UHF. Data will not be recoverable	NSP 1 - Group 7: MDM FF1 - OFF

<u>LRU</u>	<u>Power usage (W)</u>	<u>Consequences</u>	<u>Powerdown procedure</u>
Comsec	2.5(STBY) 25(OPERATE)	The capability exists to fly in the clear (encryption bypass) on the uplink. The crew would be responsible for controlling the uplink block switch to comply with Flight Rule 11-3. It is recommended that the operating Comsec not be powered off except in the case of redundant Comsec failures	
GCIL	51	There is no control for powering ON and OFF the GCIL. When the GCIL loses both power sources, all systems fail to panel mode	
Ku-Band		The only time Ku-band should be placed in standby is when the antenna has positioned itself near the Beta gimbal stop. Do not power down the Ku-band. The heaters generally are not activated for very long after the initial warmup period with one exception, the transmitter heater	Group B
Standby:			Group C - as reqd
Comm Mode			Group 5 -
w/o hrs	262		Stow and htr cbs open
w hrs	567		
Radar Mode			
w/o hrs	262		
w hrs	567		
On:			
Comm Mode			
w/o hrs	527		
w hrs	832		
Radar Mode			
w/o hrs	442		
w/ hrs	747		
ACCU	40	Do not power down the current operating ACCU since all voice loops would be lost	
ATU		The power consumption on the ATU's is so minimal, 4 W, when no signal is present that powering off an ATU does not significantly contribute to any power savings	
Transmit	12		
Receive	4		
CCTV		Do not power off the VCU unless there are no requirements for camera/video operations. If powered off, the VCU defaults to sync mode	Group C:
VCU	46		Group 6
Cameras	19	When not in use, keep cameras powered down	
heaters	20		
8mm	10	The crew will operate the 8mm to fit the mission requirements. Nominally, the 8mm cameras are connected to orbiter power at the TV outlet on panels MO58F and O19. The batteries that the 8mm can use for power provide approximately 15 minutes of record time per battery. The number of batteries flown will be mission dependent	

<u>LRU</u>	<u>Power usage (W)</u>	<u>Consequences</u>	<u>Powerdown procedure</u>
HRM	123(ON) 107(PS1 or 2) 60(PS0)	Do not power down the HRM. Only the power saving modes may be used as long as the experiment FIFO's powered down are not in use	Group C
HDRR	28(STANDBY) 97-116(RCD) 173(PPLAYBACK)	As long as the HDRR is required to support recording Spacelab data, do not power down. It may be powered down as long as the data is downlinked real time	
VAS		Do not power down the VAS. Once it is powered down, it will reinitialize itself so that input and output selects will clear	Group B
VCR		Do not power off the VCR's. These recorders are typically used often enough that it would not contribute significantly to any power savings	

**TITLE**

COMM-RELATED ONBOARD FAULT MESSAGES

**PROCEDURE**

Note: The messages below are class 3 messages and will generate a C/W tone and light.

MF	Message	NF	Possible causes	Malf no.
SM	S76 GCIL FAIL	15	The ground control interface logic (GCIL) is configured to panel mode (V74X5052E = 0)	2.2a
SM	S76 COMM CAM TEMP	15	The video switch unit (VSU) detected a camera at >45° C (V74X0847E = 1), any async source being used while the VSU is in synchronous mode	2.2a
SM	S76 KU-XMTR TEMP	15	Ku-band transmitter temp >171° F (V74T2497A)	2.2a
SM	S76 KU-GMBL A(B) TEMP	15	A Ku-band antenna gimbal is over its temperature limit. "A" limit (V74T2965A) is 150° F or "B" limit (V74T2969A) is 166° F	2.2a
SM	S76 KU-GYRO TEMP	15	Ku-band gyro temperature >155° F (V74T2967A)	2.2a
SM	S76 COMM PA2(1) TEMP	15	S-band power amplifier temperature >230° F (V74T4514A or V74T4515A)	2.2b
SM	S76 PA2(1) OUTPUT LOW	15	S-band power amplifier power output <60 W (V74E4512A or V74E4513A)	2.2c
SM	S76 NSP 2(1) BITE	15	A Network Signal Processor (NSP) Built-In Test Equipment (BITE) indicates a failure (V74X5184E or V74X5185E)	2.2d
SM	S76 COMSEC 2(1) BITE	15	Network comsec 2 or 1 indicates a BITE failure (V74X5003E or V74X5004E) Precondition: NSP 2(1) is receive encrypted (V74X5590E or V74X5390E)	2.2e
SM	ANTENNA	8	The commanded and reported S-band antennas do not agree, the panel C3 ant. switch is in GPC, and the SM antenna pointing is enabled. The antenna electronics or MDM OF3 is failed or command path (PL MDM)	2.3b
SM	S62 BCE BYP OF A	2 <sup>a</sup>	MDM OF1 or OF2 failure, card failure in OF1 or OF2, OF1/OF2 data path to the PCMMU failure	2.5a
SM	S62 BCE BYP OF B	2 <sup>a</sup>	MDM OF3 or OF4 failure, card failure in OF3 or OF4, OF3/OF4 data path to the PCMMU failure	2.5b
SM	S62 BCE BYP OA	2 <sup>a</sup>	MDM OA1, OA2, or OA3 failure; card failure in OA1, OA2, or OA3; OA1/OA2/OA3 data path to the PCMMU failure	2.5c

<sup>a</sup>Noise filter NF is part of the system software and cannot be modified.

MF	Message	NF	Possible causes	Malf no.
SM	S62 BCE BYP PL	2 <sup>a</sup>	PDI port failure, PCMMU port failure, PDI to PCMMU data path failure, SSC (EXC) to PCMMU path failure, if the PCMMU is switched and the SSC and EXC couplers are not switched	2.5d
SM	S62 BCE BYP PDI	2 <sup>a</sup>	PDI P/L bus port failure, GPC P/L port failure, PDI to GPC data path failure	2.5e
SM	S62 BCE BYP PSP 1(2)	2 <sup>a</sup>	PSP 1(2) to PF 1(2) MDM interface failure, PSP powered off, PSP power supply failure	2.5f
SM	S62 PDI DECOM FAIL	2 <sup>a</sup>	PDI DECOM 1(2,3,4) failure, P/L to PI RF link failure, P/L TLM output to PDI failure, PSP to PDI hard line failure, nonzero source with a PDI BSR word bypassed  Preconditions: If no frame sync, no word sync, or no bit sync, and FDA is enabled, then set the message  else, if PDI BSR is comm faulted and a source is greater than 0	2.5g
SM or BFS	I/O ERROR PCM	2 <sup>a</sup>	PCMMU failed to respond to the SM or BFS GPC	5.5a or 5.5b
SM or GNC	I/O ERROR D/L	2 <sup>a</sup>	SM or GNC downlister GPC detected a busy I/O PCMMU MIA when a downlist write was attempted	5.5c
GNC or BFS	BCE STRG 1(3) NSP	2 <sup>a</sup>	I/O error between NSP 1(2) and GNC or BFS GPC	5.3b
SM	BCE BYP KU	2 <sup>a</sup>	I/O error between PF1 MDM card 8 channel 2 interface to SM GPC	N/A
SM	S215 CPU FAULT (CIE) A, B	2 <sup>a</sup>	The CPU detected an error in the CIE electronic assembly A or B during powerup, initialization, or normal CIE OPS	N/A
BFS	TFL FAIL	1	TFL checksum on LDR TFL readback miscompared with checksum of the loaded LDR TFL	N/A
SM	212 OIU TEMP	10 <sup>a</sup>	The active OIU (1or 2) has a power supply temperature greater than 212°	
SM	212 OIU CONV ERR	10 <sup>a</sup>	The active OIU has an error converting floating point values from the bus controller unit	N/A
SM	212 PDI DECOM NOLK	10 <sup>a</sup>	The active OIU (1 or 2) is no longer processing the data from an active device (1,2, 3 or 4)	

<sup>a</sup>Noise filter NF is part of the system software and cannot be modified.

MF	Message	NF	Possible causes	Malf no.
GNC	G33 RNDV RADAR	1	Ku-track (V74X2903B) = 0 and was 1 on the previous 1-second cycle  Preconditions 1. No COMM faults 2. In radar mode (V74X2883B = 1) 3. In GPC ACQ (V74X2886B = 1) 4. No self-test in progress (V74X2892B = 0) 5. RNDZ NAV is active	N/A
(Note: The following messages are class 4 messages and will NOT generate a C/W tone or a light.)				
SM	ITEM RJCT PSP		A rejected or incomplete PSP CC SPEC (Cargo Control SPEC) item entry was made	N/A
SM	TLF LOAD FAIL		TFL checksum miscompared on readback after attempting to load an LDR or HDR TFL, or an OPS transition was in progress during a TFL load, or the SM common buffer or mass memory unit was busy before the attempt to load a TFL was made	N/A

(Note: See the SM FSSR for more information on how these messages are generated.)

## TITLE

STANDARD COMM MALFUNCTION RECONFIGURATION PROCEDURES

## PURPOSE

To provide a standard set of system configuration procedures to be used in response to comm system malfunctions.

## GENERAL

In the event of the malfunctions listed, comm system personnel will exercise the specific procedure to set up a comm system configuration that provides maximum redundancy and minimum impact to other operations/procedures.

## ASSUMPTIONS/GUIDELINES

- On orbit, the crew is assumed to have the time for complex troubleshooting by trying different configurations on panel A1. During entry, it is assumed that panel A1 is inaccessible.
- During entry, UHF is assumed available as a source of voice. UHF is assumed to be unavailable on orbit.
- If a choice must be made, it is more important to recover S-band voice before telemetry when on orbit. During entry, since UHF is available, telemetry is more important.
- Only one failure is assumed, as noted in each paragraph. Configurations of panel A1 are intended to protect against the next worst failure.
- On orbit, continuous use of uplink or downlink low data rate is assumed to be unacceptable because some missions, such as Spacelab, need both A/G loops. Another consideration is that MCC monitoring assumes HDR. However, Flight Rules allow mission continuation if all HDR is failed.
- Cross-strapping should be avoided in the panel configuration for entry because any of four potential bus losses can cause an unrecoverable loss of S-band. However, on orbit, it should be permissible to cross-strap because the crew has time to troubleshoot and isolate the remaining S-band capabilities following failures of an S-band LRU and a bus.



**PROCEDURE**

- | <u>Malfunction</u>                                   | <u>Configuration procedure</u>   |
|--|--|
| A. High-frequency capability lost in S-BD SYS 1 or 2 | - Select low frequency for use on S-band SYS 1 and 2.<br>- Notify GC of frequency change.<br>- Maintain standard orbit configuration (SYS 1 on PNL, cmd SYS 2).                                    |
| B. S-BD SYS 2 LRU lost                               | - The configuration will vary as a function of the LRU which failed and the flight phase. See the following pages for specifics.<br>Note: These changes may impact numerous pocket C/L procedures. |
| C. FF3 lost  | - Change orbit configuration to fly on SYS 1 with SYS 2 on PNL. Note: This impacts numerous pocket C/L procedures.   |

D. Standard S-band PNL/CMD configurations for given LRU failures

1a. XPNDR 2 UPLINK FAILURE

ORBIT

	XPNDR	NSP	ANT	PREAMP	PA
CMD -	1	2	2	2	2
PNL -	1	1	1	1	1

ENTRY

	XPNDR	NSP	ANT	PREAMP	PA
CMD -	1	1	1	1	1
PNL -	2	2	2	2	2

1b. XPNDR 2 DOWNLINK FAILURE

ORBIT/ENTRY

	XPNDR	NSP	ANT	PREAMP	PA
CMD -	1	2	2	2	2
PNL -	1	1	1	1	1

2a. NSP 2 UPLINK FAILURE - (VOICE AND/OR COMMAND; BOTH DATA RATES)

ORBIT

	XPNDR	NSP	ANT	PREAMP	PA
CMD -	2	1	2	2	2
PNL -	1	1	1	1	1

ENTRY

	XPNDR	NSP	ANT	PREAMP	PA
CMD -	1	1	1	1	1
PNL -	2	2	2	2	2

2b. NSP 2 UPLINK FAILURE - HIGH DATA RATE (LOW DATA RATE IS OK)

ORBIT

	XPNDR	NSP	ANT	PREAMP	PA
CMD -	2	1	2	2	2
PNL -	1	1	1	1	1

(Advise crew to select NSP 2 and uplink low data rate and repeat PNL/CMD if no comm)

ENTRY

	XPNDR	NSP	ANT	PREAMP	PA
CMD -	1	1	1	1	1
PNL -	2	2	2	2	2

(Config PNL A1 for low data rate uplink)

2c. NSP 2 DOWNLINK FAILURE - (VOICE AND TELEMETRY LOST)

ORBIT/ENTRY

	XPNDR	NSP	ANT	PREAMP	PA
CMD -	2	1	2	2	2
PNL -	1	1	1	1	1

2d. NSP 2 DOWNLINK FAILURE - HIGH DATA RATE (LOW DATA RATE IS OK)

ORBIT

	XPNDR	NSP	ANT	PREAMP	PA
CMD -	2	1	2	2	2
PNL -	1	1	1	1	1

(Advise crew to select NSP 2 and downlink low data rate and repeat PNL/CMD if no comm)

ENTRY

	XPNDR	NSP	ANT	PREAMP	PA
CMD -	1	1	1	1	1
PNL -	2	2	2	2	2

(Config PNL A1 for low data rate downlink)

2e. NSP 2 DOWNLINK FAILURE - (VOICE LOST; TELEMETRY OK)

ORBIT

	XPNDR	NSP	ANT	PREAMP	PA
CMD -	2	1	2	2	2
PNL -	1	1	1	1	1

ENTRY

	XPNDR	NSP	ANT	PREAMP	PA
CMD -	1	1	1	1	1
PNL -	2	2	2	2	2

2f. NSP 2 DOWNLINK FAILURE - (TELEMETRY LOST; VOICE OK)

ORBIT/ENTRY

	XPNDR	NSP	ANT	PREAMP	PA
CMD -	2	1	2	2	2
PNL -	1	1	1	1	1

(Advise crew (on orbit) to select NSP 2 and repeat PNL/CMD if no comm)

3. ANT ELEC 2 FAILURE - ORBIT AND ENTRY

	XPNDR	NSP	ANT	PREAMP	PA
CMD -	2	2	1	2	2
PNL -	1	1	1	1	1

4a. PREAMP 2 FAILURE - ORBIT

	XPNDR	NSP	ANT	PREAMP	PA
CMD -	2	2	2	1	2
PNL -	1	1	1	1	1

4b. PREAMP 2 FAILURE - ENTRY

	XPNDR	NSP	ANT	PREAMP	PA
CMD -	2	2	2	1	2
PNL -	1	1	1	1	1

Note: Select LRU's as above, except position S-band PM mode select rotary to STDN LO.

5a. POWER AMP 2 FAILURE - ORBIT

	XPNDR	NSP	ANT	PREAMP	PA
CMD -	2	2	2	2	1
PNL -	1	1	1	1	1

5b. POWER AMP 2 FAILURE - ENTRY

	XPNDR	NSP	ANT	PREAMP	PA
CMD -	2	2	2	2	1
PNL -	1	1	1	1	1

Note: Select LRU's as above, except position S-band PM mode select rotary to STDN LO on PNL A1.

**TITLE**

SUGGESTED ACTIONS FOR OI MDM AND DSC CARD FAILURES AFFECTING INCO

**GENERAL**

The following tables give suggested actions for card failures in the PL MDM, OI MDM and DSC's that contain INCO parameters.

MDM	Card	Lost	Action
OF 1	2	OEX SCM command feedback, RCDR track	None
		PCMMU 1 format select switch (GPC, program)	None
		MADS recorder motion	Verify motion by changes in % tape
		DSC OF1 BITE	Verify the data from the DSC via the raw_data display
		SSR 1 telemetry bits	Use SSR 2
		Payload recorder speed, track, EOT, record serial B, direction, write protect and run period time	Continue to use the recorder but configure the PL recorder management display to manual mode.
	3	Payload recorder head temperature	None
		Ku-band antenna feed and gyro temperature	Stow Ku-band antenna for the loss of insight into the gyro temp (flight rule A11.1.2-7) unless otherwise noted in flight-specific rules
	4	MADS recorder BITE, mode and sequence 1 - 2	Verify proper operation via % tape change and direction expected
		OPS 1 recorder RPC A	Verify that recorder is powered
	6	PCMMU 1 RPC A	None
		Payload recorder RPC A	None
		MADS MCM sequence 3	None
	10	OPS 1 recorder power switch or CNTR AB1	Verify that recorder RPC's are powered
		OEX recorder speed, BITE, mode, motion	Verify nominal operations via % tape change
		Payload recorder BOT, motion, full, BITE, reset, % tape, mode, delay	Continue to use the recorder but configure the plr recorder management display to manual mode.
	11	SSR 1 telemetry bits	Use SSR 2
		MADS recorder % tape	Verify nominal operations via mode and motion indications
	12	COMSEC 1 RPC A	None
		PCMMU 1 power switch	LDR TFL may not be loaded by the BFS during a PCMMU swap
		PDI RPC A	
		PCMMU 2 RPC A	None
	14	COMSEC 2 RPC A	None
		PCMMU 2 power switch	LDR TFL may not be loaded by the BFS during a PCMMU swap

MDM	Card	Lost	Action
OF 2	1	OPS 1 recorder head temperature	Minimize use
	2	PSP 1 frame and bit sync lock	Use PSP 2, if required
		DSC OF 2 BITE	Verify data from the DSC via the raw_data display
		OPS 1 recorder direction, write protect, delay timer, record serial B, EOT, speed, track, run time	Use OPS 2 recorder
		SSR 2 telemetry bits	Use SSR 1
	4	PI sweep narrow	None
		PI 1 input power, channel select 1	None
		PI 2 input power, channel select 2	None
		PCMMU 2 RPC B	None
	5	OPS 2 recorder head temperature	Minimize use
	6	PI freq sweep on, sweep wide, RF low power switch, modulation on	Verify payload receiver lock and AGC with the Payload Officer
		PI 1 phase lock, channel select 2, 10, 80	Use PI 2
		PI 2 channel select 4, 20, 100	None
	8	OEX recorder % tape used	A timer will have to be used to estimate % tape
		PI 1 and 2 AGC, RF out, loop stress	None
		TACAN 2 and 3 AGC	None
	10	PSP 2 bit and frame sync lock	Use PSP 1
		PCMMU 2 format select switch (GPC, program)	None
		OPS 1 BOT, motion, full, BITE, reset, % tape, mode, delay	Use OPS 2
		SSR 2 telemetry bits	Use SSR 1
	12	PI 1 channel select 4, 20, 100, 400	None
		PI 2 channel select 8, 40, 200, 400, phase lock	Use PI 1
		OPS 1 recorder RPC B	Verify recorder is powered
		COMSEC 1 RPC B	None
	14	PI 1 channel select 8, 40, 200, 800	None
		PI 2 channel select 1, 10, 80, 800	None
		PI RF power high and medium switch	Verify payload receiver AGC with the Payload Officer
		OPS 2 recorder power switch or CNTL BC 1, OPS 2 RPC B	Verify that recorder is powered
	15	BIOMED ECG channel 1 and 2	Report loss to the Surgeon and EVA officers

MDM	Card	Lost	Action
OF 3	1	Ku-band beta gimbal temperature	Stow Ku-band antenna (flight rule A11.1.2-7) unless otherwise noted in flight-specific rules
	2	NSP 1 BITE, bit and frame sync lock, receive, transmit, and record encrypted	Use NSP/COMSEC 2
		NSP 1 and 2 command validity	None
		DSC OF 3 BITE	Verify data from the DSC via the raw_data display
		COMSEC 1 and 2 authenticate and frame sync	Use GNC, SM, or BFS frame sync to determine command link status
		COMSEC 1 BITE, receive and transmit full-operate, alarm, zeroized	Use NSP/COMSEC 2
	3	Ku-band alpha gimbal temperature	Stow Ku-band antenna (flight rule A11.1.2-7) unless otherwise noted in flight-specific rules
	4	XPNDR 1 phase lock, power on	Use XPNDR 2
		Antenna elec. 1 power	Use antenna elec. 2
		Preamp 2 heater on	Monitor temperatures
		GCIL frequency low, STDN high power mode, NSP transmit HDR, receive coding on	Verify state with ground sites
		Power amp 1 operate	None
		Beam control 1 and 2 power on	Verify beam switching via telemetry
		Antenna switch S2A and S3B on	None
		FM antenna switch S5A on	None
		Power amp 2 standby power on	Expect a possible 140-second timeout delay before recovering data when switching to PA 2
	5	Ku radar transmitter temperature	None
	6	Preamp 1 heater on	Use preamp 2
		GCIL high frequency, SGLS mode, transmit coding on, source Ku, active	Verify state with ground sites
		Power amp 2 operate	None
		Ku-band GPC acquire, HDR - PL analog, LDR - PL digital, standby on	None
		FM antenna switch S5B on	None
		PM antenna switch S4A on	None
		Power amp 1 standby power on	Expect a possible 140-second timeout delay before recovering data when switching to PA 1
		Antenna elec. 2 on	Verify antenna switching
	Antenna switch position ULF, ULA, URF, URA, LLF, LLA, LRF, LRA	None	

MDM	Card	Lost	Action
OF 3	7	UHF 296.8 receiver AGC	None
		SSOR RF PWR output	Notify crew of larger keep-out zone
	8	XPNDR 1 and 2 AGC, phase error, RF out	None
		Ku receiver AGC	None
		PA 1 and 2 temperature and reflected power	None
		FM 1 and 2 RF out	None
	10	COMSEC 2 BITE, transmit and receive full-operate, alarm, zeroized	Use NSP/COMSEC 1
		NSP 2 bit and frame sync lock, receive, transmit and record encrypted	Use NSP/COMSEC 1
		SSOR PRI FS & SIG PROC, SEC FS & SIG PROC status	None
	11	UHF 259.7 receiver AGC	None
	12	NSP receive HDR and LDR, record voice on	None
		Ku-band pointing GPC designate, HDR - PL digital, LDR - PLR	Have the crew configure the switches on panel A1 to the desired state
		GCIL spread spectrum disable, transmit coding off, Ku power on, transponder transmit/receive mode, TDRS mode, XPNDR 1 direct	Have the crew configure the switches on panel A1 to the desired state
		FM 1 power on	Verify via RF out and ground signal strength
		XPNDR 2 lock, power on	Verify via NSP bit and frame lock
		Preamp 1 and 2 power on	None
		Antenna switch S1A and S4B on	None
		Payload recorder power switch or CNTL CA2, PLR RPC C	Verify recorder power is on
		PCMMU 1 RPC C	None
	14	GCIL - XPNDR 2 direct, STDN low power, Ku auto track, LDR - OPS RCDR, ranging off, Ku failsafe enable, HDR - TV, NSP rcv coding off, NSP xmit LDR, record voice on	Have the crew configure the switches on panel A1 to the desired state
		FM 2 power on	Verify via RF out and ground signal strength
		UHF 243.0 and 279.0 receiver AGC	None
		Antenna switch S3A on	None
		PDI RPC C	
		OPS 2 RPC C on	None
	15	NSP 1 and 2 bit error rate	None
		SSOR input current	Verify SSOR power is on

MDM	Card	Lost	Action
OF 4	0	BIOMED channel 1 select switch position	None
		BIOMED channel 2 select switch position	None
		DSC OM2 BITE	Verify data from the DSC via the raw_data display
		OPS 2 recorder direction, write protect, delay timer, record serial B, EOT, speed, track, run time	Use OPS 1
	2	CCTV sync normal, TV downlink inhibit	None
		Ku radar output high	None
		Antenna switch position ULF, URF	None
		Ku-band LDR - PI	None
		UHF PA switch off	Verify that the UHF is in high power by doing a voice check
		XPNDR low frequency	None
	3	DSC OM1 BITE	Verify data from the DSC via the raw_data display
		OPS 2 recorder BOT, motion, full, BITE, reset, % tape, mode, delay time	Use OPS 1
	4	CCTV sync reverse, main A power source	None
		S-band PM panel switch	None
		FM data source - PLR	None
		UHF guard transmit/receive, and simplex	None
		PSP 1 power on	None
		Antenna switch position LRF, ULA	None
	5	FM data source - DOD, SSME	None
		S-band return link enable	None
		CCTV power source main B, panel command switch	None
		PDI power on	Verify that the PDI is still powered by monitoring the PDI telemetry
		UHF simplex + guard	None
		FM antenna switch transmit upper/receive lower	None
		GCIL power supply 1 on	None
		Antenna switch position URA	None
		PSP 2 power on	None
		DSC OL 1/2 power switch on or CNTL AB2	Verify data from the DSC via the raw_data display

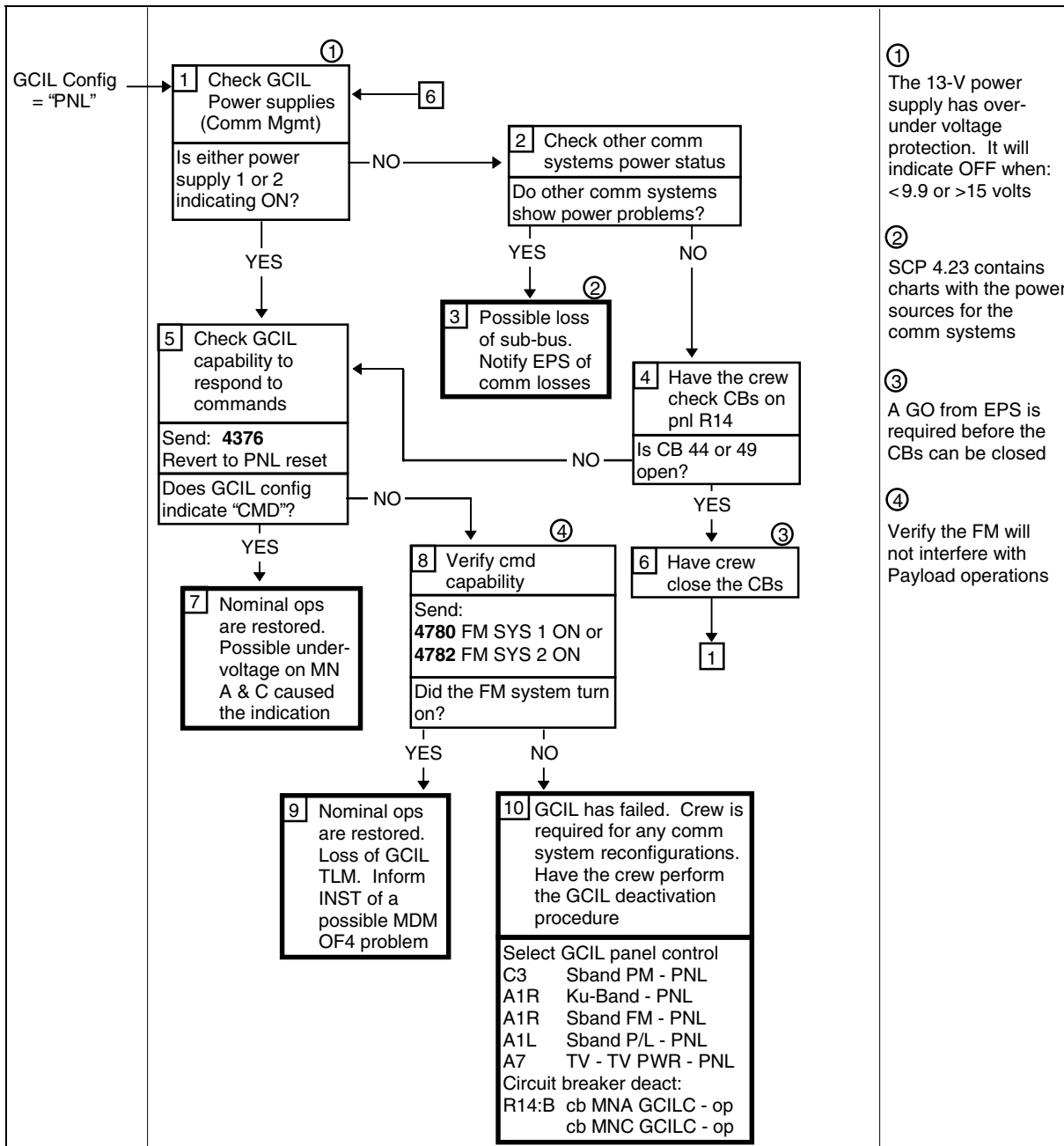


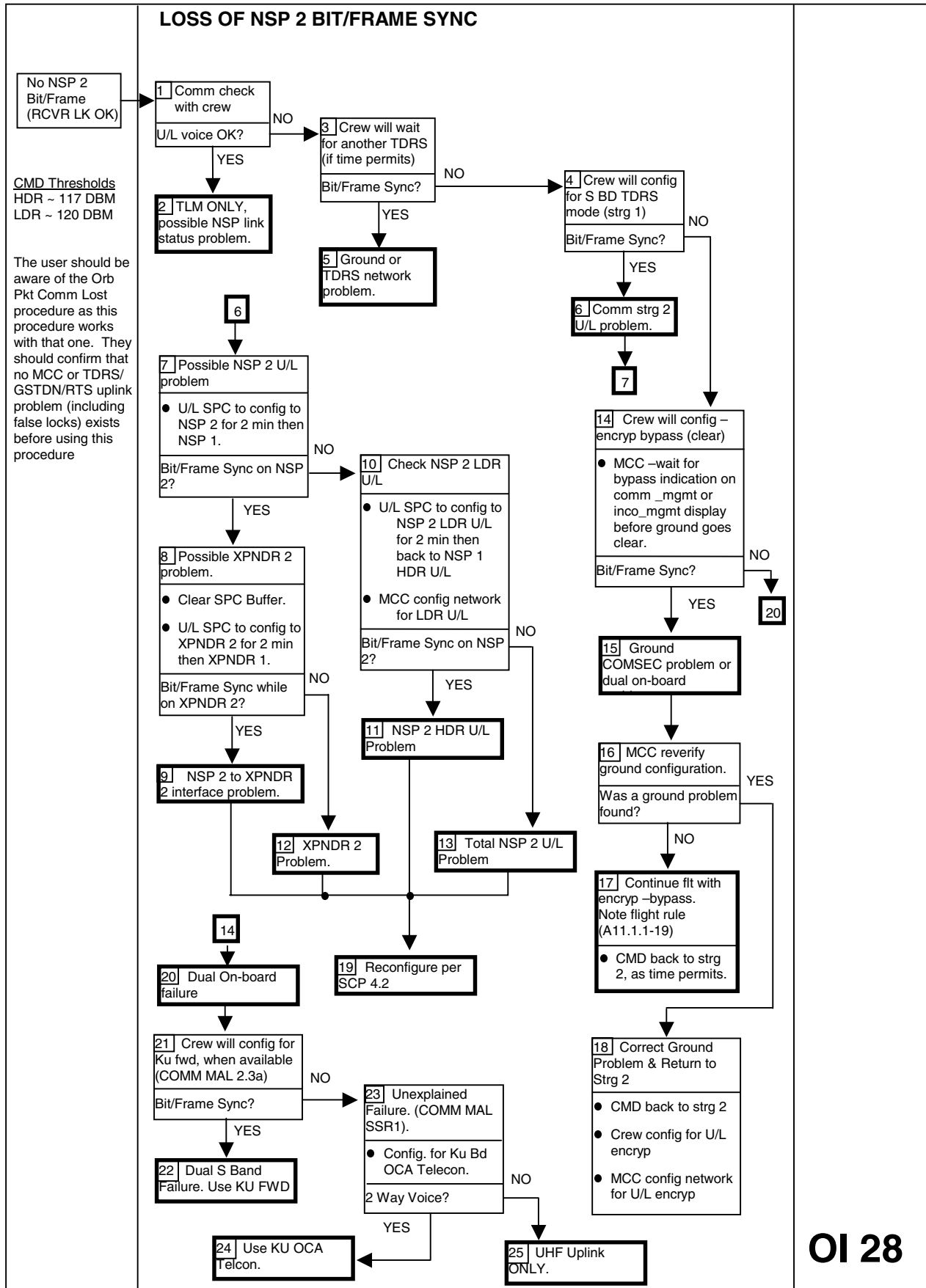
MDM	Card	Lost	Action
OF 4	7	FM data source - TV	None
		UHF frequency selected - 296.8	None
		GCIL - XPNDR in high frequency	None
		PSP command link umbilical	None
		Antenna switch position GPC	None
		CCTV selected PL1 or FWD bay selected	None
		DSC OR 1/2 power switch on or CNTL AB3	Verify data from the DSC via the raw_data display
	10	Ku radar passive mode	None
		FM data source OPS RCDR or PL analog	None
		CCTV source select PL 2 or keel	None
		PL power switch - PI only	None
		Ku HDR - PL MAX	None
	12	Ku panel command switch position	None
		CCTV source select PL 3 or aft bay	None
		SSOR string select	None
		Ku LDR - PI	None
	13	CCTV sync A selected, source selected flight deck, middeck and starboard RMS, gamma white and black stretch, overtemp	Cycle though the camera to view their temperature at least once per rev
		Ku antenna manual slew	None
		PI frequency sweep off	None
		COMSEC encryption power	None
		PL power switch - PSP only	None
		SSOR encryption on	None
		FM antenna switch transmit lower/receive upper	None
	15	COMSEC 1 zeroize switch	Use COMSEC 2
		CCTV source select cabin camera 3, port RMS	None
		UHF squelch switch	None
		FM panel command switch	None
		PI modulation on switch	None
		Ku radar output - medium	None
		NSP 1 PSS voice enable	None
		Antenna switch position LLA	None
		PSP source interrogator	None
	MDM OA 1/2/3 power switch on	Verify that data from those MDM's are valid via the raw_data display	

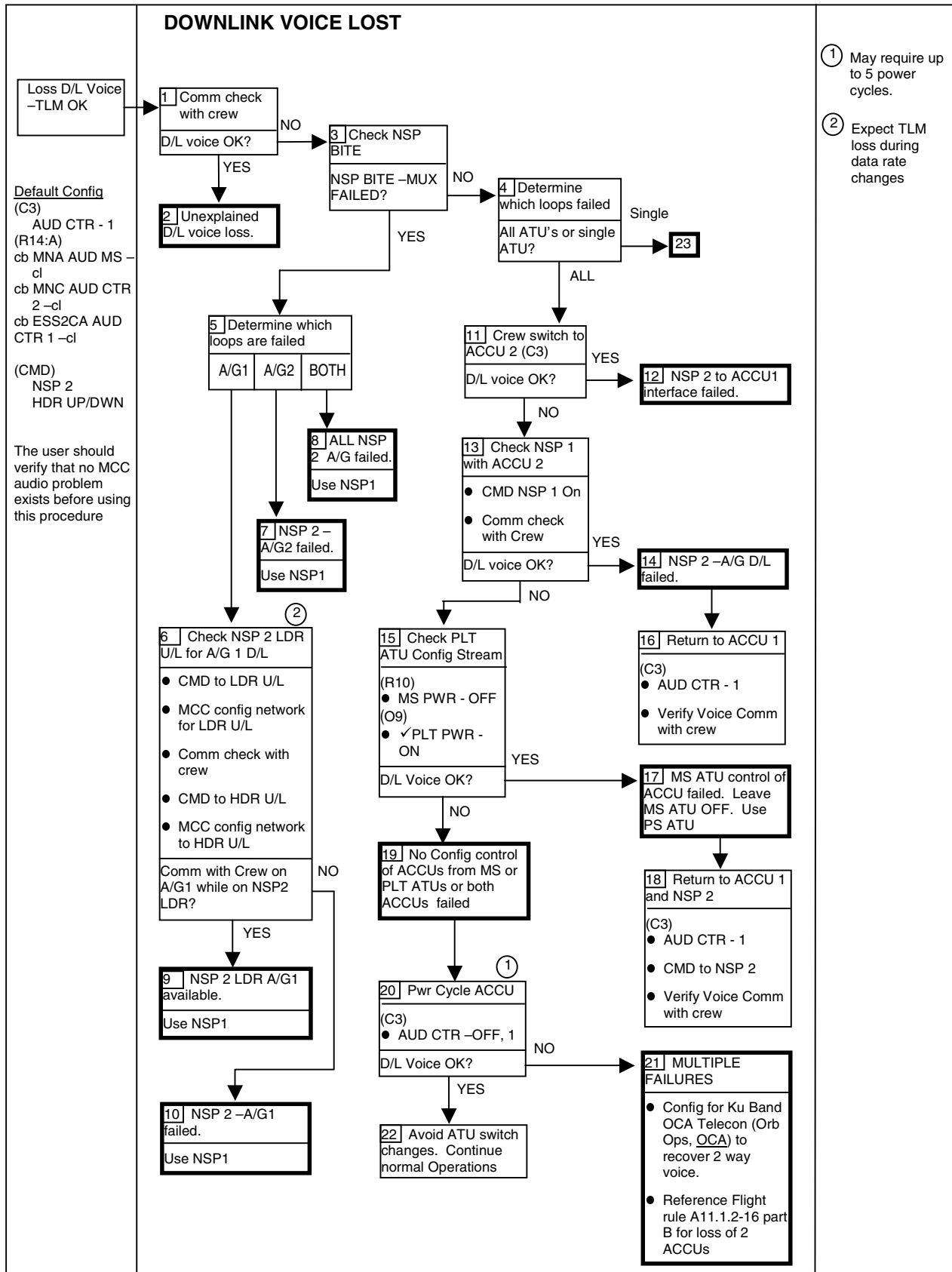
MDM	Card	Lost	Action
OA1	3	DSC OP 1 BITE (EDO only)	Verify that data from this DSC is valid via the raw_data display
	12	DSC OA 1/2/3 power switch on or CNTL AB2	Verify that data from those DSC's are valid via the raw_data display
	14	DSC OA 1 and OM 3 BITE	Verify that data from those DSC's are valid via the raw_data display
OA 2	9	MADS shelf 7/8 top and bottom heat sink temperatures	None
	14	DSC OA 2 BITE	Verify that data from those DSC's are valid via the raw_data display
OA 3	3	MADS wideband mode FDM 2 MUX1 and MUX2 and MUX3 and MUX4 and PCM2 and PCM3 BITE's	None
		DSC OP 2 BITE (EDO only)	Verify that data from this DSC is valid via the raw_data display
	14	DSC OA 3 BITE	Verify that data from this DSC is valid via the raw_data display
		MADS wideband mode FDM 1 MUX1 and MUX2 and MUX3 and MUX4 and PCM1 BITE's	None

MDM	Card	Lost	Action
PF 1	0	Payload recorder commands	Inform the Payload Officer that control of the payload recorder will have to be by crew switch action
		SSR 1 commands	Use SSR 2
		OEX SCM commands	None
	1	OIU 1 Temp (ISS flights only)	Use OIU 2
	2	Antenna electronics 1 FM antenna selects	Use antenna electronics 2 or the crew will have to control the antenna selection from panel A1L
		Antenna electronics 1 PM antenna selects	Use antenna electronics 2 or the crew will have to select PM antennas from the C3 switch
		OARE commands	None
	7	MADS calibrate, sequence 3, and SGSC commands	Crew will have to use the switches on panel A7L to calibrate MADS and turn on the strain gauge signal conditioner
		GCIL decoder A command bits and select command	Use MDM 2 on the command panel
	8	ALL Ku-band telemetry with exception of temperatures	Stow the Ku-band antenna for loss of insight into the antenna (flight rule A11.1.2-7)
		ALL Ku-band configuration commands	Stow the Ku-band antenna for loss of control of the antenna (flight rule A11.1.2-7)
		PSP 1 SIO commands & status	Use PSP 2
	9	OPS 1 recorder configuration commands	Use OPS 2 recorder or have the crew control OPS 1 from panel A1R
	14	MADS wideband/ACIP PCM on, PCM on, recorder playback reverse and playback forward commands	Crew will have to control the operations of the MADS recorder from panel A6L
PF 2	1	OIU 2 Temp (ISS flights only)	Use OIU 1
	2	Antenna electronics 2 FM antenna selects	Use antenna electronics 1 or the crew will have to control the antenna selection from panel A1L
		Antenna electronics 2 PM antenna selects	Use antenna electronics 1 or the crew will have to control the antenna selection from panel C3
	7	CCTV configuration commands	Crew will have to control the CCTV system from panel A7U
		GCIL decoder B command bits and select command	Use MDM 1 on the command panel
	8	PSP 2 SIO commands & status	Use PSP 1
	10	OPS 2 recorder configuration commands	Use OPS 1 or the crew will have to control the recorder from panel A1R
		SSR 2 commands	Use SSR 1

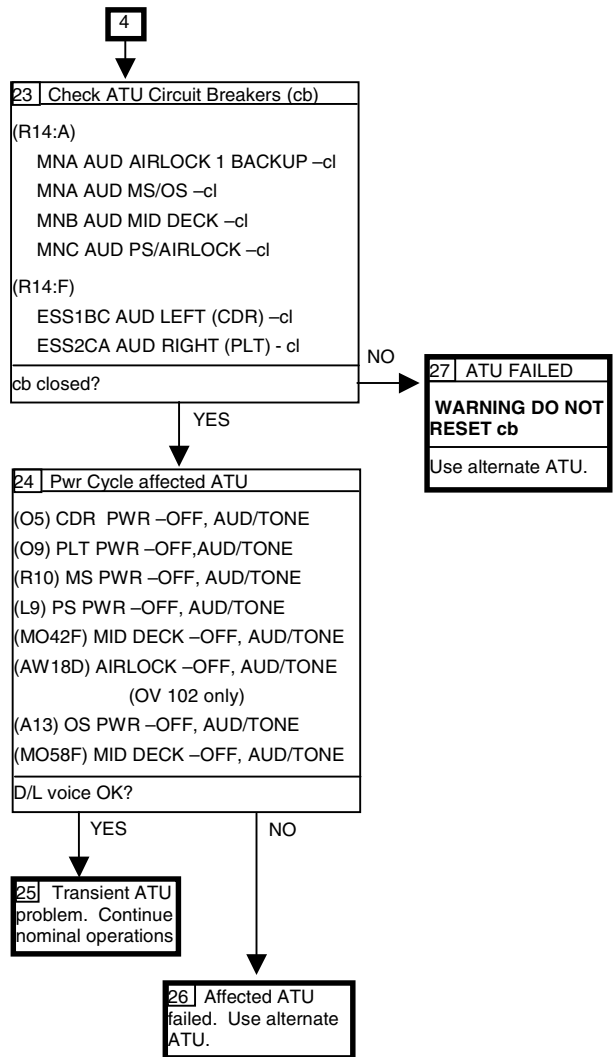
DSC	Card	Lost	Action
OF1	7	PCMMU 1 format select switch position (GPC, program)	Use PCMMU 2
		MADS recorder motion	Verify motion via % tape change
	15	Payload recorder head temperature	Minimize use
	16	MADS recorder % tape	Verify % tape change via the motion bit
	24	Ku-band antenna feed and gyro temperature	Stow Ku-band antenna for loss of insight into gyro temp (flight rule A11.1.2-7) unless otherwise noted in flight-specific rules
OF 2	7	PCMMU 2 format select switch position (GPC, program)	Use PCMMU 1
	11	OPS 1 recorder head temperature	Use OPS 2
	15	OPS 2 recorder head temperature	Use OPS 1
OF 3	18	Biomed Ch 1 switch	None
	19	Biomed Ch 2 switch	None
	20	Ku-band receiver temperature	None
		Ku radar transmitter temperature	None
		Ku-band alpha gimbal temperature	Stow Ku-band antenna for loss of insight into gimbal temp (flight rule A11.1.2-7) unless otherwise noted in flight-specific rules
OF 4	N/A		
OA 1	N/A		
OA 2	N/A		
OA 3	N/A		
OM1	N/A		
OM2	5	Ku-band beta gimbal temperature	Stow Ku-band antenna for the loss of insight into the gimbal temp (flight rule A11.1.2-7) unless otherwise noted in flight-specific rules
	25	MADS shelf 7/8 bottom and top heat sink temperatures	None



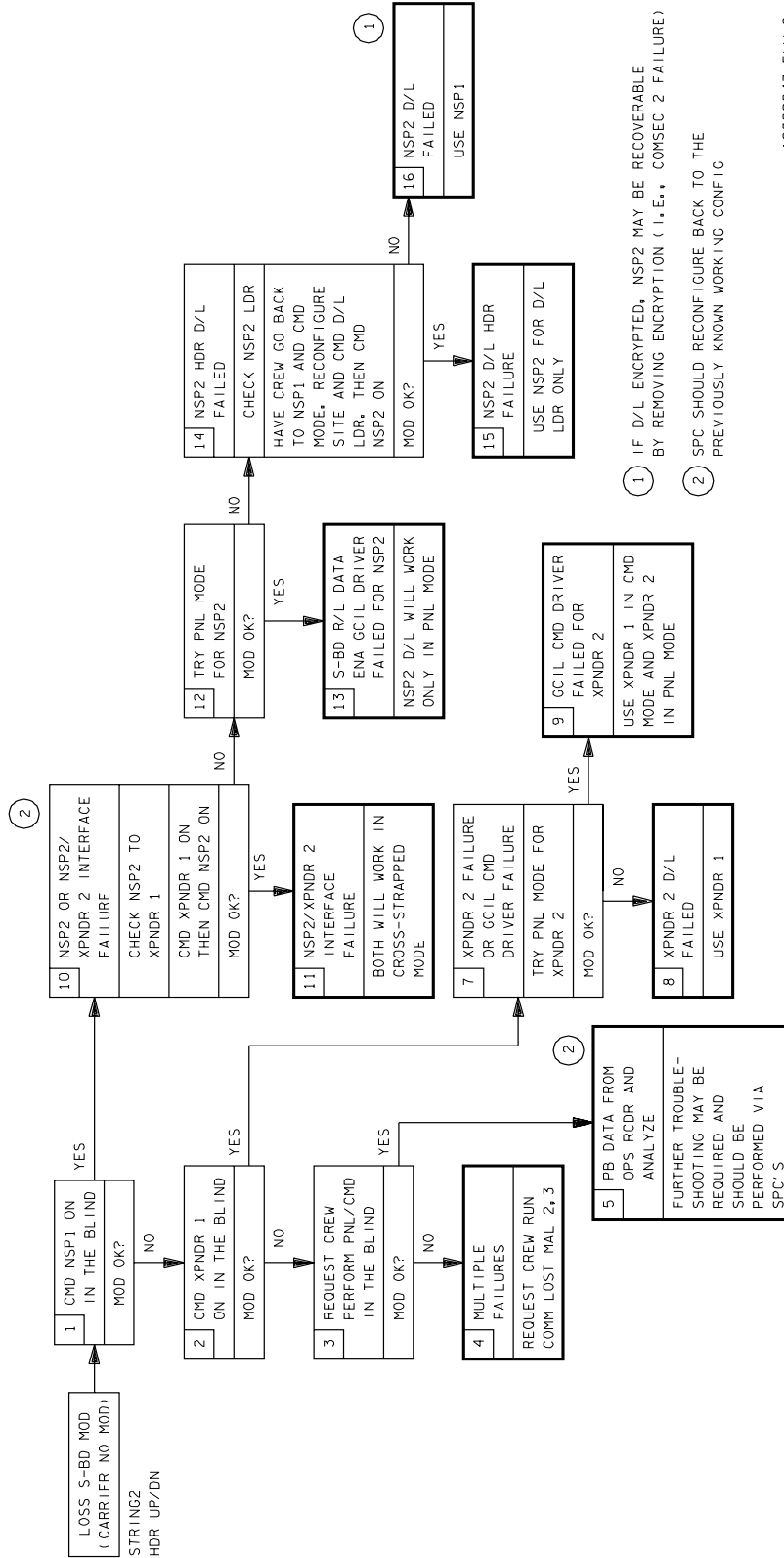


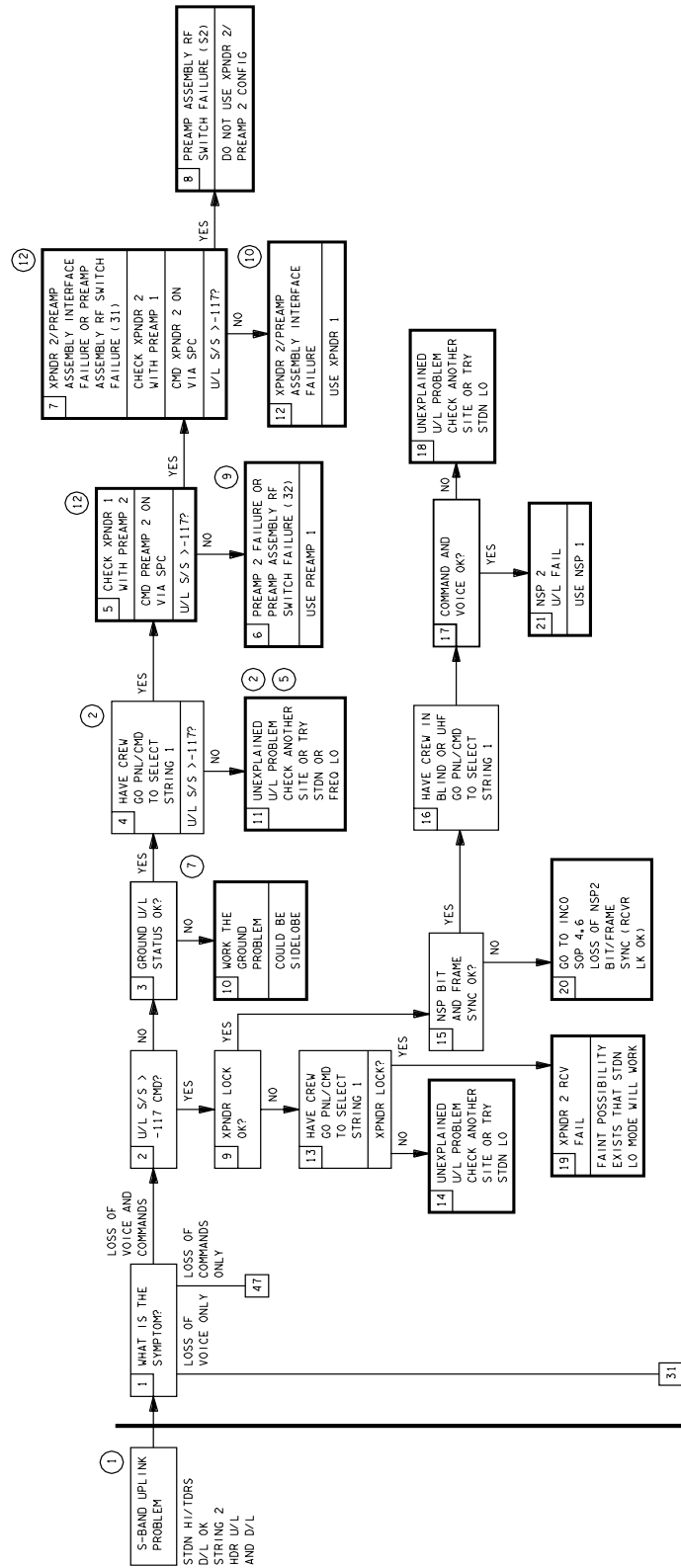


**DOWNLINK VOICE LOST (cont.)**

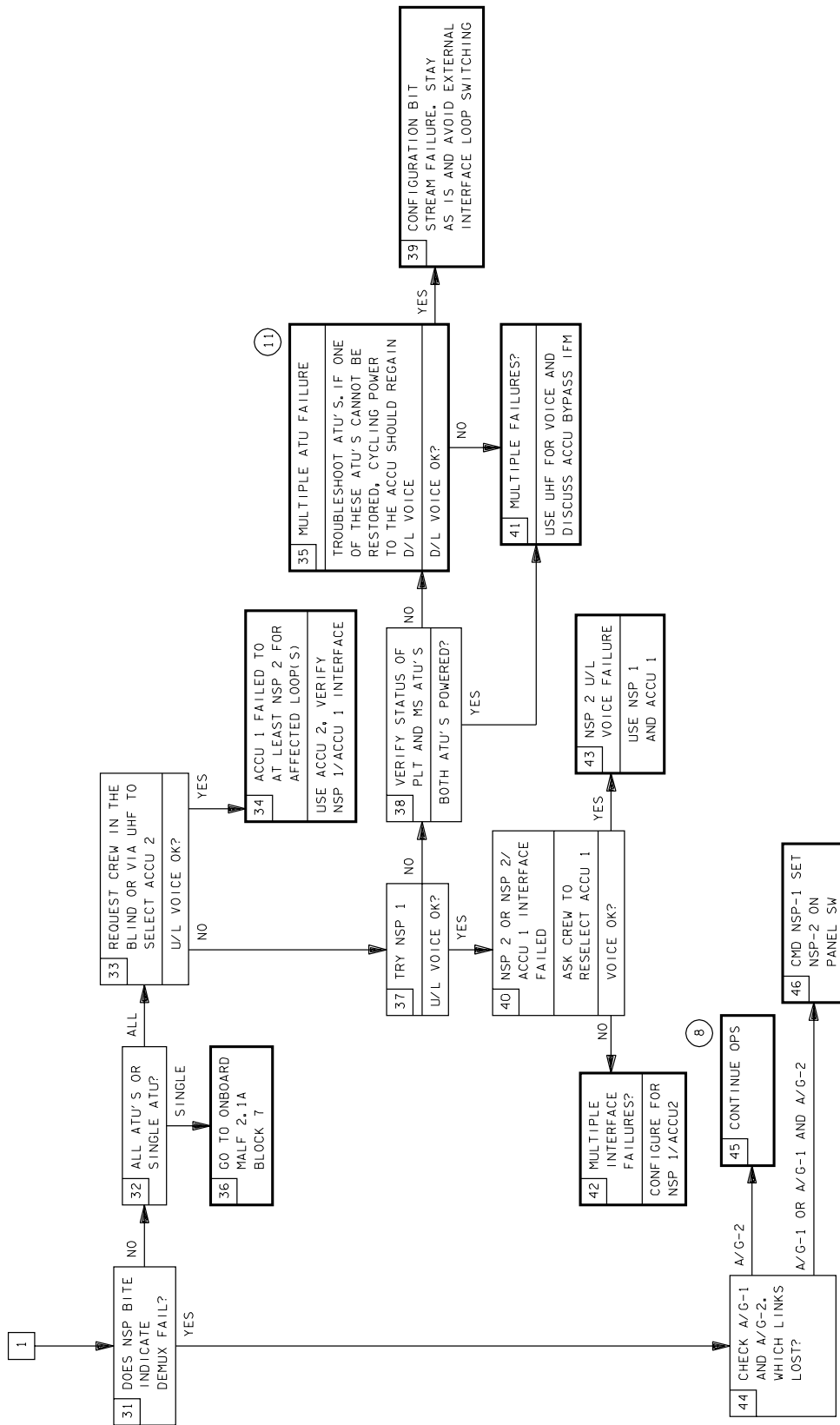




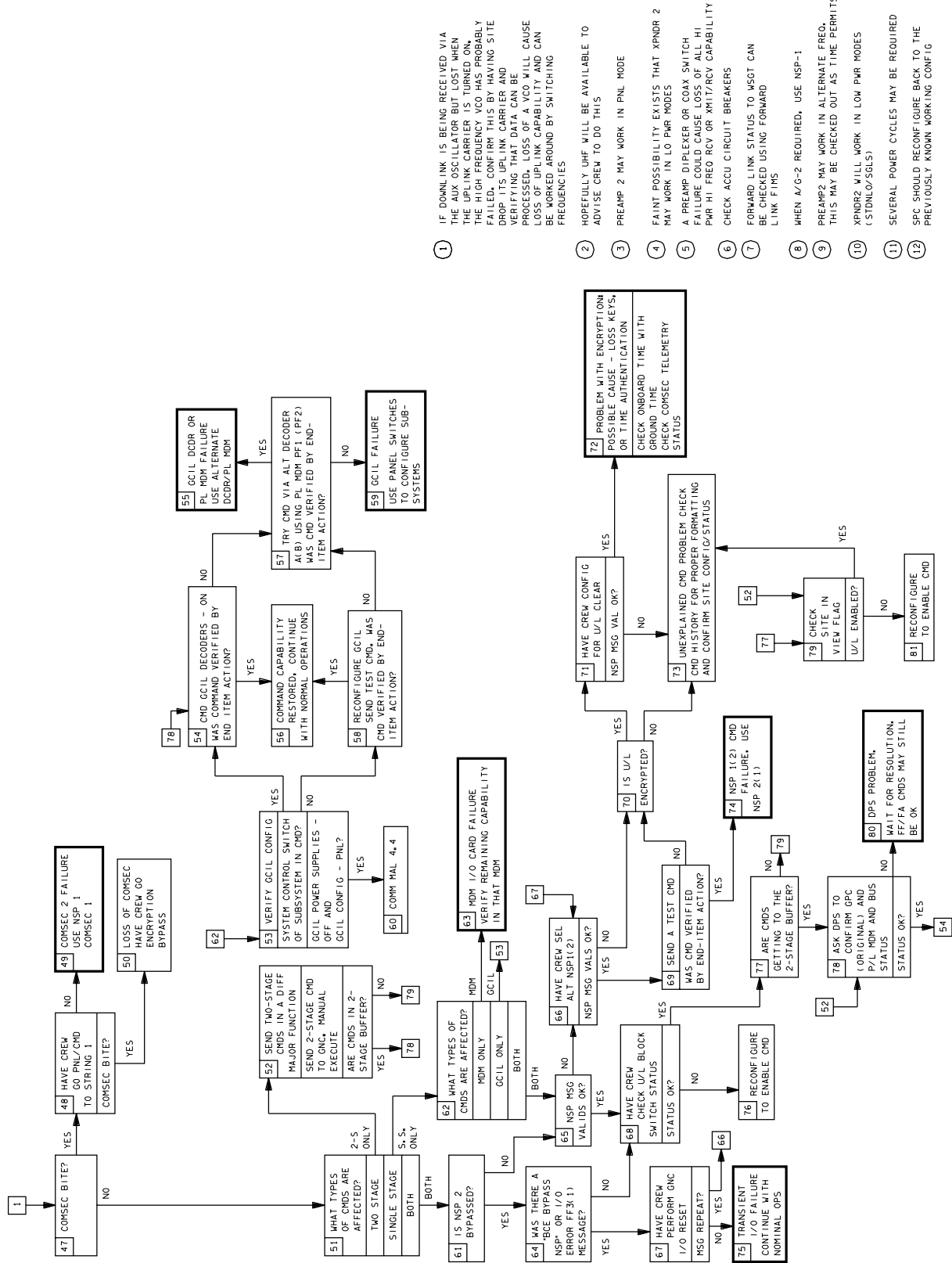




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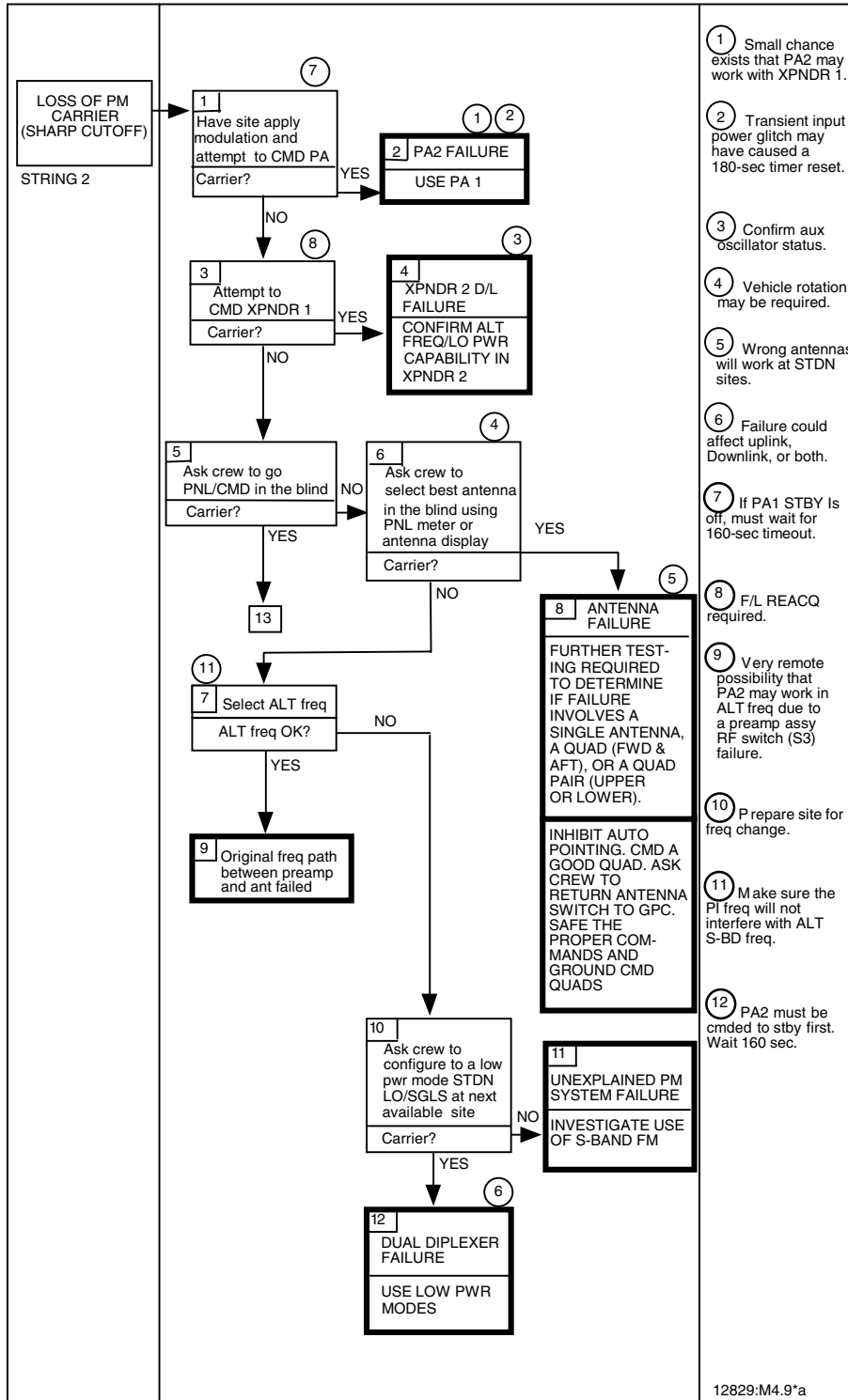


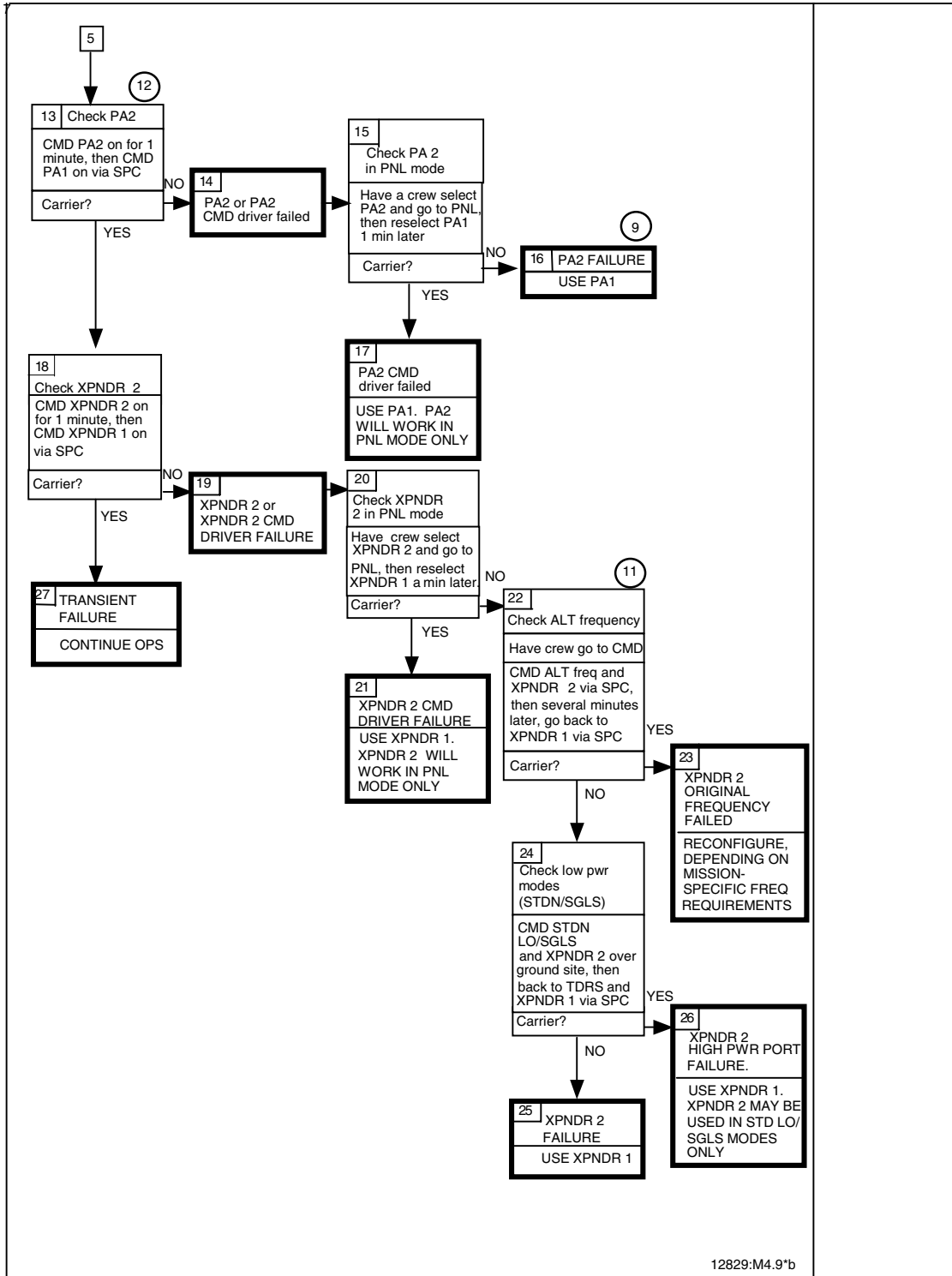
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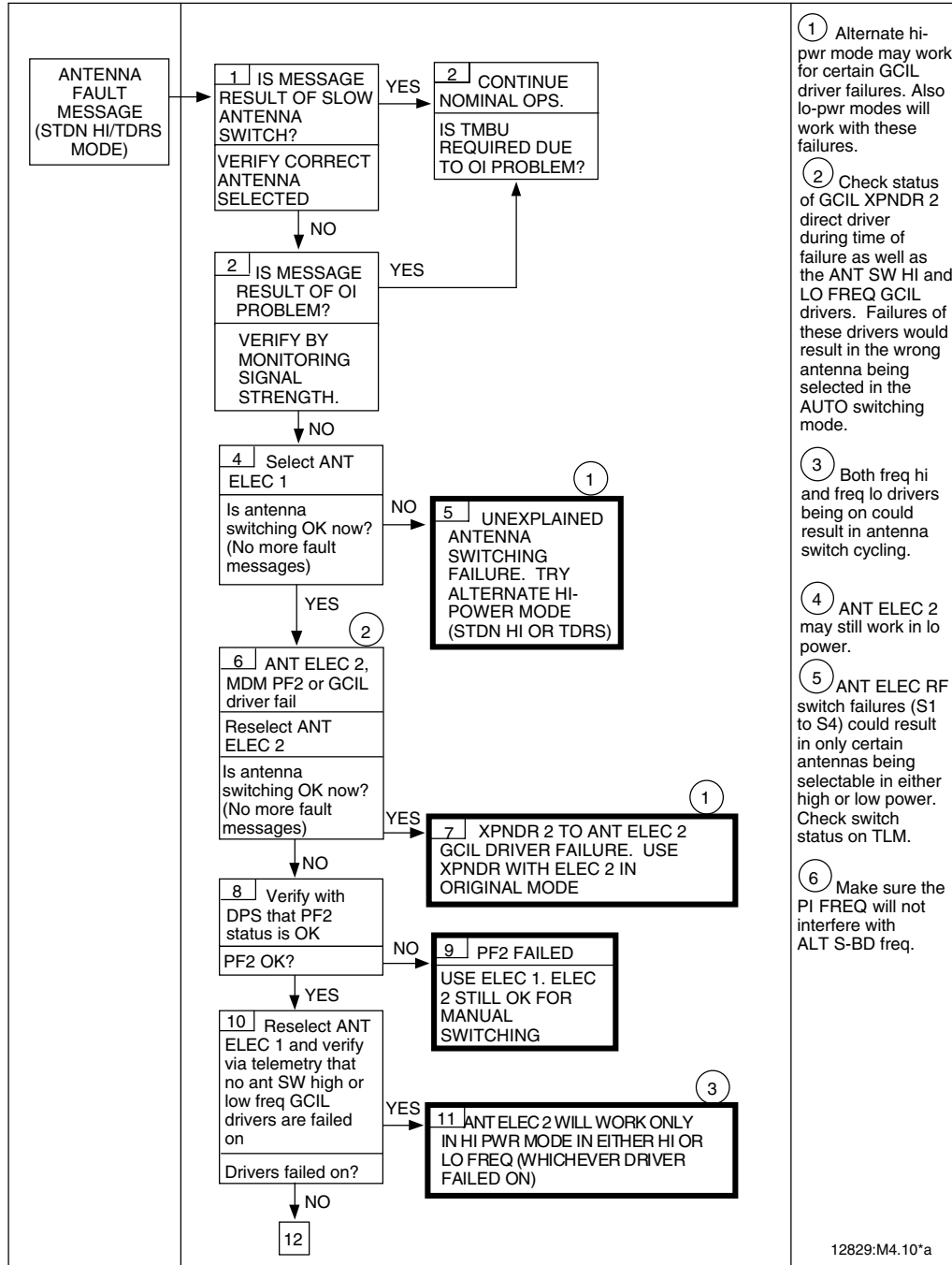
- ① IF DOWNLINK IS BEING RECEIVED VIA THE AUX OSCILLATOR BUT LOST WHEN THE UPLINK CARRIER IS TURNED ON, THE HIGH FREQUENCY XCO HAS PROBABLY FAILED. CONFIRM THIS BY HAVING SITE VERIFY UPLINK CARRIER AND UPLINK FREQUENCY. LOSS OF XCO WILL CAUSE PROCESSED LOSS OF UPLINK CAPABILITY AND CAN BE WORKED AROUND BY SWITCHING FREQUENCIES
- ② HOPEFULLY UHF WILL BE AVAILABLE TO ADVISE CREW TO DO THIS
- ③ PREAMP 2 MAY WORK IN PNL MODE
- ④ FAINT POSSIBILITY EXISTS THAT XPDR 2 MAY WORK IN LO PWR MODES
- ⑤ A PREAMP DIPLEXER OR COAX SWITCH FAILURE COULD CAUSE LOSS OF ALL HI PWR HI FREQ RCV OR XMIT/RCV CAPABILITY
- ⑥ CHECK ACCU CIRCUIT BREAKERS
- ⑦ FORWARD LINK STATUS TO USGT CAN BE CHECKED USING FORWARD LINK FIMS
- ⑧ WHEN A/G-2 REQUIRED, USE NSP-1
- ⑨ PREAMP2 MAY WORK IN ALTERNATE FREQ. THIS MAY BE CHECKED OUT AS TIME PERMITS
- ⑩ XPDR2 WILL WORK IN LOW PWR MODES (STDNLO/SGLS)
- ⑪ SEVERAL POWER CYCLES MAY BE REQUIRED
- ⑫ SPC SHOULD RECONFIGURE BACK TO THE PREVIOUSLY KNOWN WORKING CONFIG

128290483-FLW-2





12829:M4.9\*b



1 Alternate hi-pwr mode may work for certain GCIL driver failures. Also lo-pwr modes will work with these failures.

2 Check status of GCIL XPNDR 2 direct driver during time of failure as well as the ANT SW HI and LO FREQ GCIL drivers. Failures of these drivers would result in the wrong antenna being selected in the AUTO switching mode.

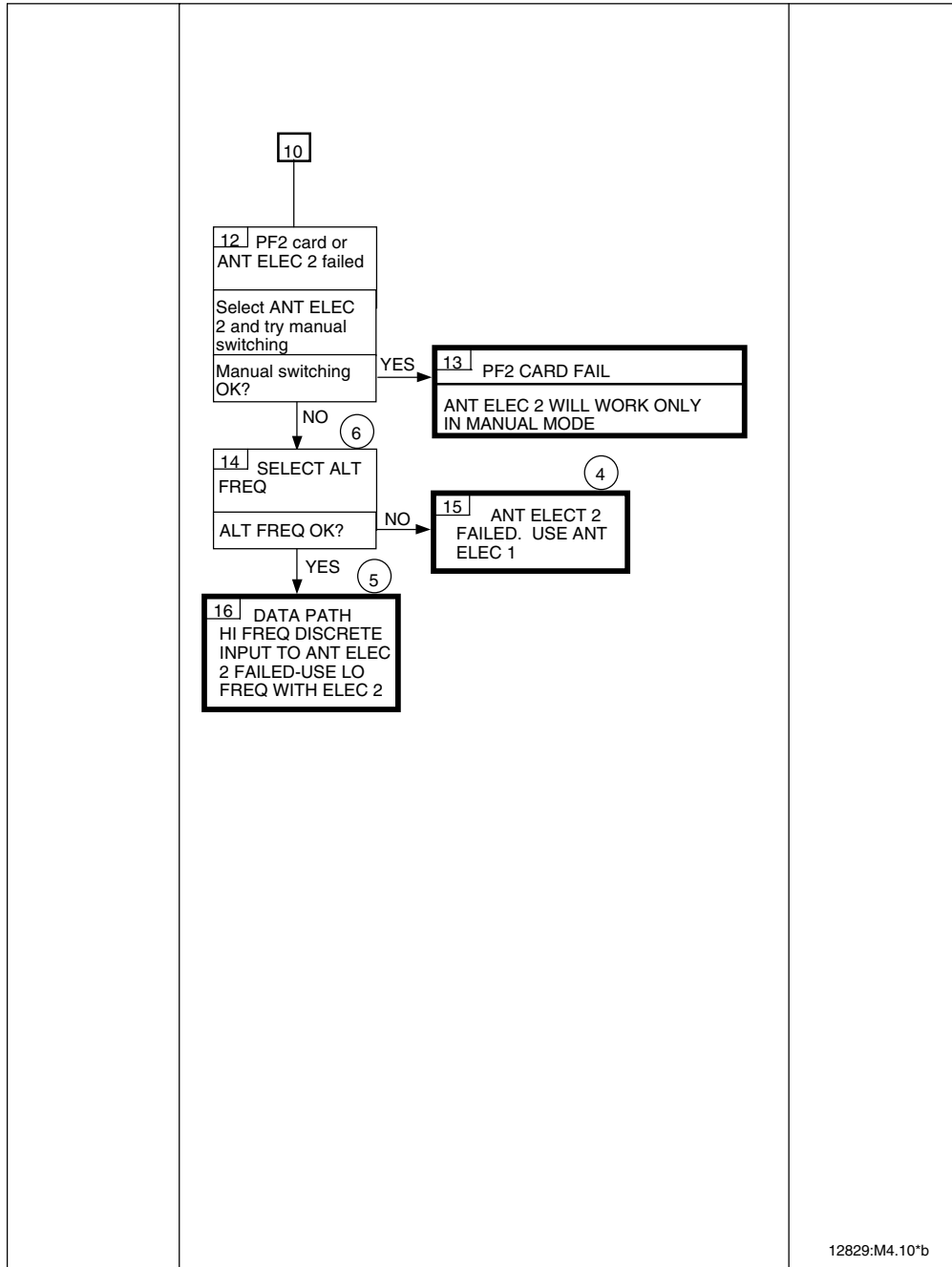
3 Both freq hi and freq lo drivers being on could result in antenna switch cycling.

4 ANT ELEC 2 may still work in lo power.

5 ANT ELEC RF switch failures (S1 to S4) could result in only certain antennas being selectable in either high or low power. Check switch status on TLM.

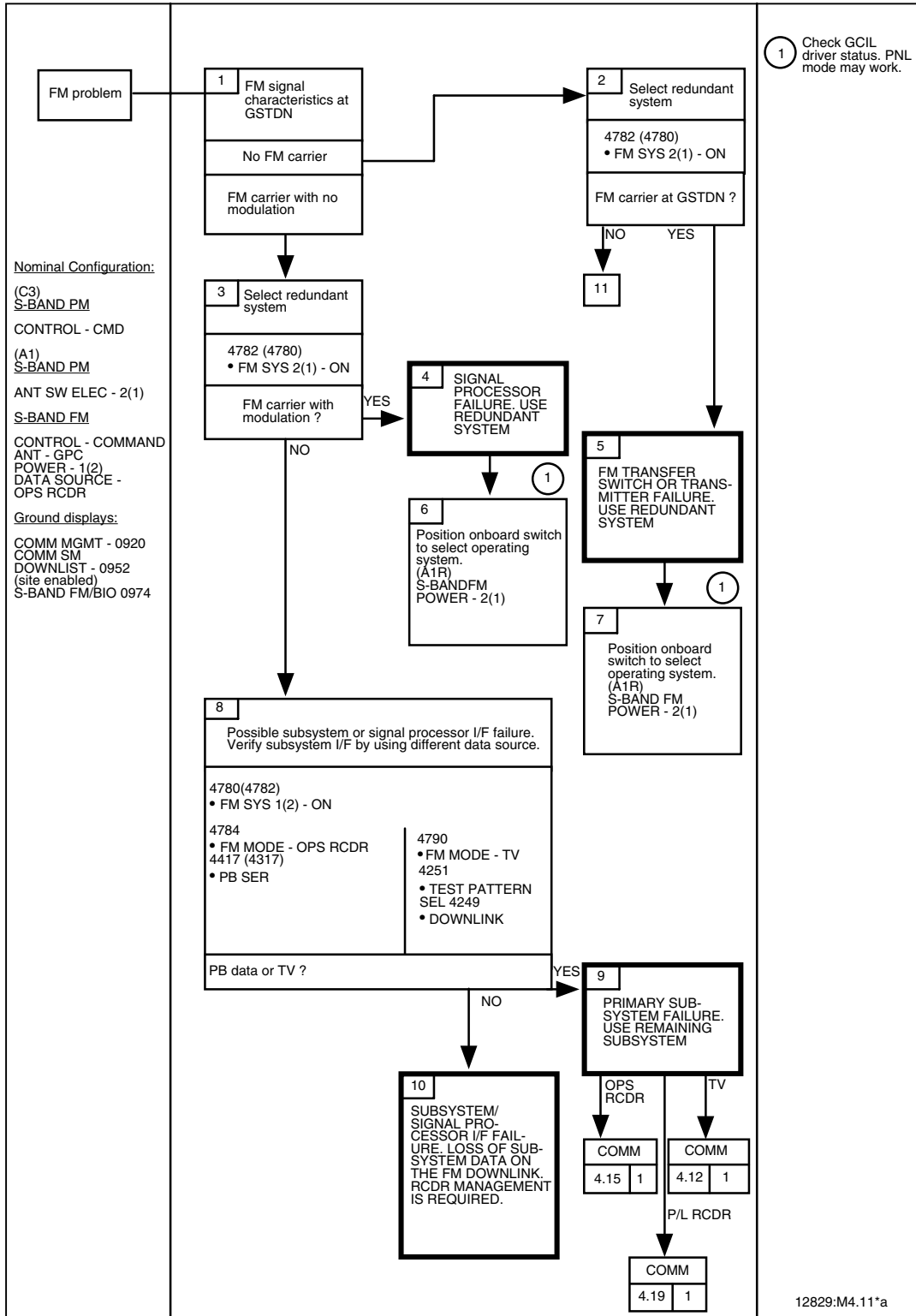
6 Make sure the PI FREQ will not interfere with ALT S-BD freq.

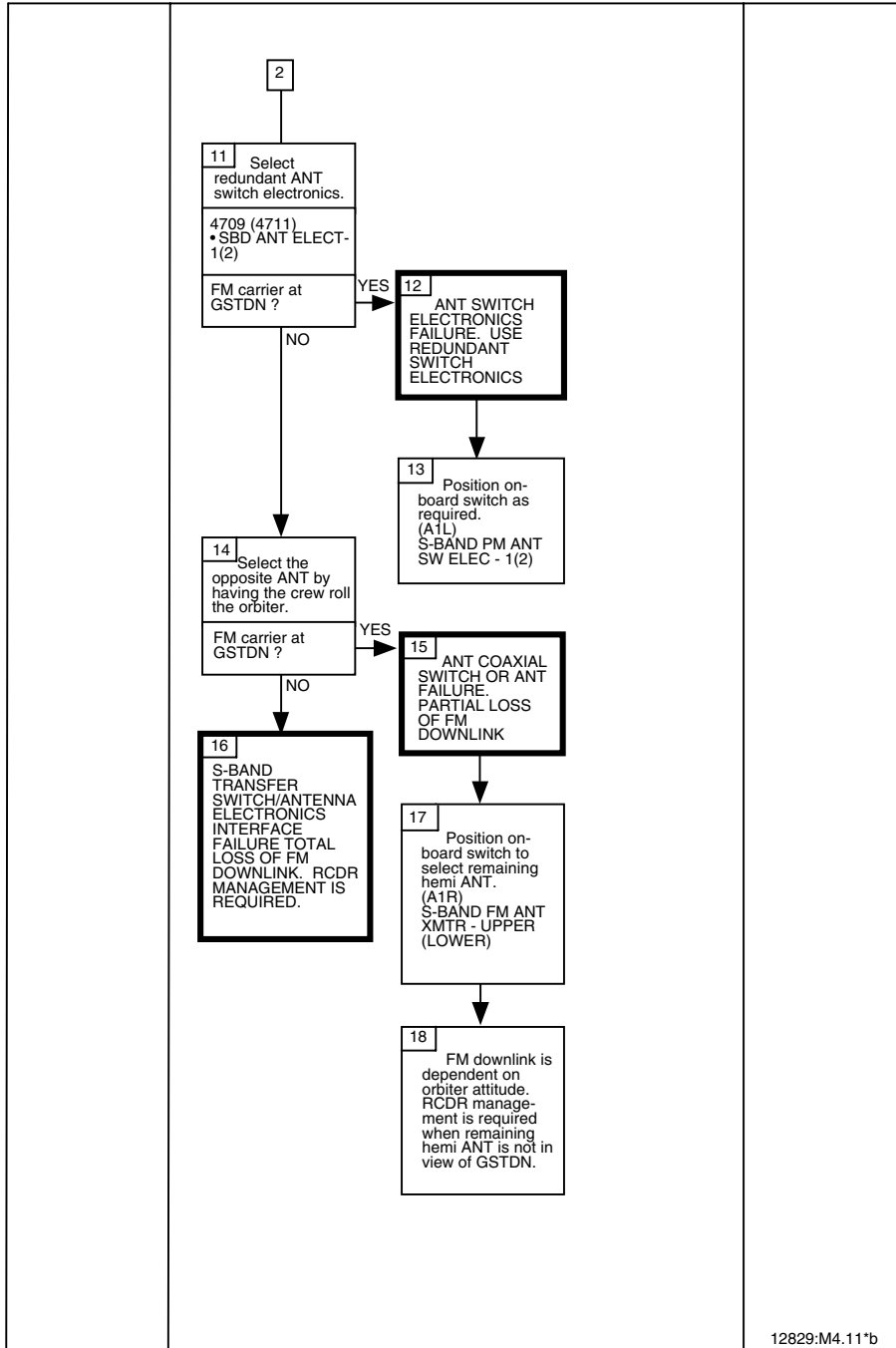
12829:M4.10\*a



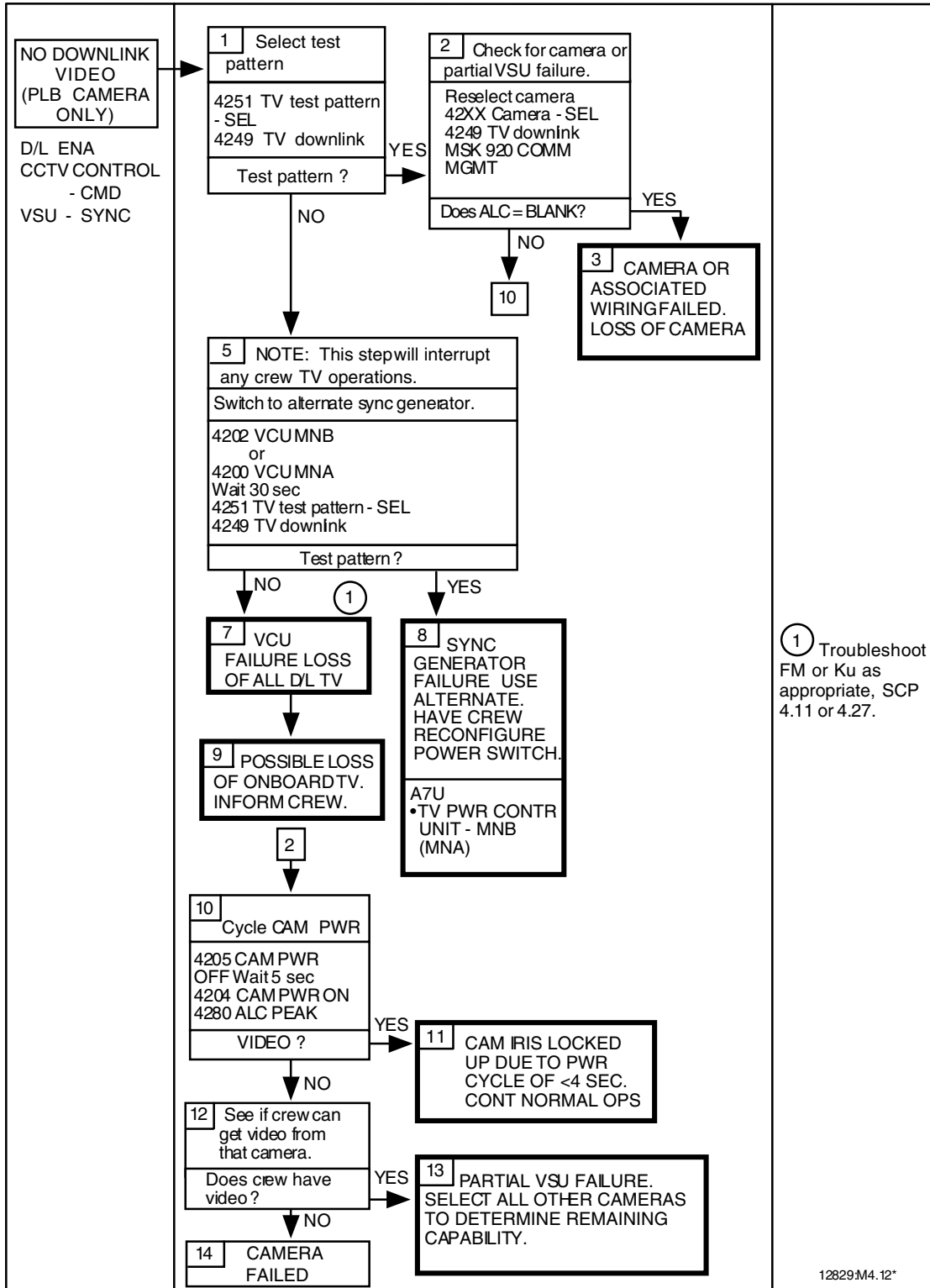
12829:M4.10\*b

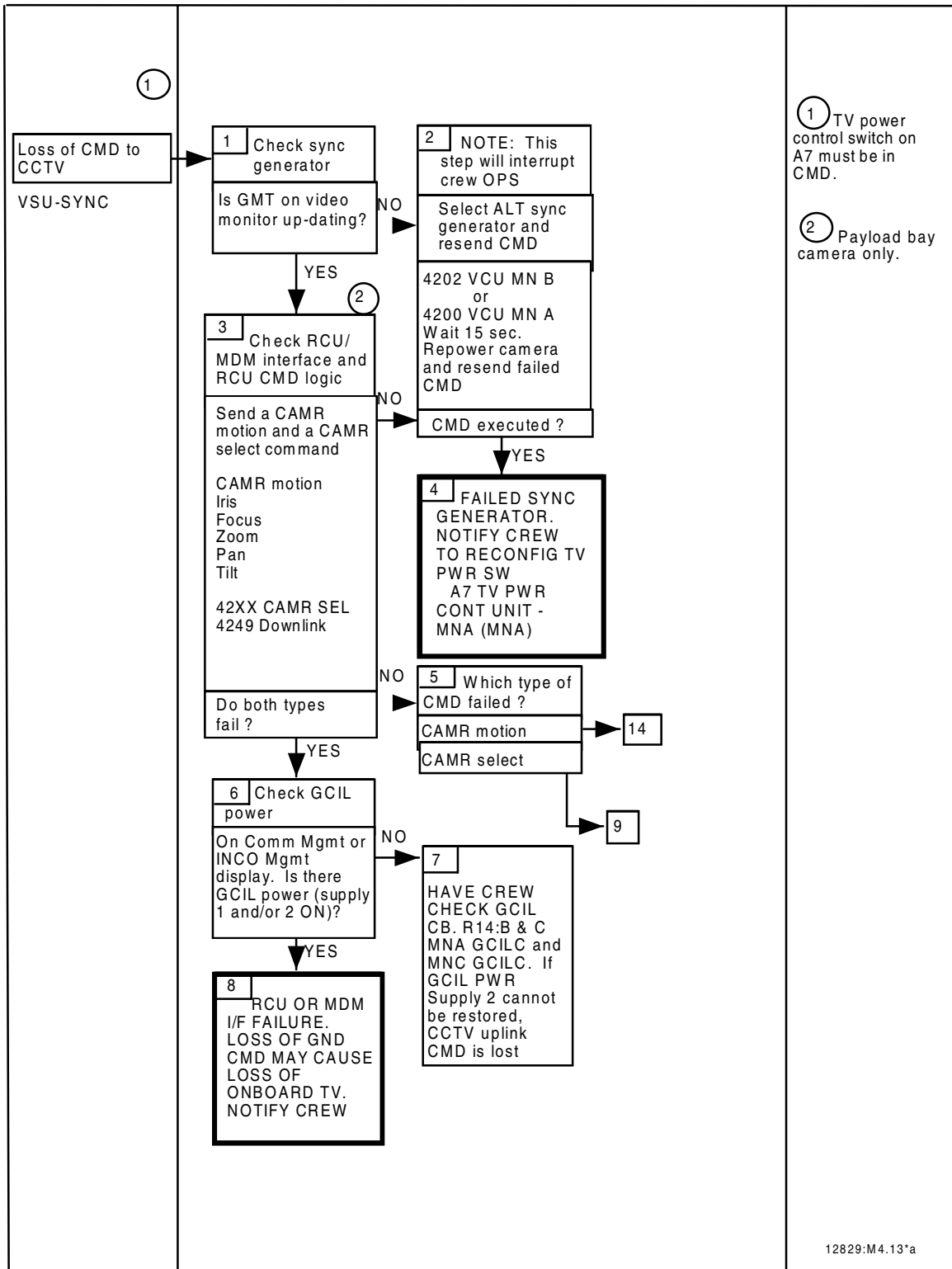






12829:M4.11\*b

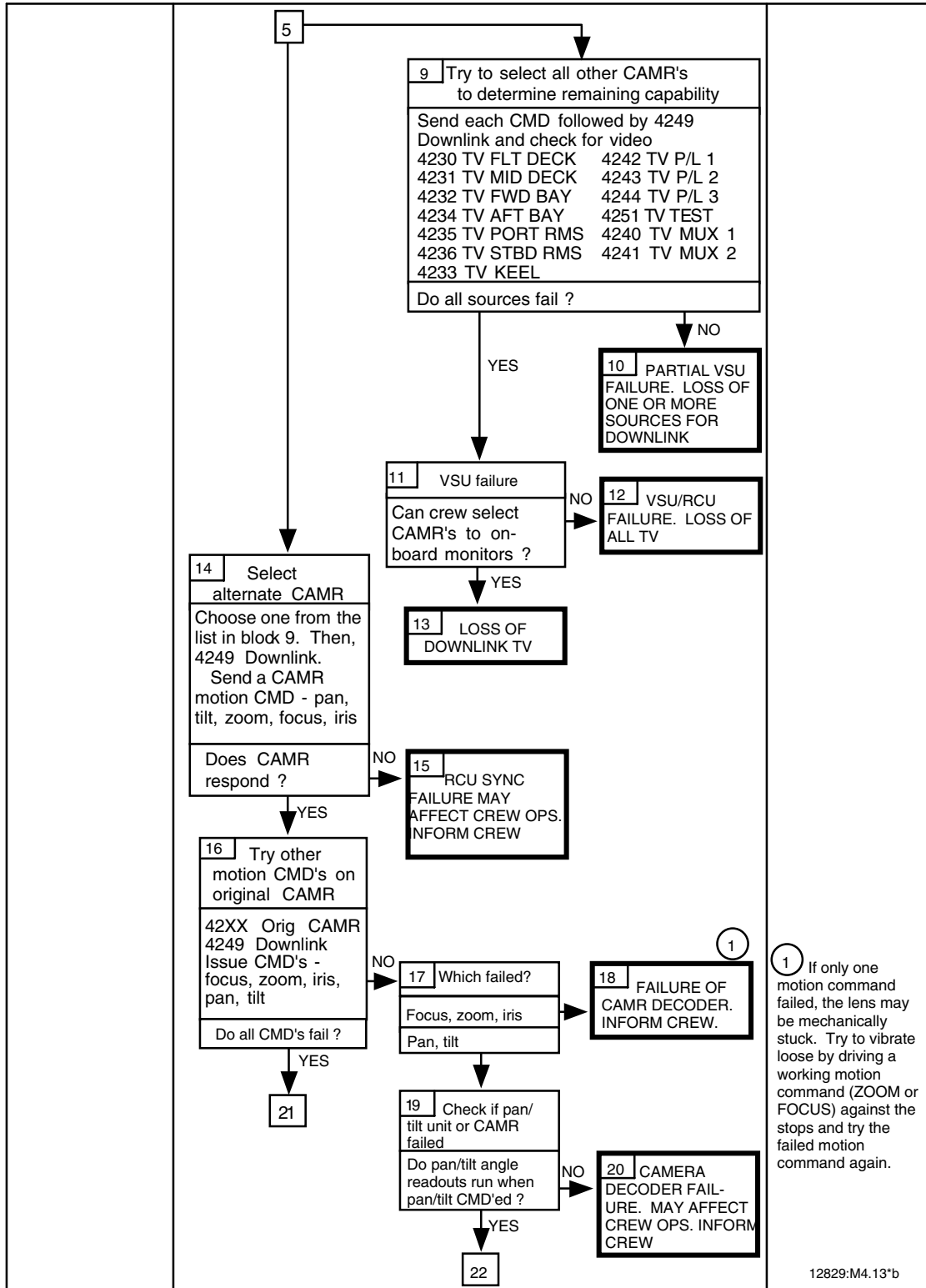


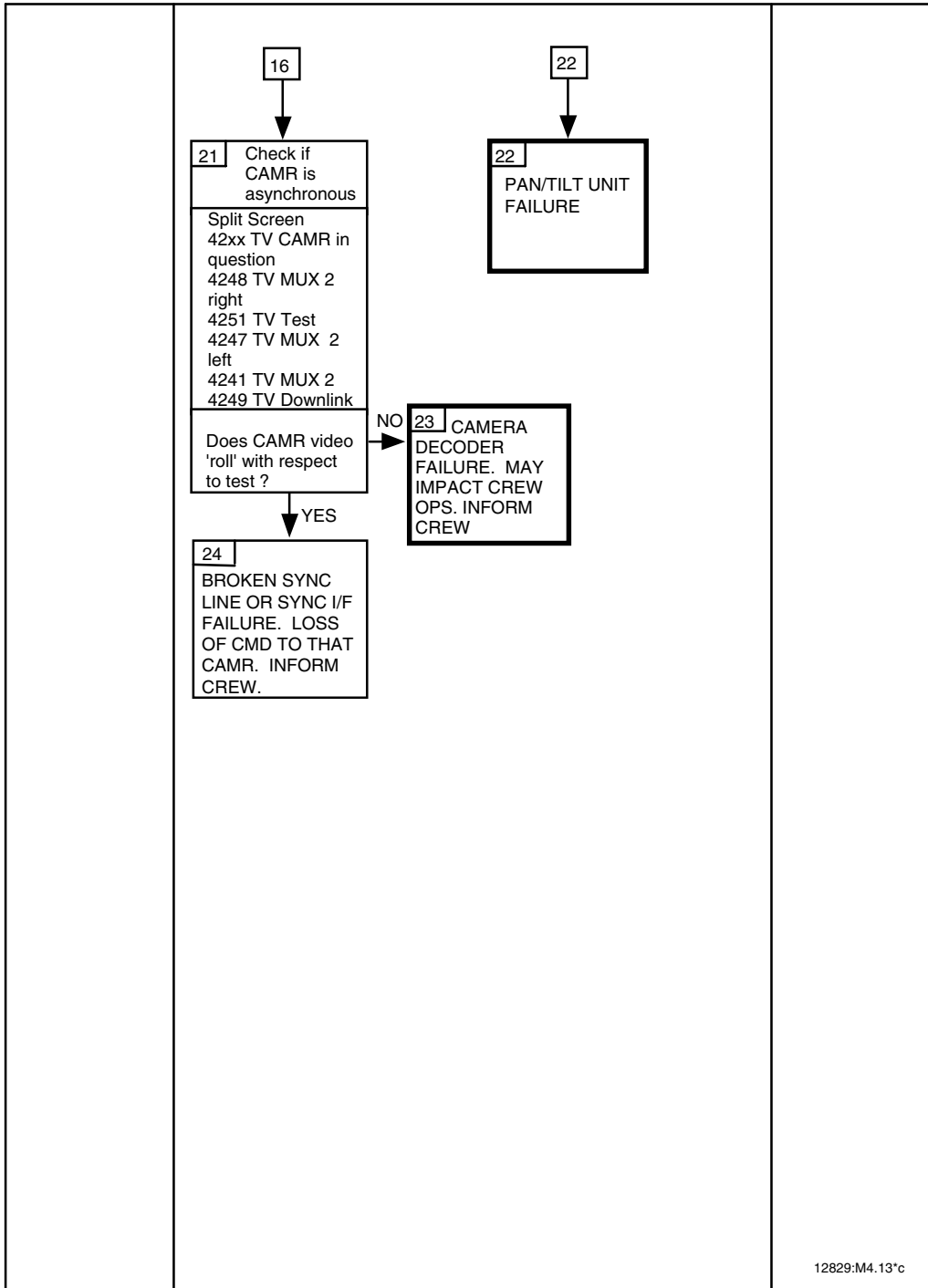


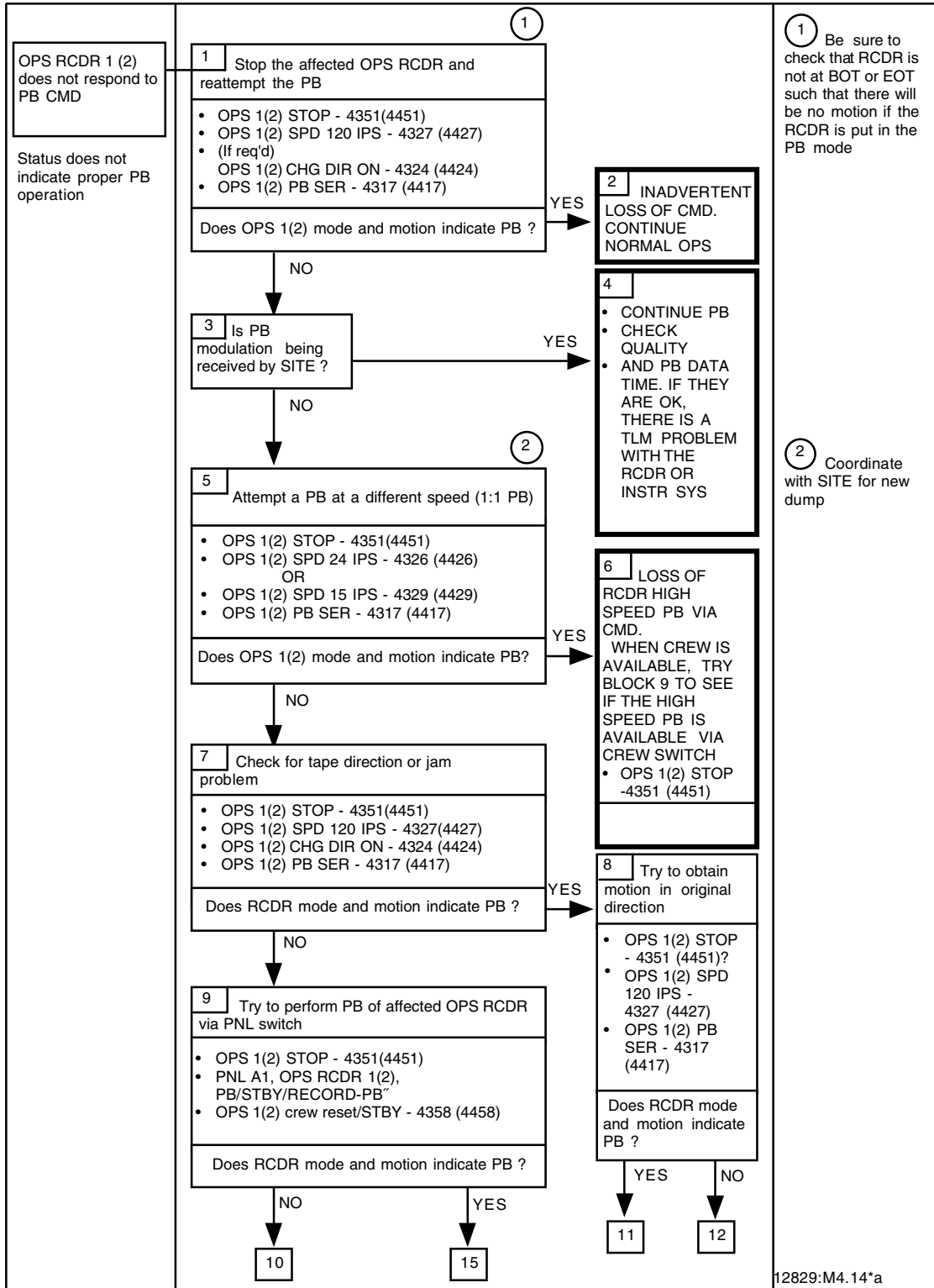
① TV power control switch on A7 must be in CMD.

② Payload bay camera only.

12829:M4.13\*a



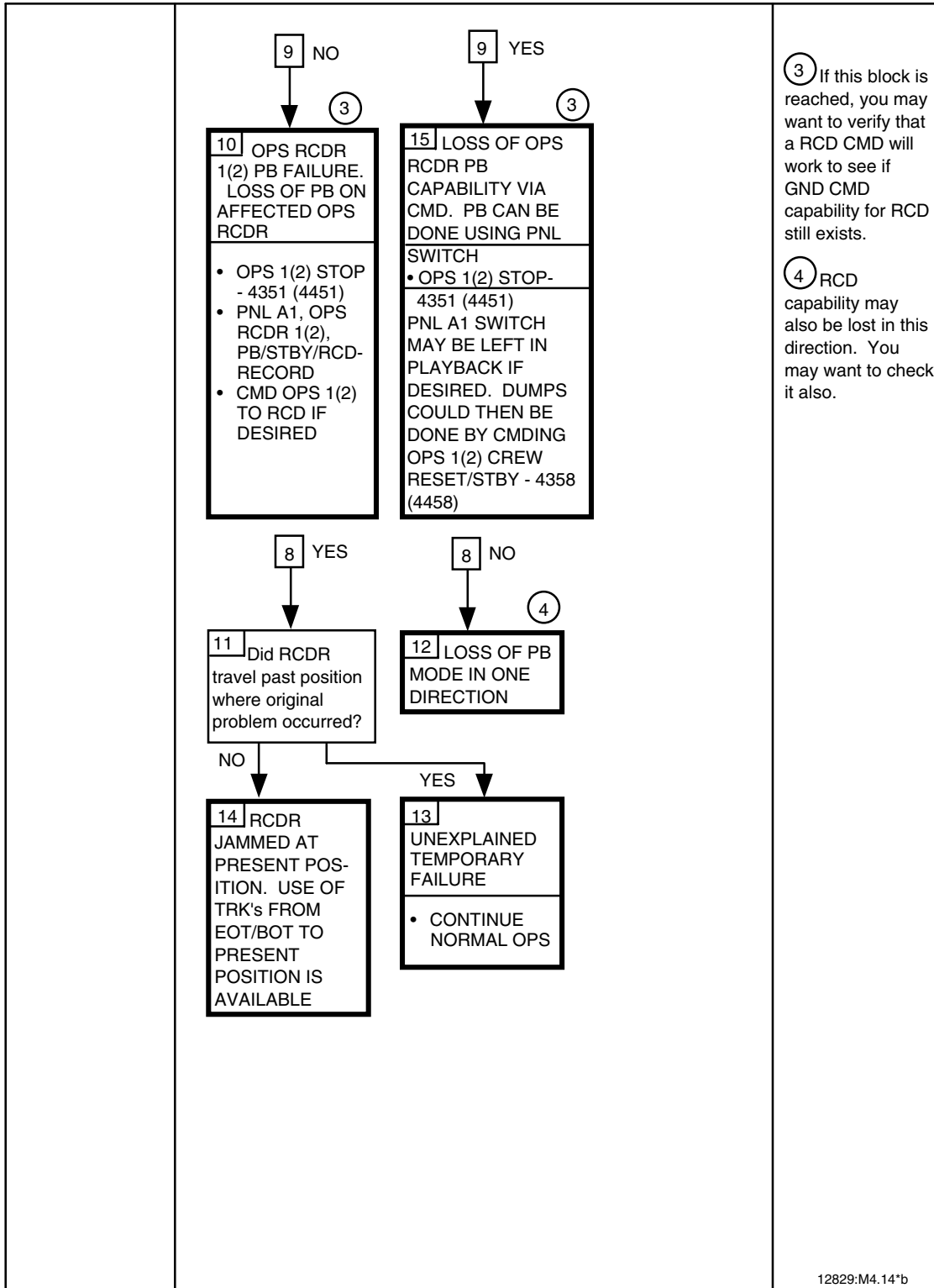




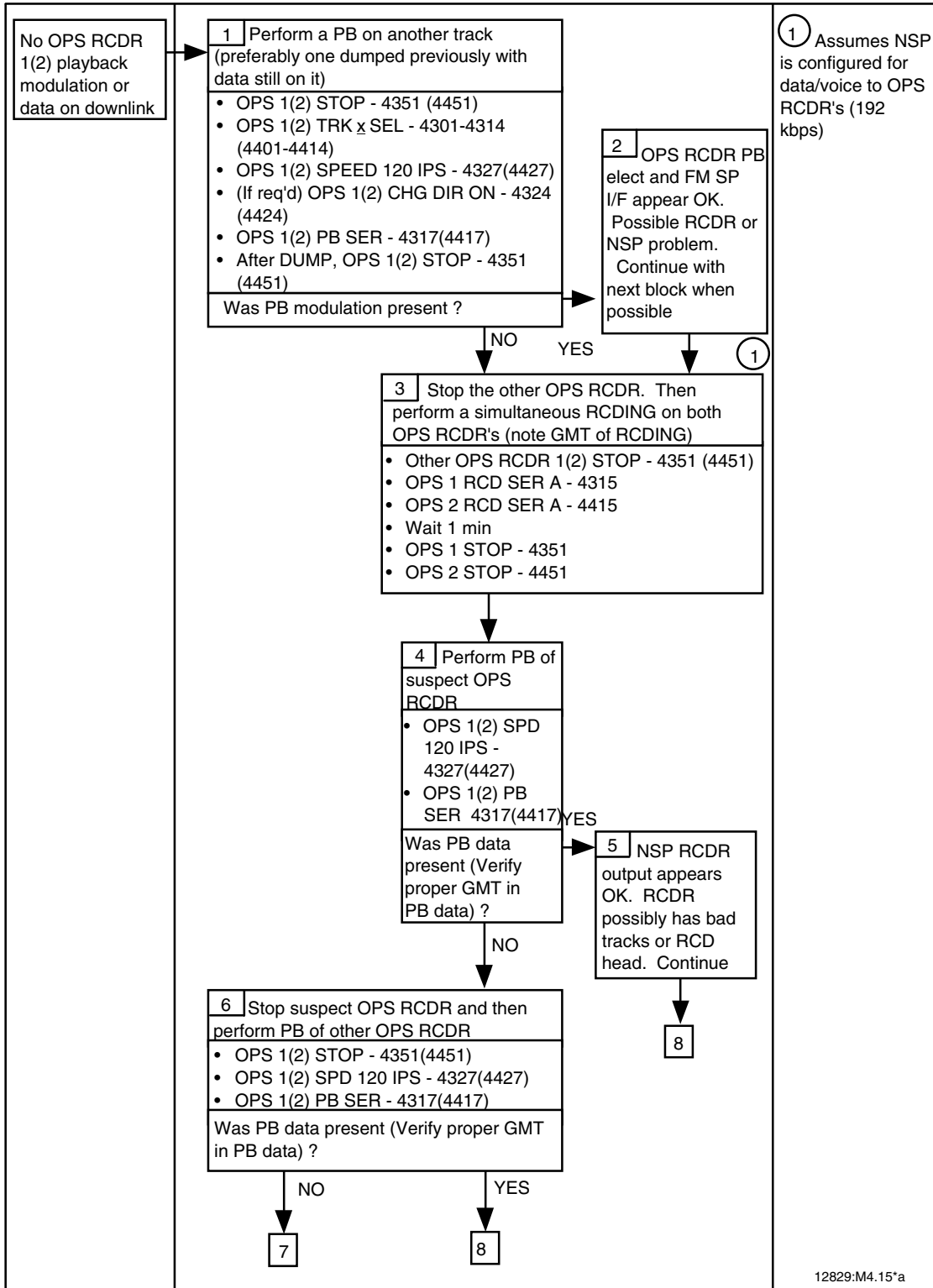
1 Be sure to check that RCDR is not at BOT or EOT such that there will be no motion if the RCDR is put in the PB mode

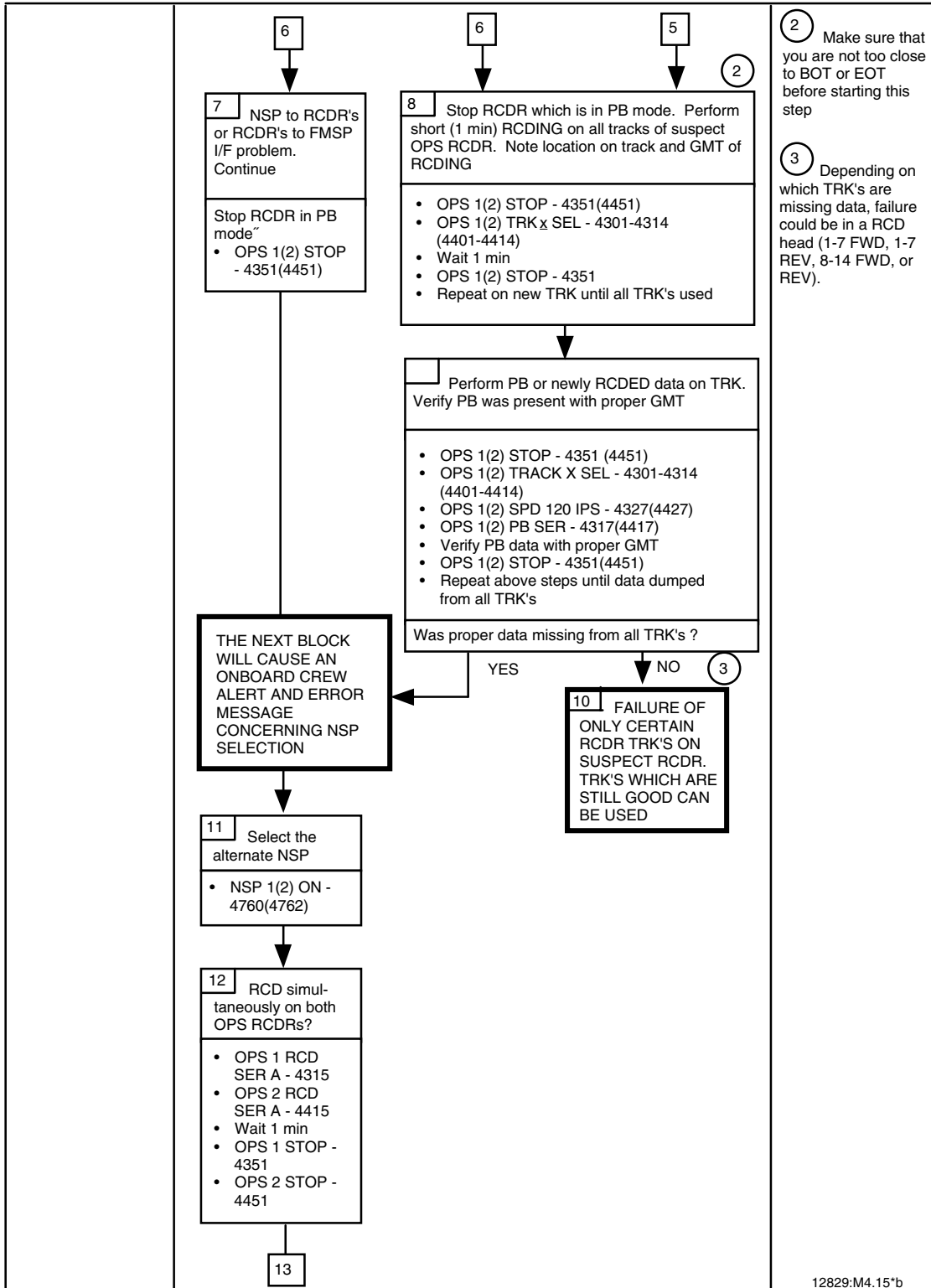
2 Coordinate with SITE for new dump

12829:M4.14\*a

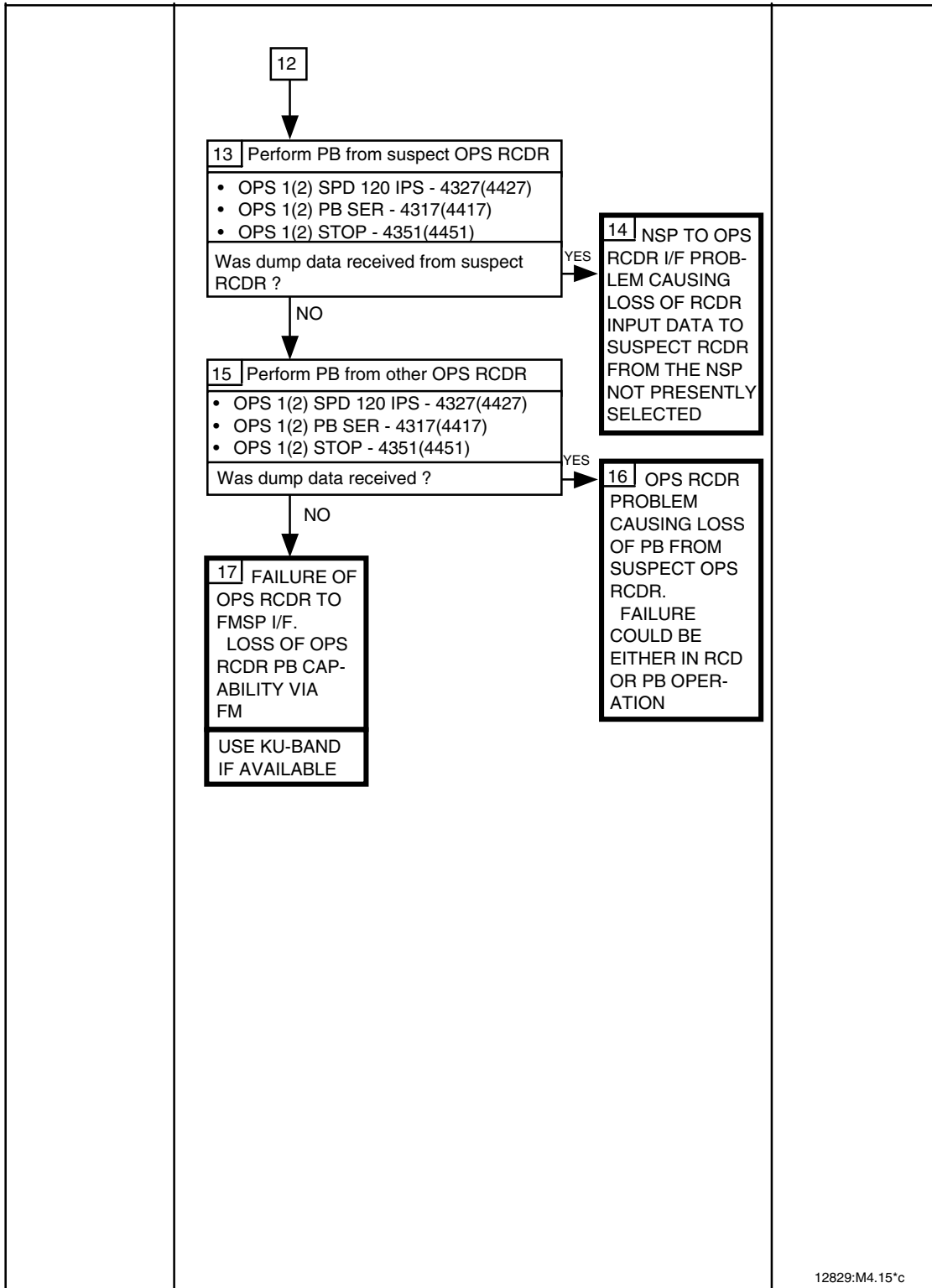


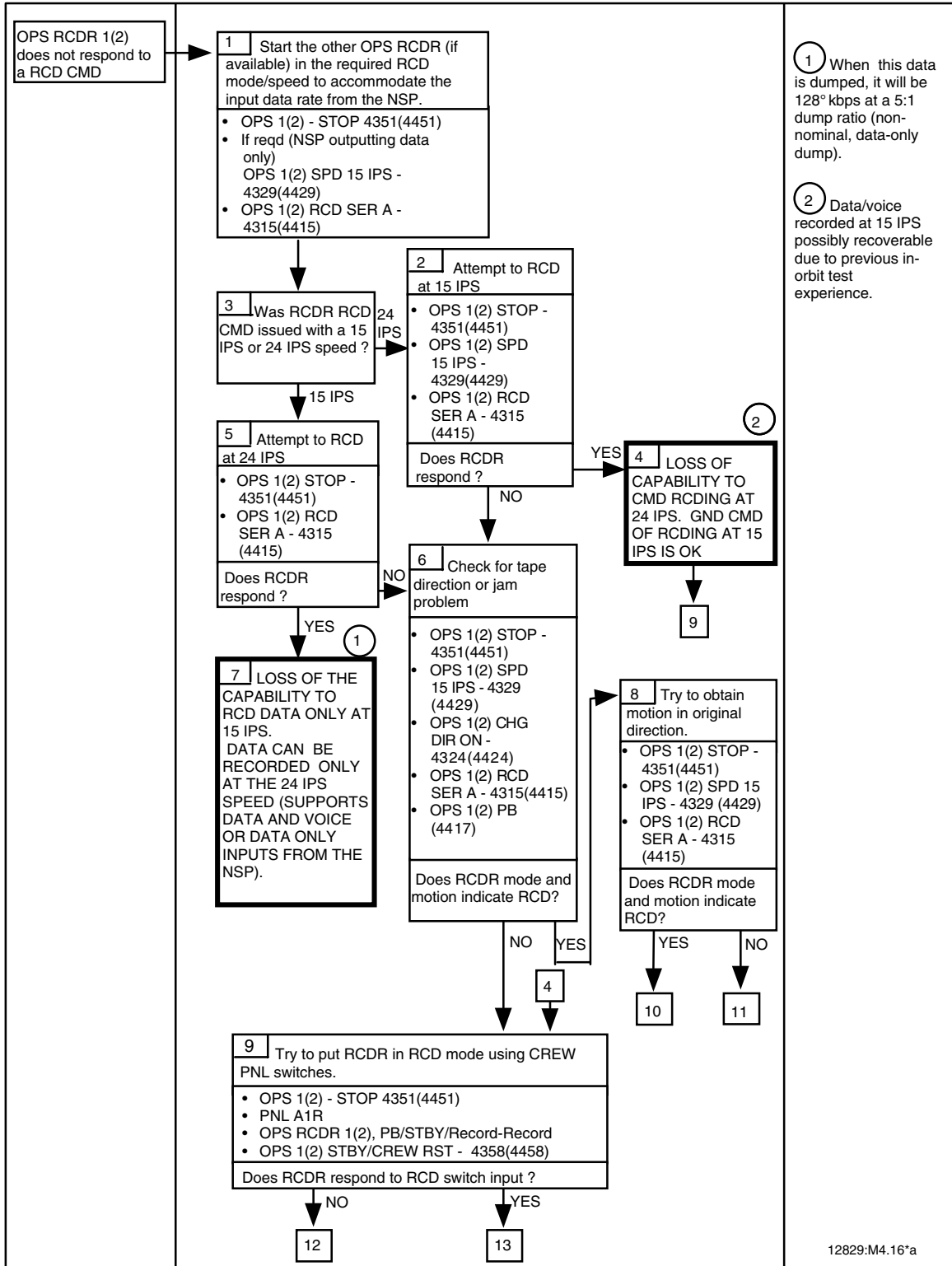


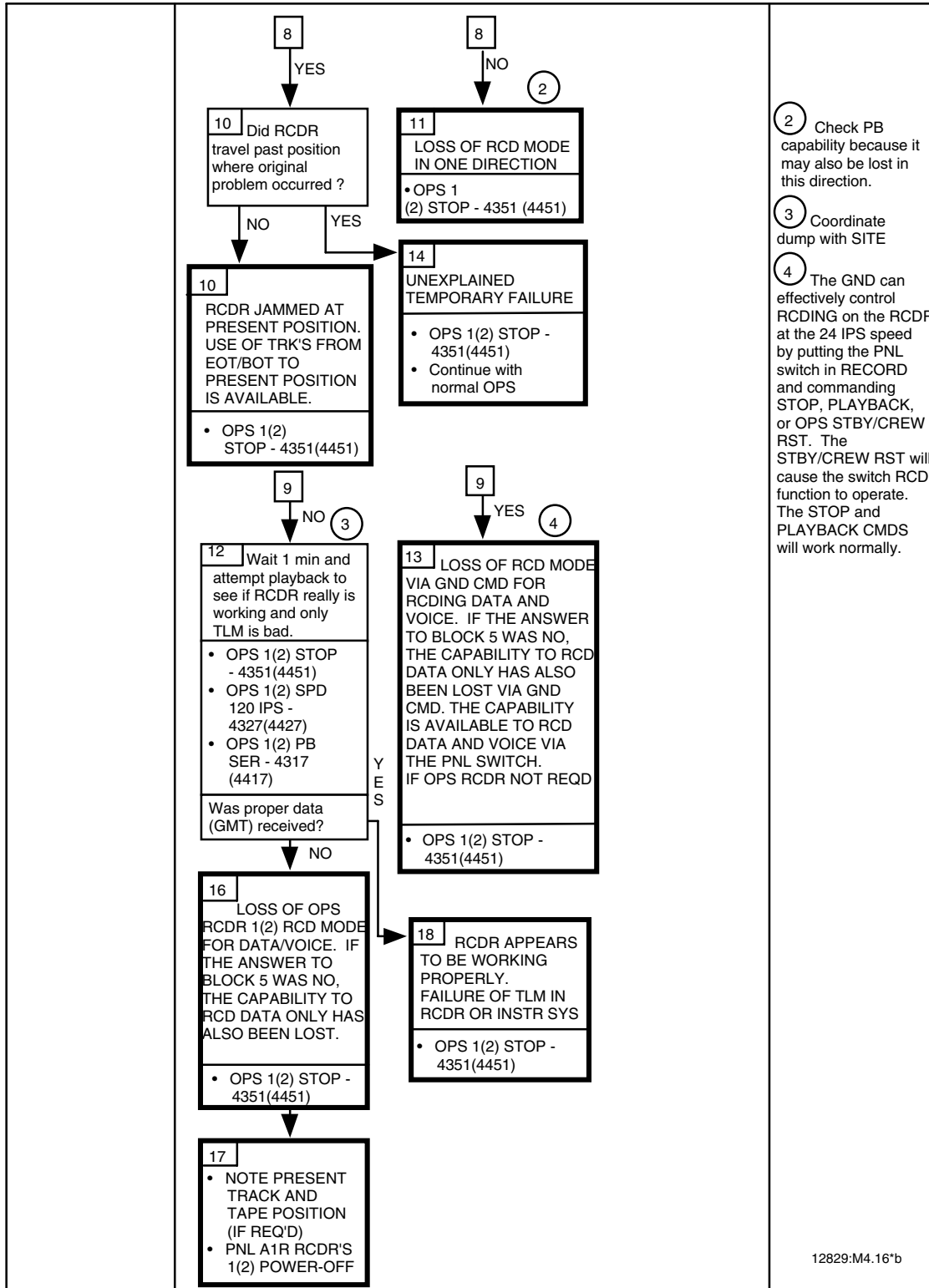


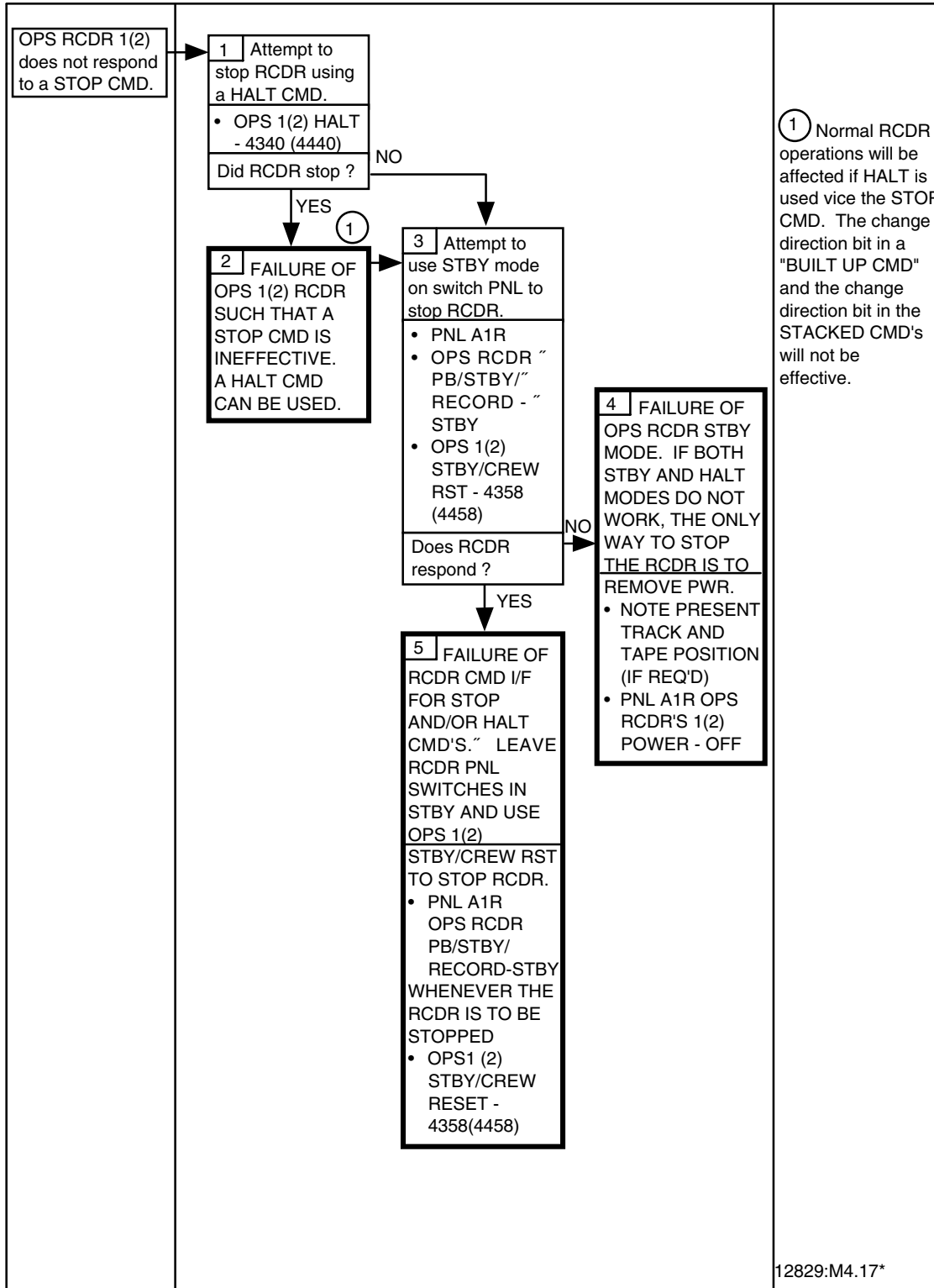


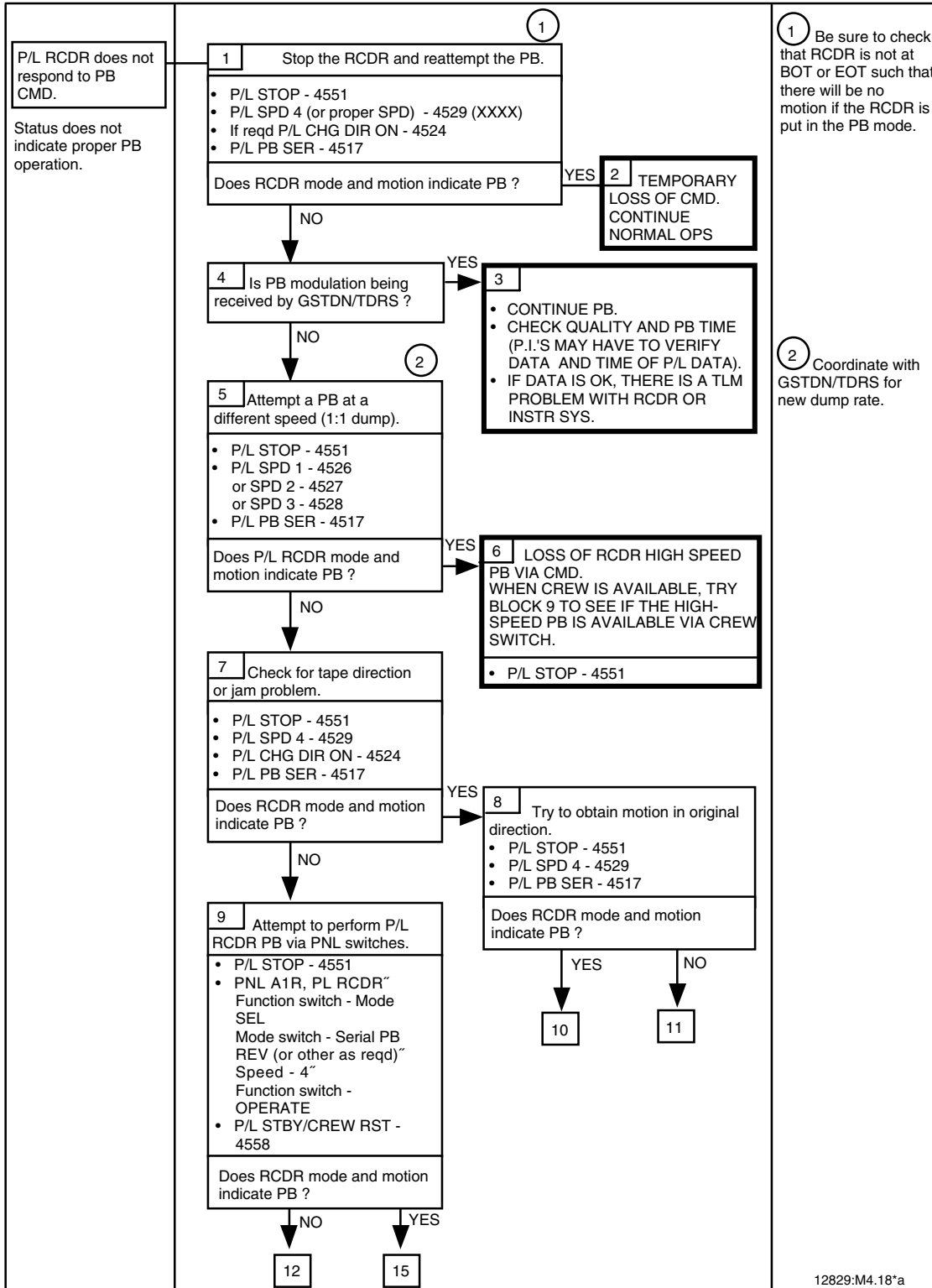
12829:M4.15\*b

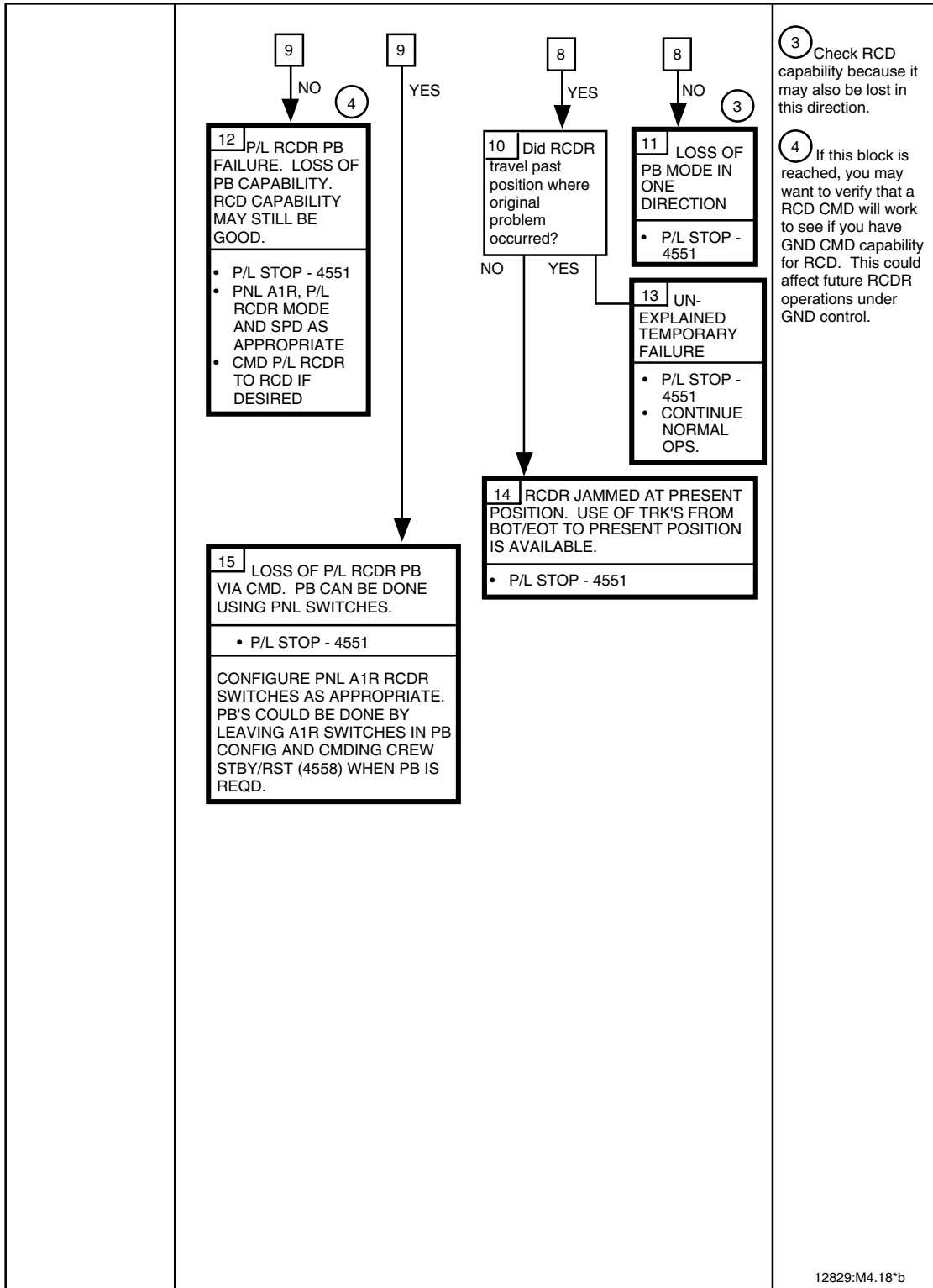




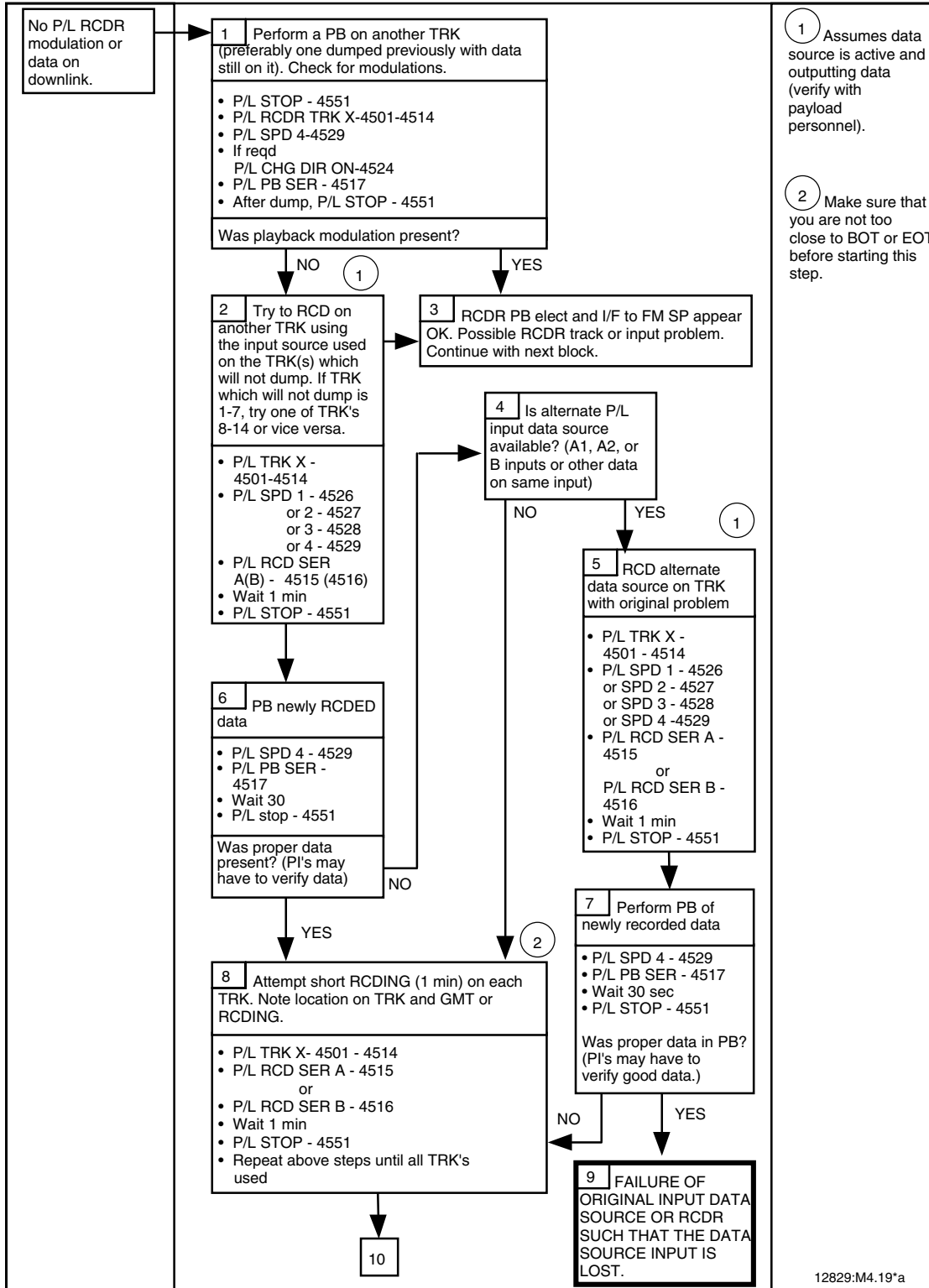


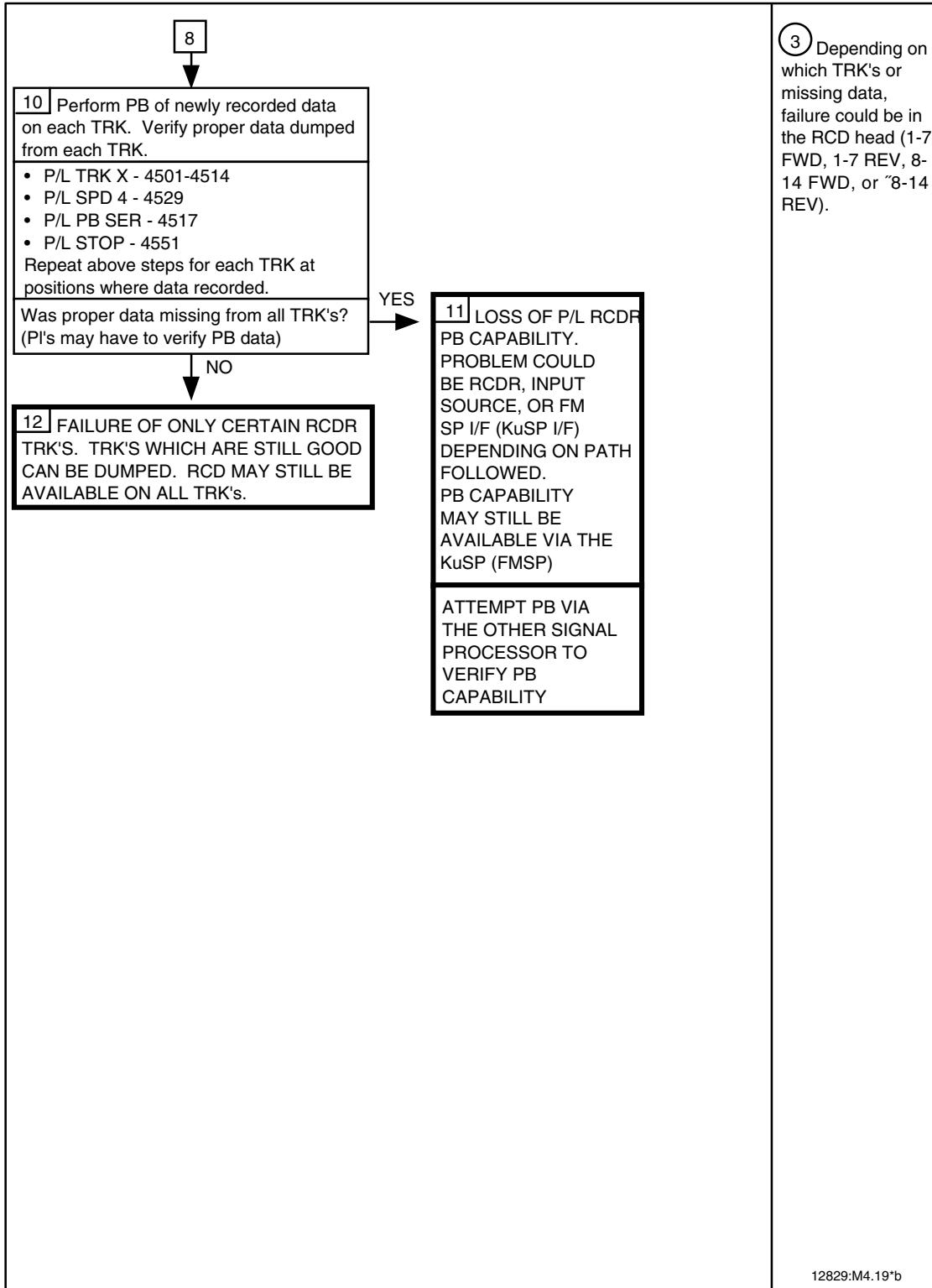


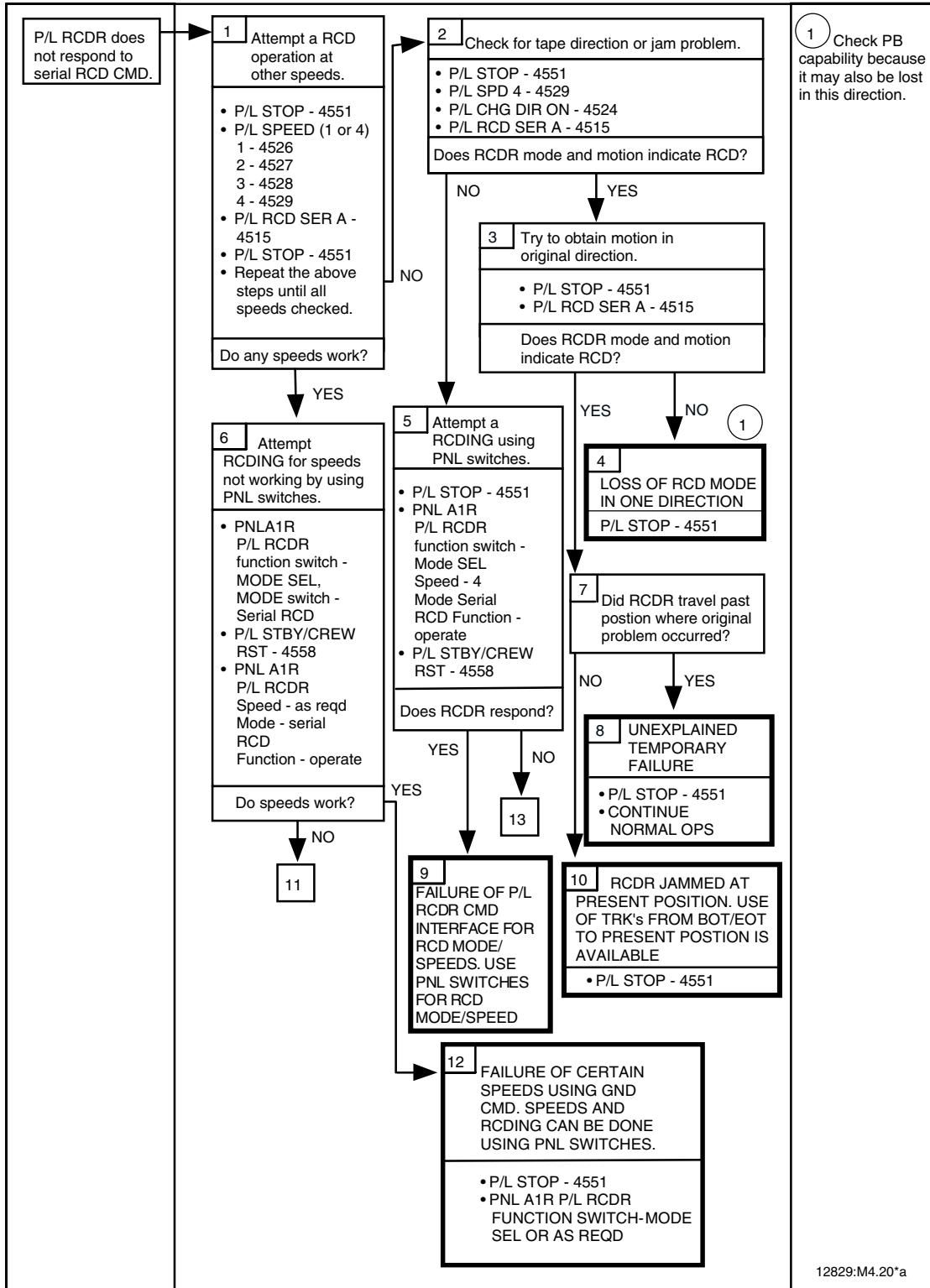




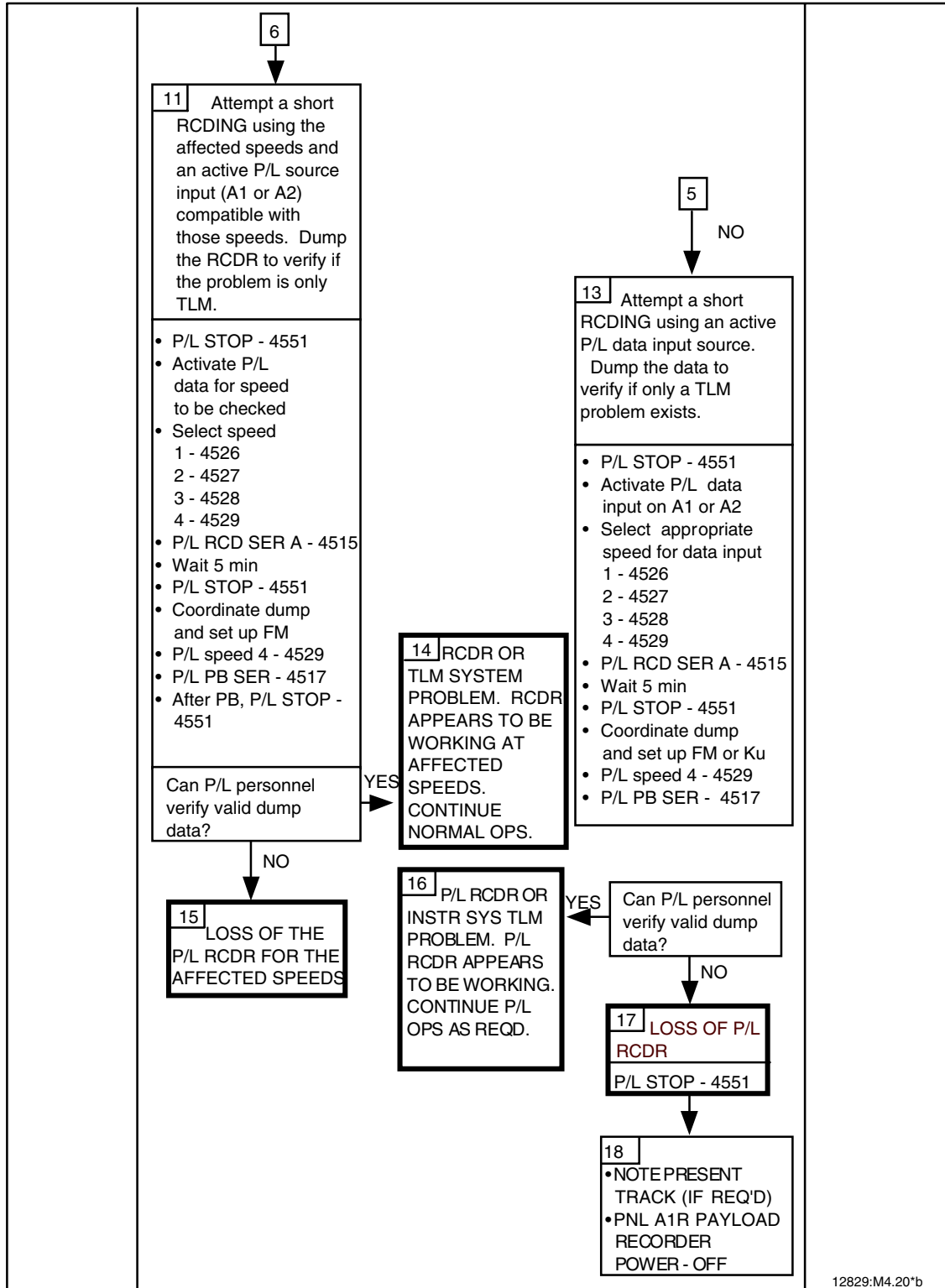




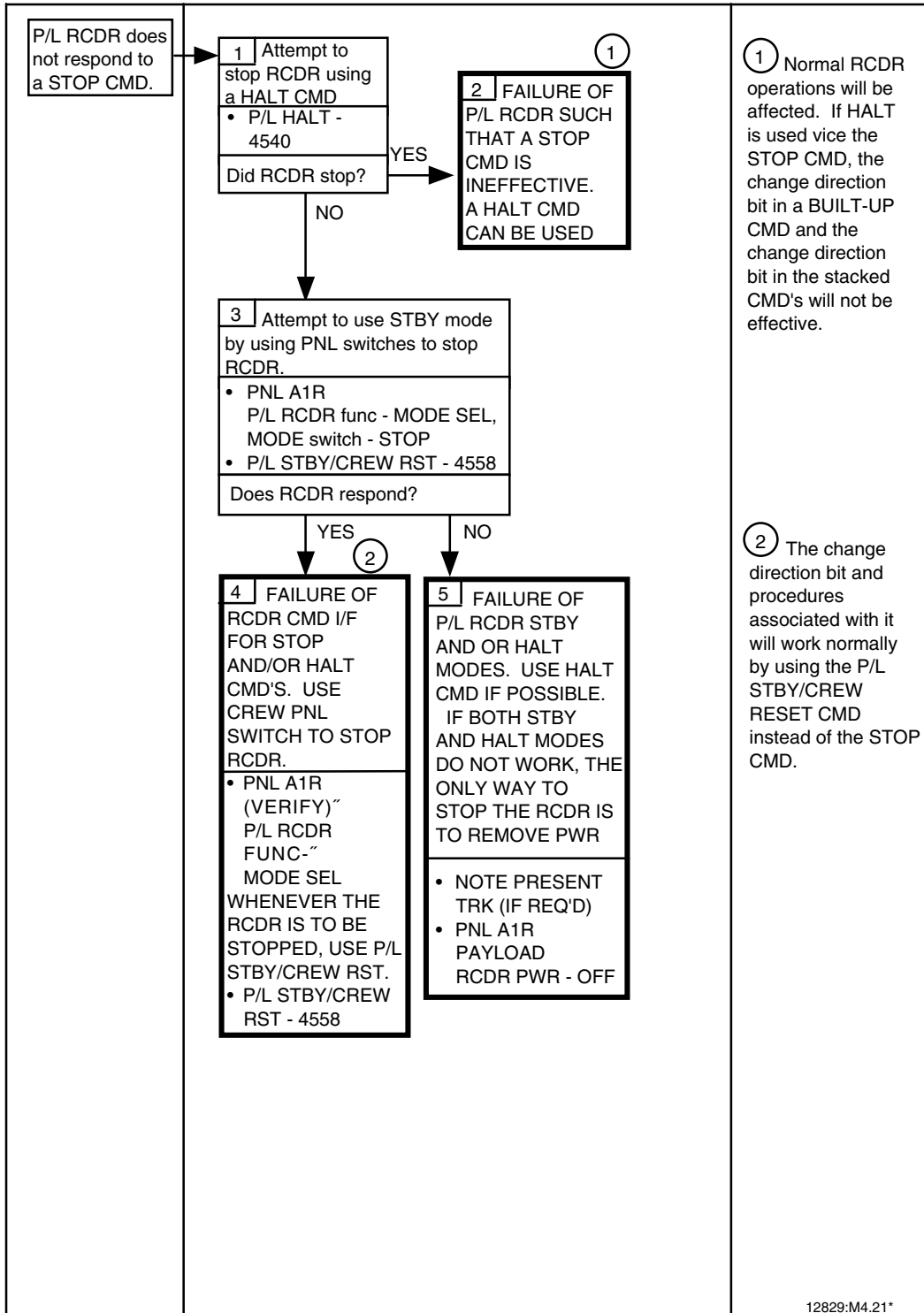


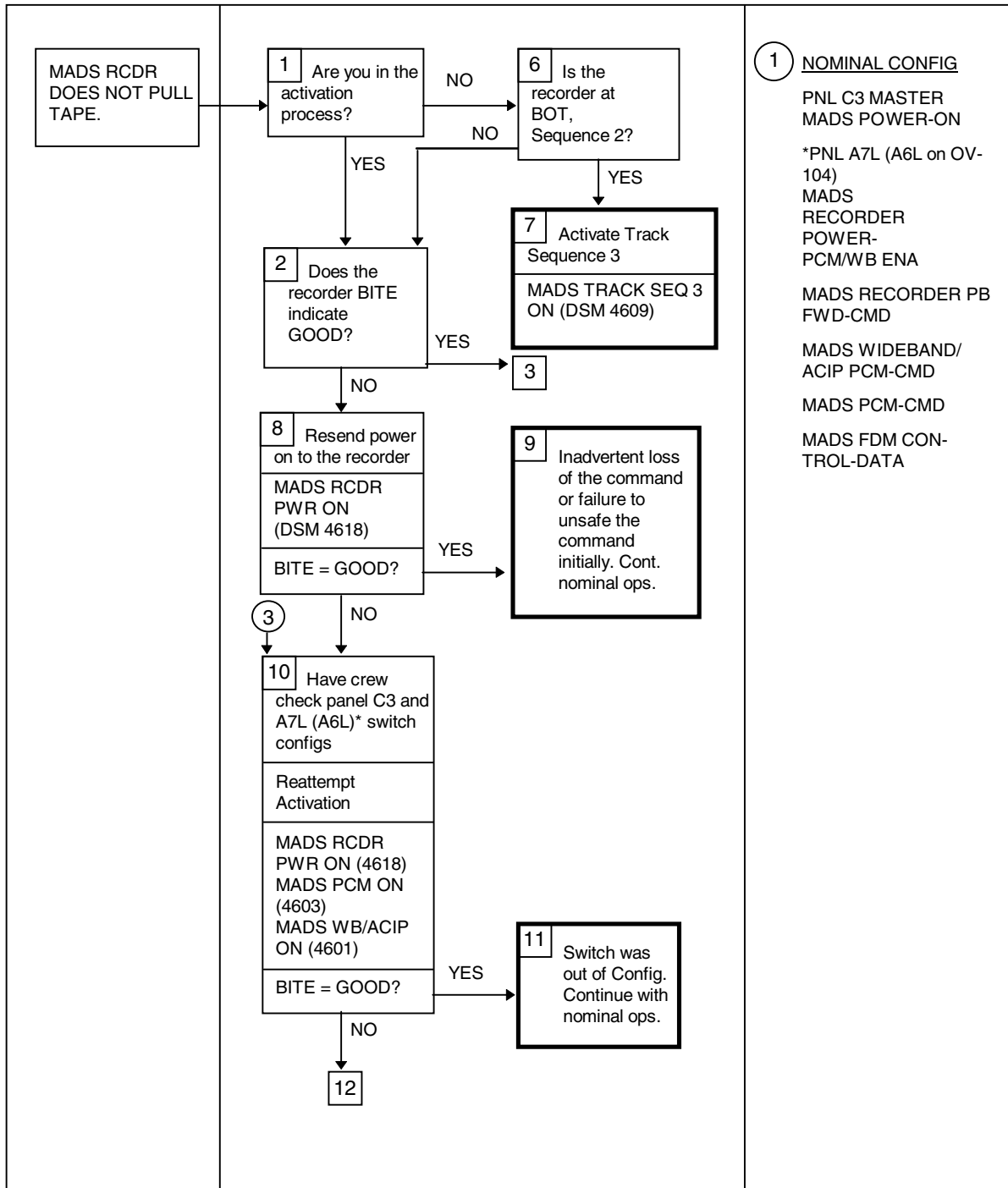


12829:M4.20\*a

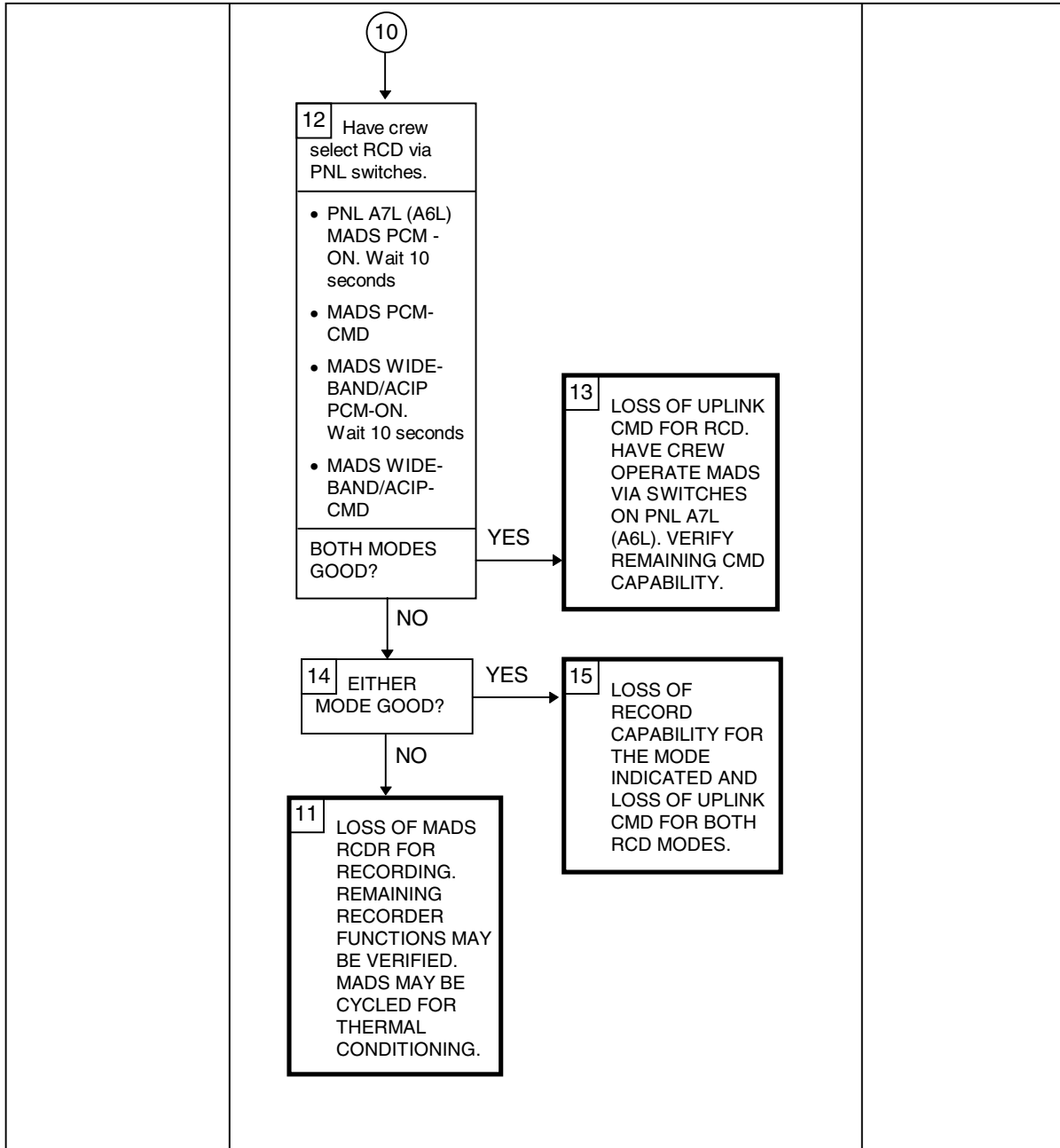


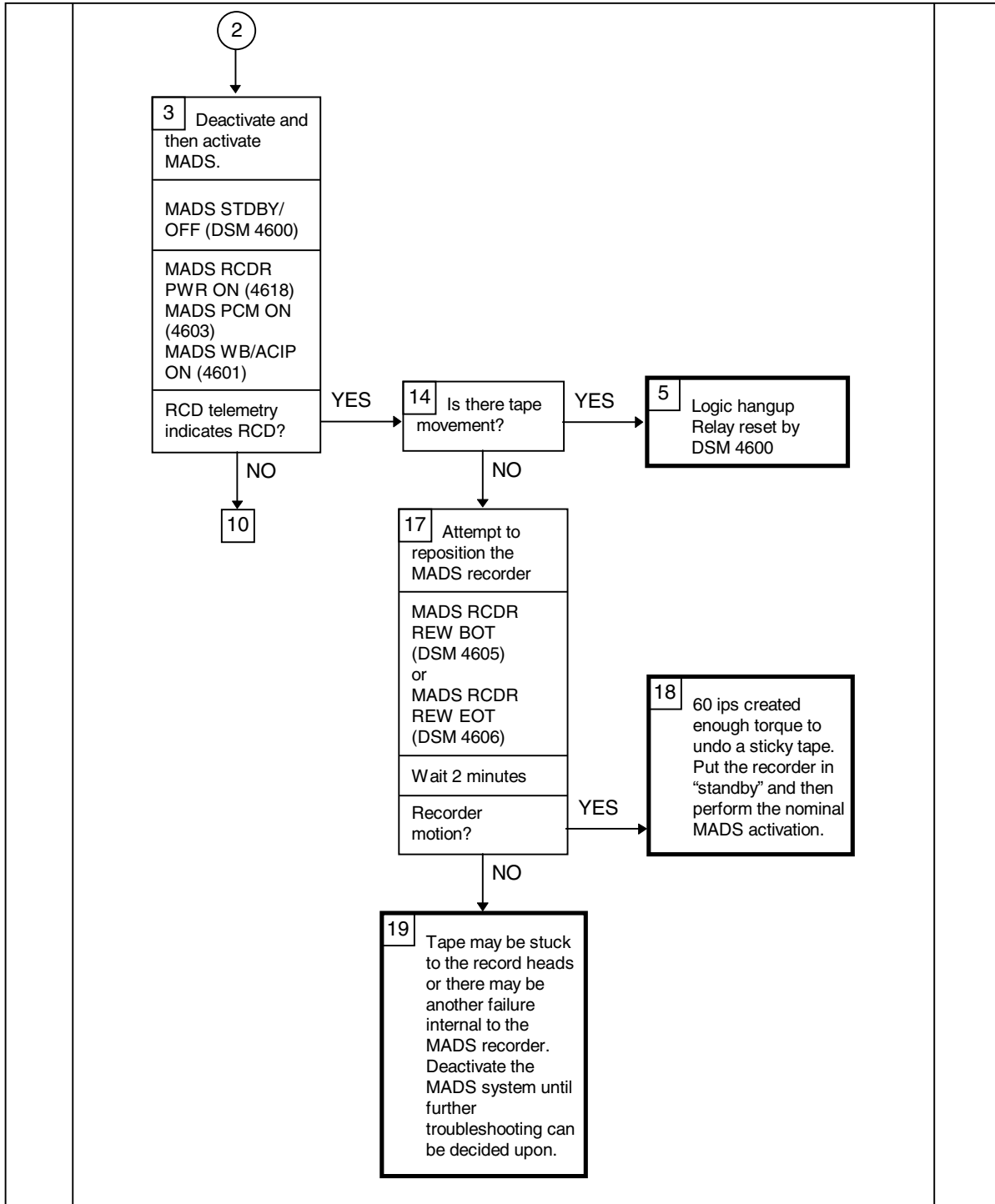
12829:M4.20\*b





- 1 NOMINAL CONFIG  
 PNL C3 MASTER  
 MADS POWER-ON  
 \*PNL A7L (A6L on OV-104)  
 MADS RECORDER POWER-PCM/WB ENA  
 MADS RECORDER PB FWD-CMD  
 MADS WIDEBAND/ACIP PCM-CMD  
 MADS PCM-CMD  
 MADS FDM CONTROL-DATA







**TITLE**

COMMUNICATION SYSTEMS POWER REQUIREMENTS AND THERMAL LIMITS

**PURPOSE**

These data are for use in determining power requirements and bus allocations as well as listing thermal control and constraints.

**PROCEDURE**

The data contained in table 4.23-1 will allow an operator to determine what reconfiguration, if any, is required if an electrical, coolant, or line replaceable unit (LRU) problem occurs on the orbiter. It will also provide insight into any LRU management that might be required if thermal limits are approached or exceeded.

Table 4.23-2 presents LRU and power usage by electrical bus in matrix form. This table is intended to be used in tracking down bus failure impacts and visualizing redundancy.

Table 4.23-3 is new to this SCP as of revision E. It has been included to assist in isolating partial control bus failures.

**Table 4.23-1. Communications equipment: power and coolant summary**

LRU	Quantity	Power consumption, W	Power bus	Coolant source	LRU location	Circuit protection	Control signal	Temperature			Notes
								Minimum temp.	Maximum Long term	Maximum Short term	
Network signal processor	2	28.8	(1) MNB FLC2 (2) MNC FLC3	Water loop	Bay 3A	(1) LCA-2, F(3A) (2) LCA-3, F(3A)	(1) CNTL BC-1 (2) CNTL BC-2 CNTL AB2,(GPC BLOCK SW TLM)	Air temperature Minimum: -20° F Maximum: 120° F Baseplate temperature Minimum: 35° F Maximum: 120° F (a)			
S-BD transponder Mode - DIRECT - TDRS - RCV ONLY	2	58.5 41.0 30.0	(1) MNB FLC2 (2) MNC FLC3	Water loop	Bay 3A	(1) LCA-2, F(10A) (2) LCA-3, F(10A)	(1) CNTL BC-1 (2) CNTL BC-2	(a)			
S-BD power amp Mode - OPERATE  - STBY	2	(1) 373.6 (1) 387.2 11.2	(1) MNB FPC2 (1) MNB FLC2 (2) MNC FPC3 (2) MNC FLC3	Water loop	Bay 3A	OPERATE: (1) LCA-2, F(3A) (2) LCA-3, F(3A) OPERATE/STBY:  (1) PCA-2, RPC(20A) (2) PCA-3, RPC(20A)	(1) CNTL BC-1 (2) CNTL BC-2	35° F 212° F 225° F			The S-BD power amp has temperature telemetry (212 <sup>†</sup> )
S-BD pre amp Mode - OPERATE S/U - OPERATE - STBY S/U - STBY	2	39.9 38.7 29.6 14.8	(1) MNB FLC2 (2) MNC FLC3	Water loop	Bay 3A	OPERATE/STBY (1) LCA-2, F(10A) (2) LCA-3, F(10A)	(1) CNTL BC-1 (2) CNTL BC-2	(a)			Start up (S/U) approx 10 min. STBY equals 2 heaters on
S-BD FM XMTR	2	(1) 75.7 (2) 74.2	(1) MNB FLC2 (2) MNC FLC3	Water loop	Bay 3A	(1) LCA-2, F(3A) (2) LCA-3, F(3A) Fusable line	(1) CNTL BC-1 (2) CNTL BC-2	(a)			
S-BD FM signal processor	1	3.8	(1) MNB FLC2 (2) MNC FLC3	Air	Bay 3A	LCA-2, F(3A) LCA-3, F(3A)	(1) CNTL BC-1 (2) CNTL BC-2				The LRU is internally redundant
S-BD FM RF switch Mode - QUES - SWITCH	1	0 11.2*	MNB FLC2 MNC FLC3	Air	Bay 3A	LCA-2, F(3A) LCA-3, F(3A)	N/A				*Switching peak
S-BD ANT switch assy Mode - QUES - PM* - FM*	1	0.6 19.6* 10.0*	(1) MNB FLC2 (2) MNC FLC3	Air	Bay 3A	LCA-2, F(3A) LCA-3, F(3A)	(1) CNTL BC-1 (2) CNTL BC-2	-20° F 120° F 120° F			The LRU is internally redundant. *Switching peak
S-BD switch beam electronics	1	3.0	(1) MNB FLC2 (2) MNC FLC3	Air	Bay 3A	LCA-2, F(3A) LCA-3, F(3A)	(1) CNTL BC-1 (2) CNTL BC-2	-20° F 120° F 120° F			OV099

(a) The baseplate temperature is assumed to be the same as the coldplate temperature. (The baseplate temperature limits take into account thermal rise caused by LRU heat dissipation.)

Table 4.23-1. Continued

LRU	Quantity	Power consumption, W	Power bus	Coolant source	LRU location	Circuit protection	Control signal	Minimum temp.	Maximum temp.		Notes
									Long term	Short term	
COMSEC unit	2		MNA FPC1	Water	Bay 3A	PCA-1&2					OV099 COMSEC units powered by Main A and/or Main B
Mode - OPERATE		25.0	MNB FPC2	loop							
Mode - STBY		2.5									
COMSEC (TAGS)	1	11									
OPS recorder	2		(1) MNA FPC1	Water	Bay 2	(1) PCA-1&2, PC(5A)	(1) CNTL AB-1 & AB-2	35° F	127° F	140° F	Recorder head has temperature telemetry (115↑)
Mode - REPRO		84.0	& MNB FPC2	loop							
Mode - RCD		56.0	(2) MNB FPC2			(2) PCA-2&3, RPC(5A)	(2) CNTL BC-1 & BC-2				
Mode - STBY		17.0	& MNC FPC3								
P/L recorder	1		MNA FPC1 & MNC FPC3	Water	Bay 1	PCA-1&3, RPC(5A)	CNTL CA-1 & CA-2	35° F	127° F	140° F	Recorder head has temperature telemetry. (115↑) (RCD = 15 ips)
Mode - REPRO		84.0		loop							
Mode - RCD		55.0									
Mode - STBY		17.0									
GCIL	1	50.9	MNA R15 MNC R15	Water	Bay 3A	CB-44, 3A CB-49, 3A	N/A	0° F	140° F	140° F	The GCIL is powered by Main A and/or Main C
ACCU	2	36.3	(1) ESS 2 CA (2) MNC R15	Water	Bay 1	(1) CB-1, 3A (2) CB-9, 3A	N/A	-20° F	100° F	120° F	The LRU is internally redundant
ATU	8			Cabin air (convection)	Cabin		N/A	-20° F	100° F	120° F	OS ATU and mid-deck CCU ATU not on OV099
Mode - No sig		4.3									
Mode - Signal		11.8									
PILOT			ESS 2 CA			CB-6, 3A					
CDR			ESS 1 BC			CB-4, 3A					
MSS			MNA R15			CB-2, 3A					
MIDDECK SPEAKER			MNB R15			CB-5, 3A					
MIDDECK CCU			MNB R15			CB-3, 3A					
PS			MNC R15			CB-10, 3A					
OS			MNA R15			CB-2, 3A					
AL			MNC R15			CB-10, 3A					
Speaker/mike unit	2			Cabin air (convection)	Cabin		N/A	-20° F	100° F	120° F	
Mode - No sig		3.0									
Mode - Signal		14.9									
OS			MNA R15			CB-2, 3A					
Middeck			MNB R15			CB-5, 3A					
HIU	2				Cabin			-20° F	100° F	120° F	Powered via CCU PWR switch; same source, circuit protection as associated ATU
Mode - No sig		0.5									
Mode - Signal		0.76									

**Table 4.23-1. Continued**

LRU	Quantity	Power consumption, W	Power bus	Coolant source	LRU location	Circuit protection	Control signal	Minimum temp.	Maximum temp.		Notes
									Long term	Short term	
KU-BD signal processor assembly	1	87	MNC R15	Water loop	Bay 3B	CB31, 5A	EA-1	0° F	140° F	140° F	
KU-BD electronics assembly 1	1	150	MNC FPCA3	Water loop	Bay 3A	RPC53, 10A	MNB R15	0° F	140° F	140° F	
KU-BD electronics assembly 2	1	48	MNB R15	Water loop	Bay 3A	CB23, 15A	EA-1	0° F	140° F	140° F	
KU-BD digital display and X-PNTR	1	15	MNB R15	Cabin air	Cabin	CB23, 15A Fuse, 3A					
KU-BD deployed electronics assembly Mode - COMM ON - COMM STBY - RADAR ON - RADAR STBY		290 112 244 112	MNB MPC2	Not actively cooled	PLB	Fuse, 20A	MNB R15	0° F	156° F	156° F	
KU-BD deployed mechanical assembly (ANT GIMBAL MOTORS)	1	20 83W PEAK 4.5W AVG	MNC FPCA3	Not actively cooled	PLB	RPC53, 10A	MNB R15	0° F	180° F	180° F	Temp limits for lubricant
KU-BD deployed mechanical assembly HEATER	1	115.5	MNB MPC2	Not actively cooled	PLB	Fuse, 20A	MNB R15				For gyro assembly gimbal motors A and B and antenna feed SPEC 76 COMM ALERT temp on TLM
KU-BD deployed electronics assembly HEATER	2	134	(1) MNB MPC2 (2) MNB MPC2	Not actively cooled	PLB	(1) Fuse, 20A (2) Fuse, 20A	MNB R15				Temp on TLM
Text and graphics (HARDCOPIER) Mode - OPERATE - STBY - WARMUP (15 min)	1	100 70 135	MNC FPC3	Water loop	Bay 3B	PCA-3 (10A)	CNTL CA1				
EBIA (Encrypton Bypass Isolation Assb.)	1	5	MNCFPC3	11	Bay 3A	PCA-3 (10A)	CNTL CA1				
Payload signal processor	2	32.0	(1) MNB FLC2 (2) MNC FLC3	Water loop	Bay 2	(1) Fuse, 3A LCA2 (2) Fuse, 3A LCA3	(1) CNTL BC1 (2) CNTL BC2	-20° F	120° F	120° F	

**Table 4.23-1. Continued**

LRU	Quantity	Power consumption, W	Power bus	Coolant source	LRU location	Circuit protection	Control signal	Minimum temp.	Maximum temp.		Notes
									Long term	Short term	
Payload interrogator	2	97.9	(1) MNB FLC2 (2) MNC FLC3	Water loop	Bay 2	(1) LCA2 (2) LCA3	(1) CNTL BC1 (2) CNTL BC2	-20° F	120° F	120° F	
Payload interrogator RF switch	1	0	MNB FLC2 MNC FLC3	Water loop	Bay 2	Fuse, 10A LCA2 Fuse, 10A LCA3	CNTL BC1 (TLM only)				
Payload data interleaver	1	27	MNA FPC1 MNC FPC3	Water loop	Bay 1	RPC(5A) RPC(5A)	CNTL BC1 CNTL BC2	35° F	120° F	120° F	
UHF EVA/ATC XCVR Mode - Simplex (XMIT) (RCV) - EVA (XMIT) (RCV) - Simplex + GRD - Guard (XMIT) (RCV)	1	158.0 25.0 34.0 21.0 25.0 165.0 25.0	MNA R15 MNC R15	Water loop	Bay 3A	CB-13, 7.5A CB-18, 7.5A	CNTL CA1, CNTL CA2 (TLM only)	15° F	155° F	155° F	
OEX RCDR Mode - REPRO - RCD - STBY	1	140 114 58	MNC MPC3	Cabin air (convection)	Vol. D of crew comp. (under middeck floor)	RPC(20A)	CNTL CA3	32° F	120° F		OV-102 only
Interface control Module Mode - OEX RCDR STBY - OEX RCDR RCD	1	0 3.6	MNC MPC3	Cabin air (convection)		RPC(10A)	CNTL CA3	-45° F	165° F		OV-102 only
MADS strain gauges	85	112 (all)	MNA MPC2	Not actively cooled	PLB	RPC(15A)	MNB A14	+20° F	165° F	165° F	
MADS wideband system - FDM - Wideband equip: ACIP PCM FASCO pressure sensors WBSC	1 1 2 10 12	56 115	MNA MPC1	Not actively cooled	PLB	RPC(15A)	MNB A14	-65° F +20° F	165° F 165° F	165° F 165° F	
MADS PCMMU	1	60	MNB MPC2	Not actively cooled	PLB	RPC(15A)	MNB A14	-45° F	150° F	150° F	
MADS RCDR - STBY - RCD 3.75 IPS - RCD 15 IPS - PB 60 IPS	1	58 103 106 109	MNB FPC2	Cabin air (forced)	Vol. D of crew comp. (under mid-deck floor)	RPC(10A)	MNB A14	35° F	120° F	120° F	Temp on TLM

**Table 4.23-1. Continued**

LRU	Quantity	Power consumption, W	Power bus	Coolant source	LRU location	Circuit protection	Control signal	Minimum temp. ° F	Maximum temp.		Notes
									Long term	Short term	
MADS control module	1	16-25	MNB FPC2	Cabin air (forced)	Vol. D of crew comp. (under mid-deck floor)	CB-1, 5A	MNB A14		125° F	125° F	Power depends on MADS RCDR direction
TV Monitor	2	36.4	(1) MNA R15 (2) MNB R15	Cabin air (forced)	Cabin	(1) CB-38, 3A (2) CB-43, 3A	N/A	TBS	88° C	88° C	Fault light comes on at 88° C (190° F)
TV remote control unit (RCU)/ video switching unit (VSU)	1	46.2	MNA R15 or MNB R15	Cabin air (forced)	Cabin	CB-37, 3A CB-42, 3A	CNTL AB-1 CNTL BC-1	TBS	140° F	TBS	The RCU and VSU have the same power supply. S17 PNL A7 selects MNA or MNB TV power. Loss of GCIL MNC R11 and R15 loses TV UL CMD
TV camera Flight deck Middeck	9	19.0	MNC R15	Cabin air (convection)	Cabin	CB-48, 5A	N/A	32° F	113° F (45° C)	113° F (45° C)	CLA or MLA, PTU, VFM power not included
Fwd PLB Aft PLB RMS WR (port) RMS ELB (port) Keel/EVA RMS WR (stbd) RMS ELB (stbd)			MNB R15 MNA R15 MNB R15 MNB R15 MNC R15 MNA R15 MNA R15	Not actively cooled	PLB	CB-39, 3A CB-34, 3A CB-55, 3A CB-55, 3A CB-45, 3A CB-51, 3A CB-51, 3A	N/A				Camera has temp telemetry. Camera degradation may occur >113° F
TV, EMU	1	See note	See note	Not actively cooled	Attached to EMU helmet						Battery powered
TV receiver, EMU		31.0	MNC R15	Cabin air	Cabin	CB-48, 5A	N/A				Powered from middeck TV input station.
Color lens assy. (CLA) Mode - STBY - 1 MOTOR - 2 MOTORS - 3 MOTORS	2	4.8 7.0 9.2 11.5	See note	See note	Cabin & PLB	See note	N/A	TBS	TBS	TBS	CLA power bus, location, circuit protection, and coolant source same as associated camera
B&W lens assy. (MLA) Mode - STBY - 1 MOTOR - 2 MOTORS - 3 MOTORS	5	0.2 2.4 4.5 6.7	See note	Not actively cooled	PLB	See note	N/A	TBS	TBS	TBS	MLA power bus, location, circuit protection same as associated PLB camera
Viewfinder monitor (VFM)	2	5.2	MNC R15	Cabin air (convection)	Cabin	CB-48, 5A	N/A	TBS	TBS	TBS	Powered via flight deck camera

**Table 4.23-1. Continued**

LRU	Quantity	Power consumption, W	Power bus	Coolant source	LRU location	Circuit protection	Control signal	Minimum temp.	Maximum temp.		Notes
									Long term	Short term	
Video tape recorder (VTR) Mode - RCD - PB - FWD/RWD - PAUSE (STBY) - STOP	1	42.6 39.8 16.0 32.2 12.0	CABPL 2 (MNA MPC1 or MNB MPC2)	Cabin air (convection)	Cabin PNL L12	CB-3	ESS 1BC ESS 2CA	60° F	120° F	120° F	Tape temp limits
TV camera (heaters) Fwd PLB Aft PLB RMS WRS (port) RMS ELB (port) Keel/EVA RMS WRS (stbd) RMS ELB (stbd)	5	19.9	MNB R15 MNA R15 MNB R15 MNB R15 MNC R15 MNA R15 MNA R15	Not actively cooled	PLB	CB-40, 3A CB-35, 3A CB-56, 3A CB-56, 3A CB-46, 3A CB-52, 3A CB-52, 3A	Thermostat	32° F	113° F (45° C)	113° F (45° C)	The heater turns on at 33.8° F and off at approx. 46° F
Pan tilt unit (PTU) Mode - STBY - 1 MOTOR - 2 MOTORS	4	0.2 2.7 5.2	See note	Not actively cooled	PLB	See note	N/A	TBS	TBS	TBS	PTU power bus, location, circuit protection same as associated PLB camera. (No PTU's in RMS wrist and keel locations)
Pan/tilt heaters Fwd PLB Aft PLB RMS ELB (port) Keel/EVA RMS ELB (stbd)	4	8.2	MNB R15 MNA R15 MNB R15 MNC R15 MNA R15	Not actively cooled	PLB	CB-41, 3A CB-36, 3A CB-57, 3A CB-47, 3A CB-53, 3A	Thermostat	TBS	TBS	TBS	The heater turns on at 25° F (-10° C) and off at approx. 38° F
Remote video switches (RVS) (port)	1	0.01	MNB R15	Not actively cooled	PLB	CB-55, 3A	N/A	TBS	TBS	TBS	
Teleprinter (TPR) Mode - PRINT - STBY	1	60 1	MNC 016 or MNA 014	Not actively cooled	Cabin: Locker MA9F	CB-9, 10A CB-10, 10A			155° F		Temp decal
UHF antenna	1							-65° F	180° F	500° F	Thermal limits for pattern degradation
S-BD quad antenna	4							-160° F	180° F	500° F	Thermal limits for pattern degradation

**Table 4.23-1. Continued**

LRU	Quantity	Power consumption, W	Power bus	Coolant source	LRU location	Circuit protection	Control signal	Temperature			Notes
								Minimum temp.	Maximum temp. Long term	Maximum temp. Short term	
S-BD quad switched beam antenna	4							-160° F	180° F	500° F	Thermal limits for pattern degradation
S-BD hemi antenna	2							-160° F	180° F	500° F	Thermal limits for pattern degradation
S-BD payload antenna	1							-160° F	180° F	500° F	Thermal limits for pattern degradation
KU-BD antenna	1										
Dedicated signal conditioner OI OA1	1	36.2	MNA APC4 MNB APC5	Cold-plate Freon	Aft bay 4	RPC 5A RPC 5A	CNTL AB2 CNTL BC2 017 S17	-65° F	160° F	160° F	Redundant power
Dedicated signal conditioner OI OA2	1	29.1	MNB APC5 MNC APC6	Cold-plate Freon	Aft bay 5	RPC 5A RPC 5A	CNTL BC2 CNTL CA1 017 S17	-65° F	160° F	160° F	Redundant power
Dedicated signal conditioner OI OA3	1	29.1	MNA APC4 MNC APC6	Cold-plate Freon	Aft bay 6	RPC 5A RPC 5A	CNTL AB2 CNTL CA1 017 S17	-65° F	160° F	160° F	Redundant power
Dedicated signal conditioner OI OF1	1	22.8	MNA 014 MNB 015	Cold-plate water	Middeck bay 1	014 CB2 015 CB2	None	-65° F	160° F	160° F	Redundant power
Dedicated signal conditioner OI OF2	1	32.6	MNB 015 MNC 016	Cold-plate water	Middeck bay 2	015 CB3 016 CB2	None	-65° F	160° F	160° F	Redundant power
Dedicated signal conditioner OI OF3	1	26.8	MNC 016 MNB 015	Cold-plate water	Avionics bay 3	016 CB2 015 CB3	None	-65° F	160° F	160° F	Redundant power
Dedicated signal conditioner OI OF4	1	26.9	MNB 015 MNA 014	Not actively cooled	FWD RCS Module	015 CB2 014 CB2	None	-65° F	160° F	160° F	Redundant power
Dedicated signal conditioner OI OL1	1	23.3	MNB APC2 MNA APC1	Not actively cooled	Left-hand OMS pod	RPC 5A RPC 5A	CNTL BC2 CNTL AB2 017 S13	-65° F	160° F	160° F	Redundant power
Dedicated signal conditioner OI OL2	1	21.4	MNA APC1 MNC APC3	Not actively cooled	Left-hand OMS pod	RPC 5A RPC 5A	CNTL AB2 CNTL CA2 017 S13	-65° F	160° F	160° F	Redundant power



**Table 4.23-1. Continued**

LRU	Quantity	Power consumption, W	Power bus	Coolant source	LRU location	Circuit protection	Control signal	Minimum temp.	Maximum temp.		Notes
									Long term	Short term	
Dedicated signal conditioner OI OM1	1	13.9	MNB 015 MNA 014	Not actively cooled	Mid-fuselage	015 CB4 014 CB3	None	-65° F	160° F	160° F	Redundant power
Dedicated signal conditioner OI OM2	1	22.1	MNB 015 MNA 014	Not actively cooled	Mid-fuselage	015 CB4 014 CB3	None	-65° F	160° F	160° F	Redundant power
Dedicated signal conditioner OI OM3	1	13.4	MNB 015 MNC 016	Not actively cooled	Mid-fuselage	015 CB37 016 CB31	None	-65° F	160° F	160° F	Redundant power
Dedicated signal conditioner OI OR1	1	23.3	MNB APC2 MNA APC1	Not actively cooled	Right-hand OMS pod	RPC 5A RPC 5A	CNTL BC3 CNTL AB3 017 S14	-65° F	160° F	160° F	Redundant power
Dedicated signal conditioner OI OR2	1	21.4	MNB APC2 MNC APC3	Not actively cooled	Right-hand OMS pod	RPC 5A RPC 5A	CNTL BC3 CNTL CA3 017 S14	-65° F	160° F	160° F	Redundant power
Dedicated signal conditioner OI OP1	1	8.7	MNA R15 MNB R15	Not actively cooled	EDO pallette	R15 CB74 R15 CB75	None	-65° F	160° F	160° F	Redundant power
Dedicated signal conditioner OI OP2	1	8.7	MNA R15 MNC R15	Not actively cooled	EDO pallette	R15 CB74 R15 CB76	None	-65° F	160° F	160° F	Redundant power
Multiplexer demultiplexer OI OA1	1	41.3	MNB APC5 MNA APC4	Cold-plate Freon	Aft bay 4	RPC 5A RPC 5A	CNTL BC1 CNTL AB1 017 S19	-65° F	160° F	160° F	Redundant power
Multiplexer demultiplexer OI OA2	1	42.1	MNC APC6 MNB APC5	Cold-plate Freon	Aft bay 4	RPC 5A RPC 5A	CNTL CA2 CNTL BC1 017 S19	-65° F	160° F	160° F	Redundant power
Multiplexer demultiplexer OI OA3	1	42.7	MNC APC6 MNA APC4	Cold-plate Freon	Aft bay 6	RPC 5A RPC 5A	CNTL CA2 CNTL AB1 017 S19	-65° F	160° F	160° F	Redundant power
Multiplexer demultiplexer OI OF1	1	46.8	MNA 014 MNB 015	Cold-plate water	Bay 1	014 CB4 015 CB5	None	-65° F	160° F	160° F	Redundant power
Multiplexer demultiplexer OI OF2	1	46.8	MNA 014 MNB 015	Cold-plate water	Bay 2	014 CB4 015 CB5	None	-65° F	160° F	160° F	Redundant power

**Table 4.23-1. Concluded**

LRU	Quantity	Power consumption, W	Power bus	Coolant source	LRU location	Circuit protection	Control signal	Minimum temp.	Maximum temp.		Notes
									Long term	Short term	
Multiplexer demultiplexer OI OF3	1	47.4	MNA 014 MNC 016	Cold-plate water	Bay 3	014 CB5 016 CB3	None	-65° F	160° F	160° F	Redundant power
Multiplexer demultiplexer OI OF4	1	40.4	MNA 014 MNC 016	Cold-plate water	Flight deck	014 CB5 016 CB3	None	-65° F	160° F	160° F	Redundant power
PCMMU OI1	1	55	MNC FPC3 MNA FPC1	Cold-plate water	Bay 1	RPC 5A RPC 5A	CNTL CA1 CNTL AB1 C3 S7	35° F	120° F	120° F	
PCMMU OI2	1	55	MNA FPC1 MNB FPC2	Cold-plate water	Bay 2	RPC 5A RPC 5A	CNTL AB1 CNTL BC1 C3 S7	35° F	120° F	120° F	
Payload data interleaver	1	40	MNA FPC1 MNC FPC3	Cold-plate water	Bay 1	RPC 5A RPC 5A	CNTL AB1 CNTL CA1 A1 S17	35° F	120° F	120° F	
Wideband signal conditioner OI 54V75A64	1	0.2	MNA APC4	Not actively cooled	Aft bay 4	RPC 5A	CNTL AB2 017 S17	20° F	165° F	165° F	
Wideband signal conditioner OI 54V75A65	1	0.2	MNA APC4	Not actively cooled	Aft bay 4	RPC 5A	CNTL AB2 017 S17	20° F	165° F	165° F	
Wideband signal conditioner OI 54V75A67	1	0.2	MNA APC4	Not actively cooled	Aft bay 4	RPC 5A	CNTL AB2 017 S17	20° F	165° F	165° F	
Wideband signal conditioner OI 54V75A68	1	0.2	MNA APC4	Not actively cooled	Aft bay 4	RPC 5A	CNTL AB2 017 S17	20° F	165° F	165° F	
Wideband signal conditioner OI 55V75A70	1	0.2	MNB APC5	Not actively cooled	Aft bay 5	RPC 5A	CNTL BC2 017 S17	20° F	165° F	165° F	
Wideband signal conditioner OI 55V75A71	1	0.2	MNB APC5	Not actively cooled	Aft bay 5	RPC 5A	CNTL BC2 017 S17	20° F	165° F	165° F	
Secure television system	1	100	MNB R15	Forced air	A11U	R15 CB70	NONE	TBS	TBS	TBS	

**Table 4.23-2. Communications equipment power matrix**

	ESS		CNTL							MAIN							
	1BC 013 R15	2CA 013 R15	AB1	AB2	AB3	BC1	BC2	CA1	CA2	A	B	C					
											FPC 1	R15	FPC 2		R15	FPC 3	
				X			X			R15				FLC 2			FLC 3
GPC BLK SW (ANDED)				X			X										
NETWK SIG PROC 1						X								28.8			
TRANSPONDER 1						X								DIR 58.5 TDRS 41.0 RCV 31.3			
PWR AMPL 1 OPERATE						X							387.3	1.7			
PWR AMPL 1 STANDBY						X							11.2				
PREAMPL 1						X								20.4			
ANTENNA SW ELEC 1						X ANT TM								0.6			
NETWK SIG PROC 2							X										28.8
TRANSPONDER 2							X										DIR 58.5 TDRS 41.0 RCV31.3
PWR AMPL 2 OPERATE							X									387.3	1.7
PWR AMPL 2 STANDBY							X									11.2	
PREAMPL 2							X										20.4
ANTENNA SW ELEC 2							X										0.6
GCIL R										50.9						50.9	
FM SYSTEM						1	2							81.1 <sup>(1)</sup>			81.1 <sup>(2)</sup>
COMSEC 1, 2, & 3R			UNITS 1 & 3		UNITS 2 & 3						1,2,3 OPR 25 STBY 2.5		1,2 OPR 25 STBY 2.5			3 OPR 25 STBY 2.5	
OPS RECORDER 1 <sup>Ⓜ</sup> R			X	X							STBY 17 RCD 56 PB 84		STBY 17 RCD 56 PB 84				
OPS RECORDER 2 <sup>Ⓜ</sup> R						X	X						STBY 17 RCD 56 PB 84			STBY 17 RCD 56 PB 84	
PAYLOAD RECORDER <sup>Ⓜ</sup> R								X	X		STBY 17 RCD 56 PB 84					STBY 17 RCD 56 PB 84	
ACCU's																40 <sup>(2)</sup>	
ATU's	CDR XMT11.8 RCV4.3	PLT XMT11.8 RCV4.3								MS.OS.MD 3.7		MD SMU 5.9				PS.AL 3.7	
JHF (XCVR) R									TLM	RCV25 KEY 35						RCV25 KEY 35	
JHF (PA)									TLM	KEY 160							
TEXT AND GRAPHICS									PNL ON/OFF							OPER 100 STBY 70 WU 135	

<sup>Ⓜ</sup> One control bus and associated MAIN BUS required  
<sup>R</sup> - Redundantly powered



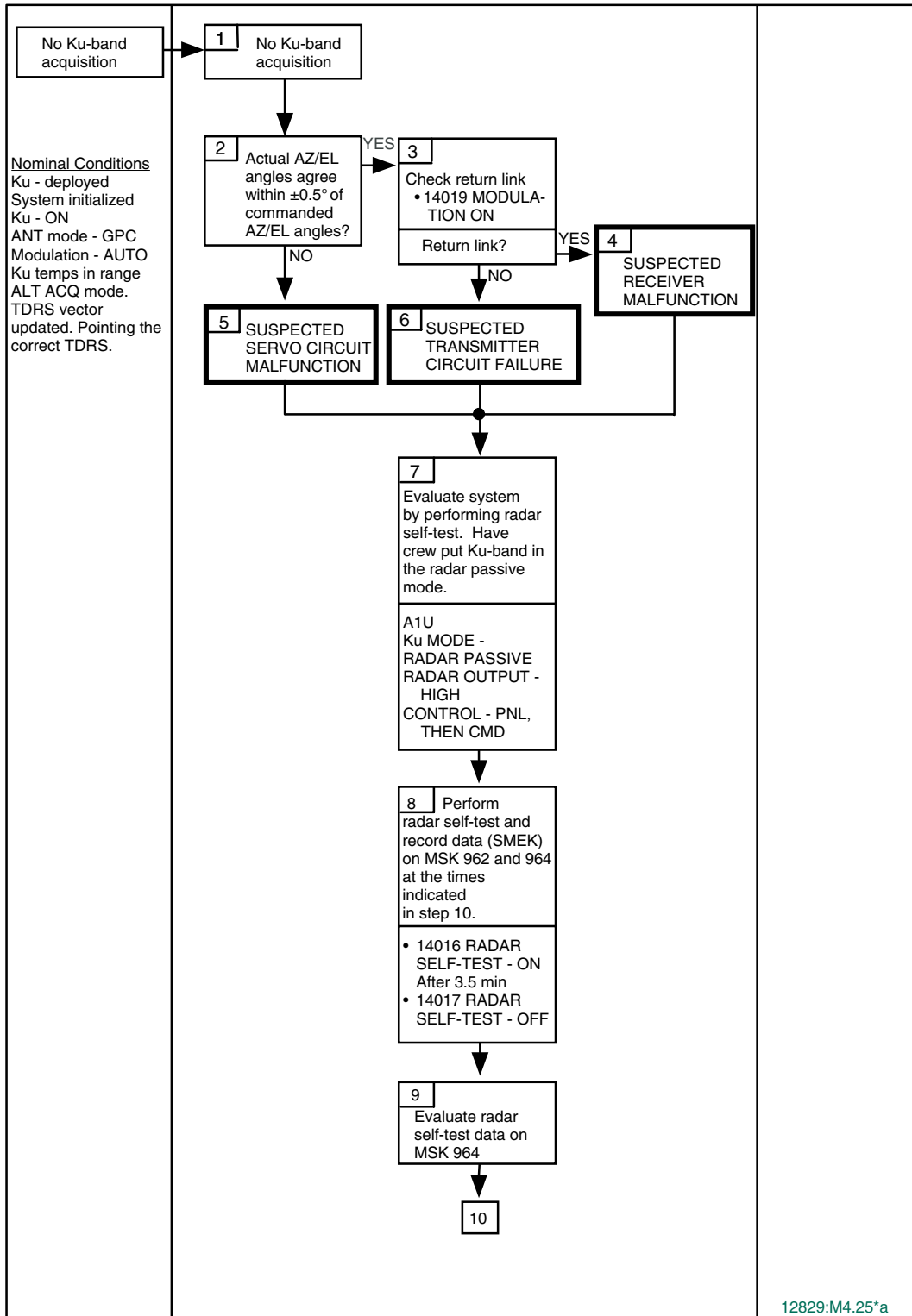


**Table 4.23-3. Communications control bus/panel isolation matrix**

LRU/FUNCTION	CONTROL BUS PANEL ROUTING								
	AB1	AB2	AB3	BC1	BC2	BC3	CA1	CA2	CA3
GPC BLK SW (ANDED)		C3A5S13			C3A5S13				
NSP 1				A1A2S23					
XPNDR 1				A1A2S16					
PA1 OPERATE				A1A2S12					
PA1 STANDBY				A1A2S11					
PREAMP 1				A1A2S10					
ANT SW ELECT 1				A1A2S5					
ANT SW (ROTARY TLM)				C3A7S10					
NSP 2					A1A2S23				
XPNDR 2					A1A2S16				
PA2 OPERATE					A1A2S12				
PA2 STANDBY					A1A2S11				
PREAMP 2					A1A2S10				
ANT SW ELECT 2					A1A2S5				
FM SYS 1				A1A3S3					
FM SYS 2					A1A3S3				
COMSEC 1	A1A2S24								
COMSEC 2			A1A2S24						
COMSEC 1 ZEROIZE (TLM)								R12A2S12	
COMSEC 3 R	A1A2S24		A1A2S24						
OPS RCDR 1 R	A1A3S11	A1A3S11							
OPS RCDR 2 R				A1A3S12	A1A3S12				
PAYLOAD RCDR R							A1A3S13	A1A3S13	
UHF XCVR MODE (TLM)								06S6	
UHF PA (TLM)							06S10		
UHF TX FREQ (TLM)								06S7	
UHF SQUELCH (TLM)								06S9	
VIDEO CNTL UNIT R	A7A1S12			A7A1S12					
VCU-SYNC (TLM)	A7A1S18								
VCU-DOWNLINK (TLM)	A7A1S11								
KU DA HTR (TLM)	A14S19								
PDI				A1A2S17	A1A2S17				

**Table 4.23-3. Concluded**

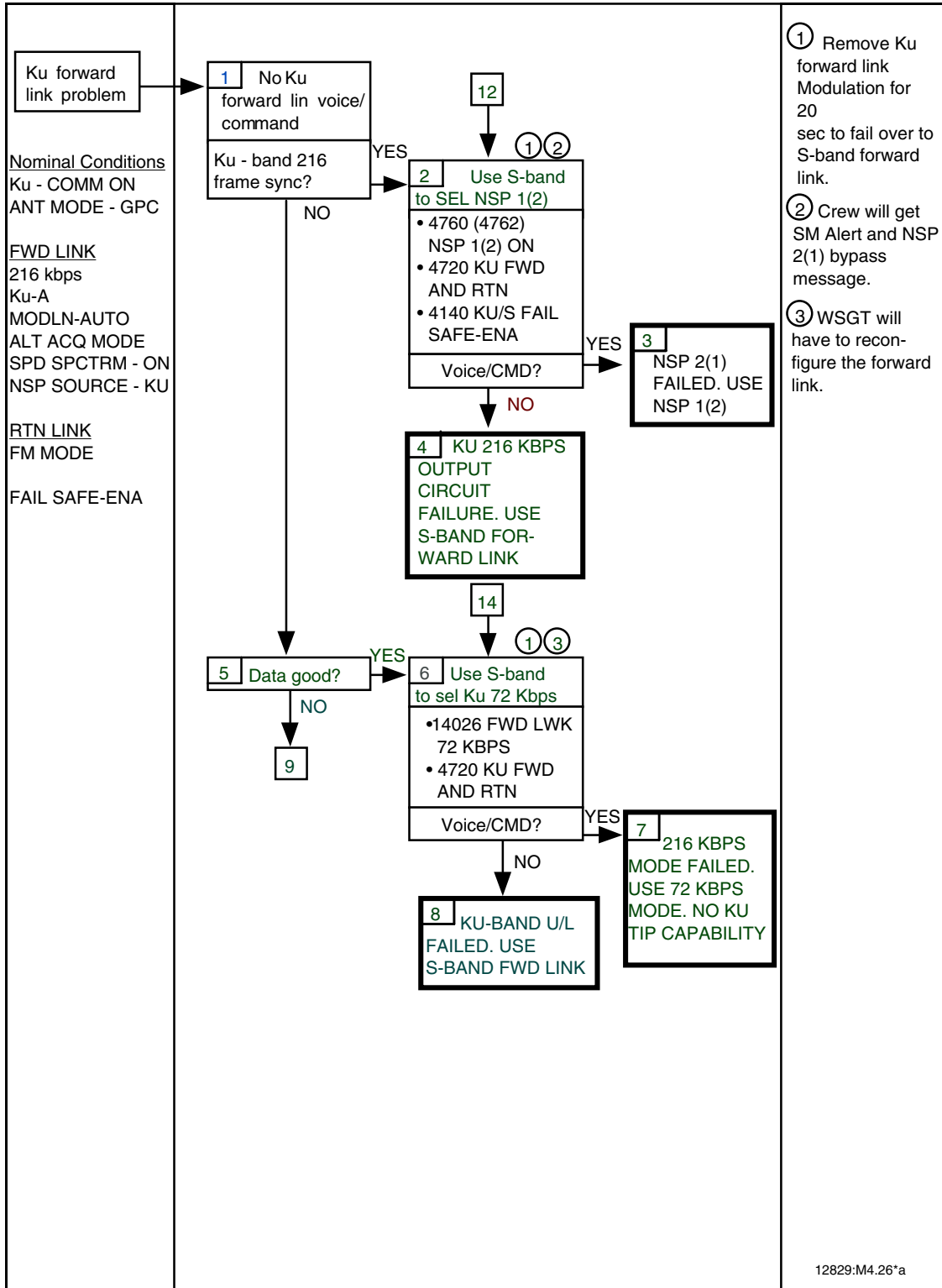
LRU/FUNCTION	CONTROL BUS PANEL ROUTING								
	AB1	AB2	AB3	BC1	BC2	BC3	CA1	CA2	CA3
PCM 1	C3A7S7						C3A7S7		
PCM 2	C3A7S7			C3A7S7					
MDM OA01	017: DS19			017:DS19					
MDM OA02				017:DS19				017: DS19	
MDM OA03	017: DS19							017: DS19	
DSC OA1		017: DS17			017: DS17				
DSC OA2					017: DS17		017: DS17		
DSC OA3		017: DS17					017: DS17		
DSC OL1		017: CS13			017: CS13				
DSC OL2		017: CS13						017: CS13	
DSC OR1			017: CS14			017: CS14			
DSC OR2						017: CS14			017: CS14
MADS CAL (OV 102)									A7A2S7
ANT STO/DPLY MTR 1							R13A2S8	R13A2S8	
ANT STO/DPLY MTR 2				R13A2S8	R13A2S8				
ANT DIRECT STOW (1)							R13A2S12	R13A2S12	
KU ANT DIRECT STOW (2)				R13A2S12	R13A2S12				
KU ANT BOOM STOW INITIATE	R			R13A2S8			R13A2S8		
KU ANT STO/DPLY MTR 1 LIMIT SW									MA73C: AS12
KU ANT STO/DPLY MTR 2 LIMIT SW						MA73C: BS9			
QEX EQUIP									A7A2S4
TAGS PNL PWR-HARDCOPIER							MA73C		
MDM PF1	R 06S52		06S52						
MDM PF2	R			06S20		06S20			
MDM FF1	R	06S26	06S26						
MDM FF3	R							06S28	06S28
PSP/PI 1				A1A2S13					
PSP/PI 2					A1A2S13				
PSP/PI SW SEL (TLM)				A1A2S14					

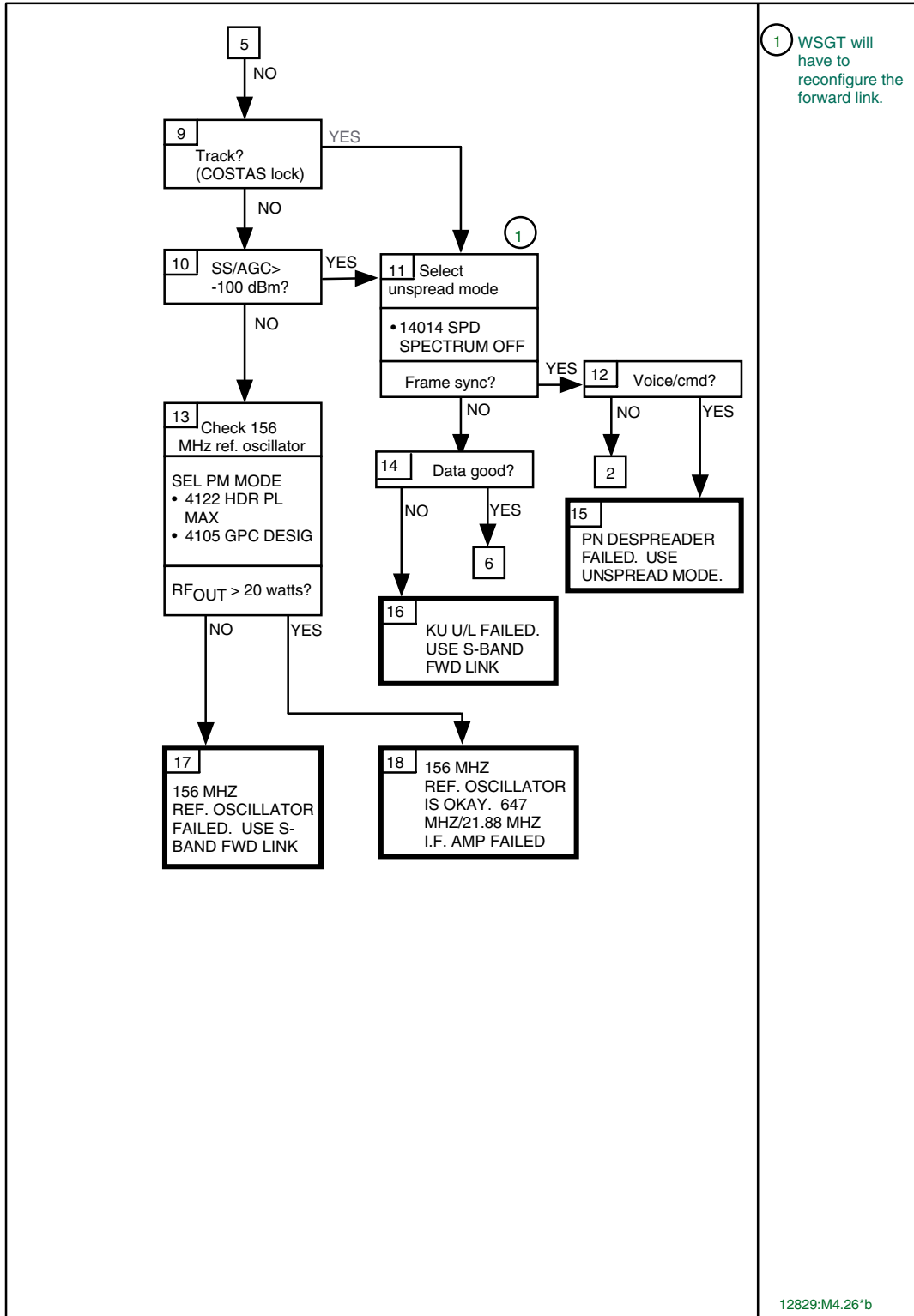


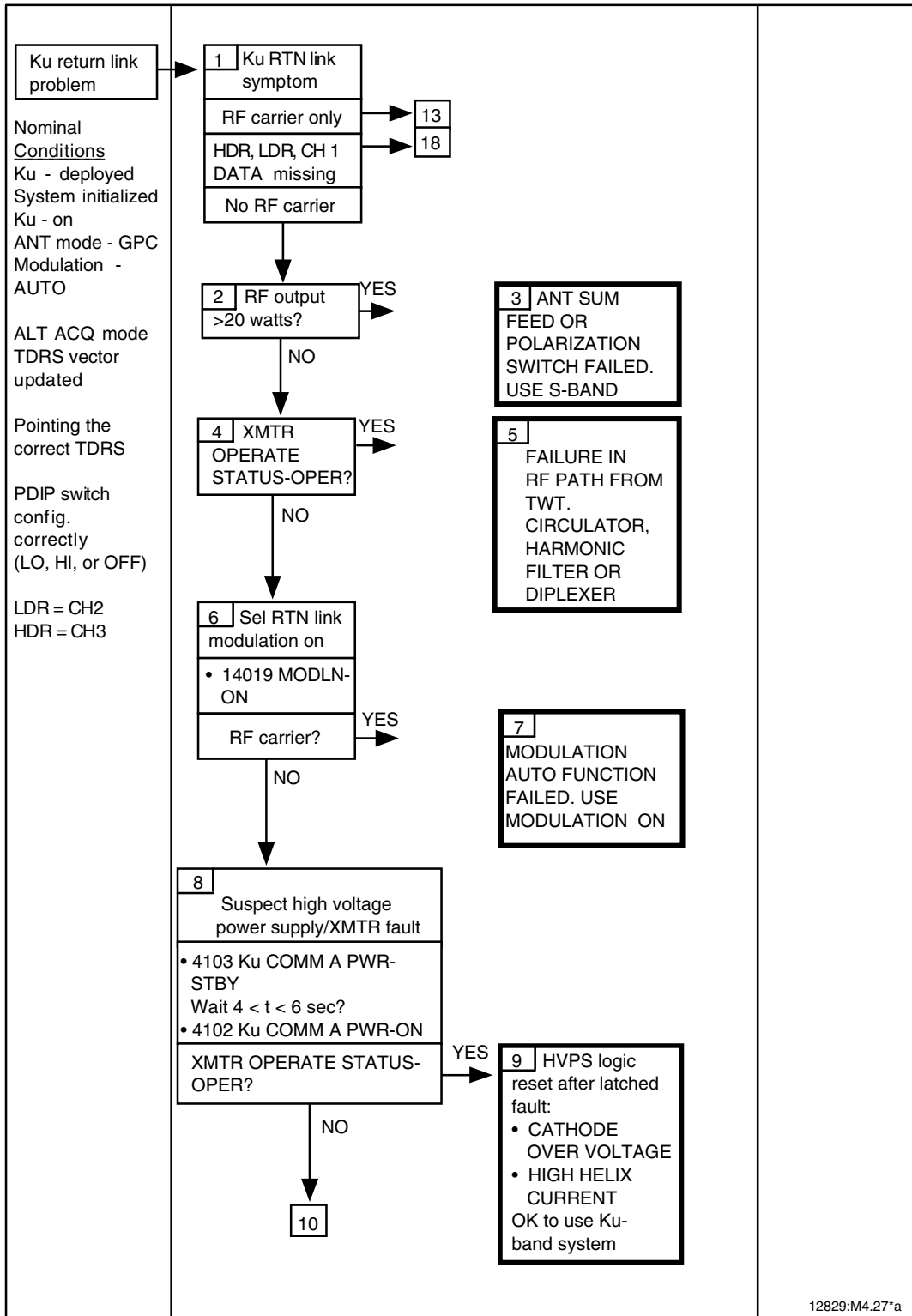


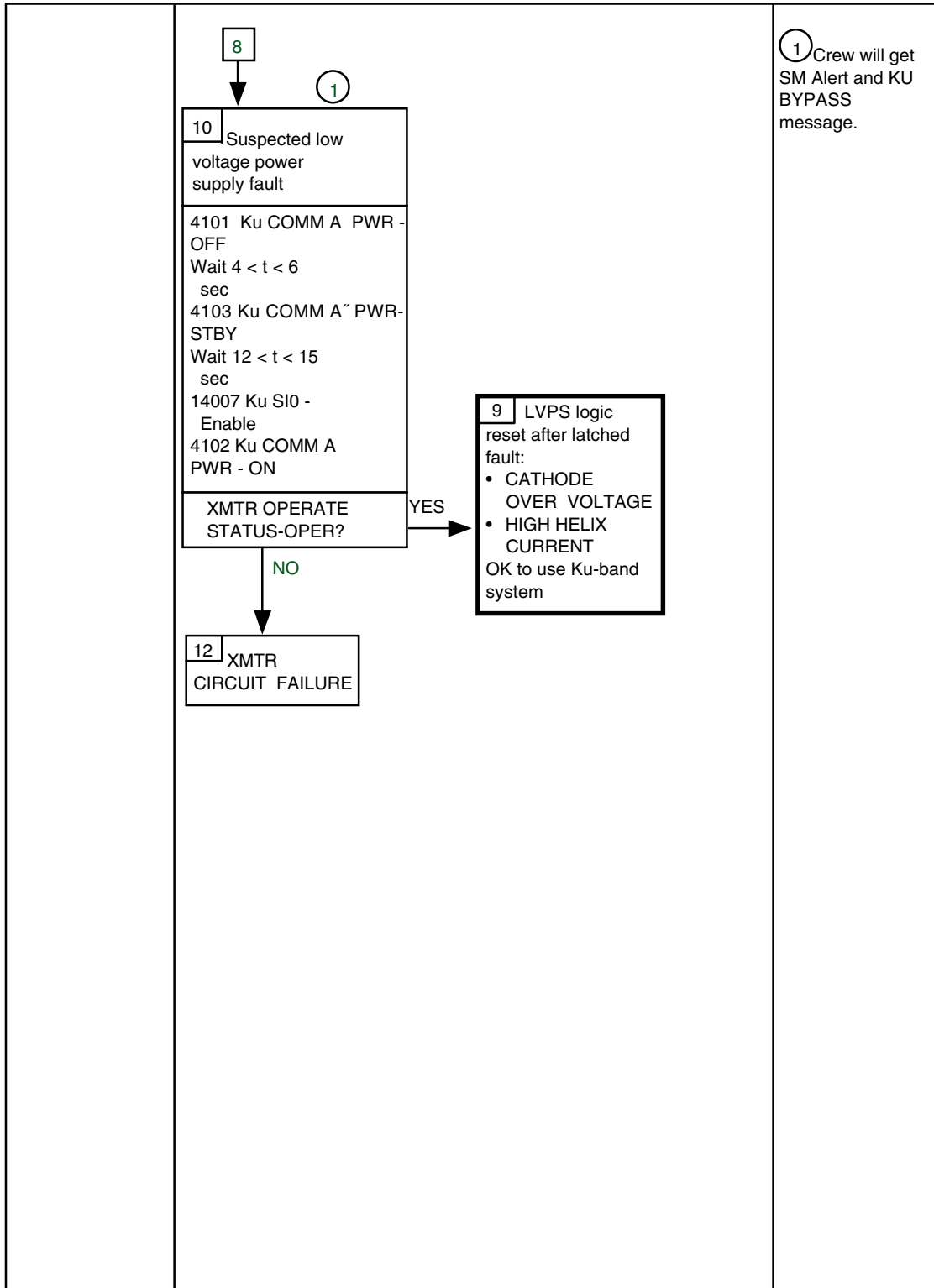


10		CONCLUSION	
TIME SEC	PARAMETER	VALUES AGREE	VALUES DO NOT AGREE
40	EL = 30° AZ = 0	α & β GIMBAL SERVO CIRCUITS ARE OK.	α, β OR BOTH GIMBAL SERVO CIRCUITS HAVE FAILED.
55	EL = 30 AZ = -30		
70	EL = 0 AZ = 0		
90	OPER. STATUS = OPER AGC > 0 VOLT	TRANSMITTER IS OK. RECEIVER IS OK.	TRANSMITTER OR RECEIVER CIRCUIT FAILURE
100	RANGE = 5,300 ± 500 FT	SUM RECEIVE CHANNEL TO EA-2 PROCESSOR IS OK.	FAILURE IN SUM RECEIVE CHANNEL FROM ANTENNA TO EA-2 PROCES- SOR OUTPUT.
110	RANGE = 0		
120	RANGE = 10,200 ± 500 FT		
150	AZ ANG RATE = -16.38%/SEC EL ANG RATE = -16.38%/SEC	DEA & EA-2 LRU'S ARE OK.	DEA OR EA-2 RECEIVE PATH FAILURE.
200	RANGE = 888,800 FT RANGE = 333,300 FT	SYSTEM IS OK.	SYSTEM FAILURE AS DESCRIBED ABOVE.

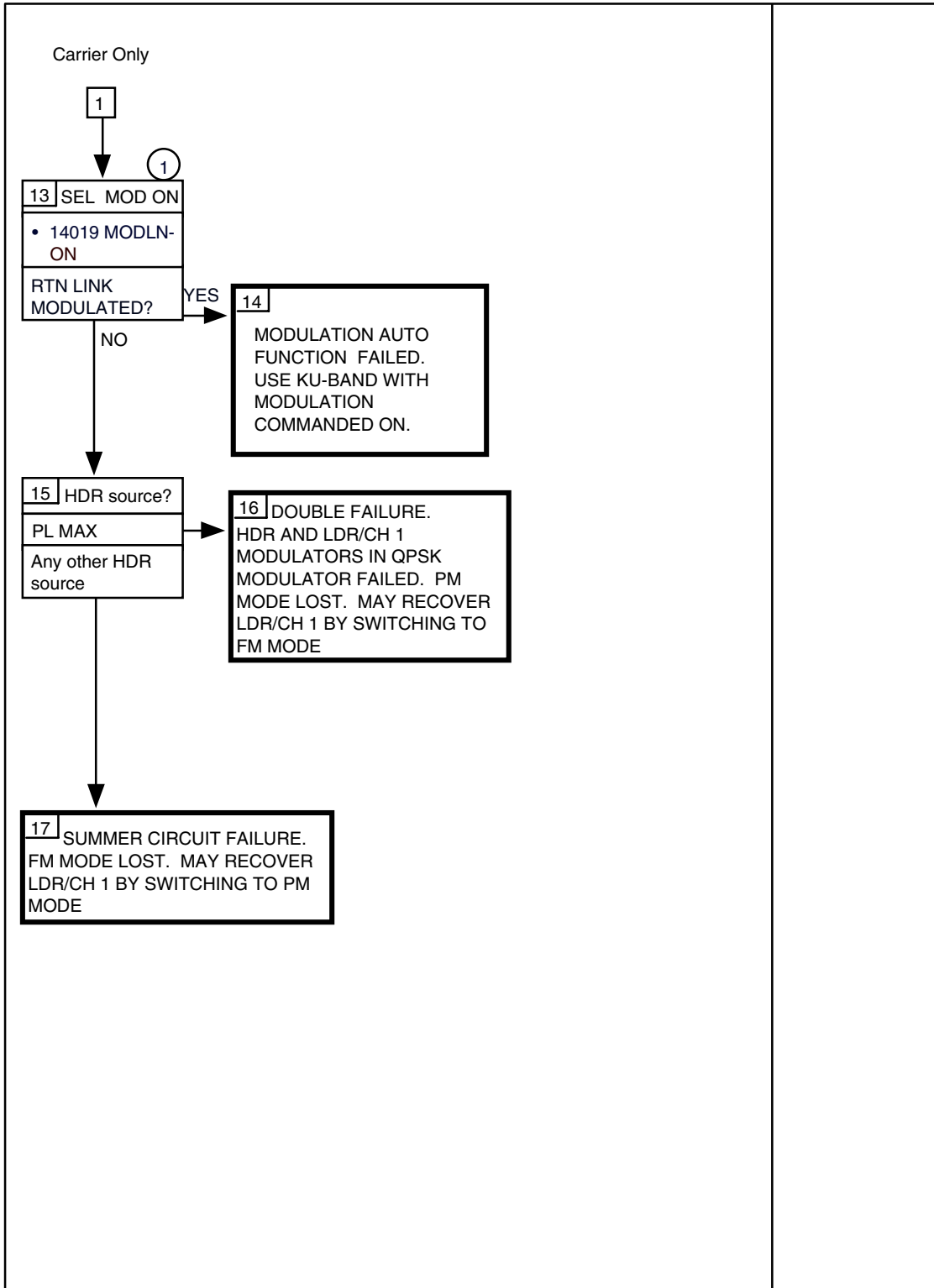




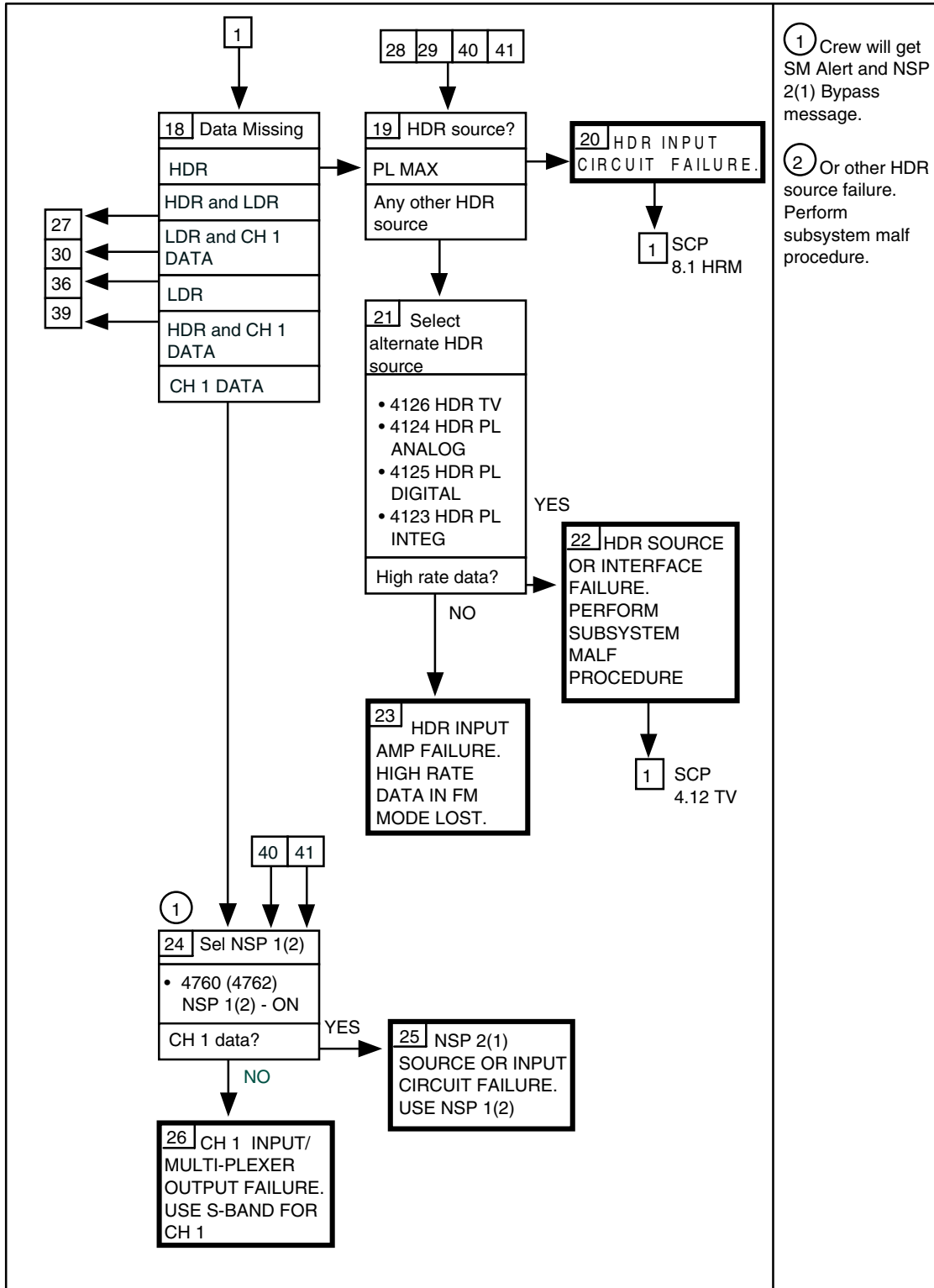




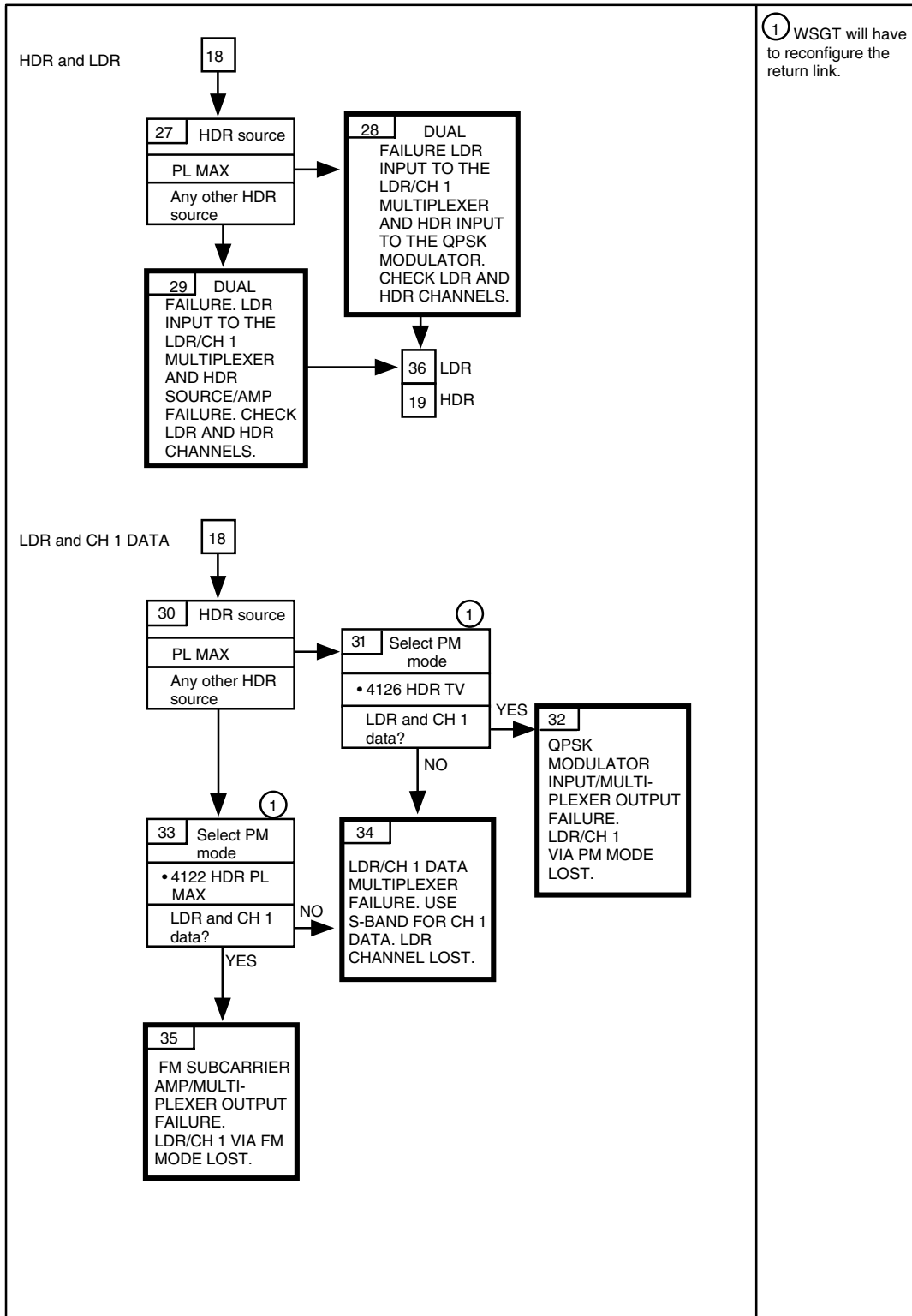
12829:M4.27\*b



12829:M4.27\*c

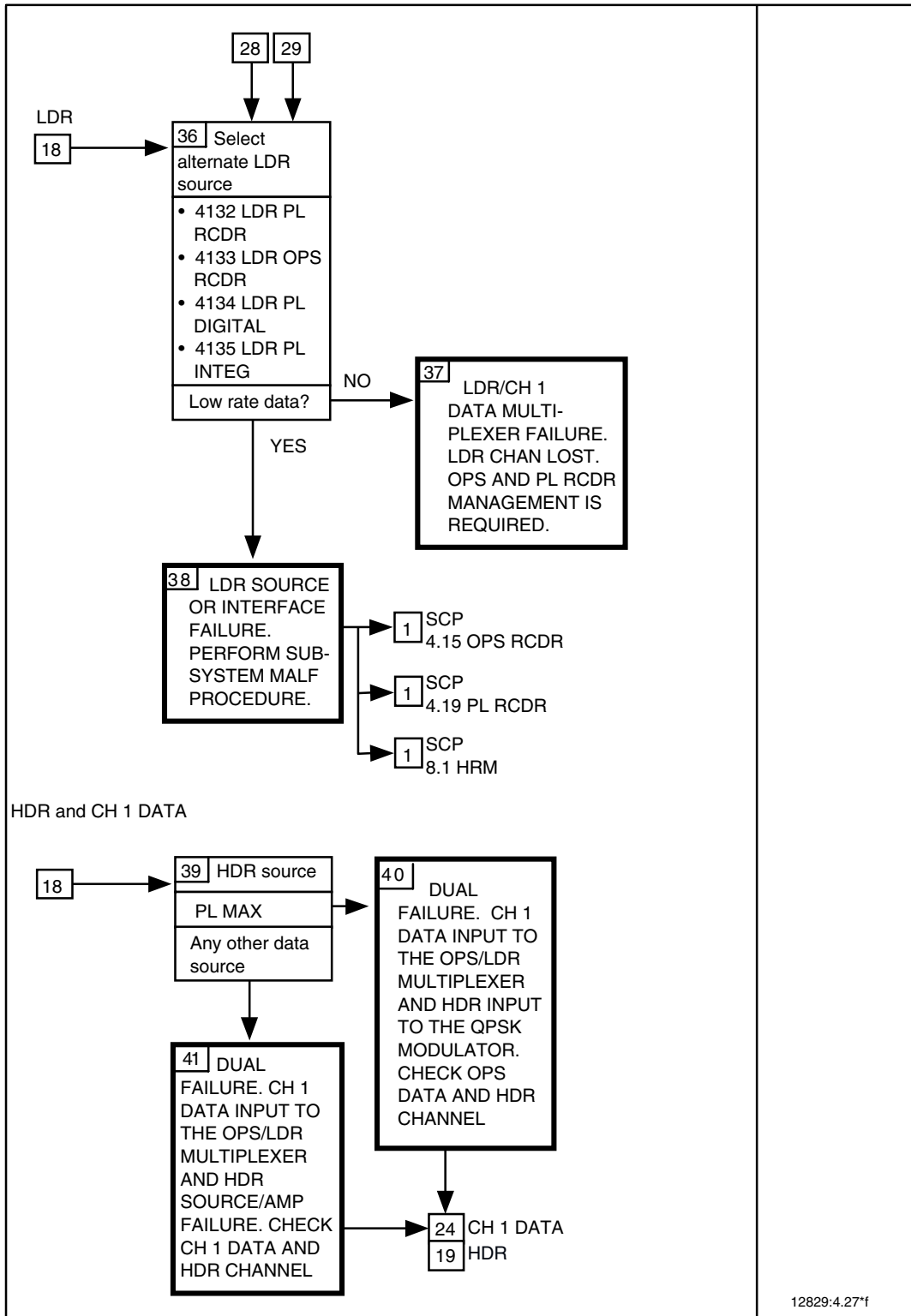


12829:M4.27\*d

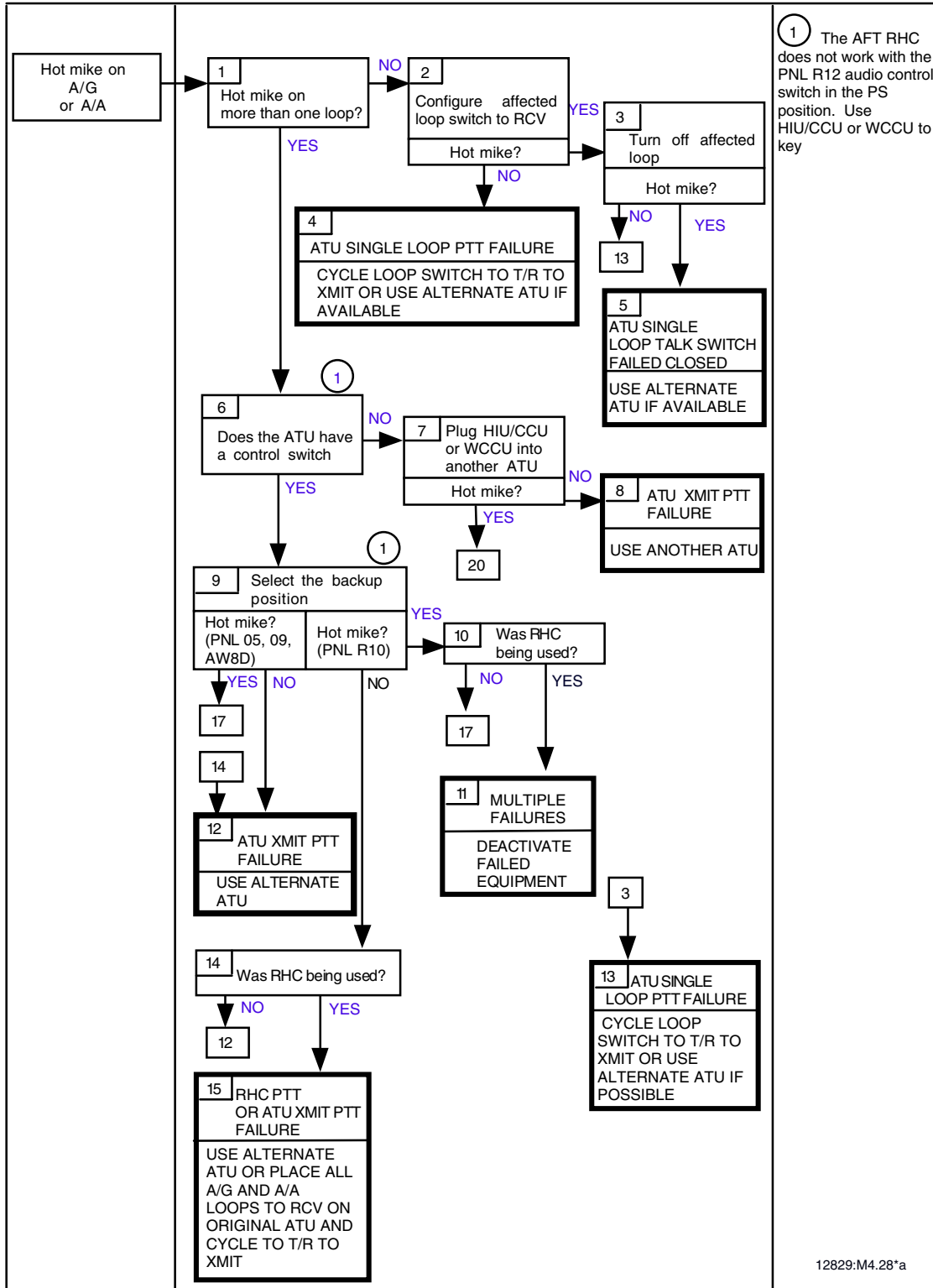


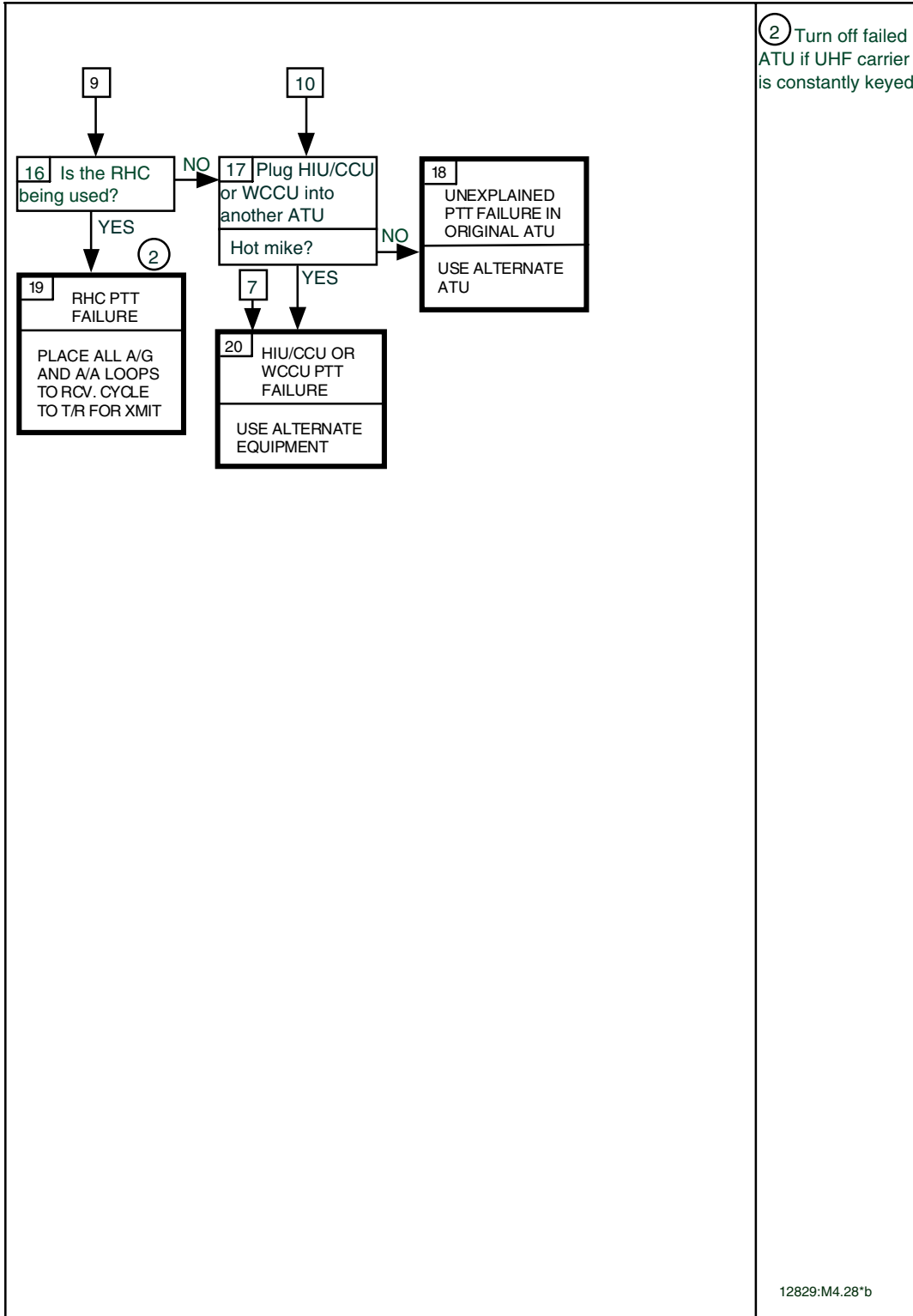
12829:M4.27\*e

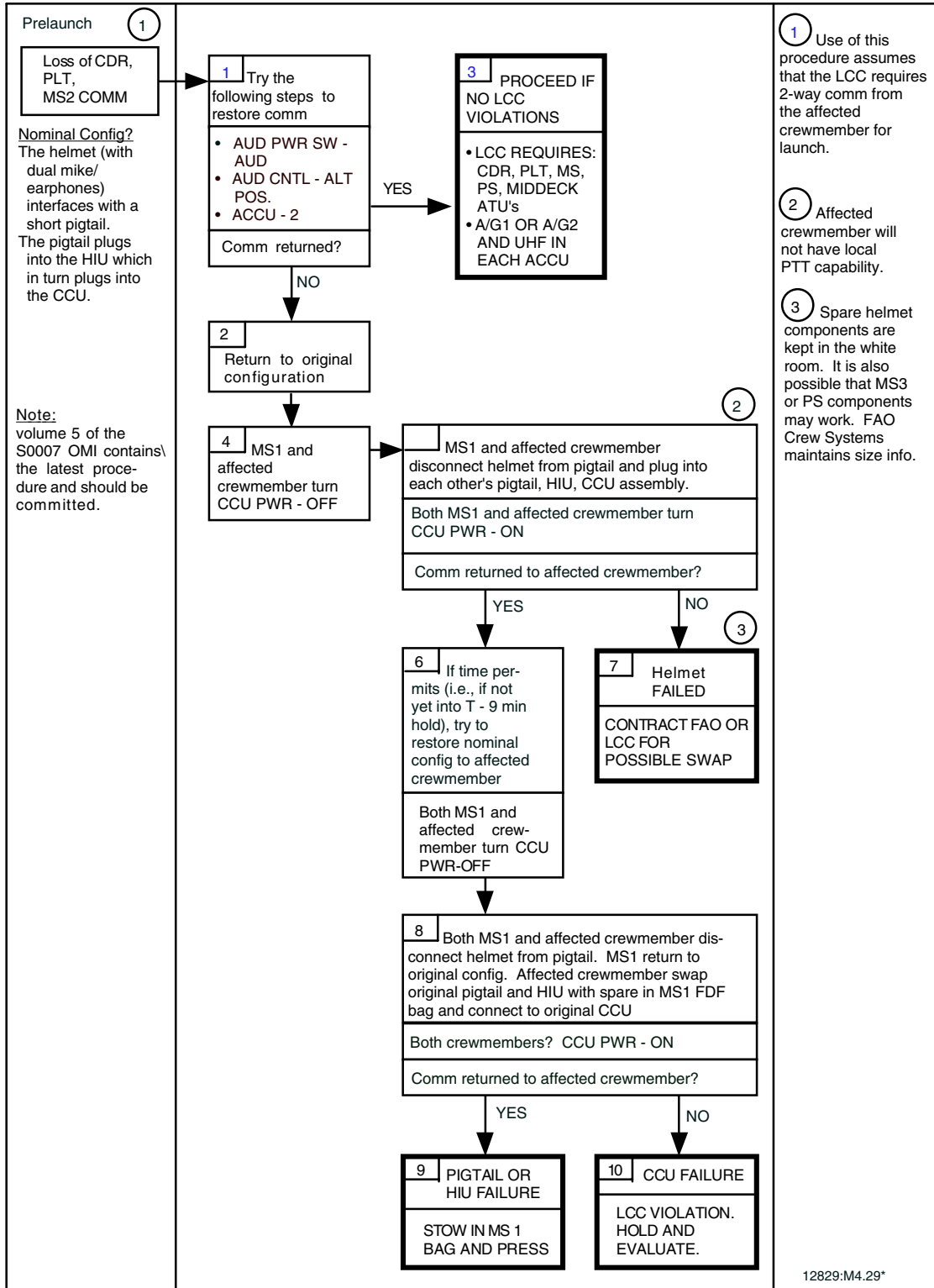




12829:4.27\*f

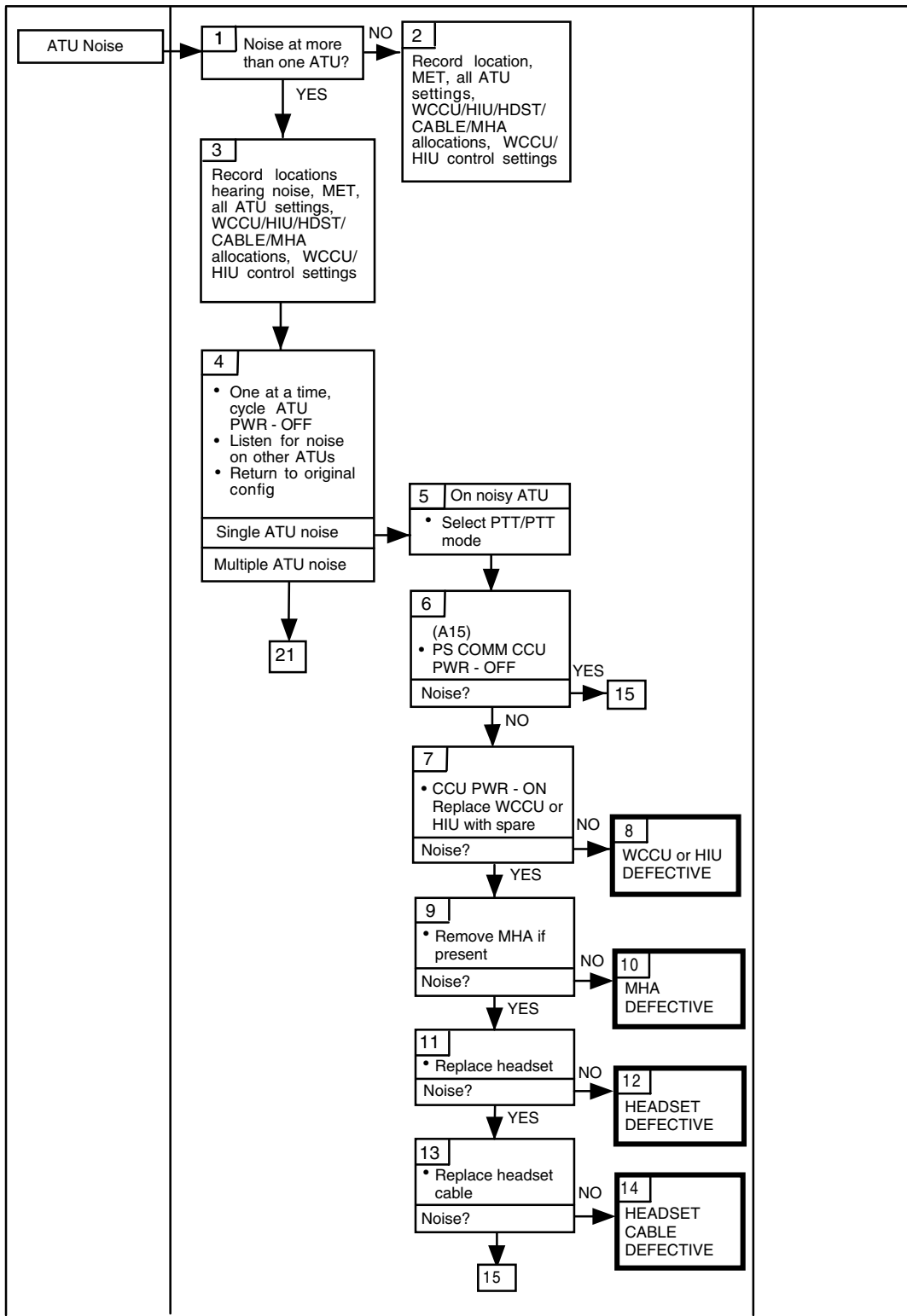


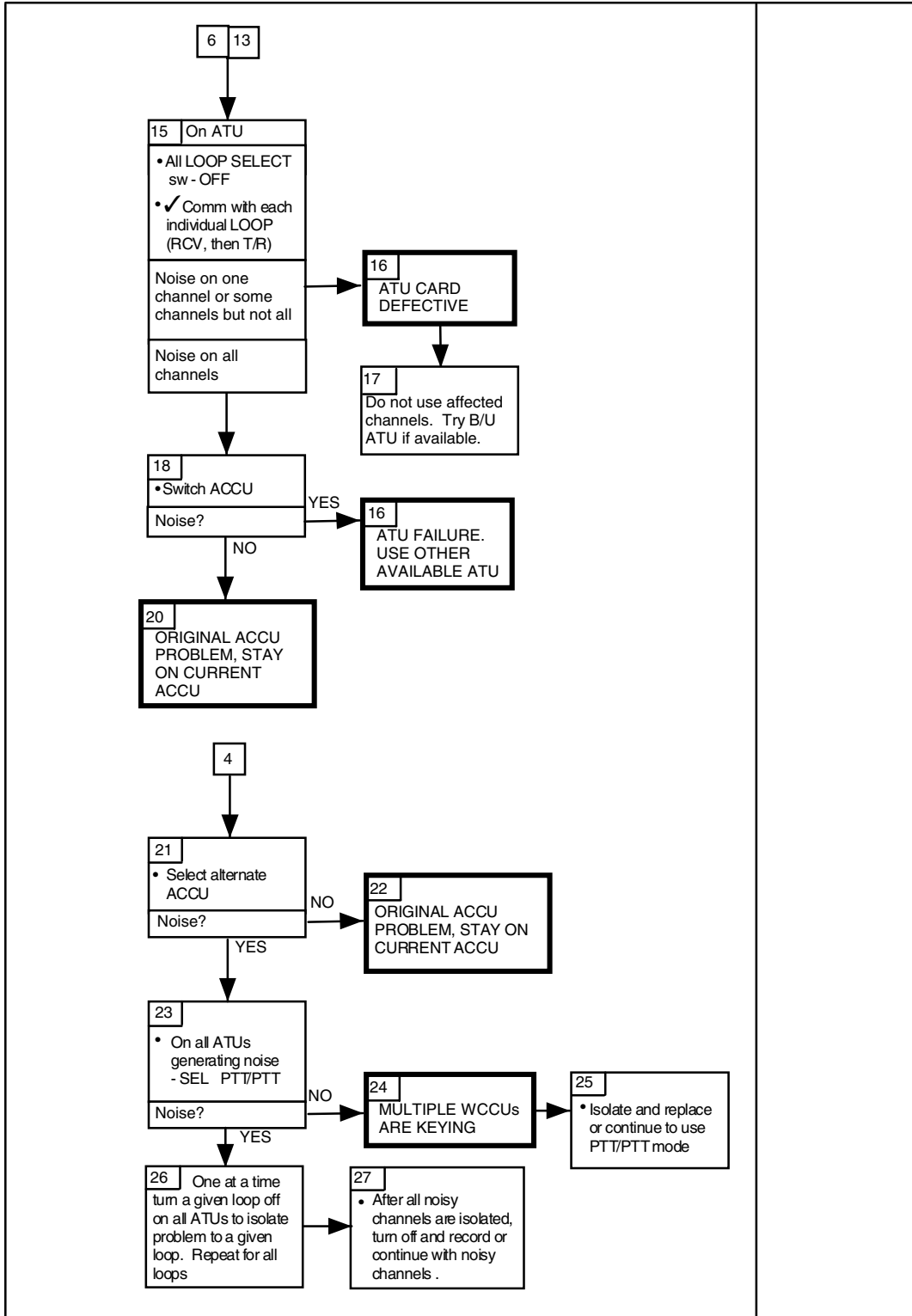




TITLE

ATU NOISE





**TITLE**

WIRELESS AUDIO PROBLEM

**PURPOSE**

To provide the console operators with a quick reference of probable wireless comm system problems/failures and their causes.

**GENERAL**

This procedure should be of help in analyzing the status of the WCCS should a wireless problem arise which the crew cannot isolate using the onboard malfunction procedure.

**PROCEDURE**

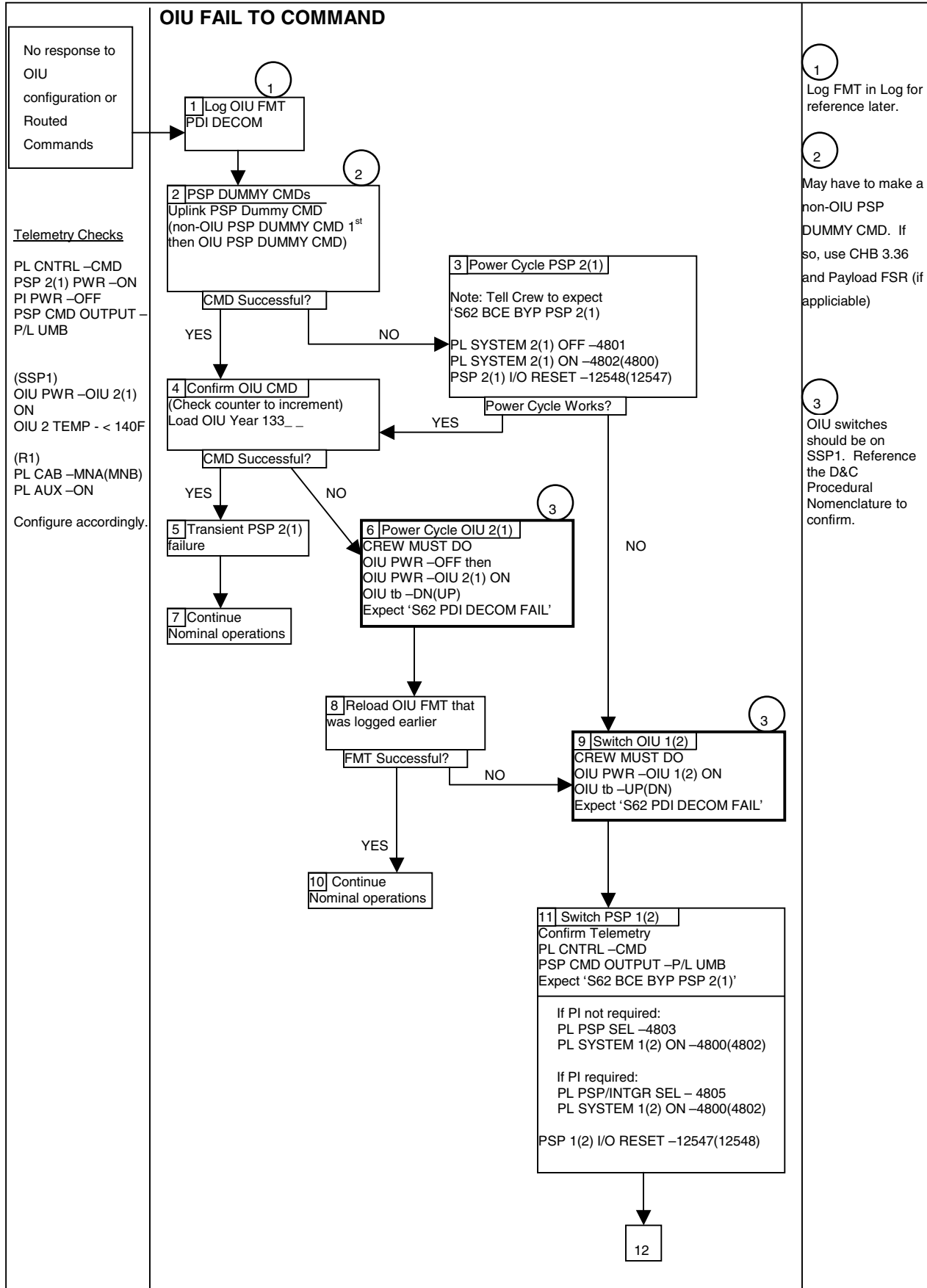
Refer to the following tables of symptoms to determine which problem or failure is the probable cause.

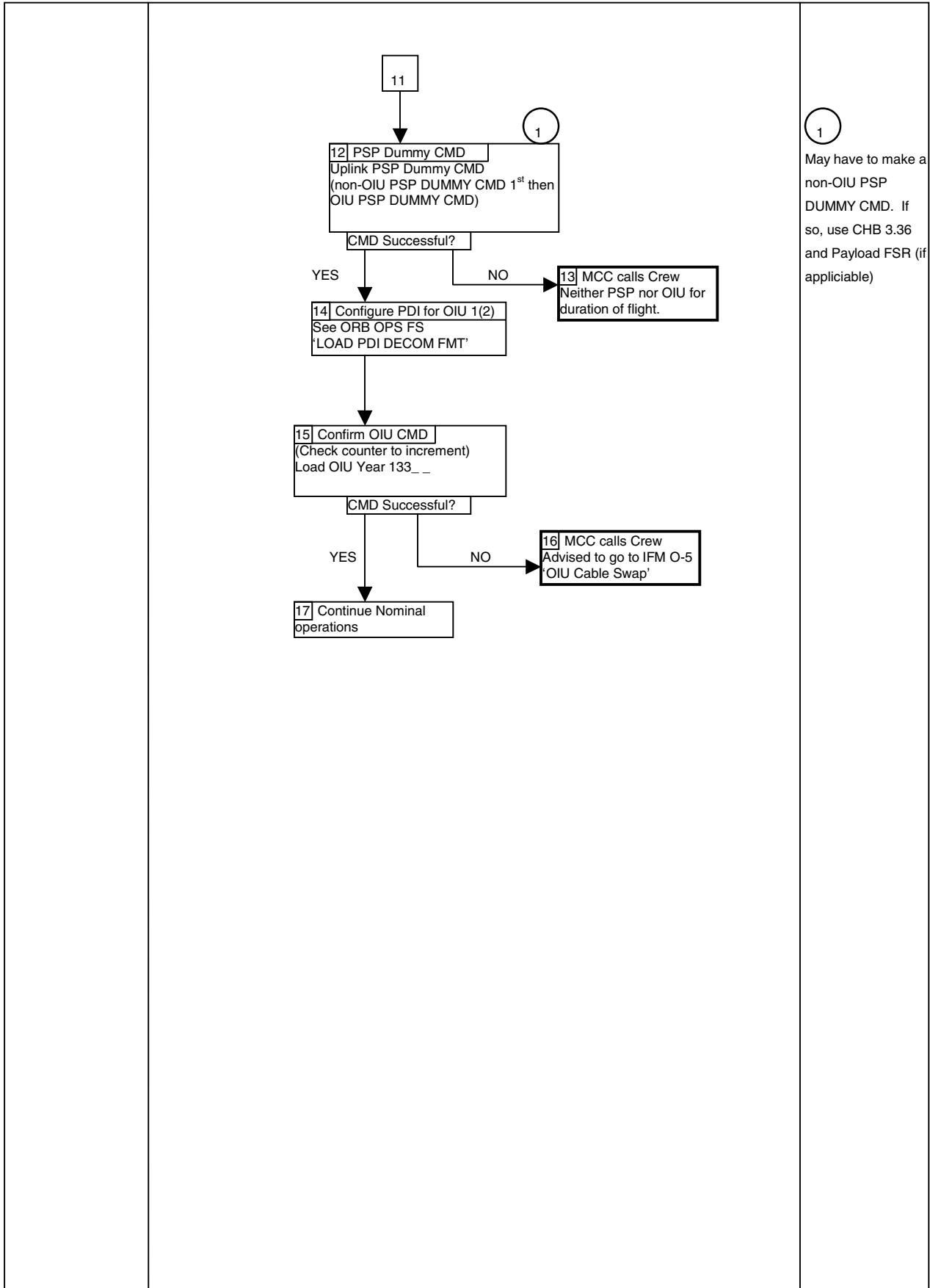
Effect	Operational problem
Loss of RCV audio of all CRU channels	CRU volume control low
CRU with greatest signal at AIU will retain sidetone and XMIT to others	Two CRU's on same channel
Loss of RCV and/or XMIT	CRU selects unassigned channel
Loss of XMIT/RCV on AIU channel 1	AIU selecting mode 2*
Loss of XMIT/RCV on AIU channel 2	AIU selecting mode 1*
Loss of XMIT/RCV on AIU channel 1 and 2	AIU selecting mode HL*
Loss of XMIT/RCV on AIU channel 1 and 2 and green power light off	AIU mode OFF
Problem will match ATU configuration	ATU misconfigured

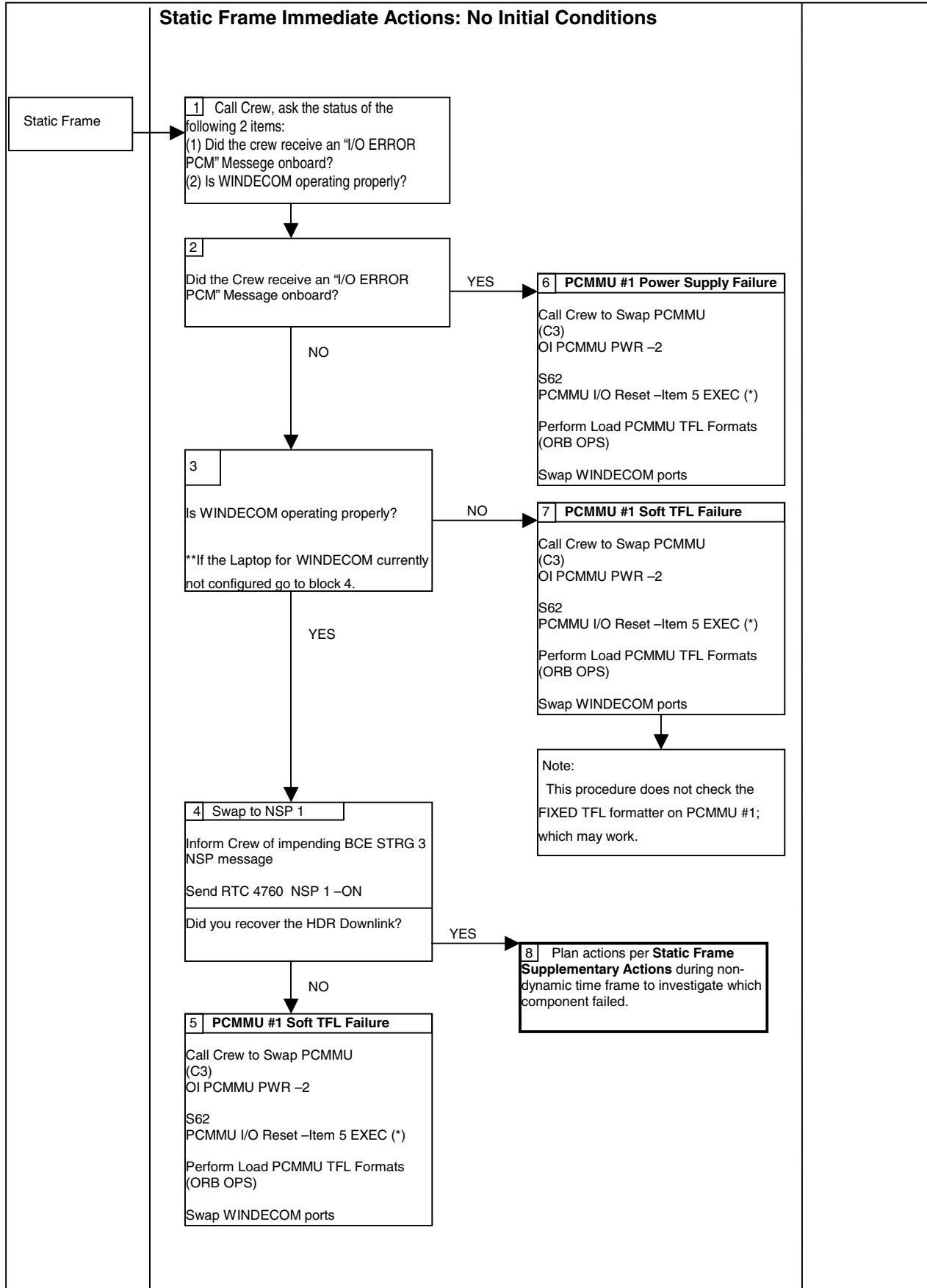
\*For XMIT/RCV on channels 1 and 2 AIU rotary must select "BOTH" position

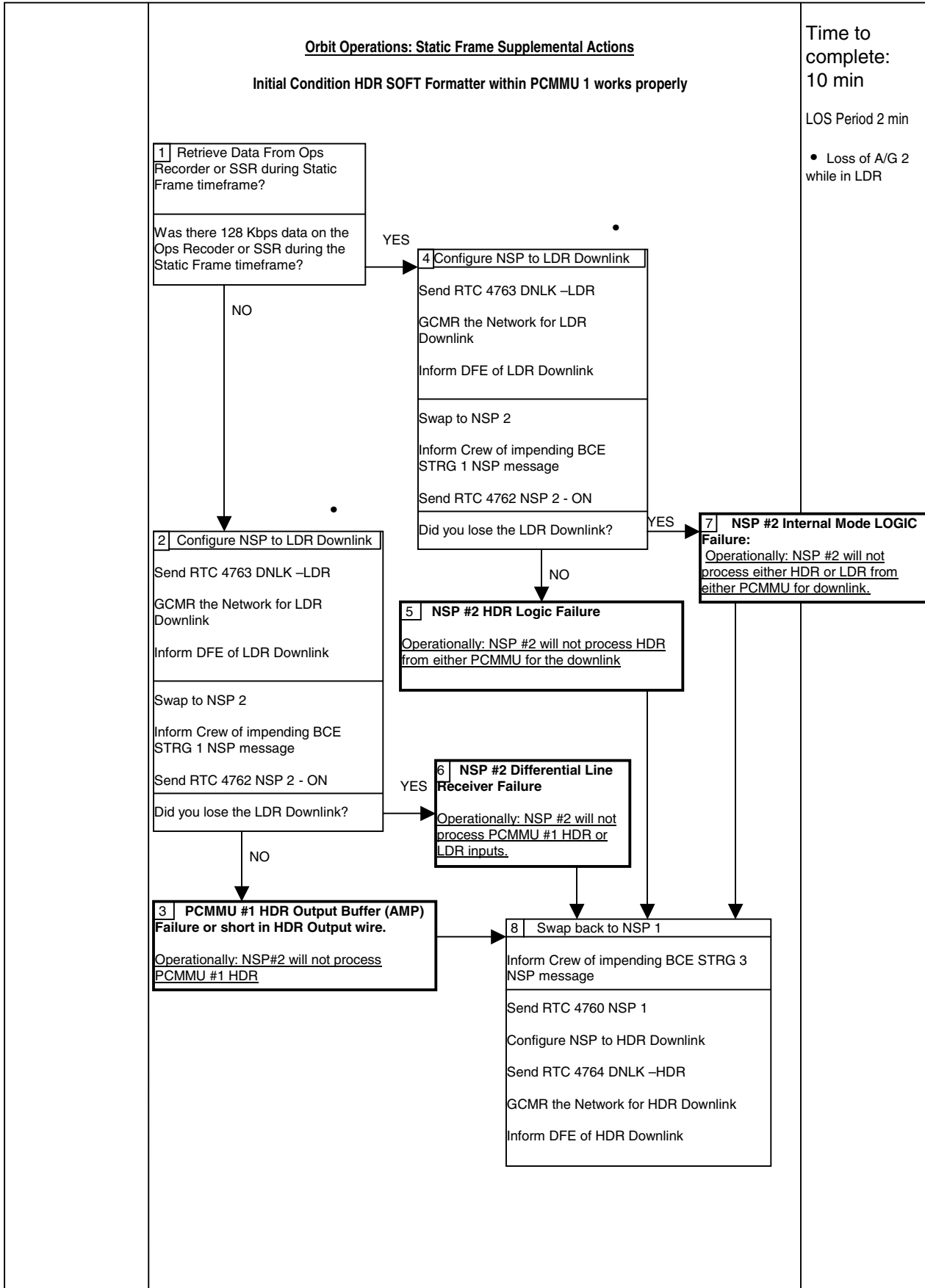
Effect	Hardware function failure
Loss of RCV AUD on all CRU channels	VLHS earphone
Loss of sidetone on all CRU channels Loss of XMIT to all other crewmembers Keying will XMIT/ICOM alternate AIU channel	VLHS microphone
Loss of RCV AUD on all CRU channels Loss of XMIT to other crewmembers No CRU turn-on tone	CRU battery
Loss of RCV AUD on all CRU channels	CRU receiver
Loss of sidetone on all CRU channels	CRU transmitter
Loss of XMIT/ICOM PTT functions on all CRU channels	CRU PTT encoder
Loss of RCV AUD and AIU channel X at all CRU's	AIU transmitter channel X
Loss of sidetone on AIU channel X at all CRU's	AIU receiver channel X
Loss of XMIT/ICOM PTT function on AIU channel X at all CRU's	AIU PTT decoder channel X
Loss of all RCV AUD except AUD from CRU on alternate channel Loss of XMIT/ICOM on both AIU channels Loss of power to AIU	AIU-ATU interface cable











**TITLE**

ASC/ENT COMM MGMT V 1.6

**GENERAL**

- A. The data displayed are real-time telemetry parameters that affect the management and operation of the COMM subsystem. A copy of the ASC/ENT COMM MGMT display is shown in figure 5.101-1.
- B. To call up the display: INCO > INCO Displays > ASC/ENT Comm Mgmt.
- C. Detailed display description.

S-BAND PM

- |    |                |           |                           |
|----|----------------|-----------|---------------------------|
| 1. | SIG STRGTH (1) | V74E4080A | FLOATING POINT<br>(green) |
|----|----------------|-----------|---------------------------|

This parameter indicates the uplinked signal strength received by the S-band transponder 1 (115 to -30 dBm).

- |    |                |           |                           |
|----|----------------|-----------|---------------------------|
| 2. | SIG STRGTH (2) | V74E4081A | FLOATING POINT<br>(green) |
|----|----------------|-----------|---------------------------|

This parameter indicates the uplinked signal strength received by the S-band transponder 2 (-115 to -30 dBm).

- |    |               |           |                   |             |
|----|---------------|-----------|-------------------|-------------|
| 3. | RCVR LOCK (1) | V74X4090E | 1 = LK<br>(green) | 0 = (blank) |
|----|---------------|-----------|-------------------|-------------|

This parameter indicates that transponder 1 is phase locked.

- |    |               |           |                   |             |
|----|---------------|-----------|-------------------|-------------|
| 4. | RCVR LOCK (2) | V74X4091E | 1 = LK<br>(green) | 0 = (blank) |
|----|---------------|-----------|-------------------|-------------|

This parameter indicates that transponder 2 is phase locked.

- |    |               |           |                           |
|----|---------------|-----------|---------------------------|
| 5. | PHASE ERR (1) | V74B4086A | FLOATING POINT<br>(green) |
|----|---------------|-----------|---------------------------|

This is an analog parameter indicating the frequency offset of transponder 1 receiver VCO (-90 to +90 kHz).

- |    |               |           |                           |
|----|---------------|-----------|---------------------------|
| 6. | PHASE ERR (2) | V74B4087A | FLOATING POINT<br>(green) |
|----|---------------|-----------|---------------------------|

This is an analog parameter indicating the frequency offset of transponder 2 receiver VCO (-90 to +90 kHz).

- |    |              |           |                    |             |
|----|--------------|-----------|--------------------|-------------|
| 7. | COHERENT (1) | V74X4516E | 1 = COH<br>(green) | 0 = (blank) |
|----|--------------|-----------|--------------------|-------------|

This parameter indicates that transponder 1 has switched to the coherent mode.



This comp is composed of

- The transponder directs signal bits V74X4780E and V74X4781E
- The preamp frequency (HI or LOW) signal bits V74X4779E and V74X4778E
- The antenna select relays S1, S2, S3, and S4 signal bits V74X7070E, V74X7072E, V74X7074E, V74X7076E, V74X7078E, V74X7080E, V74X7082E, and V74X7084E.

V7	V7	V7	V7	V7	V7	V7	V7	V4	V4	V4	V4	
70	70	70	70	70	70	70	70	77	77	77	77	
47	47	47	47	47	48	48	48	48	48	47	47	
X0	X2	X4	X6	X8	X0	X2	X4	X0	X1	X9	X8	
<u>-E</u>	<u>-E</u>	<u>-E</u>	<u>-E</u>	<u>-E</u>	<u>-E</u>	<u>-E</u>	<u>-E</u>	<u>-E</u>	<u>-E</u>	<u>-E</u>	<u>-E</u>	
1	0	X	X	X	X	0	1	1	0	0	0	UR
0	1	0	1	X	X	X	X	0	1	0	0	UR
1	0	X	X	X	X	1	0	0	0	1	0	UR
0	1	1	0	X	X	X	X	0	0	0	1	UR
X	X	X	X	0	1	1	0	1	0	0	0	LR
X	X	1	0	1	0	X	X	0	1	0	0	LR
X	X	X	X	0	1	0	1	0	0	1	0	LR
X	X	0	1	1	0	X	X	0	0	0	1	LR
X	X	X	X	1	0	1	0	1	0	0	0	LL
X	X	1	0	0	1	X	X	0	1	0	0	LL
X	X	X	X	1	0	0	1	0	0	1	0	LL
X	X	0	1	0	1	X	X	0	0	0	1	LL
0	1	X	X	X	X	0	1	1	0	0	0	UL
1	0	0	1	X	X	X	X	0	1	0	0	UL
0	1	X	X	X	X	1	0	0	0	1	0	UL
1	0	1	0	X	X	X	X	0	0	0	1	UL
All other combinations output												
ER												

11. BFS CMD ANT

BFS\_CMD\_ANT SPECIAL COMP  
(green)

In parameters:

V98X0702X sel forward beam  
V98X0705X sel upper left ant  
V98X0706X sel upper right ant  
V98X0707X sel lower left ant  
V98X0708X sel lower right ant  
V98X0710X sel aft beam











39. PM	V74S3995E	1 = CMD (green)	0 = PNL (red)
--------	-----------	--------------------	------------------

Indicates the position of the CMD control switch, which provides the command control 28 V dc to transfer control from the panel switch drivers to the uplink command drivers of the S-band PM subsystem.

40. PL	V74S5600E	1 = CMD (green)	0 = PNL (red)
--------	-----------	--------------------	------------------

Indicates the position of the CMD control switch, which provides the command control 28 V dc to transfer control from the panel switch drivers to the uplink command drivers of the payload subsystem.

41. FM	V74S6550E	1 = CMD (green)	0 = PNL (red)
--------	-----------	--------------------	------------------

Indicates the position of the CMD control switch, which provides the command control 28 V dc to transfer control from the panel switch drivers to the uplink command drivers of the S-band FM subsystem.

NSP/COM

42. SELECT (GN)	V92X6097XX	1 = 1 (green)	0 = (blank)
-----------------	------------	------------------	-------------

This parameter indicates the associated GCIL panel/command driver's status for this function; NSP no. 1 is selected.

43. SELECT (GN)	V92X6098XX	1 = 2 (green)	0 = (blank)
-----------------	------------	------------------	-------------

This parameter indicates the associated GCIL panel/command driver's status for this function; NSP no. 2 is selected.

44. SELECT (BFS)	V98X1336X	1 = 1 (green)	0 = (blank)
------------------	-----------	------------------	-------------

This parameter indicates which NSP is powered on; NSP no. 1 is powered.

45. SELECT (BFS)	V98X1337X	1 = 2 (green)	0 = (blank)
------------------	-----------	------------------	-------------

This parameter indicates which NSP is powered on; NSP no. 2 is powered.

46. BITE (OI)	V74X5184E	1 = BITE (red)	0 = (blank)
---------------	-----------	-------------------	-------------

BLANK indicates the proper operation of the forward link voice buffers (bit 6), the return link voice buffers (bit 7), and that there has not been an NSP 1 undervoltage condition (bit 9). Failure of any one of these functions for 0.5 seconds or more will cause this parameter to go high.





63.	BCE B BYP	V91X2246XX	1 = FF 1 (red)	0 = (blank)
-----	-----------	------------	-------------------	-------------

Indicates that MDM FF1 BCE B is bypassed.

64.	BCE A BYP	V91X2244XX	1 = FF 3 (red)	0 = (blank)
-----	-----------	------------	-------------------	-------------

Indicates that MDM FF3 BCE A is bypassed.

65.	BCE B BYP	V91X2248XX	1 = FF 3 (red)	0 = (blank)
-----	-----------	------------	-------------------	-------------

Indicates that MDM FF3 BCE B is bypassed.

66.	DISC BYP (GNC)	V91X2900XX	1 = 1 (red)	0 = (blank)
-----	----------------	------------	----------------	-------------

1 indicates that the GNC has bypassed the NSP no. 1 power discrete.

67.	DISC BYP (GNC)	V91X2901XX	1 = 2 (red)	0 = (blank)
-----	----------------	------------	----------------	-------------

2 indicates that the GNC has bypassed the NSP no. 2 power discrete.

68.	DISC BYP (BFS)	V98X0933X	1 = 1 (red)	0 = (blank)
-----	----------------	-----------	----------------	-------------

1 indicates that the BFS has bypassed the NSP no. 1 power discrete.

69.	DISC BYP (BFS)	V98X0935X	1 = 2 (red)	0 = (blank)
-----	----------------	-----------	----------------	-------------

2 indicates that the BFS has bypassed the NSP no. 2 power discrete.

70.	DATA BYP (GNC)	V91X2902XX	1 = 1 (red)	0 = (blank)
-----	----------------	------------	----------------	-------------

1 indicates that the GNC GPC has bypassed the NSP SI0 data output and is no longer receiving commands, command validity, or NSP status data.

71.	DATA BYP (GNC)	V91X2903XX	1 = 2 (red)	0 = (blank)
-----	----------------	------------	----------------	-------------

2 indicates that the GNC GPC has bypassed the NSP SI0 data output and is no longer receiving commands, command validity, or NSP status data.

72.	DATA BYP (BFS)	V98X0941X	1 = 1 (red)	0 = (blank)
-----	----------------	-----------	----------------	-------------

1 indicates that the BFS GPC has bypassed the NSP SI0 data output and is no longer receiving commands, command validity, or NSP status data.

73.	DATA BYP (BFS)	V98X0943X	1 = 2 (red)	0 = (blank)
-----	----------------	-----------	----------------	-------------

2 indicates that the BFS GPC has bypassed the NSP SIO data output and is no longer receiving commands, command validity, or NSP status data.

74.	U/L RATE (OI)	V74X4794E	1 = HI (green)	0 = (blank)
-----	---------------	-----------	-------------------	-------------

This parameter indicates the associated GCIL panel/command driver status for this function.

75.	U/L RATE (OI)	V74X4756E	1 = LOW (green)	0 = (blank)
-----	---------------	-----------	--------------------	-------------

This parameter indicates the associated GCIL panel/command driver status for this function.

76.	U/L CODE (OI)	V74X4796E	1 = ON (green)	0 = (blank)
-----	---------------	-----------	-------------------	-------------

This parameter indicates the associated GCIL panel/command driver status for this function.

77.	U/L CODE (OI)	V74X4752E	1 = OFF (green)	0 = (blank)
-----	---------------	-----------	--------------------	-------------

This parameter indicates the associated GCIL panel/command driver status for this function.

78.	D/L RATE (OI)	V74X4753E	1 = HI (green)	0 = (blank)
-----	---------------	-----------	-------------------	-------------

This parameter indicates the associated GCIL panel/command driver status for this function.

79.	D/L RATE (OI)	V74X4754E	1 = LOW (green)	0 = (blank)
-----	---------------	-----------	--------------------	-------------

This parameter indicates the associated GCIL panel/command driver status for this function.

80.	D/L CODE (OI)	V74X4797E	1 = ON (green)	0 = (blank)
-----	---------------	-----------	-------------------	-------------

This parameter indicates the associated GCIL panel/command driver status for this function.

81.	D/L CODE (OI)	V74X4751E	1 = OFF (green)	0 = (blank)
-----	---------------	-----------	--------------------	-------------

This parameter indicates the associated GCIL panel/command driver status for this function.



- |     |  |           |                           |                     |
|-----|--|-----------|---------------------------|---------------------|
| 82. | ENCR U/L (OI)  | V74X5390E | 1 = ENC<br>(green)        | 0 = CLR<br>(yellow) |
|     | ENC indicates NSP 1 is configured to receive encrypted data.   |           |                           |                     |
| 83. | ENCR U/L (OI)  | V74X5590E | 1 = ENC<br>(green)        | 0 = CLR<br>(yellow) |
|     | ENC indicates NSP 2 is configured to receive encrypted data.   |           |                           |                     |
| 84. | ENCR D/L (OI)  | V74X5391E | 1 = ENC<br>(yellow)       | 0 = CLR<br>(green)  |
|     | ENC indicates NSP 1 is configured to transmit encrypted data.  |           |                           |                     |
| 85. | ENCR D/L (OI)  | V74X5591E | 1 = ENC<br>(yellow)       | 0 = CLR<br>(green)  |
|     | ENC indicates NSP 2 is configured to transmit encrypted data.  |           |                           |                     |
| 86. | RCDR (OI)  | V74X5392E | 1 = DOD<br>(yellow)       | 0 = NASA<br>(green) |
|     | DOD indicates NSP 1 is configured to record encrypted data on the OPS recorder.                              |           |                           |                     |
| 87. | RCDR (OI)  | V74X5592E | 1 = DOD<br>(yellow)       | 0 = NASA<br>(green) |
|     | DOD indicates NSP 2 is configured to record encrypted data on the OPS recorder.                              |           |                           |                     |
| 88. | RCDR V (OI)  | V74X4799E | 1 = ON<br>(yellow)        | 0 = (blank)         |
|     | ON indicates that the selected NSP is ouputting channel 1 and 2 voice and 128 kbps data to the OPS recorder. |           |                           |                     |
| 89. | RCDR V (OI)  | V74X4798E | 1 = OFF<br>(green)        | 0 = (blank)         |
|     | OFF indicates that the selected NSP is ouputting 128 kbps data only to the OPS recorder.                     |           |                           |                     |
| 90. | BIT ERR (OI)   | V74V5191A | FLOATING POINT<br>(green) |                     |
|     | This is an analog parameter indicating NSP 1 bit error rate.   |           |                           |                     |
| 91. | BIT ERR (OI)   | V74V5192A | FLOATING POINT<br>(green) |                     |
|     | This is an analog parameter indicating NSP 2 bit error rate.   |           |                           |                     |













130. V98X0643X 1 = ENGA 0 = (blank)  
(red)

Indicates when the BFS machine is engaged.

131. TRK V98X2752X 1 = 1 0 = -  
(green) (red)

Indicates that the BFS is tracking string 1.

132. TRK V98X2753X 1 = 2 0 = -  
(green) (red)

Indicates that the BFS is tracking string 2.

133. TRK V98X2754X 1 = 3 0 = -  
(green) (red)

Indicates that the BFS is tracking string 3.

134. TRK V98X2755X 1 = 4 0 = -  
(green) (red)

Indicates that the BFS is tracking string 4.

135. PL V98X0961X 1 = 1BYP 0 = 1  
(red) (green)

Indicates that the BFS has bypassed MDM PF1.

136. PL V98X0965X 1 = 2BYP 0 = 2  
(red) (green)

Indicates that the BFS has bypassed MDM PF2.

137. SPC W01G5200L SPECIAL COMP  
(green)

This MOC COMP indicates the number of SPCs in the BFS computer by computing the decimal number from V98J4296C.

138. MM V98U2408C FLOATING POINT  
(green)

This parameter indicates which major mode the BFS is in.

139. SITE W01G3211R SPECIAL COMP  
(yellow)

This is a special comp of the four site select bits to determine which site the BFS antenna management program is using in computing the line-of-site pitch and roll angles.





145. V98X1665X 1 = BDA (yellow) 0 = BDA (darkslategray)

This parameter indicates that the BDA inhibit flag is set and that the BFS antenna management program is inhibited from using it.

146. V98X1666X 1 = MIL (yellow) 0 = MIL (darkslategray)

This parameter indicates that the MIL inhibit flag is set and that the BFS antenna management program is inhibited from using it.

147. V98X1667X 1 = HTS (yellow) 0 = HTS (darkslategray)

This parameter indicates that the HTS inhibit flag is set and that the BFS antenna management program is inhibited from using it.

148. V98X1668X 1 = GTS (yellow) 0 = GTS (darkslategray)

This parameter indicates that the GTS inhibit flag is set and that the BFS antenna management program is inhibited from using it.

149. V98X1669X 1 = WSM (yellow) 0 = WSM (darkslategray)

This parameter indicates that the WSM inhibit flag is set and that the BFS antenna management program is inhibited from using it.

150. V98X1671X 1 = DGS (yellow) 0 = DGS (darkslategray)

This parameter indicates that the DGS inhibit flag is set and that the BFS antenna management program is inhibited from using it.

151. V98X1672X 1 = GDX (yellow) 0 = GDX (darkslategray)

This parameter indicates that the GDX inhibit flag is set and that the BFS antenna management program is inhibited from using it.

152. V98X1673X 1 = WLP (yellow) 0 = WLP (darkslategray)

This parameter indicates that the WLP inhibit flag is set and that the BFS antenna management program is inhibited from using it.

153. V98X1674X 1 = PDL (yellow) 0 = PDL (darkslategray)

This parameter indicates that the PDL inhibit flag is set and that the BFS antenna management program is inhibited from using it.

154. V98X1675X 1 = DFR (yellow) 0 = DFR (darkslategray)

This parameter indicates that the DFR inhibit flag is set and that the BFS antenna management program is inhibited from using it.

155. V98X1676X 1 = OTS (yellow) 0 = OTS (darkslategray)

This parameter indicates that the OTS inhibit flag is set and that the BFS antenna management program is inhibited from using it.

156. V98X1677X 1 = DKR (yellow) 0 = DKR (darkslategray)

This parameter indicates that the DKR inhibit flag is set and that the BFS antenna management program is inhibited from using it.

UHF

157. MODE V74S2034E 1 = S (green) 0 = (blank)

This parameter indicates that the ultrahigh frequency (UHF) mode switch is in the SIMPLEX position

158. MODE V74S2032E 1 = E (green) 0 = (blank)

This parameter indicates that the UHF mode switch is in the extravehicular activity (EVA) position.

159. MODE V74S2010E 1 = G (green) 0 = (blank)

This parameter indicates that the UHF mode switch is in the guard transmit/receive position.

160. MODE V74S2036E 1 = S+G (green) 0 = (blank)

This parameter indicates that the UHF mode switch is in the SIMPLEX/guard receive position.

161. PA V74S2016E 1 = OFF (yellow) 0 = ON (green)

This parameter indicates the position of the crew's UHF SPLY PWR AMP switch.

162. V74V2042A FLOATING POINT (green)

This is an analog parameter indicating the uplinked signal strength received by the UHF receiver tuned to 259.7 Mhz.

163. V74S2040E 1 = 296 > 0 = < 259  
(tan) (tan)

This parameter indicates that the UHF transmit frequency switch is in the 296.8 position or the 259.7 position, respectively.

164. V74V2041A FLOATING POINT  
(green)

This is an analog parameter that indicates the uplinked signal strength received by the UHF receiver tuned to 296.8 MHz.

165. SQ V74S2001E 1 = OFF 0 = ON  
(yellow) (green)

This parameter indicates the position of the crew's squelch switch.

FM

166. SS WZZT0149A FLOATING POINT  
(green)

This is an analog parameter indicating the GSTDN-received signal strength for the S-band FM link in dBm.

167. MODE W01I0200R SPECIAL COMP  
(green)

This is a special comp of the FM mode switch parameters to determine the position selected (TV, PL ANLG, PL DGTL, PL RCD, ME, OPS RCD, DOD, or OFF). The special comp is composed of V74X4800E, V74X4801E, V74X4802E, V74X4803E, V74X4804E, V74X4805E, and V74X4806E.

V4	V4	V4	V4	V4	V4	V4	
78	78	78	78	78	78	78	
40	40	40	40	40	40	40	
X0	X1	X2	X3	X4	X5	X6	
E	E	E	E	E	E	E	
1	0	0	0	0	0	0	OPS RCD
0	1	0	0	0	0	0	ME
0	0	1	0	0	0	0	PL RCD
0	0	0	1	0	0	0	PL DGTL
0	0	0	0	1	0	0	PL DGTL
0	0	0	0	0	1	0	DOD
0	0	0	0	0	0	1	TV
0	0	0	0	0	0	0	OFF
All other combinations output							INVL

168. 1 V74X6120E 1 = ON 0 = (blank)  
(green)

This parameter indicates that the S-band FM transmitter 1 and signal processor 1 have 28 V dc applied.

169. V74E6650A FLOATING POINT  
(green)

This is an analog parameter indicating the FM 1 transmitter RF power output in watts. The normal output is 15 watts.

170. 2 V74X6121E 1 = ON 0 = (blank)  
(green)

This parameter indicates that the S-band FM transmitter 2 and signal processor 2 have 28 V dc applied.

171. V74E6651A FLOATING POINT  
(green)

This is an analog parameter indicating the FM 2 transmitter RF power output in watts. The normal output is 15 watts.

172. ANT SEL W03I0200R SPECIAL COMP  
(green)

This is a special comp of both the crew's switch positions and the antenna sel relay S5 to determine the selected hemi antenna (UP or LO).

The special comp is composed of V74X6675E and V74X6676E.

<u>V74X6675E</u>	<u>V74X6676E</u>	
1	0	UP
0	1	LOW
All other combinations output		ER

173. MODE W02I0200R SPECIAL COMP  
(green)

This is a special comp of both the crew's hemi switch positions to determine if the switch is in the manual or GPC position.

The special comp is composed of V74S6503E and V74S6504E.

<u>V74S6503E</u>	<u>V74S6504E</u>	
1	0	MAN
0	1	MAN
0	0	GPC
Other combinations output		INVL



181. MODE W01I0700R SPECIAL COMP  
(green)

Computation comprising V75S1001E, V75S1002E, V75S1003E, and V75S1004E.

<u>V75S1001E</u>	<u>V75S1002E</u>	<u>V75S1003E</u>	<u>V75S1004E</u>	
1	0	0	0	= GPC
0	1	0	0	= GPC
0	0	1	0	= PGM
0	0	0	1	= PGM
0	0	0	0	= FIXED

All other combinations are invalid and the output will be blank.

182. TFL V75X4070D DECIMAL  
(green)

Format will be displayed with unsuppressed data behind (B, D, or S).

MDM WRAP

183. OF OF1\_MDM\_WRAP 1 = 1 0 = 1  
(darkslategray) (red)

This special comp evaluates the bus link between the PCMMU and the OF1 MDM. An 8-bit OI validation word from OF1 MDM is received at 10 samples/second to test the link. This comp checks to see whether two consecutive samples complement each other. A logic zero indicates that two consecutive samples are not complements of each other and therefore failed. A logic one indicates they are complements and the link is good.

184. OF OF2\_MDM\_WRAP 1 = 2 0 = 2  
(darkslategray) (red)

Same as OF 1 WRAP for OF 2 MDM.

185. OF OF3\_MDM\_WRAP 1 = 3 0 = 3  
(darkslategray) (red)

Same as OF 1 WRAP for OF 3 MDM.

186. OF OF4\_MDM\_WRAP 1 = 4 0 = 4  
(darkslategray) (red)

Same as OF 1 WRAP for OF 4 MDM.

187. OA OA1\_MDM\_WRAP 1 = 1 0 = 1  
(darkslategray) (red)

Same as OF 1 WRAP for OA 1 MDM.

188. OA OA2\_MDM\_WRAP 1 = 2 0 = 2  
(darkslategray) (red)

Same as OF 1 WRAP for OA 2 MDM.

189. OA	OA3_MDM_WRAP	1 = 3 (darkslategray)	0 = 3 (red)
---------	--------------	--------------------------	----------------

Same as OF 1 WRAP for OA 3 MDM.

DSC BITE

190. OF	V75X2171E	1 = 1 (darkslategray)	0 = 1 (red)
---------	-----------	--------------------------	----------------

This parameter indicates the state of the two OF1 DSC power supplies. If either supply fails or is out of tolerance (0.5 percent of 17 V) or if one of the 28 V power sources powering the DSC is lost, the parameter will indicate a logic zero. A logic 1 indicates good power supplies.

191. OF	V75X2172E	1 = 2 (darkslategray)	0 = 2 (red)
---------	-----------	--------------------------	----------------

Same as OF1 DSC BITE for OF2 DSC.

192. OF	V75X2173E	1 = 3 (darkslategray)	0 = 3 (red)
---------	-----------	--------------------------	----------------

Same as OF1 DSC BITE for OF3 DSC.

193. OA	V75X2174E	1 = 1 (darkslategray)	0 = 1 (red)
---------	-----------	--------------------------	----------------

Same as OF1 DSC BITE for OA1 DSC.

194. OA	V75X2175E	1 = 2 (darkslategray)	0 = 2 (red)
---------	-----------	--------------------------	----------------

Same as OF1 DSC BITE for OA2 DSC.

195. OA	V75X2176E	1 = 3 (darkslategray)	0 = 3 (red)
---------	-----------	--------------------------	----------------

Same as OF1 DSC BITE for OA3 DSC.

196. OM	V75X2181E	1 = 1 (darkslategray)	0 = 1 (red)
---------	-----------	--------------------------	----------------

Same as OF1 DSC BITE for OM1 DSC.

197. OM	V75X2182E	1 = 2 (darkslategray)	0 = 2 (red)
---------	-----------	--------------------------	----------------

Same as OF1 DSC BITE for OM2 DSC.

198. OM	V75X2183E	1 = 3 (darkslategray)	0 = 3 (red)
---------	-----------	--------------------------	----------------

Same as OF1 DSC BITE for OM3 DSC.



199. OP	V75X2184E	1 = 1 (darkslategray)	0 = 1 (red)
---------	-----------	--------------------------	----------------

Same as OF1 DSC BITE for OP1 DSC.

200. OP	V75X2185E	1 = 2 (darkslategray)	0 = 2 (red)
---------	-----------	--------------------------	----------------

Same as OF1 DSC BITE for OP2 DSC.

PDI

201. PWR SW	V75S5100E	1 = ON (green)	0 = OFF (yellow)
-------------	-----------	-------------------	---------------------

PDI power. PDI may be powered on via GCIL command if the S-band PL control switch is in the CMD position or may be powered on by switch 17 panel A1 if in the PNL position.

202. A-	V76X4376E	1 = ON (green)	0 = OFF (yellow)
---------	-----------	-------------------	---------------------

PDI RPC A power. Indicates the status of RPC A.

203. C-	V76X4378E	1 = ON (green)	0 = OFF (yellow)
---------	-----------	-------------------	---------------------

PDI RPC C power. Indicates the status of RPC C.

204. WRAP TEST	PDI_WRAP	1 = OK (green)	0 = FAIL (red)
----------------	----------	-------------------	-------------------

For OI validation, the ground processor stores and compares two sets of two 8-bit words. If the ground processing does not receive the complement of alternate ones and zeros for the PDI, the display will be set to red. If WRAP TEST display remains red, it indicates loss of communication between the PDI and the PCMMU. Communication may be recovered with the PDI by selecting the alternate PCMMU, which in effect selects the alternate data bus.

205. DCM 1 FMT	V75J5132D	DECIMAL (green)	
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Integer value of the DFL load in DECOM 1 loaded by SM 2 via Spec 62.

206. DCM 1 LOCK	V75X6401D	1 = YES (green)	0 = NO (red)
-----------------	-----------	--------------------	-----------------

Master frame lock for DECOM 1.

207. DCM 2 FMT	V75J5152D	DECIMAL (green)	
----------------	-----------	--------------------	--

Same as item 205 for DECOM 2.



ASC/ENT COMM MGMT		GMT xxx/xx:xx:xx		MET xxx/xx:xx:xx		PASS STATUS		FMT xx	PCMMU		
v1.6 STS xxx/xxx						GPC 1 PL1/2		xxx	MM	xxx BITE	
xxxx						GPC 1 MASK DISB		xx	xx	PWR x x	
S-BAND PM		NSP/COM	OI	GN	BFS	MACH xx ORB ALT		xxx		A xx xx	
SIG STRGTH	xxx xxx	SELECT		x x	x x	Roll Ang xxx ET		xxx		B xx	
RCVR LOCK	xx xx	BITE	xxx xxx	xxxx	xxxx	T-MECO xxx/xx:xx:xx				C xx	
PHASE ERR	xx xx	BIT SYNC	xxx xxx	xxx	xxx	BFS STATUS FMT x				MODE xxxxx	
COHERENT	xxx xxx	FRM SYNC	xxx xxx	xxx	xxx	xxx	xxxx	xxxx		TFL xxx	
ANT SEL	xxx xxx	COM SYNC	xxx xxx	xxx	xxx	TRK	x x x x	PL	xxxx	xxxx	MDM WRAP
BFS CMD	xxx	COM BITE	x x			SPC	xx MM	xxx	SITE	xxx	OF 1 2 3 4
MODE	xxx	BCE A BYP	xxx xxx			T-MECO	xxx/xx:xx:xx				OA 1 2 3
ELEC	x x	BCE B BYP	xxx xxx			BFS SITE INHIBITS					DSC BITE
BEAM	x x	DISC BYP		x x	x x	xxx	xxx	xxx	xxx	xxx	OF 1 2 3
XPNDR SEL	x x	DATA BYP		x x	x x	xxx	xxx	xxx	xxx	xxx	OA 1 2 3
RF OUT	xx xx	U/L RATE	xx xxx			xxx	xxx	xxx	xxx	xxx	OM 1 2 3
MODE	xxxxxxx	CODE	xx xxx			UHF					OP 1 2
RNGING	xxx	D/L RATE	xx xxx			MODE	x x x xxx	PA	xxx		PDI
FREQ	xxx xxxx	CODE	xx xxx			xxxxx	xxxx	xxxx	SQ	xxx	PWR SW xxx
PRE AMP	x x	ENCR U/L	xxx xxx			FM					A- xx C- xx
HEATER	x x	D/L	xxx xxx			SS	xx	MODE	xxxxxxx		WRAP TEST
PWR AMP	xxxx xxxx	RCDR	xxxx xxxx			1	xx	xxx 2	xx	xxx	xx
TEMP	xxx xxx	RCDR V	xx xxx			ANT SEL	xx	MODE	xxxx		DCM FMT LOCK
RFL	xx xx	BIT ERROR	xx xx			RECORDERS					1 xx xxx
PA RF OUT	xx xx										2 xx xxx
GCIL		BITE	MODE	TRK	%TP	DIR	SPD	MTN	TEMP		3 xx xxx
CONFIG	xxx PWR x x	OPS 1	xxxx	xxxx	xx	xxx	xxx	x	xxx	xxx	4 xx xxx
PM	xxx PL xxx	2	xxxx	xxxx	xx	xxx	xxx	x	xxx	xxx	5 xx xxx
FM	xxx	P/L	xxxx	xxxx	xx	xxx	xxx	x	xxx	xxx	

Figure 5.101-1. ASC/ENT COMM MGMT display

**TITLE**

A/E EVENT

**GENERAL**

A. The data displayed are real-time telemetry parameters used to monitor the COMM and DPS systems during the ascent and entry timeframe. A copy of the A/E EVENT display is shown in Figure 5.102-1 and Figure 5.102-2.

B. Pathname of display: INCO/INCO Displays/DDDs/Asc/Ent Events.

C. Detailed display description.

1. W02I0603R SPECIAL COMP  
(ghostwhite on black)

This is a special comp of the S-band ANTENNA select (PM) special comp and the S-band SWITCH BEAM (FWD/AFT) selects. This comp is located in the upper right corner of the display.

W02I0603R is composed of W05I0200R, V74X7090E, V74X7091E, V74X7092E, V74X7093E, V74X7094E, V74X7095E, V74X7096E, and V74X7097E.

Ztblc

W0	V7	V7	V7	V7	V7	V7	V7	V7	
02	70	70	70	70	70	70	70	70	
50	49	49	49	49	49	49	49	49	
I0	X0	X1	X2	X3	X4	X5	X6	X7	
R	E	E	E	E	E	E	E	E	
UL	1	0	X	X	X	X	X	X	ULF
UL	0	1	X	X	X	X	X	X	ULA
UR	X	X	1	0	X	X	X	X	URF
UR	X	X	0	1	X	X	X	X	URA
LL	X	X	X	X	1	0	X	X	LLF
LL	X	X	X	X	0	1	X	X	LLA
LR	X	X	X	X	X	X	1	0	LRF
LR	X	X	X	X	X	X	0	1	LRA
ER	X	X	X	X	X	X	X	X	ER1
All other combinations output									ER2

2. V72X7011E 1 = GPC 1 FAIL      0 = GPC 1 GOOD  
(black on yellow)      (darkslategray on black)

Indicates a GPC 1 failure.

3. V74X4790E 1 = SPREAD SPM OFF      0 = SPREAD SPM ON  
(darkslategray on black)      (black on yellow)

Indicates the associated GCIL panel/command driver's status for this function.



TBD

*Figure 5.102-1. A/E EVENT display (given all discretets = 1)*

TBD

*Figure 5.102-2. A/E EVENT display (given all discretets = 0)*

**TITLE**

NSP BFS CONFIG V 1.2

**GENERAL**

A. The data displayed are real-time parameters that affect the management and operation of the network signal processor (NSP) and the BFS GPC. A copy of the display of the NSP BFS CONFIG is shown in figure 5.103-1.

B. Pathname of display: INCO/INCO Displays/COMM Systems/bfs nsp.

C. Detailed display description.

1.	NSP 1 POWER	V98X1336X	1 = ON (green)	0 = (blank)
----	-------------	-----------	-------------------	-------------

ON indicates the associated ground control interface logic (GCIL) panel/command driver is on and 28 V dc is applied to the NSP no. 1.

2.	NSP 1 DISC BYP	V98X0933X	1 = BYP (red)	0 = (blank)
----	----------------	-----------	------------------	-------------

BYP indicates that the GPC has bypassed the NSP power discrete.

3.	NSP 1 DATA BYP	V98X0941X	1 = BYP (red)	0 = (blank)
----	----------------	-----------	------------------	-------------

BYP indicates that the GPC has bypassed the NSP SIO data output and is no longer receiving commands, command validity, or NSP status data.

4.	NSP 2 POWER	V98X1337X	1 = ON (green)	0 = (blank)
----	-------------	-----------	-------------------	-------------

ON indicates the associated GCIL panel/command driver is on and 28 V dc is applied to NSP 2.

5.	NSP 2 DISC BYP	V98X0943X	1 = BYP (red)	0 = (blank)
----	----------------	-----------	------------------	-------------

BYP indicates that the GPC has bypassed the NSP power discrete.

6.	NSP 2 DATA BYP	V98X0935X	1 = BYP (red)	0 = (blank)
----	----------------	-----------	------------------	-------------

BYP indicates that the GPC has bypassed the NSP SIO data output and is no longer receiving commands, command validity, or NSP status data.

7.	BFS TRK STRG 1	V98X2752X	1 = TRK (green)	0 = LOSS (yellow)
----	----------------	-----------	--------------------	----------------------

TRK indicates the backup flight software is tracking string 1 I/O profile as commanded by the PASS GNC GPC(s), and it will receive and process NSP 1 uplink data.

8.	BFS TRK STRG 3	V98X2754X	1 = TRK (green)	0 = LOSS (yellow)
----	----------------	-----------	--------------------	----------------------

TRK indicates the backup flight software is tracking string 3 I/O profile as commanded by the PASS GNC GPC(s), and it will receive and process NSP 2 uplink data.

9.	BFS ENGAGE	V98X0643X	1 = ENGA (yellow)	0 = (blank)
----	------------	-----------	----------------------	-------------

ENGA indicates the backup flight software is in active control of the orbiter and the PASS guidance and navigation computers have been software halted. All flight-critical and payload buses are under control of the BFS GPC.

10.	BFS BYP PL1	V98X0961X	1 = BYP (red)	0 = (blank)
-----	-------------	-----------	------------------	-------------

BYP indicates backup flight software has inhibited the interface to the PL1 MDM.

11.	BFS BYP PL2	V98X0965X	1 = BYP (red)	0 = (blank)
-----	-------------	-----------	------------------	-------------

BYP indicates backup flight software has inhibited the interface to the PL2 MDM.

12.	DATA READY	V98X0231X	1 = YES (green)	0 = NO (yellow)
-----	------------	-----------	--------------------	--------------------

YES indicates that one command word in the 10-command double buffer has passed.

- BCH DECODER CHECK
- VALID VEHICLE ADDRESS CHECK (any nonzero address)
- BUFFER FILL TIME COMPLETE
- BRACKET DATA STATUS CHECK

NO indicates that no commands have been received or no valid commands have been received.

13.	CMD BLOCKED	V98X0232X	1 = YES (yellow)	0 = NO (green)
-----	-------------	-----------	---------------------	-------------------

YES indicates panel C3, UPLINK BLOCK switch, is in the BLOCK ALL position and only word 1, the status word, is transmitted. The NSP will not allow the CMD words or word 32, the validity work, to be transmitted.

NO indicates panel C3, UPLINK BLOCK switch, is in the CRITICAL or NONE position or power was lost to the switch.

14.	BIT SYNC	V98X0233X	1 = LOSS (yellow)	0 = LOCK (green)
-----	----------	-----------	----------------------	---------------------

LOCK indicates that the NSP bit sync threshold detector has been exceeded and the bit sync is in lock. Lock occurs at > -5 dB SNR ( $1 \times 10^{-2}$  BER)

LOSS indicates that the NSP bit sync is out of lock one or more instances of bit synchronization loss.



- |     |  |           |                      |                     |
|-----|--|-----------|----------------------|---------------------|
| 15. | FRAME SYNC   | V98X0234X | 1 = LOSS<br>(yellow) | 0 = LOCK<br>(green) |
|     | LOCK indicates that the NSP frame sync lock logic has detected two consecutive frame sync correlations with three or less frame sync errors.   |           |                      |                     |
|     | LOSS indicates that the NSP frame sync lock logic has detected three consecutive frame sync correlation failures, and the NSP forward link data processing is inhibited.   |           |                      |                     |
| 16. | BRACKET DATA   | V98X0235X | 1 = NO<br>(yellow)   | 0 = YES<br>(green)  |
|     | YES indicates that the NSP sync lock logic has indicated lock and has received two consecutive valid frame sync correlations, which means the data bracketed by the sync correlations are valid.   |           |                      |                     |
|     | NO indicates that one or more frame sync correlation failures have occurred and NSP command and Doppler data processing is inhibited.  |           |                      |                     |
| 17. | DEMUX  | V98X0236X | 1 = FAIL<br>(red)    | 0 = OK<br>(green)   |
|     | FAIL indicates that a data overflow or underflow condition has been detected in one or both forward link voice buffers because of a timing or data transmission error.   |           |                      |                     |
|     | OK indicates that both forward link buffers are operating properly in high or low data rate or no signal is present.   |           |                      |                     |
| 18. | MUX  | V98X0237X | 1 = FAIL<br>(red)    | 0 = OK<br>(green)   |
|     | FAIL indicates that a data overflow condition has been detected in one or both return link voice buffers because of a timing or data transmission error.   |           |                      |                     |
|     | OK indicates all other conditions.   |           |                      |                     |
| 19. | INTERNAL MODE  | V98X0238X | 1 = NO<br>(red)      | 0 = YES<br>(green)  |
|     | NO indicates that the NSP has detected a failure of the PCMMU sync word in three successive frames or failure of the 100-pps sync signal or 1.52 MHz clock. In the internal mode, the NSP provides the data stream with a sync pattern and alternating 1's and 0's in the telemetry data blocks. Voice data is available in this mode. |           |                      |                     |
|     | YES indicates normal operation of the NSP.   |           |                      |                     |
| 20. | SEC POWER  | V98X0239X | 1 = FAIL<br>(red)    | 0 = OK<br>(green)   |
|     | FAIL indicates momentary loss of the NSP 10-V dc regulator output and that the NSP data during this time will be in error.   |           |                      |                     |
|     | OK indicates that the 10-V dc regulator is operating properly.   |           |                      |                     |
| 21. | RCD MODE MUX   | V98X0240X | 1 = FAIL<br>(red)    | 0 = OK<br>(green)   |

FAIL indicates that one or more errors have been detected in bits 6 and 7 of the PCM frame sync pattern from the record mode processor circuitry in the record voice/data mode.

OK indicates that bit 6 is "0" and bit 7 is "1" and that they are Bi-O/encoded.

- |                   |           |                   |                   |
|-------------------|-----------|-------------------|-------------------|
| 22. BIT SYNC QUAL | V98X0241X | 1 = LOSS<br>(red) | 0 = OK<br>(green) |
|-------------------|-----------|-------------------|-------------------|

LOSS indicates that the data level is below threshold level. Threshold levels are set at a given signal-to-noise ratio, depending on the mode selected:

LOCK -5 dB (10 <sup>-2</sup> BER)	NASA CODED NASA UNCODED	-3 dB +4 dB	DOD CODED DOD UNCODED	-0 dB +7 dB
--------------------------------------	----------------------------	----------------	--------------------------	----------------

OK indicates signal above mode threshold and bit sync is in lock.

- |             |           |                    |             |
|-------------|-----------|--------------------|-------------|
| 23. BCH VAL | V98X0242X | 1 = VAL<br>(green) | 0 = (blank) |
|-------------|-----------|--------------------|-------------|

VAL indicates that at least one correct decoded message has occurred since the last MDM polling. A logic "0" (NO) will be indicated when no command words pass the binary coded hexadecimal (BCH) combined parity check and the vehicle address is zero.

- |               |           |                   |             |
|---------------|-----------|-------------------|-------------|
| 24. BCH INVAL | V98X0243X | 1 = INVL<br>(red) | 0 = (blank) |
|---------------|-----------|-------------------|-------------|

INVL indicates that at least one incorrect decoded message has occurred since the last MDM polling. A logic "0" will be indicated when the command words pass the BCH parity check and vehicle address is nonzero or no commands were sent.

- |                      |           |                     |             |
|----------------------|-----------|---------------------|-------------|
| 25. MODE PARITY EVEN | V98X0244X | 1 = EVEN<br>(green) | 0 = (blank) |
|----------------------|-----------|---------------------|-------------|

EVEN indicates that the mode logic equation is a logic 1.

(PS ENB + ENCODING) + (DECODING) + (DOD) + (RCV H1) = 1

NOTE: + means exclusive OR

- |                |           |                    |             |
|----------------|-----------|--------------------|-------------|
| 26. PARITY ODD | V98X0245X | 1 = ODD<br>(green) | 0 = (blank) |
|----------------|-----------|--------------------|-------------|

ODD is the inverse of V92X6094XX mode parity EVEN.

- |                |           |                   |        |
|----------------|-----------|-------------------|--------|
| 27. NSP STATUS | V98X0246X | 1 = FAIL<br>(red) | 0 = OK |
|----------------|-----------|-------------------|--------|

OK indicates the proper operation of the forward link voice buffers (bit 6), the return link voice buffers (bit 7), and that there has not been an NSP undervoltage condition (bit 9). Failure of any one of these functions for 0.5 sec or more will cause the parameter to indicate FAIL.

BFS NSP CONFIG v1.2		GMT XXX/XX:XX:XX	
<b>NSP 1</b>		<b>BSR</b>	
POWER	XX	1 DATA READY	XXX
DISC BYP	XXX	2 CMD BLOCKED	XXX
DATA BYP	XXX	3 BIT SYNC	XXXX
		4 FRAME SYNC	XXXX
BFS TRK STRG 1	XXXX	5 BRACKET DATA	XXX
STRG 3	XXXX	6 DEMUX	XXXX
		7 MUX	XXXX
BFS ENAGE	XXXX	8 INTERNAL MODE	XXX
		9 SEC POWER	XXXX
BFS BYP PL1	XXX	10 RCD MODE MUX	XXXX
PL2	XXX	11 BIT SYNC QUAL	XXXX
		12 BCH VALID	XXX
<b>NSP 2</b>		13 BCH INVAL	XXXX
POWER	XX	14 PARITY EVEN	XXXX
DISC BYP	XXX	15 PARITY ODD	XXX
DATA BYP	XXX	16 NSP STATUS	XXXX

Figure 5.103-1. BFS NSP CONFIG display

**TITLE**

CLOSED CIRCUIT TELEVISION V 1.1

**GENERAL**

- A. The data displayed are telemetry parameters affecting the management and operation of the CCTV system. A copy of the CCTV system display is shown in figure 5.104-1.
- B. Pathname of display: INCO/INCO Displays/COMM Systems/cctv.
- C. Detailed display description.

Cameras Selected

1.	FLT Deck	V74X0830E	1 = ON (green)	0 = (blank)
----	----------	-----------	-------------------	-------------

This parameter indicates that the flight deck camera is selected for downlink.

2.	Mid Deck	V74X0798E	1 = ON (green)	0 = (blank)
----	----------	-----------	-------------------	-------------

This parameter indicates that the middeck camera is selected for downlink.

3.	A	V74X0825E	1 = ON (green)	0 = (blank)
----	---	-----------	-------------------	-------------

This parameter indicates that the A camera is selected for downlink.

4.	B	V74X0826E	1 = ON (green)	0 = (blank)
----	---	-----------	-------------------	-------------

This parameter indicates that the B camera is selected for downlink.

5.	C	V74X0827E	1 = ON (green)	0 = (blank)
----	---	-----------	-------------------	-------------

This parameter indicates that the C camera is selected for downlink.

6.	D	V74X0828E	1 = ON (green)	0 = (blank)
----	---	-----------	-------------------	-------------

This parameter indicates that the D camera is selected for downlink.

7.	Cabin 3	V74X0799E	1 = ON (green)	0 = (blank)
----	---------	-----------	-------------------	-------------

This parameter indicates that the cabin 3 camera is selected for downlink.



- |              |           |                    |                     |
|--------------|-----------|--------------------|---------------------|
| 15. DOWNLINK | V74S0781E | 1 = INH<br>(green) | 0 = ENA<br>(yellow) |
|--------------|-----------|--------------------|---------------------|

This parameter indicates the position of the crew's downlink inhibit/enable switch.

- |                   |           |                   |             |
|-------------------|-----------|-------------------|-------------|
| 16. Overtemp Flag | V74X0847E | 1 = HIGH<br>(red) | 0 = (blank) |
|-------------------|-----------|-------------------|-------------|

This parameter indicates that the video switching unit has detected a camera overtemp.

ALC Mode

- |          |           |                     |                        |
|----------|-----------|---------------------|------------------------|
| 17. PEAK | V74X0843E | 1 = PEAK<br>(green) | 0 = PEAK<br>(dim gray) |
|----------|-----------|---------------------|------------------------|

This parameter indicates that the ALC PEAK has been selected. In the auto iris mode, one of the three ALC parameters will be high, indicating the ALC mode. In the manual iris mode, one of the three ALC parameters will be low, indicating the ALC mode. If VSU is asynchronous or off, all three ALC parameters will be low.

- |          |           |                     |                        |
|----------|-----------|---------------------|------------------------|
| 18. NORM | V74X0844E | 1 = NORM<br>(green) | 0 = NORM<br>(dim gray) |
|----------|-----------|---------------------|------------------------|

This parameter indicates that the ALC NORM has been selected. In the auto iris mode, one of the three ALC parameters will be high, indicating the ALC mode. In the manual iris mode, one of the three ALC parameters will be low, indicating the ALC mode. If VSU is asynchronous or off, all three ALC parameters will be low.

- |         |           |                    |                       |
|---------|-----------|--------------------|-----------------------|
| 19. AVG | V74X0845E | 1 = AVG<br>(green) | 0 = AVG<br>(dim gray) |
|---------|-----------|--------------------|-----------------------|

This parameter indicates that the ALC AVG has been selected. In the auto iris mode, one of the three ALC parameters will be high, indicating the ALC mode. In the manual iris mode, one of the three ALC parameters will be low, indicating the ALC mode. If VSU is asynchronous or off, all three ALC parameters will be low.

GAMMA

- |     |           |                      |                         |
|-----|-----------|----------------------|-------------------------|
| 20. | V74X0846E | 1 = WHITE<br>(green) | 0 = WHITE<br>(dim gray) |
|-----|-----------|----------------------|-------------------------|

This parameter indicates that the gamma WHITE stretch mode is selected.

- |     |           |                      |                         |
|-----|-----------|----------------------|-------------------------|
| 21. | V74X0848E | 1 = BLACK<br>(green) | 0 = BLACK<br>(dim gray) |
|-----|-----------|----------------------|-------------------------|

This parameter indicates that the gamma BLACK stretch mode is selected.



**TITLE**

COMMAND ERRORS V 1.0

**GENERAL**

- A. The data displayed are real-time telemetry parameters that affect the management and operation of the commanding system. A copy of the COMMAND ERRORS display is shown in figure 5.105-1.
- B. Pathname of display: INCO/INCO Displays/COMM Systems/cmd error.
- C. Detailed display description.

1.	SM Comm Buff	V92X0077X	1 = BUSY (yellow)	0 = (blank)
----	--------------	-----------	----------------------	-------------

Indicates that the SM common buffer is busy.

2.	TFL Load	V92J0054C	1 = REJECT (red)	0 = (blank)
----	----------	-----------	---------------------	-------------

Indicates the TFL/DFL load has been rejected in the SM GPC.

3.	Uplink Block	V92X6082XX	1 = NSP (red)	0 = (blank)
----	--------------	------------	------------------	-------------

This parameter indicates the crew's uplink switch is in the NSP BLOCK position and all uplink commands are inhibited. An NSP data bypass event will also occur on the previously operating NSP.

4.	PL Uplink	V92X1124X	1 = INVALID (red)	0 = (blank)
----	-----------	-----------	----------------------	-------------

Indicates that an uplink command field is invalid or that an output to an interface cannot be processed because the specified interface is busy.

5.	PSP Uplink	V92X1127X	1 = REJECT (red)	0 = (blank)
----	------------	-----------	---------------------	-------------

Indicates that an uplink command has been rejected.

6.	Two Stage Err	V92X6134XY	1 = SM (red)	0 = (blank)
----	---------------	------------	-----------------	-------------

Indicates an error in the SM two-stage buffer.

7.	TMBU	V92J0660C	1 = REJECT (red)	0 = (blank)
----	------	-----------	---------------------	-------------

Indicates that the last data set received by SM OPS 2 was rejected for one of the following reasons:

- a. If class 2 limit change is requested and no class 2 limit set is defined for fault detection and annunciation (FDA) parameter



- b. If class 0, 3, 4 limit change is requested and no class 0, 3, 4 limits are defined for FDA parameter
- c. If class 0, 3, 4 limit change is requested and specified limit set does not exist
- d. If requested change is a high limit and changed parameter is a discrete
- e. If parameter of a limit change is not processed by FDA
- f. If analog of engineering units (EU`s) limit value exceeds allowable range
- g. If parameter of a constant change is not a valid constant parameter

Or, the entire load may have been rejected for either of the following reasons:

- a. If TM Spec 60 is already called up in a display electronics unit (DEU) when the load reaches the application
- b. If the number of data sets is less than 1 or greater than 10

<b>Command Errors</b>		v1.0
GMT XXX/XX:XX:XX		
<b>SM Comm Buff</b>		XXXX
<b>TFL Load</b>		XXXXXX
<b>Uplink Block</b>		XXX
<b>PL Uplink</b>		XXXXXX
<b>PSP Uplink</b>		XXXXX
<b>Two Stage Err</b>		XX
<b>TMBU</b>		XXXXXX

*Figure 5.105-1. Command Errors display*

**TITLE**

COMM EVENTS V 1.2

**GENERAL**

- A. The data displayed are real-time telemetry parameters that affect the management and operation of the communications systems. A copy of the COMM EVENTS display is shown in Figure 5.106-1.
- B. Pathname of display: INCO/INCO Displays/DDDs/Comm Events.
- C. Detailed display description.

Parameters 1-5 are displayed in column 1, 6-10 in column 2, and 11-14 in column 3.

1.	V72X7011E	1 = GPC 1 FAIL (black on yellow)	0 = GPC 1 GOOD (darkslategray on black)
----	-----------	-------------------------------------	--

Indicates a GPC 1 failure.

2.	V72X7012E	1 = GPC 2 FAIL (black on yellow)	0 = GPC 2 GOOD (darkslategray on black)
----	-----------	-------------------------------------	--

Indicates a GPC 2 failure.

3.	V72X7013E	1 = GPC 3 FAIL (black on yellow)	0 = GPC 3 GOOD (darkslategray on black)
----	-----------	-------------------------------------	--

Indicates a GPC 3 failure.

4.	V72X7014E	1 = GPC 4 FAIL (black on yellow)	0 = GPC 4 GOOD (darkslategray on black)
----	-----------	-------------------------------------	--

Indicates a GPC 4 failure.

5.	V72X7015E	1 = GPC 5 FAIL (black on yellow)	0 = GPC 5 GOOD (darkslategray on black)
----	-----------	-------------------------------------	--

Indicates a GPC 5 failure.

6.	V91X2256XX	1 = Ku RADAR BYPS (black on red)	0 = Ku RADAR GOOD (darkslategray on black)
----	------------	-------------------------------------	---

Indicates that Ku-band data acquisition by the Guidance and Navigation (G&N) GPC via the FF-3 MDM Serial Input/Output (SIO) is bypassed.

7.	V93X6859X	1 = GNC POINTING (black on ghostwhite)	0 = GNC POINTING (darkslategray on black)
----	-----------	---	--

Indicates that the pointing data interface from the GNC computer for rendezvous targeting data is enabled to the SM antenna management program.



14. W02I0603R SPECIAL COMP  
(ghostwhite on black)

This is a special comp of the S-band ANTENNA select (PM) special comp and the S-band SWITCH BEAM (FWD/AFT) selects.

W02I0603R is composed of W05I0200R, V74X7090E, V74X7091E, V74X7092E, V74X7093E, V74X7094E, V74X7095E, V74X7096E, and V74X7097E.

W0	V7	V7	V7	V7	V7	V7	V7	V7	
02	70	70	70	70	70	70	70	70	
50	49	49	49	49	49	49	49	49	
10	X0	X1	X2	X3	X4	X5	X6	X7	
R	E	E	E	E	E	E	E	E	
UL	1	0	X	X	X	X	X	X	ULF
UL	0	1	X	X	X	X	X	X	ULA
UR	X	X	1	0	X	X	X	X	URF
UR	X	X	0	1	X	X	X	X	URA
LL	X	X	X	X	1	0	X	X	LLF
LL	X	X	X	X	0	1	X	X	LLA
LR	X	X	X	X	X	X	1	0	LRF
LR	X	X	X	X	X	X	0	1	LRA
ER	X	X	X	X	X	X	X	X	ER1
All other combinations output									ER2

W05I0200R is a special comp of frequency and transponder selected and the quad antenna select relays S1, S2, S3, or S4 to determine the selected quad antenna.

W05I0200R is composed of V74X7070E, V74X7072E, V74X7074E, V74X7076E, V74X7078E, V74X7080E, V74X7082E, V74X7084E, V74X4780E, V74X4781E, V74X4779E, and V74X4778E.

V7	V7	V7	V7	V7	V7	V7	V7	V4	V4	V4	V4	
70	70	70	70	70	70	70	70	77	77	77	77	
47	47	47	47	47	48	48	48	48	48	47	47	
X0	X2	X4	X6	X8	X0	X2	X4	X0	X1	X9	X8	
E	E	E	E	E	E	E	E	E	E	E	E	
1	0	X	X	X	X	0	1	1	0	0	0	UR
0	1	0	1	X	X	X	X	0	1	0	0	UR
1	0	X	X	X	X	1	0	0	0	1	0	UR
0	1	1	0	X	X	X	X	0	0	0	1	UR
X	X	X	X	0	1	1	0	1	0	0	0	LR
X	X	1	0	1	0	X	X	0	1	0	0	LR
X	X	X	X	0	1	0	1	0	0	1	0	LR
X	X	0	1	1	0	X	X	0	0	0	1	LR
X	X	X	X	1	0	1	0	1	0	0	0	LL
X	X	1	0	0	1	X	X	0	1	0	0	LL
X	X	X	X	1	0	0	1	0	0	1	0	LL
X	X	0	1	0	1	X	X	0	0	0	1	LL
0	1	X	X	X	X	0	1	1	0	0	0	UL
1	0	0	1	X	X	X	X	0	1	0	0	UL
0	1	X	X	X	X	1	0	0	0	1	0	UL
1	0	1	0	X	X	X	X	0	0	0	1	UL
All other combinations output											ER	

TBD

*Figure 5.106-1. COMM EVENTS display*

**TITLE**

COMM MANAGEMENT V1.3

**GENERAL**

- A. The data displayed are real-time telemetry parameters affecting the comm subsystem. A copy of the comm management display is shown in Figure 5.107-1.
- B. Pathname of display: INCO/INCO Displays/Comm Mgmt.
- C. Detailed display description.

- |    |  |            |                    |
|----|--|------------|--------------------|
| 1. | OI TFL   | V75X4070D  | DECIMAL<br>(green) |
|    | Format will be displayed with unsuppressed data behind (B, D, or S). |            |                    |
| 2. | SM   | V93Q0022CY | DECIMAL<br>(green) |
|    | Same as item 1.  |            |                    |
| 3. | GNC  | V93Q0022CX | DECIMAL<br>(green) |
|    | Same as item 1.  |            |                    |

S-BAND PM

- |    |   |           |                                    |
|----|---|-----------|------------------------------------|
| 4. | SIG STRGTH (1)  | V74E4080A | FLOATING POINT<br>(green)          |
|    | This parameter indicates the uplinked signal strength received by the S-band transponder 1 (-115 to -30 dBm). |           |                                    |
| 5. | SIG STRGTH (2)  | V74E4081A | FLOATING POINT<br>(green)          |
|    | This parameter indicates the uplinked signal strength received by the S-band transponder 2 (-115 to -30 dBm). |           |                                    |
| 6. | RCVR LOCK (1)   | V74X4090E | 1 = LK<br>(green)      0 = (blank) |
|    | This parameter indicates that transponder 1 is phase locked.  |           |                                    |
| 7. | RCVR LOCK (2)   | V74X4091E | 1 = LK<br>(green)      0 = (blank) |
|    | This parameter indicates that transponder 2 is phase locked.  |           |                                    |

8. PHASE ERR (1) V74B4086A FLOATING POINT  
(green)

This is an analog parameter indicating the frequency offset of transponder 1 receiver VCO (-90 to +90 kHz).

9. PHASE ERR (2) V74B4087A FLOATING POINT  
(green)

This is an analog parameter indicating the frequency offset of transponder 2 receiver VCO (-90 to +90 kHz).

10. COHERENT (1) V74X4516E 1 = COH 0 = (blank)  
(green)

This parameter indicates that transponder 1 has switched to the coherent mode.

11. COHERENT (2) V74X4517E 1 = COH 0 = (blank)  
(green)

This parameter indicates that transponder 2 has switched to the coherent mode.

12. ANT SEL V74S7214E 1 = GPC 0 = MAN  
(green) (yellow)

This parameter indicates the crew's antenna selector switch position. In the GPC position, the computer or uplink is selecting the S-band quad antennas. MAN indicates that the crew switch is selecting the quad antennas.

13. ANT SEL W02I0603R SPECIAL COMP  
(green)

This is a special comp of the S-band ANTENNA select (PM) special comp and the S-band SWITCH BEAM (FWD/AFT) selects.

W02I0603R is composed of W05I0200R, V74X7090E, V74X7091E, V74X7092E, V74X7093E, V74X7094E, V74X7095E, V74X7096E, and V74X7097E.

W0	V7	V7	V7	V7	V7	V7	V7	V7	
02	70	70	70	70	70	70	70	70	
50	49	49	49	49	49	49	49	49	
I0	X0	X1	X2	X3	X4	X5	X6	X7	
R	E	E	E	E	E	E	E	E	
UL	1	0	X	X	X	X	X	X	ULF
UL	0	1	X	X	X	X	X	X	ULA
UR	X	X	1	0	X	X	X	X	URF
UR	X	X	0	1	X	X	X	X	URA
LL	X	X	X	X	1	0	X	X	LLF
LL	X	X	X	X	0	1	X	X	LLA
LR	X	X	X	X	X	X	1	0	LRF
LR	X	X	X	X	X	X	0	1	LRA
ER	X	X	X	X	X	X	X	X	ER1
All other combinations output									ER2

W05I0200R is a special comp of frequency and transponder selected and the quad antenna select relays S1, S2, S3, or S4 to determine the selected quad antenna.



W05I0200R is composed of V74X7070E, V74X7072E, V74X7074E, V74X7076E, V74X7078E, V74X7080E, V74X7082E, V74X7084E, V74X4780E, V74X4781E, V74X4779E, and V74X4778E.

V7 70 47 X0 E	V7 70 47 X2 E	V7 70 47 X4 E	V7 70 47 X6 E	V7 70 47 X8 E	V7 70 48 X0 E	V7 70 48 X2 E	V7 70 48 X4 E	V4 77 48 X0 E	V4 77 48 X1 E	V4 77 47 X9 E	V4 77 47 X8 E	
1	0	X	X	X	X	0	1	1	0	0	0	UR
0	1	0	1	X	X	X	X	0	1	0	0	UR
1	0	X	X	X	X	1	0	0	0	1	0	UR
0	1	1	0	X	X	X	X	0	0	0	1	UR
X	X	X	X	0	1	1	0	1	0	0	0	LR
X	X	1	0	1	0	X	X	0	1	0	0	LR
X	X	X	X	0	1	0	1	0	0	1	0	LR
X	X	0	1	1	0	X	X	0	0	0	1	LR
X	X	X	X	1	0	1	0	1	0	0	0	LL
X	X	1	0	0	1	X	X	0	1	0	0	LL
X	X	X	X	1	0	0	1	0	0	1	0	LL
X	X	0	1	0	1	X	X	0	0	0	1	LL
0	1	X	X	X	X	0	1	1	0	0	0	UL
1	0	0	1	X	X	X	X	0	1	0	0	UL
0	1	X	X	X	X	1	0	0	0	1	0	UL
1	0	1	0	X	X	X	X	0	0	0	1	UL
All other combinations output												

14. ANT SEL V92X1049X 1 = FAIL 0 = (blank)  
(red)

This parameter indicates that the SM antenna management program has detected a mismatch between the SM commanded quad and the selected quad antenna.

15. SM CMD W03I0603R SPECIAL COMP  
(green)

This is a special comp of the SM commanded S-band PM antenna (quad and beam) selected, using the SM downlist telemetry. This telemetry indicates the antenna commanded by the SM GPC antenna management program.

This special comp is composed of V74K7050Y, V74K7051Y, V74K7055Y, V74K7056Y, V74K7060Y, V74K7061Y, V74K7065Y, V74K7066Y, V74K7044Y, V74K7046Y, V74K7045Y, and V74K7047Y.

V7 70 45 K0 Y	V7 70 45 K1 Y	V7 70 45 K5 Y	V7 70 45 K6 Y	V7 70 46 K0 Y	V7 70 46 K1 Y	V7 70 46 K5 Y	V7 70 46 K6 Y	V4 70 44 K4 Y	V4 70 44 K6 Y	V4 70 44 K5 Y	V4 70 44 K7 Y	
1	1	0	0	0	0	0	0	1	1	0	0	ULF
0	0	1	1	0	0	0	0	1	1	0	0	URF
0	0	0	0	1	1	0	0	1	1	0	0	LLF
0	0	0	0	0	0	1	1	1	1	0	0	LRF
1	1	0	0	0	0	0	0	0	0	1	1	ULA
0	0	1	1	0	0	0	0	0	0	1	1	URA
0	0	0	0	1	1	0	0	0	0	1	1	LLA
0	0	0	0	0	0	1	1	0	0	1	1	LRA
All other combinations												

- |     |   |           |                           |             |
|-----|---|-----------|---------------------------|-------------|
| 16. | SM CMD  | V93X5626X | 1 = INH<br>(red)          | 0 = (blank) |
|     | Indicates that the SM antenna management program output to the ANT SELECT switch is inhibited and the ground is capable of selecting antennas (if the S-band antenna switch, PNL C3, is in GPC). This function also inhibits SM antenna management quad FAIL annunciator. |           |                           |             |
| 17. | ELEC  | V74X4782E | 1 = 1<br>(green)          | 0 = (blank) |
|     | This parameter indicates that antenna electronics no. 1 is powered on.  |           |                           |             |
| 18. | ELEC  | V74X4783E | 1 = 2<br>(green)          | 0 = (blank) |
|     | This parameter indicates that antenna electronics no. 2 is powered on.  |           |                           |             |
| 19. | BEAM  | V74X6491E | 1 = 1<br>(green)          | 0 = (blank) |
|     | This parameter indicates that switch beam electronics no. 1 is powered on.  |           |                           |             |
| 20. | BEAM  | V74X6492E | 1 = 2<br>(green)          | 0 = (blank) |
|     | This parameter indicates that switch beam electronics no. 2 is powered on.  |           |                           |             |
| 21. | XPNDR SEL   | V74X4745E | 1 = 1<br>(green)          | 0 = (blank) |
|     | This parameter indicates the associated GCIL panel/command driver's status for this function. S-band PM transponder no. 1 is selected.  |           |                           |             |
| 22. | XPNDR SEL   | V74X4746E | 1 = 2<br>(green)          | 0 = (blank) |
|     | This parameter indicates the associated GCIL panel/command driver's status for this function. S-band PM transponder no. 2 is selected.  |           |                           |             |
| 23. | RF OUT  | V74E4088A | FLOATING POINT<br>(green) |             |
|     | This is an analog parameter indicating that the RF output power in transponder 1 is in the SGLS or STDN LO mode (0 to 5 watts).   |           |                           |             |
| 24. | RF OUT  | V74E4089A | FLOATING POINT<br>(green) |             |
|     | This is an analog parameter indicating that the RF output power in transponder 2 is in the SGLS or STDN LO mode (0 to 5 watts).   |           |                           |             |

25. MODE W06I0200R SPECIAL COMP  
(green)

This is a special comp of the S-band transponder mode parameters to determine which transponder mode is selected (TDRS, STDN-HI, STDN-LO, or SGLS).

The special comp is composed of V74X4786E, V74X4787E, V74X4788E, and V74X4789E.

<u>V74X4786E</u>	<u>V74X4787E</u>	<u>V74X4788E</u>	<u>V74X4789E</u>	
1	0	0	0	TDRS
0	1	0	0	STDN LO
0	0	1	0	STDN HI
0	0	0	0	SGLS
All other combinations output				INVL

26. FREQ V74X4792E 1 = LOW 0 = (blank)  
(green)

This parameter indicates the associated GCIL panel/command driver status for this function.

27. FREQ V74X4793E 1 = HIGH 0 = (blank)  
(green)

This parameter indicates the associated GCIL panel/command driver status for this function.

28. PRE AMP V74X4776E 1 = 1 0 = (blank)  
(green)

This parameter indicates the associated GCIL panel/command driver status for this function; the S-band preamp no. 1 is selected.

29. PREAMP V74X4777E 1 = 2 0 = (blank)  
(green)

This parameter indicates the associated GCIL panel/command driver status for this function; S-band preamp no. 2 is selected.

30. HEATER V74X4707E 1 = 1 0 = 1  
(green) (red)

This parameter indicates the associated GCIL panel/command driver status for this function; the S-band preamp heater no. 1 is selected.

31. HEATER V74X4708E 1 = 2 0 = 2  
(green) (red)

This parameter indicates the associated GCIL panel/command driver status for this function; the S-band preamp heater no. 2 is selected.

32. PWR AMP W09I0200R SPECIAL COMP  
(green)

This is a special comp to determine the status of power amplifier no. 1 (ON, STBY, or OFF).

<u>V74X4784E</u>	<u>V74X4747E</u>	
1	1	ON
1	0	INVL
0	1	STBY
0	0	OFF

33. PWR AMP W10I0200R SPECIAL COMP  
(green)

This is a special comp to determine the status of power amplifier no. 2 (ON, STBY, or OFF).

The special comp is composed of V74X4785E and V74X4749E.

<u>V74X4785E</u>	<u>V74X4749E</u>	
1	1	ON
1	0	INVL
0	1	STBY
0	0	OFF

34. TEMP V74T4514A FLOATING POINT  
(green)

This is an analog parameter indicating the temperature of power amplifier no. 1 in degrees Fahrenheit.

35. TEMP V74T4515A FLOATING POINT  
(green)

This is an analog parameter indicating the temperature of power amplifier no. 2 in degrees Fahrenheit.

36. RFL V74E4540A FLOATING POINT  
(green)

This is an analog parameter indicating the reflected power of power amplifier no. 1 in watts.

37. RFL V74E4541A FLOATING POINT  
(green)

This is an analog parameter indicating the reflected power of power amplifier no. 2 in watts.

38. PA RF OUT V74E4512A FLOATING POINT  
(green)

This is an analog parameter indicating the power amplifier output in watts.

39. PA RF OUT V74E4513A FLOATING POINT  
(green)

This is an analog parameter indicating the power amplifier output in watts.











The special comp is composed of V75X2733E and V75X2734E.

<u>V75X2733E</u>	<u>V75X2734E</u>	
0	0	1
1	0	2
0	1	3
1	1	4

59. OPS 1 MTN                      V75X2523E                      1 = RUN (green)                      0 = STOP (yellow)

This parameter indicates tape motion and recorder tach/speed lock.

60. OPS 2 MTN                      V75X2623E                      1 = RUN (green)                      0 = STOP (yellow)

This parameter indicates tape motion and recorder tach/speed lock.

61. P/L MTN                          V75X2723E                      1 = RUN (green)                      0 = STOP (yellow)

This parameter indicates tape motion and recorder tach/speed lock.

62. OPS 1 TEMP                      V75T2517A                      FLOATING POINT (green)

This parameter is a 0 to 5 V dc signal proportional from 0° to 140° F, respectively, of the temperature near the heads.

63. OPS 2 TEMP                      V75T2617A                      FLOATING POINT (green)

This parameter is a 0 to 5 V dc signal proportional to 0° to 140° F, respectively, of the temperature near the heads.

64. P/L TEMP                          V75T2717A                      FLOATING POINT (green)

This parameter is a 0 to 5 V dc signal proportional to 0° to 140° F, respectively, of the temperature near the heads.

Ku-BAND

65. COMM PWR                      V74X4818E                      1 = ON (green)                      0 = (blank)

This parameter indicates that the Ku-band system is in the comm mode and power is on.

66. COMM PWR                      V74X4807E                      1 = STBY (yellow)                      0 = (blank)

This parameter indicates that the Ku-band A TWT has low voltage applied, but high voltage is off and RF transmission is inhibited.

67. MODE V74X2583J 1 = RDR (yellow) 0 = COMM (green)  
 This parameter indicates that the Ku-band A system is in the comm mode or radar mode, respectively.

68. GNC PTG V93X6859X 1 = ENA (yellow) 0 = INH (darkslategray)  
 This parameter indicates that the pointing data interface from the GNC computer for rendezvous targeting data is enabled to the SM antenna management program.

69. UL SS V74E2508A FLOATING POINT (green)  
 This is an analog parameter indicating the Ku-band received signal strength.

70. TDRS SEL V74X2610J 1 = E (green) 0 = (blank)  
 This parameter indicates that the Ku-band has selected the east TDRS satellite for pointing.

71. TDRS SEL V74X2609J 1 = W (green) 0 = (blank)  
 This parameter indicates that the Ku-band has selected the west TDRS satellite for pointing.

72. RF POWER V74E2511A FLOATING POINT (green)  
 This parameter indicates the radar or comm RF output power in watts. Nominal is about 50 watts.

73. ANT MODE W01G3202R SPECIAL COMP (green)  
 This is a special comp of the three Ku-band antenna mode bits to determine which mode the antenna has selected: GPC DESIG, GPC, AUTO TRACK, MAN SLEW.  
 The special comp is composed of V74X2585J, V74X2584J, and V74X2586J.

<u>V74X2585J</u>	<u>V74X2584J</u>	<u>V74X2586J</u>	
1	0	0	DESIG
0	1	0	AUTO
0	0	1	ACQ
0	0	0	MAN
All other combination output			INVL

74. SEARCH V74X2601J 1 = SRCH (green) 0 = SRCH (darkslategray)  
 This parameter indicates that the Ku-band radar is in the search mode.

75. DETECT                      V74X2602J                      1 = DET (green)                      0 = DET (darkslategray)

This parameter indicates that the received signal has exceeded the detection threshold.

76. TRACK                      V74X2603J                      1 = TRK (green)                      0 = TRK (darkslategray)

In GPC and AUTOTRACK, this parameter indicates that the signal tracking servo circuits are closed. It indicates angle tracking in the comm mode and range, range rate, angle, and angle rate tracking in the radar mode. In GPC DESIGNATE and MANUAL SLEW, this indicates signal detection in the comm mode and range and range rate tracking in the radar mode.

77. KU OPER                      V74X2604J                      1 = OPER (green)                      0 = OPER (darkslategray)

This parameter indicates that the TWT has warmed up (3.5-min timeout), no faults have been detected, COMM/RDR is on, and the TWT is outputting an RF signal.

78. 216 SYNC                      V74X2612J                      1 = 216-Sync (green)                      0 = 216-Sync (darkslategray)

This parameter indicates that the communications signal processor has acquired the forward link and is locked up and tracking the frame sync pattern. Good only in the 216-kbps mode.

79. Data-Good                      V74X2613J                      1 = Data-Good (green)                      0 = Data-Good (darkslategray)

This parameter indicates comm carrier detect, costas lock, modulation detect, data on carrier, and, if operating in the spread spectrum mode, PN lock, data present.

80. CHANNEL 2                      W04G3202R                      SPECIAL COMP (green)

This is a special comp of the four Ku-band signal processor high-data-rate parameters to determine what has been selected for downlink on channel 2: PL DGTL, PL RCD, OPS RCD, PL INT, OFF.

The special comp is composed of V74X4839E, V74X4837E, V74X4838E, and V74X4836E.

<u>V74X4839E</u>	<u>V74X4837E</u>	<u>V74X4838E</u>	<u>V74X4836E</u>	
1	0	0	0	PL DGTL
0	1	0	0	PL RCD
0	0	1	0	OPS RCD
0	0	0	1	PL INT
0	0	0	0	OFF
All other combinations output				INVL

81. CHANNEL 3                      W03G3202R                      SPECIAL COMP (green)

This is a special comp of the five Ku-band signal processor high-data-rate parameters to determine what has been selected for downlink on channel 3: PL MAX, TV, PL ANLG, PL DGTL, PL INT.



87. EL (pitch) min V92H0547C FLOATING POINT (green)  
This parameter indicates the value of minimum elevation angle (downlisted).
88. EL (pitch) max V92H0548C FLOATING POINT (green)  
This parameter indicates the value of maximum elevation angle (downlisted).
89. S-Band PRI V93X5613X 1 = WEST (green) 0 = (blank)  
This parameter indicates that the SM antenna management program is providing S-band look angles to the western satellite if it is in view.

90. S-Band PRI V93X5615X 1 = EAST (yellow) 0 = (blank)  
This parameter indicates that the SM antenna management program is providing S-band look angles to the eastern satellite if it is in view.

91. Ku-Band PRI V93X5603X 1 = WEST (green) 0 = (blank)  
This parameter indicates that the SM ANT MGMT program is providing Ku-band look angles to the western satellite if it is in view.

92. Ku-Band PRI V93X5605X 1 = EAST (yellow) 0 = (blank)  
This parameter indicates that the SM ANT MGMT program is providing Ku-band look angles to the eastern satellite if it is in view.

UHF

93. PA V74S2016E 1 = OFF (yellow) 0 = ON (green)  
This parameter indicates the position of the crew's UHF SPLY PWR AMP switch.

94. SQL V74S2001E 1 = OFF (yellow) 0 = ON (green)  
This parameter indicates the position of the crew's squelch switch.

95. MODE V74S2034E 1 = S (green) 0 = (blank)  
This parameter indicates the position of the crew's transceiver mode switch. The switch is in SIMPLEX.

96. MODE V74S2032E 1 = E (green) 0 = (blank)  
This parameter indicates the position of the crew's transceiver mode switch. The switch is in EVA.

- |      |  |           |                           |                  |
|------|--|-----------|---------------------------|------------------|
| 97.  | MODE   | V74S2010E | 1 = G<br>(green)          | 0 = (blank)      |
|      | This parameter indicates the position of the crew's guard transceiver T/R switch. The switch is in Guard.              |           |                           |                  |
| 98.  | MODE   | V74S2036E | 1 = S+G<br>(green)        | 0 = (blank)      |
|      | This parameter indicates the position of the crew's transceiver mode switch. The switch is in SIMPLEX + Guard Receive. |           |                           |                  |
| 99.  | 259  | V74S2040E | 1 = (blank)               | 0 = *<br>(green) |
|      | This parameter indicates the position of the crew's transceiver frequency select switch.                               |           |                           |                  |
| 100. | 259  | V74V2042A | FLOATING POINT<br>(green) |                  |
|      | This analog parameter indicates the uplinked signal strength received by the UHF receiver tuned to 259.7 MHz.          |           |                           |                  |
| 101. | 296  | V74S2040E | 1 = *<br>(green)          | 0 = (blank)      |
|      | This parameter indicates the position of the crew's transceiver frequency select switch.                               |           |                           |                  |
| 102. | 296  | V74V2041A | FLOATING POINT<br>(green) |                  |
|      | This analog parameter indicates the uplinked signal strength received by the UHF receiver tuned to 296.8 MHz.          |           |                           |                  |
| 103. | 279  | V74V2043A | FLOATING POINT<br>(green) |                  |
|      | This analog parameter indicates the uplinked signal strength received by the UHF receiver tuned to 279.0 MHz.          |           |                           |                  |
| 104. | 243  | V74V2044A | FLOATING POINT<br>(green) |                  |
|      | This analog parameter indicates the uplinked signal strength received by the UHF receiver tuned to 243.0 MHz.          |           |                           |                  |

NSP

- |      |  |            |                  |             |
|------|--|------------|------------------|-------------|
| 105. | SELECT   | V91X2902XX | 1 = BYP<br>(red) | 0 = (blank) |
|      | A logic 1 indicates that the GPC has bypassed the NSP 1 SI0 data output and is no longer receiving commands, command validity, or NSP status data. |            |                  |             |

- |   |          |            |                    |                          |
|---|----------|------------|--------------------|--------------------------|
| 106.  | SELECT   | V92X6097XX | 1 = 1<br>(green)   | 0 = 1<br>(darkslategray) |
| <p>This parameter indicates the associated GCIL panel/command driver's status for this function; NSP no. 1 is selected.</p>   |          |            |                    |                          |
| 107.  | SELECT   | V92X6098XX | 1 = 2<br>(green)   | 0 = 2<br>(darkslategray) |
| <p>This parameter indicates the associated GCIL panel/command driver's status for this function; NSP no. 2 is selected.</p>   |          |            |                    |                          |
| 108.  | SELECT   | V91X2903XX | 1 = BYP<br>(red)   | 0 = (blank)              |
| <p>A logic 1 indicates that the GPC has bypassed the NSP 2 SIO data output and is no longer receiving commands, command validity, or NSP status data.</p>   |          |            |                    |                          |
| 109.  | BITE     | V74X5184E  | 1 = BITE<br>(red)  | 0 = (blank)              |
| <p>BLANK indicates the proper operation of the forward link voice buffers (bit 6) and the return link voice buffers (bit 7) and indicates that there has not been an NSP 1 undervoltage condition (bit 9). Failure of any one of these functions for 0.5 seconds or more will cause this parameter to go high.</p>  |          |            |                    |                          |
| 110.  | BITE     | V74X5185E  | 1 = BITE<br>(red)  | 0 = (blank)              |
| <p>BLANK indicates the proper operation of the forward link voice buffers (bit 6) and the return link voice buffers (bit 7) and indicates that there has not been an NSP 2 undervoltage condition (bit 9). Failure of any one of these functions for 0.5 seconds or more will cause this parameter to go high.</p>  |          |            |                    |                          |
| 111.  | BIT SYNC | V74X5188E  | 1 = BIT<br>(green) | 0 = (blank)              |
| <p>BIT indicates that the NSP 1's bit sync lock detector reached threshold after integrating for <math>2^{14}</math> symbol times. The bit lock detector threshold changes for each mode, DOD or NASA, decoding ON or OFF.</p>  |          |            |                    |                          |
| 112.  | BIT SYNC | V74X5189E  | 1 = BIT<br>(green) | 0 = (blank)              |
| <p>BIT indicates that the NSP 2's bit sync lock detector reached threshold after integrating for <math>2^{14}</math> symbol times. The bit lock detector threshold changes for each mode, DOD or NASA, decoding ON or OFF.</p>  |          |            |                    |                          |
| 113.  | FRM SYNC | V74X5176E  | 1 = FRM<br>(green) | 0 = (blank)              |
| <p>FRM indicates that the NSP 1 had two consecutive frame sync patterns pass the pattern check and will remain locked until two consecutive frame sync patterns fail the pattern check.</p> <p>"Blank" indicates that the NSP frame sync lock logic has detected three consecutive frame sync correlation failures and the NSP forward link data processing is inhibited.</p> |          |            |                    |                          |

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|---|---------------|-----------|--------------------|----------------------------|
| 114.  | FRM SYNC      | V74X5177E | 1 = FRM<br>(green) | 0 = (blank)                |
| <p>FRM indicates that the NSP 2 had two consecutive frame sync patterns pass the pattern check and will remain locked until two consecutive frame sync patterns fail the pattern check.</p> <p>“Blank“ indicates that the NSP frame sync lock logic has detected three consecutive frame sync correlation failures and the NSP forward link data processing is inhibited.</p> |               |           |                    |                            |
| 115.  | COM SYNC      | V74X5019E | 1 = FRM<br>(green) | 0 = (blank)                |
| <p>FRM indicates that COMSEC 1 has achieved frame sync on the data stream.</p>  |               |           |                    |                            |
| 116.  | COM SYNC      | V74X5020E | 1 = FRM<br>(green) | 0 = (blank)                |
| <p>FRM indicates that COMSEC 2 has achieved frame sync on the data stream.</p>  |               |           |                    |                            |
| 117.  | SOURCE        | V74X4795E | 1 = S<br>(green)   | 0 = (blank)                |
| <p>This parameter indicates the associated GCIL panel/command driver status for this function; the NSP source is S-band.</p>  |               |           |                    |                            |
| 118.  | SOURCE        | V74X4758E | 1 = KU<br>(green)  | 0 = (blank)                |
| <p>This parameter indicates the associated GCIL panel/command driver status for this function; the NSP source is Ku-band.</p>   |               |           |                    |                            |
| 119.  | Auto H/O S→Ku | V93X1014X | 1 = ENA<br>(green) | 0 = INH<br>(darkslategray) |
| <p>This parameter indicates the automatic S-band to Ku-band handover status. It will be set to 1 if Auto S-Bd to Ku-Bd H/O Enable (V93X1015X) is equal to 1 and will be set to 0 if Auto S-Bd to Ku-Bd H/O Inhibit (V93X1016X) is equal to 1.</p>   |               |           |                    |                            |
| 120.  | Auto H/O Ku→S | V93X1011X | 1 = ENA<br>(green) | 0 = INH<br>(darkslategray) |
| <p>This parameter indicates the automatic Ku-band to S-band handover status. It will be set to 1 if Auto Ku-Bd to S-Bd H/O Enable (V93X1012X) is equal to 1 and will be set to 0 if Auto Ku-Bd to S-Bd H/O Inhibit (V93X1013X) is equal to 1.</p>   |               |           |                    |                            |
| 121.  | U/L RATE      | V74X4794E | 1 = HI<br>(green)  | 0 = (blank)                |
| <p>This parameter indicates the associated GCIL panel/command driver status for this function.</p>  |               |           |                    |                            |
| 122.  | U/L RATE      | V74X4756E | 1 = LOW<br>(green) | 0 = (blank)                |
| <p>This parameter indicates the associated GCIL panel/command driver status for this function.</p>  |               |           |                    |                            |



- |      |   |           |                     |                     |
|------|---|-----------|---------------------|---------------------|
| 123. | CODE  | V74X4796E | 1 = ON<br>(green)   | 0 = (blank)         |
|      | This parameter indicates the associated GCIL panel/command driver status for this function. U/L coding. |           |                     |                     |
| 124. | CODE  | V74X4752E | 1 = OFF<br>(green)  | 0 = (blank)         |
|      | This parameter indicates the associated GCIL panel/command driver status for this function. U/L coding. |           |                     |                     |
| 125. | D/L RATE  | V74X4753E | 1 = HI<br>(green)   | 0 = (blank)         |
|      | This parameter indicates the associated GCIL panel/command driver status for this function.             |           |                     |                     |
| 126. | D/L RATE  | V74X4754E | 1 = LOW<br>(green)  | 0 = (blank)         |
|      | This parameter indicates the associated GCIL panel/command driver status for this function.             |           |                     |                     |
| 127. | CODE  | V74X4797E | 1 = ON<br>(green)   | 0 = (blank)         |
|      | This parameter indicates the associated GCIL panel/command driver status for this function. D/L coding. |           |                     |                     |
| 128. | CODE  | V74X4751E | 1 = OFF<br>(green)  | 0 = (blank)         |
|      | This parameter indicates the associated GCIL panel/command driver status for this function. D/L coding. |           |                     |                     |
| 129. | ENCR U/L  | V74X5390E | 1 = ENC<br>(green)  | 0 = CLR<br>(yellow) |
|      | ENC indicates that NSP 1 is configured to receive encrypted data.                                       |           |                     |                     |
| 130. | ENCR U/L  | V74X5590E | 1 = ENC<br>(green)  | 0 = CLR<br>(yellow) |
|      | ENC indicates that NSP 2 is configured to receive encrypted data.                                       |           |                     |                     |
| 131. | D/L   | V74X5391E | 1 = ENC<br>(yellow) | 0 = CLR<br>(green)  |
|      | ENC indicates that NSP 1 is configured to transmit encrypted data.                                      |           |                     |                     |
| 132. | D/L   | V74X5591E | 1 = ENC<br>(yellow) | 0 = CLR<br>(green)  |
|      | ENC indicates that NSP 2 is configured to transmit encrypted data.                                      |           |                     |                     |

- |      |              |           |   |                     |
|------|--------------|-----------|---|---------------------|
| 133. | RCDR         | V74X5392E | 1 = DOD<br>(yellow)   | 0 = NASA<br>(green) |
|      |              |           | DOD indicates that NSP 1 is configured to record encrypted data on OPS recorder.  |                     |
| 134. | RCDR         | V74X5592E | 1 = DOD<br>(yellow)   | 0 = NASA<br>(green) |
|      |              |           | DOD indicates that NSP 2 is configured to record encrypted data on OPS recorder.  |                     |
| 135. | RCDR V       | V74X4799E | 1 = ON<br>(yellow)  | 0 = (blank)         |
|      |              |           | ON indicates that the selected NSP is outputting channel 1 and 2 voice and 128 kbps data to the OPS recorder.           |                     |
| 136. | RCDR V       | V74X4798E | 1 = OFF<br>(green)  | 0 = (blank)         |
|      |              |           | OFF indicates that the selected NSP is outputting 128 kbps data only to the OPS recorders.                              |                     |
| 137. | BIT ERR RATE | V74V5191A | FLOATING POINT<br>(green)   |                     |
|      |              |           | This is an analog parameter indicating NSP 1 bit error rate.  |                     |
| 138. | BIT ERR RATE | V74V5192A | FLOATING POINT<br>(green)   |                     |
|      |              |           | This is an analog parameter indicating NSP 2 bit error rate.  |                     |
| 139. | COM BITE     | V74X5003E | 1 = 1<br>(green)  | 0 = BT<br>(red)     |
|      |              |           | This is the COMSEC no. 1 master BITE status indicator. This parameter indicates failure of an SRU inside the LRU.       |                     |
| 140. | COM BITE     | V74X5004E | 1 = 2<br>(green)  | 0 = BT<br>(red)     |
|      |              |           | This is the COMSEC no. 2 master BITE status indicator. This parameter indicates failure of an SRU inside the LRU.       |                     |
| 141. | ALARM        | V74X5017E | 1 = 1<br>(yellow)   | 0 = (blank)         |
|      |              |           | This parameter indicates that the KGX-60 is not operating properly; i.e., failure of the unit or failure of the memory. |                     |
| 142. | ALARM        | V74X5018E | 1 = 2<br>(yellow)   | 0 = (blank)         |
|      |              |           | This parameter indicates that the KGX-60 is not operating properly; i.e., failure of the unit or failure of the memory. |                     |



- |      |   |                    |                            |
|------|---|--------------------|----------------------------|
| 153. | V92X0978X   | 1 = NHS<br>(green) | 0 = NHS<br>(darkslategray) |
|      | This parameter indicates that the NHS inhibit flag is set and the SM antenna management program is inhibited from using it. |                    |                            |
| 154. | V92X0986X   | 1 = CTS<br>(green) | 0 = CTS<br>(darkslategray) |
|      | This parameter indicates that the CTS inhibit flag is set and the SM antenna management program is inhibited from using it. |                    |                            |
| 155. | V92X0981X   | 1 = MIL<br>(green) | 0 = MIL<br>(darkslategray) |
|      | This parameter indicates that the MIL inhibit flag is set and the SM antenna management program is inhibited from using it. |                    |                            |
| 156. | V92X0989X   | 1 = GDY<br>(green) | 0 = GDY<br>(darkslategray) |
|      | This parameter indicates that the GDY inhibit flag is set and the SM antenna management program is inhibited from using it. |                    |                            |
| 157. | V92X0980X   | 1 = BDA<br>(green) | 0 = BDA<br>(darkslategray) |
|      | This parameter indicates that the BDA inhibit flag is set and the SM antenna management program is inhibited from using it. |                    |                            |
| 158. | V92X0988X   | 1 = DFR<br>(green) | 0 = DFR<br>(darkslategray) |
|      | This parameter indicates that the DFR inhibit flag is set and the SM antenna management program is inhibited from using it. |                    |                            |
| 159. | V92X0982X   | 1 = HTS<br>(green) | 0 = HTS<br>(darkslategray) |
|      | This parameter indicates that the HTS inhibit flag is set and the SM antenna management program is inhibited from using it. |                    |                            |
| 160. | V92X0983X   | 1 = GTS<br>(green) | 0 = GTS<br>(darkslategray) |
|      | This parameter indicates that the GTS inhibit flag is set and the SM antenna management program is inhibited from using it. |                    |                            |
| 161. | V92X0990X   | 1 = OTS<br>(green) | 0 = OTS<br>(darkslategray) |
|      | This parameter indicates that the OTS inhibit flag is set and the SM antenna management program is inhibited from using it. |                    |                            |



GCIL

167.	CONFIG	V74X5052E	1 = CMD (green)	0 = PNL (red)
------	--------	-----------	--------------------	------------------

PNL indicates that both GCIL power supplies have either failed or lost power or that an undervoltage condition existed for at least 400 microseconds, causing all hybrid drivers to revert to the panel driver configuration.

168.	PWR	V74X4730E	1 = 1 (green)	0 = -- (red)
------	-----	-----------	------------------	-----------------

1 indicates that the GCIL power supply 1 +13 V dc and unregulated +10 V dc are present and that the power supply is turned on. BLANK indicates that the GCIL power supply is turned off or that the +13 V dc output has an undervolt (<9.9 V dc) or an overvolt (>15 V dc) condition.

169.	PWR	V74X4731E	1 = 2 (green)	0 = -- (red)
------	-----	-----------	------------------	-----------------

2 indicates that the GCIL power supply 2 +13 V dc and unregulated +10 V dc are present and that the power supply is turned on. BLANK indicates that the GCIL power supply is turned off or that the +13 V dc output has an undervolt (<9.9 V dc) or an overvolt (>15 V dc) condition.

170.	PM	V74S3995E	1 = CMD (green)	0 = PNL (red)
------	----	-----------	--------------------	------------------

Indicates the position of the CMD control switch, which provides the command control 28 V dc to transfer control from the panel switch drivers to the uplink command drivers of the S-band PM subsystem.

171.	KU FS	V74X4809E	1 = ENA (green)	0 = DABL (red)
------	-------	-----------	--------------------	-------------------

Indicates the GCIL-only driver status of the Ku fail/safe discrete. This discrete is AND'ed with the S-band PM control switch high discrete to enable the Ku- to S-band fail/safe circuitry.

172.	PL	V74S5600E	1 = CMD (green)	0 = PNL (red)
------	----	-----------	--------------------	------------------

Indicates the position of the CMD control switch, which provides the command control 28 V dc to transfer control from the panel switch drivers to the uplink command drivers of the payload subsystem.

173.	TV	V74S0793E	1 = CMD (green)	0 = PNL (red)
------	----	-----------	--------------------	------------------

Indicates the position of the CMD control switch, which provides the command control 28 V dc to transfer control from the panel switch drivers to the uplink command drivers of the Closed Circuit Television (CCTV) subsystem. It also provides the uplink enable to the Video Control Unit (VCU).











- |      |   |            |                     |                              |
|------|---|------------|---------------------|------------------------------|
| 192. | UPLINK  | V93X5544XY | 1 = ENA<br>(yellow) | 0 = ENA<br>(darkslategray)   |
|      | This parameter indicates that the auto ENA/INHIBIT of uplink processing has been forced to the enable state and all uplink data will be processed regardless of the state of the SM "site-in-view" indicator. |            |                     |                              |
| 193. | UPLINK  | V93X5545XY | 1 = INH<br>(red)    | 0 = INH<br>(darkslategray)   |
|      | This parameter indicates that the uplink process is inhibited and will not process uplink data.   |            |                     |                              |
| 194. | FF1 BYPS  | V91X2242XX | 1 = BCE A<br>(red)  | 0 = BCE A<br>(darkslategray) |
|      | This parameter indicates that MDM FF1 BCE A is bypassed.  |            |                     |                              |
| 195. | FF1 BYPS  | V91X2246XX | 1 = BCE B<br>(red)  | 0 = BCE B<br>(darkslategray) |
|      | This parameter indicates that MDM FF1 BCE B is bypassed.  |            |                     |                              |
| 196. | FF3 BYPS  | V91X2244XX | 1 = BCE A<br>(red)  | 0 = BCE A<br>(darkslategray) |
|      | This parameter indicates that MDM FF3 BCE A is bypassed.  |            |                     |                              |
| 197. | FF3 BYPS  | V91X2248XX | 1 = BCE B<br>(red)  | 0 = BCE B<br>(darkslategray) |
|      | This parameter indicates that MDM FF3 BCE B is bypassed.  |            |                     |                              |
| 198. | SM PL 1   | V92X0323X  | 1 = BYPS<br>(red)   | 0 = OK<br>(green)            |
|      | This parameter indicates that the SM GPC has bypassed the payload MDM (PF 1) and that the SM will not send commands via PF 1.   |            |                     |                              |
| 199. | SM PL 2   | V92X0327X  | 1 = BYPS<br>(red)   | 0 = OK<br>(green)            |
|      | This parameter indicates that the SM GPC has bypassed the payload MDM 2 (PF 2) and that the SM will not send commands via PF 2.   |            |                     |                              |
| 200. | SM SPC  | V92U6105C  | DECIMAL<br>(green)  |                              |
|      | This parameter indicates the number of stored program commands (SPCs) in the SM computer.   |            |                     |                              |
| 201. | SM TEC  | V92J1126C  | DECIMAL<br>(green)  |                              |
|      | This parameter indicates the number of time executed commands (TECs) in the SM computer.  |            |                     |                              |

COMM MANAGEMENT v 1.3	STS XX/XXX	GMT xxx/xx:xx:xx	MET xxx/xx:xx:xx	OI TFL xxx	SM xx
S BAND PM	Ku BAND	NSP/COMSEC	GNC xx	BFS xx	
SIG STRGTH xxx xxx	COMM PWR xx xxx	SELECT x xxx x xxx			
RCVR LOCK xx xx	MODE xxxxx	BITE xxxxx xxxxx			GCIL
PHASE ERR xxx xxx	GNC PTG xxx	BIT SYNC xxx xxx			CONFIG xxx PWR x x
COHERENT xxx xxx	UL SS x	FRM SYNC xxx xxx			PM xxx KU FS xxx
ANT SEL xxx xxx xxxx	TDRS SEL x x	COM SYNC xxx xxx			PL xxx TV xxx
SM CMD xxx	RF POWER x	SOURCE x xx			KU xxx FM xxx
MODE xxx	ANT MODE xxxxx	U/L RATE xx xxx			FM
ELEC x x	SEARCH xxxxx	CODE xx xxx			SIG STRGTH x
BEAM x x	DETECT xxx	D/L RATE xx xxx			DATA MODE xxxxxx
XPNDR SEL x x	TRACK xxx	CODE xx xxx			ANT SEL xxx
RF OUT x x	KU OPER xxxxx	ENCR U/L xxx xxx			MODE xxx
MODE xxxxx	216 SYNC xxx	D/L xxx xxx			SYS SEL x x
FREQ xxx xxxxx	DATA GD xxxxx	RCDR xxx xxx			RF OUT x x
PRE AMP x x	CHANNEL 3 xxxxx	RCDR V xx xxx			CCTV
HEATER x x	CHANNEL 2 xxxxx	BIT ERR RATE x x			D/L SEL xxxxx
xxxx	BETA MODE xxxxxxxx	COMM BIT x x			VCU MN x x TEMP
PWR AMP xxx xxx	ANGLE x	ALARM x x			DWNLINK xxx
TEMP xxx xxx	UHF	RPC A xxx xxx			GAM SEL xxxxxx
RFL xx xx	PA xxx SQL xxx	RPC B xxx xxx			ALC xxxxxx
PA RF OUT xxx xxx	MODE x x x xxx	SM SITE xxxxxx			MENU xxxxxx
SPC TEC	x259 x x296 x	SEL xxx xxxx xxxx			COMMAND
SM x x	279 x 243 x				UPLINK xxxx xxx xxx
RECORDERS		SITE INHIBITS			FF1 BYPS xxxx xxxx
BITE MODE TRK %TP DIR SPD MTN TEMP					FF3 BYPS xxxx xxxx
OPS 1 xxxx xxxx x xxx xxx x xxx xxx xxx					SM PL 1 xxx PL2 xxx
2 xxxx xxxx x xxx xxx x xxx xxx xxx					S-Band PRI xxxx xxxx
P/L xxxx xxxx x xxx xxx x xxx xxx xxx					Ku-Band PRI xxxx xxxx

Figure 5.107-1. COMM MANAGEMENT display

**TITLE**

COMMAND CONFIG V 1.1

**GENERAL**

- A. The data displayed are real-time telemetry parameters affecting the management and operation of the COMMAND system. A copy of the COMMAND CONFIG display is shown in Figure 5.108-1.
- B. Pathname of display: INCO/INCO Displays/COMM Systems/commands.
- C. Detailed display description.

- |    |                    |            |                  |                      |
|----|--------------------|------------|------------------|----------------------|
| 1. | UP-GPC BLOCK (GPC) | V92X6000XX | 1 = GNC<br>(red) | 0 = GNC<br>(dimgray) |
|----|--------------------|------------|------------------|----------------------|

This parameter indicates that uplink software processing is inhibited, as determined by the GNC GPCs. All uplink command capability, RTCs, and loads are inhibited.

- |    |                    |           |                  |                      |
|----|--------------------|-----------|------------------|----------------------|
| 2. | UP-GPC BLOCK (NSP) | V98X4275X | 1 = BFS<br>(red) | 0 = BFS<br>(dimgray) |
|----|--------------------|-----------|------------------|----------------------|

This parameter indicates that uplink software processing is inhibited, as determined by the BFS GPC. All uplink command capability, RTCs, and loads are inhibited.

- |    |                    |            |                  |                      |
|----|--------------------|------------|------------------|----------------------|
| 3. | UP-NSP BLOCK (GPC) | V92X6082XX | 1 = GNC<br>(red) | 0 = GNC<br>(dimgray) |
|----|--------------------|------------|------------------|----------------------|

This parameter indicates that the uplink switch is in the NSP block position. This inhibits the GPC from getting command data from the NSP.

- |    |                    |           |                  |                      |
|----|--------------------|-----------|------------------|----------------------|
| 4. | UP-NSP BLOCK (NSP) | V98X0232X | 1 = BFS<br>(red) | 0 = BFS<br>(dimgray) |
|----|--------------------|-----------|------------------|----------------------|

This parameter indicates that the uplink switch is in the NSP block position. This inhibits the GPC from getting command data from the NSP.

- |    |                 |           |                     |                     |
|----|-----------------|-----------|---------------------|---------------------|
| 5. | TEC BUFFER FULL | V92X1125X | 1 = YES<br>(yellow) | 0 = NO<br>(dimgray) |
|----|-----------------|-----------|---------------------|---------------------|

This parameter indicates that the time execute command (TEC) buffer in SM software contains its maximum number of command loads (25).

- |    |           |           |                     |  |
|----|-----------|-----------|---------------------|--|
| 6. | TEC COUNT | V92J1126C | DECIMAL<br>(yellow) |  |
|----|-----------|-----------|---------------------|--|

This parameter indicates the number of active command loads in the TEC buffer.

- |    |               |            |                     |                    |
|----|---------------|------------|---------------------|--------------------|
| 7. | SPC WORD LOST | V92X6128XY | 1 = YES<br>(yellow) | 0 = NO<br>(yellow) |
|----|---------------|------------|---------------------|--------------------|

This parameter indicates that an SPC destined for the SM SPC buffer has not been accepted by SM software because of a full SPC buffer.



**TITLE**

COMSEC V 1.0

**GENERAL**

A. The data displayed are real-time telemetry parameters affecting the management and operation of the NSP configuration in the secure mode and the communications security (COMSEC) equipment. A copy of the COMSEC display is shown in figure 5.109-1. All parameters are OI.

B. Pathname of the display: INCO/INCO Displays/COMM Systems/comsec.

C. Detailed display description.

- |    |                   |           |                    |                     |
|----|-------------------|-----------|--------------------|---------------------|
| 1. | NSP 1 ENCRYPT RCV | V74X5390E | 1 = RCV<br>(green) | 0 = OFF<br>(yellow) |
|----|-------------------|-----------|--------------------|---------------------|

This parameter indicates that the NSP 1 uplink is in the encrypted mode.

- |    |                    |           |                    |             |
|----|--------------------|-----------|--------------------|-------------|
| 2. | NSP 1 ENCRYPT XMIT | V74X5391E | 1 = XMT<br>(green) | 0 = (blank) |
|----|--------------------|-----------|--------------------|-------------|

This parameter indicates that the NSP 1 downlink is in the encrypted mode.

- |    |                      |           |                    |             |
|----|----------------------|-----------|--------------------|-------------|
| 3. | NSP 1 ENCRYPT RECORD | V74X5392E | 1 = RCD<br>(green) | 0 = (blank) |
|----|----------------------|-----------|--------------------|-------------|

This parameter indicates that the NSP 1 record data are being encrypted.

- |    |                   |           |                    |                     |
|----|-------------------|-----------|--------------------|---------------------|
| 4. | NSP 2 ENCRYPT RCV | V74X5590E | 1 = RCV<br>(green) | 0 = OFF<br>(yellow) |
|----|-------------------|-----------|--------------------|---------------------|

This parameter indicates that the NSP 2 uplink is in the encrypted mode.

- |    |                    |           |                    |             |
|----|--------------------|-----------|--------------------|-------------|
| 5. | NSP 2 ENCRYPT XMIT | V74X5591E | 1 = XMT<br>(green) | 0 = (blank) |
|----|--------------------|-----------|--------------------|-------------|

This parameter indicates that the NSP 2 downlink is in the encrypted mode.

- |    |                      |           |                    |             |
|----|----------------------|-----------|--------------------|-------------|
| 6. | NSP 2 ENCRYPT RECORD | V74X5592E | 1 = RCD<br>(green) | 0 = (blank) |
|----|----------------------|-----------|--------------------|-------------|

This parameter indicates that the NSP 2 record data are being encrypted.

- |    |                      |           |                   |                  |
|----|----------------------|-----------|-------------------|------------------|
| 7. | COMSEC 1 POWER RPC A | V76X3065E | 1 = ON<br>(green) | 0 = OFF<br>(red) |
|----|----------------------|-----------|-------------------|------------------|

This parameter indicates that main A power is being applied to COMSEC 1. (MNA FPC 1)

- |    |                      |           |                   |                  |
|----|----------------------|-----------|-------------------|------------------|
| 8. | COMSEC 2 POWER RPC A | V76X3067E | 1 = ON<br>(green) | 0 = OFF<br>(red) |
|----|----------------------|-----------|-------------------|------------------|

This parameter indicates that main A power is being applied to COMSEC 2. (MNA FPC 1)

9. COMSEC 1 POWER RPC B V76X3066E 1 = ON (green) 0 = OFF (red)

This parameter indicates that main B power is being applied to COMSEC 1. (MNB FPC 2)

10. COMSEC 2 POWER RPC B V76X3068E 1 = ON (green) 0 = OFF (red)

This parameter indicates that main B power is being applied to COMSEC 2. (MNB FPC 2)

11. COMSEC 1 ALARM V74X5017E 1 = ALRM (red) 0 = (blank)

This is the COMSEC 1 alarm condition status indicator. This parameter indicates that the KGX-60 is not operating properly, or there is a failure of the unit or a failure of the memory.

12. COMSEC 2 ALARM V74X5018E 1 = ALRM (red) 0 = (blank)

This is the COMSEC 2 alarm condition status indicator. This parameter indicates that the KGX-60 is not operating properly, or there is a failure of the unit or a failure of the memory.

13. COMSEC 1 XMIT OPER V74X5013E 1 = XMT (green) 0 = OFF (red)

This is the COMSEC 1 transmit full operate status indicator. This parameter indicates that the COMSEC 1 is in the transmit or downlink stage and is fully operable.

14. COMSEC 2 XMIT OPER V74X5014E 1 = XMT (green) 0 = OFF (red)

This is the COMSEC 2 transmit full operate status indicator. This parameter indicates that the COMSEC 2 is in the transmit or downlink stage and is fully operable.

15. COMSEC 1 RCV OPER V74X5015E 1 = RCV (green) 0 = OFF (red)

This is the COMSEC 1 receive full operate status indicator. This parameter indicates that COMSEC 1 is in the receive or uplink stage and is fully operable.

16. COMSEC 2 RCV OPER V74X5016E 1 = RCV (green) 0 = OFF (red)

This is the COMSEC 2 receive full operate status indicator. This parameter indicates that COMSEC 2 is in the receive or uplink stage and is fully operable.

17. COMSEC 1 CVM ZERO V74X5011E 1 = ZERO (red) 0 = (blank)

This is the COMSEC 1 crypto variable memory (CVM) zeroized status indicator. This parameter indicates that the COMSEC CVM has been zeroized or erased and the unit is not operable.





NSP COMSEC v1.0		GMT XXX/XX:XX:XX	
NSP		1	2
ENCRYPT	RCV	XXX	XXX
	XMIT	XXX	XXX
	RECORD	XXX	XXX
COMSEC		1	2
POWER	RPC A	XXX	XXX
	RPC B	XXX	XXX
ALARM		XXXX	XXXX
	XMIT OPER	XXX	XXX
	RCVR OPER	XXX	XXX
	CVM ZERO	XXXX	XXXX
	MASTER BITE	XXXX	XXXX
	FRAME SYNC	XXXX	XXXX
PWR SWITCH		XXX	
ENCRYPT		XXXX	

Figure 5.109-1. NSP COMSEC display

**TITLE**

GNC NSP V 1.0

**GENERAL**

A. The data displayed are real-time telemetry parameters that affect the management and operation of the NSP GNC. A copy of the GNC NSP display is shown in figure 5.110-1.

B. Pathname of display: INCO/INCO Displays/COMM Systems/gnc nsp.

C. Detailed display description.

- |    |             |            |                   |                     |
|----|-------------|------------|-------------------|---------------------|
| 1. | NSP 1 POWER | V92X6097XX | 1 = ON<br>(green) | 0 = OFF<br>(yellow) |
|----|-------------|------------|-------------------|---------------------|

This parameter indicates the associated GCIL panel/command driver's status for this function.

- |    |                     |           |                    |             |
|----|---------------------|-----------|--------------------|-------------|
| 2. | NSP 1 BIT SYNC (OI) | V74X5188E | 1 = BIT<br>(green) | 0 = (blank) |
|----|---------------------|-----------|--------------------|-------------|

BIT indicates that the NSP's bit sync lock detector reached threshold after integrating for  $2^{14}$  symbol times. The bit lock detector threshold changes for each mode, DOD or NASA, decoding ON or OFF.

- |    |                     |           |                    |             |
|----|---------------------|-----------|--------------------|-------------|
| 3. | NSP 1 FRM SYNC (OI) | V74X5176E | 1 = FRM<br>(green) | 0 = (blank) |
|----|---------------------|-----------|--------------------|-------------|

FRM indicates that the NSP had two consecutive frame sync patterns pass the pattern check and will remain locked until three consecutive frame sync patterns fail the pattern check.

The absence of FRM indicates that the NSP frame sync lock logic has detected three consecutive frame sync correlation failures and that NSP forward link data processing is inhibited.

- |    |                 |           |                   |             |
|----|-----------------|-----------|-------------------|-------------|
| 4. | NSP 1 BITE (OI) | V74X5184E | 1 = FAIL<br>(red) | 0 = (blank) |
|----|-----------------|-----------|-------------------|-------------|

FAIL indicates a failure of the forward link voice buffers (bit 6), a failure of the return link voice buffers (bit 7), or an NSP undervoltage condition (bit 9).

- |    |                |            |                  |                   |
|----|----------------|------------|------------------|-------------------|
| 5. | NSP 1 DISC BYP | V91X2900XX | 1 = BYP<br>(red) | 0 = OK<br>(green) |
|----|----------------|------------|------------------|-------------------|

BYP indicates that the GPC has bypassed the NSP power discrete.

- |    |                |            |                  |                   |
|----|----------------|------------|------------------|-------------------|
| 6. | NSP 1 DATA BYP | V91X2902XX | 1 = BYP<br>(red) | 0 = OK<br>(green) |
|----|----------------|------------|------------------|-------------------|

BYP indicates that the GPC has bypassed the NSP SIO data output and is no longer receiving commands, command validity, or NSP status data.

- |    |             |            |                   |                     |
|----|-------------|------------|-------------------|---------------------|
| 7. | NSP 2 POWER | V92X6098XX | 1 = ON<br>(green) | 0 = OFF<br>(yellow) |
|----|-------------|------------|-------------------|---------------------|

This parameter indicates the associated GCIL panel/command driver's status for this function.

- |    |                     |           |                    |             |
|----|---------------------|-----------|--------------------|-------------|
| 8. | NSP 2 BIT SYNC (OI) | V74X5189E | 1 = BIT<br>(green) | 0 = (blank) |
|----|---------------------|-----------|--------------------|-------------|

BIT indicates that the NSP's bit sync lock detector reached threshold after integrating for  $2^{14}$  symbol times. The bit lock detector threshold changes for each mode, DOD or NASA, decoding ON or OFF.

- |    |                     |           |                    |             |
|----|---------------------|-----------|--------------------|-------------|
| 9. | NSP 2 FRM SYNC (OI) | V74X5177E | 1 = FRM<br>(green) | 0 = (blank) |
|----|---------------------|-----------|--------------------|-------------|

FRM indicates that the NSP had two consecutive frame sync patterns pass pattern check and will remain locked until two consecutive frame sync patterns fail the pattern check.

The absence of FRM indicates the NSP frame sync lock logic has detected three consecutive frame sync correlation failures, and the NSP forward link data processing is inhibited.

- |     |                 |           |                   |             |
|-----|-----------------|-----------|-------------------|-------------|
| 10. | NSP 2 BITE (OI) | V74X5185E | 1 = FAIL<br>(red) | 0 = (blank) |
|-----|-----------------|-----------|-------------------|-------------|

FAIL indicates a failure of the forward link voice buffers (bit 6), a failure of the return link voice buffers (bit 7), or an NSP undervoltage condition (bit 9).

- |     |                |            |                  |                   |
|-----|----------------|------------|------------------|-------------------|
| 11. | NSP 2 DISC BYP | V91X2901XX | 1 = BYP<br>(red) | 0 = OK<br>(green) |
|-----|----------------|------------|------------------|-------------------|

BYP indicates that the GPC has bypassed the NSP power discrete.

- |     |                |            |                  |                   |
|-----|----------------|------------|------------------|-------------------|
| 12. | NSP 2 DATA BYP | V91X2903XX | 1 = BYP<br>(red) | 0 = OK<br>(green) |
|-----|----------------|------------|------------------|-------------------|

BYP indicates that the GPC has bypassed the NSP SIO data output and is no longer receiving commands, command validity, or NSP status data.

- |     |            |            |                    |                    |
|-----|------------|------------|--------------------|--------------------|
| 13. | DATA READY | V92X6081XX | 1 = YES<br>(green) | 0 = NO<br>(yellow) |
|-----|------------|------------|--------------------|--------------------|

YES indicates that one command word in the 10-command double buffer has passed:

- BCH DECODER CHECK
- VALID VEHICLE ADDRESS CHECK (any nonzero address)
- BUFFER FILL TIME COMPLETE
- BRACKET DATA STATUS CHECK

NO indicates no commands received or no valid commands received

- |                 |            |                     |                   |
|-----------------|------------|---------------------|-------------------|
| 14. CMD BLOCKED | V92X6082XX | 1 = YES<br>(yellow) | 0 = NO<br>(green) |
|-----------------|------------|---------------------|-------------------|

YES indicates panel C3, UPLINK BLOCK switch, in the BLOCK ALL position and only word 1, the status word, is transmitted. The NSP will not allow the CMD words or word 32, the validity word, to be transmitted.

NO indicates panel C3, UPLINK BLOCK switch, in the CRITICAL or NONE position, or power was lost to the switch.

- |              |            |                     |                     |
|--------------|------------|---------------------|---------------------|
| 15. BIT SYNC | V92X6083XX | 1 = LOSS<br>(green) | 0 = LOCK<br>(green) |
|--------------|------------|---------------------|---------------------|

LOCK indicates that the NSP bit sync threshold detector threshold has been exceeded and the bit sync is in lock. Lock occurs at  $> -5$  DB SNR ( $1 \times 10^{-2}$  BER).

LOSS indicates that the NSP bit sync is out of lock one or more instances of bit synchronization loss.

- |                |            |                     |                     |
|----------------|------------|---------------------|---------------------|
| 16. FRAME SYNC | V92X6084XX | 1 = LOSS<br>(green) | 0 = LOCK<br>(green) |
|----------------|------------|---------------------|---------------------|

LOCK indicates that the NSP frame sync lock logic has detected two consecutive frame sync correlations with three or less frame sync errors.

LOSS indicates that the NSP frame sync lock logic has detected three consecutive frame sync correlation failures and the NSP forward link data processing is inhibited.

- |                  |            |                    |                    |
|------------------|------------|--------------------|--------------------|
| 17. BRACKET DATA | V92X6085XX | 1 = NO<br>(yellow) | 0 = YES<br>(green) |
|------------------|------------|--------------------|--------------------|

YES indicates that the NSP sync lock logic has indicated lock, that it has received two consecutive valid frame sync correlations, and that the data bracketed by the sync correlations are valid.

NO indicates that one or more frame sync correlation failures have occurred and NSP command and Doppler data processing is inhibited.

- |           |            |                   |                   |
|-----------|------------|-------------------|-------------------|
| 18. DEMUX | V92X6086XX | 1 = FAIL<br>(red) | 0 = OK<br>(green) |
|-----------|------------|-------------------|-------------------|

FAIL indicates that a data overflow or underflow condition has been detected in one or both forward voice buffers because of a timing or data transmission error.

OK indicates that both forward link voice buffers are operating properly in HDR or LDR or no signal is present.

- |         |            |                   |                   |
|---------|------------|-------------------|-------------------|
| 19. MUX | V92X6087XX | 1 = FAIL<br>(red) | 0 = OK<br>(green) |
|---------|------------|-------------------|-------------------|

FAIL indicates that a data overflow condition has been detected in one or both return link voice buffers because of a timing or data transmission error.

OK indicates all other conditions.





<b>GNC NSP v1.0</b>		<b>GMT XXX/XX:XX:XX</b>	
<b>NSP 1</b>		<b>BSR</b>	
POWER	XXX	1 DATA READY	XXX
BIT SYNC	XXX	2 CMD BLOCKED	XXX
FRM SYNC	XXX	3 BIT SYNC	XXXX
		4 FRAME SYNC	XXXX
BITE	XXXX		
		5 BRACKET DATA	XXX
DISC BYP	XXX	6 DEMUX (U/L)	XXXX
DATA BYP	XXX	7 MUX (D/L)	XXXX
		8 INTERNAL MODE	XXX
<b>NSP 2</b>			
POWER	XXX	9 SEC POWER	XXXX
BIT SYNC	XXX	10 RCD MODE MUX	XXXX
FRM SYNC	XXX	11 BIT SYNC QUAL	XXXX
		12 BCH VALID	XXX
BITE	XXXX		
		13 BCH INVAL	XXXX
DISC BYP	XXX	14 PARITY EVEN	XXXX
DATA BYP	XXX	15 PARITY ODD	XXX
		16 NSP STATUS	XXXX

Figure 5.110-1. GNC NSP display





- |     |  |           |                      |                              |
|-----|--|-----------|----------------------|------------------------------|
| 8.  | SYSTEM SEL   | V74X2593J | 1 = B<br>(green)     | 0 = A<br>(yellow)            |
|     | Indicates which system is selected. It should always be Ku-band system A.  |           |                      |                              |
| 9.  | LINK MOD   | V74K2641J | 1 = 216<br>(green)   | 0 = 72<br>(yellow)           |
|     | Indicates the bit rate selected on the Ku-band forward link.   |           |                      |                              |
| 10. | SPRD SPECTRUM  | V74K2634J | 1 = OFF<br>(green)   | 0 = ON<br>(yellow)           |
|     | Indicates that the forward link Ku-band receiver has been configured to receive a spread spectrum signal.  |           |                      |                              |
| 11. | ANGLE TRACK  | V74X2603J | 1 = TRACK<br>(green) | 0 = TRACK<br>(darkslategray) |
|     | Indicates that antenna is angle-tracking the forward link signal in comm in GPC and AUTO TRACK antenna steering modes. In the radar mode, it is angle-, angle-rate-, range-, and range-rate-tracking in GPC and AUTO TRACK antenna steering modes or range- and range-rate-tracking in GPC DESIG and MANUAL SLEW antenna steering modes. |           |                      |                              |
| 12. | FRAME SYNC   | V74X2612J | 1 = LOCK<br>(green)  | 0 = NO LK<br>(yellow)        |
|     | Indicates that the comm signal processor has acquired bit and frame synchronization of the forward link 216-kbps signal.   |           |                      |                              |
| 13. | DATA GOOD  | V74X2613J | 1 = GOOD<br>(green)  | 0 = (blank)<br>(yellow)      |
|     | Indicates comm carrier detected (costas lock), modulation detected (data on the carrier), and if operating in the spread spectrum mode, PN lock.   |           |                      |                              |
| 14. | RETURN MOD   | V74K2638J | 1 = CMD<br>(green)   | 0 = AUTO<br>(yellow)         |
|     | Indicates that the return link modulation is controlled by command (on/off) or automatically, depending on the antenna steering mode and the acquisition mode. Modulation will be on in GPC DESIG and MANUAL SLEW or when tracking TDRS in GPC or AUTO TRACK.  |           |                      |                              |
| 15. | MOD COMMAND  | V74K2637J | 1 = ON<br>(green)    | 0 = OFF<br>(yellow)          |
|     | If modulation ON is commanded, the return link carrier with modulation on will be enabled for all antenna steering modes. If modulation is commanded OFF, then return link modulation will be disabled for all antenna steering modes.   |           |                      |                              |



**LDR (CH 2)**

- |     |                       |           |                    |                            |
|-----|-----------------------|-----------|--------------------|----------------------------|
| 22. | OPS<br>(LDR OPS RCDR) | V74X4838E | 1 = OPS<br>(green) | 0 = OPS<br>(darkslategray) |
|-----|-----------------------|-----------|--------------------|----------------------------|

Indicates that the DPS recorder has been selected as the input to the FM/PM LDR channel. This parameter indicates the associated GCIL panel/command driver status for this function.

- |     |                      |           |                    |                            |
|-----|----------------------|-----------|--------------------|----------------------------|
| 23. | P/L<br>(LDR PL RCDR) | V74X4837E | 1 = P/L<br>(green) | 0 = P/L<br>(darkslategray) |
|-----|----------------------|-----------|--------------------|----------------------------|

Indicates that the payload recorder has been selected as the input to the FM/PM LDR channel. This parameter indicates the associated GCIL panel/command driver status for this function.

- |     |                          |           |                     |                             |
|-----|--------------------------|-----------|---------------------|-----------------------------|
| 24. | DIGI<br>(LDR PL DIGITAL) | V74X4839E | 1 = DIGI<br>(green) | 0 = DIGI<br>(darkslategray) |
|-----|--------------------------|-----------|---------------------|-----------------------------|

Indicates that payload digital data has been selected as the input to the FM/PM LDR channel. This parameter indicates the associated GCIL panel/command driver status for this function.

- |     |                        |           |                     |                      |
|-----|------------------------|-----------|---------------------|----------------------|
| 25. | INTG<br>(LDT PL INTGR) | V74X4836E | 1 = INTG<br>(green) | 0 = INTG<br>(yellow) |
|-----|------------------------|-----------|---------------------|----------------------|

Indicates that the payload interrogator output has been selected as the input to the FM/PM LDR channel. This parameter indicates the associated GCIL panel/command driver status for this function.

- |     |        |           |                           |  |
|-----|--------|-----------|---------------------------|--|
| 26. | ACT AZ | V74H2618J | FLOATING POINT<br>(green) |  |
|-----|--------|-----------|---------------------------|--|

Actual azimuth pointing angle of the antenna.

- |     |        |           |                           |  |
|-----|--------|-----------|---------------------------|--|
| 27. | ACT EL | V74H2619J | FLOATING POINT<br>(green) |  |
|-----|--------|-----------|---------------------------|--|

Actual elevation pointing angle of the antenna.

- |     |          |           |                           |  |
|-----|----------|-----------|---------------------------|--|
| 28. | DESIG AZ | V74H2648J | FLOATING POINT<br>(green) |  |
|-----|----------|-----------|---------------------------|--|

SM GPC antenna-management-designated (computed) azimuth pointing angle of the antenna.

- |     |          |           |                           |  |
|-----|----------|-----------|---------------------------|--|
| 29. | DESIG EL | V74H2650J | FLOATING POINT<br>(green) |  |
|-----|----------|-----------|---------------------------|--|

SM GPC antenna-management-designated (computed) elevation pointing angle of the antenna.

30. ACT TDRS SEL

a) WEST	V74X2609J	1 = WEST (green)	0 = (blank) (yellow)
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Indicates that the Ku antenna is tracking the TDRS west satellite.

b) EAST	V74X2610J	1 = EAST (green)	0 = (blank) (yellow)
---------	-----------	---------------------	-------------------------

Indicates that the Ku antenna is tracking the TDRS east satellite.

31. Ku Band PRI

WEST	V93X5603X	1 = WEST (green)	0 = (blank) (yellow)
------	-----------	---------------------	-------------------------

This is a comp that indicates that the SM ANT MGMT program is providing Ku-band look angles to the western satellite.

EAST	V93X5605X	1 = EAST (yellow)	0 = (blank) (green)
------	-----------	----------------------	------------------------

This is a comp that indicates that the SM ANT MGMT program is providing Ku-band look angles to the eastern satellite.

32. ALPHA GMBL	V92H0098C	FLOATING POINT (green)	
----------------	-----------	---------------------------	--

Indicates the alpha gimble.

33. BETA GMBL	V92H0099C	FLOATING POINT (green)	
---------------	-----------	---------------------------	--

Indicates the beta gimble.

34. BETA FLAGS

a) BETA Stop Flag	V92X0104X	1 = STOP (yellow)	0 = STOP (darkslategray)
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A logic 1 indicates that the Ku antenna line of sight has entered the Beta stop protected zone. The positive Beta stop zone is at 74.5° and the negative stop zone is at -83.5°. If the line of sight exits this zone in less than 4 minutes, the stop flag will reset to a logic 0. If it remains in the zone for longer than 4 minutes, the stop flag will also be reset to a logic 0.

b) BETA Limit Flag	V92X0993X	1 = LIMIT (red)	0 = LIMIT (darkslategray)
--------------------	-----------	--------------------	------------------------------

A logic 1 indicates that the line of sight has remained in the Beta stop protected zone for more than 4 minutes. The limit flag will be reset to 0 when the line of sight exits the protected zone.