TECHNICAL MEMORANDUM

(TM Series)

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"Indian Ocean Station" Buffer (IOSB)

Milestone 4

by

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INTRODUCTION

This document describes the IOSB system.

The description of the telemetry processing is not complete, in that only the FM/FM procedures are present. The Telemetry Module to be used in the IOSB is to be described in the 823-Bird Buffer, Milestone 4 (TM-834/000/04).

This document was produced primarily by editing TM-834/000/01A, the Bird Buffer Milestone 4.

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1.0 SYSTEM DESCRIPTION

The IOS Buffer System is a CDC 160A computer system which provides a vehicle-oriented link between a remote tracking station, a 1604 computer and the Data Analysis/Technical Advisor, Data Presentation, and Multi-Ops complexes. The program system will process prepass and telemetry data for one vehicle and site each time it is operated. The IOSB is a modification of the existing Bird Buffer System. Although the system is primarily intended to support IOS, it can support other stations with teletype equipment.

There are two phases of operation: TELEMETRY, and PREPASS.

1.1 TELEMETRY PHASE

In the telemetry phase, the IOS Buffer is operated in order to process telemetry data sent to the STC from a RTS.

1.2 PREPASS PHASE

The prepass phase is used for the transfer of prepass data from the 1604 or input from the card reader, the production and verification of the prepass paper tape, and the updating of the prepass magnetic tape. Prepass information which is stored on the tape includes both pass-specific and non-pass specific data.

Non-pass-specific information includes:

1. Preflight Telemetry mode definition data.
2. Text messages.
3. Schedule data.
4. Command data.

Pass-specific information includes:

1. Antenna pointing data.
2. Telemetry mode selection and temporary mode modification data.
3. Command data.
4. Tracking selection data.
5. Text.

2.0 COMPONENT DESCRIPTION AND MESSAGE FORMATS

2.1 COMPONENT DESCRIPTION

2.1.1 Internal Operation of the IOS Buffer

2.1.1.1 Definition of Function. The 160A IOS Buffer Operational Program System consists of task-oriented program modules performing uniquely defined functions. The operations performed are directly dependent upon the operating phase as defined in Section 1.0, SYSTEM DESCRIPTION. The major IOS Buffer requirements are: channeling of station oriented telemetry input for data analysis and presentation at the STC; accepting and verifying vehicle commands originating at the STC, and distribution of prepass, scheduling, and textual information for use by a RTS. Tracking data from the station is processed directly by the 1604. Command operational status reports and other reports are handled by manual teletype. Modified Bird Buffer modules are suffixed with an X. The modules designed to satisfy the IOSB requirements are:

1. The Executive Control Module (SXCONX).
2. The Input Processing Module (SPROCX).
3. The Prepass Module (SPREPX).
4. The Telemetry Module (STEPP).
5. The Bird Buffer/1604 Communication Module (SIBBTC).
6. The Punch Prepass Module (SPUN).
7. The Verify Paper Tape Module (SPIN).

The Executive Control Module determines the operating sequence of the programs by permitting or suppressing module operation and designating the permutation of operations as a function of the current phase. The primary system operating sequence associated with the two operating phases are outlined below.

2.1.1.2 Prepass. The Executive Control Module contains a cyclic portion which interrogates the card reader, thus providing the capability for manual entry of job processing requests. The types of job requests acceptable during this phase may result in the following types of data transfers:

1. Accepting new data from the 1604 or the card reader for storage on the Bird Buffer prepass tape.
2. Accepting initial parameters for use internal to the Bird Buffer in anticipation of an upcoming pass.

3. Punching the prepass paper tape.

4. Verifying the prepass paper tape.

The system operation in this phase entails the recognition and read-in of a job request by the Executive Control Module and the interpretation of the job request by the Input Processing Module. The Input Processing Module determines the type of function which must be performed and sets communicative internal flags for use by the Executive Control module and/or other modules. Subsequent modules are then operated to complete the job processing cycle. If, for example, the data transfer from the 1604 described in (1) above should be requested, the Prepass Module in conjunction with the Bird Buffer 1604 Communication Module would be operated. After a requested job is completed, subsequent job requests are recognized and processed. The specific job request card formats are given in Section 2.2.4.

2.1.1.3 Telemetry Phase. This phase is actuated by a **10 request (read telemetry paper tape). The telemetry module is operated until all telemetry has been processed or this phase is overridden by a request for another operation.

2.1.2 Commanding in the Augmented System with the IOS Buffer. The commanding of vehicles will be done by direction from the STC. Commands and schedules for implementing the commands will be sent to the remote stations by the IOS Buffer computer. The operational status of the commands as they are being implemented will be sent to the STA via manual TTY. The STC will also be able to send operational directions to the remote station concerning the implementation of the commands. To transfer command control information, a voice line from the STA to the station will be available.

2.1.2.1 Commands. Commands themselves usually will be generated in non-real time in message format by the 1604 programs. In non-real time they will be transferred to the IOS Buffer as part of the prepass package and kept on a Prepass tape until they are transmitted to the remote stations. The command data needs its own special and unique control information. The Command Data Message format, as given in Section 2.2.1, has been designed to conform to all known conventions and to provide the ability to carry all types of commands. Every known commanding system was considered in the design of the formats. Certain commands may not be pass-specific, that is, they may be used on every pass over a station or they may need to be available on any pass. In this case, they will be vehicle-specific and will be sent once to a station and not included in the prepass messages for each pass.

Certain other commands will be defined as being vehicle/revolution specific. These commands will be sent to a station as part of the prepass data for a specific pass. They may be retained or deleted at the station after or during the pass at the discretion of the STC.

After the remote site has received all the commands and has successfully stored them on magnetic tape, it will send a message to that effect to the STC via Manual TTY. Included in the prepass package will be a text message generated by the 1604 which will be a schedule of command operations. The schedule will be pass-specific and will include nominal times to transmit commands, as well as command-specific instructions for the console operations.

During a pass, as the commands are sent to the bird by the station console operators, the status of each command may be sent to the STC. Only the final status of a command is sent to the STC; the intermediate status being of no use in reaching a command control decision. To illustrate: If a command that carries a reject level of five has been sent and rejected four times, these rejections will not be reported. If, on a fifth try, the command is rejected, the station will report that the reject level on this command has been reached. If the reason for the rejection is one that may be known by the T&C computer, the reason will also be reported. If the fifth try was successful, only the fact that the last transmission was good will be reported. Reporting final status implies that the console operators and the tracking station computer have reached the limit of their ability to act and that further direction must come from the STC. If the controllers at the STC recognize a need for direction from the operational status of the commands, they must send such direction by phone or manual TTY.

The operational status messages are transmitted from IOS by manual TTY.

2.1.2.2 Command Transmission Verification Scheme. All commands that are to be part of prepass are to be formatted by the 1604 computer and sent to the IOS Buffer. The IOS Buffer will send the commands back to the 1604 where they will be compared to the original commands. If this transmission is successful, the IOS Buffer Prepass Module will put the commands on magnetic tape. The commands will then be read off the tape and the write area compared against the read area to insure that the commands on the tape are correct. The Command Data Messages will be stored on magnetic tape until they are punched on the prepass paper tape. The messages are converted to a five-level format and a parity bit is added to every four data bits. The command messages are punched on the paper tape twice.

When the paper tape verifier (SPIN) reads a command message from the paper tape, it will also read the duplicate message and compare the two bit by bit. Upon receipt and verification of the message by the RTS (Remote Tracking Station), an acknowledgement will be made via manual TTY.

2.1.3 Telemetry Processing. In the augmented system, all telemetry transmitted to the STC from a RTS via the 100 WPM line will be processed by the IOS Buffer as soon as it is received. It will then be displayed on 166 printers. To accomplish this, the remote station and the IOS Buffer together require information about the format of the data as it comes from the satellite, the manner in which the data is to be compressed and formatted in order to transmit the information over the 100 WPM line, and the way in which the data are to be prepared for display at the STC.

This information will vary from flight to flight and pass to pass depending on the phase of the vehicle flight, limitations of the system, and the operational requirements at the time.

In order to achieve the necessary flexibility and meet the real time demands for reporting TLM data, the Telemetry processing and display functions at the STC are divided into three areas:

1. Preflight mode and printer format specifications.

2. Prepass mode selection and modifications.

3. Telemetry reporting and display.

2.1.3.1 Preflight Mode and Printer Format Specifications. Prior to the launch of the vehicle, it will be necessary to select from Launch Test Directions, Orbital Requirement Documents and Program Test Operational Orders, those telemetry links, channels, and commutator points whose outputs are to be processed in real time. In the case of FM/FM telemetry data, it will be necessary to generate a telemetry mode definition on a pass-independent basis. An FM/FM telemetry mode will define (for a given vehicle) a unique combination of:

1. Ground station equipment and program patchboard wiring.

2. Scanner and digitizer patchboard wiring.

3. Algorithms applied to each telemetry item.

4. Processing priority.

5. Format for reporting telemetry items on the 100 WPM line.

6. Conversion routines and printer output format for the selected TLM items.

For a given flight, it is expected that several modes will be defined to meet the operational requirements within the system limitations.

The 1604 program SPRETEL will assist in the definition of the TLM modes and will generate from punched card input a tape which will contain the following information for each mode;

1. Preflight TLM messages (#27) for each station.

2. Scanner and digitizer wiring instructions. Text messages.

3. Conversion and print tables for the IOS Buffer's telemetry processing module.

This library tape of mode-specific, site-related information will be hand-carried to the IOS Buffer tape transport, and a control card input will cause the IOS Buffer to merge this data on the prepass tape. Upon request, the IOS Buffer will punch out a prepass paper tape for the RTS. The station personnel will then have the necessary information to prepare the program patchboard wiring instructions and to wire the S&D patchboards required to suuport the flight.

The TLM computer will have a set of modes with all the necessary information for processing the TLM data. The IOS Buffer will have the necessary data for conversion and display for each TLM mode of the vehicle.

2.1.3.2 Prepass Mode Selection and Modification. With the above sets of TLM mode information available to the tracking station TLM computer, operating personnel, and IOS Buffer computer, it is only necessary to notify the system components of the particular mode which is to operate for a given pass. A card input to the IOS Buffer or the 1604 will specify the mode for the pass and will generate the mode selection message for the remote station. Upon receipt of a TLM Message from the reporting TLM computer at the RTS, the Prepass Module will read into core the appropriate mode-specific information for the Telemetry Module. The current TLM mode of operation will appear in the print-out heading.

Minor modifications to the selected mode of operation may also be incorporated into the mode selection. These modifications are limited to activation or deactivation of the processing of specified TLM items within the defined mode and changes to the algorithm parameters. The algorithm used to process a point within the mode may not be changed. All such modifications to the mode are temporary changes, effective only for the specified pass.

2.1.3.3 Telemetry Reporting and Display. The Telemetry reporting and display operations are described in the 823 Bird Buffer Milestone 4, TM-834/000/04.

2.1.4 Use of the 605 Magnetic Tapes. The operating IOS Buffer System will have full use of a 605 unit with four magnetic tapes. The tapes will be used in the following manner:

2.1.4.1 IOS Buffer System Master Tape. This binary tape contains the system programs, system tables, and parameters. They are arranged as follows:

File 1:	Record 1, Load for Bank 0 Record 2, Load for Bank 1 Record 3, Load for Bank 2 Record 4, Load for Bank 3 End of File

2.1.4.2 Prepass Tape. The prepass tape will contain the prepass and scheduling data that is to be sent to the remote stations. Prepass data for any particular pass will be retained until after that pass has taken place; scheduling data will be retained until it is sent to the site. The tape format is as follows:

File 1:	Record 1, tape, file, and vehicle identification. End of file.
File 2 to n:	One file for each of the selectable telemetry reporting modes. Record 1, file mode and site identification. Records 2 to m, these records contain the tables necessary for processing in this mode. End of file.
File n+1 to r:	Each of these files contains scheduling messages for a particular site. Record 1, file and site identification. Record 2 to m, each record contains one complete scheduling message. End of file.
File r+1 to p:	Each of these files contains the Telemetry Mode information tables to be sent to a site selecting a particular mode. Files are ordered by mode number. Record 1, file, mode, and site identification. Record 2 to m, each record contains one message. End of file.
File q+1:	End of file. End of file (double EOF means end of tape).

File p+1 to g: Each of these files contains the prepass data for one site for one pass.
Record 1, file, identification, site identification, and revolution number.
Record 2 to m, each record contains one message as received from card or the 1604. The message will include pointing data, tracking data selection, text, Telemetry Mode selection data, and command messages.
End of file.

2.1.4.4 Spare Tapes. The spare tapes will be used by the Prepass Module as a merge tape, and by SPUN as an optional punch tape.

2.2 MESSAGE FORMATS

2.2.1 IOSB and RTS Message Formats. This section lists and describes in detail the structure of the messages that will pass between the station and the STA over the 100 WPM lines. The messages are illustrated with octal representations of the 12-bit, 160A words. Additionally, the paper tape representations are shown in Appendices B and C. All symbols will be defined the first time they are used.

2.2.1.1 Conventions

1. The first word of every message will be a header consisting of 4 sevens (7777).

2. The last word of every message will be the arithmetic complement checksum for that message.

3. The second word of every message will have, in the upper six-bit positions, a numerical remote station code, and in the lower six-bit position, the numerical message type. The third word of most messages contains message type in upper six bits and the number of words in the message minus one in the lower six bits.

4. The maximum length of any message will be 64 words.

5. Bit 11 of data words is always zero unless explicitly stated otherwise.

2.2.1.2 Text Message

Word 1 7777

2 SS11

Word 3 PPJJ P's designate on which printer(s) the message is to be printed.

Bit 11 = 0
Bit 10 = 1, Message for Tracking/Commanding Computer
Bit 9 = 1, Telemetry Computer
Bit 8 = 1, Bird Buffer Printer
Bit 7 = 1, Data Presentation Printer
Bit 6 = 1, Data Analysis Printer

J's = number of lines to skip.

Bit 5 = 1, Page eject before printing
Bit 4 = 1, Page eject after printing
Bits 3-0 = Number of lines to skip before printing in binary; right justified

Word 4 Words 4-63 contain 120 printer characters. The message is always 64 words long. Printer blanks must be supplied in place of unused characters.

⋮

64 CKSM

Text messages will contain administrative or operational data which are directed to personnel and not used by computers.

2.2.1.3 Tracking Station to IOS Buffer Data Messages

2.2.1.3.1 Real Time Near Message

Word 1	7777	
2	SS10	
3	1010	
4	VV	V's = Vehicle number in four-bit BCD.
5	VVVV	
6	RRRR	R's = Revolution number in four-bit BCD, in tenths revolution.
7	RRRR	

Word 8	0000	
9	CKSM	

This message will precede the telemetry messages on the telemetry paper tape.

2.2.1.3.2 <u>Telemetry Report</u>

Word 1	7777	
2	SS13	
3	MMMM	
4	X TT	T's = System time in binary. X is Bit 11 and is set to 1 if message contains only events.
5	TTTT	Six most significant bits right-justified in Word 4; 11 least significant bits right-justified in Word 5.
6-Q	Fixed Format Telemetry	Number of words in block and contents of block are mode-specific. If system time is the same as system time in the last message received or if no fixed format telemetry is specified, the fixed format block will not appear and Q + 1 = 6.
		Words Q + 1 through N repeat telemetry events.
Q+1	Time	Word Q+1 if Bit 10 = 0 and Bit 11 = 1; Bits 9-0 = ten least significant bits of associated system time.
Q+2	Ident	Word Q+2 = Telemetry identification, if Bits 11-9 = 0.
Q+3	Value	Words Q+3 through Q+X are telemetry values, the number of values is dependent on the algorithm used.
		Words Q+1 through Q+X are repeated for the next event if the time associated with that event is different.

Words Q = 2 through Q + X are repeated for the next event if the time is the same.

N + 1 CKSM

Data values for noise and no data in "fixed format" telemetry are as follows:

For 8-bit values: 001_8 = Legal zero or one
000_8 = No processing or no sync
377_8 = Noise

For 4-bit values: 12_8 = BCD zero, legal zero
00 = No data or no sync
17_8 = Noise

For "event type reports, a legal zero is reported as 12_8, a BCD zero.

2.2.1.3.3 Tracking Formats. The tracking and vehicle time messages reported are not seen by the IOSB, but are processed directly by the 1604.

The formats of the paper tapes are given in Appendix B.

2.2.1.4 Command Messages.

1. Common Heading Data:

Word 1	7777	
2	SS16	
3	16NN	
4	VV	
5	VVVV	
6	RRRR	0000 represents vehicle-specific information. Tenths of a revolution only, represents launch information.
7	RRRR	
8	TT	Not used for STC to Site messages. 8 and 9 are binary zeros if STC to Site.
9	TTTT	

Word 10 CCCC Control and Status:

Bit 0 = 1, Command Data
1 = 1, Real Time Command Operational Report
2 = 1, Real Time Command Corrective Action Message
3 = 1, Real Time Command Text Message
4 = 1, Last Message Unit of Real Time Command Text Messages
5 - 11 Unassigned

11 to (N+1) The content of Words 11 through the last word (N+1) depends on the type of message.

2. Command Data Messages (Transmittable Data):

The smallest unit of the command data message is the command data unit which will contain all the information required to describe a single command or command step. (Command step is one of the sequential commands of a block.)

Word 11 XXXX Command Number. With command blocks, the block number will be repeated with each command step.

Command Numbering Conventions:

In order to facilitate the handling of commands and blocks of commands within the computers, a command numbering convention exists which assigns a unique range of numbers to the different types of commands. This convention identifies the types of commands but allows the numbering to correspond to switch settings at the command consoles. Conventions are as follows:

a. $1_{10} \leq X \leq 99_{10}$ Digital Manual at SOC. Digital Manual refers to a single digital command which is called up by a switch setting at the SOC. The switch setting corresponds to the command number.

b. $X = 100_{10}$ Complete Digital Manual. Table used in operational reports to designate transfer errors and other stati concerning the whole digital manual table.

c.	$101_{10} \leq X \leq 199_{10}$	Digital Manual Remote. Same as in a., but from the Remote Console. Switch setting would be $1 \leq X \leq 99$.
d.	$X = 200_{10}$	Complete Digital Manual Remote Table. Same usage as b.
e.	$201_{10} \leq X \leq 215_{10}$	Analog Command. This range is assigned to the analog commands which may be sent from the SOC. There are 15 possible commands.
f.	$301_{10} \leq X \leq 315_{10}$	Analog Auto Remote.
g.	$-199_{10} \leq X \leq -101_{10}$	Remote Auto Block. This range is assigned to the command blocks that may be sent from the Remote Console. A command block is defined as a set of one or more commands which are to be sent to a vehicle automatically in response to one setting at the console.
h.	$-99_{10} \leq X \leq -1_{10}$	SOC Auto Block. Same as g but for SOC.

MMMM Word Message Count. This will be included in the first data unit of each message. The count will be incremented by one for each message of a function, and the last message of a function will have the count word in negative form. Count will be reset for each new function. Examples of functions (defined as operational divisions of command data) are these:

(1) Remote Block Commands.
(2) SOC Block Commands.
(3) SOC Vehicle-Specific Commands.
(4) SOC Pass-Specific Commands.
(5) Remote Vehicle-Specific Commands.
(6) Remote Pass-Specific Commands.

Different vehicles and different passes have their own set of functions.

HHHH Word Bit Assignments.

Bit 11 = 1: This indicates that this is an HHHH control word as opposed to a DDDD word. It also contains special handling indicators. This flag and the special handling indicators will be included in a data unit only when a command has different requirements from the preceding command. An HHHH word will always be included in the first data unit of a new function.

Bit 1 = 1: Set for digital commands only. Indicates that a BBBB word follows.

Bit 0 = 1: Set for analog commands only. Indicates that a word will be included in this data unit.

Bit 3 = 1: Set for analog commands only. Indicates that this command must be verified before next command is sent.

Bit 4 = 1: Inhibit command.

BBBB Word Will not be included for analog commands. For digital command, it gives the bit count in the command in the data unit. Will be included only if the bit count of this command is different from that in the preceding data unit. The BBBB word will always be included in the first data unit of a new function.

DDDD Word(s) For analog commands, will contain the command number in three 4-bit BCD characters.

For digital commands, will contain the bits of the command itself. One to five DDDD words may be present, each containing up to eleven bits, left justified to Bit 10. Order of transmission is left to right, top to bottom.

ΔΔΔΔ Word Will be included only for analog commands and then only if Bit 0 = 1 in HHHH word. Contents shall specify the duration in seconds that the computer should wait before transmitting next command step of an analog block.

ZZZZ	Word	Last word of all data units. It is the data unit checksum in 12-bit and-around-carry format. The last data unit of each message is followed by a message checksum that is generated on the entire message.
	CKSM	

A data unit must have an XXXX, DDDD, and ZZZZ word; the others are optional. Additional data units may appear in the message; however, the length of the command message must be less than, or equal to, 64 words. When the optional words are left out of the message, the word number assignments must be adjusted accordingly.

3. "Real Time" Corrective Action Message:

Sent from STC to Site.

Word 11	XXXX	Command number. (See Word 11 of Command Data Message.)
12	PPPP	Report number replied to.
13	HHHH	Direction indicators: Bit 11 = 1, Retransmit the command or command step 10 = 1, Advance to next command step 9 = 1, Bypass command - clear commanding system 8 = 1, Restart the command block 7 = 1, Change the reject level 6 = 1, Change the repetition level 5 = 1, Transmit new command or command block 4 = 1, Analog manual long 3 = 1, Delete command 2-0, Unassigned
Words 14-18	YYYY	A maximum of five of these words could be included in the message. If all five were used, the assignments would be:
14		a. Number of times to advance (Bit 10 of HHHH = 1).

Word 15 b. Number reject level should be set to (Bit 7 of HHHH = 1).

16 c. Number repetition level should be set to (Bit 6 of HHHH = 1).

17 d. Command number (Bit 5 of HHHH = 1).

18 e. Command number of unit to be deleted (Bit 3 of HHHH = 1).

The relative order will be retained if all conditions did not occur at the time of the message.

Word 19 CKSM

The word number assignment logic for Words 14-18 is nearly the same as for Words 16-20 of 2.2.1.4.3.

2.2.1.5 Bird Buffer to Tracking Station Messages.

2.2.1.5.1 Prepass Message Coming.

Word 1	7777
2	SS22
3	2303
4	CKSM

This message will be sent to site preceding the prepass data for a pass. It will preceed the different types of prepass data for the same pass.

2.2.1.5.2 Prepass Transmission Finished.

Word 1	7777
2	SS23
3	2303
4	CKSM

This message is sent from the STC to site at the end of every different type of message.

2.2.1.5.3 <u>Tracking Data Selection</u>.

Word 1	7777	
2	SS24	
3	2407	
4	VV	
5	VVVV	
6	UU	U's = Seconds between Track Reports from Site as binary power of 2. (2^{uu} = time in seconds between reports. uu $\leq$ 11.)
7	ZZWW	Z's = Antenna Identification Number of first antenna. W's = Antenna Identification Number of first antenna.
8	CKSM	If ZZWW = 0000, no tracking data required for pass. If ZZWW = ZZ00, only one antenna will report.

This message should be sent any time STC wants a change in tracking reporting rate or in the antenna selection.

2.2.1.5.4 <u>Antenna Pointing Prepass Message</u>.

Word 1	7777
2	SS25
3	25NN
4	UUVV
5	VVVV
6	RRRR
7	RRRR

Word 8	DDDD	D's = Data of start of pass; Bits 0-3 month; Bits 4-7 year - 1960.
9	DDDD	Bits 7-11 day; bits 0-5 MS bits of seconds.
10	DDDD	LS bits of seconds.
11	AAAA	Azimuth. Bits 0-10 used; Bit 10 represents one-half revolution or 180°.
12	EEEE	Elevation. Same units and scaling as Word 11.
13	XXXX	Range. Bits 0-11 used. Bit 0(LS) represents 4,000 yards. Range of 777_8 will be sent as 7776_8.
.		
.		Words 11, 12, and 13 may be repeated up to 16 times.
.		
n	CKSM	

For any one pass there will be, in nearly every case, a series of these messages. The data in all the messages would be the same and would be the data associated with the first point in the first message for that pass.

2.2.1.5.5 Schedule Message.

Word 1	7777	
2	SS26	
3	26NN	
4	DDDD	Bits 8-11 month; Bits 0-4 day.
5	M VV	See below.*

*If M = 0 = Pass Schedule, V's = Vehicle number in 4-bit BCD.
5 = Prepass Period, V's = Vehicle number in 4-bit BCD.
6 = Postpass Period, V's = Vehicle number in 4-bit BCD.
7 = Preventive Maintenance Period, V's = zero.

Word 6	VVVV	
7	RRRR	
8	RRRR	
9	TT	System time to begin operation in binary.
10	TTTT	
11	GGGG	Duration of operation in seconds. (Will be zero for vehicle site can see but not scheduled to look at.)
12	GGGG	
. . .		Words 5-12 may be repeated six more times.
n	CKSM	

A single schedule message covering a single time span may be sent to the station to update, override or supplement a previous schedule.

2.2.1.5.6 Pre-Flight Telemetry Mode Specification (FM/FM).

Word 1	7777	
2	SS27	
3	27NN	
4	AAVV	A's = Telemetry type (1 = FM/FM).
5	VVVV	
6	MMMM	M's = Mode number in octal.
7	PPPP	P's = Patchboard ID; three 4-bit BCD characters.
8	FFFF	F's = Number of frames per second in octal.
9	WWWW	W's = Number of words per frame.
10	QQQQ	Q's = Number of frames per master frame in octal.

Word 11	IIII	Bit 11 = 1 process this identification. = 0 do not process this identification. 10-9 type of point: 02, fixed format. 03, events. 8-0 Identification number.**
12	LLLL	L's = Location in octal of first word in core relative to the frame.
13	DDDD	D's = The number which must be added to the L's to obtain the second word address.
14	CCCC	C's = The compression algorithm number.
15	XXXX	X's are parameters required by the algorithm.
16	XXXX	If C is 1, Algorithm No. 1 ("Step Function") is indicated and Word 15, Bits 11-9, decommutator number. 8-9, noise limit.

16, Absolute value of Step threshold, in octal, greater than noise level.
17, If bit 11 = 1, tenth second accuracy required; otherwise, zero.
18, Zero.

If C is 2, Algorithm No. 2 ("Steady State Function") is indicated and Word 15, Bits 11-9, decommutator number.

16, High limit in octal.
17, Low limit in octal.
18, Number of seconds in report period as a power of 2.

If C is 3, Algorithm No. 3 ("Smoothing Function") is indicated and Word 15, Bits 11-9, decommutator number.

16, Bits 8-0, high limit, low limit.
17, Number of seconds in report period as a power of 2.
18, Zero.

**Super commutated points are indicated by identical Identification Numbers in sequential entries.

If C is 4, Algorithm No. 4 ("Switch Setting - Unequal Increments") is indicated and Word 15, Bits 11-9, decommutator number. 8-0, first non-zero level (highest).

16, Second non-zero level.
17, Third non-zero level.
18, Fourth non-zero level (lowest).

If C is 5, Algorithm No. 5 ("Switch Setting - Equal Increments") is indicated and Word 15, Bits 11-9, decommutator number. 8-0, high limit in octal.

16, Low limit in octal.
17, Number of increments between high and low limits (1-10).
18, Zero.

If C is 6, Algorithm No. 6 ("Meter") is indicated and Word 15, Bits 11-9, decommutator number. 8-0, high level.

16, Low level.
17, Number of repeated bits in meter readout message.
18, Zero.

Words 11-18 may be repeated up to five times.

Word 19
.
.
.
n CKSM

The first mode specification message will be as it appears above. All succeeding mode specification messages within a mode will not have Words 7-10.

2.2.1.5.7 <u>Prepass Telemetry Mode Selection and Modification Message (FM/FM)</u>.

Word 1	7777	
2	SS30	
3	30NN	
4	AAVV	A's = Telemetry type; 1 = FM/FM.

Word 5	VVVV	
6	RRRR	
7	RRRR	
8	MMMM	
9	PPPP	P's = Patchboard number.
10 . . . n		If there are no changes to be made to the basic mode information, Word 10 will be a checksum. If there are changes, the eight words of the preflight message (Words 11-18) will be sent for each change.

This message will always be sent prepass to tell the tracking station what mode is desired by the STA.

2.2.1.5.8 Latitude Crossing Message.

Word 1	7777	
2	SS31	
3	31NN	
4	VV	
5	VVVV	
6	RRRR	
7	RRRR	
8	D PP	D is Bit 11. Bit 11 = 1 if crossing is North to South, Bit 11 = 0 if crossing is South to North. PP is the number of grids used in this pass to determine crossing. PP $\leq$ 10.
9 10	GGGG C	Words 9 and 10 form a couplet. There are PP such couplets in a message. GGGG is a grid number $\leq$ 4094. If Gs are the number of a warning grid, then Bit 0 = 1 in Word 10 or C = 1. If Gs are the number of a crossing grid, then Bit 1 = 1 of Word 10 or C = 2. If Gs are the number of a reporting grid only, then C will be zero. Bits 2-11 of Word 10 are not used.

NN + 1 CKSM

This message will be sent to the site as part of the prepass data for a particular revolution. The latitude crossing report going from the remote station to the STC will be sent as a status message.

2.2.2 IOS Buffer/1604 Message Formats.

2.2.2.1 Control Messages. The following messages comprise all of the control messages flowing between the IOS Buffer and a 1604. The data units are referred to as messages because of the direct transfer used. The units correspond to records on the 1615 tape.

2.2.2.1.1 "Transfer Prepass to Bird Buffer"

Word 1	7777	Header.
2	0007	Message length.
3	0002	Transfer prepass to Bird Buffer.
4	SSVV	Vehicle number in 4-bit BCD.
5	VVVV	
6	RRRR	
7	RRRR	Rev. No. or all zeros.
8	CKSM	Checksum.

This message is used by the IOS Buffer to request prepass data from the 1604. If the Rev. No. is given only the data for that rev. is requested; if the Rev. No. is zero, all prepass that the 1604 has for the vehicle is sent over.

2.2.2.1.2 "Last Operation Complete"

Word 1	7777	Header.
2	0007	Message length.
3	1003	Last operation complete.
4	OOVV	Vehicle number in 4-bit BCD.
5	VVVV	

6	RRRR	Rev. No.
7	RRRR	Rev. No.
8	CKSM	Checksum.

This message is sent by the IOS Buffer or the 1604 to indicate to the other computer that all data has been transferred.

2.2.2.1.3 "No Data Found".

Word 1	7777	Header.
2	0007	Message length.
3	1004	Data requested was not found.
4	00VV	Vehicle number in 4-bit BCD.
5	VVVV	
6	RRRR	Rev. No.
7	RRRR	
8	CKSM	Checksum.

This message is sent by the 1604 to the IOS Buffer if it cannot find the pre-pass or command data that was requested.

2.2.2.1.4 "Send SCHOPS Data".

Word 1	7777	Header.
2	0007	Message length.
3	0003	Send SCHOPS data.
4	00SS	Site Code.
5	0000	
6	0000	
7	0000	
8	CKSM	Checksum.

This message is a request from the IOS Buffer for SCHOPS data for the site specified.

2.2.2.2 Data Messages (Records). The messages contain the data sent to the IOS Buffer by the 1604 and the data sent to the 1604 by the IOS Buffer.

2.2.2.2.1 1604 to IOS Buffer.

1. Antenna Pointing Prepass Message:

   Same format as 2.2.1.4.4.

2. Command Messages:

   Same format as 2.2.1.3.5.1.

3. Text Messages:

   Same format as 2.2.1.2.1.

4. Schedule Messages:

   Same format as 2.2.1.2.1.

5. Mode Selection

6. Latitude Crossing

7. Tracking Selection

2.2.3 Printer Formats. The purpose of this section is to present formats for the 166 Printers at the STC. The printers to be considered are the Data Analysis/Technical Advisor, Data Presentation, Multi-Ops, and IOS Buffer printers. See 823 Bird Buffer Milestone 4, TM-834/000/04 for actual formats.

2.2.3.1 Data Analysis/Technical Advisor. Up to three lines of header per page may be printed with the only constraint being 120 alpha-numeric characters per line. Only telemetry is printed by the IOSB.

Telemetry printing is done in the "Telemetry phase." All available telemetry paper tape is processed unless the phase is changed by the operator.

2.2.3.2 Data Presentation Printer Format. The same rules will be followed in formatting information for the Data Presentation printer as the Data Analysis printer.

2.2.3.3 Multi-Ops Printer Format. The format and content of the Multi-Ops printout is the same as the Data Analysis printout. The Master Data Controller will be able to manually connect the Multi-Ops printer to the IOSB or any Bird Buffer so that at any moment his printer will receive the same information as that Bird Buffer or the IOSB's Data Analysis printer.

2.2.3.4 IOS Buffer Printer Format. Messages will be logged on the IOS Buffer printer under the following conditions (see 3.8.3.2):

1. Information entered manually via card reader.
2. All current prepass information has been transmitted to the station.
3. End of pass (receipt of fade message).
4. Presence of a locally generated or sensed alarm condition.
    a. Parity error in a Telemetry message received over 100 WPM line.
    b. Checksum error in a message or record.
    c. Illegal message label.
    d. Message length greater than 64 words.
    e. Tape parity.
    f. Card read error.
    g. Parity error or checksum error on prepass paper tape.

2.2.4 IOS Buffer Control Card Formats. Following are formats for all control cards used by the IOS Buffer system. An effort has been made to keep the formats simple and general in nature. The following conventions are observed: data (if any) begin in Column 7; VVVV = vehicle number in decimal; RRRR = rev. number in decimal, to the nearest tenth (no decimal point), and SS = site code.

2.2.4.1 Initialize.

Cols.	1- 4	**00	Identifies the card as an INITIALIZE card.
	5- 6	Blank	Always blank.
	7-10	VVVV	Contains the vehicle number, in decimal.
	11-12	Blank	Always blank.
	13-20	MM/DD/YY	Contains the present month, day, and year; all decimal, and separated by slashes.
	21-22	Blank	Always blank.
	23-24	AM or PM	Usually indicates whether it is morning or afternoon when the INITIALIZE card is entered (see 2.1.6).
	25-26	Blank	Always blank.
	27-28	PT or Blank	Indicates whether a new Prepass Tape should be made up for this vehicle. If blank, a Prepass Tape exists. If PT, a new Prepass Tape should be made up (new vehicles only).
	29-30	Blank	Always blank.
	31-32	SS or Blank.	Site number.
	33-80	Ignore.	

2.2.4.2 Transfer Prepass.

Cols.	1- 4	**02	Identifies the card as a Transfer Prepass card.
	5- 6	Blank	Always blank.
	7-10	VVVV	Vehicle number, in decimal.
	11-12	Blank	Always blank.

Cols. 13-16	RRRR or Blank	May contain a revolution number or may be blank. If blank, all prepass data for the specified vehicle will be transferred. If a revolution number is specified, only prepass data for that revolution will be transferred.
17-18	Blank	Always blank.
19-20	SS or Blank	May be blank or may contain a site number. If blank, all prepass data for the specified vehicle will be transferred. If Cols. 19-20 contain a site number, only prepass data for that site will be transferred.
21-80		These columns are ignored by the program and may be used for further card identification if desired.

2.2.4.3 Merge Tape.

Cols. 1- 4	**04	Identifies the card as a Merge Tape card.
5- 6	Blank	Always blank.

2.2.4.4 Send Prepass.

Cols. 1- 4	**06	Punch all prepass data on a Bird Buffer 163 tape, which has not yet been sent.
5- 6	Blank	
7	T/Blank	Blank = Punch paper tape. "T" = Write on Magnetic Tape No. 4.
9-80	Ignored	

2.2.4.5 Transfer Card Prepass.

Cols. 1- 4	**07	Indicates that card prepass data is to be merged on the Prepass Tape.
5- 6	Blank	Always blank.
7-10	VVVV	Vehicle number, in decimal.

Cols.	11-12	Blank	Always blank.
	13-16	RRRR	Revolution number, in decimal to the nearest tenth (no decimal point).
	17-18	Blank	Always blank.
	19-20	SS	Site code, in decimal.
	21-22	Blank	Always blank.
	23	T	T = Type of prepass data cards which follow this card: 1 = Commands 2 = Text 3 = Telemetry mode selection 4 = TRK sampling rate
	24-80		These columns are ignored by the Bird Buffer Program, and may be used for further card identification if desired.

2.2.4.6 Transfer SCHOPS.

Cols.	1- 4	**08	Transfer scheduling data for this site from the 1604 to a Bird Buffer 163 tape.
	5-18	Blank	
	19-20	SS	
	21-80	Ignored	

2.2.4.7 Send Text.

Col.	1- 4	**24	Print one line of text on the printer specified.
	5- 6	Blank	Text message begins in Column 11.
	7- 8	PP	PP = Printer number: 1 = Data Analysis 2 = Data Presentation (Multiple printers are represented by the decimal sum of individual printers.)

Col.	9	Blank or E	E = Eject page before printing.
	10	J	J = Number of lines to skip before printing, in decimal (no more than 9).
	11-80	TTT...T	Message to be sent.

2.2.4.8 Verify Paper Tape.

Cols.	1- 4	**09	Check validity of parity and checksum on the prepass paper tape.
	5-80	Ignored	

2.2.4.9 Read Telemetry Paper Tape.

Col.	1- 4	**10	Process the telemetry data on the telemetry paper tape.
	5-80	Ignored	

2.2.4.10 End.

Col.	1- 4	**99	End card.
	5-80	Ignored	

3.0 MODULE DESCRIPTION

Bird Buffer Modules modified for the IOSB are suffixed with an X.

3.1 EXECUTIVE MODULE FOR THE IOSB

3.1.1 Name: Executive Control Module - SXCONX

3.1.2 Description. The Executive Control Module monitors the input-output equipment associated with the 160A IOS Buffer Computer at the augmented STC. Input-output operations are conducted simultaneously to attain maximum equipment usage. The Executive Module effects required data transfers, determines the sequence for operating the IOSB programs, and transmits system output to the proper equipment. The module description is given under the following general headings:

1. Control Cycle
2. Paper Tape and Interrupt Processing Routines
3. Service Routine

3.1.2.1 The Control Cycle. The Executive Control Module coordinates the IOS Buffer functions required for processing job requests initiated under operator control. The cycle is entered by interrogating the card reader to determine current job requirement(s). The Input Processing Module is used to interpret the job request. The results from operating the Input Module are used to define subsequent IOS Buffer operations.

3.1.2.2 Paper Tape and Interrupt Processing Routines

3.1.2.2.1 Paper Tape Processing. A telemetry data message is stored in its entirety in the telemetry message buffer; however, the telemetry events are extracted and stored in an event buffer. The Control Module updates the number of events in this buffer. The Telemetry Module, Section 3.5, converts the telemetry data for printing.

3.1.2.2.2 Interrupts 10, 20, and 30. Remaining input-output equipment activity status is reported through interrupts 10, 20 or 30 and notify the Control Module when a given piece of equipment is available for data transfer. Specifically, these interrupts serve to:

1. Notify the Service Routine that a 605 tape operation is complete (Interrupt 20).

2. Notify the Executive Module that a card has been read and can be processed by the Input Module (Interrupt 30).

3. Indicate jump or stop key activation (Interrupt 10).

3.1.2.2.3 The Service Routine. The Service routine conducts periodic queries to provide the following types of input-output coordination.

1. Interpretation and administration of manual control requests introduced by card or console action. The manual input is recorded on the IOS Buffer printer and processed by the Input Module. For data entered for site transmission, the Input Module converts the data to message format.

2. Transmission of data to the 166 printers. The data sent to the analysis and presentation printers are formatted by the Telemetry Module. The Bird Buffer 166 printer output consists of status-alarm messages and content of manual input cards.

3.1.2.3 Interfaces. The Executive Control Module monitors all input-output equipment, effects required transfers, notifies the IOS Buffer programs when data is present for processing, and transmits generated output to the proper equipment.

3.1.3 Input Sources

1. Card Reader
2. 1604 direct transfer
3. Bird Buffer Program Modules

3.1.4 Output

1. 166 Printers
2. 605 Tape
3. 1604 Computer-direct transfer.

3.1.5 Flow Diagram. Page A-2

3.2 PREPASS MODULE

3.2.1 Name: SPREPX

3.2.2 Description. SPREPX will perform three functions in the IOSB system.

3.2.2.1 It will keep an updated prepass tape consisting of (a) telemetry processing tables and telemetry mode information messages obtained from the program SPRETEL; (b) scheduling and text messages obtained from either SCHOPS or SCHNOPS; and (c) prepass data obtained from either the 1604 computer or card input to the IOS Buffer.

The telemetry processing tables will be contained in the first files on the tape. Each file will be mode specific and the first record of each file will contain an identification word specifying the mode contained in the file. These files will be ordered by mode number.

The next group of files will contain the scheduling and text messages obtained from either SCHOPS or SCHNOPS. Each file will be site specific and the first record of each file will contain an identification word specifying the site. These files will be in order by site number.

The third group of files will contain the telemetry mode information messages that will be sent to the remote stations. This data will normally be sent to a station preflight and minor changes to it would be sent with the prepass data. These files will be ordered by site and by mode number and the first record of each file will contain an identification word, the site number, and the mode number.

The last group of files will contain contact-specific prepass data consisting of antenna pointing messages, command messages, text messages, latitude crossing messages, tracking data selection messages, and prepass telemetry mode selection messages. These files will be ordered by revolution number, site number and message label. The first record of each file will contain an identification word, the revolution number, site number, and message label.

New information for the prepass tape will either replace its outmoded equivalent or be merged into the proper group of files. After a revolution has been completed, the pass information pertaining to that revolution will be deleted from the tape. SPREPX will use two tape drives for its updating functions, but the prepass data will be kept on only one tape.

3.2.2.2 SPREPX, upon request, will have all new data for the IOS punched on five level paper tapes. After each file of data is punched, the first word of the header record on the magnetic tape will be changed to a 7776 octal, signifying that the station has already received this data. Hence, when it is necessary to send prepass data to IOS, SPREPX will know what data, if any, the station should have.

3.2.2.3 SPREPX, under the direction of the Executive Module, will read into core memory the telemetry processing tables for the ensuing mode.

3.2.3 Interface

3.2.3.1 SPREPX will obtain its information for the prepass tape from the following sources.

On request to transfer prepass data from the 1604 computer, SPREPX will obtain all the prepass data the 1604 has for a specific vehicle. If a request is made to transfer SCHOPS data for IOS, SPREPX will retrieve from the 1604 all the scheduling (text and binary) messages for this station. In either case, SPREPX will set the entrance parameters for SIBBTC, so SIBBTC will make the appropriate transfer. After receiving the header message, SPREPX will position the prepass tape to the appropriate file and write its own header message on the tape. Then each message will be written on the prepass tape as it is received from SIBBTC. SPREPX will make a minimum of legality checks on the data received. Command messages written on the prepass tape will be verified by reading them back into core memory and checking the read area against the write area. The prepass data obtained from the 1604 will be arranged by revolution number, station number, and message type, so SPREPX will be able to update the prepass tape without reordering any files of data. The scheduling and text messages will be arranged in station-specific files, so SPREPX can also record this data exactly as it is received from the 1604.

The Input Processing Module, SPROCX will read in any prepass data from cards, put the data into the proper message format, and after completing each message enter SPREPX with the appropriate entrance parameters set. SPREPX will position the prepass tape to the proper file, record the data, and then return to SPROCX for the next message. This process will be repeated until SPREPX has merged all the data from cards onto the prepass tape. If data is found on the tape for the same revolution, station, and message type as input on cards, the tape data will be replaced by the newer data from cards.

The telemetry processing tables and telemetry mode information messages will be merged onto the prepass tape from another tape made up by the 1604 program, SPRETEL. The SPRETEL tape will be arranged so that SPREPX only has to merge these files into their proper position on the prepass tape. SPREPX will make no legality checks on the data obtained from SPRETEL.

3.2.3.2 SPREPX, upon request, will punch out a prepass paper tape for IOS. Initially, SPREPX will retrieve from the prepass tape the revolution number, date, and system time of the initial pointing data. This information will be punched in a visual header by SPUN. SPREPX will enter SPUN with the proper entrance parameters for each message that is to be punched. SPREPX will make two passes through the prepass tape. On the first pass, it will have SPUN punch out any new message for the T & C computer at IOS, and on the second pass all new messages for the TLM computer. Before the first prepass message for each computer, SPUN will punch a visual header followed by a "Prepass Message Coming" message. The last message punched for each computer will be a "Prepass Transmission Finished" message. SPREPX at this time will also delete any information for a past revolution from the prepass tape.

3.2.3.3 SPREPX will read into core memory the telemetry tables needed by the Telemetry Module to process the forthcoming telemetry data. Also at this time, SPREPX will set up the headings for the Data Analysis and Data Presentation printers.

3.2.4 Restrictions. None

3.2.5 Use of Existing Subroutines. Most of the subroutines used by the Bird Buffer Module, SPREP, have been used for the IOSB module SPREPX.

3.2.6 Flow Diagram. Page A-11

3.3 INPUT PROCESSING MODULE

3.3.1 Name: SPROCX

3.3.2 Description. This module will interpret all cards input to the Bird Buffer and take the appropriate action indicated below.

Control cards are logged on the IOS Buffer Printer, then checked further to determine whether a non-existent job (Cols. 3-4) has been requested; the vehicle number (if any) is different from that on the previous INITIALIZE card; a non-decimal value appears where a decimal digit is expected; a non-octal value appears where an octal digit is expected; and the tape unit or the printer requested (if any) does not exist. If any of these conditions are present, the control card is ignored and the operator is notified by an **ERROR** printout. The program does not halt. If more cards are in the reader, the next card will be read in and similarly checked.

The IOS Buffer Program will process only one job request at a time. That is, after a control card which defines a legal job request is entered, no more control cards will be accepted until that job has been completed. SPROCX will cause the following action to be taken by the Bird Buffer modules when a control card is read in:

3.3.3 Interface. Input to this module will be control cards of the format specified in Section 2.2.4. SPROCX will cause the following action to be taken by the IOS Buffer modules when a control card is read in:

3.3.3.1 Initialize (**00). The Bird Buffer will identify with the vehicle number and site contained on this card. Month, day, and year are stored in the print header, and the various tape headers are set up with other information extracted from the card. A new Prepass Tape will be prepared by writing the appropriate header, if requested.

3.3.3.2 Transfer Prepass (**02). The IOS Buffer will interrupt the 1604, set up communication and ask for prepass data. It will verify (by checksum) each message transmission as it is received, and store it on the 605 in exactly the same format. If the prepass data requested cannot be found, the 1604 will notify the IOS Buffer. In this case, the IOS Buffer will print an error message on-line. If no revolution number appears on the card, SPROCX will expect all prepass data for that vehicle to be sent.

3.3.3.3 Merge Tape (**04). SPROCX expects to find the telemetry mode tables and preflight telemetry messages on tape T, as specified on this card. This data is then merged onto the Prepass Tape.

3.3.3.4 Send Prepass (**06). SPROCX will check to see whether prepass has been prepared for the site. If not, it will read the data into core and punch the prepass paper tape if the option is on-line. Otherwise, the punch image will be recorded on magnetic tape.

3.3.3.5 Transfer Card Prepass (**07). SPROCX will expect to find prepass data beginning on the card following the control card. This data must conform to the identification specified in column 18. Each message is processed and written on a 605 tape in the format appropriate for transmission to the site. Processing will continue until an END card is reached.

3.3.3.6 Transfer SCHOPS (**08). The IOS Buffer will interrupt the 1604, set up communication, and ask for this site's scheduling data. Data transfer will be core-to-core, and will be recorded on a 605 tape in exactly the same format in which it is received.

3.3.3.7 Verify Paper Tape (**09). SPROCX will cause the module SPIN to be operated to read and verify the prepass paper tape.

3.3.3.8 Read Telemetry Paper Tape (**10). SPROCX will cause the executive module to read the telemetry paper tape, and operate the modules necessary to process the telemetry data.

3.3.3.9 Send Text (**24). SPROCX will flag the text on this card for printout on any of the 166's requested. SPROCX will assemble the message and calculate a checksum. The D/P and D/A printers are the only options.

3.3.3.10 END (**99). This card signals the end of an input which is contained on more than one card. SPROCX will disregard all cards following this card until another card is encountered.

3.3.4 Flow Diagram. Page A-22

3.4 PREPASS PAPER TAPE OUTPUT MODULE

3.4.1 Name: SPUN

3.4.2 Description. SPUN will punch a five-level paper tape containing a visual header and prepass messages for transmission to a RTS via 100 WPM TTY.

Data for the visual header and the prepass messages will be contained in communication cells and data buffers set by SPREPX. Prior to entering SPUN, flags will be set by SPREPX to designate the destination computer and to request either a visual header or a prepass message. SPUN will then extract the data, format the header or message and punch the tape.

After each header or prepass message is output, SPUN will return control to SPREPX.

3.4.3 Tape Contents. Each paper tape will contain prepass messages for the TIM and for the T & C computers. Each set of messages designated for one computer will be preceded by a visual header.

The information on the header will include the station number, the destination computer (T & C or TIM), vehicle number, revolution number, and the time of initial antenna pointing data (month/day/year/seconds).

The visual header will be followed by a Prepass Coming message. Each group of messages (grouped by message code) including the Prepass Coming message will be preceded by a visual representation of the two digit message code. A 77_8 will be punched following the 15 blank frames associated with the last Prepass Ending message for the T & C computer.

Blank frames will be used to separate individual messages and groups of messages as follows:

1. 15 frames - to precede and follow each visual tape header, and to follow each Prepass Ending message.

2. 5 frames - to separate individual messages.

A graphic representation of the tape format is presented in Appendix C.

3.4.4 Method. Upon entry by SPREPX if a visual header is requested, data will be extracted by SPUN from communication cells, formatted into visual representations and punched on 5-level paper tape. After the header is punched, the Prepass Coming message will be extracted, formatted into 5-bit words (4 data bits + odd parity) and output; control will then be returned to SPREPX.

If a visual header is not requested, SPUN will extract a message from a data buffer, determine message length, and format each 12-bit word into three 5-bit words (4 data bits & odd parity). The message will then be punched and control returned to SPREPX.

An option will be provided to write the paper tape image on magnetic tape.

3.4.5 Interfaces. Communication cells used by SPUN must be preset with vehicle number, revolution number, and time of initial antenna pointing data.

The data buffer set by SPREP should contain a valid message upon each entry to SPUN.

3.4.6 Restrictions. No data validity checks will be made.

3.4.7 Use of Existing Subroutines.

SCHOOL
CHCKSM
SRDWRT

3.4.8 Flow Charts. See Appendix A, Page A-32

3.5 TELEMETRY PROCESSING MODULE

3.5.1 Name: STEPP - Telemetry Process and Print

3.5.2 Description. The functions of the Telemetry Module are to accept telemetry data from the remote station, perform any legal conversions which are requested, and prepare a selected set of data for printout on the Data Analysis Printer and another set for printout on the Data Presentation Printer. The Telemetry Module will also prepare for printout any alarms or status messages generated by the telemetry computer at the remote station.

Processing of incoming messages will be handled in the following manner: The event portion of a telemetry report will be placed in an event buffer by the Executive Module (SXCONX); the fixed format portion of a message will not be buffered but will be replaced by new fixed format each second. When the Telemetry Module is entered, it will check to see if there is a status or alarm message to be printed. If there is and it is less than twenty-three characters in length, it will be placed in the printer image beginning in the first column reserved for events; if it is twenty-three characters or more, it will replace the fixed format printout. After the status or alarm message is formatted or if there are no status and alarm messages, the Telemetry Module will begin processing the events. The first event will be placed in the column specified for events unless, (1) the event buffer has reached saturation, in which case events will replace fixed format or (2) there are more events than can be printed in one second, in which case events will replace the tracking data printout for that second. Events will be taken out of the event buffer sequentially and prepared for printout until all columns available on one of the printers have been used. Associated system time will be printed out at the beginning of each second and each time a new system time is reported by the remote station. The contents of an event printout will include a six character identification, the value, two characters of units and time in tenths of seconds or out-of-limits indication if reported by the compression algorithm. The value may be printed in octal, decimal, per cent of band width, engineering units, switch setting with two settings or a level for multilevel functions.

Fixed format information will be processed in the order that it appears in the message. A particular item of information may appear on either or both the Data Analysis or Data Presentation printer in different columns but must be printed in the same manner: octal, decimal, per cent of band width, engineering units, or switch settings. The Telemetry Module will make the required conversion and print the number of characters which have been allowed for the point.

For both fixed format and events, the module will print an "N" for the value of the point whenever the tracking station sends a report of noise for that item. For further description of the telemetry module, see TM-834/000/04.

3.6 VERIFY PAPER TAPE MODULE

3.6.1 Name: SPIN - Prepass Paper Tape Verifier

3.6.2 Description. The functions of the Verify Paper Tape Module are to read the prepass paper tape, check the parity of each frame of data, check that individual messages checksum to zero, and compare commanding messages with their redundant messages.

SPIN will be entered by the executive module upon the input of a VERIFY PAPER TAPE request card. SPIN will return to the executive upon completion of its functions, or upon recognizing an error on the paper tape.

The processing of the paper tape will be done in the following manner: SPIN will select the paper tape reader and search for the first message on the tape. The tape will then be read frame at a time, and the parity of each frame will be checked. When three frames have been read, they will be assembled into a 160A word and the word will be assigned to a message buffer. When the end of a message is signaled by a blank frame, the message in the buffer will be check-summed. If a commanding message was read, the reading and checking process will be repeated using another buffer. The two buffers will then be compared to further verify the validity of the message.

If the message was not a commanding message, a check is made for an "End Prepass" message. If the message is an "End Prepass", SPIN will request the operator to signal if further messages are to be processed.

3.6.3 Interfaces. SPIN will set a flag for the executive to indicate that the tape contained an error. The executive will print an alarm on the 166 printer.

3.6.4 Restrictions

1. The prepass paper tape must be in the reader.
2. The reader must be ready.
3. The reader must be set to read 5-level tape.

3.6.5 Use of Existing Subroutines. None

3.6.6 Flow Charts. See Appendix A, Page A-27

3.7 BIRD BUFFER/1604 COMMUNICATION MODULE

3.7.1 Name: Bird Buffer/1604 Communication Link - SIBBTC

3.7.2 Description: SIBBTC provides the IOSB 160A computer programs communication with a 1604 computer by means of a 1615 tape logic unit operating in the Satellite Mode. These operations will be performed by SIBBTC: communicate with the 1604 via control messages, receive prepass messages for a specific vehicle from the 1604, and receive SCHOPS data from the 1604. All transfers will be core-to-core, using the direct transfer mode of the 1615. The three types of transfers are detailed below.

3.7.2.1 Prepass messages from the 1604 for a vehicle will consist of antenna pointing, commands, latitude crossing, and text information. SIBBTC will examine each block of the prepass message to determine whether that block is a command. Commands will be retransmitted to the 1604 for a bit-by-bit comparison with what was sent to the 160A. All other classes of prepass messages will be checksummed to determine correctness of transmission. Prepass information may be requested by two classes: for one pass (one vehicle), or all data for all revs (for one vehicle).

3.7.2.2 SCHOPS data will be sent by the 1604 to the Bird Buffer. The Bird Buffer will respond as to correctness of the data.

3.7.3 Interfaces. This section will be devoted to a discussion of program control, processing, and input, output parameters.

3.7.3.1 Program Control. The sequence of SIBBTC program operation commences when SIBBTC has been referenced by a return jump in the user program. SIBBTC will interrogate cell 0070 in bank 2 to determine its operation. Other direct cells specify vehicle number (V), revolution number (R), and station number (S).

Cell 0070	0 = resume contact
	1 = not used
	2 = not used
	3 = transfer SCHOPS
	4 = transfer prepass

If contact is to be initiated, SIBBTC will determine whether or not the 1604 has enabled interrupt. COPII sets Flag 1 when it cannot be interrupted; in this situation, SIBBTC notifies the operator and waits for the 1604 to clear Flag 1. When it finds Flag 1 cleared, an interrupt 1604 command will be executed. If, after 55 seconds, the 1604 does not respond to the interrupt by giving write control to the 160A, SIBBTC will exit back to the user program with an error flag set. (If the switch to the 1615 is open at the time of the interrupt attempt, a phantom resume will be generated and SIBBTC will exit to the user program with the same error flag set.) If contact is to be resumed, SIBBTC will assume that contact has been previously established, and it will enable receipt of the next block of information. On initializing contact with the 1604, the following action will be performed:

1. Examine cell 0070 to determine mode of contact to be established.

2. Set V, R, and S in the control message.

3. Send proper control message (see Appendix A).

4. Test Flag 1 to see if message was received correctly; if it was not, retransmit message.

5. Wait for read control from the 1604.

6. Read block of information.

7. Check block for "No Information Found" message. If this control message is received, SIBBTC will exit to the user's program with the proper error flag set.

3.7.3.2 Transfer Processing. After contact has been established with the 1604 and the proper contact type of transfer has been set and verified, normal transfer of information may pass between the two computers. Only one block of information (64 words) will be processed by SIBBTC at any one time. SIBBTC will return to the user program, after each block of information has been transferred, with output parameters set telling the user's program of (1) no more information to be sent from the 1604, (2) more blocks of information to come from the 1604, or (3) persistent checksum errors in transmission after five retransmission of any given block of information.

All messages will be verified by the receiving computer; and if the message contains errors, retransmission of that same message will be performed by the sending computer.

3.7.3.3 Output Parameters. SIBBTC will always reply to the user program after each operation has been performed. These output replies will consist of setting a value in the "A" register. The following values are the replies:

1 = "Last Operation Complete" message received.

0 = More information to be received.

2 = Requested data not found by the 1604.

3 = Persistent checksum errors in transmission.

4 = Unable to establish contact with 1604.

-2 = Job aborted by manual intervention (jump switch 1 raised while waiting for 1604 to enable interrupts).

3.7.4 Restrictions. The 1604 will give read or write control to the 160A for all transmissions. After each read or write operation, SIBBTC will set Flag 2 to indicate that the transfer has been completed. The receiving computer will then set Flag 1 if the message sumchecks successfully; if not, the sending computer will retransmit the message (five times maximum).

3.7.5 Use of Existing Subroutines. None

3.7.6 Flow Charts. See Page A-34

3.8 INTERNAL SYSTEM INTERFACE

3.8.1 Introduction. The IOS Buffer programs communicate with each other and use common parameters and common areas of core for storage of data input or output. To facilitate this internal interface, the following six categories are defined.

3.8.1.1 Flags. A flag is set to zero or non-zero to represent a "yes" or "no" condition in the logic of the program. Flags may be set and used by the programs.

3.8.1.2 Items. Items may contain data or may be logically coded to represent one of a number of states. Items may contain fixed values or may be set dynamically.

3.8.1.3 Tables. A table is a set of registers containing fixed values for use by the IOS Buffer programs.

3.8.1.4 Storage Buffers. A storage buffer is a block of core reserved for storing data being input to the system or data to be output.

3.8.1.5 Fixed Messages. Certain messages which go out over the data lines or to the printers are invariant or require only minor changes to fit a particular situation. To excerpt the IOS Buffer from having to make up the messages each time they are required, the messages are pre-formatted and placed in core.

3.8.1.6 Subroutines. Subroutines are program functions that are used by more than one module.

3.8.2 The Symbol Table. To facilitate the use of the flags, items tables, buffers, fixed messages, and subroutines defined above, all are given unique tags. A program may address a flag or table by tag rather than absolute location. The tags are not only symbolic addresses, but are also the names of the flags, tables, etc. The absolute locations associated with each of the tags are defined at the time the programs are assembled.

A complete list of all tags, items, tables, fixed messages, storage buffers, and subroutines, together with their associated locations and storage requirements, will be attached to the symbolic program listings in their final form.

3.8.3 Status and Alarm Messages. This section contains the list of status and alarm messages which will be printed out in response to conditions sensed by the IOS Buffer programs. These messages form a part of the set of fixed message category defined in Paragraph 3.8.1.5. They appear here as they will appear on the IOS Buffer printer. Messages followed by an asterisk will also appear on the Data Analysis and Data Presentation printers.

3.8.3.1 Alarm Messages.

Relative location:

AL000 Table	Printout
01	READ PARITY TAPE X
02	WRITE PARITY TAPE X
03	ERROR PRINTER X
04	PLACE NEW TAPE ON X
05	NO RESPONSE 1604
06	SPARE
07	SPARE
08	(SPARE)
09	SPARE
10	ILLEGAL JOB REQUEST
11	ERROR IN JOB CARD
12	NO REPLY TO LAST MSG.
13	NO DATA FROM 1604
14	1604 TRANSFER ERRS
15	1604 DATA ERROR
16	TLM TAPE FORMAT ERR
17	TLM TBLS NOT ON TAPE
18	NO END CARD FOUND
19	SPARE
20	SPARE
21	SPARE
22	READY TAPE UNIT X
23	UNAVAILABLE 166S X_1 X_2 X_3 X_4
24	NOT APPROPRIATE RECD
25	ERROR IN TLM DATA
26	MISCONNECTION 1604
27	SPARE
28	SPARE

3.8.3.2 **Alarm Messages.** Relative location in

AL000 Table	Printout
01	JOB COMPLETED
02	SPARE
03	SPARE
04	SPARE
05	FADE MESSAGE RECD
06	ERR. VERIF. P.T.
07	PREPASS DATA PREPARED
08	TLM MODE XXX IN USE
09	PREPASS TAPE-UNIT X
10	RECORDING TAPE ON X
11	NO PREPASS FOUND

4.0 EQUIPMENT REQUIREMENTS

4.1 Each IOS Buffer will have the following equipment (Figure 1):

4.1.1 One 160A Computer.

4.1.2 One 169 Auxiliary memory of 8K size.

4.1.3 One 160A-P Phantom Resume. This device is installed in the typewriter, and it will give a response to the 160A when the piece of equipment the 160A is attempting to select is not available.

4.1.4 One 160A-D. This device provides for driving equipment more than 500 ft. from the 160A computer.

4.1.5 One 161 Input-Output Typewriter. This device will be placed on the 160A buffer channel.

4.1.6 One 350 Paper Tape Reader. This device will be placed on the 160A normal channel.

4.1.7 One EPRE-11 Paper Tape Punch. This device will be placed on the 160A normal channel.

4.1.8 Four 605 Magnetic Tape Units. This will consist of four tape decks and be put on the 160A buffer channel.

4.1.9 One 167-2 Card Reader. This device will read both column binary and Hollerith and will be placed on the 169 buffer channel.

4.1.10 One 166-25 printer with a 64-character drum. This device will be placed on the 160A normal channel.

4.2 The IOS Buffer will share the following equipment with the Bird Buffer:

4.2.1 Thirteen remote 166-25 printers. Up to three of these printers can be connected to the IOS Buffer at one time. Wherever one or more printers are connected to the IOS Buffer, there must be unique select codes for each printer, and these must be distinct from the code for the IOS Buffer's own printer. The remote printers will be placed on the 160A buffer channel.

4.2.2 Four 1615 Magnetic Tape Units. These devices will consist of four tape decks each and will be connected to the 160A buffer channel. Each will actually be part of a 1604 complex and not part of the 160A external equipment, but the 160A can communicate with them. All 1615 units will have the same select code, and the 160A can be connected to only one of the four at any point in time. When communication with the 1615 tape decks is desired, the 160A must have control of the 1615 which is released to it by the 1604 to which that 1615 is attached.

4.2.3 The Computer Select and Cross-Connect Unit (CSCCU) is the switch which can connect the IOS Buffer computer to 1615 units and 166 printers. It is so designed that only one 160A computer can be connected to one 1615 unit at one time. Several 166 printers can, however, be connected to one 160A. Since there will be only three different sets of select codes among the 166 printers, it is a practical necessity that no more than three printers will ever be simultaneously connected to a 160A. The switch is controlled either manually or through the switch control 160A. The 160A Bird Buffers or the IOSB have no control over the switch nor can they sense its status. The only way to determine if a relay is closed is to attempt to select an equipment on the other side of the switch; and, if the select is honored with no phantom resume (see 3.1.5), the relay can be considered to be closed.

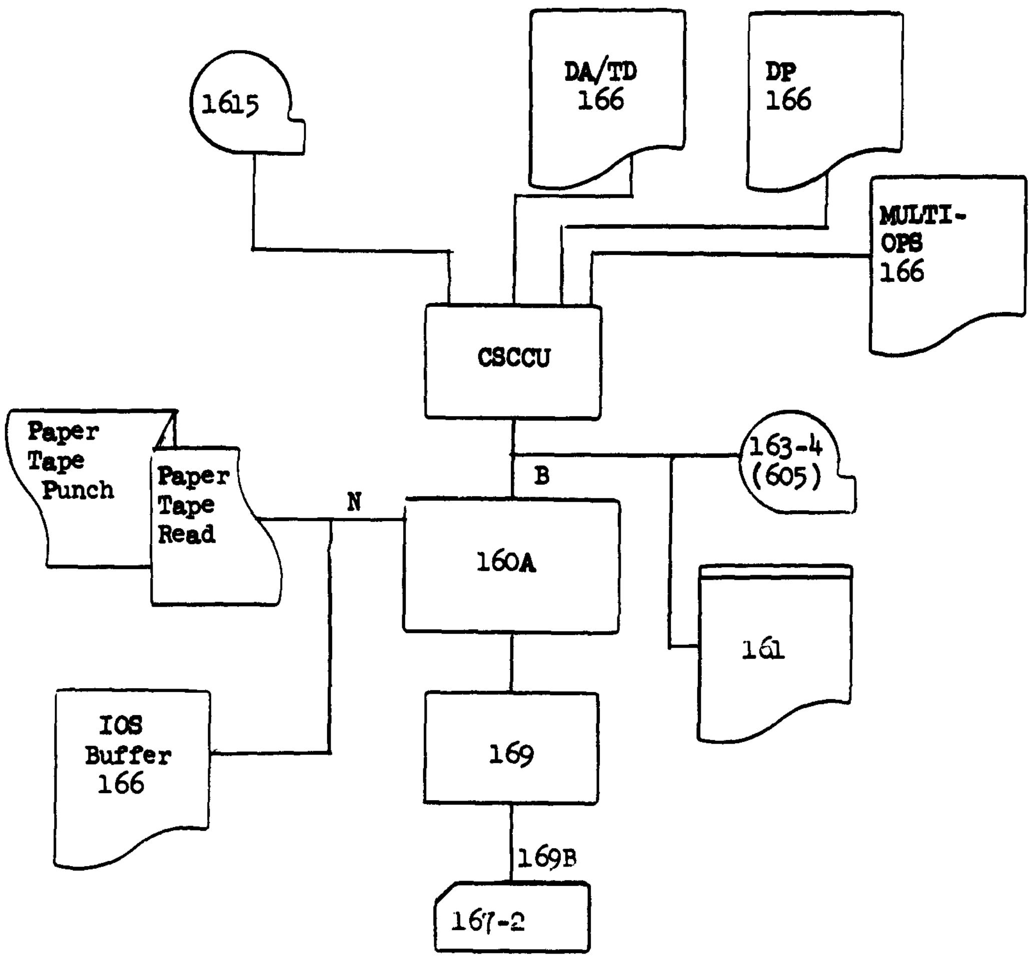


Figure 1. IOS Buffer Equipment Configuration

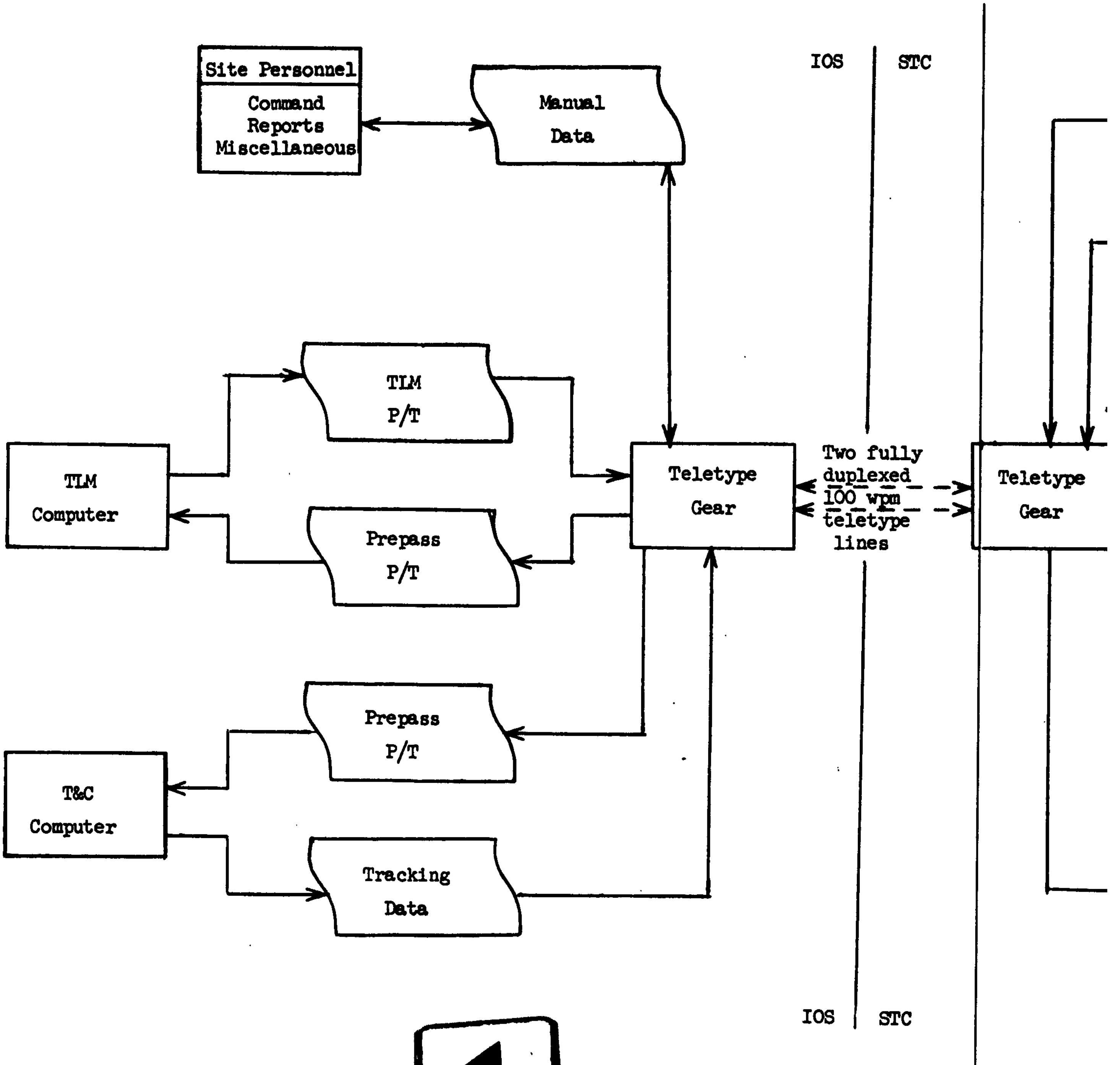
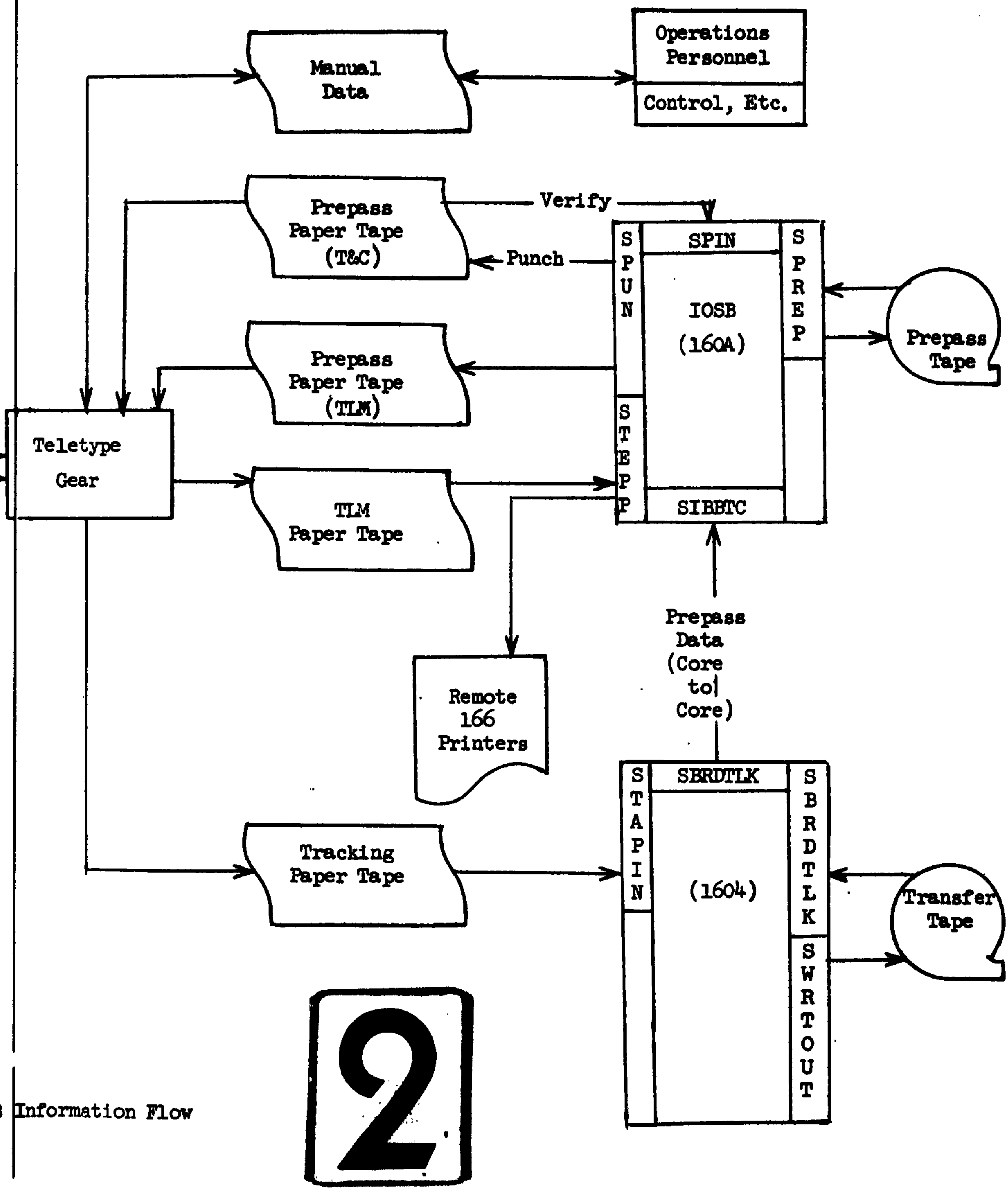


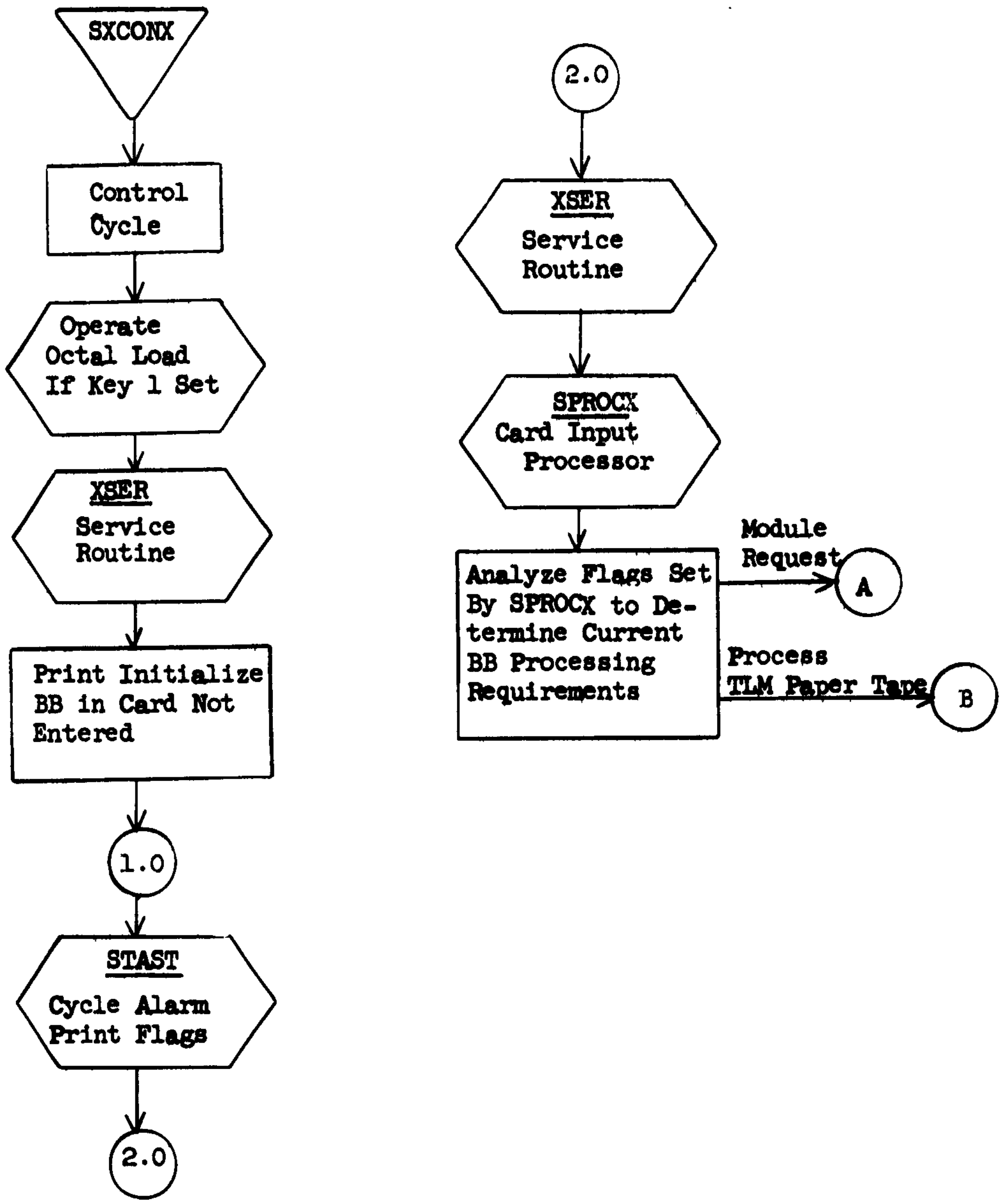
FIGURE 2. IOSB Information

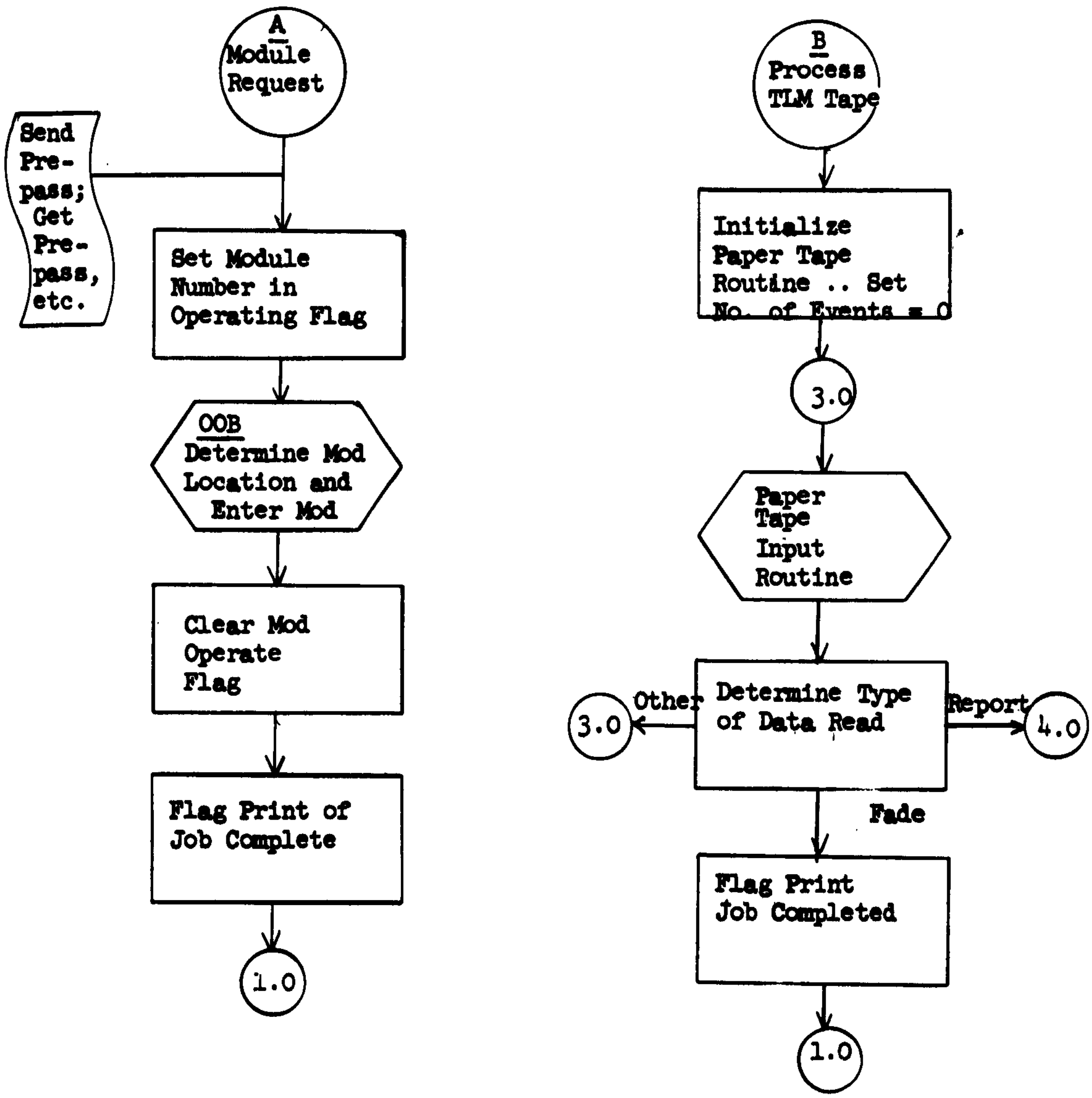


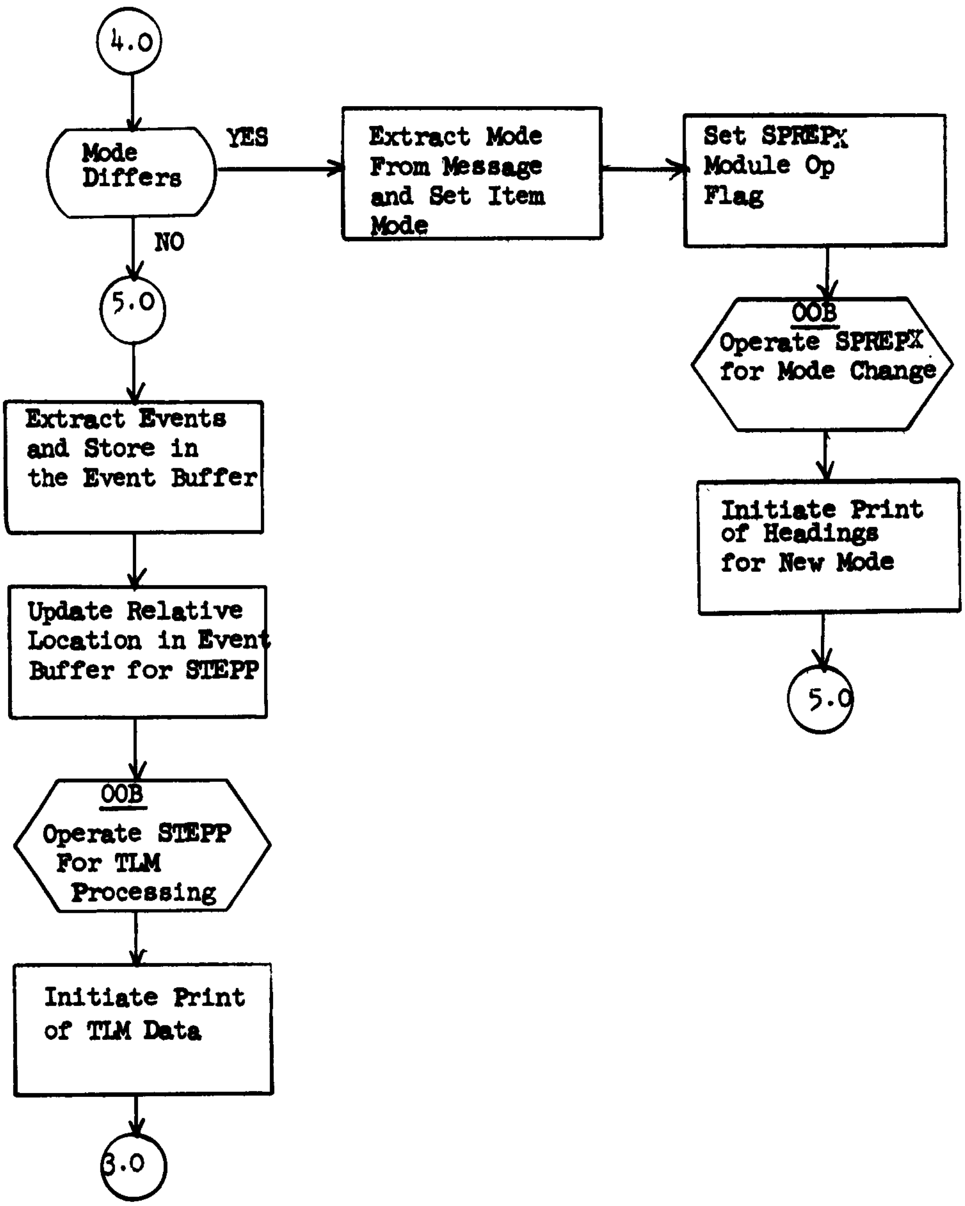
IOSB Information Flow

APPENDIX A

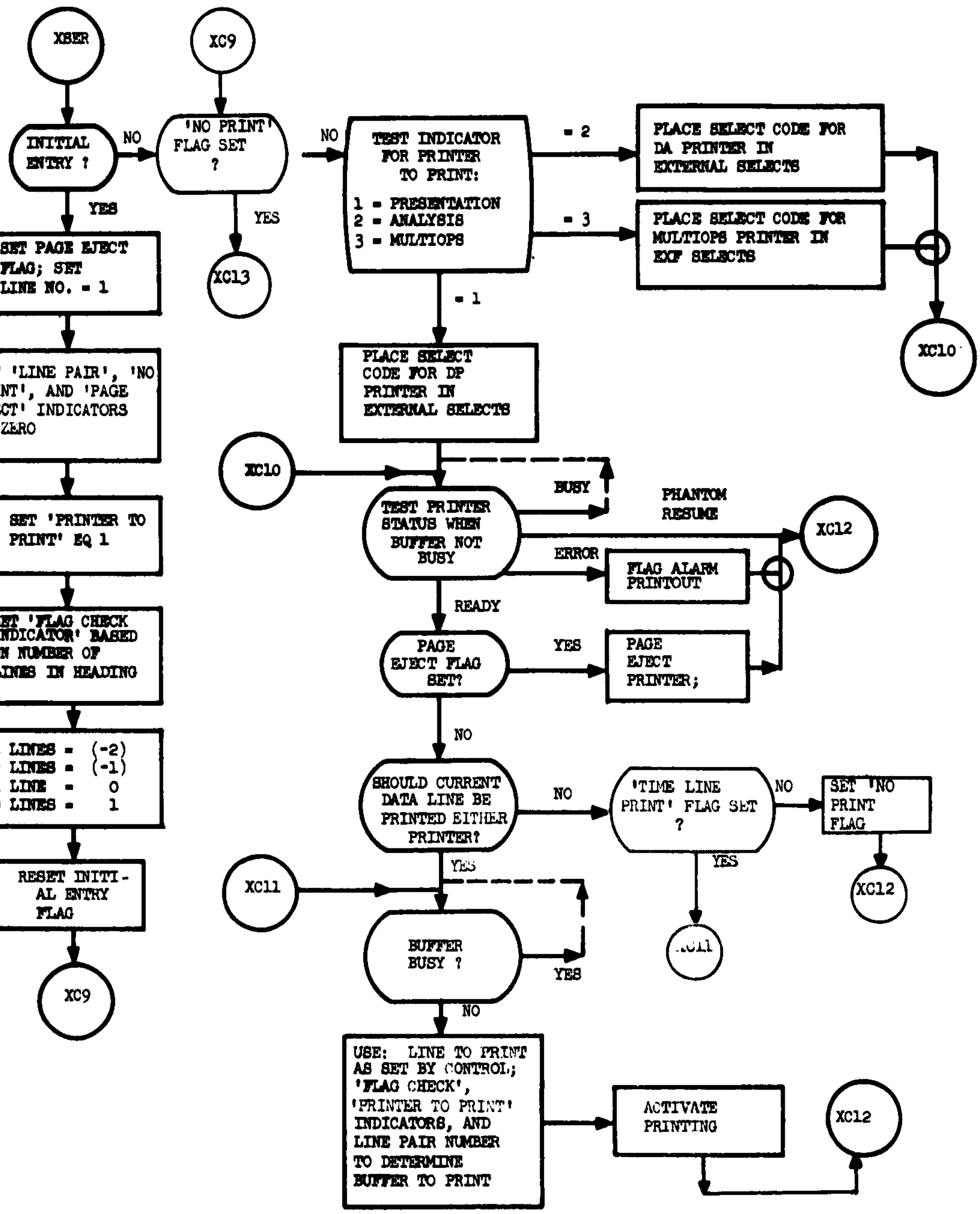
Flow Chart	Page

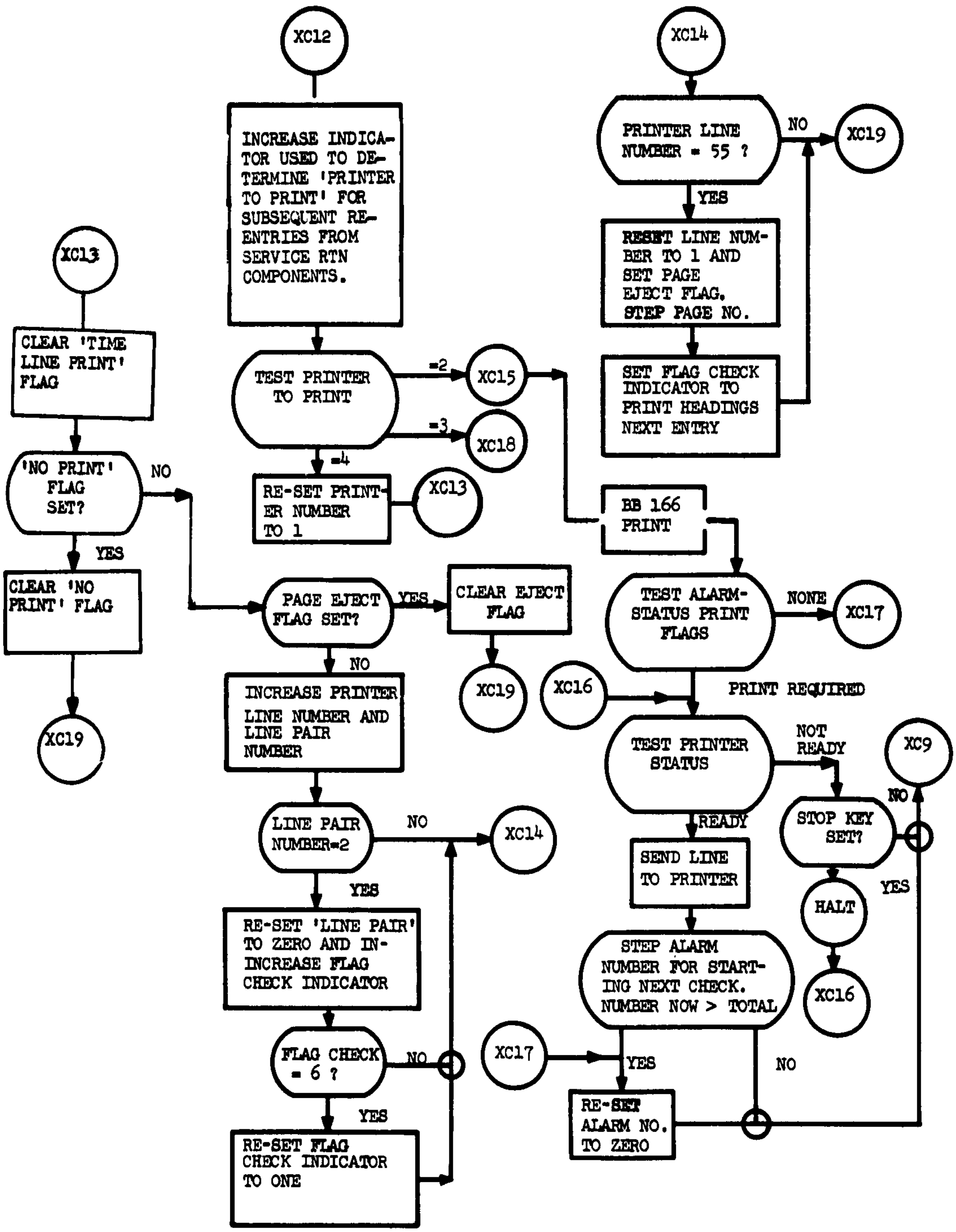

SXCONX
Control Cycle
Operate Octal Load If Key 1 Set
XSER Service Routine
Print Initialize BB in Card Not Entered
1.0
STAST Cycle Alarm Print Flags
2.0
2.0
XSER Service Routine
SPROCX Card Input Processor
Analyze Flags Set By SPROCX to Determine Current BB Processing Requirements
Module Request
A
Process TLM Paper Tape
B

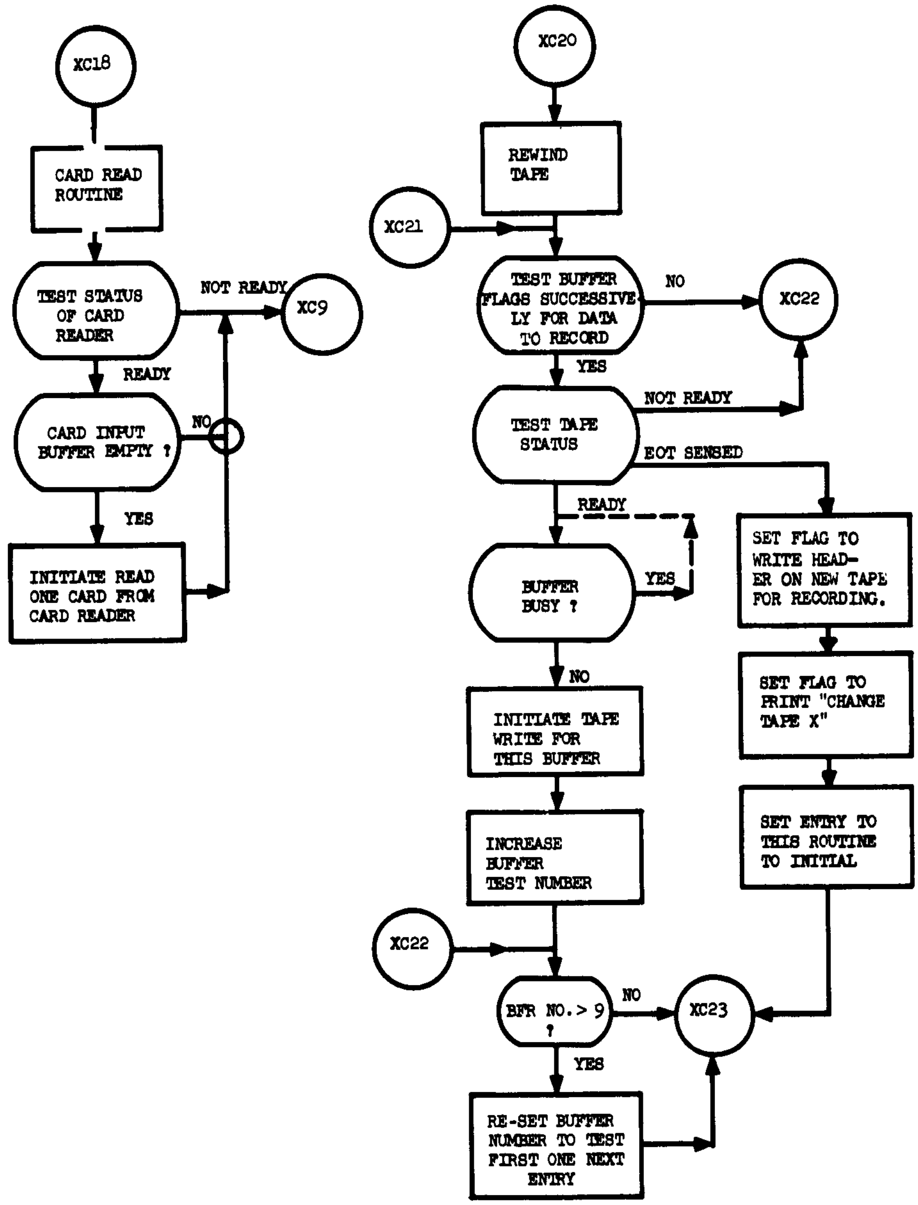

A
Module Request
Send Pre-pass; Get Pre-pass, etc.
Set Module Number in Operating Flag
OOB
Determine Mod Location and Enter Mod
Clear Mod Operate Flag
Flag Print of Job Complete
1.0
B
Process TLM Tape
Initialize Paper Tape Routine .. Set No. of Events = 0
3.0
Paper Tape Input Routine
Determine Type of Data Read
Other
3.0
Report
4.0
Fade
Flag Print Job Completed
1.0

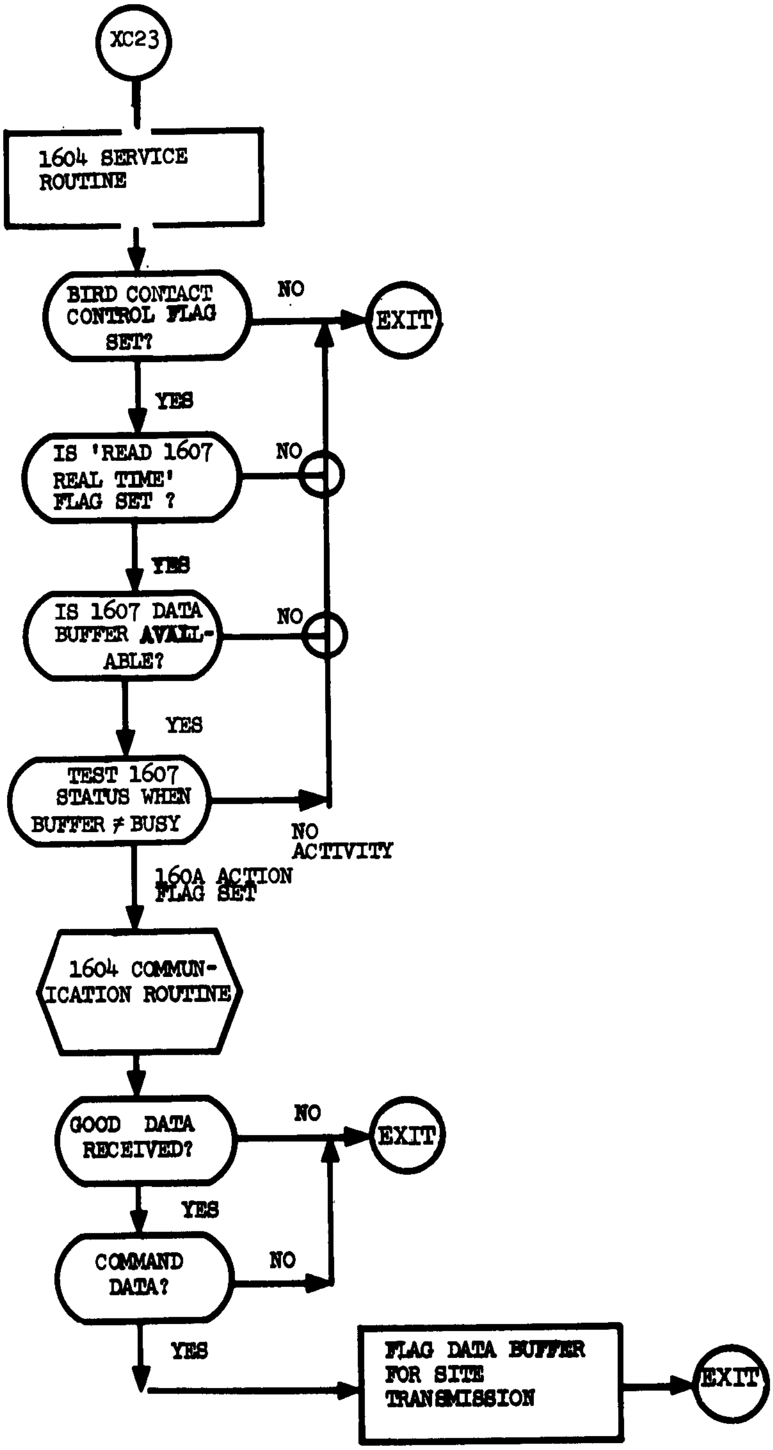

4.0
Mode Differs
YES
NO
Extract Mode From Message and Set Item Mode
Set SPREPx Module Op Flag
OOB
Operate SPREPX for Mode Change
Initiate Print of Headings for New Mode
5.0
5.0
Extract Events and Store in the Event Buffer
Update Relative Location in Event Buffer for STEPP
OOB
Operate STEPP For TLM Processing
Initiate Print of TLM Data
3.0

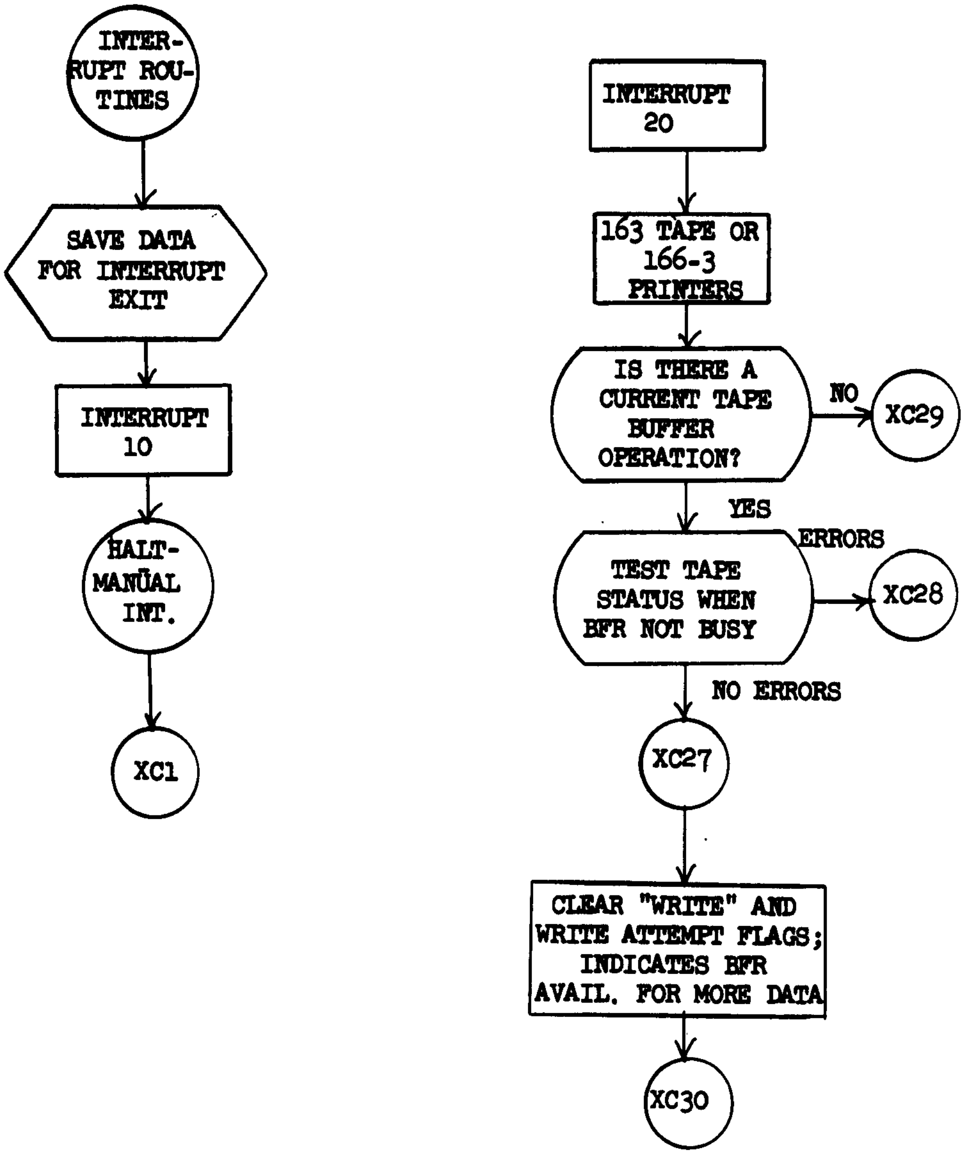
SXCON SERVICE ROUTINE (XSER)

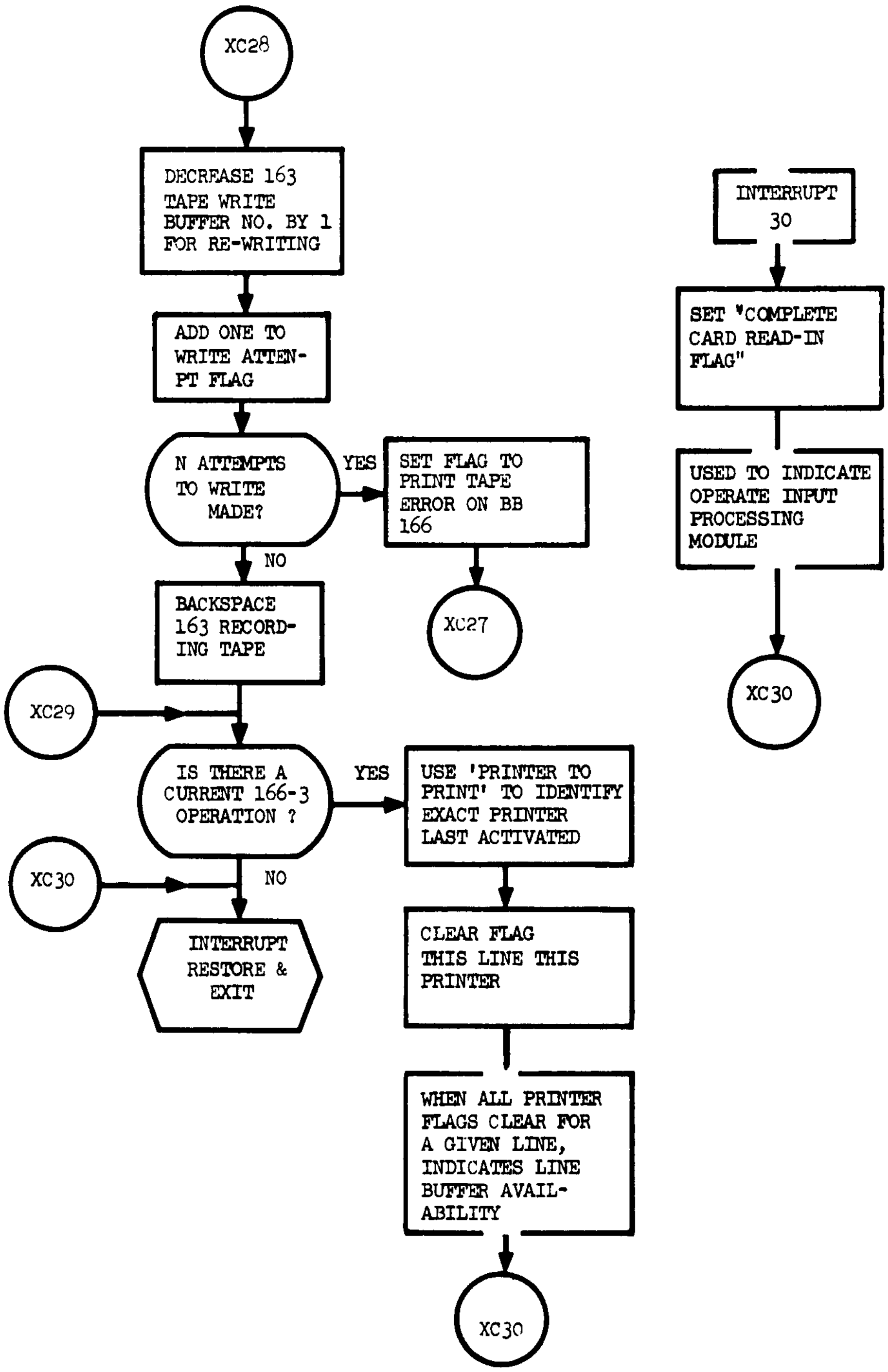


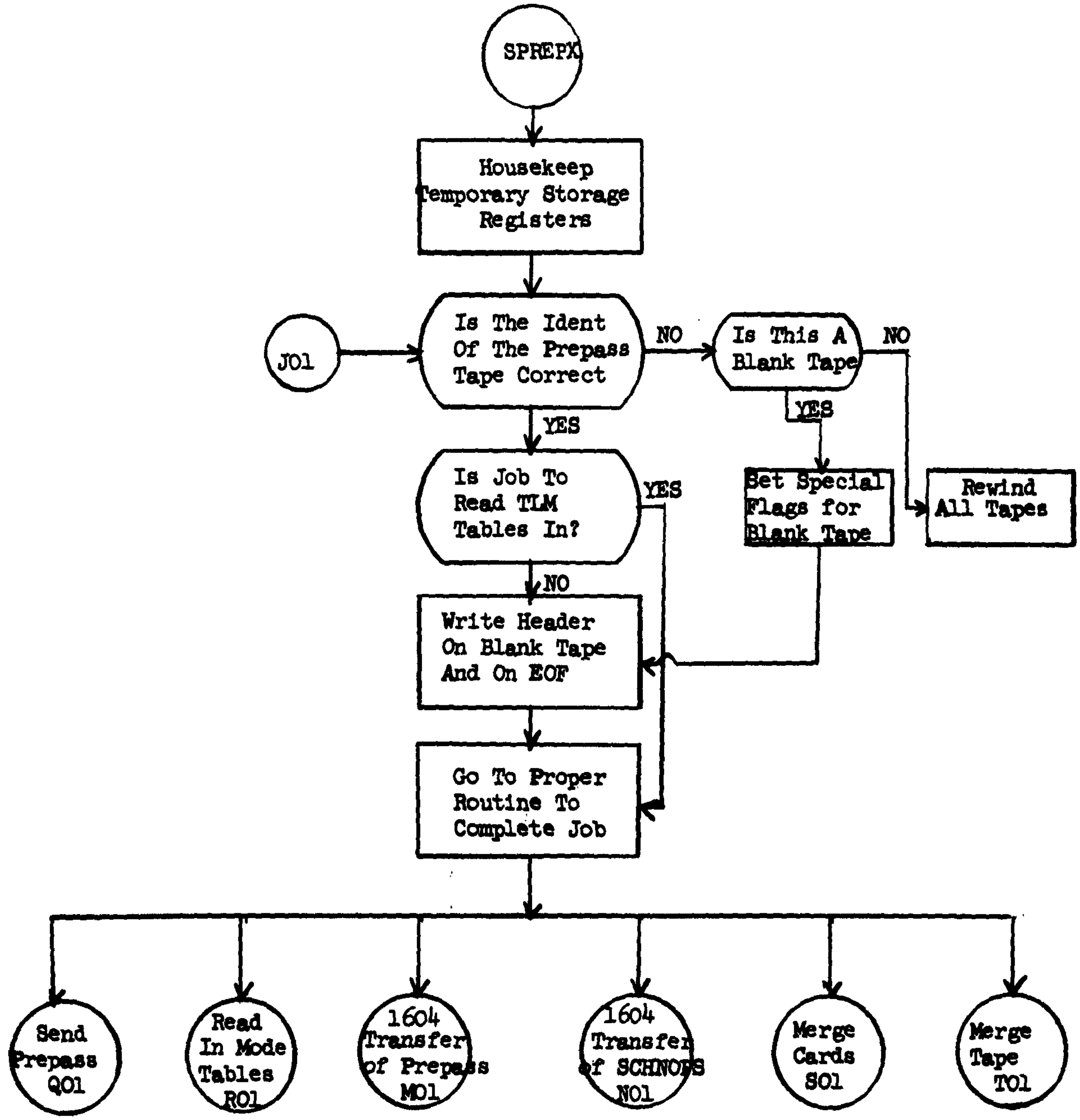

XC12
INCREASE INDICATOR USED TO DETERMINE 'PRINTER TO PRINT' FOR SUBSEQUENT RE-ENTRIES FROM SERVICE RTN COMPONENTS.
TEST PRINTER TO PRINT
=2
XC15
=3
XC18
=4
RE-SET PRINTER NUMBER TO 1
XC13
XC14
PRINTER LINE NUMBER = 55 ?
NO
XC19
YES
RESET LINE NUMBER TO 1 AND SET PAGE EJECT FLAG. STEP PAGE NO.
SET FLAG CHECK INDICATOR TO PRINT HEADINGS NEXT ENTRY
BB 166 PRINT
XC13
CLEAR 'TIME LINE PRINT' FLAG
'NO PRINT' FLAG SET?
NO
YES
CLEAR 'NO PRINT' FLAG
XC19
PAGE EJECT FLAG SET?
YES
CLEAR EJECT FLAG
XC19
NO
INCREASE PRINTER LINE NUMBER AND LINE PAIR NUMBER
LINE PAIR NUMBER=2
NO
XC14
YES
RE-SET 'LINE PAIR' TO ZERO AND INCREASE FLAG CHECK INDICATOR
FLAG CHECK = 6 ?
NO
YES
RE-SET FLAG CHECK INDICATOR TO ONE
TEST ALARM-STATUS PRINT FLAGS
NONE
XC17
XC16
PRINT REQUIRED
TEST PRINTER STATUS
NOT READY
XC9
NO
STOP KEY SET?
YES
HALT
XC16
READY
SEND LINE TO PRINTER
STEP ALARM NUMBER FOR STARTING NEXT CHECK. NUMBER NOW > TOTAL
XC17
YES
NO
RE-SET ALARM NO. TO ZERO

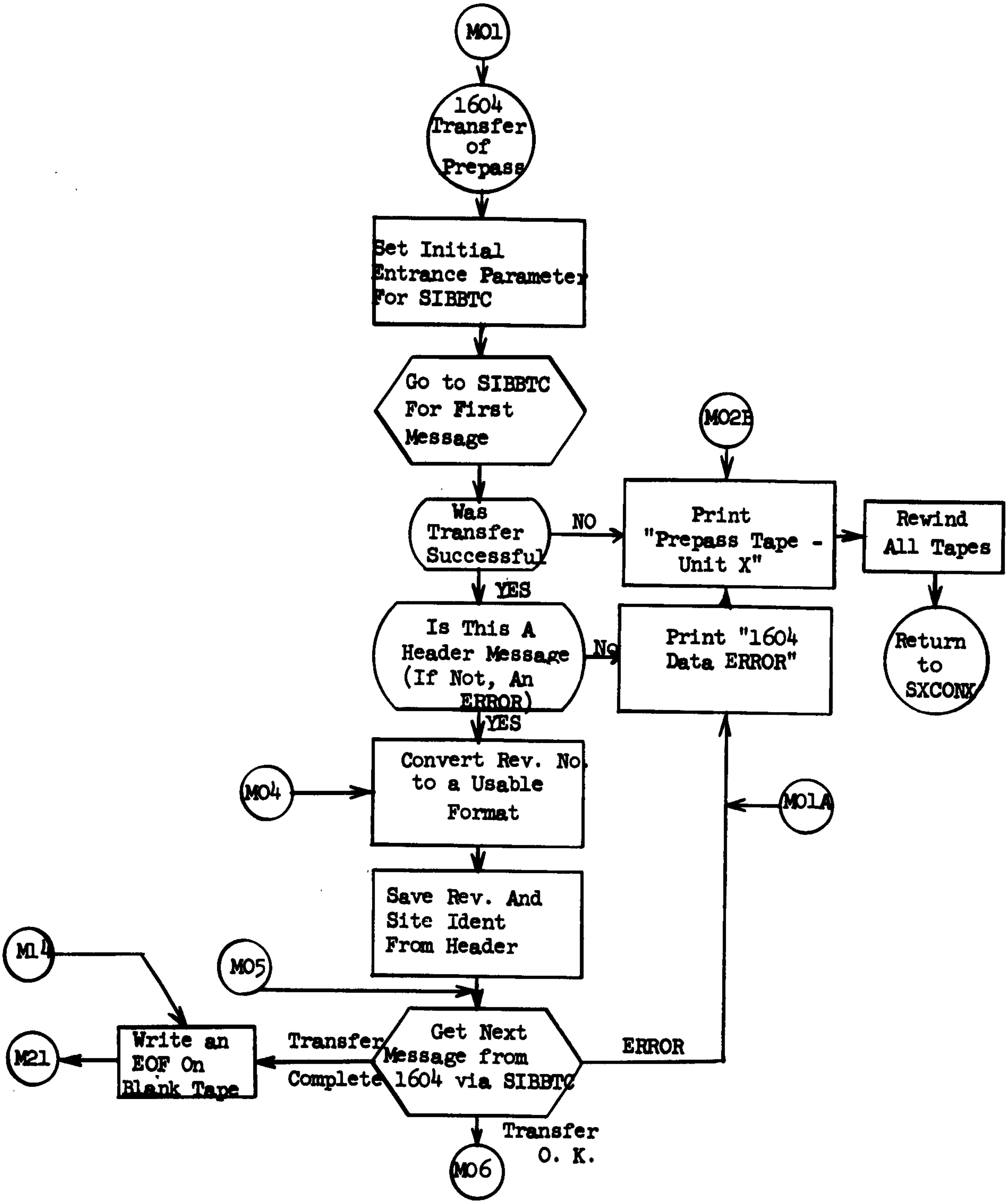

XC18
CARD READ ROUTINE
TEST STATUS OF CARD READER
NOT READY
XC9
READY
CARD INPUT BUFFER EMPTY ?
NO
YES
INITIATE READ ONE CARD FROM CARD READER
XC20
REWIND TAPE
XC21
TEST BUFFER FLAGS SUCCESSIVELY FOR DATA TO RECORD
NO
XC22
YES
TEST TAPE STATUS
NOT READY
EOT SENSED
READY
BUFFER BUSY ?
YES
NO
INITIATE TAPE WRITE FOR THIS BUFFER
INCREASE BUFFER TEST NUMBER
SET FLAG TO WRITE HEADER ON NEW TAPE FOR RECORDING.
SET FLAG TO PRINT "CHANGE TAPE X"
SET ENTRY TO THIS ROUTINE TO INITIAL
XC22
BFR NO.> 9 ?
NO
XC23
YES
RE-SET BUFFER NUMBER TO TEST FIRST ONE NEXT ENTRY

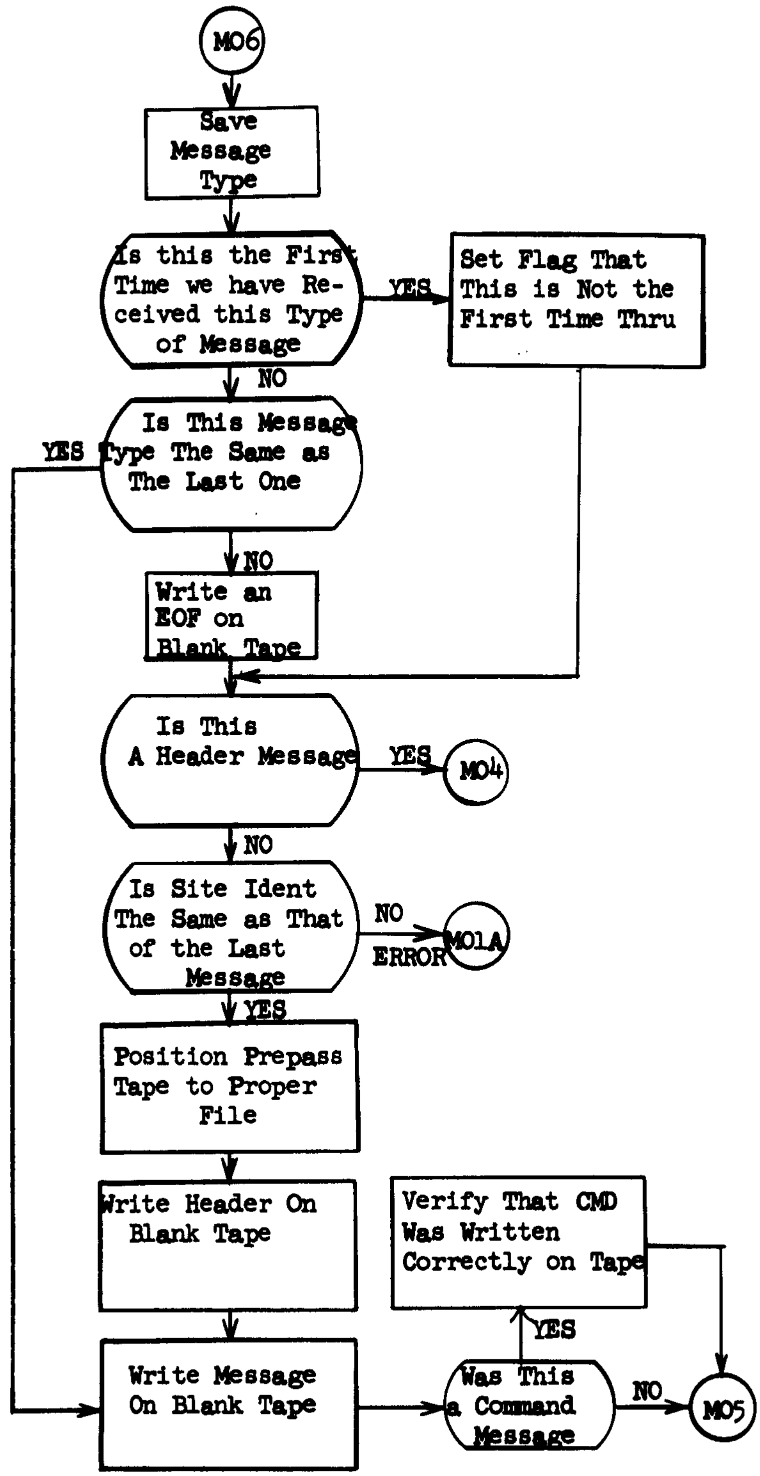

XC23
1604 SERVICE ROUTINE
BIRD CONTACT CONTROL FLAG SET?
NO
EXIT
YES
IS 'READ 1607 REAL TIME' FLAG SET ?
NO
YES
IS 1607 DATA BUFFER AVAIL-ABLE?
NO
YES
TEST 1607 STATUS WHEN BUFFER ≠ BUSY
NO ACTIVITY
160A ACTION FLAG SET
1604 COMMUN-ICATION ROUTINE
GOOD DATA RECEIVED?
NO
EXIT
YES
COMMAND DATA?
NO
YES
FLAG DATA BUFFER FOR SITE TRANSMISSION
EXIT

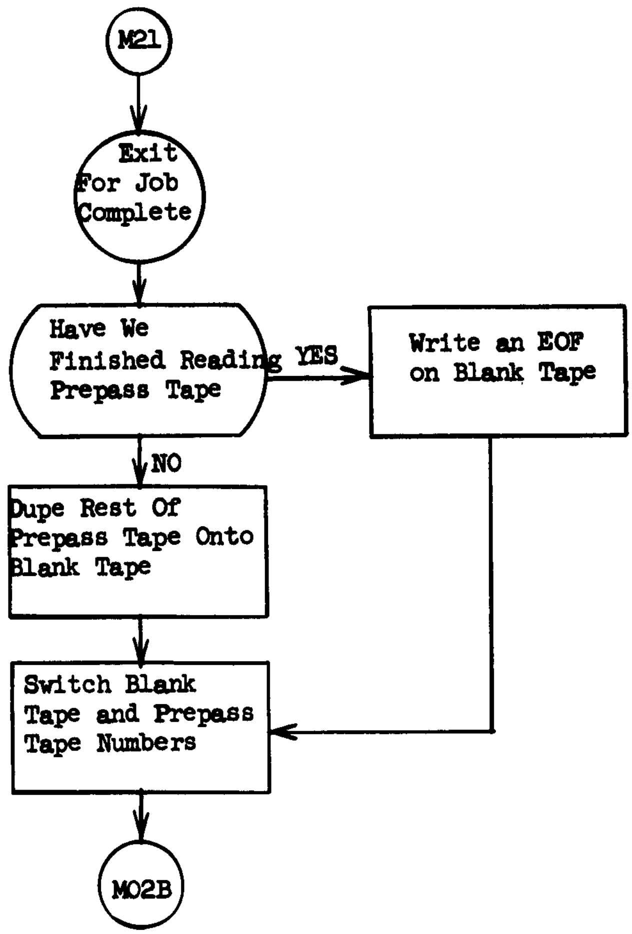

INTER-RUPT ROU-TINES
SAVE DATA FOR INTERRUPT EXIT
INTERRUPT 10
HALT-MANUAL INT.
XC1
INTERRUPT 20
163 TAPE OR 166-3 PRINTERS
IS THERE A CURRENT TAPE BUFFER OPERATION?
NO
XC29
YES
TEST TAPE STATUS WHEN BFR NOT BUSY
ERRORS
XC28
NO ERRORS
XC27
CLEAR "WRITE" AND WRITE ATTEMPT FLAGS; INDICATES BFR AVAIL. FOR MORE DATA
XC30

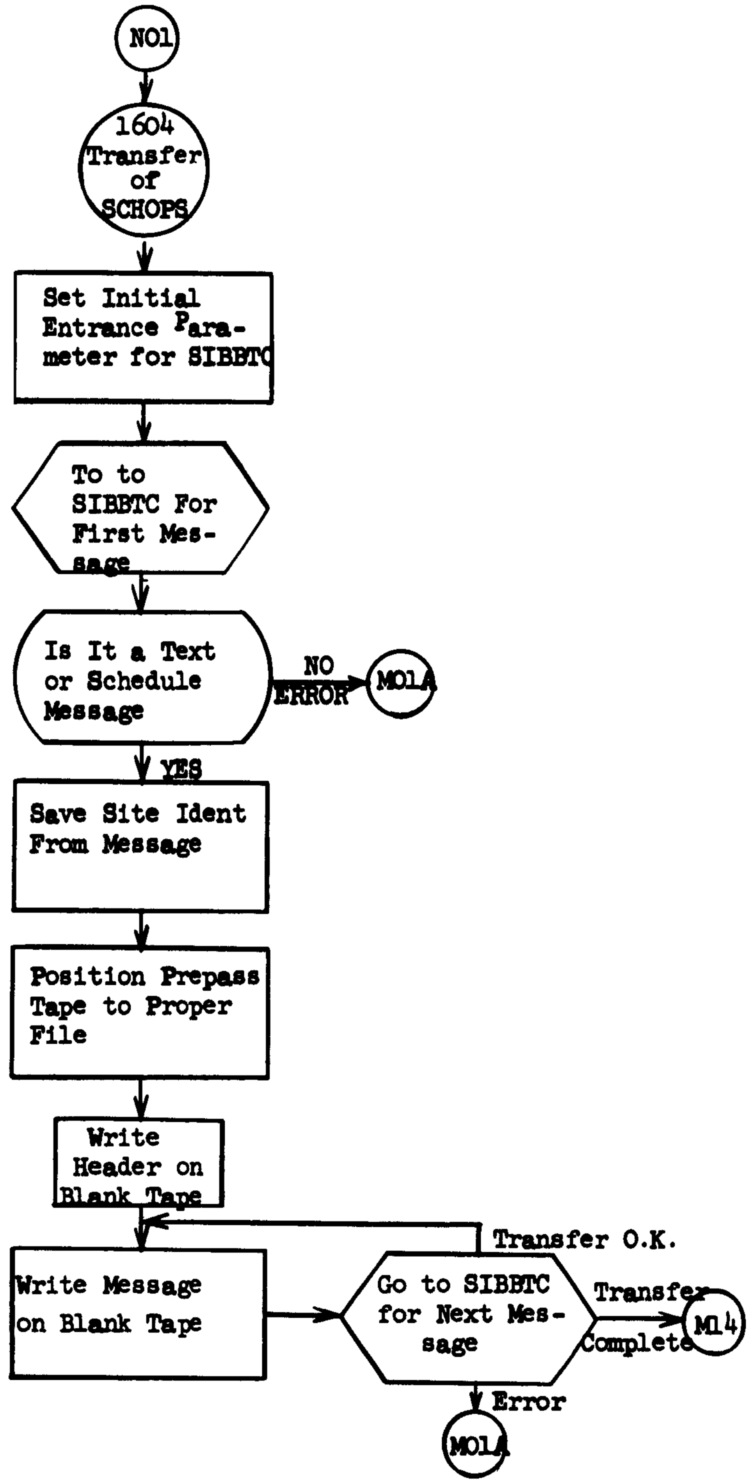

XC28
DECREASE 163 TAPE WRITE BUFFER NO. BY 1 FOR RE-WRITING
ADD ONE TO WRITE ATTEN-PT FLAG
N ATTEMPTS TO WRITE MADE?
YES
SET FLAG TO PRINT TAPE ERROR ON BB 166
XC27
NO
BACKSPACE 163 RECORD-ING TAPE
XC29
IS THERE A CURRENT 166-3 OPERATION ?
YES
USE 'PRINTER TO PRINT' TO IDENTIFY EXACT PRINTER LAST ACTIVATED
CLEAR FLAG THIS LINE THIS PRINTER
WHEN ALL PRINTER FLAGS CLEAR FOR A GIVEN LINE, INDICATES LINE BUFFER AVAIL-ABILITY
XC30
NO
XC30
INTERRUPT RESTORE & EXIT
INTERRUPT 30
SET "COMPLETE CARD READ-IN FLAG"
USED TO INDICATE OPERATE INPUT PROCESSING MODULE
XC30

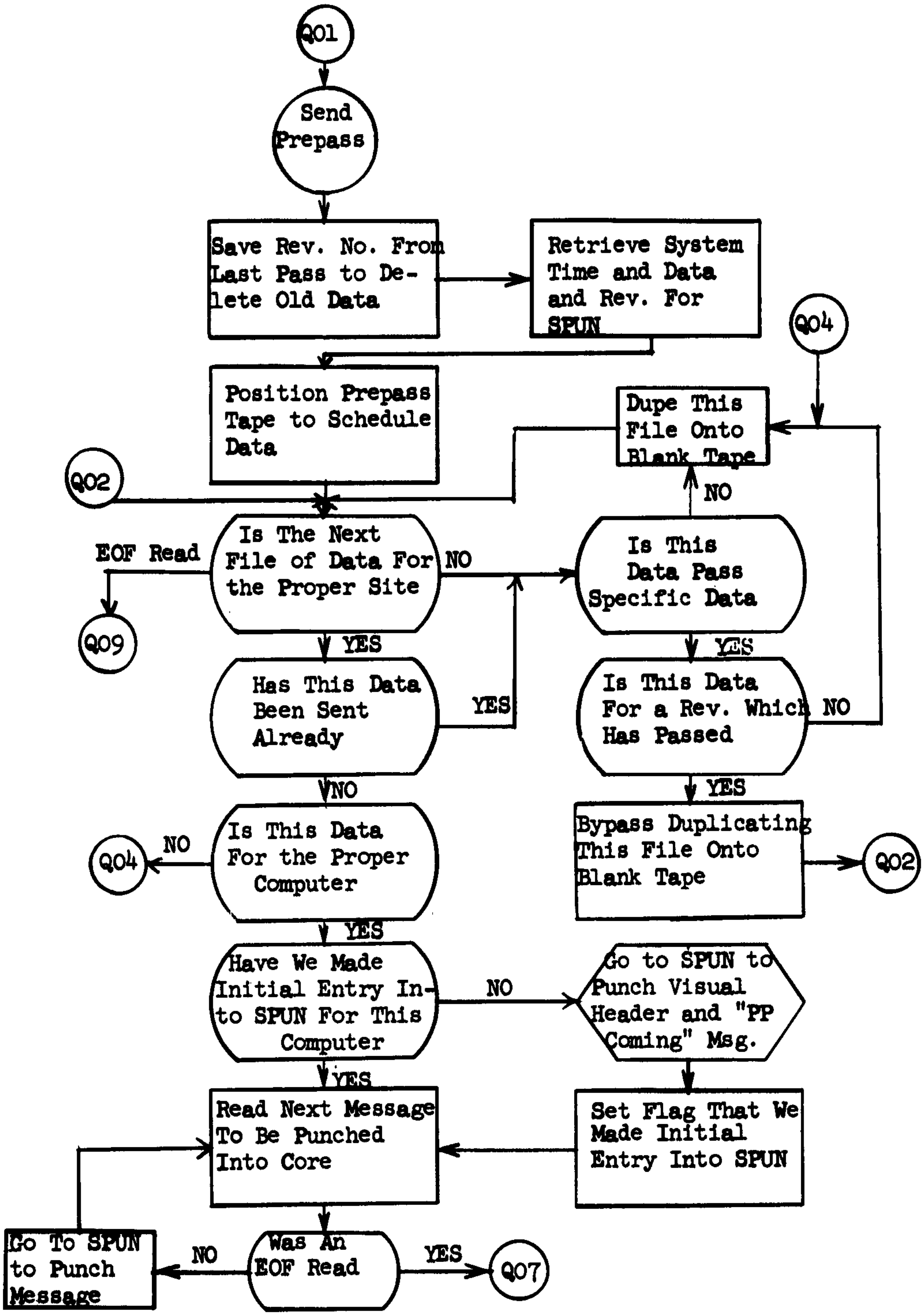

SPREPX
Housekeep Temporary Storage Registers
J01
Is The Ident Of The Prepass Tape Correct
NO
Is This A Blank Tape
NO
YES
Set Special Flags for Blank Tape
Rewind All Tapes
YES
Is Job To Read TLM Tables In?
YES
NO
Write Header On Blank Tape And On EOF
Go To Proper Routine To Complete Job
Send Prepass Q01
Read In Mode Tables R01
1604 Transfer of Prepass M01
1604 Transfer of SCHNOPS N01
Merge Cards S01
Merge Tape T01

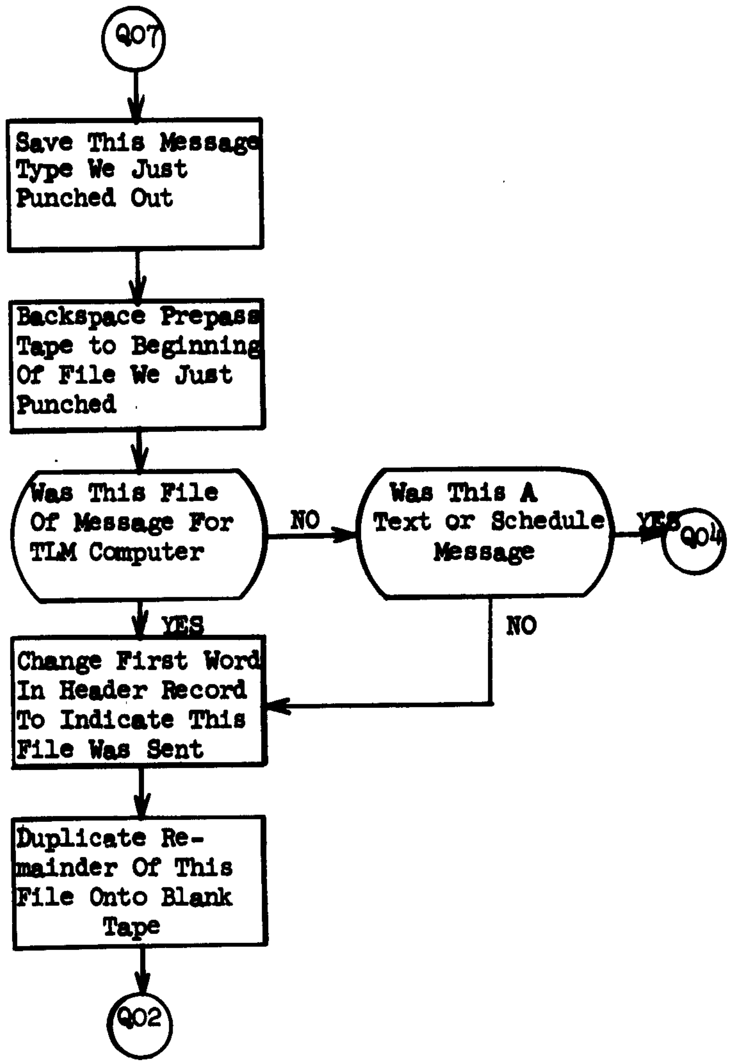

M01
1604 Transfer of Prepass
Set Initial Entrance Parameter For SIBBTC
Go to SIBBTC For First Message
M02B
Was Transfer Successful
NO
Print "Prepass Tape - Unit X"
Rewind All Tapes
Return to SXCONX
YES
Is This A Header Message (If Not, An ERROR)
NO
Print "1604 Data ERROR"
YES
M04
Convert Rev. No. to a Usable Format
M01A
Save Rev. And Site Ident From Header
M14
M05
Write an EOF On Blank Tape
M21
Transfer Complete
Get Next Message from 1604 via SIBBTC
ERROR
Transfer O. K.
M06

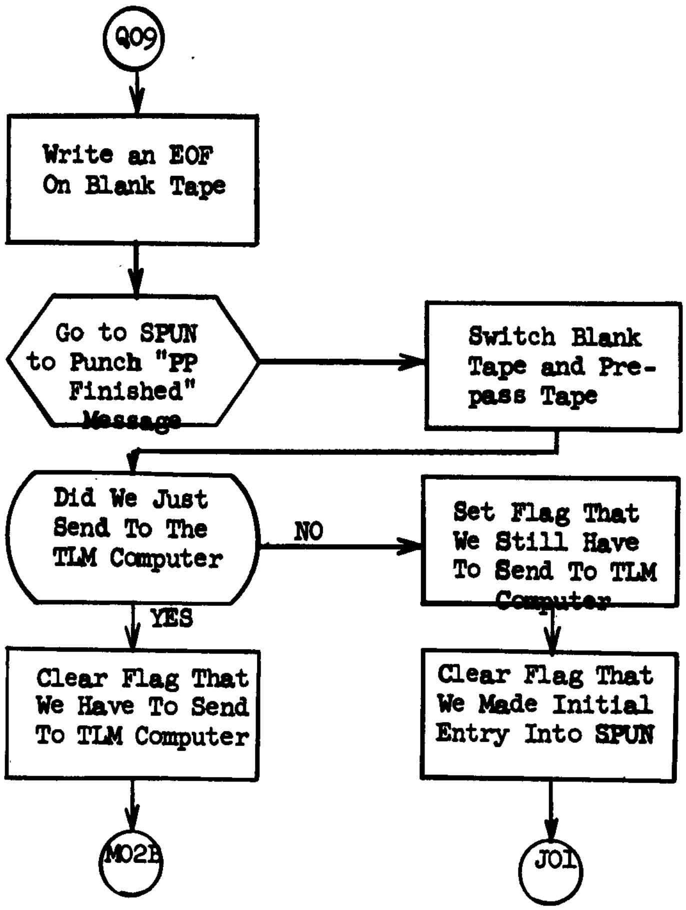

M06
Save Message Type
Is this the First Time we have Received this Type of Message
YES
Set Flag That This is Not the First Time Thru
NO
Is This Message Type The Same as The Last One
YES
NO
Write an EOF on Blank Tape
Is This A Header Message
YES
M04
NO
Is Site Ident The Same as That of the Last Message
NO ERROR
M01A
YES
Position Prepass Tape to Proper File
Write Header On Blank Tape
Write Message On Blank Tape
Was This a Command Message
YES
Verify That CMD Was Written Correctly on Tape
NO
M05

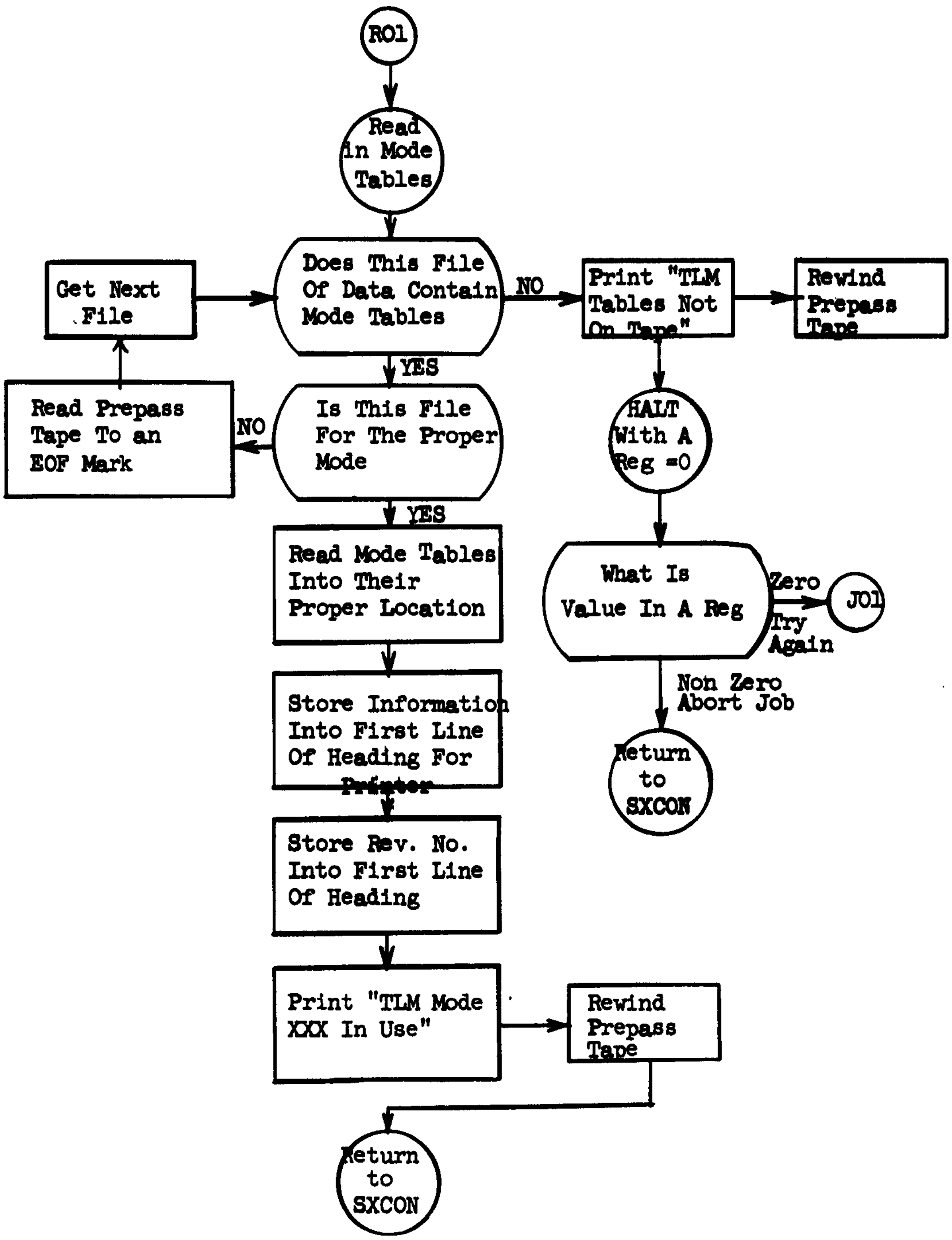

M21
Exit
For Job
Complete
Have We
Finished Reading
Prepass Tape
YES
Write an EOF
on Blank Tape
NO
Dupe Rest Of
Prepass Tape Onto
Blank Tape
Switch Blank
Tape and Prepass
Tape Numbers
M02B

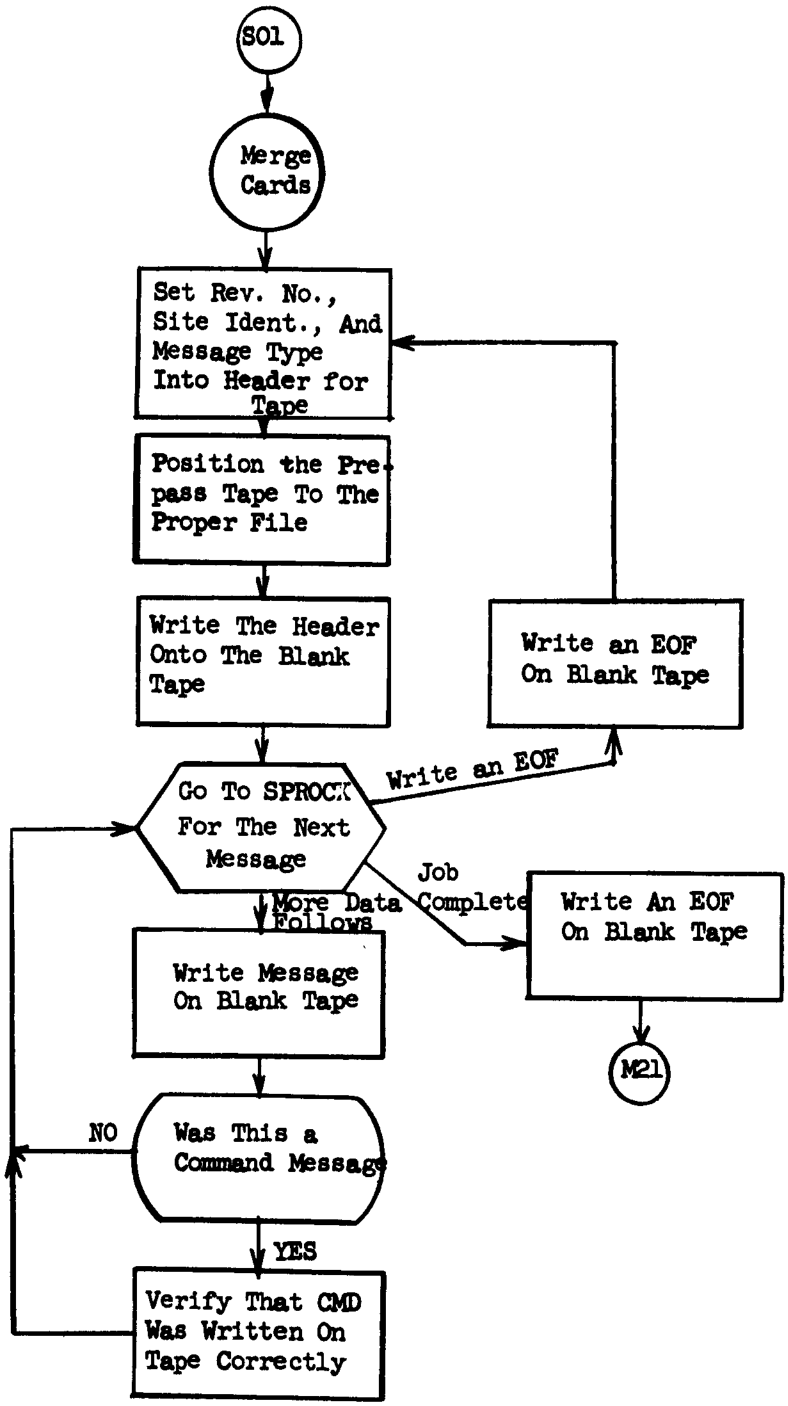

N01
1604 Transfer of SCHOPS
Set Initial Entrance Parameter for SIBBTC
To to SIBBTC For First Message
Is It a Text or Schedule Message
NO ERROR
M01A
YES
Save Site Ident From Message
Position Prepass Tape to Proper File
Write Header on Blank Tape
Write Message on Blank Tape
Go to SIBBTC for Next Message
Transfer O.K.
Transfer Complete
M14
Error
M01A

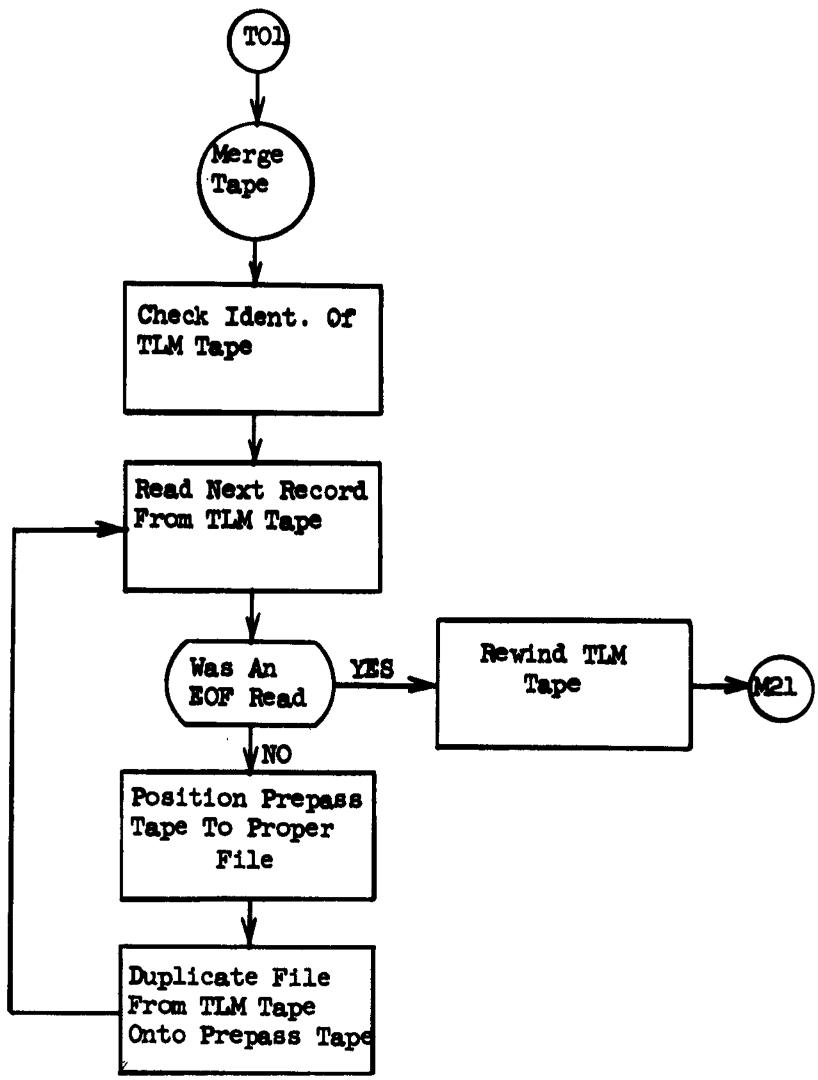

Q01
Send Prepass
Save Rev. No. From Last Pass to Delete Old Data
Retrieve System Time and Data and Rev. For SPUN
Q04
Position Prepass Tape to Schedule Data
Dupe This File Onto Blank Tape
Q02
NO
EOF Read
Is The Next File of Data For the Proper Site
NO
Is This Data Pass Specific Data
Q09
YES
YES
Has This Data Been Sent Already
YES
Is This Data For a Rev. Which Has Passed
NO
NO
YES
Q04
NO
Is This Data For the Proper Computer
Bypass Duplicating This File Onto Blank Tape
Q02
YES
Have We Made Initial Entry Into SPUN For This Computer
NO
Go to SPUN to Punch Visual Header and "PP Coming" Msg.
YES
Read Next Message To Be Punched Into Core
Set Flag That We Made Initial Entry Into SPUN
Go To SPUN to Punch Message
NO
Was An EOF Read
YES
Q07

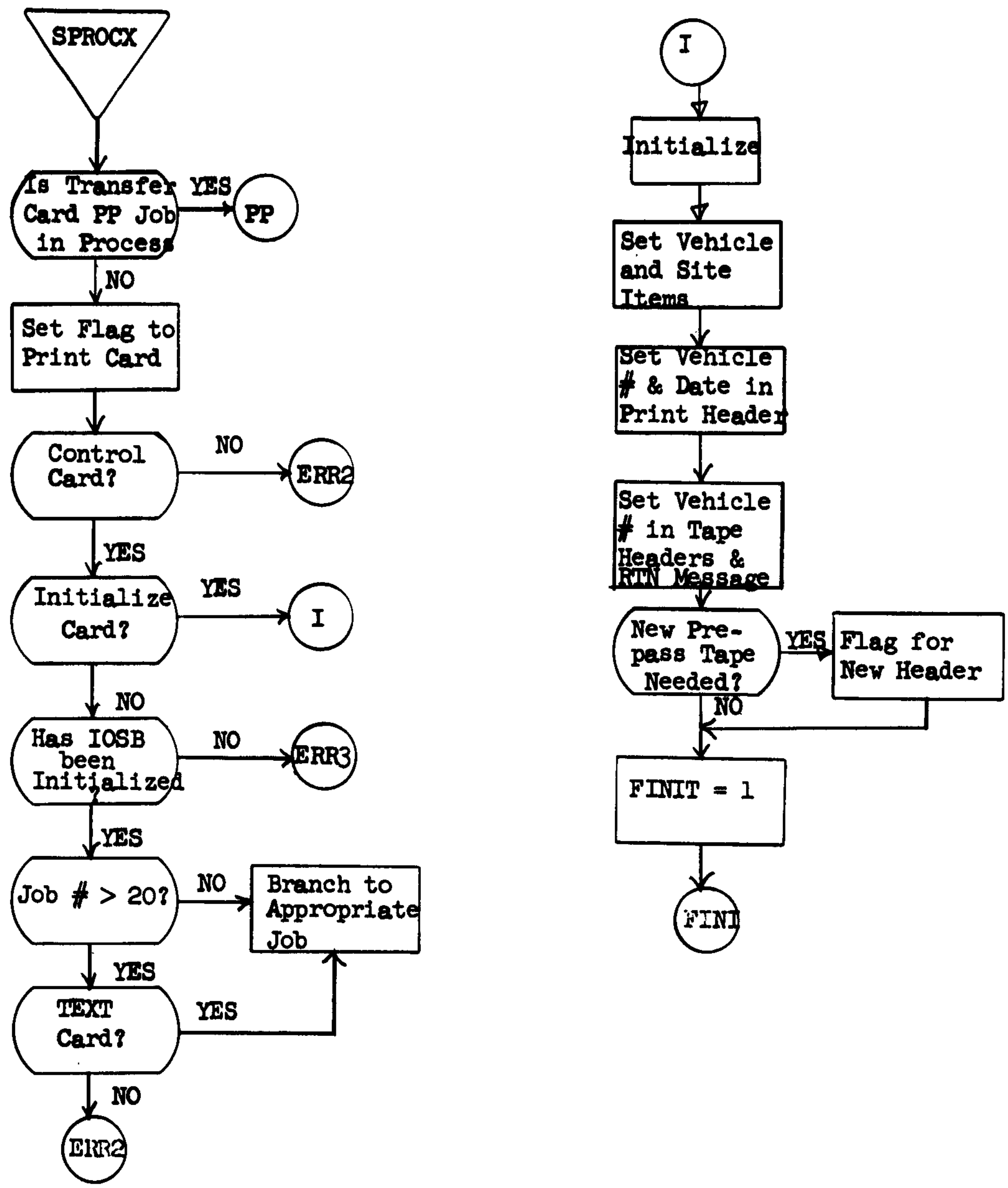

Q07
Save This Message Type We Just Punched Out
Backspace Prepass Tape to Beginning Of File We Just Punched
Was This File Of Message For TLM Computer
NO
Was This A Text or Schedule Message
YES
Q04
NO
YES
Change First Word In Header Record To Indicate This File Was Sent
Duplicate Remainder Of This File Onto Blank Tape
Q02

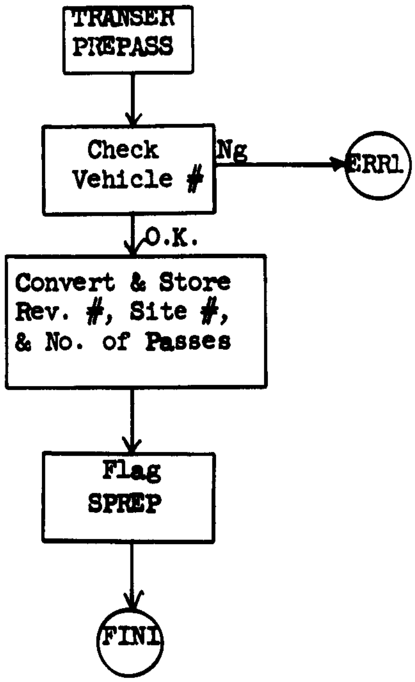

Q09
Write an EOF On Blank Tape
Go to SPUN to Punch "PP Finished" Message
Switch Blank Tape and Pre-pass Tape
Did We Just Send To The TLM Computer
NO
YES
Set Flag That We Still Have To Send To TLM Computer
Clear Flag That We Have To Send To TLM Computer
Clear Flag That We Made Initial Entry Into SPUN
M02B
J01

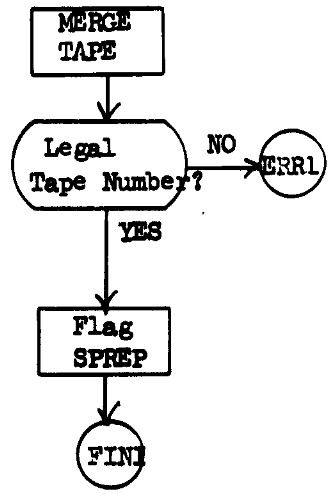

R01
Read in Mode Tables
Does This File Of Data Contain Mode Tables
NO
Print "TLM Tables Not On Tape"
Rewind Prepass Tape
Get Next File
YES
Is This File For The Proper Mode
NO
Read Prepass Tape To an EOF Mark
HALT With A Reg =0
YES
Read Mode Tables Into Their Proper Location
What Is Value In A Reg
Zero
Try Again
J01
Non Zero Abort Job
Return to SXCON
Store Information Into First Line Of Heading For Printer
Store Rev. No. Into First Line Of Heading
Print "TLM Mode XXX In Use"
Rewind Prepass Tape
Return to SXCON

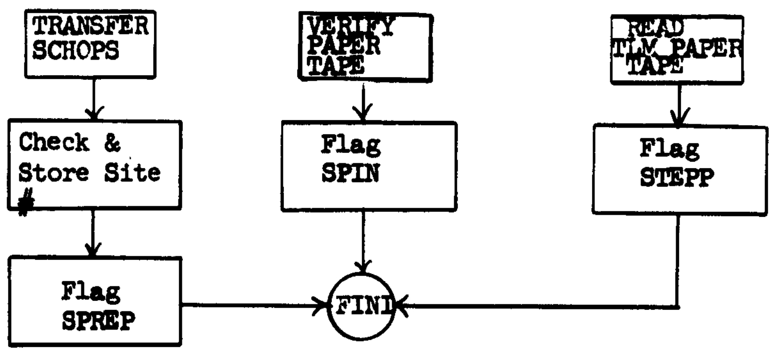

S01
Merge Cards
Set Rev. No., Site Ident., And Message Type Into Header for Tape
Position the Pre-pass Tape To The Proper File
Write The Header Onto The Blank Tape
Write an EOF On Blank Tape
Write an EOF
Go To SPROCK For The Next Message
Job Complete
More Data Follows
Write An EOF On Blank Tape
M21
Write Message On Blank Tape
NO
Was This a Command Message
YES
Verify That CMD Was Written On Tape Correctly

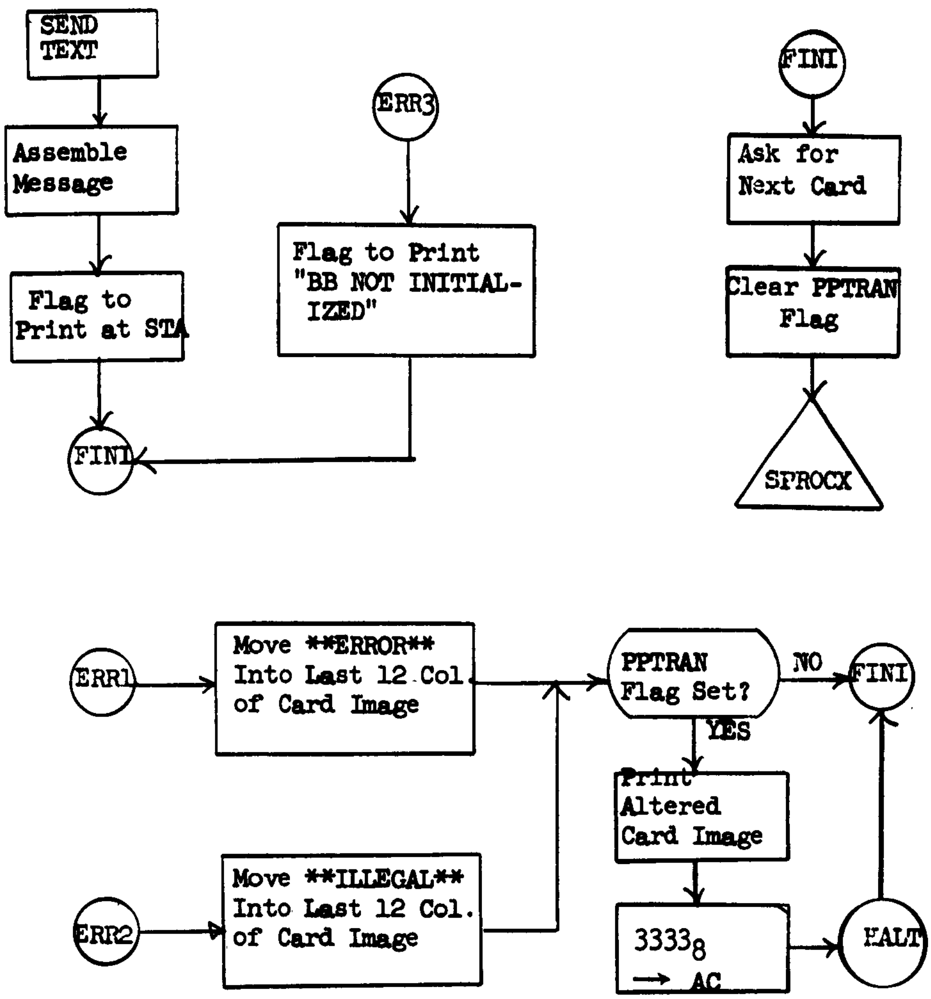

T01
Merge Tape
Check Ident. Of TLM Tape
Read Next Record From TLM Tape
Was An EOF Read
YES
Rewind TLM Tape
M21
NO
Position Prepass Tape To Proper File
Duplicate File From TLM Tape Onto Prepass Tape

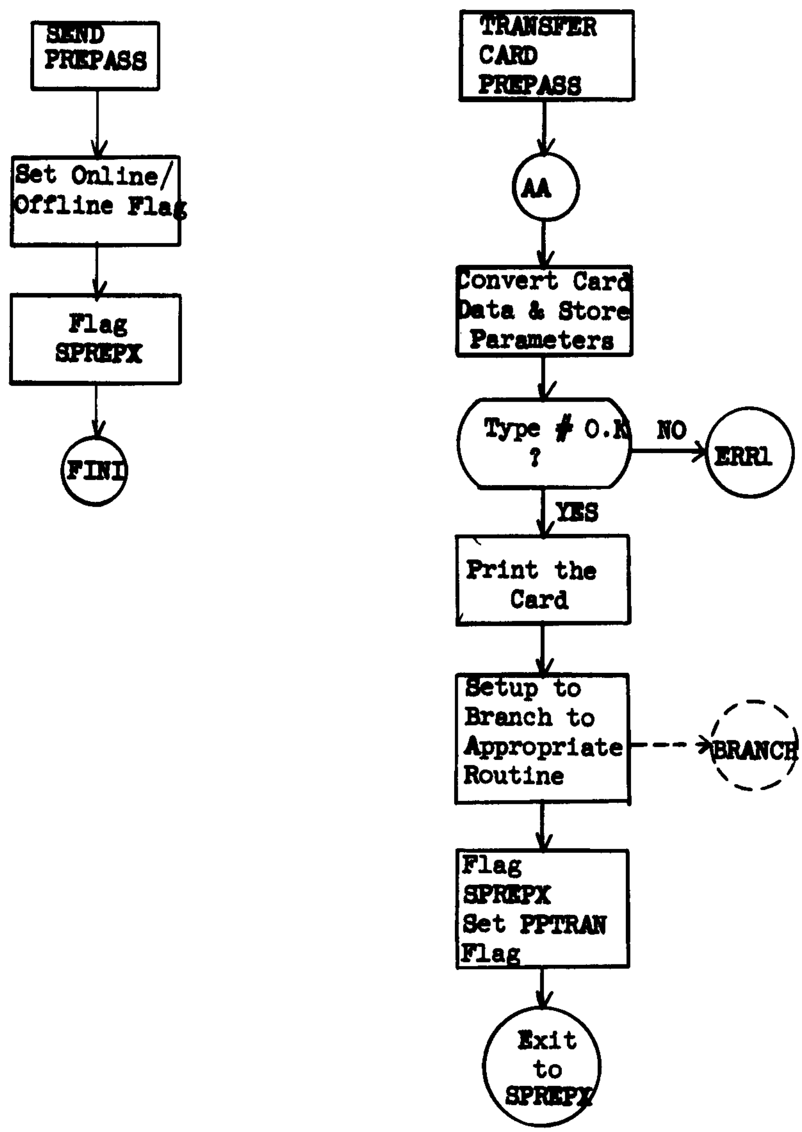

SPROCX
Is Transfer Card PP Job in Process
YES
PP
NO
Set Flag to Print Card
Control Card?
NO
ERR2
YES
Initialize Card?
YES
I
NO
Has IOSB been Initialized
NO
ERR3
YES
Job # > 20?
NO
Branch to Appropriate Job
YES
TEXT Card?
YES
NO
ERR2
I
Initialize
Set Vehicle and Site Items
Set Vehicle # & Date in Print Header
Set Vehicle # in Tape Headers & RTN Message
New Pre-pass Tape Needed?
YES
Flag for New Header
NO
FINIT = 1
FINI

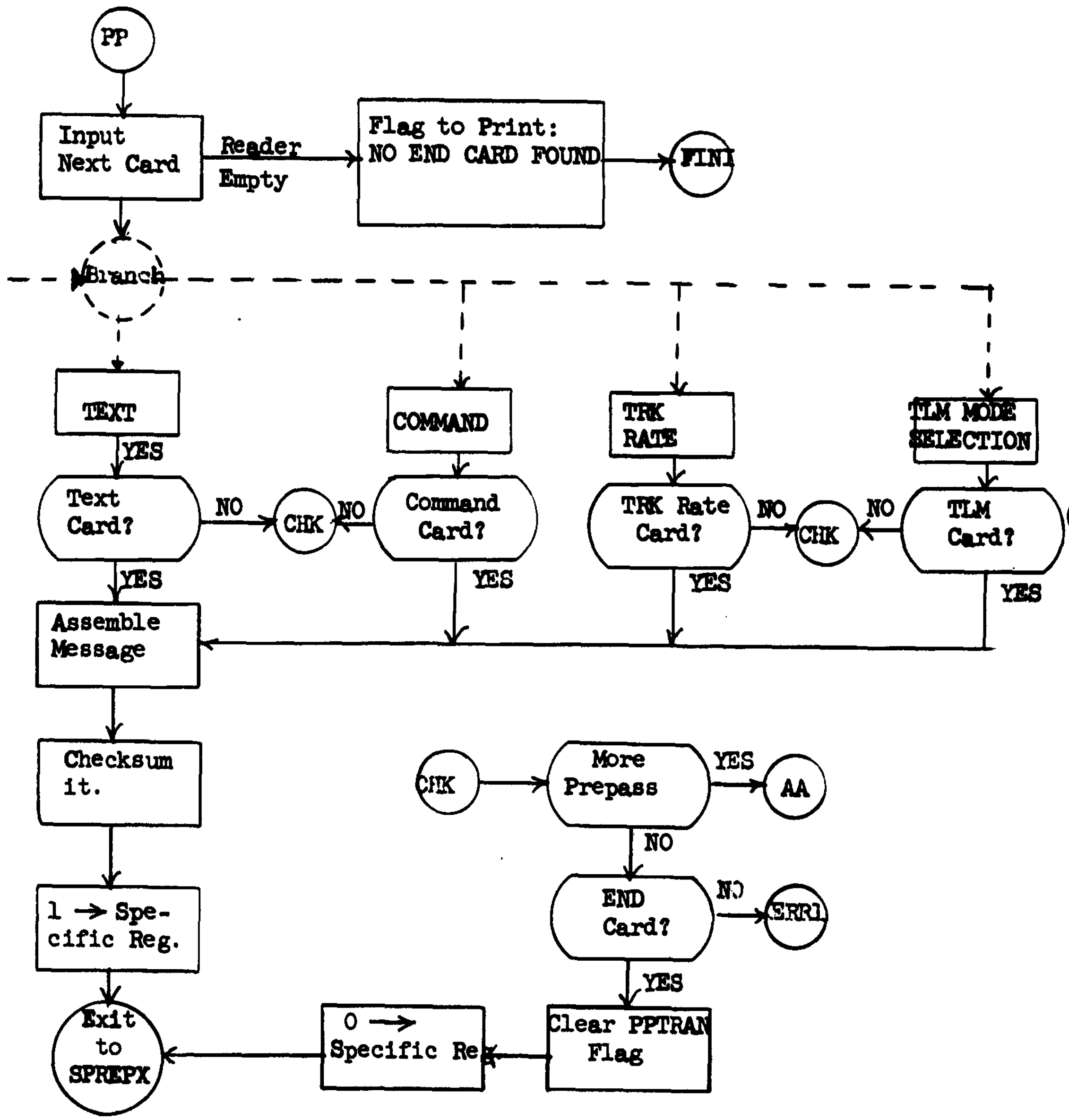

TRANSER PREPASS
Check Vehicle #
Ng
ERR1
O.K.
Convert & Store Rev. #, Site #, & No. of Passes
Flag SPREP
FINI

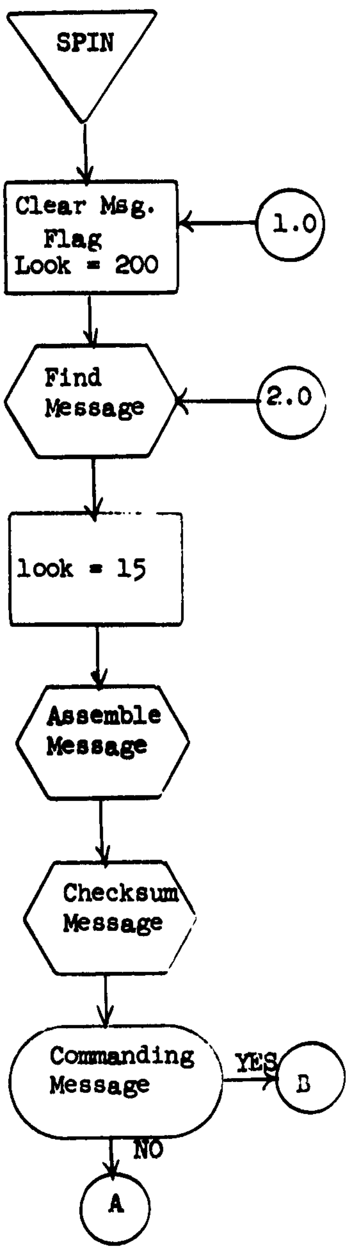

MERGE TAPE
Legal Tape Number?
NO
ERR1
YES
Flag SPREP
FINI

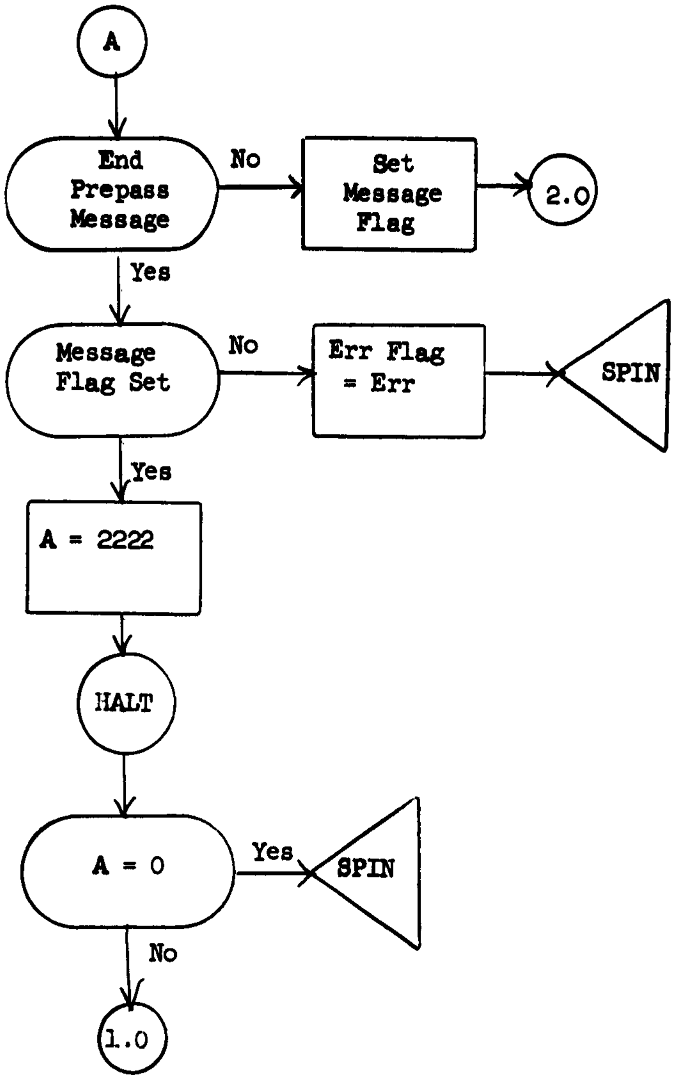

TRANSFER SCHOPS
Check & Store Site #
Flag SPREP
VERIFY PAPER TAPE
Flag SPIN
READ TLM PAPER TAPE
Flag STEPP
FINI

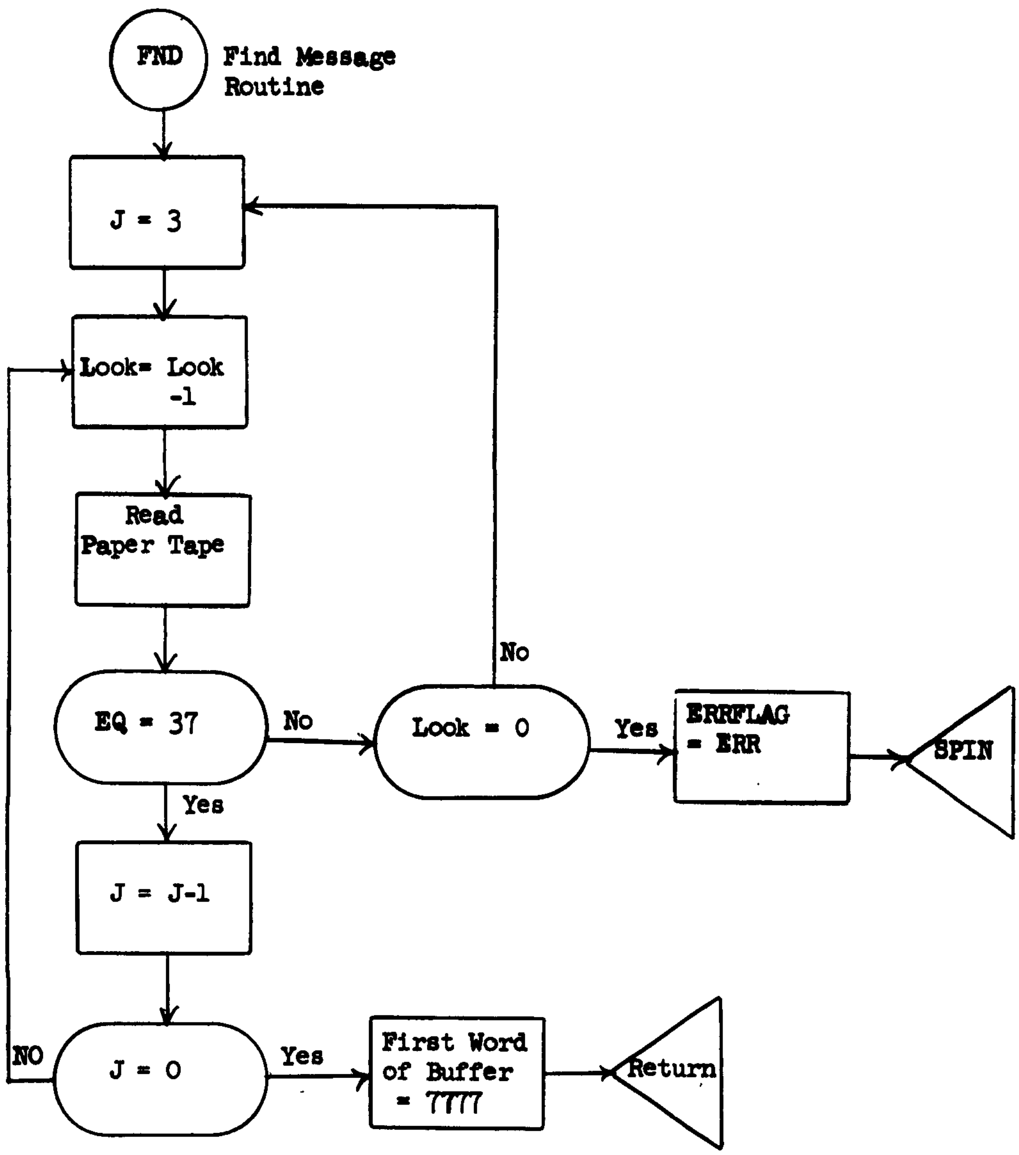

SEND TEXT
Assemble Message
Flag to Print at STA
FINI
ERR3
Flag to Print "BB NOT INITIAL-IZED"
FINI
Ask for Next Card
Clear PPTRAN Flag
SPROCX
ERR1
Move **ERROR** Into Last 12 Col. of Card Image
ERR2
Move **ILLEGAL** Into Last 12 Col. of Card Image
PPTRAN Flag Set?
NO
YES
FINI
Print Altered Card Image
3333₈ → AC
HALT

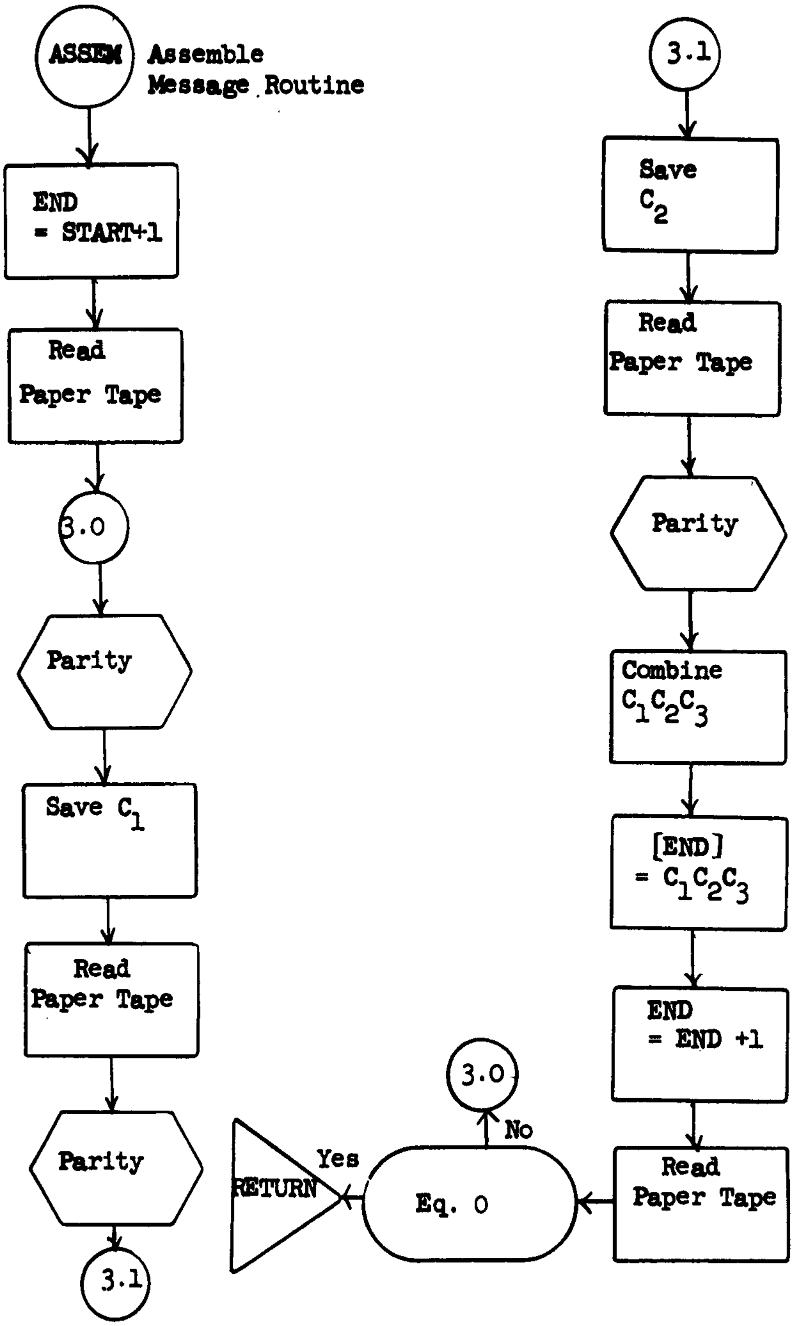

SEND PREPASS
Set Online/ Offline Flag
Flag SPREPX
FINI
TRANSFER CARD PREPASS
AA
Convert Card Data & Store Parameters
Type # O.K ?
NO
ERR1
YES
Print the Card
Setup to Branch to Appropriate Routine
BRANCH
Flag SPREPX Set PPTRAN Flag
Exit to SPREPX

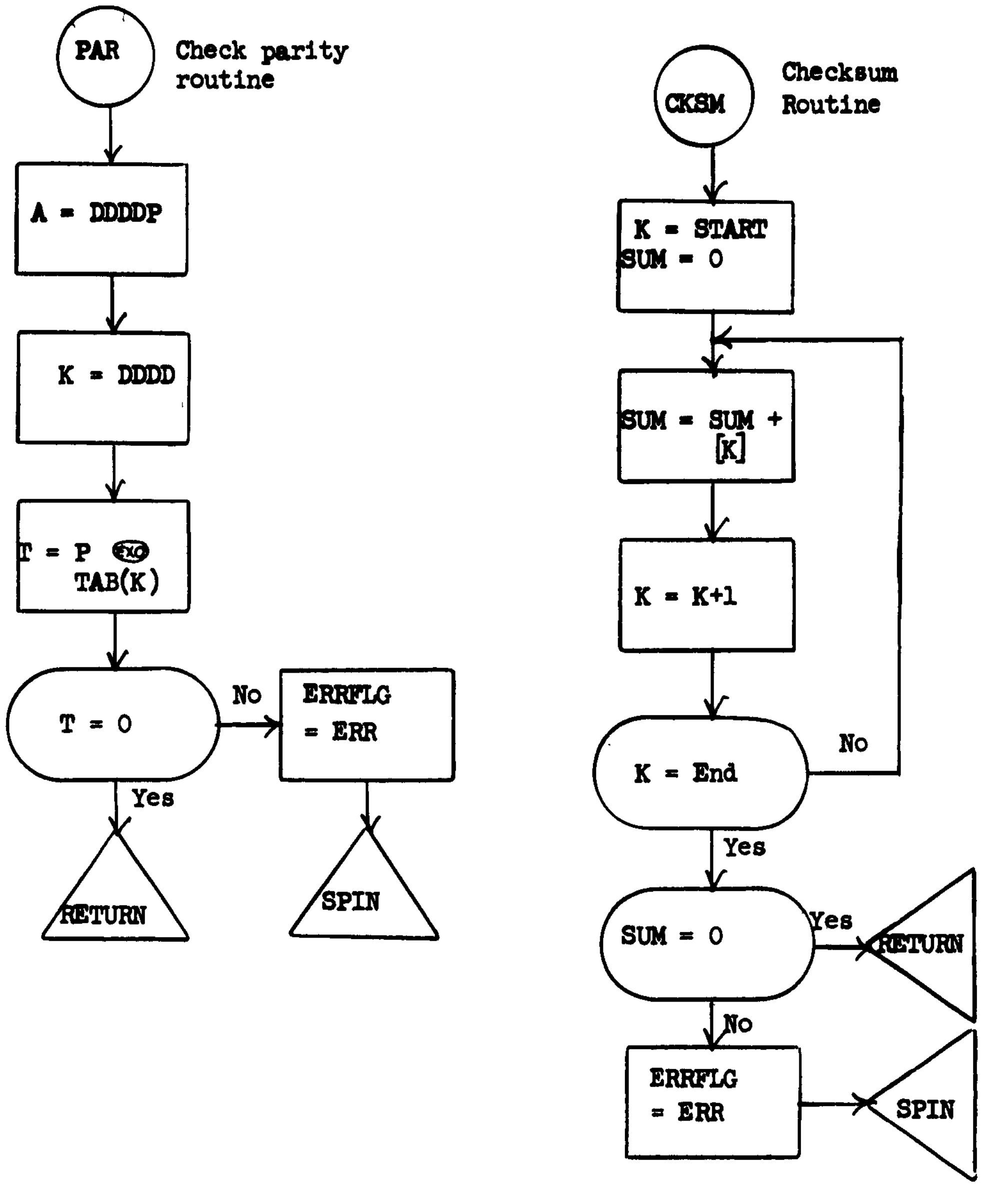

PP
Input Next Card
Reader Empty
Flag to Print: NO END CARD FOUND
FINI
Branch
TEXT
YES
Text Card?
NO
CHK
NO
COMMAND
Command Card?
YES
TRK RATE
TRK Rate Card?
NO
CHK
NO
TLM MODE SELECTION
TLM Card?
YES
YES
YES
Assemble Message
Checksum it.
1 → Specific Reg.
Exit to SPREPX
CHK
More Prepass
YES
AA
NO
END Card?
NO
ERR1
YES
Clear PPTRAN Flag
0 → Specific Reg

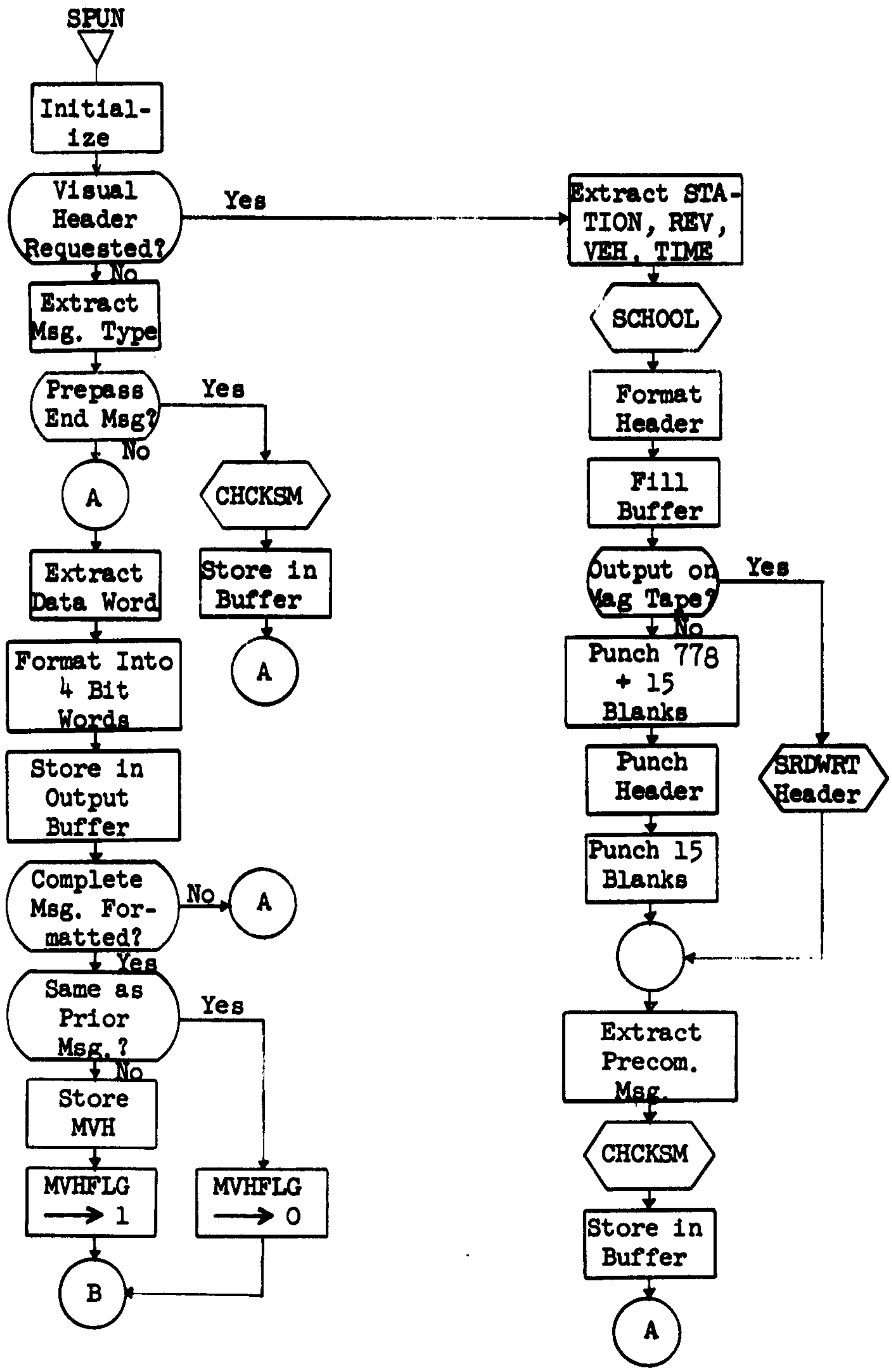

SPIN
Clear Msg. Flag
Look = 200
1.0
Find Message
2.0
look = 15
Assemble Message
Checksum Message
Commanding Message
YES
B
NO
A
B
Find Message
Look = 15
Assemble Message
Checksum Message
Compare Messages
2.0

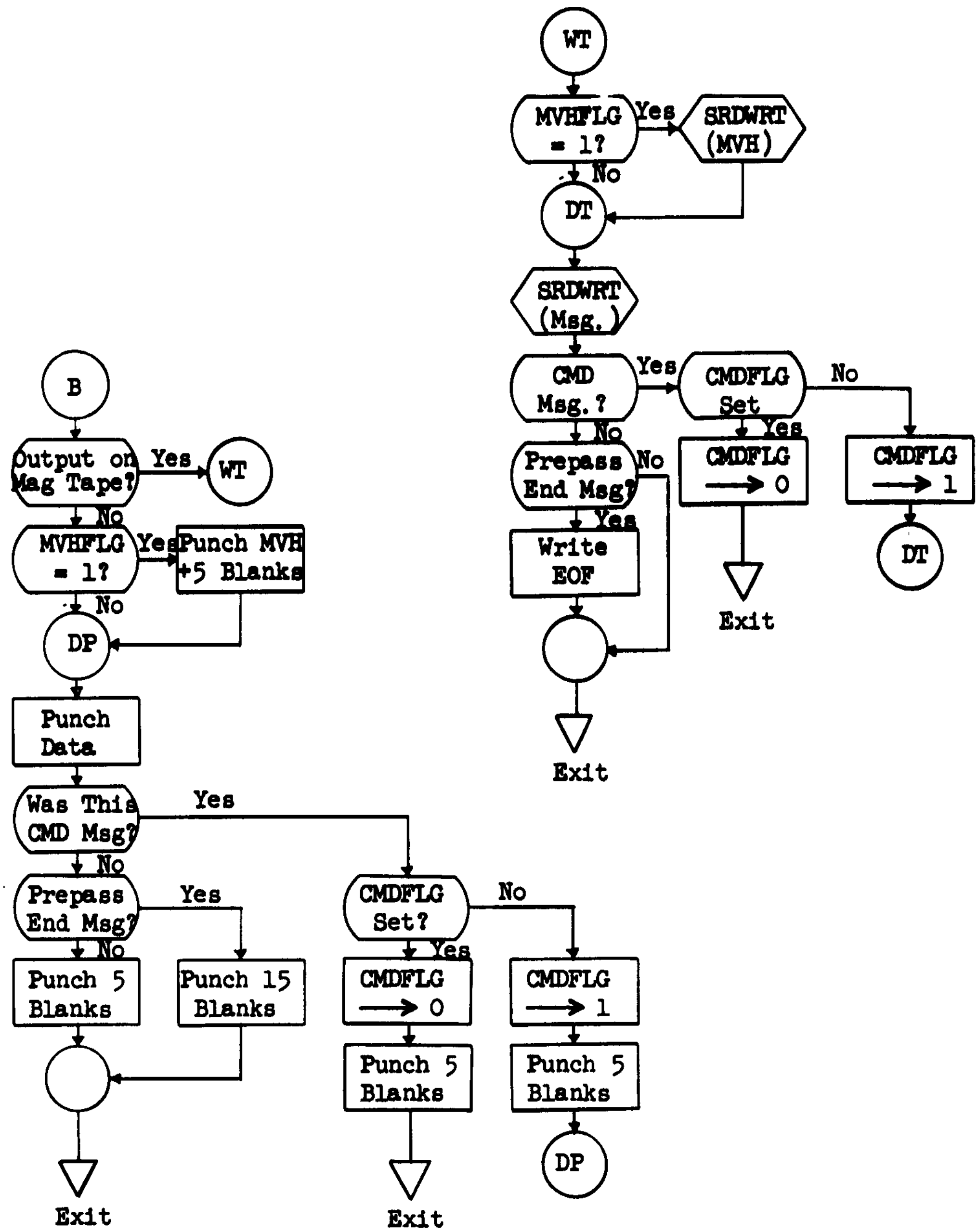

A
End Prepass Message
No
Set Message Flag
2.0
Yes
Message Flag Set
No
Err Flag = Err
SPIN
Yes
A = 2222
HALT
A = 0
Yes
SPIN
No
1.0

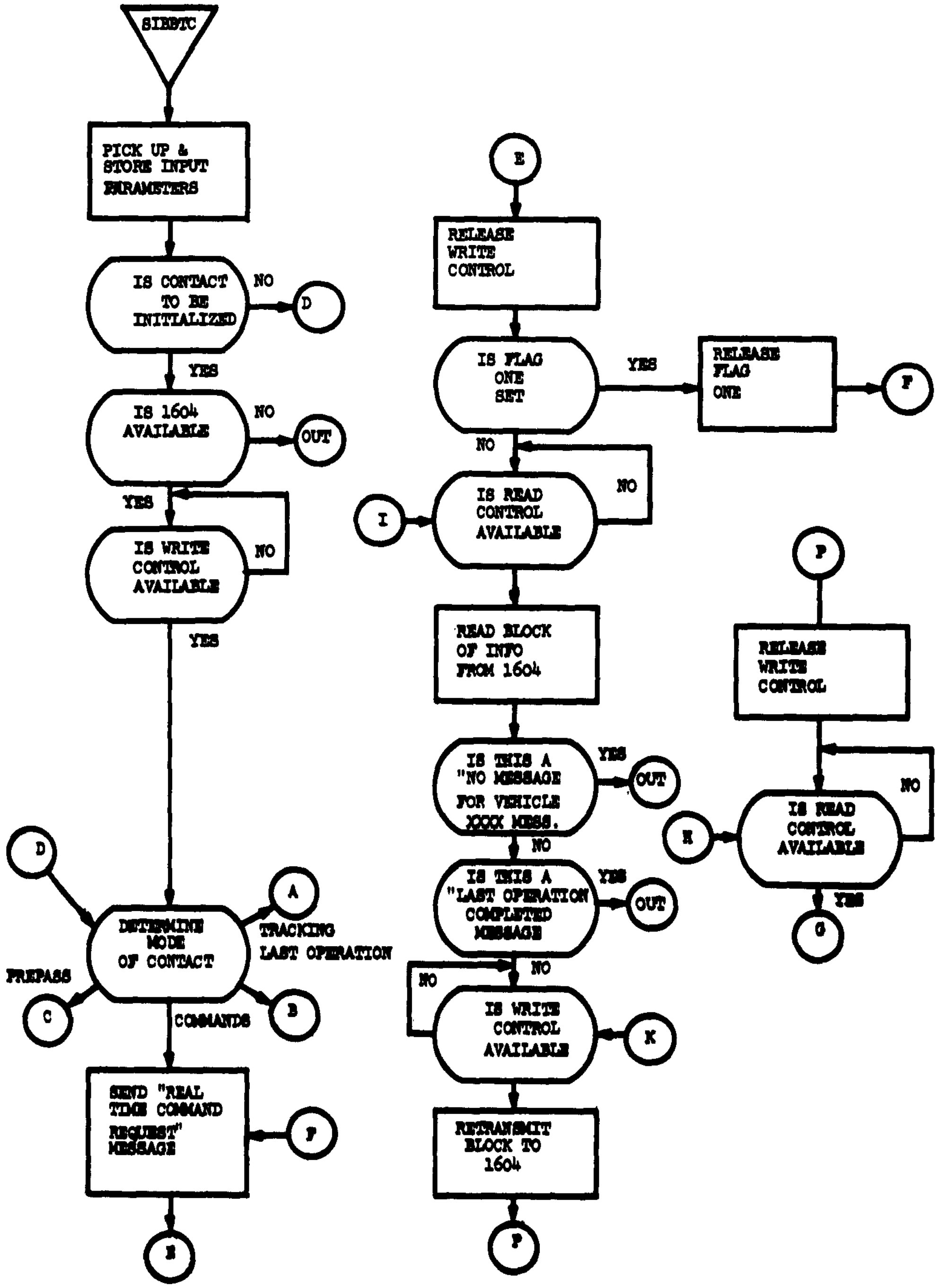

FND
Find Message Routine
J = 3
Look= Look -1
Read Paper Tape
EQ = 37
No
Look = 0
No
Yes
ERRFLAG = ERR
SPIN
Yes
J = J-1
J = 0
NO
Yes
First Word of Buffer = 7777
Return


ASSEM
Assemble Message Routine
END = START+1
Read Paper Tape
3.0
Parity
Save C_1
Read Paper Tape
Parity
3.1
3.1
Save C_2
Read Paper Tape
Parity
Combine $C_1C_2C_3$
[END] = $C_1C_2C_3$
END = END +1
Read Paper Tape
Eq. 0
No
3.0
Yes
RETURN

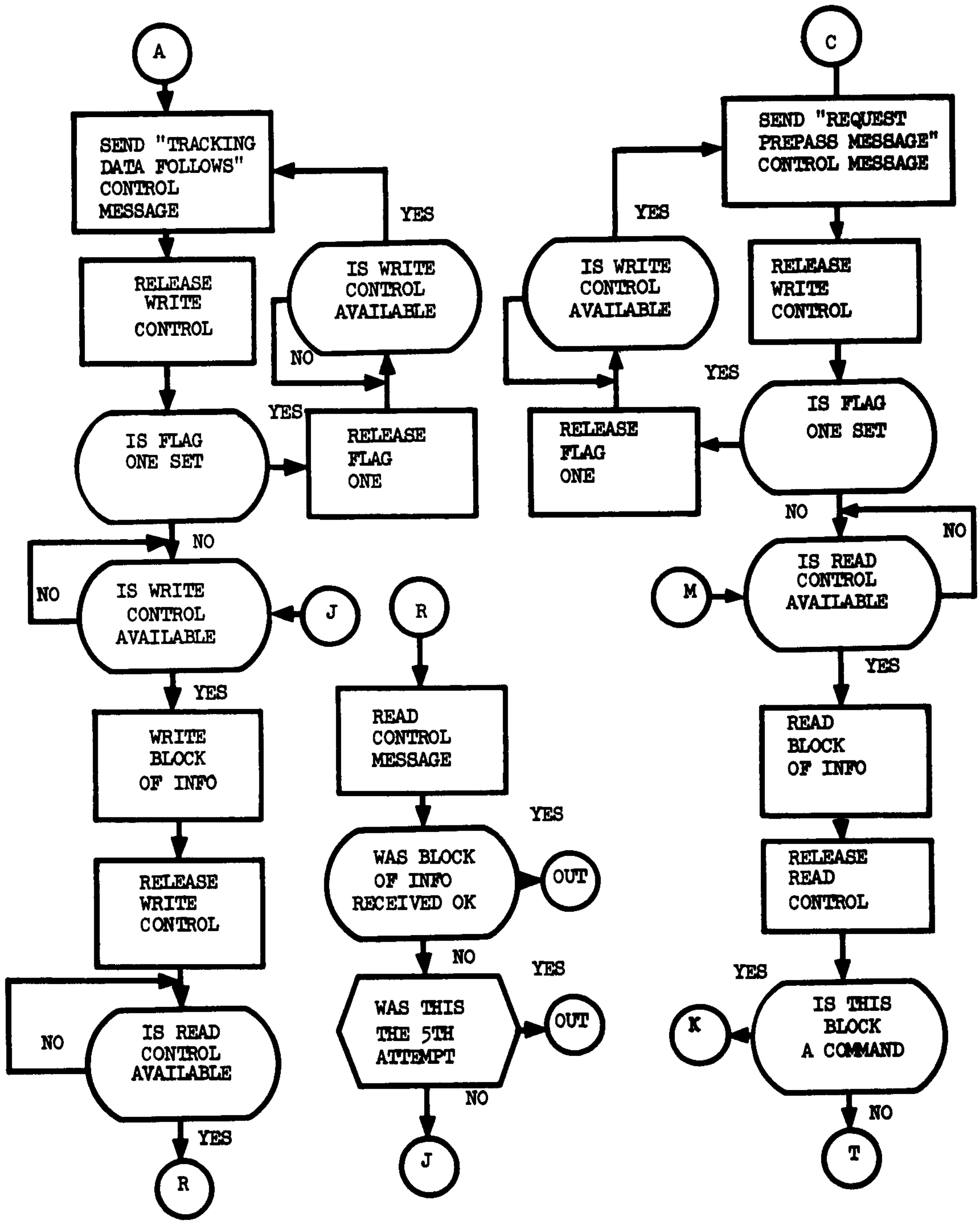

PAR
Check parity routine
A = DDDDP
K = DDDD
T = P EXO TAB(K)
T = 0
No
ERRFLG = ERR
Yes
RETURN
SPIN
CKSM
Checksum Routine
K = START
SUM = 0
SUM = SUM + [K]
K = K+1
K = End
No
Yes
SUM = 0
Yes
RETURN
No
ERRFLG = ERR
SPIN

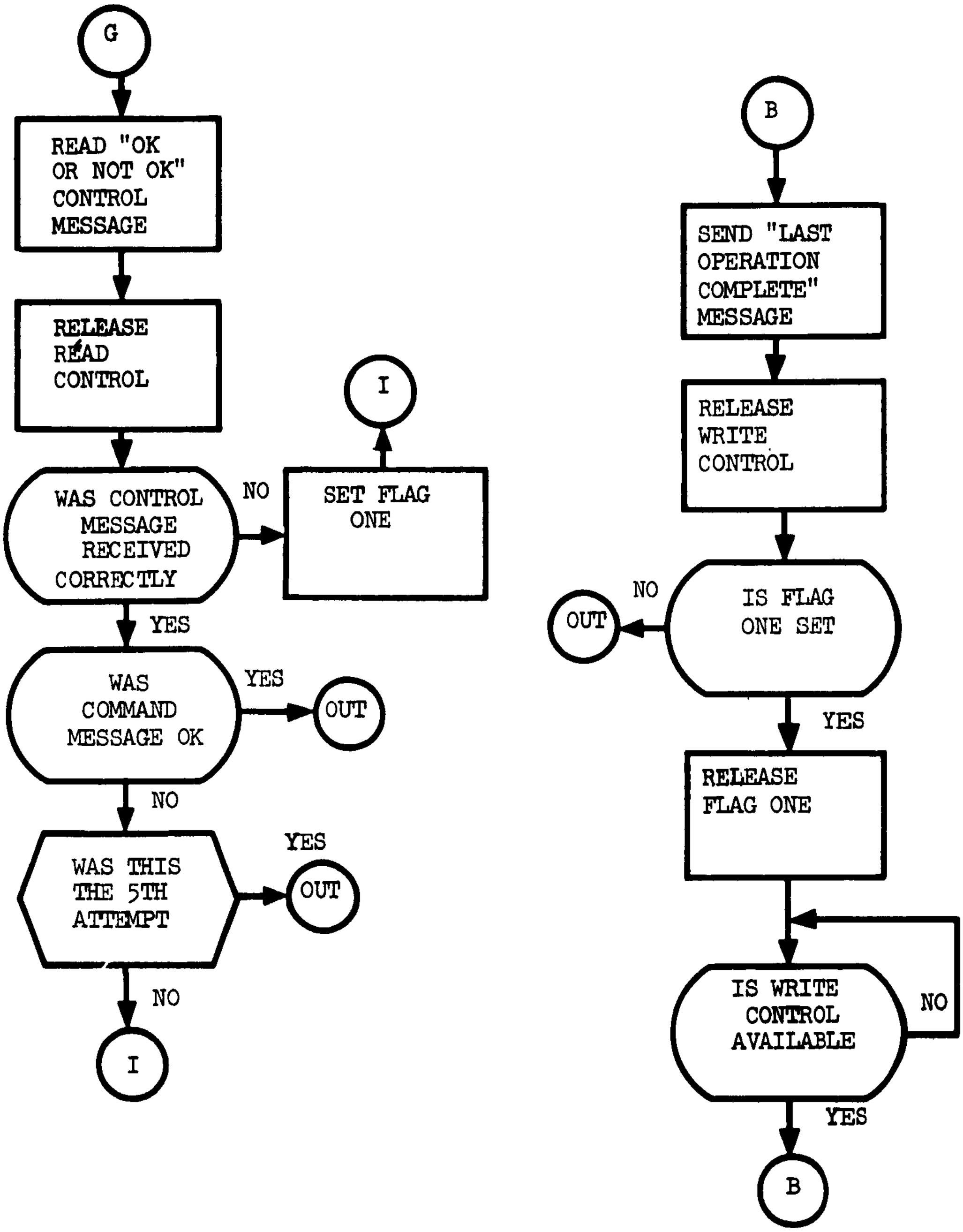

SPUN
Initial-ize
Visual Header Requested?
Yes
No
Extract Msg. Type
Prepass End Msg?
Yes
No
A
CHCKSM
Store in Buffer
A
Extract Data Word
Format Into 4 Bit Words
Store in Output Buffer
Complete Msg. For-matted?
No
A
Yes
Same as Prior Msg.?
Yes
No
Store MVH
MVHFLG → 1
MVHFLG → 0
B
Extract STA-TION, REV, VEH, TIME
SCHOOL
Format Header
Fill Buffer
Output on Mag Tape?
Yes
No
Punch 778 + 15 Blanks
SRDWRT Header
Punch Header
Punch 15 Blanks
Extract Precom. Msg.
CHCKSM
Store in Buffer
A

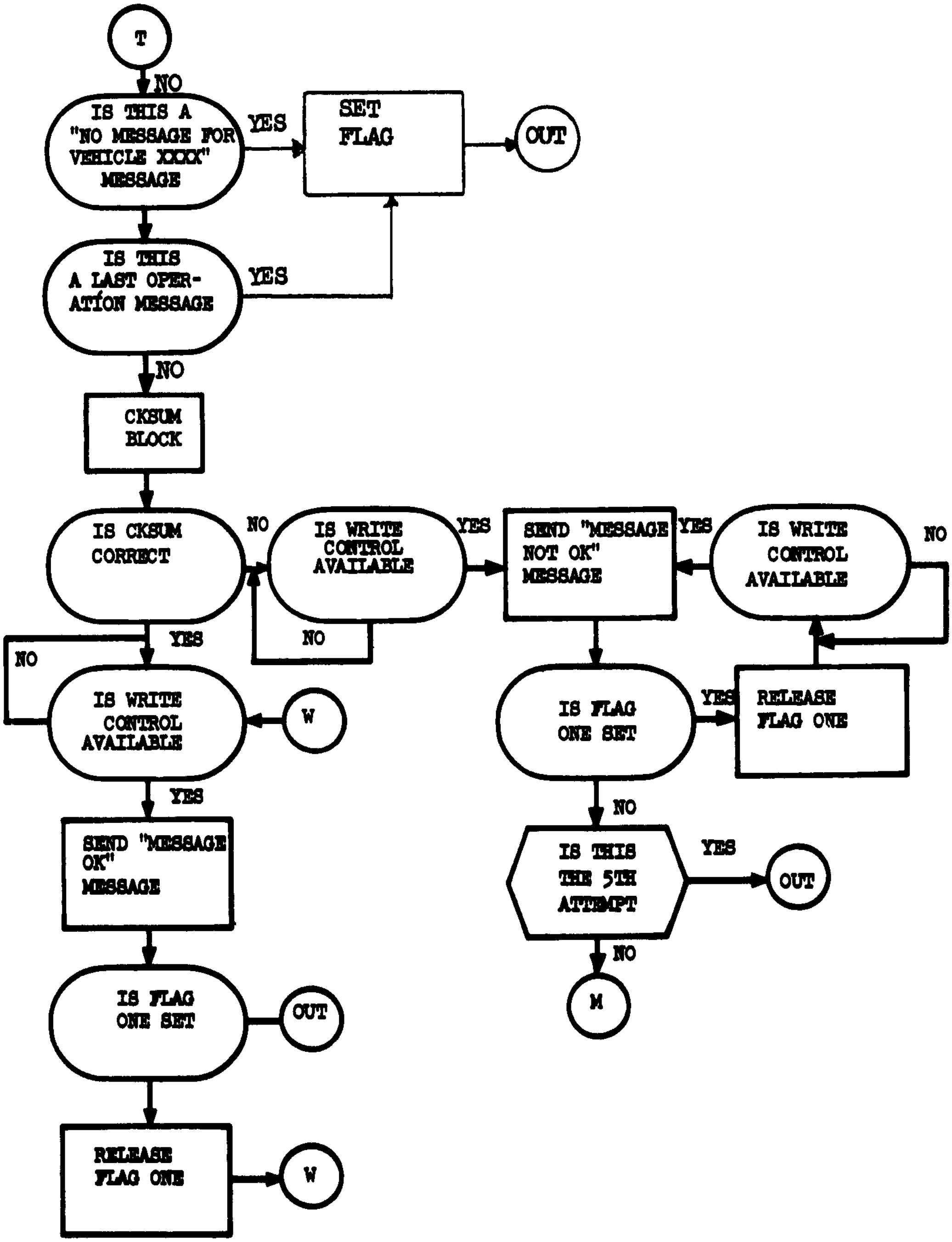

WT
MVHFLG = 1?
Yes
SRDWRT (MVH)
No
DT
SRDWRT (Msg.)
CMD Msg.?
Yes
CMDFLG Set
No
Yes
CMDFLG → 0
CMDFLG → 1
Exit
DT
No
Prepass End Msg?
No
Yes
Write EOF
Exit
B
Output on Mag Tape?
Yes
WT
No
MVHFLG = 1?
Yes
Punch MVH +5 Blanks
No
DP
Punch Data
Was This CMD Msg?
Yes
No
Prepass End Msg?
Yes
No
Punch 5 Blanks
Punch 15 Blanks
Exit
CMDFLG Set?
No
Yes
CMDFLG → 0
CMDFLG → 1
Punch 5 Blanks
Punch 5 Blanks
Exit
DP

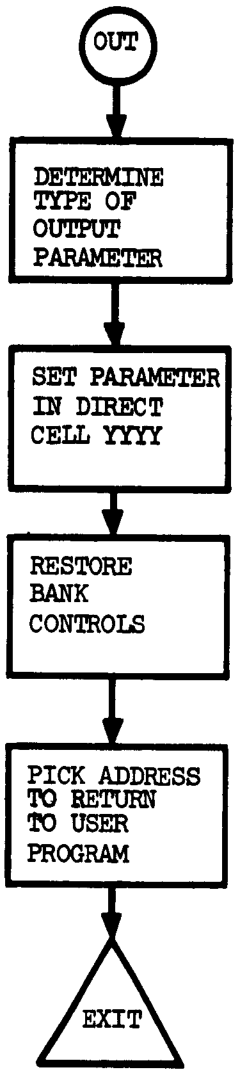


Bird Buffer/1604 Communication Module (SIBBTC)


A
SEND "TRACKING DATA FOLLOWS" CONTROL MESSAGE
RELEASE WRITE CONTROL
IS FLAG ONE SET
YES
RELEASE FLAG ONE
IS WRITE CONTROL AVAILABLE
YES
NO
NO
IS WRITE CONTROL AVAILABLE
J
NO
YES
WRITE BLOCK OF INFO
RELEASE WRITE CONTROL
IS READ CONTROL AVAILABLE
NO
YES
R
R
READ CONTROL MESSAGE
WAS BLOCK OF INFO RECEIVED OK
YES
OUT
NO
WAS THIS THE 5TH ATTEMPT
YES
OUT
NO
J
C
SEND "REQUEST PREPASS MESSAGE" CONTROL MESSAGE
RELEASE WRITE CONTROL
IS FLAG ONE SET
YES
RELEASE FLAG ONE
IS WRITE CONTROL AVAILABLE
YES
NO
IS READ CONTROL AVAILABLE
M
NO
YES
READ BLOCK OF INFO
RELEASE READ CONTROL
IS THIS BLOCK A COMMAND
YES
K
NO
T


G
READ "OK OR NOT OK" CONTROL MESSAGE
RELEASE READ CONTROL
WAS CONTROL MESSAGE RECEIVED CORRECTLY
NO
SET FLAG ONE
I
YES
WAS COMMAND MESSAGE OK
YES
OUT
NO
WAS THIS THE 5TH ATTEMPT
YES
OUT
NO
I
B
SEND "LAST OPERATION COMPLETE" MESSAGE
RELEASE WRITE CONTROL
IS FLAG ONE SET
NO
OUT
YES
RELEASE FLAG ONE
IS WRITE CONTROL AVAILABLE
NO
YES
B


T
NO
IS THIS A "NO MESSAGE FOR VEHICLE XXXX" MESSAGE
YES
SET FLAG
OUT
IS THIS A LAST OPERATION MESSAGE
YES
NO
CKSUM BLOCK
IS CKSUM CORRECT
NO
IS WRITE CONTROL AVAILABLE
YES
NO
SEND "MESSAGE NOT OK" MESSAGE
YES
IS WRITE CONTROL AVAILABLE
NO
YES
NO
IS WRITE CONTROL AVAILABLE
W
YES
SEND "MESSAGE OK" MESSAGE
IS FLAG ONE SET
OUT
RELEASE FLAG ONE
W
IS FLAG ONE SET
YES
RELEASE FLAG ONE
NO
IS THIS THE 5TH ATTEMPT
YES
OUT
NO
M


OUT
DETERMINE TYPE OF OUTPUT PARAMETER
SET PARAMETER IN DIRECT CELL YYYY
RESTORE BANK CONTROLS
PICK ADDRESS TO RETURN TO USER PROGRAM
EXIT

APPENDIX B

Station to STC Paper Tape Formats

1.0 GENERAL

All paper tapes transmitted from an RTS to the STC will begin with a visual header whose order and contents are given below.

1.1 STATION NUMBER

The visual representation of the two digit decimal station number of the transmitting station.

1.2 COMPUTER

Two-character identifier specifying the transmitting computer ("TC" = T & C computer; "TM" - TLM computer). The "TC" will indicate Tracking and Vehicle time to be processed by the 1604 computer. The "TM" will indicate telemetry and status data to be processed by the IOSB.

1.3 VEHICLE NUMBER

Visual representation of the four digit decimal vehicle number.

1.4 REVOLUTION NUMBER

Visual representation of the four-digit revolution number in the form RRR.R.

2.0 TELEMETRY PAPER TAPE

The telemetry paper tape will contain telemetry and status/alarm messages. It will be processed by the IOSB.

2.1 FORMAT OF TELEMETRY PAPER TAPE

The paper tape will consist of the following components.

2.1.1 Visual Header. A visual header will begin the paper tape.

2.1.2 Real Time Message. This message will precede the first telemetry messages and will be repeated after each transmission ending message.

2.1.3 Transmission Ending Message. This message will appear following X seconds of data, thus segmenting telemetry data into an X-second block.

2.1.4 <u>Telemetry and status/alarm messages</u>.

2.1.5 <u>Fade Messages</u>. A Fade Message will terminate the paper tape.

2 SAMPLE PAPER TAPES

2.2.1 Telemetry Report Header Message

H_{11}	H_7	H_3	S_5	S_1	A_3	M_{11}	M_7	M_3	C_{11}	C_7	C_3
H_{10}	H_6	H_2	S_4	S_0	A_2	M_{10}	M_6	M_2	C_{10}	C_6	C_2
H_9	H_5	H_1	S_3	A_5	A_1	M_9	M_5	M_1	C_9	C_5	C_1
H_8	H_4	H_0	S_2	A_4	A_0	M_8	M_4	M_0	C_8	C_4	C_0
P	P	P	P	P	P	P	P	P	P	P	P

$H_{11} - H_0$ = New Message Header (all 1's).
$S_5 - S_0$ = Station Number.
$A_5 - A_0$ = Message Code (001010 = 12).
$M_{11} - M_0$ = Telemetry Mode.
$C_{11} - C_0$ = Arithmetic Complement Checksum of the header message.
P's = Parity (odd).

2.2.2 Telemetry Report Fade Message

K_{11}	K_7	K_3	----------------------	H_{11}	H_7	H_3	S_5	S_1	A_3	R_{11}	R_7	R_3	F_{11}	F_7	F_3
K_{10}	K_6	K_2	----(15 blanks)----	H_{10}	H_6	H_2	S_4	S_0	A_2	R_{10}	R_6	R_2	F_{10}	F_6	F_2
K_9	K_5	K_1	----------------------	H_9	H_5	H_1	S_3	A_5	A_1	R_9	R_5	R_1	F_9	F_5	F_1
K_8	K_4	K_0	----------------------	H_8	H_4	H_0	S_2	A_4	A_0	R_8	R_4	R_0	F_8	F_4	F_0
P	P	P	----------------------	P	P	P	P	P	P	P	P	P	P	P	P

K_{11} - K_0 = Last message Arithmetic Complement Checksum.
H_{11} - H_0 = New Message Header (7777).
S_5 - S_0 = Station Number.
A_5 - A_0 = Message Code (010000 = 20)
R_{11} - R_0 = Fade Message Ident (010000000011 = 2003).
F_{11} - F_0 = Fade Message Arithmetic Complement Checksum.
P's = Parity (odd).

2.2.3 Telemetry Report Message

H_{11}	H_7	H_3	S_5	S_1	A_3	M_{11}	M_7	M_3	B_{11}	B_7	T_{14}	B	T_7	T_3	N	N----C_{11}	D_7	D_3	I_{11}	I_7	I_3	E....K_{11}	K_7	K_3
H_{10}	H_6	H_2	S_4	S_0	A_2	M_{10}	M_6	M_2	B_{10}	B_6	T_{13}	T_{10}	T_6	T_2	N	N----B	D_6	D_2	I_{10}	I_6	I_2	E....K_{10}	K_6	K_2
H_9	H_5	H_1	S_3	A_5	A_1	M_9	M_5	M_1	B_9	T_{16}	T_{12}	T_9	T_5	T_1	N	N----D_9	D_5	D_1	I_9	I_5	I_1	E....K_9	K_5	K_1
H_8	H_4	H_0	S_2	A_4	A_0	M_8	M_4	M_0	B_8	T_{15}	T_{11}	T_8	T_4	T_0	N	N----D_8	D_4	D_0	I_8	I_4	I_0	E....K_8	K_4	K_0
P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P----P	P	P	P	P	P	P....P	P	P

$H_{11} - H_0$ = New Message Header (all 1's)
$S_5 - S_0$ = Station Number
$A_5 - A_0$ = Message Code (001011 = 13)
$M_{11} - M_0$ = Telemetry Mode
B_{11} = 1 if message contains "event" only
= 0 if fixed format words in message
$B_{10} - B_6$ = Blanks (zers)
$T_{16} - T_{11}$ = 6 most significant bits of system time, in seconds.
N = Fixed Format telemetry items.
C_{11} = 1
C_{10} = 0 } Ident bits of "event" associated system times
$D_9 - D_0$ = 10 least significant bits of associated system time if C_{11} =1, ident otherwise
$I_{11} - I_9$ = 0 (ident bits of Event Identification)
$I_8 - I_0$ = Identification number of event telemetry item
E's = Event value
$K_{11} - K_0$ = Arithmetic Complement Checksum for one message
P's = Parity (odd).
$T_{10} - T_0$ = 11 least significant bits of system time, in seconds

3.0 TRACKING PAPER TAPE

The tracking Paper Tape will be processed by the 1604 program STAPIN.

3.1 FORMAT OF PAPER TAPE

The tape will consist of the following components:

1. Visual header
2. Coded header
3. Tracking/vehicle time data
4. Stop code

3.2 SAMPLE TAPES

3.2.1 Tracking Data Paper Tape Formats

header start

●	V_{15}	V_{11}	V_7	V_3	S_5	S_1	I_3	F_5	F_1	I'_3	F'_5	F'_1	Y_3	M_5	M_1	D_3	R_{23}	R_{19}	R_{15}	R_{11}	R_7	R_3	B	
●	V_{14}	V_{10}	V_6	V_2	S_4	S_0	I_2	F_4	F_0	I'_2	F'_4	F'_0	Y_2	M_4	M_0	D_2	R_{22}	R_{18}	R_{14}	R_{10}	R_6	R_2	B	●
●	V_{13}	V_9	V_5	V_1	S_3	I_5	I_1	F_3	I'_5	I'_1	F'_3	Y_5	Y_1	M_3	D_5	D_1	R_{21}	R_{17}	R_{13}	R_9	R_5	R_1	B	●
●	V_{12}	V_8	V_4	V_0	S_2	I_4	I_0	F_2	I'_4	I'_0	F'_2	Y_4	Y_0	M_2	D_4	D_0	R_{20}	R_{16}	R_{12}	R_8	R_4	R_0	K	●
	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	●

header stop

where: B = blank

P = parity (odd)

V_{15} - V_0 = Vehicle number in 4-bit BCD

S_5 - S_0 = station number

I_5 - I_0 = identification of first selected antenna

F_5 - F_0 = reporting rate for first antenna (power of 2)

I'_5 - I'_0 = identification of second selected antenna

F'_5 - F'_0 = reporting rate for second antenna (power of 2)

Y_5 - Y_0 = current year minus 1960

M_5 - M_0 = binary month

D_5 - D_0 = binary day

R_{23} - R_0 = revolution to a tenth in 4-bit BCD
= maximum of 999.9

K = AM/PM indicator: 0 = AM, 1 = PM

● = always punched.

3.2.2 <u>Tracking Message Format</u>

Word: 1			2			3			4			5			6			7			8		
●	●	●	S_5	S_1	●	B	B	N_3	B	B	T_{15}	T_{11}	T_7	T_3	W	I_1	I'_3	B	A_{18}	A_{14}	B	A_7	A_3
●	●	●	S_4	S_0	●	B	B	N_2	B	B	T_{14}	T_{10}	T_6	T_2	TR	I_0	I'_2	A_{21}	A_{17}	A_{13}	A_{10}	A_6	A_2
●	●	●	S_3	B	B	●	N_5	N_1	B	T_{17}	T_{13}	T_9	T_5	T_1	I_3	W	I'_3	A_{20}	A_{16}	A_{12}	A_9	A_5	A_1
●	●	●	S_2	B	B	●	N_4	N_0	B	T_{16}	T_{12}	T_8	T_4	T_0	I_2	TR'	I'_4	A_{19}	A_{15}	A_{11}	A_8	A_4	A_0
P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P

9			10			11			12			13			14			15-22	23or15 (see below)		
B	E_{18}	E_{14}	B	E_7	E_3	B	R_{18}	R_{14}	B	R_7	R_3	X_{23}	X_{19}	X_{15}	X_{11}	X_7	X_3		K	K	K
E_{21}	E_{17}	E_{13}	E_{10}	E_6	E_2	R_{21}	R_{17}	R_{13}	R_{10}	R_6	R_2	X_{22}	X_{18}	X_{14}	X_{10}	X_6	X_2	report for	K	K	K
E_{20}	E_{16}	E_{12}	E_9	E_5	E_1	R_{20}	R_{16}	R_{12}	R_9	R_5	R_1	X_{21}	X_{17}	X_{13}	X_9	X_5	X_1	anten-	K	K	K
E_{19}	E_{15}	E_{11}	E_8	E_4	E_0	R_{19}	R_{15}	R_{11}	R_8	R_4	R_0	X_{20}	X_{16}	X_{12}	X_8	X_4	X_0	na 2	K	K	K
P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	P	(same as words 7-14	P	P	P

where:

B = blank

P = parity (odd)

First three frames (word 1) = 7777 = start of report

S_5 - S_0 = station number

next 12 bits = 1414 = tracking report identification

N_5 - N_0 = number of words in message minus 1 (3 frames = 1 word)

$T_{17} - T_0$ = system time in seconds

W (W') = lockon bit of first (second) antenna

1 = lockon

0 = no lockon

TR (TR') = transverse angle indicator for first (second) antenna

1 = Transverse

0 = No transverse

$I_3 - I_0$ ($I'_3 - I'_0$) = identification of first (second) antenna

$A_{21} - A_0$ = Azimuth fraction of a revolution left justified.

$E_{21} - E_0$ = Elevation fraction of a revolution left justified.

$R_{21} - R_0$ = Transverse angle (fraction of a revolution) or range where R_0 = 9.765625 yds for Prelort and 19.53125 yds for Verlort

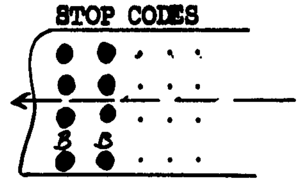
$X_{23} - X_0$ = doppler frequency shift count in cycles/sec.

K's = checksum

Word 15 = start of report for second antenna

= checksum if no second antenna reporting

STOP CODES



15 stop codes (35_8) are punched after the last tracking message on the paper tape.

= always punched.

B = blanks

APPENDIX C

Description of the Prepass Paper Tape Produced by the IOS

1.0 DESCRIPTION

The prepass paper tape produced by the IOSB will contain the prepass messages for the two computers at a RTS. The tape will be a 5-level paper tape with each frame representing four data bits and an odd parity bit.

2.1 COMPONENTS

2.1.1 Tape Visual Header. Preceding the prepass messages for each computer, there will be a visual header. The contents and order of the header are given below.

2.1.1.1 Station Number. The visual representation of the two digit decimal station of the destination station.

2.1.1.2 Computer. A two character identifier specifying the destination computer ("TC" = T & C computer; "TM" = TLM computer).

2.1.1.3 Time. The system time of the initial pointing data. The form of the time header is MM/DD/YY SSSSS, where MM is month, DD is day, YY is year, SSSSS is seconds.

2.1.1.4 Vehicle Number. The representation of the four digit decimal vehicle number.

2.1.1.5 Revolution Number. The representation of the four digit revolution number in the form RRR.R. The revolution number is the rev. number of the first data on the tape.

2.1.2 Message Visual Header. Preceding each group of messages (messages are grouped by message code) will be a representation of the two digit octal message code.

2.1.3 Control Messages

2.1.3.1 Prepass Coming Message. Preceding each group of prepass messages will be a prepass Coming Message.

2.1.3.2 Prepass Ending Message. Following each group of prepass messages will be a prepass Ending Message.

2.1.4 <u>Prepass Messages</u>. All applicable prepass messages will be on the paper tape. All commanding messages will appear twice.

2.1.5 <u>Tape Separator</u>. Following the 15 blank frames associated with the last end prepass message for the T & C prepass and preceding the 15 blank frames associated with the beginning of the TLM visual header will be one frame punched with a 77_8. This frame will allow the tape to be separated at this point with no difficulty.

2.1.6 <u>Blank Frames</u>. Blank frames will be used to separate individual messages and groups of messages. The usage of blank frames is as follows:

1. Preceding visual tape header -15 frames
2. Following tape header -15 frames
3. Following visual message header - 5 frames
4. Following prepass coming message- 5 frames
5. Following "like messages" - 5 frames
6. Preceding end prepass message - 5 frames
7. Following end prepass message -15 frames

3.0 PREPASS TAPE FORMAT

15	TVH	15	MVH	5	PC	5	PM_1	5	PM_1	5	PE	15	MVH	5	PC	5	PM_2	...	PE	15	S	15	TVH ...
b		b		b		b		b		b		b		b		b				b		b	

TVH = TAPE VISUAL HEADER

MVH = MESSAGE VISUAL HEADER

b = Blanks

PM = PREPASS MESSAGE

PC = PREPASS COMING MESSAGE

PE = PREPASS ENDING MESSAGE

S = Tape separator

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CONGER, L.	24082	OLSON, A. H.	22131
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DERANGO, W. C.	24094A	PERSICO, D. J.	24083
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DUGAS, R. L.	22125	ROCKWELL, M. A.	24085
ELLIS, R. C.	22131A	SCHROEDER, J. B.	24124
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FRANCIS, C. W.	25013	SEIDEN, H. R.	22126B
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UNCLASSIFIED

System Development Corporation,
Santa Monica, California
"INDIAN OCEAN STATION" BUFFER (IPSB)
MILESTONE 4. Scientific rept.,
TM-1245/000/00, by R. C. Wise.
20 May 1963, 102p., 2 figs. (Contract
AF 19(628)-1648, Space Systems Division
Program, for Space Systems Division,
AFSC)

Unclassified report

DESCRIPTORS: Programming (Computers).
Satellite Networks.

UNCLASSIFIED

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Describes the IOSB (Indian Ocean Station
Buffer) system. Reports that the IOS
Buffer System is a CDC 160A computer
system which provides a vehicle-oriented
link between a remote tracking station,
a 1604 computer and the Data Analysis/
Technical Advisor, Data Presentation,
and Multi-Ops complexes. Also reports
that the program system will process
prepass and telemetry data for one
vehicle and site each time it is operated.

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