Internal Report #24

OGO-6 DATA TAPE FORMATS

by

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CONTENTS:

I. Experiment tape format and data content.

Refer to Figures 1 and 2. The tapes are labelled FEXnnn-1 and FEXnnn-2, or FXnnn1 and FXnnn2. There is no difference between FEX tapes and FX tapes. The 2 suffix indicates that the tape is a continuation of the tape having the same number, but with a 1 suffix. With a few exceptions, each tape or pair of tapes contains one day of data, usually beginning and ending shortly before midnight UT.

The tapes usually contain approximately one to thirty files. Each file contains data from a single acquisition, and thus represents a continuous time interval. Time order between files is unpredictable, but usually is fairly smooth. Overlaps and gaps of several minutes' duration are common.

The tapes are 7-track, odd parity, 556 bpi. Each file begins with a 390-character label record which contains information about the acquisition (see Figure 1.). The only information used from this record is the bit rate (character 67). The remainder of the file consists of a variable number of 3132-character records (Figure 2), each of which corresponds to one complete spacecraft subcommutator sequence. Characters 1-3072 are 128 groups of 24 characters: each 24-character group corresponds to one frame of data. Characters 3073-3120 contain experiment data that is available only once in each subcommutator sequence, and spacecraft status information. Characters 3121-3128 contain the day and time corresponding to the beginning of the subcom sequence, and characters 3129-3132 are unused. A few of the tapes have 3128-character records. These usually contain the same information as the first 3128 characters of the normal tapes.

Figure 2 shows the content of each character. The letter in the "Destination" column refers to the record type in the Abstract tape where

that information is stored (see Section VI). The "Representation" column refers to the maincom word number and the subcom number which is the source of the data; e.g., D(97,72) refers to the contents of maincom word 97, when the subcommutator is in position 72. References 2 and 3 contain detailed descriptions of the contents of the experiment-generated words; descriptions of the remaining words are contained in Reference 1.

Figure 3 describes the contents of D(129,n) and D(131,n), which are generated by ground equipment. Details may be found on pages 46-49 of Reference 1. The numbers marked "normal bit order" are used in subsequent references of the form MC129/6, which refers to bit 6 of MC129 - the fill data flag.

II. Orbit tape format and data content.

Refer to Appendix B of Reference 1. Orbit tapes are labelled FAOnnn. They contain approximately 50 files each, with one orbit per file. Each file except the last contains 53 or 54 records of 1500 characters (usually). The first record contains label information describing the orbit. Subsequent records contain information such as position, velocity, and orientation of the spacecraft computed for various instants of time. These are available each minute (integer multiple of 60000 milliseconds, UT) and at a few additional special points in the orbit, such as equator crossings. The special points are not always inserted in exact time order, but if they are deleted the remaining data occur uniformly at one-minute intervals. Each 1500-character physical record consists of two 750-character logical records which are identical except that they correspond to different times. All data are in 7094 floating-point format (36-bit word: bit 0 is sign; bits 1-8 are exponent E; bits 9-35 are absolute value of mantissa, M, with implied binary

point before bit 9; number = M x 2^{-27} x 2^{E-128} if the binary point is considered to be after bit 35). The end of the tape is signalled by a file containing a single (250-word, 1500-character) record of 99999999.0's. The last logical record (second half of the last physical record) in an orbit file may be all zeroes. This occurs whenever the number of data points computed for an orbit is odd.

III. Abstraction program: Experiment data checking.

All of the discussions of the abstraction program which pertain to error checking and output listings refer to the program MERGER4, which produces FMRnnn tapes. Earlier versions of the abstraction program, which produced RMRnnn and MRnnnA tapes, incorporated very few error checks. Where an error check applies to all versions of the abstraction program, it will be so indicated.

1. Tape quality: standard IBM OS/370 error checking is performed when the tape is read. Whenever a permanent read error (e.g. a parity error) is encountered, a message is printed and the entire physical record is skipped.
2. Data quality: to be accepted for processing, the data in each record must satisfy certain constraints. These are:
   a. Day number must be greater than zero and less than 367;
   b. Day number must not increase by more than one from the previous accepted record, unless this is the first record of an acquisition;
   c. Time must be non-negative and less than or equal to 86400000;
   d. Time must not change by more than 150 seconds from previous accepted record, unless this is the first record of an acquisition.

3. Data content (all versions): fill frames are counted, then dropped.

IV. Abstraction program: Orbit data checking.

1. Tape quality: same as III. 1. above.

2. Data quality: similar to III. 2:

   a. Time must be an integer multiple of 60000 milliseconds (earlier versions required an even multiple of 60 milliseconds, which usually gives the same result);

   b. Day must be greater than zero (all versions);

   c. Day must be less than or equal to 366;

   d. Altitude must be greater than 99.0 and less than 2000.0;

   e. L. must be greater than or equal to .90 and less than or equal to 101.0;

   f. Day must not be less than previous day;

   g. Day must not increase by more than one;

   h. Time must behave properly at day change.

These checks (IV. 2.) are performed on each logical record. If any of the conditions are not met, the logical record is skipped and a message is printed.

V. Abstraction program: Data conversions.

A number of conversions are performed on the raw experiment data to facilitate later processing. In general, these are operations which convert data from a form which is convenient for the experiment electronics to a form which is convenient for the user. This section discusses only those conversions which are performed by the abstraction program. Refer to Appendix A for additional conversions done by INPUTF. Conversions are discussed in relation to logical record type. See Section VI below for details of the various record types. References 2 and 3 discuss the details of the experiment data format.

A-record:

1. The parity of MC113 and MC114 is checked. If it is incorrect, the corresponding bits (A1/5 or A1/6) are set. (The notation used corresponds to Figures 4-7. Xn/m means record type X, byte n, bit m. Bytes and bits are numbered beginning with 1. Bit 1 is the high-order bit of each byte.)
2. The MC113 and MC114 overflow bits are set to correspond to the current frame by looking ahead to the following frame of experiment data, if that is available. (A1/3 and A1/4)
3. The "next frame fill" flag (A1/8) is set by examining MC129/6 from the following frame.
4. Byte A2 (FRMDRP) is the number of fill frames counted since the last non-fill frame or the beginning of the current subcom sequence, whichever came last. This number is increased by 128 if there is a timing inconsistency between subcom sequences.
5. The MC113 and MC114 rates are decoded from the 217 shift code before being stored as A9 and A10.

B-record:

1. The MC10(C) overflow flag (B1/3) is set from MC9/6 of the following frame (cf. V. A. 2. above).
2. The parity of MC9 through MC12 is checked and the corresponding flag bits (B1/4 - B1/7) are set if the parity is incorrect.
3. MC10 is decoded in a way that depends on the event code (255 shift code for Cerenkov events and Range events, 217 shift code for Flare events and illegal event codes, and no decoding for Range-Range events).
4. MC11 and MC12 are decoded 255 shift code.

C-record: No conversions.

D-record:

1. Orbit number is converted to integer format.
2. All other data are converted to S/360 double-precision floating-point format.

VI. Abstract tape format and data content.

The abstract tapes produced by the merge (abstraction) program are 9-track, 800 bpi, with variable length records (RECFM=U). The physical records contain a variable number of logical records of four types:

A-records: one for every frame of data (except fill). These are 10 bytes long, and contain information from MC39, MC87, MC113, MC114, MC129, and MC131, and the Sun Aspect Indicator (SAI, cf. Reference 1). Also included is a flag indicating whether the following frame was fill (before being deleted by the abstraction program), and a count of the number of fill frames dropped immediately preceding the current frame. See Figure 4.

B-record: one for every frame containing a new event or a change in any of MC9-MC12. These are 5 bytes long and immediately precede the A-record to which they correspond. They contain information from MC9 through MC12. See Figure 5 .

C-record: one for every subcom sequence. These contain the day and time references for the A- and B-records following them, the bit rate for the current acquisition, and subcommutated data that is available once each subcom sequence. The day and time in the C-record correspond to the first frame of the subcom sequence. The time for subsequent frames may be found from the subcom count (MC131/6-12) and the bit rate. See Figure 6. These are 30 bytes long.

D-record: one each minute. These contain attitude-orbit data in S/360 double-precision floating-point format, and a flag indicating end-of-acquisition when appropriate. See Figure 7. These are 556 bytes long.

Normally each acquisition begins and ends with a D-record. There is then one C-record for each subcom sequence, followed by the B- and A-records for that sequence. D-records are inserted wherever appropriate to maintain time-order. Each physical record begins with either a D- or C-record, and no physical record contains more than 3 D-records or 3 C-records (except for error conditions in some RMR and MR tapes. See Section VII). The maximum physical record length in bytes is 3 x 556 (3 D-records) + 3 x 30 (3 C-records) + 128 x (5 + 10) (128 A-records each with an accompanying B-record) = 3678 bytes. Average length is about 2200 bytes. A B-record always occurs immediately before its associated A-record. Each tape consists of a single file, which contains one day of data. Acquisitions appear in the same order as on the Experiment tapes. Acquisitions always end with a D-record, which contains an end-of-acquisition flag. This may occur anywhere within a physical record.

VII. Differences between RMR, MR, and FMR tapes.

FMR tapes are produced by the current version of the abstraction program (MERGER4), and fit the description given above. RMR and MR tapes contain several errors due to bugs in earlier versions of the program. These may be divided into three groups as discussed below.

A. Buffer control errors: These occur when certain configurations of fill data cause an entire subcom sequence to be deleted. The program allocates buffer space for a C-record for that subcom sequence, but never writes the record into the buffer. The information that previously occupied that

buffer position is retained, and later misinterpreted when read by INPUTF. Version 7 of INPUTF checks for this by comparing the subcom count (A6/2-8) with that expected from the number of A-records since the last C-record and the number dropped (A2). It also checks for consistency between the fill flag (A1/8) and FRMDRP (A2) (if A1/8 is zero or one, A2 of the following frame must be zero or non-zero, respectively).

B. Timing errors: certain improbable combinations of conditions sometimes cause the program to lose synchronization between Experiment data time and Orbit data time, thus producing stretches of output with no D-records or with mismatched times. This cannot be corrected by INPUTF.

C. Maincom 10 decoding error (RMR tapes only): the program uses the event code from the previous event to decide how to decode MC10. INPUTF corrects this (if SETINV has previously been called) by checking the previous event code, translating MC10 (B3, decoded) back to the original form and then re-translating using the correct event code. This cannot be done in all cases, since the 217 shift code is not one-to-one. In cases where the translation cannot be accomplished unambigously, INPUTF signals an "inversion failure" (cf. Appendix A.)

VIII. Abstraction program output.

This section describes the printed and punched output produced by the abstraction program. Printed output applies only to the latest version (MERGER4); punched output is the same for all versions.

Printed output consists of: a) standard descriptive information, b) error messages, c) optional listings of input and/or output records. The standard information includes listing of control cards or defaults, listing of label records of each Experiment Tape or Orbit Tape file opened, listing

of day and time for each input record dropped (and reason for dropping it; cf. Sections III and IV above), listing of the internal Orbit File Dictionary maintained by the program, and a listing of acquisitions processed at the end of each run. Error messages are more or less self-explanatory, and are printed whenever I/O errors or internal errors are detected. Optional listings include the day and time for each logical record processed on input, and each C- and D-record, plus physical record number, on output. Additional information appropriate to each record type is also printed, such as altitude and L-value for input Orbit records. Appendix C explains how to request this optional output.

Punched output consists of one or two cards for each input end-of-file (except for unused Orbit files which are scanned and skipped). These contain acquisition start/end times or orbit start/end times, and other descriptive information (cf. Figure 8.)

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IX. Appendix A

INPUTF VERSION 7

I. GENERAL INFORMATION

There are currently three versions of OGO-6 Abstract Tapes available. They are designated RMR, MR, or FMR, depending upon which version of the abstraction program produced them. FMR tapes are the most recent version, and should be used whenever they are available (some older tapes have been re-abstracted and FMR versions now exist.) RMR and MR tapes contain a number of rather serious errors which have recently been discovered. The worst of these errors will cause what appears to be random garbage to show up in various unexpected places in the data. Version 7 of INPUTF contains extensive error-checking procedures which should be able to detect these errors in most cases. When an error is detected, the entire physical record containing the error is discarded and an error message is printed on FORTRAN Unit 6. This checking is not necessary when processing FMR tapes, and can be bypassed by issuing CALL BYPCHK at any time. Once issued, the call is irreversible.

In addition, RMR tapes contain an error in decoding the Maincom Word 10 shift code. This can usually be corrected by issuing CALL SETINV before the first call to INPUTF. In the event the error cannot be corrected in an individual case,

an error indication will be given as discussed below.

Version 7 should be completely compatible with all programs that used earlier versions of INPUTF. However, some changes in results might be expected due to errors in the earlier versions. Version 7 has optional additional inputs and outputs which are essentially the same as those discussed in a previous writeup for Version 5.

For a detailed description of the errors in the RMR and MR tapes, the writeup* for the new abstraction program, MERGER4, should be consulted.

II. ENTRY POINTS

CALL INPUTF - returns data as discussed below.

CALL SETINV - causes correction of Maincom 10 decoding error. Should be used for RMR tapes only, and should be called once before any call to INPUTF.

CALL SKIPRC(N)-skips N physical records. May be called at any time. If INPUTF is in the middle of a physical record when SKIPRC is called, the current record will be skipped in addition.

CALL BYPCHK - causes suppression of error checking. Should be used with FMR tapes only. Needs to be called only once.

* SRL Internal Report #24

III. CONTROL INPUTS AND DATA RETURNS

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COMMON/AREC/IA(17)
COMMON/BREC/IB(12),ILLEG*,INVERT*
COMMON/CREC/IC(27),IBITRT*
COMMON/DREC/IEOA,IORBIT,DWORD(69)
COMMON/CONTRL/NC(13)
```

All variables are INTEGER*4 except DWORD, which is REAL*8. The variables marked with an asterisk are optional, and need be present only if their function is requested (see below). All variables are outputs from INPUTF except NC(1) through NC(4), which control INPUTF. These have the following effects:

NC(1)	Return on A-record if odd, do not return if even.
NC(2)	Return on B-record if odd, no return if even.
NC(3)	Return on C-record if odd, no return if even.
NC(4)	Return on D-record if odd, no return if even.

Only the 1-bit is checked to determine a return request. Setting NC(1)=1 and NC(2)=NC(3)=NC(4)=0 will ensure that all records are read, except the last D-record on the tape, which is not followed by an A-record.

Additional returns are requested by setting other bits in these words:

COMMON/CONTRL/NC(13)

NC(1)	All bits other than 1-bit are ignored.	
NC(2)	2-bit:	If zero, ignore all higher bits, if one, set ILLEG and INVERT as appropriate and check higher bits.
	16-bit:	Ignore any B-record with event code = 0 or 1 (Cerenkov or null).
	32-bit:	Ignore any B-record with event code = 0 or 2.
	64-bit:	Ignore any B-record with event code = 0 or 4 (Range-no range).
	128-bit:	Ignore any B-record with event code = 0 or 8 (Flare)

64-bit and
32-bit: Ignore any B-record with event code = 0,2,4, or 6 (Range-no range and Range-Range).

To determine effects of other combinations, calculate (15-(NC(2)/16)) and perform a logical AND with the event code. If the result is zero, the event will be ignored.

NC(3) 2-bit: If on, return bit rate code in IBITRT.

IBITRT	Meaning
0	8 kbps realtime data
1	16 kbps " "
2	64 kbps " "
3	8 kbps playback data

NC(4) All bits other than 1-bit are ignored.

INPUTF returns the following variables:

NC(5) = 0 AREC contains old data.
= 1 AREC contains new data.
NC(6) = 0 BREC contains old data.
= 1 BREC contains new data.
NC(7) = 0 CREC as above
= 1 CREC "
NC(8) = 0 DREC "
= 1 DREC "
NC(9) = 0 Normal
= 1 End of file encountered.
= 2 SYNAD error (data check or equip. check). Next record ready for processing.
= 3 Missing DD card for TAPEAT, or unable to open for some other reason. (INPUTF should not be reentered if NC(9) = 1 or 3).
NC(10) = 0 Normal.
= 1 Timing inconsistency between subcom sequences (from abstraction program).
NC(11) = -1 Sync found disagrees with expected sync; new value used, probably correct.
= 0 Sync found agrees with expected sync.
= +1 No sync found in this subcom sequence; digital data lines were probably off for all or most of sequence.

NC(12) = 0 Normal.
= 1 Unexpected sync frame found after first sync frame in this subcom sequence.
NC(13) = 0 Normal.
= 1 Digital data lines off, this frame.

```
COMMON/AREC/IA(17)
   IA(1)          SAI
   IA(2)   = 0    Not first frame of subcom sequence.
           = 1    First frame of subcom sequence (MC129/5).
   IA(3)   = 0    Normal (MC129/6).
           = 1    This frame is fill (may be forced by INPUTF
                  error checking routine).
   IA(4)   = 1    Normal (MC131/4).
           = 0    Not in subcom sync.
   IA(5)   = 1    Normal (MC131/5): in frame sync.
           = 0    In lock, but errors.
   IA(6)          Subcom count (MC131/6-12) 0 thru 127.
   IA(7)          MC39/1-8  Analog D8 rate, channel #.
   IA(8)          MC87/1-8  Analog D4' rate, channel #.
   IA(9)          MC113 decoded from shift code:  negated if
                  overflow, excess 300 if followed by fill.
   IA(10)         MC114 as above
   IA(11)  = 0    Normal.
           = 1    MC113 parity error.
   IA(12)  = 0    Normal.
           = 1    MC114 parity error.
   IA(13)         XY    (See Internal Report #19, Table III).
   IA(14)         CNT   (See Internal Report #19, page 15).
   IA(15)         Number of fill frames dropped since last
                  C-record or since last good A-record, which-
                  ever came last.
   IA(16)         Time in milliseconds.
   IA(17)         Day number.
```

```
COMMON/BREC/IB(12),ILLEG,INVERT
   IB(1)          Event code (MC9/1-4)
                  (= 9 if inversion error and NC(2) 2-bit = 0)
   IB(2)      = 0 New event (MC9/5) (error in some previous
                  writeups).
              = 1 Not new event.
   IB(3)      =   HTC1 (MC10 decoded 255 shift code) if event
                  code = 1 or 4.
              =   0 otherwise.
   IB(4)      =   HTC2 (MC11 decoded 255 Shift Code).
   IB(5)      =   HTC3 (MC12 decoded 255 Shift Code).
   IB(6)      =   FLR RATE (MC10 decoded 217 Shift Code)
                  if event code = 8 or illegal; negated if
                  overflow; = 300 if O/F flag lost due to fill.
              =   0 otherwise.
   IB(7)      =   Low range bits (MC10/5-8) if event = 6.
              =   0 otherwise.
   IB(8)      =   High range bits (MC10/1-4) if event = 6.
              =   0 otherwise.
   IB(9) thru
    IB(12)        Parity error flags for MC9 thru MC12 respec-
                  tively:  1 if parity error, 0 if parity OK.
   ILLEG      = 1 If illegal event code  } {Set only if
              = 0 If legal event code    } {NC(2) 2-bit = 1
   INVERT     = 1 If MC10 inversion error }       "
              = 0 If MC10 inverted OK     }       "
```

```
COMMON/CREC/IC(27),IBITRT
   IC(1)          Time, milliseconds.
   IC(2)          Day number.
   IC(3)          Command status (SC72/1-6).
   IC(4)          Range telescope temperature (SC87/2-9).
   IC(5)          Cerenkov telescope temperature (SC106/2-9).
   IC(6)          Subcom I (86)   )
   IC(7)             "     (34)   )
   IC(8)             "     (98)   }  other experiments
   IC(9)             "     (36)   )
   IC(10)            "     (117)  )
   IC(11)         RII Status          SCI-9       bits 2-9
   IC(12)         RI  Status          SCI-83         "
   IC(13)         RR Mode             SCI-84         "
   IC(14)         -Z door temp.       SCIII-36       "
   IC(15)         -X door temp.       SCIII-3        "
   IC(16)         Buss Voltage        SCII-21        "
   IC(17)         Wideband A          SCII-36        "
   IC(18)         Wideband B          SCII-88        "
   IC(19)         Special Purpose     SCII-68        "
   IC(20)         Calibrations        SCII-82        "
   IC(21)               "             SCIII-81       "
   IC(22)               "             SCII-83        "
   IC(23)               "             SCIII-82       "
   IC(24)               "             SCII-84        "
   IC(25)               "             SCIII-83       "
   IC(26)               "             SCII-85        "
   IC(27)         RR Power            SCI-83         "
                   (Same as IC(11)
   IBITRT  = 0  if 8 kbps realtime data
           = 1  if 16 kbps   "       "
           = 2  if 64 kbps   "       "
           = 3  if 8 kbps playback data
                 (IBITRT Set only if NC(3) 2-bit = 1)
```

```
COMMON/DREC/IEOA,IORBIT,D(69)
```

IEOA	= 1	If this DREC indicates end-of-acquisition.
	= 0	Otherwise.
IORBIT		Orbit number.
D(1)		Day number (D(1) through D(69) all double precision floating point).
D(2)		Time, milliseconds.
D(3)		Right ascension, degrees.
D(4)		Declination, degrees.
D(5)		Position vector X }
D(6)		" " Y } GEI, kilometers
D(7)		" " Z }
D(8)		Velocity vector Vx }
D(9)		" " Vy } GEI, km/sec
D(10)		" " Vz }
D(11)		Solar Vector X }
D(12)		" " Y } GEI, kilometers
D(13)		" " Z }
D(14)		Latitude, geodetic, degrees.
D(15)		Longitude, geodetic, degrees.
D(16)		Altitude, kilometers.
D(17)		True anomaly, degrees.
D(18)		Sun-earth-satelitte angle, degrees.
D(19)		Actual body roll axis X }
D(20)		" " " " Y } GEI, unit vector
D(21)		" " " " Z }
D(22)		Actual body pitch axis X }
D(23)		" " " " Y } GEI, unit vector
D(24)		" " " " Z }
D(25)		Actual body yaw axis X }
D(26)		" " " " Y } GEI, unit vector
D(27)		" " " " Z }
D(28)		Magnetic range, earth radii.
D(29)		Magnetic latitude, degrees.
D(30)		McIlwain L-parameter, earth radii.
D(31)		Magnetic field (B), gamma (10^{-5} gauss).
D(32)		Field ratio B/B_0.
D(33)		Field line ingress latitude, degrees.
D(34)		" " " longitude, "
D(35)		Field line egress latitude, degrees
D(36)		" " " longitude, "
D(37)		Magnetic field direction X }
D(38)		" " " Y } GEI, unit vector
D(39)		" " " Z }

D(40)		Mag. field direction X } body coords., unit vector
D(41)		" " " Y
D(42)		" " " Z
D(43)		Mag. field vector Geodetic (left-handed) Coordinates { BGE, BGN, BGV } gamma
D(44)		
D(45)		
D(46) thru D(54)		GEI to GSE transformation matrix in row order (11,12,13,21,22,23,31,32,33).
D(55) thru D(63)		GEI to GSM transformation matrix, row order.
D(64)		Satellite spin axis X } GEI, unit vector
D(65)		" " " Y
D(66)		" " " Z
D(67)	= 0.0	Normally.
	=-1.0	If attitude data housekeeping discrepancies detected.
D(68)		No data flags } See below
D(69)		Suspect data flags

D(68) and D(69) are $K_0 \cdot 2^0 + K_1 \cdot 2^1 + K_2 \cdot 2^2 + \ldots + K_5 \cdot 2^5$, where K_n has the following meanings:

n	data
0	Roll
1	Pitch
2	Yaw
3	OPEP shaft angle
4	Paddle shaft angle
5	Array error

If K_n is 1 in D(68), the corresponding data is not available.

If K_n is 1 in D(69), the data is suspect. Otherwise $K_n = 0$.

More details on the meanings of these quantities can be found in various OGO writeups, e.g. NASA X-565-69-157 "OGO-F Data-Processing Plan," GSFC, March 1969.

IV. MISCELLANEOUS CONSIDERATIONS

1. NC(5) through NC(8) should always be checked to avoid reprocessing data that may not have changed since the preceeding call to INPUTF.

2. NC(9) should always be checked immediately upon return from INPUTF or SKIPRC. If NC(9) is 0 or 2, INPUTF or SKIPRC may be reentered and processing will continue (N will have to reset for SKIPRC(N), if NC(9) = 2, otherwise more records may be skipped than were intended.) If INPUTF or SKIPRC is reentered after NC(9) is returned as 1 or 3, the job step will probably ABEND.

3. With regard to illegal event codes, both the abstraction program and INPUTF treat these as if they were 8 (FLARE event) for purposes of decoding MC10. If the 2-bit of NC(2) is <u>on</u> (1), ILLEG will be set to 1 for illegal event codes. Otherwise, the calling program should check the event code each time.

ADDENDUM TO INPUTF WRITEUP
AND
DESCRIPTION OF INPUTF VERSIONS 5 and 6

0. Contents:

I. Errors in Version 3B:

1. When a fill flag is encountered, MC10 is always decoded to 300, since it is assumed that the overflow flag (which would have been in the following spacecraft frame) was lost. This is necessary only for FLARE events, where MC10 is a rate, but is done for all event types by Version 3B.

2. When attempting to set B(6) (FLR RAT) to 300 when the above condition is encountered, Version 3B sets it to 44 instead.

3. The number of frames lost (FRMDRP) is reduced by 128 if it exceeds 127. This is a signal from the merge program which indicates a timing inconsistency between subcom sequences. NC (10) is set to 1 when this occurs.

4. The names for A(2) and A(3) (SUBSEQ and FILL, respectively) are reversed in the source code for Version 3B. The reversal does not

affect the operation of the program however, since it is done consistently.

5. SETINV does not save registers properly. This might cause strange things to happen in the main program.

II. General Specifications:

1. The computation of XY and CNT (A(13) and A(14)) is quite complicated. A search through the input buffer is done each time a C-record is encountered. INPUTF looks for an A-record which has MC114 = 255 and MC113 ≠ 255. It then sets XY = 3 and CNT = 16 for that frame and then works backwards to the first frame following the C-record. The values of XY and CNT thus obtained are compared with the values expected from previous computations, except at the beginning of an acquisition when the latter are not available. If the old and new values match, NC(11) is set to zero. If they do not match, NC(11) is set to -1, and the new values are used. If the sync frame described above is not found before the next C-record or before the end of the input buffer, NC(11) is set to +1, and the old values are used for XY and CNT.

2. The meaning of XY is not that which would be expected from some of the OGO-F write-ups. When XY = 1, MC114 is MC114(1) = D5' rate; etc. This is, MC114(XY) is what would be expected from, say, Fig. 14 of Althouse et al. (1967) (ignoring $\overline{XY}$) or Table III of Murray (1970), but not Table VIII of Murray (1970). The value of XY is not to be confused with the bits $\overline{XY}$.

3. Notice that C(11) (RI Status) and C(27) (RR Power) both contain the same information.

4. In case of overflow, the following words are negated, after shift-code decoding: MC113, MC114, MC10 (latter negated only for flare event).

5. Parity bits are not stored in B(9) through B(12), A(11), A(12) These are parity error flags, not the original spacecraft parity bits.

6. In case of a fill flag, MC113 and MC114 are set to 300 (cf. I. 1-2 above for MC10).

7. Due to an error in an early version of the MERGE Program, MC10 was decoded improperly in many cases. Abstract tapes which contain this error are labelled RMRnnn. Tapes which do not contain the error are labelled MRnnnA, or FMRnnn. For tapes with the error, it is necessary to issue CALL SETINV before the first call to INPUTF (Version 4 does this automatically but incorrectly. Do not use Version 4).

8. NC(13) is set to 1 (digital data off) whenever both MC113 and MC114 are 255 (decoded from zero).

9. NEOF is set to 1×2^{24} when an end-of-file is encountered. See below (III.6) for other possibilities.

10. NC(10) is set to 1 whenever FRMDRP > 127 and FRMDRP is set 128 smaller. (cf. I.3 above).

11. NC(1) through NC(4) are never changed by INPUTF. All other quantities in COMMON/CONTRL/ are set to zero unless otherwise indicated above, except NC(5) through NC(8) are set to 1 if a new record of the respective type was processed this call. Other COMMON blocks are not disturbed until a new record of the respective type is processed.

12. The MERGE program treats illegal event codes as if they were 8 (flare event). Occasional inversion errors may be expected following illegal events and flare events. Following other event types, one should not encounter any inversion errors. On illegal event codes, B(3), B(6), B(7), and B(8) should all be zero.

III. Differences Between Version 3B and Version 5:

1. Version 5 should be basically compatible with any program that used Version 3B. The errors described above (I.1, I.2, I.4, I.5) have been corrected, and some of the internal coding has been streamlined for faster running.

2. Additional returns are available if requested. These are:

```
COMMON/BREC/IB(12),ILLEG,INVERT
COMMON/CREC/IC(27),IBITRT
```

Where ILLEG is set to 1 if an illegal event code is encountered (zero otherwise), INVERT is set to one if an inversion error is encountered (zero otherwise), and IBITRT is 0,1,2 or 3 for 8, 16, or 64 kbps real-time, or 8 kbps playback, respectively.

3. Requests for the above extra variables are made by setting the 2-bit of NC(2) and NC(3). That is, if NC(2) = 2 or 3, ILLEG and INVERT

will be returned; if NC(3) = 2 or 3, IBITRT will be returned. Notice that the COMMON blocks must be extended to provide for these returns if they are requested, otherwise other data may be destroyed. The 1-bit of NC(2) and NC(3) is interpreted the same way by both versions: if zero (even), do not return; if one (odd), return.

4. If NC(2) is not 2 or 3, the event code B(1) is set to 9 by Version 5 in case of an inversion error. This is done by Version 3B regardless of the value of NC(2). If NC(2) is 2 or 3, Version 5 does not modify the event code from what is on the tape.

5. If NC(2) is 2 or 3 (more specifically, if the 2-bit is ON), additional requests can be made by setting the 16-, 32-, 64-, and 128- bits of NC(2) (Version 5 only). The meaning of each of these bits is as follows:

BIT ON	MEANS
16	Ignore BREC if event = 1
64	" " " " = 4
64 and 32	" " " " = 6
128	" " " " = 8

The event code is tested bit by bit against this mask, so some illegal event codes will also be ignored. All bit combinations with NC(2) < 255 are valid. The 4- and 8- bits are ignored. E.g.: Nc(2) = 128+64+32+2 means: ignore all B-records except those with odd event codes (Cerenkov events and some illegal codes), set ILLEG and INVERT as needed, and do not return on B-records. Note that these codes are meaningless to Version 3B, which examines only the 1-bit.

6. NEOF is set to 1×2^{24} for EOF, 2×2^{24} for data checks, and 3 if the data set cannot be opened. This has been changed to 1, 2. and 3 respectively in Version 6.

IV. Version 5 does not handle data checks properly. Version 3 ignores them. Version 6 prints a message and skips the bad record.

IV.A. Versions 3 and 5 set MC113=MC114=300 in case of fill. Version 6 adds 300 to MC113 and MC114 in case of fill.

X. Appendix B: List of abstract tapes and time coverage.

1969 ØGØ-6 ABSTRACT TAPES

Date	June 1969	July	August	September
1		RMR 029	RMR 060	RMR 091
2		RMR 030	RMR 061	RMR 092
3		MR 031A*	RMR 062	BAD TAPE
4		RMR 032	RMR 063	RMR 094
5		RMR 033	RMR 064	NØ DATA
6		RMR 034	FMR 065	RMR 096
7	RMR 001 RMR 002	RMR 035	RMR 066	NØ DATA
8	RMR 003 RMR 004	RMR 036	RMR 067	RMR 098
9	RMR 005 RMR 006	RMR 037	RMR 068	RMR 099
10	RMR 007 RMR 008	FMR 038	RMR 069	RMR 100
11	RMR 009 RMR 010	RMR 039	RMR 070	RMR 101
12	RMR 011 RMR 012	RMR 040	RMR 071	NØ DATA
13	RMR 013 RMR 014	FMR 041*	RMR 072	RMR 103
14	RMR 015 RMR 016	RMR 042	RMR 073	RMR 104
15	RMR 017 RMR 018	RMR 043	RMR 074	RMR 105
16	RMR 019	RMR 044	RMR 075	RMR 106
17	RMR 020	FMR 045*	RMR 076	RMR 107
18	RMR 021	RMR 046	RMR 077	RMR 108
19	RMR 022	RMR 047	RMR 078	FMR 109
20	RMR 023	RMR 048	FMR 079	RMR 110
21	RMR 023-1	RMR 049	FMR 080	FMR 111
22	RMR 023-2	RMR 050	FMR 081	FMR 112
23	RMR 023-3	RMR 051	FMR 082	RMR 113
24	RMR 023-4	FMR 052*	FMR 083	RMR 114
25	FMR 024*	RMR 053	FMR 084	RMR 115
26	RMR 025	RMR 054	FMR 085	RMR 116
27	RMR 026	RMR 055	RMR 086	RMR 117
28	RMR 027	RMR 056	RMR 087	RMR 118
29	RMR 027-2	RMR 057	NØ DATA	RMR 119
30	RMR 028	RMR 058	FMR 089	RMR 120
31		RMR 059	RMR 090	

*Also RMR

1969 ØGØ-6 ABSTRACT TAPES

Date	Oct. 1969	November	December
1	RMR 121	RMR 152	FMR 182
2	RMR 122	MR 153A*	FMR 183
3	RMR 123	MR 154A*	FMR 184
4	RMR 124	RMR 155	FMR 185
5	RMR 125	RMR 156	FMR 186
6	RMR 126	MR 157A*	FMR 187
7	RMR 127	MR 158A*	FMR 188
8	RMR 128	MR 159A*	FMR 189
9	FMR 129	MR 160A*	FMR 190
10	RMR 130	MR 161A*	FMR 191
11	FMR 131	MR 162A*	FMR 192
12	RMR 132	MR 163A*	FMR 193
13	RMR 133	FMR 164*	FMR 194
14	MR 134A	FMR 165	FMR 195
15	MR 135A	FMR 166	FMR 196
16	RMR 136	FMR 167	FMR 197
17	RMR 137	FMR 168	FMR 198
18	RMR 138	MR 169A*	MR 199A
19	RMR 139	MR 170A*	FMR 200
20	MR 140A	MR 171A*	MR 201A
21	RMR 141	MR 172A*	MR 202A
22	RMR 142	MR 173A*	MR 203A
23	FMR 143	MR 174A*	MR 204A
24	RMR 144	RMR 175	MR 205A
25	FMR 145	RMR 176	FMR 206
26	RMR 146	RMR 177	FMR 207
27	RMR 147	RMR 178	FMR 208
28	BAD TAPE	RMR 179	FMR 209
29	FMR 149	FMR 180 INC BAD TAPES	FMR 210
30	FMR 150	RMR 181	MR 211A
31	RMR 151		MR 212A

* Also RMR

1970 ØGØ-6 ABSTRACT TAPES

Date	Jan. 1970	February	March	April
1	FMR 213	MR 247A	FMR 277	MR 309A
2	MR 214A	MR 248A	FMR 278	MR 310A
3	MR 215A	MR 249A	FMR 279	MR 311A
4	MR 216A	MR 250A	FMR 280	MR 312A
5	FMR 217	MR 251A	FMR 281	MR 313A
6	FMR 218	MR 252A	FMR 282	MR 314A
7	FMR 219	MR 253A	FMR 283	MR 315A
8	FMR 220	MR 254A	FMR 285	MR 316A
9	FMR 224(R)	FMR 255	FMR 286	FMR 317
10	FMR 225	FMR 256	FMR 287	FMR 318
11	FMR 226	FMR 257	FMR 288	FMR 319
12	FMR 227	FMR 258	FMR 289	FMR 320
13	FMR 228	FMR 259	FMR 290	FMR 321
14	FMR 229	FMR 260	FMR 291	FMR 322
15	FMR 230	FMR 261	FMR 292	FMR 323
16	FMR 231	FMR 262	FMR 293	FMR 324
17	FMR 232	FMR 263	FMR 294	FMR 325
18	FMR 233	FMR 264	FMR 295	FMR 326
19	FMR 234(R)	FMR 265	FMR 296	FMR 327
20	FMR 235	FMR 266	FMR 297	FMR 328
21	FMR 236	FMR 267	FMR 298	FMR 329
22	FMR 237	FMR 268	FMR 299	FMR 330
23	FMR 238	FMR 269	FMR 300	FMR 331
24	FMR 239	FMR 270	FMR 301	FMR 332
25	FMR 240	FMR 271	FMR 302	FMR 333
26	FMR 241	FMR 274	FMR 303	FMR 334
27	FMR 242	FMR 275	FMR 304	FMR 335
28	MR 243A	FMR 276	FMR 305	FMR 336
29	MR 244A		MR 306A	FMR 337
30	MR 245A		MR 307A	FMR 338
31	MR 246A		MR 308A	

1970 ØGØ-6 ABSTRACT TAPES

Date	May 1970	June	July	August
1	FMR 339	MR 370A	MR 400A	FMR 431
2	FMR 340	MR 371A	MR 401A	FMR 432
3	FMR 341	MR 372A	FMR 402	FMR 433(R)
4	FMR 342	MR 373A	MR 403A	FMR 434
5	FMR 343	MR 374A	FMR 404	FMR 435
6	FMR 344	MR 375A	MR 405A	FMR 436
7	FMR 345	MR 376A	FMR 406	FMR 437
8	FMR 346	MR 377A	FMR 407	FMR 438
9	FMR 347	FMR 378	MR 408A	FMR 439
10	FMR 348	MR 379A	FMR 409	FMR 440
11	FMR 349	MR 380A	FMR 410	FMR 441
12	FMR 350	FMR 381	FMR 411	FMR 442
13	FMR 351	MR 382A	FMR 412	FMR 443
14	FMR 352	FMR 383	FMR 413	FMR 444
15	FMR 353	MR 384A	FMR 414	NØ DATA
16	FMR 354	FMR 385	FMR 415	FMR 445
17	FMR 355	FMR 386	FMR 416	NØ DATA
18	FMR 356	MR 387A	FMR 417	FMR 448
19	FMR 357	FMR 388	FMR 418	NØ DATA
20	FMR 358	MR 389A	FMR 419	FMR 450
21	FMR 359	FMR 390	FMR 420	NØ DATA
22	FMR 360	MR 391A	FMR 421	FMR 452
23	FMR 361	MR 392A	FMR 422	NØ DATA
24	FMR 362	FMR 393	FMR 423	FMR 454
25	FMR 363	FMR 394	FMR 424	NØ DATA
26	FMR 364	MR 395A	FMR 425	FMR 456
27	FMR 365	FMR 396	FMR 426	NØ DATA
28	FMR 366	MR 397A	FMR 427	FMR 458
29	FMR 367	FMR 398	FMR 428	
30	FMR 368(R)	MR 399A	FMR 429	
31	FMR 369		FMR 430	

(R) indicates rerun

1970	Sept.	Oct.	Nov.	Dec. 1971	Jan.	Feb.	Mar.
1		FMR 462	-	1			
2		-	-	2			
3		FMR 463	-	3			FMR 504
4		-	FMR 472	4			
5		FMR 464		5			
6		-		6			
7		FMR 465		7			
8		-		8			
9		FMR 466		9			
10		-		10			FMR 505
11		FMR 467		11			
12		-		12			
13				13			
14		-		14			
15		FMR 469		15			
16		-		16			
17		-		17			FMR 509
18		-		18			
19		-		19			
20		-		20			
21		FMR 470		21			
22		-		22			
23		-		23			
24		-		24			
25		-		25			
26		-		26	FMR 500		
27	FMR 459	-		27	MR 501A		
28	FMR 460	FMR 471		28	MR 502A		
29	FMR 461	-		29			
30	FMR 462	-		30			
31		-		31			

XI. Appendix C

OGO-F MERGE PROGRAM -- VERSION 4

1. JCL:

```
//FABSTn   JOB    etc.
//      SET   PRT=25,PUN=300,IOC=200,TIME=7
//JOBLIB      DD     DSN=WJB.OGFABST,UNIT=SYSDA,DISP=SHR,
//                   VOL=SER=CITSCn
//      EXEC         PGM=MERGER4
//TAPEHD      DD     UNIT=TAPE7,LABEL=(1,BLP,,IN),DSN=ERA.FEX,
//                   DISP=OLD,VOL=SER=FEXnnn
//TAPEHO      DD     UNIT=TAPE7,LABEL=(1,BLP,,IN),DSN=ERA.FAO,
//                   DISP=OLD,VOL=SER=FAOnnn
//ATORB       DD     UNIT=TPE800,LABEL=(1,BLP),DSN=ERA.MR,
//                   DISP=(NEW,KEEP),VOL=SER=FMRnnn
//FT06F001    DD     SYSOUT=A
//SYSUDUMP    DD     SYSOUT=A
//FT07F001    DD     SYSOUT=B
//FT05F001    DD     *
      (one to five data cards, see below)
//    (end card)
```

2. DATA CARDS:

First card (required): FEXnnn or FXnnnn in cols. 1-6, any other information on rest of card;

Second card (optional): ISKF = # of files to skip at beginning of orbit tape: FORMAT(I5); default value is zero;

Third and fourth cards (optional, interchangeable): Cols. 1-60 are bad-file markers: if col. n is 1, file n will be skipped, otherwise col. n must be blank or zero; cols. 61-63 must contain either 'FEX' or 'FAO', depending on which tape the card refers to; cols. 64-80 may contain additional identification;

Fifth card: requests for listings: may be any combination of 'LISTEX','LISTAO','LISTAT' in cols. 1-6, 8-13, and 15-20. Commas or other separators in cols. 7 and 14 are optional. If the

appropriate keyword is not present, the corresponding listing will be suppressed.

All cards except the first are optional. However, if any card is omitted, all cards following it must be omitted. Blank cards may be inserted as needed to bypass this requirement.

In the listing request (fifth) card, requests will have the following results:

LISTEX: The day and time will be listed for each record on the experiment tape (approximately 4000-5000 lines per day of data).

LISTAO: The altitude, L-value, day and time will be listed for each half-record on the attitude/orbit tape (approx. 3000-4000 lines per day of data).

LISTAT: The day and time will be listed for each C- and D-record sent to the output buffer. In addition the command status and bit rate will be listed with each C-record (approx. 7000 lines per day of data).

If the listings are not requested, the program will still list all input records which are dropped, with the reason for dropping them.

A message will be printed for each input file that is opened, regardless of listing requests.

3. BAD TAPES

Input tapes with wrong record lengths can sometimes be processed by specifying DCB parameters on the DD card. These will be ignored, however, unless the corresponding DD name appears in the PARM field of the EXEC statement. Examples:

```
//STEPA     EXEC    PGM=MERGER4,PARM='TAPEHO'
   :
//TAPEHO    DD      DSN=&FAO,UNIT=TAPE7,LABEL=(1,BLP,,IN),
//                  DISP=OLD,VOL=SER=FAOnnn,
//                  DCB=(RECFM=U,BLKSIZE=1500,DEN=1,EROPT=SKP)
   :
//STEPB     EXEC    PGM=MERGER4,PARM='TAPEHD,TAPEHO'
   :
//TAPEHO    DD      as above
//TAPEHD    DD      DSN=&FEX,UNIT=TAPE7,LABEL=(1,BLP,,IN),
//                  DISP=OLD,VOL=SER=FEXnnn,
//                  DCB=(RECFM=U,BLKSIZE=3132,DEN=1,EROPT=ACC)
   :
```

The following considerations apply when modifying the DCB:

1. DCB parameters are ignored unless the DD name appears in the PARM field of the EXEC statement. These may appear in any order.

2. If the DD name does appear, DCB information must be supplied. The RECFM, BLKSIZE, and DEN subparameters must appear, other parameters may appear.

3. If the corresponding DD name(s) does not appear in the PARM field the defaults are:

   ATORB: RECFM=U,BLKSIZE=10000,DEN=2
   TAPEHD: RECFM=F,BLKSIZE=3132,DEN=1,EROPT=ACC
   TAPEHO: RECFM=F,BLKSIZE=1500,DEN=1,EROPT=SKP

XIII References

1. E. F. Szajna and G. R. Stonesifer, OGO-F Data Processing Plan, X-565-69-157, GSFC, March 1969.

2. W. E. Althouse, E. C. Stone, R. E. Vogt, and T. H. Harrington, A Solar and Galactic Cosmic Ray Experiment, IEEE Trans. Nuc. Sci., 15, 229 (1967).

3. S. Murray, OGO-F-20 Data Format, SRL Internal Report Number 19, June, 1970.

XII. List of Figures

Character	Representation
1 - 5 + Space	Satellite universal ID
7 - 8 + Space	Year
10 - 12 + Space	Station number
14 - 15 + Space	Analog file number
17 - 20 + Space	Analog tape number
22 + Space	Time correction (1 = Yes, 0 = No)
24 - 28 + Space	Orbit number
30 - 32 + Space	Date of digitization (day of year) ← 34-39 Decom Run Number:
46 - 66	Blank
67 + Space	Data Type 0 = 8 kb real time 1 = 16 kb real time 2 = 64 kb real time 3 = command storage playback
69 - 71 + Space	Day of year } Start time of data
73 - 77 + Space	Seconds of day }
79 + Space	Flex format in use (1 = Yes, 0 = No)
81 - 82	Flex format number
83 - 88	Experimenter ON/OFF status (1 = Off, 0 = On)
89 + Space	Equipment group
91 - 94 + Space	Master binary tape number
96 - 97 + Space	Master binary file number
99 - 100 + Space	A/D line operator ID
102 - 103	A/D line ID
104 - 106 + Space	Day of year } Stop time of data
108 - 112 + Space	Seconds of day }
114 - 115	Decom reel sequence number
116 - 118	~~Decom run number~~ blank
119 - 120	Experiment number
121 - 124	Group number of time fit
125 - 126	Line number of time fit
127 - 132	First line time used in time fit
133 - 138	Last line time used in time fit
139 - 144	C_0, coefficient of time fit, floating point (7094 format)*
145 - 150	C_1, coefficient of time fit, floating point (7094 format)
151 - 156	C_2, coefficient of time fit, floating point (7094 format)
157 - 162	C_3, coefficient of time fit, floating point (7094 format)
163 - 168	C_4, coefficient of time fit, floating point (7094 format)
169 - 174	C_5, coefficient of time fit, floating point (7094 format)
175 - 228	Coefficients of 2nd time fit when used (same format as 54 previous characters)
229 - 282	Coefficients of 3rd time fit when used (same format as 54 previous characters)
283 - 336	Coefficients of 4th time fit when used (same format as 54 previous characters)
337 - 390	Coefficients of 5th time fit when used (same format as 54 previous characters)

*Corrected time = $C_0 + C_1X + C_2X^2 + C_3X^3 + C_4X^4 + C_5X^5$

where X = spacecraft clock

The file label will have a density of 556 bpi and odd parity. Label will be BCD except as noted.

Figure 1. Format of an Experimenter Tape File Label

OGO-F DATA FORMAT FOR EXPERIMENT 20

Revision B (4-3-69)

Character	Destination	Representation	
1 + 2 + 24N	—	D (65, n)	Spacecraft ID Word
3 + 4 + 24N	A	D (107, n)	SAI
5 + 8 + 24N	A	D (129, n)	F1 Status Field
	A	D (131, n)	F3 Status Field
9 + 24 + 24N	B	D (9, n)	Experiment Main Commutator Data
	B	D (10, n)	
	B	D (11, n)	HTC2
	B	D (12, n)	HTC3
	A	D (39, n)	Analog D8 Rate
	A	D (87, n)	Analog D4' Rate
	A	D (113, n)	
	A	D (114, n)	
3073 + 3078	C	D (97, 72)	CMD STATUS, $\bar{x}\bar{y}$
	C	D (97, 87)	ΔE-R TEMP.
	C	D (97, 106)	ΔE-$\bar{C}$ TEMP.
3079 + 3088	C	D (97, 86)	Other Experiment Subcommutator Words
	C	D (97, 34)	
	C	D (97, 98)	
	C	D (97, 36)	
	C	D (97, 117)	
3089 + 3094	C	D (97, 9)	R_{II} Status
	C	D (97, 83)	R and RR Status R_I
	C	D (97, 84)	R and RR Mode
3095 + 3098	C	D (99, 36)	-Z Door Temperature (top third)
	C	D (99, 3)	-X Door Temperature (aft third)
3099 + 3100	C	D (98, 21)	Load Bus Voltage
3101 + 3106	C	D (98, 36)	WB-A Foward Power
	C	D (98, 88)	WB-B Foward Power
	C	D (98, 68)	SP Foward Power
3107 + 3120	C	D (98, 82)	Calibration 1-1
	C	D (99, 81)	Calibration 2-1
	C	D (98, 83)	Calibration 1-2
	C	D (99, 82)	Calibration 2-2
	C	D (98, 84)	Calibration 1-3
	C	D (99, 83)	Calibration 2-3
	C	D (98, 85)	Calibration 1-4

Figure 2.1

Character		Representation	
3121 → 3122	C	D (132, 1)	Day of Year
3123 → 3128	C C C	D (133, 1) D (134, 1) D (135, 1)	Time of Day In Milliseconds
3129 → 3132		SPARES	

$0 \leq N \leq 127$

$n = N + 1$

Packing:
9 bits into 12
6+3 with 3 high order bits zero.
eg
111 111 111 → 000111, 111 111

B_1	B_2	B_3	B_4	B_5	B_6	B_7	B_8	B_9	9-bit spacecraft word

↓

0	0	0	B_1	B_2	B_3	Character j
B_4	B_5	B_6	B_7	B_8	B_9	Character j+1

Figure 2.2

NORMAL BIT ORDER ↓

MC 129

	Bit**	State	Representation for F1, Quality Control Status
7-12	1-6		Total bit errors in the 27 bit frame sync word
6	7	1	This frame is fill data
5	8	1	This frame is the beginning of a subcomm sequence
1-4	9-12		Number of bits shifted to find frame sync word. This is expressed as sign and magnitude, bit 9 is the sign (1 = - for left shift) and bits 10-12 are the number of shifts performed to find the frame synch word.

**Bit 1 of the field is the least significant bit

Quality Status Field F1

MC 131

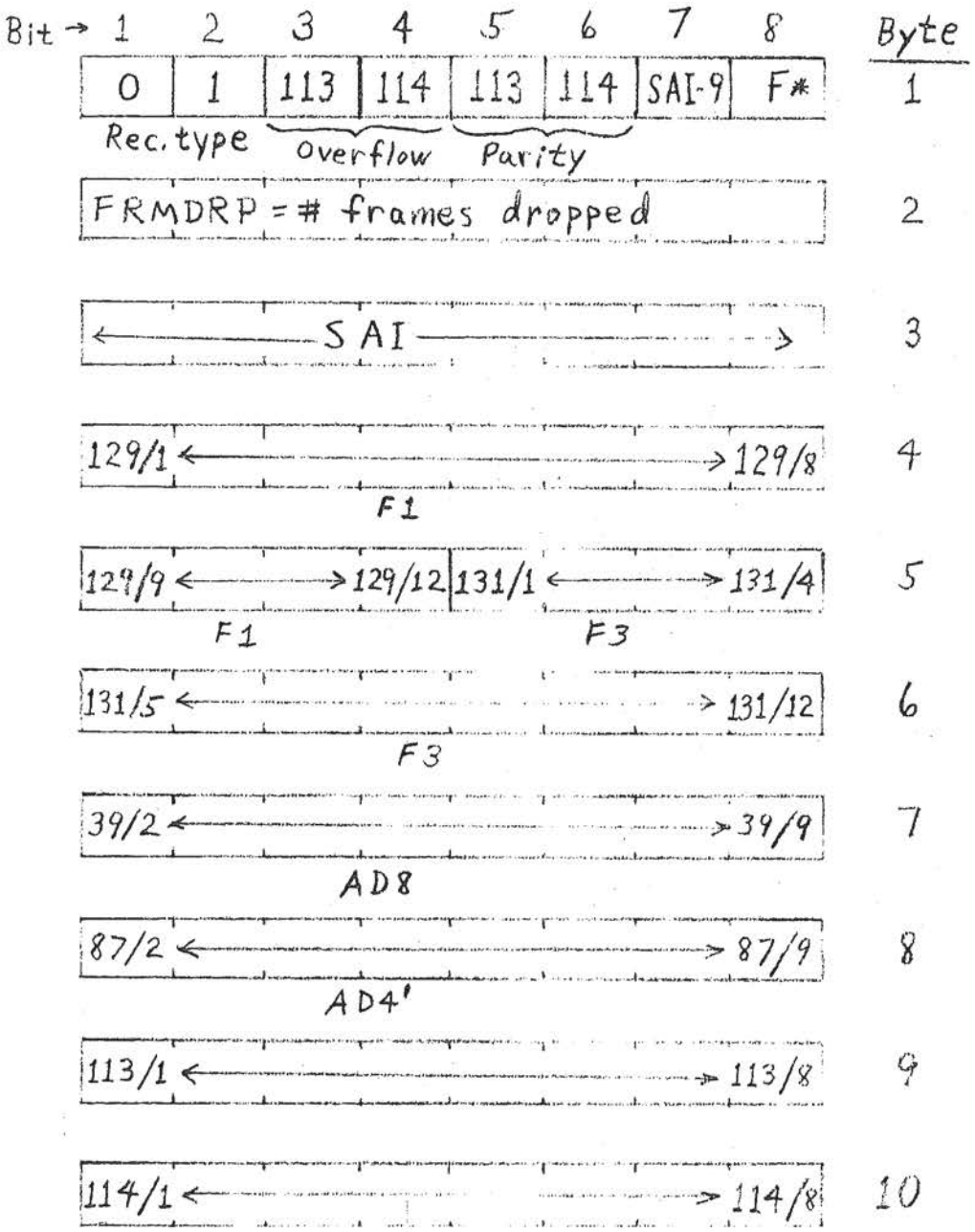
	Bit**	State	Representation for F3, Data Status
6-12	1-7		Subcomm count; 0 - 127
5	8	1	Lock mode; in frame sync
	8	0	Flywheel mode; still in lock but bit errors in frame sync exceed tolerance
4	9	1	In subcomm sync
	9	0	Not in subcomm sync
3	10	0	BCD decoded time agrees with the accumulating register
	10	1	BCD decoded time disagrees with the accumulating register
1-2	11-12		Presently not used

**Bit 1 of the field is the least significant bit

Quality Status Field F3

Figure 3

A-record format



F* : 1 ⇒ next frame fill – O/F flags unreliable
0 ⇒ O/F flags OK

Figure 4

B-record format

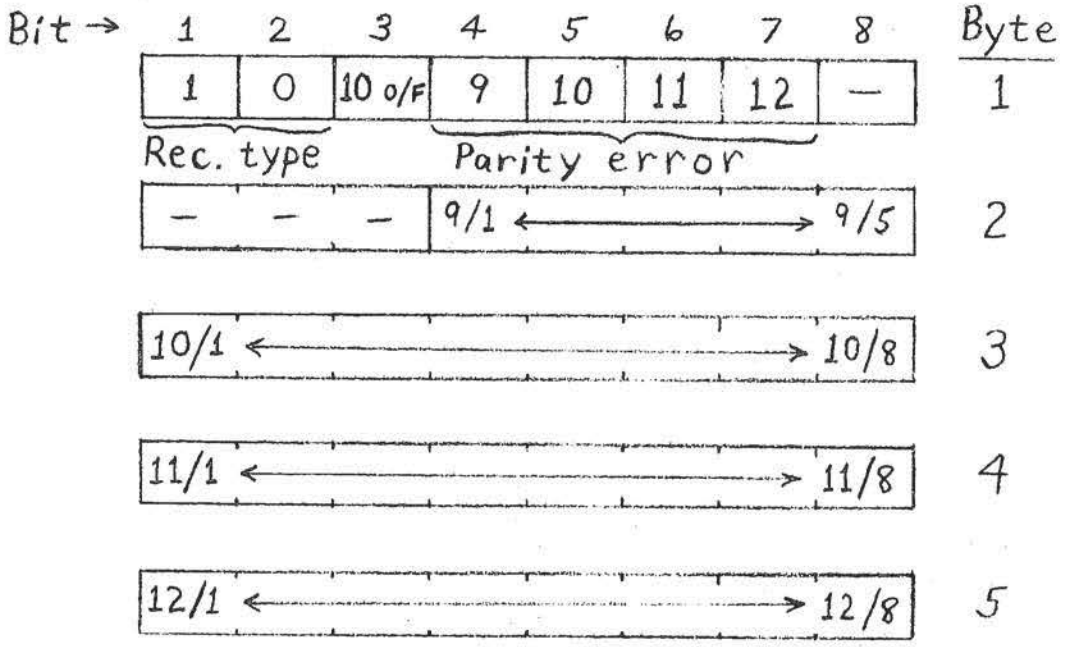
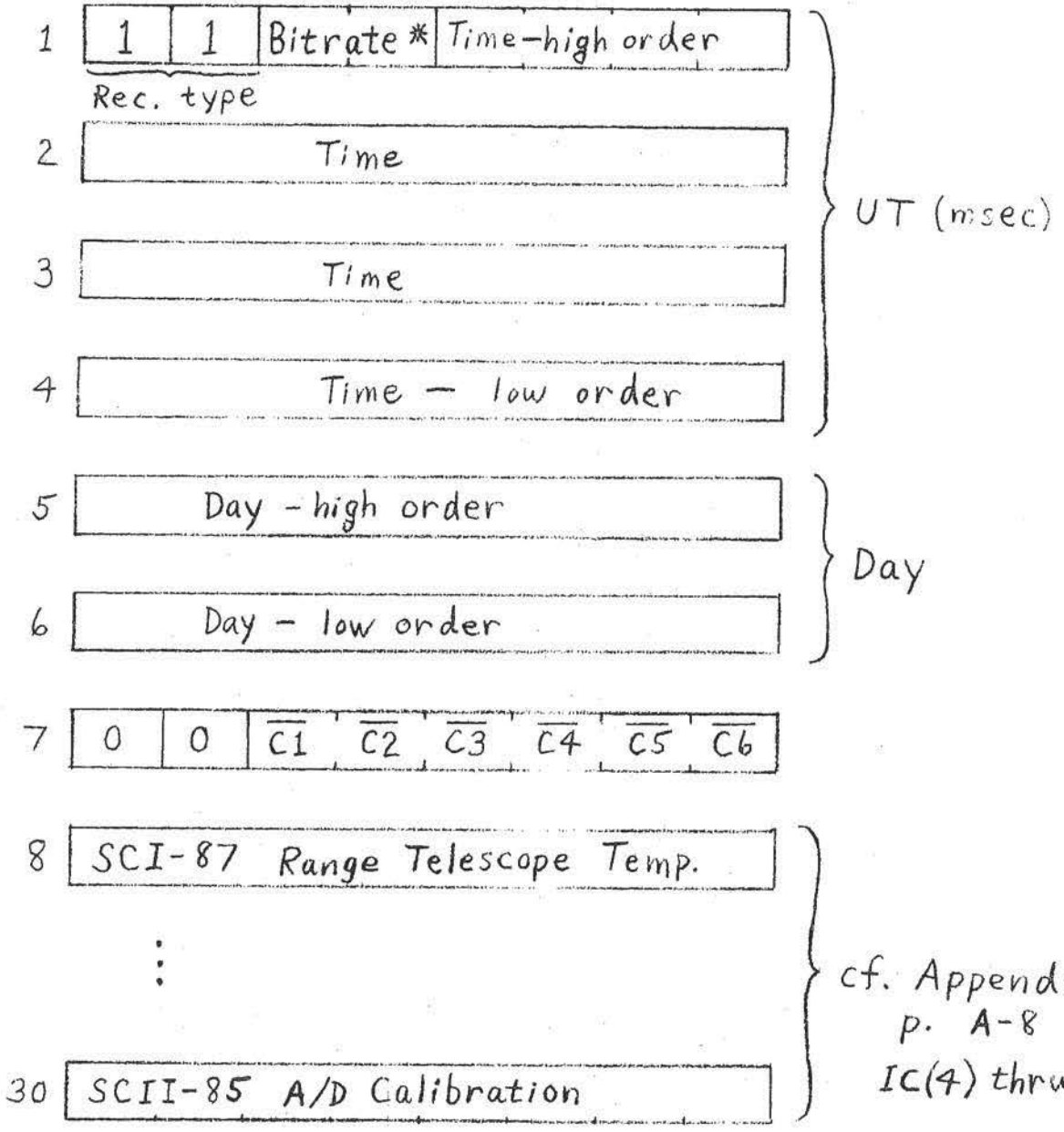


Figure 5

C-record format



* Bitrate : 00 ⇒ 8 kbps realtime
01 ⇒ 16 kbps realtime
10 ⇒ 64 kbps realtime
11 ⇒ 8 kbps playback

Figure 6

D-record format

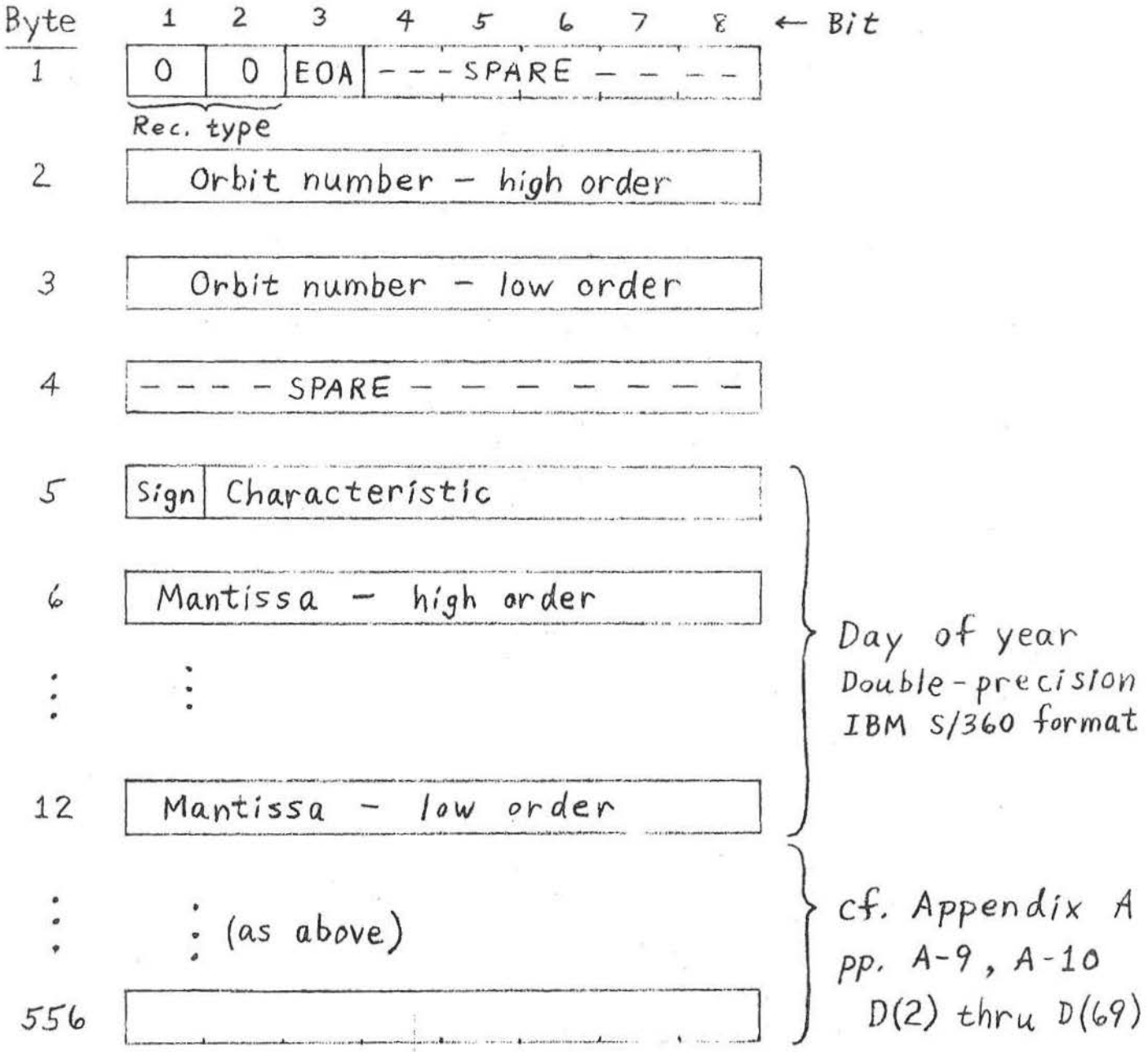


Figure 7

FIGURE 8. Punched output format - abstraction program

Card columns	Contents
1-5	Orbit number (I5)
6-8	blank
9	flag: 0 or 1 (see below)
10-19	Start time (F10.3)* (seconds)
20-29	End time (F10.3)** (seconds)
30-32	Day#(start) (I3)
33-35	Month (I3)
37-38	Day (I2)
40-41	Year (I2)
42-45	' RV.'
46-50	Orbit number (I5)
51-64	blank
65-70	FEX tape ID (A6)

** End time of current orbit if flag = 0
End time of current acquisition if flag = 1

* Start time of current orbit if flag and End time are the same as the previous card; otherwise, start time of current acquisition.