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 SIRU UTILIZATION
 VOLUME II
 SOFTWARE DESCRIPTION AND PROGRAM DOCUMENTATION
 by
 John Gehris and Roy Whittredge
 June 1973

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**CHARLES STARK DRAPER
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CAMBRIDGE, MASSACHUSETTS, 02139

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John Oehrle
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The SIRU System's success in its present state of hardware, software, and analytical maturity represents the dedicated efforts of many people from the NASA L.B. Johnson Space Center and The Draper Laboratory to synthesize, design, fabricate and test a redundant, body mounted inertial system employing state-of-the-art redundancy management techniques.

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This publication does not constitute approval by the National Aeronautics and Space Administration of the findings or the conclusions contained therein. It is published only for the exchange and stimulation of ideas.

R-747
SIRU UTILIZATION REPORT

ABSTRACT

This report presents a complete description of the additional analysis, development and evaluation provided for the SIRU system as identified in the requirements for the SIRU Utilization program set forth in Amendment 7S of NASA/Johnson Space Center Contract NAS 9-8242.

The SIRU configuration is a modular inertial subsystem with hardware and software features that achieve fault tolerant operational capabilities. The SIRU redundant hardware design is formulated about a six gyro and six accelerometer instrument module package. The modules are mounted in this package so that their measurement input axes form a unique symmetrical pattern that corresponds to the array of perpendiculars to the faces of a regular dodecahedron. This six axes array provides redundant independent sensing and the symmetry enables the formulation of an optimal software redundant data processing structure with self-contained fault detection and isolation (FDI) capabilities.

The SIRU Utilization program consisted of additional analytical and developmental effort in these four specific areas:

1. Failure Detection, Isolation, Classification and Recompensation (FDICR).
2. Error Source Propagation Characteristics.
3. Single Position Self Calibration.
4. Self Alignment System (Gyro Compassing).
5. Local Level Navigation Performance Demonstrations.

The theory, analysis, development description, software integration and performance evaluation of each of these advanced adjuncts comprised the SIRU Utilization program.

This report consists of three volumes.

Volume I, Theory, Development and Test Evaluations contains a complete description of the theory, analysis, implementation and test results for each of the tasks.

Volume I also contains a review of the reliability performance statistics, possible future applications for the developed techniques and conclusions and recommendations.

Volume II, Software Documentation, provides documentation of the additional software and software modifications required to implement the Utilization capabilities including assembly listings and flowcharts.

Volume III, contains the system-log of significant events from the beginning of the system testing program until it was completed in December, 1972.

A companion to this report, SIRU Development Final Report R-746, has been issued documenting the design, development and evaluation of the basic SIRU system.

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1.0 Introduction

This volume describes the software developed for the SIRU Utilization project. Two principal programs and their subroutines are documented, the single position calibration program and the End-to-End program which includes coarse and fine alignment, navigation and statistical failure detection, isolation, classification and recertification.

Included in the documentation for each program and subroutine is a brief functional description, a listing, where necessary a flow chart, and the machine time and memory requirements. A load map is provided showing the location of each program as it resides in core for all but four programs. These four programs, SPUF, AA5F, VELF and MLPF, for reasons explained below, reside in the upper 8K of DDP516 core memory.

The SIRU test facility DDP 516 computer has 16,000 words of core memory. The upper 8,000 words (8K) of memory are set aside for use by the utility programs including the loader program. Since the total memory requirement of the SIRU software plus overhead routines is approximately 9580 words it was necessary to put some programs in the upper 8K of memory. This was accomplished by first loading the selected programs into the lower 8K of memory from the disk operating system, transferring instruction by instruction into locations '20000 to '23560, modifying in memory access mode to change all address constants and saving as a run version called FXMR (fixed memory). These programs therefore do not show up on the load map. To call these subroutines, the main program uses a JST (jump store) in place of the normal CALL.

1.1 End to End Program

The End-to-End program is described in the write up for its main program ALUP. In order to explain the timing and scheduling of tasks, the

End-to-End program is divided into three sections P, G and F (ref. write-up for ALUP). These sections also divide the End-to-End program functionally into the following tasks.

<u>Section</u>	<u>Function</u>	<u>Associated Program</u>	<u>Page</u>
P	1. Read the six accelerometer up-down pulse counters	RE50	93
	2. Compensate for accelerometer SF, bias and misalignment	ACOM	98
	3. Do bias recompensation (statistical)	PDIS	237
	4. Normalize for $R\omega^2$ and $R\dot{\omega}$ effects	ROM5	263
	5. Accumulate pulses for FDI (failure detection and isolation)	PPUA	189
	6. Check for FDI	ERCA	249
	7. Do least squares matrix multiplying	MLPF	45
	8. Normalize quaternion	SPUF	12
	9. Perform the velocity algorithm transforming body ΔV to inertial ΔV	VELF	35
	10. Accumulate inertial ΔV	VACU	112

<u>Section</u>	<u>Function</u>	<u>Associated Program</u>	<u>Page</u>
G	1. Read the table angle encoder	part of ALUP	61
	2. Read the six gyro up-down counters and interpolators	RE5O	93
	3. Compensate for gyro SF BD, ADIA, ADOA, ADSRA, anisoelectricity, misalignments and OA coupling	GCOM DC5O	103 234
	4. Do ramp recompensation	COMP	209
	5. Do bias recompensation	COMP	209
	6. Accumulate pulses for FDI and FDICR	GPUA	220
	7. Do FDI	ERCA	249
	8. Do least squares matrix multiply	MLPF	45
	9. If $T > 260$, do inertial rate compensation	VELF	35
	10. If $T = 60$, do coarse alignment level calculation	LVCA	230
	11. If $60 < T < 260$ do coarse alignment $\Sigma \Delta V$ filter	SVFL	169
	12. If $T = 260$, set $\Sigma \Delta V = 0$, set coarse alignment finish bit =1 and do coarse alignment azimuth calculation	AZCA	223

<u>Section</u>	<u>Function</u>	<u>Associated Program</u>	<u>Page</u>
	13. If $60 < T \neq 260$ do attitude algorithm	AA5F	21
	14. Update time counters	part of ALUP	61
F	1. Do fine alignment after coarse alignment is finished	MAL6	203
	2. Do navigation (to enter navigation mode sense switch 2 on DDP516 control panel must be set)	NVIG	174
	3. If output bit is set (if time is multiple of 2 minutes) and register set 1 is restored (fine alignment or navigation update is finished) do the gyro and accelerometer statistical failure programs and start the output of system status	STFL, PDIS FNOP	119 237 75

Routines not specifically identified by task in sections P, G and F are

FNOP			15
FPOUTC	Output routines		114
STFL			119
DTIS	Statistical fail detection routines		160
IDEN	which operate every two minutes		159
STVR			191
DSQR	Square root	Math	166
SINX	sine/cos	subroutines	199
BTVR	Fail insertion test routine		272

1.2 Single Position Calibration

The single position calibration program runs in conjunction with the fine alignment program and functionally works as follows. For the first twenty minutes, only fine alignment is running at a rate of once per second. At twenty minutes the vertical axis filter (DZNC) starts and filters the one second intervals of $\Sigma(\Delta\theta_{XB} - \Delta\theta_{XCMD})$ from GDAC. Thirty minutes are allowed for the filter to settle out, at which point DZNC starts summing the filtered vertical axis drift while GDA C starts summing the six gyro $\Delta\theta$'s. Twenty minutes later (80 minutes into the run) VCMP and LGDC perform the final calculation yielding estimated A, B, C and D gyro drifts (ADFT, BDFT, CDFT and DDFT) which are then printed out.

The loaded version of the single position calibration program as shown on the load map utilizes eighteen of the subroutines documented in Volume III of the SIRU Development Final Report. Four additional programs were generated to accomplish the single position calibration function. These programs are

<u>Function</u>	<u>Associated Program</u>	
1. Controlling executive	SPM2	278
2. Output subroutines	SPCO	287
3. Fine Align program	SPAL	292
4. Vertical axes drift filter, accumulator of vertical axis drift and gyro pulses	PEP4	298

1.3 Memory and Timing

1.3.1 End to End Program

The following Table (1.1) lists each routine, its memory requirement, in octal and decimal, and the estimated machine time required for those programs and subroutines which are exercised during each update cycle (0.02 seconds for the End-to-End program running at 50 updates per second).

Total memory requirements, including the Fortran Library (182) and the Base Sector (512) plus the total of 8546 shown in Table 1.1 is 9240 words. The actual loaded End-to-End program utilizes the first 23560 locations in core (decimal 9776).

The timing estimate of 8884 μ secs is considered accurate to within 5%.

The routines not timed in the table operate at update rates of once per second or once every two minutes and therefore are not critical in the evaluation of machine time requirements. For example, during Navigation (the computer's busiest mode) the additional untimed programs raise the percentage of computer time utilized from the 44.4% to a conservative 44.7%.

1.3.2 Single Position Calibration

Table 1.2 lists each routine, its memory requirement, in octal and decimal, and the estimated machine time for each routine. The single position calibration program runs at 100 updates per second (i. e. .01 second per update cycle).

Total memory requirements including the Fortran Library (586) and the Base Sector (512) plus the total of 3731 shown in table 1.2 is 4829 words.

The present demonstration program operating at 100 updates per second takes 70% of the machine time. A conservative estimate for the single position

calibration when integrated with the End-to-End program is 46% of the machine time. This will not alter the 44.7% machine time required by the End-to-End program when operating in alternate modes.

TABLE 1.1 END-TO-END MEMORY AND TIMING

SOURCE	MEMORY		SOURCE OR SUBROUTINE	TIMING	
	OCTAL	DECIMAL		CYCLES	μSEC
MLPF	1560	880	PIPR	631	605.8*
			GYPR	661	634.6*
VELF	712	458	VELA	979	939.8
			IRCO	468	449.3
AA5F	424	276		855	820.8
SPUF	257	175		488	468.5
ERCA	1222	658	PFDI	1052	1009.9*
			GFDI	1069	1026.2*
ROM5	366	246		523	502.1
BTVR	203	131			
SINX	165	117			
MAL6	257	175			
DSQR	146	98			
PPUA	33	27		108	103.4
AZCA	425	277			
GPUA	56	46		148	142.1
LVCA	147	103			
SVFL	151	105			
DC50	127	87		177	169.9
PDIS	774	508	PRBI	59	56.6*
ALUP	777	511	(ACC'S)	79	75.8
			(GYRO'S)	149	143.0*
FNOP	1273	699			
RE50	224	148	INPIP	43	41.3
			INGYRO	105	100.8
GCOM	463	307		959	920.6
ACOM	201	129		426	409.0
VACU	50	40		97	93.1
FPOUTC	242	162			
STFL	1025	533			
DTIS	667	439			
IDEN	311	201			
COMP	465	309	GRMP	119	114.2
			GRBI	59	56.6*
LNAV	771	505			
STVR	304	196			
TOTALS		8546		9254	8884

* indicates worst case

TABLE 1.2 SINGLE POSITION CALIBRATION
MEMORY AND TIMING

SOURCE	MEMORY		TIMING	
	OCTAL	DECIMAL	CYCLES	μSEC
SPM2	604	388	228	219
SPCO	217	143		
SPAL	362	242		
PEP4/GDAC	547	359	136	131
READ	210	136	148	142
GCOM	463	307	959	921
ACOM	201	129	426	409
VACU	50	40	97	93
SPUN	257	175	488	468
AA6S	424	276	855	821
VESP	517	335	979	940
DCOA	127	87	177	170
DCMT	164	116	146	140
ERC6	104	68	191	183
EMIN	42	34	16	15
GMIN	42	34	16	15
GPMA	524	340	920	883
SFPOUT	242	162		
SXOU	63	51		
SDGS	145	101		
MG63	173	123	804	772
MV63	125	85	740	710
TOTALS		3731	7326	7032

END-TO-END PROGRAM LOAD MAP

ATTACH ITSTAT
 OK
 DEBUG
 GO

 \$Z 300 777
 \$D 310
 000310 000000
 \$4
 000311 000000
 \$07630
 000312 000000
 \$D 314
 000314 000000
 \$4
 000315 000000
 \$41210
 000316 000000
 \$5
 LDRX 23665 1000 64
 GO
 MN
 I BALUP
 MR
 C BFNOP
 MR
 C BRE50
 MR
 C BACOM
 MR
 C BGC0M
 MR
 C BVACU
 MR
 C BFPOUT
 MR
 C FILIBY
 MR
 C BSTFL
 MR
 C BDIIS
 MR
 C BIDEN
 MR
 C BDSQR
 MR
 C BSVFL
 MR
 C BNVIQ

MR
 C BPPUA
 MR
 C BSTVR
 MR
 C BSINX
 MR
 C BMAL6
 MR
 C BCOMP
 MR
 C BGPUA
 MR
 C BAZCA
 MR
 C BLVCA
 MR
 C BDC50
 MR
 C BPDIS
 MR
 C BERCA
 MR
 C BR0M5
 MR
 C BBTVR
 LC
 M
 *START 01000
 *HIGH 17034
 *NAMES 17151
 *COMN 23777
 *BASE 15411
 *BASE 16551
 *BASE 01760
 *BASE 00272
 LIST 00001
 RUPT 01340
 MODE 01721
 OUTPUT 02000
 ICINIT 03274
 INPIP 03347
 INGYRO 03410
 ACOM 03522
 GCOM 03724
 VACU 04410
 FPOUTC 04462
 OUT100 04674
 SQRTX 04726

↓
 (A)

(A)

FSAT 04726
ARG\$ 05010
TI CU 05061
INOUA 05104
INOU 05111
TOOCT 05161
STFL 05214
DTIS 06242
ZEIN 06666
ETA 06716
ZETA 06732
IDEN 07132
IDMV 07325
IDIN 07345
IPL2 07420
DSQR 07444
SVFL 07614
S1 07752
S2 07754
S3 07756
S4 07760
LNAV 07766
LAMB 10666
OMGA 10670
H 10672
VR 10700
VN 10702
VE 10704
PPAC 10770
STVR 11024
ZBTA 11232
COSX 11332
SINX 11351
FALN 11520
COMP 12000
CMIN 12216
CMMV 12232
STRP 12252
B 12326
BP2 12330
PLCD 12356
PCP2 12360
GRBI 12371
GRMP 12436
GPAC 12466
AZCA 12546
LVCA 13174
DCOA 13344
AOAP 13452

BOAP 13454
COAP 13456
DOAP 13460
EOAP 13462
FOAP 13464
PSFI 14000
PRBI 14740
ROMS 15000
WXPR 15333
WYPR 15334
WZPR 15335
GFDI 15450
PFDI 15544
BBOT 16630
23777

LC

ATTACH OHRLE
OK
RESTOR FXMR
OK
ATTACH ITSTAT
OK
SAVE RALUP 64 23560 1000
OK

PROGRAM NAME
 SOURCE: SPUF
 BINARY: BSPUF
 ENTRY POINTS (location): SPUN ('20500)
 GENERAL DESCRIPTION:

This subroutine when called will correct the quaternion in order to maintain it as a unit quaternion. It imposes the constraint that

$$\lambda^2 + \rho_x^2 + \rho_y^2 + \rho_z^2 = 1.$$

Ideally the equations to be implemented would be

$$\begin{aligned}\lambda' &= \lambda d \\ \rho_x' &= \rho_x d \\ \rho_y' &= \rho_y d \\ \rho_z' &= \rho_z d\end{aligned}$$

where

$$d = \frac{1}{\sqrt{\lambda^2 + \rho_x^2 + \rho_y^2 + \rho_z^2}}$$

However, since the sum of the squares of the elements of the quaternion never deviates significantly from 1, we can simplify as follows:

$$\epsilon = \lambda^2 + \rho_x^2 + \rho_y^2 + \rho_z^2 - 1$$

or

$$\lambda^2 + \rho_x^2 + \rho_y^2 + \rho_z^2 = 1 + \epsilon$$

$$\sqrt{\lambda^2 + \rho_x^2 + \rho_y^2 + \rho_z^2} = \sqrt{1 + \epsilon} \approx 1 + \frac{\epsilon}{2}$$

$$d \approx \frac{1}{1 + \frac{\epsilon}{2}} \approx 1 - \frac{\epsilon}{2}$$

so

$$\lambda' \approx \lambda(1 - \frac{\epsilon}{2})$$

$$\rho_x' \approx \rho_x(1 - \frac{\epsilon}{2})$$

$$\rho_y' \approx \rho_y(1 - \frac{\epsilon}{2})$$

$$\rho_z' \approx \rho_z(1 - \frac{\epsilon}{2})$$

Using the scaling and terminology for the quaternion described in the program AA5F

$$(i.e., L = \frac{\lambda}{2}, RX = \frac{\rho_x}{2}, RY = \frac{\rho_y}{2} \text{ and } RZ = \frac{\rho_z}{2})$$

we derive the new constraint that

$$L^2 + RX^2 + RY^2 + RZ^2 \text{ equal } 1/4$$

$$L' = L D$$

$$RX' = RX D$$

$$RY' = RY D$$

$$RZ' = RZ D$$

where

$$D = \frac{1}{2\sqrt{L^2 + RX^2 + RY^2 + RZ^2}}$$

$$E = L^2 + RX^2 + RY^2 + RZ^2 - \frac{1}{4}$$

$$L^2 + RX^2 + RY^2 + RZ^2 = \frac{1}{4} + E$$

$$\sqrt{L^2 + RY^2 + RY^2 + RZ^2} = \sqrt{\frac{1}{4} + E} \approx \frac{1}{2} + E$$

$$D \approx \frac{1}{1 + 2E} \approx 1 - 2E$$

so

$$L' = L (1 - 2E)$$

$$RX' = RX (1 - 2E)$$

$$RY' = RY (1 - 2E)$$

$$RZ' = RZ (1 - 2E)$$

or

$$\begin{aligned}\Delta L &= -2E L \\ \Delta RX &= -2E RX \\ \Delta RY &= -2E RY \\ \Delta RZ &= -2E RZ\end{aligned}$$

Now expand the ΔL term (the ΔRX , ΔRY and ΔRZ terms are analogous).
Since ΔL is very small we shall really calculate

$$2^{24}\Delta L = -2^{25}E L.$$

define FACT = $-2^{25}E$. Then

$$\Delta L = \frac{\text{FACT } L}{2^{24}}$$

since

$$L = L1 + \frac{L2}{2^{15}} + \frac{L3}{2^{30}}$$

then

$$\Delta L = \frac{\text{FACT } L1}{2^{24}} + \frac{\text{FACT } L2}{2^{39}} + \frac{\text{FACT } L3}{2^{54}}$$

and we need only calculate

$$\Delta L = \frac{\text{FACT } L1}{2^{24}}$$

repeating we have

$$E = L^2 + RX^2 + RY^2 + RZ^2 - 1/4$$

and

$$L^2 = L1^2 + \frac{L2^2}{2^{30}} + \frac{L3^2}{2^{60}} + \frac{L1 L2}{2^{14}} + \frac{L1 L3}{2^{29}} + \frac{L2 L3}{2^{44}}$$

$$RX^2 = RX1^2 + \frac{RX2^2}{2^{30}} + \frac{RX3^2}{2^{60}} + \frac{RX1 RX2}{2^{14}} + \frac{RX1 RX3}{2^{29}} + \frac{RX2 RX3}{2^{44}}$$

$$RY^2 = \dots$$

$$RZ^2 = \dots$$

substituting and gathering terms we get

$$\begin{aligned}
 E = & L_1^2 + RX_1^2 + RY_1^2 + RZ_1^2 \\
 & + \frac{L_2^2 + RX_2^2 + RY_2^2 + RZ_2^2}{2^{30}} + \frac{L_3^2 + RX_3^2 + RY_3^2 + RZ_3^2}{2^{60}} \\
 & + \frac{L_1 L_2 + RX_1 RX_2 + RY_1 RY_2 + RZ_1 RZ_2}{2^{14}} \\
 & + \frac{L_1 L_3 + RX_1 RX_3 + RY_1 RY_3 + RZ_1 RZ_3}{2^{29}} \\
 & + \frac{L_2 L_3 + RX_2 RX_3 + RY_2 RY_3 + RZ_2 RZ_3}{2^{44}} - \frac{1}{4}
 \end{aligned}$$

We now want to calculate

$$FACT = -2^{25}E$$

Since FACT has only 15 bits of significance, all terms contributing to E with denominators greater than 2^{40} can be ignored. This eliminates the terms

$$\frac{L_3^2 \dots}{2^{60}} \text{ and } \frac{L_2 L_3 \dots}{2^{44}}$$

The flow chart for the implementation on the DDP516 of the above derivation follows.

SPUN

$$\text{SUMM} = \frac{L2^2 + RX2^2 + RY2^2 + RZ2^2}{8} + \frac{L1L3 + RX1RX3 + RY1RY3 + RZ1RZ3}{4}$$

$$\text{SUMM} = \frac{(\text{SUMM})}{2^{15}}$$

$$\text{SUMM} = \text{SUMM} + \frac{(L1L2 + RX1RX2 + RY1RY2 + RZ1RZ2)}{4}$$

$$\text{SUMM} + \frac{(\text{THRD})}{2^{15}} = \frac{(\text{SUMM})}{2^{12}}$$

$$\text{SUMM} = \text{SUMM} + L1^2 + RX1^2 + RY1^2 + RZ1^2$$

$$A, B = \text{SUMM} - \frac{1}{4}$$

(Double Precision Accumulator)

A, B = A, B 2^{15}
 (At this point A, B is either 0, 0
 or 177777, so IAB, CRA is same as 2^{15})

$$A, B = A, B + \text{THRD}$$

$$\text{FACT} = -2^{10} (A, B)$$

$$L = I + \frac{(\text{FACT} \text{ RX1})}{2^{24}}$$

$$\text{RY} = \text{RY} + \frac{(\text{FACT} \text{ RY1})}{2^{24}}$$

$$\text{RZ} = \text{RZ} + \frac{(\text{FACT} \text{ RZ1})}{2^{24}}$$

EXIT

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0001					ABS	
0002					ORG	*20500
0003					SUB ^o	SPUN
0004	20500	0 000000	SPUN	DAC	**	
0005	20501	0 02 00461		LDA	L2	
0006	20502	000007		DBL		
0007	20503	0 16 00461		MPY	L2	
0008	20504	0401 77		LRS	1	
0009	20505	0 04 20744		DST	OVFP	
0010	20506	0 02 00462		DLD	L3	
0011	20507	000201		IAB		
0012	20510	0 07 20754		DSB	FUDG	
0013	20511	0 16 00460		MPY	L1	
0014	20512	0 06 20744		DAD	OVFP	
0015	20513	0401 76		LRS	2	
0016	20514	0 04 20742		DST	SUMM	
0017	20515	0 02 00464		DLD	RX1	
0018	20516	000201		IAB		
0019	20517	0 16 00465		MPY	RX2	
0020	20520	0401 77		LRS	1	
0021	20521	0 04 20744		DST	OVFP	
0022	20522	0 02 00466		DLD	RX3	
0023	20523	000201		IAB		
0024	20524	0 07 20754		DSB	FUDG	
0025	20525	0 16 00464		MPY	RX1	
0026	20526	0 06 20744		DAD	OVFP	
0027	20527	0401 76		LRS	2	
0028	20530	0 06 20742		DAD	SUMM	
0029	20531	0 04 20742		DST	SUMM	
0030	20532	0 02 00470		DLD	RY1	
0031	20533	000201		IAB		
0032	20534	0 16 00471		MPY	RY2	
0033	20535	0401 77		LRS	1	
0034	20536	0 04 20744		DST	OVFP	
0035	20537	0 02 00472		DLD	RY3	
0036	20540	000201		IAB		
0037	20541	0 07 20754		DSB	FUDG	
0038	20542	0 16 00470		MPY	RY1	
0039	20543	0 06 20744		DAD	OVFP	
0040	20544	0401 76		LRS	2	
0041	20545	0 06 20742		DAD	SUMM	
0042	20546	0 04 20742		DST	SUMM	
0043	20547	0 02 00474		DLD	RZ1	
0044	20550	000201		IAB		
0045	20551	0 16 00475		MPY	RZ2	
0046	20552	0401 77		LRS	1	
0047	20553	0 04 20744		DST	OVFP	
0048	20554	0 02 00476		DLD	RZ3	
0049	20555	000201		IAB		
0050	20556	0 07 20754		DSB	FUDG	
0051	20557	0 16 00474		MPY	RZ1	
0052	20560	0 06 20744		DAD	OVFP	
0053	20561	0401 76		LRS	2	
0054	20562	0 06 20742		DAD	SUMM	
0055	20563	0401 61		LRS	15	
0056	20564	0 04 20742		DST	SUMM	
0057	20565	0 02 00460		DLD	L1	

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0059	20566	0 16	00461	MPY	L2
0059	20567	0 04	20744	DST	OVFP
0060	20570	0 02	00464	DLD	RX1
0061	20571	0 16	00465	MPY	RX2
0062	20572	0 06	20744	DAD	OVFP
0063	20573	0 04	20744	DST	OVFP
0064	20574	0 02	00470	DLD	PY1
0065	20575	0 16	00471	MPY	RY2
0066	20576	0 06	20744	DAD	OVFP
0067	20577	0 04	20744	DST	OVFP
0068	20600	0 02	00474	DLD	PZ1
0069	20601	0 16	00475	MPY	RZ2
0070	20602	0 06	20744	DAD	OVFP
0071	20603	0401	76	LRS	2
0072	20604	0 06	20742	DAD	SUMM
0073	20605	0 04	20742	DST	SUMM
0074	20606	0411	75	LLS	3
0075	20607	140040		CRA	
0076	20610	0 04	20752	DST	THRD
0077	20611	0 02	20742	DLD	SUMM
0078	20612	0401	64	LRS	12
0079	20613	0 04	20742	DST	SUMM
0080	20614	0 02	00460	DLD	L1
0081	20615	0 16	00460	MPY	L1
0082	20616	0 06	20742	DAD	SUMM
0083	20617	0 04	20742	DST	SUMM
0084	20620	0 02	00464	DLD	RX1
0085	20621	0 16	00464	MPY	RX1
0086	20622	0 06	20742	DAD	SUMM
0087	20623	0 04	20742	DST	SUMM
0088	20624	0 02	00470	DLD	PY1
0089	20625	0 16	00470	MPY	RY1
0090	20626	0 06	20742	DAD	SUMM
0091	20627	0 04	20742	DST	SUMM
0092	20630	0 02	00474	DLD	RZ1
0093	20631	0 16	00474	MPY	RZ1
0094	20632	0 06	20742	DAD	SUMM
0095	20633	0 07	20750	DSB	TWNZ
0096	20634	000201		IAB	
0097	20635	140040		CRA	
0098	20636	000201		IAB	
0099	20637	0 06	20752	DAD	THPD
0100	20640	0411	66	LLS	10
0101	20641	0 06	20756	DAD	HALF
0102	20642	140407		TCA	
0103	20643	0 04	20746	DST	FACT
0104	20644	0 16	00460	MPY	L1
0105	20645	0 06	20756	DAD	HALF
0106	20646	000201		IAB	
0107	20647	140040		CRA	
0108	20650	000201		IAB	
0109	20651	0401	67	LRS	9
0110	20652	0 06	00462	DAD	L3
0111	20653	0 04	20744	DST	OVFP
0112	20654	140040		CRA	
0113	20655	0 04	00462	DST	L3
0114	20656	0 02	20744	DLD	OVFP

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0115	20657	0401 61	LRS	15
0116	20660	0 06 00460	DAD	L1
0117	20661	0 04 00460	DST	L1
0118	20662	0 02 00464	DLD	RX1
0119	20663	0 16 20746	MPY	FACT
0120	20664	0 06 20756	DAD	HALF
0121	20665	000201	IAB	
0122	20666	140040	CRA	
0123	20667	000201	IAB	
0124	20670	0401 67	LRS	9
0125	20671	0 06 00466	DAD	RX3
0126	20672	0 04 20744	DST	OVFP
0127	20673	140040	CRA	
0128	20674	0 04 00466	DST	RX3
0129	20675	0 02 20744	DLD	OVFP
0130	20676	0401 61	LRS	15
0131	20677	0 06 00464	DAD	RX1
0132	20700	0 04 00464	DST	RX1
0133	20701	0 02 00470	DLD	RY1
0134	20702	0 16 20746	MPY	FACT
0135	20703	0 06 20756	DAD	HALF
0136	20704	000201	IAB	
0137	20705	140040	CRA	
0138	20706	000201	IAB	
0139	20707	0401 67	LRS	9
0140	20710	0 06 00472	DAD	RY3
0141	20711	0 04 20744	DST	OVFP
0142	20712	140040	CRA	
0143	20713	0 04 00472	DST	RY3
0144	20714	0 02 20744	DLD	OVFP
0145	20715	0401 61	LRS	15
0146	20716	0 06 00470	DAD	RY1
0147	20717	0 04 00470	DST	RY1
0148	20720	0 02 00474	DLD	RZ1
0149	20721	0 16 20746	MPY	FACT
0150	20722	0 06 20756	DAD	HALF
0151	20723	000201	IAB	
0152	20724	140040	CRA	
0153	20725	000201	IAB	
0154	20726	0401 67	LRS	9
0155	20727	0 06 00476	DAD	RZ3
0156	20730	0 04 20744	DST	OVFP
0157	20731	140040	CRA	
0158	20732	0 04 00476	DST	RZ3
0159	20733	0 02 20744	DLD	OVFP
0160	20734	0401 61	LRS	15
0161	20735	0 06 00474	DAD	RZ1
0162	20736	0 04 00474	DST	RZ1
0163	20737	000005	SGL	
0164	20740	-0 01 20500	JMP*	SPUN
0165	20742	000000	SUMM DBP	0
	20743	000000		
0166	20744	000000	OVFP DBP	0
	20745	000000		
0167	20746	000000	FACT DBP	0
	20747	000000		
0168	20750	020000	TWNZ OCT	20000,0

MICROCOMP TELECOMMUNICATED DATA
 ODP-516 ASSEMBLY LISTING

	20751	000000			
0169	20752	000000	THRD	DBP	0
	20753	000000			
0170	20754	040000	FUDG	OCT	40000,0
	20755	000000			
0171	20756	000000	HALF	OCT	0,40000
	20757	040000			
0172		000460	L1	EOU	'460
0173		000461	L2	EOU	L1+1
0174		000462	L3	EOU	L1+2
0175		000464	RX1	EOU	L1+4
0176		000465	RX2	EOU	L1+5
0177		000466	RX3	EOU	L1+6
0178		000470	RY1	EOU	L1+8
0179		000471	RY2	EOU	L1+9
0180		000472	RY3	EOU	L1+10
0181		000474	PZ1	EOU	L1+12
0182		000475	RZ2	EOU	L1+13
0183		000476	RZ3	EOU	L1+14
0184				END	

PROGRAM NAME

SOURCE: AA5F

BINARY: BAA5F

RELATED MEMOS: T-493

ENTRY POINTS (location): ATTA ('20000)

GENERAL DESCRIPTION:

This subroutine when called will perform a third order attitude algorithm to update the quaternion of rotation. The equation representing the algorithm can be expressed as:

$$\rho_x' = \lambda S \alpha_x + R \rho_x + S(\rho_y \alpha_z - \rho_z \alpha_y)$$

$$\rho_y' = \lambda S \alpha_y + R \rho_y + S(\rho_z \alpha_x - \rho_x \alpha_z)$$

$$\rho_z' = \lambda S \alpha_z + R \rho_z + S(\rho_x \alpha_y - \rho_y \alpha_x)$$

$$\lambda' = -S(\bar{\rho} \cdot \bar{\alpha}) + R \lambda$$

where

$$\bar{\alpha} = \frac{\Delta \theta}{2}$$

$$M = \bar{\alpha} \cdot \bar{\alpha}$$

$$R = (1 - \frac{1}{2} M)$$

$$S = (1 - \frac{1}{6} M)$$

expanding this equation, if we define $\Delta = \Delta \theta_x \Delta \theta_x + \Delta \theta_y \Delta \theta_y + \Delta \theta_z \Delta \theta_z$

$$\rho_x' = \lambda (1 - \frac{\Delta}{24}) \frac{\Delta \theta_x}{2} + (1 - \frac{\Delta}{8}) \rho_x + (1 - \frac{\Delta}{24}) \left(\frac{\rho_y \Delta \theta_z - \rho_z \Delta \theta_y}{2} \right)$$

therefore:

$$\rho_x' = \rho_x + \frac{\lambda \Delta \theta_x}{2} - \frac{\lambda \Delta \Delta \theta_x}{48} - \frac{\Delta \rho_x}{8} + \frac{\rho_y \Delta \theta_z - \rho_z \Delta \theta_y}{2} - \Delta \frac{(\rho_y \Delta \theta_z - \rho_z \Delta \theta_y)}{48}$$

to determine ρ_y' , replace x, y, z subscripts by y, z, x in the equation for ρ_x' . To determine ρ_z' , replace x, y, z subscripts by z, x, y in the equation

for ρ_x' . Then,

$$\lambda' = -S(\bar{\rho} \cdot \bar{\alpha}) + R\lambda$$

therefore:

$$\lambda' = \lambda - \frac{\Delta}{8}\lambda - \frac{(\rho_x \Delta\theta_x + \rho_y \Delta\theta_y + \rho_z \Delta\theta_z)}{2} + \frac{\Delta}{48}(\rho_x \Delta\theta_x + \rho_y \Delta\theta_y + \rho_z \Delta\theta_z)$$

In the present DDP516 implementation the actual numbers in the computer are scaled as follows:

$$DX = 2^5 \Delta\theta_x \text{ or } \Delta\theta_x = DX 2^{-5}$$

$$DY = 2^5 \Delta\theta_y \text{ or } \Delta\theta_y = DY 2^{-5}$$

$$DZ = 2^5 \Delta\theta_z \text{ or } \Delta\theta_z = DZ 2^{-5}$$

$$RX = \frac{\rho_x}{2} \text{ or } \rho_x = 2RX$$

$$RY = \frac{\rho_y}{2} \text{ or } \rho_y = 2RY$$

$$RZ = \frac{\rho_z}{2} \text{ or } \rho_z = 2RZ$$

$$L = \frac{\lambda}{2} \text{ or } \lambda = 2L$$

$$D^2 = 2^{10} \Delta \text{ or } \Delta = D^2 2^{-10} = (DX^2 + DY^2 + DZ^2) 2^{-10}$$

now substituting this scaling into the equation given above we find:

$$\begin{aligned} 2RX' = 2RX + \frac{L DX}{2^5} - \frac{L D^2 DX}{3 \times 2^{18}} - \frac{D^2 RX}{2^{12}} \\ + \frac{RY DZ - RZ DY}{2^5} - \frac{D^2 (RY DZ - RZ DY)}{3 \times 2^{18}} \end{aligned}$$

if we define

$$\Delta RX = RX' - RX$$

then,

$$\Delta RX = \frac{L DX}{2^6} - \frac{L D^2 DX}{3 \times 2^{19}} - \frac{D^2 RX}{2^{13}} + \frac{RY DZ - RZ DY}{2^6} - \frac{D^2(RY DZ - RZ DY)}{3 \times 2^{19}}$$

also,

$$2L' = 2L - \frac{D^2 L}{2^{12}} - \frac{RX DX + RY DY + RZ DZ}{2^5} + \frac{D^2(RX DX + RY DY + RZ DZ)}{3 \times 2^{18}}$$

and if

$$\Delta L = L' - L,$$

$$\Delta L = -\frac{D^2 L}{2^{13}} - \frac{RX DX + RY DY + RZ DZ}{2^6} + \frac{D^2(RX DX + RY DY + RZ DZ)}{3 \times 2^{19}}$$

The equations for ΔRY and ΔRZ are obtained in a similar manner.

A 16 bit word in the DDP516 is made up of a sign bit and 15 bits of fraction. For example, 0110 000 000 000 000 represents +.75 decimal. Each quaternion component is made up of three of these numbers. For example, L will be represented by

$$L1 + \frac{L2}{2^{15}} + \frac{L3}{2^{30}},$$

which is equivalent to a 45 bit signed fraction where the sign bits of L2 and L3 are ignored. In core L1 is in location '460, L2 in '461 and L3 + '40000* is in '463. Location '462 is normally zero except when '463 overflows into '462 which is then added to '461. RX, RY and RZ follow L in core in locations '464, '470 and '474 respectively. A unit quaternion in core

$$\lambda = 1, \rho_x = 0, \rho_y = 0, \rho_z = 0$$

or

$$L = 1/2, RX = 0, RY = 0, RZ = 0)$$

would look like the following (in octal):

* Since only L1 and L2 are used in the velocity algorithm, the '40000 (1/2) added to L3 is for rounding.

loc.	'460	'461	'462	'463
L	040000	000000	000000	040000
	L1	L2		L3+'40000
loc.	'464	'465	'466	'467
RX	000000	000000	000000	040000
	RX1	RX2		RX3+'40000
loc.	'470	'471	'472	'473
RY	000000	000000	000000	040000
	RY1	RY2		RY3+'40000
loc.	'474	'475	'476	'477
RZ	000000	000000	000000	040000
	RZ1	RZ2		RZ3+'40000

DX, DY and DZ are single precision fractions. However, D^2 will be 30 bits and will be represented by

$$D^2_1 + \frac{D^2_2}{2^{15}}$$

With these considerations in mind the quaternion update equations can be expanded as:

$$\begin{aligned}
\Delta_{RX} = & \frac{L1 DX}{2^6} + \frac{L2 DX}{2^{21}} + \frac{L3 DX}{2^{36}} \\
& - \frac{DX D^2_1 L1}{3 \times 2^{19}} - \frac{DX D^2_1 L2}{3 \times 2^{34}} - \frac{DX D^2_1 L3}{3 \times 2^{49}} \\
& - \frac{DX D^2_2 L1}{3 \times 2^{34}} - \frac{DX D^2_2 L2}{3 \times 2^{49}} - \frac{DX D^2_2 L3}{3 \times 2^{64}} \\
& - \frac{D^2_1 RX1}{2^{13}} - \frac{D^2_1 RX2}{2^{28}} - \frac{D^2_1 RX3}{2^{43}} \\
& - \frac{D^2_2 RX1}{2^{28}} - \frac{D^2_2 RX2}{2^{43}} - \frac{D^2_2 RX3}{2^{58}} \\
& + \frac{RY1 DZ}{2^6} + \frac{RY2 DZ}{2^{21}} + \frac{RY3 DZ}{2^{36}} \\
& - \frac{RZ1 DY}{2^6} - \frac{RZ2 DY}{2^{21}} - \frac{RZ3 DY}{2^{36}}
\end{aligned}$$

$$\begin{aligned}
& - \frac{D^2_1 RY1 DZ}{3 \times 2^{19}} - \frac{D^2_1 RY^2 DZ}{3 \times 2^{34}} - \frac{D^2_1 RY3 DZ}{3 \times 2^{49}} \\
& + \frac{D^2_1 RZ1 DY}{3 \times 2^{19}} + \frac{D^2_1 RZ2 DY}{3 \times 2^{34}} + \frac{D^2_1 RZ3 DY}{3 \times 2^{49}} \\
& - \frac{D^2_2 RY1 DZ}{3 \times 2^{34}} - \frac{D^2_2 RY2 DZ}{3 \times 2^{49}} - \frac{D^2_2 RY3 DZ}{3 \times 2^{64}} \\
& + \frac{D^2_2 RZ1 DY}{3 \times 2^{34}} + \frac{D^2_2 RZ2 DY}{3 \times 2^{49}} + \frac{D^2_2 RZ3 DY}{3 \times 2^{64}} \\
\Delta L = & - \frac{D^2_1 L1}{2^{13}} - \frac{D^2_1 L2}{2^{28}} - \frac{D^2_1 L3}{2^{43}} - \frac{D^2_2 L1}{2^{28}} - \frac{D^2_2 L2}{2^{43}} - \frac{D^2_2 L3}{2^{58}} \\
& - \frac{RX1 DX}{2^6} - \frac{RX2 DX}{2^{21}} - \frac{RX3 DX}{2^{36}} - \frac{RY1 DY}{2^6} - \frac{RY2 DY}{2^{21}} - \frac{RY3 DY}{2^{36}} \\
& - \frac{RZ1 DZ}{2^6} - \frac{RZ2 DZ}{2^{21}} - \frac{RZ3 DZ}{2^{36}} \\
& + \frac{D^2_1 RX1 DX}{3 \times 2^{19}} + \frac{D^2_1 RX2 DX}{3 \times 2^{34}} + \frac{D^2_1 RX3 DX}{3 \times 2^{49}} \\
& + \frac{D^2_1 RY1 DY}{3 \times 2^{19}} + \frac{D^2_1 RY2 DY}{3 \times 2^{34}} + \frac{D^2_1 RY3 DY}{3 \times 2^{49}} \\
& + \frac{D^2_1 RZ1 DZ}{3 \times 2^{19}} + \frac{D^2_1 RZ2 DZ}{3 \times 2^{34}} + \frac{D^2_1 RZ3 DZ}{3 \times 2^{49}} \\
& + \frac{D^2_2 RX1 DX}{3 \times 2^{34}} + \frac{D^2_2 RX2 DX}{3 \times 2^{49}} + \frac{D^2_2 RX3 DX}{3 \times 2^{64}} \\
& + \frac{D^2_2 RY1 DY}{3 \times 2^{34}} + \frac{D^2_2 RY2 DY}{3 \times 2^{49}} + \frac{D^2_2 RY3 DY}{3 \times 2^{64}} \\
& + \frac{D^2_2 RZ1 DZ}{3 \times 2^{34}} + \frac{D^2_2 RZ2 DZ}{3 \times 2^{49}} + \frac{D^2_2 RZ3 DZ}{3 \times 2^{64}}
\end{aligned}$$

With ΔRY and ΔRZ defined in a similar manner.

The algorithm that is written considers L, RX, RY and RZ to have only 35 bits of significance. Therefore, all terms in the final equations with denominators greater than 2^{35} can be ignored. This simplifies the final equations to be programmed to:

$$\begin{aligned} \Delta RX = & \frac{L1 DX}{2^6} + \frac{L2 DX}{2^{21}} - \frac{DX D^2_1 L1}{3 \times 2^{19}} \\ & - \frac{D^2_1 RX1}{2^{13}} - \frac{D^2_1 RX2}{2^{28}} - \frac{D^2_2 RX1}{2^{28}} \\ & + \frac{RY1 DZ}{2^6} + \frac{RY2 DZ}{2^{21}} - \frac{RZ1 DY}{2^6} - \frac{RZ2 DY}{2^{21}} \\ & - \frac{D^2_1 RY1 DZ}{3 \times 2^{19}} + \frac{D^2_1 RZ1 DY}{3 \times 2^{19}} \end{aligned}$$

and,

$$\begin{aligned} \Delta L = & -\frac{D^2_1 L1}{2^{13}} - \frac{D^2_1 L2}{2^{28}} - \frac{D^2_2 L1}{2^{28}} \\ & - \frac{RX1 DX}{2^6} - \frac{RX2 DX}{2^{21}} - \frac{RY1 DY}{2^6} - \frac{RY2 DY}{2^{21}} - \frac{RZ1 DZ}{2^6} - \frac{RZ2 DZ}{2^{21}} \\ & + \frac{D^2_1 RX1 DX}{3 \times 2^{19}} + \frac{D^2_1 RY1 DY}{3 \times 2^{19}} + \frac{D^2_1 RZ1 DZ}{3 \times 2^{19}} \end{aligned}$$

The final simplification is to replace

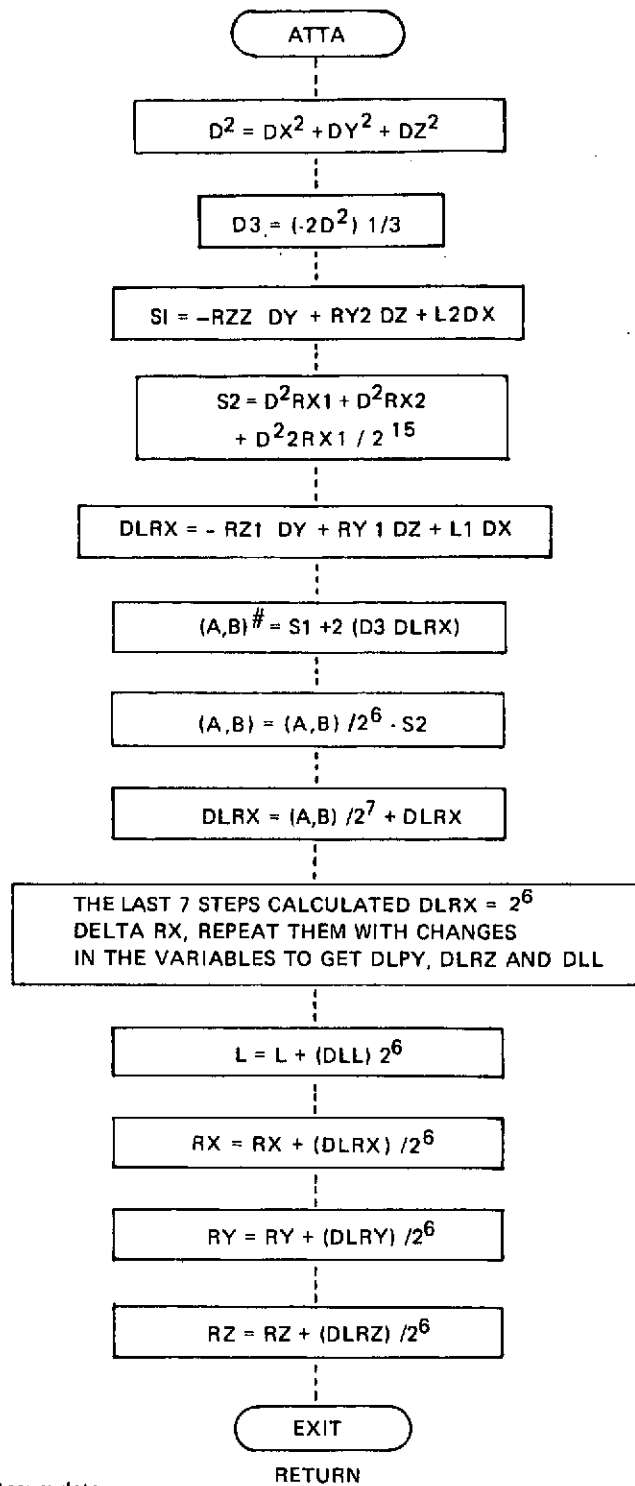
$$(-2D^2_1)/3$$

with a variable called D3 and to calculate $2^6 \Delta RX$, $2^6 \Delta RY$, $2^6 \Delta RZ$ and $2^6 \Delta L$ before deriving ΔRX , ΔRY , ΔRZ and ΔL . The program equations then are:

$$\begin{aligned} 2^6 \Delta RX = & L1 DX + \frac{L2 DX}{2^{15}} + \frac{DX D3 L1}{2^{14}} \\ & - \frac{D^2_1 RX1}{2^7} - \frac{D^2_1 RX2}{2^{22}} - \frac{D^2_2 RX1}{2^{22}} \\ & + RY1 DZ + \frac{RY2 DZ}{2^{15}} - RZ1 DY - \frac{RZ2 DY}{2^{15}} \\ & + \frac{D3 RY1 DZ}{2^{14}} - \frac{D3 RZ1 DY}{2^{14}} \end{aligned}$$

and,

$$\begin{aligned} 2^6 \Delta L &= \frac{D^2_1 L1}{2^7} - \frac{D^2_1 L2}{2^{22}} - \frac{D^2_2 L1}{2^{22}} \\ &- RX1 DX - \frac{RX2 DX}{2^{15}} - RY1 DY - \frac{RY2 DY}{2^{15}} - RZ1 DZ - \frac{RZ2 DZ}{2^{15}} \\ &- \frac{D3 RX1 DX}{2^{14}} - \frac{D3 RY1 DY}{2^{14}} - \frac{D3 RZ1 DZ}{2^{14}} \end{aligned}$$



The Double Precision Accumulator

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0001				ABS	
0002				ORG	*20000
0003				SUBR	ATTA
0004	20000	0 000000	ATTA	DAC	**
0005	20001	0 02 00414		LDA	DX
0006	20002	000007		DBL	
0007	20003	0 16 00414		MPY	DX
0008	20004	0 04 20410		DST	D1
0009	20005	0 02 00416		DLD	DY
0010	20006	0 16 00416		MPY	DY
0011	20007	0 06 20410		DAD	D1
0012	20010	0 04 20410		DST	D1
0013	20011	0 02 00420		DLD	DZ
0014	20012	0 16 00420		MPY	DZ
0015	20013	0 06 20410		DAD	D1
0016	20014	0 04 20410		DST	D1
0017	20015	0 16 20424		MPY	=*125253
0018	20016	0 06 20420		DAD	TRND
0019	20017	0 04 20412		DST	D3
0020	20020	0 02 00416		DLD	DY
0021	20021	0 16 00475		MPY	RZ2
0022	20022	0 04 20414		DST	S1
0023	20023	0 02 00420		DLD	DZ
0024	20024	0 16 00471		MPY	RY2
0025	20025	0 07 20414		DSB	S1
0026	20026	0 04 20414		DST	S1
0027	20027	0 02 00414		DLD	DX
0028	20030	0 16 00461		MPY	L2
0029	20031	0 06 20414		DAD	S1
0030	20032	0 04 20414		DST	S1
0031	20033	0 02 00464		DLD	RX1
0032	20034	0 16 20411		MPY	D2
0033	20035	0 04 20416		DST	S2
0034	20036	0 02 20410		DLD	D1
0035	20037	0 16 00465		MPY	RX2
0036	20040	0 06 20416		DAD	S2
0037	20041	0401 61		LRS	15
0038	20042	0 04 20416		DST	S2
0039	20043	0 02 20410		DLD	D1
0040	20044	0 16 00464		MPY	RX1
0041	20045	0 06 20416		DAD	S2
0042	20046	0 04 20416		DST	S2
0043	20047	0 02 00416		DLD	DY
0044	20050	0 16 00474		MPY	RZ1
0045	20051	0 04 20402		DST	DLRX
0046	20052	0 02 00420		DLD	DZ
0047	20053	0 16 00470		MPY	RY1
0048	20054	0 07 20402		DSB	DLRX
0049	20055	0 04 20402		DST	DLRX
0050	20056	0 02 00414		DLD	DX
0051	20057	0 16 00460		MPY	L1
0052	20060	0 06 20402		DAD	DLRX
0053	20061	0 04 20402		DST	DLRX
0054	20062	0 16 20412		MPY	D3
0055	20063	0411 77		LLS	1
0056	20064	0 06 20414		DAD	S1
0057	20065	0401 70		LRS	8

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0058	20066	0 07	20416	DSB	S2
0059	20067	0 06	20422	DAD	SRND
0060	20070	0401	71	LRS	7
0061	20071	0 06	20402	DAD	DLRX
0062	20072	0 04	20402	DST	DLRX
0063	20073	0 02	00420	DLD	DZ
0064	20074	0 16	00465	MPY	RX2
0065	20075	0 04	20414	DST	S1
0066	20076	0 02	00414	DLD	DX
0067	20077	0 16	00475	MPY	RZ2
0068	20100	0 07	20414	DSB	S1
0069	20101	0 04	20414	DST	S1
0070	20102	0 02	00416	DLD	DY
0071	20103	0 16	00461	MPY	L2
0072	20104	0 06	20414	DAD	S1
0073	20105	0 04	20414	DST	S1
0074	20106	0 02	00470	DLD	RY1
0075	20107	0 16	20411	MPY	D2
0076	20110	0 04	20416	DST	S2
0077	20111	0 02	20410	DLD	D1
0078	20112	0 16	00471	MPY	RY2
0079	20113	0 06	20416	DAD	S2
0080	20114	0401	61	LRS	15
0081	20115	0 04	20416	DST	S2
0082	20116	0 02	20410	DLD	D1
0083	20117	0 16	00470	MPY	RY1
0084	20120	0 06	20416	DAD	S2
0085	20121	0 04	20416	DST	S2
0086	20122	0 02	00420	DLD	DZ
0087	20123	0 16	00464	MPY	RX1
0088	20124	0 04	20404	DST	DLRY
0089	20125	0 02	00414	DLD	DX
0090	20126	0 16	00474	MPY	RZ1
0091	20127	0 07	20404	DSB	DLRY
0092	20130	0 04	20404	DST	DLRY
0093	20131	0 02	00416	DLD	DY
0094	20132	0 16	00460	MPY	L1
0095	20133	0 06	20404	DAD	DLRY
0096	20134	0 04	20404	DST	DLRY
0097	20135	0 16	20412	MPY	D3
0098	20136	0411	77	LLS	1
0099	20137	0 06	20414	DAD	S1
0100	20140	0401	70	LRS	8
0101	20141	0 07	20416	DSB	S2
0102	20142	0 06	20422	DAD	SRND
0103	20143	0401	71	LRS	7
0104	20144	0 06	20404	DAD	DLRY
0105	20145	0 04	20404	DST	DLRY
0106	20146	0 02	00414	DLD	DX
0107	20147	0 16	00471	MPY	RY2
0108	20150	0 04	20414	DST	S1
0109	20151	0 02	00416	DLD	DY
0110	20152	0 16	00465	MPY	RX2
0111	20153	0 07	20414	DSB	S1
0112	20154	0 04	20414	DST	S1
0113	20155	0 02	00420	DLD	DZ
0114	20156	0 16	00461	MPY	L2

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0115	20157	0 06	20414	DAD	S1
0115	20160	0 04	20414	DST	S1
0117	20161	0 02	00474	DLD	RZ1
0118	20162	0 16	20411	MPY	D2
0119	20163	0 04	20416	DST	S2
0120	20164	0 02	20410	DLD	D1
0121	20165	0 16	00475	MPY	RZ2
0122	20166	0 06	20416	DAD	S2
0123	20167	0401	61	LRS	15
0124	20170	0 04	20416	DST	S2
0125	20171	0 02	20410	DLD	D1
0126	20172	0 16	00474	MPY	RZ1
0127	20173	0 06	20416	DAD	S2
0128	20174	0 04	20416	DST	S2
0129	20175	0 02	00414	DLD	DX
0130	20176	0 16	00470	MPY	RY1
0131	20177	0 04	20406	DST	DLRZ
0132	20200	0 02	00416	DLD	DY
0133	20201	0 16	00464	MPY	RY1
0134	20202	0 07	20406	DSB	DLRZ
0135	20203	0 04	20406	DST	DLRZ
0136	20204	0 02	00420	DLD	DZ
0137	20205	0 16	00460	MPY	L1
0138	20206	0 06	20406	DAD	DLRZ
0139	20207	0 04	20406	DST	DLRZ
0140	20210	0 16	20412	MPY	D3
0141	20211	0411	77	LLS	1
0142	20212	0 06	20414	DAD	S1
0143	20213	0401	70	LRS	8
0144	20214	0 07	20416	DSB	S2
0145	20215	0 06	20422	DAD	SRND
0146	20216	0401	71	LRS	7
0147	20217	0 06	20406	DAD	DLRZ
0148	20220	0 04	20406	DST	DLRZ
0149	20221	0 02	00414	DLD	DX
0150	20222	0 16	00465	MPY	RX2
0151	20223	0 04	20414	DST	S1
0152	20224	0 02	00416	DLD	DY
0153	20225	0 16	00471	MPY	RY2
0154	20226	0 06	20414	DAD	S1
0155	20227	0 04	20414	DST	S1
0156	20230	0 02	00420	DLD	DZ
0157	20231	0 16	00475	MPY	RZ2
0158	20232	0 06	20414	DAD	S1
0159	20233	0 04	20414	DST	S1
0160	20234	0 02	00460	DLD	L1
0161	20235	0 16	20411	MPY	D2
0162	20236	0 04	20416	DST	S2
0163	20237	0 02	20410	DLD	D1
0164	20240	0 16	00461	MPY	L2
0165	20241	0 06	20416	DAD	S2
0166	20242	0401	61	LRS	15
0167	20243	0 04	20416	DST	S2
0168	20244	0 02	20410	DLD	D1
0169	20245	0 16	00460	MPY	L1
0170	20246	0 06	20416	DAD	S2
0171	20247	0 04	20416	DST	S2

MICROCOMP TELECOMMUNICATED DATA
 NDP-516 ASSEMBLY LISTING

0172	20250	0 02 00414	DLD	DX
0173	20251	0 16 00464	MPY	RX1
0174	20252	0 04 20400	DST	DLL
0175	20253	0 02 00416	DLD	DY
0176	20254	0 16 00470	MPY	RY1
0177	20255	0 06 20400	DAD	DLL
0178	20256	0 04 20400	DST	DLL
0179	20257	0 02 00420	DLD	DZ
0180	20260	140407	TCA	
0181	20261	0 16 00474	MPY	RZ1
0182	20262	0 07 20400	DSB	DLL
0183	20263	0 04 20400	DST	DLL
0184	20264	0 16 20412	MPY	D3
0185	20265	0411 77	LLS	1
0186	20266	0 07 20414	DSB	S1
0187	20267	0401 70	LRS	8
0188	20270	0 07 20416	DSB	S2
0189	20271	0 06 20422	DAD	SRND
0190	20272	0401 71	LRS	7
0191	20273	0 06 20400	DAD	DLL
0192	20274	0 04 20400	DST	DLL
0193	20275	140040	CRA	
0194	20276	000201	IAB	
0195	20277	0401 72	LRS	6
0196	20300	140040	CRA	
0197	20301	0 06 00462	DAD	L3
0198	20302	0 04 00462	DST	L3
0199	20303	000201	IAB	
0200	20304	140040	CRA	
0201	20305	0 06 00460	DAD	L1
0202	20306	0 04 00460	DST	L1
0203	20307	0 02 20400	DLD	DLL
0204	20310	0401 72	LRS	6
0205	20311	0 06 00460	DAD	L1
0206	20312	0 04 00460	DST	L1
0207	20313	0 02 20402	DLD	DLRX
0208	20314	140040	CRA	
0209	20315	000201	IAB	
0210	20316	0401 72	LRS	6
0211	20317	140040	CRA	
0212	20320	0 06 00466	DAD	RX3
0213	20321	0 04 00466	DST	RX3
0214	20322	000201	IAB	
0215	20323	140040	CRA	
0216	20324	0 06 00464	DAD	RX1
0217	20325	0 04 00464	DST	RX1
0218	20326	0 02 20402	DLD	DLRX
0219	20327	0401 72	LRS	6
0220	20330	0 06 00464	DAD	RX1
0221	20331	0 04 00464	DST	RX1
0222	20332	0 02 20404	DLD	DLRY
0223	20333	140040	CRA	
0224	20334	000201	IAB	
0225	20335	0401 72	LRS	6
0226	20336	140040	CRA	
0227	20337	0 06 00472	DAD	RY3
0228	20340	0 04 00472	DST	RY3

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0229	20341	000201	IAB		
0230	20342	140040	CRA		
0231	20343	0 06 00470	DAD	RY1	
0232	20344	0 04 00470	DST	RY1	
0233	20345	0 02 20404	DLD	DLRY	
0234	20346	0401 72	LRS	6	
0235	20347	0 06 00470	DAD	RY1	
0236	20350	0 04 00470	DST	RY1	
0237	20351	0 02 20406	DLD	DLRZ	
0238	20352	140040	CRA		
0239	20353	000201	IAB		
0240	20354	0401 72	LRS	6	
0241	20355	140040	CRA		
0242	20356	0 06 00476	DAD	RZ3	
0243	20357	0 04 00476	DST	RZ3	
0244	20360	000201	IAB		
0245	20361	140040	CRA		
0246	20362	0 06 00474	DAD	RZ1	
0247	20363	0 04 00474	DST	RZ1	
0248	20364	0 02 20406	DLD	DLRZ	
0249	20365	0401 72	LRS	6	
0250	20366	0 06 00474	DAD	RZ1	
0251	20367	0 04 00474	DST	RZ1	
0252	20370	000005	SGL		
0253	20371	140040	CRA		
0254	20372	0 04 00462	STA	L3	
0255	20373	0 04 00466	STA	RX3	
0256	20374	0 04 00472	STA	RY3	
0257	20375	0 04 00476	STA	RZ3	
0258	20376	-0 01 20000	JMP*	ATTA	
0259	20400	000000	DLL	DBP	0
	20401	000000			
0260	20402	000000	DLRX	DBP	0
	20403	000000			
0261	20404	000000	DLRY	DBP	0
	20405	000000			
0262	20406	000000	DLRZ	DBP	0
	20407	000000			
0263	20410	000000	D1	OCT	0
0264	20411	000000	D2	OCT	0
0265	20412	000000	D3	DBP	0
	20413	000000			
0266	20414	000000	S1	DBP	0
	20415	000000			
0267	20416	000000	S2	DBP	0
	20417	000000			
0268	20420	000000	TRND	OCT	0,40000
	20421	040000			
0269	20422	000000	SRND	OCT	0,100
	20423	000100			
0270		000414	DX	EQU	414
0271		000416	DY	EQU	DX+2
0272		000420	DZ	EQU	DX+4
0273		000460	L1	EQU	460
0274		000461	L2	EQU	L1+1
0275		000462	L3	EQU	L1+2
0276		000464	RX1	EQU	L1+4

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0277	000465	RX2	EQU	L1+5
0278	000466	RX3	EQU	L1+6
0279	000470	RY1	EQU	L1+8
0280	000471	RY2	EQU	L1+9
0281	000472	RY3	EQU	L1+10
0282	000474	RZ1	EQU	L1+12
0283	000475	RZ2	EQU	L1+13
0284	000476	RZ3	EQU	L1+14
0285 20424	125253		END	

PROGRAM NAME:

SOURCE: VELF

BINARY: BVOLF

ENTRY POINTS (LOCATION): VELA ('21000), IRCO ('21522)

GENERAL DESCRIPTION

The subroutine VELA takes a quaternion (scaled at 2^1) creates a cosine matrix from it (scaled at 2^2) and performs the matrix multiplication $\Delta V_I = 2 C_B^I \Delta V_B$. Since $C_B^I = 4F_B^I$ (where $F_B^I = (FXX, FXY...FZZ)$) the above equation can be rewritten as $\Delta V_I = 8F_B^I \Delta V_B$.

The subroutine IRCO takes an inertial rotational command ($\Delta \bar{\theta}_I$) which might be either calculated by the fine alignment program or the navigation program and modifies the body rotational command ($\Delta \bar{\theta}_B$) as follows:

$$\Delta \bar{\theta}_B = \Delta \bar{\theta}_B + F_B^I{}^T \Delta \bar{\theta}_I$$

This is performed every update. In this 50 update per second system, $\Delta \bar{\theta}_B$ is scaled at 2^{-5} , F_B^I at 2^2 and $\Delta \bar{\theta}_I$ at 50×2^{-7} .

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0001				ABS	
0002				ORG	*21000
0003				SUBR	VELA
0004				SUBR	IRCO
0005	21000	0 000000	VELA	DAC	**
0006	21001	0 02 00465		LDA	RX2
0007	21002	000007		DBL	
0008	21003	0 16 00465		MPY	RX2
0009	21004	000201		IAB	
0010	21005	140040		CRA	
0011	21006	0401 77		LRS	1
0012	21007	0 04 21444		DST	T1
0013	21010	0 02 00464		DLD	RX1
0014	21011	0 16 00465		MPY	RX2
0015	21012	0 06 21444		DAD	T1
0016	21013	0 06 21514		DAD	SQRD
0017	21014	0401 63		LRS	13
0018	21015	0 04 21444		DST	T1
0019	21016	0 02 00464		DLD	RX1
0020	21017	0 16 00464		MPY	RX1
0021	21020	0411 77		LLS	1
0022	21021	0 06 21444		DAD	T1
0023	21022	0 04 21472		DST	RXSQ
0024	21023	0 02 00470		DLD	RY1
0025	21024	000201		IAB	
0026	21025	0 16 00471		MPY	RY2
0027	21026	000201		IAB	
0028	21027	140040		CRA	
0029	21030	0401 77		LRS	1
0030	21031	0 04 21444		DST	T1
0031	21032	0 02 00470		DLD	RY1
0032	21033	0 16 00471		MPY	RY2
0033	21034	0 06 21444		DAD	T1
0034	21035	0 06 21514		DAD	SQRD
0035	21036	0401 63		LRS	13
0036	21037	0 04 21444		DST	T1
0037	21040	0 02 00470		DLD	RY1
0038	21041	0 16 00470		MPY	RY1
0039	21042	0411 77		LLS	1
0040	21043	0 06 21444		DAD	T1
0041	21044	0 04 21474		DST	RYSQ
0042	21045	0 02 00474		DLD	RZ1
0043	21046	000201		IAB	
0044	21047	0 16 00475		MPY	RZ2
0045	21050	000201		IAB	
0046	21051	140040		CRA	
0047	21052	0401 77		LRS	1
0048	21053	0 04 21444		DST	T1
0049	21054	0 02 00474		DLD	RZ1
0050	21055	0 16 00475		MPY	RZ2
0051	21056	0 06 21444		DAD	T1
0052	21057	0 06 21514		DAD	SQRD
0053	21060	0401 63		LRS	13
0054	21061	0 04 21444		DST	T1
0055	21062	0 02 00474		DLD	RZ1
0056	21063	0 16 00474		MPY	RZ1
0057	21064	0411 77		LLS	1

MICROCOMP TELECOMMUNICATED DATA
 DDD-516 ASSEMBLY LISTING

0058	21065	0 06	21444	DAD	T1
0059	21066	0 04	21476	DST	RZSO
0060	21067	0 02	00460	DLD	L1
0061	21070	000201		IAB	
0062	21071	0 16	00465	MPY	RX2
0063	21072	000201		IAB	
0064	21073	140040		CRA	
0065	21074	0 04	21444	DST	T1
0066	21075	0 02	00460	DLD	L1
0067	21076	0 16	00465	MPY	RX2
0068	21077	0 06	21444	DAD	T1
0069	21100	0 04	21444	DST	T1
0070	21101	0 02	00464	DLD	RX1
0071	21102	0 16	00461	MPY	L2
0072	21103	0 06	21444	DAD	T1
0073	21104	0 06	21516	DAD	CPRD
0074	21105	0401	62	LRS	14
0075	21106	0 04	21444	DST	T1
0076	21107	0 02	00460	DLD	L1
0077	21110	0 16	00464	MPY	RX1
0078	21111	0411	77	LLS	1
0079	21112	0 06	21444	DAD	T1
0080	21113	0 04	21500	DST	LPX
0081	21114	0 02	00460	DLD	L1
0082	21115	000201		IAB	
0083	21116	0 16	00471	MPY	RY2
0084	21117	000201		IAB	
0085	21120	140040		CRA	
0086	21121	0 04	21444	DST	T1
0087	21122	0 02	00460	DLD	L1
0088	21123	0 16	00471	MPY	RY2
0089	21124	0 06	21444	DAD	T1
0090	21125	0 04	21444	DST	T1
0091	21126	0 02	00470	DLD	RY1
0092	21127	0 16	00461	MPY	L2
0093	21130	0 06	21444	DAD	T1
0094	21131	0 06	21516	DAD	CPRD
0095	21132	0401	62	LRS	14
0096	21133	0 04	21444	DST	T1
0097	21134	0 02	00460	DLD	L1
0098	21135	0 16	00470	MPY	RY1
0099	21136	0411	77	LLS	1
0100	21137	0 06	21444	DAD	T1
0101	21140	0 04	21502	DST	LRV
0102	21141	0 02	00460	DLD	L1
0103	21142	000201		IAB	
0104	21143	0 16	00475	MPY	RZ2
0105	21144	000201		IAB	
0106	21145	140040		CRA	
0107	21146	0 04	21444	DST	T1
0108	21147	0 02	00460	DLD	L1
0109	21150	0 16	00475	MPY	RZ2
0110	21151	0 06	21444	DAD	T1
0111	21152	0 04	21444	DST	T1
0112	21153	0 02	00474	DLD	RZ1
0113	21154	0 16	00461	MPY	L2
0114	21155	0 06	21444	DAD	T1

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0115	21156	0 06	21516	DAD	CPRD
0116	21157	0401	62	LRS	14
0117	21160	0 04	21444	DST	T1
0118	21161	0 02	00460	DLD	L1
0119	21162	0 16	00474	MPY	RZ1
0120	21163	0411	77	LLS	1
0121	21164	0 06	21444	DAD	T1
0122	21165	0 04	21504	DST	LRZ
0123	21166	0 02	00464	DLD	RX1
0124	21167	000201		IAB	
0125	21170	0 16	00471	MPY	RY2
0126	21171	000201		IAB	
0127	21172	140040		CRA	
0128	21173	0 04	21444	DST	T1
0129	21174	0 02	00464	DLD	RX1
0130	21175	0 16	00471	MPY	RY2
0131	21176	0 06	21444	DAD	T1
0132	21177	0 04	21444	DST	T1
0133	21200	0 02	00470	DLD	RY1
0134	21201	0 16	00465	MPY	RX2
0135	21202	0 06	21444	DAD	T1
0136	21203	0 06	21516	DAD	CPRD
0137	21204	0401	62	LRS	14
0138	21205	0 04	21444	DST	T1
0139	21206	0 02	00464	DLD	RX1
0140	21207	0 16	00470	MPY	RY1
0141	21210	0411	77	LLS	1
0142	21211	0 06	21444	DAD	T1
0143	21212	0 04	21506	DST	RXRY
0144	21213	0 02	00464	DLD	RX1
0145	21214	000201		IAB	
0146	21215	0 16	00475	MPY	RZ2
0147	21216	000201		IAB	
0148	21217	140040		CRA	
0149	21220	0 04	21444	DST	T1
0150	21221	0 02	00464	DLD	RX1
0151	21222	0 16	00475	MPY	RZ2
0152	21223	0 06	21444	DAD	T1
0153	21224	0 04	21444	DST	T1
0154	21225	0 02	00474	DLD	RZ1
0155	21226	0 16	00465	MPY	RX2
0156	21227	0 06	21444	DAD	T1
0157	21230	0 06	21516	DAD	CPRD
0158	21231	0401	62	LRS	14
0159	21232	0 04	21444	DST	T1
0160	21233	0 02	00464	DLD	RX1
0161	21234	0 16	00474	MPY	RZ1
0162	21235	0411	77	LLS	1
0163	21236	0 06	21444	DAD	T1
0164	21237	0 04	21510	DST	RXRZ
0165	21240	0 02	00470	DLD	RY1
0166	21241	000201		IAB	
0167	21242	0 16	00475	MPY	RZ2
0168	21243	000201		IAB	
0169	21244	140040		CRA	
0170	21245	0 04	21444	DST	T1
0171	21246	0 02	00470	DLD	RY1

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0172	21247	0 16	00475	MPY	RZ2
0173	21250	0 06	21444	DAD	T1
0174	21251	0 04	21444	DST	T1
0175	21252	0 02	00474	DLD	RZ1
0176	21253	0 16	00471	MPY	RY2
0177	21254	0 06	21444	DAD	T1
0179	21255	0 06	21516	DAD	CPRD
0179	21256	0401	62	LRS	14
0180	21257	0 04	21444	DST	T1
0181	21260	0 02	00470	DLD	RY1
0182	21261	0 16	00474	MPY	RZ1
0183	21262	0411	77	LLS	1
0184	21263	0 06	21444	DAD	T1
0185	21264	0 04	21512	DST	RYZRZ
0186	21265	0 02	21520	DLD	ONOT
0187	21266	0 07	21474	DSB	RYSQ
0188	21267	0 07	21476	DSB	RZSQ
0189	21270	0 04	21450	DST	PXX
0190	21271	0 02	21506	DLD	RXPY
0191	21272	0 07	21504	DSB	LRZ
0192	21273	0 04	21452	DST	FXV
0193	21274	0 02	21510	DLD	RXPZ
0194	21275	0 06	21502	DAD	LRV
0195	21276	0 04	21454	DST	PXZ
0196	21277	0 02	21520	DLD	ONOT
0197	21300	0 07	21472	DSB	RXSQ
0198	21301	0 07	21476	DSB	RZSQ
0199	21302	0 04	21460	DST	PYY
0200	21303	0 02	21512	DLD	RYZRZ
0201	21304	0 07	21500	DSB	LRX
0202	21305	0 04	21462	DST	FYZ
0203	21306	0 02	21506	DLD	RXRY
0204	21307	0 06	21504	DAD	LRZ
0205	21310	0 04	21456	DST	PYX
0206	21311	0 02	21520	DLD	ONOT
0207	21312	0 07	21472	DSB	RXSQ
0208	21313	0 07	21474	DSB	RYSQ
0209	21314	0 04	21470	DST	PZZ
0210	21315	0 02	21510	DLD	RXRZ
0211	21316	0 07	21502	DSB	LRV
0212	21317	0 04	21464	DST	PZX
0213	21320	0 02	21512	DLD	RYZRZ
0214	21321	0 06	21500	DAD	LRX
0215	21322	0 04	21466	DST	FZY
0216	21323	0 02	21450	DLD	PXX
0217	21324	0 16	00614	MPY	DVBX
0218	21325	0 04	00656	DST	DVIX
0219	21326	0 02	21452	DLD	PXY
0220	21327	0 16	00616	MPY	DVBY
0221	21330	0 06	00656	DAD	DVIX
0222	21331	0 04	00656	DST	DVIX
0223	21332	0 02	21454	DLD	FXZ
0224	21333	0 16	00620	MPY	DVBZ
0225	21334	0 06	00656	DAD	DVIX
0226	21335	0411	75	LLS	3
0227	21336	0 04	00656	DST	DVIX
0228	21337	0 02	21456	DLD	PYX

MICROCOMP TELECOMMUNICATED DATA
 NDP-516 ASSEMBLY LISTING

0229	21340	0 16	00614	MPY	DVBI
0230	21341	0 04	00660	DST	DVIY
0231	21342	0 02	21460	DLD	FYY
0232	21343	0 16	00616	MPY	DVBY
0233	21344	0 06	00660	DAD	DVIY
0234	21345	0 04	00660	DST	DVIY
0235	21346	0 02	21462	DLD	FYZ
0236	21347	0 16	00620	MPY	DVBZ
0237	21350	0 06	00660	DAD	DVIY
0238	21351	0411	75	LLS	3
0239	21352	0 04	00660	DST	DVIY
0240	21353	0 02	21464	DLD	FZX
0241	21354	0 16	00614	MPY	DVBX
0242	21355	0 04	00662	DST	DVIZ
0243	21356	0 02	21466	DLD	FZY
0244	21357	0 16	00616	MPY	DVBY
0245	21360	0 06	00662	DAD	DVIZ
0246	21361	0 04	00662	DST	DVIZ
0247	21362	0 02	21470	DLD	FZZ
0248	21363	0 16	00620	MPY	DVBZ
0249	21364	0 06	00662	DAD	DVIZ
0250	21365	0411	75	LLS	3
0251	21366	0 04	00662	DST	DVIZ
0252	21367	0 02	00614	DLD	DVBX
0253	21370	0 16	21451	MPY	FXX+1
0254	21371	0 04	21444	DST	T1
0255	21372	0 02	00616	DLD	DVBY
0256	21373	0 16	21453	MPY	FXY+1
0257	21374	0 06	21444	DAD	T1
0258	21375	0 04	21444	DST	T1
0259	21376	0 02	00620	DLD	DVBZ
0260	21377	0 16	21455	MPY	FYZ+1
0261	21400	0 06	21444	DAD	T1
0262	21401	0 06	21514	DAD	SQRD
0263	21402	0401	64	LRS	12
0264	21403	0 06	00656	DAD	DVIX
0265	21404	0 04	00656	DST	DVIX
0266	21405	0 02	00614	DLD	DVBX
0267	21406	0 16	21457	MPY	FYZ+1
0268	21407	0 04	21444	DST	T1
0269	21410	0 02	00616	DLD	DVBY
0270	21411	0 16	21461	MPY	FYY+1
0271	21412	0 06	21444	DAD	T1
0272	21413	0 04	21444	DST	T1
0273	21414	0 02	00620	DLD	DVBZ
0274	21415	0 16	21463	MPY	FYZ+1
0275	21416	0 06	21444	DAD	T1
0276	21417	0 06	21514	DAD	SQRD
0277	21420	0401	64	LRS	12
0278	21421	0 06	00660	DAD	DVIY
0279	21422	0 04	00660	DST	DVIY
0280	21423	0 02	00614	DLD	DVBX
0281	21424	0 16	21465	MPY	FZX+1
0282	21425	0 04	21444	DST	T1
0283	21426	0 02	00616	DLD	DVBY
0284	21427	0 16	21467	MPY	FZY+1
0285	21430	0 06	21444	DAD	T1

MICROCOMP TELECOMMUNICATED DATA
DDP-515 ASSEMBLY LISTING

0286	21431	0 04	21444	DST	T1	
0287	21432	0 02	00620	DLD	DVBZ	
0288	21433	0 16	21471	MPY	FZZ+1	
0289	21434	0 06	21444	DAD	T1	
0290	21435	0 06	21514	DAD	SQPD	
0291	21436	0401	64	LRS	12	
0292	21437	0 06	00662	DAD	DVIZ	
0293	21440	0 04	00662	DST	DVIZ	
0294	21441	000005		SGL		
0295	21442	-0 01	21000	JMP*	VELA	
0296	21444	000000		T1	DBP	0
	21445	000000				
0297	21446	000000		T2	DBP	0
	21447	000000				
0298	21450	000000		FXX	DBP	0
	21451	000000				
0299	21452	000000		FYY	DBP	0
	21453	000000				
0300	21454	000000		FYZ	DBP	0
	21455	000000				
0301	21456	000000		FYX	DBP	0
	21457	000000				
0302	21460	000000		FYY	DBP	0
	21461	000000				
0303	21462	000000		FYZ	DBP	0
	21463	000000				
0304	21464	000000		FZX	DBP	0
	21465	000000				
0305	21466	000000		FZY	DBP	0
	21467	000000				
0306	21470	000000		FZZ	DBP	0
	21471	000000				
0307	21472	000000		RXSQ	DBP	0
	21473	000000				
0308	21474	000000		RYSQ	DBP	0
	21475	000000				
0309	21476	000000		RZSQ	DBP	0
	21477	000000				
0310	21500	000000		LPX	DBP	0
	21501	000000				
0311	21502	000000		IRY	DBP	0
	21503	000000				
0312	21504	000000		LRZ	DBP	0
	21505	000000				
0313	21506	000000		RXRY	DBP	0
	21507	000000				
0314	21510	000000		RXRZ	DBP	0
	21511	000000				
0315	21512	000000		RYZ	DBP	0
	21513	000000				
0316	21514	000000		SQPD	OCT	0,10000
	21515	010000				
0317	21516	000000		CPRD	OCT	0,20000
	21517	020000				
0318	21520	020000		ONOT	OCT	20000,0
	21521	000000				
0319		000460		L1	EQU	'460

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0320		000461	L2	EQU	L1+1
0321		000464	RX1	EQU	L1+4
0322		000465	RX2	EQU	L1+5
0323		000470	RY1	EQU	L1+8
0324		000471	RY2	EQU	L1+9
0325		000474	RZ1	EQU	L1+12
0326		000475	RZ2	EQU	L1+13
0327		000614	DVBX	EQU	'614
0328		000616	DVBY	EQU	DVBX+2
0329		000620	DVBZ	EQU	DVBX+8
0330		000656	DVIX	EQU	'656
0331		000660	DVIY	EQU	DVIX+2
0332		000662	DVIZ	EQU	DVIX+4
0333		000310	DTIX	EQU	'310
0334		000312	DTIY	EQU	DTIX+2
0335		000314	DTIZ	EQU	DTIX+4
0336		000414	DTBX	EQU	'414
0337		000416	DTBY	EQU	DTBX+2
0338		000420	DTBZ	EQU	DTBX+4
0339	21522	0 000000	IRCO	DAC	**
0340	21523	000007		DBL	
0341	21524	0 02 00310	DLD		DTIX
0342	21525	0 16 21451	MPY		PXX+1
0343	21526	0 04 21446	DST		T2
0344	21527	0 02 21450	DLD		PXX
0345	21530	0 16 00311	MPY		DTIX+1
0346	21531	0 06 21446	DAD		T2
0347	21532	0401 61	LRS		15
0348	21533	0 04 21444	DST		T1
0349	21534	0 02 00310	DLD		DTIX
0350	21535	0 16 21450	MPY		PXX
0351	21536	0 06 21444	DAD		T1
0352	21537	0 04 21444	DST		T1
0353	21540	0 02 00312	DLD		DTIY
0354	21541	0 16 21457	MPY		PYX+1
0355	21542	0 04 21446	DST		T2
0356	21543	0 02 21456	DLD		PYX
0357	21544	0 16 00313	MPY		DTIY+1
0358	21545	0 06 21446	DAD		T2
0359	21546	0401 61	LRS		15
0360	21547	0 06 21444	DAD		T1
0361	21550	0 04 21444	DST		T1
0362	21551	0 02 00312	DLD		DTIY
0363	21552	0 16 21456	MPY		PYX
0364	21553	0 06 21444	DAD		T1
0365	21554	0 04 21444	DST		T1
0366	21555	0 02 00314	DLD		DTIZ
0367	21556	0 16 21465	MPY		PZX+1
0368	21557	0 04 21446	DST		T2
0369	21560	0 02 21464	DLD		PZX
0370	21561	0 16 00315	MPY		DTIZ+1
0371	21562	0 06 21446	DAD		T2
0372	21563	0401 61	LRS		15
0373	21564	0 06 21444	DAD		T1
0374	21565	0 04 21444	DST		T1
0375	21566	0 02 00314	DLD		DTIZ
0376	21567	0 16 21464	MPY		PZX

MICROCOMP TELECOMMUNICATED DATA

DDP-516 ASSEMBLY LISTING

0377	21570	0 06	21444	DAD	T1
0378	21571	0 06	00414	DAD	DTBX
0379	21572	0 04	00414	DST	DTBX
0380	21573	0 02	00310	DLD	DTIX
0381	21574	0 16	21453	MPY	FXV+1
0382	21575	0 04	21446	DST	T2
0383	21576	0 02	21452	DLD	FXV
0384	21577	0 16	00311	MPY	DTIX+1
0385	21600	0 06	21446	DAD	T2
0386	21601	0401	61	LRS	15
0387	21602	0 04	21444	DST	T1
0388	21603	0 02	00310	DLD	DTIX
0389	21604	0 16	21452	MPY	FXV
0390	21605	0 06	21444	DAD	T1
0391	21606	0 04	21444	DST	T1
0392	21607	0 02	00312	DLD	DTIY
0393	21610	0 16	21461	MPY	FYY+1
0394	21611	0 04	21446	DST	T2
0395	21612	0 02	21460	DLD	FYY
0396	21613	0 16	00313	MPY	DTIY+1
0397	21614	0 06	21446	DAD	T2
0398	21615	0401	61	LRS	15
0399	21616	0 06	21444	DAD	T1
0400	21617	0 04	21444	DST	T1
0401	21620	0 02	00312	DLD	DTIY
0402	21621	0 16	21460	MPY	FYY
0403	21622	0 06	21444	DAD	T1
0404	21623	0 04	21444	DST	T1
0405	21624	0 02	00314	DLD	DTIZ
0406	21625	0 16	21467	MPY	FZY+1
0407	21626	0 04	21446	DST	T2
0408	21627	0 02	21466	DLD	FZY
0409	21630	0 16	00315	MPY	DTIZ+1
0410	21631	0 06	21446	DAD	T2
0411	21632	0401	61	LRS	15
0412	21633	0 06	21444	DAD	T1
0413	21634	0 04	21444	DST	T1
0414	21635	0 02	00314	DLD	DTIZ
0415	21636	0 16	21466	MPY	FZY
0416	21637	0 06	21444	DAD	T1
0417	21640	0 06	00416	DAD	DTBY
0418	21641	0 04	00416	DST	DTBY
0419	21642	0 02	00310	DLD	DTIX
0420	21643	0 16	21455	MPY	FXZ+1
0421	21644	0 04	21446	DST	T2
0422	21645	0 02	21454	DLD	FXZ
0423	21646	0 16	00311	MPY	DTIX+1
0424	21647	0 06	21446	DAD	T2
0425	21650	0401	61	LRS	15
0426	21651	0 04	21444	DST	T1
0427	21652	0 02	00310	DLD	DTIX
0428	21653	0 16	21454	MPY	FXZ
0429	21654	0 06	21444	DAD	T1
0430	21655	0 04	21444	DST	T1
0431	21656	0 02	00312	DLD	DTIY
0432	21657	0 16	21463	MPY	FYZ+1
0433	21660	0 04	21446	DST	T2

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0434	21661	0 02	21462	DLD	FYZ
0435	21662	0 16	00313	MPY	DTIY+1
0436	21663	0 06	21446	DAD	T2
0437	21664	0401	61	LRS	15
0438	21665	0 06	21444	DAD	T1
0439	21666	0 04	21444	DST	T1
0440	21667	0 02	00312	DLD	DTIY
0441	21670	0 16	21462	MPY	FYZ
0442	21671	0 06	21444	DAD	T1
0443	21672	0 04	21444	DST	T1
0444	21673	0 02	00314	DLD	DTIZ
0445	21674	0 16	21471	MPY	FZZ+1
0446	21675	0 04	21446	DST	T2
0447	21676	0 02	21470	DLD	FZZ
0448	21677	0 16	00315	MPY	DTIZ+1
0449	21700	0 06	21446	DAD	T2
0450	21701	0401	61	LRS	15
0451	21702	0 06	21444	DAD	T1
0452	21703	0 04	21444	DST	T1
0453	21704	0 02	00314	DLD	DTIZ
0454	21705	0 16	21470	MPY	FZZ
0455	21706	0 06	21444	DAD	T1
0456	21707	0 06	00420	DAD	DTBZ
0457	21710	0 04	00420	DST	DTBZ
0458	21711	000005		SGL	
0459	21712	-0 01	21522	JMP*	IRCO
0460				END	

PROGRAM NAME:

SOURCE: MLPF

BINARY: BMLPF

ENTRY POINTS (LOCATION): PIPR ('22000) GYPR ('22053)

GENERAL DESCRIPTION:

The subroutine PIPR takes the six ΔV 's from the accelerometers and effectively multiplies them by the matrix corresponding to the accelerometer working fail status to yield $\Delta \bar{V}_B$. The six ΔV 's are stored in locations '600, '602, '604, '606, '610 and '612. ΔV_B is stored (double precision) in locations '614, '616 and '620. The high order of ΔV_B is zeroed prior to this multiplication and the double precision calculated ΔV_B is added to the residual low order of locations '614, '616 and '620. The accelerometer first and second failures are stored in locations '320 and '321.

The subroutine GYPR does an analagous multiply for the gyros except at the end, in addition, it scales $\Delta \bar{\theta}_B$ to 2^{-5} radians by effectively multiplying by 7/4.

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0001			SUBR	PIPR
0002			SUBR	GYPR
0003			ABS	
0004			ORG	'22000
0005			SETB	BAS1
0006	22000		BAS1	BSS
0007	22024	0 000000	PIPR	DAC
0008	22025	000007	DBL	**
0009	22026	0 02 00320	DLD	'320
0010	22027	0 04 22134	DST	FLST
0011	22030	000005	SGL	
0012	22031	140040	CRA	
0013	22032	0 04 22132	STA	INST
0014	22033	0 04 00614	STA	'614
0015	22034	0 04 00616	STA	'616
0016	22035	0 04 00620	STA	'620
0017	22036	0 02 00600	LDA	'600
0018	22037	0 04 22124	STA	TDA
0019	22040	0 02 00602	LDA	'602
0020	22041	0 04 22125	STA	TDB
0021	22042	0 02 00604	LDA	'604
0022	22043	0 04 22126	STA	TDC
0023	22044	0 02 00606	LDA	'606
0024	22045	0 04 22127	STA	TDD
0025	22046	0 02 00610	LDA	'610
0026	22047	0 04 22130	STA	TDE
0027	22050	0 02 00612	LDA	'612
0028	22051	0 04 22131	STA	TDF
0029	22052	0 01 22102	JMP	CMPR
0030	22053	0 000000	GYPR	DAC
0031	22054	000007	DBL	**
0032	22055	0 02 00316	DLD	'316
0033	22056	0 04 22134	DST	FLST
0034	22057	000005	SGL	
0035	22060	140040	CRA	
0036	22061	0 04 00414	STA	'414
0037	22062	0 04 00416	STA	'416
0038	22063	0 04 00420	STA	'420
0039	22064	141206	AOA	
0040	22065	0 04 22132	STA	INST
0041	22066	0 02 00400	LDA	'400
0042	22067	0 04 22124	STA	TDA
0043	22070	0 02 00402	LDA	'402
0044	22071	0 04 22125	STA	TDB
0045	22072	0 02 00404	LDA	'404
0046	22073	0 04 22126	STA	TDC
0047	22074	0 02 00406	LDA	'406
0048	22075	0 04 22127	STA	TDD
0049	22076	0 02 00410	LDA	'410
0050	22077	0 04 22130	STA	TDE
0051	22100	0 02 00412	LDA	'412
0052	22101	0 04 22131	STA	TDF
0053	22102	0 02 22135	CMPR	LDA
0054	22103	0 11 22134	CAS	FLST+1
0055	22104	0 01 22107	JMP	**3
0056	22105	101000	NOP	
0057	22106	0 01 22111	JMP	**3

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0058	22107	0 13 22134	IHA	FLST	
0059	22110	0 13 22135	IHA	FLST+1	
0060	22111	0 02 22135	LDA	FLST+1	
0061	22112	101040	SNZ		
0062	22113	0 01 22121	JMP	**6	
0063	22114	0 02 23557	LDA	=11	
0064	22115	0 07 22135	SUB	FLST+1	
0065	22116	0 16 22135	MPY	FLST+1	
0066	22117	000201	IAB		
0067	22120	0401 77	LRS	1	
0068	22121	0 06 22134	ADD	FLST	
0069	22122	0 04 00000	STA	0	
0070	22123	-1 01 22136	JMP*	FLAD, 1	
0071	22124	000000	TDA	OCT	0
0072	22125	000000	TDB	OCT	0
0073	22126	000000	TDC	OCT	0
0074	22127	000000	TDD	OCT	0
0075	22130	000000	TDE	OCT	0
0076	22131	000000	TDF	OCT	0
0077		000366	HTMP	EQU	'366
0078		000372	TDX	EQU	'372
0079		000374	TDY	EQU	'374
0080		000376	TDZ	EQU	'376
0081	22132	000000	INST	DEC	0
0082	22134	000000	FLST	DBP	0
	22135	000000			
0083	22136	0 022416	FLAD	DAC	NOFL
0084	22137	0 022423		DAC	AFL
0085	22140	0 022450		DAC	BFL
0086	22141	0 022501		DAC	CFL
0087	22142	0 022525		DAC	DFL
0088	22143	0 022555		DAC	EFL
0089	22144	0 022601		DAC	FFL
0090	22145	0 022630		DAC	ABFL
0091	22146	0 022650		DAC	ACFL
0092	22147	0 022705		DAC	ADFL
0093	22150	0 022743		DAC	AEFL
0094	22151	0 023001		DAC	AFFL
0095	22152	0 023034		DAC	BCFL
0096	22153	0 023066		DAC	BDFL
0097	22154	0 023131		DAC	BEFL
0098	22155	0 023166		DAC	BFFL
0099	22156	0 023230		DAC	CDFL
0100	22157	0 023247		DAC	CEFL
0101	22160	0 023304		DAC	CFFL
0102	22161	0 023341		DAC	DFFL
0103	22162	0 023374		DAC	DFFL
0104	22163	0 023436		DAC	EFFL
0105	22164	000000		DBP	0
	22165	000000			
0106	22166	020645	CSEQ	DEC	0.2628655565BB0
	22167	045016			
0107	22170	033161		DEC	0.4253254040BB0
	22171	004013			
0108	22172	000000		DBP	0
	22173	000000			
0109	22174	011231		DEC	0.1453085058BB0

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

	22175	036014			
0110	22176	042575	DEC	0.5428824547BB0	
	22177	013015			
0111	22200	007414	DEC	0.1175570507BB0	
	22201	007002			
0112	22202	000000	DBP	0	
	22203	000000			
0113	22204	047311	DEC	0.6155367075BB0	
	22205	072023			
0114	22206	014130	DEC	0.1902113036BB0	
	22207	066010			
0115	22210	034776	DEC	0.4530768591BB0	
	22211	033025			
0116	22212	000000	DBP	0	
	22213	000000			
0117	22214	045474	DEC	0.5877852524BB0	
	22215	043011			
0118	22216	000000	DBP	0	
	22217	000000			
0119	22220	074674	DEC	0.9510565168BB0	
	22221	016047			
0120	22222	000000	DBP	0	
	22223	000000			
0121	22224	024022	DEC	0.3130684104BB0	
	22225	050026			
0122	22226	076664	DEC	0.9820835861BB0	
	22227	072435			
0123	22230	043503	DEC	0.5567581822BB0	
	22231	066422			
0124	22232	003155	DEC	0.05020285398BB0	
	22233	003010			
0125	22234	000000	DBP	0	
	22235	000000			
0126	22236	005145	DEC	0.08122992423BB0	
	22237	057377			
0127	22240	003155	DEC	0.05020285398BB0	
	22241	003010			
0128	22242	050651	DEC	0.6379881064BB0	
	22243	046021			
0129	22244	040326	DEC	0.5065553282BB0	
	22245	063412			
0130	22246	000000	DBP	0	
	22247	000000			
0131	22250	043503	DEC	0.5567581822BB0	
	22251	066422			
0132	22252	026013	DEC	0.3440954797BB0	
	22253	024414			
0133	22254	046660	DEC	0.6069610362BB0	
	22255	071432			
0134	22256	031170	DEC	0.3942983337BB0	
	22257	027424			
0135	22260	000000	DBP	0	
	22261	000000			
0136	22262	0 000000	MULT DAC	**	
0137	22263	000007	DBL		
0138	22264	1 02 22166	DLD	CSEQ, 1	
0139	22265	0 16 00366	MPY	MTMP	

MICROCOMP TELECOMMUNICATED DATA
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0140	22266	0 04 22344	DST	TACC
0141	22267	1 02 22166	DLD	CSFQ, 1
0142	22270	000201	IAB	
0143	22271	0 16 00366	MPY	MTMP
0144	22272	0401 61	LRS	15
0145	22273	0 06 22344	DAD	TACC
0146	22274	0 04 22344	DST	TACC
0147	22275	1 02 22170	DLD	CSFQ+2, 1
0148	22276	101040	SNZ	
0149	22277	0 01 22341	JMP	EXM
0150	22300	0 16 00367	MPY	MTMP+1
0151	22301	0 06 22344	DAD	TACC
0152	22302	0 04 22344	DST	TACC
0153	22303	1 02 22170	DLD	CSFQ+2, 1
0154	22304	000201	IAB	
0155	22305	0 16 00367	MPY	MTMP+1
0156	22306	0401 61	LRS	15
0157	22307	0 06 22344	DAD	TACC
0158	22310	0 04 22344	DST	TACC
0159	22311	1 02 22172	DLD	CSFQ+4, 1
0160	22312	101040	SNZ	
0161	22313	0 01 22341	JMP	EXM
0162	22314	0 16 00370	MPY	MTMP+2
0163	22315	0 06 22344	DAD	TACC
0164	22316	0 04 22344	DST	TACC
0165	22317	1 02 22172	DLD	CSFQ+4, 1
0166	22320	000201	IAB	
0167	22321	0 16 00370	MPY	MTMP+2
0168	22322	0401 61	LRS	15
0169	22323	0 06 22344	DAD	TACC
0170	22324	0 04 22344	DST	TACC
0171	22325	1 02 22174	DLD	CSFQ+6, 1
0172	22326	101040	SNZ	
0173	22327	0 01 22341	JMP	EXM
0174	22330	0 16 00371	MPY	MTMP+3
0175	22331	0 06 22344	DAD	TACC
0176	22332	0 04 22344	DST	TACC
0177	22333	1 02 22174	DLD	CSFQ+6, 1
0178	22334	000201	IAB	
0179	22335	0 16 00371	MPY	MTMP+3
0180	22336	0401 61	LRS	15
0181	22337	0 06 22344	DAD	TACC
0182	22340	-0 01 22262	JMP*	MULT
0183	22341	0 02 22344	EXM DLD	TACC
0184	22342	-0 01 22262	JMP*	MULT
0185	22344	000000	TACC DBP	0
	22345	000000		
0186	22346	0 000000	XNPL DAC	**
0187	22347	140040	CRA	
0188	22350	0 04 00000	STA	0
0189	22351	0 02 22124	LDA	TDA
0190	22352	0 07 22125	SUB	TDB
0191	22353	0 04 00366	STA	MTMP
0192	22354	0 02 22126	LDA	TDC
0193	22355	0 06 22127	ADD	TDD
0194	22356	140407	TCA	
0195	22357	0 04 00367	STA	MTMP+1

MICROCOMP TELECOMMUNICATED DATA
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0196	22360	0 10 22262	JST	MULT
0197	22361	0 04 00372	DST	TDY
0198	22362	000005	SGL	
0199	22363	-0 01 22346	JMP*	YNFL
0200	22364	0 000000	YNFL DAC	**
0201	22365	140040	CRA	
0202	22366	0 04 00000	STA	0
0203	22367	0 02 22127	LDA	TDD
0204	22370	0 07 22126	SUB	TDC
0205	22371	0 04 00366	STA	MTMP
0206	22372	0 02 22130	LDA	TDE
0207	22373	0 07 22131	SUB	TDF
0208	22374	0 04 00367	STA	MTMP+1
0209	22375	0 10 22262	JST	MULT
0210	22376	0 04 00374	DST	TDY
0211	22377	000005	SGL	
0212	22400	-0 01 22364	JMP*	YNFL
0213	22401	0 000000	ZNFL DAC	**
0214	22402	140040	CRA	
0215	22403	0 04 00000	STA	0
0216	22404	0 02 22130	LDA	TDE
0217	22405	0 06 22131	ADD	TDF
0218	22406	0 04 00366	STA	MTMP
0219	22407	0 02 22124	LDA	TDA
0220	22410	0 06 22125	ADD	TDB
0221	22411	0 04 00367	STA	MTMP+1
0222	22412	0 10 22262	JST	MULT
0223	22413	0 04 00376	DST	TDZ
0224	22414	000005	SGL	
0225	22415	-0 01 22401	JMP*	ZNFL
0226	22416	0 10 22346	NOFL JST	YNFL
0227	22417	0 10 22364	JST	YNFL
0228	22420	0 10 22401	JST	ZNFL
0229	22421	000007	DBL	
0230	22422	0 01 23454	JMP	OUTD
0231	22423	0 10 22364	AFL JST	YNFL
0232	22424	0 35 23556	LDX	=6
0233	22425	0 02 22125	LDA	TDB
0234	22426	140407	TCA	
0235	22427	0 04 00366	STA	MTMP
0236	22430	0 02 22126	LDA	TDC
0237	22431	0 06 22127	ADD	TDD
0238	22432	140407	TCA	
0239	22433	0 04 00367	STA	MTMP+1
0240	22434	0 02 22130	LDA	TDE
0241	22435	0 06 22131	ADD	TDF
0242	22436	0 04 00370	STA	MTMP+2
0243	22437	0 10 22262	JST	MULT
0244	22440	0 04 00372	DST	TDX
0245	22441	000005	SGL	
0246	22442	0 35 23555	LDX	=14
0247	22443	0 02 22125	LDA	TDB
0248	22444	0 04 00366	STA	MTMP
0249	22445	0 10 22262	JST	MULT
0250	22446	0 04 00376	DST	TDZ
0251	22447	0 01 23454	JMP	OUTD
0252	22450	0 10 22364	BFL JST	YNFL

MICROCOMP TELECOMMUNICATED DATA
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0253	22451	0 35 23556		LDX	=6
0254	22452	0 02 22124		LDA	TDA
0255	22453	0 04 00366		STA	MTMP
0256	22454	0 02 22126		LDA	TDC
0257	22455	0 06 22127		ADD	TDD
0258	22456	140407		TCA	
0259	22457	0 04 00367		STA	MTMP+1
0260	22460	0 02 22130		LDA	TDE
0261	22461	0 06 22131		ADD	TDF
0262	22462	140407		TCA	
0263	22463	0 04 00370		STA	MTMP+2
0264	22464	0 10 22262		JST	MULT
0265	22465	0 04 00372		DST	TDX
0266	22466	000005		SGL	
0267	22467	0 35 23555		LDX	=14
0268	22470	0 02 00367		LDA	MTMP+1
0269	22471	140407		TCA	
0270	22472	0 04 00367		STA	MTMP+1
0271	22473	0 02 00370		LDA	MTMP+2
0272	22474	140407		TCA	
0273	22475	0 04 00370		STA	MTMP+2
0274	22476	0 10 22262		JST	MULT
0275	22477	0 04 00376		DST	TDZ
0276	22500	0 01 23454		JMP	OUTD
0277	22501	0 10 22401	CPL	JST	ZNFL
0278	22502	0 35 23555		LDX	=14
0279	22503	0 02 22127		LDA	TDD
0280	22504	140407		TCA	
0281	22505	0 04 00366		STA	MTMP
0282	22506	0 02 22130		LDA	TDE
0283	22507	0 07 22131		SUB	TDF
0284	22510	0 04 00367		STA	MTMP+1
0285	22511	0 02 22124		LDA	TDA
0286	22512	0 07 22125		SUB	TDB
0287	22513	0 04 00370		STA	MTMP+2
0288	22514	0 10 22262		JST	MULT
0289	22515	0 04 00372		DST	TDY
0290	22516	000005		SGL	
0291	22517	0 35 23556		LDX	=6
0292	22520	0 02 22127		LDA	TDD
0293	22521	0 04 00366		STA	MTMP
0294	22522	0 10 22262		JST	MULT
0295	22523	0 04 00374		DST	TDY
0296	22524	0 01 23454		JMP	OUTD
0297	22525	0 10 22401	DPI	JST	ZNFL
0298	22526	0 35 23555		LDX	=14
0299	22527	0 02 22126		LDA	TDC
0300	22530	140407		TCA	
0301	22531	0 04 00366		STA	MTMP
0302	22532	0 02 22131		LDA	TDF
0303	22533	0 07 22130		SUB	TDE
0304	22534	0 04 00367		STA	MTMP+1
0305	22535	0 02 22124		LDA	TDA
0306	22536	0 07 22125		SUB	TDB
0307	22537	0 04 00370		STA	MTMP+2
0308	22540	0 10 22262		JST	MULT
0309	22541	0 04 00372		DST	TDX

MICROCOMP TELECOMMUNICATED DATA
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0310	22542	000005		SGL	
0311	22543	0 35 23556		LDX	=6
0312	22544	0 02 00367		LDA	NTMP+1
0313	22545	140407		TCA	
0314	22546	0 04 00367		STA	NTMP+1
0315	22547	0 02 00370		LDA	NTMP+2
0316	22550	140407		TCA	
0317	22551	0 04 00370		STA	NTMP+2
0318	22552	0 10 22262		JST	MULT
0319	22553	0 04 00374		DST	TDY
0320	22554	0 01 23454		JMP	OUTD
0321	22555	0 10 22346	EPL	JST	XNPL
0322	22556	0 35 23555		LDX	=14
0323	22557	0 02 22131		LDA	TDF
0324	22560	140407		TCA	
0325	22561	0 04 00366		STA	NTMP
0326	22562	0 02 22124		LDA	TDA
0327	22563	0 06 22125		ADD	TDB
0328	22564	0 04 00367		STA	NTMP+1
0329	22565	0 02 22127		LDA	TDD
0330	22566	0 07 22126		SUB	TDC
0331	22567	0 04 00370		STA	NTMP+2
0332	22570	0 10 22262		JST	MULT
0333	22571	0 04 00374		DST	TDY
0334	22572	000005		SGL	
0335	22573	0 35 23556		LDX	=6
0336	22574	0 02 22131		LDA	TDF
0337	22575	0 04 00366		STA	NTMP
0338	22576	0 10 22262		JST	MULT
0339	22577	0 04 00376		DST	TDZ
0340	22600	0 01 23454		JMP	OUTD
0341	22601	0 10 22346	FFL	JST	XNPL
0342	22602	0 35 23556		LDX	=6
0343	22603	0 02 22130		LDA	TDE
0344	22604	0 04 00366		STA	NTMP
0345	22605	0 02 22124		LDA	TDA
0346	22606	0 06 22125		ADD	TDB
0347	22607	0 04 00367		STA	NTMP+1
0348	22610	0 02 22126		LDA	TDC
0349	22611	0 07 22127		SUB	TDD
0350	22612	0 04 00370		STA	NTMP+2
0351	22613	0 10 22262		JST	MULT
0352	22614	0 04 00376		DST	TDZ
0353	22615	000005		SGL	
0354	22616	0 35 23555		LDX	=14
0355	22617	0 02 00367		LDA	NTMP+1
0356	22620	140407		TCA	
0357	22621	0 04 00367		STA	NTMP+1
0358	22622	0 02 00370		LDA	NTMP+2
0359	22623	140407		TCA	
0360	22624	0 04 00370		STA	NTMP+2
0361	22625	0 10 22262		JST	MULT
0362	22626	0 04 00374		DST	TDY
0363	22627	0 01 23454		JMP	OUTD
0364	22630	0 10 22364	ABFL	JST	YNPL
0365	22631	0 35 23554		LDX	=22
0366	22632	0 02 22126		LDA	TDC

MICROCOMP TELECOMMUNICATED DATA
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0367	22633	0 06 22127	ADD	TDD
0368	22634	140407	TCA	
0369	22635	0 04 00366	STA	MTMP
0370	22636	0 10 22262	JST	MULT
0371	22637	0 04 00372	DST	TDX
0372	22640	000005	SGL	
0373	22641	0 35 23553	LDX	=26
0374	22642	0 02 22130	LDA	TDE
0375	22643	0 06 22131	ADD	TDF
0376	22644	0 04 00366	STA	MTMP
0377	22645	0 10 22262	JST	MULT
0378	22646	0 04 00376	DST	TDZ
0379	22647	0 01 23454	JMP	OUTD
0380	22650	0 35 23552	ACPL LDX	=40
0381	22651	0 02 22125	LDA	TDB
0382	22652	140407	TCA	
0383	22653	0 04 00366	STA	MTMP
0384	22654	0 02 22127	LDA	TDD
0385	22655	0 04 00367	STA	MTMP+1
0386	22656	0 02 22130	LDA	TDE
0387	22657	0 04 00370	STA	MTMP+2
0388	22660	0 02 22131	LDA	TDF
0389	22661	140407	TCA	
0390	22662	0 04 00371	STA	MTMP+3
0391	22663	0 10 22262	JST	MULT
0392	22664	0 04 00374	DST	TDY
0393	22665	000005	SGL	
0394	22666	0 35 23551	LDX	=30
0395	22667	0 02 22127	LDA	TDD
0396	22670	140407	TCA	
0397	22671	0 04 00367	STA	MTMP+1
0398	22672	0 10 22262	JST	MULT
0399	22673	0 04 00372	DST	TDX
0400	22674	000005	SGL	
0401	22675	0 35 23550	LDX	=50
0402	22676	0 02 22125	LDA	TDB
0403	22677	0 04 00366	STA	MTMP
0404	22700	0 02 22131	LDA	TDF
0405	22701	0 04 00371	STA	MTMP+3
0406	22702	0 10 22262	JST	MULT
0407	22703	0 04 00376	DST	TDZ
0408	22704	0 01 23454	JMP	OUTD
0409	22705	0 35 23551	ADFL LDX	=30
0410	22706	0 02 22125	LDA	TDB
0411	22707	140407	TCA	
0412	22710	0 04 00366	STA	MTMP
0413	22711	0 02 22126	LDA	TDC
0414	22712	140407	TCA	
0415	22713	0 04 00367	STA	MTMP+1
0416	22714	0 02 22130	LDA	TDE
0417	22715	140407	TCA	
0418	22716	0 04 00371	STA	MTMP+3
0419	22717	0 02 22131	LDA	TDF
0420	22720	0 04 00370	STA	MTMP+2
0421	22721	0 10 22262	JST	MULT
0422	22722	0 04 00372	DST	TDX
0423	22723	000005	SGL	

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0424	22724	0 35 23550	LDX	=50
0425	22725	0 02 22125	LDA	TDB
0426	22726	0 04 00366	STA	MTMP
0427	22727	0 02 22130	LDA	TDE
0428	22730	0 04 00371	STA	MTMP+3
0429	22731	0 10 22262	JST	MULT
0430	22732	0 04 00376	DST	TDZ
0431	22733	000005	SGL	
0432	22734	0 35 23552	LDX	=40
0433	22735	0 02 22131	LDA	TDF
0434	22736	140407	TCA	
0435	22737	0 04 00370	STA	MTMP+2
0436	22740	0 10 22262	JST	MULT
0437	22741	0 04 00374	DST	TDY
0438	22742	0 01 23454	JMP	OUTD
0439	22743	0 35 23552	AEPI LDX	=40
0440	22744	0 02 22131	LDA	TDF
0441	22745	0 04 00366	STA	MTMP
0442	22746	0 02 22125	LDA	TDB
0443	22747	140407	TCA	
0444	22750	0 04 00367	STA	MTMP+1
0445	22751	0 02 22126	LDA	TDC
0446	22752	140407	TCA	
0447	22753	0 04 00370	STA	MTMP+2
0448	22754	0 02 22127	LDA	TDD
0449	22755	140407	TCA	
0450	22756	0 04 00371	STA	MTMP+3
0451	22757	0 10 22262	JST	MULT
0452	22760	0 04 00372	DST	TDX
0453	22761	000005	SGL	
0454	22762	0 35 23551	IDX	=30
0455	22763	0 02 22125	LDA	TDB
0456	22764	0 04 00367	STA	MTMP+1
0457	22765	0 10 22262	JST	MULT
0458	22766	0 04 00376	DST	TDZ
0459	22767	000005	SGL	
0460	22770	0 35 23550	LDX	=50
0461	22771	0 02 22131	LDA	TDF
0462	22772	140407	TCA	
0463	22773	0 04 00366	STA	MTMP
0464	22774	0 02 22127	LDA	TDD
0465	22775	0 04 00371	STA	MTMP+3
0466	22776	0 10 22262	JST	MULT
0467	22777	0 04 00374	DST	TDY
0468			ORG	*23000
0469			SETB	BAS2
0470	23000	0 01 23454	JMP	OUTD
0471	23001	0 35 23551	APFL LDX	=30
0472	23002	0 02 22130	LDA	TDE
0473	23003	0 04 00366	STA	MTMP
0474	23004	0 02 22125	LDA	TDB
0475	23005	0 04 00367	STA	MTMP+1
0476	23006	0 02 22127	LDA	TDD
0477	23007	140407	TCA	
0478	23010	0 04 00370	STA	MTMP+2
0479	23011	0 02 22126	LDA	TDC
0480	23012	140407	TCA	

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0481	23013	0 04 00371	STA	MTMP+3
0482	23014	0 10 22262	JST	MUIT
0483	23015	0 04 00376	DST	TDZ
0484	23016	000005	SGI	
0485	23017	0 35 23552	IDX	=40
0486	23020	0 02 22125	LDA	TDB
0487	23021	140407	TCA	
0488	23022	0 04 00367	STA	MTMP+1
0489	23023	0 10 22262	JST	MUIT
0490	23024	0 04 00372	DST	TDY
0491	23025	000005	SGI	
0492	23026	0 35 23550	IDX	=50
0493	23027	0 02 22127	LDA	TDD
0494	23030	0 04 00370	STA	MTMP+2
0495	23031	0 10 22262	JST	MUIT
0496	23032	0 04 00374	DST	TDY
0497	23033	0 01 23454	JMP	OUTD
0498	23034	0 35 23551	BCFI IDX	=30
0499	23035	0 02 22124	LDA	TDA
0500	23036	0 04 00366	STA	MTMP
0501	23037	0 02 22127	LDA	TDD
0502	23040	140407	TCA	
0503	23041	0 04 00367	STA	MTMP+1
0504	23042	0 02 22131	LDA	TDF
0505	23043	140407	TCA	
0506	23044	0 04 00370	STA	MTMP+2
0507	23045	0 02 22130	LDA	TDF
0508	23046	0 04 00371	STA	MTMP+3
0509	23047	0 10 22262	JST	MUIT
0510	23050	0 04 00372	DST	TDY
0511	23051	000005	SGI	
0512	23052	0 35 23552	IDX	=40
0513	23053	0 02 22127	LDA	TDD
0514	23054	0 04 00367	STA	MTMP+1
0515	23055	0 10 22262	JST	MUIT
0516	23056	0 04 00374	DST	TDY
0517	23057	000005	SGI	
0518	23060	0 35 23550	IDX	=50
0519	23061	0 02 22131	LDA	TDF
0520	23062	0 04 00370	STA	MTMP+2
0521	23063	0 10 22262	JST	MUIT
0522	23064	0 04 00376	DST	TDZ
0523	23065	0 01 23454	JMP	OUTD
0524	23066	0 35 23551	BDFI IDX	=30
0525	23067	0 02 22124	LDA	TDA
0526	23070	0 04 00366	STA	MTMP
0527	23071	0 02 22126	LDA	TDC
0528	23072	140407	TCA	
0529	23073	0 04 00367	STA	MTMP+1
0530	23074	0 02 22130	LDA	TDE
0531	23075	140407	TCA	
0532	23076	0 04 00370	STA	MTMP+2
0533	23077	0 02 22131	LDA	TDF
0534	23100	0 04 00371	STA	MTMP+3
0535	23101	0 10 22262	JST	MUIT
0536	23102	0 04 00372	DST	TDY
0537	23103	000005	SGI	

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0538	23104	0 35 23550	LDX	=50
0539	23105	0 02 22126	LDA	TDC
0540	23106	0 04 00367	STA	MTMP+1
0541	23107	0 02 22130	LDA	TDE
0542	23110	0 04 00370	STA	MTMP+2
0543	23111	0 10 22262	JST	MULT
0544	23112	0 04 00376	DST	TDZ
0545	23113	000005	SGL	
0546	23114	0 35 23552	LDX	=40
0547	23115	0 02 22124	LDA	TDA
0548	23116	140407	TCA	
0549	23117	0 04 00366	STA	MTMP
0550	23120	0 02 22126	LDA	TDC
0551	23121	140407	TCA	
0552	23122	0 04 00367	STA	MTMP+1
0553	23123	0 02 22131	LDA	TDF
0554	23124	140407	TCA	
0555	23125	0 04 00371	STA	MTMP+3
0556	23126	0 10 22262	JST	MULT
0557	23127	0 04 00374	DST	TDY
0558	23130	0 01 23454	JMP	OUTD
0559	23131	0 35 23552	BEFL LDX	=40
0560	23132	0 02 22131	LDA	TDF
0561	23133	140407	TCA	
0562	23134	0 04 00366	STA	MTMP
0563	23135	0 02 22124	LDA	TDA
0564	23136	0 04 00367	STA	MTMP+1
0565	23137	0 02 22127	LDA	TDD
0566	23140	140407	TCA	
0567	23141	0 04 00370	STA	MTMP+2
0568	23142	0 02 22126	LDA	TDC
0569	23143	140407	TCA	
0570	23144	0 04 00371	STA	MTMP+3
0571	23145	0 10 22262	JST	MULT
0572	23146	0 04 00372	DST	TDX
0573	23147	000005	SGL	
0574	23150	0 35 23550	LDX	=50
0575	23151	0 02 22127	LDA	TDD
0576	23152	0 04 00370	STA	MTMP+2
0577	23153	0 10 22262	JST	MULT
0578	23154	0 04 00374	DST	TDY
0579	23155	000005	SGL	
0580	23156	0 35 23551	LDX	=30
0581	23157	0 02 22131	LDA	TDF
0582	23160	0 04 00366	STA	MTMP
0583	23161	0 02 22126	LDA	TDC
0584	23162	0 04 00371	STA	MTMP+3
0585	23163	0 10 22262	JST	MULT
0586	23164	0 04 00376	DST	TDZ
0587	23165	0 01 23454	JMP	OUTD
0588	23166	0 35 23552	BEFL LDX	=40
0589	23167	0 02 22130	LDA	TDE
0590	23170	140407	TCA	
0591	23171	0 04 00366	STA	MTMP
0592	23172	0 02 22124	LDA	TDA
0593	23173	0 04 00367	STA	MTMP+1
0594	23174	0 02 22126	LDA	TDC

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0595	23175	140407		TCA	
0596	23176	0 04 00370		STA	MTMP+2
0597	23177	0 02 22127		LDA	TDD
0598	23200	140407		TCA	
0599	23201	0 04 00371		STA	MTMP+3
0600	23202	0 10 22262		JST	MULT
0601	23203	0 04 00372		DST	TDY
0602	23204	000005		SGL	
0603	23205	0 35 23550		IDX	=50
0604	23206	0 02 22130		LDA	TDF
0605	23207	0 04 00366		STA	MTMP
0606	23210	0 02 22124		LDA	TDA
0607	23211	140407		TCA	
0608	23212	0 04 00367		STA	MTMP+1
0609	23213	0 02 22127		LDA	TDD
0610	23214	0 04 00371		STA	MTMP+3
0611	23215	0 10 22262		JST	MULT
0612	23216	0 04 00374		DST	TDY
0613	23217	000005		SGL	
0614	23220	0 35 23551		IDX	=30
0615	23221	0 02 22124		LDA	TDA
0616	23222	0 04 00367		STA	MTMP+1
0617	23223	0 02 22126		LDA	TDC
0618	23224	0 04 00370		STA	MTMP+2
0619	23225	0 10 22262		JST	MULT
0620	23226	0 04 00376		DST	TDZ
0621	23227	0 01 23454		JMP	ONTD
0622	23230	0 10 22401	CDFL	JST	ZNFI
0623	23231	0 35 23553		IDX	=26
0624	23232	0 02 22124		LDA	TDA
0625	23233	0 07 22125		SUB	TDB
0626	23234	0 04 00366		STA	MTMP
0627	23235	0 10 22262		JST	MULT
0628	23236	0 04 00372		DST	TDY
0629	23237	000005		SGL	
0630	23240	0 35 23554		IDX	=22
0631	23241	0 02 22130		LDA	TDF
0632	23242	0 07 22131		SUB	TDF
0633	23243	0 04 00366		STA	MTMP
0634	23244	0 10 22262		JST	MULT
0635	23245	0 04 00374		DST	TDY
0636	23246	0 01 23454		JMP	ONTD
0637	23247	0 35 23550	CDFI	IDX	=50
0638	23250	0 02 22127		LDA	TDD
0639	23251	140407		TCA	
0640	23252	0 04 00366		STA	MTMP
0641	23253	0 02 22131		LDA	TDF
0642	23254	140407		TCA	
0643	23255	0 04 00367		STA	MTMP+1
0644	23256	0 02 22124		LDA	TDA
0645	23257	0 04 00370		STA	MTMP+2
0646	23260	0 02 22125		LDA	TDB
0647	23261	140407		TCA	
0648	23262	0 04 00371		STA	MTMP+3
0649	23263	0 10 22262		JST	MULT
0650	23264	0 04 00372		DST	TDY
0651	23265	000005		SGL	

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0652	23266	0 35	23551	LDX	=30
0653	23267	0 02	22127	LDA	TDD
0654	23270	0 04	00366	STA	MTMP
0655	23271	0 02	22125	LDA	TDR
0656	23272	0 04	00371	STA	MTMP+3
0657	23273	0 10	22262	JST	MULT
0658	23274	0 04	00374	DST	TDY
0659	23275	000005		SGL	
0660	23276	0 35	23552	LDX	=40
0661	23277	0 02	22131	LDA	TDF
0662	23300	0 04	00367	STA	MTMP+1
0663	23301	0 10	22262	JST	MULT
0664	23302	0 04	00376	DST	TDZ
0665	23303	0 01	23454	JMP	OUTD
0666	23304	0 35	23551	CEFL LDX	=30
0667	23305	0 02	22127	LDA	TDD
0668	23306	0 04	00366	STA	MTMP
0669	23307	0 02	22130	LDA	TDE
0670	23310	0 04	00367	STA	MTMP+1
0671	23311	0 02	22125	LDA	TDR
0672	23312	140407		TCA	
0673	23313	0 04	00370	STA	MTMP+2
0674	23314	0 02	22124	LDA	TDA
0675	23315	140407		TCA	
0676	23316	0 04	00371	STA	MTMP+3
0677	23317	0 10	22262	JST	MULT
0678	23320	0 04	00374	DST	TDY
0679	23321	000005		SGL	
0680	23322	0 35	23550	LDX	=50
0681	23323	0 02	22127	LDA	TDD
0682	23324	140407		TCA	
0683	23325	0 04	00366	STA	MTMP
0684	23326	0 02	22124	LDA	TDA
0685	23327	0 04	00371	STA	MTMP+3
0686	23330	0 10	22262	JST	MULT
0687	23331	0 04	00372	DST	TDX
0688	23332	000005		SGL	
0689	23333	0 35	23552	LDX	=40
0690	23334	0 02	22125	LDA	TDB
0691	23335	0 04	00370	STA	MTMP+2
0692	23336	0 10	22262	JST	MULT
0693	23337	0 04	00376	DST	TDZ
0694	23340	0 01	23454	JMP	OUTD
0695	23341	0 35	23550	DEFL LDX	=50
0696	23342	0 02	22126	LDA	TDC
0697	23343	140407		TCA	
0698	23344	0 04	00366	STA	MTMP
0699	23345	0 02	22131	LDA	TDF
0700	23346	0 04	00367	STA	MTMP+1
0701	23347	0 02	22125	LDA	TDB
0702	23350	140407		TCA	
0703	23351	0 04	00370	STA	MTMP+2
0704	23352	0 02	22124	LDA	TDA
0705	23353	0 04	00371	STA	MTMP+3
0706	23354	0 10	22262	JST	MULT
0707	23355	0 04	00372	DST	TDX
0708	23356	000005		SGL	

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0709	23357	0 35 23552	LDX	=40
0710	23360	0 02 22125	LDA	TDB
0711	23361	0 04 00370	STA	MTMP+2
0712	23362	0 10 22262	JST	MULT
0713	23363	0 04 00376	DST	TDZ
0714	23364	000005	SGL	
0715	23365	0 35 23551	LDX	=30
0716	23366	0 02 22131	LDA	TDF
0717	23367	140407	TCA	
0718	23370	0 04 00367	STA	MTMP+1
0719	23371	0 10 22262	JST	MULT
0720	23372	0 04 00374	DST	TDY
0721	23373	0 01 23454	JMP	OUTD
0722	23374	0 35 23550	DDPFL LDX	=50
0723	23375	0 02 22126	LDA	TDC
0724	23376	140407	TCA	
0725	23377	0 04 00366	STA	MTMP
0726	23400	0 02 22130	LDA	TDF
0727	23401	140407	TCA	
0728	23402	0 04 00367	STA	MTMP+1
0729	23403	0 02 22124	LDA	TDA
0730	23404	0 04 00370	STA	MTMP+2
0731	23405	0 02 22125	LDA	TDB
0732	23406	140407	TCA	
0733	23407	0 04 00371	STA	MTMP+3
0734	23410	0 10 22262	JST	MULT
0735	23411	0 04 00372	DST	TDY
0736	23412	000005	SGL	
0737	23413	0 35 23551	LDX	=30
0738	23414	0 02 22130	LDA	TDE
0739	23415	0 04 00367	STA	MTMP+1
0740	23416	0 02 22124	LDA	TDA
0741	23417	140407	TCA	
0742	23420	0 04 00370	STA	MTMP+2
0743	23421	0 10 22262	JST	MULT
0744	23422	0 04 00374	DST	TDY
0745	23423	000005	SGL	
0746	23424	0 35 23552	LDX	=40
0747	23425	0 02 22126	LDA	TDC
0748	23426	0 04 00366	STA	MTMP
0749	23427	0 02 22124	LDA	TDA
0750	23430	0 04 00370	STA	MTMP+2
0751	23431	0 02 22125	LDA	TDB
0752	23432	0 04 00371	STA	MTMP+3
0753	23433	0 10 22262	JST	MULT
0754	23434	0 04 00376	DST	TDZ
0755	23435	0 01 23454	JMP	OUTD
0756	23436	0 10 22346	DDPFL JST	XNPL
0757	23437	0 35 23553	LDX	=26
0758	23440	0 02 22127	LDA	TDD
0759	23441	0 07 22126	SOB	TDC
0760	23442	0 04 00366	STA	MTMP
0761	23443	0 10 22262	JST	MULT
0762	23444	0 04 00374	DST	TDY
0763	23445	000005	SGL	
0764	23446	0 35 23554	LDX	=22
0765	23447	0 02 22124	LDA	TDA

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0766	23450	0 06	22125	ADD	TDB
0767	23451	0 04	00366	STA	MTMP
0768	23452	0 10	22262	JST	MULT
0769	23453	0 04	00376	DST	TDZ
0770	23454	0 02	22132	OUTD DLD	INST
0771	23455	101040		SNZ	
0772	23456	0 01	23506	JMP	PIPS
0773	23457	0 02	23522	DLD	DBPO
0774	23460	0 07	00372	DSR	TDX
0775	23461	0401	76	LRS	2
0776	23462	0 06	00372	DAD	TDX
0777	23463	0 06	00372	DAD	TDX
0778	23464	0 06	00414	DAD	'414
0779	23465	0 04	00414	DST	'414
0780	23466	0 02	23522	DLD	DBPO
0781	23467	0 07	00374	DSR	TDY
0782	23470	0401	76	LRS	2
0783	23471	0 06	00374	DAD	TDY
0784	23472	0 06	00374	DAD	TDY
0785	23473	0 06	00416	DAD	'416
0786	23474	0 04	00416	DST	'416
0787	23475	0 02	23522	DLD	DBPO
0788	23476	0 07	00376	DSR	TDZ
0789	23477	0401	76	LRS	2
0790	23500	0 06	00376	DAD	TDZ
0791	23501	0 06	00376	DAD	TDZ
0792	23502	0 06	00420	DAD	'420
0793	23503	0 04	00420	DST	'420
0794	23504	000005		SGL	
0795	23505	-0 01	22053	JMP*	GYPR
0796	23506	0 02	00372	PIPS DLD	TDX
0797	23507	0 06	00614	DAD	'614
0798	23510	0 04	00614	DST	'614
0799	23511	0 02	00374	DLD	TDY
0800	23512	0 06	00616	DAD	'616
0801	23513	0 04	00616	DST	'616
0802	23514	0 02	00376	DLD	TDZ
0803	23515	0 06	00620	DAD	'620
0804	23516	0 04	00620	DST	'620
0805	23517	000005		SGL	
0806	23520	-0 01	22024	JMP*	PIPR
0807	23522	000000		DBPO DBP	0
	23523	000000			
0808	23524			BAS2 BSS	20
0809	23550	000062		END	
	23551	000036			
	23552	000050			
	23553	000032			
	23554	000026			
	23555	000016			
	23556	000006			
	23557	000013			

PROGRAM NAME:

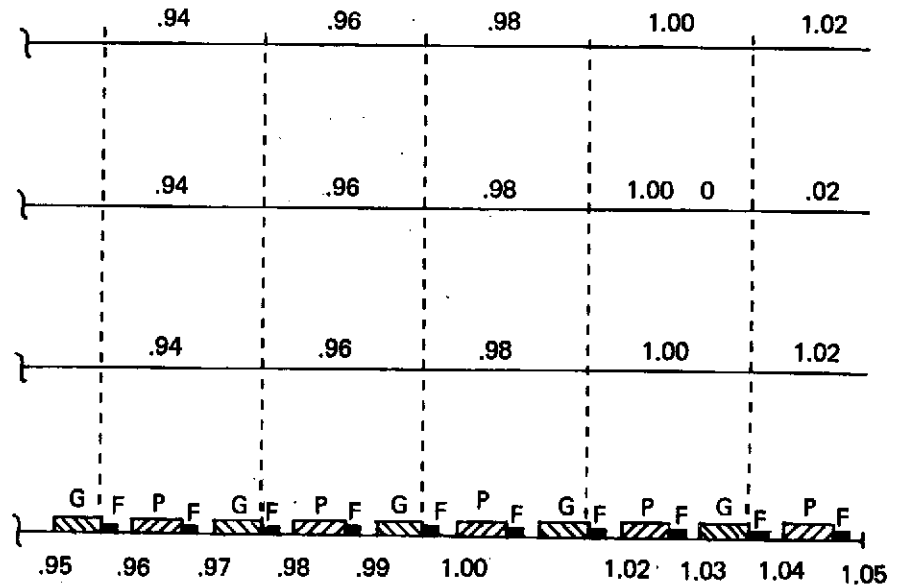
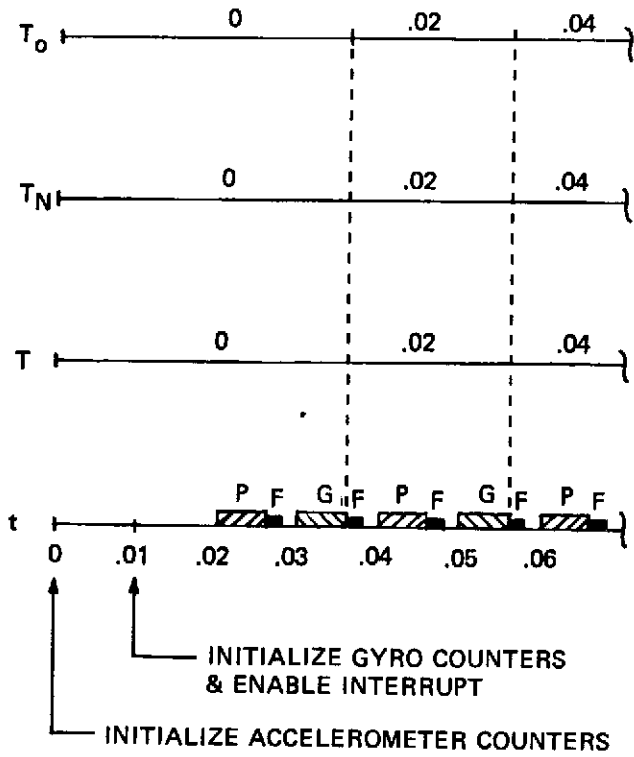
SOURCE: ALUP

BINARY: BALUP

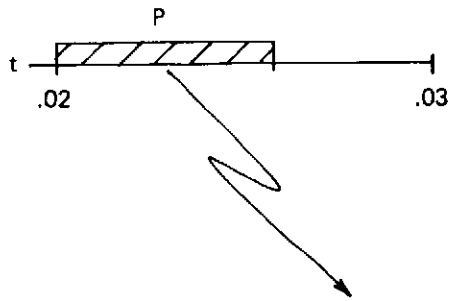
ENTRY POINTS (LOCATION): This is the main program and starts in '1000.

GENERAL DESCRIPTION:

This program controls all the timing, moding and subroutine calls that make the system work. The timing diagram shows what is done as a function of real time (t). T , T_N and T_O are incremented by .02 after each gyro update (G). T_N times the fine align or navigation and is zeroed every second. T_O times the teletype output and is zeroed every two minutes. T simply counts time. The three functional diagrams (P, G and F) show the details of what are represented on the t line of the timing diagram as P, G and F. The statistical failure detection, isolation, classification and re-certification programs are called every two minutes immediately prior to the output call and use the two minutes of data which are saved for them as shown in F.

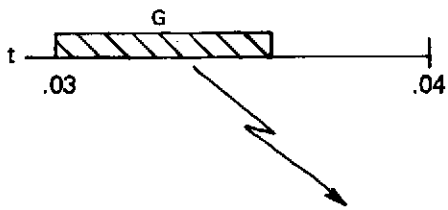


TIMING DIAGRAM

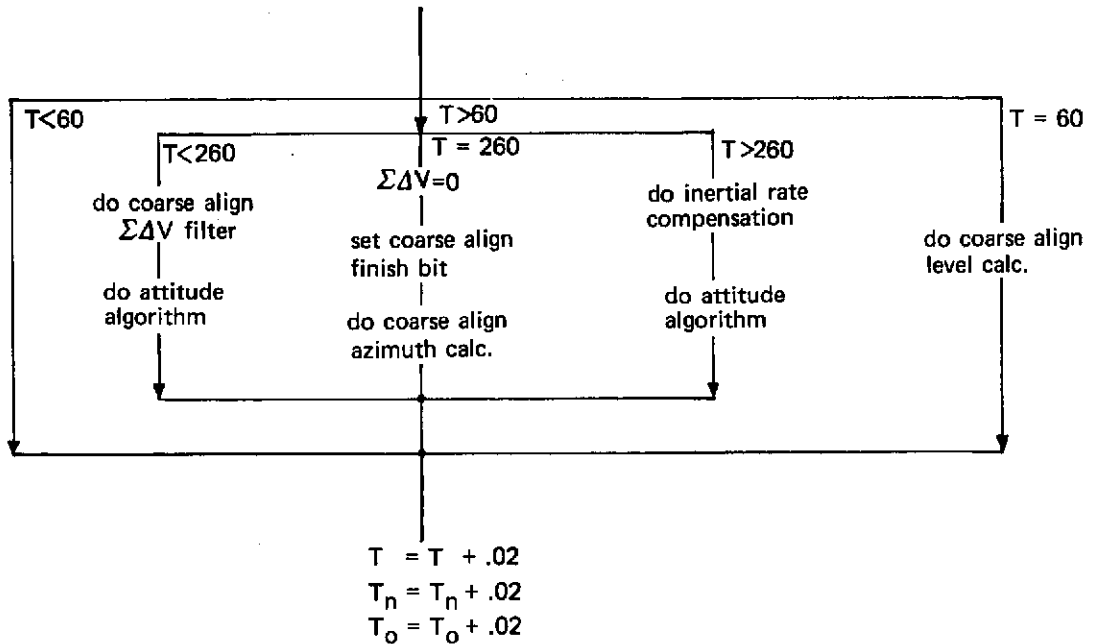


save registers in register set 1
 read accelerometers
 do accelerometer compensation
 do bias recompensation
 do RW^2 , $R\dot{W}$ compensation
 do accelerometer pulse accumulation
 do accelerometer deterministic FDI
 do accelerometer 6x3 multiply
 do quaternion normalization
 do velocity algorithm
 do $\Sigma\Delta V_X$, $\Sigma\Delta V_Y$, $\Sigma\Delta V_Z$

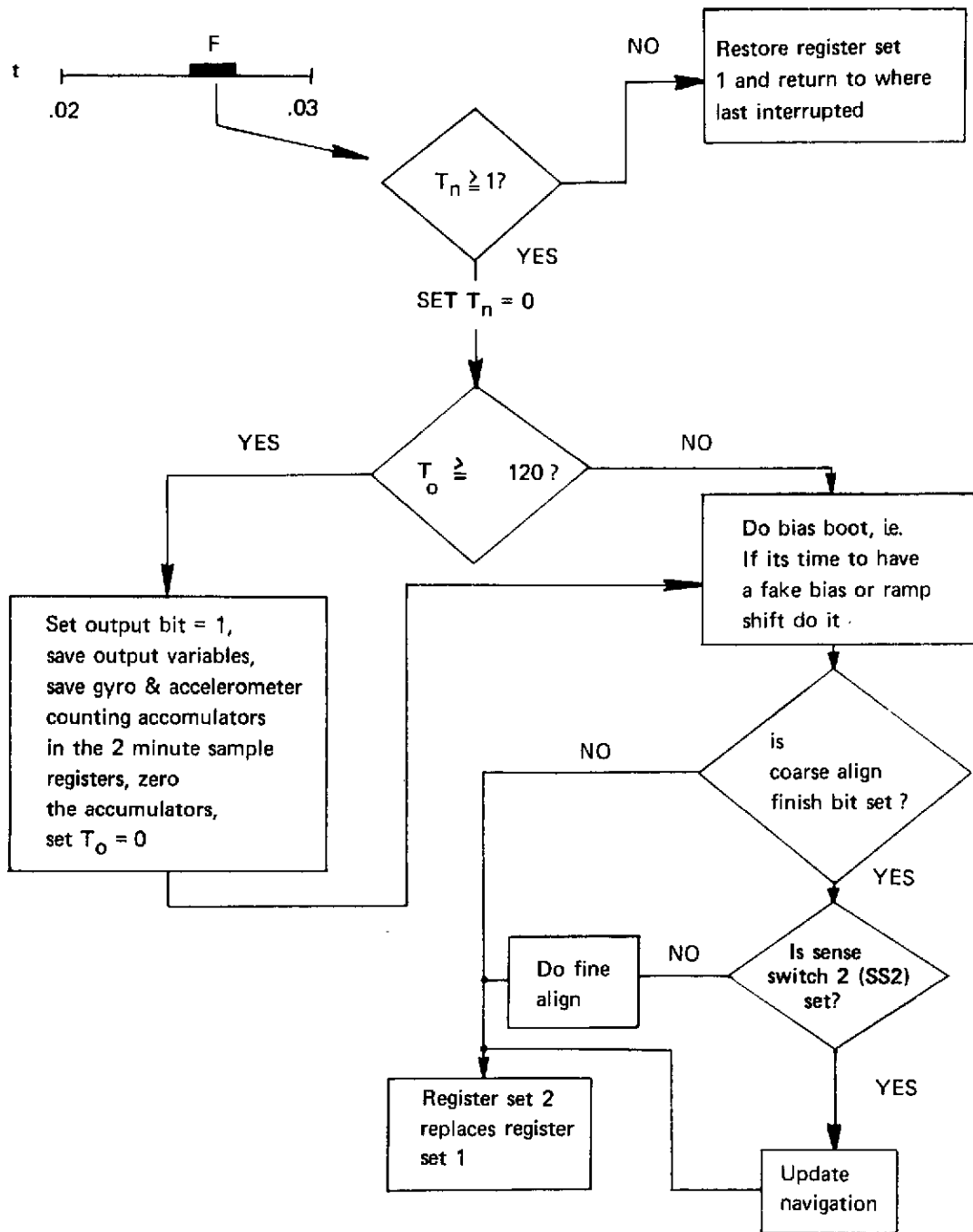
FUNCTIONAL DIAGRAM P



save registers in register set 1
 read table encoder
 read gyros
 do gyro compensation
 do statistical ramp compensation
 do statistical bias compensation
 do gyro deterministic FDI
 do gyro 6x3 multiply



FUNCTIONAL DIAGRAM G



FUNCTIONAL DIAGRAM F

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

			REL	
0001			SUBR	MODE
0002			SETB	BASE
0003			DBL	
0004	00000	000007	DLA	DZRO
0005	00001	0 02 00216	LDX	=-68
0006	00002	0 35 00777	DST	'422,1
0007	00003	1 04 00422	IRS	0
0008	00004	0 12 00000	IRS	0
0009	00005	0 12 00000	IRS	0
0010	00006	0 01 00003	JMP	*-3
0011	00007	0 35 00776	LDX	=-40
0012	00010	1 04 00500	DST	'500,1
0013	00011	0 12 00000	IRS	0
0014	00012	0 12 00000	IRS	0
0015	00013	0 01 00010	JMP	*-3
0016	00014	0 35 00777	LDX	=-68
0017	00015	1 04 00700	DST	'700,1
0018	00016	0 12 00000	IRS	0
0019	00017	0 12 00000	IRS	0
0020	00020	0 01 00015	JMP	*-3
0021	00021	-0 04 00177	DST*	PAOA
0022	00022	-0 04 00200	DST*	PAOB
0023	00023	-0 04 00201	DST*	PAOC
0024	00024	-0 04 00202	DST*	PAOD
0025	00025	-0 04 00203	DST*	PAOE
0026	00026	-0 04 00204	DST*	PAOF
0027	00027	0 02 00224	DLA	NOUP
0028	00030	0 04 00772	DST	'772
0029	00031	0 02 00222	DLA	POUP
0030	00032	0 04 00770	DST	'770
0031	00033	000005	SGL	
0032	00034	0 02 00775	!DA	= '40000
0033	00035	0 04 00401	STA	'401
0034	00036	0 04 00403	STA	'403
0035	00037	0 04 00405	STA	'405
0036	00040	0 04 00407	STA	'407
0037	00041	0 04 00411	STA	'411
0038	00042	0 04 00413	STA	'413
0039	00043	0 04 00601	STA	'601
0040	00044	0 04 00603	STA	'603
0041	00045	0 04 00605	STA	'605
0042	00046	0 04 00607	STA	'607
0043	00047	0 04 00611	STA	'611
0044	00050	0 04 00613	STA	'613
0045	00051	0 04 00415	STA	'415
0046	00052	0 04 00417	STA	'417
0047	00053	0 04 00421	STA	'421
0048	00054	0 04 00615	STA	'615
0049	00055	0 04 00617	STA	'617
0050	00056	0 04 00621	STA	'621
0051	00057	0 04 00460	STA	'460
0052	00060	0 04 00463	STA	'463
0053	00061	0 04 00467	STA	'467
0054	00062	0 04 00473	STA	'473
0055	00063	0 04 00477	STA	'477
0056	00064	0 04 00447	STA	'447
0057	00065	0 04 00453	STA	'453

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0059	00066	0 04 00457	STA	'457
0059	00067	0 02 00176	LDA	RDAD
0060	00070	0 04 00063	STA	'63
0061	00071	0 10 00000	CALL	ICINIT
0062	00072	0 02 00774	LDA	=6
0063	00073	74 0020	SMK	'20
0064	00074	0 02 00101	LDA	AOUT
0065	00075	0 04 00340	STA	RUPT
0066	00076	000043	INK	
0067	00077	0 04 00334	STA	KEYS
0068	00100	0 01 00412	JMP	PAKS
0069	00101	0 000102	AOUT DAC	*+1
0070			*	
0071			*	
0072	00102	000401	LOOP FNB	
0073	00103	0 02 00337	LDA	OUTB
0074	00104	101040	SNZ	
0075	00105	0 01 00103	JMP	*-2
0076	00106	0 10 00000	CALL	STFL
0077	00107	0 10 00000	CALL	PSPI
0078	00110	0 02 00640	LDA	'640
0079	00111	0 04 00270	STA	QTMP+30
0080	00112	0 02 00641	LDA	'641
0081	00113	0 04 00271	STA	QTMP+31
0082	00114	0 02 00642	LDA	'642
0083	00115	0 04 00272	STA	QTMP+32
0084	00116	0 02 00644	LDA	'644
0085	00117	0 04 00273	STA	QTMP+33
0086	00120	0 02 00650	LDA	'650
0087	00121	0 04 00274	STA	QTMP+34
0088	00122	0 02 00651	LDA	'651
0089	00123	0 04 00275	STA	QTMP+35
0090	00124	0 02 00652	LDA	'652
0091	00125	0 04 00276	STA	QTMP+36
0092	00126	0 02 00636	LDA	'636
0093	00127	0 04 00277	STA	QTMP+37
0094	00130	000007	DBL	
0095	00131	-0 02 00205	DLD*	B
0096	00132	0 04 00300	DST	QTMP+38
0097	00133	-0 02 00206	DLD*	BP2
0098	00134	0 04 00302	DST	QTMP+40
0099	00135	0 02 00622	DLD	'622
0100	00136	0 04 00304	DST	QTMP+42
0101	00137	0 02 00624	DLD	'624
0102	00140	0 04 00306	DST	QTMP+44
0103	00141	0 02 00626	DLD	'626
0104	00142	0 04 00310	DST	QTMP+46
0105	00143	0 02 00630	DLD	'630
0106	00144	0 04 00312	DST	QTMP+48
0107	00145	0 02 00632	DLD	'632
0108	00146	0 04 00314	DST	QTMP+50
0109	00147	0 02 00634	DLD	'634
0110	00150	0 04 00316	DST	QTMP+52
0111	00151	0 02 00436	DLD	'436
0112	00152	0 04 00320	DST	QTMP+54
0113	00153	0 02 00440	DLD	'440
0114	00154	0 04 00322	DST	QTMP+56

MICROCOMP TELECOMMUNICATED DATA

DDP-516 ASSEMBLY LISTING

0115	00155	0 02 00442	DLD	'442
0116	00156	0 04 00324	DST	QTMP+58
0117	00157	000005	SGL	
0118	00160	0 10 00000	CALL	OUTPUT
0119	00161	0 000232	DAC	QTMP
0120	00162	0 000721	DAC	MODE
0121	00163	000000	OCT	0
0122	00164	140040	CRA	
0123	00165	0 04 00337	STA	OUTB
0124	00166	101002	SS4	
0125	00167	0 01 00102	JMP	LOOP
0126			*	
0127			* EXIT CODING	
0128			*	
0129	00170	14 0047	OCP	'47
0130	00171	14 0057	OCP	'57
0131	00172	140040	CRA	
0132	00173	74 0020	SNK	'20
0133	00174	001001	INH	
0134	00175	-0 01 00367	JMP*	DOS
0135			*	
0136			*	
0137			*	
0138	00176	0 000000	RDAD XAC	RUPT
0139	00177	0 000000	PAOA XAC	AOAP
0140	00200	0 000000	PAOB XAC	BOAP
0141	00201	0 000000	PAOC XAC	COAP
0142	00202	0 000000	PAOD XAC	DOAP
0143	00203	0 000000	PAOE XAC	EOAP
0144	00204	0 000000	PAOF XAC	FOAP
0145	00205	0 000000	B XAC	B
0146	00206	0 000000	BP2 XAC	BP2
0147	00207	0 000000	VR XAC	VR
0148	00210	0 000000	VE XAC	VE
0149	00211	0 000000	VN XAC	VN
0150	00212	0 000000	LAMB XAC	LAMB
0151	00213	0 000000	OMGA XAC	OMGA
0152	00214	0 000000	H XAC	H
0153	00216	000000	DZRO DBP	0
	00217	000000		
0154	00220	000000	DONE OCT	0,2
	00221	000002		
0155	00222	000000	FOUP OCT	0,144
	00223	000144		
0156	00224	000000	NOUP OCT	0,27340
	00225	027340		
0157	00226	000000	SIXS DEC	5998BB30
	00227	013556		
0158	00230	000000	D260 DEC	26000BB30
	00231	062620		
0159	00232	000000	QTMP BSZ	60
	00233	000000		
	00234	000000		
	00235	000000		
	00236	000000		
	00237	000000		
	00240	000000		

MICROCOMP TELECOMMUNICATED DATA
 DDP-516 ASSEMBLY LISTING

00241	000000		
00242	000000		
00243	000000		
00244	000000		
00245	000000		
00246	000000		
00247	000000		
00250	000000		
00251	000000		
00252	000000		
00253	000000		
00254	000000		
00255	000000		
00256	000000		
00257	000000		
00260	000000		
00261	000000		
00262	000000		
00263	000000		
00264	000000		
00265	000000		
00266	000000		
00267	000000		
00270	000000		
00271	000000		
00272	000000		
00273	000000		
00274	000000		
00275	000000		
00276	000000		
00277	000000		
00300	000000		
00301	000000		
00302	000000		
00303	000000		
00304	000000		
00305	000000		
00306	000000		
00307	000000		
00310	000000		
00311	000000		
00312	000000		
00313	000000		
00314	000000		
00315	000000		
00316	000000		
00317	000000		
00320	000000		
00321	000000		
00322	000000		
00323	000000		
00324	000000		
00325	000000		
0160		*	
0161	00326	AREG OCT	0
0162	00327	GERA OCT	0
0163	00330	BREG OCT	0

MICROCOMP TELECOMMUNICATED DATA

DDP-516 ASSEMBLY LISTING

0164	00331	000000	GERB	OCT	0	
0165	00332	000000	XREG	OCT	0	
0166	00333	000000	GERX	OCT	0	
0167	00334	000000	KEYS	OCT	0	
0168	00335	000000	SYEK	OCT	0	
0169	00336	000000	TPUR	OCT	0	
0170	00337	000000	OUTB	OCT	0	
0171		000776	TIME	EQN	'776	
0172			*			
0173				SUBR	RUPT	
0174				SUBR	ASCT	
0175				REL		
0176	00340	0 000000	RUPT	DAC	**	
0177	00341	14 0102		OCP	'102	SHUT OFF DGS
0178	00342	34 0507		SKS	'507	
0179	00343	0 01 00370		JMP	PDO	
0180	00344	34 0407		SKS	'407	
0181	00345	0 01 00607		JMP	GDO	
0182	00346	34 0607		SKS	'607	
0183	00347	0 01 00364		JMP	ICLK	
0184	00350	34 0425		SKS	'425	
0185	00351	0 01 00362		JMP	DISK	DISK RUPT
0186	00352	34 0404		SKS	'404	
0187	00353	0 01 00356		JMP	ASR	ASR RUPT
0188	00354	000401	RSM	ENB		
0189	00355	-0 01 00340		JMP*	RUPT	
0190			*			
0191	00356	14 0004	ASR	OCP	4	
0192	00357	54 0004		INA	4	DUMMPY
0193	00360	101000		NOP		
0194	00361	0 01 00354		JMP	RSM	
0195			*			
0196	00362	14 1425	DISK	OCP	'1425	
0197	00363	0 01 00354		JMP	RSM	
0198			*			
0199	00364	14 0027	ICLK	OCP	'27	
0200	00365	14 0067		OCP	'67	
0201	00366	0 01 00354		JMP	RSM	
0202	00367	030000	DOS	OCT	30000	
0203			*			
0204			*			
0205	00370	0 13 00326	PDO	IMA	AREG	
0206	00371	000043		INK		
0207	00372	000005		SGL		
0208	00373	0 04 00334		STA	KEYS	
0209	00374	000201		IAB		
0210	00375	0 04 00330		STA	BREG	
0211	00376	0 15 00332		STX	XREG	
0212			*			
0213			*			
0214			*			
0215			*			
0216	00377	0 10 00000	CALL	INPIP		
0217	00400	000401		ENB		
0218	00401	0 10 00000	CALL	ACON		
0219	00402	0 10 00000	CALL	PRBI		
0220	00403	0 10 00000	CALL	ROMS		

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0221	00404	0 10 00000	CALL	PPAC
0222	00405	0 10 00000	CALL	PFDI
0223	00406	0 10 22024	JST	PIPR
0224	00407	0 10 20500	JST	SPUN
0225	00410	0 10 21000	JST	VELA
0226	00411	0 10 00000	CALL	VACU
0227	00412	000007	FAKS DBL	
0228	00413	0 02 00770	DLD	'770
0229	00414	0 07 00222	DSB	POUP
0230	00415	000005	SGL	
0231	00416	100400	SPL	
0232	00417	0 01 00577	JMP	COMN
0233	00420	0 02 00332	LDA	XREG
0234	00421	0 04 00333	STA	GERX
0235	00422	0 02 00334	LDA	KEYS
0236	00423	0 04 00335	STA	SYEK
0237	00424	0 02 00326	LDA	AREG
0238	00425	0 04 00327	STA	GERA
0239	00426	0 02 00330	LDA	BREG
0240	00427	0 04 00331	STA	GERB
0241	00430	0 02 00340	LDA	RUPT
0242	00431	0 04 00336	STA	TPUR
0243	00432	000007	DBL	
0244	00433	0 02 00772	DLD	'772
0245	00434	0 07 00224	DSB	NOUP
0246	00435	000005	SGL	
0247	00436	100400	SPL	
0248	00437	0 01 00550	JMP	NSOB
0249	00440	0 02 00773	LDA	=1
0250	00441	0 04 00337	STA	OUTB
0251	00442	000007	DBL	
0252	00443	0 02 00460	DLD	'460
0253	00444	0 04 00232	DST	QTMP
0254	00445	0 02 00464	DLD	'464
0255	00446	0 04 00234	DST	QTMP+2
0256	00447	0 02 00470	DLD	'470
0257	00450	0 04 00236	DST	QTMP+4
0258	00451	0 02 00474	DLD	'474
0259	00452	0 04 00240	DST	QTMP+6
0260	00453	0 02 00330	DLD	'330
0261	00454	0 04 00344	DST	'344
0262	00455	-0 02 00207	DLD*	VR
0263	00456	0 04 00242	DST	QTMP+8
0264	00457	0 02 00332	DLD	'332
0265	00460	0 04 00346	DST	'346
0266	00461	-0 02 00210	DLD*	VE
0267	00462	0 04 00244	DST	QTMP+10
0268	00463	0 02 00334	DLD	'334
0269	00464	0 04 00350	DST	'350
0270	00465	-0 02 00211	DLD*	VN
0271	00466	0 04 00246	DST	QTMP+12
0272	00467	0 02 00336	DLD	'336
0273	00470	0 04 00352	DST	'352
0274	00471	-0 02 00212	DLD*	LAMB
0275	00472	0 04 00250	DST	QTMP+14
0276	00473	0 02 00340	DLD	'340
0277	00474	0 04 00354	DST	'354

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0278	00475	-0 02 00213	DLD*	OMGA
0279	00476	0 04 00252	DST	QTMP+16
0280	00477	0 02 00342	DLD	'342
0281	00500	0 04 00356	DST	'356
0282	00501	-0 02 00214	DLD*	H
0283	00502	0 04 00254	DST	QTMP+18
0284	00503	0 02 00664	DLD	'664
0285	00504	0 04 00744	DST	'744
0286	00505	0 02 00666	DLD	'666
0287	00506	0 04 00746	DST	'746
0288	00507	0 02 00670	DLD	'670
0289	00510	0 04 00750	DST	'750
0290	00511	0 02 00672	DLD	'672
0291	00512	0 04 00752	DST	'752
0292	00513	0 02 00674	DLD	'674
0293	00514	0 04 00754	DST	'754
0294	00515	0 02 00676	DLD	'676
0295	00516	0 04 00756	DST	'756
0296	00517	0 02 00776	DLD	TIME
0297	00520	0 04 00256	DST	QTMP+20
0298	00521	0 02 00324	DLD	'324
0299	00522	0 04 00260	DST	QTMP+22
0300	00523	0 02 00316	DLD	'316
0301	00524	0 04 00262	DST	QTMP+24
0302	00525	0 02 00320	DLD	'320
0303	00526	0 04 00264	DST	QTMP+26
0304	00527	0 02 00322	DLD	'322
0305	00530	0 04 00266	DST	QTMP+28
0306	00531	0 02 00216	DLD	DZRO
0307	00532	0 04 00330	DST	'330
0308	00533	0 04 00332	DST	'332
0309	00534	0 04 00334	DST	'334
0310	00535	0 04 00336	DST	'336
0311	00536	0 04 00340	DST	'340
0312	00537	0 04 00342	DST	'342
0313	00540	0 04 00664	DST	'664
0314	00541	0 04 00666	DST	'666
0315	00542	0 04 00670	DST	'670
0316	00543	0 04 00672	DST	'672
0317	00544	0 04 00674	DST	'674
0318	00545	0 04 00676	DST	'676
0319	00546	0 04 00772	DST	'772
0320	00547	000005	SGL	
0321	00550	000007	NSOB DBL	
0322	00551	0 02 00216	DLD	DZRO
0323	00552	0 04 00770	DST	'770
0324	00553	000005	SGL	
0325	00554	0 10 00000	CALL	BBOT
0326	00555	0 02 00722	LDA	CAFN
0327	00556	101040	SNZ	
0328	00557	0 01 00564	JMP	**5
0329	00560	100010	SR2	
0330	00561	0 10 00000	CALL	LNAV
0331	00562	101010	SS2	
0332	00563	0 10 00000	CALL	FALN
0333	00564	001001	INH	
0334	00565	0 02 00333	LDA	GERX

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0335	00566	0 04 00332	STA	XREG	
0336	00567	0 02 00335	LDA	SYEK	
0337	00570	0 04 00334	STA	KEYS	
0338	00571	0 02 00327	LDA	GERA	
0339	00572	0 04 00326	STA	AREG	
0340	00573	0 02 00331	LDA	GERB	
0341	00574	0 04 00330	STA	BREG	
0342	00575	0 02 00336	LDA	TPUR	
0343	00576	0 04 00340	STA	RUPT	
0344			*		
0345			*		
0346	00577	0 35 00332	CONN LDX	XREG	
0347	00600	0 02 00330	LDA	BREG	
0348	00601	000201	IAB		
0349	00602	0 02 00334	LDA	KEYS	
0350	00603	171020	OTK		
0351	00604	0 13 00326	IMA	AREG	
0352	00605	000401	ENR		
0353	00606	-0 01 00340	JMP*	RUPT	
0354			*		
0355			*		
0356	00607	0 13 00326	GDO IMA	AREG	
0357	00610	000043	INK		
0358	00611	000005	SGL		
0359	00612	0 04 00334	STA	KEYS	
0360	00613	000201	IAB		
0361	00614	0 04 00330	STA	BREG	
0362	00615	0 15 00332	STX	XREG	
0363			*		
0364			*		
0365	00616	34 0007	SKS	'007	WAIT FOR DIGISEC
0366	00617	0 01 00616	JMP	*-1	
0367	00620	14 0406	OCP	'406	HOLD
0368	00621	0401 62	LRs	14	WAIT 8 MCT'S
0369	00622	54 1016	INA	'1016	HIGH HALF
0370	00623	101000	NOP		
0371	00624	0 04 00324	STA	'324	
0372	00625	54 1006	INA	'1006	LOW HALF
0373	00626	101000	NOP		
0374	00627	0 04 00325	STA	'325	
0375	00630	14 0006	OCP	'006	END HOLD
0376	00631	0 10 00000	CALL	INGYRO	
0377	00632	000401	ENB		
0378	00633	0 10 00000	CALL	GCOM	
0379	00634	0 10 00000	CALL	GRMP	
0380	00635	0 10 00000	CALL	GRBI	
0381	00636	0 10 00000	CALL	GPAC	
0382	00637	0 10 00000	CALL	GFDI	
0383	00640	0 10 22053	JST	GYPR	
0384	00641	000007	DBL		
0385	00642	0 02 00776	DLD	TIME	
0386	00643	0 07 00226	DSB	SIXS	
0387	00644	100400	SPL		
0388	00645	0 01 00705	JMP	BF60	
0389	00646	100040	SZE		
0390	00647	0 01 00656	JMP	OV60	
0391	00650	000201	IAB		

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0392	00651	100040	SZE	
0393	00652	0 01 00656	JMP	OV60
0394	00653	000005	SGL	
0395	00654	0 10 00000	CALL	LVCA
0396	00655	0 01 00705	JMP	BF60
0397	00656	0 02 00776	DLD	TIME
0398	00657	0 07 00230	DSR	D260
0399	00660	100400	SPL	
0400	00661	0 01 00700	JMP	B260
0401	00662	100040	SZE	
0402	00663	0 01 00703	JMP	0260
0403	00664	000201	IAB	
0404	00665	100040	SZE	
0405	00666	0 01 00703	JMP	0260
0406	00667	0 02 00216	DLD	DZRO
0407	00670	0 04 00444	DST	'444
0408	00671	0 04 00450	DST	'450
0409	00672	0 04 00454	DST	'454
0410	00673	000005	SGL	
0411	00674	0 02 00773	LDA	=1
0412	00675	0 04 00722	STA	CAFN
0413	00676	0 10 00000	CALL	AZCA
0414	00677	0 01 00705	JMP	BF60
0415	00700	000005	B260 SGL	
0416	00701	0 10 00000	CALL	SVFL
0417	00702	100000	SKP	
0418	00703	0 10 21522	0260 JST	IRCO
0419	00704	0 10 20000	NIRC JST	ATTA
0420	00705	000007	BF60 DBL	
0421	00706	0 02 00770	DLD	'770
0422	00707	0 06 00220	DAD	DONE
0423	00710	0 04 00770	DST	'770
0424	00711	0 02 00772	DLD	'772
0425	00712	0 06 00220	DAD	DONE
0426	00713	0 04 00772	DST	'772
0427	00714	0 02 00776	DLD	TIME
0428	00715	0 06 00220	DAD	DONE
0429	00716	0 04 00776	DST	TIME
0430	00717	000005	SGL	
0431	00720	0 01 00412	JMP	FAKS
0432			*	
0432			*	
0434	00721	000001	MODE OCT	1
0435	00722	000000	CAFN OCT	0
0436		022024	PIPR EQU	'22024
0437		022053	GYPR EQU	'22053
0438		020000	ATTA EQU	'20000
0439		020500	SPUN EQU	'20500
0440	00723		BASE BSS	40
0441		021000	VELA EQU	'21000
0442		021522	IRCO EQU	'21522
0443	00773	000001	END	
	00774	000006		
	00775	040000		
	00776	177730		
	00777	177674		

PROGRAM NAME: (Note: This is a FORTRAN program)

SOURCE: FNOP

BINARY: BFNOP

ENTRY POINTS (LOCATION): OUTPUT ('2000)

GENERAL DESCRIPTION:

This subroutine outputs on the teletype the data saved by the main program in its buffer QTMP. It makes use of the subroutine FPOUTC which outputs a DAP double precision word in decimal with various scalings, and the FORTRAN subroutines, T1OU and TNOUA, used for teletype output. Several examples of the output format are shown below.

QUAT	0.999999	0.000048	0.000010	0.000003
VRVEVN	0.000000	0.000000	0.000000	
LALOAL	0.117678	0.000000	0.000000	
GYRO FAIL				
PIPA FAIL				
TIME	840.00			
TABLE	0.999996			
STATISTIC				
IDEN 0	0	0	0	
COMP 0	0			
POLAR 0				
BIAS	0.000000	0.000000	0.000000	0.000000
PART	1.143554	0.190429	1.715820	
-	0.381835	- 0.381835	- 2.093632	

QUAT	0.999999	- 0.000317	0.000009	- 0.000013
VRVEVN	0.003936	0.629608	- 0.129211	
LALOAL	0.117675	0.000016	0.022359	
GYRO FAIL				
PIPA FAIL				
TIME	3480.00			
TABLE	0.999996			
STATISTIC				
IDEN 0	0	0	0	
COMP 0	0			
POLAR 0				
BIAS	0.000000	0.000000	0.000000	0.000000
PART	0.571289	- 0.191406	0.000000	
-	0.571289	- 0.763571	- 1.526357	

DEFINITIONS IN PRINTOUT FORMAT

QUAT	λ non dimensional	ρ_x (radians)	ρ_y (radians)	ρ_z (radians)
VRVEVN	RADIAL VELOCITY (meters/sec)	EAST VELOCITY (meters/sec)	NORTH VELOCITY (meters/sec)	
LALOAL	LATITUDE (42.36° = .117678 rev)	LONGITUDE (rev)	ALTITUDE (meters)	
GYRO FAIL	1st FAIL	2nd FAIL		
PIPA FAIL	1st FAIL	2nd FAIL		
TIME	PROGRAM TIME (seconds)			
TABLE	TABLE ANGLE (rev)			
STATISTIC	1st FAIL	2nd FAIL		
IDEN	1st FAIL P=bias N=ramp	2nd FAIL P=bias N=ramp		
COMP	1st FAIL (N=variance)	2nd FAIL (N=variance)		
POLAR	POLARITY OF OVERLIMIT PARITY EQ (N=negative) (P=positive)			
BIAS	1st GYRO FAIL (degrad. est) (bias or ramp)	2nd FAIL GYRO (degrad. est) (bias or ramp)	1st FAIL ACC (degrad. est)	2nd FAIL ACC (degrad. est)
PART	PARITY EQ RESIDUAL EQ1(meru) EQ4(meru)	EQ2(meru) EQ5(meru)	EQ3(meru) EQ6(meru)	

MICROCOMP TELECOMMUNICATED DATA
 DDP-516 ASSEMBLY LISTING
 SUBROUTINE OUTPUT (ARG, MODE)

```

000000   DAC   000000
000001   CALL  F$AT
000002   OCT   000002
000003   DAC   000000
000004   DAC   000000
          INTEGER ARG(60), MODE
          CALL TNOUA(8HQ$AT , 8)
000005   JMP   000004
          STG   000005
000006   JMP   000000
000007   OCT   150725
000010   OCT   140724
000011   OCT   120240
000012   OCT   120240
          STG   000006
000013   CALL  TNOUA
000014   DAC   000007
000015   DAC   ='000010
000016   OCT   000000
          DO 10 I=1,7,2
000017   LDA   ='000001
000020   STA   I
          CALL FPOUTC (ARG(I) , 1,6)
000021   LDA   I
000022   ADD   ARG
000023   ADD   000025
000024   JMP   000026
000025   OCT   177777
000026   STA   T$1000
000027   CALL  FPOUTC
000030   DAC*  T$1000
000031   DAC   ='000001
000032   DAC   ='000006
000033   OCT   000000
10       CALL TNOUA(2H , 2)
000034   CALL  TNOUA
000035   DAC   ='120240
000036   DAC   ='000002
000037   OCT   000000
000040   LDA   I
000041   ADD   ='000002
000042   CAS   ='000007
000043   JMP   000046
000044   JMP   000020
000045   JMP   000020
          CALL T100(138)
000046   CALL  T100
000047   DAC   ='000212
          CALL TNOUA(8HVRVEVN , 8)
000050   JMP   000000
000051   OCT   153322
000052   OCT   153305
000053   OCT   153316
000054   OCT   120240
          STG   000050
000055   CALL  TNOUA

```

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

```

000056   DAC   000051
000057   DAC   ='000010
000060   OCT   000000
        DO 20 I=9,13,2
000061   LDA   ='000011
000062   STA   I
        CALL FPOUTC(ARG(I),15,6)
000063   LDA   I
000064   ADD   ARG
000065   ADD   000067
000066   JMP   000070
000067   OCT   177777
000070   STA   T$1000
000071   CALL  FPOUTC
000072   DAC*  T$1000
000073   DAC   ='000017
000074   DAC   ='000006
000075   OCT   000000
20      CALL TNOUA(2H,2)
000076   CALL  TNOUA
000077   DAC   ='120240
000100   DAC   ='000002
000101   OCT   000000
000102   LDA   I
000103   ADD   ='000002
000104   CAS   ='000015
000105   JMP   000110
000106   JMP   000062
000107   JMP   000062
        CALL T10U(138)
000110   CALL  T10U
000111   DAC   ='000212
        CALL TNOUA(9HLALOAL,8)
000112   JMP   000000
000113   OCT   146301
000114   OCT   146317
000115   OCT   140714
000116   OCT   120240
        STG   000112
000117   CALL  TNOUA
000120   DAC   000113
000121   DAC   ='000010
000122   OCT   000000
        CALL FPOUTC(ARG(15),0,6)
000123   LDA   ARG
000124   ADD   000126
000125   JMP   000127
000126   OCT   000016
000127   STA   T$1000
000130   CALL  FPOUTC
000131   DAC*  T$1000
000132   DAC   ='000000
000133   DAC   ='000006
000134   OCT   000000
        CALL TNOUA(2H,2)
000135   CALL  TNOUA
000136   DAC   ='120240

```

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

```

000137   DAC   ='000002
000140   OCT   000000
          CALL FPOUTC (ARG (17) ,0,6)
000141   LDA   ARG
000142   ADD   000144
000143   JMP   000145
000144   OCT   000020
000145   STA   T$1000
000146   CALL  FPOUTC
000147   DAC*  T$1000
000150   DAC   ='000000
000151   DAC   ='000006
000152   OCT   000000
          CALL TNOUA (2H ,2)
000153   CALL  TNOUA
000154   DAC   ='120240
000155   DAC   ='000002
000156   OCT   000000
          CALL FPOUTC (ARG (19) ,15,6)
000157   LDA   ARG
000160   ADD   000162
000161   JMP   000163
000162   OCT   000022
000163   STA   T$1000
000164   CALL  FPOUTC
000165   DAC*  T$1000
000166   DAC   ='000017
000167   DAC   ='000006
000170   OCT   000000
          CALL T10U (138)
000171   CALL  T10U
000172   DAC   ='000212
          CALL TNOUF (10HGYRO FAIL ,10)
000173   JMP   000000
000174   OCT   143731
000175   OCT   151317
000176   OCT   120306
000177   OCT   140711
000200   OCT   146240
          STG   000173
000201   CALL  TNOUA
000202   DAC   000174
000203   DAC   ='000012
000204   OCT   000000
          IF (ARG (25) .EQ.0) GO TO 35
000205   LDA   ARG
000206   ADD   000210
000207   JMP   000211
000210   OCT   000030
000211   STA   T$1000
000212   LDA*  T$1000
000213   SZE   000000
000214   JMP   000000
000215   JMP   .35
          STG   000214
          CALL TNOUA (4H ,4)
000216   JMP   000000

```

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

```

000217   OCT   120240
000220   OCT   120240
          STG   000216
000221   CALL  TNOUA
000222   DAC   000217
000223   DAC   ='000004
000224   OCT   000000
          CALL T10U(ARG(25)+192)
000225   LDA   ARG
000226   ADD   000230
000227   JMP   000231
000230   OCT   000030
000231   STA   T$1000
000232   LDA*  T$1000
000233   ADD   ='000300
000234   STA   T$1001
000235   CALL  T10U
000236   DAC   T$1001
          IF(ARG(26).EQ.0) GO TO 35
000237   LDA   ARG
000240   ADD   000242
000241   JMP   000243
000242   OCT   000031
000243   STA   T$1000
000244   LDA*  T$1000
000245   SZE   000000
000246   JMP   000000
000247   JMP   .35
          STG   000246
          CALL TNOUA(4H ,4)
000250   JMP   000000
000251   OCT   120240
000252   OCT   120240
          STG   000250
000253   CALL  TNOUA
000254   DAC   000251
000255   DAC   ='000004
000256   OCT   000000
          CALL T10U(ARG(26)+192)
000257   LDA   ARG
000260   ADD   000262
000261   JMP   000263
000262   OCT   000031
000263   STA   T$1000
000264   LDA*  T$1000
000265   ADD   ='000300
000266   STA   T$1001
000267   CALL  T10U
000270   DAC   T$1001
          IF(ARG(29).NE.0) CALL TNOUA(10H THIRD ,10)
000271   LDA   ARG
000272   ADD   000274
000273   JMP   000275
000274   OCT   000034
000275   STA   T$1000
000276   LDA*  T$1000
000277   SNZ   000000

```

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

```

000300    JMP    000000
000301    JMP    000000
000302    OCT    120240
000303    OCT    120240
000304    OCT    152310
000305    OCT    144722
000306    OCT    142240
           STG    000301
000307    CALL  TNOVA
000310    DAC    000302
000311    DAC    ='000012
000312    OCT    000000
           STG    000300
35    CALL  T10U(138)
           STG    .35
000313    CALL  T10U
000314    DAC    ='000212
           CALL  TNOVA(10HPIPA FAIL ,10)
000315    JMP    000000
000316    OCT    150311
000317    OCT    150301
000320    OCT    120306
000321    OCT    140711
000322    OCT    146240
           STG    000315
000323    CALL  TNOVA
000324    DAC    000316
000325    DAC    ='000012
000326    OCT    000000
           IF(ARG(27).EQ.0) GO TO 40
000327    LDA    ARG
000330    ADD    000332
000331    JMP    000333
000332    OCT    000032
000333    STA    T$1000
000334    LDA*   T$1000
000335    SZE    000000
000336    JMP    000000
000337    JMP    .40
           STG    000336
           CALL  TNOVA(4H ,4)
000340    JMP    000000
000341    OCT    120240
000342    OCT    120240
           STG    000340
000343    CALL  TNOVA
000344    DAC    000341
000345    DAC    ='000004
000346    OCT    000000
           CALL  T10U(ARG(27)+192)
000347    LDA    ARG
000350    ADD    000352
000351    JMP    000353
000352    OCT    000032
000353    STA    T$1000
000354    LDA*   T$1000
000355    ADD    ='000300

```


MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

```

000356 STA T$1001
000357 CALL T100
000360 DAC T$1001
      IF (ARG(28).EQ.0) GO TO 40
000361 LDA ARG
000362 ADD 000364
000363 JMP 000365
000364 OCT 000033
000365 STA T$1000
000366 LDA* T$1000
000367 SZE 000000
000370 JMP 000000
000371 JMP .40
      STG 000370
      CALL TNOUA(4H ,4)
000372 JMP 000000
000373 OCT 120240
000374 OCT 120240
      STG 000372
000375 CALL TNOUA
000376 DAC 000373
000377 DAC ='000004
000400 OCT 000000
      CALL T100(ARG(28)+192)
000401 LDA ARG
000402 ADD 000404
000403 JMP 000405
000404 OCT 000033
000405 STA T$1000
000406 LDA* T$1000
000407 ADD ='000300
000410 STA T$1001
000411 CALL T100
000412 DAC T$1001
      IF (ARG(30).NE.0) CALL TNOUA(10H THIRD ,10)
000413 LDA ARG
000414 ADD 000416
000415 JMP 000417
000416 OCT 000035
000417 STA T$1000
000420 LDA* T$1000
000421 SNZ 000000
000422 JMP 000000
000423 JMP 000000
000424 OCT 120240
000425 OCT 120240
000426 OCT 152310
000427 OCT 144722
000430 OCT 142240
      STG 000423
000431 CALL TNOUA
000432 DAC 000424
000433 DAC ='000012
000434 OCT 000000
      STG 000422
40 CALL T100(138)
      STG .40

```

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

```

000435 CALL T10U
000436 DAC ='000212
      CALL TNOUA(8HTIME ,8)
000437 JMP 000000
000440 OCT 152311
000441 OCT 146705
000442 OCT 120240
000443 OCT 120240
      STG 000437
000444 CALL TNOUA
000445 DAC 000440
000446 DAC ='000010
000447 OCT 000000
      CALL OUT100(ARG(21))
000450 LDA ARG
000451 ADD 000453
000452 JMP 000454
000453 OCT 000024
000454 STA T$1000
000455 CALL OUT100
000456 DAC* T$1000
      CALL T10U(138)
000457 CALL T10U
000460 DAC ='000212
      CALL TNOUA(8HTABLE ,8)
000461 JMP 000000
000462 OCT 152301
000463 OCT 141314
000464 OCT 142640
000465 OCT 120240
      STG 000461
000466 CALL TNOUA
000467 DAC 000462
000470 DAC ='000010
000471 OCT 000000
      CALL FPOUTC(ARG(23),0,6)
000472 LDA ARG
000473 ADD 000475
000474 JMP 000476
000475 OCT 000026
000476 STA T$1000
000477 CALL FPOUTC
000500 DAC* T$1000
000501 DAC ='000000
000502 DAC ='000006
000503 OCT 000000
      CALL T10U(138)
000504 CALL T10U
000505 DAC ='000212
      CALL TNOUA(10HSTATISTIC ,10)
000506 JMP 000000
000507 OCT 151724
000510 OCT 140724
000511 OCT 144723
000512 OCT 152311
000513 OCT 141640
      STG 000506

```

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

```

000514 CALL TNOUA
000515 DAC 000507
000516 DAC ='000012
000517 OCT 000000
      IF(ARG(31).EQ.0) GO TO 55
000520 LDA ARG
000521 ADD 000523
000522 JMP 000524
000523 OCT 000036
000524 STA T$1000
000525 LDA* T$1000
000526 SZE 000000
000527 JMP 000000
000530 JMP .55
      STG 000527
      CALL TNOUA(4H ,4)
000531 JMP 000000
000532 OCT 120240
000533 OCT 120240
      STG 000531
000534 CALL TNOUA
000535 DAC 000532
000536 DAC ='000004
000537 OCT 000000
      CALL T10U(ARG(31)+192)
000540 LDA ARG
000541 ADD 000543
000542 JMP 000544
000543 OCT 000036
000544 STA T$1000
000545 LDA* T$1000
000546 ADD ='000300
000547 STA T$1001
000550 CALL T10U
000551 DAC T$1001
      IF(ARG(32).EQ.0) GO TO 55
000552 LDA ARG
000553 ADD 000555
000554 JMP 000556
000555 OCT 000037
000556 STA T$1000
000557 LDA* T$1000
000560 SZE 000000
000561 JMP 000000
000562 JMP .55
      STG 000561
      CALL TNOUA(4H ,4)
000563 JMP 000000
000564 OCT 120240
000565 OCT 120240
      STG 000563
000566 CALL TNOUA
000567 DAC 000564
000570 DAC ='000004
000571 OCT 000000
      CALL T10U(ARG(32)+192)
000572 LDA ARG

```

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

```

000573  ADD  000575
000574  JMP  000576
000575  OCT  000037
000576  STA  T$1000
000577  LDA* T$1000
000600  ADD  ='000300
000601  STA  T$1001
000602  CALL T10H
000603  DAC  T$1001
      IF(ARG(37),NE,0) CALL TNOVA(10H      THIRD ,10)
000604  LDA  APC
000605  ADD  000607
000606  JMP  000610
000607  OCT  000044
000610  STA  T$1000
000611  LDA* T$1000
000612  SNZ  000000
000613  JMP  000000
000614  JMP  000000
000615  OCT  120240
000616  OCT  120240
000617  OCT  152310
000620  OCT  144722
000621  OCT  142240
      STG  000614
000622  CALL TNOVA
000623  DAC  000615
000624  DAC  ='000012
000625  OCT  000000
      STG  000613
55     CALL T10H(119)
      STG  .55
000626  CALL T10H
000627  DAC  ='000012
      CALL TNOVA(8HIDEN ,8)
000630  JMP  000000
000631  OCT  144704
000632  OCT  142716
000633  OCT  120240
000634  OCT  120240
      STG  000630
000635  CALL TNOVA
000636  DAC  000631
000637  DAC  ='000010
000640  OCT  000000
      CALL T10H(ARG(34)+207)
000641  LDA  ARG
000642  ADD  000644
000643  JMP  000645
000644  OCT  000041
000645  STA  T$1000
000646  LDA* T$1000
000647  ADD  ='000317
000650  STA  T$1001
000651  CALL T10H
000652  DAC  T$1001
      CALL TNOVA(4H ,4)

```

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

```

000653   JMP   000000
000654   OCT   120240
000655   OCT   120240
          STG   000653
000656   CALL  TNOUA
000657   DAC   000654
000660   DAC   ='000004
000661   OCT   000000
          CALL T10U(ARG(33)+207)
000662   LDA   ARG
000663   ADD   000665
000664   JMP   000666
000665   OCT   000040
000666   STA   T$1000
000667   LDA*  T$1000
000670   ADD   ='000317
000671   STA   T$1001
000672   CALL  T10U
000673   DAC   T$1001
          CALL TNOUA(12H ,12)
000674   JMP   000000
000675   OCT   120240
000676   OCT   120240
000677   OCT   120240
000700   OCT   120240
000701   OCT   120240
000702   OCT   120240
          STG   000674
000703   CALL  TNOUA
000704   DAC   000675
000705   DAC   ='000014
000706   OCT   000000
          CALL T10U(ARG(59)+207)
000707   LDA   ARG
000710   ADD   000712
000711   JMP   000713
000712   OCT   000072
000713   STA   T$1000
000714   LDA*  T$1000
000715   ADD   ='000317
000716   STA   T$1001
000717   CALL  T10U
000720   DAC   T$1001
          CALL TNOUA(4H ,4)
000721   JMP   000000
000722   OCT   120240
000723   OCT   120240
          STG   000721
000724   CALL  TNOUA
000725   DAC   000722
000726   DAC   ='000004
000727   OCT   000000
          CALL T10U(ARG(60)+207)
000730   LDA   ARG
000731   ADD   000733
000732   JMP   000734
000733   OCT   000073

```

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

```

000734 STA T$1000
000735 LDA* T$1000
000736 ADD ='000317
000737 STA T$1001
000740 CALL T109
000741 DAC T$1001
      CALL T10H(138)
000742 CALL T10H
000743 DAC ='000212
      CALL TNOVA(8HCOMP , 8)
000744 JMP 000000
000745 OCT 141717
000746 OCT 146720
000747 OCT 120240
000750 OCT 120240
      STG 000744
000751 CALL TNOVA
000752 DAC 000745
000753 DAC ='000010
000754 OCT 000000
      CALL T10H(ARG(36)+207)
000755 LDA ARG
000756 ADD 000760
000757 JMP 000761
000760 OCT 000043
000761 STA T$1000
000762 LDA* T$1000
000763 ADD ='000317
000764 STA T$1001
000765 CALL T109
000766 DAC T$1001
      CALL TNOVA(4H , 4)
000767 JMP 000000
000770 OCT 120240
000771 OCT 120240
      STG 000767
000772 CALL TNOVA
000773 DAC 000770
000774 DAC ='000004
000775 OCT 000000
      CALL T10H(ARG(35)+207)
000776 LDA ARG
000777 ADD 001001
001000 JMP 001002
001001 OCT 000042
001002 STA T$1000
001003 LDA* T$1000
001004 ADD ='000317
001005 STA T$1001
001006 CALL T10H
001007 DAC T$1001
      CALL T10H(138)
001010 CALL T10H
001011 DAC ='000212
      CALL TNOVA(8HPOLAR , 8)
001012 JMP 000000
001013 OCT 150317

```

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

```

001014   OCT   146301
001015   OCT   151240
001016   OCT   120240
          STG   001012
001017   CALL  TNOUA
001020   DAC   001013
001021   DAC   ='000010
001022   OCT   000000
          CALL T10U (ARG (38) +207)
001023   LDA   ARG
001024   ADD   001026
001025   JMP   001027
001026   OCT   000045
001027   STA   T$1000
001030   LDA*  T$1000
001031   ADD   ='000317
001032   STA   T$1001
001033   CALL  T10U
001034   DAC   T$1001
          CALL T10U (138)
001035   CALL  T10U
001036   DAC   ='000212
          CALL TNOUA (8HBIAS ,8)
001037   JMP   000000
001040   OCT   141311
001041   OCT   140723
001042   OCT   120240
001043   OCT   120240
          STG   001037
001044   CALL  TNOUA
001045   DAC   001040
001046   DAC   ='000010
001047   OCT   000000
          CALL FPOUTC (ARG (41), 15,6)
001050   LDA   ARG
001051   ADD   001053
001052   JMP   001054
001053   OCT   000050
001054   STA   T$1000
001055   CALL  FPOUTC
001056   DAC*  T$1000
001057   DAC   ='000017
001060   DAC   ='000006
001061   OCT   000000
          CALL TNOUA (2H ,2)
001062   CALL  TNOUA
001063   DAC   ='120240
001064   DAC   ='000002
001065   OCT   000000
          CALL FPOUTC (ARG (39), 15,6)
001066   LDA   ARG
001067   ADD   001071
001070   JMP   001072
001071   OCT   000046
001072   STA   T$1000
001073   CALL  FPOUTC
001074   DAC*  T$1000

```

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

```

001075   DAC   ='000017
001076   DAC   ='000006
001077   OCT   000000
          CALL TNOUA(2H ,2)
001100   CALL  TNOUA
001101   DAC   ='120240
001102   DAC   ='000002
001103   OCT   000000
          CALL FPOUTC (ARG (55) ,15,6)
001104   LDA   ARG
001105   ADD   001107
001106   JMP   001110
001107   OCT   000066
001110   STA   T$1000
001111   CALL  FPOUTC
001112   DAC*  T$1000
001113   DAC   ='000017
001114   DAC   ='000006
001115   OCT   000000
          CALL TNOUA(2H ,2)
001116   CALL  TNOUA
001117   DAC   ='120240
001120   DAC   ='000002
001121   OCT   000000
          CALL FPOUTC (ARG (57) ,15,6)
001122   LDA   ARG
001123   ADD   001125
001124   JMP   001126
001125   OCT   000070
001126   STA   T$1000
001127   CALL  FPOUTC
001130   DAC*  T$1000
001131   DAC   ='000017
001132   DAC   ='000006
001133   OCT   000000
          CALL T10U(138)
001134   CALL  T10U
001135   DAC   ='000212
          CALL TNOUA(8HPART ,8)
001136   JMP   000000
001137   OCT   150301
001140   OCT   151324
001141   OCT   120240
001142   OCT   120240
          STG   001136
001143   CALL  TNOUA
001144   DAC   001137
001145   DAC   ='000010
001146   OCT   000000
          DO 60 I=43,47,2
001147   LDA   ='000053
001150   STA   I
          CALL FPOUTC (ARG (I) ,15,6)
001151   LDA   I
001152   ADD   ARG
001153   ADD   001155
001154   JMP   001156

```


MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

```

001155    OCT    177777
001156    STA    T$1000
001157    CALL   FPOUTC
001160    DAC*   T$1000
001161    DAC    ='000017
001162    DAC    ='000006
001163    OCT    000000
60    CALL   TNOUA(2H ,2)
001164    CALL   TNOUA
001165    DAC    ='120240
001166    DAC    ='000002
001167    OCT    000000
001170    LDA    I
001171    ADD    ='000002
001172    CAS    ='000057
001173    JMP    001176
001174    JMP    001150
001175    JMP    001150
        CALL   T10H(138)
001176    CALL   T10H
001177    DAC    ='000212
        CALL   TNOUA(8H ,9)
001200    JMP    000000
001201    OCT    120240
001202    OCT    120240
001203    OCT    120240
001204    OCT    120240
        STG    001200
001205    CALL   TNOUA
001206    DAC    001201
001207    DAC    ='000010
001210    OCT    000000
        DO 65 I=49,53,2
001211    LDA    ='000061
001212    STA    I
        CALL   FPOUTC(ARG(I),15,6)
001213    LDA    I
001214    ADD    ARG
001215    ADD    001217
001216    JMP    001220
001217    OCT    177777
001220    STA    T$1000
001221    CALL   FPOUTC
001222    DAC*   T$1000
001223    DAC    ='000017
001224    DAC    ='000006
001225    OCT    000000
65    CALL   TNOUA(2H ,2)
001226    CALL   TNOUA
001227    DAC    ='120240
001230    DAC    ='000002
001231    OCT    000000
001232    LDA    I
001233    ADD    ='000002
001234    CAS    ='000065
001235    JMP    001240
001236    JMP    001212

```

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

```

001237    JMP    001212
          CALL T10U(138)
001240    CALL T10U
001241    DAC    ='000212
          CALL T10U(138)
001242    CALL T10U
001243    DAC    ='000212
          RETURN
001244    JMP*   000000
          END
          STG    ='000001
001245    OCT    000001
          STG    ='000002
001246    OCT    000002
          STG    ='000004
001247    OCT    000004
          STG    ='000006
001250    OCT    000006
000003    DAC    ARG
000004    DAC    MODE
000000    DAC    TNCUA
          STG    ='000010
001251    OCT    000010
000034    DAC    .10
          STG    I
001252    OCT    004640
          STG    ='000007
001253    OCT    000007
000000    DAC    FPOUTC
          STG    T$1000
001254    OCT    012244
          STG    ='120240
001255    OCT    120240
000000    DAC    T10U
          STG    ='000212
001256    OCT    000212
000076    DAC    .20
          STG    ='000011
001257    OCT    000011
          STG    ='000015
001260    OCT    000015
          STG    ='000017
001261    OCT    000017
          STG    ='000000
001262    OCT    000000
          STG    ='000012
001263    OCT    000012
000313    DAC    .35
          STG    ='000300
001264    OCT    000300
          STG    T$1001
001265    OCT    012244
000435    DAC    .40
000000    DAC    OUT100
000626    DAC    .55
          STG    ='000317
001266    OCT    000317

```

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

	STG	= '000014
001267	OCT	000014
001164	DAC	.60
	STG	= '000053
001270	OCT	000053
	STG	= '000057
001271	OCT	000057
001226	DAC	.65
	STG	= '000061
001272	OCT	000061
	STG	= '000065
001273	OCT	000065
\$0		

PROGRAM NAME

SOURCE: RE50

BINARY: BRE50

ENTRY POINTS (location): ICINIT ('3274), INPIP ('3347),

INGYRO ('3410)

GENERAL DESCRIPTION:

The subroutine ICINIT will set up the gyro and PIPA interface to interrupt the main program every 10 milliseconds. The first interrupt will be a PIPA interrupt and will occur when the PIPA counters have 20 milliseconds of data in them. The next interrupt will be a gyro interrupt 10 milliseconds later and will occur when the gyro counters have 20 milliseconds of data in them. From then on every 10 milliseconds the interrupts will occur alternately. ICINIT will also read the initial interpolator values of the gyros.

The subroutine INPIP will read the 6 PIPA pulse counters and store them in the locations indicated by the listing with a scaling of 2^{-5} pulses. For example, an octal 000200 represents one pulse or 4 cm/sec of ΔV .

The subroutine INGYRO will read the 6 gyro pulse counters, subtract the old interpolator values, add the new interpolator values and store them in the locations indicated by the listing. These are also scaled at 2^{-5} pulses. For example, an octal 000200 represents one pulse or 7×2^{-15} radians.

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0001			SUBR	ICINIT	
0002			REL		
0003	00000	0 000000	ICIN	DAC	**
0004	00001	14 0047		OCP	'47
0005	00002	14 0057		OCP	'57
0006	00003	14 0077		OCP	'77
0007	00004	0 02 00224		LDA	=95
0008	00005	74 0077		OTA	'77
0009	00006	0 01 00005		JMP	*-1
0010	00007	14 0027		OCP	'27
0011	00010	34 0207		SKS	'207
0012	00011	0 01 00010		JMP	*-1
0013	00012	0400 56		LRL	18
0014	00013	14 0017		OCP	'17
0015	00014	0 35 00223		LDX	=-48
0016	00015	14 0027	WLUP	OCP	'27
0017	00016	34 0207		SKS	'207
0018	00017	0 01 00016		JMP	*-1
0019	00020	0 12 00000		IRS	0
0020	00021	0 01 00015		JMP	WLUP
0021	00022	14 0027		OCP	'27
0022	00023	14 0067		OCP	'67
0023	00024	0400 56		LRL	18
0024	00025	14 0007		OCP	'7
0025	00026	34 0307		SKS	'307
0026	00027	0 01 00026		JMP	*-1
0027			* READ INITIAL INTERPOLATOR DATA		
0028	00030	54 1307		INA	'1307
0029	00031	0 01 00030		JMP	*-1
0030	00032	0 04 00430		STA	'430
0031	00033	54 1317		INA	'1317
0032	00034	0 01 00033		JMP	*-1
0033	00035	0 04 00431		STA	'431
0034	00036	54 1327		INA	'1327
0035	00037	0 01 00036		JMP	*-1
0036	00040	0 04 00432		STA	'432
0037	00041	54 1337		INA	'1337
0038	00042	0 01 00041		JMP	*-1
0039	00043	0 04 00433		STA	'433
0040	00044	54 1347		INA	'1347
0041	00045	0 01 00044		JMP	*-1
0042	00046	0 04 00434		STA	'434
0043	00047	54 1357		INA	'1357
0044	00050	0 01 00047		JMP	*-1
0045	00051	0 04 00435		STA	'435
0046	00052	-0 01 00000		JMP*	ICIN
0047			*		
0048			*		
0049			*		
0050			SUBR	INPIP	
0051			REL		
0052	00053	0 000000	INPI	DAC	**
0053	00054	54 1107		INA	'1107
0054	00055	0 01 00054		JMP	*-1
0055	00056	141240		ICR	
0056	00057	0405 77		ARS	1
0057	00060	0 04 00600		STA	PIPA

MICROCOMP TELECOMMUNICATED DATA
NDP-516 ASSEMBLY LISTING

0058	00061	54 1117	INA	'1117
0059	00062	0 01 00061	JMP	*-1
0060	00063	141240	ICR	
0061	00064	0405 77	ARS	1
0062	00065	0 04 00602	STA	PIPB
0063	00066	54 1127	INA	'1127
0064	00067	0 01 00066	JMP	*-1
0065	00070	141240	ICR	
0066	00071	0405 77	ARS	1
0067	00072	0 04 00604	STA	PIPC
0068	00073	54 1137	INA	'1137
0069	00074	0 01 00073	JMP	*-1
0070	00075	141240	ICR	
0071	00076	0405 77	ARS	1
0072	00077	0 04 00606	STA	PIPD
0073	00100	54 1147	INA	'1147
0074	00101	0 01 00100	JMP	*-1
0075	00102	141240	ICR	
0076	00103	0405 77	ARS	1
0077	00104	0 04 00610	STA	PIPE
0078	00105	54 1157	INA	'1157
0079	00106	0 01 00105	JMP	*-1
0080	00107	141240	ICR	
0081	00110	0405 77	ARS	1
0082	00111	0 04 00612	STA	PIPF
0083	00112	14 0017	OCP	'17
0084	00113	-0 01 00053	JMP*	INPI
0085			*	
0086			*	
0087		000600	PIPA EQU	'600
0088		000602	PIPB EQU	PIPA+2
0089		000604	PIPC EQU	PIPB+2
0090		000606	PIPD EQU	PIPC+2
0091		000610	PIPE EQU	PIPD+2
0092		000612	PIPF EQU	PIPE+2
0093			*	
0094			*	
0095			SUBR	INGYRO
0096			REL	
0097			*	
0098	00114	0 000000	INGY DAC	**
0099	00115	54 1007	INA	'1007
0100	00116	0 01 00115	JMP	*-1
0101	00117	141240	ICR	
0102	00120	0 07 00430	SUB	'430
0103	00121	0 04 00400	STA	GYRA
0104	00122	54 1017	INA	'1017
0105	00123	0 01 00122	JMP	*-1
0106	00124	141240	ICR	
0107	00125	0 07 00431	SUB	'431
0108	00126	0 04 00402	STA	GYRB
0109	00127	54 1027	INA	'1027
0110	00130	0 01 00127	JMP	*-1
0111	00131	141240	ICR	
0112	00132	0 07 00432	SUB	'432
0113	00133	0 04 00404	STA	GYRC
0114	00134	54 1037	INA	'1037

CLEAR AND ENABLE

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0115	00135	0 01 00134	JMP	*-1	
0116	00136	141240	ICR		
0117	00137	0 07 00433	SUB	'433	
0118	00140	0 04 00406	STA	GYRD	
0119	00141	54 1047	INA	'1047	
0120	00142	0 01 00141	JMP	*-1	
0121	00143	141240	ICR		
0122	00144	0 07 00434	SUB	'434	
0123	00145	0 04 00410	STA	GYRE	
0124	00146	54 1057	INA	'1057	
0125	00147	0 01 00146	JMP	*-1	
0126	00150	141240	ICR		
0127	00151	0 07 00435	SUB	'435	
0128	00152	0 04 00412	STA	GYRF	
0129	00153	14 0007	OCP	'7	CLEAR AND ENABLE
0130					
			* READ INTERPOLATORS		
0131	00154	34 0307	SKS	'307	
0132	00155	0 01 00154	JMP	*-1	
0133	00156	54 1307	INA	'1307	
0134	00157	0 01 00156	JMP	*-1	
0135	00160	0 04 00430	STA	'430	
0136	00161	0 06 00400	ADD	GYRA	
0137	00162	0405 77	ARS	1	
0138	00163	0 04 00400	STA	GYRA	
0139	00164	54 1317	INA	'1317	
0140	00165	0 01 00164	JMP	*-1	
0141	00166	0 04 00431	STA	'431	
0142	00167	0 06 00402	ADD	GYRB	
0143	00170	0405 77	ARS	1	
0144	00171	0 04 00402	STA	GYRB	
0145	00172	54 1327	INA	'1327	
0146	00173	0 01 00172	JMP	*-1	
0147	00174	0 04 00432	STA	'432	
0148	00175	0 06 00404	ADD	GYRC	
0149	00176	0405 77	ARS	1	
0150	00177	0 04 00404	STA	GYRC	
0151	00200	54 1337	INA	'1337	
0152	00201	0 01 00200	JMP	*-1	
0153	00202	0 04 00433	STA	'433	
0154	00203	0 06 00406	ADD	GYRD	
0155	00204	0405 77	ARS	1	
0156	00205	0 04 00406	STA	GYRD	
0157	00206	54 1347	INA	'1347	
0158	00207	0 01 00206	JMP	*-1	
0159	00210	0 04 00434	STA	'434	
0160	00211	0 06 00410	ADD	GYRE	
0161	00212	0405 77	ARS	1	
0162	00213	0 04 00410	STA	GYRE	
0163	00214	54 1357	INA	'1357	
0164	00215	0 01 00214	JMP	*-1	
0165	00216	0 04 00435	STA	'435	
0166	00217	0 06 00412	ADD	GYRF	
0167	00220	0405 77	ARS	1	
0168	00221	0 04 00412	STA	GYRF	
0169	00222	-0 01 00114	JMP*	INGY	
0170					*
0171					*

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0172	000400	GYRA EQU	'400
0173	000402	GYRB EQU	GYRA+2
0174	000404	GYRC EQU	GYRB+2
0175	000406	GYRD EQU	GYRC+2
0176	000410	GYRE EQU	GYRD+2
0177	000412	GYRF EQU	GYRE+2
0178		*	
0179	00223 177720		END
	00224 000137		

PROGRAM NAME
SOURCE: ACOM
BINARY: BACOM
ENTRY POINTS (location): ACOM ('3522)
GENERAL DESCRIPTION:

This subroutine compensates the accelerometers for scale factor, bias and two misalignments, SO and SP, expressed as misalignments toward the negative X, Y and Z axes. Considering just the A accelerometer, the following equations are programmed.

$$AAPC = AAPC + AABD + \frac{1}{2^6} AASF AAPC$$

where

AAPC is accelerometer A's pulse count

AABD is accelerometer A's bias

and

AASF is $2^6 \times$ accelerometer A's Δ scale factor

then

$$AAPC = \frac{1}{2^9} (DVXB AAMX + DVYB AAMY + DVZB AAMZ)$$

DVXB, DVYB, DVZB are the $\Delta V_{x,y,z}$ outputs in the body frame and AAMX, Y, Z are $2^9 \times$ accelerometer A's misalignments in the negative X, Y, Z directions. See listing for coding.

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

REL	ACOM
0001	
0002	ACOM
0003 00000	DAC **
0004 00001	LDA AAPC
0005 00002	MPY AASF
0006 00003	DBL
0007 00004	LRS 6
0008 00005	DAD AABD
0009 00006	DAD AAPC
0010 00007	DST AAPC
0011 00010	DLD ABPC
0012 00011	MPY ABSF
0013 00012	LRS 6
0014 00013	DAD ABBD
0015 00014	DAD ABPC
0016 00015	DST ABPC
0017 00016	DLD ACPC
0018 00017	MPY ACSF
0019 00020	LRS 6
0020 00021	DAD ACBD
0021 00022	DAD ACPC
0022 00023	DST ACPC
0023 00024	DLD ADPC
0024 00025	MPY ADSF
0025 00026	LRS 6
0026 00027	DAD ADRD
0027 00030	DAD ADPC
0028 00031	DST ADPC
0029 00032	DLD AEPC
0030 00033	MPY AESF
0031 00034	LRS 6
0032 00035	DAD AEBD
0033 00036	DAD AEPC
0034 00037	DST AEPC
0035 00040	DLD AFPC
0036 00041	MPY AFSP
0037 00042	LRS 6
0038 00043	DAD AFRD
0039 00044	DAD AFPC
0040 00045	DST AFPC
0041 00046	DLD DVXB
0042 00047	MPY AAMX
0043 00050	DST TACM
0044 00051	DLD DVXB
0045 00052	MPY ABMX
0046 00053	DST TBCM
0047 00054	DLD DVXB
0048 00055	MPY ACMX
0049 00056	DST TCCM
0050 00057	DLD DVXB
0051 00060	MPY ADMX
0052 00061	DST TDCM
0053 00062	DLD DVXB
0054 00063	MPY AEMX
0055 00064	DST TECM
0056 00065	DLD DVXB
0057 00066	MPY AFMX

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0058	00067	0 04	00200	DST	TFCM
0059	00070	0 02	00616	DLD	DVYB
0060	00071	0 16	00730	MPY	AAMY
0061	00072	0 06	00166	DAD	TACM
0062	00073	0 04	00166	DST	TACM
0063	00074	0 02	00616	DLD	DVYB
0064	00075	0 16	00731	MPY	ABMY
0065	00076	0 06	00170	DAD	TBCM
0066	00077	0 04	00170	DST	TBCM
0067	00100	0 02	00616	DLD	DVYB
0068	00101	0 16	00732	MPY	ACMY
0069	00102	0 06	00172	DAD	TCCM
0070	00103	0 04	00172	DST	TCCM
0071	00104	0 02	00616	DLD	DVYB
0072	00105	0 16	00733	MPY	ADMY
0073	00106	0 06	00174	DAD	TDCM
0074	00107	0 04	00174	DST	TDCM
0075	00110	0 02	00616	DLD	DVYB
0076	00111	0 16	00734	MPY	AEMY
0077	00112	0 06	00176	DAD	TECM
0078	00113	0 04	00176	DST	TECM
0079	00114	0 02	00616	DLD	DVYB
0080	00115	0 16	00735	MPY	AFMY
0081	00116	0 06	00200	DAD	TFCM
0082	00117	0 04	00200	DST	TFCM
0083	00120	0 02	00620	DLD	DVZB
0084	00121	0 16	00736	MPY	AAMZ
0085	00122	0 06	00166	DAD	TACM
0086	00123	0401	67	LRS	9
0087	00124	0 06	00600	DAD	AAPC
0088	00125	0 04	00600	DST	AAPC
0089	00126	0 02	00620	DLD	DVZB
0090	00127	0 16	00737	MPY	ABMZ
0091	00130	0 06	00170	DAD	TBCM
0092	00131	0401	67	LRS	9
0093	00132	0 06	00602	DAD	ABPC
0094	00133	0 04	00602	DST	ABPC
0095	00134	0 02	00620	DLD	DVZB
0096	00135	0 16	00740	MPY	ACMZ
0097	00136	0 06	00172	DAD	TCCM
0098	00137	0401	67	LRS	9
0099	00140	0 06	00604	DAD	ACPC
0100	00141	0 04	00604	DST	ACPC
0101	00142	0 02	00620	DLD	DVZB
0102	00143	0 16	00741	MPY	ADMZ
0103	00144	0 06	00174	DAD	TDCM
0104	00145	0401	67	LRS	9
0105	00146	0 06	00606	DAD	ADPC
0106	00147	0 04	00606	DST	ADPC
0107	00150	0 02	00620	DLD	DVZB
0108	00151	0 16	00742	MPY	AEMZ
0109	00152	0 06	00176	DAD	TECM
0110	00153	0401	67	LRS	9
0111	00154	0 06	00610	DAD	AEPC
0112	00155	0 04	00610	DST	AEPC
0113	00156	0 02	00620	DLD	DVZB
0114	00157	0 16	00743	MPY	AFMZ

MICROCOMP TFI ECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0115	00160	0 06 00200	DAD	TFCM
0116	00161	0401 67	TRS	9
0117	00162	0 06 00612	DAD	AFPC
0118	00163	0 04 00612	DST	AFPC
0119	00164	000005	SGL	
0120	00165	-0 01 00000	JMP*	ACOM
0121		000500	AAPC EQU	'600
0122		000602	ABPC EQU	AAPC+2
0123		000604	ACPC EQU	AAPC+4
0124		000606	ADPC EQU	AAPC+6
0125		000610	APPC EQU	AAPC+8
0126		000612	AFPC EQU	AAPC+10
0127		000700	AASF EQU	'700
0128		000701	ABSF EQU	AASF+1
0129		000702	ACSF EQU	AASF+2
0130		000703	ADSF EQU	AASF+3
0131		000704	AESF EQU	AASF+4
0132		000705	AFSF EQU	AASF+5
0133		000706	AABD EQU	'706
0134		000710	AFRD EQU	AABD+2
0135		000712	ACBD EQU	AABD+4
0136		000714	ADB D EQU	AABD+6
0137		000716	AEBD EQU	AABD+8
0138		000720	AFBD EQU	AABD+10
0139		000722	AAMX EQU	'722
0140		000723	ARMX EQU	AAMX+1
0141		000724	ACMX EQU	AAMX+2
0142		000725	ADMX EQU	AAMX+3
0143		000726	AEMX EQU	AAMX+4
0144		000727	AFMX EQU	AAMX+5
0145		000730	AAMY EQU	AAMX+6
0146		000731	APMY EQU	AAMX+7
0147		000732	ACMY EQU	AAMX+8
0148		000733	ADMY EQU	AAMX+9
0149		000734	AEMY EQU	AAMX+10
0150		000735	AFMY EQU	AAMX+11
0151		000736	AAMZ EQU	AAMX+12
0152		000737	ARMZ EQU	AAMX+13
0153		000740	ACMZ EQU	AAMX+14
0154		000741	ADMZ EQU	AAMX+15
0155		000742	AEMZ EQU	AAMX+16
0156		000743	AFMZ EQU	AAMX+17
0157		000614	DVXB EQU	'614
0158		000616	DVYB EQU	DVXB+2
0159		000620	DVZB EQU	DVXB+4
0160	00166	000000	TACM DBP	0
	00167	000000		
0161	00170	000000	TBCM DBP	0
	00171	000000		
0162	00172	000000	TCCM DBP	0
	00173	000000		
0163	00174	000000	TDCM DBP	0
	00175	000000		
0164	00176	000000	TFCM DBP	0
	00177	000000		
0165	00200	000000	TFCM DBP	0
	00201	000000		

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING
0166 END

PROGRAM NAME
 SOURCE: GCOM
 BINARY: BGC0M
 ENTRY POINT (location): GCOM ('3724)
 GENERAL DESCRIPTION:

This subroutine compensates the gyros for $\pm\Delta SF$, NBD, ADIA, ADOA, ADSRA, major compliance, GO, GS and OA coupling (by calling the OA coupling compensation subroutine, DCOA). Considering just the A gyro its compensation parameters are:

GANS = 2^6 X gyro A negative ΔSF
 GAPS = 2^6 X gyro A positive ΔSF
 GABD = gyro A's NBD
 ADAX, Y, Z = 2^{12} x Acceleration dependent
 drifts of gyro A for
 accelerations on the
 X, Y and Z axes
 (a function of ADIA, OA, SRA)
 AASD = 2^6 x A gyro acceleration
 squared drift or major
 compliance
 GAMX, Y, Z = 2^{10} x gyro A's misalignment
 along the negative X, Y
 and Z axes (functions
 of GO and GS).

For the A gyro the following equations are implemented.

$$GAPC = GAPC + GABD + \frac{1}{2^6} GAPC \begin{matrix} \text{GAPS} \\ \text{or} \\ \text{GANS} \end{matrix}$$

where GAPC is Gyro A's pulse count

$$GAPC = \frac{1}{2^{12}}(ADAX DVXB + ADAY DVYB + ADAZ DVZB)$$

where DVXB, DVYB and DVZB are the accelerations (in units of $\Delta V_{x,y,z}$ per update).

$$GAPC = GAPC + \frac{1}{2^6}(DVZB DVZB - DVXB DVXB - DVYB DVYB) AASD$$

where the parenthesized expression is proportional to DVAIA DVASRA, the product of the accelerations on A gyros IA and SRA.

CALL DCOA (see documentation for subroutine DC50)

$$GAPC = GAPC + \frac{1}{2^{10}}(GAMX DTXB + GAMY DTYB + GAMZ DTZB)$$

where DTXB, DTYB and DTZB are $\Delta\theta_x$, $\Delta\theta_y$ and $\Delta\theta_z$ during the last update.

(Note, since ACOM is the subroutine which compensates the accelerometers and is a little simpler, it might be better to read its documentation first).

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0001			RFL	
0002			SUBR	GCOM
0003	00000	0 000000	GCOM DAC	**
0004	00001	0 02 00400	LDA	GAPC
0005	00002	000007	DBL	
0006	00003	101400	SMI	
0007	00004	0 01 00007	JMP	**3
0008	00005	0 16 00506	MPY	GANS
0009	00006	100000	SKP	
0010	00007	0 16 00500	MPY	GAPS
0011	00010	0401 72	LRS	6
0012	00011	0 06 00514	DAD	GABD
0013	00012	0 06 00400	DAD	GAPC
0014	00013	0 04 00400	DST	GAPC
0015	00014	0 02 00402	DLD	GBPC
0016	00015	101400	SMI	
0017	00016	0 01 00021	JMP	**3
0018	00017	0 16 00507	MPY	GBNS
0019	00020	100000	SKP	
0020	00021	0 16 00501	MPY	GBPS
0021	00022	0401 72	LRS	6
0022	00023	0 06 00516	DAD	GBBD
0023	00024	0 06 00402	DAD	GBPC
0024	00025	0 04 00402	DST	GBPC
0025	00026	0 02 00404	DLD	GCPC
0026	00027	101400	SMI	
0027	00030	0 01 00033	JMP	**3
0028	00031	0 16 00510	MPY	GCNS
0029	00032	100000	SKP	
0030	00033	0 16 00502	MPY	GCPS
0031	00034	0401 72	LRS	6
0032	00035	0 06 00520	DAD	GCBD
0033	00036	0 06 00404	DAD	GCPC
0034	00037	0 04 00404	DST	GCPC
0035	00040	0 02 00406	DLD	GDPC
0036	00041	101400	SMI	
0037	00042	0 01 00045	JMP	**3
0038	00043	0 16 00511	MPY	GDNS
0039	00044	100000	SKP	
0040	00045	0 16 00503	MPY	GDPS
0041	00046	0401 72	LRS	6
0042	00047	0 06 00522	DAD	GDBD
0043	00050	0 06 00406	DAD	GDPC
0044	00051	0 04 00406	DST	GDPC
0045	00052	0 02 00410	DLD	GEPC
0046	00053	101400	SMI	
0047	00054	0 01 00057	JMP	**3
0048	00055	0 16 00512	MPY	GENS
0049	00056	100000	SKP	
0050	00057	0 16 00504	MPY	GEPS
0051	00060	0401 72	LRS	6
0052	00061	0 06 00524	DAD	GERD
0053	00062	0 06 00410	DAD	GEPC
0054	00063	0 04 00410	DST	GEPC
0055	00064	0 02 00412	DLD	GFPC
0056	00065	101400	SMI	
0057	00066	0 01 00071	JMP	**3

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0058	00067	0 16	00513	MPY	GFNS
0059	00070	100000		SKP	
0060	00071	0 16	00505	MPY	GFPS
0061	00072	0401	72	LRS	6
0062	00073	0 06	00526	DAD	GFBD
0063	00074	0 06	00412	DAD	GFPC
0064	00075	0 04	00412	DST	GFPC
0065	00076	0 02	00614	DLD	DVXB
0066	00077	0 16	00530	MPY	ADAX
0067	00100	0 04	00450	DST	TACM
0068	00101	0 02	00614	DLD	DVXB
0069	00102	0 16	00531	MPY	ADBX
0070	00103	0 04	00452	DST	TBCM
0071	00104	0 02	00614	DLD	DVXB
0072	00105	0 16	00532	MPY	ADCK
0073	00106	0 04	00454	DST	TCCM
0074	00107	0 02	00614	DLD	DVXB
0075	00110	0 16	00533	MPY	ADDX
0076	00111	0 04	00456	DST	TDCM
0077	00112	0 02	00614	DLD	DVXB
0078	00113	0 16	00534	MPY	ADEX
0079	00114	0 04	00460	DST	TFCM
0080	00115	0 02	00614	DLD	DVXB
0081	00116	0 16	00535	MPY	ADFX
0082	00117	0 04	00462	DST	TFCM
0083	00120	0 02	00616	DLD	DVYB
0084	00121	0 16	00536	MPY	ADAY
0085	00122	0 06	00450	DAD	TACM
0086	00123	0 04	00450	DST	TACM
0087	00124	0 02	00616	DLD	DVYB
0088	00125	0 16	00537	MPY	ADBY
0089	00126	0 06	00452	DAD	TBCM
0090	00127	0 04	00452	DST	TBCM
0091	00130	0 02	00616	DLD	DVYB
0092	00131	0 16	00540	MPY	ADCY
0093	00132	0 06	00454	DAD	TCCM
0094	00133	0 04	00454	DST	TCCM
0095	00134	0 02	00616	DLD	DVYB
0096	00135	0 16	00541	MPY	ADDY
0097	00136	0 06	00456	DAD	TDCM
0098	00137	0 04	00456	DST	TDCM
0099	00140	0 02	00616	DLD	DVYB
0100	00141	0 16	00542	MPY	ADEY
0101	00142	0 06	00460	DAD	TECM
0102	00143	0 04	00460	DST	TECM
0103	00144	0 02	00616	DLD	DVYB
0104	00145	0 16	00543	MPY	ADFY
0105	00146	0 06	00462	DAD	TFCM
0106	00147	0 04	00462	DST	TFCM
0107	00150	0 02	00620	DLD	DVZB
0108	00151	0 16	00544	MPY	ADAZ
0109	00152	0 06	00450	DAD	TACM
0110	00153	0401	64	LRS	12
0111	00154	0 06	00400	DAD	GAPC
0112	00155	0 04	00400	DST	GAPC
0113	00156	0 02	00620	DLD	DVZB
0114	00157	0 16	00545	MPY	ADEZ

MICROCOMP TELECOMMUNICATED DATA

DDP-516 ASSEMBLY LISTING

0115	00160	0 06 00452	DAD	TBCM
0116	00161	0401 64	LRS	12
0117	00162	0 06 00402	DAD	GBPC
0118	00163	0 04 00402	DST	GBPC
0119	00164	0 02 00620	DLD	DVZB
0120	00165	0 16 00546	MPY	ADCZ
0121	00166	0 06 00454	DAD	TCCM
0122	00167	0401 64	LRS	12
0123	00170	0 05 00404	DAD	GCPC
0124	00171	0 04 00404	DST	GCPC
0125	00172	0 02 00620	DLD	DVZB
0126	00173	0 16 00547	MPY	ADDZ
0127	00174	0 06 00456	DAD	TDCM
0128	00175	0401 64	LRS	12
0129	00176	0 06 00406	DAD	GDPC
0130	00177	0 04 00406	DST	GDPC
0131	00200	0 02 00620	DLD	DVZB
0132	00201	0 16 00550	MPY	ADEZ
0133	00202	0 06 00460	DAD	TECM
0134	00203	0401 64	LRS	12
0135	00204	0 06 00410	DAD	GEPC
0136	00205	0 04 00410	DST	GEPC
0137	00206	0 02 00620	DLD	DVZB
0138	00207	0 16 00551	MPY	ADFZ
0139	00210	0 06 00462	DAD	TFCM
0140	00211	0401 64	LRS	12
0141	00212	0 06 00412	DAD	GFPC
0142	00213	0 04 00412	DST	GFPC
0143	00214	0 02 00614	DLD	DVXB
0144	00215	0 16 00614	MPY	DVXB
0145	00216	0 04 00434	DST	XSQU
0146	00217	0 02 00616	DLD	DVYB
0147	00220	0 16 00616	MPY	DVYB
0148	00221	0 04 00436	DST	YSQU
0149	00222	0 02 00620	DLD	DVZB
0150	00223	0 16 00620	MPY	DVZB
0151	00224	0 04 00440	DST	ZSQU
0152	00225	0 02 00614	DLD	DVXB
0153	00226	0 16 00616	MPY	DVYB
0154	00227	0 04 00442	DST	XWHY
0155	00230	0 02 00614	DLD	DVXB
0156	00231	0 16 00620	MPY	DVZB
0157	00232	0 04 00444	DST	XZEE
0158	00233	0 02 00616	DLD	DVYB
0159	00234	0 16 00620	MPY	DVZB
0160	00235	0 04 00446	DST	YZEE
0161	00236	0 02 00440	DLD	ZSQU
0162	00237	0 07 00434	DSB	XSQU
0163	00240	0 07 00444	DSB	XZEE
0164	00241	0 16 00422	MPY	AASD
0165	00242	0401 72	LRS	6
0166	00243	0 06 00400	DAD	GAPC
0167	00244	0 04 00400	DST	GAPC
0168	00245	0 02 00440	DLD	ZSQU
0169	00246	0 07 00434	DSB	XSQU
0170	00247	0 06 00444	DAD	XZEE
0171	00250	0 16 00423	MPY	BASD

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0172	00251	0401 72	LRS	6
0173	00252	0 06 00402	DAD	GBPC
0174	00253	0 04 00402	DST	GBPC
0175	00254	0 02 00434	DLD	XSQU
0176	00255	0 07 00436	DSB	YSQU
0177	00256	0 07 00442	DSB	XWHY
0178	00257	0 16 00424	MPY	CASD
0179	00260	0401 72	LRS	6
0180	00261	0 06 00404	DAD	GCPC
0181	00262	0 04 00404	DST	GCPC
0182	00263	0 02 00434	DLD	XSQU
0183	00264	0 07 00436	DSB	YSQU
0184	00265	0 06 00442	ADD	XWHY
0185	00266	0 16 00425	MPY	DASD
0186	00267	0401 72	LRS	6
0187	00270	0 06 00406	DAD	GDPC
0188	00271	0 04 00406	DST	GDPC
0189	00272	0 02 00436	DLD	YSQU
0190	00273	0 07 00440	DSB	ZSQU
0191	00274	0 07 00446	DSB	YZEE
0192	00275	0 16 00426	MPY	EASD
0193	00276	0401 72	LRS	6
0194	00277	0 06 00410	DAD	GEPC
0195	00300	0 04 00410	DST	GEPC
0196	00301	0 02 00436	DLD	YSQU
0197	00302	0 07 00440	DSB	ZSQU
0198	00303	0 06 00446	ADD	YZEE
0199	00304	0 16 00427	MPY	FASD
0200	00305	0401 72	LRS	6
0201	00306	0 06 00412	DAD	GFPC
0202	00307	0 04 00412	DST	GFPC
0203	00310	000005	SGL	
0204	00311	0 10 00000	CALL	DCOA
0205	00312	000007	DBL	
0206	00313	0 02 00414	DLD	DTXB
0207	00314	0 16 00552	MPY	GAMX
0208	00315	0 04 00450	DST	TACM
0209	00316	0 02 00414	DLD	DTXB
0210	00317	0 16 00553	MPY	GBMX
0211	00320	0 04 00452	DST	TBCM
0212	00321	0 02 00414	DLD	DTXB
0213	00322	0 16 00554	MPY	GCMX
0214	00323	0 04 00454	DST	TCCM
0215	00324	0 02 00414	DLD	DTXB
0216	00325	0 16 00555	MPY	GDMX
0217	00326	0 04 00456	DST	TDCM
0218	00327	0 02 00414	DLD	DTXB
0219	00330	0 16 00556	MPY	GEMX
0220	00331	0 04 00460	DST	TECM
0221	00332	0 02 00414	DLD	DTXB
0222	00333	0 16 00557	MPY	GFMX
0223	00334	0 04 00462	DST	TFCM
0224	00335	0 02 00416	DLD	DTYB
0225	00336	0 16 00560	MPY	GAMY
0226	00337	0 06 00450	DAD	TACM
0227	00340	0 04 00450	DST	TACM
0228	00341	0 02 00416	DLD	DTYB

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0229	00342	0 16	00561	MPY	GBMY
0230	00343	0 06	00452	DAD	TBCM
0231	00344	0 04	00452	DST	TBCM
0232	00345	0 02	00416	DLD	DTYB
0233	00346	0 16	00562	MPY	GCMY
0234	00347	0 06	00454	DAD	TCCM
0235	00350	0 04	00454	DST	TCCM
0236	00351	0 02	00416	DLD	DTYB
0237	00352	0 16	00563	MPY	GDMY
0238	00353	0 06	00456	DAD	TDCM
0239	00354	0 04	00456	DST	TDCM
0240	00355	0 02	00416	DLD	DTYB
0241	00356	0 16	00564	MPY	GEMY
0242	00357	0 06	00460	DAD	TFCM
0243	00360	0 04	00460	DST	TECM
0244	00361	0 02	00416	DLD	DTYB
0245	00362	0 16	00565	MPY	GEMY
0246	00363	0 06	00462	DAD	TFCM
0247	00364	0 04	00462	DST	TFCM
0248	00365	0 02	00420	DLD	DTZB
0249	00366	0 16	00566	MPY	GAMZ
0250	00367	0 06	00450	DAD	TACM
0251	00370	0401	66	LRS	10
0252	00371	0 06	00400	DAD	GAPC
0253	00372	0 04	00400	DST	GAPC
0254	00373	0 02	00420	DLD	DTZB
0255	00374	0 16	00567	MPY	GRMZ
0256	00375	0 06	00452	DAD	TBCM
0257	00376	0401	66	LRS	10
0258	00377	0 06	00402	DAD	GBPC
0259	00400	0 04	00402	DST	GBPC
0260	00401	0 02	00420	DLD	DTZB
0261	00402	0 16	00570	MPY	GCMZ
0262	00403	0 06	00454	DAD	TCCM
0263	00404	0401	66	LRS	10
0264	00405	0 06	00404	DAD	GCPC
0265	00406	0 04	00404	DST	GCPC
0266	00407	0 02	00420	DLD	DTZB
0267	00410	0 16	00571	MPY	GDMZ
0268	00411	0 06	00456	DAD	TDCM
0269	00412	0401	66	LRS	10
0270	00413	0 06	00406	DAD	GDPC
0271	00414	0 04	00406	DST	GDPC
0272	00415	0 02	00420	DLD	DTZB
0273	00416	0 16	00572	MPY	GFMZ
0274	00417	0 06	00460	DAD	TECM
0275	00420	0401	66	LRS	10
0276	00421	0 06	00410	DAD	GFPC
0277	00422	0 04	00410	DST	GFPC
0278	00423	0 02	00420	DLD	DTZB
0279	00424	0 16	00573	MPY	GFMZ
0280	00425	0 06	00462	DAD	TFCM
0281	00426	0401	66	LRS	10
0282	00427	0 06	00412	DAD	GFPC
0283	00430	0 04	00412	DST	GFPC
0284	00431	000005		SGL	
0285	00432	-0 01	00000	JMP*	GCOM

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0286	000400	GAPC EQU	*400
0287	000402	GBPC EQU	GAPC+2
0288	000404	GCPC EQU	GAPC+4
0289	000406	GDPC EQU	GAPC+6
0290	000410	GEPC EQU	GAPC+8
0291	000412	G*PC EQU	GAPC+10
0292	000500	GAPS EQU	*500
0293	000501	GBPS EQU	GAPS+1
0294	000502	GCPS EQU	GAPS+2
0295	000503	GDPS EQU	GAPS+3
0296	000504	GEPS EQU	GAPS+4
0297	000505	GFPS EQU	GAPS+5
0298	000506	GANS EQU	GAPS+6
0299	000507	GENS EQU	GAPS+7
0300	000510	GCNS EQU	GAPS+8
0301	000511	GDNS EQU	GAPS+9
0302	000512	GENS EQU	GAPS+10
0303	000513	GFNS EQU	GAPS+11
0304	000514	GABD EQU	*514
0305	000516	GBBD EQU	GABD+2
0306	000520	G CBD EQU	GABD+4
0307	000522	GDBD EQU	GABD+6
0308	000524	GEBD EQU	GABD+8
0309	000526	G FBD EQU	GABD+10
0310	000530	ADAX EQU	*530
0311	000531	ADBX EQU	ADAX+1
0312	000532	ADCX EQU	ADAX+2
0313	000533	ADDX EQU	ADAX+3
0314	000534	ADEX EQU	ADAX+4
0315	000535	ADFX EQU	ADAX+5
0316	000536	ADAY EQU	ADAX+6
0317	000537	ADRY EQU	ADAX+7
0318	000540	ADCY EQU	ADAX+8
0319	000541	ADDY EQU	ADAX+9
0320	000542	ADEY EQU	ADAX+10
0321	000543	ADFY EQU	ADAX+11
0322	000544	ADAZ EQU	ADAX+12
0323	000545	ADBZ EQU	ADAX+13
0324	000546	ADCZ EQU	ADAX+14
0325	000547	ADDZ EQU	ADAX+15
0326	000550	ADEZ EQU	ADAX+16
0327	000551	ADPZ EQU	ADAX+17
0328	000552	GAMX EQU	*552
0329	000553	GBMX EQU	GAMX+1
0330	000554	GCMX EQU	GAMX+2
0331	000555	GDMX EQU	GAMX+3
0332	000556	GEMX EQU	GAMX+4
0333	000557	GFMX EQU	GAMX+5
0334	000560	GAMY EQU	GAMX+6
0335	000561	GBMY EQU	GAMX+7
0336	000562	GCMY EQU	GAMX+8
0337	000563	GDMY EQU	GAMX+9
0338	000564	GEMY EQU	GAMX+10
0339	000565	G FMY EQU	GAMX+11
0340	000566	GAMZ EQU	GAMX+12
0341	000567	GBMZ EQU	GAMX+13
0342	000570	GCMZ EQU	GAMX+14

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0343	000571	GDMZ EQU	GAMX+15
0344	000572	GENZ EQU	GAMX+16
0345	000573	GPMZ EQU	GAMX+17
0346	000422	AASD EQU	'422
0347	000423	BASD EQU	AASD+1
0348	000424	CASD EQU	AASD+2
0349	000425	DASD EQU	AASD+3
0350	000426	EASD EQU	AASD+4
0351	000427	FASD EQU	AASD+5
0352	000614	DVXB EQU	'614
0353	000616	DVYB EQU	DVXB+2
0354	000620	DVZB EQU	DVXB+4
0355	000414	DTXB EQU	'414
0356	000416	DTYB EQU	DTXB+2
0357	000420	DTZB EQU	DTXB+4
0358	00434	XSQU DBP	0
	00435		
0359	00436	YSQU DBP	0
	00437		
0360	00440	ZSQU DBP	0
	00441		
0361	00442	XWHY DBP	0
	00443		
0362	00444	XZEE DBP	0
	00445		
0363	00446	YZEE DBP	0
	00447		
0364	00450	TACM DBP	0
	00451		
0365	00452	TBCM DBP	0
	00453		
0366	00454	TCCM DBP	0
	00455		
0367	00456	TDCM DBP	0
	00457		
0368	00460	TECM DBP	0
	00461		
0369	00462	TPCM DBP	0
	00463		
0370		END	

PROGRAM NAME:
SOURCE: VACU
BINARY: BVACU
ENTRY POINTS (location): VACU ('4410)
GENERAL DESCRIPTION:

This subroutine, when called, accumulates delta velocity in the inertial frame (DVIX, DVIY and DVIZ calculated by the velocity algorithm, program source name VELF subroutine entry point VELA). The three accumulators (XAV1-XAV3, YAV1-YAV3 and ZAV1-ZAV3) are triple precision accumulators and a brief examination of this subroutine will show that it performs the following three tasks:

$$XAV = XAV + \frac{DVIX}{2^{15}}$$

$$YAV = YAV + \frac{DVIY}{2^{15}}$$

$$ZAV = ZAV + \frac{DVIZ}{2^{15}}$$

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0001				REL	
0002				SUBR	VACU
0003	00000	0 000000	VACU	DAC	**
0004	00001	000007		DBL	
0005	00002	0 02 00656		DLD	DVIX
0006	00003	140040		CRA	
0007	00004	0 06 00446		DAD	XAV3
0008	00005	0 04 00446		DST	XAV3
0009	00006	000201		IAB	
0010	00007	140040		CRA	
0011	00010	000201		IAB	
0012	00011	0 06 00656		DAD	DVIX
0013	00012	0401 61		LRS	15
0014	00013	0 06 00444		DAD	XAV1
0015	00014	0 04 00444		DST	XAV1
0016	00015	0 02 00660		DLD	DVIY
0017	00016	140040		CRA	
0018	00017	0 06 00452		DAD	YAV3
0019	00020	0 04 00452		DST	YAV3
0020	00021	000201		IAB	
0021	00022	140040		CRA	
0022	00023	000201		IAB	
0023	00024	0 06 00660		DAD	DVIY
0024	00025	0401 61		LRS	15
0025	00026	0 06 00450		DAD	YAV1
0026	00027	0 04 00450		DST	YAV1
0027	00030	0 02 00662		DLD	DVIZ
0028	00031	140040		CRA	
0029	00032	0 06 00456		DAD	ZAV3
0030	00033	0 04 00456		DST	ZAV3
0031	00034	000201		IAB	
0032	00035	140040		CRA	
0033	00036	000201		IAB	
0034	00037	0 06 00662		DAD	DVIZ
0035	00040	0401 61		LRS	15
0036	00041	0 06 00454		DAD	ZAV1
0037	00042	0 04 00454		DST	ZAV1
0038	00043	000005		SGL	
0039	00044	140040		CRA	
0040	00045	0 04 00446		STA	XAV3
0041	00046	0 04 00452		STA	YAV3
0042	00047	0 04 00456		STA	ZAV3
0043	00050	-0 01 00000		JMP*	VACU
0044		000656	DVIX	EQU	'656
0045		000660	DVIY	EQU	DVIX+2
0046		000662	DVIZ	EQU	DVIX+4
0047		000444	XAV1	EQU	'444
0048		000446	XAV3	EQU	XAV1+2
0049		000450	YAV1	EQU	XAV1+4
0050		000452	YAV3	EQU	XAV1+6
0051		000454	ZAV1	EQU	XAV1+8
0052		000456	ZAV3	EQU	XAV1+10
0053				END	

PROGRAM NAME:
SOURCE: FPOUTC
BINARY: BFPOUT
ENTRY POINT (location): FPOUTC ('4462), OUT100 ('4674)
GENERAL DESCRIPTION:

FPOUTC is called by the output subroutine FNOP and prints on the teletype a decimal number representation of the binary number designated by the call. The call in FORTRAN is

CALL FPOUTC (ARG, S, P)

or in DAP

CALL	FPOUTC
DAC	ARG
DAC	S
DAC	P
OCT	0

where ARG is the number to be printed, S is the number of bits after the sign bit before the binary point, and P is how many decimal digits to print after the decimal point.

OUT100 is also called by FNOP and is used to print on the teletype 1/100 of a double precision integer. It is only used to print out the variable TIME, which is really a count of updates and needs to be divided by 100 to scale it to seconds. The call in FORTRAN is CALL OUT100 (TIME), or in DAP

CALL	OUT100
DAC	TIME

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0001			SUBR	FPOUTC	
0002			REL		
0003	00000	0 000000	FPOU DAC	**	
0004	00001	0 10 00000	CALL	FSAT	
0005	00002	000003	DEC3 OCT	3	
0006	00003	0 00 00000	ARG PZE		
0007	00004	0 00 00000	SCAL PZE		
0008	00005	0 00 00000	PREC PZE		
0009	00006	140040	CPA		
0010	00007	0 04 00166	STA	SGFL	SIGN FLAG
0011	00010	0 04 00173	STA	INT	
0012	00011	0 02 00202	LDA	BIBL	
0013	00012	0 04 00170	STA	STR	
0014	00013	0 04 00171	STA	STR+1	
0015	00014	0 04 00172	STA	STR+2	OVERPLAYS CNTR
0016	00015	0 02 00206	LDA	SIX	
0017	00016	0 04 00167	STA	PPTR	
0018			*		
0019	00017	0 35 00003	LDX	ARG	
0020	00020	1 02 00001	LDA	1,1	
0021	00021	000201	IAB		
0022	00022	1 02 00000	LDA	0,1	
0023	00023	000007	DRL		
0024	00024	0 04 00174	DST	FRAC	
0025	00025	101400	SMI		
0026	00026	0 01 00033	JMP	ARGP	
0027	00027	0 12 00166	IRS	SGFL	
0028	00030	0 07 00174	DSB	FRAC	
0029	00031	0 07 00174	DSB	FRAC	
0030	00032	0 04 00174	DST	FRAC	
0031			*		
0032	00033	000005	ARGP SGL		
0033	00034	-0 02 00004	LDA*	SCAL	
0034	00035	101040	SNZ		
0035	00036	0 01 00051	JMP	SDON	
0036	00037	101400	SMI		
0037	00040	0 01 00144	JMP	TPLS	
0038	00041	0 03 00210	ANA	CC77	
0039	00042	0 05 00201	ERA	RSI	
0040	00043	0 04 00046	STA	INS2	
0041	00044	000007	DBL		
0042	00045	0 02 00174	DLD	FRAC	
0043	00046	0 00 00000	INS2 ***		
0044	00047	0 04 00174	DST	FRAC	
0045	00050	000005	SGL		
0046			*		
0047	00051	0 02 00173	SDON LDA	INT	
0048	00052	0400 60	NEXT LRL	16	
0049	00053	0 17 00207	DIV	TEN	
0050	00054	0 04 00173	STA	INT	
0051	00055	000201	IAB		
0052	00056	0 06 00176	ADD	FRMT	
0053			*		
0054	00057	000201	IAB		
0055	00060	0 02 00167	LDA	PPTR	
0056	00061	0 07 00205	SUB	ONE	
0057	00062	0 04 00167	STA	PPTR	

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0058	00063	0404 77	LGR	1
0059	00064	0 04 00000	STA	0
0060	00065	1 02 00170	LDA	STR,1
0061	00066	100001	SRC	
0062	00067	000201	IAB	
0063	00070	0414 70	LGL	8
0064	00071	0402 70	LRR	8
0065	00072	1 04 00170	STA	STR,1
0066			*	
0067	00073	0 02 00173	LDA	INT
0068	00074	100040	SZE	
0069	00075	0 01 00052	JMP	NEXT
0070	00076	0 02 00166	LDA	SGFL
0071	00077	101040	SNZ	
0072	00100	0 01 00104	JMP	SOUT
0073	00101	0 02 00170	LDA	STR
0074	00102	0 05 00204	ERA	NEGS
0075	00103	0 04 00170	STA	STR
0076	00104	0 10 00000	SOUT CALL	TNOUA
0077	00105	0 000170	DAC	STR
0078	00106	0 000206	DAC	SIX
0079	00107	000000	OCT	0
0080			*	
0081	00110	-0 02 00005	IDA*	PREC
0082	00111	140407	TCA	
0083	00112	101400	SMI	
0084	00113	-0 01 00000	JMP*	FPOU
0085	00114	0 04 00172	STA	CNTR
0086	00115	0 10 00000	CALL	T10U
0087	00116	0 000203	DAC	DOTC
0088			*	
0089	00117	0 02 00175	FIP LDA	LOW
0090	00120	0 16 00207	MPY	TFN
0091	00121	000007	DBL	
0092	00122	0 04 00166	DST	TEMP
0093	00123	0 02 00174	DLD	HIGH
0094	00124	0 16 00207	MPY	TEN
0095	00125	0 06 00176	DAD	PRMT
0096	00126	0 13 00173	TMA	DGT
0097	00127	140040	CRA	
0098	00130	000201	IAB	
0099	00131	0 06 00166	DAD	TEMP
0100	00132	100001	SRC	
0101	00133	0 12 00173	IRS	DGT
0102	00134	140100	SSP	
0103	00135	0 04 00174	DST	FRAC
0104	00136	000005	SGL	
0105	00137	0 10 00000	CALL	T10U
0106	00140	0 000173	DAC	DGT
0107	00141	0 12 00172	IRS	CNTR
0108	00142	0 01 00117	JMP	FLP
0109	00143	-0 01 00000	JMP*	FPOU
0110			*	
0111	00144	0 05 00200	TPLS ERA	LSI
0112	00145	141206	AOA	
0113	00146	0 04 00153	STA	INS1
0114	00147	0 35 00002	LDX	DEC3

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0115	00150	140040		CRA	
0116	00151	000201		IAB	
0117	00152	1 02 00172	TPLP	LDA	INT-1,1
0118	00153	0 00 00000	INS1	***	
0119	00154	140100		SSP	
0120	00155	1 13 00172		IHA	INT-1,1
0121	00156	000201		IAB	
0122	00157	0 02 00000		LDA	0
0123	00160	0 07 00205		SUB	ONE
0124	00161	0 04 00000		STA	0
0125	00162	100040		SZE	
0126	00163	0 01 00152		JMP	TPLP
0127	00164	0 01 00051		JMP	SDON
0128			*		
0129			*		
0130			*		
0131	00166	000000	TEMP	DBP	0
	00167	000000			
0132	00170	000000	STR	DBP	0
	00171	000000			
0133	00172	000000	CNTR	BSZ	1
0134	00173	000000	INT	BSZ	1
0135	00174	000000	FRAC	DBP	0
	00175	000000			
0136		000173	DGT	EQU	INT
0137		000174	HIGH	EQU	FRAC
0138		000175	LOW	EQU	FRAC+1
0139		000166	SGFL	EQU	TEMP
0140		000167	PPTR	EQU	TEMP+1
0141			*		
0142	00176	000260	FRMT	OCT	260,0
	00177	000000			
0143	00200	0411 77	LSI	LLS	1
0144	00201	0401 00	RSI	LRS	0
0145	00202	120240	BLBL	OCT	120240
0146	00203	000256	DOTC	OCT	256
0147	00204	006400	NEGS	OCT	6400
0148			*		
0149	00205	000001	ONE	DEC	1
0150	00206	000006	SIX	DEC	6
0151	00207	000012	TEN	OCT	12
0152	00210	000077	OC77	DEC	63
0153	00211	000000	ZERE	OCT	0
0154				PIN	
0155			*		
0156			*		
0157				SUBR	OUT100
0158				REL	
0159	00212	0 000000	OUT1	DAC	**
0160	00213	0 10 00000		CALL	ARG\$
0161	00214	-0 000212		DAC*	OUT1
0162	00215	1 02 00001		LDA	1,1
0163	00216	000201		IAB	
0164	00217	1 02 00000		LDA	0,1
0165	00220	0 17 00240		DIV	D100
0166	00221	0 04 00236		STA	OTHP
0167	00222	140040		CRA	

MICROCOMP TELECOMMUNICATED DATA
 DDP-516 ASSEMBLY LISTING

0168	00223	000201	IAB		
0169	00224	0 17 00240	DIV	D100	
0170	00225	141206	AOA		
0171	00226	0 04 00237	STA	OTMP+1	
0172	00227	0 10 00000	CALL	FPOUTC	
0173	00230	0 000236	DAC	OTMP	
0174	00231	0 000242	DAC	=15	
0175	00232	0 000241	DAC	=2	
0176	00233	000000	OCT	0	
0177	00234	0 12 00212	IRS	OUT1	
0178	00235	-0 01 00212	JMP*	OUT1	
0179			*		
0180	00236	000000	OTMP	BSZ	2
	00237	000000			
0181	00240	000144	D100	DEC	100
0182	00241	000002		END	
	00242	000017			

PROGRAM NAME

SOURCE: STFL

BINARY: BSTFL

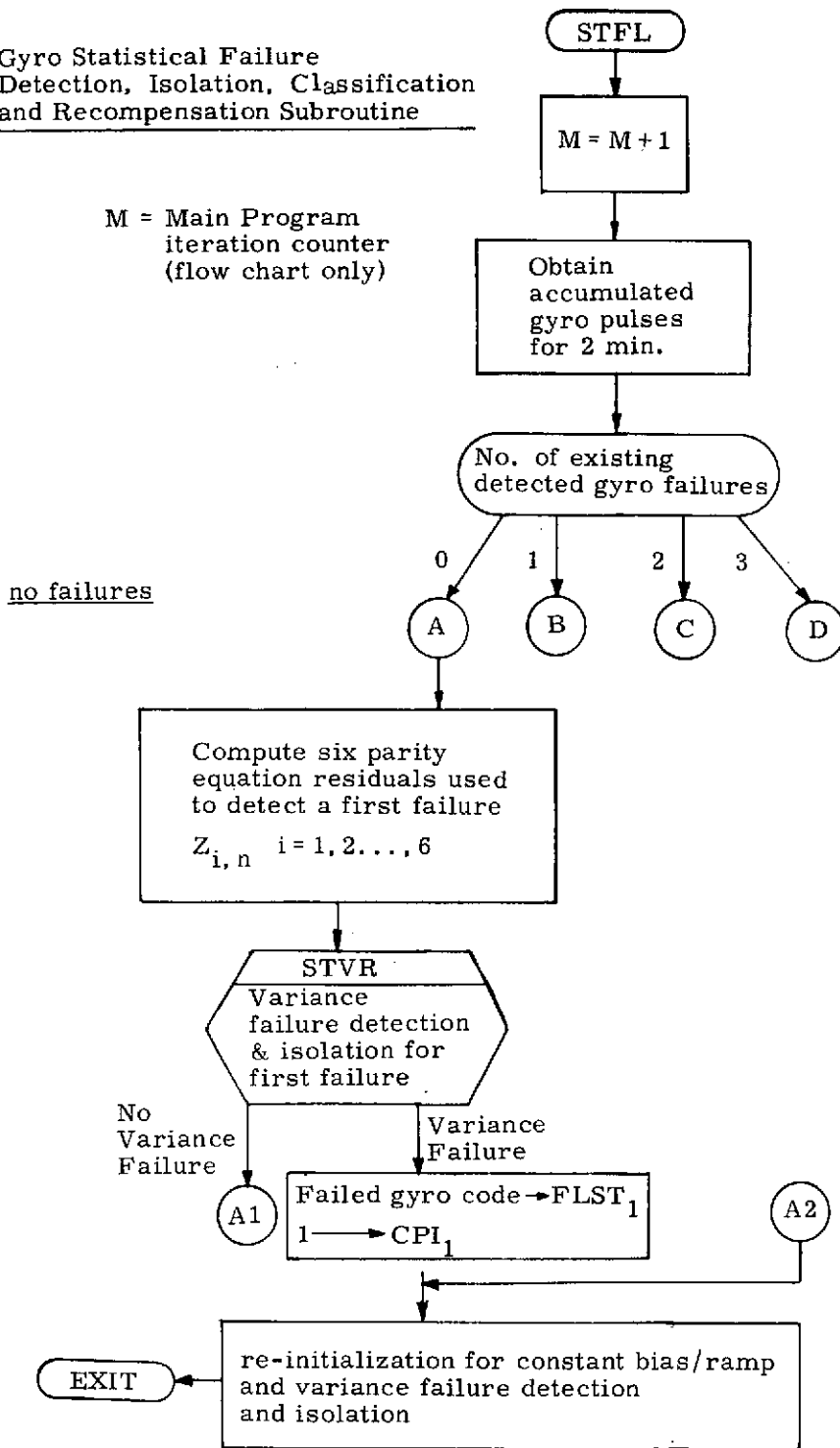
ENTRY POINTS (location): STFL ('5214)

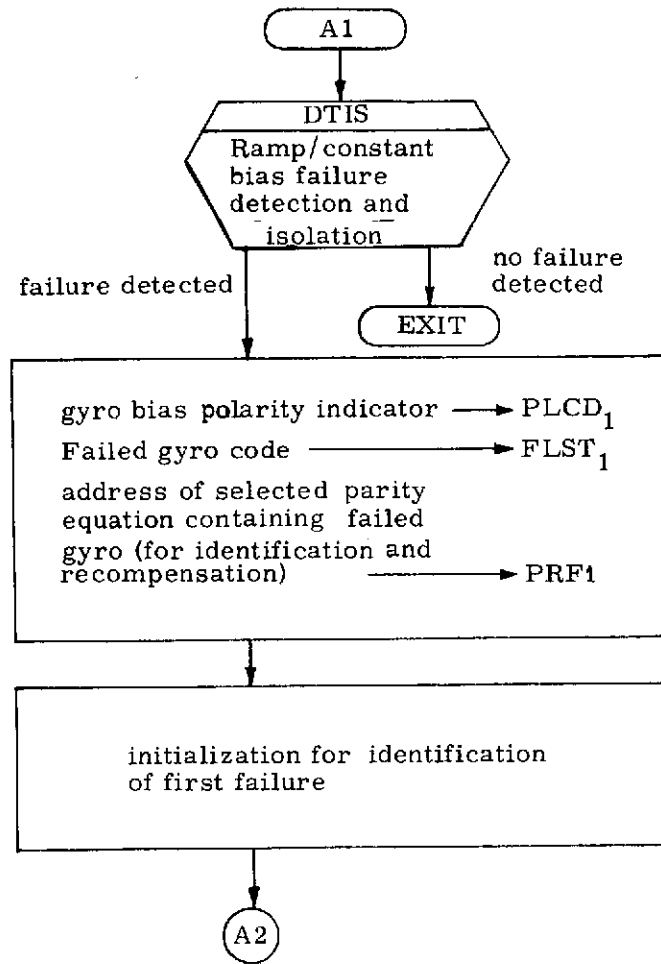
GENERAL DESCRIPTION:

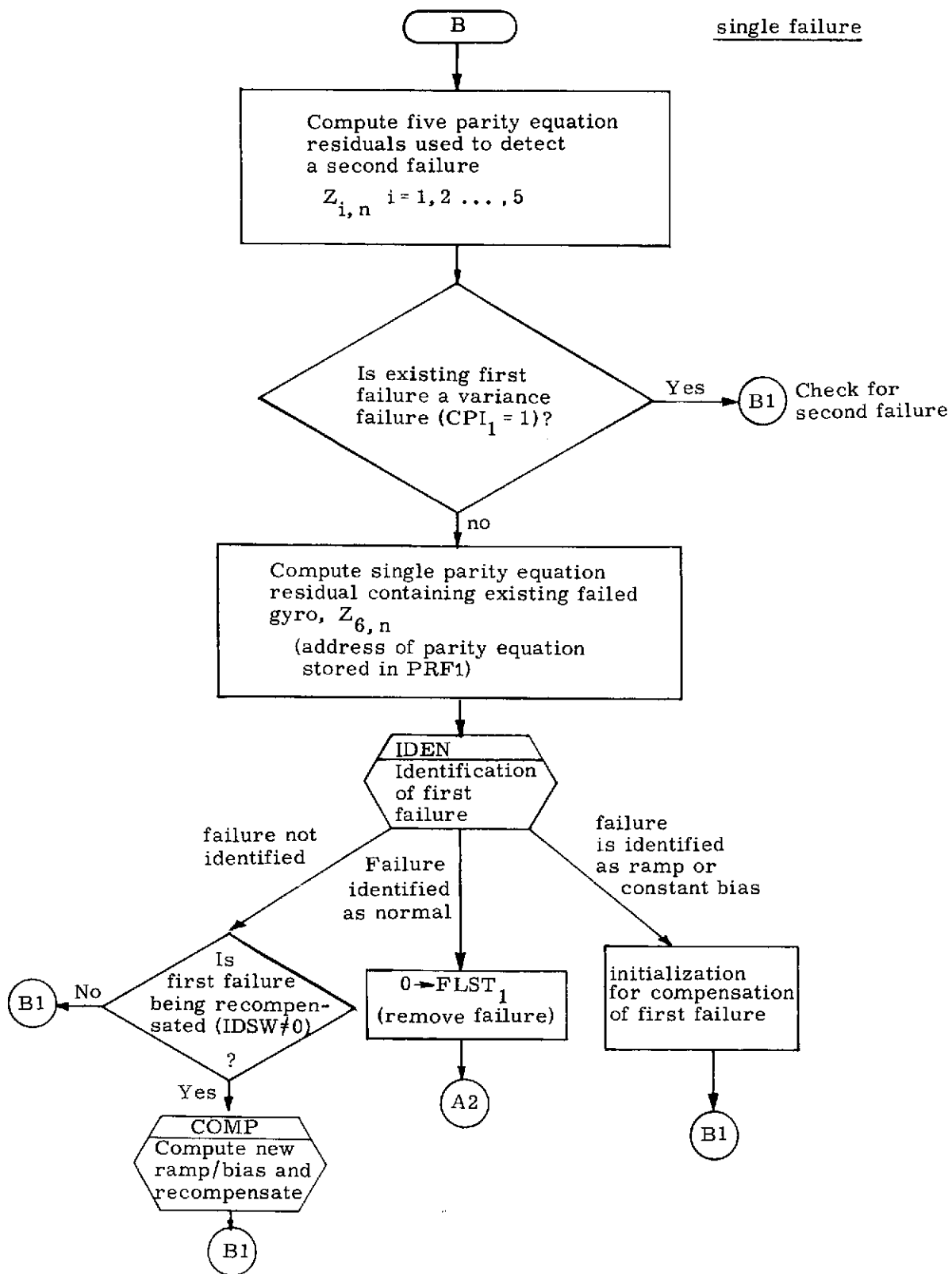
This subroutine is the main controlling program for the Gyro Statistical Failure Detection, Isolation Classification and Recompensation Process (FDICR). It is called by the main executive every two minutes and has as its main input 2 minutes worth of accumulated gyro pulses. After computing the appropriate parity equation residuals, failure detection and isolation for constant bias and ramp failures is accomplished by calling subroutine DTIS. In parallel, variance failure detection and isolation is accomplished via subrouting STVR. Upon detection of a constant bias/ramp failure, the classification process is started on the next iteration by calling subprogram IDEN. With classification of the failure as a constant bias or a ramp, recompensation is commenced via subroutine COMP. After a delay of 10 iterations the reverification of the compensated gyro is started via subroutine IDEN. When the failed gyro is recertified it is placed on line. Each of the above processes will probably take multiple iterations. Failure detection, isolation, identification and recompensation of a 1st and 2nd failure proceed in parallel with one another. In addition, the capability for the detection of a 3rd failure is included.

Gyro Statistical Failure
Detection, Isolation, Classification
and Recompensation Subroutine

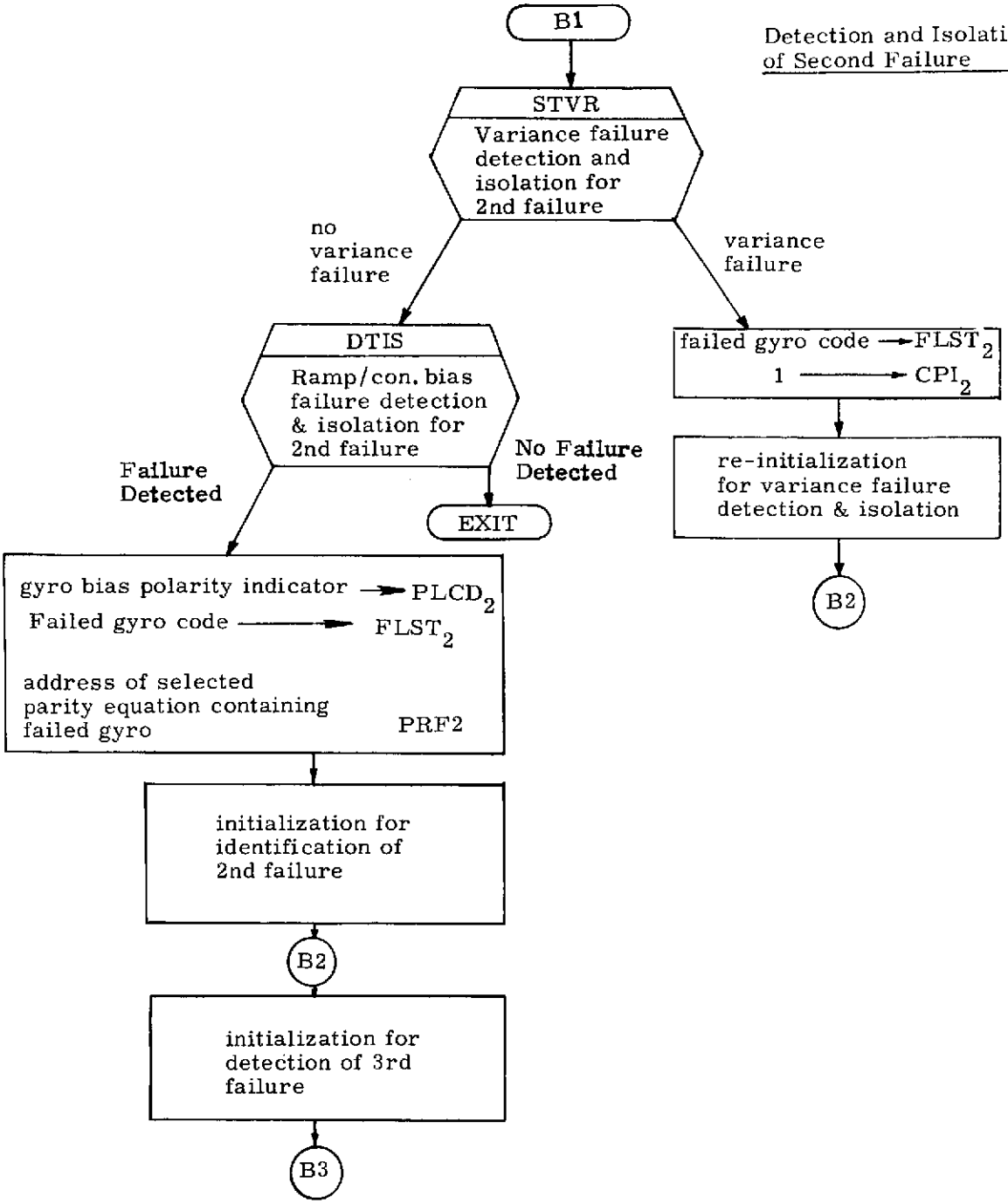
M = Main Program
iteration counter
(flow chart only)

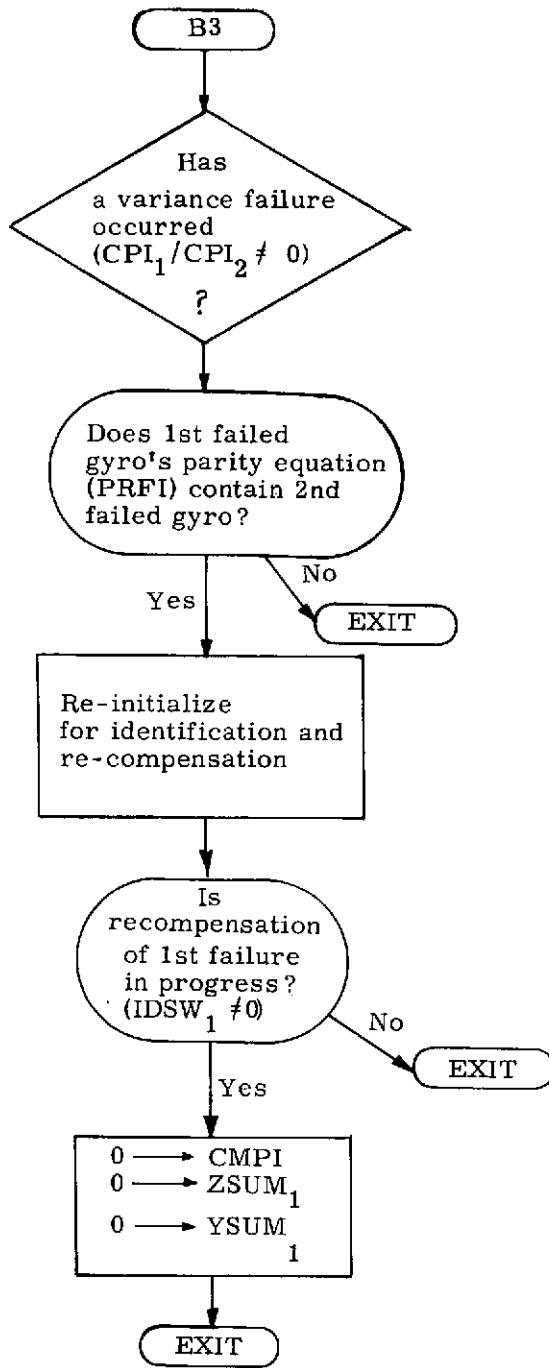




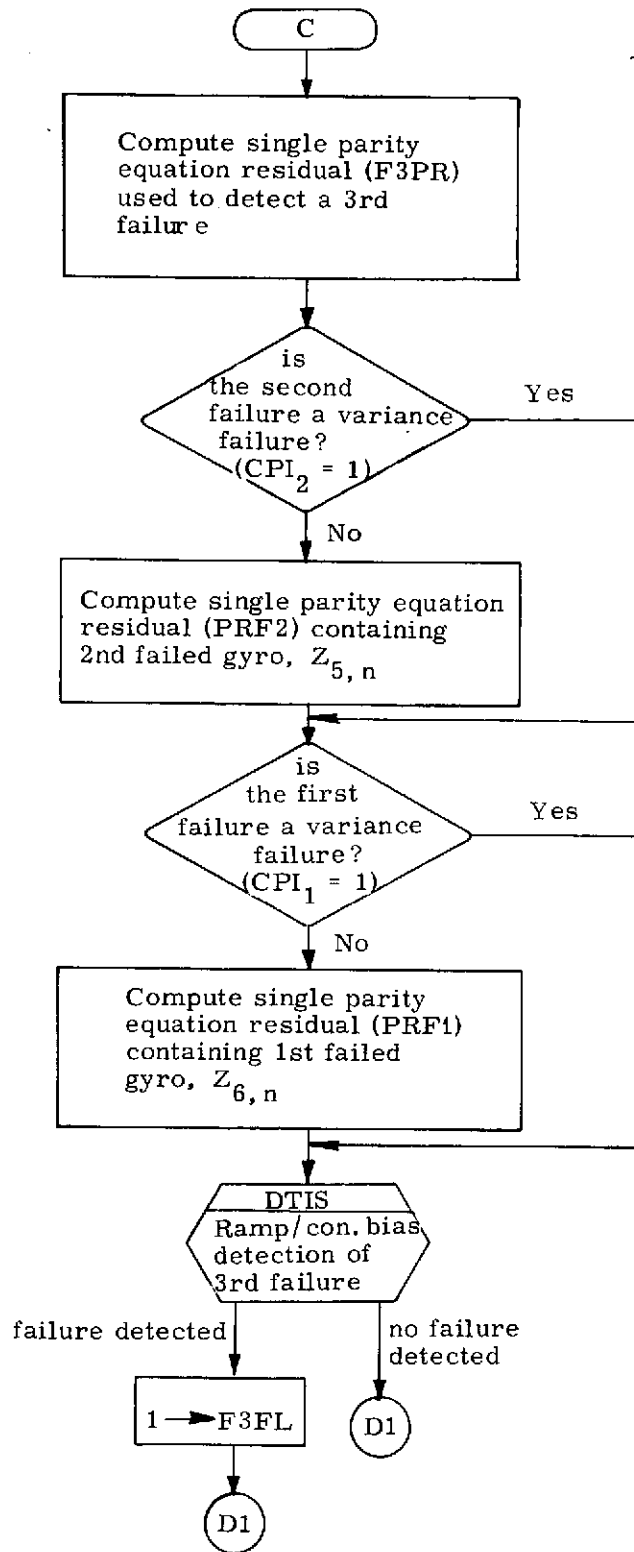


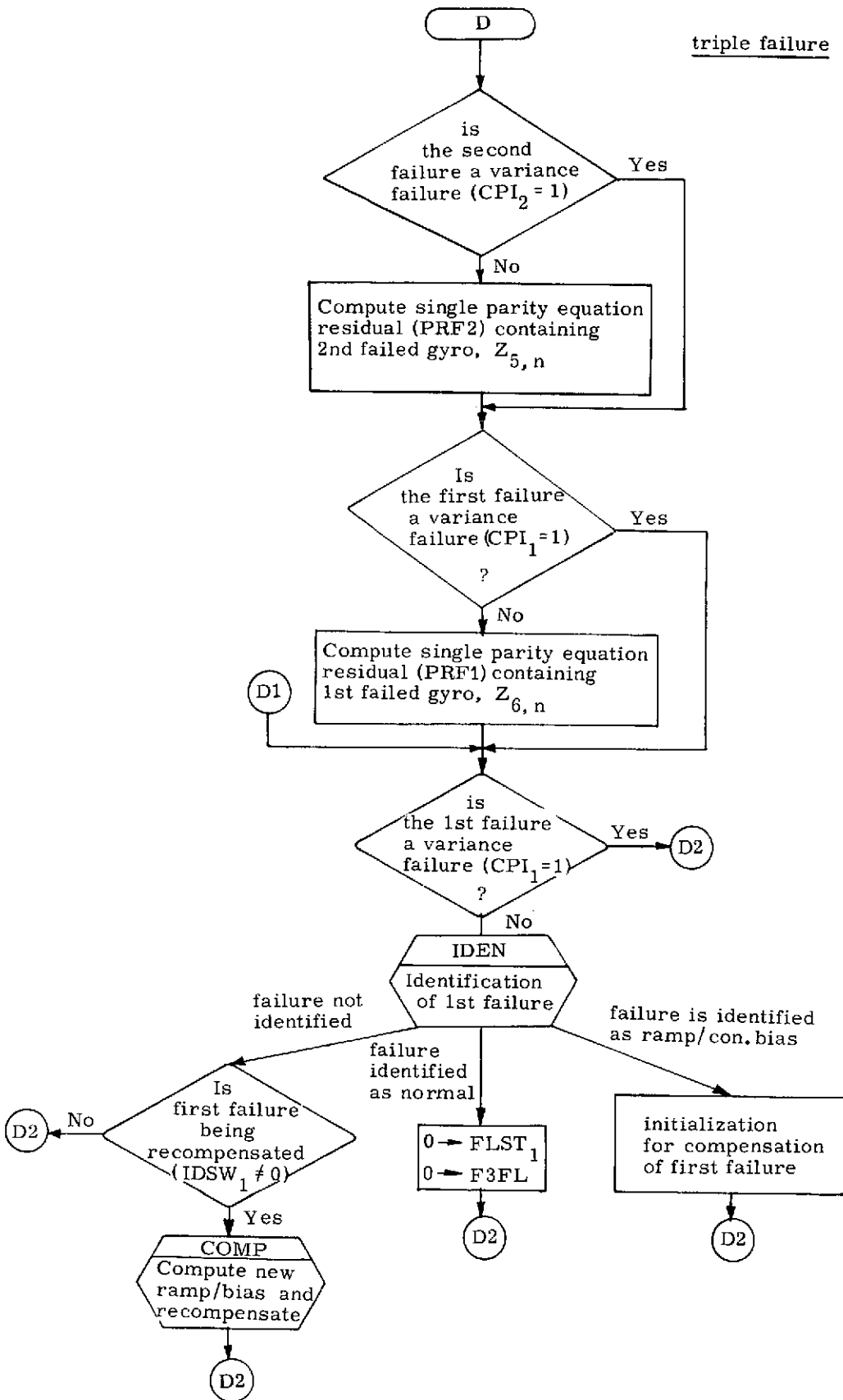
Detection and Isolation of Second Failure

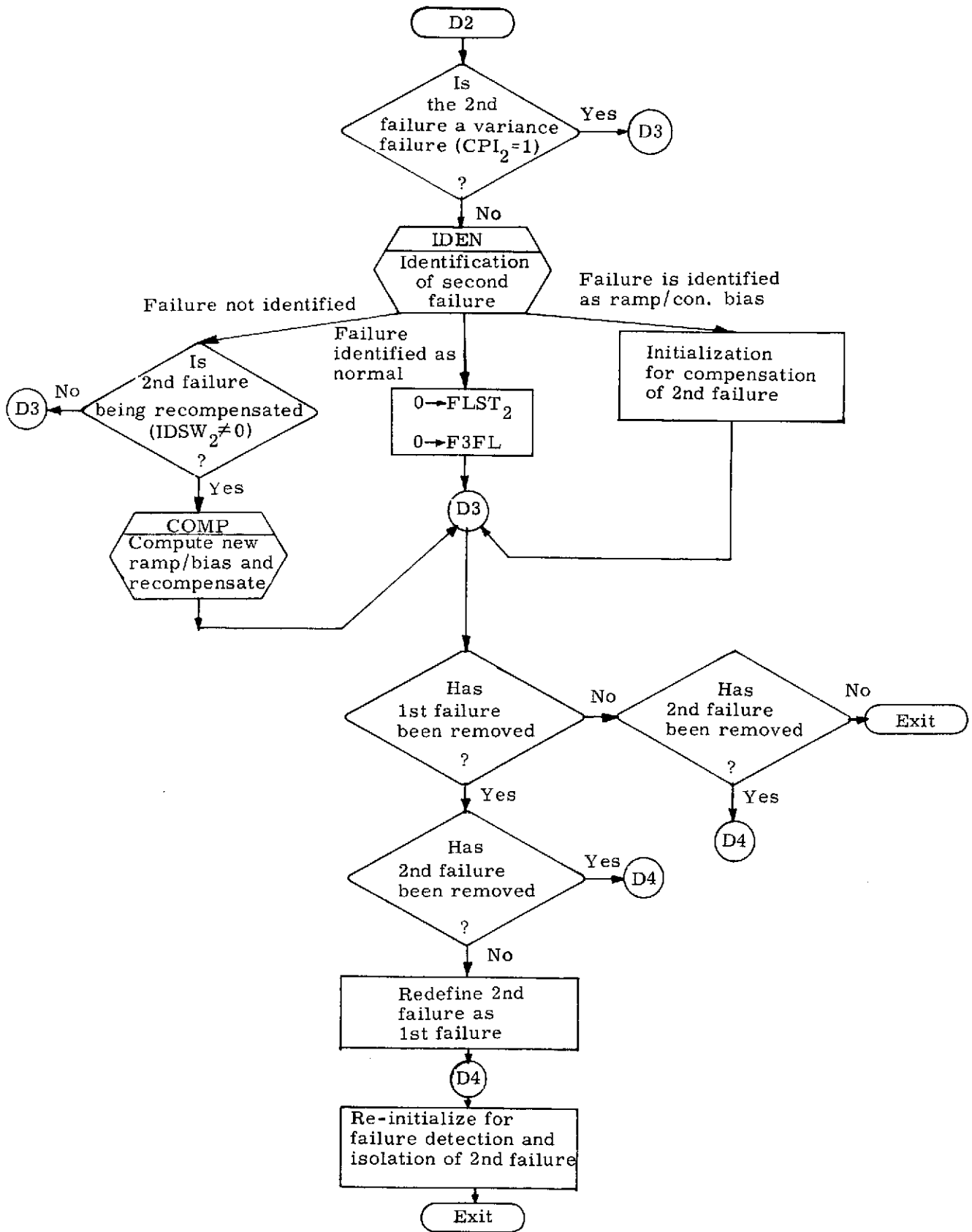




double failure







DATA ITEM DEFINITIONS

FLST	(FLST)	Failed gyro code for the first detected failure (A gyro = 1, B gyro =2, ..., F gyro = 6). Used for both ramp/constant bias and variance failures.
FLST ₂	(FLST +1)	Same as above except for the second detected failure
F3FL		Third fail indicator (0=no third fail detected, 1=third fail detected)
CPI ₁	(CPI + 1)	Variance failure indicator for first failure (1 = first failure is a variance failure, 0= first failure is not a variance failure). Failed gyro code is in FLST.
CPI ₂	(CPI)	Same as above except for 2nd failure. Failed gyro code is in FLST ₂ .
PRF1		Contains address of selected parity equation containing first failed gyro. Used for identification and recompensation of 1st failed gyro.
PRF2		same as above except for 2nd failed gyro.
F3PR		Contains address of the single parity equation in which 1st and 2nd failed gyro do not appear. Used for detection of a third failure.

DATA ITEM DEFINITIONS -continued

$Z_{i,n}$

($Z \rightarrow Z + 11$)

Table of parity equation residuals for the nth iteration of STFL. According to the gyro failure status, the table is composed as follows:

No Failures - $Z_{1,n} \rightarrow Z_{6,n}$ are the 6 parity equation residuals used to detect a first failure.

One failure - $Z_{1,n} \rightarrow Z_{5,n}$ are the 5 parity equation residuals used to detect a 2nd failure. $Z_{6,n}$ is the parity equation residual used for identification and compensation of the 1st failed gyro (PRF1 above).

Two failures- $Z_{1,n}$ is the parity equation residual used to detect a 3rd failure. $Z_{5,n}$ is the parity equation residual used for identification and compensation of the 2nd failed gyro (PRF2 above). $Z_{6,n}$ is the same as in the one failure case.

Three failures- $Z_{5,n}$ and $Z_{6,n}$ are the same as in the two failure case.

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0001				SUBR	STPL
0002				REL	
0003	00000	0 000000	STPL	DAC	**
0004	00001	000007		DBL	
0005	00002	0 02 00344		DLD	GAPA
0006	00003	0 04 00426		DST	WA
0007	00004	0 02 00346		DLD	GAPA+2
0008	00005	0 04 00430		DST	WB
0009	00006	0 02 00350		DLD	GAPA+4
0010	00007	0 04 00432		DST	WC
0011	00010	0 02 00352		DLD	GAPA+6
0012	00011	0 04 00434		DST	WD
0013	00012	0 02 00354		DLD	GAPA+8
0014	00013	0 04 00436		DST	WE
0015	00014	0 02 00356		DLD	GAPA+10
0016	00015	0 04 00440		DST	WF
0017	00016	000005		SGL	
0018	00017	0 02 00640		LDA	FLST
0019	00020	100040		SZE	
0020	00021	0 01 00061		JMP	SODF
0021	00022	000007		DBL	
0022	00023	0 35 01025		LDX	=0
0023	00024	0 10 00556		JST	ABCD
0024	00025	0 10 00577		JST	ABCF
0025	00026	0 10 00632		JST	ABEF
0026	00027	0 10 00673		JST	ADEF
0027	00030	0 10 00703		JST	BCDE
0028	00031	0 10 00747		JST	CDEF
0029	00032	000005		SGL	
0030	00033	0 02 01024		LDA	=12
0031	00034	0 10 00000		CALL	STVR
0032	00035	0 01 00041		JMP	CKBF
0033	00036	0 04 00640		STA	FLST
0034	00037	0 12 00651		IRS	CPI+1
0035	00040	0 01 00056		JMP	INC1
0036	00041	0 02 01024	CKBF	LDA	=12
0037	00042	0 10 00000		CALL	DTIS
0038	00043	-0 01 00000		JMP*	STFL
0039	00044	-0 04 00502		STA*	PCP2
0040	00045	000201		IAB	
0041	00046	0 04 00640		STA	FLST
0042	00047	1 02 00460		LDA	PRAD,1
0043	00050	0 04 00446		STA	PRF1
0044	00051	140040		CRA	
0045	00052	000201		IAB	
0046	00053	0 02 00636		LDA	PLTM
0047	00054	0 35 01023		LDX	=2
0048	00055	0 10 00000		CALL	IDIN
0049	00056	0 10 00000	INC1	CALL	ZEIN
0050	00057	0 10 00000		CALL	ZBTA
0051	00060	-0 01 00000		JMP*	STFL
0052	00061	0 02 00641	SODF	LDA	FLST+1
0053	00062	100040		SZE	
0054	00063	0 01 00251		JMP	DBFL
0055	00064	0 35 00640		LDX	FLST
0056	00065	000007		DBL	
0057	00066	-1 01 00451		JMP*	FLAD,1

MICROCOMP TELECOMMUNICATED DATA

DDP-516 ASSEMBLY LISTING

0058	00067	0 02 00650	PARK DLD	CPI
0059	00070	000201	IAB	
0060	00071	100040	SZE	
0061	00072	0 01 00114	JMP	CK2F
0062	00073	-0 10 00446	JST*	PRF1
0063	00074	0 35 01023	LDX	=2
0064	00075	0 10 00000	CALL	IDEN
0065	00076	0 01 00106	JMP	DOCM
0066	00077	0 01 00102	JMP	NO1F
0067	00100	0 10 00000	CALL	CMIN
0068	00101	0 01 00114	JMP	CK2F
0069	00102	0 10 00000	NO1F CALL	ZEIN
0070	00103	0 04 00640	STA	FLST
0071	00104	0 10 00000	CALL	ZBTA
0072	00105	-0 01 00000	JMP*	STFL
0073	00106	000005	DOCM SGL	
0074	00107	0 02 00644	LDA	IDSW+2
0075	00110	101040	SNZ	
0076	00111	0 01 00114	JMP	CK2F
0077	00112	0 35 01023	LDX	=2
0078	00113	0 10 00000	CALL	COMP
0079	00114	000005	CK2F SGL	
0080	00115	0 02 01022	LDA	=10
0081	00116	0 10 00000	CALL	STVR
0082	00117	0 01 00124	JMP	CKB2
0083	00120	0 04 00641	STA	FLST+1
0084	00121	0 12 00650	IRS	CPI
0085	00122	0 10 00000	CALL	ZBTA
0086	00123	0 01 00144	JMP	CKB3
0087	00124	0 02 01022	CKB2 LDA	=10
0088	00125	0 10 00000	CALL	DTIS
0089	00126	-0 01 00000	JMP*	STFL
0090	00127	0 04 00442	STA	ADTM
0091	00130	0404 73	LGR	5
0092	00131	0414 73	JGL	5
0093	00132	-0 04 00503	STA*	PLCD
0094	00133	000201	IAB	
0095	00134	0 04 00641	STA	FLST+1
0096	00135	1 02 00460	LDA	PRAD,1
0097	00136	0 04 00447	STA	PRF2
0098	00137	140040	CRA	
0099	00140	000201	IAB	
0100	00141	0 02 00636	LDA	PLTM
0101	00142	0 35 01025	LDX	=0
0102	00143	0 10 00000	CALL	IDIN
0103	00144	000007	CKB3 DBL	
0104	00145	0 02 00416	DLD	DBPO
0105	00146	-0 04 00477	DST*	ETA
0106	00147	-0 04 00500	DST*	ZETA
0107	00150	0 02 00640	DLD	FLST
0108	00151	0 04 00414	DST	FSTM
0109	00152	000005	SGL	
0110	00153	0 02 00415	LDA	FSTM+1
0111	00154	0 11 00414	CAS	FSTM
0112	00155	0 01 00160	JMP	*+3
0113	00156	101000	NOP	
0114	00157	0 01 00162	JMP	*+3

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0115	00160	0 13 00414	IMA	FSTM
0116	00161	0 13 00415	IMA	FSTM+1
0117	00162	0 02 01021	LDA	=11
0119	00163	0 07 00415	SUB	FSTM+1
0119	00164	0 16 00415	MPY	FSTM+1
0120	00165	000201	IAB	
0121	00166	0401 77	LRS	1
0122	00167	0 06 00414	ADD	FSTM
0123	00170	0 04 00000	STA	0
0124	00171	1 02 00451	LDA	FLAD, 1
0125	00172	0 04 00450	STA	F3PR
0126	00173	0 02 00651	LDA	CPI+1
0127	00174	100040	SZE	
0128	00175	-0 01 00000	JMP*	STPL
0129	00176	0 02 00650	LDA	CPI
0130	00177	100040	SZE	
0131	00200	-0 01 00000	JMP*	STPL
0132	00201	0 02 00442	LDA	ADTM
0133	00202	0414 65	LGL	11
0134	00203	0405 65	ARS	11
0135	00204	0 04 00442	STA	ADTM
0136	00205	101400	SMI	
0137	00206	0 01 00210	JMP	**2
0138	00207	140407	TCA	
0139	00210	0 04 00000	STA	0
0140	00211	1 02 00460	LDA	PRAD, 1
0141	00212	0 11 00446	CAS	PRF1
0142	00213	0 01 00215	JMP	**2
0143	00214	-0 01 00000	JMP*	STFL
0144	00215	0 04 00446	STA	PRF1
0145	00216	0 02 00442	LDA	ADTM
0146	00217	101400	SMI	
0147	00220	0 01 00227	JMP	SMPL
0148	00221	-0 02 00502	LDA*	PCP2
0149	00222	140024	CHS	
0150	00223	-0 04 00502	STA*	PCP2
0151	00224	-0 02 00501	LDA*	IPL2
0152	00225	140407	TCA	
0153	00226	0 01 00230	JMP	**2
0154	00227	-0 02 00501	SMPL LDA*	IPL2
0155	00230	0 04 00442	STA	ADTM
0156	00231	0 02 00644	LDA	IDS#+2
0157	00232	100040	SZE	
0158	00233	0 01 00241	JMP	NOID
0159	00234	000201	IAB	
0160	00235	0 02 00442	LDA	ADTM
0161	00236	0 35 01023	LDX	=2
0162	00237	0 10 00000	CALL	IDIN
0163	00240	-0 01 00000	JMP*	STFL
0164	00241	0 02 00442	NOID LDA	ADTM
0165	00242	000201	IAB	
0166	00243	0 02 00442	LDA	ADTM
0167	00244	0 35 01023	LDX	=2
0168	00245	0 10 00000	CALL	IDIN
0169	00246	140040	CRA	
0170	00247	0 10 00000	CALL	CMIN
0171	00250	-0 01 00000	JMP*	STFL

MICROCOMP TELECOMMUNICATED DATA

DDP-516 ASSEMBLY LISTING

0172	00251	0 02 00652	DBFL LDA	F3FL
0173	00252	101040	SNZ	
0174	00253	0 01 00372	JMP	TPFL
0175	00254	000007	DBL	
0176	00255	0 35 01020	LDX	=8
0177	00256	0 02 00650	DLD	CPI
0178	00257	101040	SNZ	
0179	00260	-0 10 00447	JST*	PRP2
0180	00261	0 35 01022	LDX	=10
0181	00262	0 02 00650	DLD	CPI
0182	00263	000201	IAB	
0183	00264	101040	SNZ	
0184	00265	-0 10 00446	JST*	PRP1
0185	00266	000005	SGL	
0186	00267	0 02 00651	CNDF LDA	CPI+1
0187	00270	100040	SZE	
0188	00271	0 01 00313	JMP	IDF2
0189	00272	0 35 01023	LDX	=2
0190	00273	0 10 00000	CALL	IDEN
0191	00274	0 01 00305	JMP	CMF1
0192	00275	0 01 00300	JMP	NMF1
0193	00276	0 10 00000	CALL	CMIN
0194	00277	0 01 00313	JMP	IDF2
0195	00300	000005	NMF1 SGL	
0196	00301	140040	CRA	
0197	00302	0 04 00640	STA	FLST
0198	00303	0 04 00652	STA	F3FL
0199	00304	0 01 00313	JMP	IDF2
0200	00305	000005	CMF1 SGL	
0201	00306	0 02 00644	LDA	IDSW+2
0202	00307	101040	SNZ	
0203	00310	0 01 00313	JMP	IDF2
0204	00311	0 35 01023	LDX	=2
0205	00312	0 10 00000	CALL	COMP
0206	00313	000005	IDF2 SGL	
0207	00314	0 02 00650	LDA	CPI
0208	00315	100040	SZE	
0209	00316	0 01 00340	JMP	DFLX
0210	00317	0 35 01025	LDX	=0
0211	00320	0 10 00000	CALL	IDEN
0212	00321	0 01 00332	JMP	CMF2
0213	00322	0 01 00325	JMP	NMF2
0214	00323	0 10 00000	CALL	CMIN
0215	00324	0 01 00340	JMP	DFLX
0216	00325	000005	NMF2 SGL	
0217	00326	140040	CRA	
0218	00327	0 04 00652	STA	F3FL
0219	00330	0 04 00641	STA	FLST+1
0220	00331	0 01 00340	JMP	DFLX
0221	00332	000005	CMF2 SGL	
0222	00333	0 02 00642	LDA	IDSW
0223	00334	101040	SNZ	
0224	00335	0 01 00340	JMP	DFLX
0225	00336	0 35 01025	LDX	=0
0226	00337	0 10 00000	CALL	COMP
0227	00340	000005	DFLX SGL	
0228	00341	0 02 00640	LDA	FLST

MICROCOMP TELECOMMUNICATED DATA
 DDP-516 ASSEMBLY LISTING

0229	00342	101040		SNZ	
0230	00343	0 01 00350		JMP	RMF1
0231	00344	0 02 00641		LDA	FLST+1
0232	00345	100040		SZE	
0233	00346	-0 01 00000		JMP*	STFL
0234	00347	0 01 00367		JMP	OUT
0235	00350	0 02 00641	RMF1	LDA	FLST+1
0236	00351	100040		SZE	
0237	00352	0 01 00354		JMP	**2
0238	00353	0 01 00367		JMP	OUT
0239	00354	0 04 00640		STA	FLST
0240	00355	140040		CRA	
0241	00356	0 04 00641		STA	FLST+1
0242	00357	0 10 00000		CALL	IDMV
0243	00360	0 10 00000		CALL	CMMV
0244	00361	0 02 00447		LDA	PRF2
0245	00362	0 04 00446		STA	PRF1
0246	00363	0 02 00650		LDA	CPI
0247	00364	0 04 00651		STA	CPI+1
0248	00365	140040		CRA	
0249	00366	0 04 00650		STA	CPI
0250	00367	0 10 00000	OUT	CALL	ZBIN
0251	00370	0 10 00000		CALL	ZBTA
0252	00371	-0 01 00000		JMP*	STFL
0253	00372	000007	TPFL	DBL	
0254	00373	0 35 01025		LDX	=0
0255	00374	-0 10 00450		JST*	F3PR
0256	00375	0 35 01020		LDX	=8
0257	00376	0 02 00650		DLD	CPI
0258	00377	101040		SNZ	
0259	00400	-0 10 00447		JST*	PRF2
0260	00401	0 35 01022		LDX	=10
0261	00402	0 02 00650		DLD	CPI
0262	00403	000201		IAB	
0263	00404	101040		SNZ	
0264	00405	-0 10 00446		JST*	PRF1
0265	00406	000005		SGL	
0266	00407	0 02 01023		LDA	=2
0267	00410	0 10 00000		CALL	DTIS
0268	00411	0 01 00267		JMP	CNDF
0269	00412	0 12 00652		IPS	F3FL
0270	00413	0 01 00267		JMP	CNDF
0271	00414	000000	ESTM	DBP	0
	00415	000000			
0272	00416	000000	DBPO	DBP	0
	00417	000000			
0273	00420	000000	SNFC	DBP	0
	00421	000000			
0274	00422	000000	CSFC	DBP	0
	00423	000000			
0275	00424	000000	ZTMP	DBP	0
	00425	000000			
0276	00426	000000	WA	DBP	0
	00427	000000			
0277	00430	000000	WB	DBP	0
	00431	000000			
0278	00432	000000	WC	DBP	0

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

	00433	000000				
0279	00434	000000	WD	DBP	0	
	00435	000000				
0280	00436	000000	WE	DBP	0	
	00437	000000				
0281	00440	000000	WF	DBP	0	
	00441	000000				
0282	00442	000000	ADTM	DEC	0	
0283	00443	060643	PTOM	DEC	24.4185	CONVERTS PULSES/2 MIN
0284	00444	041513	SINA	DEC	0.52573B0	
0285	00445	066342	COSA	DEC	0.85065B0	
0286	00446	0 000000	PRF1	DAC	**	
0287	00447	0 000000	PRF2	DAC	**	
0288	00450	0 000000	F3PR	DAC	**	
0289	00451	0 000000	FIAD	DAC	**	
0290	00452	0 000504		DAC	AFL	
0291	00453	0 000513		DAC	BFL	
0292	00454	0 000522		DAC	CFL	
0293	00455	0 000531		DAC	DFL	
0294	00456	0 000540		DAC	EFL	
0295	00457	0 000547		DAC	FFI	
0296	00460	0 000747	PRAD	DAC	CDEF	
0297	00461	0 000736		DAC	BDEF	
0298	00462	0 000725		DAC	BCEF	
0299	00463	0 000714		DAC	BCDF	
0300	00464	0 000703		DAC	BCDE	
0301	00465	0 000673		DAC	ADEF	
0302	00466	0 000663		DAC	ACEF	
0303	00467	0 000653		DAC	ACDF	
0304	00470	0 000643		DAC	ACDE	
0305	00471	0 000632		DAC	ABEF	
0306	00472	0 000621		DAC	ABDF	
0307	00473	0 000610		DAC	ABDE	
0308	00474	0 000577		DAC	ABCF	
0309	00475	0 000566		DAC	ABCE	
0310	00476	0 000556		DAC	ABCD	
0311		000640	FLST	EQU	'640	
0312		000636	PLTM	EQU	'636	
0313		000652	F3PL	EQU	'652	
0314		000650	CPI	EQU	'650	
0315		000344	GAPA	EQU	'344	
0316		000642	IDSW	EQU	'642	
0317		000622	Z	EQU	'622	
0318	00477	0 000000	ETA	XAC	ETA	
0319	00500	0 000000	ZETA	XAC	ZETA	
0320	00501	0 000000	IPL2	XAC	IPL2	
0321	00502	0 000000	PCP2	XAC	PCP2	
0322	00503	0 000000	PLCD	XAC	PLCD	
0323	00504	0 35 01025	AFL	LDX	=0	
0324	00505	0 10 00703		JST	BCDE	
0325	00506	0 10 00714		JST	BCDF	
0326	00507	0 10 00725		JST	BCEF	
0327	00510	0 10 00736		JST	BDEF	
0328	00511	0 10 00747		JST	CDEF	
0329	00512	0 01 00067		JMP	PARX	
0330	00513	0 35 01025	BFL	LDX	=0	
0331	00514	0 10 00643		JST	ACDE	

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0332	00515	0 10 00653	JST	ACDF
0333	00516	0 10 00663	JST	ACEF
0334	00517	0 10 00673	JST	ADEF
0335	00520	0 10 00747	JST	CDEF
0336	00521	0 01 00067	JMP	PARX
0337	00522	0 35 01025	CFL LDX	=0
0338	00523	0 10 00610	JST	ABDE
0339	00524	0 10 00621	JST	ABDF
0340	00525	0 10 00632	JST	ABEF
0341	00526	0 10 00673	JST	ADEF
0342	00527	0 10 00736	JST	BDEF
0343	00530	0 01 00067	JMP	PARX
0344	00531	0 35 01025	DFL LDX	=0
0345	00532	0 10 00566	JST	ABCE
0346	00533	0 10 00577	JST	ABCF
0347	00534	0 10 00632	JST	ABEF
0348	00535	0 10 00663	JST	ACEF
0349	00536	0 10 00725	JST	BCEF
0350	00537	0 01 00067	JMP	PARX
0351	00540	0 35 01025	EFL LDX	=0
0352	00541	0 10 00556	JST	ABCD
0353	00542	0 10 00577	JST	ABCF
0354	00543	0 10 00621	JST	ABDF
0355	00544	0 10 00653	JST	ACDF
0356	00545	0 10 00714	JST	BCDF
0357	00546	0 01 00067	JMP	PARX
0358	00547	0 35 01025	FFL LDX	=0
0359	00550	0 10 00556	JST	ABCD
0360	00551	0 10 00566	JST	ABCE
0361	00552	0 10 00610	JST	ABDE
0362	00553	0 10 00643	JST	ACDE
0363	00554	0 10 00703	JST	BCDE
0364	00555	0 01 00067	JMP	PARX
0365	00556	0 000000	ABCD DAC	**
0366	00557	0 02 00432	DLD	WC
0367	00560	0 06 00434	DAD	WD
0368	00561	0 04 00420	DST	SNFC
0369	00562	0 02 00426	DLD	WA
0370	00563	0 07 00430	DSB	WB
0371	00564	0 10 00757	JST	MLSC
0372	00565	-0 01 00556	JMP*	ABCD
0373	00566	0 000000	ABCE DAC	**
0374	00567	0 02 00416	DLD	DBFO
0375	00570	0 07 00426	DSB	WA
0376	00571	0 07 00436	DSB	WE
0377	00572	0 04 00420	DST	SNFC
0378	00573	0 02 00430	DLD	WB
0379	00574	0 07 00432	DSB	WC
0380	00575	0 10 00757	JST	MLSC
0381	00576	-0 01 00566	JMP*	ABCE
0382	00577	0 000000	ABCF DAC	**
0383	00600	0 02 00430	DLD	WB
0384	00601	0 06 00440	DAD	WF
0385	00602	0 04 00420	DST	SNFC
0386	00603	0 02 00416	DLD	DEPO
0387	00604	0 07 00426	DSB	WA
0388	00605	0 07 00432	DSB	WC

MICROCOMP TELECOMMUNICATED DATA

DDP-516 ASSEMBLY LISTING

0389	00606	0 10 00757	JST	MLSC
0390	00607	-0 01 00577	JMP*	ABCF
0391	00610	0 000000	ABDE DAC	**
0392	00611	0 02 00430	DLD	WB
0393	00612	0 06 00436	DAD	WE
0394	00613	0 04 00420	DST	SNFC
0395	00614	0 02 00416	DLD	DBPO
0396	00615	0 07 00426	DSB	WA
0397	00616	0 07 00434	DSB	WD
0398	00617	0 10 00757	JST	MLSC
0399	00620	-0 01 00610	JMP*	ABDE
0400	00621	0 000000	ABDF DAC	**
0401	00622	0 02 00416	DLD	DBPO
0402	00623	0 07 00426	DSB	WA
0403	00624	0 07 00440	DSB	WF
0404	00625	0 04 00420	DST	SNFC
0405	00626	0 02 00430	DLD	WB
0406	00627	0 07 00434	DSB	WD
0407	00630	0 10 00757	JST	MLSC
0408	00631	-0 01 00621	JMP*	ABDF
0409	00632	0 000000	ABEF DAC	**
0410	00633	0 02 00416	DLD	DBPO
0411	00634	0 07 00426	DSB	WA
0412	00635	0 07 00430	DSB	WB
0413	00636	0 04 00420	DST	SNFC
0414	00637	0 02 00436	DLD	WE
0415	00640	0 06 00440	DAD	WF
0416	00641	0 10 00757	JST	MLSC
0417	00642	-0 01 00632	JMP*	ABEF
0418	00643	0 000000	ACDE DAC	**
0419	00644	0 02 00426	DLD	WA
0420	00645	0 07 00432	DSB	WC
0421	00646	0 04 00420	DST	SNFC
0422	00647	0 02 00434	DLD	WD
0423	00650	0 07 00436	DSB	WE
0424	00651	0 10 00757	JST	MLSC
0425	00652	-0 01 00643	JMP*	ACDE
0426	00653	0 000000	ACDF DAC	**
0427	00654	0 02 00426	DLD	WA
0428	00655	0 07 00434	DSB	WD
0429	00656	0 04 00420	DST	SNFC
0430	00657	0 02 00432	DLD	WC
0431	00660	0 07 00440	DSB	WF
0432	00661	0 10 00757	JST	MLSC
0433	00662	-0 01 00653	JMP*	ACDF
0434	00663	0 000000	ACEF DAC	**
0435	00664	0 02 00432	DLD	WC
0436	00665	0 07 00436	DSB	WE
0437	00666	0 04 00420	DST	SNFC
0438	00667	0 02 00426	DLD	WA
0439	00670	0 07 00440	DSB	WF
0440	00671	0 10 00757	JST	MLSC
0441	00672	-0 01 00663	JMP*	ACEF
0442	00673	0 000000	ADEF DAC	**
0443	00674	0 02 00434	DLD	WD
0444	00675	0 07 00440	DSB	WF
0445	00676	0 04 00420	DST	SNFC

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DDP-516 ASSEMBLY LISTING

0446	00677	0 02 00426	DLD	WA
0447	00700	0 07 00436	DSB	WE
0448	00701	0 10 00757	JST	MLSC
0449	00702	-0 01 00673	JMP*	ADEF
0450	00703	0 000000	BCDE DAC	**
0451	00704	0 02 00416	DLD	DBPO
0452	00705	0 07 00430	DSB	WB
0453	00706	0 07 00434	DSB	WD
0454	00707	0 04 00420	DST	SNFC
0455	00710	0 02 00432	DLD	WC
0456	00711	0 06 00436	DAD	WE
0457	00712	0 10 00757	JST	MLSC
0458	00713	-0 01 00703	JMP*	BCDE
0459	00714	0 000000	BCDF DAC	**
0460	00715	0 02 00430	DLD	WB
0461	00716	0 06 00432	DAD	WC
0462	00717	0 04 00420	DST	SNFC
0463	00720	0 02 00416	DLD	DBPO
0464	00721	0 07 00434	DSB	WD
0465	00722	0 07 00440	DSB	WF
0466	00723	0 10 00757	JST	MLSC
0467	00724	-0 01 00714	JMP*	BCDF
0468	00725	0 000000	BCEF DAC	**
0469	00726	0 02 00416	DLD	DBPO
0470	00727	0 07 00432	DSB	WC
0471	00730	0 07 00440	DSB	WF
0472	00731	0 04 00420	DST	SNFC
0473	00732	0 02 00430	DLD	WB
0474	00733	0 07 00436	DSB	WE
0475	00734	0 10 00757	JST	MLSC
0476	00735	-0 01 00725	JMP*	BCEF
0477	00736	0 000000	BDEF DAC	**
0478	00737	0 02 00416	DLD	DBPO
0479	00740	0 07 00434	DSB	WD
0480	00741	0 07 00436	DSB	WE
0481	00742	0 04 00420	DST	SNFC
0482	00743	0 02 00430	DLD	WB
0483	00744	0 07 00440	DSB	WF
0484	00745	0 10 00757	JST	MLSC
0485	00746	-0 01 00736	JMP*	BDEF
0486	00747	0 000000	CDEF DAC	**
0487	00750	0 02 00436	DLD	WE
0488	00751	0 07 00440	DSB	WF
0489	00752	0 04 00420	DST	SNFC
0490	00753	0 02 00432	DLD	WC
0491	00754	0 07 00434	DSB	WD
0492	00755	0 10 00757	JST	MLSC
0493	00756	-0 01 00747	JMP*	CDEF
0494	00757	0 000000	MLSC DAC	**
0495	00760	0 04 00422	DST	CSFC
0496	00761	0 16 00445	MPY	COSA
0497	00762	0 04 00424	DST	ZTMP
0498	00763	0 02 00422	DLD	CSFC
0499	00764	000201	TAB	
0500	00765	0 16 00445	MPY	COSA
0501	00766	0401 61	LRS	15
0502	00767	0 06 00424	DAD	ZTMP

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DDP-516 ASSEMBLY LISTING

0503	00770	0 04 00424	DST	ZTMP
0504	00771	0 02 00420	DLD	SNFC
0505	00772	0 16 00444	MPY	SINA
0506	00773	0 06 00424	DAD	ZTMP
0507	00774	0 04 00424	DST	ZTMP
0508	00775	0 02 00420	DLD	SNFC
0509	00776	000201	IAB	
0510	00777	0 16 00444	MPY	SINA
0511	01000	0401 61	LRS	15
0512	01001	0 06 00424	DAD	ZTMP
0513	01002	0411 70	LLS	8
0514	01003	0 04 00424	DST	ZTMP
0515	01004	0 16 00443	MPY	PTOM
0516	01005	0 04 00420	DST	SNFC
0517	01006	0 02 00424	DLD	ZTMP
0518	01007	000201	IAB	
0519	01010	0 16 00443	MPY	PTOM
0520	01011	0401 61	LRS	15
0521	01012	0 06 00420	DAD	SNFC
0522	01013	0411 73	LLS	5
0523	01014	1 04 00622	DST	Z,1
0524	01015	0 12 00000	IRS	0
0525	01016	0 12 00000	IRS	0
0526	01017	-0 01 00757	JMP*	MLSC
0527	01020	000010	END	
	01021	000013		
	01022	000012		
	01023	000002		
	01024	000014		
	01025	000000		

PROGRAM NAME:

SOURCE : DTIS

BINARY: BDTIS

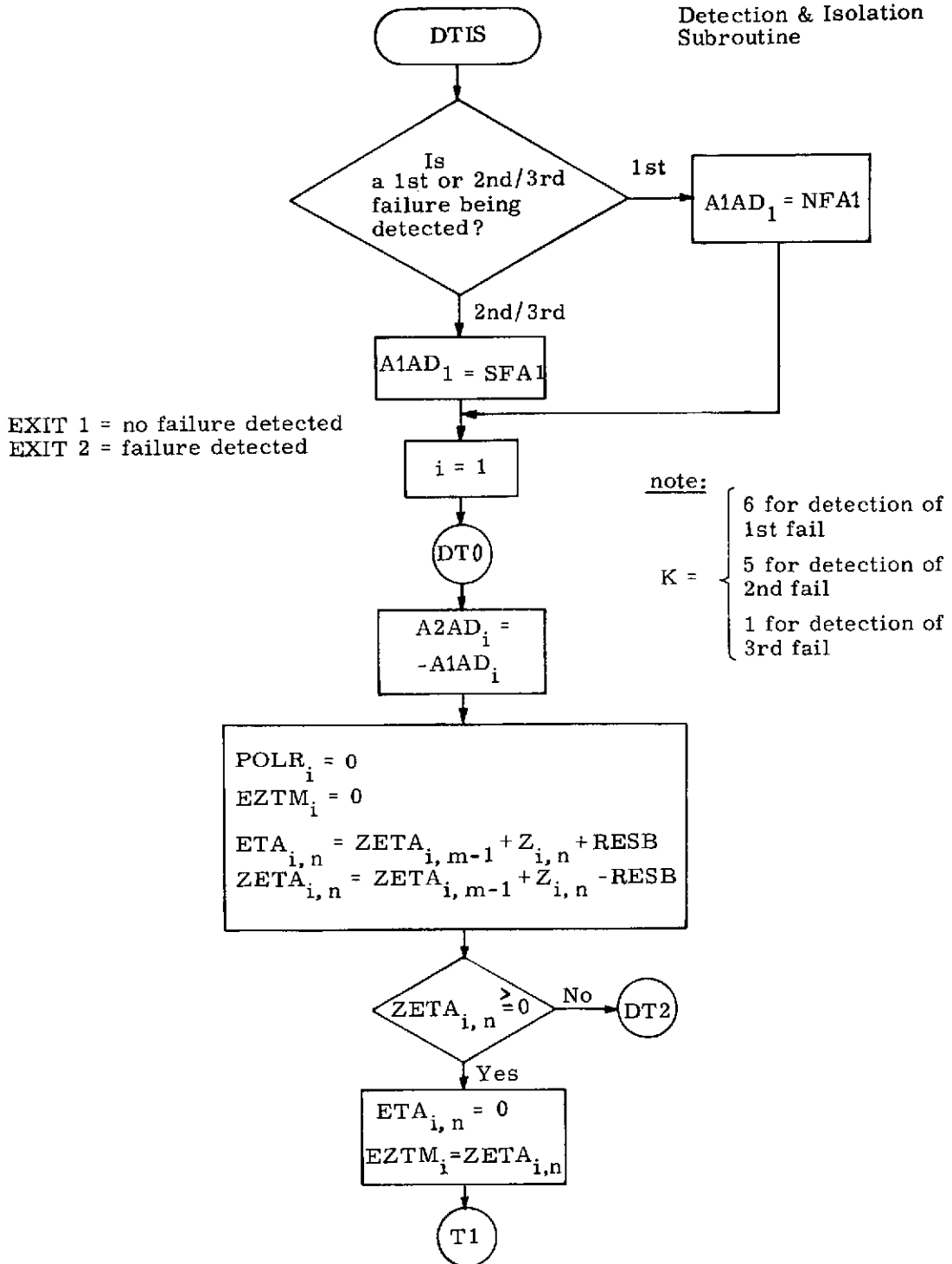
ENTRY POINTS (location): DTIS ('6242)

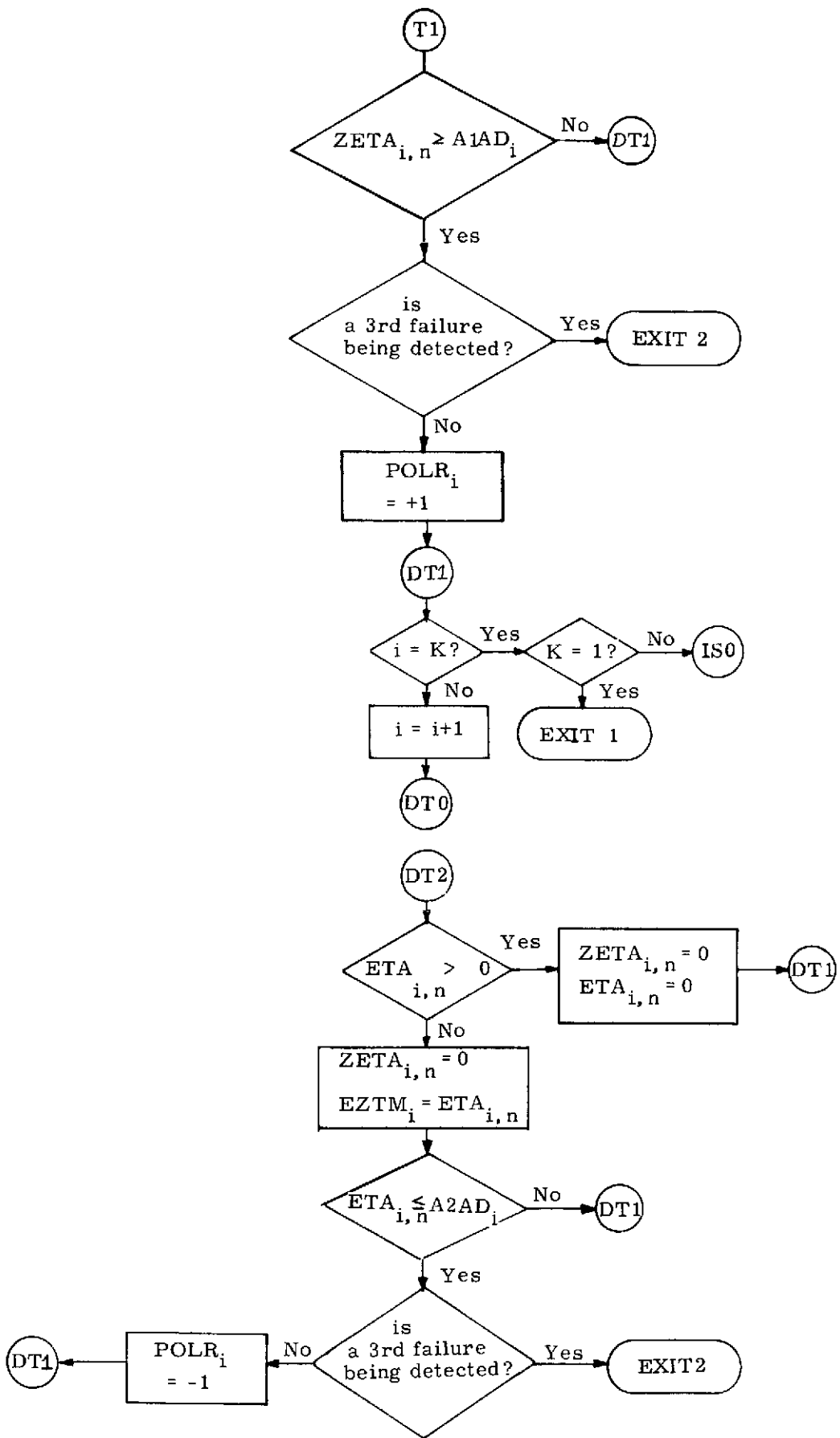
GENERAL DESCRIPTION:

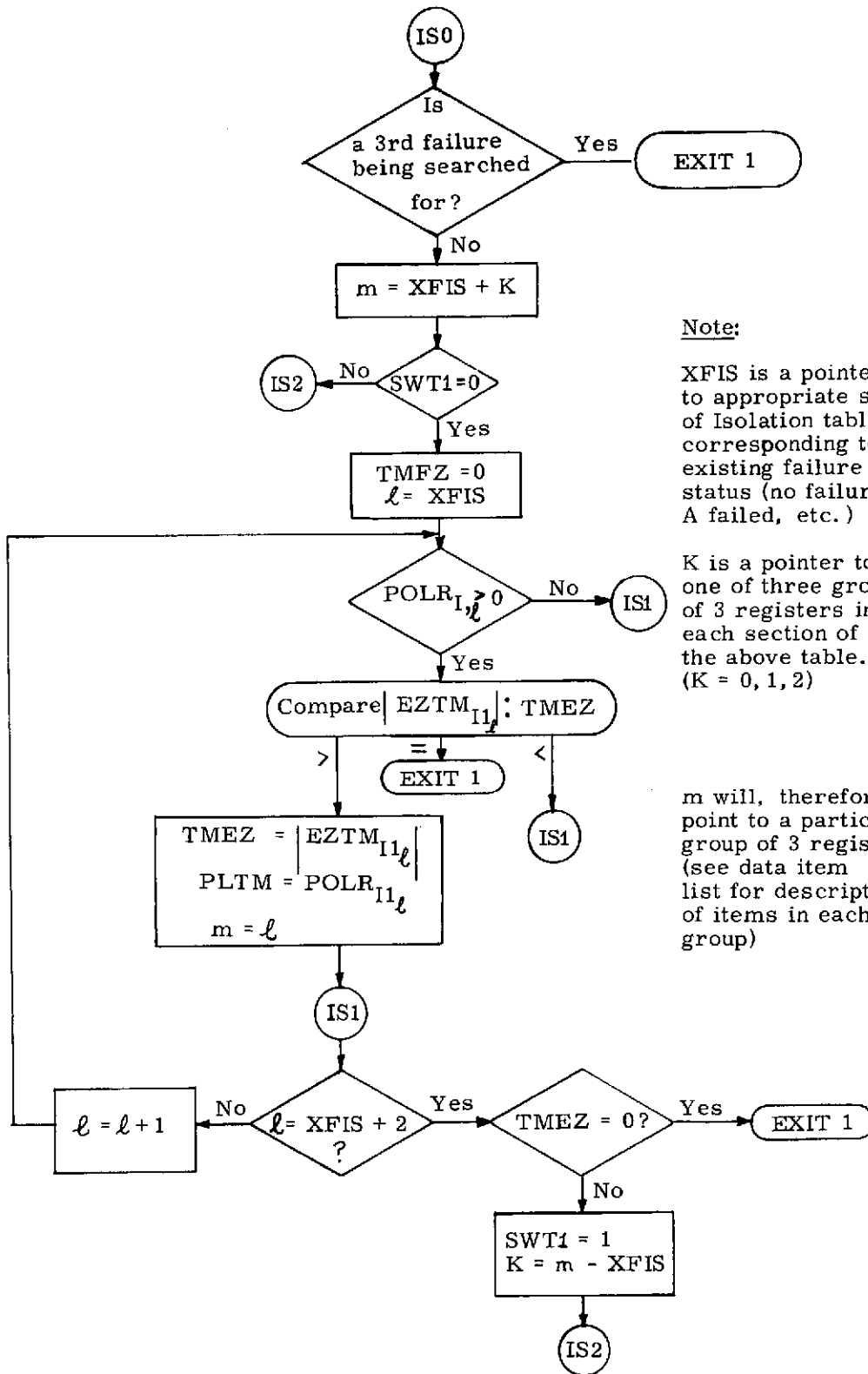
The subroutine performs the detection and isolation of a gyro constant bias or ramp failure. This is accomplished by computing 2 sets of parity equation degradation functions. One set is for positive degradation (ZETA) and one is for negative degradation (ETA). Each parity equation being computed (6 for 1st failure detection, 5 for 2nd failure detection, 1 for 3 failure detection) has its corresponding ETA and ZETA functions. If a parity equation has a non-zero ZETA function, then its corresponding ETA function is zero. Likewise, if a parity equation has a non-zero ETA functional then its corresponding ZETA function is zero. If a parity is statistically not degraded, then both ZETA and ETA functions are zero. A failure is detected when certain of these degradation functions exceed given degradation thresholds.

Isolation of the failed gyro is accomplished by examining the degradation functions and their respective polarities. Which functions are examined and which polarities are checked for each possible gyro failure is determined by a 63 entry isolation table.

Detection & Isolation Subroutine





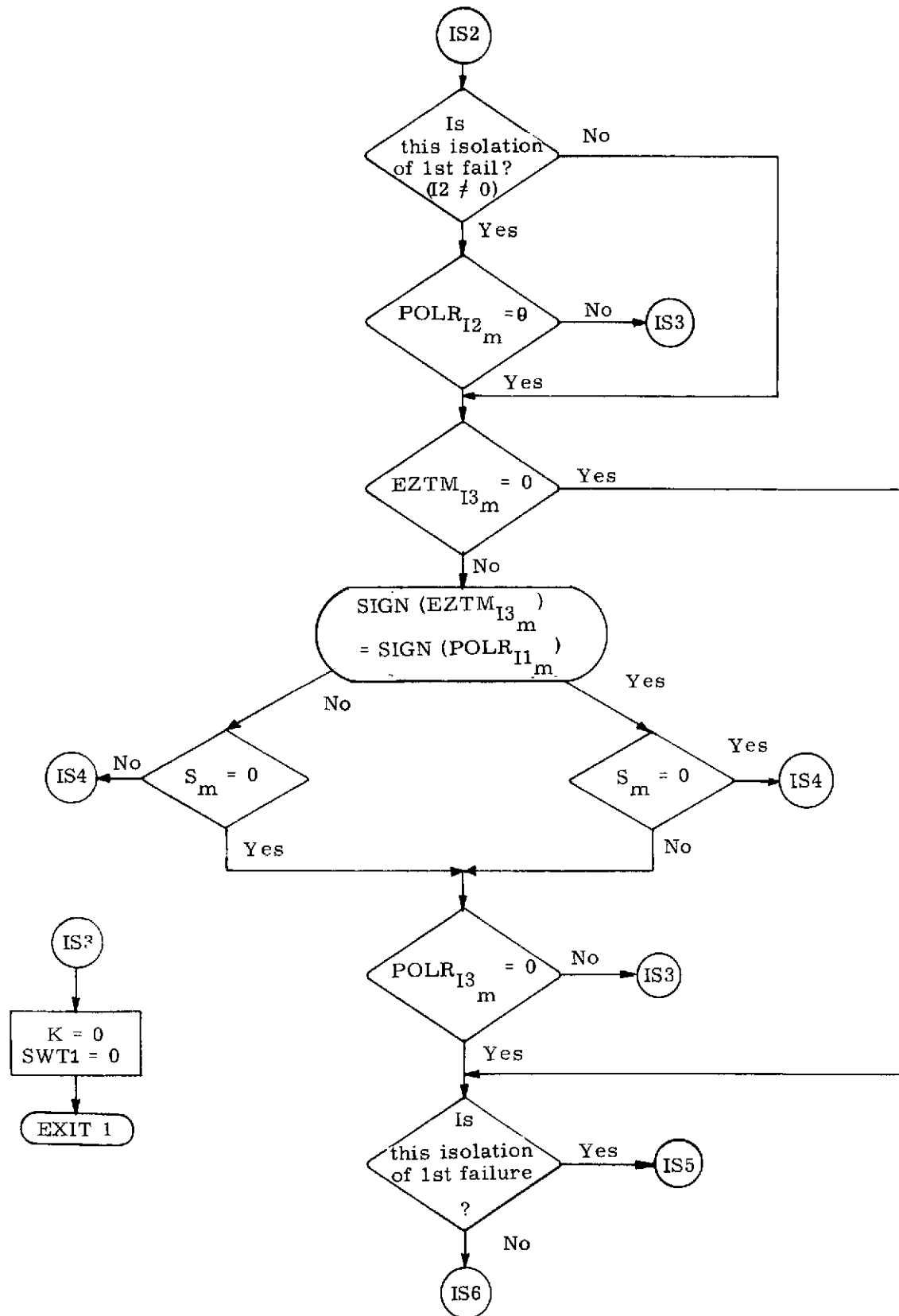


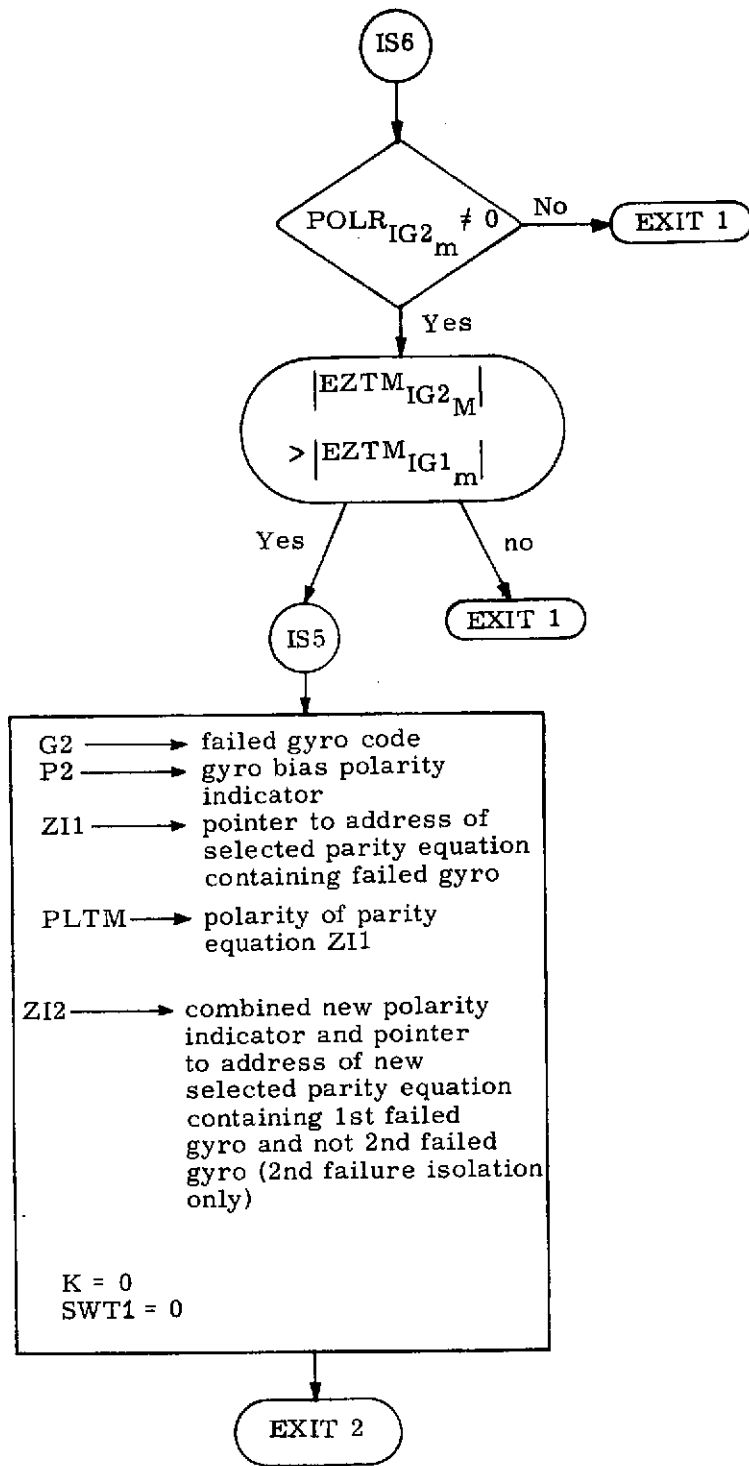
Note:

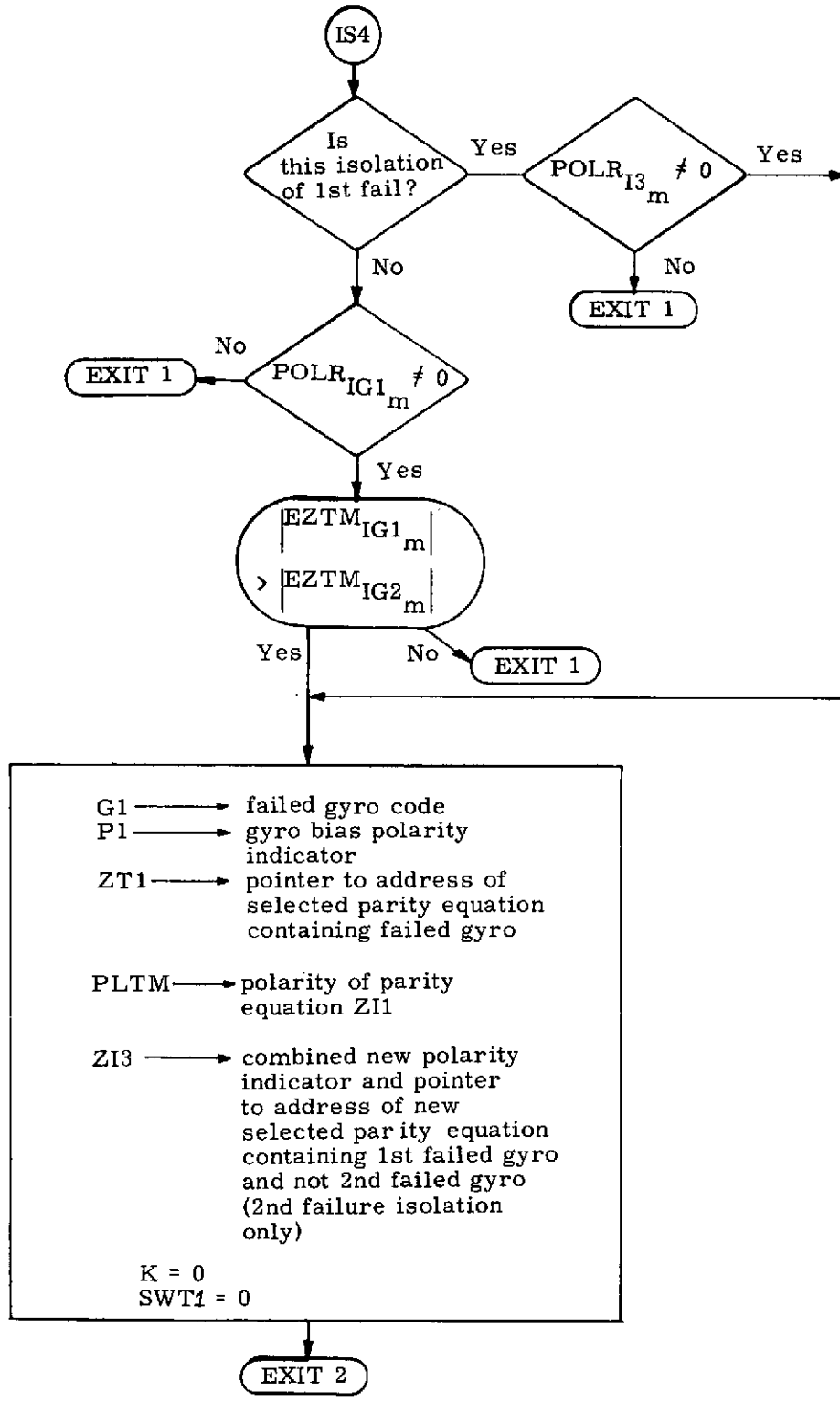
XFIS is a pointer to appropriate section of Isolation table corresponding to existing failure status (no failures, A failed, etc.)

K is a pointer to one of three groups of 3 registers in each section of the above table. (K = 0, 1, 2)

m will, therefore, point to a particular group of 3 registers (see data item list for descriptions of items in each group)







DATA ITEM DEFINITIONS

ZETA	(ZETA → ZETA + 11)	Table of 6 positive degradation detection functions.
ETA	(ETA → ETA + 11)	Table of 6 negative degradation detection functions.
POLR	(POLR → POLR + 11)	Table of 6 degradation indicators (+1 = positive degradation, -1 = negative degradation, 0 = no degradation)
EZTM	(EZTM → EZTM + 11)	Table of 6 Temporary degradation functions (for a particular iteration, $EZTM_K = ZETA_K$, if $ZETA_K \neq 0$ or $EZTM_K = ETA_K$ if $ETA_K \neq 0$ or $EZTM_K = 0$ if $ETA_K = ZETA_K = 0$)
RESB	(RESB)	Constant used in the computation of the degradation detection functions ETA and ZETA . $RESB = \frac{BB \cos}{2}$ where BB is the specification of gyro performance defining degradation given in meru
NFAI	(NFAI → NFAI + 5)	Table of 6 constants defining degradation detection functions ZETA and ETA. Used for detection of 1st failure.
SFAI	(NFAI → SFAI + 4)	Table of 5 constants defining degradation thresholds for degradation detection functions ZETA and ETA. Used in detection of a 2nd or 3rd failure.

DATA ITEM DEFINITIONS (continued)

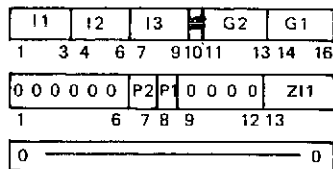
Note: $NFAI_1$ ($SFAI_1$)

$$\sigma_{p_i}^2 = \frac{6.12}{BB \cos \alpha}$$

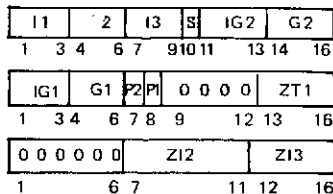
where $\sigma_{p_i}^2$ = parity equation variance and BB is as above.

- PLTM (PLTM) Temporary register containing polarity of principal parity equation residual with failed gyro (+1 = positive polarity, -1 = negative polarity).
- NFIS (NFIS•NFIS + 62) Table used to isolate failed gyro. It has 7 sections corresponding to the existing failure status (NFIS = no fails, AFIS = A failed BFIS = B failed etc.). Within each section are 3 sets of 3 registers each. Each set corresponds to two possible failed gyros. The Isolation process first selects appropriate section and then narrows failure down to two gyros by selecting a particular set in that section. Each set contains the following items:

NFIS



XFIS (X=A, BC ... F)



DATA ITEM DEFINITIONS continued

I1	index to principle degradation function (ZETA or ETA) for each set. This function should exceed threshold first. Used in choosing particular set within each section.
I2	index to degradation function (ZETA or ETA) in each set which should never exceed threshold. Used only in isolating first failure.
I3	index to degradation function (ZETA or ETA) which is checked for its polarity. Used to decide between the two gyros in a set.
S	Switch used with I3 to decide between the two gyros in a set.
G1, G2	gyro codes of the two gyros corresponding to the particular set.
IG1	Used to isolate 2nd failure only. Index to degradation function (ZETA or ETA) which is used as a final verification if G1 gyro failure
IG2	Same as above except for G2 gyro.
P1	Switch indicating whether G1 gyro's bias polarity is the same as or opposite the polarity of degradation function indexed by I. (0 = same as, 1= opposite of)
P2	same as above except for G2 gyro.

DATA ITEM DEFINITIONS continued

- ZI1 index to starting address of parity equation residual computation corresponding to degradation function indexed by I1
- ZI2 used in isolating 2nd failure only. Index to starting address of parity equation residual computation which contains 1st failed gyro and not G2 gyro. If index is negative, polarity of this new parity equation residual is opposite that of the one currently being used in recompensating 1st failed gyro.
- ZI3 same as above except for G1 gyro.

Most of the above items are used in deciding between the two gyros in a set.

MICROCOMP TELECOMMUNICATED DATA
 DDP-516 ASSEMBLY LISTING

0001			SUBR	ZEIN
0002			SUBR	DTIS
0003			SUBR	ETA
0004			SUBR	ZETA
0005			REL	
0006	00000	0 000000	DTIS	DAC **
0007	00001	0 04 00551	STA	DSIN
0008	00002	0 02 00640	LDA	FLST
0009	00003	101040	SNZ	
0010	00004	0 01 00007	JMP	**+3
0011	00005	0 02 00546	LDA	SFAD
0012	00006	0 01 00010	JMP	**+2
0013	00007	0 02 00547	LDA	NFAD
0014	00010	0 04 00550	STA	A1AD
0015	00011	0 35 00667	LDX	=0
0016	00012	140040	DTLP	CRA
0017	00013	000201	IAB	
0018	00014	-0 02 00550	LDA*	A1AD
0019	00015	0401 70	LRS	8
0020	00016	000007	DBL	
0021	00017	0 04 00542	DST	A1TM
0022	00020	0 02 00436	DLD	DBPO
0023	00021	0 07 00542	DSB	A1TM
0024	00022	0 04 00544	DST	A2TM
0025	00023	0 02 00436	DLD	DBPO
0026	00024	1 04 00440	DST	POIR,1
0027	00025	1 04 00504	DST	EZTM,1
0028	00026	1 02 00622	DLD	Z,1
0029	00027	0 06 00540	DAD	RESB
0030	00030	1 06 00454	DAD	ETA,1
0031	00031	1 04 00454	DST	ETA,1
0032	00032	1 02 00622	DLD	Z,1
0033	00033	0 07 00540	DSB	RESB
0034	00034	1 06 00470	DAD	ZETA,1
0035	00035	1 04 00470	DST	ZETA,1
0036	00036	100400	SPL	
0037	00037	0 01 00056	JMP	STP2
0038	00040	0 02 00436	DLD	DBPO
0039	00041	1 04 00454	DST	ETA,1
0040	00042	1 02 00470	DLD	ZETA,1
0041	00043	1 04 00504	DST	EZTM,1
0042	00044	0 07 00542	DSB	A1TM
0043	00045	100400	SPL	
0044	00046	0 01 00114	JMP	STP1
0045	00047	0 02 00640	DLD	FLST
0046	00050	000201	IAB	
0047	00051	100040	SZE	
0048	00052	0 01 00406	JMP	FLRT
0049	00053	0 02 00520	DLD	PLS1
0050	00054	1 04 00440	DST	POLR,1
0051	00055	0 01 00114	JMP	STP1
0052	00056	1 02 00454	STP2	DLD ETA,1
0053	00057	0 11 00436	CAS	DBPO
0054	00060	0 01 00111	JMP	STP3
0055	00061	0 01 00063	JMP	**+2
0056	00062	0 01 00066	JMP	SP2A
0057	00063	000201	IAB	

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0058	00064	100040		SZE	
0059	00065	0 01 00111		JMP	STP3
0060	00066	0 02 00436	SP2A	DLD	DBPO
0061	00067	1 04 00470		DST	ZETA, 1
0062	00070	1 02 00454		DLD	ETA, 1
0063	00071	1 04 00504		DST	EZTH, 1
0064	00072	0 07 00544		DSB	A2TM
0065	00073	0 11 00436		CAS	DBPO
0066	00074	0 01 00114		JMP	STP1
0067	00075	0 01 00077		JMP	*+2
0068	00076	0 01 00102		JMP	SP2B
0069	00077	000201		IAB	
0070	00100	100040		SZE	
0071	00101	0 01 00114		JMP	STP1
0072	00102	0 02 00640	SP2B	DLD	FLST
0073	00103	000201		IAB	
0074	00104	100040		SZE	
0075	00105	0 01 00406		JMP	FLRT
0076	00106	0 02 00522		DLD	MNS1
0077	00107	1 04 00440		DST	POLR, 1
0078	00110	0 01 00114		JMP	STP1
0079	00111	0 02 00436	STP3	DLD	DBPO
0080	00112	1 04 00470		DST	ZETA, 1
0081	00113	1 04 00454		DST	ETA, 1
0082	00114	000005	STP1	SGL	
0083	00115	0 12 00550		IRS	A1AD
0084	00116	0 02 00000		LDA	0
0085	00117	0 06 00666		ADD	=2
0086	00120	0 04 00000		STA	0
0087	00121	0 07 00551		SUB	DSIN
0088	00122	100040		SZE	
0089	00123	0 01 00012		JMP	DTLP
0090	00124	0 02 00551		LDA	DSIN
0091	00125	0 07 00666		SUB	=2
0092	00126	101040		SNZ	
0093	00127	-0 01 00000		JMP*	DTIS
0094	00130	0 02 00665		LDA	=-3
0095	00131	0 04 00551		STA	DSIN
0096	00132	0 35 00640		LDX	FLST
0097	00133	1 02 00552		LDA	ISTB, 1
0098	00134	0 04 00417		STA	TBTM
0099	00135	0 06 00422		ADD	SWT2
0100	00136	0 04 00561		STA	TBAD
0101	00137	141206		AOA	
0102	00140	0 04 00415		STA	TAP1
0103	00141	141206		AOA	
0104	00142	0 04 00416		STA	TAP2
0105	00143	0 02 00421		LDA	SWT1
0106	00144	100040		SZE	
0107	00145	0 01 00215		JMP	PRTG
0108	00146	0 04 00420		STA	TMEZ
0109	00147	-0 02 00561	ISLP	LDA*	TBAD
0110	00150	0404 63		LGR	13
0111	00151	0 07 00664		SUB	=1
0112	00152	0415 77		ALS	1
0113	00153	0 04 00000		STA	0
0114	00154	1 02 00440		LDA	POLR, 1

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0115	00155	101040	SNZ	
0116	00156	0 01 00173	JMP	NTRG
0117	00157	1 02 00504	LDA	EZTM,1
0118	00160	100400	SPL	
0119	00161	100407	TCA	
0120	00162	0 11 00420	CAS	TMEZ
0121	00163	0 01 00166	JMP	*+3
0122	00164	-0 01 00000	JMP*	DTIS
0123	00165	0 01 00173	JMP	NTRG
0124	00166	0 04 00420	STA	TMEZ
0125	00167	1 02 00440	LDA	POLR,1
0126	00170	0 04 00636	STA	PLTM
0127	00171	0 02 00561	LDA	TBAD
0128	00172	0 04 00414	STA	ADTB
0129	00173	0 02 00561	NTRG LDA	TBAD
0130	00174	0 06 00663	ADD	=3
0131	00175	0 04 00561	STA	TBAD
0132	00176	0 12 00551	IRS	DSIN
0133	00177	0 01 00147	JMP	ISLP
0134	00200	0 02 00420	LDA	TMEZ
0135	00201	101040	SNZ	
0136	00202	-0 01 00000	JMP*	DTIS
0137	00203	0 02 00414	LDA	ADTB
0138	00204	0 04 00561	STA	TBAD
0139	00205	141206	AOA	
0140	00206	0 04 00415	STA	TAP1
0141	00207	141206	AOA	
0142	00210	0 04 00416	STA	TAP2
0143	00211	0 02 00561	LDA	TBAD
0144	00212	0 07 00417	SUB	TBTM
0145	00213	0 04 00422	STA	SWT2
0146	00214	0 12 00421	IRS	SWT1
0147	00215	-0 02 00561	PRTG LDA*	TBAD
0148	00216	000201	IAB	
0149	00217	0410 75	LLL	3
0150	00220	140040	CRA	
0151	00221	0410 75	LLL	3
0152	00222	101040	SNZ	
0153	00223	0 01 00232	JMP	NZCK
0154	00224	0 07 00664	SUB	=1
0155	00225	0415 77	ALS	1
0156	00226	0 04 00000	STA	0
0157	00227	1 02 00440	LDA	POLR,1
0158	00230	100040	SZE	
0159	00231	0 01 00407	JMP	ISO1
0160	00232	0410 75	NZCK LLL	3
0161	00233	0 07 00664	SUB	=1
0162	00234	0415 77	ALS	1
0163	00235	0 04 00000	STA	0
0164	00236	000201	IAB	
0165	00237	0 04 00562	STA	SWTM
0166	00240	000201	IAB	
0167	00241	1 02 00504	LDA	EZTM,1
0168	00242	101040	SNZ	
0169	00243	0 01 00254	JMP	ISX2
0170	00244	0 02 00636	LDA	PLTM
0171	00245	1 05 00504	ERA	EZTM,1

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0172	00246	0 05 00562	ERA	SWTM
0173	00247	101400	SMI	
0174	00250	0 01 00324	JMP	ISX1
0175	00251	1 02 00440	LDA	POLR,1
0176	00252	100040	SZE	
0177	00253	0 01 00407	JMP	ISO1
0178	00254	0410 77	ISX2 LLL	1
0179	00255	0 02 00640	LDA	FLST
0180	00256	101040	SNZ	
0181	00257	0 01 00307	JMP	IX2A
0182	00260	140040	CRA	
0183	00261	0410 75	LLL	3
0184	00262	0 07 00664	SUB	=1
0185	00263	0415 77	ALS	1
0186	00264	0 04 00000	STA	0
0187	00265	1 02 00440	LDA	POLR,1
0188	00266	101040	SNZ	
0189	00267	-0 01 00000	JMP*	DTIS
0190	00270	1 02 00504	LDA	EZTM,1
0191	00271	100400	SPL	
0192	00272	140407	TCA	
0193	00273	0 04 00420	STA	TMEZ
0194	00274	-0 02 00415	LDA*	TAP1
0195	00275	0404 63	LGR	13
0196	00276	0 07 00664	SUB	=1
0197	00277	0415 77	ALS	1
0198	00300	0 04 00000	STA	0
0199	00301	1 02 00504	LDA	EZTM,1
0200	00302	100400	SPL	
0201	00303	140407	TCA	
0202	00304	0 11 00420	CAS	TMEZ
0203	00305	-0 01 00000	JMP*	DTIS
0204	00306	0 01 00305	JMP	*-1
0205	00307	140040	IX2A CRA	
0206	00310	0410 75	LLL	3
0207	00311	000201	IAB	
0208	00312	-0 02 00415	LDA*	TAP1
0209	00313	0404 77	LGR	1
0210	00314	141044	CAR	
0211	00315	0414 71	LGL	7
0212	00316	0 04 00423	STA	PGTM
0213	00317	-0 02 00416	LDA*	TAP2
0214	00320	0404 73	LGR	5
0215	00321	0 05 00423	ISO3 ERA	PGTM
0216	00322	0 04 00423	STA	PGTM
0217	00323	0 01 00402	JMP	ISOT
0218	00324	0410 74	ISX1 LLL	4
0219	00325	0 02 00640	LDA	FLST
0220	00326	100040	SZE	
0221	00327	0 01 00334	JMP	DX1A
0222	00330	1 02 00440	LDA	POLR,1
0223	00331	101040	SNZ	
0224	00332	-0 01 00000	JMP*	DTIS
0225	00333	0 01 00366	JMP	IX1A
0226	00334	-0 02 00415	DX1A LDA*	TAP1
0227	00335	000201	IAB	
0228	00336	140040	CRA	

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0229	00337	0410 75	LLL	3
0230	00340	0 07 00664	SUB	=1
0231	00341	0415 77	ALS	1
0232	00342	0 04 00000	STA	0
0233	00343	1 02 00440	LDA	POLR,1
0234	00344	101040	SNZ	
0235	00345	-0 01 00000	JMP*	DTIS
0236	00346	1 02 00504	LDA	EZTM,1
0237	00347	100400	SPL	
0238	00350	140407	TCA	
0239	00351	0 04 00420	STA	TMEZ
0240	00352	-0 02 00561	LDA*	TBAD
0241	00353	0414 66	LGL	10
0242	00354	0404 63	LGR	13
0243	00355	0 07 00664	SUB	=1
0244	00356	0415 77	ALS	1
0245	00357	0 04 00000	STA	0
0246	00360	1 02 00504	LDA	EZTM,1
0247	00361	100400	SPL	
0248	00362	140407	TCA	
0249	00363	0 11 00420	CAS	TMEZ
0250	00364	-0 01 00000	JMP*	DTIS
0251	00365	0 01 00364	JMP	*-1
0252	00366	140040	IX1A CRA	
0253	00367	0410 75	LLL	3
0254	00370	000201	IAB	
0255	00371	-0 02 00415	LDA*	TAP1
0256	00372	141044	CAR	
0257	00373	0414 71	LGL	7
0258	00374	0 04 00423	STA	PGTM
0259	00375	-0 02 00416	LDA*	TAP2
0260	00376	0414 75	LGL	3
0261	00377	141050	CAL	
0262	00400	0404 75	LGR	3
0263	00401	0 01 00321	JMP	ISO3
0264	00402	-0 02 00415	ISOT LDA*	TAP1
0265	00403	0414 70	LGL	8
0266	00404	0404 70	LGR	8
0267	00405	0 04 00000	STA	0
0268	00406	0 12 00000	FLRT IRS	DTIS
0269	00407	140040	ISO1 CRA	
0270	00410	0 04 00421	STA	SWT1
0271	00411	0 04 00422	STA	SWT2
0272	00412	0 02 00423	LDA	PGTM
0273	00413	-0 01 00000	JMP*	DTIS
0274	00414	0 000000	ADTB DAC	**
0275	00415	0 000000	TAP1 DAC	**
0276	00416	0 000000	TAP2 DAC	**
0277	00417	0 000000	TBTM DAC	**
0278	00420	000000	TMEZ DEC	0
0279	00421	000000	SWT1 DEC	0
0280	00422	000000	SWT2 DEC	0
0281	00423	000000	PGTM DEC	0
0282	00424	0 000000	ZEIN DAC	**
0283	00425	000007	DBI	
0284	00426	0 35 00662	LDX	--24
0285	00427	0 02 00436	DLA	DBPO

MICROCOMP TELECOMMUNICATED DATA

NDP-516 ASSEMBLY LISTING

0286	00430	1 04 00504	ZRZE DST	ETA+24,1
0287	00431	0 12 00000	IRS	0
0288	00432	0 12 00000	IRS	0
0289	00433	0 01 00430	JMP	ZRZE
0290	00434	000005	SGL	
0291	00435	-0 01 00424	JMP*	ZFIN
0292	00436	000000	DBPO DBP	0
	00437	000000		
0293	00440	000000	POLR BSZ	12
	00441	000000		
	00442	000000		
	00443	000000		
	00444	000000		
	00445	000000		
	00446	000000		
	00447	000000		
	00450	000000		
	00451	000000		
	00452	000000		
	00453	000000		
0294	00454	000000	ETA BSZ	12
	00455	000000		
	00456	000000		
	00457	000000		
	00460	000000		
	00461	000000		
	00462	000000		
	00463	000000		
	00464	000000		
	00465	000000		
	00466	000000		
	00467	000000		
0295	00470	000000	ZETA BSZ	12
	00471	000000		
	00472	000000		
	00473	000000		
	00474	000000		
	00475	000000		
	00476	000000		
	00477	000000		
	00500	000000		
	00501	000000		
	00502	000000		
	00503	000000		
0296	00504	000000	EZTM BSZ	12
	00505	000000		
	00506	000000		
	00507	000000		
	00510	000000		
	00511	000000		
	00512	000000		
	00513	000000		
	00514	000000		
	00515	000000		
	00516	000000		
	00517	000000		
0297	00520	000001	PLS1 OCT	1,0

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0298	00521	000000		
	00522	177777	MNS1	OCT 177777,0
	00523	000000		
0299			* THE FOLLOWING CONSTANTS ARE THE PARITY EQUATION	
0300			* THRESHOLDS FOR BB EQUAL TO 4 MERU	
0301	00524	013327	NFA1	DEC 22.841B7
0302	00525	006020		DEC 12.064B7
0303	00526	013327		DEC 22.841B7
0304	00527	006162		DEC 12.446B7
0305	00530	003611		DEC 7.536B7
0306	00531	013327		DEC 22.841B7
0307	00532	013327	SFA1	DEC 22.841B7
0308	00533	013327		DEC 22.841B7
0309	00534	013327		DEC 22.841B7
0310	00535	013327		DEC 22.841B7
0311	00536	013327		DEC 22.841B7
0312	00540	000001	RESB	DBP 1.70130BR15
	00541	054704		ACTUALLY RESB/2
0313			* END OF CONSTANTS	
0314	00542	000000	A1TM	DBP 0
	00543	000000		
0315	00544	000000	A2TM	DBP 0
	00545	000000		
0316	00546	0 000532	SFAD	DAC SPA1
0317	00547	0 000524	NFAD	DAC NFA1
0318	00550	0 000000	A1AD	DAC **
0319	00551	000000	DSIN	DEC 0
0320	00552	0 000563	ISTB	DAC NFIS
0321	00553	0 000574		DAC AFIS
0322	00554	0 000605		DAC BFIS
0323	00555	0 000616		DAC CFIS
0324	00556	0 000627		DAC DFIS
0325	00557	0 000640		DAC EFIS
0326	00560	0 000651		DAC FFIS
0327	00561	0 000000	TBAD	DAC **
0328	00562	000000	SWTM	DEC 0
0329		000636	PLTM	EQU '636
0330		000640	PLST	EQU '640
0331		000622	Z	EQU '622
0332	00563	035021	NFIS	OCT 35021, 1016, 0
	00564	001016		
	00565	000000		
0333	00566	146543		OCT 146543, 1000, 0
	00567	001000		
	00570	000000		
0334	00571	063265		OCT 63265, 11, 0
	00572	000011		
	00573	000000		
0335	00574	020435	AFIS	OCT 20435, 126004, 705
	00575	126004		
	00576	000705		
0336	00577	100326		OCT 100326, 65001, 705
	00600	065001		
	00601	000705		
0337	00602	120724		OCT 120724, 27000, 305
	00603	027000		
	00604	000305		

MICROCOMP TELECOMMUNICATED DATA
 DDP-516 ASSEMBLY LISTING

0338	00605	020545	BFIS	OCT	20545,131010,1323
	00606	131010			
	00607	001323			
0339	00610	060226		OCT	60226,103006,1176
	00611	103006			
	00612	001176			
0340	00613	120614		OCT	120614,47000,1166
	00614	047000			
	00615	001166			
0341	00616	020624	CFIS	OCT	20624,103413,1200
	00617	103413			
	00620	001200			
0342	00621	060256		OCT	60256,112011,224
	00622	112011			
	00623	000224			
0343	00624	121022		OCT	121022,74401,4
	00625	074401			
	00626	000004			
0344	00627	020723	DFIS	OCT	20723,125015,540
	00630	125015			
	00631	000540			
0345	00632	100336		OCT	100336,43006,540
	00633	043006			
	00634	000540			
0346	00635	120435		OCT	120435,25002,500
	00636	025002			
	00637	000500			
0347	00640	021032	EFIS	OCT	21032,43016,1544
	00641	043016			
	00642	001544			
0348	00643	100256		OCT	100256,47007,233
	00644	047007			
	00645	000233			
0349	00646	060454		OCT	60454,25012,473
	00647	025012			
	00650	000473			
0350	00651	021022	FFIS	OCT	21022,63016,1475
	00652	063016			
	00653	001475			
0351	00654	100255		OCT	100255,71010,1451
	00655	071010			
	00656	001451			
0352	00657	040653		OCT	40653,25015,471
	00660	025015			
	00661	000471			
0353	00662	177750		END	
	00663	000003			
	00664	000001			
	00665	177775			
	00666	000002			
	00667	000000			

PROGRAM NAME

SOURCE: IDEN

BINARY: BIDEN

ENTRY POINTS (location): IDEN ('7132)

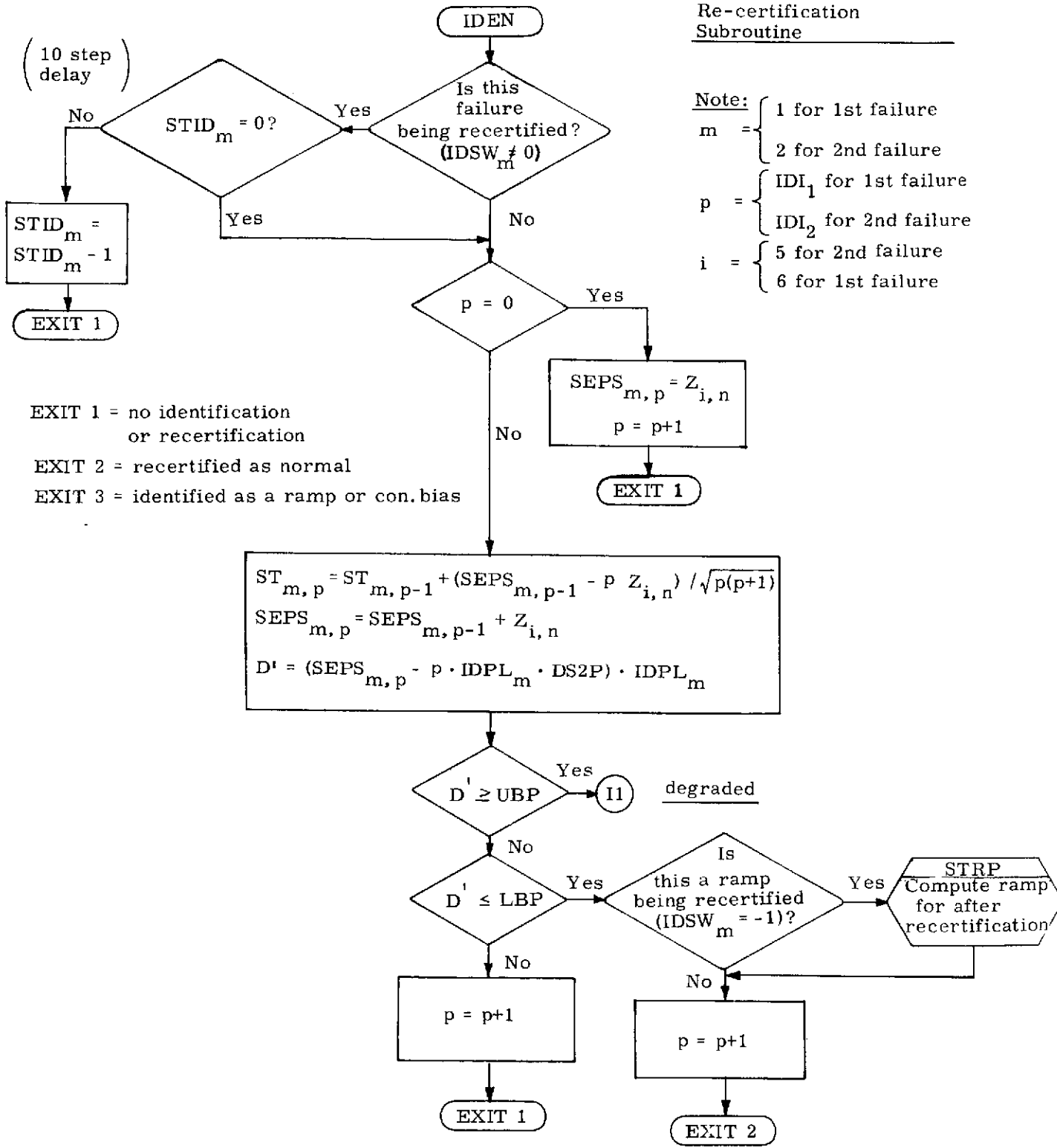
GENERAL DESCRIPTION:

This subroutine performs two functions; After a failed gyro has been detected and isolated, IDEN will verify the failure to be a true failure or, if otherwise, will recertify the gyro as normal. If a true failure, IDEN will further classify the failure as either a constant bias or a ramp.

In addition, after each computation of the bias compensation for the failed gyro, IDEN will perform the verification test above to ensure that the gyro has been properly compensated. After the gyro has been verified as normal, it is put back on-line by the controlling program IDEN.

Failure Identification and Re-certification Subroutine

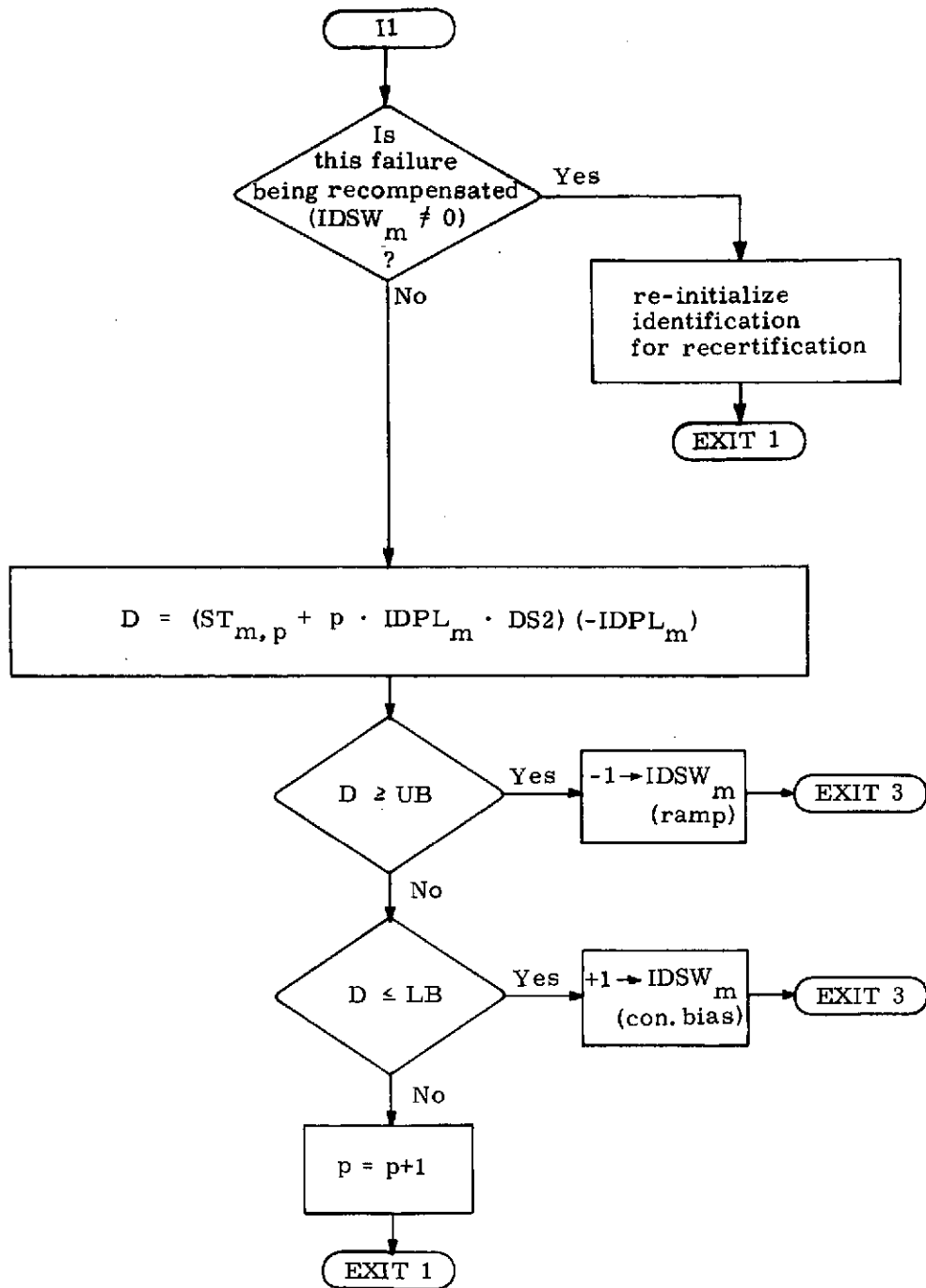
Note: $m = \begin{cases} 1 & \text{for 1st failure} \\ 2 & \text{for 2nd failure} \end{cases}$
 $p = \begin{cases} IDI_1 & \text{for 1st failure} \\ IDI_2 & \text{for 2nd failure} \end{cases}$
 $i = \begin{cases} 5 & \text{for 2nd failure} \\ 6 & \text{for 1st failure} \end{cases}$



EXIT 1 = no identification or recertification

EXIT 2 = recertified as normal

EXIT 3 = identified as a ramp or con. bias



MICROCOMP TELECOMMUNICATED DATA
 DDP-516 ASSEMBLY LISTING

0001				SUBR	IDEN
0002				SUBR	IDIN
0003				SUBR	IDMV
0004				SUBR	IPI2
0005				REL	
0006	00000	0 000000	IDEN	DAC	**
0007	00001	000007		DBL	
0008	00002	1 02 00642		DLD	IDSW,1
0009	00003	101040		SNZ	
0010	00004	0 01 00013		JMP	IDT5
0011	00005	1 02 00270		DLD	STID,1
0012	00006	101040		SNZ	
0013	00007	0 01 00013		JMP	IDT5
0014	00010	0 07 00244		DSB	DRP1
0015	00011	1 04 00270		DST	STID,1
0016	00012	-0 01 00000		JMP*	IDEN
0017	00013	1 02 00250	IDT5	DLD	IDI,1
0018	00014	100040		SZE	
0019	00015	0 01 00023		JMP	IDT0
0020	00016	1 02 00632		DLD	Z+8,1
0021	00017	1 04 00254		DST	SEPS,1
0022	00020	0 02 00246		DLD	DBM1
0023	00021	1 04 00250		DST	IDI,1
0024	00022	-0 01 00000		JMP*	IDEN
0025	00023	101400	IDT0	SMI	
0026	00024	0 01 00027		JMP	**3
0027	00025	0 02 00274		DLD	D1B8
0028	00026	0 01 00030		JMP	**2
0029	00027	0 06 00274		DAD	D1B8
0030	00030	1 04 00250		DST	IDI,1
0031	00031	0 06 00274		DAD	D1B8
0032	00032	1 16 00250		MPY	IDI,1
0033	00033	0 10 00000		CALL	DSOR
0034	00034	0 04 00236		DST	ATMP
0035	00035	1 02 00632		DLD	Z+8,1
0036	00036	1 16 00250		MPY	IDI,1
0037	00037	0 04 00240		DST	BTMP
0038	00040	1 02 00632		DLD	Z+8,1
0039	00041	000201		IAB	
0040	00042	1 16 00250		MPY	IDI,1
0041	00043	0401 61		LRS	15
0042	00044	0 06 00240		DAD	BTMP
0043	00045	0411 70		LLS	8
0044	00046	0 04 00240		DST	BTMP
0045	00047	1 02 00254		DLD	SEPS,1
0046	00050	0 07 00240		DSB	BTMP
0047	00051	0 17 00236		DIV	ATMP
0048	00052	000201		IAB	
0049	00053	140040		CRA	
0050	00054	000201		IAB	
0051	00055	0401 70		LRS	8
0052	00056	1 06 00260		DAD	ST,1
0053	00057	1 04 00260		DST	ST,1
0054	00060	1 02 00254		DLD	SEPS,1
0055	00061	1 06 00632		DAD	Z+8,1
0056	00062	1 04 00254		DST	SEPS,1
0057	00063	1 02 00250		DLD	IDI,1

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0058	00064	0 16 00311	MPY	DS2P
0059	00065	0401 76	LRS	2
0060	00066	0 04 00236	DST	ATMP
0061	00067	1 02 00264	DLD	IDPL, 1
0062	00070	101400	SMI	
0063	00071	0 01 00076	JMP	IDT1
0064	00072	0 02 00242	DLD	DBPO
0065	00073	1 07 00254	DSB	SEPS, 1
0066	00074	0 07 00236	DSB	ATMP
0067	00075	0 01 00100	JMP	IDT2
0068	00076	1 02 00254	IDT1 DLD	SEPS, 1
0069	00077	0 07 00236	DSB	ATMP
0070	00100	0 04 00236	IDT2 DST	ATMP
0071	00101	0 07 00304	DSB	UBP
0072	00102	101400	SMI	
0073	00103	0 01 00116	JMP	DEGR
0074	00104	0 02 00236	DLD	ATMP
0075	00105	0 07 00306	DSB	LBP
0076	00106	0 11 00242	CAS	DBPO
0077	00107	0 01 00165	JMP	OUT1
0078	00110	0 01 00112	JMP	*+2
0079	00111	0 01 00166	JMP	OT2A
0080	00112	000201	IAB	
0081	00113	100040	SZE	
0082	00114	0 01 00165	JMP	OUT1
0083	00115	0 01 00166	JMP	OT2A
0084	00116	1 02 00642	DEGR DLD	IDSW, 1
0085	00117	101040	SNZ	
0086	00120	0 01 00125	JMP	DEGA
0087	00121	000005	SGL	
0088	00122	140040	CRA	
0089	00123	0 10 00000	CALL	IDIN
0090	00124	0 01 00165	JMP	OUT1
0091	00125	1 02 00250	DEGA DLD	IDI, 1
0092	00126	0 16 00310	MPY	DS2
0093	00127	0401 76	LRS	2
0094	00130	0 04 00236	DST	ATMP
0095	00131	1 02 00264	DLD	IDPL, 1
0096	00132	100400	SPI	
0097	00133	0 01 00140	JMP	IDT3
0098	00134	0 02 00242	DLD	DBPO
0099	00135	1 07 00260	DSB	ST, 1
0100	00136	0 07 00236	DSB	ATMP
0101	00137	0 01 00142	JMP	IDT4
0102	00140	1 02 00260	IDT3 DLD	ST, 1
0103	00141	0 07 00236	DSB	ATMP
0104	00142	0 04 00236	IDT4 DST	ATMP
0105	00143	0 07 00300	DSB	DB
0106	00144	101400	SMI	
0107	00145	0 01 00161	JMP	RPES
0108	00146	0 02 00236	DLD	ATMP
0109	00147	0 07 00302	DSB	LB
0110	00150	0 11 00242	CAS	DBPO
0111	00151	0 01 00165	JMP	OUT1
0112	00152	0 01 00154	JMP	*+2
0113	00153	0 01 00157	JMP	CNBS
0114	00154	000201	IAB	

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0115	00155	100040		SZE	
0116	00156	0 01 00165		JMP	OUT1
0117	00157	0 02 00244	CNRS	DLD	DRP1
0118	00160	100000		SKP	
0119	00161	0 02 00246	RPBS	DLD	DBM1
0120	00162	1 04 00642		DST	IDSW,1
0121	00163	0 12 00000		IRS	IDEN
0122	00164	0 12 00000	OUT2	IRS	IDEN
0123	00165	-0 01 00000	OUT1	JMP*	IDEN
0124	00166	1 02 00642	OT2A	DLD	IDSW,1
0125	00167	101400		SMI	
0126	00170	0 01 00164		JMP	OUT2
0127	00171	0 10 00000		CALL	STRP
0128	00172	0 01 00164		JMP	OUT2
0129	00173	0 000000	IDMV	DAC	**
0130	00174	000007		DBL	
0131	00175	0 02 00250		DLD	IDI
0132	00176	0 04 00252		DST	IDI+2
0133	00177	0 02 00260		DLD	ST
0134	00200	0 04 00262		DST	ST+2
0135	00201	0 02 00254		DLD	SEPS
0136	00202	0 04 00256		DST	SEPS+2
0137	00203	0 02 00264		DLD	IDPL
0138	00204	0 04 00266		DST	IDPL+2
0139	00205	0 02 00642		DLD	IDSW
0140	00206	0 04 00644		DST	IDSW+2
0141	00207	0 02 00270		DLD	STID
0142	00210	0 04 00272		DST	STID+2
0143	00211	000005		SGL	
0144	00212	-0 01 00173		JMP*	IDMV
0145	00213	0 000000	IDIN	DAC	**
0146	00214	101040		SNZ	
0147	00215	0 01 00225		JMP	IDIA
0148	00216	1 04 00264		STA	IDPL,1
0149	00217	000201		TAB	
0150	00220	100040		SZE	
0151	00221	0 01 00225		JMP	IDIA
0152	00222	000007		DBL	
0153	00223	0 02 00242		DLD	DBPO
0154	00224	1 04 00642		DST	IDSW,1
0155	00225	000007	IDIA	DBL	
0156	00226	0 02 00242		DLD	DBPO
0157	00227	1 04 00250		DST	IDI,1
0158	00230	1 04 00254		DST	SEPS,1
0159	00231	1 04 00260		DST	ST,1
0160	00232	0 02 00276		DLD	INBI
0161	00233	1 04 00270		DST	STID,1
0162	00234	000005		SGL	
0163	00235	-0 01 00213		JMP*	IDIN
0164	00236	000000	ATMP	DBP	0
	00237	000000			
0165	00240	000000	BTMP	DBP	0
	00241	000000			
0166	00242	000000	DBPO	DBP	0
	00243	000000			
0167	00244	000001	DBP1	OCT	1,0
	00245	000000			

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0168	00246	177777	DBM1	OCT	177777,0
	00247	000000			
0169	00250	000000	IDI	BSZ	4
	00251	000000			
	00252	000000			
	00253	000000			
0170	00254	000000	SEPS	BSZ	4
	00255	000000			
	00256	000000			
	00257	000000			
0171	00260	000000	ST	BSZ	4
	00261	000000			
	00262	000000			
	00263	000000			
0172	00264	000000	IDPL	BSZ	2
	00265	000000			
0173	00266	000000	IPL2	BSZ	2
	00267	000000			
0174	00270	000000	STID	BSZ	4
	00271	000000			
	00272	000000			
	00273	000000			
0175	00274	000200	D1B8	DEC	1BB8
	00275	000000			
0176	00276	000012	INBI	DBP	10BB15
	00277	000000			
0177			* THE FOLLOWING CONSTANTS ARE FOR		
0178			* DELTA EQUAL TO 2,		
0179			* SIGMA EQUAL TO 3.64		
0180			* P		
0181	00300	000004	UB	DBP	4BB15
	00301	000000			
0182	00302	177774	LB	DBP	-4BB15
	00303	000000			
0183	00304	000004	UBP	DBP	4BB15
	00305	000000			
0184	00306	177774	LBP	DBP	-4BB15
	00307	000000			
0185	00310	007217	DS2	DEC	3.64B5
0186	00311	007217	DS2P	DEC	3.64B5
0187			* END OF CONSTANTS		
0188		000642	IDSW	EQU	'642
0189		000622	Z	EQU	'622
0190			END		

PROGRAM NAME:
SOURCE: DSQR
BINARY: BDSQR
ENTRY POINTS (LOCATION): DSQR ('7444)
GENERAL DESCRIPTION:

This subroutine will compute the square root of a double precision number stored in the A, B reg with an even scale factor B2N. It will return the square root in the A, B reg scaled BN. The square root is computed using two iterations of the Newton-Raphson square root approximation. Accuracy with only 2 iterations is achieved by normalizing the number to lie between $\frac{1}{4}$ and 1. When this is done, the initial values used are such that the correct square root is found with only 2 iterations.

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0001				SUBR	DSQR
0002				REL	
0003	00000	0 000000	DSQR	DAC	**
0004	00001	0 11 00140		CAS	DBZR
0005	00002	0 01 00014		JMP	APOS
0006	00003	0 01 00010		JMP	AZER
0007	00004	0 04 00130		DST	TS
0008	00005	0 02 00140		DLD	DBZR
0009	00006	0 07 00130		DSB	TS
0010	00007	0 01 00014		JMP	APOS
0011	00010	000201	AZER	IAB	
0012	00011	101040		SNZ	
0013	00012	-0 01 00000		JMP*	DSQR
0014	00013	000201		IAB	
0015	00014	000005	APOS	SGL	
0016	00015	0 04 00136		STA	SHFT
0017	00016	140040		CRA	
0018	00017	0 13 00136		IMA	SHFT
0019	00020	0 11 00146		CAS	= '20000
0020	00021	101000		NOP	
0021	00022	0 01 00033		JMP	INAP
0022	00023	0411 77		LLS	1
0023	00024	0 12 00136		IRS	SHFT
0024	00025	0 11 00145	SLLP	CAS	= '10000
0025	00026	101000		NOP	
0026	00027	0 01 00034		JMP	INAP+1
0027	00030	0411 76		LLS	2
0028	00031	0 12 00136		IRS	SHFT
0029	00032	0 01 00025		JMP	SLLP
0030	00033	0401 77	INAP	LRS	1
0031	00034	000007		DBL	
0032	00035	0 04 00130		DST	TS
0033	00036	000005		SGL	
0034	00037	0 11 00146		CAS	= '20000
0035	00040	101000		NOP	
0036	00041	0 01 00045		JMP	APX1
0037	00042	0 16 00124		MPY	K2A
0038	00043	0 06 00125		ADD	K2B
0039	00044	0 01 00047		JMP	APX1+2
0040	00045	0 16 00126	APX1	MPY	K1A
0041	00046	0 06 00127		ADD	K1B
0042	00047	000201		IAB	
0043	00050	140040		CRA	
0044	00051	000201		IAB	
0045	00052	0 04 00132		STA	TS1
0046	00053	0 02 00130		LDA	TS
0047	00054	0401 77		LRS	1
0048	00055	0 17 00132		DIV	TS1
0049	00056	0 06 00132		ADD	TS1
0050	00057	0 04 00132		STA	TS1
0051	00060	000201		IAB	
0052	00061	140040		CRA	
0053	00062	000201		IAB	
0054	00063	0401 77		LRS	1
0055	00064	000007		DBL	
0056	00065	0 04 00134		DST	QTMP
0057	00066	0 02 00130		DLD	TS

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0058	00067	000005		SGL	
0059	00070	0 17 00132		DIV	TS1
0060	00071	0 04 00133		STA	TS1+1
0061	00072	140040		CRA	
0062	00073	000201		IAB	
0063	00074	0 17 00132		DIV	TS1
0064	00075	000201		IAB	
0065	00076	0 02 00133		LDA	TS1+1
0066	00077	000007		DBI	
0067	00100	140200		RCB	
0068	00101	0 06 00134		DAD	OTMP
0069	00102	100001		SRC	
0070	00103	0 02 00142		DLD	DMAX
0071	00104	0 04 00130		DST	TS
0072	00105	000005		SGL	
0073	00106	0 02 00136		LDA	SHFT
0074	00107	101040		SNZ	
0075	00110	0 01 00121		JMP	EXSQ
0076	00111	140407		TCA	
0077	00112	0 03 00144		ANA	=*00077
0078	00113	0 05 00137		ERA	LRSI
0079	00114	0 04 00117		STA	RSHF
0080	00115	000007		DBI	
0081	00116	0 02 00130		DLD	TS
0082	00117	0401 00	RSHF	LRS	**
0083	00120	-0 01 00000		JMP*	DSOR
0084	00121	000007	EXSQ	DBI	
0085	00122	0 02 00130		DLD	TS
0086	00123	-0 01 00000		JMP*	DSOR
0087	00124	065214	K2A	DEC	0.8324B0
0088	00125	011410	K2B	DEC	0.2974B1
0089	00126	045520	K1A	DEC	0.5884B0
0090	00127	015324	K1B	DEC	0.4192B1
0091	00130	000000	TS	DBP	0
	00131	000000			
0092	00132	000000	TS1	DBP	0
	00133	000000			
0093	00134	000000	OTMP	DBP	0
	00135	000000			
0094	00136	000000	SHFT	DEC	0
0095	00137	040100	LRSI	OCT	40100
0096	00140	000000	DBZR	DBP	0
	00141	000000			
0097	00142	077777	DMAX	OCT	77777,77777
	00143	077777			
0098	00144	000077		END	
	00145	010000			
	00146	020000			

PROGRAM NAME

SOURCE: SVFL

BINARY: BSVFL

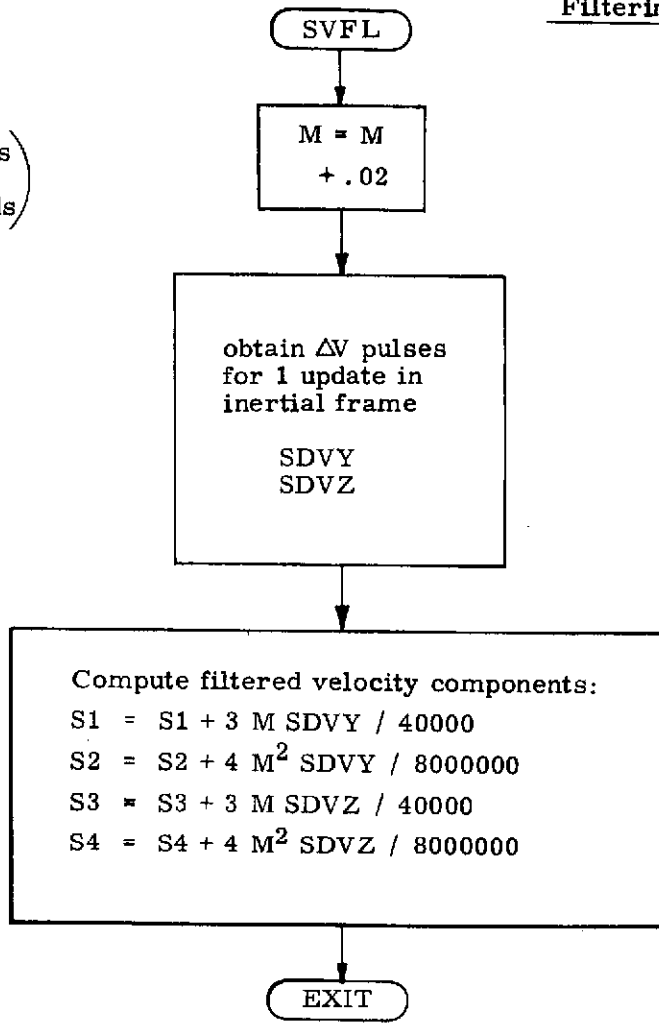
ENTRY POINTS(LOCATION): SVFL('7614)

GENERAL DESCRIPTION:

This subroutine accumulates and filters ΔV pulses every update for 200 sec for use in the azimuth alignment portion of coarse align. The ΔV 's are accumulated in an inertial frame i.e., are not compensated for earth rate.

ΔV Accumulation and
Filtering Subroutine

(called 50 times
a second
for 200 seconds)



MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0001				SUBR	SVFL
0002				SUBR	S1
0003				SUBR	S2
0004				SUBR	S3
0005				SUBR	S4
0006				REL	
0007	00000	0 000000	SVFL	DAC	**
0008	00001	0 12 00146		IRS	M
0009	00002	0 12 00146		IRS	M
0010	00003	000007		DBL	
0011	00004	0 02 00146		DLD	M
0012	00005	0 16 00150		MPY	K1
0013	00006	0 04 00132		DST	MK1
0014	00007	0 02 00146		DID	M
0015	00010	0 16 00146		MPY	M
0016	00011	0 04 00130		DST	MTMP
0017	00012	0 16 00151		MPY	K2
0018	00013	0 04 00134		DST	M2K2
0019	00014	0 02 00130		DLD	MTMP
0020	00015	000201		IAB	
0021	00016	0 16 00151		MPY	K2
0022	00017	0401 61		LRS	15
0023	00020	0 06 00134		DAD	M2K2
0024	00021	0 04 00134		DST	M2K2
0025	00022	0 02 00454		DLD	SDVZ
0026	00023	0 16 00132		MPY	MK1
0027	00024	0401 73		LRS	5
0028	00025	0 06 00136		DAD	S1
0029	00026	0 04 00136		DST	S1
0030	00027	0 02 00454		DLD	SDVZ
0031	00030	000201		IAB	
0032	00031	0 16 00132		MPY	MK1
0033	00032	0401 54		LRS	20
0034	00033	0 06 00136		DAD	S1
0035	00034	0 04 00136		DST	S1
0036	00035	0 02 00132		DLD	MK1
0037	00036	000201		IAB	
0038	00037	0 16 00454		MPY	SDVZ
0039	00040	0401 54		LRS	20
0040	00041	0 06 00136		DAD	S1
0041	00042	0 04 00136		DST	S1
0042	00043	0 02 00454		DLD	SDVZ
0043	00044	0 16 00134		MPY	M2K2
0044	00045	0401 74		LRS	4
0045	00046	0 06 00140		DAD	S2
0046	00047	0 04 00140		DST	S2
0047	00050	0 02 00454		DLD	SDVZ
0048	00051	000201		IAB	
0049	00052	0 16 00134		MPY	M2K2
0050	00053	0401 55		LRS	19
0051	00054	0 06 00140		DAD	S2
0052	00055	0 04 00140		DST	S2
0053	00056	0 02 00134		DLD	M2K2
0054	00057	000201		IAB	
0055	00060	0 16 00454		MPY	SDVZ
0056	00061	0401 55		LRS	19
0057	00062	0 06 00140		DAD	S2

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0058	00067	0 04 00140	DST	S2	
0059	00064	0 02 00450	DLD	SDVY	
0060	00065	0 16 00132	MPY	MK1	
0061	00066	0401 73	LRS	5	
0062	00067	0 06 00142	DAD	S3	
0063	00070	0 04 00142	DST	S3	
0064	00071	0 02 00450	DLD	SDVY	
0065	00072	000201	IAB		
0066	00073	0 16 00132	MPY	MK1	
0067	00074	0401 54	LRS	20	
0068	00075	0 06 00142	DAD	S3	
0069	00076	0 04 00142	DST	S3	
0070	00077	0 02 00132	DLD	MK1	
0071	00100	000201	IAB		
0072	00101	0 16 00450	MPY	SDVY	
0073	00102	0401 54	LRS	20	
0074	00103	0 06 00142	DAD	S3	
0075	00104	0 04 00142	DST	S3	
0076	00105	0 02 00450	DLD	SDVY	
0077	00106	0 16 00134	MPY	M2K2	
0078	00107	0401 74	LRS	4	
0079	00110	0 06 00144	DAD	S4	
0080	00111	0 04 00144	DST	S4	
0081	00112	0 02 00450	DLD	SDVY	
0082	00113	000201	IAB		
0083	00114	0 16 00134	MPY	M2K2	
0084	00115	0401 55	LRS	19	
0085	00116	0 06 00144	DAD	S4	
0086	00117	0 04 00144	DST	S4	
0087	00120	0 02 00134	DLD	M2K2	
0088	00121	000201	IAB		
0089	00122	0 16 00450	MPY	SDVY	
0090	00123	0401 55	LRS	19	
0091	00124	0 06 00144	DAD	S4	
0092	00125	0 04 00144	DST	S4	
0093	00126	000005	SGL		
0094	00127	-0 01 00000	JMP*	SVFL	
0095	00130	000000	MTMP	DBP	0
	00131	000000			
0096	00132	000000	MK1	DBP	0
	00133	000000			
0097	00134	000000	M2K2	DBP	0
	00135	000000			
0098	00136	000000	S1	DBP	0
	00137	000000			
0099	00140	000000	S2	DBP	0
	00141	000000			
0100	00142	000000	S3	DBP	0
	00143	000000			
0101	00144	000000	S4	DBP	0
	00145	000000			
0102	00146	000000	M	DBP	0
	00147	000000			
0103	00150	062251	K1	DEC	0.75E-6B-20
0104	00151	066763	K2	DEC	0.5E-10B-34
0105		000454	SDVZ	EQU	454
0106		000450	SDVY	EQU	450

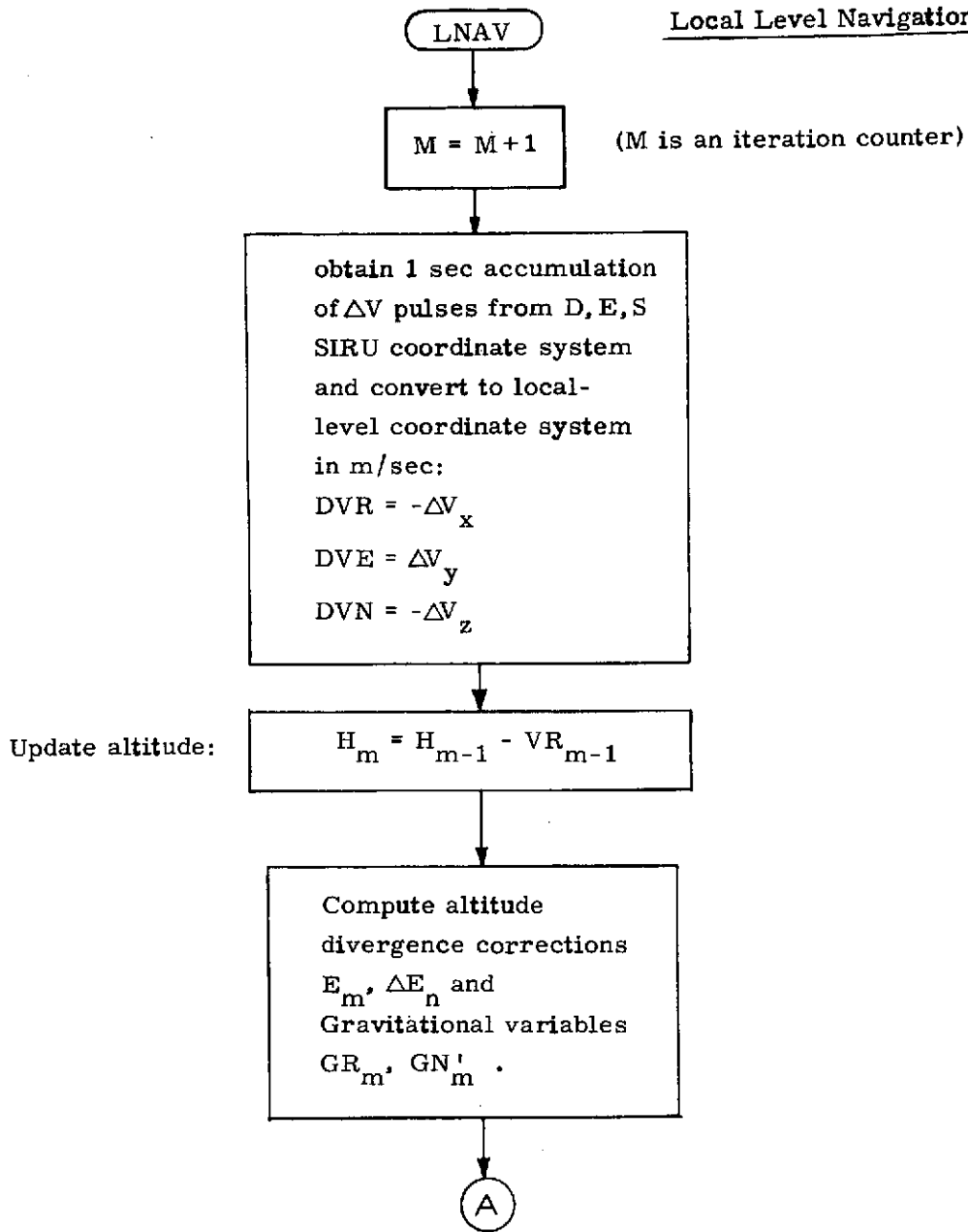
MICROCOMP TELECOMMUNICATED DATA
DDR-516 ASSEMBLY LISTING
0107 . END

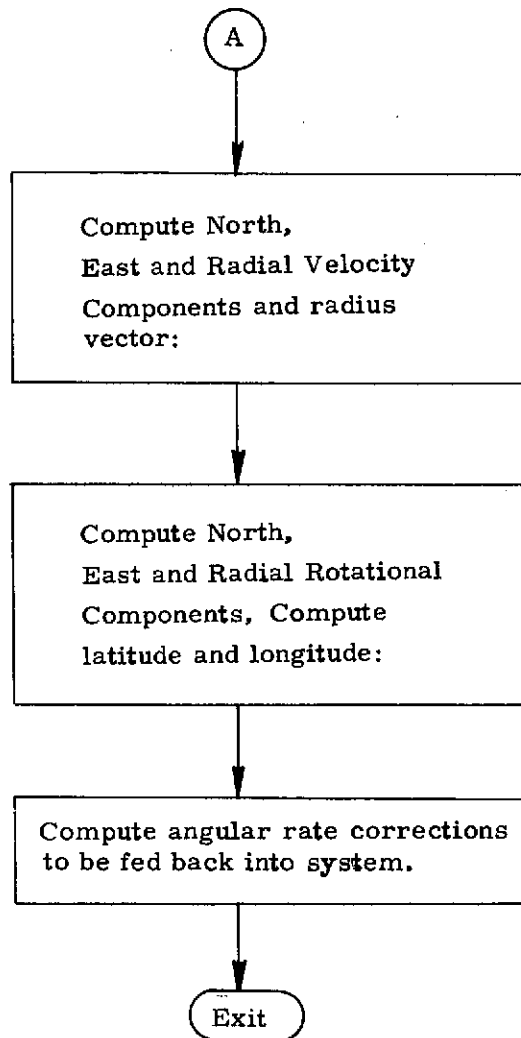
PROGRAM NAME
SOURCE: NVIG
BINARY: BNVIG
ENTRY POINTS (location): LNAV ('7766)
GENERAL DESCRIPTION:

This subroutine performs local-level navigation at a frequency of 1 update/sec. The coordinate system used is a simplified local-level coordinate system where one component R is directed from the center of the earth to the navigated vehicle, one component (N) is tangent to the circular meridian and directed north, and the final component (E) is tangent to a circle of constant latitude and directed east. The quantities computed at each update are:

VR - radial velocity in m/sec
VN - North velocity in m/sec
VE - East velocity in m/sec
OME - rotation about East directed vector in rev/sec
OMN - rotation about North directed vector in rev/sec
OMR - rotation about Radial directed vector in rev/sec
LAMB - latitude in revs
OMGA - longitude in revs
H - altitude in m.

Local Level Navigation





DATA ITEM DESCRIPTIONS

IDI ₁	(IDI + 2)	Iteration counter used in the 1st failure identification/recertification process.
IDI ₂	(IDI)	Same as above except for a 2nd failure
SEPS ₁	(SEPS + 2)	Parity equation residual accumulator used in the 1st failure identification/recertification process.
SEPS ₂	(SEPS)	Same as above except for a 2nd failure.
ST ₁	(ST + 2)	Parity equation residual transformation accumulator used in identifying a 1st failure as a ramp or constant bias.
ST ₂	(ST)	same as above except for a 2nd failure
IDPL ₁	(IDPL + 2)	Polarity of degraded parity equation, Z _{6,n} used in identification/recertification process for 1st failure (+1 = positive polarity, -1 = negative polarity)
IDPL ₂	(IDPL)	Same as above except for 2nd failure.
IDSW ₁	(IDSW + 2)	failure identification code for 1st failed gyro (+1 = constant bias, -1 = ramp, 0 = failure not identified.)
IDSW ₂	(IDSW)	same as above except for 2nd failure
STID ₁	(STID + 2)	Constant used to specify delay before starting the recertification of the 1st failure (currently = 10 iterations)
STID ₂	(STID)	same as above except for 2nd failure
D'		Decision function used in identifying/recertifying a 1st or 2nd failure. If $D' \leq LBP$, then failure is recertified or is identified as normal. If $D' \geq UBP$, the failure is identified as a degraded mode (ramp or constant bias).

DATA ITEM DESCRIPTIONS continued

D		Decision function used in identifying a 1st or 2nd failure. If $D \leq LB$, then the failure is identified as a constant bias. If $D \geq UB$, then the failure is identified as a ramp.
DS2	(DS2)	Constant used in computing decision function D above.
		$DS2 = \frac{\delta \sigma_p}{2}$ <p>where δ = dimensionless design parameter (= 1 or 2) σ_p = maximum value of parity equation residual standard deviations.</p>
DS2P	(DS2P)	Constant used in computing decision function D' above.
		$DS2P = \frac{\delta' \sigma_p}{2}$ <p>where δ' is another dimensionless design parameter (currently = δ)</p>
UB, LB	(UB, LB)	Constant limits used in testing decision function D above.
		$UB = \sigma_p \ln(\beta/(1-\alpha))/\delta$ $LB = \sigma_p \ln((1-\beta)/\alpha)/\delta$ <p>where $\alpha = .01$, $\beta = .01$</p>
UBP, LBP	(UBP, LBP)	Constant limits used in testing decision function D' above.
		$UBP = \sigma_p \ln(\beta/(1-\alpha))/\delta'$ $LBP = \sigma_p \ln(\beta/(1-\alpha))/\delta'$ <p>(currently $UB = UBP$ $LB = LBP$)</p>

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0001				SUBR	LNAV
0002				SUBR	LAMB
0003				SUBR	OMGA
0004				SUBR	H
0005				SUBR	VR
0006				SUBR	VN
0007				SUBR	VE
0008				REL	
0009	00000	0 000000	LNAV	DAC	**
0010	00001	000007		DBL	
0011	00002	0 02 00444		DLD	'444
0012	00003	0 16 00774		MPY	MP01
0013	00004	0411 75		LLS	3
0014	00005	0 04 00730		DST	DVR
0015	00006	0 02 00444		DLD	'444
0016	00007	000201		IAB	
0017	00010	0 16 00774		MPY	MP01
0018	00011	0401 64		LRS	12
0019	00012	0 06 00730		DAD	DVP
0020	00013	0 04 00730		DST	DVP
0021	00014	0 02 00450		DLD	'450
0022	00015	0 16 00775		MPY	PP01
0023	00016	0411 75		LLS	3
0024	00017	0 04 00734		DST	DVE
0025	00020	0 02 00450		DLD	'450
0026	00021	000201		IAB	
0027	00022	0 16 00775		MPY	PP01
0028	00023	0401 64		LRS	12
0029	00024	0 06 00734		DAD	DVE
0030	00025	0 04 00734		DST	DVE
0031	00026	0 02 00454		DLD	'454
0032	00027	0 16 00774		MPY	MP01
0033	00030	0411 75		LLS	3
0034	00031	0 04 00732		DST	DVN
0035	00032	0 02 00454		DLD	'454
0036	00033	000201		IAB	
0037	00034	0 16 00774		MPY	MP01
0038	00035	0401 64		LRS	12
0039	00036	0 06 00732		DAD	DVN
0040	00037	0 04 00732		DST	DVN
0041	00040	0 02 00766		DLD	DRP0
0042	00041	0 04 00444		DST	'444
0043	00042	0 04 00450		DST	'450
0044	00043	0 04 00454		DST	'454
0045	00044	0 02 00704		DLD	H
0046	00045	0 06 00712		DAD	VR
0047	00046	0 04 00704		DST	H
0048	00047	0 07 00706		DSB	HA
0049	00050	0 04 00742		DST	ATMP
0050	00051	0 07 00710		DSB	E
0051	00052	0 04 00744		DST	BTMP
0052	00053	0 16 00753		MPY	K2
0053	00054	0 06 00712		DAD	VR
0054	00055	0 06 00730		DAD	DVR
0055	00056	0 04 00712		DST	VR
0056	00057	0 02 00744		DLD	BTMP
0057	00060	000201		IAB	

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0058	00061	0 16 00753	MPY	K2
0059	00062	0401 61	LRS	15
0060	00063	0 06 00712	DAD	VR
0061	00064	0 04 00712	DST	VR
0062	00065	0 02 00742	DLD	ATMP
0063	00066	0 04 00710	DST	E
0064	00067	0 16 00752	MPY	K1
0065	00070	0 06 00712	DAD	VR
0066	00071	0 04 00712	DST	VR
0067	00072	0 02 00742	DLD	ATMP
0068	00073	000201	IAB	
0069	00074	0 16 00752	MPY	K1
0070	00075	0401 61	LRS	15
0071	00076	0 06 00712	DAD	VR
0072	00077	0 04 00712	DST	VR
0073	00100	0 02 00700	DLD	LAMB
0074	00101	0 10 00000	CALL	SINX
0075	00102	0 04 00736	DST	SINL
0076	00103	0 16 00736	MPY	SINL
0077	00104	0 04 00742	DST	ATMP
0078	00105	0 02 00736	DLD	SINL
0079	00106	000201	IAB	
0080	00107	0 16 00736	MPY	SINL
0081	00110	0401 62	LRS	14
0082	00111	0 06 00742	DAD	ATMP
0083	00112	0 04 00742	DST	ATMP
0084	00113	0 16 00754	MPY	C1
0085	00114	0 04 00744	DST	BTMP
0086	00115	0 02 00742	DLD	ATMP
0087	00116	000201	IAB	
0088	00117	0 16 00754	MPY	C1
0089	00120	0401 61	LRS	15
0090	00121	0 06 00744	DAD	BTMP
0091	00122	0 04 00744	DST	BTMP
0092	00123	0 02 00754	DLD	C1
0093	00124	000201	IAB	
0094	00125	0 16 00742	MPY	ATMP
0095	00126	0401 61	LRS	15
0096	00127	0 06 00744	DAD	BTMP
0097	00130	0 04 00744	DST	BTMP
0098	00131	0 02 00756	DLD	C2
0099	00132	0 07 00744	DSB	BTMP
0100	00133	0 04 00750	DST	DTMP
0101	00134	0 02 00760	DLD	C3
0102	00135	0 10 00644	JST	DDIV
0103	00136	0 16 00704	MPY	H
0104	00137	0401 61	LRS	15
0105	00140	0 07 00762	DSB	C4
0106	00141	0 06 00712	DAD	VR
0107	00142	0 04 00712	DST	VR
0108	00143	0 02 00700	DLD	LAMB
0109	00144	0 10 00000	CALL	COSX
0110	00145	0 04 00740	DST	COSL
0111	00146	0 16 00740	MPY	COSL
0112	00147	0 04 00744	DST	BTMP
0113	00150	0 02 00740	DLD	COSL
0114	00151	000201	IAB	

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0115	00152	0 16 00740	MPY	COSL
0116	00153	0401 62	LRS	14
0117	00154	0 06 00744	DAD	BTMP
0118	00155	0 04 00744	DST	BTMP
0119	00156	0 02 00720	DLD	R
0120	00157	0 16 00764	MPY	ERTS
0121	00160	0 04 00746	DST	CTMP
0122	00161	0 02 00720	DLD	R
0123	00162	000201	IAB	
0124	00163	0 16 00764	MPY	ERTS
0125	00164	0401 61	LRS	15
0126	00165	0 06 00746	DAD	CTMP
0127	00166	0 04 00746	DST	CTMP
0128	00167	0 16 00744	MPY	BTMP
0129	00170	0 04 00742	DST	ATMP
0130	00171	0 02 00746	DLD	CTMP
0131	00172	000201	IAB	
0132	00173	0 16 00744	MPY	BTMP
0133	00174	0401 61	LRS	15
0134	00175	0 06 00742	DAD	ATMP
0135	00176	0 04 00742	DST	ATMP
0136	00177	0 02 00744	DLD	BTMP
0137	00200	000201	IAB	
0138	00201	0 16 00746	MPY	CTMP
0139	00202	0401 61	LRS	15
0140	00203	0 06 00742	DAD	ATMP
0141	00204	0401 57	LRS	17
0142	00205	0 06 00712	DAD	VR
0143	00206	0 04 00712	DST	VR
0144	00207	0 02 00740	DLD	COSL
0145	00210	0 16 00765	MPY	ERTD
0146	00211	0 04 00744	DST	BTMP
0147	00212	0 02 00740	DLD	COSL
0148	00213	000201	IAB	
0149	00214	0 16 00765	MPY	ERTD
0150	00215	0401 61	LRS	15
0151	00216	0 06 00744	DAD	BTMP
0152	00217	0401 65	LRS	11
0153	00220	0 06 00724	DAD	OMN
0154	00221	0 04 00742	DST	ATMP
0155	00222	0 16 00716	MPY	VE
0156	00223	0 06 00712	DAD	VR
0157	00224	0 04 00712	DST	VR
0158	00225	0 02 00742	DLD	ATMP
0159	00226	000201	IAB	
0160	00227	0 16 00716	MPY	VE
0161	00230	0401 61	LRS	15
0162	00231	0 06 00712	DAD	VR
0163	00232	0 04 00712	DST	VR
0164	00233	0 02 00716	DLD	VE
0165	00234	000201	IAB	
0166	00235	0 16 00742	MPY	ATMP
0167	00236	0401 61	LRS	15
0168	00237	0 06 00712	DAD	VR
0169	00240	0 04 00712	DST	VR
0170	00241	0 02 00714	DLD	VN
0171	00242	0 16 00722	MPY	OMF

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0172	00243	0 04 00744	DST	BTMP
0173	00244	0 02 00714	DLD	VN
0174	00245	000201	IAB	
0175	00246	0 16 00722	MPY	OME
0176	00247	0401 61	LRS	15
0177	00250	0 06 00744	DAD	BTMP
0178	00251	0 04 00744	DST	BTMP
0179	00252	0 02 00722	DLD	OME
0180	00253	000201	IAB	
0181	00254	0 16 00714	MPY	VN
0182	00255	0401 61	LRS	15
0183	00256	0 06 00744	DAD	BTMP
0184	00257	0 04 00744	DST	BTMP
0185	00260	0 02 00712	DLD	VR
0186	00261	0 07 00744	DSB	BTMP
0187	00262	0 04 00712	DST	VR
0188	00263	0 16 00722	MPY	OME
0189	00264	0 06 00714	DAD	VN
0190	00265	0 06 00732	DAD	DVN
0191	00266	0 04 00714	DST	VN
0192	00267	0 02 00712	DLD	VR
0193	00270	000201	IAB	
0194	00271	0 16 00722	MPY	OME
0195	00272	0401 61	LRS	15
0196	00273	0 06 00714	DAD	VN
0197	00274	0 04 00714	DST	VN
0198	00275	0 02 00722	DLD	OME
0199	00276	000201	IAB	
0200	00277	0 16 00712	MPY	VR
0201	00300	0401 61	LRS	15
0202	00301	0 06 00714	DAD	VN
0203	00302	0 04 00714	DST	VN
0204	00303	0 02 00736	DLD	SINL
0205	00304	0 16 00765	MPY	ERTD
0206	00305	0 04 00744	DST	BTMP
0207	00306	0 02 00736	DLD	SINL
0208	00307	000201	IAB	
0209	00310	0 16 00765	MPY	ERTD
0210	00311	0401 61	LRS	15
0211	00312	0 06 00744	DAD	BTMP
0212	00313	0401 65	LRS	11
0213	00314	0 06 00726	DAD	OMR
0214	00315	0 04 00744	DST	BTMP
0215	00316	0 16 00716	MPY	VE
0216	00317	0 04 00746	DST	CTMP
0217	00320	0 02 00744	DLD	BTMP
0218	00321	000201	IAB	
0219	00322	0 16 00716	MPY	VE
0220	00323	0401 61	LRS	15
0221	00324	0 06 00746	DAD	CTMP
0222	00325	0 04 00746	DST	CTMP
0223	00326	0 02 00716	DLD	VE
0224	00327	000201	IAB	
0225	00330	0 16 00744	MPY	BTMP
0226	00331	0401 61	LRS	15
0227	00332	0 06 00746	DAD	CTMP
0228	00333	0 04 00746	DST	CTMP

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DDP-516 ASSEMBLY LISTING

0229	00334	0 02 00714	DLD	VN
0230	00335	0 07 00746	DSB	CTMP
0231	00336	0 04 00714	DST	VN
0232	00337	0 16 00744	MPY	BTMP
0233	00340	0 06 00716	DAD	VE
0234	00341	0 06 00734	DAD	DVE
0235	00342	0 04 00716	DST	VE
0236	00343	0 02 00714	DLD	VN
0237	00344	000201	IAB	
0238	00345	0 16 00744	MPY	BTMP
0239	00346	0401 61	LRS	15
0240	00347	0 06 00716	DAD	VE
0241	00350	0 04 00716	DST	VE
0242	00351	0 02 00744	DLD	BTMP
0243	00352	000201	IAB	
0244	00353	0 16 00714	MPY	VN
0245	00354	0401 61	LRS	15
0246	00355	0 06 00716	DAD	VE
0247	00356	0 04 00716	DST	VE
0248	00357	0 02 00712	DLD	VR
0249	00360	0 16 00742	MPY	ATMP
0250	00361	0 04 00746	DST	CTMP
0251	00362	0 02 00712	DLD	VR
0252	00363	000201	IAB	
0253	00364	0 16 00742	MPY	ATMP
0254	00365	0401 61	LRS	15
0255	00366	0 06 00746	DAD	CTMP
0256	00367	0 04 00746	DST	CTMP
0257	00370	0 02 00742	DLD	ATMP
0258	00371	000201	IAB	
0259	00372	0 16 00712	MPY	VR
0260	00373	0401 61	LRS	15
0261	00374	0 06 00746	DAD	CTMP
0262	00375	0 04 00746	DST	CTMP
0263	00376	0 02 00716	DLD	VE
0264	00377	0 07 00746	DSB	CTMP
0265	00400	0 04 00716	DST	VE
0266	00401	0 02 00712	DLD	VR
0267	00402	0401 70	LRS	8
0268	00403	0 06 00720	DAD	R
0269	00404	0 04 00720	DST	R
0270	00405	0 04 00750	DST	DTMP
0271	00406	0 02 00766	DLD	DBPO
0272	00407	0 07 00714	DSB	VN
0273	00410	0 10 00644	JST	DDIV
0274	00411	0401 70	LRS	8
0275	00412	0 04 00722	DST	OME
0276	00413	0 02 00716	DLD	VE
0277	00414	0 10 00644	JST	DDIV
0278	00415	0401 70	LRS	8
0279	00416	0 04 00724	DST	OMN
0280	00417	0 02 00722	DLD	OME
0281	00420	0 16 00772	MPY	RDRV
0282	00421	0 04 00742	DST	ATMP
0283	00422	0 02 00722	DLD	OME
0284	00423	000201	IAB	
0285	00424	0 16 00772	MPY	RDRV

MICROCOMP TELECOMMUNICATED DATA
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0286	00425	0401 61	LRS	15
0287	00426	0 06 00742	DAD	ATMP
0288	00427	0 04 00742	DST	ATMP
0289	00430	0 02 00700	DLD	LAMB
0290	00431	0 07 00742	DSB	ATMP
0291	00432	0 04 00700	DST	LAMB
0292	00433	140200	RCB	
0293	00434	0411 76	LLS	2
0294	00435	101001	SSC	
0295	00436	0 01 00447	JMP	LBOK
0296	00437	0 02 00766	DLD	DBPO
0297	00440	0 07 00700	DSB	LAMB
0298	00441	101400	SMI	
0299	00442	0 01 00445	JMP	**3
0300	00443	0 06 00770	DAD	HFRV
0301	00444	0 01 00446	JMP	**2
0302	00445	0 07 00770	DSB	HFRV
0303	00446	0 04 00700	DST	LAMB
0304	00447	0 02 00700	LBOK DLD	LAMB
0305	00450	0 10 00000	CALL	SINX
0306	00451	0 04 00736	DST	SINL
0307	00452	0 02 00700	DLD	LAMB
0308	00453	0 10 00000	CALL	COSX
0309	00454	0 04 00740	DST	COSL
0310	00455	000101	NRM	
0311	00456	000005	SGL	
0312	00457	0 04 00742	STA	ATMP
0313	00460	000041	SCA	
0314	00461	0 04 00773	STA	SHFT
0315	00462	0 02 00742	LDA	ATMP
0316	00463	000007	DBL	
0317	00464	0 04 00750	DST	DTMP
0318	00465	0 02 00724	DLD	OMN
0319	00466	000101	NRM	
0320	00467	000005	SGL	
0321	00470	0 04 00744	STA	BTMP
0322	00471	000041	SCA	
0323	00472	0 07 00773	SUB	SHFT
0324	00473	0 04 00773	STA	SHFT
0325	00474	0 02 00744	LDA	BTMP
0326	00475	000007	DBL	
0327	00476	0401 77	LRS	1
0328	00477	0 10 00644	JST	DDIV
0329	00500	0 04 00742	DST	ATMP
0330	00501	000005	SGL	
0331	00502	0 02 00773	LDA	SHFT
0332	00503	101400	SMI	
0333	00504	0 01 00510	JMP	**4
0334	00505	0 03 01000	ANA	=*00077
0335	00506	0 05 00777	ERA	=*41100
0336	00507	0 01 00513	JMP	**4
0337	00510	140407	TCA	
0338	00511	0 03 01000	ANA	=*00077
0339	00512	0 05 00776	ERA	=*40100
0340	00513	0 04 00516	STA	SFIN
0341	00514	000007	DBL	
0342	00515	0 02 00742	DLD	ATMP

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0343	00516	0411 00	SPIN	LLS	**
0344	00517	0 04 00742		DST	ATMP
0345	00520	0 16 00736		MPY	SINL
0346	00521	0 04 00726		DST	OMR
0347	00522	0 02 00742		DLD	ATMP
0348	00523	000201		IAR	
0349	00524	0 16 00736		MPY	SINL
0350	00525	0401 61		LRS	15
0351	00526	0 06 00726		DAD	OMR
0352	00527	0 04 00726		DST	OMR
0353	00530	0 02 00736		DLD	SINL
0354	00531	000201		IAB	
0355	00532	0 16 00742		MPY	ATMP
0356	00533	0401 61		LRS	15
0357	00534	0 06 00726		DAD	OMR
0358	00535	0411 77		LLS	1
0359	00536	0 04 00726		DST	OMR
0360	00537	0 02 00742		DLD	ATMP
0361	00540	0 16 00772		MPY	RDRV
0362	00541	0 06 00702		DAD	OMGA
0363	00542	0 04 00702		DST	OMGA
0364	00543	0 02 00742		DLD	ATMP
0365	00544	000201		IAB	
0366	00545	0 16 00772		MPY	RDRV
0367	00546	0401 61		LRS	15
0368	00547	0 06 00702		DAD	OMGA
0369	00550	0 04 00702		DST	OMGA
0370	00551	140200		RCB	
0371	00552	0411 77		LLS	1
0372	00553	101001		SSC	
0373	00554	0 01 00566		JMP	LOUT
0374	00555	0 02 00702		DLD	OMGA
0375	00556	0401 77		LRS	1
0376	00557	101400		SMI	
0377	00560	0 01 00563		JMP	**3
0378	00561	0 06 00770		DAD	AREV
0379	00562	0 01 00564		JMP	**2
0380	00563	0 07 00770		DSB	AREV
0381	00564	0411 77		LLS	1
0382	00565	0 04 00702		DST	OMGA
0383	00566	0 02 00736	LOUT	DLD	SINL
0384	00567	0 16 00765		MPY	ERTD
0385	00570	0401 66		LRS	10
0386	00571	0 04 00742		DST	ATMP
0387	00572	0 02 00726		DLD	OMR
0388	00573	0411 76		LLS	2
0389	00574	0 06 00742		DAD	ATMP
0390	00575	0 04 00742		DST	ATMP
0391	00576	0 16 00775		MPY	PP01
0392	00577	0 04 00750		DST	DTMP
0393	00600	0 02 00742		DLD	ATMP
0394	00601	000201		IAR	
0395	00602	0 16 00775		MPY	PP01
0396	00603	0401 61		LRS	15
0397	00604	0 06 00750		DAD	DTMP
0398	00605	0 04 00310		DST	'310
0399	00606	0 02 00766		DLD	DBPO

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0400	00607	0 07 00722	DSB	ONE
0401	00610	0411 76	LLS	2
0402	00611	0 04 00742	DST	ATMP
0403	00612	0 16 00775	MPY	PP01
0404	00613	0 04 00750	DST	DTMP
0405	00614	0 02 00742	DLD	ATMP
0406	00615	000201	IAB	
0407	00616	0 16 00775	MPY	PP01
0408	00617	0401 61	LRS	15
0409	00620	0 06 00750	DAD	DTMP
0410	00621	0 04 00312	DST	'312
0411	00622	0 02 00740	DLD	COSL
0412	00623	0 16 00765	MPY	ERTD
0413	00624	0401 66	LRS	10
0414	00625	0 04 00742	DST	ATMP
0415	00626	0 02 00724	DLD	OMN
0416	00627	0411 76	LLS	2
0417	00630	0 06 00742	DAD	ATMP
0418	00631	0 04 00742	DST	ATMP
0419	00632	0 16 00775	MPY	PP01
0420	00633	0 04 00750	DST	DTMP
0421	00634	0 02 00742	DLD	ATMP
0422	00635	000201	IAB	
0423	00636	0 16 00775	MPY	PP01
0424	00637	0401 61	LRS	15
0425	00640	0 06 00750	DAD	DTMP
0426	00641	0 04 00314	DST	'314
0427	00642	000005	SGL	
0428	00643	-0 01 00000	JMP*	LNAV
0429	00644	0 000000	DDIV DAC	**
0430	00645	0 17 00750	DIV	DTMP
0431	00646	0 04 00672	DST	TMP1
0432	00647	0 16 00751	MPY	DTMP+1
0433	00650	0 04 00674	DST	TMP2
0434	00651	0 02 00672	DLD	TMP1
0435	00652	140040	CRA	
0436	00653	000201	IAB	
0437	00654	0 07 00674	DSB	TMP2
0438	00655	0 17 00750	DIV	DTMP
0439	00656	000201	IAB	
0440	00657	140040	CRA	
0441	00660	000201	IAB	
0442	00661	0401 61	LRS	15
0443	00662	0 04 00674	DST	TMP2
0444	00663	0 02 00672	DLD	TMP1
0445	00664	000201	IAB	
0446	00665	140040	CRA	
0447	00666	000201	IAB	
0448	00667	0 06 00674	DAD	TMP2
0449	00670	-0 01 00644	JMP*	DDIV
0450	00672	000000	TMP1 DBP	0
	00673	000000		
0451	00674	000000	TMP2 DBP	0
	00675	000000		
0452	00676	000000	ROUND OCT	0,40000
	00677	040000		
0453	00700	007420	LAMB DEC	0.117678241B80

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	00701	005121			
0454	00702	000000	OMGA	DBP	0
	00703	000000			
0455	00704	000000	H	DBP	0
	00705	000000			
0456	00706	000000	HA	DBP	0
	00707	000000			
0457	00710	000000	E	DBP	0
	00711	000000			
0458	00712	000000	VR	DBP	0
	00713	000000			
0459	00714	000000	VN	DBP	0
	00715	000000			
0460	00716	000000	VE	DBP	0
	00717	000000			
0461	00720	060454	R	DEC	6368449BB23
	00721	060200			
0462	00722	000000	OME	DBP	0
	00723	000000			
0463	00724	000000	OMN	DBP	0
	00725	000000			
0464	00726	000000	OMR	DBP	0
	00727	000000			
0465	00730	000000	DVR	DBP	0
	00731	000000			
0466	00732	000000	DVN	DBP	0
	00733	000000			
0467	00734	000000	DVE	DBP	0
	00735	000000			
0468	00736	000000	SINL	DBP	0
	00737	000000			
0469	00740	000000	COSL	DBP	0
	00741	000000			
0470	00742	000000	ATMP	DBP	0
	00743	000000			
0471	00744	000000	BTMP	DBP	0
	00745	000000			
0472	00746	000000	CTMP	DBP	0
	00747	000000			
0473	00750	000000	DTMP	DBP	0
	00751	000000			
0474	00752	131464	K1	DEC	-0.6B0
0475	00753	154632	K2	DEC	-0.3B0
0476	00754	000517	C1	DEC	21475.2963BB21
	00755	043227			
0477	00756	060522	C2	DEC	6378163BB23
	00757	054600			
0478	00760	004715	C3	DEC	19.60804BB8
	00761	065040			
0479	00762	000011	C4	DEC	9.80402BB15
	00763	063352			
0480	00764	055532	ERTS	DEC	0.53174941E-8B-27
0481	00765	046166	ERTD	DEC	0.1458423029E-3B-12
0482	00766	000000	DBP0	DBP	0
	00767	000000			
0483	00770	040000	AREV	OCT	40000,0
	00771	000000			

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0484	00772	012137	RDRV DEC	0.1591549B0
0485	00773	000000	SHFT DEC	0
0486	00774	127025	MP01 DEC	-.01B-6
0487	00775	050753	PP01 DEC	.01B-6
0488		000770	HPRV EQU	AREV
0489	00776	040100	END	
	00777	041100		
	01000	000077		

PROGRAM NAME:

SOURCE: PPUA

BINARY: BPPAC

ENTRY POINTS: (LOCATION): PPAC ('10770)

GENERAL DESCRIPTION:

This subroutine accumulates accelerometer pulses for the failure isolation, detection, classification and recertification programs in this system.

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0001				REL	
0002				SUBR	PPAC
0003	00000	0 000000	PPAC	DAC	**
0004	00001	000007		DBL	
0005	00002	0 02 00600		DLD	PAPC
0006	00003	0401 61		LRS	15
0007	00004	0 06 00664		DAD	PACA
0008	00005	0 04 00664		DST	PACA
0009	00006	0 02 00602		DLD	PBPC
0010	00007	0401 61		LRS	15
0011	00010	0 06 00665		DAD	PACB
0012	00011	0 04 00666		DST	PACB
0013	00012	0 02 00604		DLD	PCPC
0014	00013	0401 61		LRS	15
0015	00014	0 06 00670		DAD	PACC
0016	00015	0 04 00670		DST	PACC
0017	00016	0 02 00606		DLD	PDPC
0018	00017	0401 61		LRS	15
0019	00020	0 06 00672		DAD	PACD
0020	00021	0 04 00672		DST	PACD
0021	00022	0 02 00610		DLD	PEPC
0022	00023	0401 61		LRS	15
0023	00024	0 06 00674		DAD	PACE
0024	00025	0 04 00674		DST	PACE
0025	00026	0 02 00612		DLD	PFPC
0026	00027	0401 61		LRS	15
0027	00030	0 06 00676		DAD	PACF
0028	00031	0 04 00676		DST	PACF
0029	00032	000005		SGL	
0030	00033	-0 01 00000		JMP*	PPAC
0031		000600	PAPC	EQU	*600
0032		000602	PBPC	EQU	PAPC+2
0033		000604	PCPC	EQU	PAPC+4
0034		000606	PDPC	EQU	PAPC+6
0035		000610	PEPC	EQU	PAPC+8
0036		000612	PFPC	EQU	PAPC+10
0037		000664	PACA	EQU	*664
0038		000665	PACB	EQU	PACA+2
0039		000670	PACC	EQU	PACA+4
0040		000672	PACD	EQU	PACA+6
0041		000674	PACE	EQU	PACA+8
0042		000676	PACF	EQU	PACA+10
0043				END	

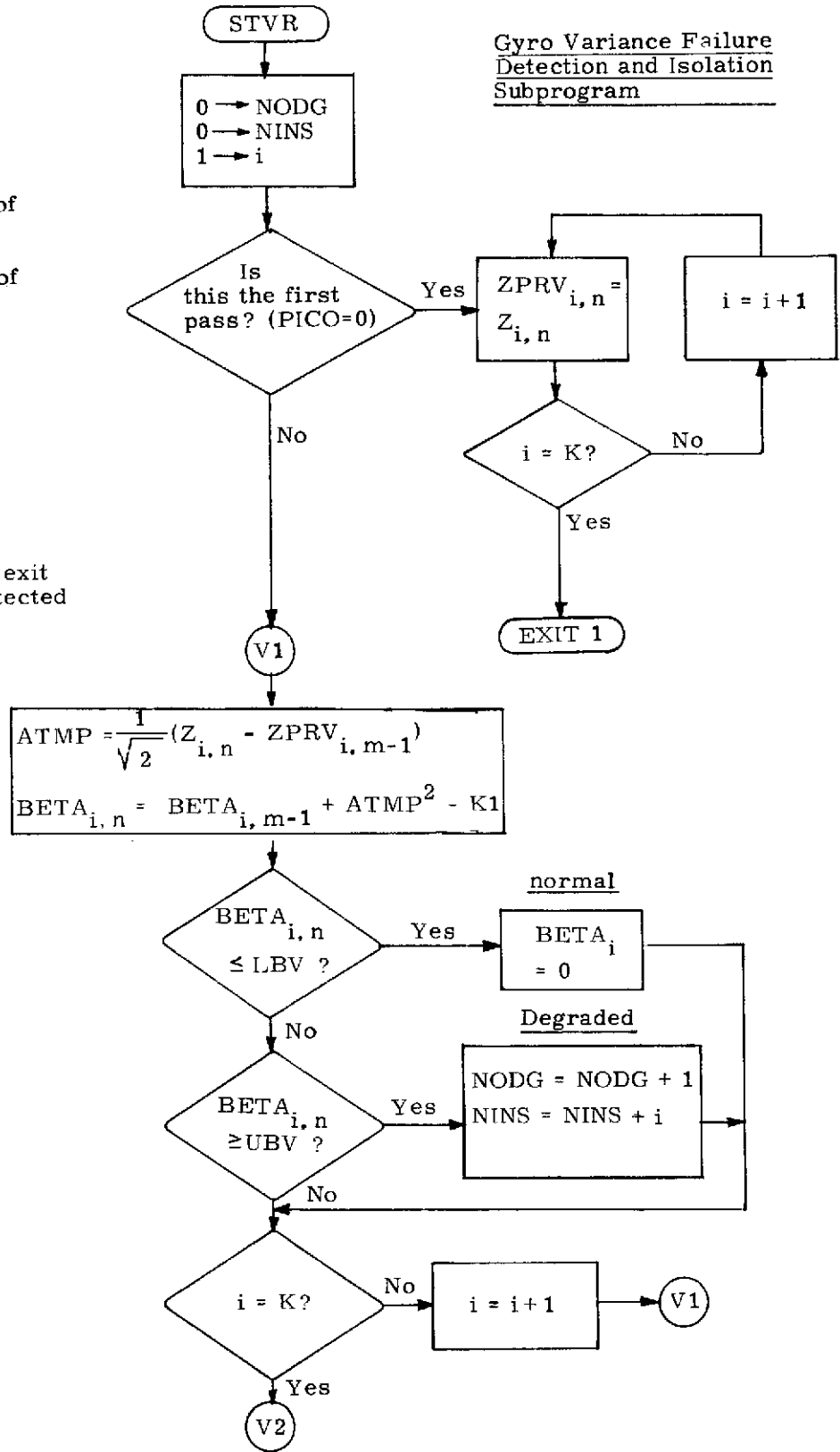
PROGRAM NAME:
SOURCE: STVR
BINARY: BSTVR
ENTRY POINTS (location): STVR('11024)
GENERAL DESCRIPTION:

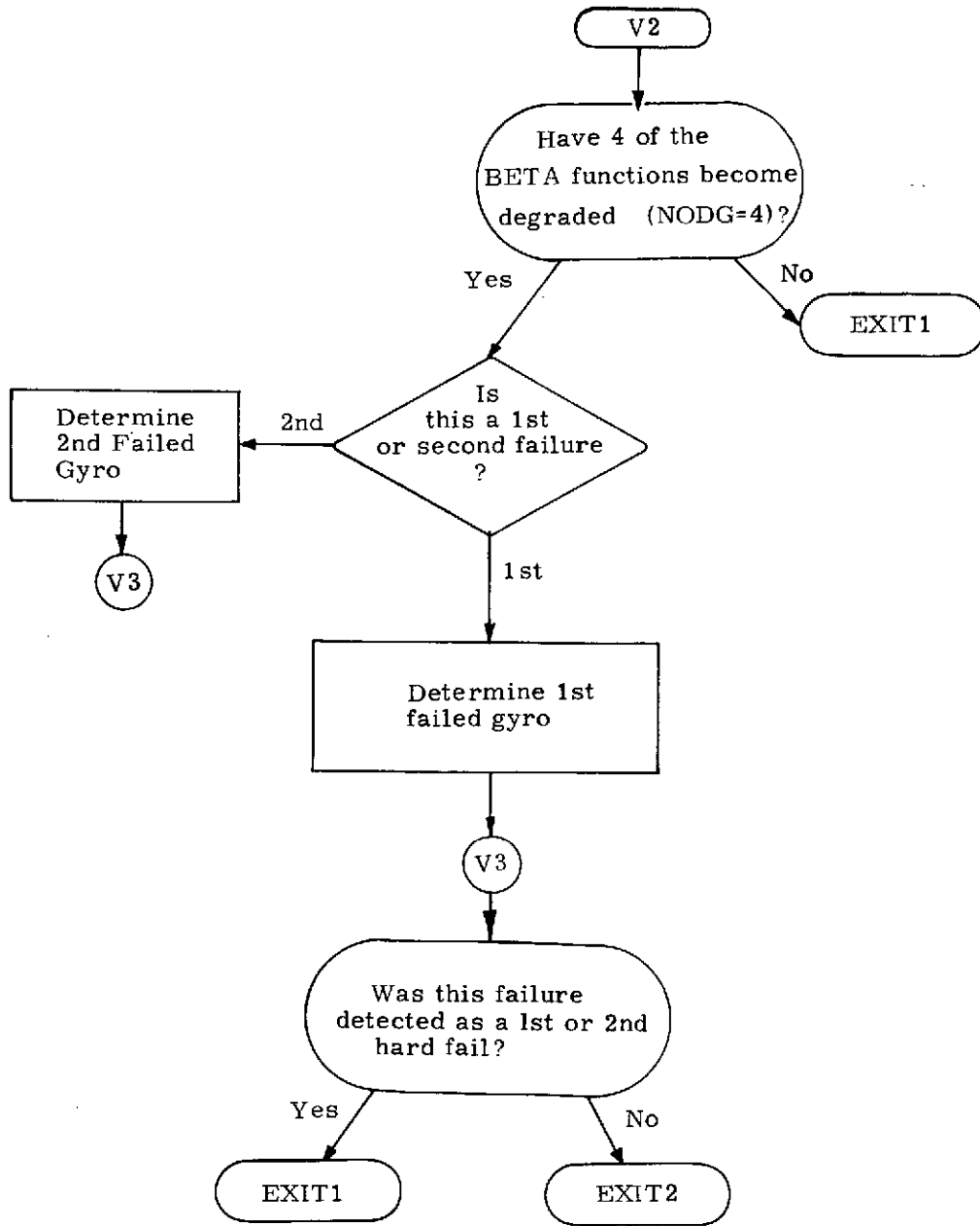
This subroutine performs the detection and isolation of a gyro variance failure. This is accomplished by computing a set of variance degradation functions. When four of these functions have exceeded a certain limit, a variance failure is detected. Which functions have degraded determine which gyro is at fault. Once a gyro variance failure is detected and isolated, the gyro is put off-line by the controlling program STFL. No attempt at healing the failure is made.

Gyro Variance Failure
Detection and Isolation
Subprogram

note:
K = { 6 for detection of
1st failure
5 for detection of
2nd failure

EXIT1 = no failure exit
EXIT2 = failure detected
exit





DATA ITEM DEFINITIONS

ZPRV (ZPRV → ZPRV + 11)	Table of parity equation residuals from previous iteration.
BETA (BETA → BETA + 11)	Table of variance failure detection functions.
K1 (K1)	Constant used in computing variance failure detection functions, BETA where σ_p^2 = maximum parity equation residual variance.
UBV (UBV)	Constant used in testing variance failure detection function. If $BETA_1 \geq UBV$, then a degraded variance has been detected.
LBV (LBV)	Constant used in testing variance failure detection functions. If $BETA_1 \leq LBV$, then the normal variance mode is confirmed. $LBV = -UBV$
NODG (NODG)	No. of BETA functions/iteration which have become degraded (4 needed for isolation).
NINS (NINS)	Arithmetic sum of the indices of those BETA Functions which have become degraded. Used in isolation of the failed gyro.
PICD (PICD)	First pass indicator (0=1st pass, +1 = other than 1st pass).

MICROCOMP TELECOMMUNICATED DATA
NDP-516 ASSEMBLY LISTING

0001				SUBR	ZETA
0002				SUBR	STVR
0003				REL	
0004	00000	0 000000	STVR	DAC	**
0005	00001	0 04 00271		STA	VRIN
0006	00002	0 35 00304		LDX	=0
0007	00003	140040		CRA	
0008	00004	0 04 00270		STA	NODG
0009	00005	0 04 00267		STA	NINS
0010	00006	0 02 00266		LDA	P1CD
0011	00007	100040		SZE	
0012	00010	0 01 00025		JMP	NINP
0013	00011	000007	VLP1	DBL	
0014	00012	1 02 00622		DLD	Z,1
0015	00013	1 04 00230		DST	ZPRV,1
0016	00014	000005		SGL	
0017	00015	0 02 00000		LDA	0
0018	00016	0 06 00303		ADD	=2
0019	00017	0 04 00000		STA	0
0020	00020	0 07 00271		SUB	VRIN
0021	00021	100040		SZE	
0022	00022	0 01 00011		JMP	VLP1
0023	00023	0 12 00266		IRS	P1CD
0024	00024	-0 01 00000		JMP*	STVR
0025	00025	000007	NINP	DBL	
0026	00026	1 02 00622		DLD	Z,1
0027	00027	1 07 00230		DSB	ZPRV,1
0028	00030	0 04 00224		DST	ATMP
0029	00031	1 02 00622		DLD	Z,1
0030	00032	1 04 00230		DST	ZPRV,1
0031	00033	0 02 00224		DLD	ATMP
0032	00034	0 16 00272		MPY	ISP2
0033	00035	0 04 00226		DST	BTMP
0034	00036	0 02 00224		DLD	ATMP
0035	00037	000201		IAB	
0036	00040	0 16 00272		MPY	ISP2
0037	00041	0401 61		IRS	15
0038	00042	0 06 00226		DAD	BTMP
0039	00043	0411 71		LLS	7
0040	00044	0 04 00224		DST	ATMP
0041	00045	0 16 00224		MPY	ATMP
0042	00046	0 04 00226		DST	BTMP
0043	00047	0 02 00224		DLD	ATMP
0044	00050	000201		IAB	
0045	00051	0 16 00224		MPY	ATMP
0046	00052	0401 62		IRS	14
0047	00053	0 06 00226		DAD	BTMP
0048	00054	0411 77		LLS	1
0049	00055	1 06 00244		DAD	BETA,1
0050	00056	0 07 00264		DSB	K1
0051	00057	1 04 00244		DST	BETA,1
0052	00060	0 07 00260		DSB	UBV
0053	00061	100400		SPL	
0054	00062	0 01 00073		JMP	NMCK
0055	00063	0 12 00270		IRS	NODG
0056	00064	000005		SGL	
0057	00065	0 02 00000		LDA	0

MICROCOMP TELECOMMUNICATED DATA
 PDP-516 ASSEMBLY LISTING

0058	00066	0405 77	ARS	1
0059	00067	0 06 00302	ADD	=1
0060	00070	0 06 00267	ADD	NINS
0061	00071	0 04 00267	STA	NINS
0062	00072	0 01 00106	JMP	INVL
0063	00073	1 02 00244	NMCK DLD	BETA,1
0064	00074	0 07 00262	DSB	LBV
0065	00075	0 11 00222	CAS	DBPO
0066	00076	0 01 00106	JMP	INVL
0067	00077	0 01 00101	JMP	*+2
0068	00100	0 01 00104	JMP	*+4
0069	00101	000201	IAB	
0070	00102	100040	SZE	
0071	00103	0 01 00106	JMP	INVL
0072	00104	0 02 00222	DLD	DBPO
0073	00105	1 04 00244	DST	BETA,1
0074	00106	000005	INVL SGL	
0075	00107	0 02 00000	LDA	0
0076	00110	0 06 00303	ADD	=2
0077	00111	0 04 00000	STA	0
0078	00112	0 07 00271	SUB	VRIN
0079	00113	100040	SZE	
0080	00114	0 01 00025	JMP	NINP
0081	00115	0 02 00270	LDA	NODG
0082	00116	0 07 00301	SUB	=4
0083	00117	100040	SZE	
0084	00120	-0 01 00000	JMP*	STVR
0085	00121	0 02 00640	LDA	FLST
0086	00122	100040	SZE	
0087	00123	0 01 00151	JMP	F2IS
0088	00124	0 02 00300	LDA	=21
0089	00125	0 07 00267	SUB	NINS
0090	00126	0 07 00277	SUB	=3
0091	00127	101040	SNZ	
0092	00130	0 01 00167	JMP	VEFL
0093	00131	0 07 00303	SUB	=2
0094	00132	101040	SNZ	
0095	00133	0 01 00170	JMP	VDFL
0096	00134	0 07 00302	SUB	=1
0097	00135	101040	SNZ	
0098	00136	0 01 00166	JMP	VFPL
0099	00137	0 07 00302	SUB	=1
0100	00140	101040	SNZ	
0101	00141	0 01 00171	JMP	VCFL
0102	00142	0 07 00277	SUB	=3
0103	00143	101040	SNZ	
0104	00144	0 01 00172	JMP	VEFL
0105	00145	0 07 00302	SUB	=1
0106	00146	101040	SNZ	
0107	00147	0 01 00173	JMP	VAFL
0108	00150	-0 01 00000	JMP*	STVR
0109	00151	0 02 00276	F2IS LDA	=15
0110	00152	0 07 00267	SUB	NINS
0111	00153	0 04 00267	STA	NINS
0112	00154	0 02 00275	LDA	=6
0113	00155	0 07 00640	SUB	FLST
0114	00156	0 11 00267	CAS	NINS

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0115	00157	101000		NOP	
0116	00160	0 01 00164		JMP	**4
0117	00161	0 02 00275		LDA	=6
0118	00162	0 07 00267		SUB	NINS
0119	00163	0 01 00174		JMP	EROT
0120	00164	0 02 00274		LDA	=7
0121	00165	0 01 00162		JMP	*-3
0122	00166	141206	VFFL	AOA	
0123	00167	141206	VEFL	AOA	
0124	00170	141206	VDFL	AOA	
0125	00171	141206	VCFL	AOA	
0126	00172	141206	VBFL	AOA	
0127	00173	141206	VAFI	AOA	
0128	00174	0 11 00316	EROT	CAS	'316
0129	00175	0 01 00177		JMP	**2
0130	00176	0 01 00204		JMP	NTVR
0131	00177	0 11 00317		CAS	'317
0132	00200	0 01 00202		JMP	**2
0133	00201	0 01 00204		JMP	NTVR
0134	00202	0 12 00000		IRS	STVR
0135	00203	-0 01 00000		JMP*	STVR
0136	00204	0 10 00000	NTVR	CALL	ZBTA
0137	00205	-0 01 00000		JMP*	STVR
0138	00206	0 000000	ZBTA	DAC	**
0139	00207	000007		DBL	
0140	00210	0 35 00273		LDX	--12
0141	00211	0 02 00222		DLD	DBPO
0142	00212	1 04 00260	ZRPT	DST	RFTA+12,1
0143	00213	0 12 00000		IRS	0
0144	00214	0 12 00000		IRS	0
0145	00215	0 01 00212		JMP	ZRBT
0146	00216	000005		SGL	
0147	00217	140040		CRA	
0148	00220	0 04 00266		STA	P1CD
0149	00221	-0 01 00206		JMP*	ZBTA
0150	00222	000000	DBPO	DBP	0
	00223	000000			
0151	00224	000000	ATMP	DBP	0
	00225	000000			
0152	00226	000000	RTMP	DBP	0
	00227	000000			
0153	00230	000000	ZPRV	BSZ	12
	00231	000000			
	00232	000000			
	00233	000000			
	00234	000000			
	00235	000000			
	00236	000000			
	00237	000000			
	00240	000000			
	00241	000000			
	00242	000000			
	00243	000000			
0154	00244	000000	BETA	BSZ	12
	00245	000000			
	00246	000000			
	00247	000000			

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

00250	000000	
00251	000000	
00252	000000	
00253	000000	
00254	000000	
00255	000000	
00256	000000	
00257	000000	
0155		
0156		* THE FOLLOWING CONSTANTS ARE FOR
0157		* K EQUAL TO 2
0158		* SIGMA EQUAL TO 3.64
		* P
0159	00260	000363
	00261	041625
0160	00262	177414
	00263	036153
0161	00264	000022
	00265	027432
0162		
0163	00266	000000
0164	00267	000000
0165	00270	000000
0166	00271	000000
0167	00272	055205
0168		000622
0169		000640
0170	00273	177764
	00274	000007
	00275	000006
	00276	000017
	00277	000003
	00300	000025
	00301	000004
	00302	000001
	00303	000002
	00304	000000
		UBV DBP 243.528BB15
		LRV DBP -243.528BB15
		K1 DBP 18.368BB15
		* END OF CONSTANTS
		PICD DEC 0
		NINS DEC 0
		NODG DEC 0
		VRIN DEC 0
		ISP2 DEC 0.7072B0
		Z EQU '622
		FLST EQU '640
		FND

PROGRAM NAME:

SOURCE: SINX

BINARY: BSINX

ENTRY POINTS: (LOCATION): SINX ('11351), COSX ('11332)

GENERAL DESCRIPTION:

This subroutine will compute the sine or cosine of an angle depending on which entry point is called. The input to the subroutine is assumed to be a double precision angle in revolutions scaled $B\phi$ in the A,B reg. The sine or cosine is returned in the A,B reg scaled B1. In the case of the sine, the angle is first reduced to an equivalent angle between $\pm \pi / 2$. The sine is then computed using a 5 term series expansion. The cosine of the input angle is computed from the identity: $\cos x = \sin\left(\frac{\pi}{2} - x\right)$ where x is the input angle.

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0001				SUBR	SINX
0002				SUBR	COSX
0003				REL	
0004	00000	0 000000	COSX	DAC	**
0005	00001	0 04 00140		DST	ARG
0006	00002	000005		SGL	
0007	00003	0 02 00000		LDA	COSX
0008	00004	0 04 00017		STA	SINX
0009	00005	000007		DBL	
0010	00006	0 02 00140		DLD	ARG
0011	00007	101400		SMI	
0012	00010	0 01 00014		JMP	**+4
0013	00011	0 02 00142		DLD	DBPO
0014	00012	0 07 00140		DSB	ARG
0015	00013	0 04 00140		DST	ARG
0016	00014	0 02 00150		DLD	QRRV
0017	00015	0 07 00140		DSB	ARG
0018	00016	100000		SKP	
0019	00017	0 000000	SINX	DAC	**
0020	00020	0 15 00164		STX	SVIN
0021	00021	0 04 00140		DST	ARG
0022	00022	0 04 00132		DST	ATMP
0023	00023	140200		RCB	
0024	00024	0411 77		LLS	1
0025	00025	101001		SSC	
0026	00026	0 01 00030		JMP	**+2
0027	00027	0 10 00116		JST	RDAG
0028	00030	0 04 00140		DST	ARG
0029	00031	140200		RCB	
0030	00032	0411 77		ILS	1
0031	00033	101001		SSC	
0032	00034	0 01 00037		JMP	SINB
0033	00035	0 10 00116		JST	RDAG
0034	00036	0 04 00140		DST	ARG
0035	00037	0 02 00140	SINB	DLD	ARG
0036	00040	0 16 00140		MPY	ARG
0037	00041	0 04 00136		DST	ARG2
0038	00042	0 02 00140		DLD	ARG
0039	00043	000201		IAB	
0040	00044	0 16 00140		MPY	ARG
0041	00045	0401 62		LRS	14
0042	00046	0 06 00136		DAD	ARG2
0043	00047	0 04 00136		DST	ARG2
0044	00050	0 35 00165		JDX	==8
0045	00051	0 02 00152		DLD	CONS
0046	00052	0 04 00134		DST	ACML
0047	00053	0 02 00136	CMPL	DLD	ARG2
0048	00054	0 16 00134		MPY	ACML
0049	00055	0 04 00132		DST	ATMP
0050	00056	0 02 00136		DLD	ARG2
0051	00057	000201		TAB	
0052	00060	0 16 00134		MPY	ACML
0053	00061	0401 61		LRS	15
0054	00062	0 06 00132		DAD	ATMP
0055	00063	0 04 00132		DST	ATMP
0056	00064	0 02 00134		DLD	ACML
0057	00065	000201		IAB	

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0058	00066	0 16 00136	MPY	ARG2
0059	00067	0401 61	IRS	15
0060	00070	0 06 00132	DAD	ATMP
0061	00071	1 06 00164	DAD	CONS+10,1
0062	00072	0 04 00134	DST	ACML
0063	00073	0 12 00000	TRS	0
0064	00074	0 12 00000	IRS	0
0065	00075	0 01 00053	JMP	CMPL
0066	00076	0 16 00140	MPY	ARG
0067	00077	0 04 00132	DST	ATMP
0069	00100	0 02 00134	DLD	ACML
0069	00101	000201	IAB	
0070	00102	0 16 00140	MPY	ARG
0071	00103	0401 61	IRS	15
0072	00104	0 06 00132	DAD	ATMP
0073	00105	0 04 00132	DST	ATMP
0074	00106	0 02 00140	DLD	ARG
0075	00107	000201	IAB	
0076	00110	0 16 00134	MPY	ACML
0077	00111	0401 61	IRS	15
0078	00112	0 06 00132	DAD	ATMP
0079	00113	0411 76	LLS	2
0080	00114	0 35 00164	LDX	SVIN
0081	00115	-0 01 00017	JMP*	SINX
0082	00116	0 000000	RDAG DAC	**
0083	00117	0 02 00140	DLD	ARG
0084	00120	101400	SMT	
0085	00121	0 01 00124	JMP	**3
0086	00122	0 02 00146	DLD	MHFR
0087	00123	0 01 00125	JMP	**2
0088	00124	0 02 00144	DLD	HFRV
0089	00125	0 07 00132	DSB	ATMP
0090	00126	0 04 00132	DST	ATMP
0091	00127	0411 77	LLS	1
0092	00130	-0 01 00116	JMP*	RDAG
0093	00132	000000	ATMP DBP	0
	00133	000000		
0094	00134	000000	ACML DBP	0
	00135	000000		
0095	00136	000000	ARG2 DBP	0
	00137	000000		
0096	00140	000000	ARG DBP	0
	00141	000000		
0097	00142	000000	DBP0 DBP	0
	00143	000000		
0098	00144	040000	HFRV OCT	40000,0
	00145	000000		
0099	00146	140000	MHFR OCT	140000,0
	00147	000000		
0100	00150	020000	QRRV OCT	20000,0
	00151	000000		
0101	00152	000475	CONS DEC	0.009694988BB0
	00153	053672		
0102	00154	173155	DEC	-0.074780249BB0
	00155	046350		
0103	00156	024315	DEC	0.318758717BB0
	00157	005366		

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0104	00160	126521	DEC	-0.6459637111BB0
	00161	003723		
0105	00162	031103	DEC	0.3926990796BB0
	00163	075522		
0106	00164	000000	SVIN DEC	0
0107	00165	177770	END	

PROGRAM NAME:
SOURCE: MAL6
BINARY: BMAL6
ENTRY POINTS (LOCATION): FALN ('11520)
GENERAL DESCRIPTION:

This subroutine calculates the small inertial frame rotations to fine align the quaternion to an inertial frame of Down, East and South. It uses the sum of delta velocity East and South over a one second interval to calculate these rotations. It employs a time varying filter for both levelling and azimuth alignment. The levelling has two gains, one for the first sixty seconds and the other after sixty seconds. Azimuth alignment starts three minutes after levelling starts and has a gain change seven minutes later or ten minutes after the fine align program starts.

In this SIRU end-to-end program the fine alignment is scheduled to start at 260 seconds into the run, immediately after coarse alignment is complete. The following procedure is iterated once per second

$$SDVE = 2^{14} \Sigma \Delta V_{YI}$$

$$SDVS = 2^{14} \Sigma \Delta V_{ZI}$$

$$\Sigma \Delta V_{XI} = 0$$

$$\Sigma \Delta V_{YI} = 0$$

$$\Sigma \Delta V_{ZI} = 0$$

(see source program VACU for scaling of $\Sigma \Delta V$)

$$0 < t < 60 \quad VPBE = \left(1 - \frac{9}{32}\right) VPBE + SDVE$$

$$VPBE = \left(1 - \frac{9}{16}\right) VPBE + \frac{9}{16} VPBE$$

$$MZ = \frac{43}{512} VPBE + CONZ$$

$$\begin{aligned} \text{VPAS} &= \left(1 - \frac{9}{32}\right) \text{VPAS} + \text{SDVS} \\ \text{VPBS} &= \left(1 - \frac{9}{16}\right) \text{VPBS} + \frac{9}{16} \text{VPAS} \\ \text{MY} &= \frac{-43}{512} \text{VPBS} \end{aligned}$$

60 < t

$$\begin{aligned} \text{VPAE} &= \left(1 - \frac{3}{64}\right) \text{VPAE} + \text{SDVE} \\ \text{VPBE} &= \left(1 - \frac{3}{32}\right) \text{VPBE} + \frac{3}{32} \text{VPAE} \\ \text{MZ} &= \frac{9}{4096} \text{VPBE} + \text{CONZ} \end{aligned}$$

$$\begin{aligned} \text{VPAS} &= \left(1 - \frac{3}{64}\right) \text{VPAS} + \text{SDVS} \\ \text{VPBS} &= \left(1 - \frac{3}{32}\right) \text{VPBS} + \frac{3}{32} \text{VPAS} \\ \text{MY} &= -\frac{9}{4096} \text{VPBS} \end{aligned}$$

0 < t < 180

$$\text{MX} = 0$$

180 < t < 600

$$\begin{aligned} \text{VPRD} &= \left(1 - \frac{5}{128}\right) \text{VPRD} + \frac{5}{128} \text{VPBS} \\ \text{MX} &= -\frac{3}{16} \text{VPRD} + \text{CONX} \end{aligned}$$

600 < t

$$\begin{aligned} \text{VPRD} &= \left(1 - \frac{5}{512}\right) \text{VPRD} + \frac{5}{512} \text{VPBS} \\ \text{MX} &= -\frac{3}{32} \text{VPRD} + \text{CONX} \end{aligned}$$

where MX, MY and MZ are the inertial angular commands used by program IRCO. CONX and CONZ are the nominal earth rate inertial angular commands used by IRCO for Down, East and South coordinates.

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

REL	SUBR	FALN	FALN
0001			
0002			
0003	00000	0 000000	FALN DAC **
0004	00001	000007	DBL
0005	00002	0 02 00450	DLD '450
0006	00003	0411 62	LLS 14
0007	00004	0 04 00254	DST SDVE
0008	00005	0 02 00454	DLD '454
0009	00006	0411 62	LLS 14
0010	00007	0 04 00256	DST SDVS
0011	00010	0 02 00224	DLD DBPO
0012	00011	0 04 00444	DST '444
0013	00012	0 04 00450	DST '450
0014	00013	0 04 00454	DST '454
0015	00014	0 02 00776	DLD TIME
0016	00015	0 07 00246	DSB SIXT
0017	00016	101400	SMI
0018	00017	0 01 00102	JMP AP60
0019	00020	0 02 00224	DLD DBPO
0020	00021	0 07 00226	DSB VPAB
0021	00022	0401 75	LRS 3
0022	00023	0 07 00226	DSB VPAB
0023	00024	0401 76	LRS 2
0024	00025	0 06 00226	DAD VPAB
0025	00026	0 06 00254	DAD SDVE
0026	00027	0 04 00226	DST VPAB
0027	00030	0 07 00232	DSB VPBE
0028	00031	0 04 00240	DST TEMP
0029	00032	0401 75	LRS 3
0030	00033	0 06 00240	DAD TEMP
0031	00034	0401 77	LRS 1
0032	00035	0 06 00232	DAD VPBE
0033	00036	0 04 00232	DST VPBE
0034	00037	0 02 00224	DLD DBPO
0035	00040	0 07 00230	DSB VPAS
0036	00041	0401 75	LRS 3
0037	00042	0 07 00230	DSB VPAS
0038	00043	0401 76	LRS 2
0039	00044	0 06 00230	DAD VPAS
0040	00045	0 06 00256	DAD SDVS
0041	00046	0 04 00230	DST VPAS
0042	00047	0 07 00234	DSB VPBS
0043	00050	0 04 00240	DST TEMP
0044	00051	0401 75	LRS 3
0045	00052	0 06 00240	DAD TEMP
0046	00053	0401 77	LRS 1
0047	00054	0 06 00234	DAD VPBS
0048	00055	0 04 00234	DST VPBS
0049	00056	0401 76	LRS 2
0050	00057	0 06 00234	DAD VPBS
0051	00060	0401 76	LRS 2
0052	00061	0 07 00234	DSB VPBS
0053	00062	0401 77	LRS 1
0054	00063	0 07 00234	DSB VPBS
0055	00064	0401 74	LRS 4
0056	00065	0 04 00312	DST MY
0057	00066	0 02 00224	DLD DBPO

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0058	00067	0 07 00232	DSB	VPBE
0059	00070	0401 76	LRS	2
0060	00071	0 07 00232	DSB	VPBE
0061	00072	0401 76	LRS	2
0062	00073	0 06 00232	DAD	VPBE
0063	00074	0401 77	LRS	1
0064	00075	0 06 00232	DAD	VPBE
0065	00076	0401 74	LRS	4
0066	00077	0 06 00244	DAD	CONZ
0067	00100	0 04 00314	DST	MZ
0068	00101	0 01 00153	JMP	BF60
0069	00102	000007	AP60 DBL	
0070	00103	0 02 00226	DLD	VPAE
0071	00104	0401 76	LRS	2
0072	00105	0 07 00226	DSB	VPAE
0073	00106	0401 74	LRS	4
0074	00107	0 05 00226	DAD	VPAE
0075	00110	0 06 00254	DAD	SDVE
0076	00111	0 04 00226	DST	VPAE
0077	00112	0 07 00232	DSB	VPRE
0078	00113	0 04 00240	DST	TEMP
0079	00114	0401 77	LRS	1
0080	00115	0 06 00240	DAD	TEMP
0081	00116	0401 74	LRS	4
0082	00117	0 06 00232	DAD	VPRE
0083	00120	0 04 00232	DST	VPRE
0084	00121	0 02 00230	DLD	VPAS
0085	00122	0401 76	LRS	2
0086	00123	0 07 00230	DSB	VPAS
0087	00124	0401 74	LRS	4
0088	00125	0 06 00230	DAD	VPAS
0089	00126	0 06 00256	DAD	SDVS
0090	00127	0 04 00230	DST	VPAS
0091	00130	0 07 00234	DSB	VPRS
0092	00131	0 04 00240	DST	TEMP
0093	00132	0401 77	LRS	1
0094	00133	0 06 00240	DAD	TEMP
0095	00134	0401 74	LRS	4
0096	00135	0 06 00234	DAD	VPBS
0097	00136	0 04 00234	DST	VPBS
0098	00137	0 02 00224	DLD	DBPO
0099	00140	0 07 00234	DSB	VPRS
0100	00141	0401 75	LRS	3
0101	00142	0 07 00234	DSB	VPRS
0102	00143	0401 67	LRS	9
0103	00144	0 04 00312	DST	NY
0104	00145	0 02 00232	DLD	VPBE
0105	00146	0401 75	LRS	3
0106	00147	0 06 00232	DAD	VPBE
0107	00150	0401 67	LRS	9
0108	00151	0 06 00244	DAD	CONZ
0109	00152	0 04 00314	DST	MZ
0110	00153	0 02 00776	BF60 DLD	TIME
0111	00154	0 07 00250	DSB	OH80
0112	00155	100400	SPL	
0113	00156	0 01 00221	JMP	LEVO
0114	00157	0 07 00252	DSB	PH20

MICROCOMP TELECOMMUNICATED DATA
 DDP-516 ASSEMBLY LISTING

0115	00160	100400		SPL	
0116	00161	0 01 00202		JMP	ORAG
0117	00162	0 02 00234		DLD	VPBS
0118	00163	0 07 00236		DSB	VPRD
0119	00164	0 04 00240		DST	TEMP
0120	00165	0401 76		LRS	2
0121	00166	0 05 00240		DAD	TEMP
0122	00167	0401 71		LRS	7
0123	00170	0 06 00236		DAD	VPRD
0124	00171	0 04 00236		DST	VPRD
0125	00172	0 02 00224		DLD	DBPO
0126	00173	0 07 00236		DSB	VPRD
0127	00174	0401 77		LRS	1
0128	00175	0 07 00236		DSB	VPRD
0129	00176	0401 74		LRS	4
0130	00177	0 06 00242		DAD	CONX
0131	00200	0 04 00310		DST	MX
0132	00201	0 01 00221		JMP	LEVO
0133	00202	0 02 00234	ORAG	DLD	VPBS
0134	00203	0 07 00236		DSB	VPRD
0135	00204	0 04 00240		DST	TEMP
0136	00205	0401 76		LRS	2
0137	00206	0 06 00240		DAD	TEMP
0138	00207	0401 73		LRS	5
0139	00210	0 06 00236		DAD	VPRD
0140	00211	0 04 00236		DST	VPRD
0141	00212	0 02 00224		DLD	DBPO
0142	00213	0 07 00236		DSB	VPRD
0143	00214	0401 77		LRS	1
0144	00215	0 07 00236		DSB	VPRD
0145	00216	0401 75		LRS	3
0146	00217	0 06 00242		DAD	CONX
0147	00220	0 04 00310		DST	MX
0148	00221	000005	LEVO	SGL	
0149	00222	-0 01 00000		JMP*	FALN
0150	00224	000000	DBPO	DBP	0
	00225	000000			
0151	00226	000000	VPAE	DBP	0
	00227	000000			
0152	00230	000000	VPAS	DBP	0
	00231	000000			
0153	00232	000000	VPBE	DBP	0
	00233	000000			
0154	00234	000000	VPBS	DBP	0
	00235	000000			
0155	00236	000000	VPRD	DBP	0
	00237	000000			
0156	00240	000000	TEMP	DBP	0
	00241	000000			
0157	00242	000004	CONX	OCT	4,7630
	00243	007630			
0158	00244	000004	CONZ	OCT	4,41210
	00245	041210			
0159	00246	000000	SIXT	DEC	32000BB30
	00247	076400			
0160	00250	000001	OH80	DEC	44000RB30
	00251	025740			

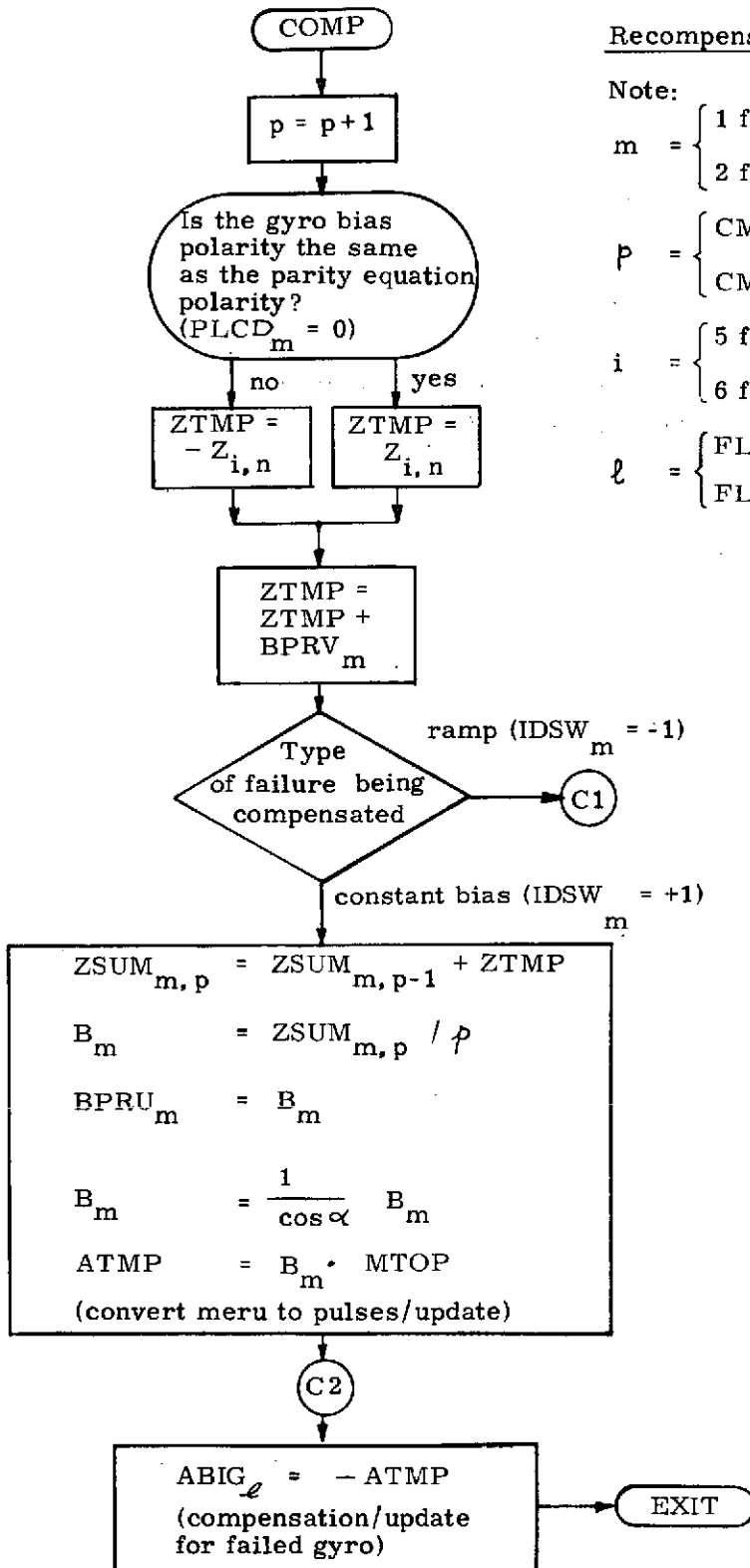
MICROCOMP TELECOMMUNICATED DATA

DDP-516 ASSEMBLY LISTING

0161	00252	000001	FH20 DEC	42000BB30
	00253	022020		
0162	00254	000000	SDVE DBP	0
	00255	000000		
0163	00256	000000	SDVS DBP	0
	00257	000000		
0164		000310	MX EQU	'310
0165		000312	MY EQU	MX+2
0166		000314	MZ EQU	MX+4
0167		000776	TIME EQU	'776
0168			END	

PROGRAM NAME
SOURCE: COMP
BINARY: BCOMP
ENTRY POINTS: (location): COMP ('12000)
GENERAL DESCRIPTION:

After identification/classification of a failure by IDEN, this subroutine will start to compute the constant bias/ramp compensation to heal the failure. After 10 iterations, the recertification process is started via subroutine IDEN. Recompensation will stop as soon as the gyro has been recertified with the latest value of the bias.



Recompensation Subroutine

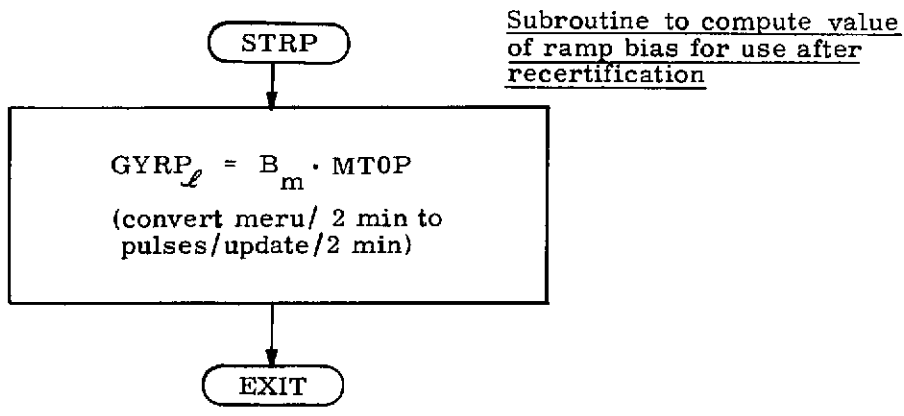
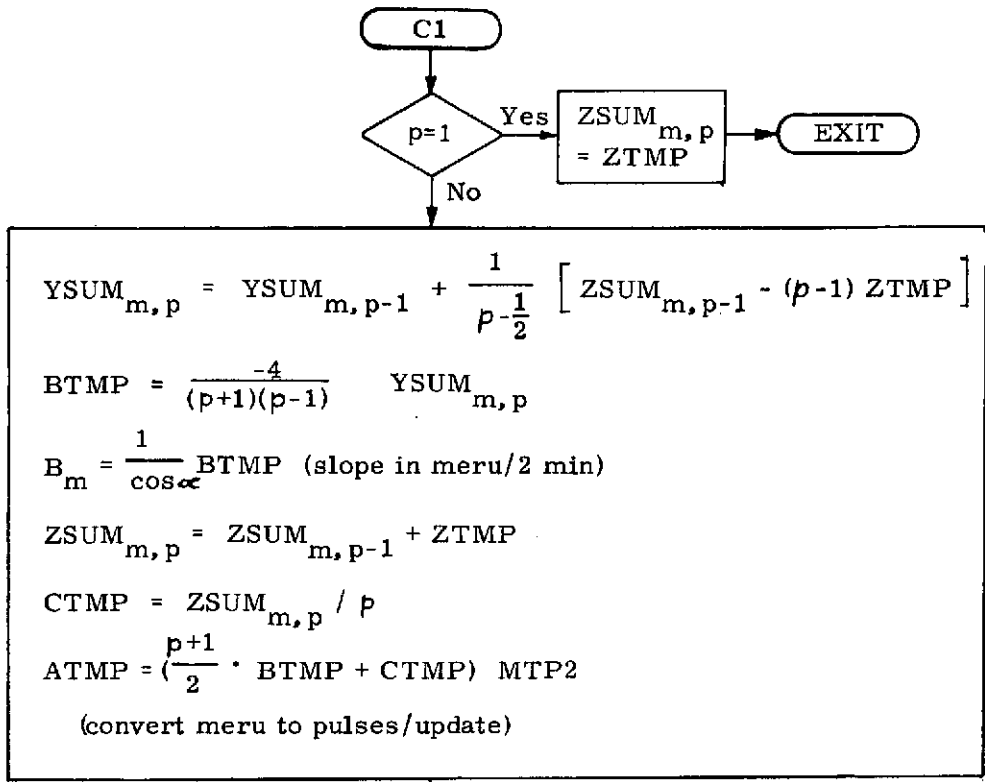
Note:

$$m = \begin{cases} 1 & \text{for 1st failure} \\ 2 & \text{for 2nd failure} \end{cases}$$

$$p = \begin{cases} \text{CMPI}_1 & \text{for 1st failure} \\ \text{CMPI}_2 & \text{for 2nd failure} \end{cases}$$

$$i = \begin{cases} 5 & \text{for 2nd failure} \\ 6 & \text{for 1st failure} \end{cases}$$

$$l = \begin{cases} \text{FLST}_1 & \text{for 1st failure} \\ \text{FLST}_2 & \text{for 2nd failure} \end{cases}$$



DATA ITEM DEFINITIONS

CMPI ₁	(CMPI + 2)	Iteration counter used in recompensation of a 1st failure
CMPI ₂	(CMPI)	Same as above except for a 2nd failure
PLCD ₁	(PLCD + 2)	gyro bias polarity indicator for 1st failure recompensation. (0 = gyro bias has the same sign as parity equation polarity, + 1 = gyro bias has the opposite sign of the parity equation polarity)
PLCD ₂	(PLCD)	same as above except for a 2nd failure
BPRV ₁	(BPRV + 2)	Previous iteration's computed value for bias compensation of a 1st failure (parity equation bias rather than gyro bias)
BPRV ₂	(BPRV)	same as above except for a 2nd failure
ZSUM ₁	(ZSUM + 2)	Parity equation residual accumulator for a 1st failure.
		$ZSUM_1 = \sum_{p=0}^{CMPI_1} Z_{6,p}$
		where p = 0 corresponds to the value of n at which the recompensation process starts.
ZSUM ₂	(ZSUM)	Same as above except for a 2nd failure
		$ZSUM_2 = \sum_{p=0}^{CMPI_2} Z_{5,p}$
YSUM ₁	(YSUM + 2)	Parity equation residual transformation accumulator used in recompensating a 1st failure when it is a ramp type.
YSUM ₂	(YSUM)	Same as above except for a 2nd failure ramp.
B ₁	(B + 2)	Computed value of the gyro compensation for a 1st failure. If the failure is of the constant bias type, B ₁ is the bias in meru. If the failure is of the ramp type, B ₁ is the slope in meru/2 min.

DATA ITEM DEFINITIONS (continued)

B ₂	(B)	same as above except for a 2nd failure.
MTOP	(MTOPI)	Constant used to convert a <u>gyro</u> bias in meru to <u>gyro</u> bias in pulses/update.
MTP2	(MTP2)	Constant used to convert a <u>parity equation</u> bias in meru to a <u>gyro</u> bias in pulses/update (MTP2 = MTOPI/cos α)
ABIG _e	(ABIG → ABIG + 11)	Table of 6 compensation values, in pulses to be added to its corresponding gyro each update cycle (50 times/sec)
GYRP _e	(GYRP → GYRP + 11)	Table of 6 ramp compensation values in pulses to be added to its corresponding ABIG _e (see above) every 2 min.

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0001				SUBR	COMP
0002				SUBR	CMIN
0003				SUBR	CMMV
0004				SUBR	B
0005				SUBR	BP2
0006				SUBR	STRP
0007				SUBR	GRMP
0008				SUBR	PLCD
0009				SUBR	PCP2
0010				SUBR	GRBI
0011				REL	
0012	00000	0 000000	COMP	DAC	**
0013	00001	000007		DEL	
0014	00002	1 02 00316		DLD	CMPI,1
0015	00003	0 06 00364		DAD	D1B6
0016	00004	1 04 00316		DST	CMPI,1
0017	00005	1 02 00356		DLD	PLCD,1
0018	00006	100400		SPL	
0019	00007	0 01 00012		JMP	**3
0020	00010	1 02 00632		DLD	Z+8,1
0021	00011	0 01 00014		JMP	**3
0022	00012	0 02 00314		DLD	DBPO
0023	00013	1 07 00632		DSB	Z+8,1
0024	00014	1 06 00322		DAD	BPRV,1
0025	00015	0 04 00312		DST	ZTMP
0026	00016	1 02 00642		DLD	IDSW,1
0027	00017	100400		SPL	
0028	00020	0 01 00076		JMP	RPCM
0029	00021	1 02 00332		DLD	ZSUM,1
0030	00022	0 06 00312		DAD	ZTMP
0031	00023	1 04 00332		DST	ZSUM,1
0032	00024	1 17 00316		DIV	CMPI,1
0033	00025	000201		IAB	
0034	00026	140040		CRA	
0035	00027	000201		IAB	
0036	00030	0401 72		LRS	6
0037	00031	1 04 00322		DST	BPRV,1
0038	00032	0 04 00304		DST	ATMP
0039	00033	0 16 00366		MPY	ICOS
0040	00034	1 04 00326		DST	B,1
0041	00035	0 02 00304		DLD	ATMP
0042	00036	000201		IAB	
0043	00037	0 16 00366		MPY	ICOS
0044	00040	0401 61		LRS	15
0045	00041	1 06 00326		DAD	B,1
0046	00042	0411 77		LLS	1
0047	00043	1 04 00326		DST	B,1
0048	00044	0 16 00367		MPY	MTOP
0049	00045	0 04 00304		DST	ATMP
0050	00046	1 02 00326		DLD	B,1
0051	00047	000201		IAB	
0052	00050	0 16 00367		MPY	MTOP
0053	00051	0401 61		LRS	15
0054	00052	0 06 00304		DAD	ATMP
0055	00053	0401 66		LRS	10
0056	00054	0 04 00304	RMPA	DST	ATMP
0057	00055	000005		SGL	

MICROCOMP TELECOMMUNICATED DATA
 NDP-516 ASSEMBLY LISTING

0058	00056	0 02 00000	LDA	0
0059	00057	100040	SZE	
0060	00060	0 01 00063	JMP	*+3
0061	00061	0 02 00641	LDA	FLST+1
0062	00062	0 01 00064	JMP	*+2
0063	00063	0 02 00640	LDA	FLST
0064	00064	0 07 00465	SUB	=1
0065	00065	0415 77	ALS	1
0066	00066	0 04 00000	STA	0
0067	00067	000007	DBL	
0068	00070	1 02 00422	PLD	ABIG,1
0069	00071	0 07 00304	DSB	ATMP
0070	00072	1 07 00422	DSB	ABIG,1
0071	00073	1 04 00422	DST	ABIG,1
0072	00074	000005	SGL	
0073	00075	-0 01 00000	JMP*	COMP
0074	00076	1 02 00316	RPCM DLD	CMPI,1
0075	00077	0 07 00364	DSB	D1B6
0076	00100	0 04 00306	DST	BTMP
0077	00101	100040	SZE	
0078	00102	0 01 00106	JMP	NTP1
0079	00103	0 02 00312	DLD	ZTMP
0080	00104	1 04 00332	DST	ZSUM,1
0081	00105	-0 01 00000	JMP*	COMP
0082	00106	0 06 00362	NTP1 DAD	DHB6
0083	00107	0 04 00310	DST	CTMP
0084	00110	0 02 00312	DLD	ZTMP
0085	00111	0 16 00306	MPY	BTMP
0086	00112	0 04 00304	DST	ATMP
0087	00113	0 02 00312	DLD	ZTMP
0088	00114	000201	IAB	
0089	00115	0 16 00306	MPY	BTMP
0090	00116	0401 61	LRS	15
0091	00117	0 06 00304	DAD	ATMP
0092	00120	0411 72	LLS	6
0093	00121	0 04 00304	DST	ATMP
0094	00122	1 02 00332	DLD	ZSUM,1
0095	00123	0 07 00304	DSB	ATMP
0096	00124	0 17 00310	DIV	CTMP
0097	00125	000201	IAB	
0098	00126	140040	CRA	
0099	00127	000201	IAB	
0100	00130	0401 72	LRS	6
0101	00131	1 06 00336	DAD	YSUM,1
0102	00132	1 04 00336	DST	YSUM,1
0103	00133	1 02 00316	DLD	CMPI,1
0104	00134	0 06 00364	DAD	D1B6
0105	00135	0 04 00310	DST	CTMP
0106	00136	0 16 00306	MPY	BTMP
0107	00137	0 04 00306	DST	BTMP
0108	00140	0 02 00314	DLD	DBPO
0109	00141	1 07 00336	DSB	YSUM,1
0110	00142	0 17 00306	DIV	BTMP
0111	00143	000201	IAB	
0112	00144	140040	CRA	
0113	00145	000201	IAB	
0114	00146	0401 67	LRS	9

MICROCOMP TELECOMMUNICATED DATA
 DDP-516 ASSEMBLY LISTING

0115	00147	0 04 00304	DST	ATMP
0116	00150	0 16 00366	MPY	ICOS
0117	00151	1 04 00326	DST	B,1
0118	00152	0 02 00304	DLD	ATMP
0119	00153	000201	IAB	
0120	00154	0 16 00366	MPY	ICOS
0121	00155	0401 61	LRS	15
0122	00156	1 06 00326	DAD	B,1
0123	00157	1 04 00326	DST	B,1
0124	00160	1 02 00332	DLD	ZSUM,1
0125	00161	0 06 00312	DAD	ZTMP
0126	00162	1 04 00332	DST	ZSUM,1
0127	00163	1 17 00316	DIV	CMPI,1
0128	00164	000201	IAB	
0129	00165	140040	CRA	
0130	00166	000201	IAB	
0131	00167	0401 72	LRS	6
0132	00170	0 04 00306	DST	BTMP
0133	00171	0 02 00304	DLD	ATMP
0134	00172	0 16 00310	MPY	CTMP
0135	00173	0 04 00312	DST	ZTMP
0136	00174	0 02 00304	DLD	ATMP
0137	00175	000201	IAB	
0138	00176	0 16 00310	MPY	CTMP
0139	00177	0401 61	LRS	15
0140	00200	0 06 00212	DAD	ZTMP
0141	00201	0411 74	LLS	4
0142	00202	0 06 00306	DAD	BTMP
0143	00203	1 04 00322	DST	BPRV,1
0144	00204	0 04 00304	DST	ATMP
0145	00205	0 16 00370	MPY	MTP2
0146	00206	0 04 00310	DST	CTMP
0147	00207	0 02 00304	DLD	ATMP
0148	00210	000201	IAB	
0149	00211	0 16 00370	MPY	MTP2
0150	00212	0401 61	LRS	15
0151	00213	0 06 00310	DAD	CTMP
0152	00214	0401 67	LRS	9
0153	00215	0 01 00054	JMP	RMPA
0154	00216	0 000000	CMTN DAC	**
0155	00217	000007	DBL	
0156	00220	101040	SNZ	
0157	00221	0 01 00224	JMP	*+3
0158	00222	0 02 00314	DLD	DBPO
0159	00223	1 04 00322	DST	BPRV,1
0160	00224	0 02 00314	DLD	DBPO
0161	00225	1 04 00316	DST	CMPI,1
0162	00225	1 04 00332	DST	ZSUM,1
0163	00227	1 04 00336	DST	YSUM,1
0164	00230	000005	SGL	
0165	00231	-0 01 00216	JMP*	CMIN
0166	00232	0 000000	CMNV DAC	**
0167	00233	000007	DBL	
0168	00234	0 02 00316	DLD	CMPI
0169	00235	0 04 00320	DST	CMPI+2
0170	00236	0 02 00332	DLD	ZSUM
0171	00237	0 04 00334	DST	ZSUM+2

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0172	00240	0 02 00326	DLD	R
0173	00241	0 04 00330	DST	B+2
0174	00242	0 02 00336	DLD	YSUM
0175	00243	0 04 00340	DST	YSUM+2
0176	00244	0 02 00356	DLD	PLCD
0177	00245	0 04 00360	DST	PLCD+2
0178	00246	0 02 00322	DLD	BPRV
0179	00247	0 04 00324	DST	BPRV+2
0180	00250	000005	SGL	
0181	00251	-0 01 00232	JMP*	CMNV
0182	00252	0 000000	STRP DAC	**
0183	00253	1 02 00326	DLD	B,1
0184	00254	0 16 00367	MPY	MTOP
0185	00255	0 04 00304	DST	ATMP
0186	00256	1 02 00326	DLD	B,1
0187	00257	000201	IAB	
0188	00260	0 16 00367	MPY	MTOP
0189	00261	0401 61	LRS	15
0190	00262	0 06 00304	DAD	ATMP
0191	00263	0401 66	LRS	10
0192	00264	0 04 00304	DST	ATMP
0193	00265	000005	SGL	
0194	00266	0 02 00000	LDA	0
0195	00267	100040	SZE	
0196	00270	0 01 00273	JMP	**3
0197	00271	0 02 00641	LDA	PLST+1
0198	00272	0 01 00274	JMP	**2
0199	00273	0 02 00640	LDA	PLST
0200	00274	0 07 00465	SUB	=1
0201	00275	0415 77	ALS	1
0202	00276	0 04 00000	STA	0
0203	00277	000007	DBL	
0204	00300	1 02 00342	DLD	GYRP,1
0205	00301	0 05 00304	DAD	ATMP
0206	00302	1 04 00342	DST	GYRP,1
0207	00303	-0 01 00252	JMP*	STRP
0208	00304	000000	ATMP DBP	0
	00305	000000		
0209	00306	000000	BTMP DBP	0
	00307	000000		
0210	00310	000000	CTMP DBP	0
	00311	000000		
0211	00312	000000	ZTMP DBP	0
	00313	000000		
0212	00314	000000	DBP0 DBP	0
	00315	000000		
0213	00316	000000	CMPI BSZ	4
	00317	000000		
	00320	000000		
	00321	000000		
0214	00322	000000	BPRV BSZ	4
	00323	000000		
	00324	000000		
	00325	000000		
0215	00326	000000	B BSZ	2
	00327	000000		
0216	00330	000000	BP2 DBP	0

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

	00331	000000			
0217	00332	000000	ZSUM BSZ	4	
	00333	000000			
	00334	000000			
	00335	000000			
0218	00336	000000	YSUM BSZ	4	
	00337	000000			
	00340	000000			
	00341	000000			
0219	00342	000000	GYRP BSZ	12	
	00343	000000			
	00344	000000			
	00345	000000			
	00346	000000			
	00347	000000			
	00350	000000			
	00351	000000			
	00352	000000			
	00353	000000			
	00354	000000			
	00355	000000			
0220	00356	000000	PLC0 BSZ	2	
	00357	000000			
0221	00360	000000	PCP2 BSZ	2	
	00361	000000			
0222	00362	000400	DHB6 DEC	0.5BB6	
	00363	000000			
0223	00364	001000	D1B6 DEC	1BB6	
	00365	000000			
0224	00366	045475	ICOS DEC	1.1756B1	
0225			* CONSTANT TO CONVERT MERN TO PULSES/UPDATE		
0226	00367	071216	MTOP DEC	0.6828E-5B-17	
0227			* CONSTANT EQUAL TO ABOVE CONSTANT TIMES 1/COS		
0228	00370	041525	MTP2 DEC	0.8027E-5B-16	
0229		000646	CMYX EQU	'646	
0230		000650	CPI EQU	'650	
0231		000622	Z EQU	'622	
0232		000642	IDSW EQU	'642	
0233		000640	FLST EQU	'640	
0234	00371	0 000000	GRBI DAC	**	
0235	00372	100020	SR1		
0236	00373	-0 01 00371	JMP*	GRBI	
0237	00374	000007	DBL		
0238	00375	0 02 00422	DLD	ABIG	
0239	00376	0 06 00400	DAD	GAPC	
0240	00377	0 04 00400	DST	GAPC	
0241	00400	0 02 00424	DLD	BBIG	
0242	00401	0 06 00402	DAD	GBPC	
0243	00402	0 04 00402	DST	GBPC	
0244	00403	0 02 00426	DLD	CBIG	
0245	00404	0 06 00404	DAD	GCPC	
0246	00405	0 04 00404	DST	GCPC	
0247	00406	0 02 00430	DLD	DBIG	
0248	00407	0 06 00406	DAD	GDPC	
0249	00410	0 04 00406	DST	GDPC	
0250	00411	0 02 00432	DLD	EBIG	
0251	00412	0 06 00410	DAD	GEPC	

MICROCOMP TELECOMMUNICATED DATA
 ODD-516 ASSEMBLY LISTING

0252	00413	0 04 00410	DST	GEPC
0253	00414	0 02 00434	DLD	FBIG
0254	00415	0 06 00412	DAD	GFPC
0255	00416	0 04 00412	DST	GFPC
0256	00417	000005	SGL	
0257	00420	-0 01 00371	JMP*	GRBI
0258	00422	000000	ABIG DBP	0
	00423	000000		
0259	00424	000000	BRIG DBP	0
	00425	000000		
0260	00426	000000	CBIG DBP	0
	00427	000000		
0261	00430	000000	DBIG DBP	0
	00431	000000		
0262	00432	000000	EBIG DBP	0
	00433	000000		
0263	00434	000000	FBIG DBP	0
	00435	000000		
0264		000400	GAPC EQU	'400
0265		000402	GBPC EQU	GAPC+2
0266		000404	GCPC EQU	GBPC+2
0267		000406	GDPC EQU	GCPC+2
0268		000410	GEPC EQU	GDPC+2
0269		000412	GFPC EQU	GEPC+2
0270	00436	0 000000	GRMP DAC	**
0271	00437	0 35 00464	LDX	==12
0272	00440	000007	DBL	
0273	00441	0 02 00776	DLD	'776
0274	00442	0 07 00460	DSB	TTMP
0275	00443	100400	SPL	
0276	00444	0 01 00456	JMP	GROT
0277	00445	0 02 00462	DLD	TMIN
0278	00446	0 06 00460	DAD	TTMP
0279	00447	0 04 00460	DST	TTMP
0280	00450	1 02 00436	GPLP DLD	ABIG+12,1
0281	00451	1 07 00356	DSB	GYRP+12,1
0282	00452	1 04 00436	DST	ABIG+12,1
0283	00453	0 12 00000	IRS	0
0284	00454	0 12 00000	IRS	0
0285	00455	0 01 00450	JMP	GRLP
0286	00456	000005	GROT SGL	
0287	00457	-0 01 00436	JMP*	GRMP
0288	00460	000000	TTMP DBP	0
	00461	000000		
0289	00462	000000	TMIN OCT	0,27340
	00463	027340		
0290	00464	177764	END	
	00465	000001		

PROGRAM NAME:
SOURCE: GPU A
BINARY: BGPAC
ENTRY POINTS (LOCATION): GPAC ('12466)
GENERAL DESCRIPTION:

This subroutine accumulates gyro pulses for the failure isolation, detection, classification and recertification programs in this system. It also accumulates $\Delta\theta$ body ($\Sigma |\Delta\theta_B|$) for the X, Y and Z axes, used to raise the TSE limit for dynamic environments.

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0001				REL	
0002				SUBR	GPAC
0003	00000	0 000000	GPAC	DAC	**
0004	00001	000007		DBL	
0005	00002	0 02 00400		DLD	GAPC
0006	00003	0401 61		LRS	15
0007	00004	0 06 00330		DAD	GACA
0008	00005	0 04 00330		DST	GACA
0009	00006	0 02 00402		DLD	GBPC
0010	00007	0401 61		LRS	15
0011	00010	0 06 00332		DAD	GACB
0012	00011	0 04 00332		DST	GACB
0013	00012	0 02 00404		DLD	GCPC
0014	00013	0401 61		LRS	15
0015	00014	0 06 00334		DAD	GACC
0016	00015	0 04 00334		DST	GACC
0017	00016	0 02 00406		DLD	GDPC
0018	00017	0401 61		LRS	15
0019	00020	0 06 00336		DAD	GACD
0020	00021	0 04 00336		DST	GACD
0021	00022	0 02 00410		DLD	GEPC
0022	00023	0401 61		LRS	15
0023	00024	0 06 00340		DAD	GACE
0024	00025	0 04 00340		DST	GACE
0025	00026	0 02 00412		DLD	GFPC
0026	00027	0401 61		LRS	15
0027	00030	0 06 00342		DAD	GACF
0028	00031	0 04 00342		DST	GACF
0029	00032	000005		SGL	
0030	00033	0 02 00414		LDA	DTXB
0031	00034	100400		SPL	
0032	00035	140407		TCA	
0033	00036	0 04 00056		STA	STSE
0034	00037	0 02 00416		LDA	DTYB
0035	00040	100400		SPL	
0036	00041	140407		TCA	
0037	00042	0 06 00056		ADD	STSE
0038	00043	0 04 00056		STA	STSE
0039	00044	0 02 00420		LDA	DTZB
0040	00045	100400		SPL	
0041	00046	140407		TCA	
0042	00047	0 06 00056		ADD	STSE
0043	00050	000007		DBL	
0044	00051	0401 61		LRS	15
0045	00052	0 06 00574		DAD	SUDT
0046	00053	0 04 00574		DST	SUDT
0047	00054	000005		SGL	
0048	00055	-0 01 00000		JMP*	GPAC
0049		000400	GPAC	EQU	'400
0050		000402	GBPC	EQU	GAPC+2
0051		000404	GCPC	EQU	GAPC+4
0052		000406	GDPC	EQU	GAPC+6
0053		000410	GEPC	EQU	GAPC+8
0054		000412	GFPC	EQU	GAPC+10
0055		000330	GACA	EQU	'330
0056		000332	GACB	EQU	GACA+2
0057		000334	GACC	EQU	GACA+4

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0058	000336	GACD EQU	GACA+6	
0059	000340	GACE EQU	GACA+8	
0060	000342	GACF EQU	GACA+10	
0061	000414	DTXB EQU	'414	
0062	000416	DTYB EQU	DTXB+2	
0063	000420	DTZB EQU	DTXB+4	
0064	000574	SUDT EQU	'574	
0065	00056	000000	STSE OCT	0
0066			END	

PROGRAM NAME
SOURCE: AZCA
BINARY: BAZCA
ENTRY POINTS (location):AZCA ('12546)
GENERAL DESCRIPTION:

This subroutine performs the final portion of the coarse alignment sequence: Azimuth alignment. As input, it uses the 200 sec worth of accumulated and filtered ΔV pulses from subroutine SVFL. It first computes the level frame-to-navigation frame quaternion LQN. It then computes the desired body frame-to-navigation frame quaternion BQN by quaternion multiplication:

$$BQN = LQN(BQL)$$

Where BQL is the quaternion computed in the leveling subroutine LUCA. BQN becomes the new system quaternion.

Compute Filtered Velocity
Components

AZCA

SVFY = S3-S4
SVFZ = S2-S1

Compute LQN:

$$B = \sqrt{SDFY^2 + SDFZ^2}$$

$$E = \sqrt{(1 - SDFY/B) / 2}$$

$$JX = \sqrt{(1 + SDFY/B) / 2}$$

-SDFZ
< 0?

Yes

JX = -JX

No

LQN
= (E, JX, 0, 0)

Compute BQN:

Let BQL = (LI, PIX, PIY, PIZ)
be quarternion computed in LVCA
and now the system quarternion
Then:

$$JIX = E(PIX) + LI(JX)$$

$$JIY = E(PIY) + JX(PIZ)$$

$$JIZ = E(PIZ) + JX(PIY)$$

$$EI = E(LI) - JX(PIX)$$

$$BQN = (EI, JIX, JIY, JIZ)$$

EXIT

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0001				SUBR	AZCA
0002				REL	
0003	00000	0 000000	AZCA	DAC	**
0004	00001	000007		DBL	
0005	00002	-0 02 00422		DLD*	S3C
0006	00003	-0 07 00423		DSB*	S4C
0007	00004	0411 76		LLS	2
0008	00005	0 04 00366		DST	SVFY
0009	00006	000101		NRM	
0010	00007	000005		SGL	
0011	00010	0 04 00370		STA	TMPA
0012	00011	000041		SCA	
0013	00012	0 04 00376		STA	SHF1
0014	00013	0 02 00370		LDA	TMPA
0015	00014	000007		DBL	
0016	00015	0 04 00370		DST	TMPA
0017	00016	-0 02 00421		DLD*	S2C
0018	00017	-0 07 00420		DSB*	S1C
0019	00020	0411 76		LLS	2
0020	00021	0 04 00364		DST	SVFZ
0021	00022	000101		NRM	
0022	00023	000005		SGL	
0023	00024	0 04 00372		STA	TMPB
0024	00025	000041		SCA	
0025	00026	0 04 00377		STA	SHF2
0026	00027	0 02 00372		LDA	TMPB
0027	00030	000007		DBL	
0028	00031	0 04 00372		DST	TMPB
0029	00032	000005		SGL	
0030	00033	0 02 00376		LDA	SHF1
0031	00034	0 11 00377		CAS	SHF2
0032	00035	0 01 00040		JMP	EXCH
0033	00036	101000		NOP	
0034	00037	0 01 00047		JMP	LDBT
0035	00040	0 02 00377	EXCH	LDA	SHF2
0036	00041	0 04 00376		STA	SHF1
0037	00042	000007		DBL	
0038	00043	0 02 00372		DLD	TMPB
0039	00044	0 04 00370		DST	TMPA
0040	00045	0 02 00366		DLD	SVFY
0041	00046	0 01 00051		JMP	LDBT+2
0042	00047	000007	LDBT	DBL	
0043	00050	0 02 00364		DLD	SVFZ
0044	00051	0 04 00372		DST	TMPB
0045	00052	000005		SGL	
0046	00053	0 02 00376		LDA	SHF1
0047	00054	140407		TCA	
0048	00055	0 03 00425		ANA	=*00077
0049	00056	0 05 00424		ERA	=*41100
0050	00057	0 04 00062		STA	LSHA
0051	00060	000007		DBL	
0052	00061	0 02 00372		DLD	TMPB
0053	00062	0411 00	LSHA	LLS	**
0054	00063	0 04 00372		DST	TMPB
0055	00064	0 16 00372		MPY	TMPB
0056	00065	0401 76		LRS	2
0057	00066	0 04 00374		DST	STMP

MICROCOMP TELECOMMUNICATED DATA
 RDP-516 ASSEMBLY LISTING

0059	00067	0 02 00372	DLD	TMPB
0059	00070	000201	IAB	
0060	00071	0 16 00372	MPY	TMPB
0061	00072	0401 60	LRS	16
0062	00073	0 06 00374	DAD	STMP
0063	00074	0 04 00374	DST	STMP
0064	00075	0 02 00370	DLD	TMPA
0065	00076	0 16 00370	MPY	TMPA
0066	00077	0401 76	LRS	2
0067	00100	0 06 00374	DAD	STMP
0068	00101	0 04 00374	DST	STMP
0069	00102	0 02 00370	DLD	TMPA
0070	00103	000201	IAB	
0071	00104	0 16 00370	MPY	TMPA
0072	00105	0401 60	LRS	16
0073	00106	0 06 00374	DAD	STMP
0074	00107	0 10 00000	CALL	DSQR
0075	00110	0 04 00374	DST	STMP
0076	00111	000005	SGL	
0077	00112	0 02 00376	LDA	SHF1
0078	00113	140407	TCA	
0079	00114	0 03 00425	ANA	= '00077
0080	00115	0 05 00424	ERA	= '41100
0081	00116	0 04 00121	STA	LSHB
0082	00117	000007	DBI	
0083	00120	0 02 00366	DLD	SVFY
0084	00121	0411 00	LSH ^a LLS	**
0085	00122	0401 75	LRS	3
0086	00123	0 17 00374	DIV	STMP
0087	00124	0401 61	LRS	15
0088	00125	0411 61	LLS	15
0089	00126	0 04 00374	DST	STMP
0090	00127	0 02 00400	DLD	DBL1
0091	00130	0 07 00374	DSB	STMP
0092	00131	0401 77	LRS	1
0093	00132	0 10 00000	CALL	DSQR
0094	00133	0 04 00404	DST	E
0095	00134	0 02 00374	DLD	STMP
0096	00135	0 06 00400	DAD	DBL1
0097	00136	0401 77	LRS	1
0098	00137	0 10 00000	CALL	DSQR
0099	00140	0 04 00406	DST	JX
0100	00141	0 02 00402	DLD	DBL0
0101	00142	0 07 00364	DSB	SVFZ
0102	00143	101400	SMI	
0103	00144	0 01 00150	JMP	QRTC
0104	00145	0 02 00402	DLD	DBL0
0105	00146	0 07 00406	DSB	JX
0106	00147	0 04 00406	DST	JX
0107	00150	0 02 00460	QRTC DLD	L1
0108	00151	0 16 00404	MPY	E
0109	00152	0 04 00410	DST	E1
0110	00153	0 02 00460	DLD	L1
0111	00154	000201	IAB	
0112	00155	0 16 00404	MPY	E
0113	00156	0401 61	LRS	15
0114	00157	0 06 00410	DAD	E1

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0115	00160	0 04 00410	DST	E1
0116	00161	0 02 00404	DLD	E
0117	00162	000201	IAB	
0118	00163	0 16 00460	MPY	L1
0119	00164	0401 61	LRS	15
0120	00165	0 06 00410	DAD	E1
0121	00166	0 04 00410	DST	E1
0122	00167	0 02 00464	DLD	P1X
0123	00170	0 16 00406	MPY	JX
0124	00171	0 04 00412	DST	J1X
0125	00172	0 02 00464	DLD	P1X
0126	00173	000201	IAB	
0127	00174	0 16 00406	MPY	JX
0128	00175	0401 61	LRS	15
0129	00176	0 06 00412	DAD	J1X
0130	00177	0 04 00412	DST	J1X
0131	00200	0 02 00406	DLD	JX
0132	00201	000201	IAB	
0133	00202	0 16 00464	MPY	P1X
0134	00203	0401 61	LRS	15
0135	00204	0 06 00412	DAD	J1X
0136	00205	0 04 00412	DST	J1X
0137	00206	0 02 00410	DLD	E1
0138	00207	0 07 00412	DSB	J1X
0139	00210	0411 77	LLS	1
0140	00211	0 04 00410	DST	E1
0141	00212	0 02 00404	DLD	E
0142	00213	0 16 00470	MPY	P1Y
0143	00214	0 04 00414	DST	J1Y
0144	00215	0 02 00404	DLD	E
0145	00216	000201	IAB	
0146	00217	0 16 00470	MPY	P1Y
0147	00220	0401 61	LRS	15
0148	00221	0 06 00414	DAD	J1Y
0149	00222	0 04 00414	DST	J1Y
0150	00223	0 02 00470	DLD	P1Y
0151	00224	000201	IAB	
0152	00225	0 16 00404	MPY	E
0153	00226	0401 61	LRS	15
0154	00227	0 06 00414	DAD	J1Y
0155	00230	0 04 00414	DST	J1Y
0156	00231	0 02 00474	DLD	P1Z
0157	00232	0 16 00406	MPY	JX
0158	00233	0 04 00412	DST	J1X
0159	00234	0 02 00474	DLD	P1Z
0160	00235	000201	IAB	
0161	00236	0 16 00406	MPY	JX
0162	00237	0401 61	LRS	15
0163	00240	0 06 00412	DAD	J1X
0164	00241	0 04 00412	DST	J1X
0165	00242	0 02 00406	DLD	JX
0166	00243	000201	IAB	
0167	00244	0 16 00474	MPY	P1Z
0168	00245	0401 61	LRS	15
0169	00246	0 06 00412	DAD	J1X
0170	00247	0 04 00412	DST	J1X
0171	00250	0 02 00414	DLD	J1Y

MICROCOMP TELECOMMUNICATED DATA
 DDP-516 ASSEMBLY LISTING

0172	00251	0 07 00412	DSB	J1X
0173	00252	0411 77	LLS	1
0174	00253	0 04 00414	DST	J1Y
0175	00254	0 02 00464	DLD	P1X
0176	00255	0 16 00404	MPY	E
0177	00256	0 04 00412	DST	J1X
0178	00257	0 02 00464	DLD	P1X
0179	00260	000201	IAB	
0180	00261	0 16 00404	MPY	E
0181	00262	0401 61	LRS	15
0182	00263	0 06 00412	DAD	J1X
0183	00264	0 04 00412	DST	J1X
0184	00265	0 02 00404	DLD	E
0185	00266	000201	IAB	
0186	00267	0 16 00464	MPY	P1X
0187	00270	0401 61	LRS	15
0188	00271	0 06 00412	DAD	J1X
0189	00272	0 04 00412	DST	J1X
0190	00273	0 02 00460	DLD	L1
0191	00274	0 16 00406	MPY	JX
0192	00275	0 06 00412	DAD	J1X
0193	00276	0 04 00412	DST	J1X
0194	00277	0 02 00460	DLD	L1
0195	00300	000201	IAB	
0196	00301	0 16 00406	MPY	JX
0197	00302	0401 61	LRS	15
0198	00303	0 06 00412	DAD	J1X
0199	00304	0 04 00412	DST	J1X
0200	00305	0 02 00406	DLD	JX
0201	00306	000201	IAB	
0202	00307	0 16 00460	MPY	L1
0203	00310	0401 61	LRS	15
0204	00311	0 06 00412	DAD	J1X
0205	00312	0411 77	LLS	1
0206	00313	0 04 00412	DST	J1X
0207	00314	0 02 00470	DLD	P1Y
0208	00315	0 16 00406	MPY	JX
0209	00316	0 04 00416	DST	J1Z
0210	00317	0 02 00470	DLD	P1Y
0211	00320	000201	IAB	
0212	00321	0 16 00406	MPY	JX
0213	00322	0401 61	LRS	15
0214	00323	0 06 00416	DAD	J1Z
0215	00324	0 04 00416	DST	J1Z
0216	00325	0 02 00406	DLD	JX
0217	00326	000201	IAB	
0218	00327	0 16 00470	MPY	P1Y
0219	00330	0401 61	LRS	15
0220	00331	0 06 00416	DAD	J1Z
0221	00332	0 04 00416	DST	J1Z
0222	00333	0 02 00404	DLD	E
0223	00334	0 16 00474	MPY	P1Z
0224	00335	0 06 00416	DAD	J1Z
0225	00336	0 04 00416	DST	J1Z
0226	00337	0 02 00404	DLD	E
0227	00340	000201	IAB	
0228	00341	0 16 00474	MPY	P1Z

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0229	00342	0401 61	LRS	15
0230	00343	0 06 00416	DAD	J1Z
0231	00344	0 04 00416	DST	J1Z
0232	00345	0 02 00474	DLD	P1Z
0233	00346	000201	IAB	
0234	00347	0 16 00404	MPY	E
0235	00350	0401 61	LRS	15
0236	00351	0 06 00416	DAD	J1Z
0237	00352	0411 77	LLS	1
0238	00353	0 04 00474	DST	P1Z
0239	00354	0 02 00414	DLD	J1Y
0240	00355	0 04 00470	DST	P1Y
0241	00356	0 02 00412	DLD	J1X
0242	00357	0 04 00464	DST	P1X
0243	00360	0 02 00410	DLD	E1
0244	00361	0 04 00460	DST	L1
0245	00362	000005	SGL	
0246	00363	-0 01 00000	JMP*	AZCA
0247	00364	000000	SVFZ DBP	0
	00365	000000		
0248	00366	000000	SVFY DBP	0
	00367	000000		
0249	00370	000000	TMPA DBP	0
	00371	000000		
0250	00372	000000	TMPB DBP	0
	00373	000000		
0251	00374	000000	STMP DBP	0
	00375	000000		
0252	00376	000000	SHP1 DEC	0
0253	00377	000000	SHP2 DEC	0
0254	00400	020000	DBI.1 OCT	20000,0
	00401	000000		
0255	00402	000000	DBI.0 DBP	0
	00403	000000		
0256		000460	L1 EQU	'460
0257		000464	P1X EQU	'464
0258		000470	P1Y EQU	'470
0259		000474	P1Z EQU	'474
0260	00404	000000	E DBP	0
	00405	000000		
0261	00406	000000	JX DBP	0
	00407	000000		
0262	00410	000000	E1 DBP	0
	00411	000000		
0263	00412	000000	J1X DBP	0
	00413	000000		
0264	00414	000000	J1Y DBP	0
	00415	000000		
0265	00416	000000	J1Z DBP	0
	00417	000000		
0266	00420	0 000000	S1C XAC	S1
0267	00421	0 000000	S2C XAC	S2
0268	00422	0 000000	S3C XAC	S3
0269	00423	0 000000	S4C XAC	S4
0270	00424	041100	END	
	00425	000077		

PROGRAM NAME

SOURCE: LVCA

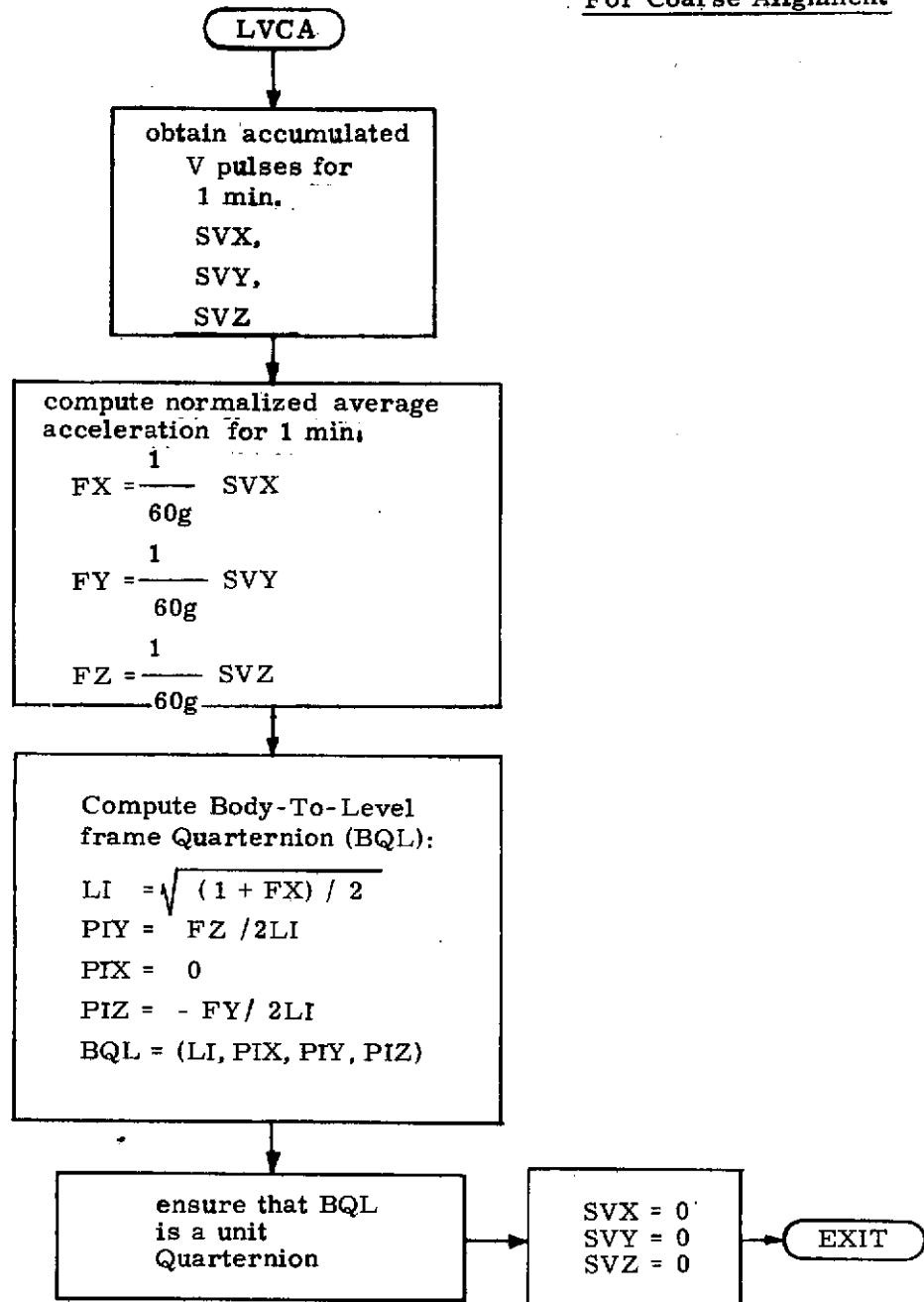
BINARY: BLVCA

ENTRY POINTS (location): LVCA ('13174)

GENERAL DESCRIPTION:

This subroutine performs the leveling function for coarse alignment. As input it uses 1 minute's accumulation of ΔV pulses in body-frame coordinates. As output, it passes on to the executive the body-to-level-frame-quaternion. This quaternion is then used as the system quaternion prior to the azimuth alignment.

Leveling Subroutine
For Coarse Alignment



MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

Address	Code	Subcode	Label	Value
0001			SUBR	LVCA
0002			REL	
0003	00000	0 000000	LVCA	DAC **
0004	00001	000007	DBL	
0005	00002	0 02 00454	DLD	SVZ
0006	00003	0 16 00140	MPY	I60G
0007	00004	0 04 00134	DST	FZ
0008	00005	0 02 00454	DLD	SVZ
0009	00006	000201	IAB	
0010	00007	0 16 00140	MPY	I60G
0011	00010	0401 61	LRS	15
0012	00011	0 06 00134	DAD	FZ
0013	00012	0411 70	LLS	8
0014	00013	0 04 00134	DST	FZ
0015	00014	0 02 00450	DLD	SVY
0016	00015	0 16 00140	MPY	I60G
0017	00016	0 04 00132	DST	FY
0018	00017	0 02 00450	DLD	SVY
0019	00020	000201	IAB	
0020	00021	0 16 00140	MPY	I60G
0021	00022	0401 61	LRS	15
0022	00023	0 06 00132	DAD	FY
0023	00024	0411 70	LLS	8
0024	00025	0 04 00132	DST	FY
0025	00026	0 02 00444	DLD	SVX
0026	00027	0 16 00140	MPY	I60G
0027	00030	0 04 00130	DST	FX
0029	00031	0 02 00444	DLD	SVX
0029	00032	000201	IAB	
0030	00033	0 16 00140	MPY	I60G
0031	00034	0401 61	LRS	15
0032	00035	0 06 00130	DAD	FX
0033	00036	0411 71	LLS	7
0034	00037	0 06 00136	DAD	DBP1
0035	00040	0401 77	LRS	1
0036	00041	0 10 00000	CALL	DSOR
0037	00042	0 06 00146	DAD	RND
0038	00043	000005	SGL	
0039	00044	0 04 00460	STA	L1
0040	00045	000007	DBL	
0041	00046	0 02 00134	DLD	FZ
0042	00047	0401 76	LRS	2
0043	00050	0 17 00460	DIV	L1
0044	00051	0401 61	LRS	15
0045	00052	0411 61	LLS	15
0046	00053	0 04 00470	DST	P1Y
0047	00054	0 02 00142	DLD	DBP0
0048	00055	0 04 00464	DST	P1X
0049	00056	0 07 00132	DSB	FY
0050	00057	0401 76	LRS	2
0051	00060	0 17 00460	DIV	L1
0052	00061	0401 61	LRS	15
0053	00062	0411 61	LLS	15
0054	00063	0 04 00474	DST	P1Z
0055	00064	0 02 00460	DLD	L1
0056	00065	0 16 00460	MPY	L1
0057	00066	0 04 00144	DST	ATMP

MTCRCCOMP TELECOMMUNICATED DATA
 DBP-516 ASSEMBLY LISTING

0058	00067	0 02 00470	DLD	P1Y	
0059	00070	0 16 00470	MPY	P1Y	
0060	00071	0 06 00144	DAD	ATMP	
0061	00072	0 04 00144	DST	ATMP	
0062	00073	0 02 00474	DLD	P1Z	
0063	00074	0 16 00474	MPY	P1Z	
0064	00075	0 06 00144	DAD	ATMP	
0065	00076	0 04 00144	DST	ATMP	
0066	00077	0 02 00136	DLD	DBP1	
0067	00100	0 07 00144	DSP	ATMP	
0069	00101	0411 64	LLS	12	
0069	00102	0 04 00144	DST	ATMP	
0070	00103	0 16 00460	MPY	L1	
0071	00104	0401 65	LRS	11	
0072	00105	0 06 00460	DAD	L1	
0073	00106	0 04 00460	DST	L1	
0074	00107	0 02 00470	DLD	P1Y	
0075	00110	0 16 00144	MPY	ATMP	
0076	00111	0401 65	LRS	11	
0077	00112	0 06 00470	DAD	P1Y	
0078	00113	0 04 00470	DST	P1Y	
0079	00114	0 02 00474	DLD	P1Z	
0080	00115	0 16 00144	MPY	ATMP	
0081	00116	0401 65	LRS	11	
0082	00117	0 06 00474	DAD	P1Z	
0083	00120	0 04 00474	DST	P1Z	
0084	00121	0 02 00142	DLD	DBP0	
0085	00122	0 04 00444	DST	SVX	
0086	00123	0 04 00450	DST	SVY	
0087	00124	0 04 00454	DST	SVZ	
0088	00125	000005	SGL		
0089	00126	-0 01 00000	JMP*	LVCA	
0090		000444	SVX	EQU	'444
0091		000450	SVY	EQU	'450
0092		000454	SVZ	EQU	'454
0093	00130	000000	FX	DBP	0
	00131	000000			
0094	00132	000000	FY	DBP	0
	00133	000000			
0095	00134	000000	FZ	DBP	0
	00135	000000			
0096	00136	020000	DBP1	OCT	20000,0
	00137	000000			
0097	00140	134263	I60G	DEC	-0.169998E-4E-15
0098		000460	L1	EQU	'460
0099		000464	P1X	EQU	'464
0100		000470	P1Y	EQU	'470
0101		000474	P1Z	EQU	'474
0102	00142	000000	DBP0	DBP	0
	00143	000000			
0103	00144	000000	ATMP	DBP	0
	00145	000000			
0104	00146	000000	RND	OCT	0,40000
	00147	040000			
0105				END	

PROGRAM NAME

SOURCE: DC50

BINARY: BDC50

ENTRY POINT (location): DCOA ('13344)

ACCESSIBLE VARIABLES (location): AOAP ('13452)

BOAP ('13454), COAP ('13456), DOAP ('13460), EOAP ('13462),

FOAP ('13464)

GENERAL DESCRIPTION:

The SIRU gyros sense not only a rotational input about their input axes, i.e., the $\Delta\theta$ pulses over some interval would equal the integral of W_{IRA} over that interval, but also they sense a change in the rotational input about their output axes, i.e., the $\Delta\theta$ pulses over some interval would equal $(-I)/H$ times the integral of W_{ORA} over that interval. The latter can essentially be considered an error source since the gyro output is supposed to represent only the former input axis rotation.

The integral of W_{ORA} from t_1 to t_2 is simply $W_{ORA}(t_2) - W_{ORA}(t_1)$. The $\Delta\theta$ error during that interval is simply $(-I/H)W_{ORA}(t_2) - (-I/H)W_{ORA}(t_1)$. To compensate this error, one simply has to add $((I/H)(W_{ORA}(t_2)))$ and subtract $(I/H)(W_{ORA}(t_1))$ at time t_2 . Over one update interval the rate W_{ORA} (for say the E gyro) equals

$$\frac{\Delta\theta_x}{\Delta t}$$

Since Δt is constant (.02 seconds), we can express W_{ORA} as K_x and rewrite the compensation quantity as

$$+(\frac{I}{H} K) \Delta\theta_x(t_2) - (\frac{I}{H} K) \Delta\theta_x(t_1) .$$

This subroutine is called once per update and calculates the first of the two compensation terms above. The second term is saved from the previous update. DTXB, DTYB and DTZB are $\Delta\theta_x$, $\Delta\theta_y$ and $\Delta\theta_z$ respectively.

GAIH, GBIH GFIH are the scaled constants equal to

$$(\frac{I}{H} K)$$

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0001				REL	
0002				SUBR	DCOA
0003				SUBR	AOAP
0004				SUBR	BOAP
0005				SUBR	COAP
0006				SUBR	DOAP
0007				SUBR	EOAP
0008				SUBR	FOAP
0009	00000	0 000000	DCOA	DAC	**
0010	00001	0 02 00414		LDA	DTXB
0011	00002	000007		DBI	
0012	00003	0 16 00126		MPY	GFIH
0013	00004	0 04 00102		DST	EOAO
0014	00005	0 02 00414		DLD	DTXB
0015	00006	0 16 00127		MPY	GFIH
0016	00007	0 04 00104		DST	FOAO
0017	00010	0 02 00416		DLD	DTYB
0018	00011	0 16 00122		MPY	GAIH
0019	00012	0 04 00072		DST	AOAO
0020	00013	0 02 00416		DLD	DTYB
0021	00014	0 16 00123		MPY	GBIH
0022	00015	0 04 00074		DST	BOAO
0023	00016	0 02 00420		DLD	DTZB
0024	00017	0 16 00124		MPY	GCIH
0025	00020	0 04 00076		DST	COAO
0026	00021	0 02 00420		DLD	DTZB
0027	00022	0 16 00125		MPY	GDIH
0028	00023	0 04 00100		DST	DOAO
0029	00024	0 06 00406		DAD	GDPC
0030	00025	0 07 00114		DSB	DOAP
0031	00026	0 04 00406		DST	GDPC
0032	00027	0 02 00072		DLD	AOAO
0033	00030	0 06 00400		DAD	GAPC
0034	00031	0 07 00106		DSB	AOAP
0035	00032	0 04 00400		DST	GAPC
0036	00033	0 02 00074		DLD	BOAO
0037	00034	0 06 00402		DAD	GRPC
0038	00035	0 07 00110		DSB	BOAP
0039	00036	0 04 00402		DST	GBPC
0040	00037	0 02 00076		DLD	COAO
0041	00040	0 06 00404		DAD	GCPC
0042	00041	0 07 00112		DSB	COAP
0043	00042	0 04 00404		DST	GCPC
0044	00043	0 02 00102		DLD	EOAO
0045	00044	0 06 00410		DAD	GEPC
0046	00045	0 07 00116		DSB	EOAP
0047	00046	0 04 00410		DST	GEPC
0048	00047	0 02 00104		DLD	FOAO
0049	00050	0 06 00412		DAD	GFPC
0050	00051	0 07 00120		DSB	FOAP
0051	00052	0 04 00412		DST	GFPC
0052	00053	0 02 00072		DLD	AOAO
0053	00054	0 04 00106		DST	AOAP
0054	00055	0 02 00074		DLD	BOAO
0055	00056	0 04 00110		DST	BOAP
0056	00057	0 02 00076		DLD	COAO
0057	00060	0 04 00112		DST	COAP

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0058	00061	0 02 00100	DLD	DOAO
0059	00062	0 04 00114	DST	DOAP
0060	00063	0 02 00102	DLD	EOAO
0061	00064	0 04 00116	DST	EOAP
0062	00065	0 02 00104	DLD	FOAO
0063	00066	0 04 00120	DST	FOAP
0064	00067	000005	SGL	
0065	00070	-0 01 00000	JMP*	DCOA
0066	00072	000000	AOAO DBP	0
	00073	000000		
0067	00074	000000	BOAO DBP	0
	00075	000000		
0068	00076	000000	COAO DBP	0
	00077	000000		
0069	00100	000000	DOAO DBP	0
	00101	000000		
0070	00102	000000	EOAO DBP	0
	00103	000000		
0071	00104	000000	FOAO DBP	0
	00105	000000		
0072	00106	000000	AOAP DBP	0
	00107	000000		
0073	00110	000000	SOAP DBP	0
	00111	000000		
0074	00112	000000	COAP DBP	0
	00113	000000		
0075	00114	000000	DOAP DBP	0
	00115	000000		
0076	00116	000000	EOAP DBP	0
	00117	000000		
0077	00120	000000	FOAP DBP	0
	00121	000000		
0078	00122	002567	GAIH OCT	2567
0079	00123	175211	GBIH OCT	175211
0080	00124	002567	GCIH OCT	2567
0081	00125	175211	GDIH OCT	175211
0082	00126	002567	GEIH OCT	2567
0083	00127	175211	GFIH OCT	175211
0084		000400	GAPC EQU	*400
0085		000402	GBPC EQU	GAPC+2
0086		000404	GCPC EQU	GAPC+4
0087		000406	GDPC EQU	GAPC+6
0088		000410	GEPC EQU	GAPC+8
0089		000412	GFPC EQU	GAPC+10
0090		000414	DTXB EQU	*414
0091		000416	DTYB EQU	DTXB+2
0092		000420	DTZB EQU	DTXB+4
0093			END	

PROGRAM NAME:
SOURCE: PDIS
BINARY: BPSFI
ENTRY POINTS (LOCATION): PSFI ('14000), PRBI ('14740)
GENERAL DESCRIPTION:

The subroutine PSFI is called once every two minutes and its purpose is to estimate bias recompenations for failed accelerometers. Whenever the accelerometer fail status changes, this subroutine will jump to RSTC which restarts the compensation estimator by zeroing INIT and storing the new fail status in PSFC (except when a change is made such that there are no fails, in other words a fail has healed, in which case PSFI just returns). The first time one accelerometer fail is detected and isolated PSFI will jump to RSTC. The next iteration, 2 minutes later, provided that the fail status is the same, PSFI will jump to COCR to do the first of five iterations (10 minutes of ΔV) used to estimate the bias. If a second fail occurs during the 10 minutes the whole process is restarted.

For one fail, five bias estimates are calculated and stored sequentially in E11, E11 + 2, E11 + 4, E11 + 6 and E11 + 8. After the fifth iteration these are summed by SUMC, scaled by BIAM and stored in OPFB. Then a call is made to RORB which takes a statistical differential of the five bias estimates which is then compared to LIMR to classify the degradation as either a bias or a ramp, indicating such by putting a plus or minus 1 in FROB. The bias estimate is then added to ABIA, BBIA . . . or FBIA which eventually recompensates the accelerometers. Finally the bias estimate is scaled for the output program and stored in FPBO.

For two failures, the sequence starts at TWFL and requires more manipulation because it is not desirable to have one failed accelerometer effect the bias estimate of another. It also requires a scaling of 5/4 because of the difference in the two fail error equations.

The subroutine PRBI is called once every accelerometer update and if sense switch 1 is reset will add the recompensation estimates made by PSFI (ABIA . . .FBIA) to the raw accelerometer pulse counts.

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0001				ABS	
0002				ORG	'14000
0003				SUBR	PSFI
0004				SUBR	PRBY
0005	14000	0 000000	PSFI	DAC	**
0006	14001	000007		DBL	
0007	14002	0 02 14052		DLD	PSFS
0008	14003	0 04 14054		DST	PSSP
0009	14004	0 02 00320		DLD	PFST
0010	14005	0 04 14052		DST	PSFS
0011	14006	000201		IAB	
0012	14007	100040		SZE	
0013	14010	0 01 14025		JMP	TROB
0014	14011	000201		IAB	
0015	14012	000005		SGL	
0016	14013	101040		SNZ	
0017	14014	-0 01 14000		JMP*	PSFI
0018	14015	000007		DBL	
0019	14016	0 07 14054		DSB	PSSP
0020	14017	100040		SZE	
0021	14020	0 01 14044		JMP	RSTC
0022	14021	000201		IAB	
0023	14022	100040		SZE	
0024	14023	0 01 14044		JMP	RSTC
0025	14024	0 01 14102		JMP	COCR
0026	14025	000201	TROB	IAB	
0027	14026	0 07 14054		DSB	PSSP
0028	14027	100040		SZE	
0029	14030	0 01 14034		JMP	SPCC
0030	14031	000201		IAB	
0031	14032	101040		SNZ	
0032	14033	0 01 14102		JMP	COCR
0033	14034	0 02 14052	SPCC	DLD	PSFS
0034	14035	000201		IAB	
0035	14036	0 07 14054		DSB	PSSP
0036	14037	100040		SZE	
0037	14040	0 01 14044		JMP	RSTC
0038	14041	000201		IAB	
0039	14042	101040		SNZ	
0040	14043	0 01 14102		JMP	COCR
0041	14044	0 02 14052	RSTC	DLD	PSFS
0042	14045	0 04 14056		DST	PSFC
0043	14046	000005		SGL	
0044	14047	140040		CRA	
0045	14050	0 04 14100		STA	INIT
0046	14051	-0 01 14000		JMP*	PSFI
0047		000744	PACA	EQU	'744
0048		000746	PBCA	EQU	PACA+2
0049		000750	PCCA	EQU	PACA+4
0050		000752	PDCA	EQU	PACA+6
0051		000754	PECA	EQU	PACA+8
0052		000756	PFCA	EQU	PACA+10
0053		000320	PFST	EQU	'320
0054	14052	000000	PSFS	DBP	0
	14053	000000			
0055	14054	000000	PSSP	DBP	0
	14055	000000			

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0056	14056	000000	PSFC DBP	0
	14057	000000		
0057	14060	000000	OPPB DBP	0
	14061	000000		
0058	14062	000000	OPSB DBP	0
	14063	000000		
0059		000436	FPRO EQU	'436
0060		000440	SPBO EQU	'440
0061	14064	000000	LIMR OCT	0,10000
	14065	010000		
0062	14066	000000	D DBP	0
	14067	000000		
0063	14070	000000	D1 DBP	0
	14071	000000		
0064	14072	000000	D2 DBP	0
	14073	000000		
0065		000442	FROB EQU	'442
0066		000443	SROB EQU	'443
0067	14074	000000	SAVM DBP	0
	14075	000000		
0068	14076	000000	DBPO DBP	0
	14077	000000		
0069	14100	000000	INIT OCT	0
0070	14101	000144	OPMC DEC	100B15
0071	14102	0 02 00744	COCR DLD	PACA
0072	14103	0 04 14620	DST	MA
0073	14104	0 02 00746	DLD	PBCA
0074	14105	0 04 14622	DST	MB
0075	14106	0 02 00750	DLD	PCCA
0076	14107	0 04 14624	DST	MC
0077	14110	0 02 00752	DLD	PDCA
0078	14111	0 04 14626	DST	MD
0079	14112	0 02 00754	DLD	PECA
0080	14113	0 04 14630	DST	ME
0081	14114	0 02 00756	DLD	PFCA
0082	14115	0 04 14632	DST	MF
0083	14116	000005	SGL	
0084	14117	0 02 14100	LDA	INIT
0085	14120	141206	AOA	
0086	14121	0 04 14100	STA	INIT
0087	14122	0415 77	ALS	1
0088	14123	0 04 00000	STA	0
0089	14124	0 02 14057	LDA	PSFC+1
0090	14125	100040	SZE	
0091	14126	0 01 14235	JMP	TWFL
0092	14127	0 02 14056	LDA	PSFC
0093	14130	0415 76	ALS	2
0094	14131	0 06 14204	ADD	FPAD
0095	14132	0 04 14203	STA	FAPT
0096	14133	000007	DBL	
0097	14134	-0 10 14203	JST*	FAPT
0098	14135	1 04 14646	DST	E11-2,1
0099	14136	000005	SGL	
0100	14137	0 02 14100	LDA	INIT
0101	14140	0 07 14774	SUB	=5
0102	14141	100040	SZE	
0103	14142	-0 01 14000	JMP*	PSFI

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0104	14143	0 04	14100	STA	INIT
0105	14144	0 35	14773	LDX	=0
0106	14145	000007		DBL	
0107	14146	0 10	14475	JST	SUMC
0108	14147	0 10	14504	JST	BIAM
0109	14150	0 04	14060	DST	OPFB
0110	14151	0 10	14431	JST	ROFB
0111	14152	0 04	14070	DST	D1
0112	14153	101400		SMI	
0113	14154	0 01	14157	JMP	**+3
0114	14155	0 07	14070	DSB	D1
0115	14156	0 07	14070	DSB	D1
0116	14157	0 07	14064	DSB	LIMR
0117	14160	000005		SGL	
0118	14161	100400		SPL	
0119	14162	0 01	14165	JMP	**+3
0120	14163	0 02	14772	LDA	=-1
0121	14164	100000		SKP	
0122	14165	0 02	14771	LDA	=1
0123	14166	0 04	00442	STA	PROB
0124	14167	0 02	14056	LDA	FSFC
0125	14170	0415 77		ALS	1
0126	14171	0 04	00000	STA	0
0127	14172	000007		DBL	
0128	14173	0 02	14060	DLI	OPFB
0129	14174	1 06	14722	DAD	ABIA-2,1
0130	14175	1 04	14722	DST	ABIA-2,1
0131	14176	0411 67		LLS	9
0132	14177	0 16	14101	MPY	OPMC
0133	14200	0 04	00436	DST	FPBO
0134	14201	000005		SGL	
0135	14202	-0 01	14000	JMP*	PSFI
0136	14203	000000		FAPT OCT	0
0137	14204	0 014201		FFAD DAC	*-3
0138	14205	0 000000		AFAL DAC	**
0139	14206	0 10	14530	JST	CACA
0140	14207	0 07	14620	DSB	MA
0141	14210	-0 01	14205	JMP*	AFAL
0142	14211	0 000000		BFAL DAC	**
0143	14212	0 10	14541	JST	CACB
0144	14213	0 07	14622	DSB	ME
0145	14214	-0 01	14211	JMP*	BFAL
0146	14215	0 000000		CFAL DAC	**
0147	14216	0 10	14552	JST	CACC
0148	14217	0 07	14624	DSB	MC
0149	14220	-0 01	14215	JMP*	CFAL
0150	14221	0 000000		DFAL DAC	**
0151	14222	0 10	14563	JST	CACD
0152	14223	0 07	14626	DSB	MD
0153	14224	-0 01	14221	JMP*	DFAL
0154	14225	0 000000		EPAL DAC	**
0155	14226	0 10	14574	JST	CACE
0156	14227	0 07	14630	DSB	ME
0157	14230	-0 01	14225	JMP*	EPAL
0158	14231	0 000000		FFAL DAC	**
0159	14232	0 10	14605	JST	CACF
0160	14233	0 07	14632	DSB	MF

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0161	14234	-0 01	14231	JMP*	FPAL
0162	14235	0415	76	TWFL ALS	2
0163	14236	0 06	14204	ADD	FPAD
0164	14237	0 04	14203	STA	FAPT
0165	14240	0 02	14056	LDA	FSFC
0166	14241	0415	77	ALS	1
0167	14242	0 06	14617	ADD	MADR
0168	14243	0 04	14616	STA	MPTR
0169	14244	000007		DBL	
0170	14245	-0 02	14616	DLD*	MPTR
0171	14246	0 04	14074	DST	SAVM
0172	14247	000005		SGL	
0173	14250	0 02	14056	LDA	FSFC
0174	14251	0415	75	ALS	3
0175	14252	0 06	14056	ADD	FSFC
0176	14253	0 06	14527	ADD	DACA
0177	14254	0 04	14526	STA	CAPT
0178	14255	000007		DBL	
0179	14256	-0 10	14526	JST*	CAPT
0180	14257	-0 04	14616	DST*	MPTR
0181	14260	-0 10	14203	JST*	FAPT
0182	14261	1 04	14660	DST	E21-2,1
0183	14262	0 02	14074	DLD	SAVM
0184	14263	-0 04	14616	DST*	MPTR
0185	14264	000005		SGL	
0186	14265	0 02	14056	LDA	FSFC
0187	14266	0415	76	ALS	2
0188	14267	0 06	14204	ADD	FPAD
0189	14270	0 04	14203	STA	FAPT
0190	14271	0 02	14057	LDA	FSFC+1
0191	14272	0415	77	ALS	1
0192	14273	0 06	14617	ADD	MADR
0193	14274	0 04	14616	STA	MPTR
0194	14275	000007		DBL	
0195	14276	-0 02	14616	DLD*	MPTR
0196	14277	0 04	14074	DST	SAVM
0197	14300	000005		SGL	
0198	14301	0 02	14057	LDA	FSFC+1
0199	14302	0415	75	ALS	3
0200	14303	0 06	14057	ADD	FSFC+1
0201	14304	0 06	14527	ADD	DACA
0202	14305	0 04	14526	STA	CAPT
0203	14306	000007		DBL	
0204	14307	-0 10	14526	JST*	CAPT
0205	14310	-0 04	14616	DST*	MPTR
0206	14311	-0 10	14203	JST*	FAPT
0207	14312	1 04	14646	DST	E11-2,1
0208	14313	0 02	14074	DLD	SAVM
0209	14314	-0 04	14616	DST*	MPTR
0210	14315	000005		SGL	
0211	14316	0 02	14100	LDA	INIT
0212	14317	0 07	14774	SUB	=5
0213	14320	100040		SZE	
0214	14321	-0 01	14000	JMP*	PSPI
0215	14322	0 04	14100	STA	INIT
0216	14323	0 35	14773	LDX	=0
0217	14324	000007		DBL	

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0218	14325	0 10	14475	JST	SUMC
0219	14326	0 04	14060	DST	OPFB
0220	14327	0401	76	LRS	2
0221	14330	0 06	14060	DAD	OPFB
0222	14331	0 10	14504	JST	BIAM
0223	14332	0 04	14060	DST	OPFB
0224	14333	0 10	14431	JST	RORB
0225	14334	0 04	14070	DST	D1
0226	14335	0401	76	LRS	2
0227	14336	0 06	14070	DAD	D1
0228	14337	0 04	14070	DST	D1
0229	14340	101400		SMI	
0230	14341	0 01	14344	JMP	*+3
0231	14342	0 07	14070	DSB	D1
0232	14343	0 07	14070	DSB	D1
0233	14344	0 07	14064	DSB	LIMR
0234	14345	000005		SGL	
0235	14346	100400		SPL	
0236	14347	0 01	14352	JMP	*+3
0237	14350	0 02	14772	LDA	--1
0238	14351	100000		SKP	
0239	14352	0 02	14771	LDA	=1
0240	14353	0 04	00442	STA	PROB
0241	14354	0 02	14056	LDA	FSPC
0242	14355	0415	77	ALS	1
0243	14356	0 04	00000	STA	0
0244	14357	000007		DBL	
0245	14360	0 02	14060	DLD	OPFB
0246	14361	1 06	14722	DAD	ABIA-2,1
0247	14362	1 04	14722	DST	ABIA-2,1
0248	14363	0411	67	LLS	9
0249	14364	0 16	14101	MPY	OPMC
0250	14365	0 04	00436	DST	FPBO
0251	14366	0 35	14770	LDX	=10
0252	14367	0 10	14475	JST	SUMC
0253	14370	0 04	14062	DST	OPSB
0254	14371	0401	76	LRS	2
0255	14372	0 06	14062	DAD	OPSB
0256	14373	0 10	14504	JST	BIAM
0257	14374	0 04	14062	DST	OPSB
0258	14375	0 10	14431	JST	RORB
0259	14376	0 04	14072	DST	D2
0260	14377	0401	76	LRS	2
0261	14400	0 06	14072	DAD	D2
0262	14401	101400		SMI	
0263	14402	0 01	14405	JMP	*+3
0264	14403	0 07	14072	DSB	D2
0265	14404	0 07	14072	DSB	D2
0266	14405	0 07	14064	DSB	LIMR
0267	14406	000005		SGL	
0268	14407	100400		SPL	
0269	14410	0 01	14413	JMP	*+3
0270	14411	0 02	14772	LDA	--1
0271	14412	100000		SKP	
0272	14413	0 02	14771	LDA	=1
0273	14414	0 04	00443	STA	SROB
0274	14415	0 02	14057	LDA	FSPC+1

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0275	14416	0415 77	ALS	1
0276	14417	0 04 00000	STA	0
0277	14420	000007	DBL	
0278	14421	0 02 14062	DLD	OPSB
0279	14422	1 05 14722	DAD	ABIA-2,1
0280	14423	1 04 14722	DST	ABIA-2,1
0281	14424	0411 67	LLS	9
0282	14425	0 16 14101	MPY	OPMC
0283	14426	0 04 00440	DST	SPBO
0284	14427	000005	SGL	
0285	14430	-0 01 14000	JMP*	PSFI
0286	14431	0 000000	RORB DAC	**
0287	14432	1 02 14650	DLD	E11,1
0288	14433	0401 76	LRS	2
0289	14434	1 06 14650	DAD	E11,1
0290	14435	0401 77	LRS	1
0291	14436	1 06 14650	DAD	E11,1
0292	14437	0 04 14066	DST	D
0293	14440	0 02 14076	DLD	DBPO
0294	14441	1 07 14652	DSB	E11+2,1
0295	14442	0401 74	LRS	4
0296	14443	1 06 14652	DAD	E11+2,1
0297	14444	0401 77	LRS	1
0298	14445	0 06 14066	DAD	D
0299	14446	0 04 14066	DST	D
0300	14447	0 02 14076	DLD	DBPO
0301	14450	1 07 14654	DSB	E11+4,1
0302	14451	0401 76	LRS	2
0303	14452	1 07 14654	DSB	E11+4,1
0304	14453	0401 76	LRS	2
0305	14454	0 06 14066	DAD	D
0306	14455	0 04 14066	DST	D
0307	14456	0 02 14076	DLD	DBPO
0308	14457	1 07 14656	DSB	E11+6,1
0309	14460	0401 76	LRS	2
0310	14461	1 07 14656	DSB	E11+6,1
0311	14462	0401 77	LRS	1
0312	14463	0 06 14066	DAD	D
0313	14464	0 04 14066	DST	D
0314	14465	1 02 14660	DLD	E11+8,1
0315	14466	0401 77	LRS	1
0316	14467	1 06 14660	DAD	E11+8,1
0317	14470	0401 74	LRS	4
0318	14471	1 07 14660	DSB	E11+8,1
0319	14472	0 06 14066	DAD	D
0320	14473	0 04 14066	DST	D
0321	14474	-0 01 14431	JMP*	RORB
0322	14475	0 000000	SUMC DAC	**
0323	14476	1 02 14650	DLD	E11,1
0324	14477	1 06 14652	DAD	E11+2,1
0325	14500	1 06 14654	DAD	E11+4,1
0326	14501	1 06 14656	DAD	E11+6,1
0327	14502	1 06 14660	DAD	E11+8,1
0328	14503	-0 01 14475	JMP*	SUMC
0329	14504	0 000000	BIAN DAC	**
0330	14505	0 04 14714	DST	TEM1
0331	14506	0 16 14525	MPY	BIHC+1

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0332	14507	0401 77	LRS	1
0333	14510	0 04 14716	DST	TEM2
0334	14511	0 02 14524	DLD	BIMC
0335	14512	0 16 14715	MPY	TEM1+1
0336	14513	0401 77	LRS	1
0337	14514	0 06 14716	DAD	TEM2
0338	14515	0401 63	LRS	13
0339	14516	0 04 14716	DST	TEM2
0340	14517	0 02 14714	DLD	TEM1
0341	14520	0 16 14524	MPY	BIMC
0342	14521	0411 77	LLS	1
0343	14522	0 06 14716	DAD	TEM2
0344	14523	-0 01 14504	JMP*	BIAM
0345	14524	042747	BIMC DBP	0.333333333333E-4BB-14
	14525	054471		
0346			* SBMC DEC	0.333333333333E-3BB-11
0347	14526	000000	CAPT OCT	0
0348	14527	0 014517	DACA DAC	*-8
0349	14530	0 000000	CACA DAC	**
0350	14531	0 02 14622	DLD	NB
0351	14532	0 07 14624	DSB	MC
0352	14533	0 07 14626	DSB	MD
0353	14534	0 06 14630	DAD	ME
0354	14535	0 06 14632	DAD	MF
0355	14536	0 10 14674	JST	MSPT
0356	14537	0 04 14634	DST	CA
0357	14540	-0 01 14530	JMP*	CACA
0358	14541	0 000000	CACB DAC	**
0359	14542	0 02 14620	DLD	MA
0360	14543	0 06 14624	DAD	MC
0361	14544	0 06 14626	DAD	MD
0362	14545	0 06 14630	DAD	ME
0363	14546	0 06 14632	DAD	MF
0364	14547	0 10 14674	JST	MSPT
0365	14550	0 04 14636	DST	CB
0366	14551	-0 01 14541	JMP*	CACB
0367	14552	0 000000	CACC DAC	**
0368	14553	0 02 14622	DLD	NB
0369	14554	0 07 14620	DSB	MA
0370	14555	0 06 14626	DAD	MC
0371	14556	0 07 14630	DSB	ME
0372	14557	0 06 14632	DAD	MF
0373	14560	0 10 14674	JST	MSPT
0374	14561	0 04 14640	DST	CC
0375	14562	-0 01 14552	JMP*	CACC
0376	14563	0 000000	CACD DAC	**
0377	14564	0 02 14622	DLD	NB
0378	14565	0 07 14620	DSB	MA
0379	14566	0 06 14624	DAD	MC
0380	14567	0 06 14630	DAD	ME
0381	14570	0 07 14632	DSB	MF
0382	14571	0 10 14674	JST	MSPT
0383	14572	0 04 14642	DST	CD
0384	14573	-0 01 14563	JMP*	CACD
0385	14574	0 000000	CACE DAC	**
0386	14575	0 02 14620	DLD	MA
0387	14576	0 06 14622	DAD	NB

MICROCOMP TELECOMMUNICATED DATA

DDP-516 ASSEMBLY LISTING

0388	14577	0 07 14624	DSB	MC
0389	14600	0 06 14626	DAD	MD
0390	14601	0 07 14632	DSB	MF
0391	14602	0 10 14674	JST	MSPT
0392	14603	0 04 14644	DST	CE
0393	14604	-0 01 14574	JMP*	CACE
0394	14605	0 000000	CACF DAC	**
0395	14606	0 02 14620	DLD	MA
0396	14607	0 06 14622	DAD	MB
0397	14610	0 06 14624	DAD	MC
0398	14611	0 07 14626	DSB	MD
0399	14612	0 07 14630	DSB	ME
0400	14613	0 10 14674	JST	MSPT
0401	14614	0 04 14646	DST	CF
0402	14615	-0 01 14605	JMP*	CACF
0403	14616	000000	MPTR OCT	0
0404	14617	0 014616	MADR DAC	*-1
0405	14620	000000	MA DBP	0
	14621	000000		
0406	14622	000000	MB DBP	0
	14623	000000		
0407	14624	000000	MC DBP	0
	14625	000000		
0408	14626	000000	MD DBP	0
	14627	000000		
0409	14630	000000	ME DBP	0
	14631	000000		
0410	14632	000000	MF DBP	0
	14633	000000		
0411	14634	000000	CA DBP	0
	14635	000000		
0412	14636	000000	CB DBP	0
	14637	000000		
0413	14640	000000	CC DBP	0
	14641	000000		
0414	14642	000000	CD DBP	0
	14643	000000		
0415	14644	000000	CE DBP	0
	14645	000000		
0416	14646	000000	CF DBP	0
	14647	000000		
0417	14650	000000	E11 DBP	0
	14651	000000		
0418	14652	000000	BSZ	8
	14653	000000		
	14654	000000		
	14655	000000		
	14656	000000		
	14657	000000		
	14660	000000		
	14661	000000		
0419	14662	000000	E21 DBP	0
	14663	000000		
0420	14664	000000	BSZ	8
	14665	000000		
	14666	000000		
	14667	000000		

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

14670	000000			
14671	000000			
14672	000000			
14673	000000			
0421	14674	0 000000	MSPT DAC	**
0422	14675	0 04 14714	DST	TEM1
0423	14676	0 16 14721	MPY	RPTT+1
0424	14677	0401 77	LRS	1
0425	14700	0 04 14716	DST	TEM2
0426	14701	0 02 14720	DLD	RPTT
0427	14702	0 16 14715	MPY	TEM1+1
0428	14703	0401 77	LRS	1
0429	14704	0 05 14716	DAD	TEM2
0430	14705	0 05 14722	DAD	ROND
0431	14706	0401 62	LRS	14
0432	14707	0 04 14716	DST	TEM2
0433	14710	0 02 14714	DLD	TEM1
0434	14711	0 16 14720	MPY	RPTT
0435	14712	0 06 14716	DAD	TEM2
0436	14713	-0 01 14674	JMP*	MSPT
0437	14714	000000	TEM1 DBP	0
	14715	000000		
0438	14716	000000	TEM2 DBP	0
	14717	000000		
0439	14720	034476	RPTT OCT	34476,22706
	14721	022706		
0440	14722	000000	ROND OCT	0,20000
	14723	020000		
0441	14724	000000	ABIA DBP	0
	14725	000000		
0442	14726	000000	BBIA DBP	0
	14727	000000		
0443	14730	000000	CBIA DBP	0
	14731	000000		
0444	14732	000000	DBIA DBP	0
	14733	000000		
0445	14734	000000	EBIA DBP	0
	14735	000000		
0446	14736	000000	FBIA DBP	0
	14737	000000		
0447		000600	PAPC EQU	*600
0448		000602	PBPC EQU	PAPC+2
0449		000604	PCPC EQU	PAPC+4
0450		000606	PDPC EQU	PAPC+6
0451		000610	PEPC EQU	PAPC+8
0452		000612	PFPC EQU	PAPC+10
0453	14740	0 000000	PRBI DAC	**
0454	14741	100020	SR1	
0455	14742	-0 01 14740	JMP*	PRBI
0456	14743	000007	DBL	
0457	14744	0 02 14724	DLD	ABIA
0458	14745	0 06 00600	DAD	PAPC
0459	14746	0 04 00600	DST	PAPC
0460	14747	0 02 14726	DLD	BBIA
0461	14750	0 06 00602	DAD	PBPC
0462	14751	0 04 00602	DST	PRPC
0463	14752	0 02 14730	DLD	CBIA

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0464	14753	0 06 00604	DAD	PCPC
0465	14754	0 04 00604	DST	PCPC
0466	14755	0 02 14732	DLD	DBIA
0467	14756	0 06 00606	DAD	PDPC
0468	14757	0 04 00606	DST	PDPC
0469	14760	0 02 14734	DLD	EBIA
0470	14761	0 06 00610	DAD	PEPC
0471	14762	0 04 00610	DST	PEPC
0472	14763	0 02 14736	DLD	FBIA
0473	14764	0 06 00612	DAD	PFPC
0474	14765	0 04 00612	DST	PFPC
0475	14766	000005	SGL	
0476	14767	-0 01 14740	JMP*	PRRI
0477	14770	000012	END	
	14771	000001		
	14772	177777		
	14773	000000		
	14774	000005		

PROGRAM NAME

SOURCE: ERCA

BINARY: BERCA

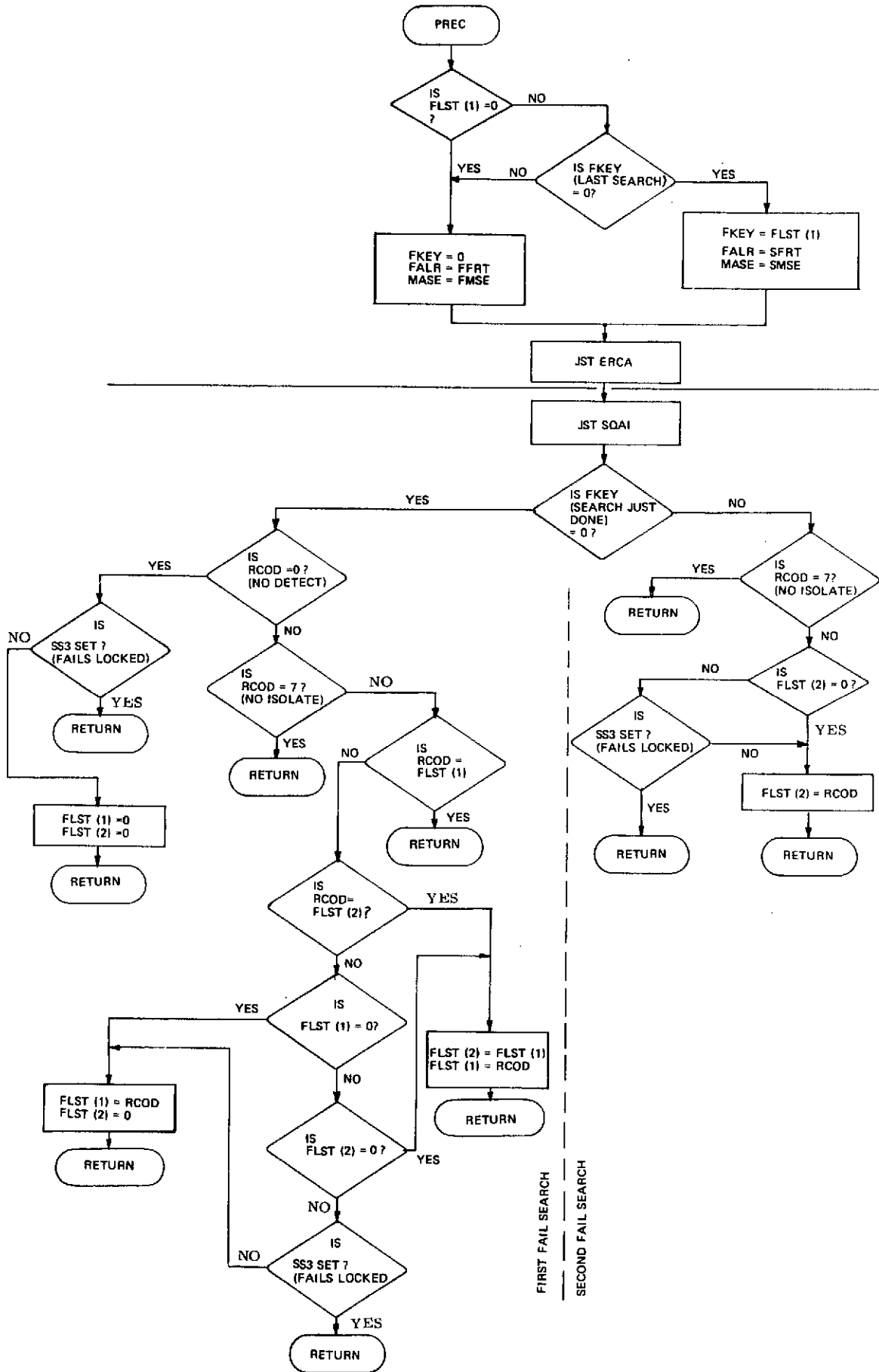
ENTRY POINTS (LOCATION): GFDI (15450), PFDI (15544)

GENERAL DESCRIPTION:

These two subroutines do the deterministic failure detection and isolation for the gyros and accelerometers and determine what fail status should be used in the gyro and accelerometer 6x3 matrix multiplication. The first part of each subroutine involves transferring the six instruments accumulated arguments into the local variables MA, MB, MC, MD, ME and MF, storing the current fail status in the local variable FLST, creating and storing the proper maximum allowable total squared errors for first and second failure detection limits and storing these in the local variables FMSE and SMSE and finally restoring the appropriate failure key (an indication of whether the last detection cycle was looking for a first or second failure) and storing this key in FKEY. A call to the common part of this subroutine is then made by the instruction JST PREC.

Starting at PREC the following functions are performed. First it is determined whether to search for a first or second fail. The logic for this is simple. If there are no failures, search for a first fail. If there are any failures and a first fail was searched for the previous time, search for a second fail, otherwise search for a first fail. When this is determined the proper maximum allowable total squared error is stored in MASE and the proper failure isolation ratio is stored in FALR. Then the error calculator is called via the instruction JST ERCA. ERCA calculates and stores the instrument errors in EA, EB, EC, ED, EE and EF and returns. A call to SQAI is then made which squares the errors, totals them and if a detection is made, tries to isolate the faulty instrument. Upon return, the return code is stored in RCODE and is a 0 if no detection was made, a 1-6 if a detection was made and instrument A-F was isolated and a 7 if a detection was made and no instrument was isolated. The best estimate of the fail status is then made and stored in FLST (see flow chart) and PREC returns to where it was called.

After the return from PREC the gyro and PIPA failure detection and isolation subroutines (GFDI and PFDI) first save the failure key (FKEY) for the next call. They then determine what the working fail status (GFST or PFST) ought to be depending on the results from PREC (FLST) and the statistical fail status (GSFS or PSFS). If FLST is 0,0 (neither a first or second fail) the statistical fail status is used for the working fail status. If FLST indicates two fails (2,4 for example indicating B and D failed) then FLST replaces the working fail status. If FLST indicates only a first fail then the first statistical fail status will be used for the second working fail status unless it agrees with the first fail of FLST in which case the second statistical fail status will be used for the second working fail status.



MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0001				ABS	
0002				ORG	15400
0003				SETB	BAS1
0004	15400			BAS1	RSS 40
0005				SUBR	GFDI
0006				SUBR	PFDI
0007	15450	0 000000		GFDI	DAC **
0008	15451	000007		DBL	
0009	15452	0 02 00330		DLD	GAPA
0010	15453	0 06 00344		DAD	GACA
0011	15454	0401 74		LRS	4
0012	15455	0 04 16130		DST	MA
0013	15456	0 02 00332		DLD	GBPA
0014	15457	0 06 00346		DAD	GBCA
0015	15460	0401 74		LRS	4
0016	15461	0 04 16132		DST	MB
0017	15462	0 02 00334		DLD	GCPA
0018	15463	0 06 00350		DAD	GCCA
0019	15464	0401 74		LRS	4
0020	15465	0 04 16134		DST	MC
0021	15466	0 02 00336		DLD	GDPA
0022	15467	0 06 00352		DAD	GDCA
0023	15470	0401 74		LRS	4
0024	15471	0 04 16136		DST	MD
0025	15472	0 02 00340		DLD	GEPA
0026	15473	0 06 00354		DAD	GECA
0027	15474	0401 74		LRS	4
0028	15475	0 04 16140		DST	ME
0029	15476	0 02 00342		DLD	GFPA
0030	15477	0 06 00356		DAD	GFCA
0031	15500	0401 74		LRS	4
0032	15501	0 04 16142		DST	MF
0033	15502	0 02 00316		DLD	GFST
0034	15503	0 04 15652		DST	FLST
0035	15504	0 02 00574		DLD	AXYZ
0036	15505	0 06 00576		DAD	CXYZ
0037	15506	0405 75		ARS	3
0038	15507	0 04 15640		DST	MASE
0039	15510	0 16 15640		MPY	MASE
0040			*	DST	MASE
0041	15511	0 06 15642		DAD	GFSE
0042	15512	0 04 15634		DST	FMSE
0043			*	DLD	MASE
0044			*	DAD	GSSE
0045	15513	0 07 15644		DSB	GSSE
0046	15514	0 04 15636		DST	SMSE
0047	15515	000005		SGL	
0048	15516	0 02 15660		LDA	GKEY
0049	15517	0 04 15662		STA	FKEY
0050	15520	0 10 15664		JST	PREC
0051	15521	0 02 15662		LDA	FKEY
0052	15522	0 04 15660		STA	GKEY
0053	15523	0 02 15652		LDA	FLST
0054	15524	101040		SNZ	
0055	15525	0 01 15537		JMP	USPS
0056	15526	0 04 00316		STA	GFST
0057	15527	0 02 15653		LDA	FLST+1

MICROCOMP TELECOMMUNICATED DATA
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0058	15530	100040		SZE	
0059	15531	0 01 15542		JMP	UHFS
0060	15532	0 02 00640		LDA	GSFS
0061	15533	0 11 00316		CAS	GFST
0062	15534	0 01 15542		JMP	UHFS
0063	15535	0 01 15541		JMP	USFS+2
0064	15536	0 01 15542		JMP	UHFS
0065	15537	0 02 00640	USFS	LDA	GSFS
0066	15540	0 04 00316		STA	GFST
0067	15541	0 02 00641		LDA	GSFS+1
0068	15542	0 04 00317	UHFS	STA	GFST+1
0069	15543	-0 01 15450		JMP*	GPDI
0070	15544	0 000000	PFDI	DAC	**
0071	15545	000007		DEL	
0072	15546	0 02 00664		DLD	PAPA
0073	15547	0 06 00744		DAD	PACA
0074	15550	0401 74		LRS	4
0075	15551	0 04 16130		DST	MA
0076	15552	0 02 00666		DLD	PBPA
0077	15553	0 06 00746		DAD	PBCA
0078	15554	0401 74		LRS	4
0079	15555	0 04 16132		DST	MB
0080	15556	0 02 00670		DLD	PCPA
0081	15557	0 06 00750		DAD	PCCA
0082	15560	0401 74		LRS	4
0083	15561	0 04 16134		DST	MC
0084	15562	0 02 00672		DLD	PDPA
0085	15563	0 06 00752		DAD	PDCA
0086	15564	0401 74		LRS	4
0087	15565	0 04 16136		DST	MD
0088	15566	0 02 00674		DLD	PEPA
0089	15567	0 06 00754		DAD	PECA
0090	15570	0401 74		LRS	4
0091	15571	0 04 16140		DST	ME
0092	15572	0 02 00676		DLD	PFPA
0093	15573	0 06 00756		DAD	PFCA
0094	15574	0401 74		LRS	4
0095	15575	0 04 16142		DST	MF
0096	15576	0 02 00320		DLD	PFST
0097	15577	0 04 15652		DST	FLST
0098	15600	0 02 15646		DLD	PFSE
0099	15601	0 04 15634		DST	FMSE
0100	15602	0 02 15650		DLD	PSSE
0101	15603	0 04 15636		DST	SMSE
0102	15604	000005		SGL	
0103	15605	0 02 15661		LDA	PKEY
0104	15606	0 04 15662		STA	PKEY
0105	15607	0 10 15664		JST	PREC
0106	15610	0 02 15662		LDA	PKEY
0107	15611	0 04 15661		STA	PKEY
0108	15612	0 02 15652		LDA	FLST
0109	15613	101040		SNZ	
0110	15614	0 01 15626		JMP	UTFS
0111	15615	0 04 00320		STA	PFST
0112	15616	0 02 15653		LDA	FLST+1
0113	15617	100040		SZE	
0114	15620	0 01 15631		JMP	UOFS

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0115	15621	0 02 00760	LDA	PSFS
0116	15622	0 11 00320	CAS	PFST
0117	15623	0 01 15631	JMP	UOFS
0118	15624	0 01 15630	JMP	UTFS+2
0119	15625	0 01 15631	JMP	UOFS
0120	15626	0 02 00760	UTFS LDA	PSFS
0121	15627	0 04 00320	STA	PFST
0122	15630	0 02 00761	LDA	PSFS+1
0123	15631	0 04 00321	UOFS STA	PFST+1
0124	15632	-0 01 15544	JMP*	PFDI
0125		000330	GAPA EQU	'330
0126		000332	GBPA EQU	GAPA+2
0127		000334	GCPA EQU	GAPA+4
0128		000336	GDPA EQU	GAPA+6
0129		000340	GEPA EQU	GAPA+8
0130		000342	GFPA EQU	GAPA+10
0131		000344	GACA EQU	'344
0132		000346	GBCA EQU	GACA+2
0133		000350	GCCA EQU	GACA+4
0134		000352	GDCA EQU	GACA+6
0135		000354	GECA EQU	GACA+8
0136		000356	GFCA EQU	GACA+10
0137		000574	AXYZ EQU	'574
0138		000576	CXYZ EQU	AXYZ+2
0139		000316	GFST EQU	'316
0140		000640	GSFS EQU	'640
0141		000664	PAPA EQU	'664
0142		000666	PEPA EQU	PAPA+2
0143		000670	PCPA EQU	PAPA+4
0144		000672	PDPA EQU	PAPA+6
0145		000674	PEPA EQU	PAPA+8
0146		000676	PFPA EQU	PAPA+10
0147		000744	PACA EQU	'744
0148		000746	PBCA EQU	PACA+2
0149		000750	PCCA EQU	PACA+4
0150		000752	PECA EQU	PACA+6
0151		000754	PECA EQU	PACA+8
0152		000756	PFCA EQU	PACA+10
0153		000320	PFST EQU	'320
0154		000760	PSFS EQU	'760
0155	15634	000000	PMSE DBP	0
	15635	000000		
0156	15636	000000	SMSE DBP	0
	15637	000000		
0157	15640	000000	MASE DBP	0
	15641	000000		
0158	15642	000000	GFSE OCT	0,2200
	15643	002200		
0159	15644	000000	GSSE OCT	0,346
	15645	000346		
0160	15646	000000	PFSE OCT	0,11000
	15647	011000		
0161	15650	000000	PSSE OCT	0,7146
	15651	007146		
0162	15652	000000	PLST DBP	0
	15653	000000		
0163	15654	000000	FALR DBP	0

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15655	000000			
0164	15656	034343	FFRT OCT	34343
0165	15657	030600	SFRT OCT	30600
0166	15660	000000	GKEY OCT	0
0167	15661	000000	PKEY OCT	0
0168	15662	000000	FKEY OCT	0
0169	15663	000000	RCOD OCT	0
0170	15664	0 000000	PREC DAC	**
0171	15665	0 02 15652	LDA	FLST
0172	15666	100040	SZE	
0173	15667	0 01 15700	JMP	ALOF
0174	15670	140040	FFTR CRA	
0175	15671	0 04 15662	STA	FKEY
0176	15672	0 02 15656	LDA	FFRT
0177	15673	0 04 15654	STA	FAIR
0178	15674	000007	DBL	
0179	15675	0 02 15634	DLD	FMSE
0180	15676	0 04 15640	DST	MASE
0181	15677	0 01 15712	JMP	COCA
0182	15700	0 02 15662	ALOF LDA	FKEY
0183	15701	100040	SZE	
0184	15702	0 01 15670	JMP	FFTR
0185	15703	0 02 15652	LDA	FLST
0186	15704	0 04 15662	STA	FKEY
0187	15705	0 02 15657	LDA	SFRT
0188	15706	0 04 15654	STA	FAIR
0189	15707	000007	DBL	
0190	15710	0 02 15636	DLD	SMSE
0191	15711	0 04 15640	DST	MASE
0192	15712	000005	COCA SGL	
0193	15713	0 10 16001	JST	ERCA
0194	15714	0 10 16276	JST	SQAI
0195	15715	0 02 15662	LDA	FKEY
0196	15716	100040	SZE	
0197	15717	0 01 15765	JMP	SFSR
0198	15720	0 02 15663	LDA	RCOD
0199	15721	100040	SZE	
0200	15722	0 01 15731	JMP	NOZE
0201	15723	100004	SR3	
0202	15724	-0 01 15664	JMP*	PREC
0203	15725	140040	CRA	
0204	15726	0 04 15652	STA	FLST
0205	15727	0 04 15653	STA	FLST+1
0206	15730	-0 01 15664	JMP*	PREC
0207	15731	0 07 16622	NOZE SUB	=7
0208	15732	101400	SMI	
0209	15733	-0 01 15664	JMP*	PREC
0210	15734	0 02 15663	LDA	RCOD
0211	15735	0 11 15652	CAS	FLST
0212	15736	100000	SKP	
0213	15737	-0 01 15664	JMP*	PREC
0214	15740	0 11 15653	CAS	FLST+1
0215	15741	100000	SKP	
0216	15742	0 01 15760	JMP	SPCA
0217	15743	0 02 15652	LDA	FLST
0218	15744	101040	SNZ	
0219	15745	0 01 15753	JMP	**6

MICROCOMP TELECOMMUNICATED DATA
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0220	15746	0 02 15653	LDA	FLST+1
0221	15747	101040	SNZ	
0222	15750	0 01 15760	JMP	SPCA
0223	15751	100004	SR3	
0224	15752	-0 01 15664	JMP*	PREC
0225	15753	0 02 15663	LDA	RCOD
0226	15754	0 04 15652	STA	FLST
0227	15755	140040	CRA	
0228	15756	0 04 15653	STA	FLST+1
0229	15757	-0 01 15664	JMP*	PREC
0230	15760	0 02 15652	SPCA LDA	FLST
0231	15761	0 04 15653	STA	FLST+1
0232	15762	0 02 15663	LDA	RCOD
0233	15763	0 04 15652	STA	FLST
0234	15764	-0 01 15664	JMP*	PREC
0235	15765	0 02 15663	SFSR LDA	RCOD
0236	15766	0 07 16622	SUB	=7
0237	15767	101400	SMI	
0238	15770	-0 01 15664	JMP*	PREC
0239	15771	0 02 15653	LDA	FLST+1
0240	15772	101040	SNZ	
0241	15773	0 01 15776	JMP	*+3
0242	15774	100004	SR3	
0243	15775	-0 01 15664	JMP*	PREC
0244	15776	0 02 15663	LDA	RCOD
0245	15777	0 04 15653	STA	FLST+1
0246			SETB	BAS2
0247	16000	-0 01 15664	JMP*	PREC
0248	16001	0 000000	ERCA DAC	**
0249	16002	0 02 15662	LDA	FKEY
0250	16003	101040	SNZ	
0251	16004	0 01 16015	JMP	DONF
0252	16005	0415 76	ALS	2
0253	16006	0 06 15662	ADD	FKEY
0254	16007	0 06 16022	ADD	DCAP
0255	16010	0 04 16021	STA	FLAD
0256	16011	000007	DBL	
0257	16012	-0 10 16021	JST*	FLAD
0258	16013	000005	SGL	
0259	16014	-0 01 16001	JMP*	ERCA
0260	16015	000007	DONF DBL	
0261	16016	0 10 16061	JST	NOFL
0262	16017	000005	SGL	
0263	16020	-0 01 16001	JMP*	ERCA
0264	16021	000000	FLAD OCT	0
0265	16022	0 016016	DCAP DAC	*-4
0266	16023	0 000000	AFAL DAC	**
0267	16024	0 10 16210	JST	CACA
0268	16025	0 04 16130	DST	MA
0269	16026	0 10 16061	JST	NOFL
0270	16027	-0 01 16023	JMP*	AFAL
0271	16030	0 000000	BFAL DAC	**
0272	16031	0 10 16221	JST	CACB
0273	16032	0 04 16132	DST	MB
0274	16033	0 10 16061	JST	NOFL
0275	16034	-0 01 16030	JMP*	BFAL
0276	16035	0 000000	CFAL DAC	**

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0277	16036	0 10	16232	JST	CACC
0278	16037	0 04	16134	DST	MC
0279	16040	0 10	16061	JST	NOFL
0280	16041	-0 01	16035	JMP*	CFAL
0281	16042	0 000000	DFAL	DAC	**
0282	16043	0 10	16243	JST	CACD
0283	16044	0 04	16136	DST	MD
0284	16045	0 10	16061	JST	NOFL
0285	16046	-0 01	16042	JMP*	DFAL
0286	16047	0 000000	EFAL	DAC	**
0287	16050	0 10	16254	JST	CACE
0288	16051	0 04	16140	DST	ME
0289	16052	0 10	16061	JST	NOFL
0290	16053	-0 01	16047	JMP*	EFAL
0291	16054	0 000000	FFAL	DAC	**
0292	16055	0 10	16265	JST	CACF
0293	16056	0 04	16142	DST	MF
0294	16057	0 10	16061	JST	NOFL
0295	16060	-0 01	16054	JMP*	FFAL
0296	16061	0 000000	NOFL	DAC	**
0297	16062	0 10	16210	JST	CACA
0298	16063	0 10	16221	JST	CACB
0299	16064	0 10	16232	JST	CACC
0300	16065	0 10	16243	JST	CACD
0301	16066	0 10	16254	JST	CACE
0302	16067	0 10	16265	JST	CACF
0303	16070	0 02	16130	DLD	MA
0304	16071	0 07	16144	DSB	CA
0305	16072	0 04	16114	DST	EA
0306	16073	0 02	16132	DLD	MB
0307	16074	0 07	16146	DSB	CB
0308	16075	0 04	16116	DST	EB
0309	16076	0 02	16134	DLD	MC
0310	16077	0 07	16150	DSB	CC
0311	16100	0 04	16120	DST	EC
0312	16101	0 02	16136	DLD	MD
0313	16102	0 07	16152	DSB	CD
0314	16103	0 04	16122	DST	ED
0315	16104	0 02	16140	DLD	ME
0316	16105	0 07	16154	DSB	CE
0317	16106	0 04	16124	DST	EE
0318	16107	0 02	16142	DLD	NF
0319	16110	0 07	16156	DSB	CF
0320	16111	0 04	16126	DST	EF
0321	16112	-0 01	16061	JMP*	NOFL
0322	16114	000000	FA	DBP	0
	16115	000000			
0323	16116	000000	EB	DBP	0
	16117	000000			
0324	16120	000000	EC	DBP	0
	16121	000000			
0325	16122	000000	ED	DBP	0
	16123	000000			
0326	16124	000000	EE	DBP	0
	16125	000000			
0327	16126	000000	EF	DBP	0
	16127	000000			

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0328	16130	000000	MA	DBP	0
	16131	000000			
0329	16132	000000	MB	DBP	0
	16133	000000			
0330	16134	000000	MC	DBP	0
	16135	000000			
0331	16136	000000	MD	DBP	0
	16137	000000			
0332	16140	000000	ME	DBP	0
	16141	000000			
0333	16142	000000	MF	DBP	0
	16143	000000			
0334	16144	000000	CA	DBP	0
	16145	000000			
0335	16146	000000	CB	DBP	0
	16147	000000			
0336	16150	000000	CC	DBP	0
	16151	000000			
0337	16152	000000	CD	DBP	0
	16153	000000			
0338	16154	000000	CE	DBP	0
	16155	000000			
0339	16156	000000	CF	DBP	0
	16157	000000			
0340	16160	0 000000	MSPT	DAC	**
0341	16161	0 04 16200		DST	TEM1
0342	16162	0 16 16205		MPY	RPTT+1
0343	16163	0401 77		LRS	1
0344	16164	0 04 16202		DST	TEM2
0345	16165	0 02 16204		DLD	RPTT
0346	16166	0 16 16201		MPY	TEM1+1
0347	16167	0401 77		LRS	1
0348	16170	0 06 16202		DAD	TEM2
0349	16171	0 06 16206		DAD	ROND
0350	16172	0401 62		LRS	14
0351	16173	0 04 16202		DST	TEM2
0352	16174	0 02 16200		DLD	TEM1
0353	16175	0 16 16204		MPY	RPTT
0354	16176	0 06 16202		DAD	TEM2
0355	16177	-0 01 16160		JMP*	MSPT
0356	16200	000000	TEM1	DBP	0
	16201	000000			
0357	16202	000000	TEM2	DBP	0
	16203	000000			
0358	16204	034476	RPTT	OCT	34476, 22706
	16205	022706			
0359	16206	000000	ROND	OCT	0, 20000
	16207	020000			
0360	16210	0 000000	CACA	DAC	**
0361	16211	0 02 16132		DLD	MB
0362	16212	0 07 16134		DSB	MC
0363	16213	0 07 16136		DSB	MD
0364	16214	0 06 16140		DAD	ME
0365	16215	0 06 16142		DAD	MF
0366	16216	0 10 16160		JST	MSPT
0367	16217	0 04 16144		DST	CA
0368	16220	-0 01 16210		JMP*	CACA

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0369	16221	0	000000	CACB	DAC	**
0370	16222	0	02 16130		DLD	MA
0371	16223	0	06 16134		DAD	MC
0372	16224	0	06 16136		DAD	MD
0373	16225	0	06 16140		DAD	ME
0374	16226	0	06 16142		DAD	MF
0375	16227	0	10 16160		JST	MSPT
0376	16230	0	04 16146		DST	CB
0377	16231	-0	01 16221		JMP*	CACB
0378	16232	0	000000	CACC	DAC	**
0379	16233	0	02 16132		DLD	MB
0380	16234	0	07 16130		DSB	MA
0381	16235	0	06 16136		DAD	MD
0382	16236	0	07 16140		DSB	ME
0383	16237	0	06 16142		DAD	MF
0384	16240	0	10 16160		JST	MSPT
0385	16241	0	04 16150		DST	CC
0386	16242	-0	01 16232		JMP*	CACC
0387	16243	0	000000	CACD	DAC	**
0388	16244	0	02 16132		DLD	MB
0389	16245	0	07 16130		DSB	MA
0390	16246	0	06 16134		DAD	MC
0391	16247	0	06 16140		DAD	ME
0392	16250	0	07 16142		DSB	MF
0393	16251	0	10 16160		JST	MSPT
0394	16252	0	04 16152		DST	CD
0395	16253	-0	01 16243		JMP*	CACD
0396	16254	0	000000	CACE	DAC	**
0397	16255	0	02 16130		DLD	MA
0398	16256	0	06 16132		DAD	MB
0399	16257	0	07 16134		DSB	MC
0400	16260	0	06 16136		DAD	MD
0401	16261	0	07 16142		DSB	MF
0402	16262	0	10 16160		JST	MSPT
0403	16263	0	04 16154		DST	CE
0404	16264	-0	01 16254		JMP*	CACE
0405	16265	0	000000	CACF	DAC	**
0406	16266	0	02 16130		DLD	MA
0407	16267	0	06 16132		DAD	MB
0408	16270	0	06 16134		DAD	MC
0409	16271	0	07 16136		DSB	MD
0410	16272	0	07 16140		DSB	ME
0411	16273	0	10 16160		JST	MSPT
0412	16274	0	04 16156		DST	CF
0413	16275	-0	01 16265		JMP*	CACF
0414	16276	0	000000	SOAI	DAC	**
0415	16277		000007		DBL	
0416	16300	0	02 16114		DLD	EA
0417	16301		101400		SMI	
0418	16302	0	01 16305		JMP	**+3
0419	16303	0	07 16114		DSB	EA
0420	16304	0	07 16114		DSB	EA
0421	16305		100040		SZE	
0422	16306	0	01 16466		JMP	OVFL
0423	16307		000201		IAB	
0424	16310	0	04 16526		DST	ASE
0425	16311	0	16 16526		MPY	ASE

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0426	16312	0 04	16526	DST	ASE
0427	16313	0 02	16116	DLD	EB
0428	16314	101400		SMI	
0429	16315	0 01	16320	JMP	++3
0430	16316	0 07	16116	DSB	EB
0431	16317	0 07	16116	DSB	EB
0432	16320	100040		SZE	
0433	16321	0 01	16466	JMP	OVFL
0434	16322	000201		IAB	
0435	16323	0 04	16530	DST	BSE
0436	16324	0 16	16530	MPY	BSE
0437	16325	0 04	16530	DST	BSE
0438	16326	0 02	16120	DLD	EC
0439	16327	101400		SMI	
0440	16330	0 01	16333	JMP	++3
0441	16331	0 07	16120	DSB	EC
0442	16332	0 07	16120	DSB	EC
0443	16333	100040		SZE	
0444	16334	0 01	16466	JMP	OVFL
0445	16335	000201		IAB	
0446	16336	0 04	16532	DST	CSE
0447	16337	0 16	16532	MPY	CSE
0448	16340	0 04	16532	DST	CSE
0449	16341	0 02	16122	DLD	ED
0450	16342	101400		SMI	
0451	16343	0 01	16346	JMP	++3
0452	16344	0 07	16122	DSB	ED
0453	16345	0 07	16122	DSB	ED
0454	16346	100040		SZE	
0455	16347	0 01	16466	JMP	OVFL
0456	16350	000201		IAB	
0457	16351	0 04	16534	DST	DSE
0458	16352	0 16	16534	MPY	DSE
0459	16353	0 04	16534	DST	DSE
0460	16354	0 02	16124	DLD	EE
0461	16355	101400		SMI	
0462	16356	0 01	16361	JMP	++3
0463	16357	0 07	16124	DSB	EE
0464	16360	0 07	16124	DSB	EE
0465	16361	100040		SZE	
0466	16362	0 01	16466	JMP	OVFL
0467	16363	000201		IAB	
0468	16364	0 04	16536	DST	ESE
0469	16365	0 16	16536	MPY	ESE
0470	16366	0 04	16536	DST	ESE
0471	16367	0 02	16126	DLD	EF
0472	16370	101400		SMI	
0473	16371	0 01	16374	JMP	++3
0474	16372	0 07	16126	DSB	EF
0475	16373	0 07	16126	DSB	EF
0476	16374	100040		SZE	
0477	16375	0 01	16466	JMP	OVFL
0478	16376	000201		IAB	
0479	16377	0 04	16540	DST	FSE
0480	16400	0 16	16540	MPY	FSE
0481	16401	0 04	16540	DST	FSE
0482	16402	0 06	16526	DAD	ASE

MICROCOMP TELECOMMUNICATED DATA
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0483	16403	100001	SRC	
0484	16404	0 01 16466	JMP	OVFL
0485	16405	0 06 16530	DAD	BSE
0486	16406	100001	SRC	
0487	16407	0 01 16466	JMP	OVFL
0488	16410	0 06 16532	DAD	CSE
0489	16411	100001	SRC	
0490	16412	0 01 16466	JMP	OVFL
0491	16413	0 06 16534	DAD	DSE
0492	16414	100001	SRC	
0493	16415	0 01 16466	JMP	OVFL
0494	16416	0 06 16536	DAD	ESE
0495	16417	100001	SRC	
0496	16420	0 01 16466	JMP	OVFL
0497	16421	0 04 16542	DST	TSE
0498	16422	0 07 15640	DSB	MASE
0499	16423	100400	SPL	
0500	16424	0 01 16472	JMP	ZRTU
0501	16425	0 02 15654	DLD	FALR
0502	16426	0 16 16543	MPY	TSE+1
0503	16427	000201	IAB	
0504	16430	140040	CRA	
0505	16431	0 04 16202	DST	TEM2
0506	16432	0 02 16542	DLD	TSE
0507	16433	0 16 15654	MPY	FALR
0508	16434	0 06 16202	DAD	TEM2
0509	16435	0 04 16202	DST	TEM2
0510	16436	0 02 16526	DLD	ASE
0511	16437	0 07 16202	DSB	TEM2
0512	16440	101400	SMI	
0513	16441	0 01 16476	JMP	ISOA
0514	16442	0 02 16530	DLD	BSE
0515	16443	0 07 16202	DSB	TEM2
0516	16444	101400	SMI	
0517	16445	0 01 16502	JMP	ISOB
0518	16446	0 02 16532	DLD	CSE
0519	16447	0 07 16202	DSB	TEM2
0520	16450	101400	SMI	
0521	16451	0 01 16506	JMP	ISOC
0522	16452	0 02 16534	DLD	DSE
0523	16453	0 07 16202	DSB	TEM2
0524	16454	101400	SMI	
0525	16455	0 01 16512	JMP	ISOD
0526	16456	0 02 16536	DLD	ESE
0527	16457	0 07 16202	DSB	TEM2
0528	16460	101400	SMI	
0529	16461	0 01 16516	JMP	ISOE
0530	16462	0 02 16540	DLD	FSE
0531	16463	0 07 16202	DSB	TEM2
0532	16464	101400	SMI	
0533	16465	0 01 16522	JMP	ISOF
0534	16466	000005	OVFL SGL	
0535	16467	0 02 16622	LDA	=7
0536	16470	0 04 15663	STA	RCOD
0537	16471	-0 01 16276	JMP*	SQAI
0538	16472	000005	ZRTU SGL	
0539	16473	140040	CRA	

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0540	16474	0 04 15663	STA	RCOD	
0541	16475	-0 01 16276	JMP*	SQAI	
0542	16476	000005	ISOA	SGL	
0543	16477	0 02 16621	LDA	=1	
0544	16500	0 04 15663	STA	RCOD	
0545	16501	-0 01 16276	JMP*	SQAI	
0546	16502	000005	ISOB	SGL	
0547	16503	0 02 16620	LDA	=2	
0548	16504	0 04 15663	STA	RCOD	
0549	16505	-0 01 16276	JMP*	SOAI	
0550	16506	000005	ISOC	SGL	
0551	16507	0 02 16617	LDA	=3	
0552	16510	0 04 15663	STA	RCOD	
0553	16511	-0 01 16276	JMP*	SQAI	
0554	16512	000005	ISOD	SGL	
0555	16513	0 02 16616	LDA	=4	
0556	16514	0 04 15663	STA	RCOD	
0557	16515	-0 01 16276	JMP*	SOAI	
0558	16516	000005	ISOE	SGL	
0559	16517	0 02 16615	LDA	=5	
0560	16520	0 04 15663	STA	RCOD	
0561	16521	-0 01 16276	JMP*	SOAI	
0562	16522	000005	ISOF	SGL	
0563	16523	0 02 16614	LDA	=6	
0564	16524	0 04 15663	STA	RCOD	
0565	16525	-0 01 16276	JMP*	SQAI	
0566	16526	000000	ASE	DBP	0
	16527	000000			
0567	16530	000000	BSE	DBP	0
	16531	000000			
0568	16532	000000	CSE	DBP	0
	16533	000000			
0569	16534	000000	DSE	DBP	0
	16535	000000			
0570	16536	000000	ESE	DBP	0
	16537	000000			
0571	16540	000000	FSE	DBP	0
	16541	000000			
0572	16542	000000	TSE	DBP	0
	16543	000000			
0573	16544		BAS2	BSS	40
0574	16614	000006		END	
	16615	000005			
	16616	000004			
	16617	000003			
	16620	000002			
	16621	000001			
	16622	000007			

PROGRAM NAME
SOURCE: ROM5
BINARY: BROM5
ENTRY POINTS (location): ROMS ('15000)
ACCESSIBLE VARIABLES: WXPR ('15333)
WYPR ('15334), WZPR ('15335)
GENERAL DESCRIPTION:

When the SIRU strapdown system is subjected to a rotational environment its accelerometers will sense acceleration due to $\omega^2 R$ and ωR . Since the accelerometers do not all sense acceleration at the same point, these rotation-induced accelerations will make the accelerometers appear to be in disagreement. This subroutine compensates the accelerometers to make them look as if they are all sensing acceleration at the same point (since the location of this point is not critical we pick the center of the A accelerometer so that at least the A accelerometer need not be compensated).

Consider some point which has an R vector from the center of the A accelerometer of (RX, RY, RZ). The acceleration sensed at this point different from the acceleration sensed at the center of the A accelerometer is:

$$\begin{aligned} & \bar{i}(\omega_x \omega_y RY + \omega_x \omega_z RZ - \omega_y^2 R_x - \omega_z^2 RX + \dot{\omega}_y RZ - \dot{\omega}_z RY) \\ & + \bar{j}(\omega_y \omega_z RZ + \omega_y \omega_x RX - \omega_x^2 RY - \omega_z^2 RY + \dot{\omega}_z RX - \dot{\omega}_x RZ) \\ & + \bar{k}(\omega_z \omega_x RX + \omega_z \omega_y RY - \omega_x^2 RZ - \omega_y^2 RZ + \dot{\omega}_x RY - \dot{\omega}_y RX) \end{aligned}$$

B, C, D, E and F accelerometers can be corrected by adding the negative of the acceleration each one senses due to rotation. For the F accelerometer this would be

$$-S (Z \text{ axis acceleration}) + C (Y \text{ axis acceleration})$$

where

$$C = \text{cosine}, S = \text{sine}$$

or

$$\begin{aligned}
 & -S(\omega_z \omega_x \text{RFX} + \omega_z \omega_y \text{RFY} - \omega_x^2 \text{RFZ} - \omega_y^2 \text{RFZ} + \dot{\omega}_x \text{RFY} - \dot{\omega}_y \text{RFX}) \\
 & + C(\omega_y \omega_z \text{RFZ} + \omega_y \omega_x \text{RFX} - \omega_x^2 \text{RFY} - \omega_z^2 \text{RFY} + \dot{\omega}_z \text{RFX} - \dot{\omega}_x \text{RFZ})
 \end{aligned}$$

these terms can be combined to give:

$$\begin{aligned}
 & C \text{RFX}(\omega_y \omega_x + \dot{\omega}_z) \\
 & + C \text{RFY}(-\omega_x^2 - \omega_z^2) \\
 & + C \text{RFZ}(\omega_y \omega_z - \dot{\omega}_x) \\
 & + S \text{RFX}(-\omega_z \omega_x + \dot{\omega}_y) \\
 & + S \text{RFY}(-\omega_z \omega_y - \dot{\omega}_x) \\
 & + S \text{RFZ}(\omega_x^2 + \omega_y^2)
 \end{aligned}$$

a similar set of corrections can be derived for accelerometers B, C, D and E.

This subroutine first calculates $\omega_x \omega_y$, $\omega_x \omega_z$, $\omega_y \omega_z$, ω_x^2 , ω_y^2 , ω_z^2 , $\dot{\omega}_x$, $\dot{\omega}_y$ and $\dot{\omega}_z$ using $\Delta \theta_x$, $\Delta \theta_y$ and $\Delta \theta_z$ over one update interval as an indication of ω_x , ω_y and ω_z . It then calculates.

$$\text{PAR1} = \omega_y \omega_x + \dot{\omega}_z$$

$$\text{PAR2} = \omega_x^2 + \omega_z^2$$

$$\text{PAR3} = \omega_y \omega_z - \dot{\omega}_x$$

$$\text{PAR4} = \omega_z \omega_x - \dot{\omega}_y$$

$$\text{PAR5} = \omega_z \omega_y - \dot{\omega}_x$$

$$\text{PAR6} = \omega_x^2 + \omega_y^2$$

$$\text{PAR7} = \omega_y^2 + \omega_z^2$$

$$\text{PAR8} = \omega_x \omega_y - \dot{\omega}_z$$

$$\text{PAR9} = \omega_x \omega_z + \dot{\omega}_y$$

F's correction can now be defined as:

```

C RFX PAR1
-C RFY PAR2
+C RFZ PAR3
-S RFX PAR4
-S RFY PAR5
+S RFZ PAR6

```

Without doing the whole derivation B's correction can be defined as:

```

-C RBX PAR4
-C RBY PAR5
+C RBZ PAR6
-S RBX PAR7
+S RBY PAR8
+S RBZ PAR9

```

C, D and E have similar corrections.

The terms in the above equations such as -C RBX are constants and are stored as such in this subroutine. They are functions of the following table of distances which was made from detailed drawings of the SIRU PI-frame and SIRU accelerometers.

AXIS R(cm)	A	B	C	D	E	F
X	0	-8.603	13.937	13.937	2.718	0.902
Y	0	-1.816	-24.021	-15.418	-27.081	11.130
Z	0	0	2.482	0.665	1.085	1.085

A look at the subroutine listing will show how the above equations are implemented.

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0001				ABS	
0002				ORG	'15000
0003				SUBR	WXPR
0004				SUBR	WYPR
0005				SUBR	WZPR
0006				SUBR	ROMS
0007	15000	0 000000	ROMS	DAC	**
0008	15001	0 02 00414		LDA	WX
0009	15002	0 16 00416		MPY	WY
0010	15003	0 04 15322		STA	WXWY
0011	15004	0 02 00414		LDA	WX
0012	15005	0 16 00420		MPY	WZ
0013	15006	0 04 15323		STA	WXWZ
0014	15007	0 02 00416		LDA	WY
0015	15010	0 16 00420		MPY	WZ
0016	15011	0 04 15324		STA	WYWZ
0017	15012	0 02 00414		LDA	WX
0018	15013	0 16 00414		MPY	WX
0019	15014	0 04 15325		STA	WXSQ
0020	15015	0 02 00416		LDA	WY
0021	15016	0 16 00416		MPY	WY
0022	15017	0 04 15326		STA	WYSQ
0023	15020	0 02 00420		LDA	WZ
0024	15021	0 16 00420		MPY	WZ
0025	15022	0 04 15327		STA	WZSQ
0026	15023	0 02 00414		LDA	WX
0027	15024	0 07 15333		SUB	WXPR
0028	15025	0415 73		ALS	5
0029	15026	0 04 15330		STA	WYDT
0030	15027	0 02 00416		LDA	WY
0031	15030	0 07 15334		SUB	WYPR
0032	15031	0415 73		ALS	5
0033	15032	0 04 15331		STA	WYDT
0034	15033	0 02 00420		LDA	WZ
0035	15034	0 07 15335		SUB	WZPR
0036	15035	0415 73		ALS	5
0037	15036	0 04 15332		STA	WZDT
0038	15037	0 06 15322		ADD	WXWY
0039	15040	0 04 15262		STA	PAR1
0040	15041	0 16 15336		MPY	CRFX
0041	15042	000007		DBL	
0042	15043	0 04 15304		DST	CORF
0043	15044	000005		SGL	
0044	15045	0 02 15325		LDA	WXSQ
0045	15046	0 06 15327		ADD	WZSQ
0046	15047	0 04 15264		STA	PAR2
0047	15050	0 16 15337		MPY	CRFY
0048	15051	000007		DBL	
0049	15052	0 06 15304		DAD	CORF
0050	15053	0 04 15304		DST	CORF
0051	15054	000005		SGL	
0052	15055	0 02 15324		LDA	WYWZ
0053	15056	0 07 15330		SUB	WYDT
0054	15057	0 04 15266		STA	PAR3
0055	15060	0 16 15340		MPY	CRFZ
0056	15061	000007		DBL	
0057	15062	0 04 15316		DST	TEM1

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0058	15063	0 06	15304	DAD	COPF
0059	15064	0 04	15304	DST	CORF
0060	15065	000005		SGL	
0061	15066	0 02	15323	LDA	WXWZ
0062	15067	0 07	15331	SUB	WYDT
0063	15070	0 04	15270	STA	PAP4
0064	15071	0 16	15341	MPY	SRFX
0065	15072	000007		DBL	
0066	15073	0 06	15304	DAD	CORF
0067	15074	0 04	15304	DST	CORF
0068	15075	000005		SGL	
0069	15076	0 02	15324	LDA	WYWZ
0070	15077	0 07	15330	SUB	WXDT
0071	15100	0 04	15272	STA	PAP5
0072	15101	0 16	15342	MPY	SRFY
0073	15102	000007		DBL	
0074	15103	0 06	15304	DAD	CORF
0075	15104	0 04	15304	DST	CORF
0076	15105	000005		SGL	
0077	15106	0 02	15325	LDA	WXS0
0078	15107	0 06	15326	ADD	WYS0
0079	15110	0 04	15274	STA	PAR6
0080	15111	0 16	15343	MPY	SRFZ
0081	15112	000007		DBL	
0082	15113	0 04	15306	DST	COPE
0083	15114	0 06	15304	DAD	CORF
0084	15115	0401 67		LRS	9
0085	15116	0 06	00612	DAD	'612
0086	15117	0 04	00612	DST	'612
0087	15120	000005		SGL	
0088	15121	0 02	15326	LDA	WYSQ
0089	15122	0 06	15327	ADD	WZSQ
0090	15123	0 04	15276	STA	PAR7
0091	15124	0 16	15351	MPY	CRDX
0092	15125	000007		DBL	
0093	15126	0 04	15310	DST	COPD
0094	15127	0 04	15312	DST	CORC
0095	15130	000005		SGL	
0096	15131	0 02	15322	LDA	WXWY
0097	15132	0 07	15332	SUB	WZDT
0098	15133	0 04	15300	STA	PAR8
0099	15134	0 16	15352	MPY	CRDY
0100	15135	000007		DBL	
0101	15136	0 06	15310	DAD	CORD
0102	15137	0 04	15310	DST	CORD
0103	15140	000005		SGL	
0104	15141	0 02	15323	LDA	WXWZ
0105	15142	0 06	15331	ADD	WYDT
0106	15143	0 04	15302	STA	PAR9
0107	15144	0 16	15353	MPY	CRDZ
0108	15145	000007		DBL	
0109	15146	0 06	15310	DAD	CORD
0110	15147	0 04	15310	DST	CORD
0111	15150	0 02	15264	DLD	PAR2
0112	15151	0 16	15345	MPY	CREY
0113	15152	0 06	15306	DAD	CORE
0114	15153	0 07	15316	DSB	TEM1

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0115	15154	0 04	15306	DST	CORE
0116	15155	0 02	15270	DLD	PAR4
0117	15156	0 16	15346	MPY	SREX
0118	15157	0 06	15306	DAD	CORE
0119	15160	0 04	15306	DST	COPE
0120	15161	0 02	15272	DLD	PAR5
0121	15162	0 16	15350	MPY	SREY
0122	15163	0 06	15306	DAD	CORE
0123	15164	0401	67	LRS	9
0124	15165	0 06	00610	DAD	'610
0125	15166	0 04	00610	DST	'610
0126	15167	0 02	15262	DLD	PAR1
0127	15170	0 16	15354	MPY	SRDX
0128	15171	0 04	15320	DST	TEM2
0129	15172	0 06	15310	DAD	CORD
0130	15173	0 04	15310	DST	CORD
0131	15174	0 02	15264	DLD	PAR2
0132	15175	0 16	15355	MPY	SRDY
0133	15176	0 06	15310	DAD	CORD
0134	15177	0 04	15310	DST	CORD
0135	15200	0 02	15266	DLD	PAR3
0136	15201	0 16	15356	MPY	SRDZ
0137	15202	0 06	15310	DAD	CORD
0138	15203	0401	67	LRS	9
0139	15204	0 06	00606	DAD	'606
0140	15205	0 04	00606	DST	'606
0141	15206	0 02	15300	DLD	PAR8
0142	15207	0 16	15357	MPY	CRCY
0143	15210	0 06	15312	DAD	CORC
0144	15211	0 07	15320	DSB	TEM2
0145	15212	0 04	15312	DST	CORC
0146	15213	0 02	15302	DLD	PAR9
0147	15214	0 16	15360	MPY	CRCZ
0148	15215	0 06	15312	DAD	CORC
0149	15216	0 04	15312	DST	CORC
0150	15217	0 02	15264	DLD	PAR2
0151	15220	0 16	15361	MPY	SRCY
0152	15221	0 06	15312	DAD	CORC
0153	15222	0 04	15312	DST	CORC
0154	15223	0 02	15266	DLD	PAR3
0155	15224	0 16	15362	MPY	SR CZ
0156	15225	0 06	15312	DAD	CORC
0157	15226	0401	67	LRS	9
0158	15227	0 06	00604	DAD	'604
0159	15230	0 04	00604	DST	'604
0160	15231	0 02	15270	DLD	PAR4
0161	15232	0 16	15363	MPY	CRBX
0162	15233	0 04	15314	DST	CORB
0163	15234	0 02	15272	DLD	PAR5
0164	15235	0 16	15364	MPY	CRBY
0165	15236	0 06	15314	DAD	CORB
0166	15237	0 04	15314	DST	CORB
0167	15240	0 02	15276	DLD	PAR7
0168	15241	0 16	15365	MPY	SRBX
0169	15242	0 06	15314	DAD	CORB
0170	15243	0 04	15314	DST	CORB
0171	15244	0 02	15300	DLD	PAR8

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DDP-516 ASSEMBLY LISTING

0172	15245	0 16 15366	MPY	SRBY
0173	15246	0 06 15314	DAD	CORB
0174	15247	0401 67	LRS	9
0175	15250	0 06 00602	DAD	'602
0176	15251	0 04 00602	DST	'602
0177	15252	000005	SGL	
0178	15253	0 02 00414	LDA	WX
0179	15254	0 04 15333	STA	WXPR
0180	15255	0 02 00416	LDA	WY
0181	15256	0 04 15334	STA	WYPR
0182	15257	0 02 00420	LDA	WZ
0183	15260	0 04 15335	STA	WZPR
0184	15261	-0 01 15000	JMP*	ROMS
0185	15262	000000	PAR1 DBP	0
	15263	000000		
0186	15264	000000	PAR2 DBP	0
	15265	000000		
0187	15266	000000	PAR3 DBP	0
	15267	000000		
0188	15270	000000	PAR4 DBP	0
	15271	000000		
0189	15272	000000	PAR5 DBP	0
	15273	000000		
0190	15274	000000	PAR6 DBP	0
	15275	000000		
0191	15276	000000	PAR7 DBP	0
	15277	000000		
0192	15300	000000	PAR8 DBP	0
	15301	000000		
0193	15302	000000	PAR9 DBP	0
	15303	000000		
0194	15304	000000	CORF DBP	0
	15305	000000		
0195	15306	000000	CORE DBP	0
	15307	000000		
0196	15310	000000	CORD DBP	0
	15311	000000		
0197	15312	000000	CORC DBP	0
	15313	000000		
0198	15314	000000	CORB DBP	0
	15315	000000		
0199	15316	000000	TEM1 DBP	0
	15317	000000		
0200	15320	000000	TEM2 DBP	0
	15321	000000		
0201	15322	000000	WXWY OCT	0
0202	15323	000000	WXWZ OCT	0
0203	15324	000000	WYWZ OCT	0
0204	15325	000000	WYSQ OCT	0
0205	15326	000000	WYSQ OCT	0
0206	15327	000000	WZSQ OCT	0
0207	15330	000000	WXDT OCT	0
0208	15331	000000	WYDT OCT	0
0209	15332	000000	WZDT OCT	0
0210	15333	000000	WXPR OCT	0
0211	15334	000000	WYPR OCT	0
0212	15335	000000	WZPR OCT	0

MICROCOMP TELECOMMUNICATED DATA

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0213	15336	001145	CRFX	DEC	76.703B12
0214	15337	161152	CRFY	DEC	-946.8B12
0215	15340	001342	CRFZ	DEC	92.26B12
0216	15341	177205	SRFX	DEC	-47.405B12
0217	15342	166667	SRFY	DEC	-585.15B12
0218	15343	000710	SRFZ	DEC	57.02B12
0219	15344	174307	CREX	DEC	-231.19B12
0220	15345	134003	CREY	DEC	-2303.69B12
0221	15346	135670	SREX	DEC	-142.88
	15347	107535			
0222	15350	026176	SREY	DEC	1423.76B12
0223	15351	155364	CRDX	DEC	-1185.55B12
0224	15352	153404	CRDY	DEC	-1311.52B12
0225	15353	000704	CRDZ	DEC	56.609B12
0226	15354	164433	SRDX	DEC	-732.71B12
0227	15355	163254	SRDY	DEC	-810.56B12
0228	15356	177351	SRDZ	DEC	-34.986B12
0229	15357	140046	CRCY	DEC	-2043.33B12
0230	15360	003230	CRCZ	DEC	211.096B12
0231	15361	023566	SRCY	DEC	1262.85B12
0232	15362	002023	SRCZ	DEC	130.464B12
0233	15363	013336	CRBX	DEC	731.813B12
0234	15364	002323	CRBY	DEC	154.49B12
0235	15365	007042	SRBX	DEC	452.29B12
0236	15366	176405	SRBY	DEC	-95.48B12
0237		000414	WX	EQU	*414
0238		000416	WY	EQU	*416
0239		000420	WZ	EQU	*420
0240				END	

PROGRAM NAME:

SOURCE: BTVR

BINARY: BBBOT

ENTRY POINTS (LOCATION): BBOT ('16630)

GENERAL DESCRIPTION:

The subroutine BBOT is used for test purposes only. It will initiate gyro/accelerometer failures at specified times during the test run. Constant bias, ramp and various failures are all simulated by miscompensating the specified gyros and/or accelerometers. Prior to the start of the test run the gyro to be failed, the time of failure and the amount of miscompensation are loaded manually. Up to four instruments (2 gyros and 2 accelerometers) may be failed during one test run.

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0001				ABS	
0002				SUBR	BBOT
0003				ORG	'16630
0004	16630	0 000000	BBOT	DAC	**
0005	16631	000007		DBL	
0006	16632	0 02 00776		DLD	'776
0007	16633	0 07 16742		DSB	TFR1
0008	16634	100400		SPL	
0009	16635	0 01 16644		JMP	TRFA
0010	16636	0 02 16754		DLD	TMIN
0011	16637	0 06 16742		DAD	TFR1
0012	16640	0 04 16742		DST	TFR1
0013	16641	0 02 16746		DLD	FRP1
0014	16642	0 06 00520		DAD	'520
0015	16643	0 04 00520		DST	'520
0016	16644	0 02 00766	TRFA	DLD	'766
0017	16645	0 07 16744		DSB	TFR2
0018	16646	100400		SPL	
0019	16647	0 01 16656		JMP	TRFB
0020	16650	0 02 16754		DLD	TMIN
0021	16651	0 06 16744		DAD	TFR2
0022	16652	0 04 16744		DST	TFR2
0023	16653	0 02 16750		DLD	FRP2
0024	16654	0 06 00524		DAD	'524
0025	16655	0 04 00524		DST	'524
0026	16656	0 02 00776	TRFB	DLD	'776
0027	16657	0 07 16732		DSB	TFFB
0028	16660	100040		SZE	
0029	16661	0 01 16670		JMP	TRFS
0030	16662	000201		IAB	
0031	16663	100040		SZE	
0032	16664	0 01 16670		JMP	TRFS
0033	16665	0 02 16736		DLD	FBBT
0034	16666	0 06 00514		DAD	'514
0035	16667	0 04 00514		DST	'514
0036	16670	0 02 00776	TRFS	DLD	'776
0037	16671	0 07 16734		DSB	TFSB
0038	16672	100040		SZE	
0039	16673	0 01 16702		JMP	RTUR
0040	16674	000201		IAB	
0041	16675	100040		SZE	
0042	16676	0 01 16702		JMP	RTUR
0043	16677	0 02 16740		DLD	SBBT
0044	16700	0 06 00516		DAD	'516
0045	16701	0 04 00516		DST	'516
0046	16702	0 02 00776	RTUR	DLD	'776
0047	16703	0 07 16752		DSB	TFVR
0048	16704	100400		SPL	
0049	16705	0 01 16725		JMP	RTRA
0050	16706	0 02 16754		DLD	TMIN
0051	16707	0 06 16752		DAD	TFVR
0052	16710	0 04 16752		DST	TFVR
0053	16711	000005		SGL	
0054	16712	-0 02 16762		LDA*	VRAD
0055	16713	0 16 16763		MPY	MTOB
0056	16714	0401 55		LRS	19
0057	16715	000007		DBL	

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0058	16716	0 04 16756	DST	NVAR	
0059	16717	0 07 16760	DSB	OVAR	
0060	16720	0 06 00526	DAD	'526	
0061	16721	0 04 00526	DST	'526	
0062	16722	0 02 16756	DLD	NVAR	
0063	16723	0 04 16760	DST	OVAR	
0064	16724	0 12 16762	IRS	VRAD	
0065	16725	000005	RTRA	SGL	
0066	16726	-0 01 16630	JMP*	BBOT	
0067	16730	000000	DBP	0	
	16731	000000			
0068	16732	000000	TFFB	OCT	0,0
	16733	000000			
0069	16734	000000	TFSB	OCT	0,0
	16735	000000			
0070	16736	000000	FBRT	OCT	0,0
	16737	000000			
0071	16740	000000	SBBT	OCT	0,0
	16741	000000			
0072	16742	000000	TFR1	OCT	0,0
	16743	000000			
0073	16744	000000	TFR2	OCT	0,0
	16745	000000			
0074	16746	000000	FRP1	OCT	0,0
	16747	000000			
0075	16750	000000	FRP2	OCT	0,0
	16751	000000			
0076	16752	077777	TFVR	OCT	77777,77777
	16753	077777			
0077	16754	000000	TMIN	OCT	0,27340
	16755	027340			
0078	16756	000000	NVAR	DBP	0
	16757	000000			
0079	16760	000000	OVAR	DBP	0
	16761	000000			
0080	16762	0 016764	VRAD	DAC	VAR
0081	16763	071146	MTOB	DEC	28.6B5
0082	16764	162542	VAR	DEC	-6.655B5
0083	16765	006166		DEC	3.116B5
0084	16766	177735		DEC	-.035B5
0085	16767	174434		DEC	-1.723B5
0086	16770	007231		DEC	3.650B5
0087	16771	173157		DEC	-2.392B5
0088	16772	167166		DEC	-4.385B5
0089	16773	002646		DEC	1.413B5
0090	16774	161243		DEC	-7.341B5
0091	16775	015620		DEC	6.891B5
0092	16776	001446		DEC	.788B5
0093	16777	174366		DEC	-1.760B5
0094	17000	172246		DEC	-2.838B5
0095	17001	177612		DEC	-.116B5
0096	17002	013624		DEC	5.895B5
0097	17003	175624		DEC	-1.106B5
0098	17004	163735		DEC	-6.035B5
0099	17005	007504		DEC	3.817B5
0100	17006	173003		DEC	-2.498B5
0101	17007	006462		DEC	3.299B5

MICROCOMP TELECOMMUNICATED DATA
DDP-515 ASSEMBLY LISTING

0102	17010	162206	DEC	-6.870B5
0103	17011	023415	DEC	9.763B5
0104	17012	160346	DEC	-7.776B5
0105	17013	172612	DEC	-2.616B5
0106	17014	011363	DEC	4.738B5
0107	17015	162004	DEC	-6.997B5
0108	17016	005523	DEC	2.832B5
0109	17017	161061	DEC	-7.453B5
0110	17020	011003	DEC	4.503B5
0111	17021	174424	DEC	-1.731B5
0112	17022	002314	DEC	1.200B5
0113	17023	024420	DEC	10.266B5
0114	17024	176721	DEC	-.546B5
0115	17025	155041	DEC	-9.468B5
0116	17026	021010	DEC	8.508B5
0117	17027	166567	DEC	-4.634B5
0118	17030	034105	DEC	14.068B5
0119	17031	171124	DEC	-3.418B5
0120	17032	176407	DEC	-.744B5
0121	17033	167461	DEC	-4.203B5
0122			END	

Single Position Calibration Load Map

ATTACH ROYSW
OK
DEBUG
GO

SZ 200 777
\$D 250
000250 000000
\$40763
000251 000000
\$
000252 000000
\$44121
000253 000000
\$D 460
000460 000000
\$40000
000461 000000
\$D 463
000463 000000
\$40000
000464 000000
\$D 467
000467 000000
\$40000
000470 000000
\$D 473
000473 000000
\$40000
000474 000000
\$D 477
000477 000000
\$40000
000500 000000
\$
000501 000000
\$S
LDRX 23665 1000 64
GO
MN
I BSPM2
MR

OK
ATTACH MCKERN
OK
START 23001
GO
MR
C BREAD
MR

OK
ATTACH ROYSW
OK
START 23001
GO
MR
C BSPCO
MR
C BSPAL
MR

OK
ATTACH MAIN
OK
START 23001
GO
MR
C BGCOM
MR
C BACOM
MR
C BVACU
MR
C BSPUN
MR
C BAA6S
MR
C BVESP
MR
C BDCOA
MR
C BDCMT
MR
C BERCS
MR
C BEMIN
MR
C BGMIN
MR
C BGFMA
MR
C BFPOUT
MR
C BXOU
MR
C BDGS
MR
C FTLIBY
MR
C BNG63
MR
C BMV63
MR

↓
Ⓐ

OK
 ATTACH ROYSW
 OK
 START 23001
 GO
 MR
 C BPEP4
 LC
 M
 *START 01000
 *HIGH 11500
 *NAMES 17110
 *COMN 23777
 *BASE 00223
 LIST 00001
 RUPT 01346
 ASCT 01404
 ICINIT 01606
 INPIP 01661
 INGYRO 01714
 OUTPUT 02020
 DODSP 02070
 FALN 02242
 VPAE 02556
 VPAS 02560
 VPBE 02562
 VPBS 02 64
 VPRD 02566
 ZAZI 02576
 SDVE 02610
 SDVS 02612
 DADX 02614
 DA EY 02616
 DASZ 02620
 GCOM 02626
 ACOM 03312
 VACU 03514
 SPUN 03566
 ATIA 04046
 VELA 04474
 FXX 05142
 FXY 05144
 FXZ 05146
 FYX 05150
 FYY 05152
 FYZ 05154
 FZX 05156
 FZY 05160
 FZZ 05162
 DCOA 05214
 AOAP 05322

BOAP 05324
 COAP 05326
 DOAP 05330
 EOAP 05332
 FOAP 05334
 DDMI 05344
 DCMT 05417
 ERCO 05532
 EMIN 05640
 GMIN 05704
 MATR 05750
 GMAT 06004
 FPOUTC 06476
 OUT100 06710
 IOMODE 06742
 X1OU 06774
 XNOU 07000
 XNOUA 07004
 XOOCT 07010
 DGSWRT 07026
 DGSRD 07067
 CNOU 07174
 CNOUA 07201
 COOCT 07254
 C1OU 07310
 DOPAGE 07502
 CRTOUT 10002
 CRTQUA 10010
 SQRTX 10120
 FSAT 10120
 ARG\$ 10202
 T1OU 10253
 TNOUA 10276
 TNOU 10303
 TOOCT 10353
 MG63 10406
 MP63 10602
 VCMP 10730
 DZNC 11030
 D1 11100
 D2 11102
 D3 11104
 D4 11106
 GDAC 11123
 LGDC 11237
 23777

LC

OK
 SAVE RSPM2 64 11500 1000
 OK

PROGRAM NAME

SOURCE: SPM2

BINARY: BSPM2

ENTRY POINTS (LOCATION): This is the main controlling program for the single position calibration and starts in 1000

GENERAL DESCRIPTION:

This program controls the calls to the subroutines which perform the single position calibration and is similar to the main program used in SIRU Development. There is an initialization section ending with a call to ICINIT which sets up the interrupt and flows into LOOP which outputs the system data periodically and also gets interrupted periodically to update the accelerometers or gyros by branching to either PDO or GDO.

The accelerometer update consists of reading the accelerometers (INPIP), compensating them (ACOM) doing the 6x3 matrix multiplication (EMIN, MP63) normalizing the quaternion (SPUN) transforming the body ΔV into the inertial frame (VELA) accumulating inertial ΔV (VACV) and finally once every hundred times (once a second) doing the fine alignment (FALN). From the listing it can be seen that when the counter NCON reaches 0 it gets reset to -100, the ΔV East and South (in locations '450 and '454) are transferred to SDVE and SDVS) in the fine alignment program and FALN is called. If it is **twenty minutes or more** from initialization, the fine alignment program will call DZNC (see source programs SPAL and PEP4) which filters the vertical axis drift. Finally, the ΔV accumulators are zeroed to start accumulation for the next second.

The gyro update consists of reading the gyros (INGYRO), compensating the gyros (DCMT, GCOM), doing the 6x3 matrix multiplication (GMIN, MG63) doing earth rate compensation (ERCO), adding the fine align commands (DADX, DAEY and DASZ) into $\Delta \theta$ body ('414, '416 and '420), doing the attitude algorithm (ATTA) and **if it is** twenty minutes or more from run initialization, doing the single position calibration (GDAC, program source name PEP4).

When it is time to output, the appropriate variables are saved in the buffer QTMP and a call to OUTPUT is made (see program SPCO).

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0001				REL	
0002	00000	0 10	00000	CALL	DCMI
0003	00001	000007		DBL	
0004	00002	0 02	00236	DLD	DZBO
0005	00003	0 35	00604	LDX	=-98
0006	00004	1 04	00422	DST	'422,1
0007	00005	0 12	00000	IRS	0
0008	00006	0 12	00000	IRS	0
0009	00007	0 01	00004	JMP	*-3
0010	00010	0 35	00603	LDX	=-24
0011	00011	1 04	00460	DST	'460,1
0012	00012	0 12	00000	IRS	0
0013	00013	0 12	00000	IRS	0
0014	00014	0 01	00011	JMP	*-3
0015	00015	0 35	00602	LDX	=-68
0016	00016	1 04	00700	DST	'700,1
0017	00017	0 12	00000	IRS	0
0018	00020	0 12	00000	IRS	0
0019	00021	0 01	00016	JMP	*-3
0020	00022	0 35	00601	LDX	=-28
0021	00023	1 04	01000	DST	'1000,1
0022	00024	0 12	00000	IRS	0
0023	00025	0 12	00000	IRS	0
0024	00026	0 01	00023	JMP	*-3
0025	00027	-0 04	00223	DST*	PAOA
0026	00030	-0 04	00224	DST*	PAOB
0027	00031	-0 04	00225	DST*	PAOC
0028	00032	-0 04	00226	DST*	PAOD
0029	00033	-0 04	00227	DST*	PAOE
0030	00034	-0 04	00230	DST*	PAOF
0031	00035	000005		SGL	
0032	00036	0 04	00405	STA	DSCT
0033	00037	0 04	00404	STA	ASCT
0034	00040	0 04	00406	STA	MSCT
0035	00041	0 04	00407	STA	ICNT
0036	00042	0 02	00600	LDA	='77777
0037	00043	0 04	00561	STA	TCNT
0038	00044	0 02	00577	LDA	='40000
0039	00045	0 04	00401	STA	'401
0040	00046	0 04	00403	STA	'403
0041	00047	0 04	00405	STA	'405
0042	00050	0 04	00407	STA	'407
0043	00051	0 04	00411	STA	'411
0044	00052	0 04	00413	STA	'413
0045	00053	0 04	00601	STA	'601
0046	00054	0 04	00603	STA	'603
0047	00055	0 04	00605	STA	'605
0048	00056	0 04	00607	STA	'607
0049	00057	0 04	00611	STA	'611
0050	00060	0 04	00613	STA	'613
0051	00061	0 04	00415	STA	'415
0052	00062	0 04	00417	STA	'417
0053	00063	0 04	00421	STA	'421
0054	00064	0 04	00615	STA	'615
0055	00065	0 04	00617	STA	'617
0056	00066	0 04	00621	STA	'621
0057				STA	'460

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0058			*	STA	'463
0059			*	STA	'467
0060			*	STA	'473
0061			*	STA	'477
0062	00067	0 04 00447		STA	'447
0063	00070	0 04 00453		STA	'453
0064	00071	0 04 00457		STA	'457
0065	00072	0 10 00000		CALL	GMIN
0066	00073	0 10 00000		CALL	EMIN
0067	00074	0 02 00222		LDA	RDAD
0068	00075	0 04 00063		STA	'63
0069	00076	0 10 00000		CALL	ICINIT
0070	00077	0 02 00576		LDA	=6
0071	00100	74 0020		SMK	'20
0072	00101	0 10 00207		JST	GETM
0073			*		
0074			*		
0075	00102	000401	LOOP	ENB	
0076	00103	0 02 00561		LDA	TCNT
0077	00104	0 11 00557		CAS	CRIT
0078	00105	101000		NOP	
0079	00106	0 01 00122		JMP	OUT
0080	00107	000201		IAB	
0081	00110	101002		SS4	
0082	00111	0 01 00102		JMP	LOOP
0083	00112	100004		SR3	
0084	00113	0 01 00102		JMP	LOOP
0085			*		
0086			*	EXIT CODING	
0087			*		
0088	00114	14 0047		OCP	'47
0089	00115	14 0057		OCP	'57
0090	00116	140040		CRA	
0091	00117	74 0020		SMK	'20
0092	00120	001001		INH	
0093	00121	-0 01 00553		JMP*	DOS
0094			*		
0095			*		
0096	00122	100004	OUT	SR3	
0097	00123	101002		SS4	
0098	00124	0 01 00146		JMP	NOQZ
0099	00125	000007		DBL	
0100	00126	0 02 00236		DLD	DZRO
0101	00127	0 04 00460		DST	'460
0102	00130	0 04 00462		DST	'462
0103	00131	0 04 00464		DST	'464
0104	00132	0 04 00466		DST	'466
0105	00133	0 04 00470		DST	'470
0106	00134	0 04 00472		DST	'472
0107	00135	0 04 00474		DST	'474
0108	00136	0 04 00476		DST	'476
0109	00137	000005		SGL	
0110	00140	0 02 00577		LDA	=40000
0111	00141	0 04 00460		STA	'460
0112	00142	0 04 00463		STA	'463
0113	00143	0 04 00467		STA	'467
0114	00144	0 04 00473		STA	'473

TO SET UP TIME

MICROCOMP TELECOMMUNICATED DATA

DDP-516 ASSEMBLY LISTING

0115	00145	0 04 00477	STA	'477	
0116	00146	000007	NOQZ DBL		
0117	00147	0 02 00460	DLD	'460	
0118	00150	0 04 00244	DST	QTMP	
0119	00151	0 02 00464	DLD	'464	
0120	00152	0 04 00246	DST	QTMP+2	
0121	00153	0 02 00470	DLD	'470	
0122	00154	0 04 00250	DST	QTMP+4	
0123	00155	0 02 00474	DLD	'474	
0124	00156	0 04 00252	DST	QTMP+6	
0125	00157	-0 02 00231	DLD*	D1	
0126	00160	0411 74	LLS	4	
0127	00161	0 04 00254	DST	QTMP+8	
0128	00162	-0 02 00232	DLD*	D2	
0129	00163	0411 74	LLS	4	
0130	00164	0 04 00256	DST	QTMP+10	
0131	00165	-0 02 00233	DLD*	D3	
0132	00166	0411 74	LLS	4	
0133	00167	0 04 00260	DST	QTMP+12	
0134	00170	-0 02 00234	DLD*	D4	
0135	00171	0411 74	LLS	4	
0136	00172	0 04 00262	DST	QTMP+14	
0137	00173	0 02 00776	DLD	TIME	
0138	00174	0 04 00264	DST	QTMP+16	
0139	00175	0 02 00236	DLD	DZHO	
0140			*	DST	'444
0141			*	DST	'450
0142			*	DST	'454
0143	00176	000005	SGL		
0144	00177	0 04 00561	STA	TCNT	
0145	00200	0 10 00207	JST	GETM	GET MODE
0146	00201	000005	SGL		
0147	00202	0 10 00000	CALL	OUTPUT	
0148	00203	0 000244	DAC	QTMP	
0149	00204	0 000560	DAC	MODE	
0150	00205	000000	OCT	0	
0151	00206	0 01 00102	JMP	LOOP	
0152			*		
0153	00207	0 000000	GETM DAC	**	
0154	00210	140040	CRA		
0155	00211	100020	SR1		
0156	00212	141206	AOA		
0157	00213	100010	SR2		
0158	00214	0 02 00575	LDA	=2	
0159	00215	0 04 00560	STA	MODE	
0160			*		
0161	00216	0 04 00000	STA	0	
0162	00217	1 02 00554	LDA	TCON,1	
0163	00220	0 04 00557	STA	CRIT	
0164	00221	-0 01 00207	JMP*	GETM	
0165			*		
0166	00222	0 000000	RDAD XAC	RUPT	
0167	00223	0 000000	PAOA XAC	AOAP	
0168	00224	0 000000	PAOB XAC	BOAP	
0169	00225	0 000000	PAOC XAC	COAP	
0170	00226	0 000000	PAOD XAC	DOAP	
0171	00227	0 000000	PAOE XAC	EOAP	

MICROCOMP TELECOMMUNICATED DATA
 DDP-516 ASSEMBLY LISTING

0172	00230	0 000000	PAOF XAC	FOAP
0173	00231	0 000000	D1 XAC	D1
0174	00232	0 000000	D2 XAC	D2
0175	00233	0 000000	D3 XAC	D3
0176	00234	0 000000	D4 XAC	D4
0177	00236	000000	DZRO DBP	0
	00237	000000		
0178	00240	000000	DONE OCT	0,1
	00241	000001		
0179	00242	000003	TWMN DEC	120000BB30
	00243	052300		
0180	00244	000000	QTMP BSZ	52
	00245	000000		
	00246	000000		
	00247	000000		
	00250	000000		
	00251	000000		
	00252	000000		
	00253	000000		
	00254	000000		
	00255	000000		
	00256	000000		
	00257	000000		
	00260	000000		
	00261	000000		
	00262	000000		
	00263	000000		
	00264	000000		
	00265	000000		
	00266	000000		
	00267	000000		
	00270	000000		
	00271	000000		
	00272	000000		
	00273	000000		
	00274	000000		
	00275	000000		
	00276	000000		
	00277	000000		
	00300	000000		
	00301	000000		
	00302	000000		
	00303	000000		
	00304	000000		
	00305	000000		
	00306	000000		
	00307	000000		
	00310	000000		
	00311	000000		
	00312	000000		
	00313	000000		
	00314	000000		
	00315	000000		
	00316	000000		
	00317	000000		
	00320	000000		
	00321	000000		

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

00322	000000				
00323	000000				
00324	000000				
00325	000000				
00326	000000				
00327	000000				
0181	00330	000000	PISE BSZ	14	
	00331	000000			
	00332	000000			
	00333	000000			
	00334	000000			
	00335	000000			
	00336	000000			
	00337	000000			
	00340	000000			
	00341	000000			
	00342	000000			
	00343	000000			
	00344	000000			
	00345	000000			
0182			*		
0183			*		
0184				SUBP	RUPT
0185				SUBR	ASCT
0186				REL	
0187	00346	0 000000	RUPT	DAC	**
0188	00347	14 0102		OCP	'102
0189	00350	34 0507		SKS	'507
0190	00351	0 01 00410		JMP	PDO
0191	00352	34 0407		SKS	'407
0192	00353	0 01 00464		JMP	GDO
0193	00354	34 0607		SKS	'607
0194	00355	0 01 00377		JMP	ICLK
0195	00356	34 0425		SKS	'425
0196	00357	0 01 00373		JMP	DISK
0197	00360	34 0404		SKS	'404
0198	00361	0 01 00365		JMP	ASR
0199	00362	0 12 00406		IRS	MSCT
0200	00363	000401	RSM	ENB	
0201	00364	-0 01 00346		JMP*	RUPT
0202			*		
0203	00365	14 0004	ASR	OCP	4
0204	00366	54 0004		INA	4
0205	00367	101000		NOP	
0206	00370	0 12 00404		IRS	ASCT
0207	00371	101000		NOP	
0208	00372	0 01 00363		JMP	RSM
0209			*		
0210	00373	14 1425	DISK	OCP	'1425
0211	00374	0 12 00405		IRS	DSCT
0212	00375	101000		NOP	
0213	00376	0 01 00363		JMP	RSM
0214			*		
0215	00377	0 12 00407	ICLK	IRS	ICNT
0216	00400	101000		NOP	
0217	00401	14 0027		OCP	'27
0218	00402	14 0067		OCP	'67

SHUT OFF DGS

DISK RUPT

ASR RUPT
MISCELLANEOUS

DUMMPY

IN CASE OF SKIP

IN CASE OF SKIP

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0219	00403	0 01 00363	JMP	RSM
0220	00404	000000	ASCT BSZ	1
0221	00405	000000	DSCT BSZ	1
0222	00406	000000	MSCT BSZ	1
0223	00407	000000	ICNT BSZ	1
0224			*	
0225			*	
0226	00410	0 13 00562	PDO IMA	AREG
0227	00411	000043	INK	
0228	00412	000005	SGL	
0229	00413	0 04 00563	STA	KEYS
0230	00414	000201	IAB	
0231	00415	0 04 00564	STA	BREG
0232	00416	0 15 00565	STX	XREG
0233			*	
0234			*	
0235			*	
0236			*	
0237	00417	0 10 00000	CALL	INPIP
0238	00420	000401	ENB	
0239	00421	0 10 00000	CALL	ACOM
0240	00422	0 10 00000	CALL	EMIN
0241	00423	0 10 00000	CALL	MP63
0242	00424	0 10 00000	CALL	SPUN
0243	00425	0 10 00000	CALL	VELA
0244	00426	0 10 00000	CALL	VACU
0245	00427	0 12 00566	IRS	NCON
0246	00430	0 01 00452	JMP	NOAL
0247	00431	0 02 00574	LDA	--100
0248	00432	0 04 00566	STA	NCON
0249	00433	000007	DBL	
0250	00434	0 02 00450	DLD	'450
0251	00435	0411 62	LLS	14
0252	00436	-0 04 00572	DST*	SDVE
0253	00437	0 02 00454	DLD	'454
0254	00440	0411 62	LLS	14
0255	00441	-0 04 00573	DST*	SDVS
0256	00442	000005	SGL	
0257	00443	0 10 00000	CALL	FALN
0258	00444	000007	DBL	
0259	00445	0 02 00236	DLD	DZRO
0260	00446	0 04 00444	DST	'444
0261	00447	0 04 00450	DST	'450
0262	00450	0 04 00454	DST	'454
0263	00451	000005	SGL	
0264	00452	000007	NOAL DBL	
0265	00453	000005	SGL	
0266			*	
0267			*	
0268	00454	0 35 00565	COMN LDX	XREG
0269	00455	0 02 00564	LDA	BREG
0270	00456	000201	IAB	
0271	00457	0 02 00563	LDA	KEYS
0272	00460	171020	OTK	
0273	00461	0 13 00562	IMA	AREG
0274	00462	000401	ENB	
0275	00463	-0 01 00346	JMP*	RUPT

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0276			*		
0277			*		
0278	00464	0 13 00562	GDO	IMA	AREG
0279	00465	000043		INK	
0280	00466	000005		SGL	
0281	00467	0 04 00563		STA	KEYS
0282	00470	000201		IAB	
0283	00471	0 04 00564		STA	BREG
0284	00472	0 15 00565		STX	XREG
0285			*		
0286			*		
0287	00473	34 0007		SKS	'007
0288	00474	0 01 00473		JMP	*-1
0289	00475	14 0406		OCP	'406
0290	00476	0401 62		LRS	14
0291	00477	54 1016		INA	'1016
0292	00500	101000		NOP	
0293	00501	0 04 00324		STA	'324
0294	00502	54 1006		INA	'1006
0295	00503	101000		NOP	
0296	00504	0 04 00325		STA	'325
0297	00505	14 0006		OCP	'006
0298	00506	0 10 00000		CALL	INGYRO
0299	00507	000401		ENB	
0300	00510	0 10 00000		CALL	DCMT
0301	00511	0 10 00000		CALL	GCOM
0302	00512	0 10 00000		CALL	GMIN
0303	00513	0 10 00000		CALL	MG63
0304	00514	0 10 00000		CALL	ERCO
0305	00515	000007		DBL	
0306	00516	-0 02 00567		DLD*	DADX
0307	00517	0 06 00414		DAD	'414
0308	00520	0 04 00414		DST	'414
0309	00521	-0 02 00570		DLD*	DAEY
0310	00522	0 06 00416		DAD	'416
0311	00523	0 04 00416		DST	'416
0312	00524	-0 02 00571		DLD*	DASZ
0313	00525	0 06 00420		DAD	'420
0314	00526	0 04 00420		DST	'420
0315	00527	000005		SGL	
0316	00530	0 10 00000		CALL	ATTA
0317	00531	0 02 00776		DLD	'776
0318	00532	0 07 00242		DSB	TWMN
0319	00533	000005		SGL	
0320	00534	101400		SMI	
0321	00535	0 10 00000		CALL	GDAC
0322	00536	000007		DBL	
0323	00537	0 02 00236		DLD	DZRO
0324	00540	-0 04 00567		DST*	DADX
0325	00541	-0 04 00570		DST*	DAEY
0326	00542	-0 04 00571		DST*	DASZ
0327	00543	000005		SGL	
0328	00544	0 12 00561		IRS	TCNT
0329	00545	000007		DBL	
0330	00546	0 02 00776		BLD	TIME
0331	00547	0 06 00240		DAD	DONE
0332	00550	0 04 00776		DST	TIME

WAIT FOR DIGISEC

HOLD

WAIT 8 MCT'S
HIGH HALF

LOW HALF

END HOLD

CA

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0333	00551	000005		SGL	
0334			*		
0335			*		
0336	00552	0 01 00454		JMP	COMM
0337			*		
0338			*		
0339			*		
0340	00553	030000	DOS	OCT	30000
0341	00554	013560	TCON	DEC	6000
0342	00555	000620		DEC	400
0343	00556	000144		DEC	100
0344			*		
0345	00557	000000	CRIT	BSZ	1
0346	00560	000000	MODE	BSZ	1
0347	00561	077777	TCNT	OCT	77777
0348	00562	000000	AREG	BSZ	1
0349	00563	000000	KEYS	BSZ	1
0350	00564	000000	BREG	BSZ	1
0351	00565	000000	XREG	BSZ	1
0352	00566	177634	NCON	OCT	177634
0353	00567	0 000000	DADX	XAC	DADX
0354	00570	0 000000	DAEY	XAC	DAEY
0355	00571	0 000000	DASZ	XAC	DASZ
0356	00572	0 000000	SDVE	XAC	SDVE
0357	00573	0 000000	SDVS	XAC	SDVS
0358		000776	TIME	EQU	'776
0359	00574	177634		END	
	00575	000002			
	00576	000006			
	00577	040000			
	00600	077777			
	00601	177744			
	00602	177674			
	00603	177750			
	00604	177636			

30 SEC FOR TTY
4 SEC FOR CRT
.4 SEC FOR DGS

PROGRAM NAME

SOURCE: SPCO

BINARY: B SPCO (note: this is a FORTRAN program)

ENTRY POINTS (LOCATION): OUTPUT ('2020), DODSP ('2070)

GENERAL DESCRIPTION:

This subroutine is called by the main program (SPM2) every minute and outputs the quaternion, the filtered vertical axis drifts (D1, D2, D3 and D4 from program PEP4) and time in the format shown below. D1 through D4 are scaled at 2^{-10} radians per second.

At eighty minutes the A, B, C and D gyro drifts are printed out. To convert to meru, the printed values must be multiplied by 476.16.

QUAT	0.999999	-	0.000418	0.000010	-	0.000007
D1234	-	0.000170	-	0.000154	-	0.000154
TIME	4500.00					
QUAT	0.999999	-	0.000402	0.000014	-	0.000007
D1234	-	0.000123	-	0.000154	-	0.000154
TIME	4560.00					
QUAT	0.999999	-	0.000299	0.000019	-	0.000003
D1234	-	0.000153	-	0.000153	-	0.000153
TIME	4620.00					
QUAT	0.999999	-	0.000310	0.000016	-	0.000001
D1234	-	0.000148	-	0.000153	-	0.000153
TIME	4680.00					
QUAT	0.999999	-	0.000357	0.000011	-	0.000001
D1234	-	0.000137	-	0.000153	-	0.000153
TIME	4740.00					
Q-	0.00228733					
-	0.00066333					
	0.00228406					
	0.00712491					

OK

MICROCOMP TELECOMMUNICATED DATA
 DDP-516 ASSEMBLY LISTING
 SUBROUTINE OUTPUT(ARG,MODE)

```

000000   DAC   000000
000001   CALL  F$AT
000002   OCT   000002
000003   DAC   000000
000004   DAC   000000
          INTEGER ARG(18),MODE,MODSAV
          DATA MODSAV /-1/
000005   JMP   000000
000006   OCT   177777
          IF(MODE.EQ.2) GOTO 100
          STG   000005
000007   LDA*  MODE
000010   SUB   ='000002
000011   SZE   000000
000012   JMP   000000
000013   JMP   .100
          STG   000012
          IF(MODE.EQ.MODSAV) GOTO 50
000014   LDA*  MODE
000015   SUB   MODSAV
000016   SZE   000000
000017   JMP   000000
000020   JMP   .50
          STG   000017
          CALL IOMODE(MODE)
000021   CALL  IOMODE
000022   DAC*  MODE
          MODSAV=MODE
000023   LDA*  MODE
000024   STA  MODSAV
50   CALL  DODSP(ARG)
          STG   .50
000025   CALL  DODSP
000026   DAC*  ARG
          IF(MODSAV.EQ.1) CALL C10U(2H ~)
000027   LDA  MODSAV
000030   SHR  ='000001
000031   SZE  000000
000032   JMP  000000
000033   CALL  C10U
000034   DAC  ='120336
          STG  000032
          RETURN
C
C DIGISTOR OUTPUT
C
000035   JMP*  000000
100   CALL  DGSWRT(ARG,18)
          STG   .100
000036   CALL  DGSWRT
000037   DAC*  ARG
000040   DAC  ='000022
000041   OCT  000000
          RETURN
000042   JMP*  000000
          END

```

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

```

C
C
C
      STG   ='000001
000043   OCT   000001
      STG   ='000002
000044   OCT   000002
000003   DAC   ARG
000004   DAC   MODE
      STG   ='000022
000045   OCT   000022
000006   DAC   MODSAV
000036   DAC   .100
000025   DAC   .50
000000   DAC   IOMODE
000000   DAC   DODSP
000000   DAC   C100
      STG   ='120336
000046   OCT   120336
000000   DAC   DGSWRT
      SUBROUTINE DODSP(ARG)
000000   DAC   000000
000001   CALL  FBAT
000002   OCT   000001
000003   DAC   000000
      COMMON/LIST/ LIST(1)
      LOGICAL LIST
      INTEGER ARG(18)
      CALL XNOUA(8HQDAT ,8)
000004   JMP   000000
      STG   000004
000005   JMP   000000
000006   OCT   150725
000007   OCT   140724
000010   OCT   120240
000011   OCT   120240
      STG   000005
000012   CALL  XNOUA
000013   DAC   000006
000014   DAC   ='000010
000015   OCT   000000
      DO 10 I=1,7,2
000016   LDA   ='000001
000017   STA   I
      CALL FPOUTC(ARG(I),1,6)
000020   LDA   I
000021   ADD   ARG
000022   ADD   000024
000023   JMP   000025
000024   OCT   177777
000025   STA   T$1000
000026   CALL  FPOUTC
000027   DAC*  T$1000
000030   DAC   ='000001
000031   DAC   ='000006
000032   OCT   000000
10      CALL XNOUA(2H ,2)

```


MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

```

000033 CALL XNOUA
000034 DAC ='120240
000035 DAC ='000002
000036 OCT 000000
000037 LDA I
000040 ADD ='000002
000041 CAS ='000007
000042 JMP 000045
000043 JMP 000017
000044 JMP 000017
      CALL X10U(138)
000045 CALL X10U
000046 DAC ='000212
      CALL XNOUA(8HD1234 ,8)
000047 JMP 000000
000050 OCT 142261
000051 OCT 131263
000052 OCT 132240
000053 OCT 120240
      STG 000047
000054 CALL XNOUA
000055 DAC 000050
000056 DAC ='000010
000057 OCT 000000
      DO 20 I=9,15,2
000060 LDA ='000011
000061 STA I
      CALL FPOUTC(ARG(I),0,6)
000062 LDA I
000063 ADD ARG
000064 ADD 000066
000065 JMP 000067
000066 OCT 177777
000067 STA T$1000
000070 CALL FPOUTC
000071 DAC* T$1000
000072 DAC ='000000
000073 DAC ='000006
000074 OCT 000000
20      CALL XNOUA(2H ,2)
000075 CALL XNOUA
000076 DAC ='120240
000077 DAC ='000002
000100 OCT 000000
000101 LDA I
000102 ADD ='000002
000103 CAS ='000017
000104 JMP 000107
000105 JMP 000061
000106 JMP 000061
      CALL X10U(138)
000107 CALL X10U
000110 DAC ='000212
      CALL XNOUA(8HTIME ,8)
000111 JMP 000000
000112 OCT 152311
000113 OCT 146705

```

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

```

000114   OCT   120240
000115   OCT   120240
          STG   000111
000116   CALL  XNOUA
000117   DAC   000112
000120   DAC   ='000010
000121   OCT   000000
          CALL OUT100(ARG(17))
000122   LDA   ARG
000123   ADD   000125
000124   JMP   000126
000125   OCT   000020
000126   STA   T$1000
000127   CALL  OUT100
000130   DAC*  T$1000
          CALL X10U(138)
000131   CALL  X10U
000132   DAC   ='000212
          CALL X10U(138)
000133   CALL  X10U
000134   DAC   ='000212
          RETURN
000135   JMP*  000000
          END
          STG   ='000001
000136   OCT   000001
          STG   ='000002
000137   OCT   000002
          STG   ='000006
000140   OCT   000006
000003   DAC   ARG
000000   DAC   LIST
000000   DAC   XNOUA
          STG   ='000010
000141   OCT   000010
000033   DAC   .10
          STG   I
000142   OCT   004640
          STG   ='000007
000143   OCT   000007
000000   DAC   PPOUTC
          STG   T$1000
000144   OCT   012244
          STG   ='120240
000145   OCT   120240
000000   DAC   X10U
          STG   ='000212
000146   OCT   000212
000075   DAC   .20
          STG   ='000011
000147   OCT   000011
          STG   ='000017
000150   OCT   000017
          STG   ='000000
000151   OCT   000000
000000   DAC   OUT100
#0

```

PROGRAM NAME

SOURCE: SPAL

BINARY: BSPAL

ENTRY POINTS (LOCATION): FALN('2242)

ACCESSIBLE VARIABLES (LOCATION): VPAE ('2556), VPAS ('2560),
VPBE ('2562), VPBS ('2564), VPRD ('2566), ZAZT ('2576), SDVE ('2610),
SDVS ('2612), DADX ('2614), DAEY ('2616), DASZ ('2620)

GENERAL DESCRIPTION:

The subroutine FALN gets called once a second and calculates the commands DADX, DAEY and DASZ which fine align the quaternion to down, East and South. It does a time varying filter on SDVE and SDVS ($\Sigma\Delta V$ East and $\Sigma\Delta V$ South given it by the main program) to get MX, MY and MZ, which are the Inertial $\Delta\theta$ commands. These are then transformed into the body frame yielding DADX, DAEY and DASZ. Finally, if it is twenty minutes or more from initialization, it will call DZNC, the vertical axis drift filter in the program PEP4.

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0001			SUBR	FALN
0002			SUBR	VPAE
0003			SUBR	VPAS
0004			SUBR	VPBE
0005			SUBR	VPBS
0006			SUBR	VPRD
0007			SUBR	ZAZT
0008			SUBR	DADX
0009			SUBR	DAEY
0010			SUBR	DASZ
0011			SUBR	SDVE
0012			SUBR	SDVS
0013			REL	
0014	00000	0 000000	FALN DAC	**
0015	00001	0 02 00334	LDA	ZAZT
0016	00002	0 07 00362	SUB	=60
0017	00003	101400	SMI	
0018	00004	0 01 00065	JMP	AF60
0019	00005	000007	DBL	
0020	00006	0 02 00302	DLD	DBPO
0021	00007	0 07 00314	DSB	VPAE
0022	00010	0401 75	LRS	3
0023	00011	0 07 00314	DSB	VPAE
0024	00012	0401 76	LRS	2
0025	00013	0 06 00314	DAD	VPAE
0026	00014	0 06 00346	DAD	SDVE
0027	00015	0 04 00314	DST	VPAE
0028	00016	0 07 00320	DSB	VPBE
0029	00017	0 04 00326	DST	TEMP
0030	00020	0401 75	LRS	3
0031	00021	0 06 00326	DAD	TEMP
0032	00022	0401 77	LRS	1
0033	00023	0 06 00320	DAD	VPBE
0034	00024	0 04 00320	DST	VPBE
0035	00025	0 02 00302	DLD	DBPO
0036	00026	0 07 00316	DSB	VPAS
0037	00027	0401 75	LRS	3
0038	00030	0 07 00316	DSB	VPAS
0039	00031	0401 76	LRS	2
0040	00032	0 06 00316	DAD	VPAS
0041	00033	0 06 00350	DAD	SDVS
0042	00034	0 04 00316	DST	VPAS
0043	00035	0 07 00322	DSB	VPBS
0044	00036	0 04 00326	DST	TEMP
0045	00037	0401 75	LRS	3
0046	00040	0 06 00326	DAD	TEMP
0047	00041	0401 77	LRS	1
0048	00042	0 06 00322	DAD	VPBS
0049	00043	0 04 00322	DST	VPBS
0050	00044	0401 75	LRS	3
0051	00045	0 07 00322	DSB	VPBS
0052	00046	0401 74	LRS	4
0053	00047	0 07 00322	DSB	VPBS
0054	00050	0411 75	LLS	3
0055	00051	0 06 00330	DAD	ROND
0056	00052	0 04 00310	DST	MY
0057	00053	0 02 00302	DLD	DBPO

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0058	00054	0 07 00320	DSB	VPBE
0059	00055	0401 75	LRS	3
0060	00056	0 06 00320	DAD	VPBE
0061	00057	0401 74	LRS	4
0062	00060	0 06 00320	DAD	VPBE
0063	00061	0411 75	LLS	3
0064	00062	0 06 00330	DAD	ROND
0065	00063	0 04 00312	DST	MZ
0066	00064	0 01 00136	JMP	BF60
0067	00065	000007	AF60 DBL	
0068	00066	0 02 00314	DLD	VPAE
0069	00067	0401 76	LRS	2
0070	00070	0 07 00314	DSB	VPAE
0071	00071	0401 74	LRS	4
0072	00072	0 06 00314	DAD	VPAE
0073	00073	0 06 00346	DAD	SDVE
0074	00074	0 04 00314	DST	VPAE
0075	00075	0 07 00320	DSB	VPBE
0076	00076	0 04 00326	DST	TEMP
0077	00077	0401 77	LRS	1
0078	00100	0 06 00326	DAD	TEMP
0079	00101	0401 74	LRS	4
0080	00102	0 06 00320	DAD	VPBE
0081	00103	0 04 00320	DST	VPBE
0082	00104	0 02 00316	DLD	VPAS
0083	00105	0401 76	LRS	2
0084	00106	0 07 00316	DSB	VPAS
0085	00107	0401 74	LRS	4
0086	00110	0 06 00316	DAD	VPAS
0087	00111	0 06 00350	DAD	SDVS
0088	00112	0 04 00316	DST	VPAS
0089	00113	0 07 00322	DSB	VPBS
0090	00114	0 04 00326	DST	TEMP
0091	00115	0401 77	LRS	1
0092	00116	0 06 00326	DAD	TEMP
0093	00117	0401 74	LRS	4
0094	00120	0 06 00322	DAD	VPBS
0095	00121	0 04 00322	DST	VPBS
0096	00122	0401 74	LRS	4
0097	00123	0 07 00322	DSB	VPBS
0098	00124	0401 76	LRS	2
0099	00125	0 06 00330	DAD	ROND
0100	00126	0 04 00310	DST	MY
0101	00127	0 02 00302	DLD	DBPO
0102	00130	0 07 00320	DSB	VPBE
0103	00131	0401 74	LRS	4
0104	00132	0 06 00320	DAD	VPBE
0105	00133	0401 76	LRS	2
0106	00134	0 06 00330	DAD	ROND
0107	00135	0 04 00312	DST	MZ
0108	00136	000005	BF60 SGL	
0109	00137	0 02 00334	LDA	ZAZT
0110	00140	0 07 00361	SUB	=180
0111	00141	100400	SPL	
0112	00142	0 01 00206	JMP	LEVO
0113	00143	0 07 00360	SUB	=420
0114	00144	100400	SPL	

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0115	00145	0 01 00166	JMP	ORAG
0116	00146	000007	DBL	
0117	00147	0 02 00322	DLD	VPBS
0118	00150	0 07 00324	DSB	VPRD
0119	00151	0 04 00326	DST	TEMP
0120	00152	0401 76	LRS	2
0121	00153	0 06 00326	DAD	TEMP
0122	00154	0401 71	LRS	7
0123	00155	0 06 00324	DAD	VPRD
0124	00156	0 04 00324	DST	VPRD
0125	00157	0 02 00302	DLD	DBPO
0126	00160	0 07 00324	DSB	VPRD
0127	00161	0411 75	LLS	3
0128	00162	0 07 00324	DSB	VPRD
0129	00163	0 06 00330	DAD	ROND
0130	00164	0 04 00306	DST	MX
0131	00165	0 01 00207	JMP	BFOS
0132	00166	000007	ORAG DBL	
0133	00167	0 02 00322	DLD	VPBS
0134	00170	0 07 00324	DSB	VPRD
0135	00171	0 04 00326	DST	TEMP
0136	00172	0401 76	LRS	2
0137	00173	0 06 00326	DAD	TEMP
0138	00174	0401 73	LRS	5
0139	00175	0 06 00324	DAD	VPRD
0140	00176	0 04 00324	DST	VPRD
0141	00177	0 02 00302	DLD	DBPO
0142	00200	0 07 00324	DSB	VPRD
0143	00201	0411 75	LLS	3
0144	00202	0 07 00324	DSB	VPRD
0145	00203	0411 77	LLS	1
0146	00204	0 06 00330	DAD	ROND
0147	00205	0 04 00306	DST	MX
0148	00206	0 12 00334	LEVO IRS	ZAZT
0149	00207	000007	BFOS DBL	
0150	00210	0 02 00306	DLD	MX
0151	00211	140040	CRA	
0152	00212	000201	IAB	
0153	00213	0 07 00332	DSB	ANRD
0154	00214	-0 16 00335	MPY*	CBXX
0155	00215	0401 61	LRS	15
0156	00216	0 04 00352	DST	DADX
0157	00217	-0 02 00335	DLD*	CBXX
0158	00220	0 16 00306	MPY	MX
0159	00221	0 06 00352	DAD	DADX
0160	00222	0 04 00352	DST	DADX
0161	00223	-0 02 00336	DLD*	CBXY
0162	00224	0 16 00310	MPY	MY
0163	00225	0 06 00352	DAD	DADX
0164	00226	0 04 00352	DST	DADX
0165	00227	-0 02 00337	DLD*	CBXZ
0166	00230	0 16 00312	MPY	MZ
0167	00231	0 06 00352	DAD	DADX
0168	00232	0 04 00352	DST	DADX
0169	00233	-0 02 00340	DLD*	CBYX
0170	00234	0 16 00306	MPY	MX
0171	00235	0 04 00354	DST	DAEY

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0172	00236	0 02 00310	DLD	MY	
0173	00237	140040	CRA		
0174	00240	000201	IAB		
0175	00241	0 07 00332	DSB	ANRD	
0176	00242	-0 16 00341	MPY*	CBYY	
0177	00243	0401 61	LRS	15	
0178	00244	0 06 00354	DAD	DAEY	
0179	00245	0 04 00354	DST	DAEY	
0180	00246	-0 02 00341	DLD*	CBYY	
0181	00247	0 16 00310	MPY	MY	
0182	00250	0 06 00354	DAD	DAEY	
0183	00251	0 04 00354	DST	DAEY	
0184	00252	-0 02 00342	DLD*	CBYZ	
0185	00253	0 16 00312	MPY	MZ	
0186	00254	0 06 00354	DAD	DAEY	
0187	00255	0 04 00354	DST	DAEY	
0188	00256	-0 02 00343	DLD*	CBZX	
0189	00257	0 16 00306	MPY	MX	
0190	00260	0 04 00356	DST	DASZ	
0191	00261	-0 02 00344	DLD*	CBZY	
0192	00262	0 16 00310	MPY	MY	
0193	00263	0 06 00356	DAD	DASZ	
0194	00264	0 04 00356	DST	DASZ	
0195	00265	-0 02 00345	DLD*	CRZZ	
0196	00266	0 16 00312	MPY	MZ	
0197	00267	0 06 00356	DAD	DASZ	
0198	00270	0 04 00356	DST	DASZ	
0199	00271	000005	SGL		
0200	00272	000007	DBL		
0201	00273	0 02 00776	DLD	1776	
0202	00274	0 07 00304	DSB	TWMN	
0203	00275	000005	SGL		
0204	00276	101400	SMI		
0205	00277	0 10 00000	CALL	DZNC	
0206	00300	-0 01 00000	JMP*	FALN	
0207	00302	000000	DBPO	DBP	0
	00303	000000			
0208	00304	000003	TWMN	DEC	120000BR30
	00305	052300			
0209	00306	000000	MX	DBP	0
	00307	000000			
0210	00310	000000	MY	DBP	0
	00311	000000			
0211	00312	000000	MZ	DBP	0
	00313	000000			
0212	00314	000000	VPAB	DBP	0
	00315	000000			
0213	00316	000000	VPAS	DBP	0
	00317	000000			
0214	00320	000000	VPBE	DBP	0
	00321	000000			
0215	00322	000000	VPBS	DBP	0
	00323	000000			
0216	00324	000000	VPRD	DBP	0
	00325	000000			
0217	00326	000000	TEMP	DBP	0
	00327	000000			

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0218	00330	000000	ROND	OCT	0,40000
	00331	040000			
0219	00332	040000	ANRD	OCT	40000,0
	00333	000000			
0220	00334	000000	ZAZT	DEC	0
0221	00335	0 000000	CBXX	XAC	FXX
0222	00336	0 000000	CBXY	XAC	FYX
0223	00337	0 000000	CBXZ	XAC	FZX
0224	00340	0 000000	CBYX	XAC	FXY
0225	00341	0 000000	CBYY	XAC	FYY
0226	00342	0 000000	CBYZ	XAC	FZY
0227	00343	0 000000	CBZX	XAC	FXZ
0228	00344	0 000000	CBZY	XAC	FYZ
0229	00345	0 000000	CBZZ	XAC	FZZ
0230	00346	000000	SDVE	DBP	0
	00347	000000			
0231	00350	000000	SDVS	DBP	0
	00351	000000			
0232	00352	000000	DADX	DBP	0
	00353	000000			
0233	00354	000000	DAEY	DBP	0
	00355	000000			
0234	00356	000000	DASZ	DBP	0
	00357	000000			
0235	00360	000644		END	
	00361	000264			
	00362	000074			

PROGRAM NAME:

SOURCE: PEP4

BINARY: BPEP4

ENTRY POINTS (LOCATION): VCMP ('10730), DZNC ('11030),

GDAC ('11123), LGDC ('11237)

ACCESSIBLE VARIABLES (LOCATION): D1 ('11100), D2 ('11102),

D3 ('11104), D4 ('11106)

GENERAL DESCRIPTION:

This subroutine is the heart of the single position calibration procedure. It is divided into five parts, DZNC, GDAC, VCMP, FNAC and LGDC. DZNC is called by the fine alignment program once every second after twenty minutes or more from initialization. It filters WZER (the 1 sec accumulation of vertical axis drift) twice giving D1 and D2 (note: D3 and D4 are the same as D2). After thirty minutes of filtering (or fifty minutes from initialization) it scales and accumulates D4 (same as D2) in D5.

GDAC is culled every update in the gyro loop of the main program after twenty minutes or more from initialization. From twenty to fifty minutes it accumulates $\Delta\theta_X - \Delta\theta_{XCMD}$ (vertical axis drift) in WZER. From fifty to eighty minutes from initialization it will also accumulate $\Delta\theta A$ through $\Delta\theta F$ and at eighty minutes it calls the final calculation (FNAC).

FNAC starts by inhibiting the interrupt, calling VCMP (which scales $\Delta\theta A$ through $\Delta\theta F$ and forms $(\Delta\theta A + \Delta\theta B)$, $(\Delta\theta A - \Delta\theta B)$, $(\Delta\theta C + \Delta\theta D)$, $(\Delta\theta C - \Delta\theta D)$, $(\Delta\theta E + \Delta\theta F)$ and $(\Delta\theta E - \Delta\theta F)$ and calling LGDC (the lumped gyro drift calculator which performs the single position calibrations, equations on the parameters formed by VCMP and DZNC (D5)) to yield A, B, C and D estimated drifts (ADFT, BDFT, CDFT and DDFT). FNAC then prints out these drifts in the format shown below and halts. Since these drifts are scaled at 2^{-4} radians and represent thirty minutes of accumulation they must be multiplied by $\frac{2^{-4}}{1800}$ to get radians per second. To get meru one must multiply by

$$\frac{2^{-4}}{1800 \times 7.2921158 \times 10^{-8}} = 476.16$$

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0001			SUBR	VCMP	
0002			SUBR	DZNC	
0003			SUBR	LGDC	
0004			SUBR	D1	
0005			SUBR	D2	
0006			SUBR	D3	
0007			SUBR	D4	
0008			SUBR	GDAC	
0009			FEL		
0010	00000	0 000000	VCMP	DAC	**
0011	00001	000007	DPL		
0012	00002	0 02 00064	DLD	OMGA	
0013	00003	0 06 00066	DAD	OMGB	
0014	00004	0 04 00050	DST	SMAB	
0015	00005	0411 75	LLS	3	MULTIPLY BY 7 TO
0016	00006	0 07 00050	DSB	SMAB	SCALE TO RADIANS, R7
0017	00007	0 04 00050	DST	SMAB	OMEGA + OMEGAR
0018	00010	0 02 00064	DLD	OMGA	
0019	00011	0 07 00066	DSB	OMGB	
0020	00012	0 04 00056	DST	DFAB	
0021	00013	0411 75	LLS	3	
0022	00014	0 07 00056	DSB	DFAB	
0023	00015	0 04 00056	DSB	DFAB	OMEGA - OMEGAR
0024	00016	0 02 00070	DLD	OMGC	
0025	00017	0 06 00072	DAD	OMGD	
0026	00020	0 04 00052	DST	SMCD	
0027	00021	0411 75	LLS	3	
0028	00022	0 07 00052	DSB	SMCD	
0029	00023	0 04 00052	DSB	SMCD	
0030	00024	0 02 00070	DLD	OMGC	
0031	00025	0 07 00072	DSB	OMGD	
0032	00026	0 04 00060	DST	DFCD	
0033	00027	0411 75	LLS	3	
0034	00030	0 07 00060	DSB	DFCD	
0035	00031	0 04 00060	DST	DFCD	OMEGAC - OMEGAD
0036	00032	0 02 00074	DLD	OMGE	
0037	00033	0 06 00076	DAD	OMGF	
0038	00034	0 04 00054	DST	SMFF	
0039	00035	0411 75	LLS	3	
0040	00036	0 07 00054	DSB	SMFF	
0041	00037	0 04 00054	DST	SMFF	OMEGAF + OMEGAF
0042	00040	0 02 00074	DLD	OMGE	
0043	00041	0 07 00076	DSB	OMGF	
0044	00042	0 04 00062	DST	DFEF	
0045	00043	0411 75	LLS	3	
0046	00044	0 07 00062	DSB	DFEF	
0047	00045	0 04 00062	DST	DFEF	OMEGAE - OMEGAF
0048	00046	000005	SGL		
0049	00047	-0 01 00000	JMP*	VCMP	
0050	00050	000000	SMAB	DRP	0
0051	00051	000000			
0051	00052	000000	SMCD	DRP	0
0051	00053	000000			
0052	00054	000000	SMFF	DRP	0
0052	00055	000000			
0053	00056	000000	DFAB	DRP	0
0053	00057	000000			

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0054	00060	000000	DFCD DBP	0
	00061	000000		
0055	00062	000000	DFEF DBP	0
	00063	000000		
0056	00064	000000	OMGA DBP	0
	00065	000000		
0057	00066	000000	OMGB DBP	0
	00067	000000		
0058	00070	000000	OMGC DBP	0
	00071	000000		
0059	00072	000000	OMGD DBP	0
	00073	000000		
0060	00074	000000	OMGE DBP	0
	00075	000000		
0061	00076	000000	OMGF DBP	0
	00077	000000		
0062	00100	0 000000	DZNC DAC	**
0063	00101	000007	DBL	
0064	00102	0 02 00164	DLD	WZER
0065	00103	0 07 00150	DSR	D1
0066	00104	0401 67	LRS	9
0067	00105	0 04 00162	DST	SAVD
0068	00106	0401 77	LRS	1
0069	00107	0 06 00162	DAD	SAVD
0070	00110	0 06 00150	DAD	D1
0071	00111	0 04 00150	DST	D1
0072	00112	0 07 00152	DSB	D2
0073	00113	0401 67	LRS	9
0074	00114	0 04 00162	DST	SAVD
0075	00115	0401 77	LRS	1
0076	00116	0 06 00162	DAD	SAVD
0077	00117	0 06 00152	DAD	D2
0078	00120	0 04 00152	DST	D2
0079	00121	0 07 00154	DSB	D3
0080			*	LRS 9
0081	00122	0 06 00154	DAD	D3
0082	00123	0 04 00154	DST	D3
0083	00124	0 07 00156	DSB	D4
0084			*	LRS 9
0085	00125	0 06 00156	DAD	D4
0086	00126	0 04 00156	DST	D4
0087	00127	140040	CRA	
0088	00130	000201	IAB	
0089	00131	140040	CRA	
0090	00132	0 04 00164	DST	WZER
0091	00133	0 02 00776	DLD	1776
0092	00134	0 07 00166	DSB	FFTM
0093	00135	000005	SGL	
0094	00136	100400	SPL	
0095	00137	-0 01 00100	JMP*	DZNC
0096	00140	000007	DBL	
0097	00141	0 02 00156	DLD	D4
0098	00142	0401 76	LRS	2
0099	00143	0 06 00160	DAD	D5
0100	00144	0 04 00160	DST	D5
0101	00145	000005	SGL	
0102	00146	-0 01 00100	JMP*	DZNC

KD = .01, OR APPROX 5/5

D1 = KD(WZ-D1) +D1

D1 -D2

D2 = KD(D1-D2) +D2

D2-D3

KF = .002 OR APPROX 1/

D3 = KF(D2-D3) +D3

D3 -D4

D4 = KF(D3 -D4) +D4

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0103	00150	000000	D1	DBP	0
	00151	000000			
0104	00152	000000	D2	DBP	0
	00153	000000			
0105	00154	000000	D3	DBP	0
	00155	000000			
0106	00156	000000	D4	DBP	0
	00157	000000			
0107	00160	000000	D5	DBP	0
	00161	000000			
0108	00162	000000	SAVD	DBP	0
	00163	000000			
0109	00164	000000	WZER	DBP	0
	00165	000000			
0110	00166	000011	FPTM	DEC	300000RB30
	00167	011740			
0111	00170	000005	THTM	DEC	180000RB30
	00171	037440			
0112	00172	0 000000	DADX	XAC	DADX
0113	00173	0 000000	GDAC	DAC	**
0114	00174	140040		CRA	
0115	00175	000201		IAB	
0116	00176	0 02 00414	LDA		'414
0117	00177	000007		DBL	
0118	00200	-0 07 00172	DSB*		DADX
0119	00201	0 06 00164	DAD		WZER
0120	00202	0 04 00164	DST		WZER
0121	00203	0 02 00776	DLD		'776
0122	00204	0 07 00166	DSB		FPTM
0123	00205	000005		SGL	
0124	00206	100400		SPL	
0125	00207	-0 01 00173	JMP*		GDAC
0126	00210	000007		DRL	
0127	00211	0 07 00170	DSB		THTM
0128	00212	101400		SMI	
0129	00213	0 01 00246	JMP		FNAC
0130	00214	0 02 00400	DLD		'400
0131	00215	0401 61	LRS		15
0132	00216	0 06 00064	DAD		OMGA
0133	00217	0 04 00064	DST		OMGA
0134	00220	0 02 00402	DLD		'402
0135	00221	0401 61	LRS		15
0136	00222	0 06 00066	DAD		OMGB
0137	00223	0 04 00066	DST		OMGB
0138	00224	0 02 00404	DLD		'404
0139	00225	0401 61	LRS		15
0140	00226	0 06 00070	DAD		OMGC
0141	00227	0 04 00070	DST		OMGC
0142	00230	0 02 00406	DLD		'406
0143	00231	0401 61	LRS		15
0144	00232	0 06 00072	DAD		OMGD
0145	00233	0 04 00072	DST		OMGD
0146	00234	0 02 00410	DLD		'410
0147	00235	0401 61	LRS		15
0148	00236	0 06 00074	DAD		OMGE
0149	00237	0 04 00074	DST		OMGE
0150	00240	0 02 00412	DLD		'412

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0151	00241	0401 61	LRS	15	
0152	00242	0 06 00076	DAD	OMGF	
0153	00243	0 04 00076	DST	OMGF	
0154	00244	000005	SGL		
0155	00245	-0 01 00173	JMP*	GDAC	
0156	00246	000005	FNAC SGL		
0157	00247	001001	INH		
0158	00250	0 10 00000	JST	VCMP	
0159	00251	0 10 00307	JST	LGDC	
0160	00252	0 10 00000	CALL	FPOUTC	
0161	00253	0 000510	DAC	ADFT	
0162	00254	0 000536	DAC	=0	
0163	00255	0 000535	DAC	=8	
0164	00256	000000	OCT	0	
0165	00257	0 10 00000	CALL	T10U	
0166	00260	0 000534	DAC	=138	
0167	00261	0 10 00000	CALL	FPOUTC	
0168	00262	0 000512	DAC	RDFT	
0169	00263	0 000536	DAC	=0	
0170	00264	0 000535	DAC	=8	
0171	00265	000000	OCT	0	
0172	00266	0 10 00000	CALL	T10U	
0173	00267	0 000534	DAC	=138	
0174	00270	0 10 00000	CALL	FPOUTC	
0175	00271	0 000514	DAC	CDFT	
0176	00272	0 000536	DAC	=0	
0177	00273	0 000535	DAC	=8	
0178	00274	000000	OCT	0	
0179	00275	0 10 00000	CALL	T10U	
0180	00276	0 000534	DAC	=138	
0181	00277	0 10 00000	CALL	FPOUTC	
0182	00300	0 000516	DAC	DDFT	
0183	00301	0 000536	DAC	=0	
0184	00302	0 000535	DAC	=8	
0185	00303	000000	OCT	0	
0186	00304	0 10 00000	CALL	T10U	
0187	00305	0 000534	DAC	=138	
0188	00306	000000	HLT		
0189			* SUBROUTINE LGDC - LUMPED GYRO DRIFT CALCULATION		
0190	00307	0 000000	LGDC DAC	**	
0191	00310	000007	DBL		
0192	00311	0 02 00054	DLD	SMFF	OMEGA E + OMEGA F, R7
0193	00312	0 16 00520	MPY	COVS	B8
0194	00313	0 04 00474	DST	A1	
0195	00314	0 02 00520	DLD	COVS	
0196	00315	0 16 00055	MPY	SMFF+1	
0197	00316	0401 61	LRS	15	
0198	00317	0 06 00474	DAD	A1	
0199	00320	0 04 00474	DST	A1	
0200	00321	0 02 00054	DLD	SMFF	
0201	00322	0 16 00521	MPY	COVS+1	
0202	00323	0401 61	LRS	15	
0203	00324	0 06 00474	DAD	A1	
0204	00325	0 04 00474	DST	A1	C/S (OMEGA E + OMEGA F) B8
0205	00326	0 02 00050	DLD	SMAB	
0206	00327	0 07 00474	DSB	A1	
0207	00330	0 07 00474	DSB	A1	A1 = .5(SMAB - C/S(SMFF

MICROCOMP TELECOMMUNICATED DATA
DDP-516 ASSEMBLY LISTING

0208	00331	0411	66	LLS	10	
0209	00332	0 04	00474	DST	A1	B-4
0210	00333	0 02	00056	DLD	DFAB	B7
0211	00334	0 16	00522	MPY	CXC	
0212	00335	0 04	00504	DST	B1	
0213	00336	0 02	00522	DLD	CXC	
0214	00337	0 16	00057	MPY	DFAB+1	
0215	00340	0401	61	LRS	15	
0216	00341	0 06	00504	DAD	B1	
0217	00342	0 04	00504	DST	B1	C**2 (DFAB) B7
0218	00343	0 02	00056	DLD	DFAB	
0219	00344	0 16	00523	MPY	CXC+1	
0220	00345	0401	61	LRS	15	
0221	00346	0 06	00504	DAD	B1	
0222	00347	0 04	00504	DST	B1	
0223	00350	0 02	00052	DLD	SMCD	B7
0224	00351	0 16	00524	MPY	CXS	C*S B0
0225	00352	0 04	00506	DST	B1TM	
0226	00353	0 02	00524	DLD	CXS	
0227	00354	0 16	00053	MPY	SMCD+1	
0228	00355	0401	61	LRS	15	
0229	00356	0 06	00506	DAD	B1TM	
0230	00357	0 04	00506	DST	B1TM	
0231	00360	0 02	00052	DLD	SMCD	
0232	00361	0 16	00525	MPY	CXS+1	
0233	00362	0401	61	LRS	15	
0234	00363	0 06	00506	DAD	B1TM	C/S (SMCD) B7
0235	00364	0 06	00504	DAD	B1	
0236	00365	0411	66	LLS	10	B1 = .5 (C**2 (DFAB) + C*S
0237	00366	0 04	00504	DST	B1	B-4
0238	00367	0 02	00160	DLD	D5	DZN B-4
0239	00370	0 16	00526	MPY	SINA	B-4
0240	00371	0 04	00476	DST	A2	
0241	00372	0 02	00526	DLD	SINA	
0242	00373	0 16	00161	MPY	D5+1	
0243	00374	0401	61	LRS	15	
0244	00375	0 06	00476	DAD	A2	
0245	00376	0 04	00476	DST	A2	
0246	00377	0 02	00160	DLD	D5	
0247	00400	0 16	00527	MPY	SINA+1	
0248	00401	0401	61	LRS	15	
0249	00402	0 06	00476	DAD	A2	S*DZN B-4
0250	00403	0 06	00504	DAD	B1	
0251	00404	0 04	00476	DST	A2	A2 = B1 + S*DZN B-4
0252	00405	0 06	00474	DAD	A1	
0253	00406	0 04	00510	DST	ADFT	A DRIFT = A1 + A2
0254	00407	0 02	00474	DLD	A1	
0255	00410	0 07	00476	DSB	A2	
0256	00411	0 04	00512	DST	BDFT	B DRIFT = A1 - A2
0257	00412	0 02	00062	DLD	DFEF	B7
0258	00413	0 16	00532	MPY	SDVC	S/C B7
0259	00414	0 04	00500	DST	A3	
0260	00415	0 02	00532	DLD	SDVC	
0261	00416	0 16	00063	MPY	DFEF+1	
0262	00417	0401	61	LRS	15	
0263	00420	0 06	00500	DAD	A3	
0264	00421	0 04	00500	DST	A3	

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0265	00422	0 02 00062	DLD	DFEF	
0266	00423	0 16 00533	MPY	SDVC+1	
0267	00424	0401 61	LRS	15	
0268	00425	0 06 00500	DAD	A3	S/C (SMBF) B7
0269	00426	0 06 00060	DAD	DFCD	B7
0270	00427	0411 66	LLS	10	
0271	00430	0 04 00500	DST	A3	A3 = .5 (DFCD + S/C (DFEF
0272	00431	0 02 00160	DLD	D5	B-4
0273	00432	0 16 00530	MPY	COSA	B0
0274	00433	0 04 00506	DST	R1TM	
0275	00434	0 02 00530	DLD	COSA	
0276	00435	0 16 00161	MPY	D5+1	
0277	00436	0401 61	LRS	15	
0278	00437	0 06 00506	DAD	R1TM	
0279	00440	0 04 00506	DST	R1TM	
0280	00441	0 02 00160	DLD	D5	
0281	00442	0 16 00531	MPY	COSA+1	
0282	00443	0401 61	LRS	15	
0283	00444	0 06 00506	DAD	R1TM	
0284	00445	0 04 00506	DST	R1TM	C*DZN B-4
0285	00446	0 02 00504	DLD	B1	B-4
0286	00447	0 16 00532	MPY	SDVC	S/C B0
0287	00450	0 04 00502	DST	A4	
0288	00451	0 02 00532	DLD	SDVC	
0289	00452	0 16 00505	MPY	R1+1	
0290	00453	0401 61	LRS	15	
0291	00454	0 06 00502	DAD	A4	
0292	00455	0 04 00502	DST	A4	
0293	00456	0 02 00504	DLD	B1	
0294	00457	0 16 00533	MPY	SDVC+1	
0295	00460	0401 61	LRS	15	
0296	00461	0 06 00502	DAD	A4	S/C (B1) B-4
0297	00462	0 07 00506	DSB	B1TM	
0298	00463	0 04 00502	DST	A4	A4 = S/C (B1) -C*DZN B-
0299	00464	0 06 00500	DAD	A3	
0300	00465	0 04 00514	DST	CDFT	C DPFT = A4 +A3 B-4
0301	00466	0 02 00502	DLD	A4	
0302	00467	0 07 00500	DSB	A3	
0303	00470	0 04 00516	DST	DDFT	D DPFT = A4 -A3 B-4
0304	00471	000005	SGL		
0305	00472	-0 01 00307	JMP*	LGDC	
0306	00474	000000	A1	DRP	0
	00475	000000			
0307	00476	000000	A2	DRP	0
	00477	000000			
0308	00500	000000	A3	DRP	0
	00501	000000			
0309	00502	000000	A4	DRP	0
	00503	000000			
0310	00504	000000	R1	DRP	0
	00505	000000			
0311	00506	000000	B1TM	DRP	0
	00507	000000			
0312	00510	000000	ADFT	DRP	0
	00511	000000			
0313	00512	000000	BDFT	DRP	0
	00513	000000			

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0314	00514	000000	CDFT DRP	0	
	00515	000000			
0315	00516	000000	DDFT DRP	0	
	00517	000000			
0316	00520	063615	COVS DEC	1.61803408B1	COS A/SIN A
	00521	067475			
0317	00522	056237	CXC DEC	0.72360688B0	COSA**2
	00523	011345			
0318	00524	034476	CXS DEC	0.44721368B0	COSA*SINA
	00525	022712			
0319	00526	041513	SINA DEC	0.52573118B0	SIN A
	00527	012016			
0320	00530	066342	COSA DEC	0.85065088B0	COSINE A
	00531	010015			
0321	00532	047433	SDVC DEC	0.61803408B1	SINA/COSA
	00533	057172			
0322	00534	000212	END		
	00535	000010			
	00536	000000			
	00537	000212			
	00540	000010			
	00541	000000			
	00542	000212			
	00543	000010			
	00544	000000			
	00545	000212			
	00546	000010			
	00547	000000			