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PAGE CHANGES TO

ARTS IIIA PROGRAM CODING SPECIFICATIONS

VOLUME I OF III

FOR

ARTS IIIA FINAL APPROACH SPACING TOOL PHASE 1 CONFIGURATION CONTROL DECISIONS (CCD) T15712 AND T16295 CASE FILES CD300-CPT-OO3A and CD300-AR3A-003

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LIST OF ILLUSTRATIONS (Continued)

Figure		*Page*
3.2.5.0–2	CAOF Flow Diagram (3 Sheets)	3.2.5.0–91
3.2.5.1–1	Initiate Control Function (STL) (13 Sheets)	3.2.5.1–4
3.2.5.2–1	Track Reposition Operational Function (6 Sheets)	3.2.5.2–3
3.2.5.3–1	Track Suspend Function (6 Sheets)	3.2.5.3–3
3.2.5.4–1	Terminate Control Function (DPL) (5 Sheets)	3.2.5.4–3
3.2.5.5–1	Handoff Initiate/Recall/Accept (30 Sheets)	3.2.5.5–6
3.2.5.6–1	Flight Data Entry Function (9 Sheets)	3.2.5.6–4
3.2.5.6–2	TI Beacon Code Check	3.2.5.6–13
3.2.5.7–1	ATIS Multifunction (ATIS) (2 Sheets)	3.2.5.7–3
3.2.5.8–1	Beacon Multifunction (BCNK) (3 Sheets)	3.2.5.8–3
3.2.5.9–1	Configuration Multifunction (43 Sheets)	3.2.5.9–10
3.2.5.10–1	Multifunction Display (DISPL) (11 Sheets)	3.2.5.10–3
3.2.5.11–1	Emergency Multifunction (EMGL) (4 Sheets)	3.2.5.11–2
3.2.5.12–1	Filter Multifunction (FILK) (6 Sheets)	3.2.5.12–3
3.2.5.13–1	BRATS Multifunction (MULTFG) (2 Sheets)	3.2.5.13–2
3.2.5.14–1	Heavy Jet Multifunction (8 Sheets)	3.2.5.14–3
3.2.5.15–1	IFP Operational Multifunction (6 Sheets)	3.2.5.15–3
3.2.5.17–1	Reinitialize Display (KINK)	3.2.5.17–2
3.2.5.18–1	Leader Multifunction (5 Sheets)	3.2.5.18–3
3.2.5.19–1	Modify Multifunction (MODL) (17 Sheets)	3.2.5.19–4
3.2.5.20–1	CRDA Operational Multifunction (37 Sheets)	3.2.5.20–13
3.2.5.21–1	Auto-Offset (OFFK)	3.2.5.21–2
3.2.5.22–1	Preview Multifunction (PREK) (4 Sheets)	3.2.5.22–3
3.2.5.23–1	MSAW Display Inhibit (QMSAW) (6 Sheets)	3.2.5.23–4
3.2.5.24–1	Memory Readout/RSM (RDTL) (9 Sheets)	3.2.5.24–3
3.2.5.25–1	System Data (SYSK) (15 Sheets)	3.2.5.25–5
3.2.5.26–1	Tab Multifunction (TABG) (6 Sheets)	3.2.5.26–4

LIST OF ILLUSTRATIONS (Continued)

Figure		*Page*
3.2.5.28–1	Enable/Disable MSAW (VMSAW) (6 Sheets)	3.2.5.28–3
3.2.5.30–1	Enable/Disable Beacon Subsystem (3 Sheets)	3.2.5.30–2
3.2.5.31–1	Scratch Pad Data Multifunction (4 Sheets)	3.2.5.31–2
3.2.5.33–1	CDR Extractor Control (CDKEY) (24 Sheets)	3.2.5.33–6
3.2.5.34–1	I/O Reconfiguration (IORFG) (31 Sheets)	3.2.5.34–5
3.2.5.34A–1	Control Performance Monitor Keyboard Entry Schematic (2 Sheets)	3.2.5.34A–6
3.2.5.34A–2	Control Performance Monitor (10 Sheets)	3.2.5.34A–8
3.2.5.36–1	VFR Flight Plan Function (VFRFP) (10 Sheets)	3.2.5.36–5
3.2.5.37–1	Select/Inhibit IF Printouts (INPRNT) (2 Sheets)	3.2.5.37–3
3.2.5.38–1	Conflict Alert Operational Functions (14 Sheets)	3.2.5.38–7
3.2.5.39–1	FINAL APPROACH SPACING TOOL (10 Sheets)	3.2.5.39–
3.2.5.38–2	CAOF Flow Diagram (8 Sheets)	3.2.5.38–21
3.2.5.43–1	Track Amplify Maintenance Function (KAMP) (4 Sheets)	3.2.5.43–3
3.2.5.44.1–1	Check ACID (ACIDL) (2 Sheets)	3.2.5.44–2
3.2.5.44.1A–1	Check for Aircraft Category (ACCC) (2 Sheets)	3.2.5.44–5
3.2.5.44.2–1	Check for Aircraft Type (ACTP) (2 Sheets)	3.2.5.44–8
3.2.5.44.3–1	Check Beacon Code (BCNL) (2 Sheets)	3.2.5.44–11
3.2.5.44.3A–1	Check for Altitude (ALTL) (2 Sheets)	3.2.5.44–14
3.2.5.44.3B–1	VFR FP Duplicate Aircraft ID Check (VFRDUPE) (3 Sheets)	3.2.5.44–18
3.2.5.44.4–1	Check Controller Subsystem (CHCOND) (2 Sheets)	3.2.5.44–22
3.2.5.44.6–1	Check Paired Status (CMEL)	3.2.5.44–25
3.2.5.44.7–1	Check if Controller Entered (CONL) (3 Sheets)	3.2.5.44–27
3.2.5.44.7A–1	Disable Converging Runway Display Aid Function (CRDAOFF) (3 Sheets)	3.2.5.44–32
3.2.5.44.8–1	Get Controller From Symbol (DCNL)	3.2.5.44–36
3.2.5.44.9–1	Display Track Data (DSPL) (5 Sheets)	3.2.5.44–39
3.2.5.44.9A–1	Display Airport Information (DSPAIR) (3 Sheets)	3.2.5.44–46
3.2.5.44.10–1	Check Duplicate ACIDS (DUL) (5 Sheets)	3.2.5.44–50

The interrupt status words are pushed into a different push/pull list for each MDBM channel. KIP pulls the interrupt status words from the appropriate channel's push/pull interrupt status word table. The paragraphs which follow describe the detailed processing requirements of the various types of interrupts.

When the IOP detects a parity error on an input word, it corrects the parity, stores it in the input buffer, stores a status word identifying the parity error and its location, and generates an Input Line Parity Error Interrupt. Neither the input buffer nor the input chain is terminated, but normal progression is continued.

The program responds by performing the following tasks:

1. The DEDS which sent the data upon which bad parity was detected, is identified by DBM number.
2. A printout of "IN BUFF PAR (Display number)" on the console typewriter is requested.
3. A display of "PAR ERR" is provided in each preview area associated with the identified DEDS. (The error readout shall be erased upon receipt of the clear or disconnect function character.)
4. KIP is flagged to ignore the (possibly) spurious data by clearing the word with detected bad parity.
5. A count of all input parity errors occurring since program startup is maintained for each DBM in the system.

The data field of the external interrupt status word is interpreted. Two types of external interrupts are possible. They indicate a detection of a parity error on (1) an IOP to MDBM channel or (2) on a DBM to DEDS channel.

The status data indicates an output (DBM to DEDS) line parity error detected by a DED's if bit 2^2 is set. If so, the MDBM also sets the DBM number in bits 2^3 — 2^5. The program responds by doing the following:

1. A printout of "OUT PAR ER (Display Number)" on the console typewriter is requested.
2. A count of all DEDS — detected output parity errors since program startup is maintained for each DBM in the system and when KEDQ interrupts (SP nominally 5) are detected within one lattice time the DBM will have refresh disabled.

A parity error detected by the MDBM on its IOP output channel is indicated by bit 2^6 set in the status word. Until the IOP responds by sending an EF to the MDBM all further output on that channel is disabled. Therefore, in this case the program performs the following functions:

1. A count of all MDBM-detected output parity errors is maintained for each MDBM channel in the system.
2. The processor reinitiates the output in which the parity error was detected, commencing with an EF to Set SP (Processor Memory Address Register).
3. A printout of "OUT PAR ER (MDBM Number)" on the console typewriter is requested.

If the IOP detects a parity error on an External Interrupt word, it responds by doing the following:

1. A count of all such errors detected from program start-up is maintained for each MDBM channel.
2. A TTY message EI BAD PAR (display number) (contents of 30 bit status word) is requested.

3.2.4.2.2 Display Input Buffer Processing. KIP processes all input data contained in buffers completed since the last entry. Eight, four-word buffer segments for each DEDS or DBM are provided for a single processing cycle.

The input is initiated during task initialization and runs continuously without interruption until a channel switch occurs.

The MDBM honors data requests from the DEDS on its channel on a first-come first-served basis. The four input words from an individual DEDS are transferred sequentially to the processor before requests from other DEDS are honored.

KIP processes the respective DEDS four-word input buffer. Each DEDS input buffer consists of one Type I data word and three Type II data words (one Type II word per keyboard). The Type I data word contains range and off-centering changes (if any), and the DBM designator. The Type II data words contains quick look bits, trackball coordinate changes, data/function character codes, and the keyboard identification codes. All keyboard entries are reflected in the Type II data words. INSERT ATTACHMENT 1

The Type I word is checked for either a range increase or an off-center change. The display number is pushed onto a stack (ROCSTK) requesting that all data blocks previously erased by the range off-center filter by output.

KIP uses the input BCW pointer from control memory to flag the amount of data in the input buffer. Four words are pulled from the input buffer to serve as one input unit. For each unit the originating display is identified using MDBM and DBM numbers and that display's keyboard and display parameters updated in the usual fashion.

The Type II word quick look data is stored in the display parameter tables for use by the display output processing subprogram. The Type II word trackball change data is used to update the keyboard's trackball coordinates. The Type II word data/function character (if not an idle word) is used to make the appropriate changes to a keyboard's preview message.

During the course of processing a four word buffer segment, KIP examines the first word to verify that it is a Type I data word. If it is not, an out-of-sync condition is declared. In this case KIP searches the input buffer for that channel until a Type I data word is found. The buffer pointer is left pointing to that word.

If an input parity error had been flagged, KIP will not process its associated four word group.

3.2.4.2.3 Output Processing. Since KIP runs at lattice time intervals (nominally 60 msec), there are normally several four word buffers to be processed for each display in the system. To save I/O data loads the job of originating teletype outputs and DBM memory updates has been relegated to a separate section.

Since character data comes in at a relatively slow rate, updates to the preview area are handled on an as-detected basis. Trackball movements tend to appear in several consecutive input buffers so KIP waits until all buffers have been processed for one lattice before changing the trackball B-word in buffer memory.

After all DBM refreshed displays have had trackballs updated, the error flags from the interrupt processing tasks are checked to determine whether any teletype messages are called for. This procedure permits multiple errors to be combined into a single message. While preparing teletype outputs special actions are completed, such as putting "PAR ERR" in the readout area for input buffer parity errors.

3.2.4.3 Outputs

1. MSLPX — index to MDBM interrupt status buffer.

When a change in either the range or center coordinates is detected a check in made to determine if FAST is enabled. If so, a FAST TYP1T data packet is formatted and transmitted to FAST.

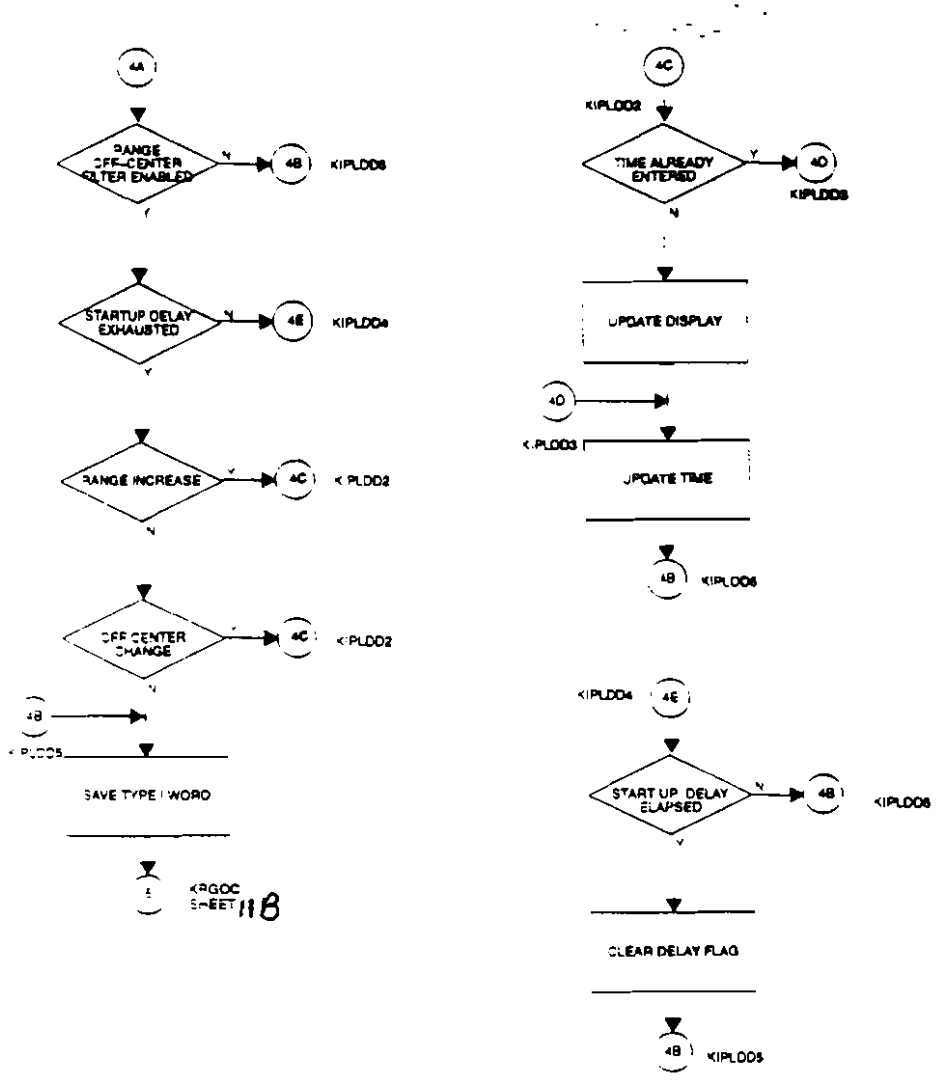

FIGURE 3.2.4-1. KEYBOARD INPUT PROCESSING (SHEET 11A)

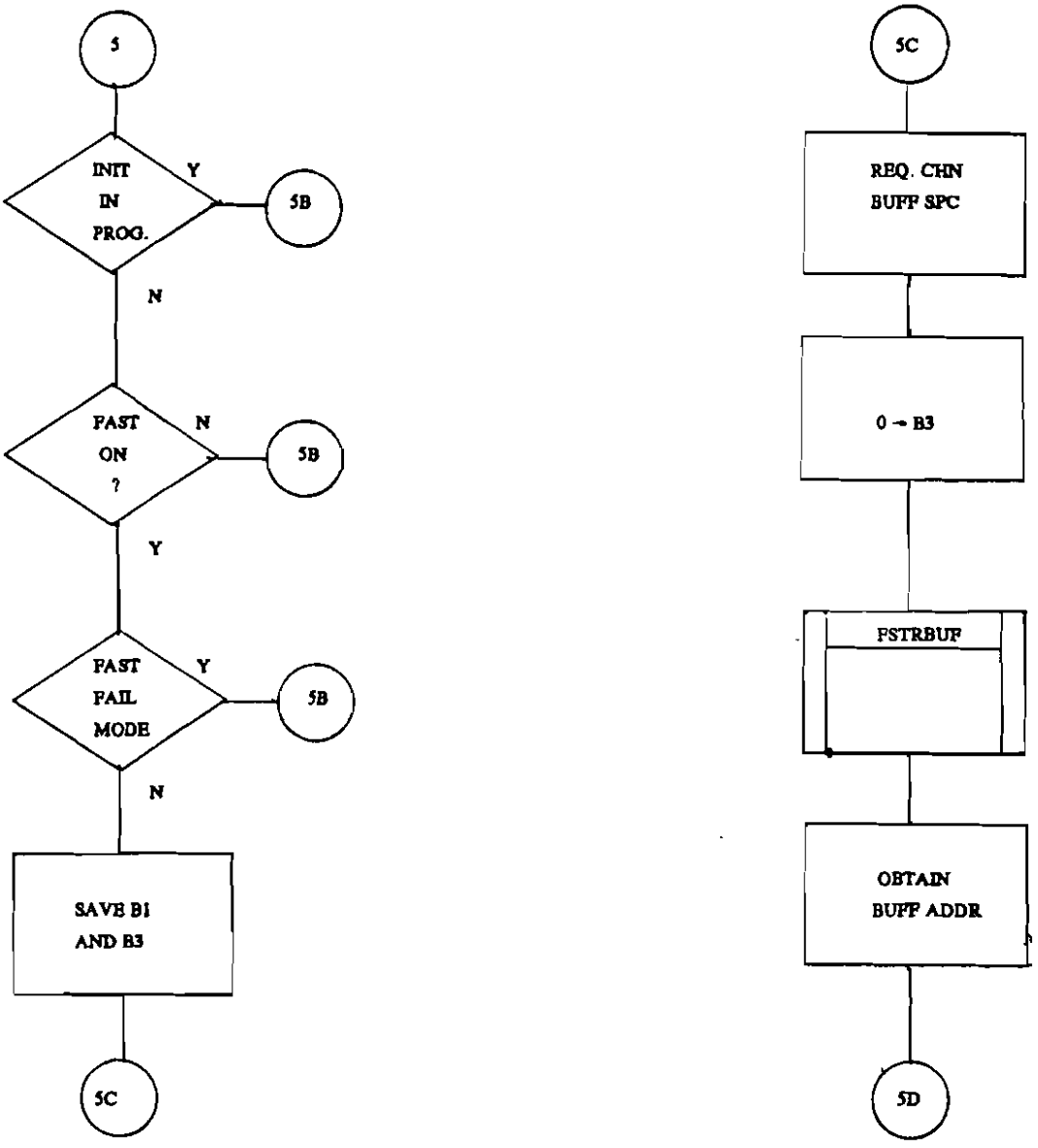

FIGURE 3.2.4-1 KEYBOARD INPUT PROCESSING (SHEET 11B)

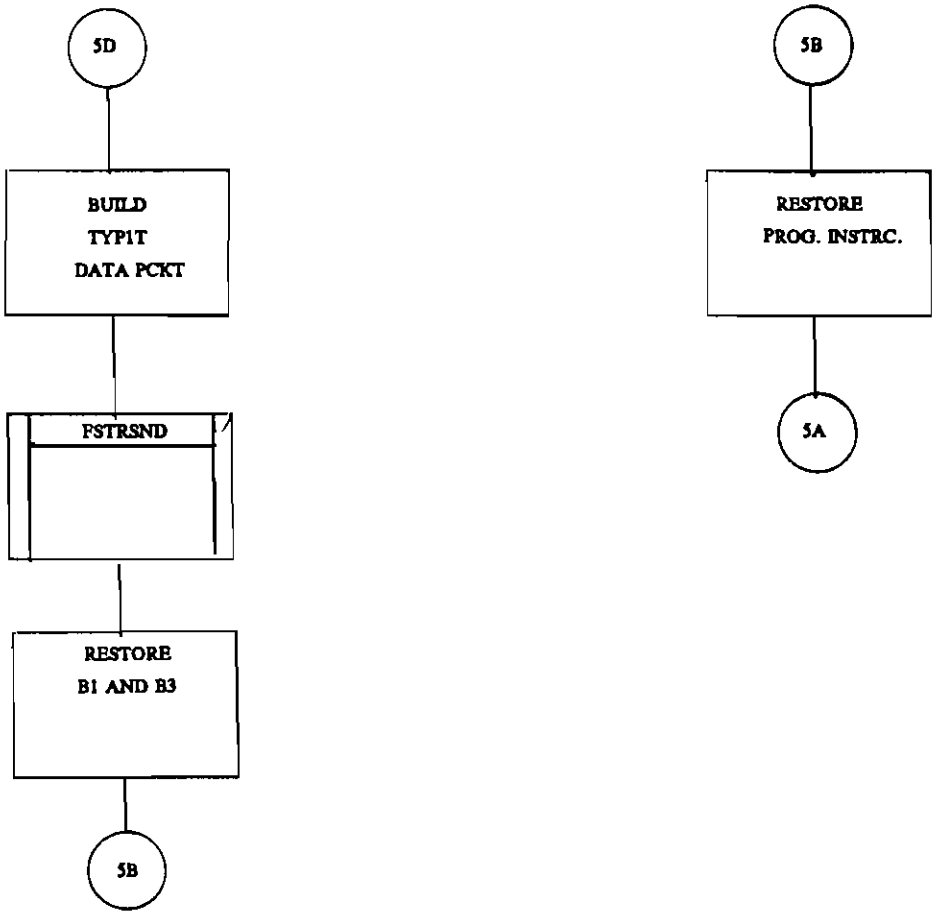

FIGURE 3.2.4-1 KEYBOARD INPUT PROCESSING (SHEET 11C)

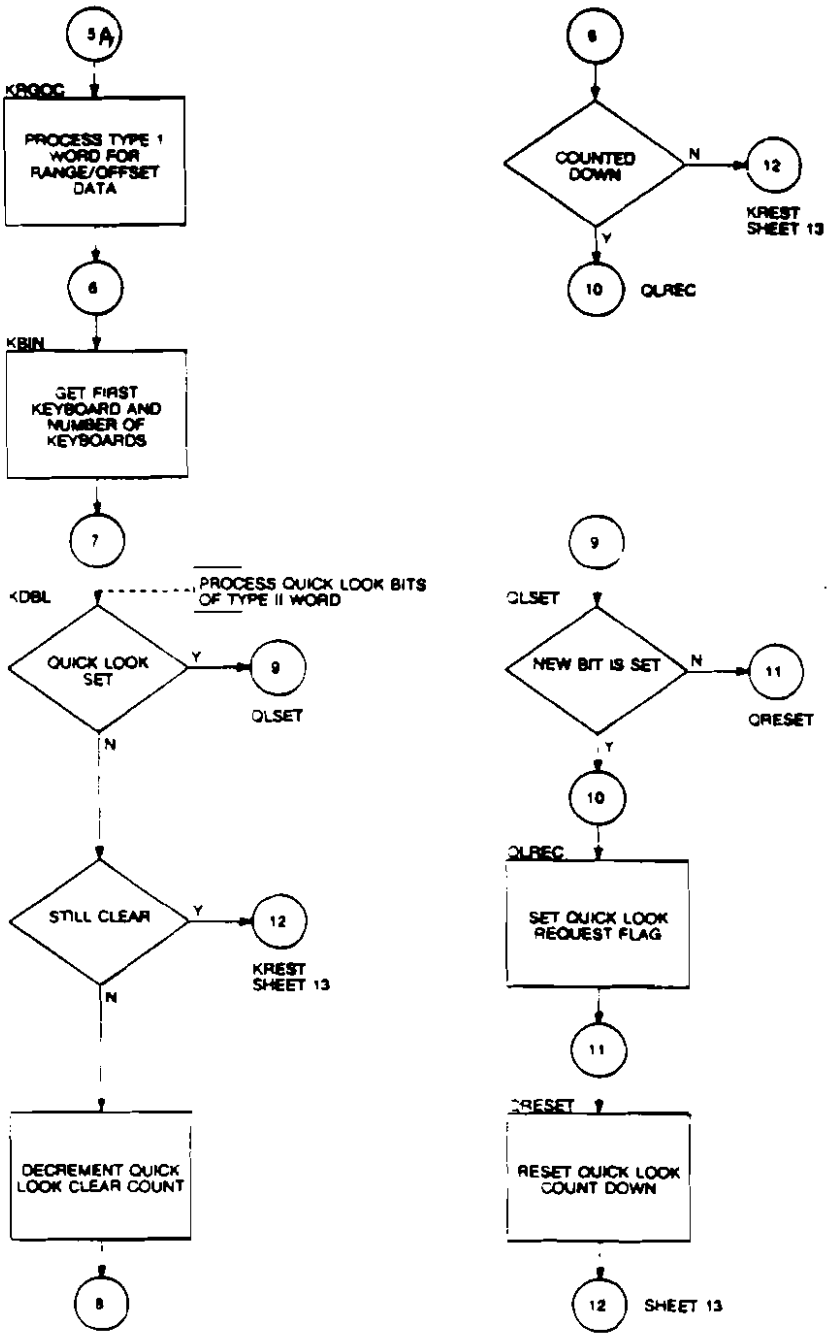

FIGURE 3.2.4-1. KEYBOARD INPUT PROCESSING (SHEET 12)

TABLE 3.2.5–3. KEYBOARD INPUT MESSAGES (NORMAL) (Continued)

Function	Message Format (1)	Purpose
Subsystem Filter	F7, 1, FS, n, y, Enter(8)	Inhibit/enable extraction in subsystem n. y = "I" for inhibit, "E" for enable.
Association Status Filter	F7, 1, FC, X(OP), Enter(8)	Inhibit extraction of data relating to associated tracks if X = "U". Inhibit extraction of data relating to unassociated tracks if X = "A". Delete filter if X is omitted.
Manual Reconfiguration	F7, 2, RCF, Space, nn, Enter(8)	Provide manual control of switching from full operational program to a buckup program or vice versa (where nn is a two alphanumeric character program ID).
	F7, 2, D, nn, E/I, Enter(8)	Enable/Inhibit display (where nn is a two digit decimal display number).
	F7, 2, K, nn, E/I, Enter(8)	Enable/Inhibit keyboard (where nn is a two digit decimal keyboard number).
	F7, 2, T/M, Enter(8)	Select TTY/MSP as destination for failure, error or status messages (T for TTY, M for MSP).
	F7, 2, M, nn, E/I, Enter(8)	Enable/Inhibit MDBM (where nn is a two digit decimal MDBM number).
	F7, 2, S, n, R, r, Enter(8)	Enables only SRAP r. See note*.
	F7, 2, S, n, R, r, r, Enter(8)	Enables automatic switching.
		*Note: n = sensor#, R = SRAP separator; r = designate SRAP as input and disable auto switching; r, r = enable auto switching.
	F7, 2, L, Enter(8)	Enable/Inhibit overload sensing and protection.
	F7, 2, TST, E/I, Enter(8)	Enable/Inhibit Test Targets for this display.

INSERT ATTACHMENT 3

TABLE 3.2.5-3. KEYBOARD INPUT MESSAGES (NORMAL) (Continued)

Function	Message Format (1)	Purpose
	F7, 2, n, E/I, Enter(8)	1. Enable/Inhibit TTY/MSP printouts for a specific task indicated by the alpha character entered (where n is an alpha character entered: D (DISPLAY), K (KIP), S (SRAP), and Q (RTQC). 2. Enable/Inhibit specific functions indicated by the alpha character entered (where n is an alpha character entered: M(MSAW) R(Memory Readout), T(Test Mode), and V(Supervisory Control).
	F7, 2, B, S/D, Enter (8)	Select Single/Dual system mode of operation.
	F7, 2, C, P, E/I, Enter (8)	Enable/Inhibit CENRAP mode
	F7, 2, U, n, Enter (8)	Declare the I/O device specified by the character entered up for normal operation (where n is a device identifier entered: T (TTY), 0 (D0), 1 (D1), M (MSP), or I (IMT)).
VFR FLIGHT PLAN	F9, ACID, Δ, Entry/Exit Fix Data, Δ, ACT, Δ, ALT (OP)(28), Δ, CID (OP)(23), Enter	Enter an ARTS/NAS VFR Flight Plan message.
	F9, ACID, Δ, Entry/Exit Fix Data, Δ, ACT, Δ, ALT (OP)(28), Δ, CID (OP)(23), Enter	Re-transmit the VFR Flight Plan message (IFP).
	F9, ACID or VFR Flight Plan List Identifier(29), Δ, Exit Fix Data(28), Enter	Re-transmit the VFR Flight Plan message (FIX).
	F9, ACID or VFR Flight Plan List Identifier(29), Enter	Drop the VFR Flight Plan from the VFR list.
PMKMF3	F7, 3, A, Enter	Activate or deactivate the CTS report.

Function	Message Format[1]	Purpose
	F7,2,F,Enter	Enables the selection of the primary or alternate FAST channel

TABLE 3.2.5-3. KEYBOARD INPUT MESSAGES (NORMAL) (Continued)

Function	Message Format (1)	Purpose
	F7, 3, A, Time (1 to 6 digits), M, n, Enter	Activate or alter the CTS report. The time entered is the interval between reports and is optional. M and the following digit indicate the number of current-maximum reports between overall-maximum reports, and are optional. If M and the digit are not entered, the default number is used. If M is entered with no digit, overall-maximum reports are not printed.
	F7, 3, B, Enterd	Activate or deactivate the RTR report.
	F7, 3, B, Time (1 to 6 digits), M, n, Enter	Activate or alter the RTR report.
	F7, 3, C, Enter	Activate or deactivate the LAT report.
	F7, 3, C, Time (3 to 6 digits), M, n, Enter	Activate or alter the LAT report.
	F7, 3, D, Enter	Activate or deactivate the COR report. Deactivate the CTS, RTR, and LAT reports.
	F7, 3, D, Time (3 to 6 digits), M, n, Enter	Activate or alter the COR report.
	F7, 3, M S P, Enter	Select the MSP as the output device for reports and forgo the TTY.
	F7, 3, M S P, T T Y, Enter	Select both the MSP and the TTY as output devices for reports.
	F7, 3, S	Activate or deactivate the SUM report.
	F7, 3, S, Time (3 to 6 digits), Enter	Activate or alter the LAT SUM report. The time entered is the interval between reports and is optional.
	F7, 3, S, A, Time (1 to 6 digits), Enter	Activate or alter the ASC SUM report.
	F7, 3, S, C, Time (1 to 6 digits), Enter	Activate or alter the CTS SUM report.
	F7, 3, S, L, Time (3 to 6 digits), Enter	Activate or alter the LAT SUM report.
	F7, 3, S, P, Enter	Print an immediate SUM report.

TABLE 3.2.5–3. KEYBOARD INPUT MESSAGES (NORMAL) (Continued)

Function	Message Format [1]	Purpose
	F7, 3, S, U, Time (1 to 6 digits), Enter	Activate or alter the UAS SUM report.
	F7, 3, T T Y, Enter	Select the TTY as the output device for reports and forgo the MSP.
	F7, 3, T T Y, M S P, Enter	Select both the MSP and the TTY as output devices for reports.
INPRINT	F10, Message Type[20], Enter	Select/Inhibit printout of selected ARTCC interfacility messages.
CAOF	F11, A, E/I, Enter	Enable/Inhibit Conflict Alert processing.
	F11, K, Identity (ADST), Enter	Enable/Inhibit specified track.
	F11, G, E/I, Enter	Enable/Inhibit MSAW Aural Alarm Consolidation
	F11, C, Enter	Enable/Inhibit controller.
	F11, SED Enter	Enable/Inhibit track pair in conflict.
	F11, P, ACID (optional), SED (optional), Enter	Enable/Inhibit specified track pair (for specifying track pairs which are currently in conflict status or are in the conflict pairwise inhibit table). NOTE: ACID or SED must be entered or both may be entered.
	F11, P, ACID, SED Enter	Enable/Inhibit specified track pair (for specifying any track pair that is not in conflict status or is in the conflict pairwise inhibit table).
IF	F14, 0, Enter	Enable/Disable Interfacility Test Program. May be entered at any time.

INSERT ATTACHMENT 4

Function	Message Format[1]	Purpose
QK	F12,E/I,Enter	Enables/Inhibits FAST
	F12,T,1n/2n/3n, Enter	Enables Test pattern 1,2 or 3 messages to FAST
	F12,T,4, Enter	Enables Test pattern 4 message to FAST

When the function subprogram is finished processing the entry, control is returned to front end processing. If the function is completed without encountering any errors, control goes to label GOKOFK. If errors were encountered, the appropriate error readout will be displayed in the readout area. The error readout and the label where each is processed is listed below:

Error return to KOFK	Label
FORMAT	KFORMK
CAPACITY	KCK
NO SLEW	KSLEWK
ILL TRK	KILTRK
ILL POS	KILPSK
ILL LINE	KILINK
ILL FNCT	KILFK
IF WAIT	KIFK
DUP BCN	KDUPBK
DUP ID	KDUPAK
IF INHBT	KIFIHK
ILL CHAR	KICK
OUT RNGE	KOTRGK

Upon return from the operational function subroutine, the keyboard's trackball shall be homed to (0,0) in HTBQ(SP) (0 = radar, 1 = display) coordinates, and the trackball symbol shall be inhibited. If HTBQ is set to 1, the coordinates will be converted to radar 0,0. However, the trackball will not be homed if the multiple function mode and the functions track drop or track handoff are selected.

At this point, the readout and preview areas on the display are updated if required. If in multiple function mode, the function characters will not be deleted from the preview area. After each keyboard is processed, its request flag (process preview field) is cleared to allow modifications to its preview area.

TABLE 3.2.5-5. FUNCTION JUMP TABLE

29 28 27 26 25 24	23 22 21 20 19 18	17 16 15 14 13 12 11 10 9 8 7 6 5 4 3 2 1 0
I	C	STL
R	P	RPL
S	U	SUL
T	C	DPL
H	D	HDL
D	A	FDL
F	PAD	KFK
V	P	VFRFP
I	L	FILFK
I	P	INPRNT
C	A	CAOF
~~I Q~~	~~L K~~	~~KILFK~~ FAST
I	L	KILFK
I	F	TKOF14
T	G	TGENKOFK
A	M	AMPLIFY

NUMKQ — number of keyboards

TNMS2Q — track number mask

3.2.5.9.4 Functional Description. Perform the specified logic as described below for one of the following functions:

- Consolidation

  If the enterer is on an RDBM display, ILL FNCT is displayed. If a trackball is entered, FORMAT is displayed. If training is active on the enterer's display, ILL POS is displayed. If a consolidation printout is active (CSTAT), ILL FNCT will be displayed.

INSERT ATTACHMENT 5

  If only one controller is entered, the controller symbol and subset will be checked for legality by calling CONL. If the controller entered is not legal it results in FORMAT being displayed. If the entered controller is not valid, ILL POS is displayed. If two controllers are entered, both are checked as described above.

  Next the enterer is checked. If it is a training position ILL POS is displayed. If it is a maintenance position, ILL FNCT will be displayed. Then the entered controller(s) are checked. If they are training position(s), ILL POS is displayed.

  If they are paired position(s), ILL FNCT is displayed.

  After all above checks the current configuration table is searched for all entries whose primary controller index is equal to the index of the position to be consolidated. When a match is found, the active controller is changed to the entered controller. Then a search is made of all associated tracks in the consolidated controllers subsystem. All flight plans and store tracks whose active controller is equal to the index of the position to be consolidated are changed to the new position. A printout request of the above action is then made and control is returned.

- Limited Consolidation

  If the enterer is on an RDBM display, ILL FNCT is displayed. If a trackball is entered, FORMAT is displayed. If training is active on the enterer's display, ILL POS is displayed. If a limited consolidation printout is currently active (LCSTAT), ILL FNCT is displayed.

  If only a virgule was entered, a check is made if the entering position is currently or previously fully consolidated. If not, ILL FNCT is displayed. If the keyboard is paired ILL FNCT is displayed. Else, the consolidated controller field for the controller he was previously consolidated with, (PAIRT bits 21–26) is restored to original controller number. A printout of the above action is then made.

  If controller(s) is (are) entered, the same checks for controller legality as made in consolidation are made. After it has been determined that the positions entered and entering positions are legal, the current configuration table is searched for a primary controller index equal to the index of the position to be consolidated. If a match is found, the active controller is changed to the new position. Then a search of the to be consolidated controllers subsystem associated track thread is made. All current flight plans and store tracks whose active controller is equal to the index of the position to be consolidated are changed to the new position. After the associated track search, all positions which were previously consolidated to the entered position are set to their original controller (PAIRT bits 21–26).

  A flag (bit 28 of count) is cleared to denote this position as limited consolidated. A printout if the above action is then made.

- Full Consolidation

If the enterer is on and RDBM display, ILL FNCT is displayed. If a trackball is entered, FORMAT is displayed. If training is currently active on the enterer's display, ILL POS will be displayed.

At this time the FULCON flag will be set to 1.

If only 1 controller is entered, the controller symbol and subset will be checked for legality by calling CONL. If the controller entered is not legal, it results in FORMAT being displayed. If the controller entered is not valid, then ILL POS is displayed.

Next the message status for Full Consolidation is checked (FCSTAT). If a message is pending, ILL FNCT will be displayed. If more than 1 controller was entered, the legal and valid controller checks for both of the entered controllers is done as described in the preceding paragraph. If the first entered controller equals the second entered controller, ILL FNCT is displayed. If only 1 controller was entered and the enterer equals the entered, ILL POS is displayed.

Next, the enterer is checked. If it is a training position, ILL POS is displayed. If it is a maintenance position, ILL FNCT is displayed. Then the entered controller(s) are checked. If they are training positions, ILL POS is displayed. If they are paired positions, ILL FNCT is displayed.

After all the above checks have been made, the current configuration table is searched for all Primary and Active controllers who are equal to the controller to be consolidated. If any are found, they are changed to the first entered controller (enterer if only one controller entered). Then, using the subsystem of the second entered controller (1st if only one controller entered) the associated track thread is searched for all tracks controlled by the specified controller depending on the tracks status, one of the following will happen:

1. If track is flight plan or store track, Active controller will be changed and a tabular line change will be requested.

2. If track is active tracking, change active controller and flag for possible thread change.

3. If track is active suspend, change active controller, request tabular line change and subsystem thread change.

4. If track is an interfacility track and in flight plan or store status, get new controller and call CHCOND. If active interfacility track, flag for possible subsystem thread change. If suspend interfacility track flag for tabular line change and possible subsystem thread change.

5. If track is in Handoff to the specified controller, insert new primary controller and flag for possible subsystem thread change and tabular line change.

6. If track created via the VFR flight plan entry (F9) is displayed in the VFR flight plan list on the display of the active controller, continue to display track in VFR flight plan list of the second entered controller.

The 2nd controller entered (1st if only one entered) is then flagged as fully consolidated and puts controller consolidated to in PAIRT (bits 21–27). Then, looping on the number of keyboards, all controllers consolidated to the 1st entered controller (enterer if only one entered) are deconsolidated back to original controller. A message of the above action is then requested and control is given back to KOF.

If FAST initialization is in progress, ILL FNCT is displayed.

FAST

If the second numeric is a 4 or a 5 and Interfacility is inhibited, FORMAT is displayed. If the numeric is greater than 5, FORMAT is displayed.

If the second numeric is a 4 and the capability is not FDP, FORMAT will be displayed, else the capability will be changed to RDP (set INIFC (lower) to zero). A message of this action will be requested and a normal return to GOKOFK is executed.

If the second numeric is a 5 and the capability is not RDP, FORMAT is displayed. If an AHOP System Enable/Inhibit message is still pending (AHEIST (upper) set), ILL FNCT is displayed.

The interfacility capability will be changed to FDP (set INIFC (lower) to 1). A message of this action will be requested.

If the Auto Handoff function is enabled, it is disabled by setting INAHOP (lower) to 1. 'INH' is then packed into the message output buffer and the AHOP System Inhibit message is requested. Then, by looping thru all keyboards, the controller inhibit flag (bit 22) is cleared from the IDUBT keyboard table. Subroutine AHOPINH is then called for each display to output 'AHOP OFF' to each system data area and a normal return to GOKOFK is executed.

3.2.5.9.5 Storage and Timing

Storage: 1015 core

Timing: N/A

3.2.5.9.6 Flowcharts. See figure 3.2.5.9–1.

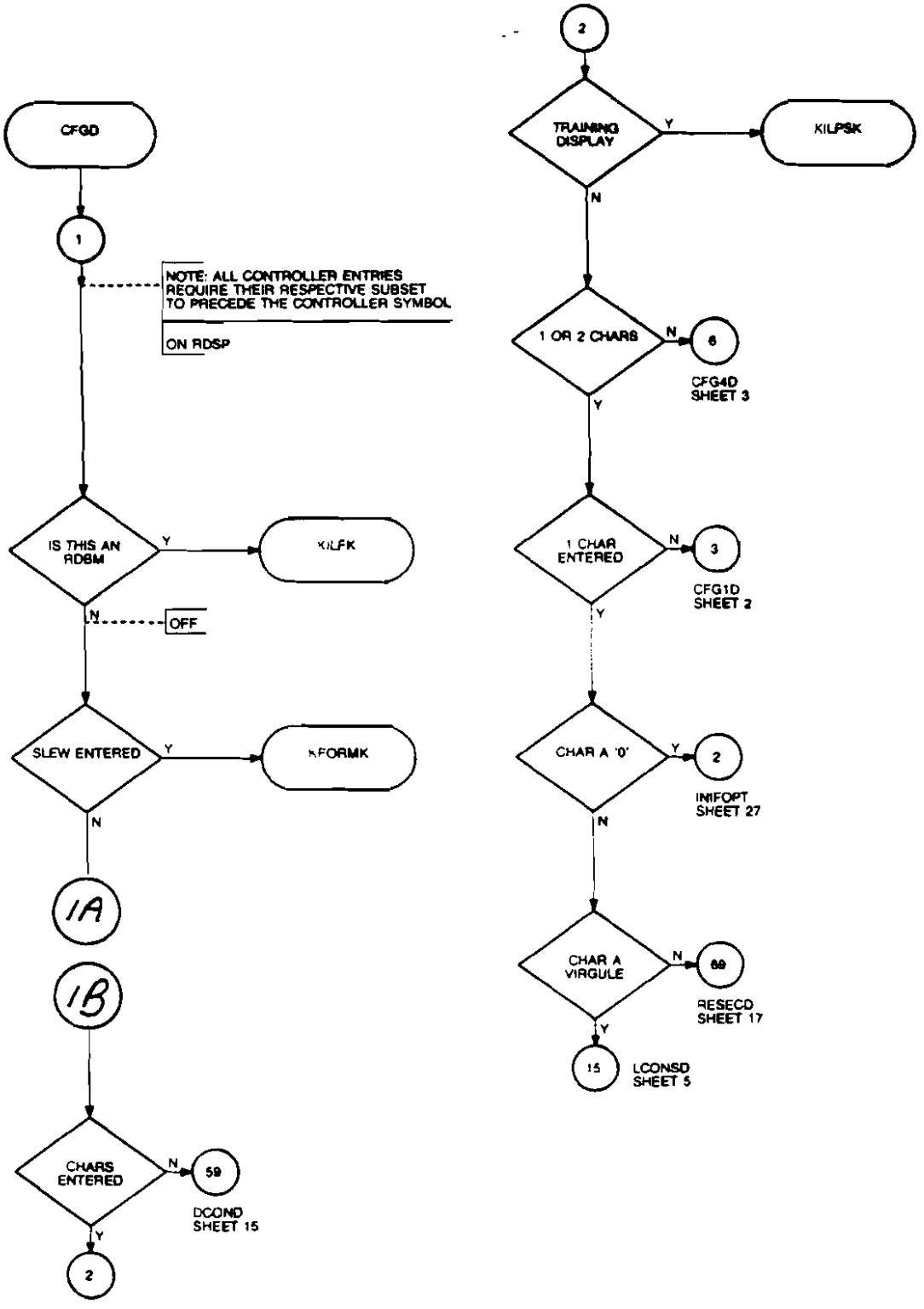

FIGURE 3.2.5.9-1. CONFIGURATION MULTIFUNCTION (SHEET 1)

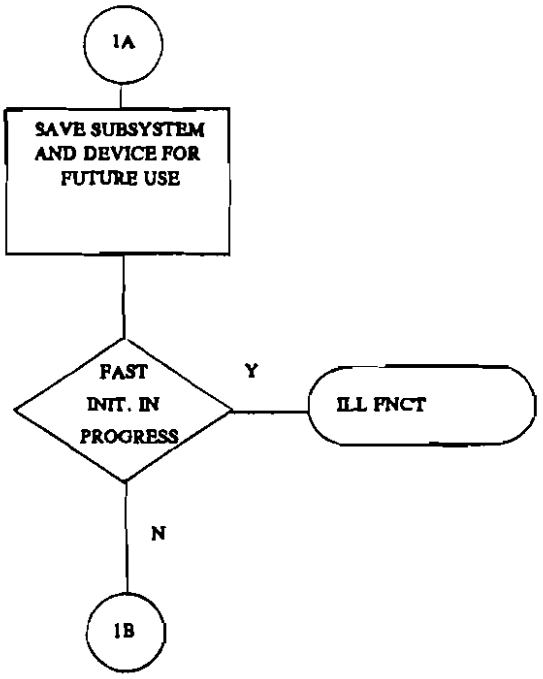

FIGURE 3.2.5.9-1 CONFIGURATION MULTIFUNCTION SHEET 1A)

3.2.5.18 Leader Multifunction (LDRL)

3.2.5.18.1 Purpose. The purpose of this keyboard entry is to modify the offset direction of a specified full data block or to modify the initial offset assigned to all active track files at the message enterer's position.

3.2.5.18.2 Inputs/Outputs

Input

Table 3.2.5−1 shows the input from the Keyboard Operational Functions subprogram.

CTS file containing track data.

Display tables containing the necessary display information.

SDB1 — contains the FIRST associated track number in the thread

— contains the TRKXT track index table for track file addresses

Outputs

CTS file contains new leader direction

Display tables contain new display leader direction

Local data

M4W contains track number mask

LDRSL contains offset bits to be shifted

3.2.5.18.3 Parameters. None.

3.2.5.18.4 Design Logic. Initially INITL is referenced to initialize DCODT. Then, if no data is entered or if the data entered is non-numeric or equal to a zero or a five, control is returned to KOFK at KFORMK for error processing.

If no identity data is entered the message enterers initial offset is changed. Since Auto-offset is used to effect the leader change for active tracks, a test is performed to determine if Auto-offset is enabled or disabled. If Auto-offset is enabled, control is returned to KOFK at GOKOFK and controlled tracks will have their leader direction changed by Auto-offset.

If Auto-offset is disabled and no controlled tracks exist in this subsystem, control is returned to KOFK at GOKOFK. ~~If Auto-offset is disabled and controlled tracks exist in this subsystem, each track controlled by the enterer has his leader offset changed and common subroutine PCKFUL is called to output a new full data block for each track.~~ REPLACE WITH ATTACHMENT 7

If a slew has been entered, VLDTRKL is referenced to determine whether or not the slew refers to a tracked target. If the slew is invalid, control is returned to KOFK at KILTRK for error processing.

If Auto-offset is disabled and controlled tracks exist in this subsystem, each track controlled by the enterer has his leader offset changed. A check is then made to determine if FAST is enabled. If it is, a FAST Leader Change data packet is constructed and transmitted to FAST for each track that had a leader off-set change. The common subroutine PCKFUL is then called to output a new full data block for each track.

If identity data has been entered, checks are made for ACID match via ACIDL DUPIDC, and DUL. Checks for beacon code match are made via BCNL and DUPBC. If any of the above checks fail, control is returned to KOFK at KILTRK, KFORMK, or DUPBK for appropriate error processing.

If a track is found via slew or identity and extraneous data has been entered, control is returned to KOFK at KFORMK for error processing. If no extraneous data has been entered and the message enterer does not control the identified track or the track is not an active track, control is returned to KOFK at KILTRK for error processing.

~~If a legal track has been identified, its leader direction is changed and its leader change inhibit bit is set and control is returned to KOFK at GOFOFK.~~ REPLACE WITH ATTACHMENT 8

Although one of eight numerics may be entered, each console has only four possible offset directions available at a given time. A maintenance adjustment on each console sets either one of two groups of four directions each, Group 1 (North, East, South, West) or Group 2 (Northeast, Southeast, Southwest). Table 3.2.5–7 shows the correspondence between the group selected on the console and the resulting offset direction obtained.

TABLE 3.2.5–7. OFFSET DIRECTION SPECIFICATION AS A FUNCTION OF MAINTENANCE

ADJUSTMENT SELECTION AND NUMERIC DIRECTION INDICATOR

Single Numeric Entry Required to Select Desired Offset Direction

Desired Offset Direction	Maintenance Adjustment Selection	
	N.S.E.W.	NW.NE.SE.SW
N (2)	2 or 3	—
NE (3)	—	2 or 3
E (6)	6 or 9	—
SE (9)	—	6 or 9
S (8)	7 or 8	—
SW (7)	—	7 or 8
W (4)	1 or 4	—
NW (1)	—	1 or 4

3.2.5.18.5 Storage and Timing

Storage: 120 core

Timing: N/A

3.2.5.18.6 Flowcharts. See figure 3.2.5.18–1.

If a legal track has been identified, its leader direction is changed and its leader change inhibit bit is set. A check is then made to determine if FAST is enabled. If it is, a FAST Leader Change data packet is constructed and transmitted to FAST for this track. Control is then returned to KOFK at GOKOFK.

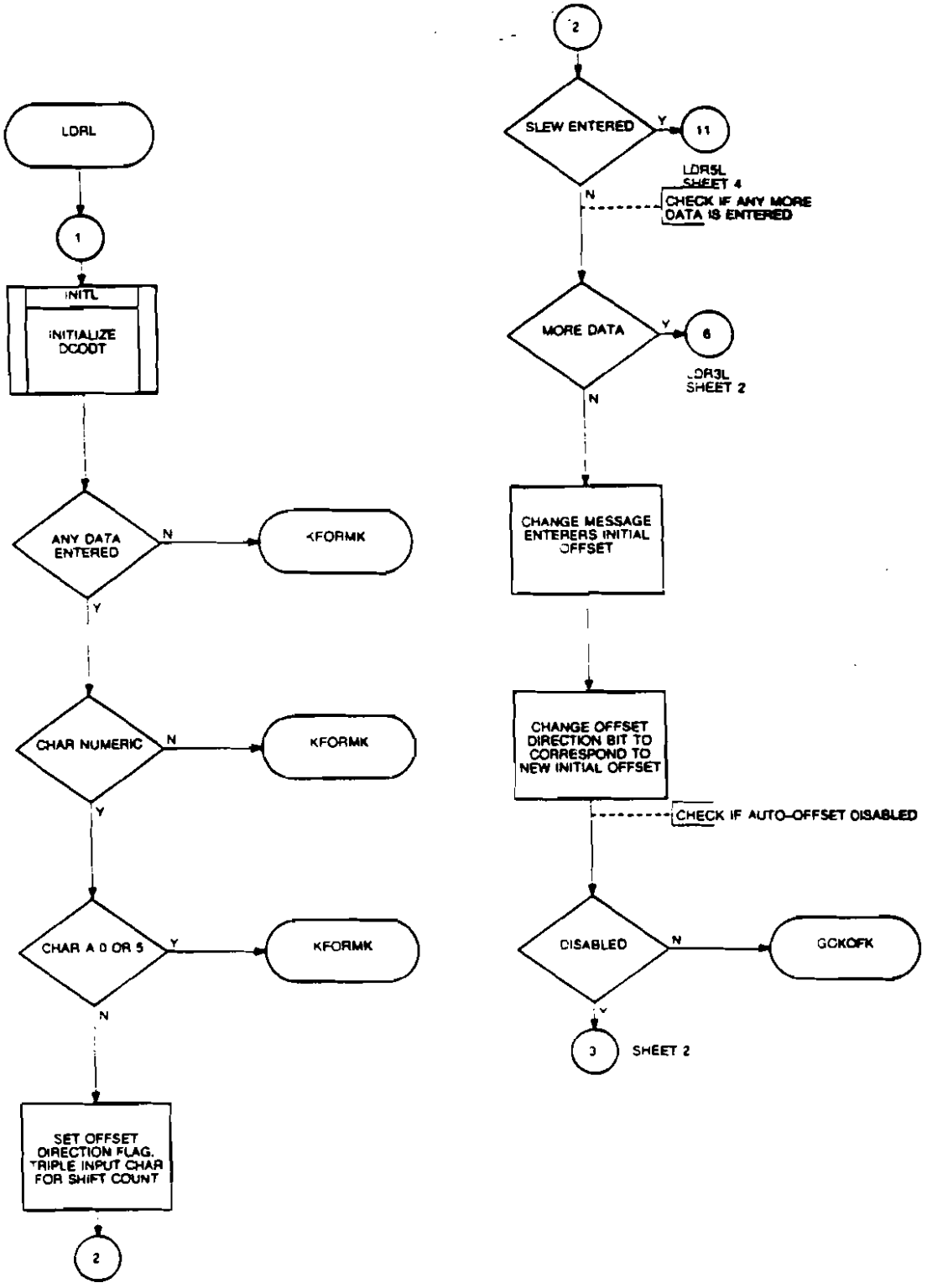

FIGURE 3.2.5.18–1. LEADER MULTIFUNCTION (SHEET 1)

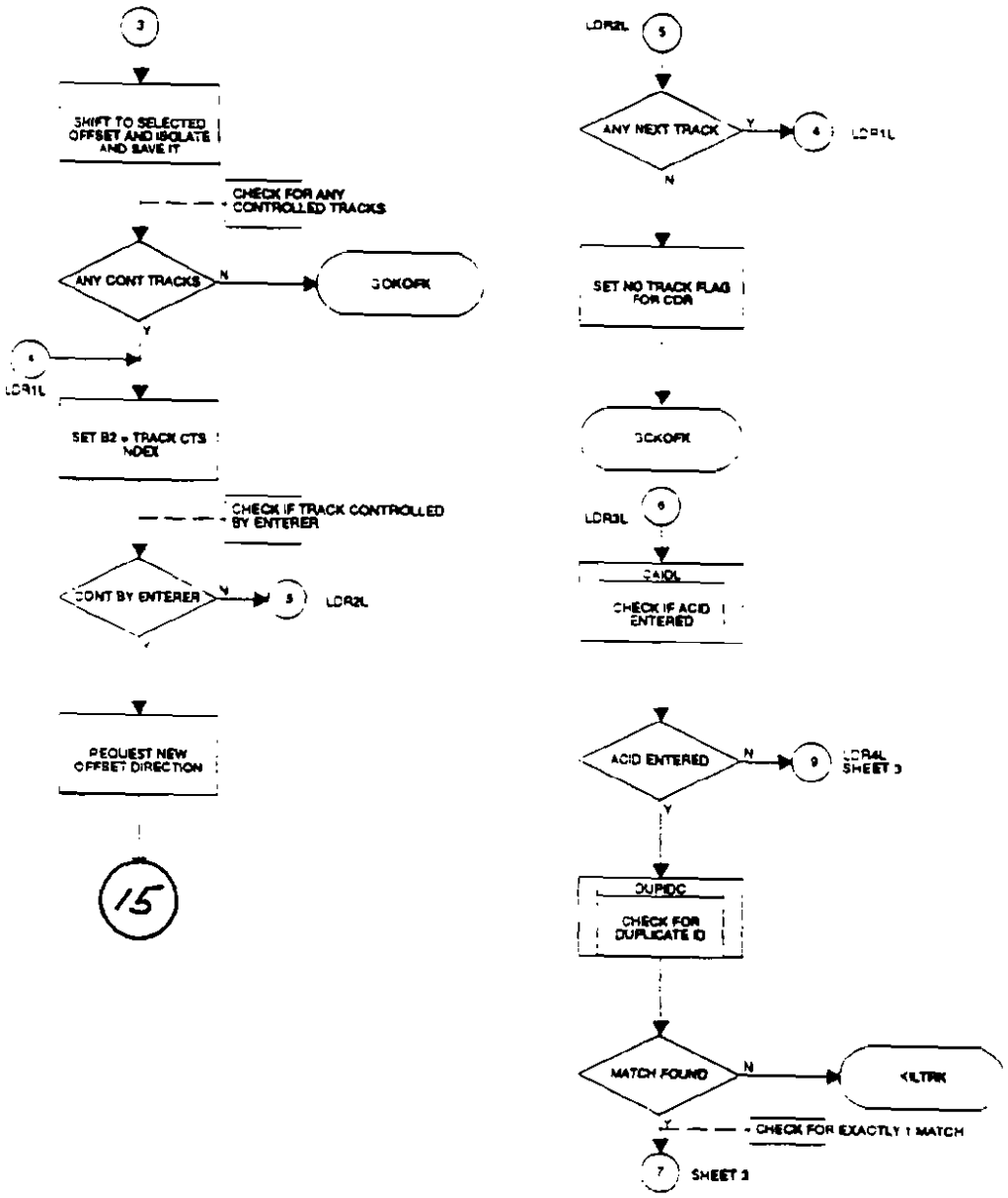

FIGURE 3.2.5.18-1. LEADER MULTIFUNCTION (SHEET 2)

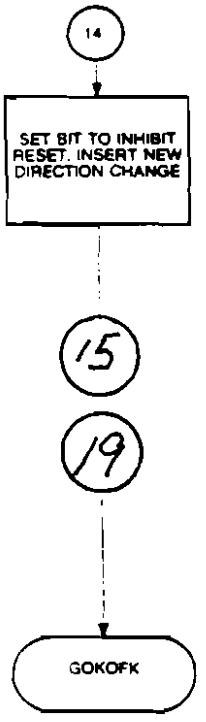

FIGURE 3.2.5.18–1. LEADER MULTIFUNCTION (SHEET 5 —)

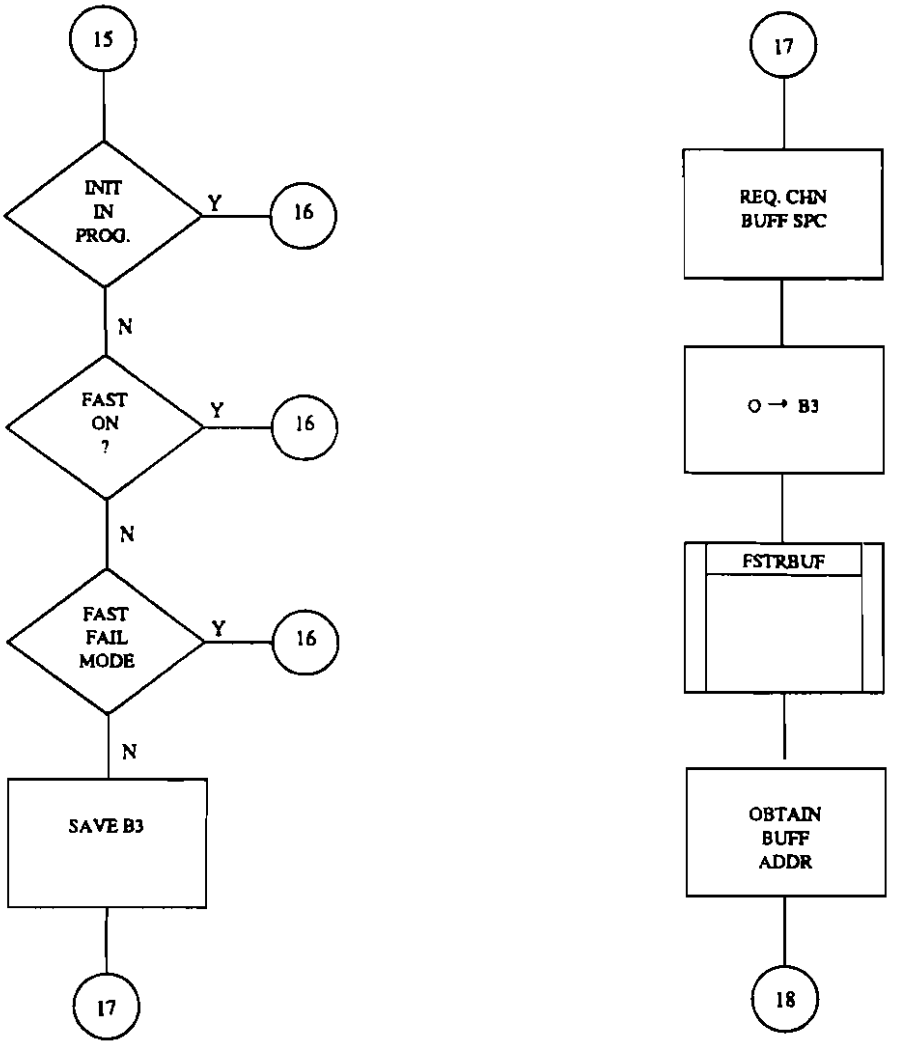

FIGURE 3.2.5.18-1 LEADER MULTIFUNTION (SHEET 6)

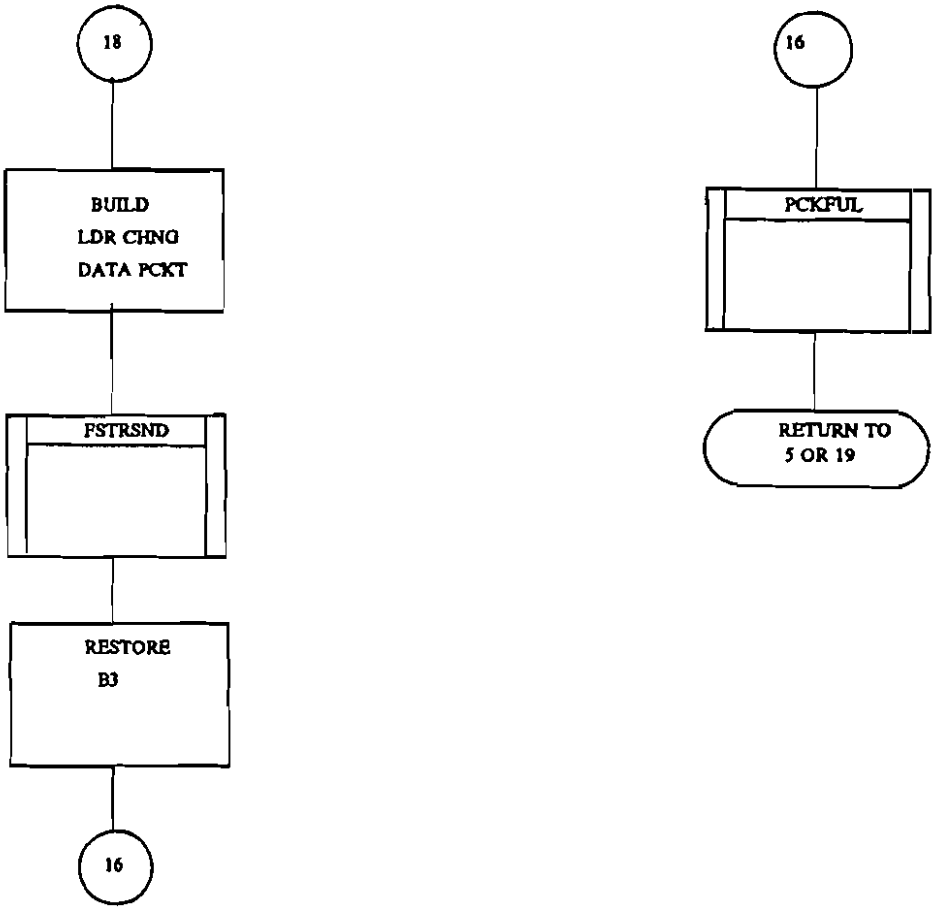

FIGURE 3.2.5.18-1 LEADER MULTIFUNCTION (SHEET 7)

3.2.5.34 I/O Reconfiguration (IORFG)

3.2.5.34.1 Purpose. This routine is referenced by KOF whenever Multifunction (F7),2 is detected. The purpose of this function is to allow a controller at a supervisory position to:

1. change level of operational program to any available level.
2. enable/inhibit input from a single keyboard, output to a single display, input and output for a complete MDBM.
3. select destination (TTY or MSP) for console messages generated within the op program.
4. enable a single SRAP with or without automatic switching.
5. flip-flop overload sensing and protection.
6. enable/inhibit test targets on the entering display.
7. enable/inhibit console message printouts for KIP, SRAP processing, DOP or TRAD, and RTQC.
8. enable/inhibit MSAW processing, memory readout, CENRAP mode, CENRAP TP processing, test mode (for target generator) and supervisory changes.
9. select single/dual system mode of operation when SWABBED over to sensor 0 or 1.
10. declare a selected peripheral up for normal operation.

INSERT ATTACHMENT (10

The routine also allows any remote display to request a DBM re-initialization.

3.2.5.34.2 Inputs/Outputs. IORFG uses the variables defined in table 3.2.5−1. In addition IORFG also uses the MDBM table DISTRT, the display tables DCONT and DFLAGT, and the keyboard tables SYMT, PREVT, PAIRT, TBAL2T, COUNT, and TBPRET. IORFG also uses the system level table SYSLVL.

3.2.5.34.3 Parameters

NMDBMQ	—	number of MDBM's in system
NUMDQ	—	number of displays in system
NUMKQ	—	number of keyboards in system
SLEVQ	—	number of op program levels in table SYSLVL
AWDQ	—	number of words in TBPRET for A-word and TB B-word
RWDQ	—	number of words in TBPRET used for readout data

3.2.5.34.4 Functional Description. This portion of KOF gets referenced everytime a multifunction (F7) 2 entry is detected by the control portion of the program. IORFG determines which subfunction is intended and, assuming a legal entry from a legal position, performs the change or flags the change for tasks (or exec tasks) concerned. The subfunctions (in order for which they are tested) are:

1. re-initialize refresh memory for entering remote display

11. Select the alternate or primary channel for FAST.

FAST

2. overload sensing and protection flip-flop (by sensor)

3. direct console printer messages to TTY

4. direct console printer messages to MSP

5. enable/inhibit I/O with a given display

6. enable/inhibit I/O with a given MDBM

7. select SRAP interface (option to control interface switching)

8. select new program level

9. enable/inhibit input processing for a given keyboard

10. enable/inhibit display of test targets on entering display

11. enable/inhibit CENRAP mode

12. enable/inhibit processing of TP messages in CENRAP

13. select single/dual system mode of operation when SWABBED over to sensor 0 or 1

14. declare a selected peripheral up for normal operation

15. enable/inhibit console printer messages from DOP or TRAD

16. enable/inhibit console printer messages from SRAP processing

17. enable/inhibit console printer messages from KIP

18. enable/inhibit MSAW processing

19. enable/inhibit memory readout function (multifunction R)

20. enable/inhibit test mode (ETG selection)

21. enable/inhibit supervisory keyboard changes

22. enable/inhibit console printer messages from RTQC

For ease of reference subfunction's will be referred to by these numbers during ensuing discussion.

If a slew entry was made a FORMAT error is displayed in entering keyboard's readout area. If entering display is in training mode ILL POS will appear. If entering display is a remote display only subfunction 1 is legal. Anything else will result in ILL FNCT in the remote readout area. If subfunction 1 is legal the subroutine RDISP is called to cause re-initialization to be started with flags set as necessary for RKIP, RDOP, RCOM and RTDOP.

For all other displays no data entered except the function means a FORMAT error has occurred. If the entering keyboard is not supervisory an ILL POS error has occurred. Otherwise the number of characters entered is checked. If exactly 1 character has been entered subfunctions 2, 3, or 4, are the only legal entries. The entered character is tested to determine subfunction. If legal subfunction 3 or 4 entry has been made, the appropriate ESR call is made to direct console printer messages to the requested device. If subfunction 2 is requested additional tests are required. Since console printer message is necessary the status word

5. Select the alternate or primary channel for FAST.

FAST

on the message must have been cleared after the last subfunction 2 entry or it is ILL FNCT and the entry disabling overload protection for the same sensor must have been made from the same display as the enabler or it is ILL FNCT. Otherwise the entry is processed and the flag set if the first entry on a given sensor or cleared if the second entry. If more than one character was entered the first character is tested to select between subfunctions 6-15. These subfunctions react similarly to several error conditions so they will be discussed now. If the number of characters entered is wrong the program goes to the start of subfunction 16-23 processing. If a console printer message is currently active for the selected subfunction an ILL FNCT is declared. If the entry is accepted a console printer message is prepared and started. An erroneous character will cause a FORMAT error except that a bad level identification in subfunction 8 will result in ILL FNCT.

If the first character is 'D', the second and third a legitimate display number and the last 'E' or 'I' then subfunction 5 has been entered. For an enable the display must have been previously disabled by a Keyboard entry or KIP interrupt processing or this is declared ILL FNCT. A legal enable causes the proper display initialization subroutine (IDISP or RDISP) to be called. For an inhibit all keyboards must have been fully consolidated with a position at another display or ILL FNCT is declared. A legal inhibit causes a disable refresh external function to be added to the MDBM output chain. Bits 13 and 14 of DCONT are set for inhibit or cleared for enable subfunctions.

If the first character is 'M', the second and third a legal MDBM number and the last an 'E' or 'I' then subfunction 7 is recognized. An enable is always legal, clears the MDBM failed bit in DISTRT and enables all displays on the subject MDBM as though a legal subfunction 5 had been entered. An inhibit is legal only if a subfunction 6 inhibit would have been legal for every display on the subject MDBM. An inhibit is flagged for each display as subfunction 6 would have been and the MDBM is flagged as failed in DISTRT.

If the first character is 'S' and 4 or 5 characters have been entered subfunction 8 is assumed. To be legal the second character must be a legal sensor number, the third must be 'R', the fourth must be '0' or '1' and the fifth (if entered) must also be '0' or '1'. A legal fifth character enables SRAP switching for the selected sensor as well as selecting the current interface to be used. If only 4 characters were entered the SRAP interface selected by sensor and SRAP number is forced and switching from that interface is inhibited.

If the first character is 'R' and 6 characters were entered subfunction 9 is assumed. The second, third and fourth characters must be 'C', 'F' and 'space'. The fifth and sixth characters must be a legal program level as defined by table SYSLVL. When a legal entry has been verified flags are set for the exec and a scatter is scheduled for 30 seconds after verfication. The 30 second delay ensures that critical data storage can occur after the entry, but before the system recovery at the new level, is initiated.

If the first character is 'K', the second and third a legal keyboard number and the last 'E' or 'I' then subfunction 10 has been entered. An enable is always legal and clears the KIP processing lockout bit in TBAL2T and clears the readout area on the display. An inhibit in legal only if the effected keyboard has been previously fully consolidated (see multifunction, C). A legal inhibit will place 'NO INPUT' in the readout area for the affected keyboard and lockout KIP processing. If the first character is 'T' and 4 characters were entered subfunction 11 is assigned. The character entered must be 'TST' and 'E' or 'I'. An enable stores the entering display number and sets a flag requesting the display of test target while an inhibit clears the entries.

If the first character is 'C', the second a 'P', and the third an 'E' or an 'I', then subfunction 12 has been entered. Any error in one of the characters is a FORMAT. If the console printer message buffer is active, or if the requested status (E/I) is already the current status, an ILL FNCT is declared. For Dual systems, if the system is not SWABBED to a single sensor configuration, is not in a single mode of operation, or the sensor aligned to does not correspond to the subsystem for interfacility coordinates (SUBQ), then an ILL FUNCT is declared. A CENRAP enable causes MSAW, Conflict Alert, CRDA (if assembled into the program), and training (if assembled and active) to be disabled, and appropriate flags are set

to begin the enable. A CENRAP inhibit caused MSAW and Conflict Alert to be enabled, and the appropriate flags to be set to being the inhibit.

If the first character is 'T', the second a 'P', and the third an 'E' or an 'I', then subfunction 13 has been entered. Any error in one of the characters is a FORMAT. If the console printer message buffer is active, or if the requested status (E/I) is already the current status, an ILL FNCT is declared. The entry sets (Enable) or clears (Inhibit) the flag word IFTPF, which IFI used to determine whether to process incoming TP messages or not.

If the first character is 'B' and the second an 'S' or a 'D', then subfunction ~~13~~ 14 has been entered. This entry is only legal when SWABS has defined a single sensor configuration, and when CENRAP is not active. If the second entered character is an 'S' and the system is in a dual mode of operation, the appropriate flag is set so that SWABS can disable purely dual functions. If the second entered character is a 'D' and the system is in a single mode of operation, the appropriate flag is set so that SWABS can enable purely dual functions.

If the first character is 'U' and the second a valid device identifier — 'T' for TTY, '0' for D0, '1' for D1, 'M' for MSP, or 'I' for IMT — then subfunction 15 has been entered. The appropriate ESR (E$UP) call is made to declare the selected peripheral up for normal operation.

Subfunctions ~~15-22~~ 16-23 consist of two characters the second of which must be 'E' or 'I'. An error either place is a FORMAT and if the console printer message buffer is active an ILL FNCT is declared. Since all the subfunctions merely set a flag for other parts of the operational program the value for the flag is determined at the E/I check before the flag to be set is known. The subfunctions and the affected program elements are:

'D' — subfunction ~~15~~ 16 — display oriented console printer messages

'S' — subfunction ~~16~~ 17 — SRAP oriented console printer messages

'K' — subfunction ~~17~~ 18 — KIP originated console printer messages

'M' — subfunction ~~18~~ 19 — all minimum safe altitude warning processing

'R' — subfunction ~~19~~ 20 — memory readout (multifunction R)

'T' — subfunction ~~20~~ 21 — target generator activation

'V' — subfunction ~~21~~ 22 — changes in supervisory keyboard assignments (multifunction P)

'Q' — subfunction ~~22~~ 23 — RTQC oriented console printer messages

All other first characters result in FORMAT being displayed in the readout area for the entering keyboard.

3.2.5.34.5 Storage and Timing. IORFG uses 790_{10} memory locations (approximately) and timing varies so widely according to path taken as to be meaningless.

3.2.5.34.6 Flowcharts. See figure 3.2.5.34-1.

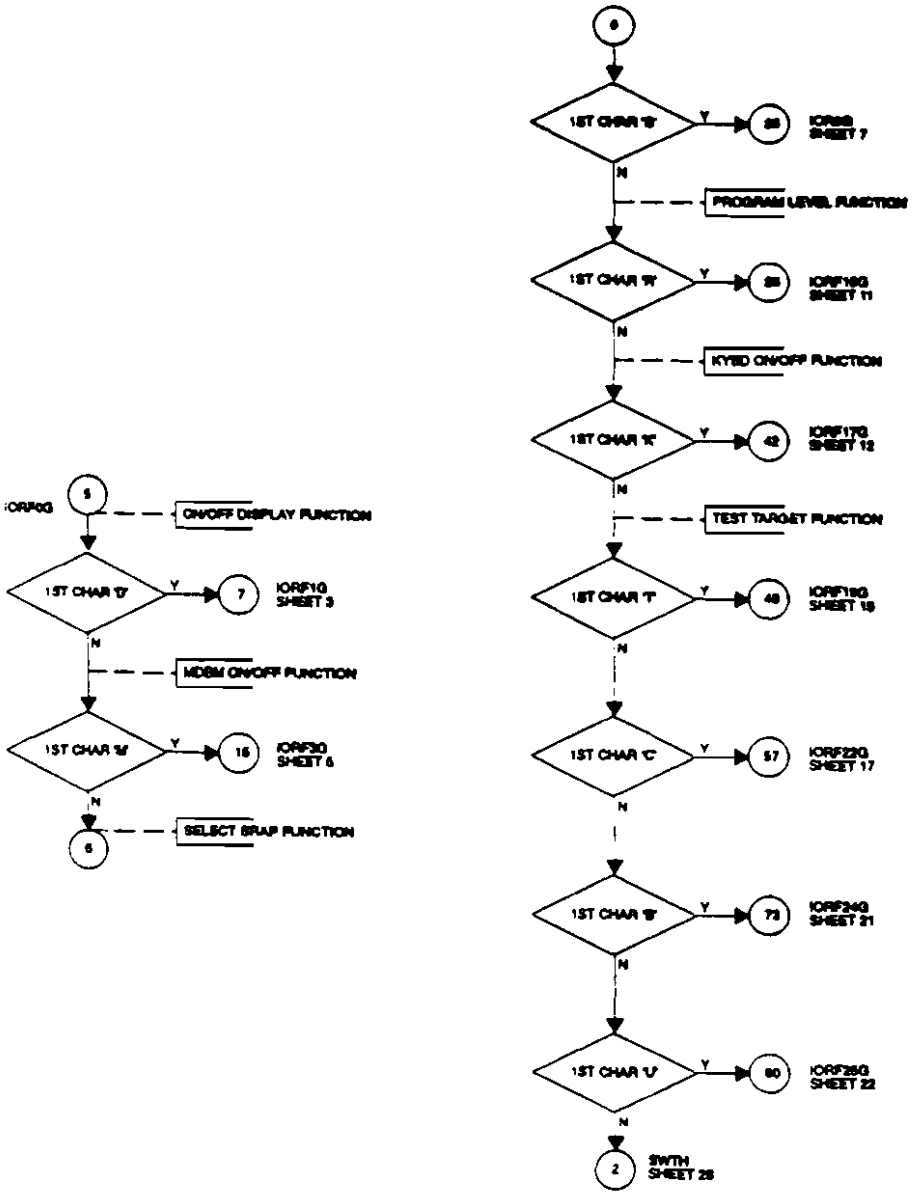

FIGURE 3.2.5.34–1. I/O RECONFIGURATION (IORFG) (SHEET 2)

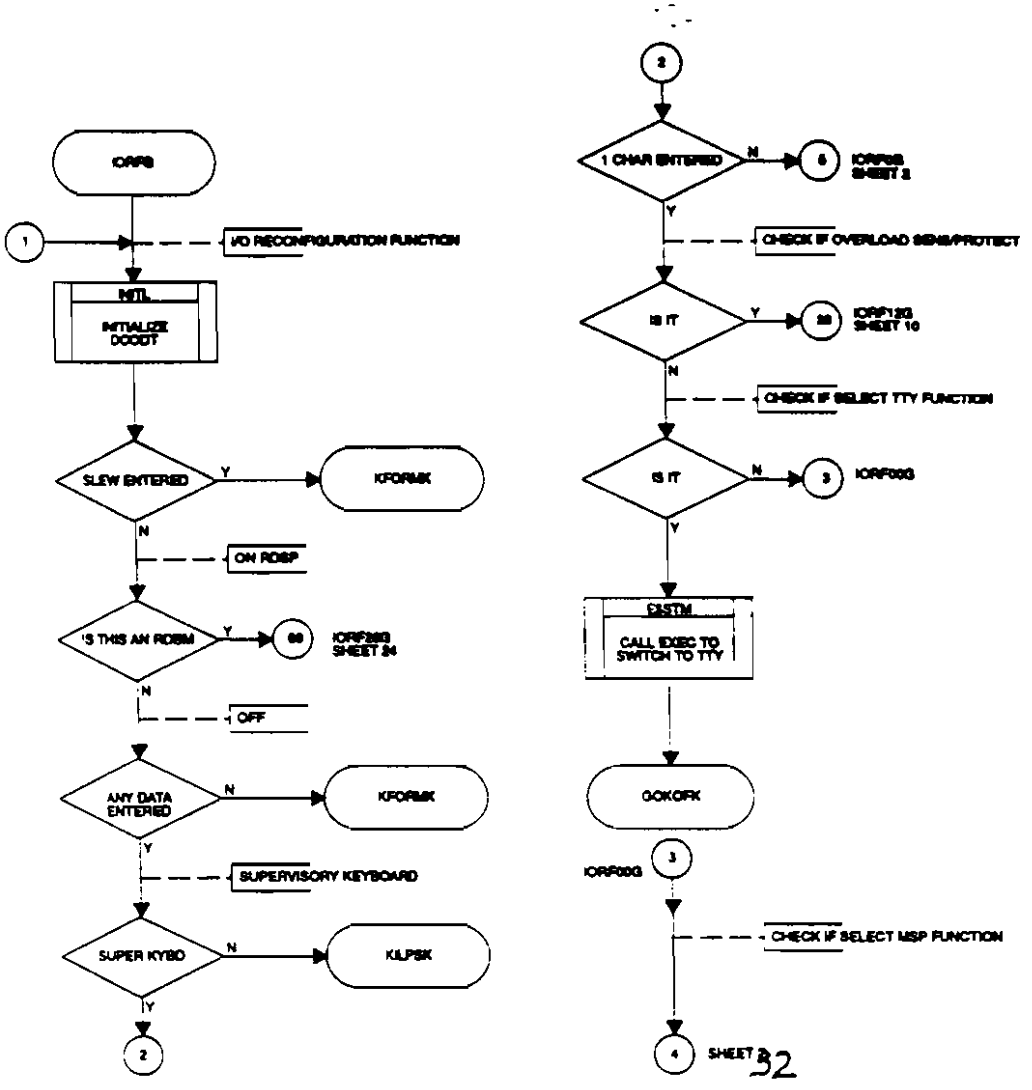

FIGURE 3.2.5.34-1. I/O RECONFIGURATION (IORFG) (SHEET 1)

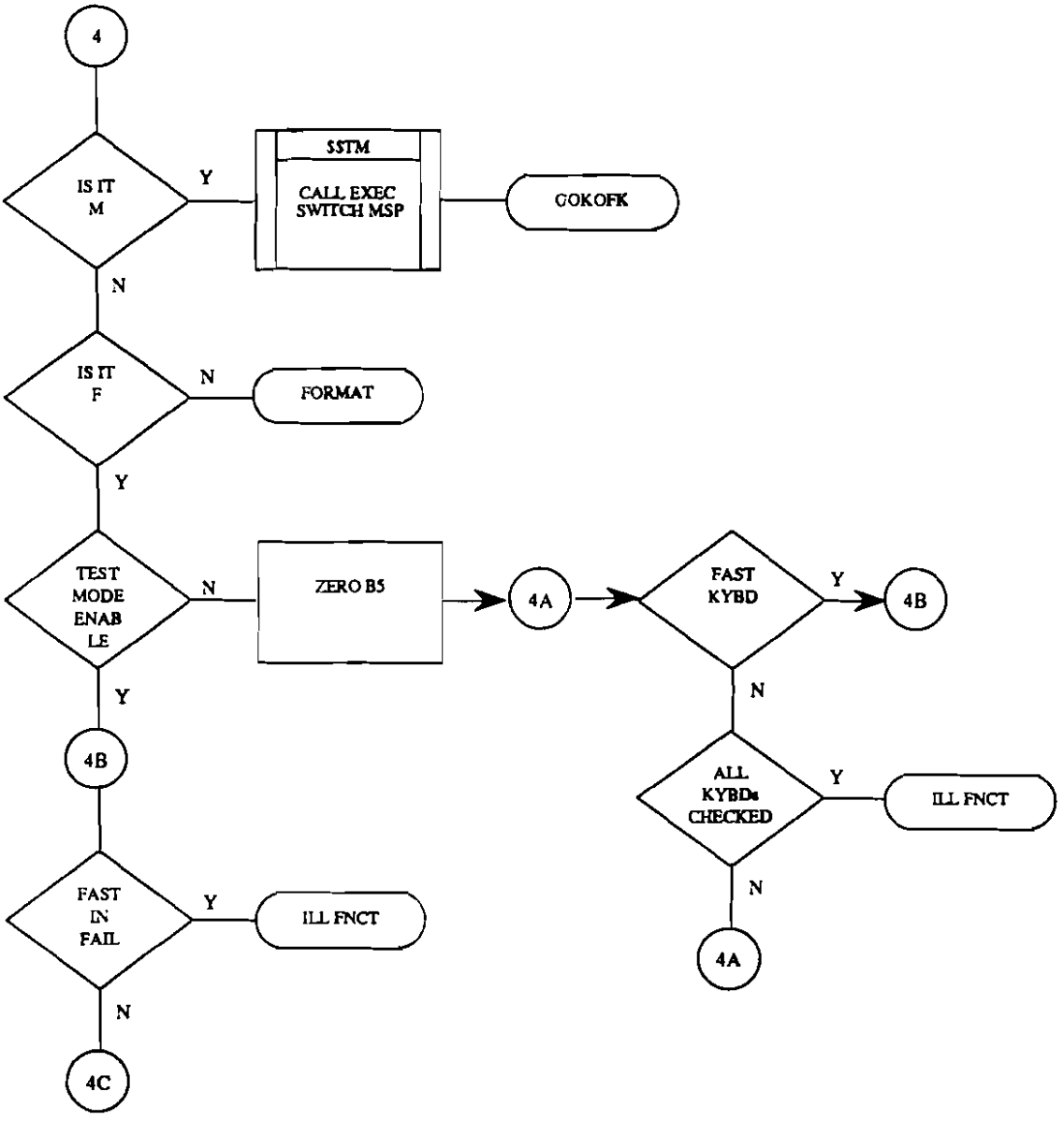

FIGURE 3.2.5.34-1 I/O RECONFIGURATION (IORFG) (SHEET 32)

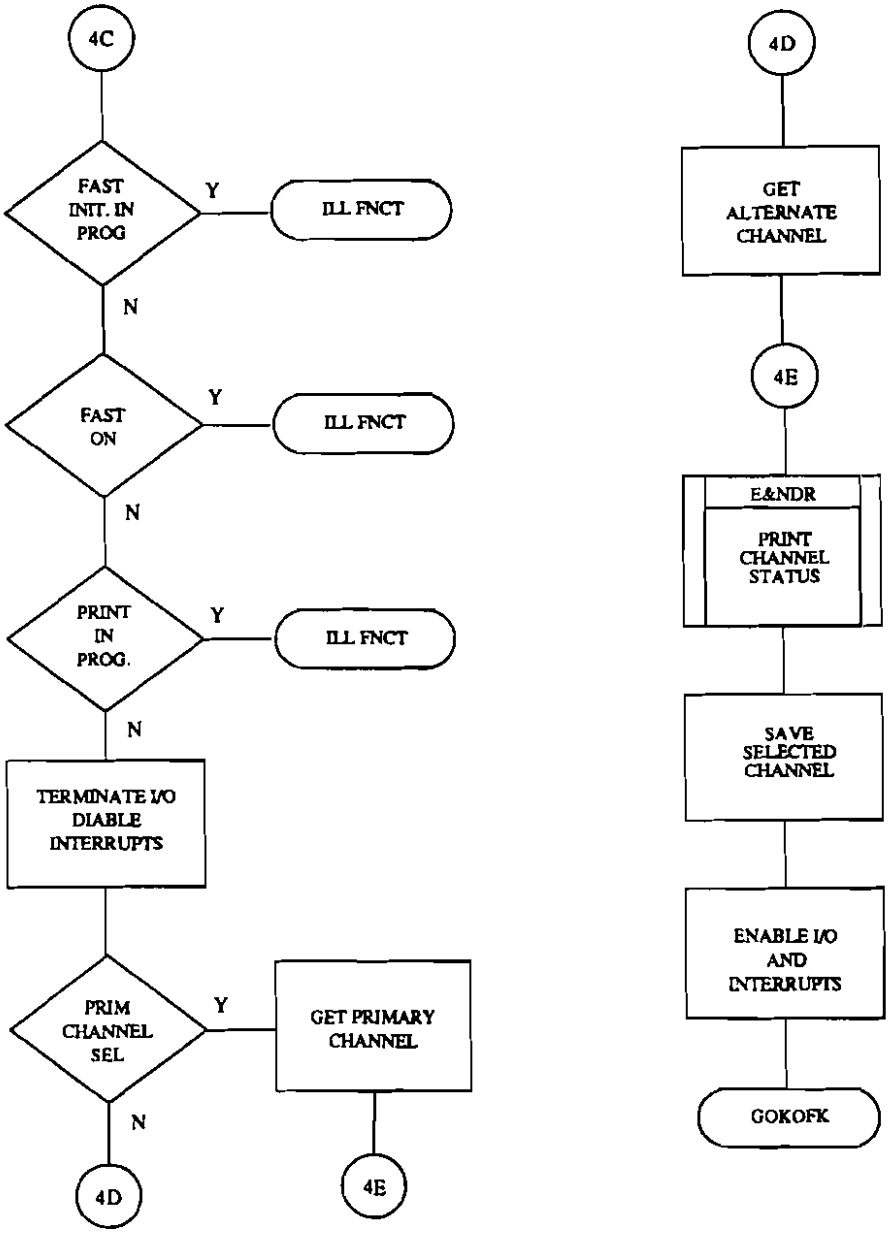

FIGURE 3.2.5.34-1 I/O RECONFIGURATION (IORFG) SHEET 33)

3.2.5.39 FINAL APPROACH SPACING TOOL (FSTINTL)

3.2.5.39.1 Purpose. To enabled/disable the FAST function. To send an initialization data packet and the various test patterns data packets to FAST. To allow the various FAST keyboard (valid and invalid) entries to be processed and eventually sent to FAST for processing.

3.2.5.39.2 Inputs.

Register preset:

S1 - Set to FASTD

B3 - Contains the callers buffer priority (index)

- Zero (0) low priority buffer request
- One (1) high priority buffer request

B5 - Contains the category (Oper/training)

- Zero (0) operational
- One (1) training

TSTKY - XTEST flag

TGTGEN - Target Generator Flag

FASTKT - FAST eligible keyboard table

FASTFAIL - FAST fail flag

FASTFLG - FAST on/off flag

FINTFLG - FAST Initialization flag

FTROP - FAST Oper./training indicator

FONOFF - Valid FAST keyboard table

FONOFF - FAST on/off category indicator (operational)

FONOFF+1 - FAST on/off category indicator (training)

FASTFLAG - FAST on/off flag

COUNT - A keyboard table containing the supervisory indicator

SYMT - A keyboard table containing the maintenance indicator

RTCQ - Real Time Clock

3.2.5.39.3 Outputs.

FON1 - On print data (OPNL)

FON2 - On print data (TRNG)

FOFF1 - Off print data (OPNL)

FOFF2 - Off print data (TRNG)

FSTUSER - FAST output buffer user counter

FSTBUFRT - FAST output buffer reset flag

FSTBEGBF - FAST output buffer beginning

FSTCRBUF - FAST output buffer current address

FSTSBADD - FAST output sub-buffer address

FSTRBUFR - Buffer request sub-routine lock

HBFAST - TIU heartbeat receipt time

HBSEQLK - Heartbeat sequence lock

HBSEQCNT - Heartbeat sequence count

FSTIME - FAST output buffer initiate time

FSTRBUFR - Buffer request sub-routine lock

3.2.5.39.4 Temporary storage

DCODT + 4 - DCODT + 6 the lower halves

3.2.5.39.5 Functional description.

When Fast is initialized a check is made to see if the system is in the XTEST mode. If it is all keyboard are valid FAST keyboards. When it is not in the XTEST mode the entering keyboard must be an eligible FAST keyboard, if not ILL FNCT is displayed. When FAST is in the initialization state or FAST FAIL is in progress ILL FNCT will be displayed. If the entering keyboard is not a supervisory position or has maintenance status ILL FNCT will be displayed.

When a SLEW entry has been made and FAST is in the initialization state or FAST FAIL is in progress ILL FNCT will be displayed. If the enterers FAST category in not on, ILL FNCT will be displayed. Otherwise the routine is exited with a call to GOKOFK.

When the first character entered is an E and a TTY printout is in progress ILL FNCT will be displayed. When FAST is previously enabled and the enterer category (OPNL/TRNG) is the same category that is enabled, ILL FNCT will be displayed. If the entering keyboard has training status but the target generator was not enabled ILL FNCT is displayed.

When FAST is previously enabled and the enterers category is different than the category that previously enabled FAST. FAST will be enabled for the enterers category and a Status message will be directed to the TTY.

When FAST is not previously enabled, A FAST initialization data packet will be constructed and transmitted to FAST. FAST will be enabled for the enterers category and a Status message will be directed to the TTY.

When the first character entered is an I and FAST is not enabled for this category ILL FNCT will be displayed. If a TTY printout is in progress ILL FNCT will be displayed.

When FAST remains enabled for the other category, FAST will be disabled for the enterers category and a Status message will be directed to the TTY.

When FAST is disabled for the other category, A FAST disable data packet will be constructed and transmitted to FAST. FAST will be disabled for the enterers category and a Status message will be directed to the TTY.

When the first character entered is a T and FAST is in the initialization state or FAST FAIL is in progress ILL FNCT will be displayed. If the second character is other than a 1, 2, 3, or 4, FORMAT will be displayed.

When a four is entered as the second character and the keyboard entry contains a third character, FORMAT will be displayed.

When 1, 2, or 3 is entered as the second character and the keyboard entry does not contain a third character, a default (10) value will be used for the number of words in the TEST pattern. When a third character is entered and is other than one through nine, FORMAT will be displayed.

When all the above conditions are satisfied, the requested test pattern will be constructed and transmitted to FAST.

When the first character entered is other than an E, I, or a T, and FAST is in the initialization state or FAST FAIL is in progress ILL FNCT will be displayed. If the enterers FAST category in not on, ILL FNCT will be displayed. Otherwise the routine is exited with a call to GOKOFK.

3.2.5.39.6 Storage and Timing

Storage 243

Timing N/A

3.2.5.39.7 Flowcharts See Figure 3.2.5.39.1

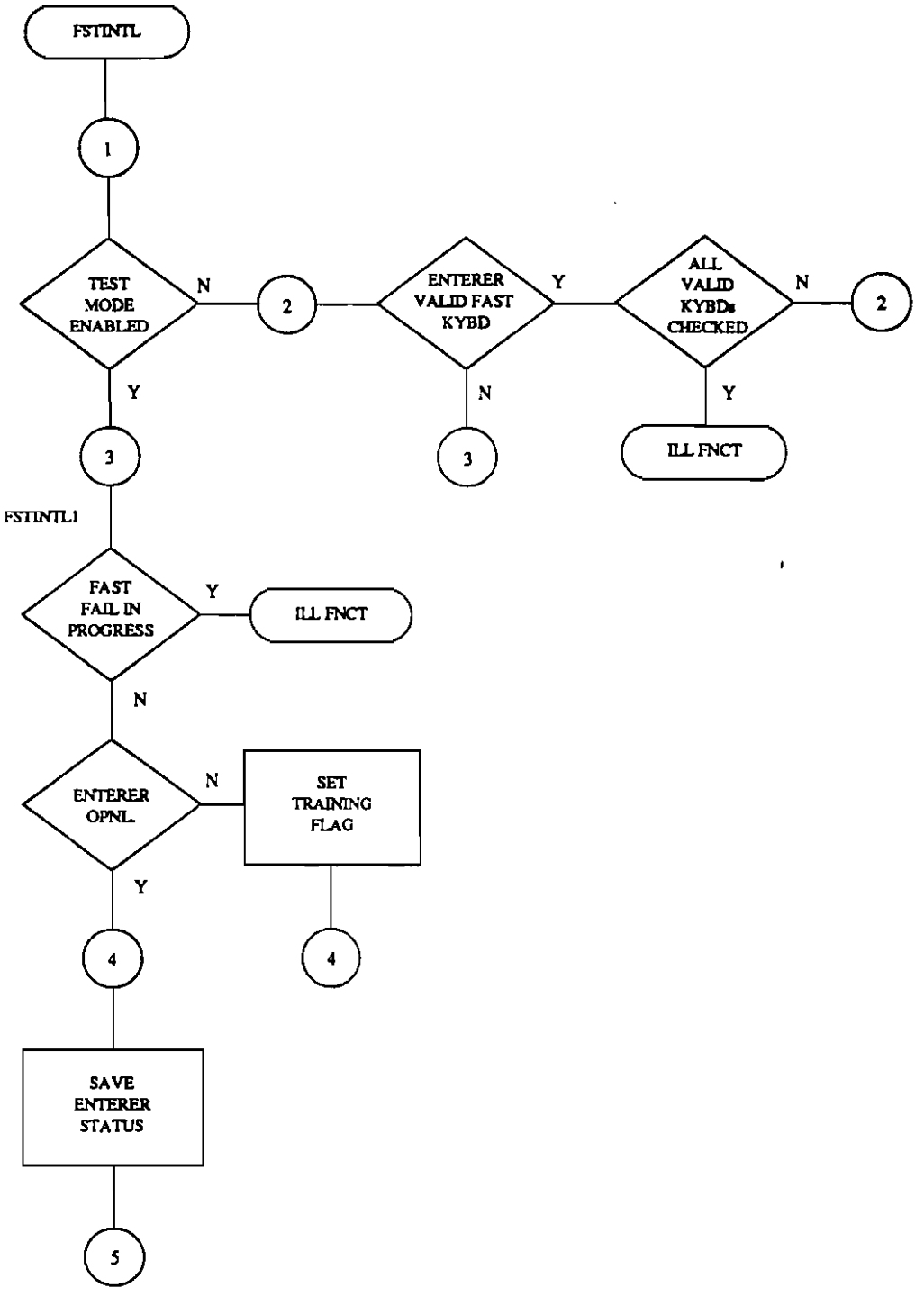

FIGURE 3.2.5.39-1 FINAL APPROACH SPACING TOOL (FAST) (SHEET 1)

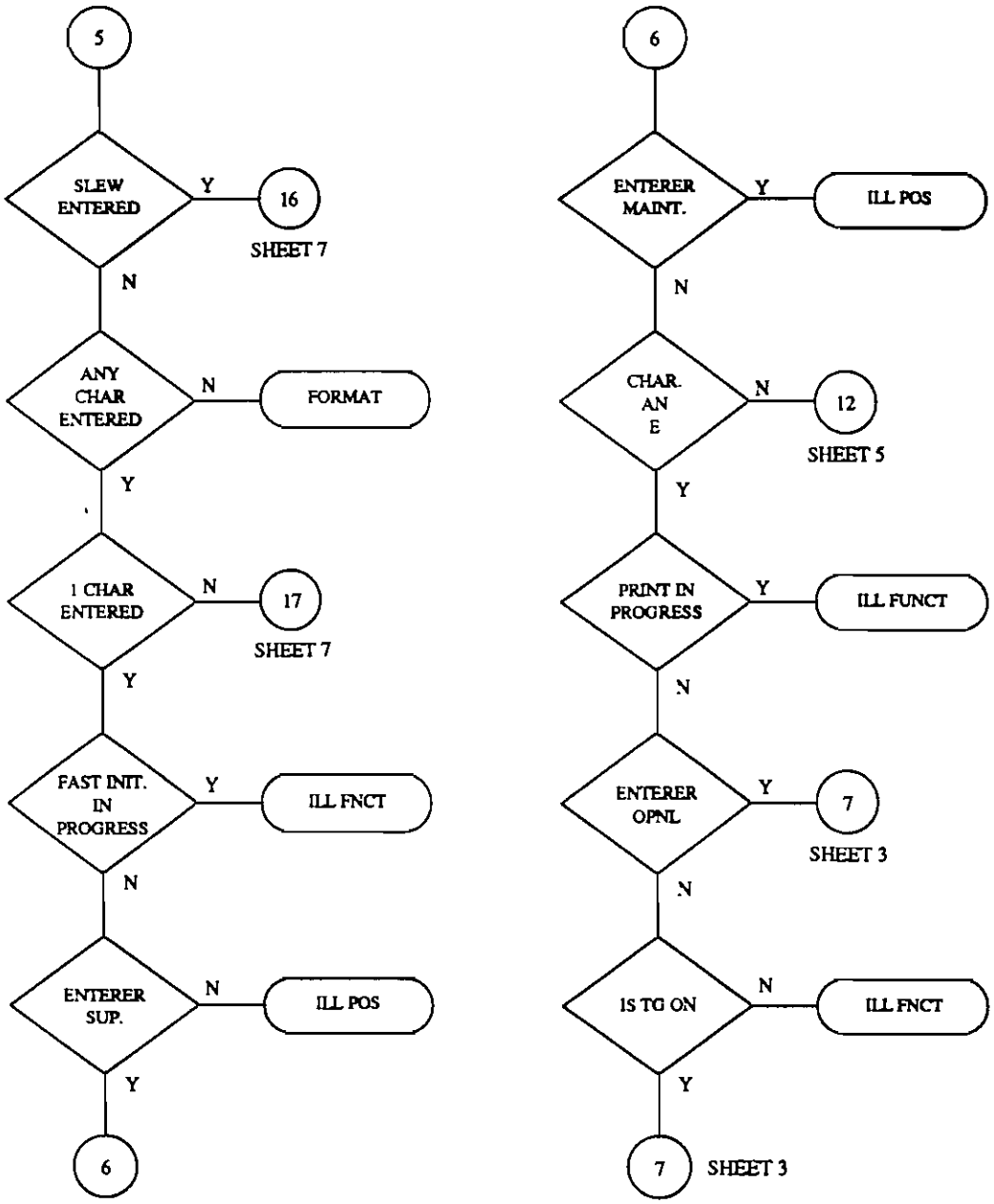

FIGURE 3.2.5.39-1 FINAL APPROACH SPACING TOOL (SHEET I2

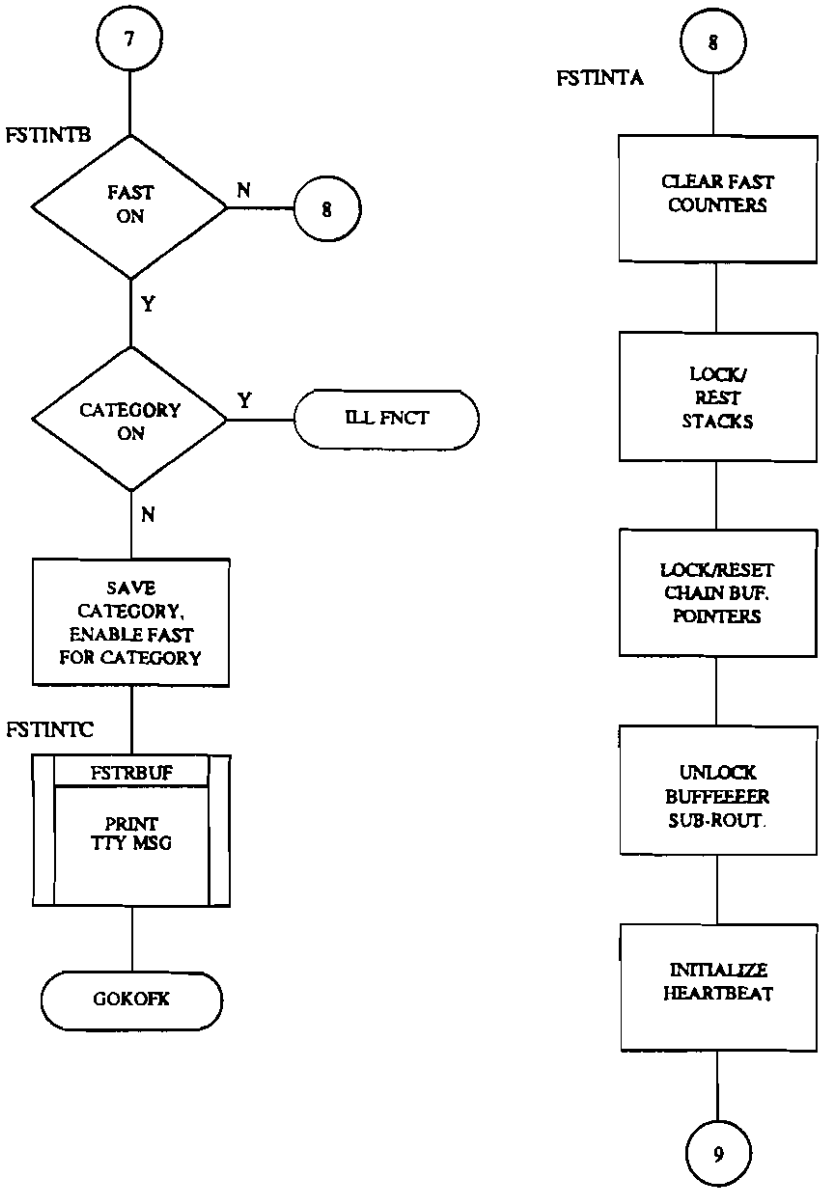

FIGURE 3.2.5.39-1 FINAL APPROACH SPACING TOOL (SHEET 3)

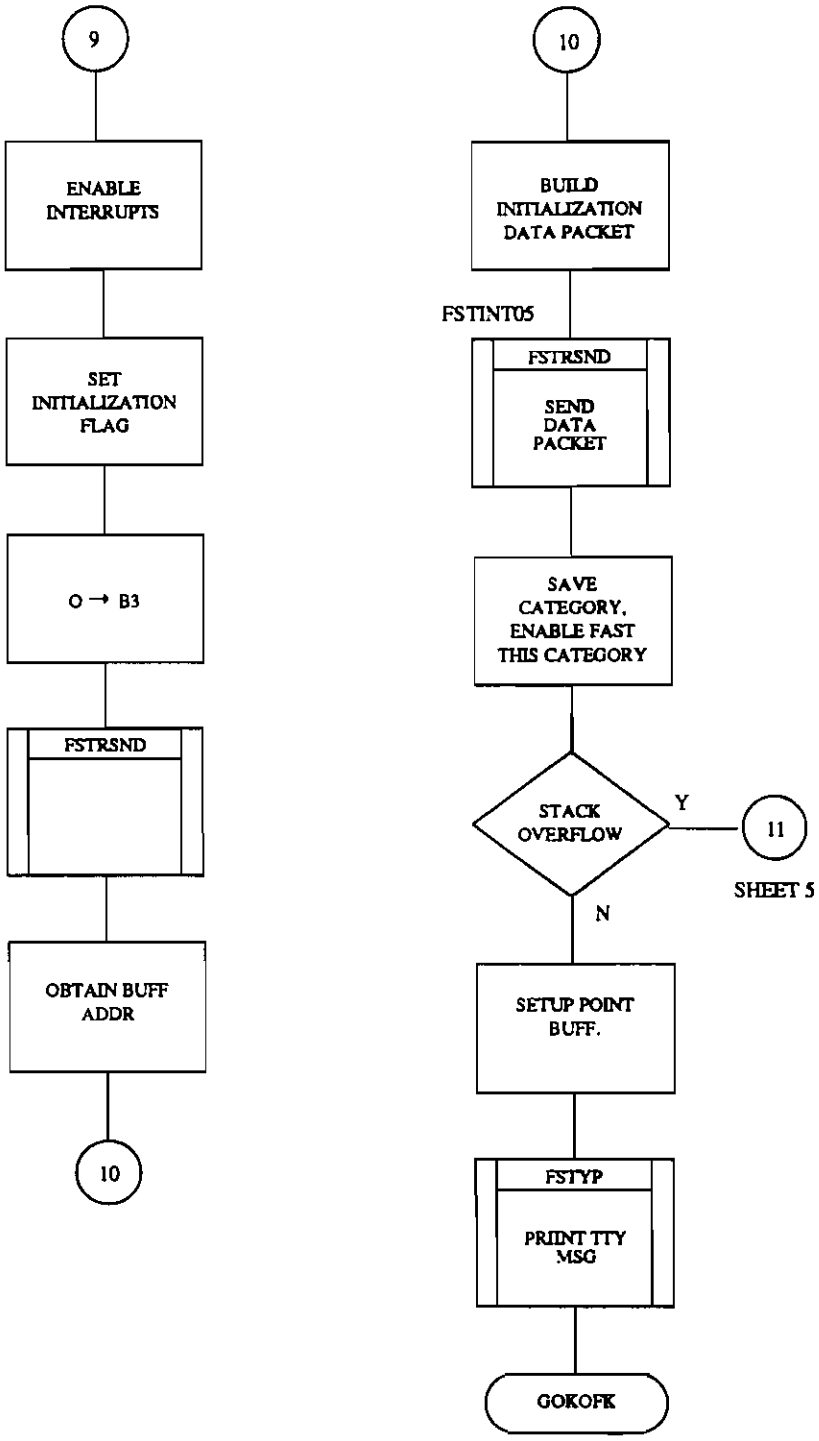

FIGURE 3.2.5.39-1 FINAL APPROACH SPACING TOOL (SHEET 4)

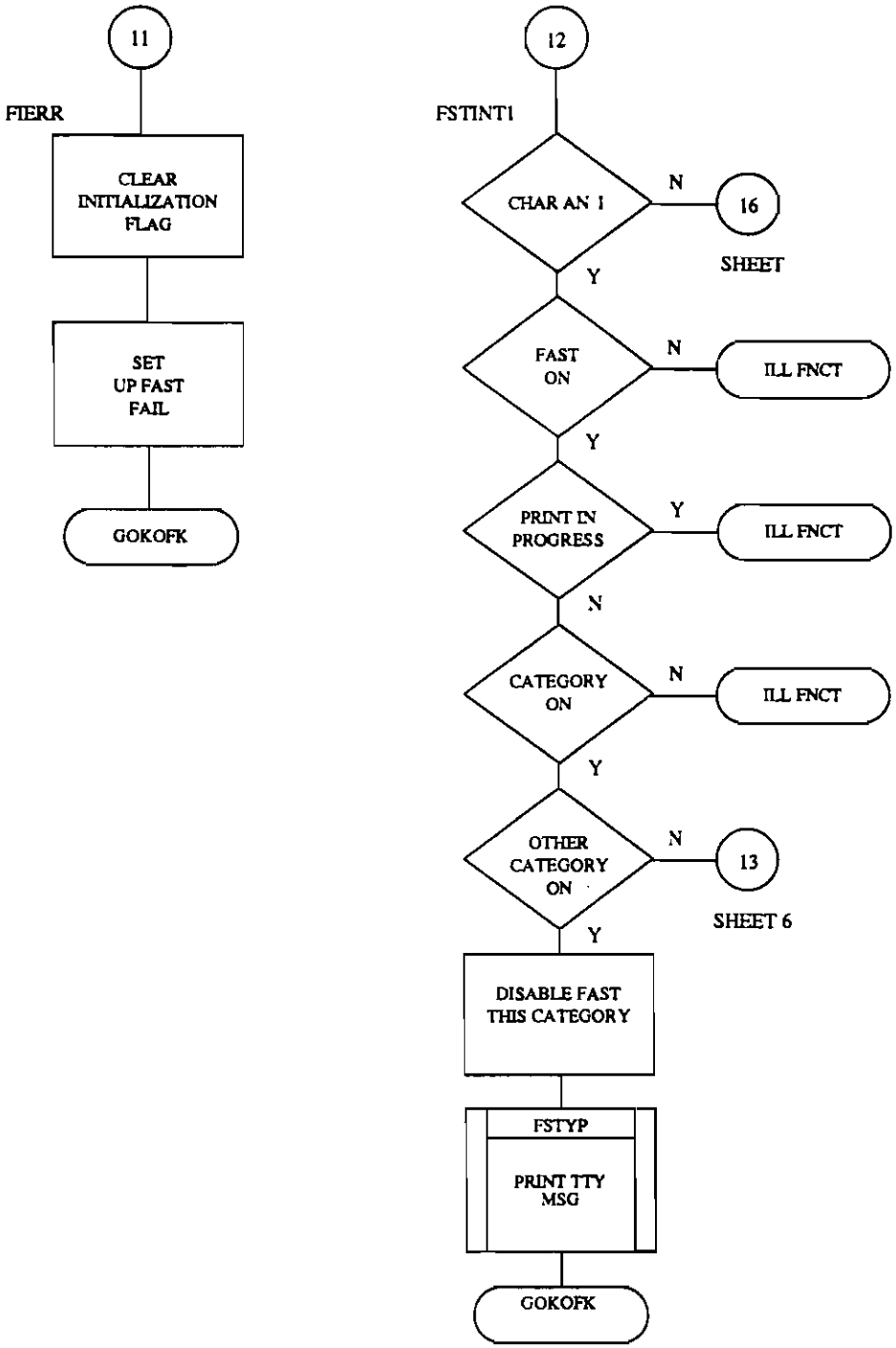

FIGURE 3.2.5.39-1 FINAL APPROACH SPACING TOOL (SHEET 5)

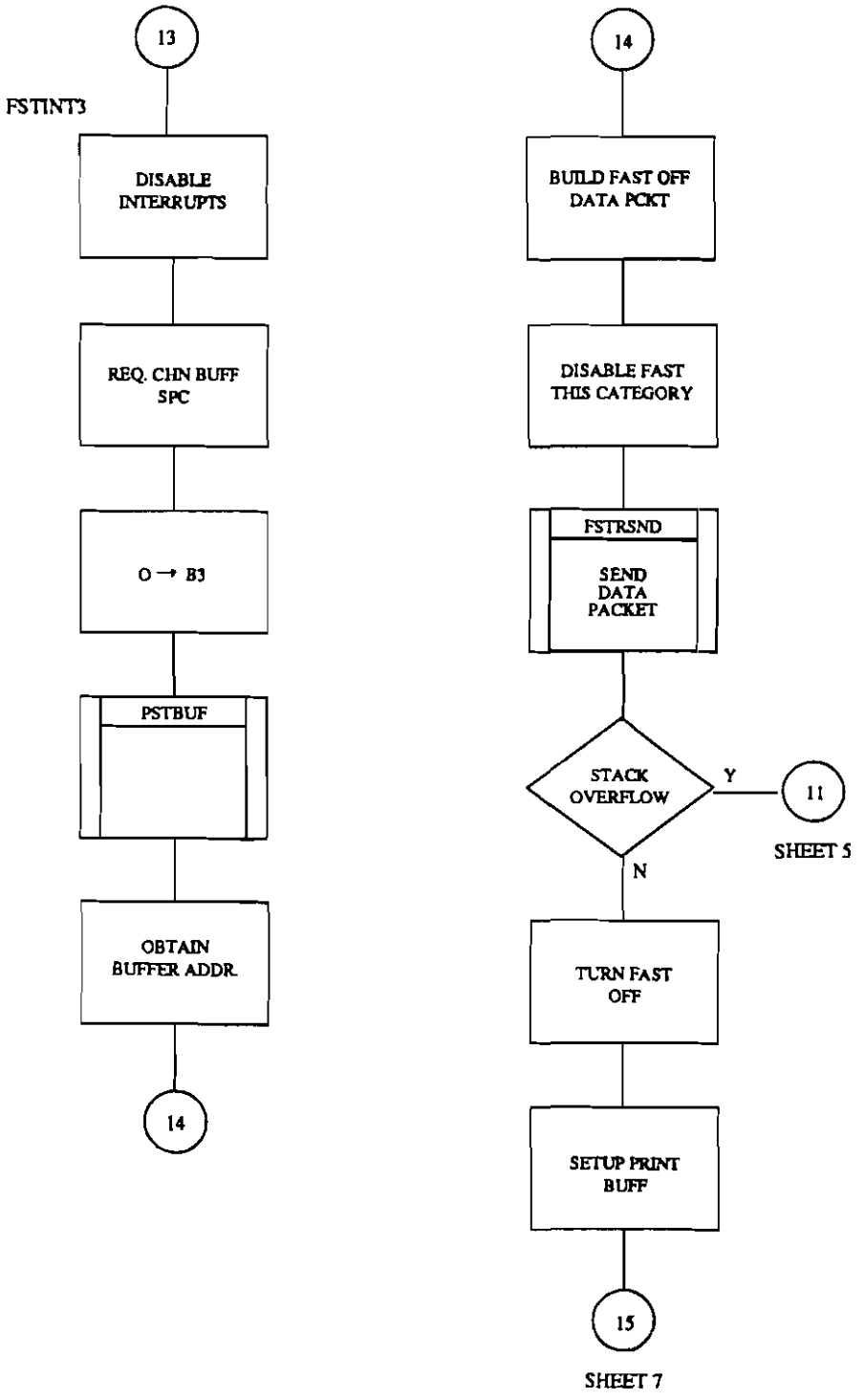

FIGURE 3.2.5.39-1 FINAL APPROACH SPACING TOOL (SHEET 6)

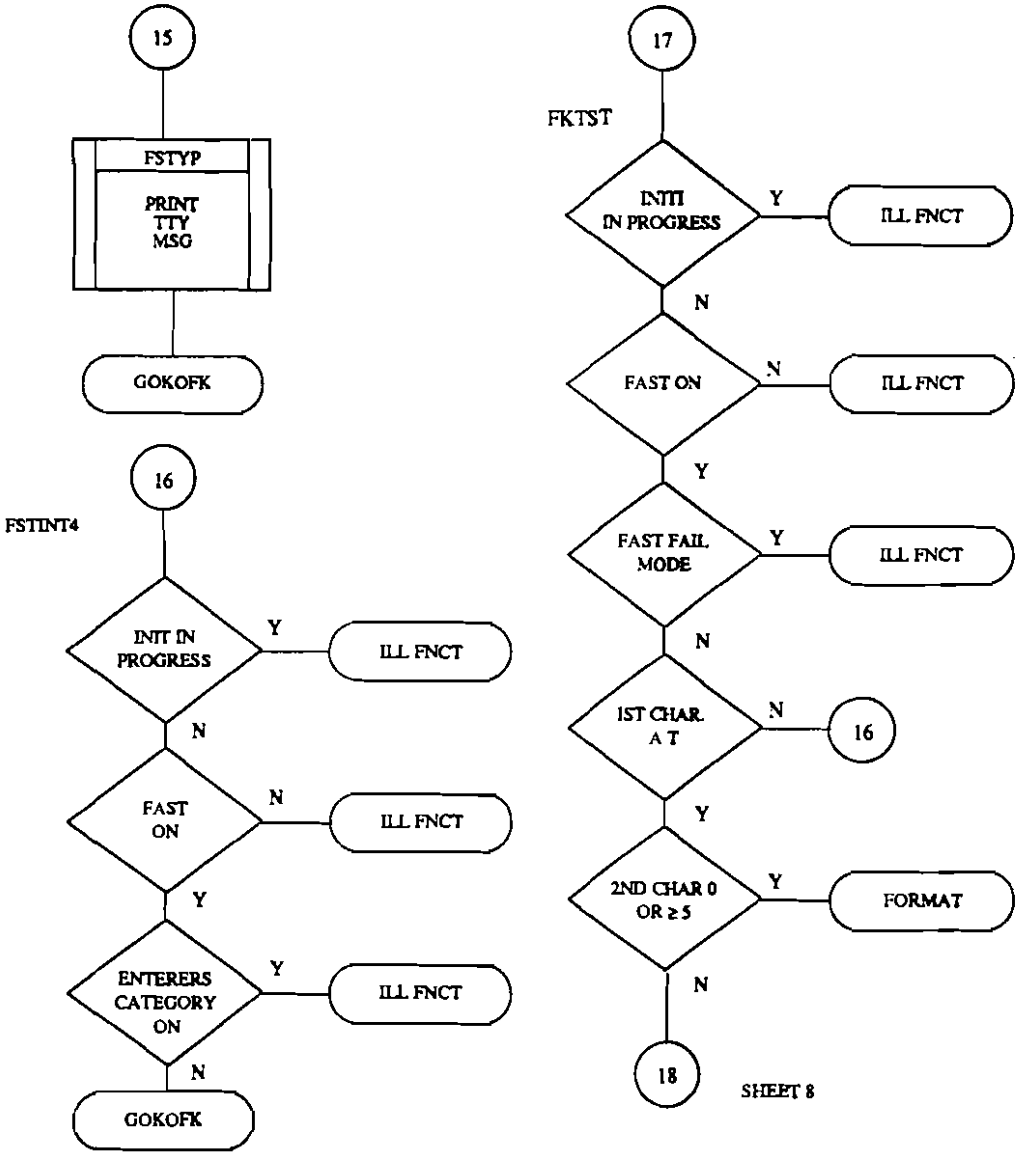

FIGURE 3.2.5.39-1 FINAL APPROACH SPACING TOOL (SHEET 7)

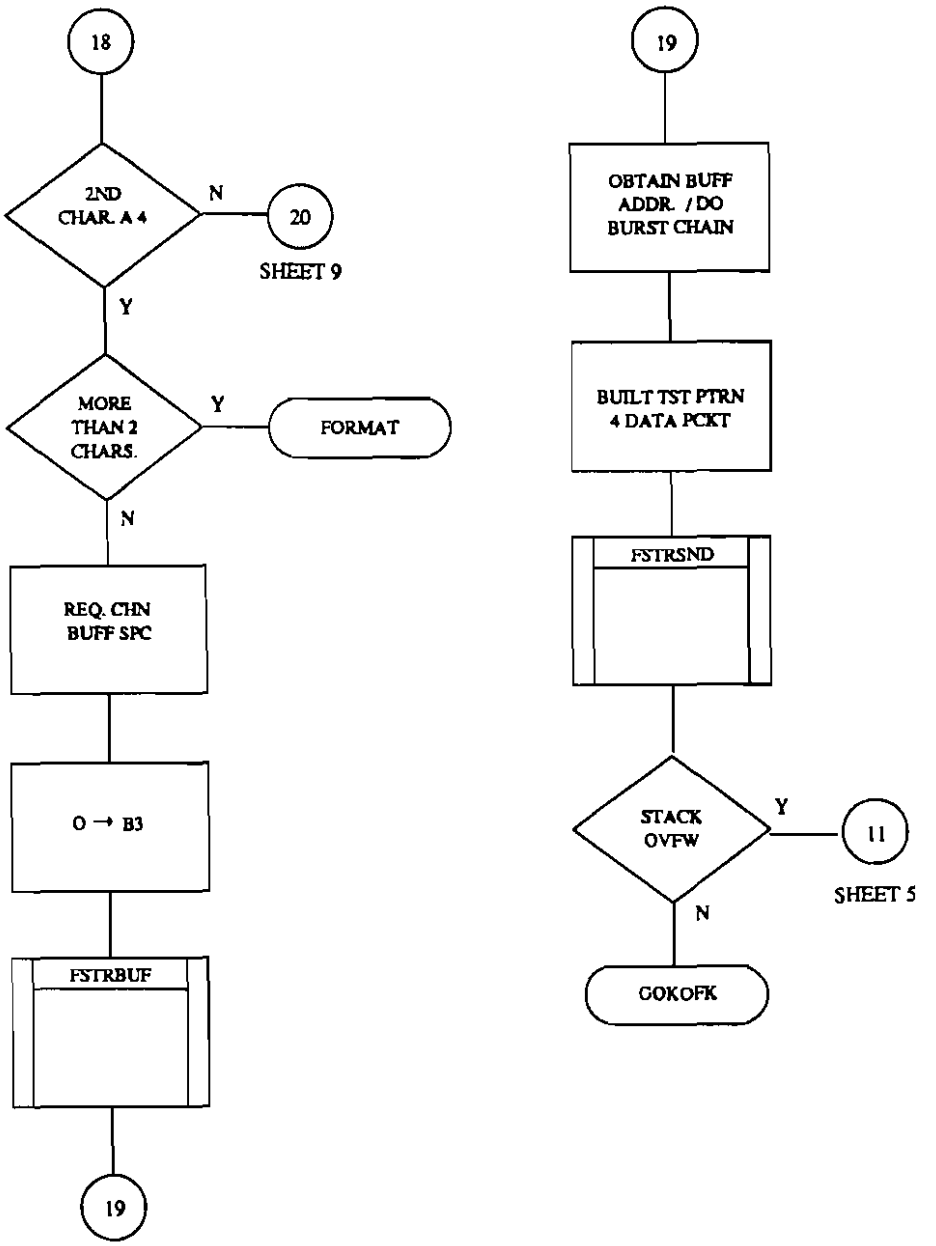

FIGURE 3.2.5.39-1 FINAL APPROACH SPACING TOOL (SHEET 8)

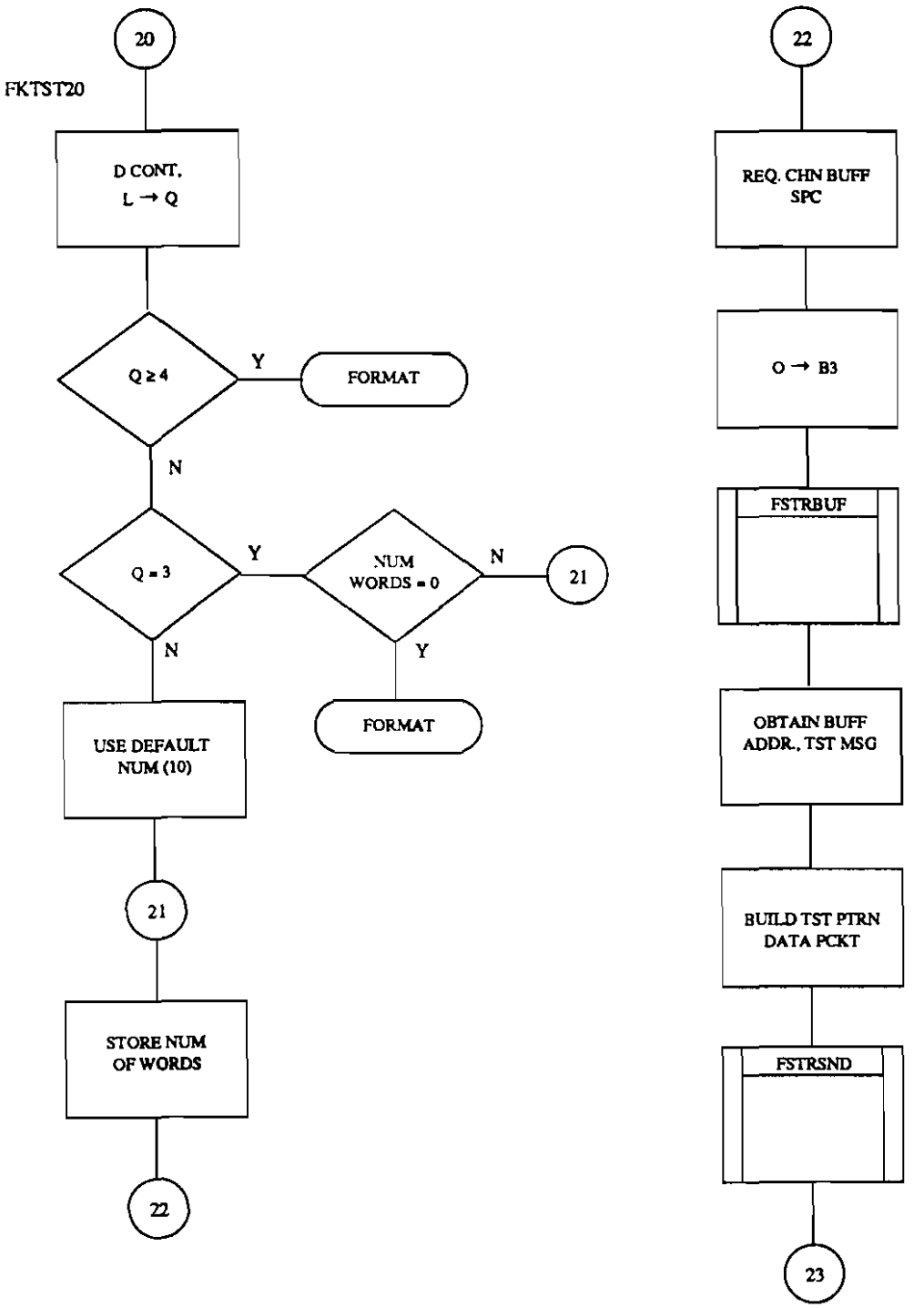

FIGURE 3.2.5.39-1 FINAL APPROACH SPACING TOOL (SHEET 9)

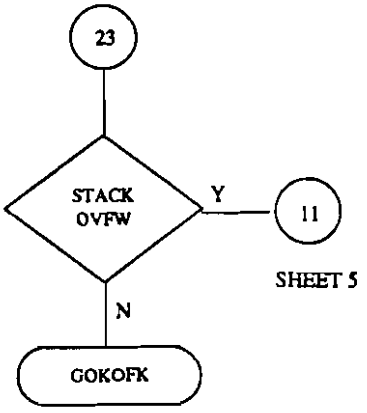

FIGURE 3.2.5.39-1 FINAL APPROACH SPACING TOOL (SHEET 10)

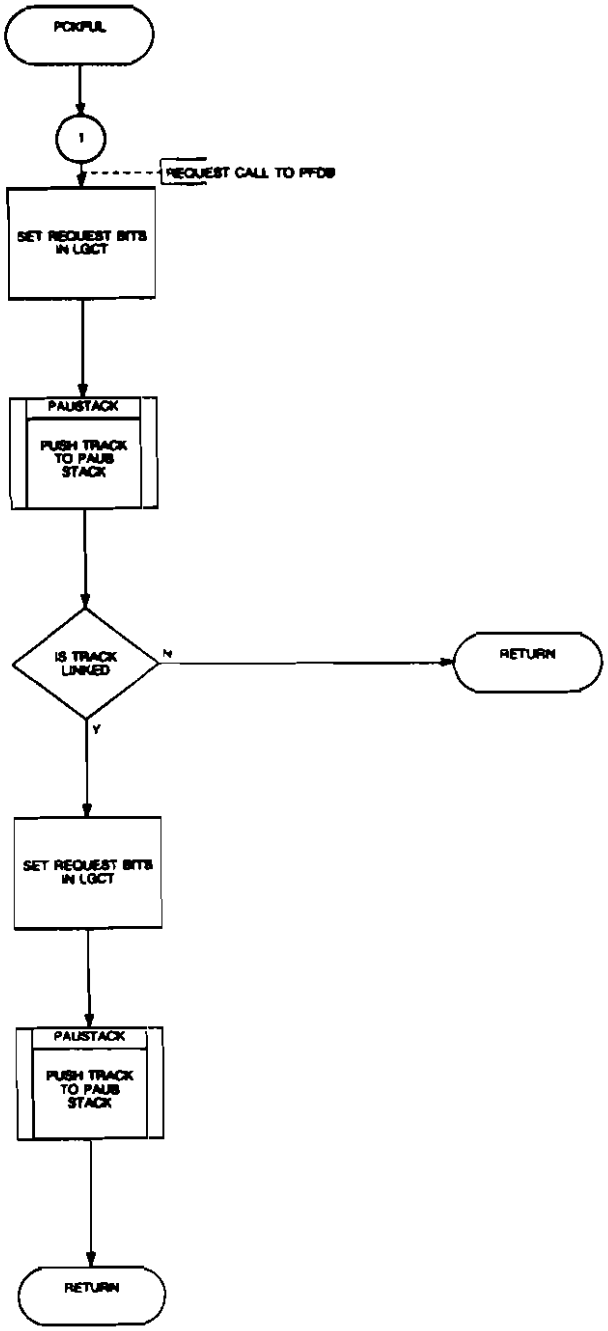

FIGURE 3.2.5.44.25-1. SET UP TO CALL PFDB (PCKFUL)

3.2.5.44.26 Set Up to Call PFDB — PCKONE

3.2.5.44.26.1 Purpose. The purpose of this subroutine is to set bits to call PFDB for associated and unassociated tracks.

3.2.5.44.26.2 Inputs/Outputs

Input

B2 — track CTS index

Output

LGCT — bits flagging PFDB for update

3.2.5.44.26.3 Parameters. None.

3.2.5.44.26.4 Functional Description. This subroutine sets the required bits to flag PFDB for either associated or unassociated tracks. The track address is placed on PAUS stack.

INSERT ATTACHMENT 14

3.2.5.44.26.5 Storage and Timing

Storage: 5 core

Timing: N/A

3.2.5.44.26.6 Flowcharts. See figure 3.2.5.44.26-1.

Tracks that are processed by routine PCKONE will have a FAST track drop data packet constructed and sent to FAST when the FAST function is enabled.

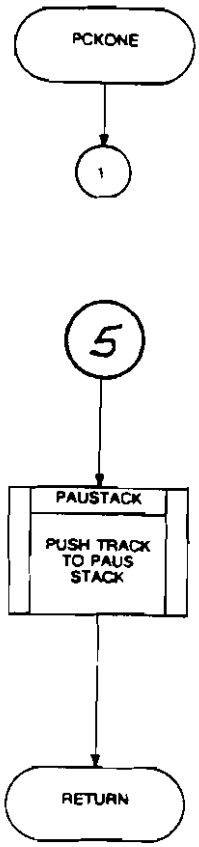

FIGURE 3.2.5.44.26-1. SET UP TO CALL PFDB (PCKONE)

3.2.5.44.27 Check for Radar Only Data — RDRCHK

3.2.5.44.27.1 Purpose. The purpose of this subroutine is to determine if radar only data has been entered.

3.2.5.44.27.2 Inputs/Outputs

Input

DCODT+4 — DCODT+n (lower) — contains entered data characters, one per word

DCODT (lower) — number of data characters entered

B3 — DCODT index

Output

DCODT+22 (upper) — 0 implies no radar only data, 1 implies radar only data

3.2.5.44.27.3 Parameters. None.

3.2.5.44.27.4 Functional Description. If a delta is entered followed by no data or a space, DCODT+22,U is set to 1 to indicate radar only data was entered.

3.2.5.44.27.5 Storage and Timing

Storage: 11 core

Timing: N/A

3.2.5.44.27.6 Flowcharts. See figure 3.2.5.44.27-1.

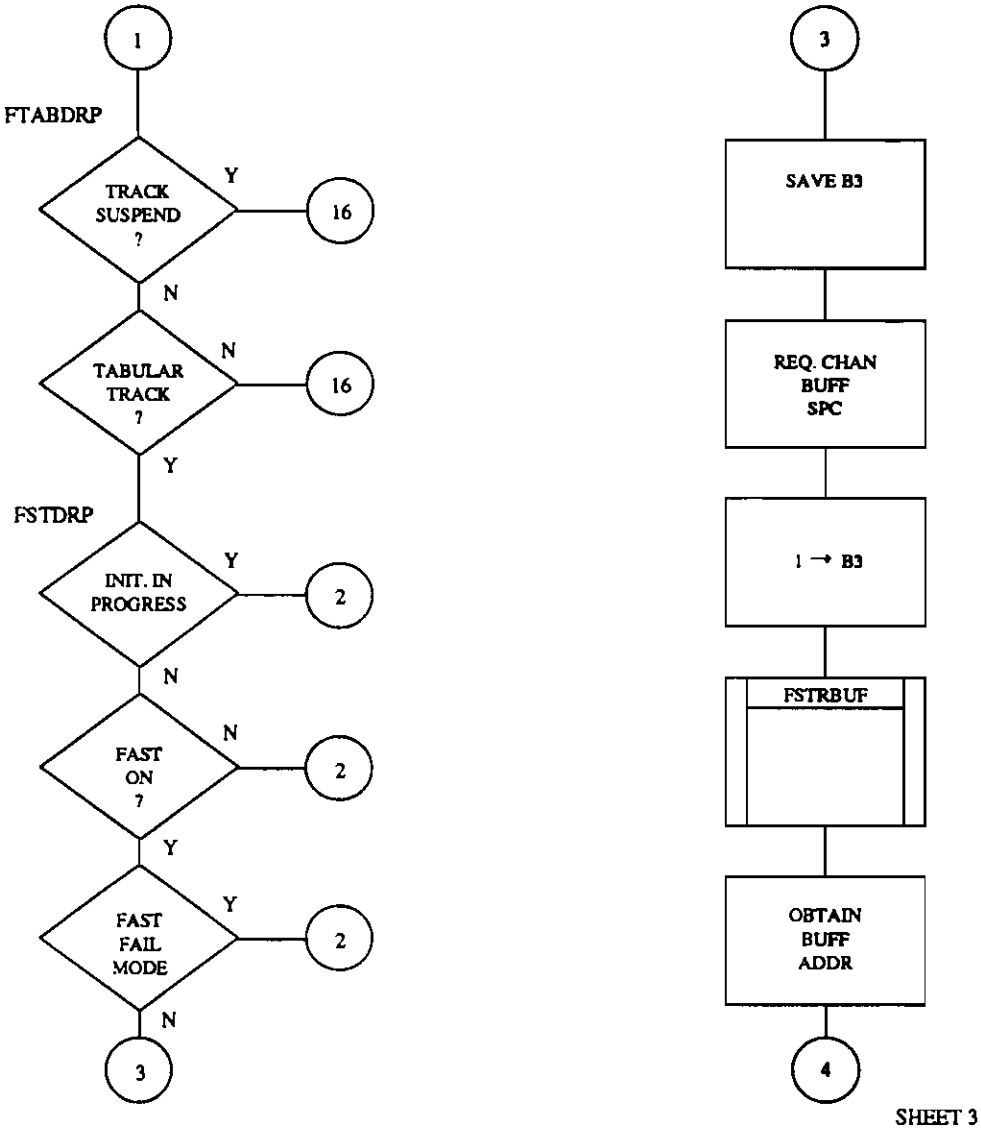

FIGURE 3.2.5.44.26-1 SET UP TO CALL PFDB (PCKONE) (SHEET 2)

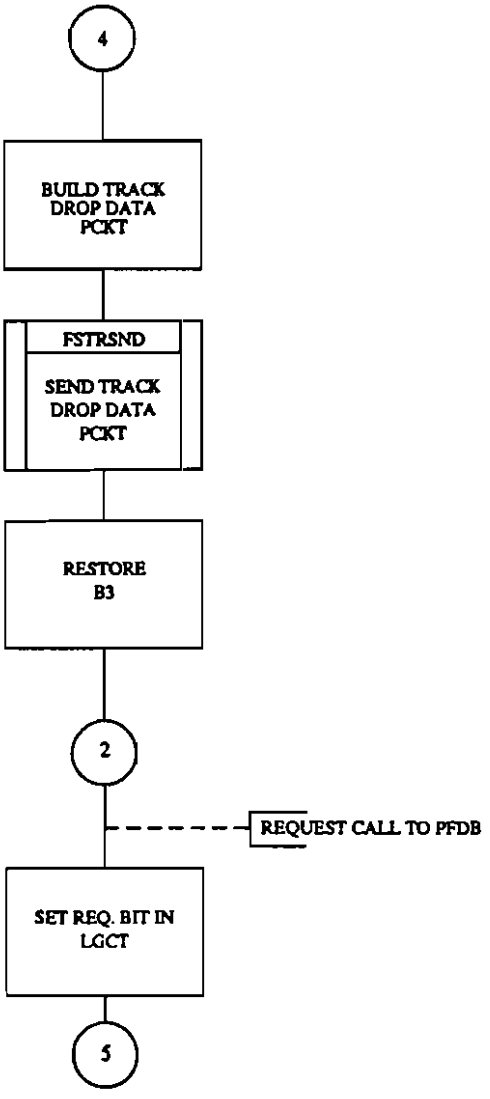

FIGURE 3.2.5.44.26-1 SET UP TO CALL PFDB (PCKONE) (SHEET 3)

3.2.12 Tracking Control Processing (TEXEC)

Tracking control is a planned task which maintains base sector numbers for each subsystem. The base sector number is used to determine if the subsequent tracking tasks should be executed at this time.

Tracking control also modifies the data necessary for tracking CENRAP mode, when CENRAP is enabled, and sets the data back to normal when CENRAP is inhibited.

3.2.12.1 Inputs. From SDB1:

BSECT	—	table of the base sector for each subsystem
CSECjT	—	current sector number for each subsystem (j)
SECLST	—	Sector Lost Count
CTSOVT	—	CTS overflow count
BOTOVT	—	table of BOT overflow counts by subsystem
ROTOVT	—	table of ROT overflow counts by subsystem
SASTjT	—	table of sector access store indices by subsystem (j)
SENSW,L	—	number of subsystem (sensors) to process
NSENSQKK	—	number of sensors adapted in the system
ADNSECT	—	addresses of NECT tables
ADSUMT	—	addresses of SASTjT tables
ADRPT	—	addresses of TRSjT tables
ENDRPT	—	ending addresses of TRSjT tables
DDTFLAG	—	designates single or dual configuration
ACQSCN	—	auto-acquisition parameters, active(L) and inactive(U)
AZSCALEW	—	bin size azimuth scaling factors, active(L) and inactive(U)
CBINW	—	bin size C_2 constants, active(L) and inactive(U)
PEAMXW	—	bin size E_A maximum constants, active(L) and inactive(U)
RGSCALEW	—	bin size range scaling factors, active(L) and inactive(U)
COAST	—	active coast parameters for associated and unassociated tracks
COASTCP	—	inactive (initially CENRAP) coast parameters

EX1PR — active XR for TPRED, based upon ASR scan rates

EX1PRCP — inactive XR for TPRED, initially based on ARTCC scan rate for CENRAP

SCAN1T — table of active scan rates, initially ASR values

SCAN1TCP — inactive scan rate, initially CENRAP scan rate

TIMK — active time between hits parameters, initially based on ASR scan rates

TIMKCP — inactive time between hits parameter, initially based on ARTCC scan rate

From SDB2:

TAST — current time for TTY messages

From SDB3:

CPFLAG — CENRAP active flag

CPEI — CENRAP enable/inhibit flag

CPEITSF — CENRAP enable/inhibit Test and Set

3.2.12.2 Design Logic. The Tracking Control Processing task is executed approximately once each sector for each tracker subsystem. TEXEC compares BSECT against CSECjT to determine if there is work for tracking.

If there are no sectors to process for a sensor, TEXEC flags the other tracking tasks to not execute for that sensor when called and tests other sensors in a similar manner.

If there are more than two sectors to process, which would be a temporary overload state or a resynch of the radar processing program, TEXEC erases reports, sector by sector, oldest data first, until there are only two sectors to process. SECLST is incremented for every sector containing reports, that is erased.

In the case of only one or two sectors to process, BSECT is incremented, the NSECT table is calculated and tracking is flagged to execute. After the first subsystem tested for activity is processed, SENSW,L is decremented to the next subsystem. TEXEC then examines the system load to determine the PAUS time limit. If tracking falls behind, the PAUS time limit will be decremented to allow tracking to catch-up.

Each sector, TEXEC passes to Performance Monitor (PERFO) the number of sectors behind for each processor.

← INSERT ATTACHMENT 16

During system initialization, and on each execution, TEXEC checks if a CENRAP enable or inhibit is requested. If a CENRAP enable is requested, TEXEC modifies various tracking parameters to allow tracking at the ARTCC scan rate, and flags the modification complete so that PSRAP will continue the enable. If a CENRAP inhibit is requested, TEXEC resets the tracking parameters for tracking at the ASR scan rate, and flags the modification complete so that PSRAP will continue the inhibit. In either case, if an enable or inhibit is requested, but TEXEC has already processed it, TEXEC will continue with normal processing.

Approximately once a minute TEXEC requests by tracking tasks are examined to see if any TTY messages need be output. The time and appropriate data are packed into messages in TTYD and queued for output. The messages are: 1) Sectors lost, 2) Central Track Store overflow, 3) Beacon only table overflow in each subsystem and 4) Radar only table overflow in each subsystem.

The number of sectors behind for each sensor are also passed to the Final Approach Spacing Tool (FAST) function, and if the sectors behind exceed a parameter value the FAST function will be automatically disabled.

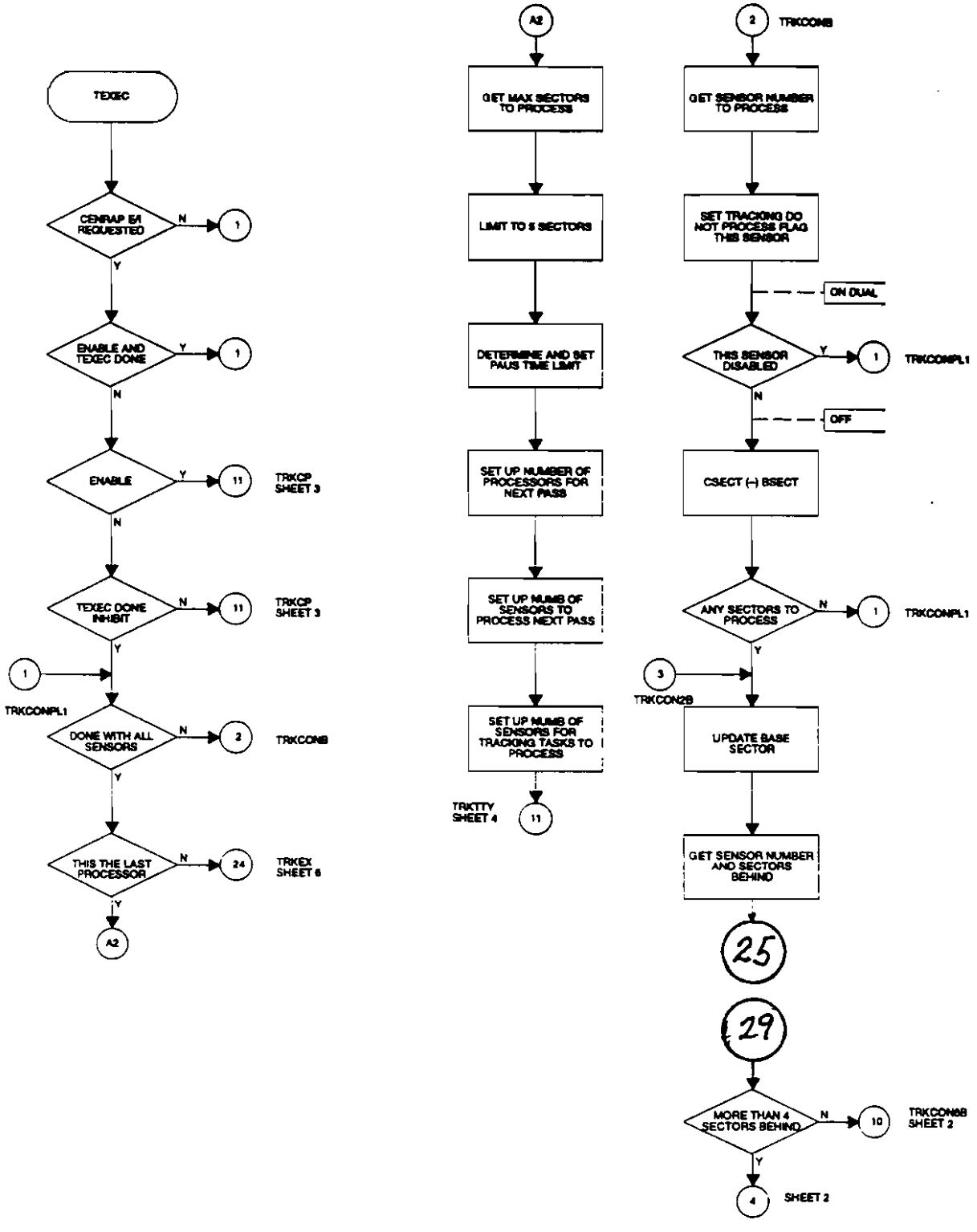

FIGURE 3.2.12-1. TRACKING CONTROL PROCESSING (SHEET 1)

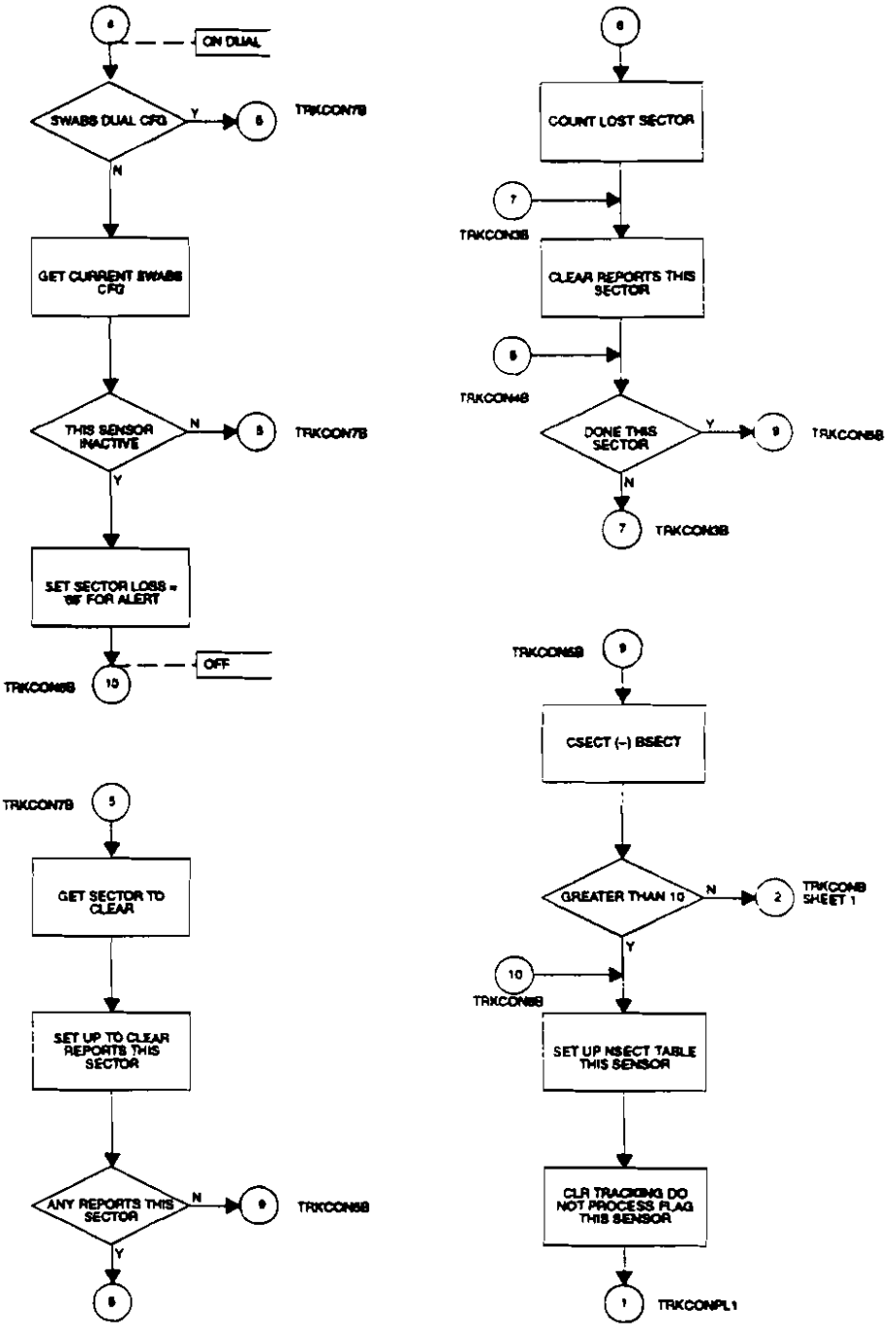

FIGURE 3.2.12–1. TRACKING CONTROL PROCESSING (SHEET 2)

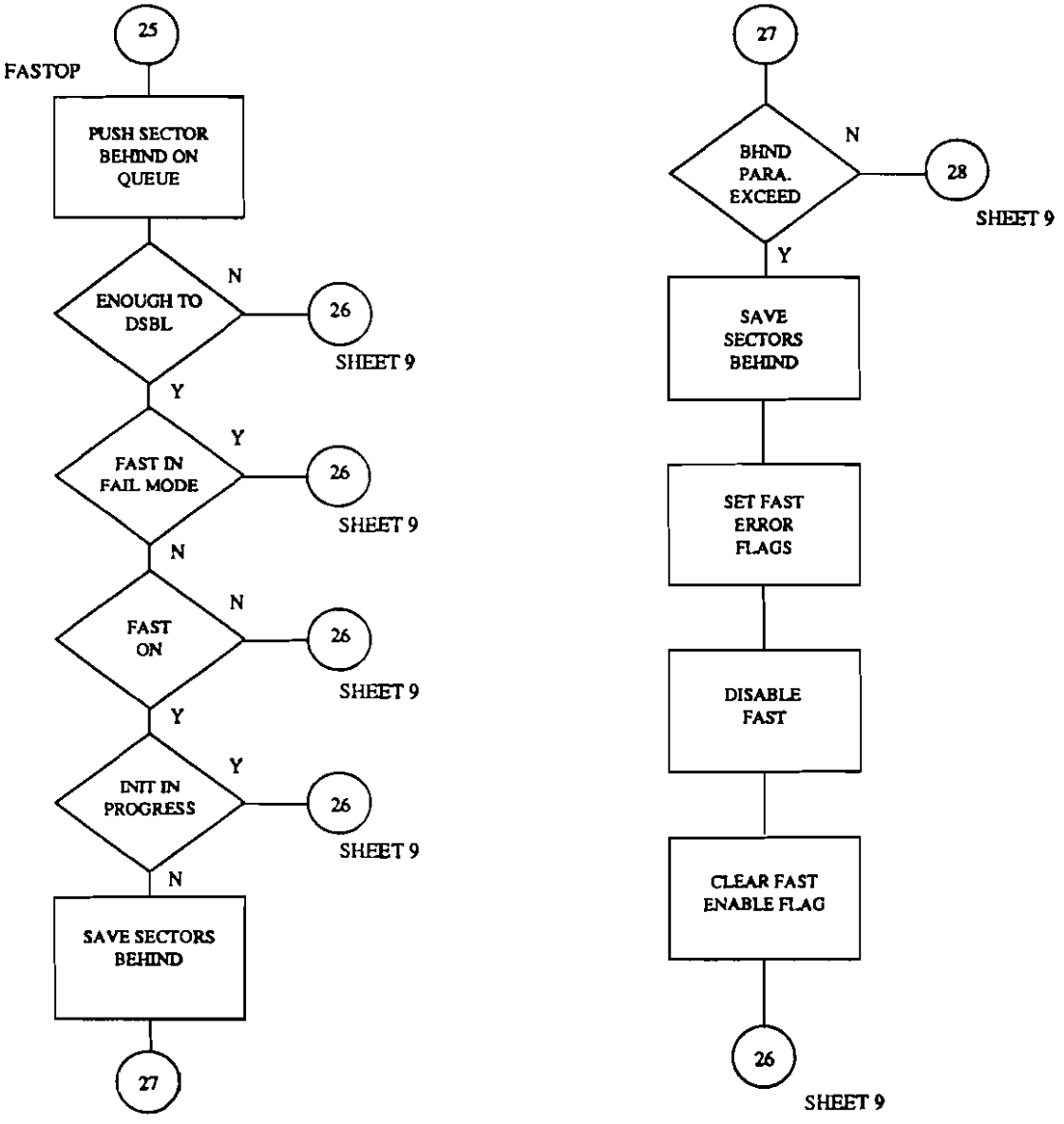

FIGURE 3.2.12-1 TRACKING CONTROL PROCESSING (SHEET 8)

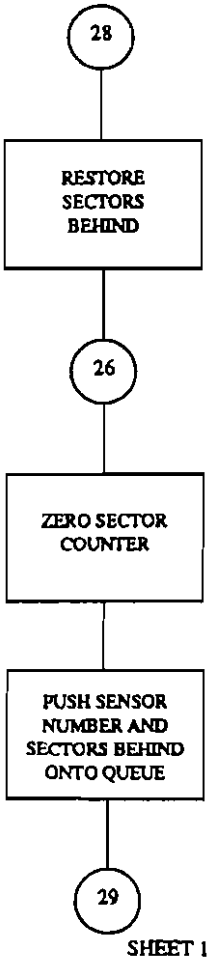

FIGURE 3.2.12-1 TRACKING CONTROL PROCESSING (SHEET 9)