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Research Memorandum 76-14

**PLANIT SUPPORT AND UTILITY PROGRAMS--
FLOW CHARTS**

Richard F. Bergfeld, James L. Silva, Barry Seid
James M. Fletcher and Alan M. Hoff
Litton Systems Incorporated

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Educational Technology and
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Contract Number DAHC-19-74-C-0064

9 Research Memorandum 76-14

6 PLANIT SUPPORT AND UTILITY PROGRAMS--
FLOW CHARTS.

10 Richard F./Bergfeld, James L./Cilva, Barry/Seid,
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ABSTRACT

↙ This document presents the detailed flow ^{charting}charts of the computer program logic of the AN/GYK-12 computer PLANIT support and utility programs. The flows are intended for use in conjunction with the program listings to aid in understanding the program logic. These programs are part of the system installation of PLANIT (Programming Language for Interactive Teaching) on the AN/GYK-12 (TACFIRE) computer. ↗

The PLANIT Support and Utility Programs were developed as a part of a Litton Systems, Inc., Data Systems Division (DSD), contract with the U. S. Army Research Institute for the Behavioral and Social Sciences (ARI). This contract (# DAHC19-74-C-0064) was awarded on 11 June 1974 as a part of an overall ARI research project which addresses the application of tactical computers to training. This contract specifically addressed the installation of the PLANIT author/student language on the U. S. Army Artillery Tactical Fire Direction System (TACFIRE) general purpose computer. This computer (AN/GYK-12) is also used in several other Army tactical computer systems.

The successful completion of this contract included the delivery and demonstration of a fully operational PLANIT system on the AN/GYK-12 computer. This project included the development of a translator and translation of PLANIT (version 2.6) from FORTRAN to TACPOL (AN/GYK-12 computer programming language). This task was accomplished under a separate ARI contract to the Northwest Regional Educational Laboratory. The Litton contract included the development of the operating system, machine input/output programs, system start and termination routines, utility support programs, and system integration and support to the installation of PLANIT on the AN/GYK-12 system.

BACKGROUND OF THE PLANIT USER TRAINING SYSTEM

Several explicit user requirements converged to generate the research which resulted in the documents contained in this set of reports. The need for some type of user training subsystem in support of tactical automatic data processing (ADP) system developments was clearly established during the evolutionary phase of the Army Tactical Operations System (TOS) development in Europe.¹ In 1974, after a decade of involvement in the development of tactical ADP systems, the Army Computer Systems Command summarized this experience into six "Lessons Learned."² One of these lessons was: A dedicated and trained user is required if tactical ADPS is to succeed.

One approach toward meeting this requirement is to apply techniques derived from modern educational technology and the computer sciences by embedding training subsystem packages within the operating system and then using the system itself to teach the user how to use the system. The approach was delineated in a concept paper,³ which was subsequently submitted, evaluated and found by key Army Personnel to have merit. As a consequence, a requirement was placed on the Army's Behavior and Systems Research Laboratory (BESRL--the predecessor of what is now the Army Research Institute) by what was then the Assistant Chief of Staff for Force Development (ACSFOR) and the Director of Army Research, Office of the Chief of Research and Development (OCD),^{4,5} to effectuate the research necessary to test the concept.

¹Baker, J. D. "Human Factors Experimentation Within a Tactical Operations System (TOS) Environment." Proceedings: Office of Naval Research Sponsored Tri-Service Coordination Meeting, London, England, 20-21 February 1968.

²Memorandum from Headquarters, U.S. Army Computer Systems Command to Assistant Deputy Commander, CACDA, Ft. Leavenworth, KA; Deputy Commander, MASSTER, Fort Hood, TX; Project Manager, Army Tactical Data Systems, Fort Monmouth, NJ, dtd 30 January 1974, Subject: TSDG Lessons Learned.

³Memorandum from U.S. Army Behavior and Systems Research Laboratory to Assistant Chief of Staff for Force Development, dated 28 September 1971, Subject: Proficiency Maintenance Using Computer-Assisted Instruction in an Operational Setting.

⁴Memorandum from Assistant Chief of Staff for Force Development to Chief of Research and Development, dated 10 November 1971; with 18 November 1971 indorsement to Behavior and Systems Research Laboratory, Subject: Request for Research in Application of Tactical Data Systems for Training.

⁵Memorandum from Chief of Research and Development to Assistant Chief of Staff for Force Development, dated 29 Nov 1971, Subject: Request for Research in Application of Tactical Data Systems for Training.

The terms of the requirement actually levied, however, went well beyond the scope of the original concept and called for a simultaneous attack on all facets of the problem associated with testing the feasibility of the approach. In terms of broadened scope, the primary role of these systems is in support of tactical operations. Our original concept paper suggested a potential, select secondary role for these computerized tactical data systems, viz., that of directly supporting the system user by using the system itself, in a stand-alone mode, to teach the user how to use the system. The agencies structuring the research requirements saw a possible tertiary role for these systems. About the time they were structuring their requirements, the Army's Dynamic Training Board identified the maintenance of proficiency of Military Occupation Specialty (MOS) 11B40, the light weapons infantryman, as a glaring unit training problem and suggested that Computer-Assisted Instruction (CAI) as one technique for alleviating the situation.⁶ In addition, a subsequent Continental Army Command (CONARC) Task Group report on CAI identified the 11B40 MOS as a top contender for attention in the "non-technical" skills area.⁷ Consequently, the scope of the effort was expanded to encompass an examination of a tertiary role, i.e., in support of the system's parent unit by using these computers to meet individual and unit training requirements such as those associated with the 11B40 MOS. Additionally, in response to concern that the implementation of the Modern Volunteer Army concept might produce a need for general education development (GED) upgrading it was determined that an examination should be made of the feasibility of employing extant CAI GED on tactical computers in an operational setting. The assumption was made that accomplishment of these latter requirements would be tantamount to proving the feasibility of the secondary role concept as well. The test, therefore, would be a cost-effective undertaking since it would provide data directed toward answering a number of diverse questions concerned with a common training delivery system, viz., tactical computers.

Irrespective of whether it was the secondary or tertiary role concept being assessed, four major components were required: a test in a credible operational environment; appropriate hardware; functioning software and representative people-ware. The vehicle for this overall assessment was MASSTER⁸ Test FM 122, "IBCS: Automated Instruction." The hardware was a "given" viz., the Developmental Tactical Operations

⁶Report of the Board for Dynamic Training, Volume II. 17 December 1971, page 116.

⁷Headquarters, United States Continental Army Command Task Group Report and Computer Assisted Instruction. April 1972.

⁸MASSTER - Modern Army Selected Systems Test, Evaluation, and Review--is the Army's test bed for assessing equipment, concepts and doctrine. This activity is located at Fort Hood, Texas.

System (DEV'TOS) which was then located at Fort Hood, Texas (Hoyt, et al⁹ provide a description of the hardware). Likewise, the people were a "given"--our student population would be MOS 11B40 personnel drawn from the 2nd Armored Division and 1st Cavalry Division located at Fort Hood. The question of what "software" approach to take (specifically, whether to use an existing student/author language) was key to the success or failure of Test 122. Clearly, the decision made at this juncture would determine whether we would hit the assigned "test window" in time to conduct the test. As a related issue, courseware development would largely depend upon the structure of the student/author language selected, so courseware development could not commence until this decision was made. The decision itself had to be correct and timely--and whatever decision was made would undoubtedly be risky.

To add to the difficulty in reaching a decision, it must be realized that it could not be made unilaterally. Conduct of a test of the complexity of MASSTER Test FM 122 required support from and coordination between a number of different agencies--key among them being mutual cooperation of the organization which had DEV'TOS responsibility, the U.S. Army Computer Systems Command (USACSC), and the Army Research Institute (ARI). A Memorandum of Understanding¹⁰ was drawn up between these two organizations and, as the first USACSC task in this joint undertaking, a MASSTER Test 122 CAI Concept Paper¹¹ was to provide alternative concepts for implementing automated instruction materials on the DEV'TOS in support of MASSTER Test 122. Concurrent with this effort, a contract was let by ARI with the System Development Corporation (SDC) to develop the courseware (i.e., the instructional materials which would be presented through CAI). The first task SDC had to accomplish was to provide alternative student/author language alternatives for generating the courseware and to determine which alternative provided the best likelihood of success under the test conditions and time constraints imposed. In essence, the combined results of these analytic studies were expressed as follows: "At this stage, many alternative design concepts can be formulated. However, due to time constraints on the implementation of any concept, the only alternative concept considered feasible...is the use of PLANIT."¹²

⁹Hoyt, W. G., Butler, A. K. and Bennik, F. D. "Application of Tactical Data Systems for Training: DEV'TOS Feasibility Determination and Selection of an Instructional Operating System." ARI Technical Paper 267, October 1975.

¹⁰Memorandum of Understanding Between Commander, U.S. Army Research Institute and Commander, U.S. Army Computer Systems Command, Dated 5 June 1973.

¹¹Bunker-Ramo Technical Note "MASSTER Test 122--Computer Assisted Instruction (CAI) Concept Paper," February 1973, prepared for the U.S. Army Computer Systems Command.

¹²Ibid. 11, page 18.

PLANIT (Programming Language for Interactive Teaching) is an instructional system consisting of an author language and supporting computer programs for preparing, editing and presenting any subject matter suitable for individualized CAI presentation to students, as well as recording all relevant response data for immediate utilization and subsequent analyses. PLANIT was developed over an eleven year period under the aegis of the National Science Foundation (NSF) at a total investment cost of approximately \$740,000. The main goal of this NSF project was to produce a student/author language which would be fully transportable and guaranteed compatible with a large and diversified class of machines.¹³ We at ARI take professional pride in the fact that it was our early and subsequent work with PLANIT which validated this visionary transportability notion of NSF.¹⁴ We also take "economic" pride in the fact that we capitalized upon an already "hefty" U.S. Government investment to solve a problem, rather than slipping into the classic mold of "reinventing the wheel" by starting from scratch and building a separate student/author language tailored to the hardware/software system constraints.

To lower the curtain on MASSTER Test FM 122, the test was successfully conducted and demonstrated that it was feasible to use tactical computers in a stand-alone training mode to satisfy individual and unit training requirements. It was found that automated instruction in a field setting was enthusiastically accepted by the non-commissioned officers (NCO's) examined and, as a training medium, it proved to be more effective than the traditional study-method of training.^{15,16,17,18,19}

¹³Frye, C. H. "A Report on PLANIT: One Stage of Completion," Final Report for the National Science Foundation Grant No. EPP73-07319 A04, August 1975.

¹⁴For a complete account of the experiences of ARI in installing, using and evaluating PLANIT in an Army setting, including all the "warts and blemishes" uncovered during this endeavor, see: Johnson, C. "Implementation of PLANIT at the U.S. Army Research Institute for the Behavioral and Social Sciences," PLANIT Newsletter, July 1975.

¹⁵Hoyt, W. G. and Baker, J. D. The use of tactical computers to provide weapons and tactics training to combat NCO's: Results of a field test. Proceedings: Sixteenth Annual Conference of the Military Testing Association MTA, U.S. Coast Guard Institute, Oklahoma City, OK. 21-25 October 1974.

¹⁶Hoyt, W. G., Butler, A. K. and Bennik, F. D. Application of tactical data systems for training: Volume II - CAI/DEVLOS automation studies. ARI Technical Paper 267, October 1975.

¹⁷Hoyt, W. G., Butler, A. K. and Bennik, F. D. Application of tactical data systems for training: Volume I - Executive Summary. ARI Technical Paper ____, in preparation.

But the results of this test proved more than the preceding. They also indicated that the obvious Army needs mentioned at the outset of this preface, could be met by applying this technology to a real and present problem. It also went beyond the exploratory stage and satisfied a specific Army requirement. The U.S. Army Combat Developments Command (CDC)/Systems Analysis Group (now the U.S. Army Training and Doctrine Command/Combined Arms Combat Developments Activity, or TRADOC/CACDA) had levied the following requirement²⁰ on ARI:

The Proposed Material Need for the Tactical Operations System - TOS (Unclassified title, portions of contents classified CONFIDENTIAL) states: "During system non-tactical employment the equipment shall have the capability to permit the training of user personnel without affecting the mission ready capability of the system." While the need exists, no specific data are extant which can be brought to bear on this problem. The requested research will provide data which could impact on all TOS users and result in considerable savings in training costs related to the user's need to maintain proficiency in the use of these systems.

The 122 Test data satisfied the CDC requirement. The Proposed Material Need (MN) for TOS was found to be a viable concept and that MN remains to this day as a bonafide component of the TOS program.

As previously discussed, the results from MASSTER Test FM 122 demonstrated the viability of the embedded training subsystem concept in general and that tactical data systems could be used in a tertiary role, i.e., specifically, that these systems could be used in a stand-alone mode in support of individual and unit softskills training requirements. But conceptually our main goal had always been to embed system specific training packages within the operating system itself and then to use the system to teach the user how to use the system--the earlier noted secondary role for these systems.

¹⁸Hoyt, W. G., Butler, A. K. and Bennik, F. D. Application of tactical data systems for training: Volume III - Development of courseware and analysis of results for MOS 11B40. ARI Technical Paper ___, in preparation.

¹⁹Hoyt, E. G., Butler, A. K. and Bennik, F. D. Application of tactical data systems for training: Volume IV - Development of courseware and analysis of results for GED math. ARI Technical Paper ___, in preparation.

²⁰Letter, DARB-ARB 19 July 1972, Subject: New Research Requirements for the Human Resources Research and Development Program (RCS CSCRD 70 CRI); letter response from CDCSAG-AG1, same subject as above, dated 1 September 1972.

As a follow-on to Test 122, research was initiated under the aegis of the Product Manager, Computer Training Systems (PM CTS) through HRN 75-158 (and, subsequently, HRN 76-195) which tasked ARI to address the problem of reducing the novice user's difficulties by making tactical data systems (e.g., TOS², TACFIRE, TSQ-73, etc.) more "approachable" through applications of the embedded training concept.²¹

Because of its stage of development, the fact that its basic central processing unit would serve as the core for other Army Tactical Data Systems (ARTADS) to follow, and the fact that its operator training problems appeared to be amenable to reduction through the application of automated instructional technology, TACFIRE (the Army's field artillery tactical fire control system) was chosen by the PM CTS as the test vehicle for assessing the embedded training subsystems concept. The initial and specific requirements for the TACFIRE research were delineated in HRN 76-193, "Development and Evaluation of PLANIT Based Computer Embedded Training Packages for TACFIRE" which was prepared by personnel of the U.S. Army Field Artillery School, Fort Sill, OK.

Once again we were faced with the dilemma as to whether the best decision would be to develop a tailor-made student/author language smoothly fitted to the hardware/software constraints of the TACFIRE system, or to build upon our already successfully operating PLANIT system and attempt to install it on TACFIRE. The latter approach had many merits, among them: (1) it was an author language system with which we were familiar, while a customized system would be untested, costly and would require an extensive checkout; (2) a customized authoring system would be limited to a given TACFIRE configuration, whereas PLANIT would be transportable to the family of ARTADS systems, and (3) because of PLANIT's machine independent characteristics, courseware could be prepared on commercial computers and, after content checkout, easily installed on the tactical system, whereas a customized approach would tie-up the actual tactical system during courseware preparation.

The effort to install PLANIT on the AN/GYK-12 computer, the results of which are contained in this set of reports, was independently undertaken as Technology Based - Exploratory Development research and not as Advanced Development activity (i.e., it was not done in direct response to an explicit, stated user need). It serves as a classic example of what Dr. Malcolm R. Currie, Director of Defense Research and Engineering (DDR&E) was describing in the following statement to the Second Session of the 94th Congress: "The objective of the Technology Base is the advancement of technology applicable to future systems and subsystem

²¹Human Resource Need (HRN) 75-158, title: "User Training and Proficiency Maintenance in a Tactical Data Systems Environment," submitted as a research requirement for inclusion in the ARI FY 75 Advanced Development Work Program by the Product Manager, Computerized Training System, Fort Monmouth, NJ. HRN 76-195 was a revalidation of the requirements delineated in 75-158 for inclusion in the FY 76 Work Program.

options. These options (or new ideas) usually involve enhanced military capability, reduced cost, increased performance, better reliability and maintainability, more efficient use of resources or some combination of these attributes." Success in this effort would produce a broadly applicable, cost-effective vehicle for employing embedded training subsystem packages in a variety of military system settings.

It merits comment, however, that while this work was a Technology Based-Exploratory Effort, it had the potential for feeding into the Advanced Development program efforts associated with the user tasks presented in HRN 75-158, "User Training and Proficiency Maintenance in a Tactical Data Systems Environment," if the outcome were successful. Consequently, the PM-CTS was appraised of this effort at the outset and he, in turn, coordinated it with the Program Manager, Army Tactical Data Systems (PM ARTADS). During this coordination some valid points of criticism were raised²² concerning the PLANIT approach. The PM ARTADS recommended that ARI meet with system developers, users and training agencies as soon as sufficient data were available to determine whether, or not, PLANIT would operate on TACFIRE. At that time a determination would be made concerning implementation implications and to assess if, indeed, this were the most effective approach to take, given the potential for impact on TACFIRE system development efforts. In keeping with this recommendation, a Workshop was convened at ARI in Arlington, VA on 1 October 1974 and these items were covered in detail with personnel from all of the suggested groups in attendance. The interaction was found to be most beneficial to all concerned and the consensus of the group was to install the system described in this set of reports on the TACFIRE system at Fort Sill, OK, and to use it as the test vehicle for assessing the embedded training concept on that ARTADS system.

This historic overview of the events leading up to the production of the set of quite specialized reports may seem untoward in view of the projected, limited set of users of these documents. It is, however, a quite meaningful forum for discussing these events. Too frequently the question is raised as to how did a particular research product originate and was it utilized. The intent here is to show that the warp and woof of concepts and coordination, requirements and research are so intertwined that a simple one-to-one relationship (one response, one use) does not tell the story--only a view of the whole cloth will put it into proper perspective. Additionally, it exemplifies a point made in the previously cited presentation by the Director of Defense Research and Engineering to the 94th Congress when he said: "To deploy systems DOD must not only pursue advanced technology but must endure the long years of research required to bring an idea through growth problems to a finished, proven and useful end product."

²²Memorandum from Product Manager, Computer Training Systems (PM-CTS) to Program Manager, Army Tactical Data Systems (PM-ARTADS) 28 Jan 74, Subject: HRN 75-158 and 1st indorsement from PM-ARTADS to PM-CTS, same subject as above dated 7 February 74.

This set of reports provides detailed instructions for implementation and operation of PLANIT and auxiliary programs on the AN/GYK-12 computer. The set consists of a report on:

- o TRANSL - The PLANIT Translator Program: Installation and Application
- o PLANIT Support Programs - Operator/user manual
- o PLANIT Utility Program - Operator/user manual
- o PLANIT Support and Utility Programs -- Test Procedure
- o PLANIT Support and Utility Programs - Flow Charts.

The first report contains the information for installing and operating a program which is designed to translate the FORTRAN from the PLANIT system of programs into the TACPOL language for compilation on the AN/GYK-12 computer. The second covers the general and specific aspects of leading and operating PLANIT on the AN/GYK-12 computer. The third document covers the general and specific aspects of operating the PLANIT utility programs which are a specialized group of routines developed to accomplish various tasks in support of the AN/GYK-12 computer installation of PLANIT. The fourth report covers the procedures used to verify that PLANIT Support and Utility Programs are functioning as per specifications. The fifth document provides the detailed flow charts of the computer logic of the PLANIT Support and Utility Programs.

The effort detailed in the first report (i.e., TRANSL) was accomplished under ARI Contract DAHC19-74-C-0038 by the Northwest Regional Educational Laboratory, Portland, Oregon. The other four reports in the series were prepared by the Data Systems Division, Litton Systems Inc., Van Nuys, CA under ARI Contract No. DAHC19-74-C-0064.

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SECTION 1

INTRODUCTION

1.1 Scope

This document provides the detailed flow charts of the computer program logic of the PLANIT support and utility programs. The programs were developed in support of the installation of the PLANIT (Programming Language for Interactive Teaching) author/student language on the AN/GYK-12 computer used in the U. S. Army Artillery Tactical Fire Direction System (TACFIRE). The flow charts are intended for use in conjunction with the program listings to aid in understanding the logic of the programs.

1.2 General Information

The AN/GYK-12 PLANIT system installation utilizes the basic PLANIT version 2.6 generated with the AN/GYK-12 computer and system parameters and then translated from FORTRAN to TACPOL. The resulting nine program modules (PLANIT MAIN and PLAN1 through PLAN8 overlays) are compiled along with the PLANIT Support Programs and integrated into the object and load tapes using the PLANIT Utility Program (PUP). All compilations were performed using the TACFIRE PSSB Compiler (version 3.4). In addition to this document and the individual program listings, detailed information on the operation and use of the AN/GYK-12 PLANIT System can be found in the documents listed in Table I.

The PLANIT Support Programs Operator/User Manual provides a detailed description of the procedures and operational sequences encountered during operation and use of the PLANIT Support Programs as a part of the overall AN/GYK-12 PLANIT system installation. Appendix I of the Support Programs Manual is a Glossary of Terms for reference purposes.

The PLANIT Utility Program (PUP) Operator/User Manual provides a detailed description of the procedures and operational sequences for use of the PUP routines for such support tasks as preparation of PLANIT load tapes or cartridges, field history/lesson tapes and cartridges, object library updates and processing of PLANIT translation tapes.

The PLANIT Author's Guide, Language Reference Manual and Document Update Information provide the information required for the application and use of PLANIT itself. In addition, supplementary information on the AN/GYK-12 PLANIT is provided in Appendix F (character set), Appendix G (PLANIT cards file), and Appendix H (PLANIT map) of the PLANIT Support Programs Operator/User Manual.

TABLE I. SUPPLEMENTARY INFORMATION DOCUMENTS

Litton Systems, Inc.

Data Systems Division

125200-900
(Dated 25 March 1975)

PLANIT Support Programs
Operator/User Manual

125201-900
(Dated 25 March 1975)

PLANIT Utility Program
Operator/User Manual

System Development Corporation

TM-(L)-4422/001/01
(Dated 1 October 1970)

PLANIT Author's Guide

TM-(L)-4422/002/01
(Dated 1 October 1970)

PLANIT Language
Reference Manual

Northwest Regional Educational Laboratory

(No document number)
(Dated 12 February 1974,
revised 27 March 1974)

Document Update Information
for PLANIT, Version 2.0

1.3 General System Flow

The AN/GYK-12 PLANIT system is comprised of the basic PLANIT author/student language (version 2.6, translated from FORTRAN to the AN/GYK-12 TACPOL programming language) and a set of support programs as listed below:

- o PLANIT Operating System (POS)
- o RAMCHECK
- o START
- o FINAL
- o Machine Input/Output Program (MIOP)
- o Terminal MIOP (TMIOP)

In addition a set of specialized utility routines have been developed to support the installation in such areas as preparation of field load tapes and cartridges, field history tapes and cartridges, library updates, character conversion, etc. This program is identified as the PLANIT Utility Program (PUP).

The detailed flow charts for the above programs are included in Section 2 of this document. Figure 1 depicts the generalized functional system interfaces of the various programs. It should be noted that PLANIT consists of nine program modules; PLANIT Main and the PLAN 1 through PLAN 8 overlays.

POS provides all of the initialization, executive and interrupt control functions including the bootstrap load routine and the byte handling routines; LDBYTE and SBYTE. RAMCHECK is used by POS during system initialization to check the Random Access Memory (RAM, drum memory) for bad tracks and establish an operational RAM map. In addition, POS handles MIOP and PLANIT calls, I/O support functions, PLANIT timer service and time of day and date maintenance.

START is used during system initialization to handle the date/time initialization, load sequences (bad RAM tracks, warm start, load history tape, etc.) and transfers control of the system to **PLANIT** upon completion of the initialization sequence.

FINAL is used to process the termination sequence, unload history tape data, termination file statistics, etc.

MIOP and **TMIOP** handle all RAM operations, unit record operations (card reader/punch, line printer, magnetic tape), terminal operations and **PLANIT** system service operations.

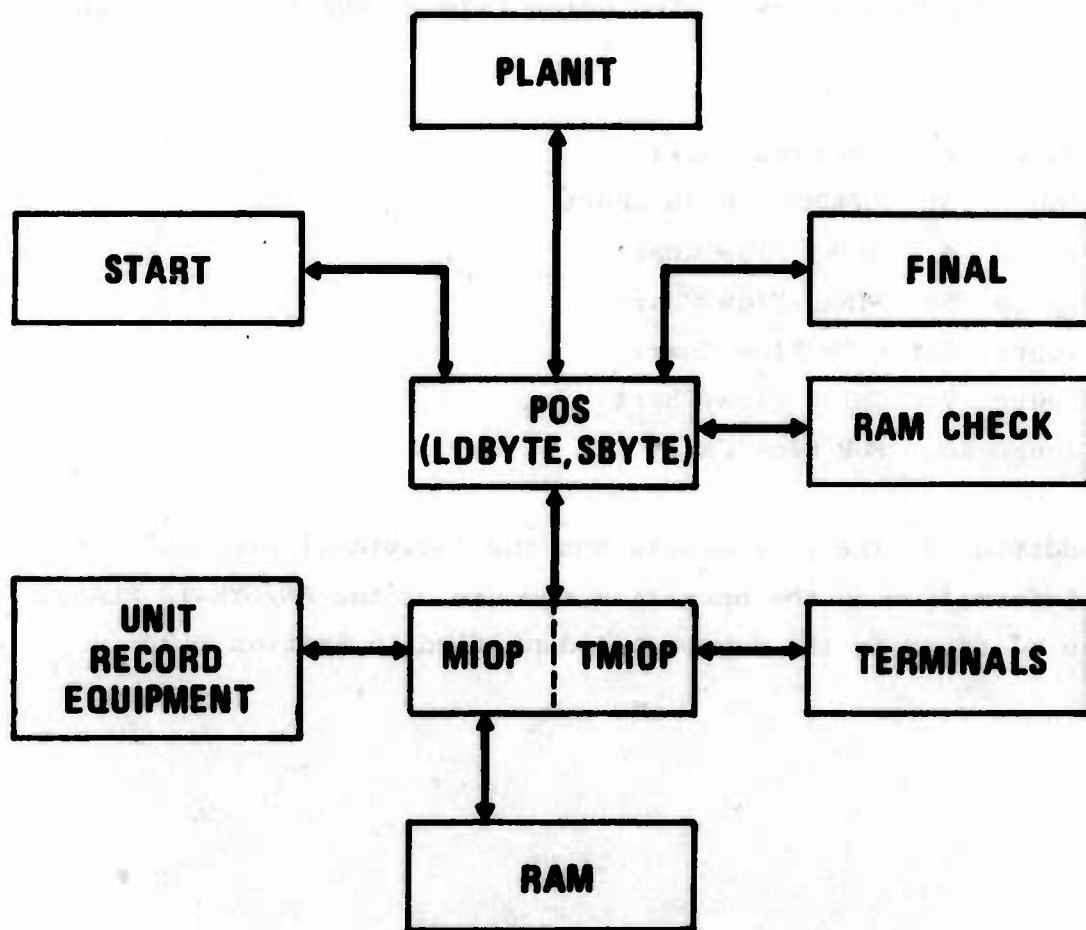


FIGURE 1. PLANIT SYSTEM FUNCTIONAL INTERFACES

SECTION 2

DETAILED FLOW CHARTS

This section is comprised of the detailed flow charts for the PLANIT support and utility programs. The flow charts are identified as figures 2 through 7 and figure 20 as listed below (figure numbers 8 through 19 not used):

- Figure 2: POS Flow Chart
- Figure 3: RAMCHECK Flow Chart
- Figure 4: START Flow Chart
- Figure 5: FINAL Flow Chart
- Figure 6: MIOP Flow Chart
- Figure 7: TMIOP Flow Chart
- Figure 20: PUP Flow Chart

In addition to the flow charts and the individual program listings, detailed information on the operation and use of the AN/GYK-12 PLANIT system can be found in the documents identified in Section 1.2.

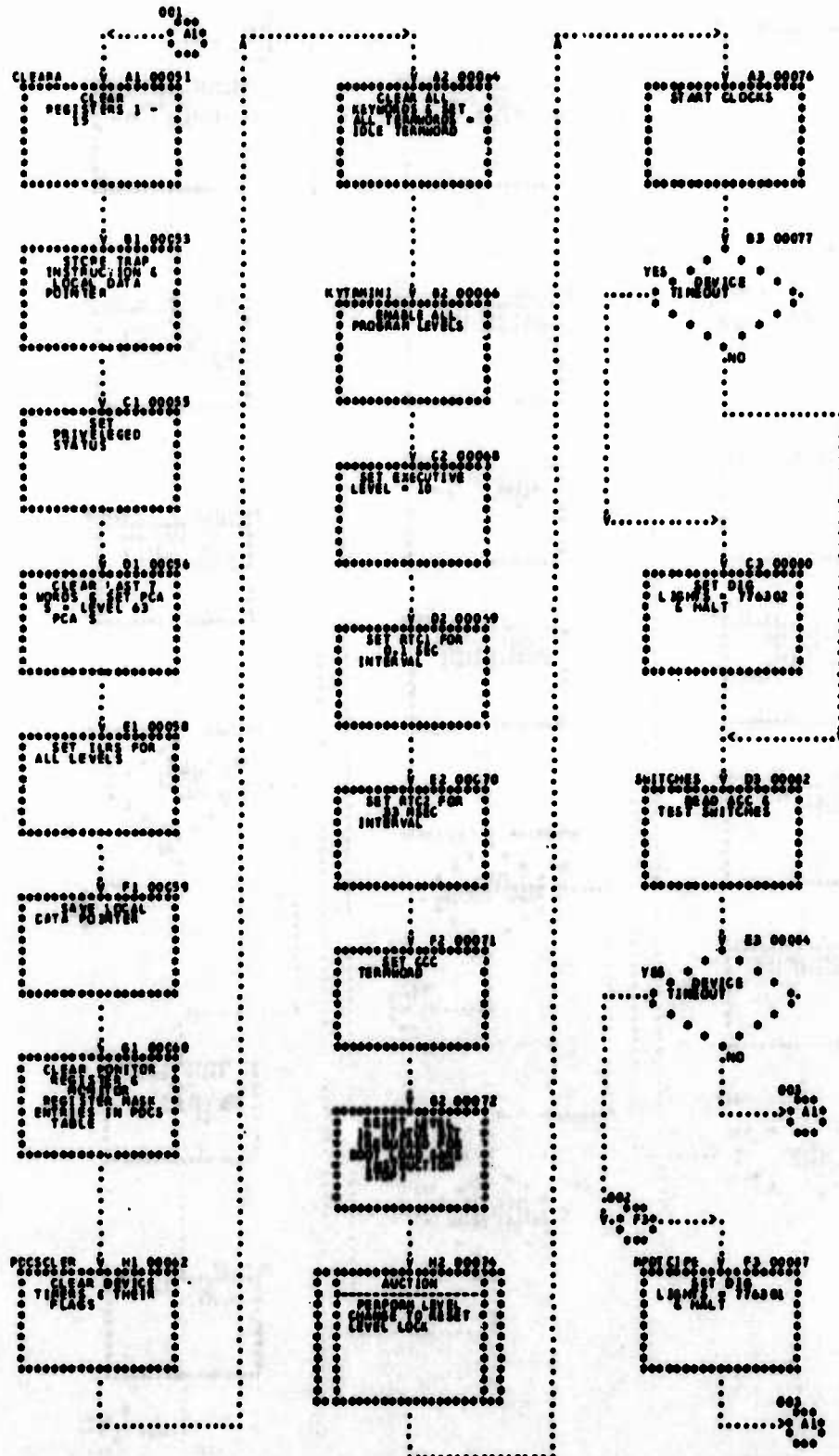


FIGURE SHEET 001 OF 003 CLENCHART

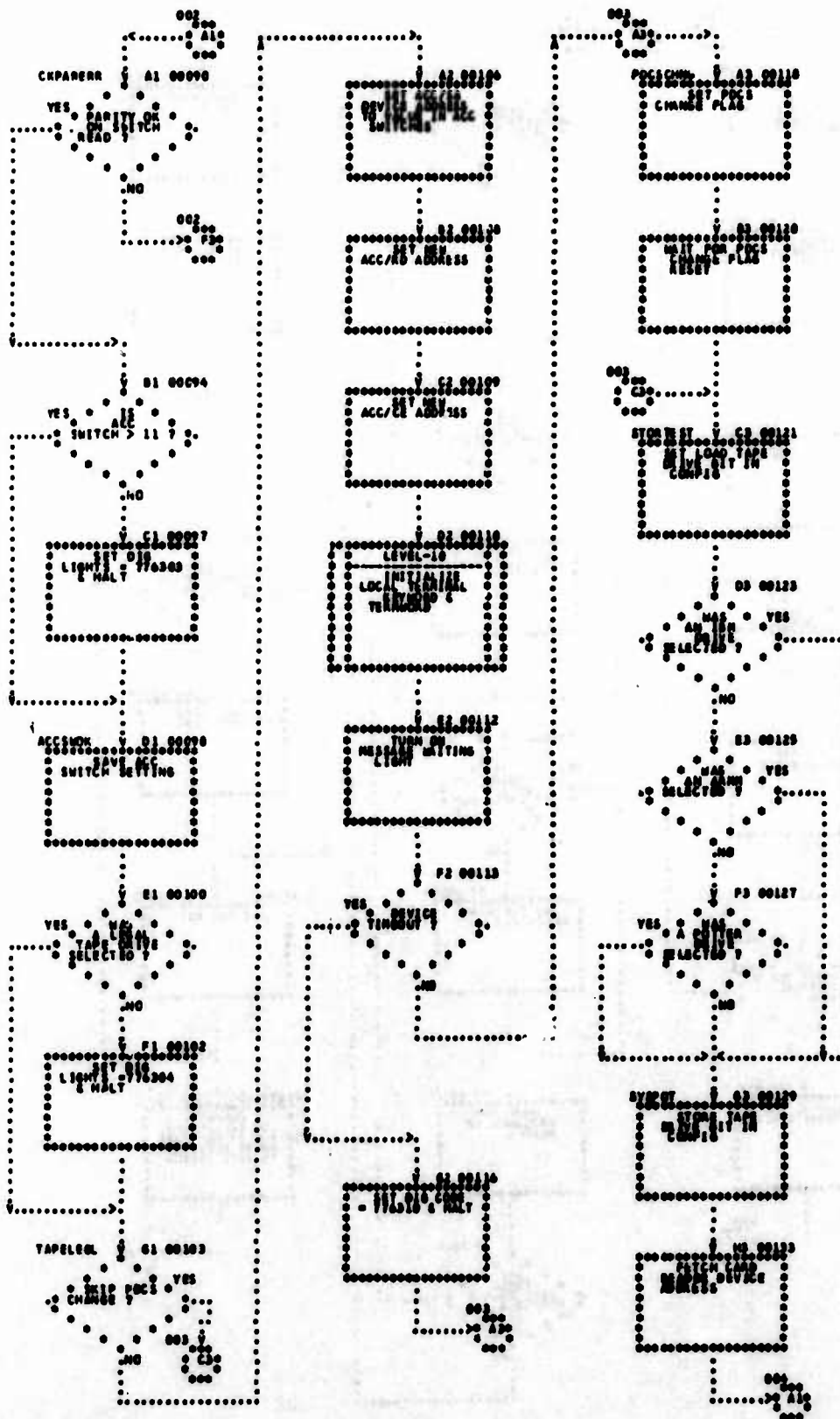
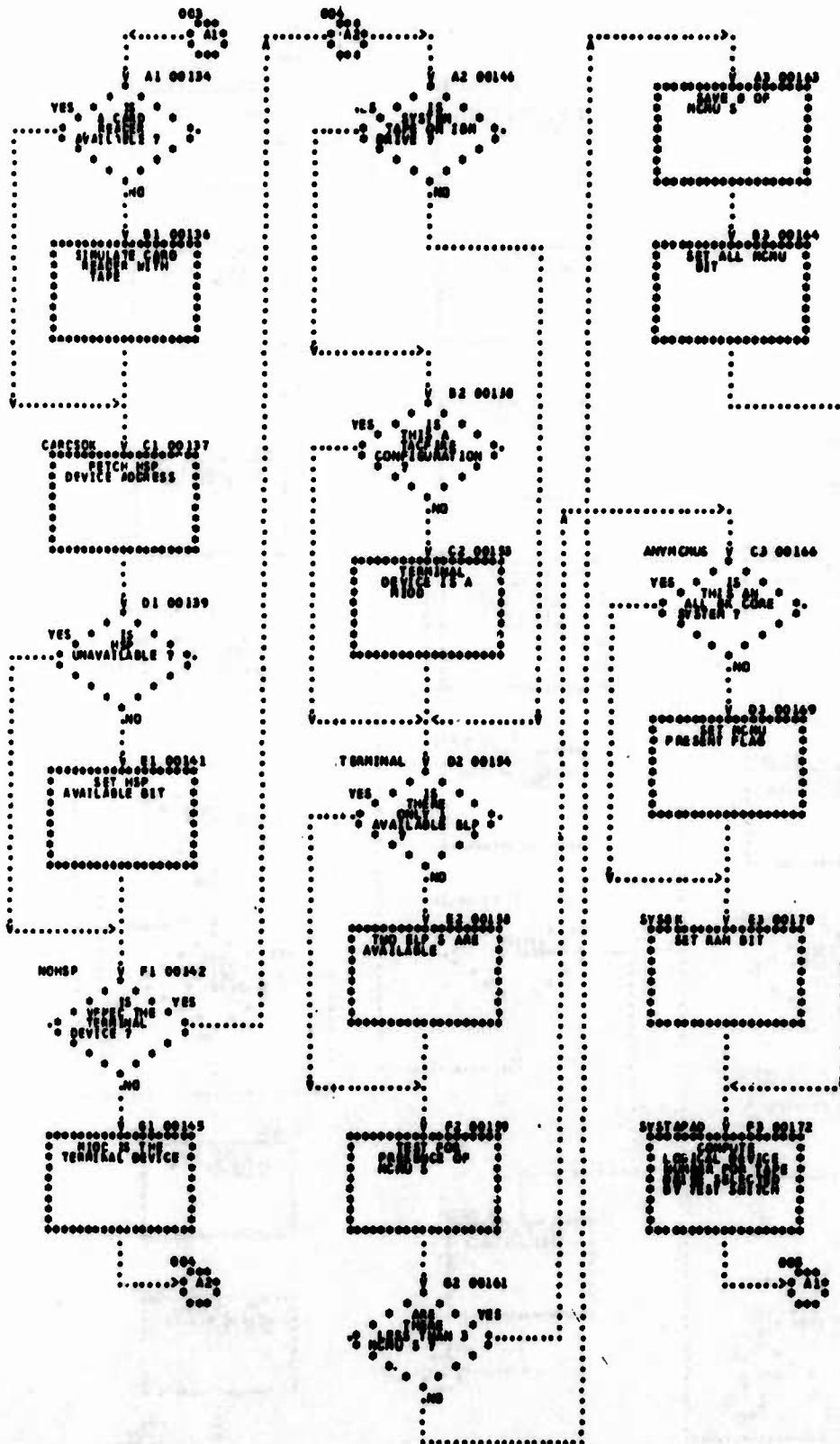


FIGURE SHEET 002 OF 005 FLOWCHART



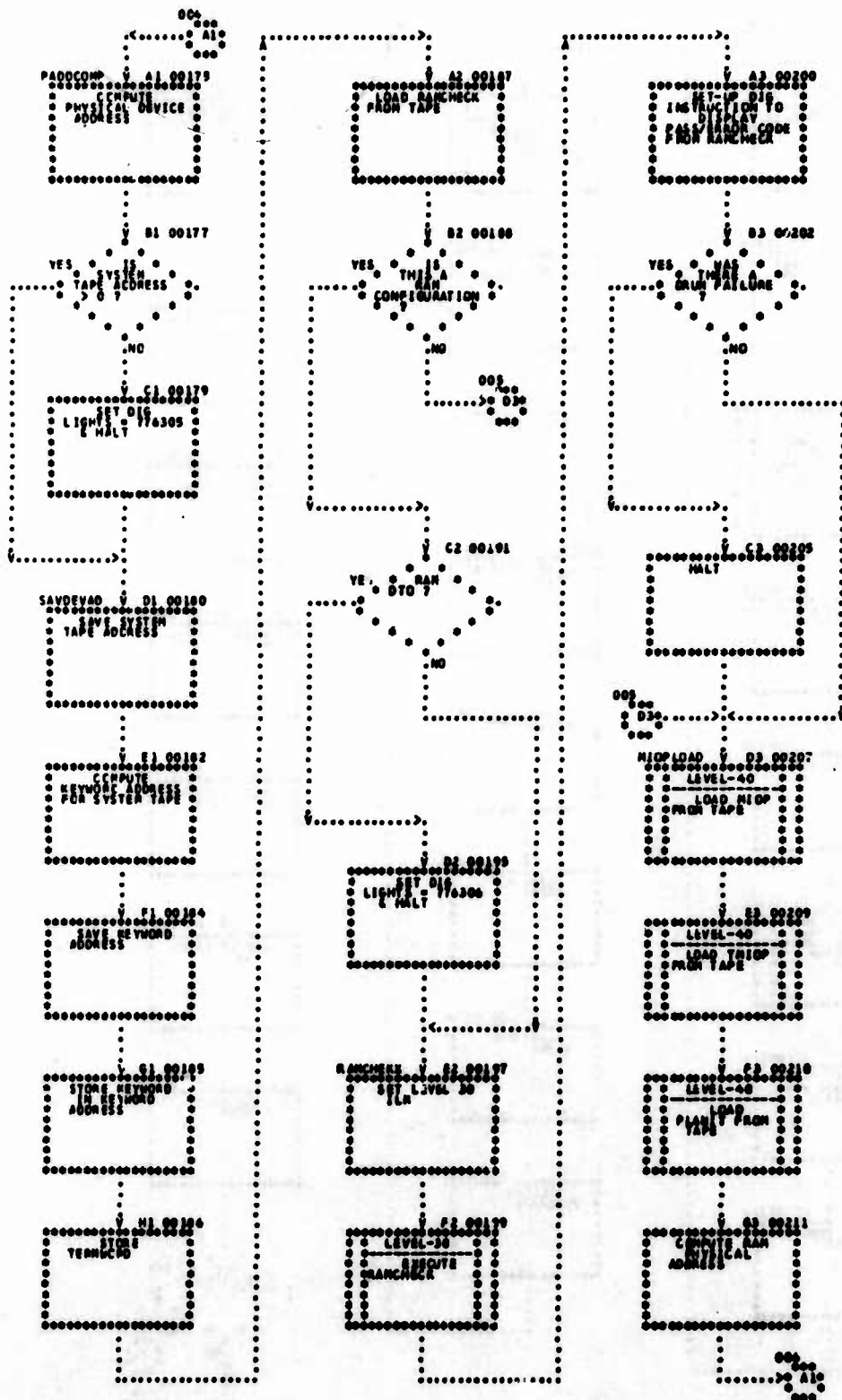


FIGURE SHEET 005 OF 005 FLOWCHART

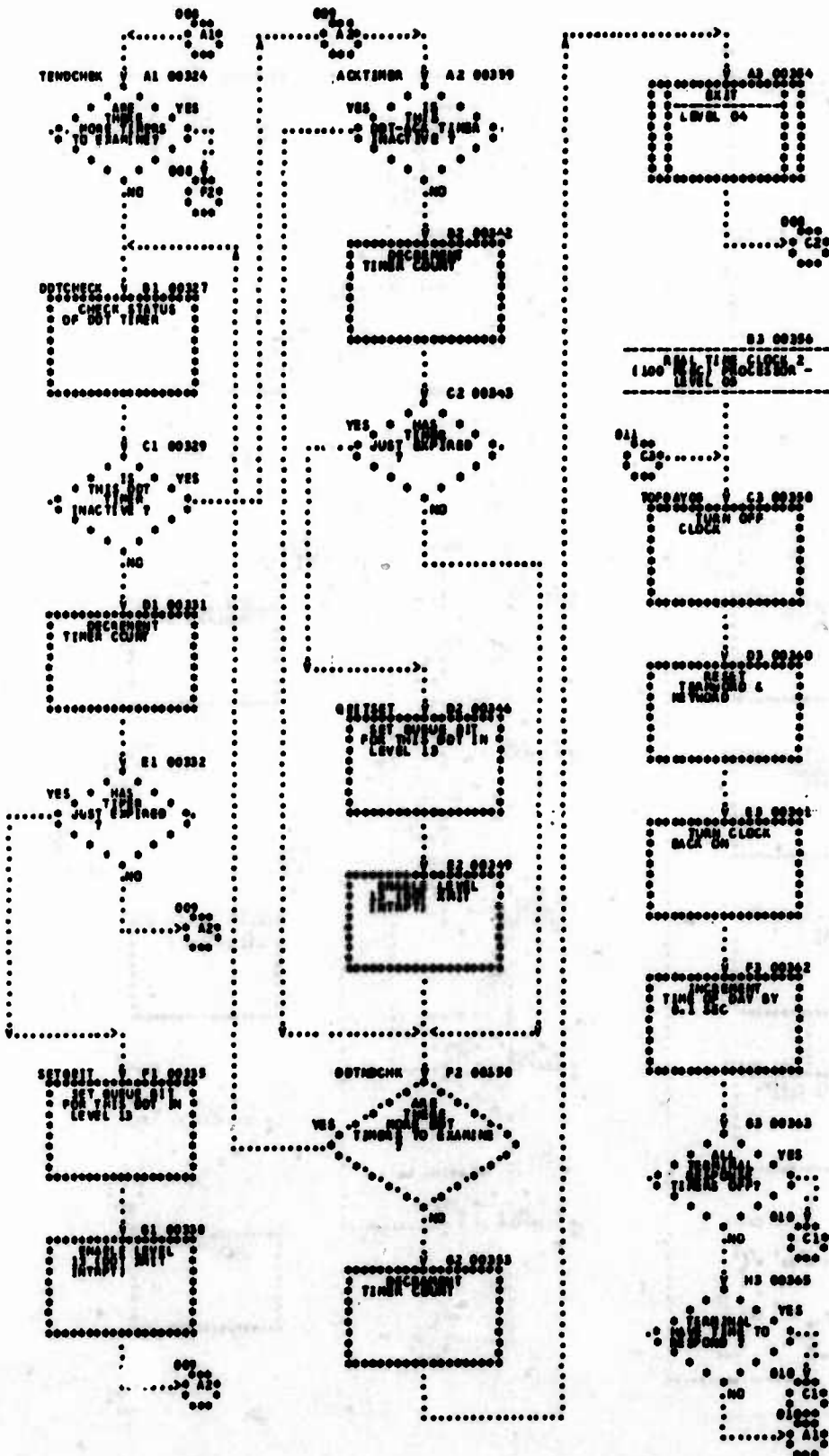
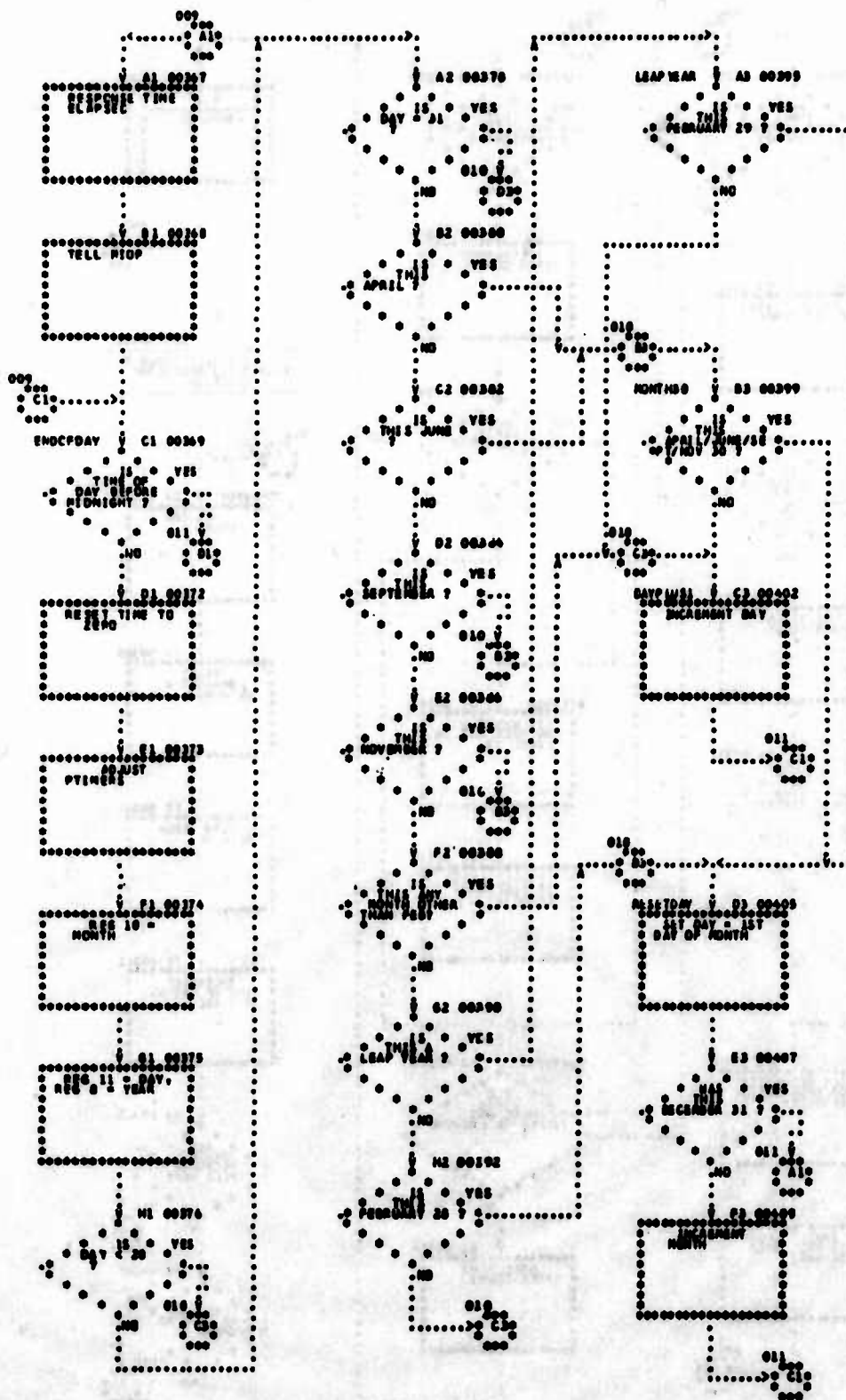


FIGURE SHEET ONE OF 65 FLOWCHART



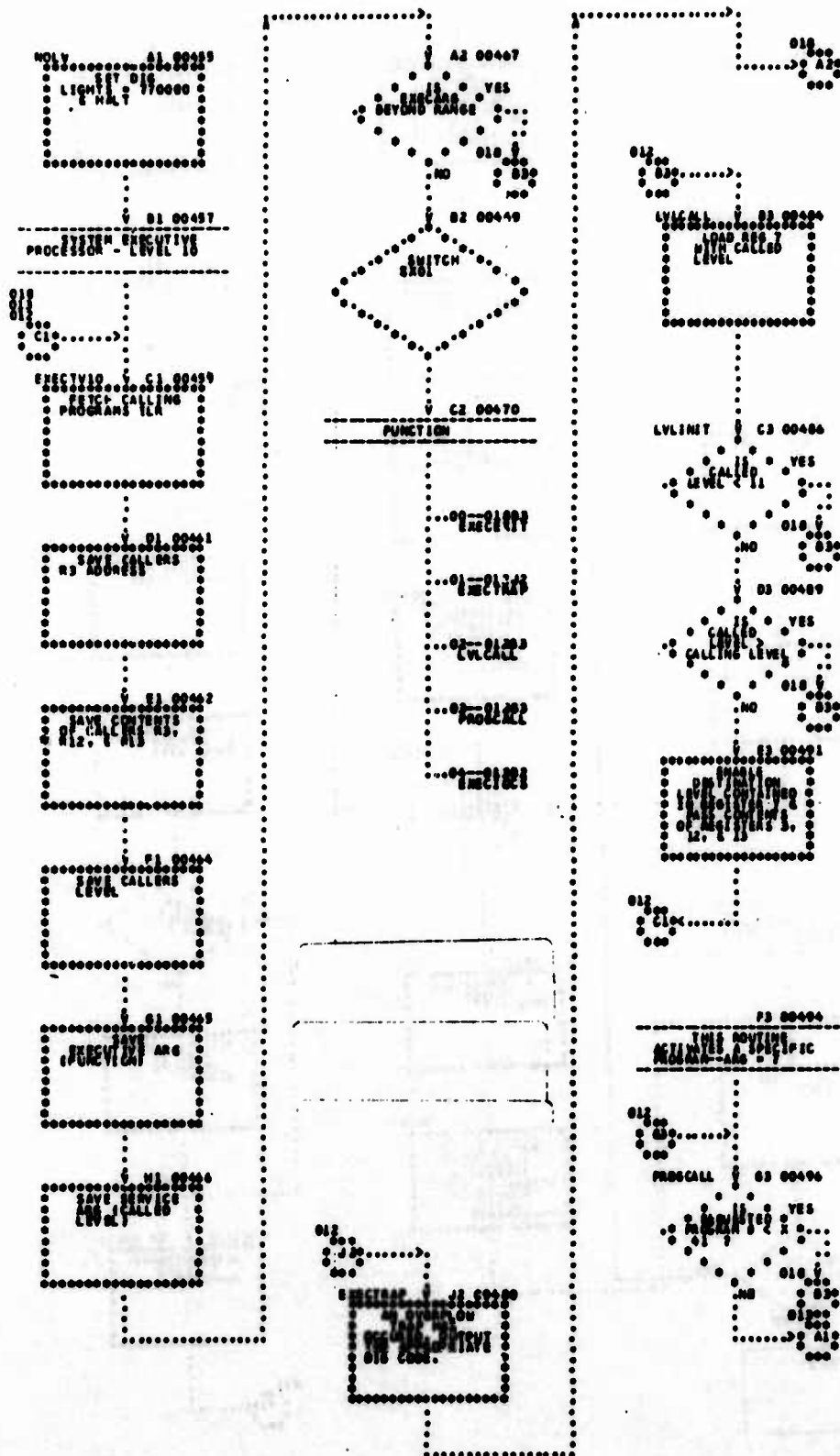


FIGURE 001 002 OF 005 FLOWCHART

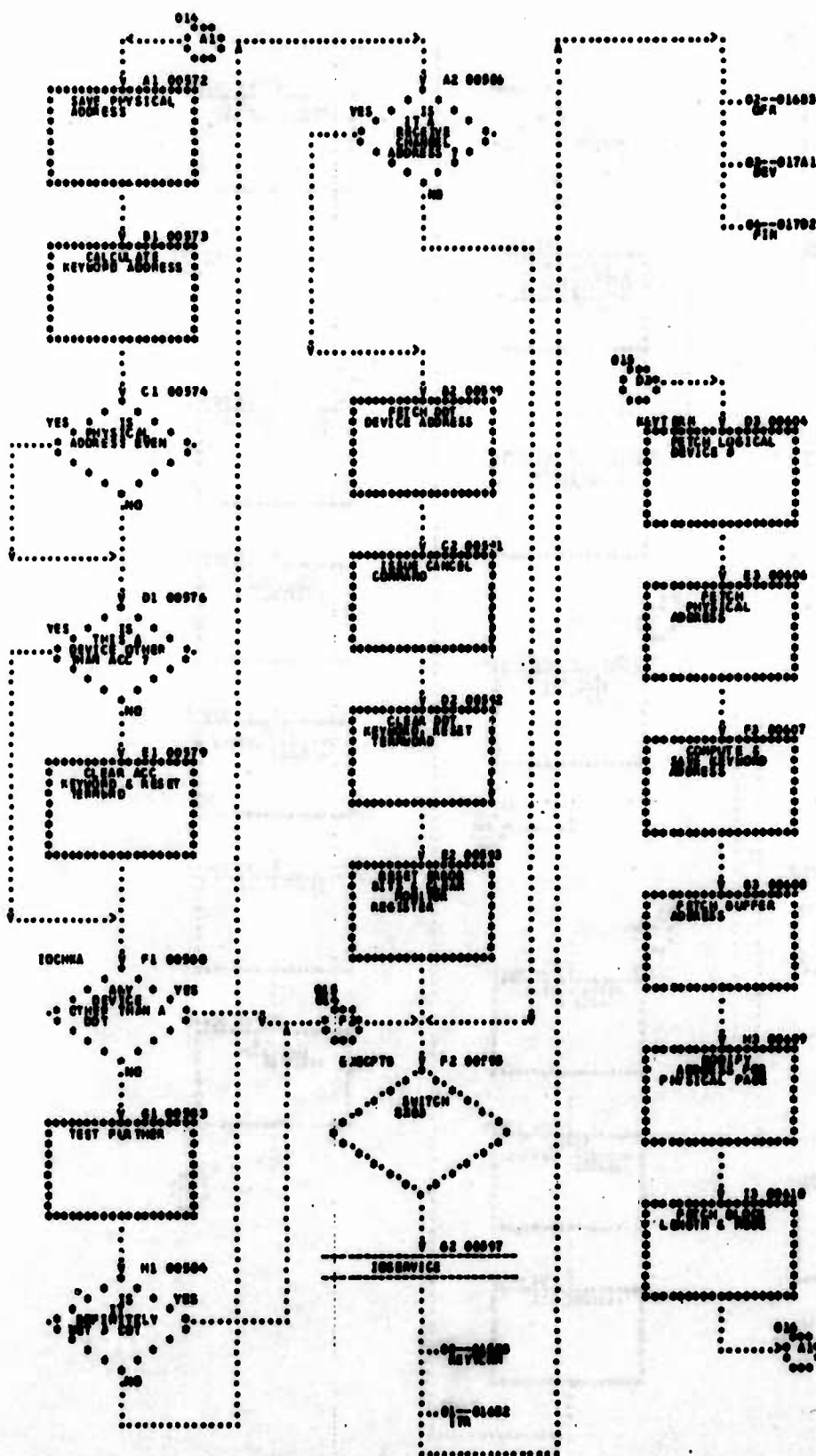


FIGURE 88720/75

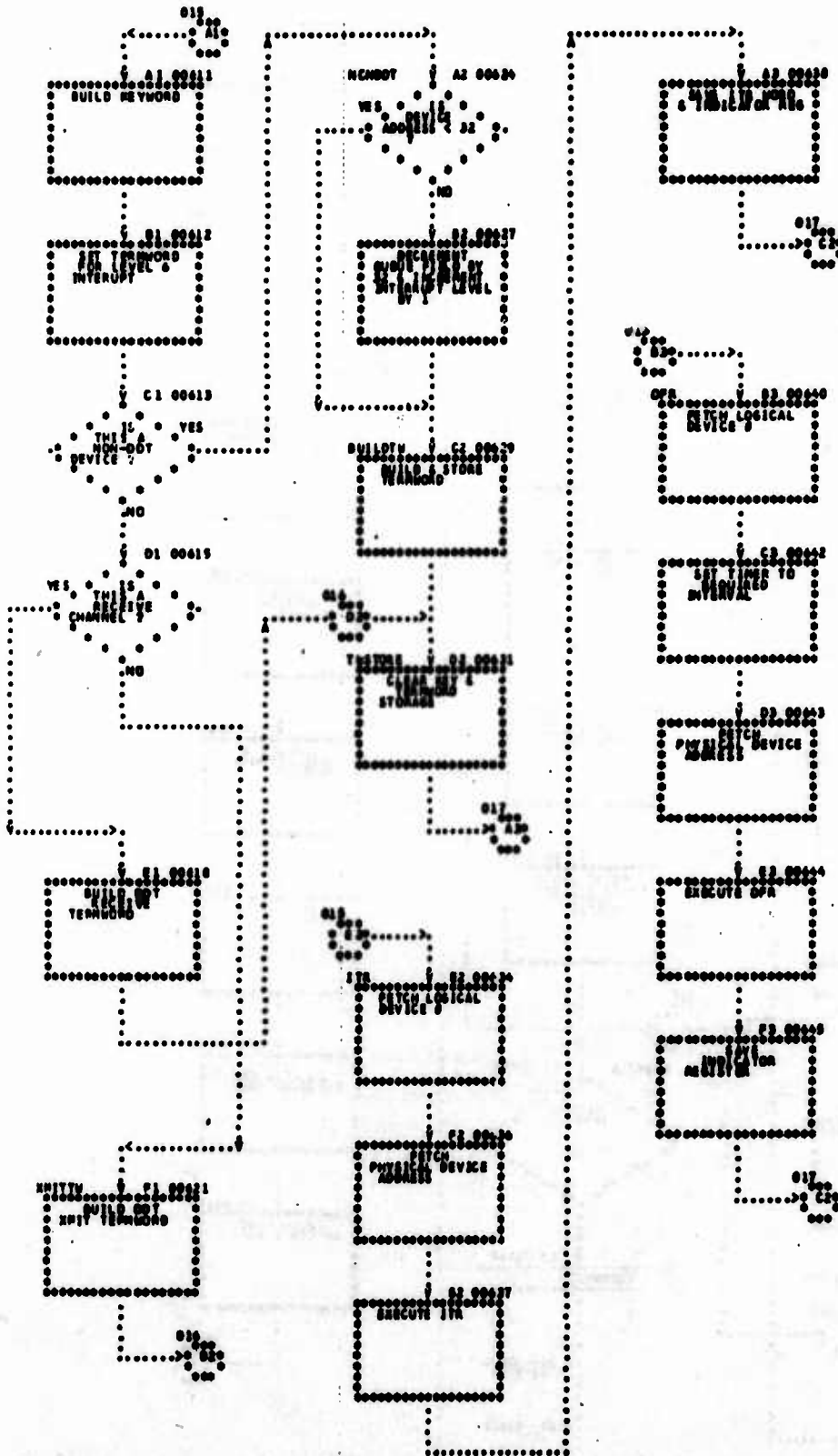


FIGURE SHEET 575 OF 605 FLOWCHART

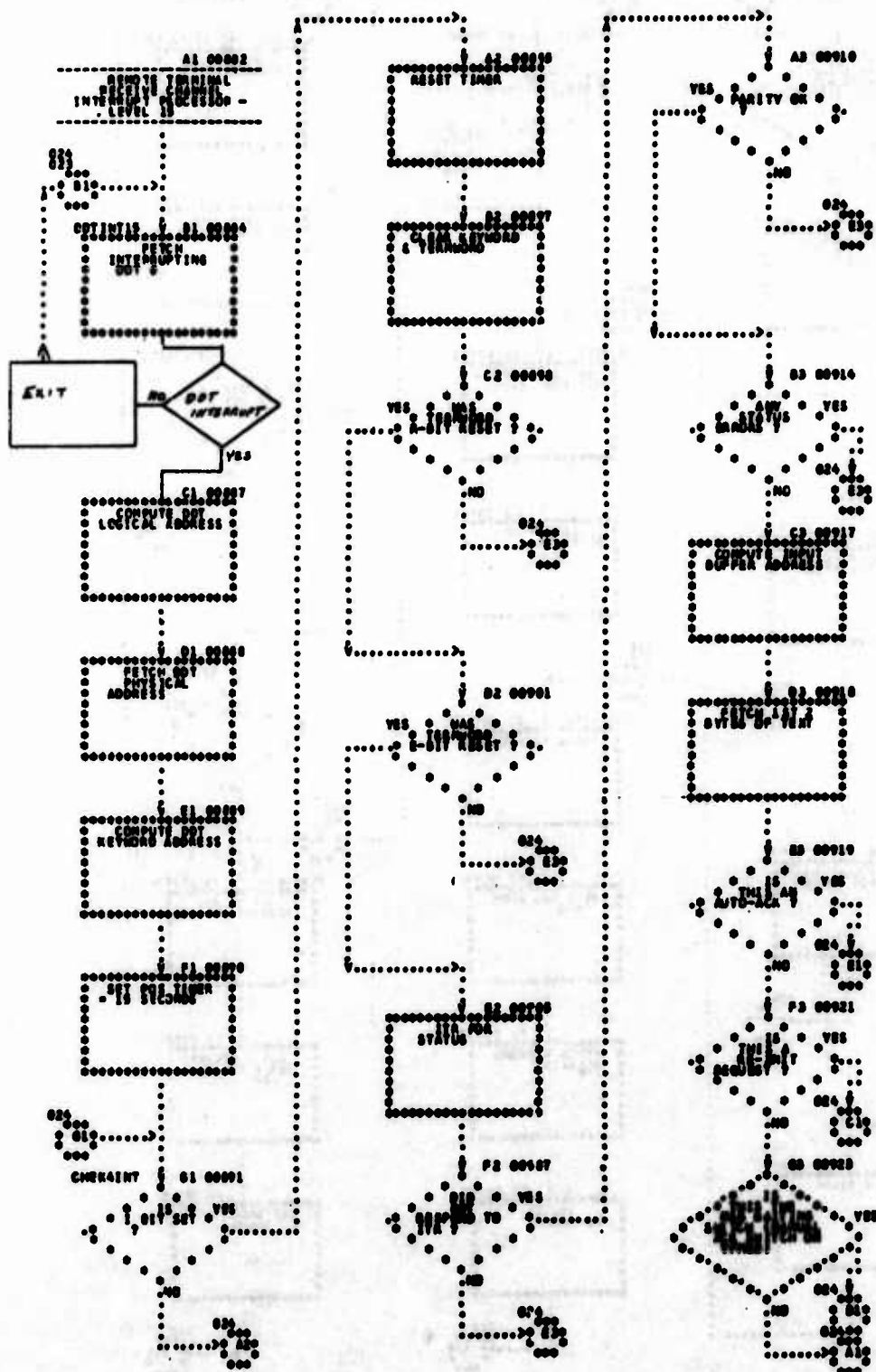


FIGURE 20-25 OF ANCHART

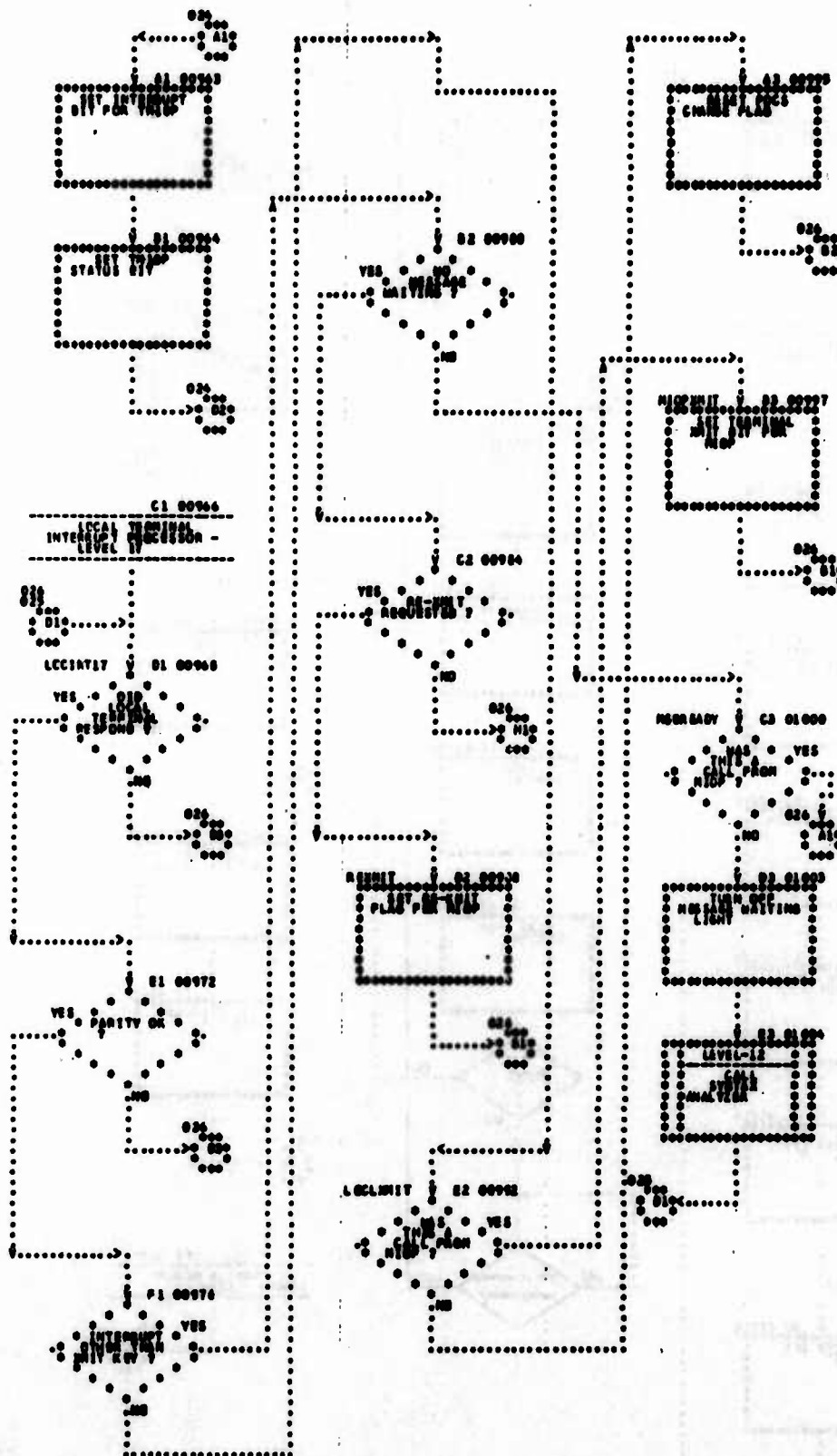
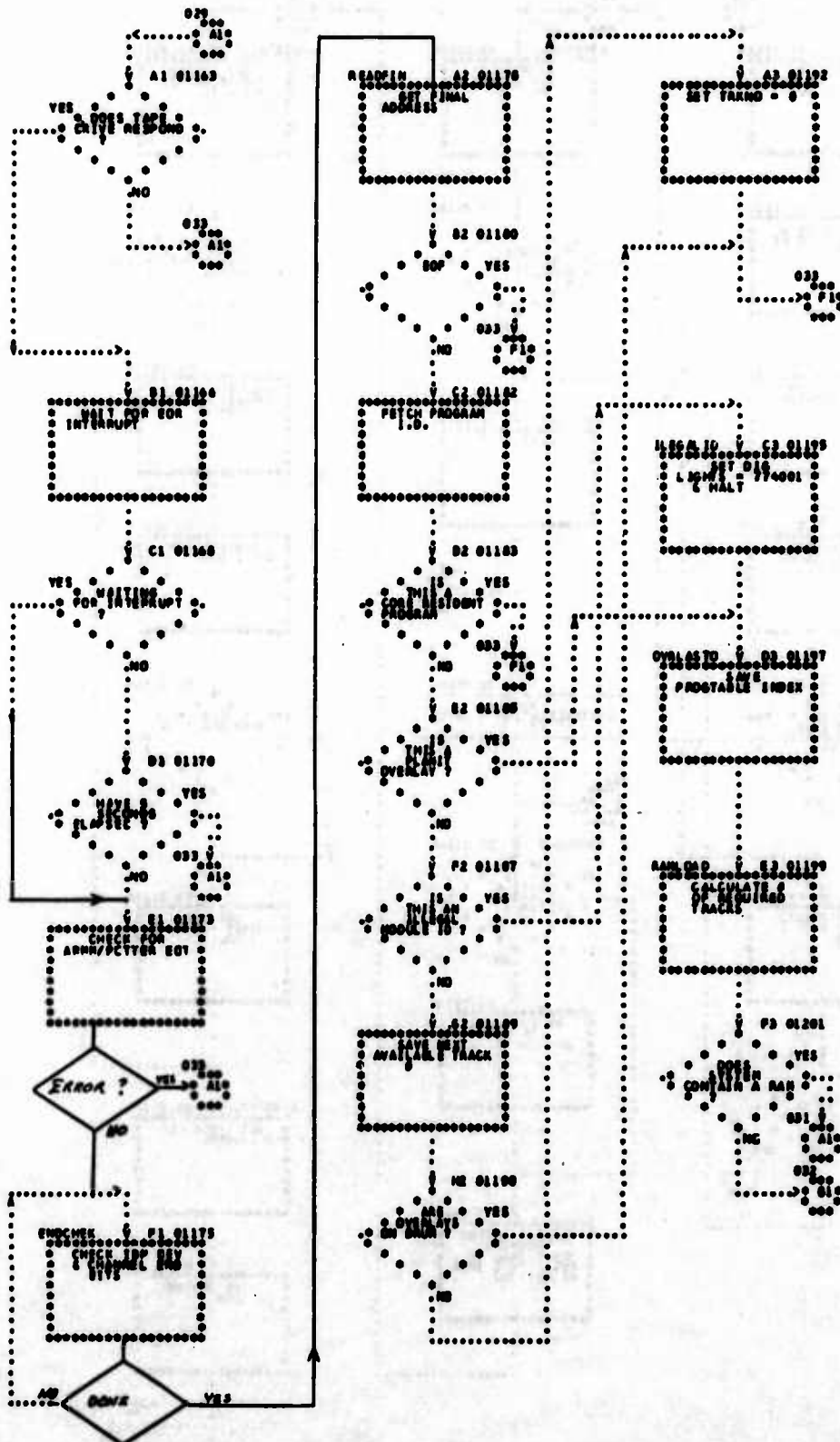


FIGURE 3001 53730/75



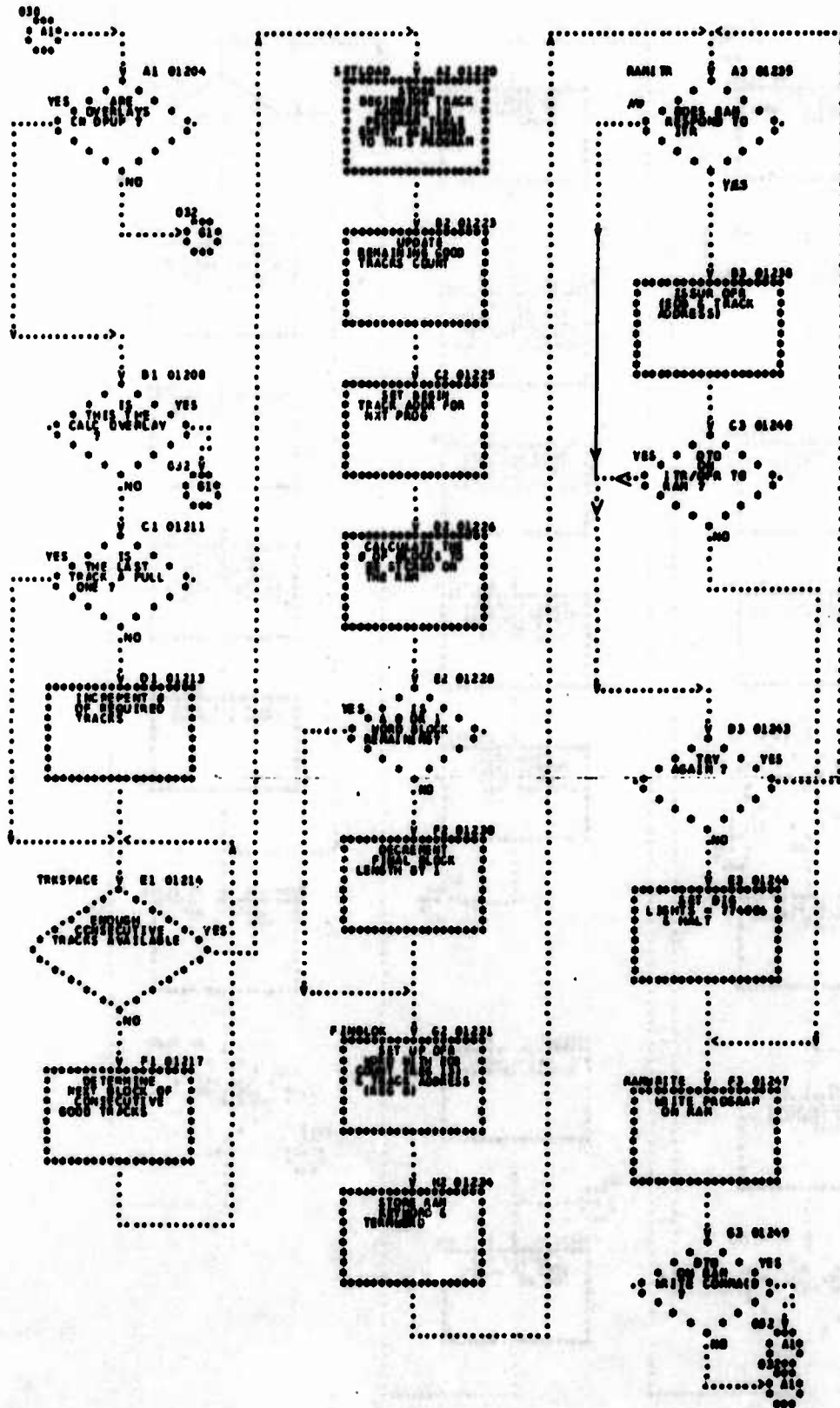


FIGURE SHEET 501 OF 505 FLOWCHART

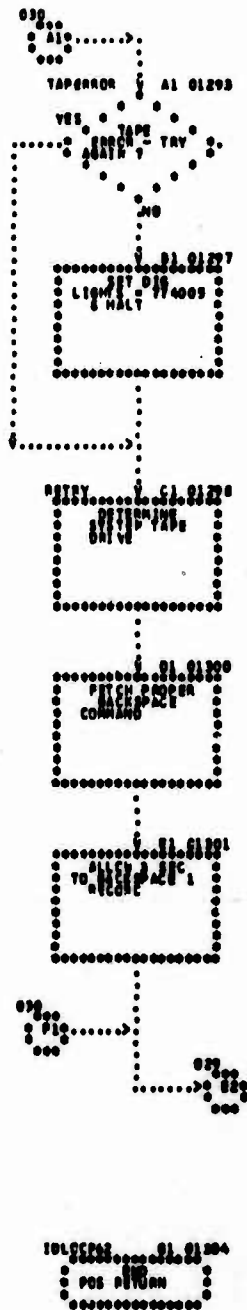


FIGURE SHEET 888 OF 885 FLOWCHART



FIGURE 83753596-1 RANCHER FLOWCHART

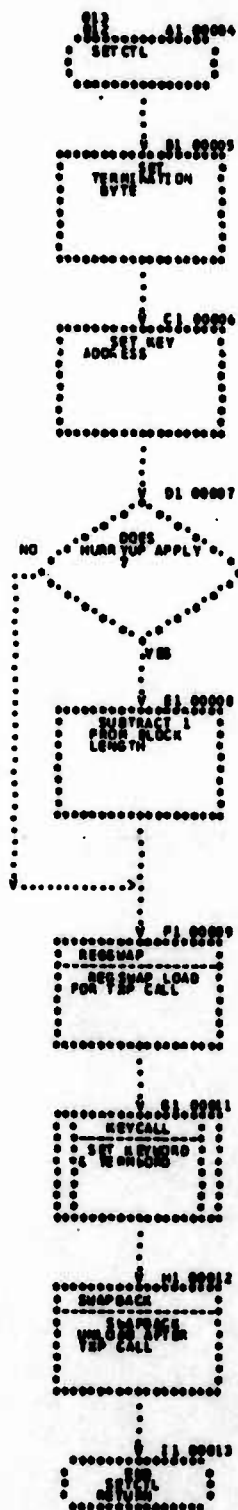


FIGURE 1 SAMPLES FLOWCHART

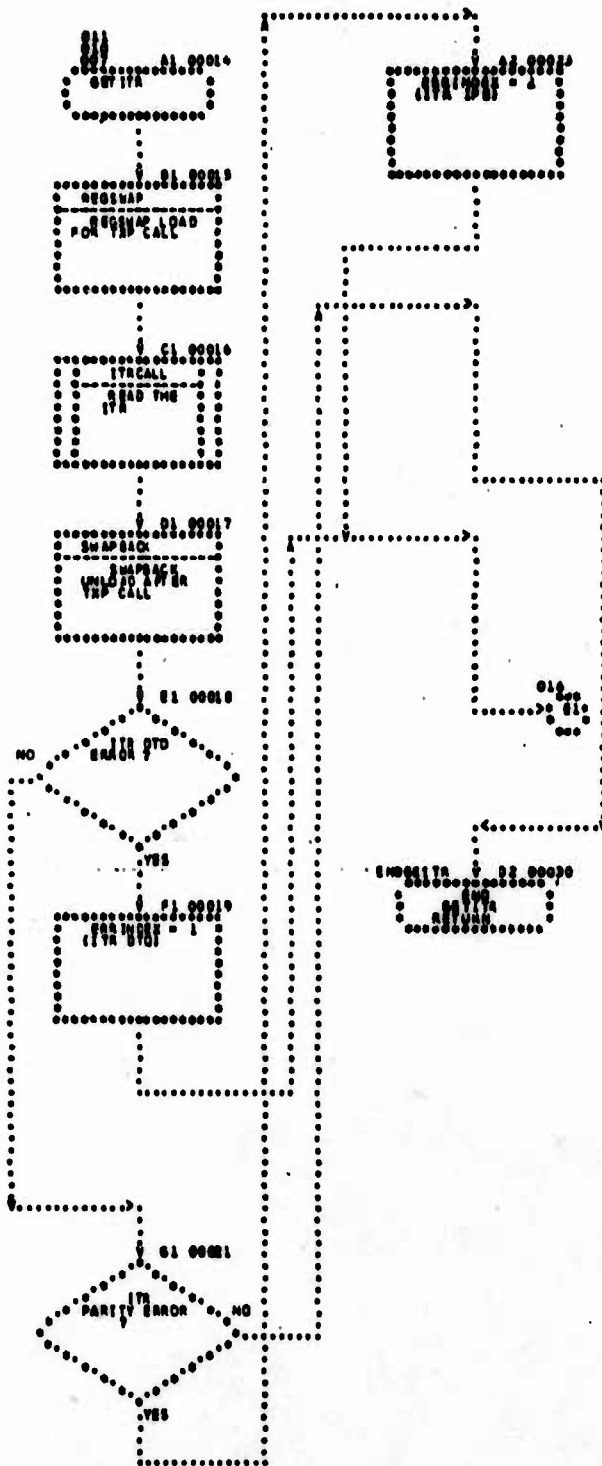


FIGURE 1 SANCHICK FLOWCHART

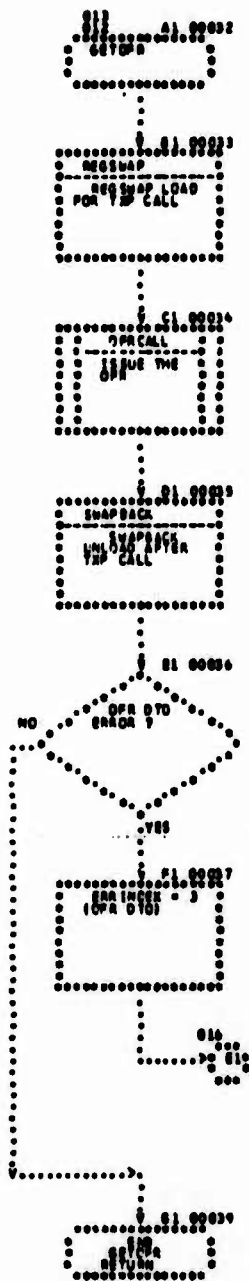


FIGURE 1 SAFETY-02/13/75 FLOWCHART

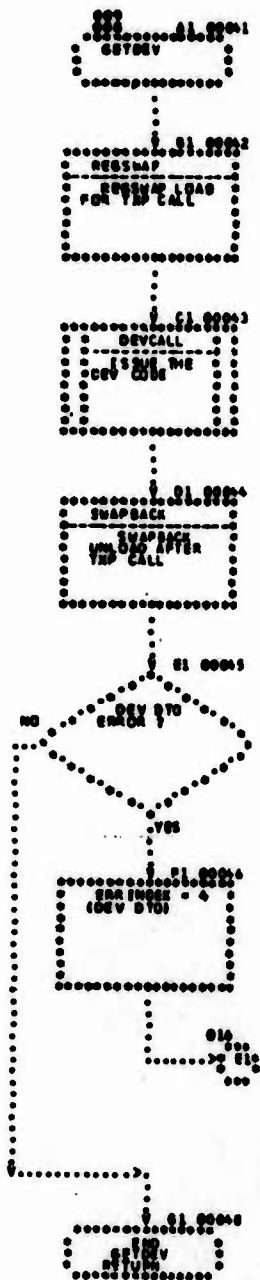


FIGURE 1-1 SAMPLE FLOWCHART

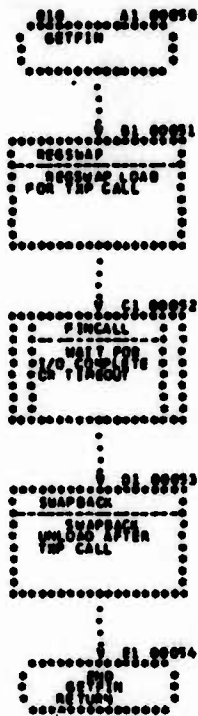


FIGURE 3. DANCEY FLOWCHART

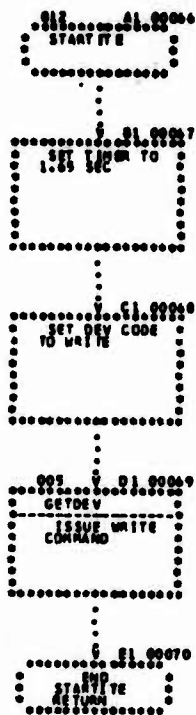


FIGURE SHEET 77 BANGORICE FLOWCHART
888 OF 916

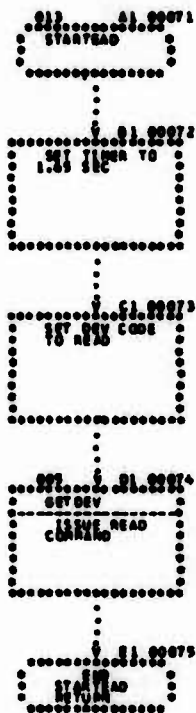


FIGURE 1: RAMCHS FLOWCHART
Sheet 001 of 010

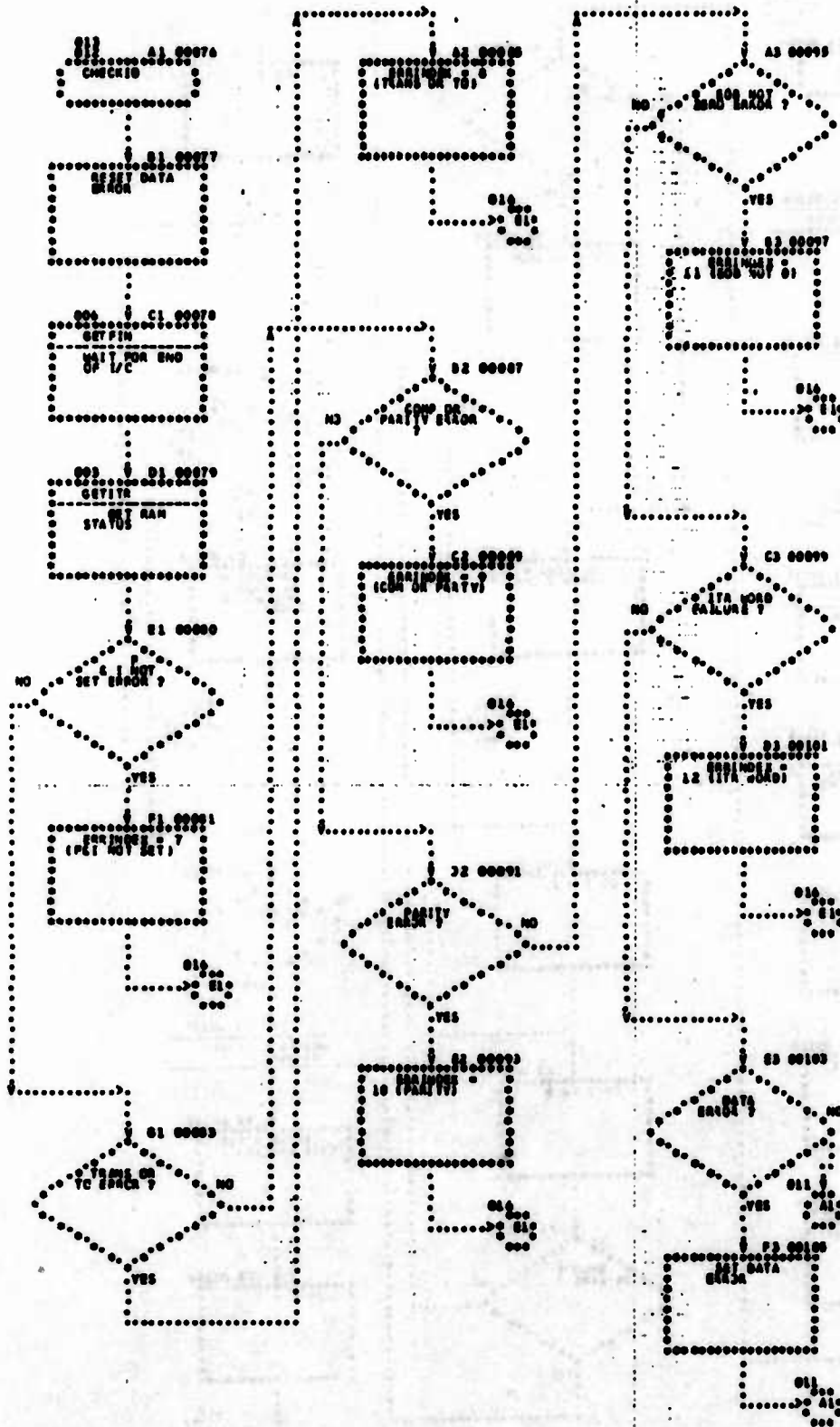


FIGURE SHEET 82713795-5 FLOWCHART

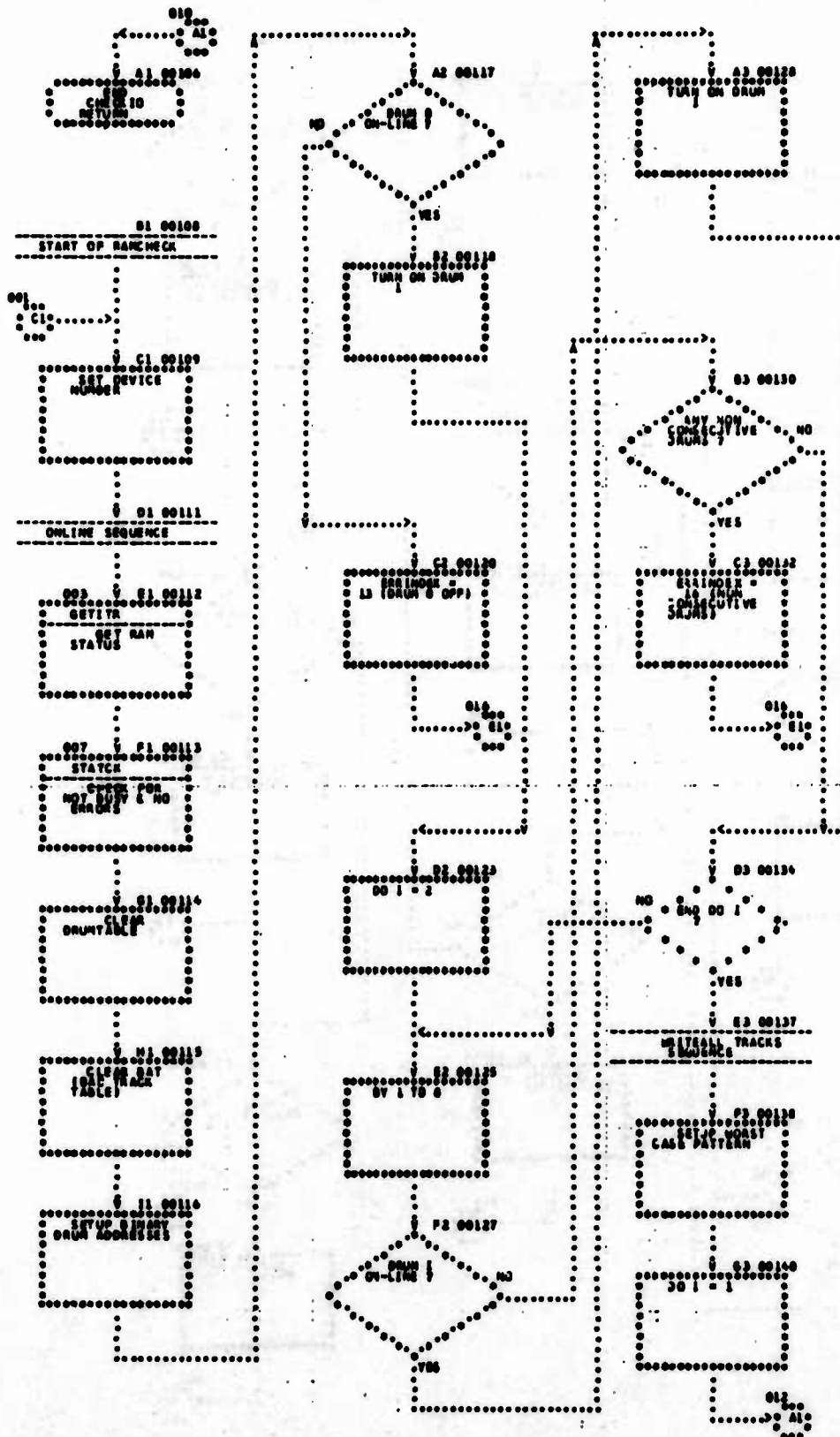


FIGURE 1 RAMMCS FLOWCHART
Sheet 1 of 2

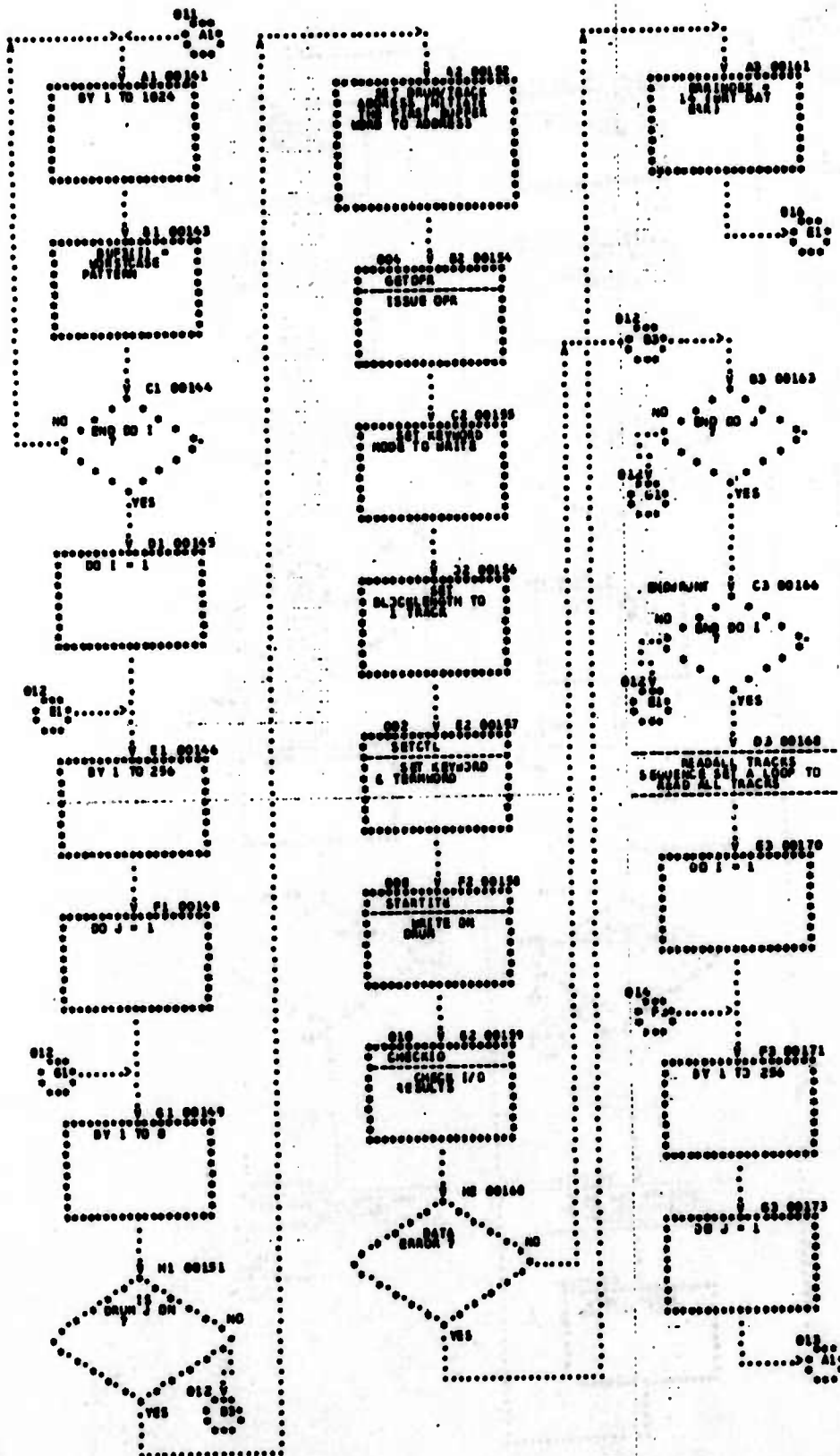


FIGURE SHEET RAM-505 FLOWCHART
SHEET 012 OF 010

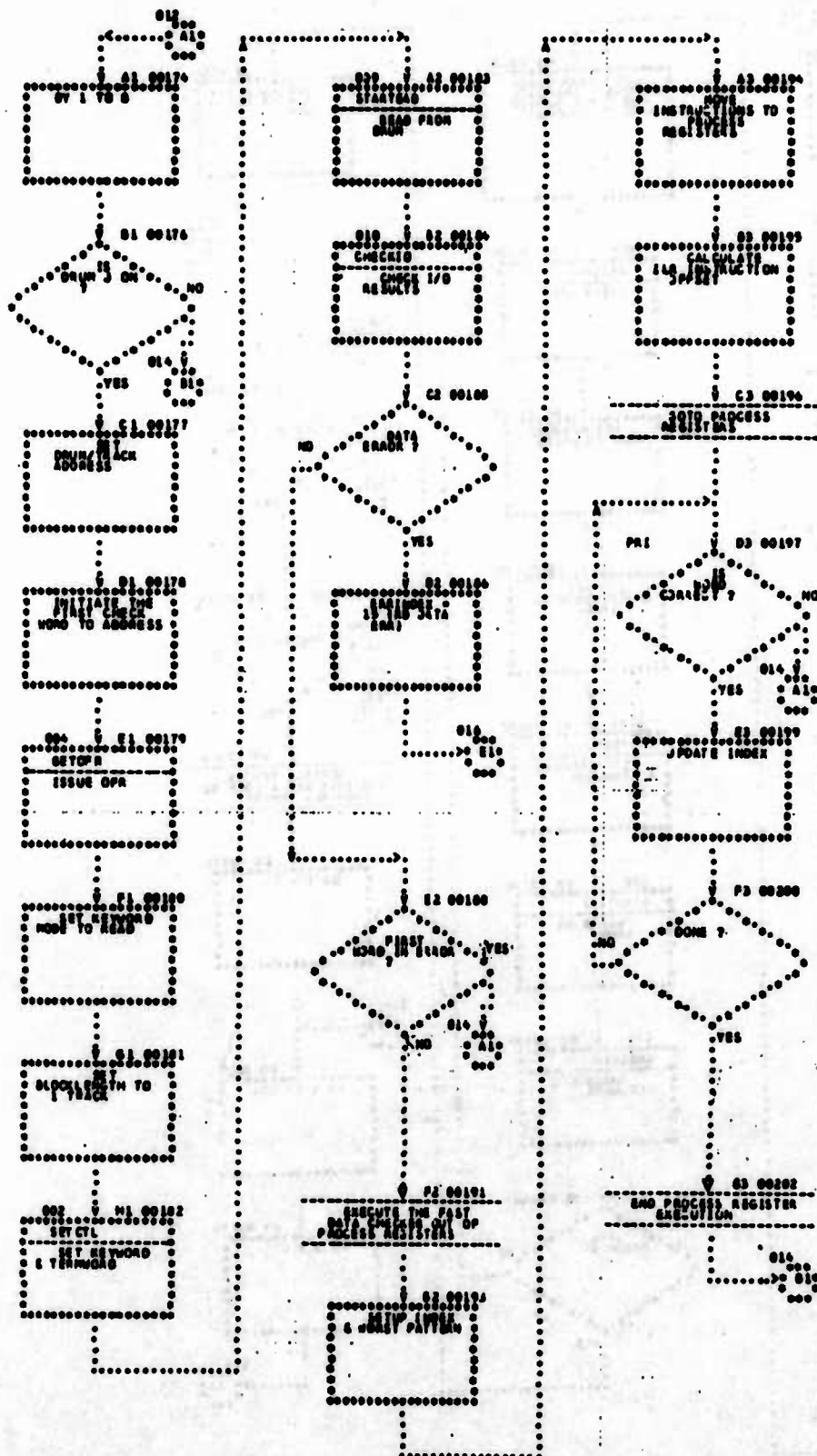


FIGURE 001 SAMCHICK FLOWCHART

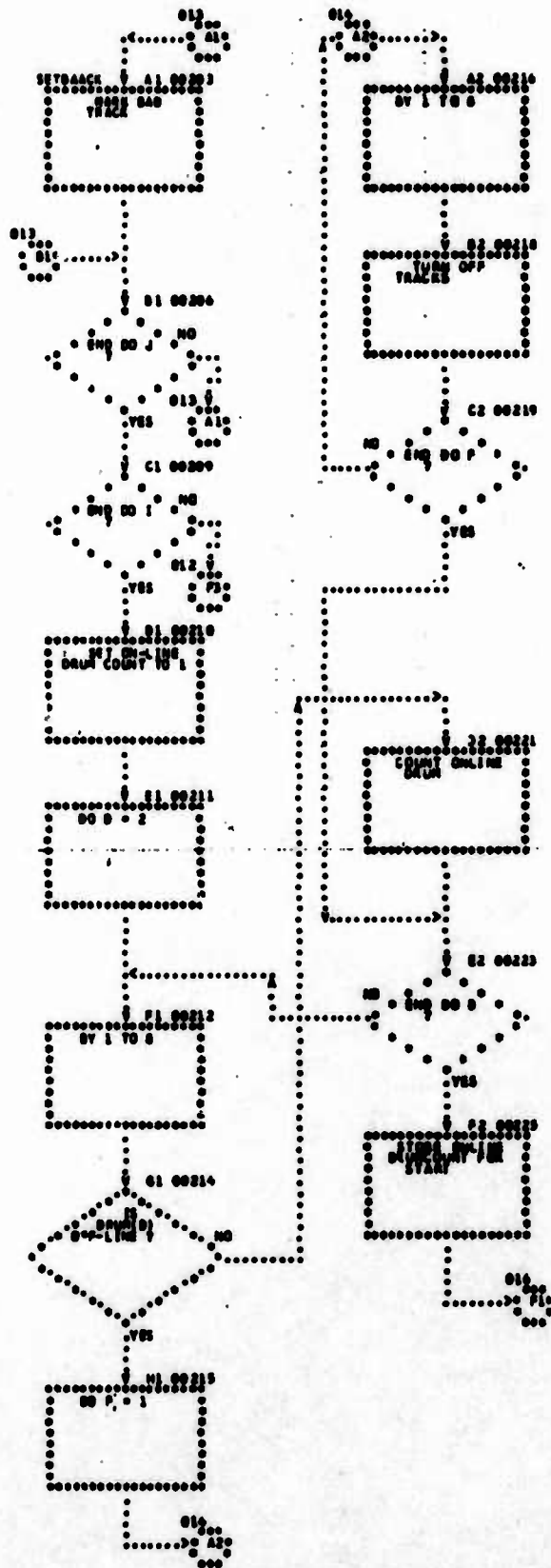


FIGURE 1. SANDWICH FLOWCHART

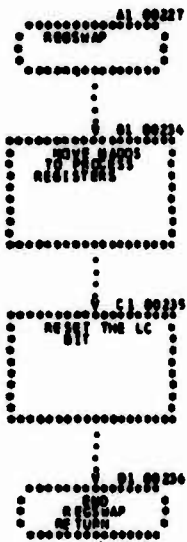


FIGURE 1. 1001WAP FLOWCHART

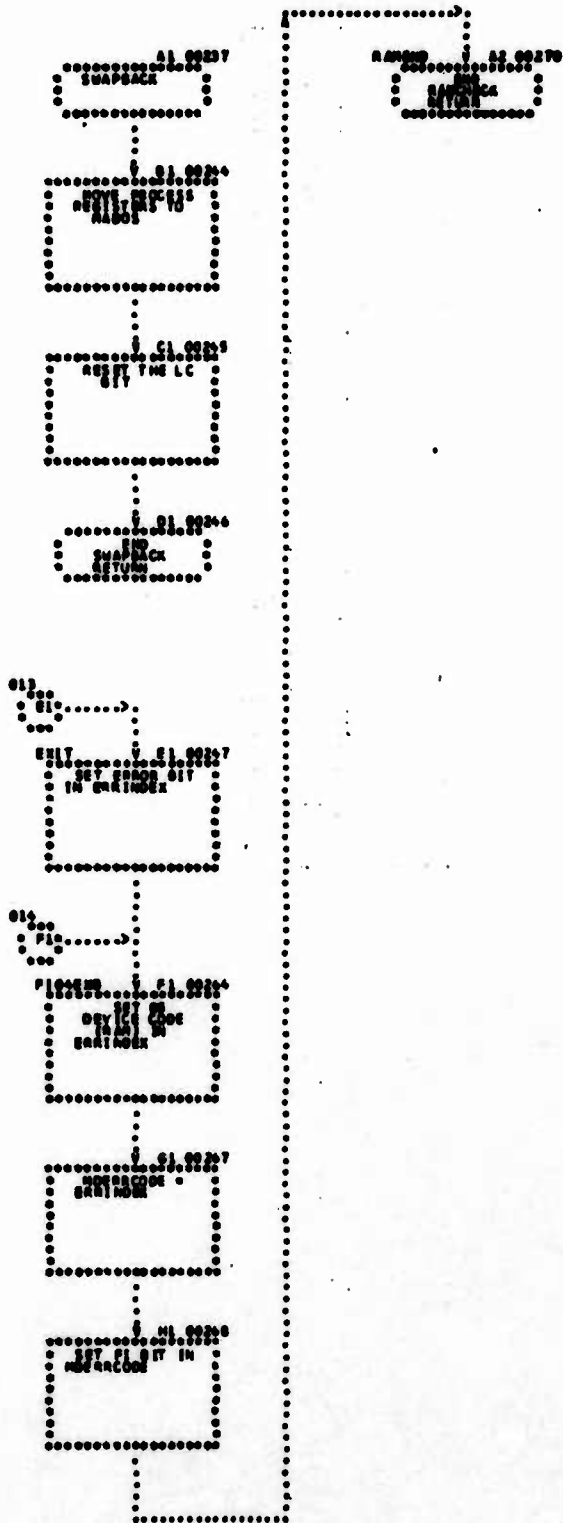
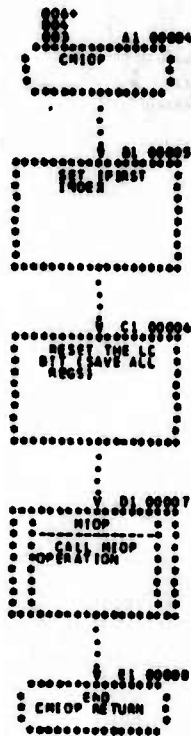


FIGURE 01.0027-01.0040 FLOWCHART



FIGURE SHEET START OF PLOUGHCHART



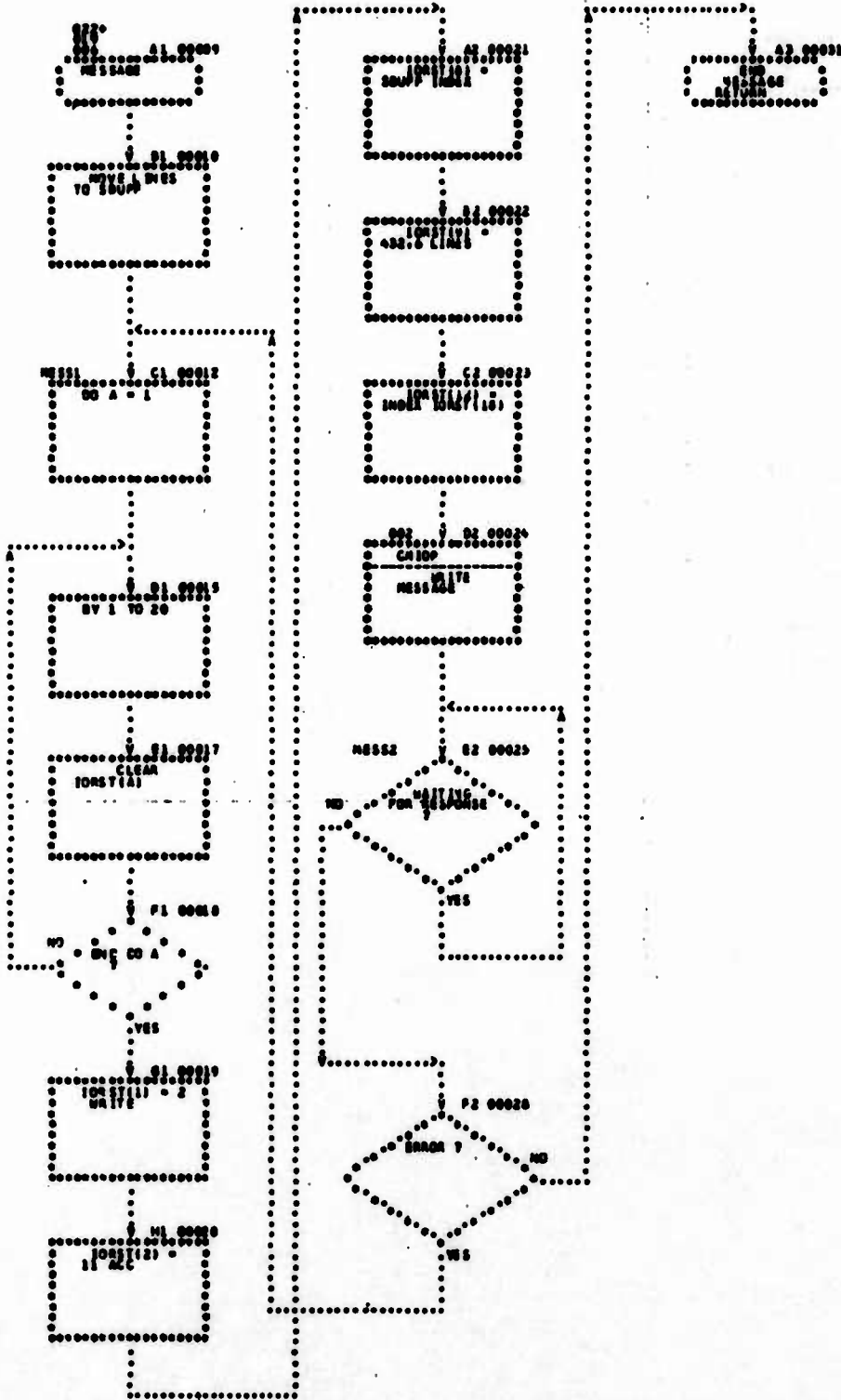


FIGURE 1 START FLOWCHART

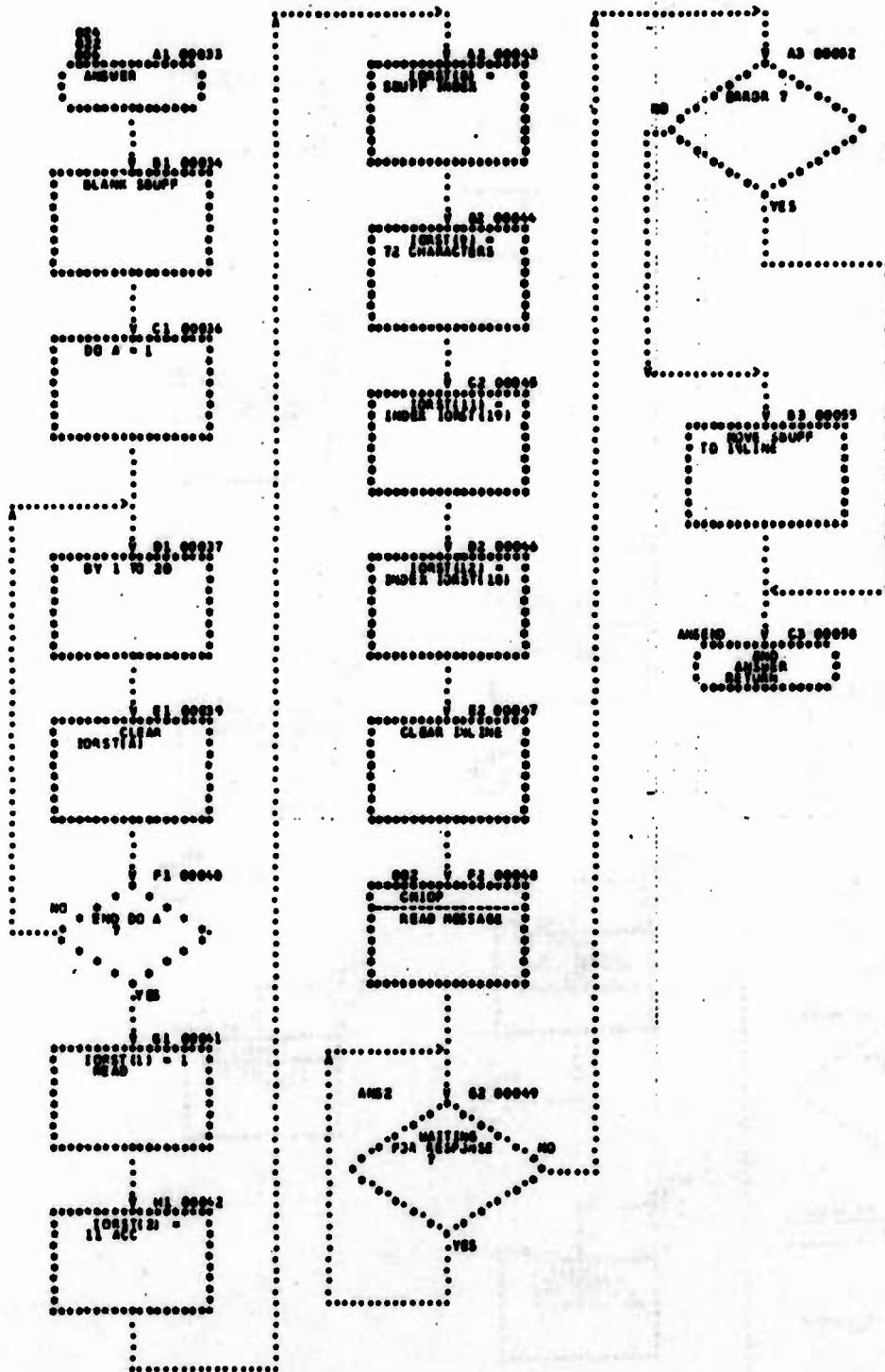


FIGURE 1-1 START FLOWCHART

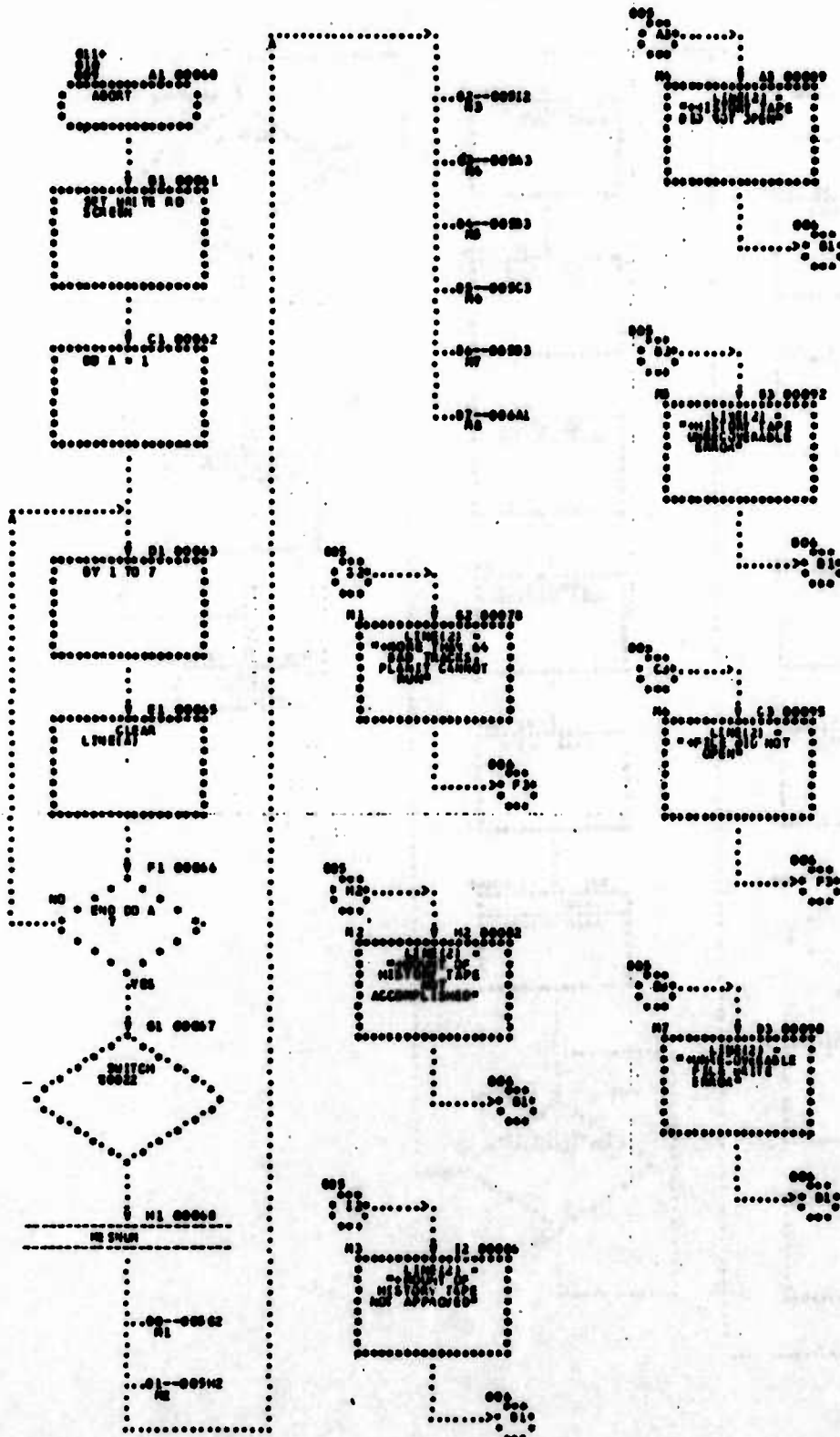
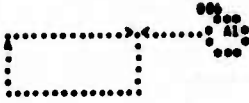


FIGURE 1. START PLANCHART



8871379
 ABOUT RETURN

FIGURE 8871379 PLANCHART

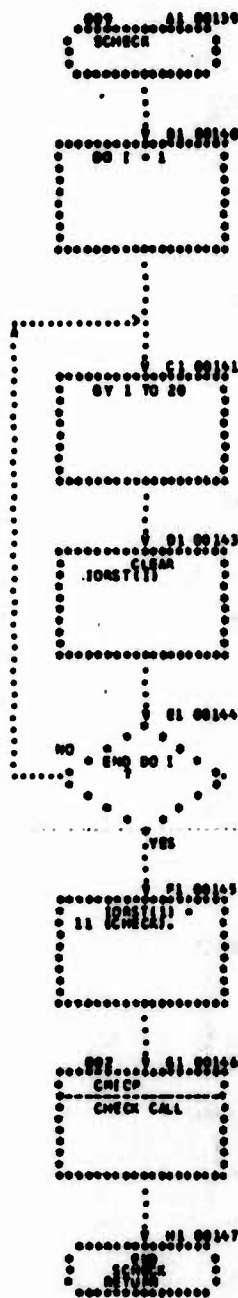


FIGURE 1. 8871773. FLOWCHART

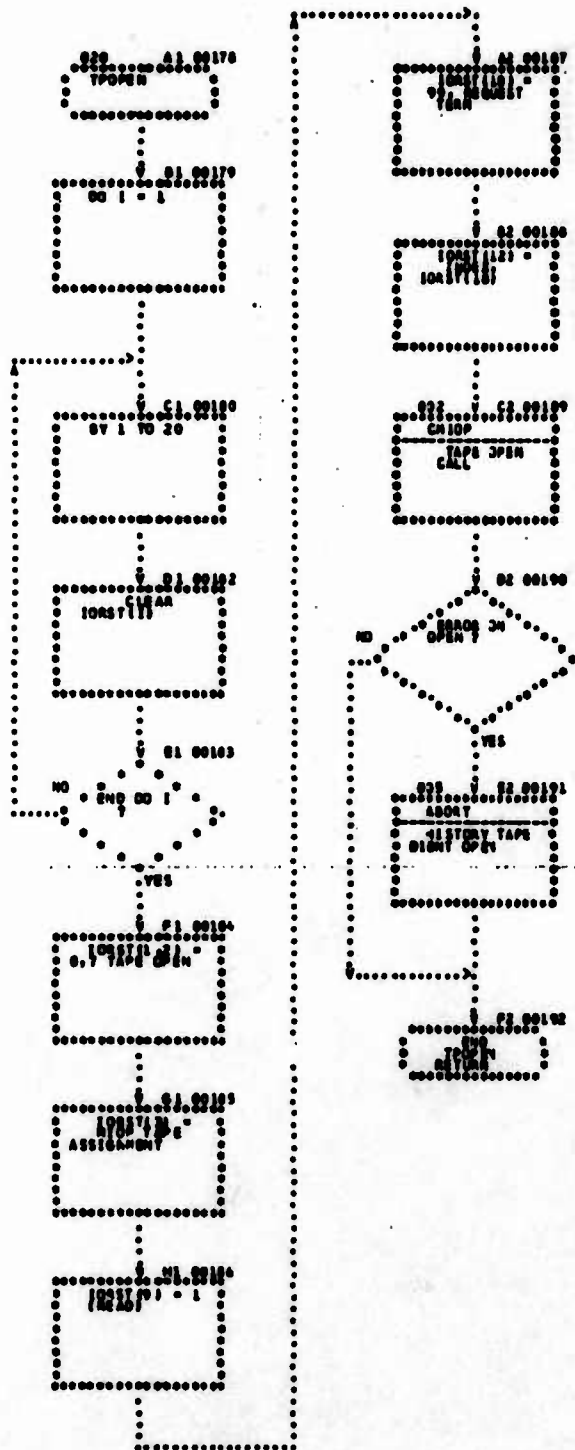


FIGURE 1 START FLOWCHART
SHEET 010 OF 020

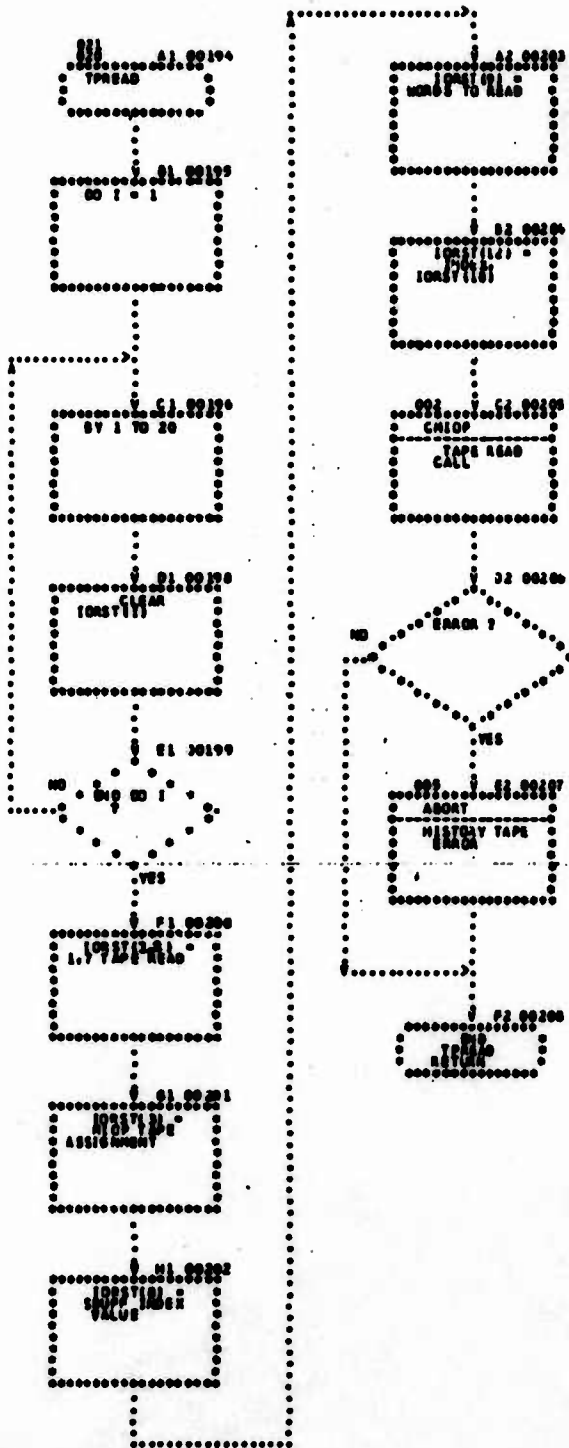


FIGURE 1-10 START FLOWCHART
SECRET 84715715

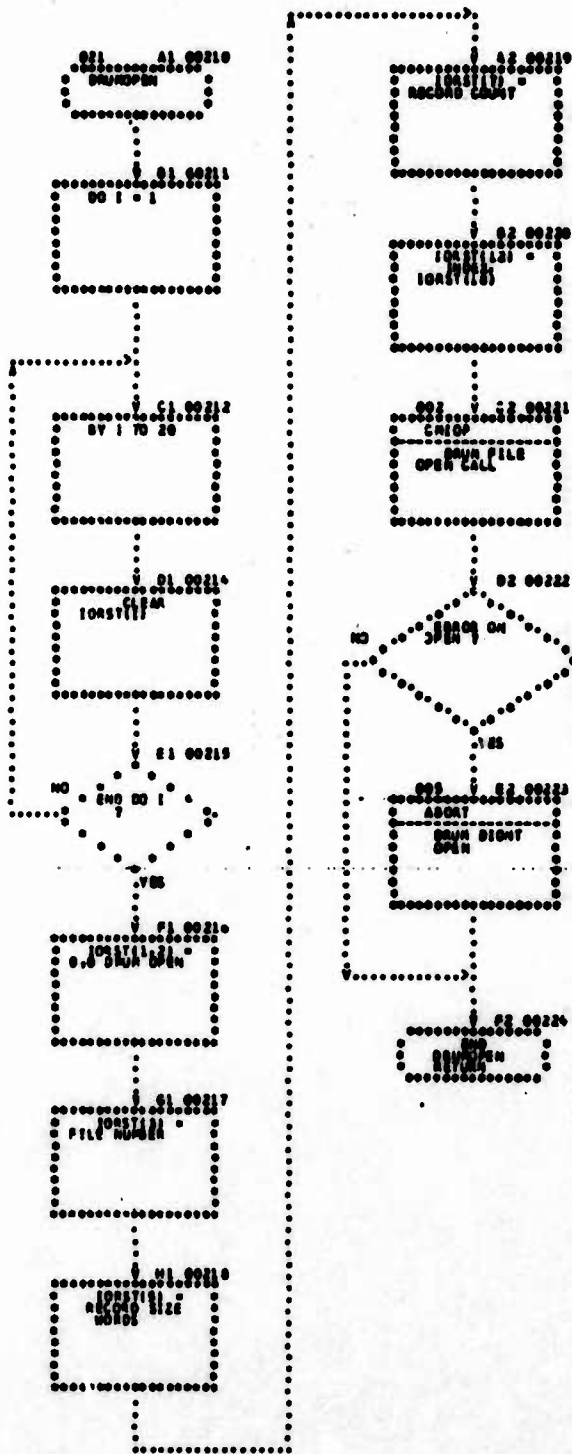


FIGURE SHEET 012 OF 015 FLOWCHART

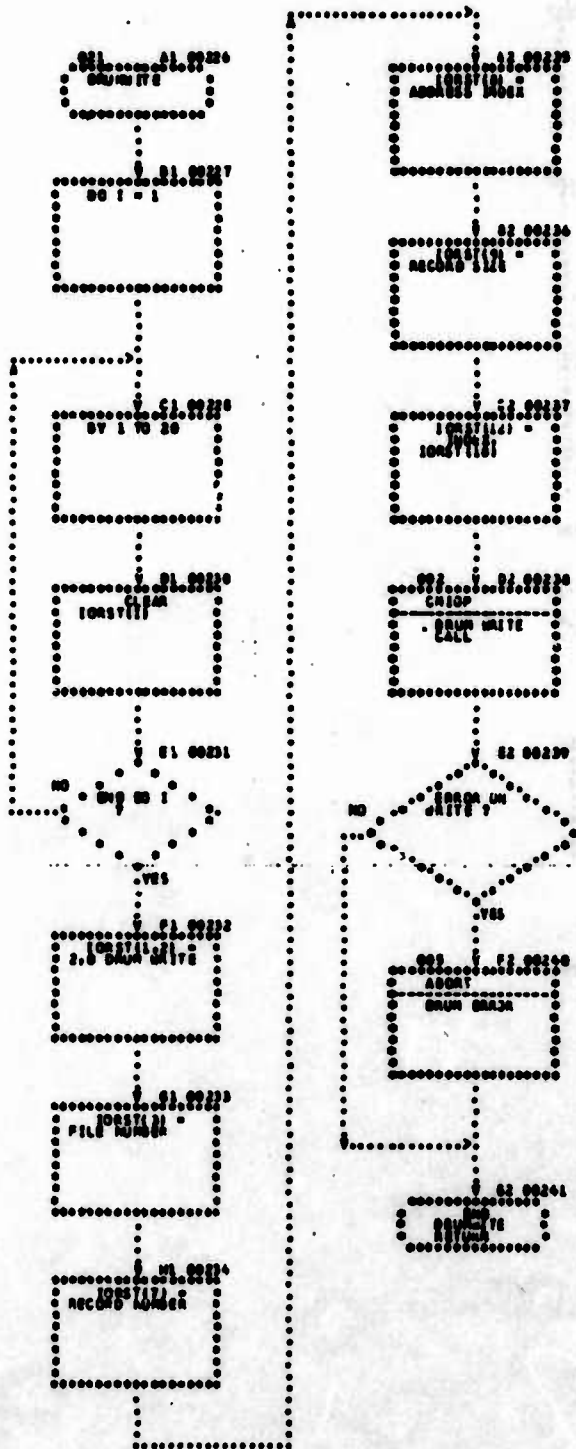
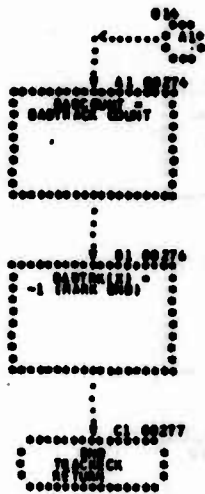
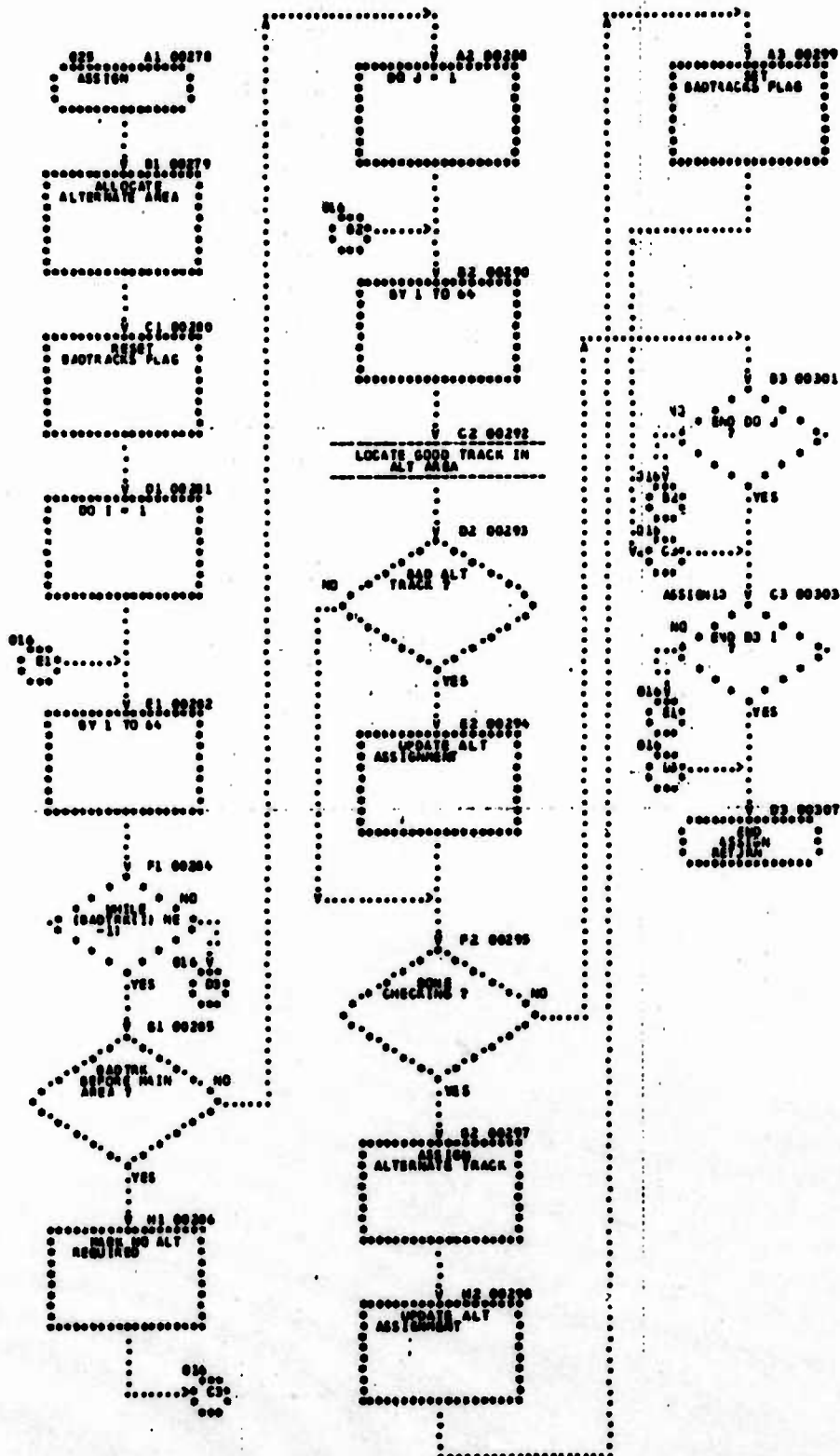
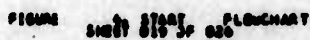


FIGURE 8-10 START FLOWCHART

69







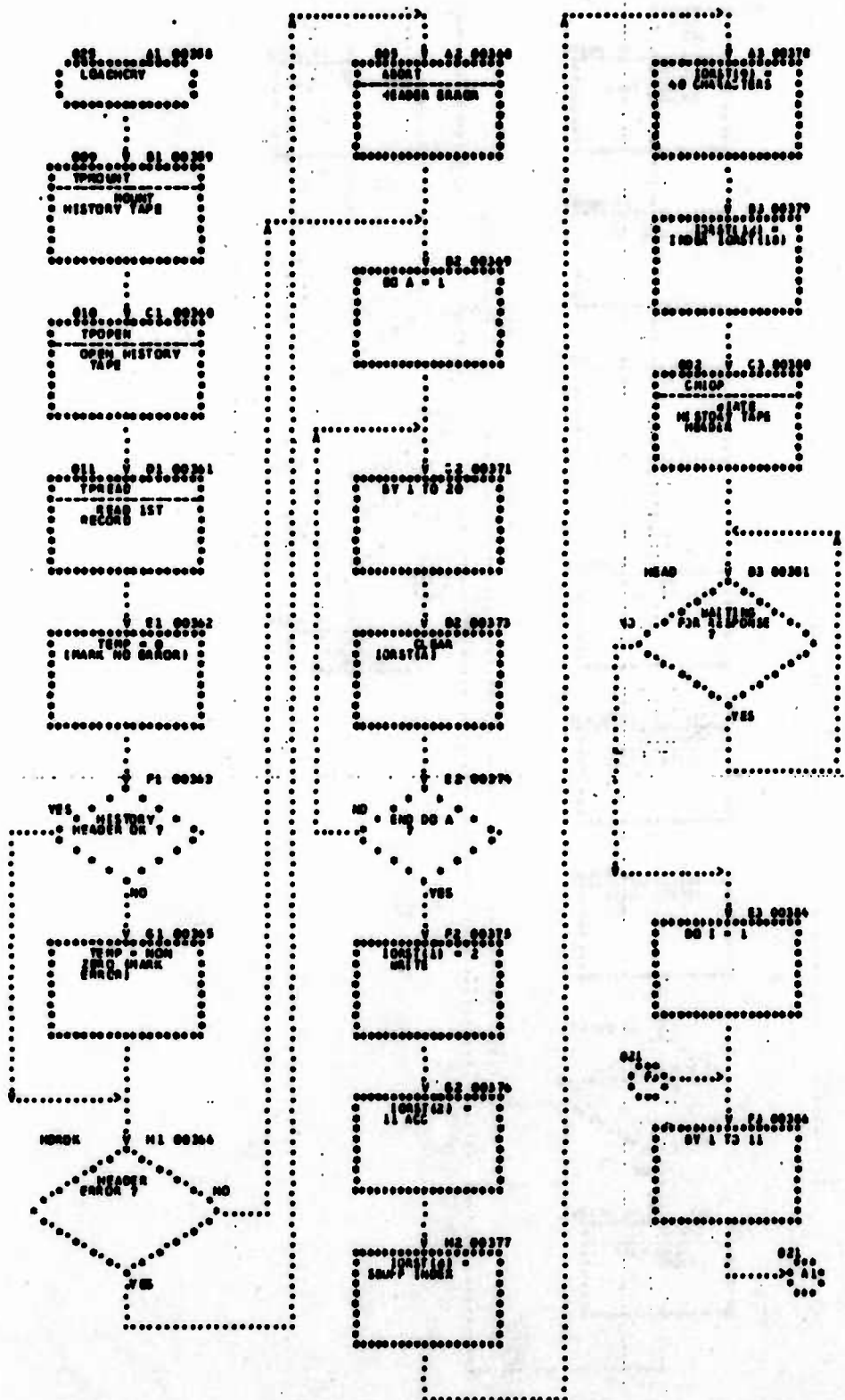


FIGURE SHEET START FLOWCHART
SHEET 020 OF 026

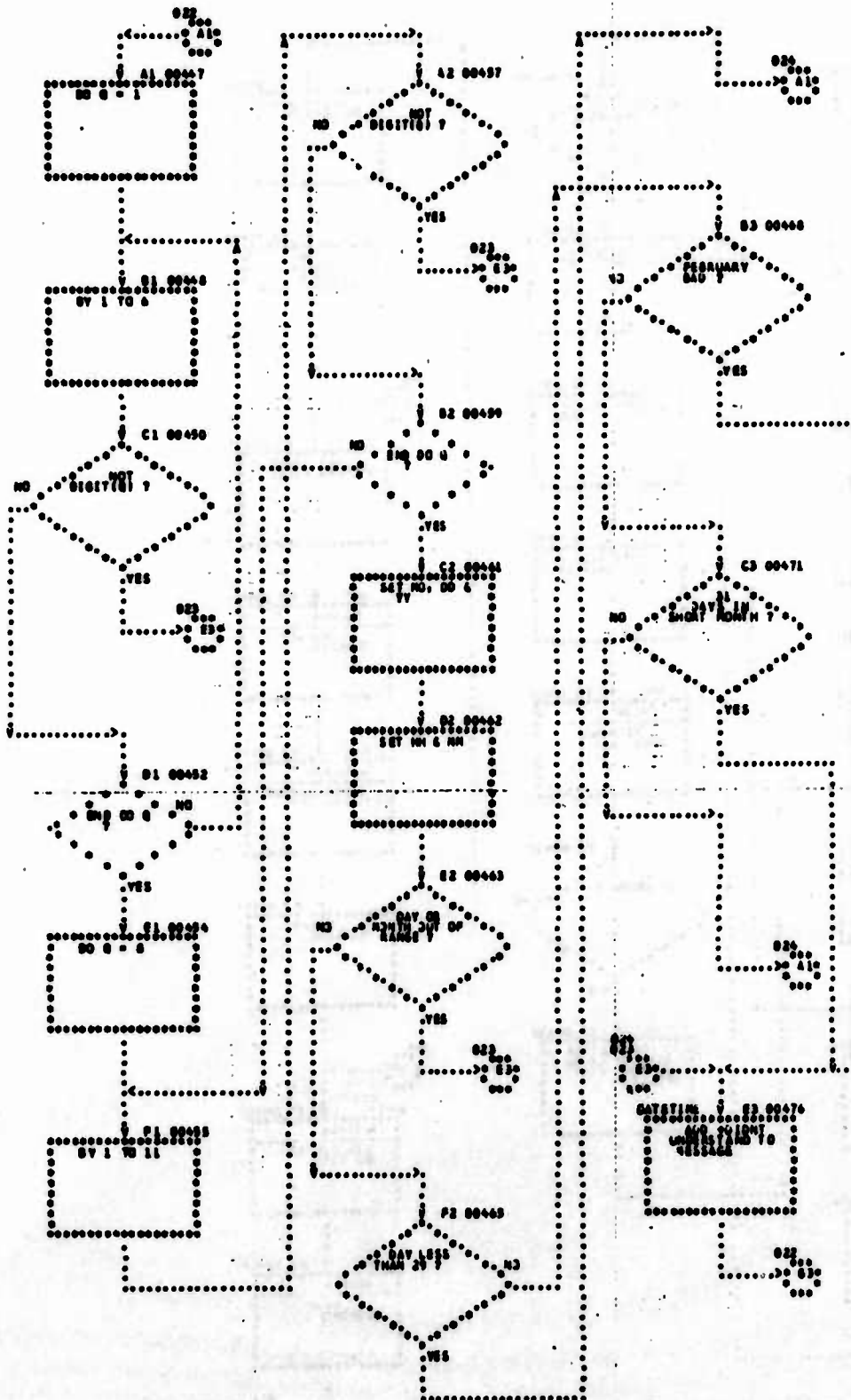
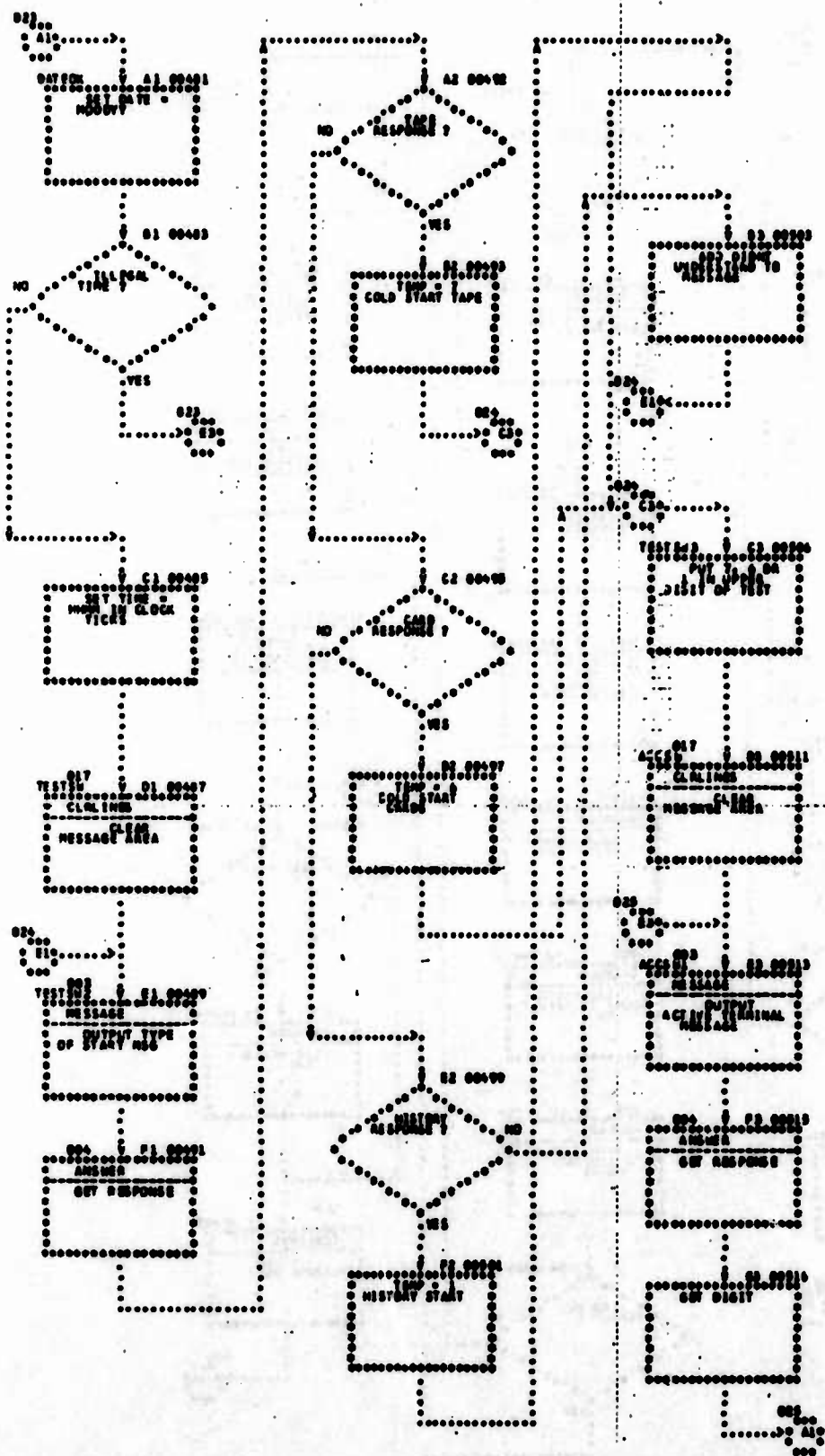


FIGURE 22713775 FLOWCHART



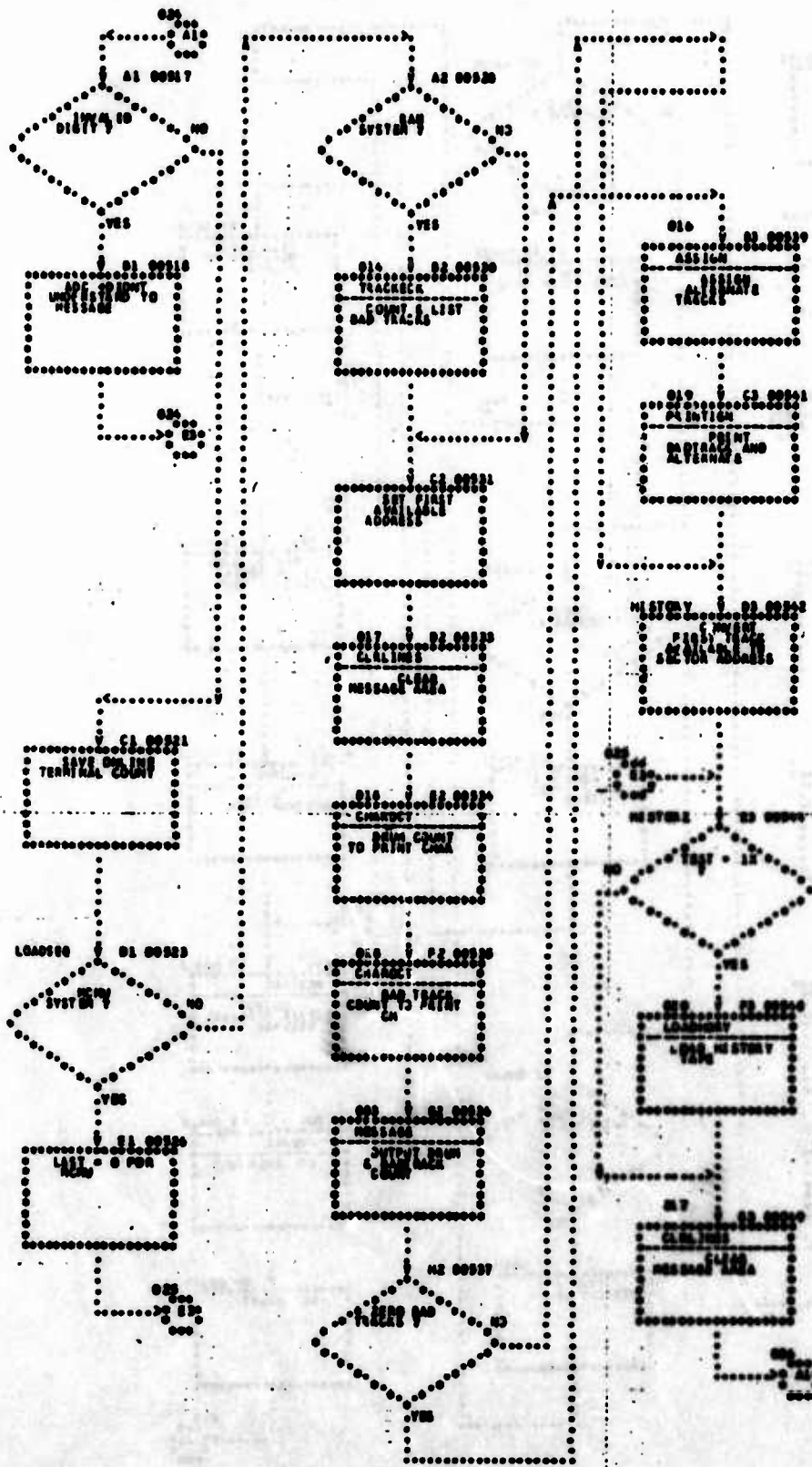


FIGURE 1-10 SYSTEM FLOWCHART

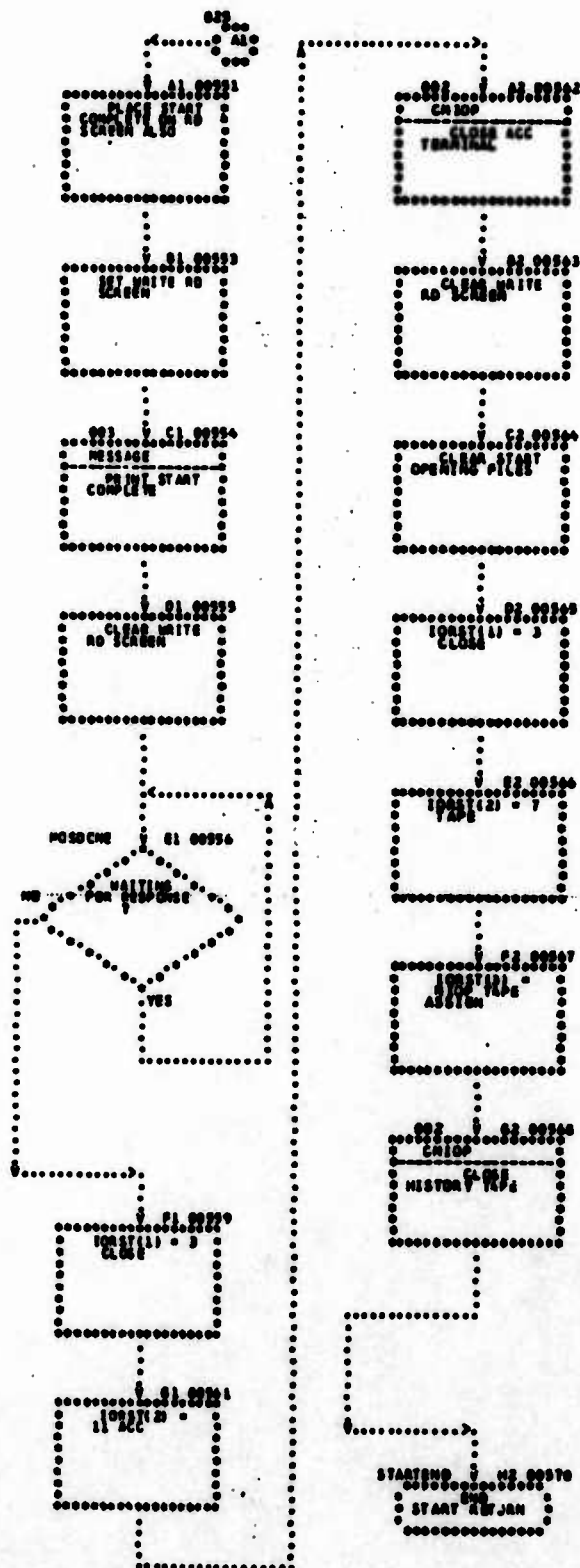


FIGURE 2. INITIAL AND FINAL FLOWCHART

85

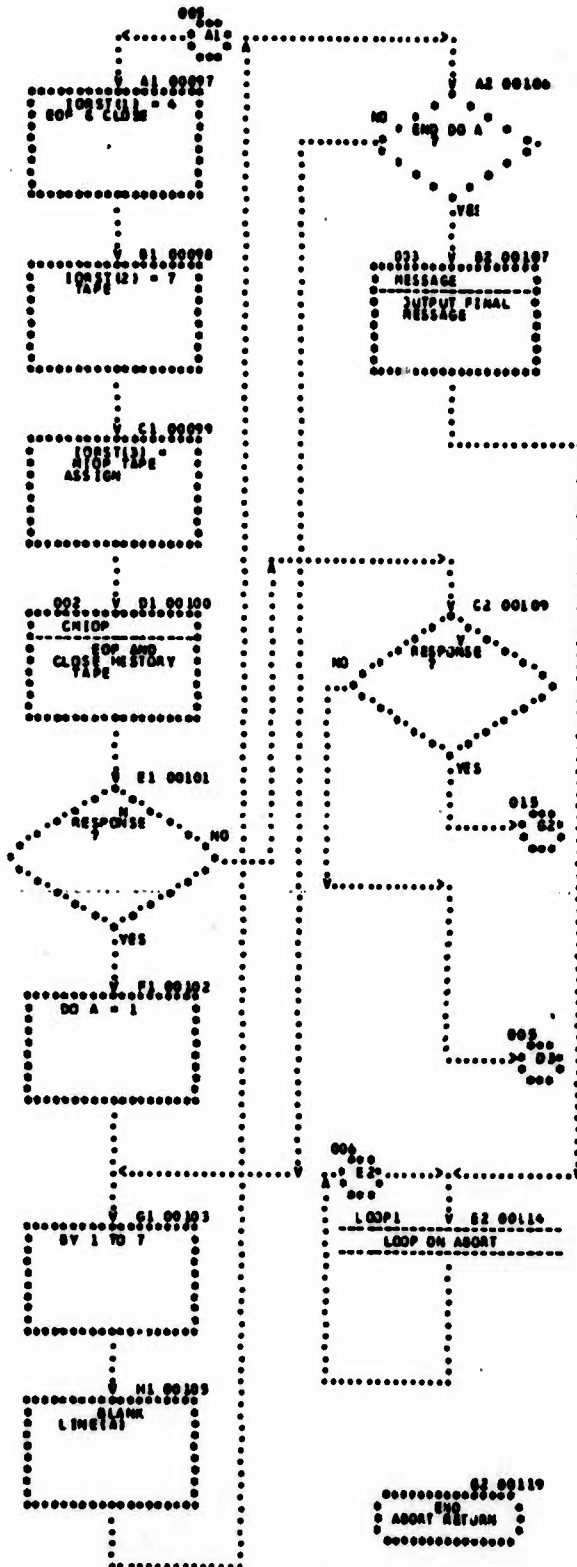


FIGURE 87 FINAL FLOWCHART
SHEET 006 OF 010

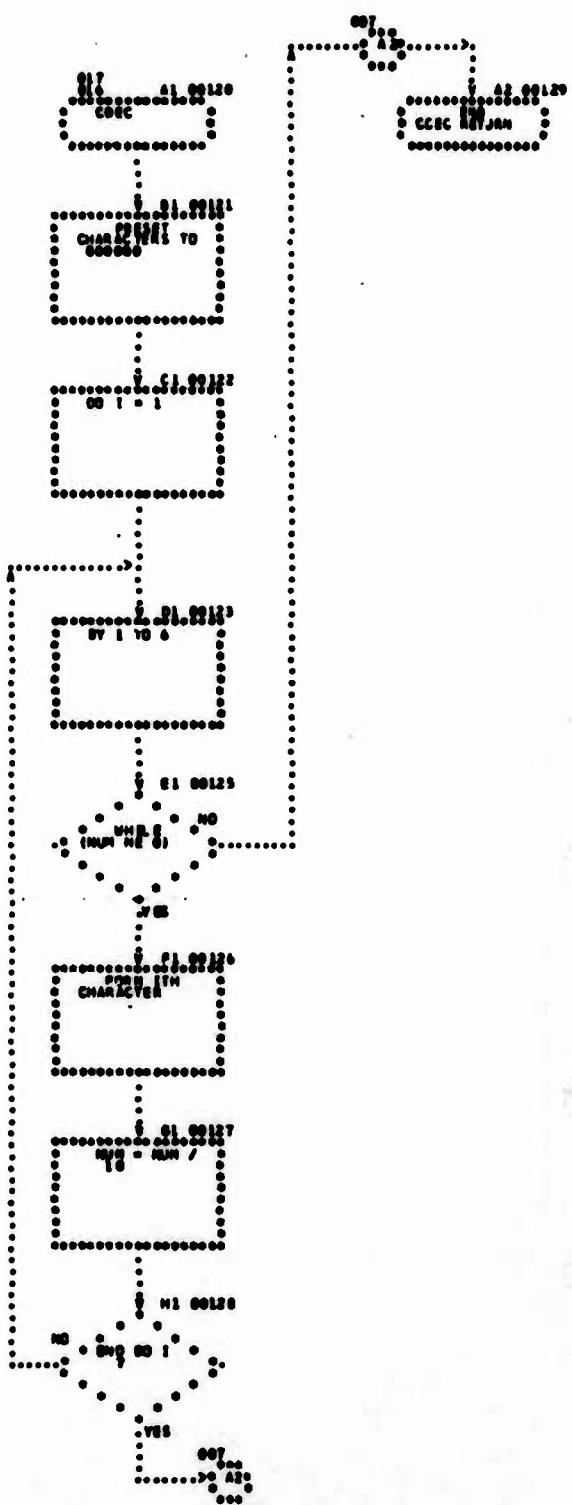


FIGURE 1007-3P-015 FLOWCHART

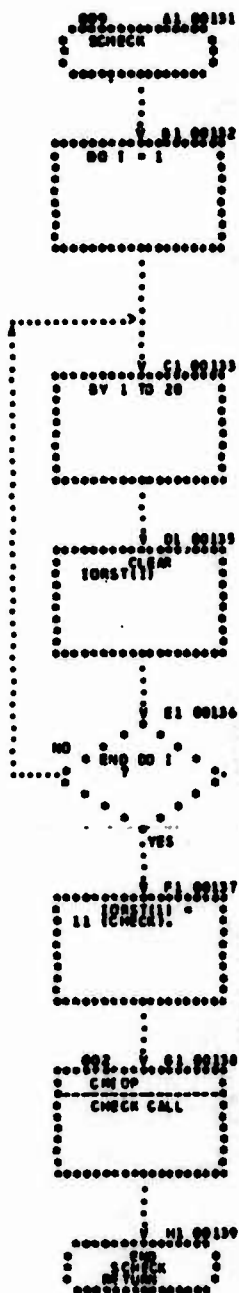


FIGURE 101.00131 FLOWCHART

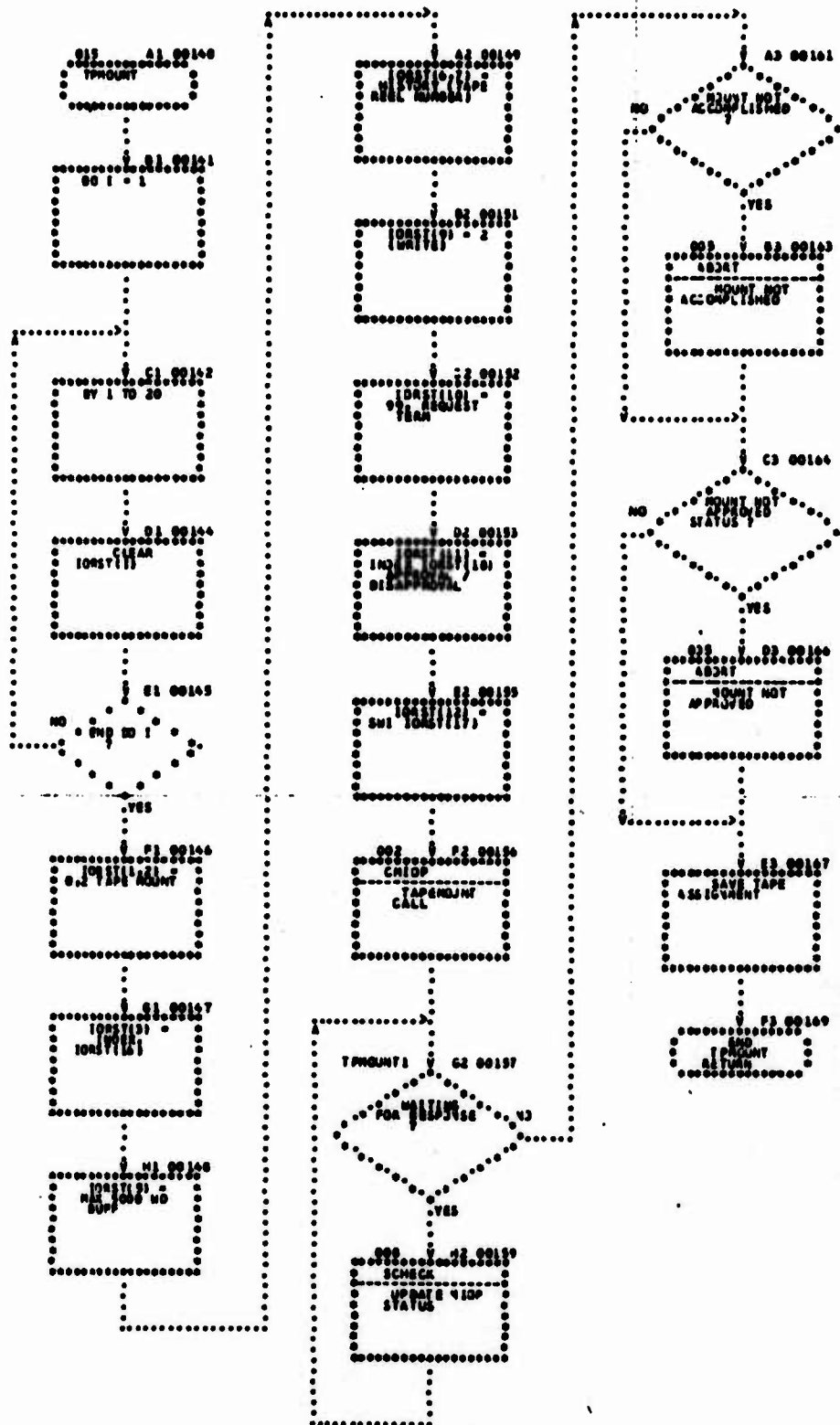


FIGURE 51941
SHEET 500 OF 519

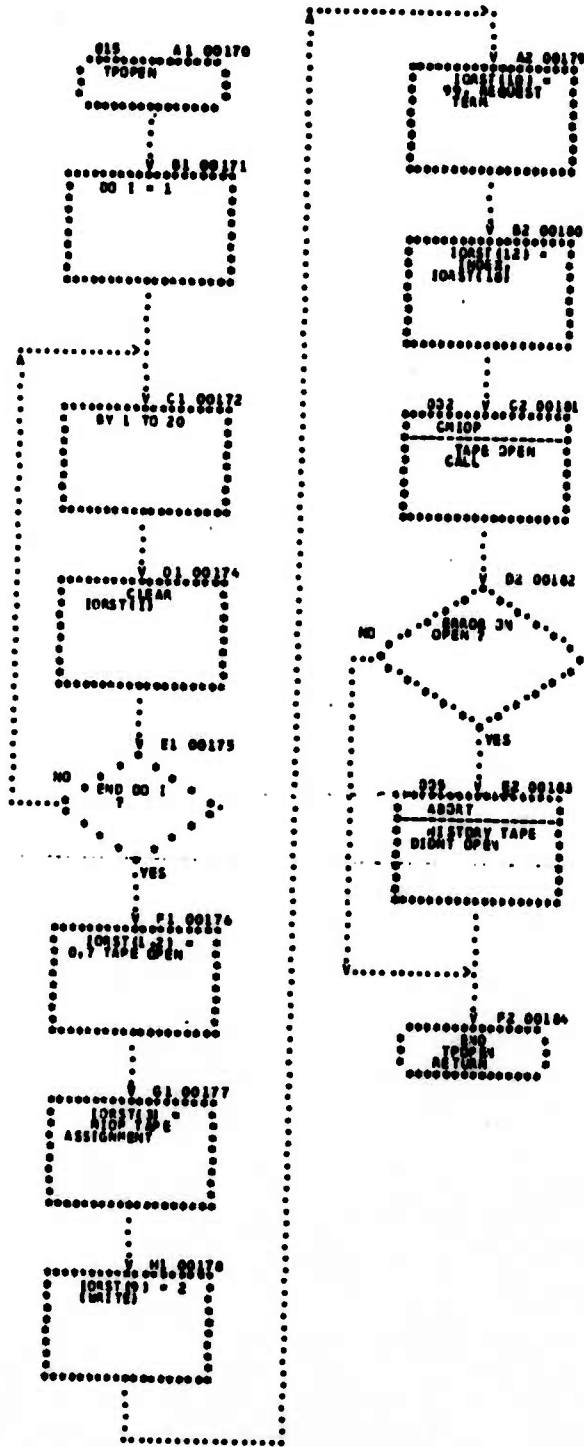


FIGURE 3-1 FINAL FLOWCHART
Sheet 512 of 518

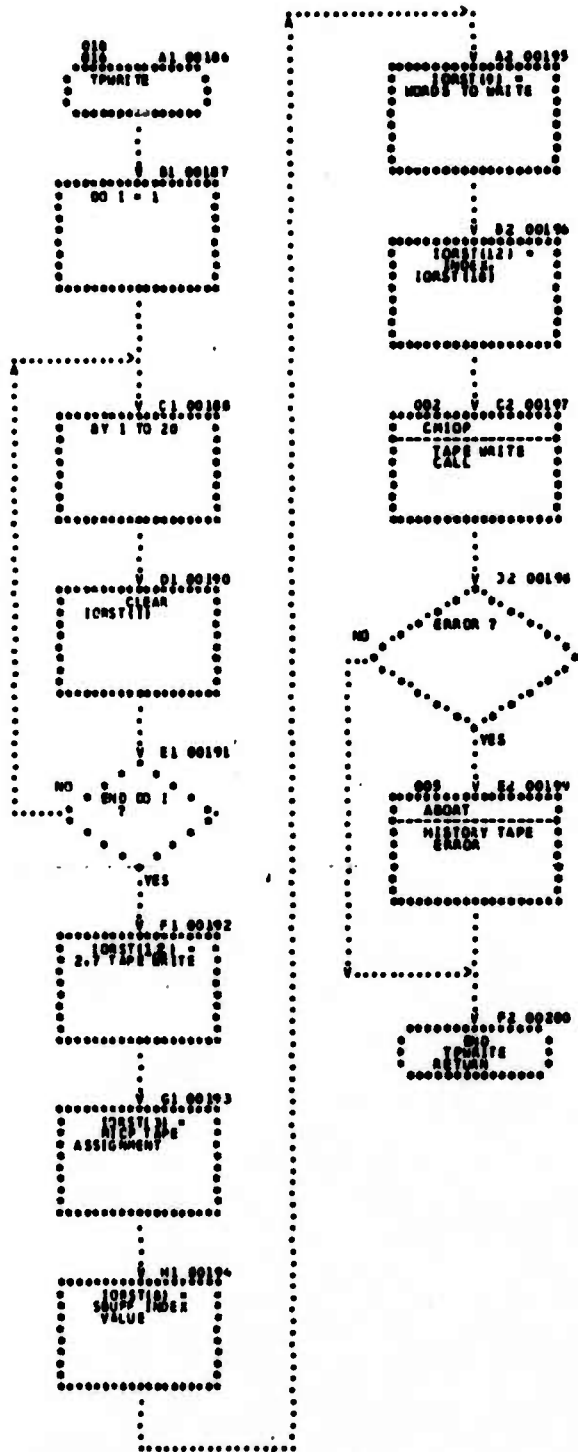


FIGURE SHEET 011 OF 010 FLOWCHART

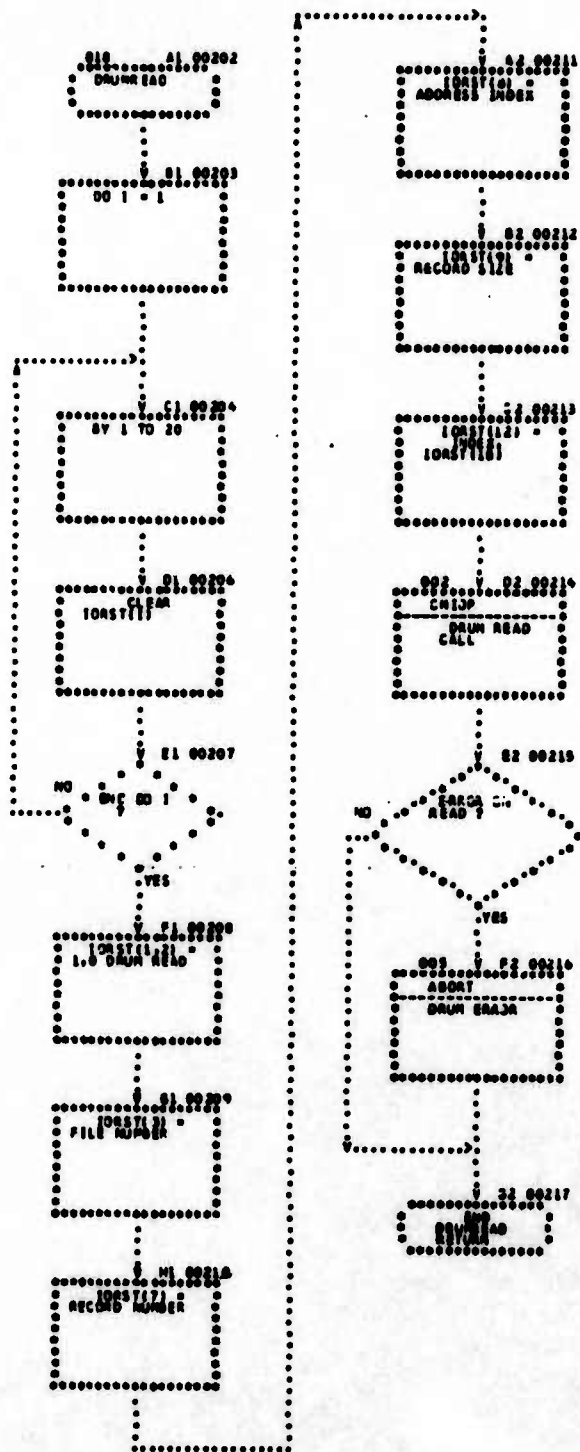


FIGURE 51001
SHEET 51001 OF 51001

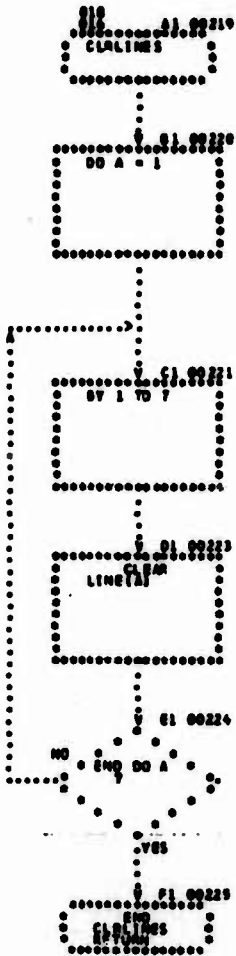


FIGURE 2. CLALIN CLALIN

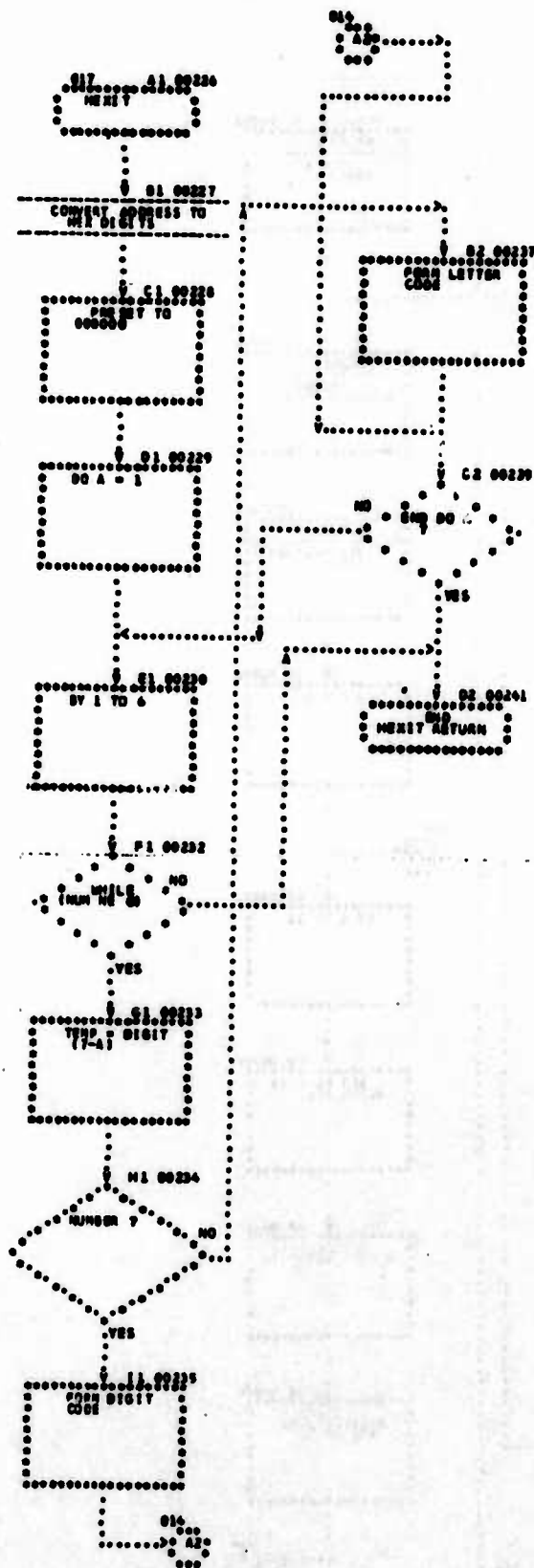
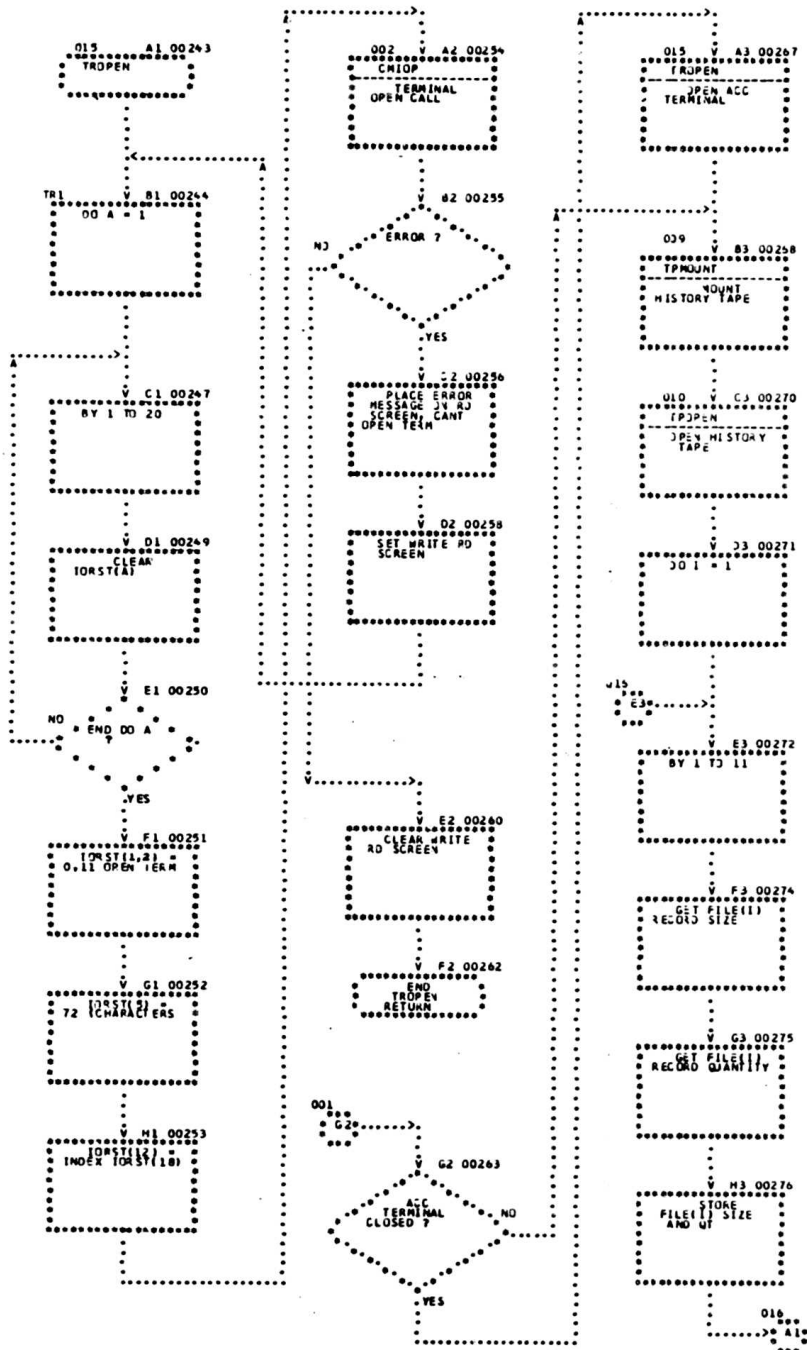
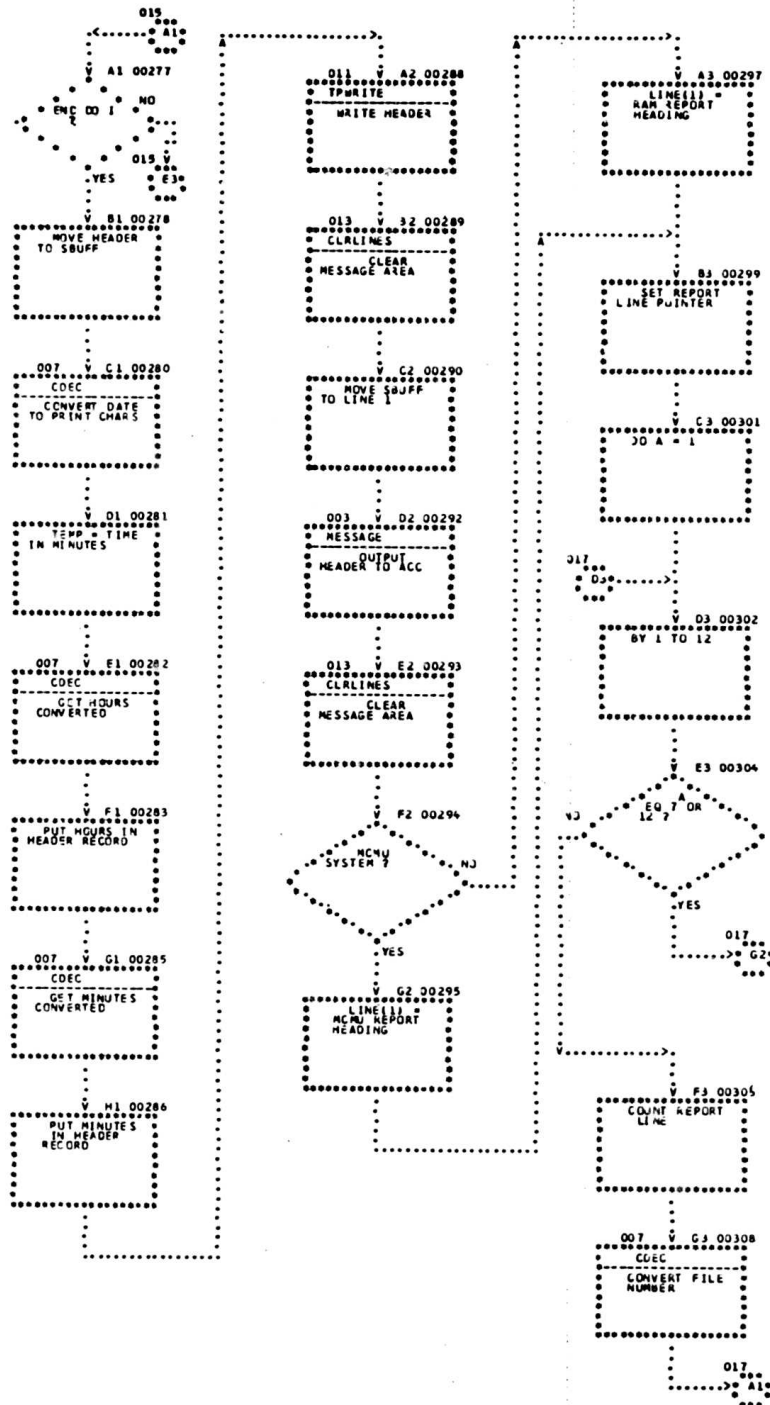


FIGURE 12-12 FINAL FLOWCHART





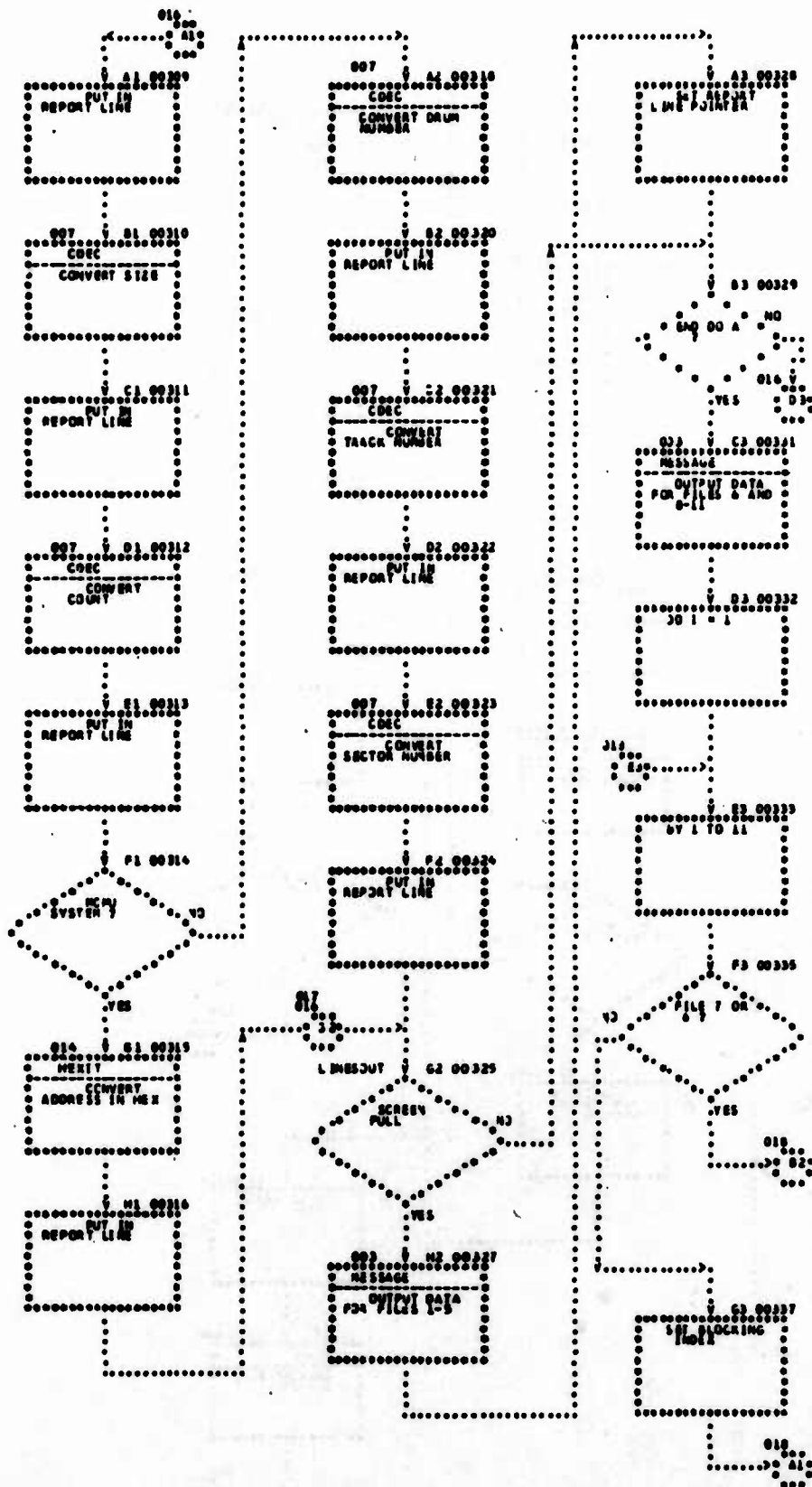
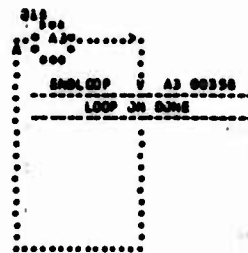
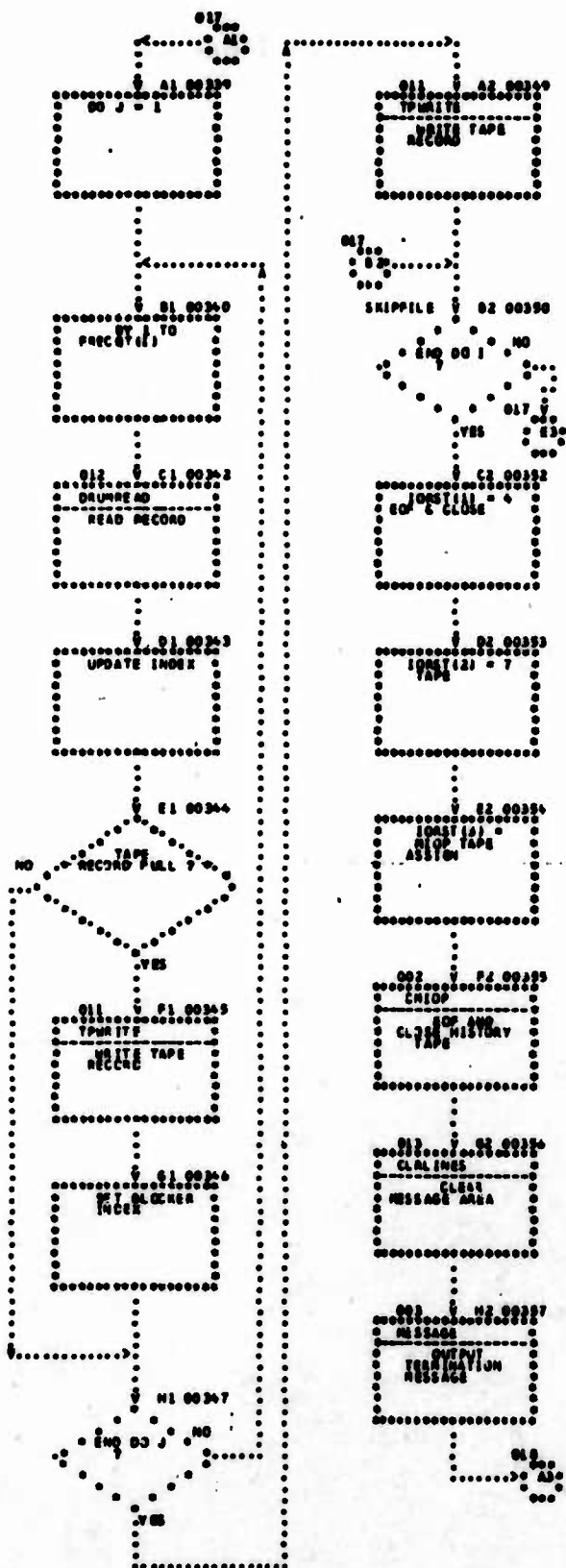


FIGURE SHEET 5/17 OF 015 FLOWCHART



FINISHED 03 00362
END
FINAL RETURN

FIGURE SHEET 615 OF 615

01/04/79



FIGURE SHEET 001 OF 000 PLANNING

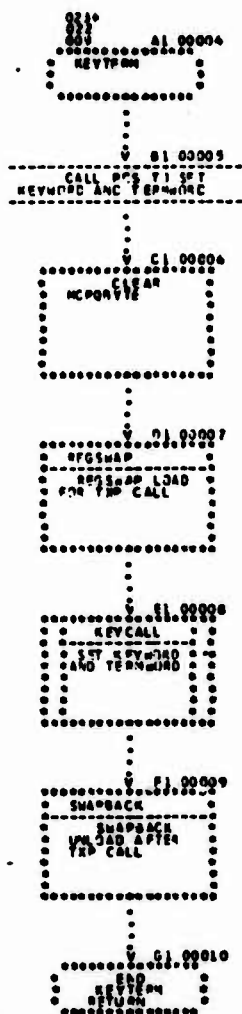


FIGURE SHEET NO. 10 PLAN

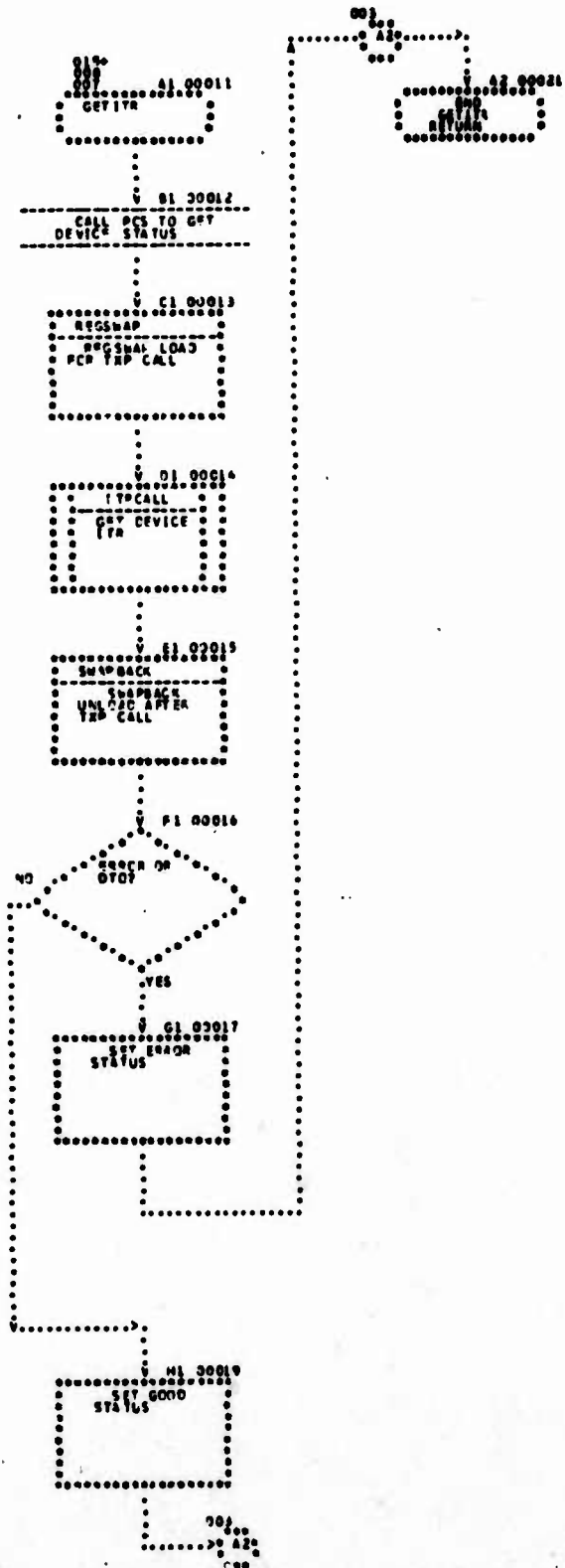


FIGURE SHEET 001 OF 002

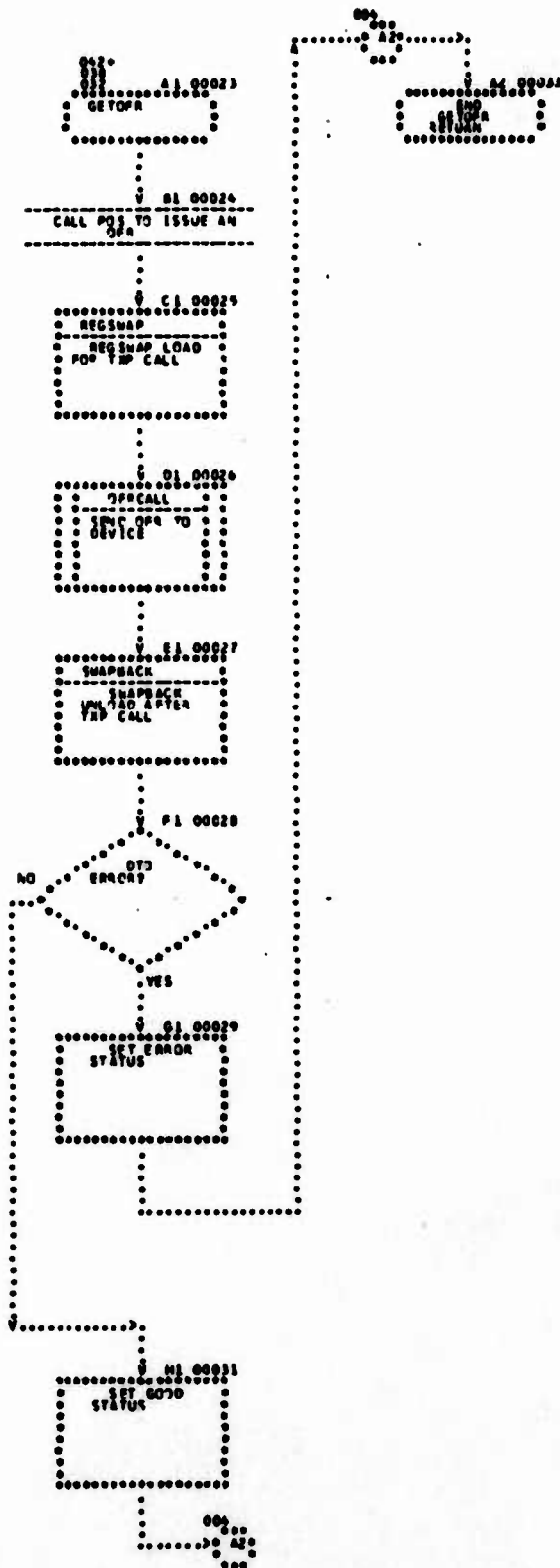


FIGURE 103
SHEET 004 OF 005

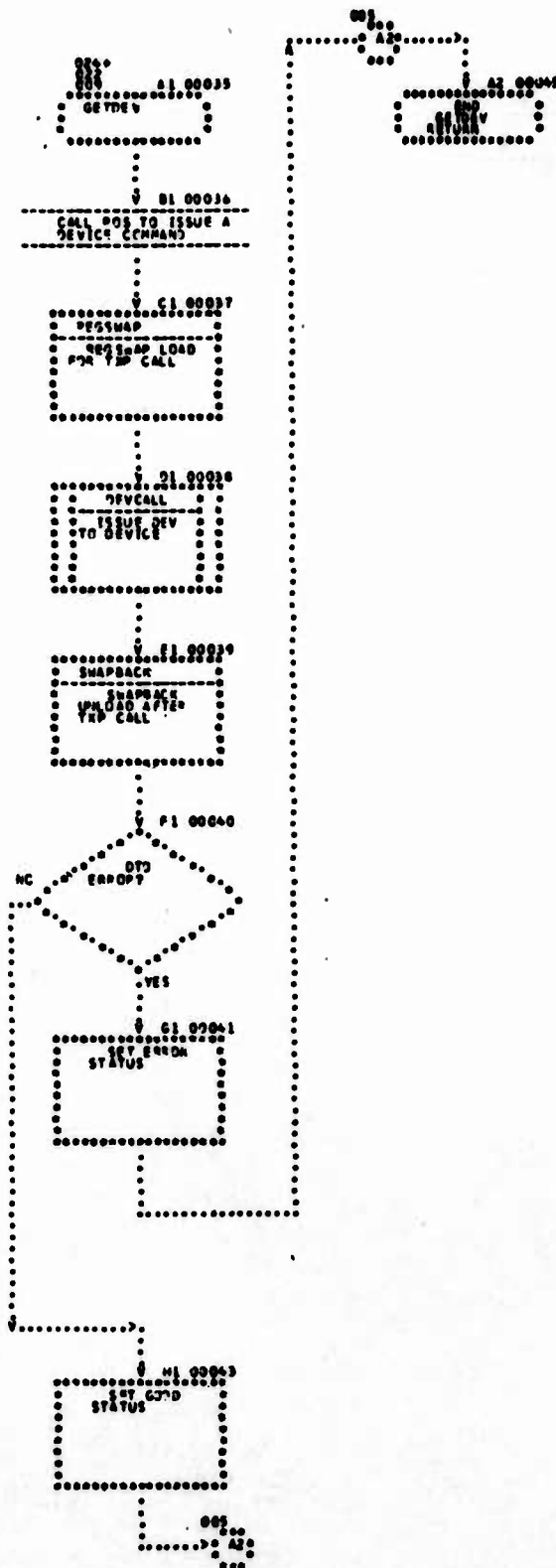


FIGURE 104 SET UP OF DOS FLOWCHART

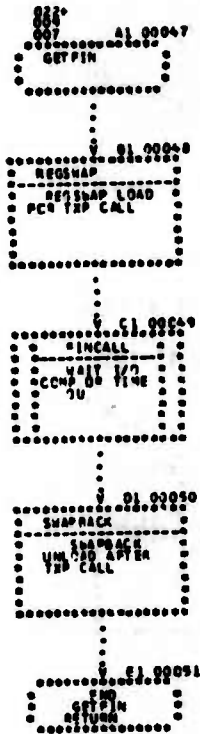


FIGURE 105: 8102 PLUMCHART

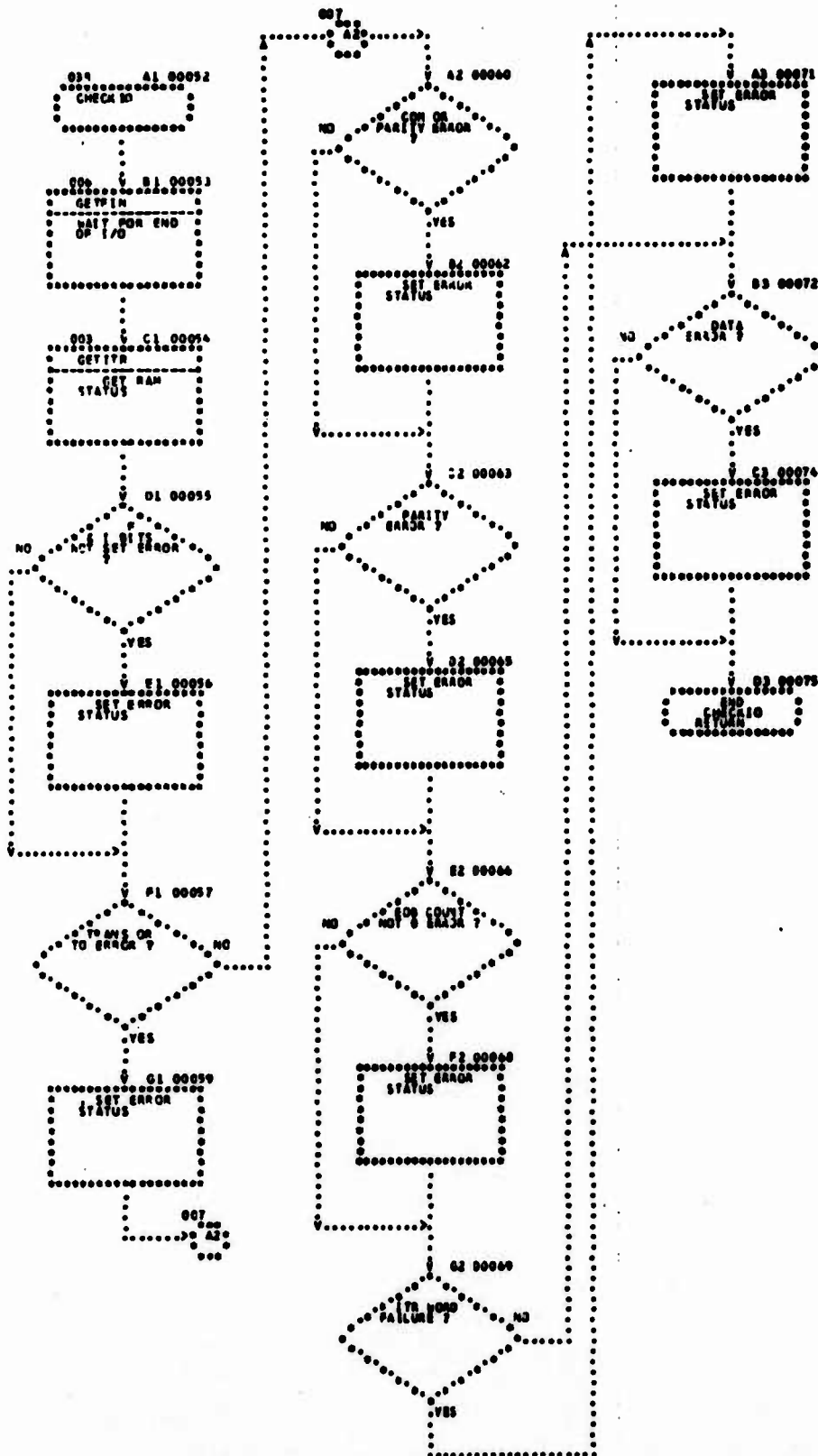


FIGURE 2-11-1
SHEET 001 OF 000 FLOWCHART



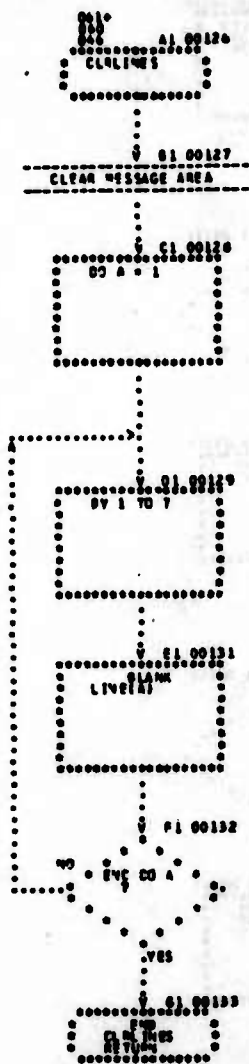


FIGURE SHEET 010 OF 005 FLOWCHART

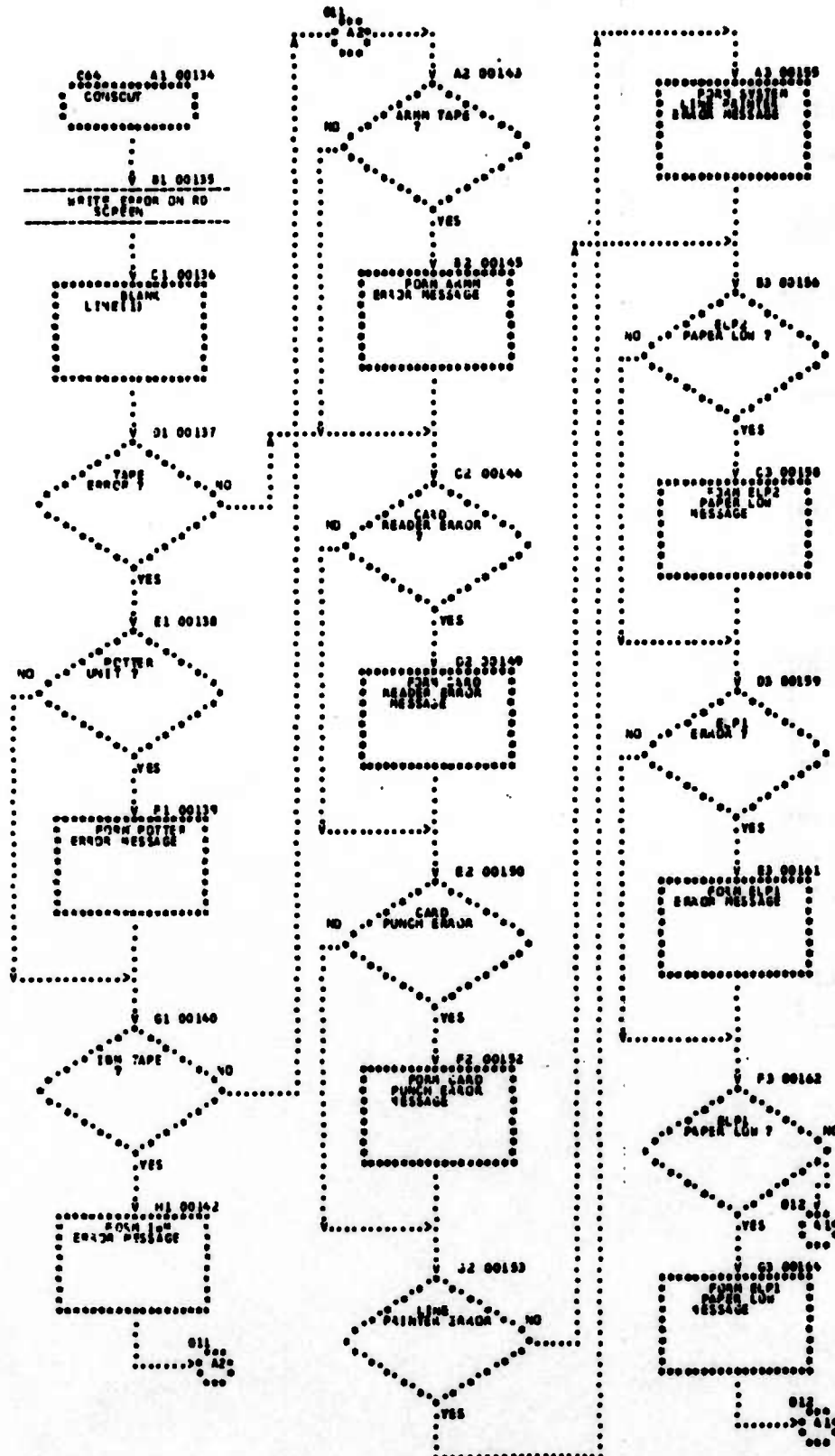


FIGURE 110-1
SHEET 011 OF 010 FLOWCHART

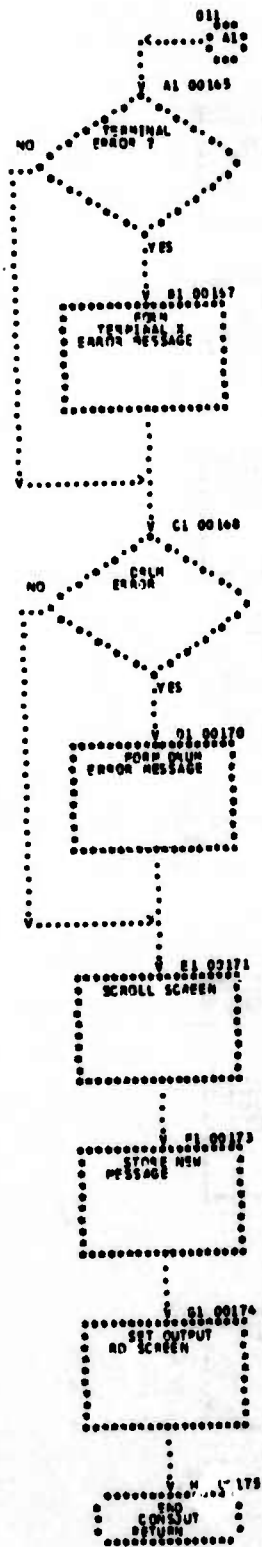
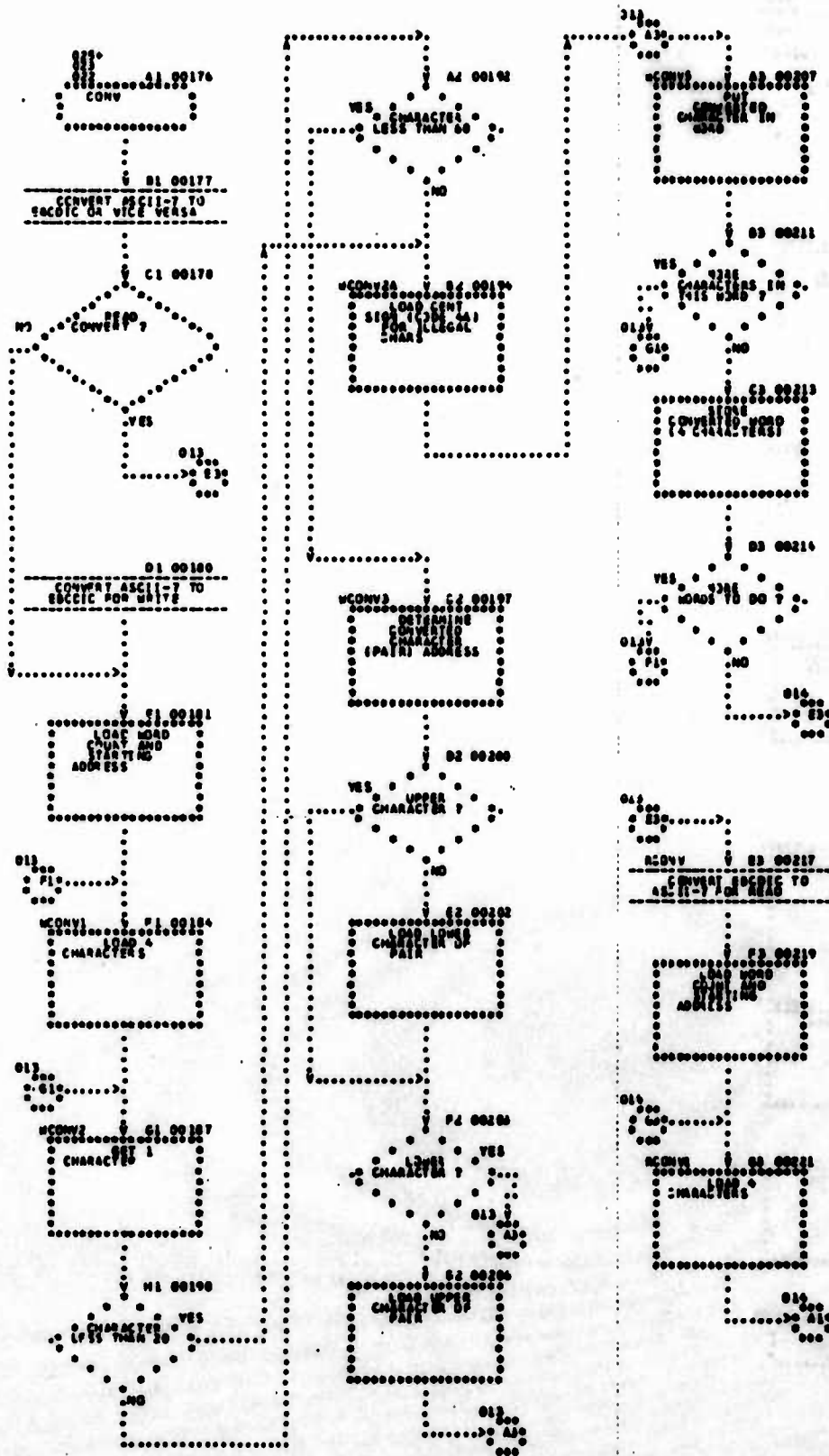


FIGURE SHEET 012 OF 005 FLOWCHART



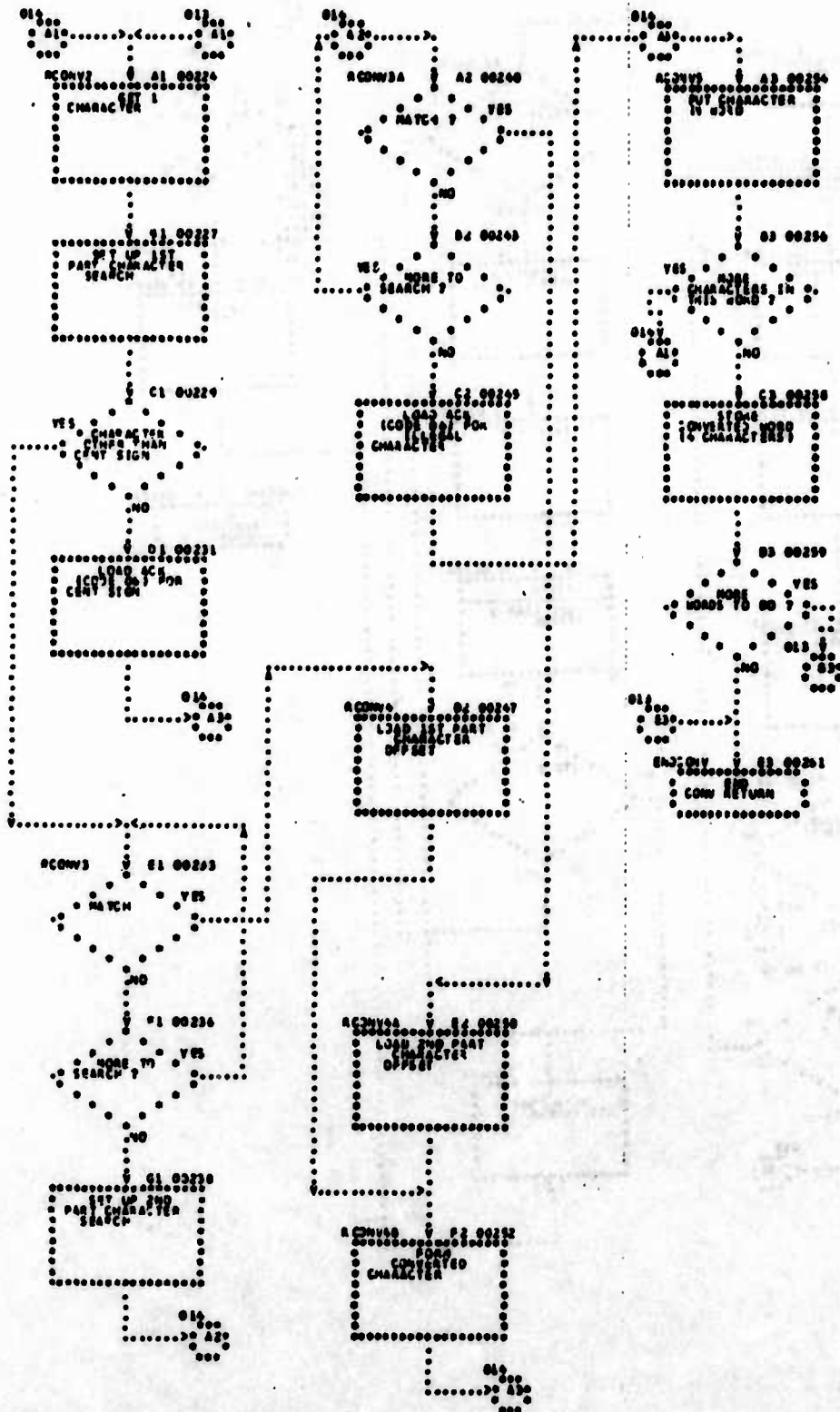


FIGURE 1100
SUBSET SET OF 004 FLOWCHART

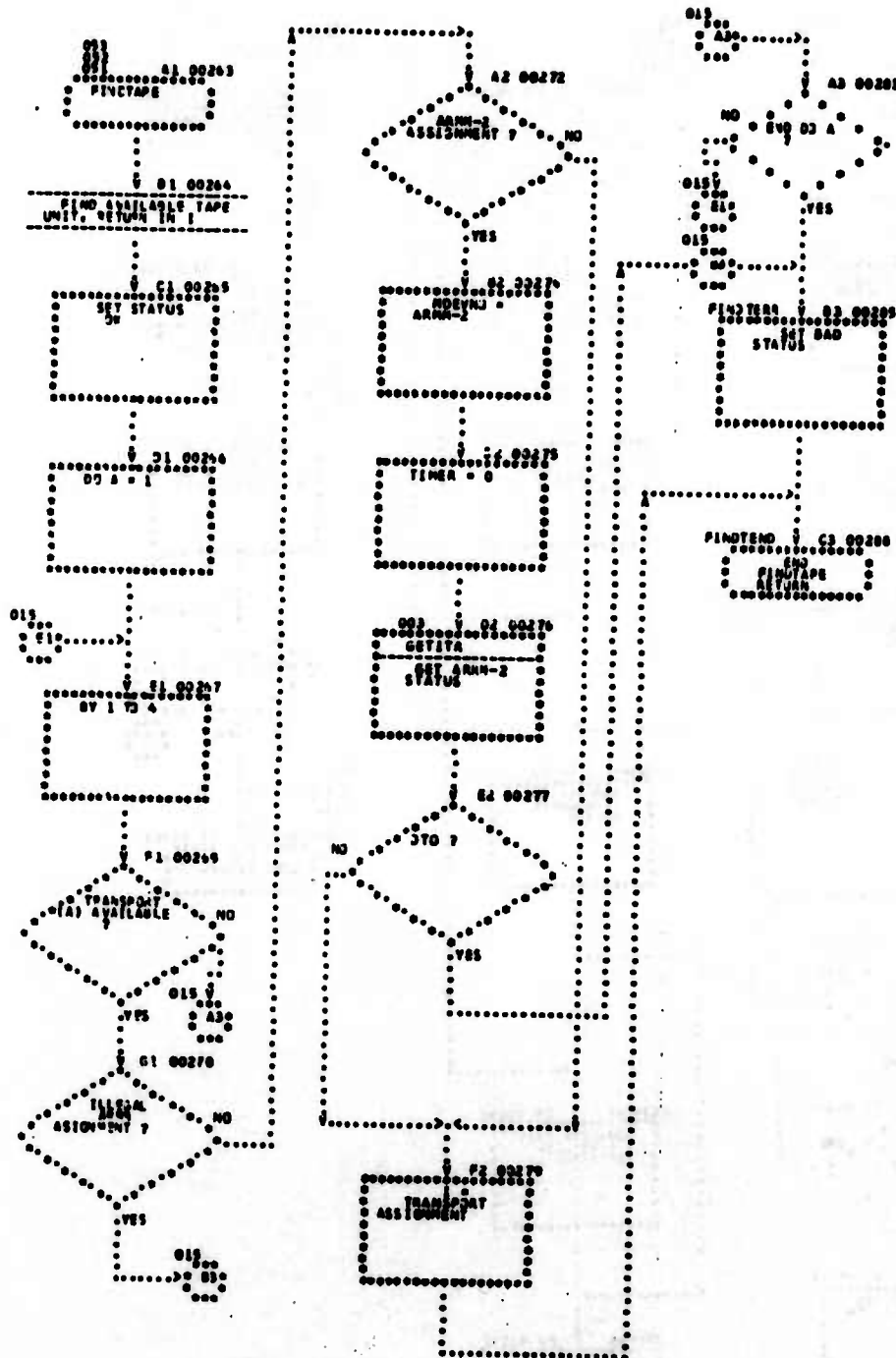


FIGURE 1
 SHEET 001 OF 001

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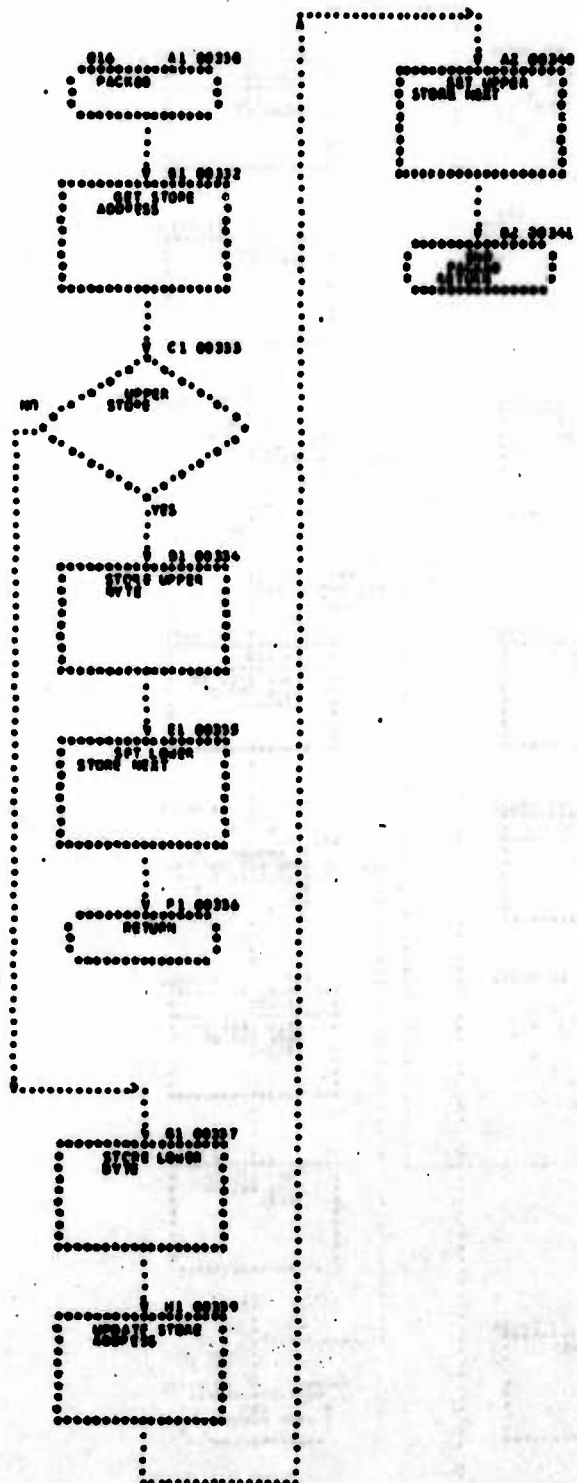


FIGURE 2. ²³⁸U and ²³⁵U FLOW-RATE

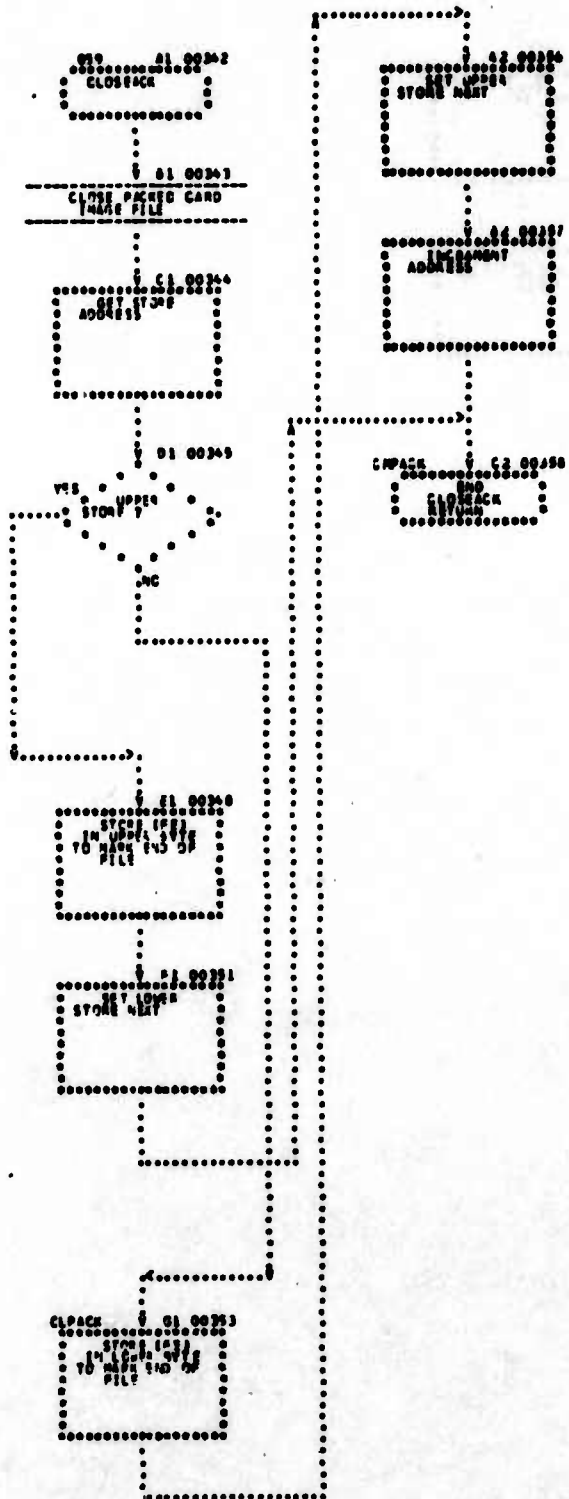


FIGURE SHEET 818 OF 805 FLOCHMAN

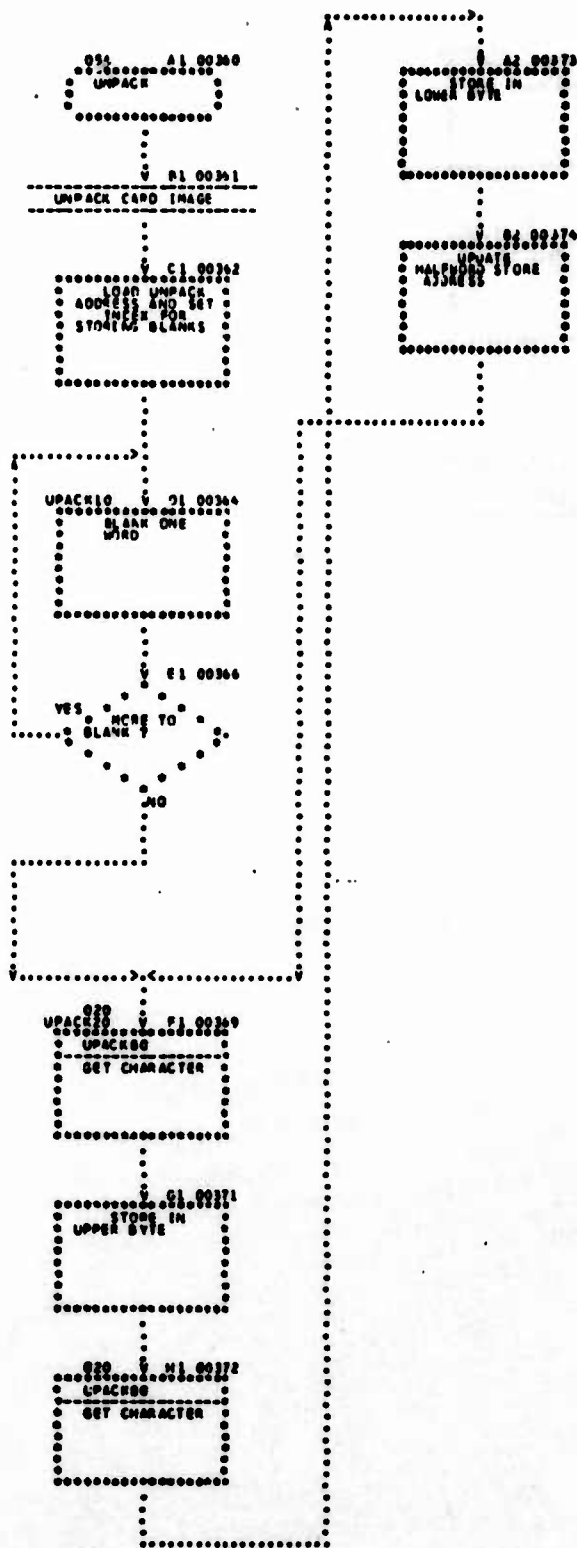


FIGURE 2 SHEET 2 OF 2 PLOCHART

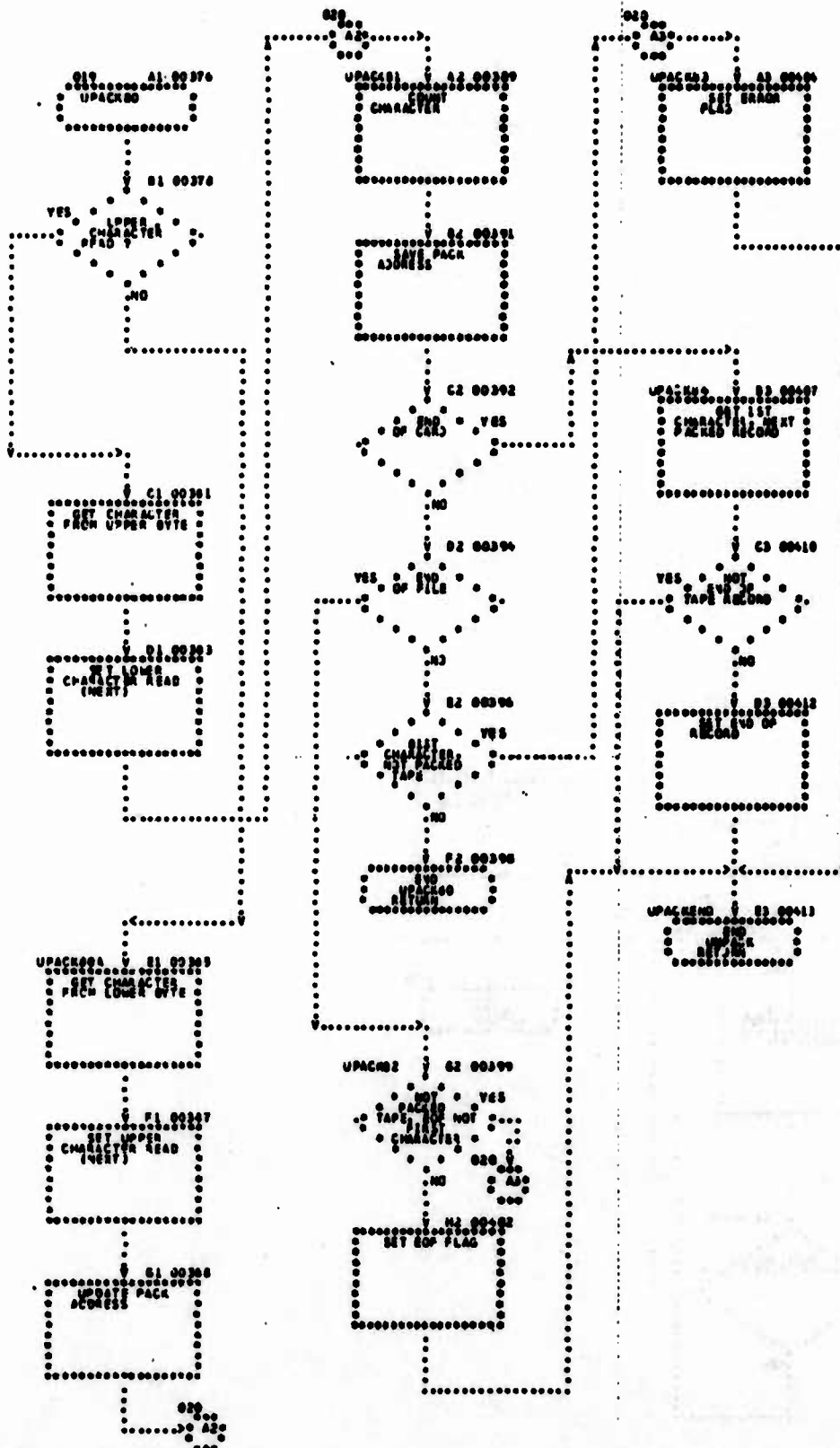


FIGURE SHEET 012P FLOWCHART
SHEET 030 JP 000

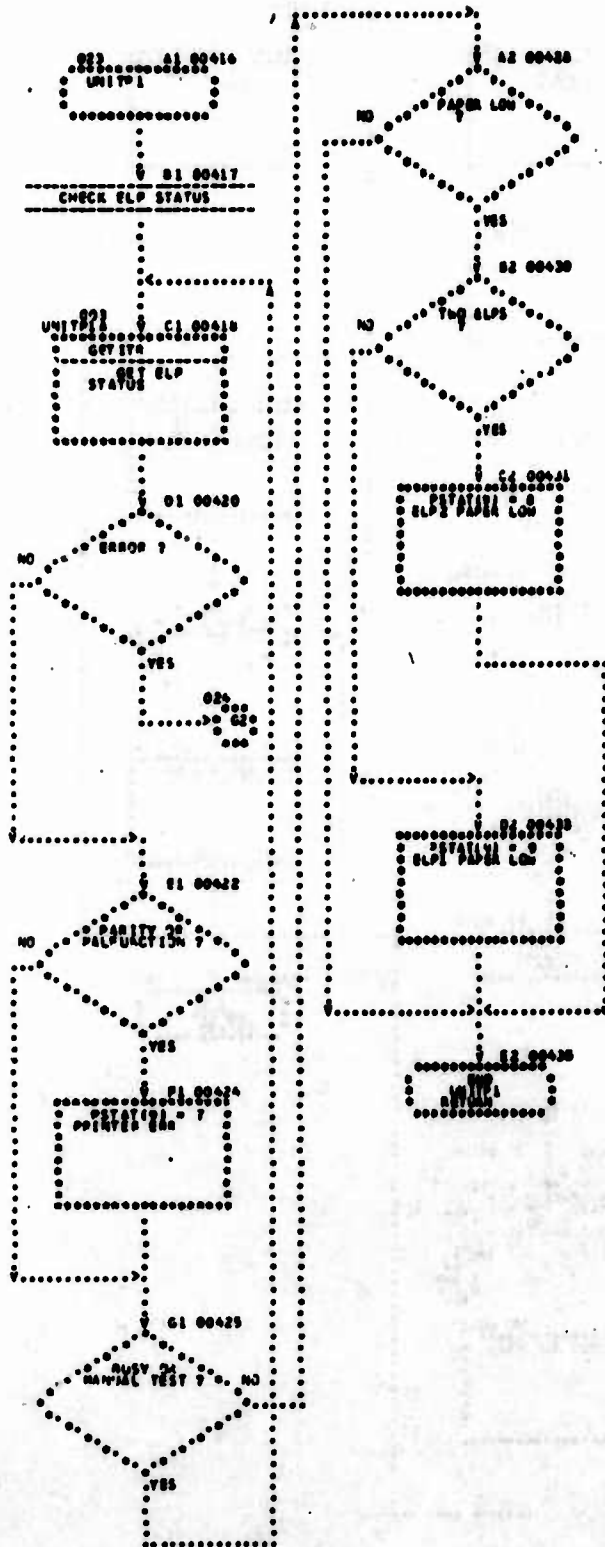


FIGURE 1 Unit 1 and Unit 2 Flowchart



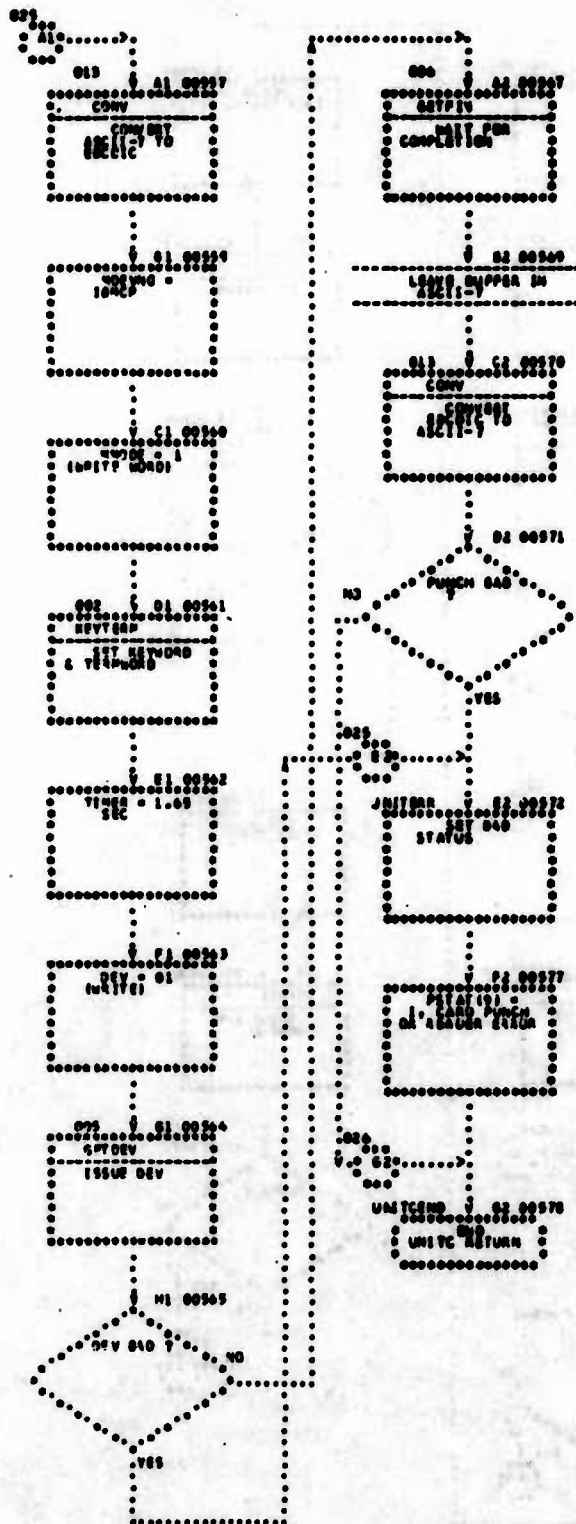


FIGURE 1
SHIRT 830 3P 000

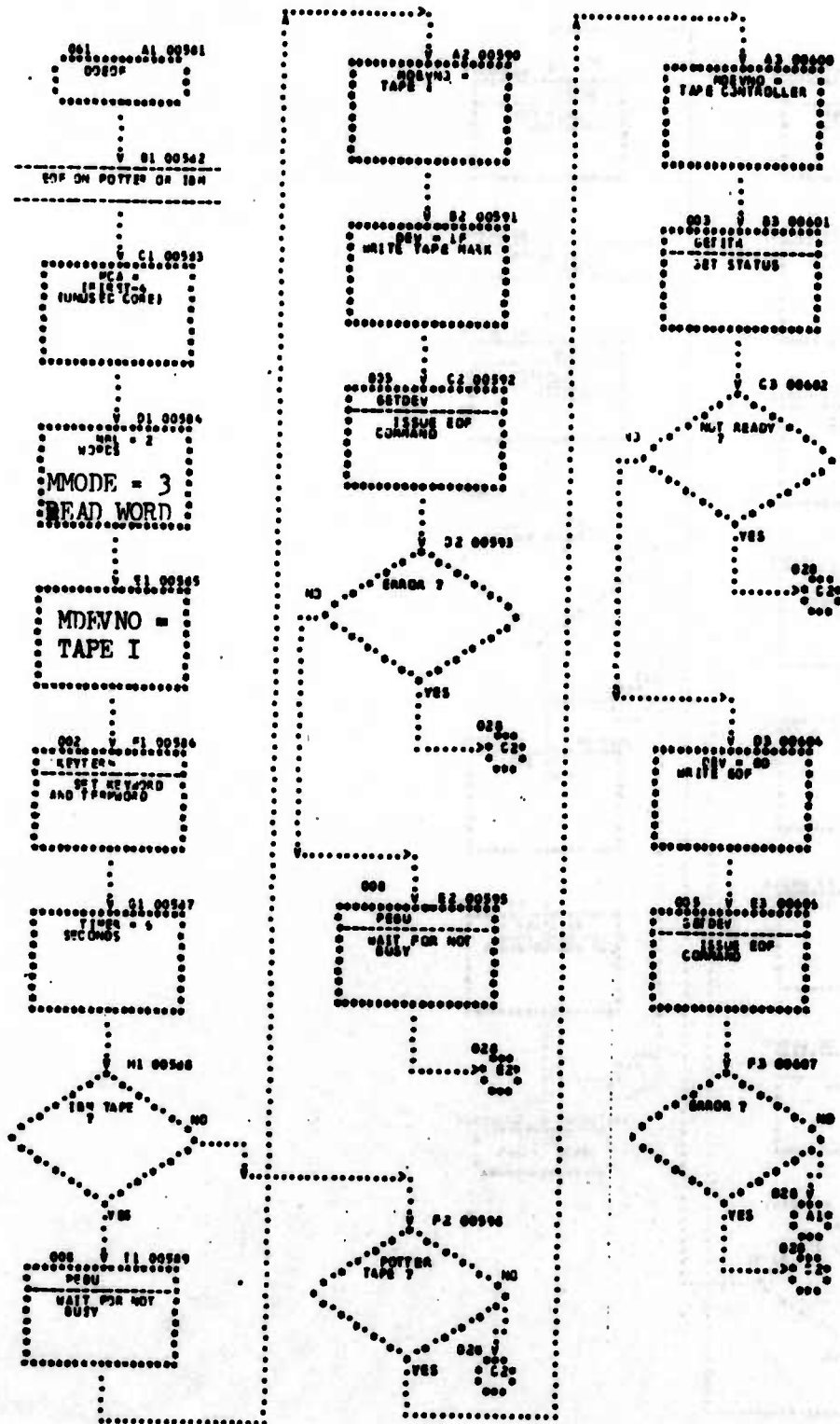


FIGURE 1 HICP
Sheet 1 of 2 FLOWCHART

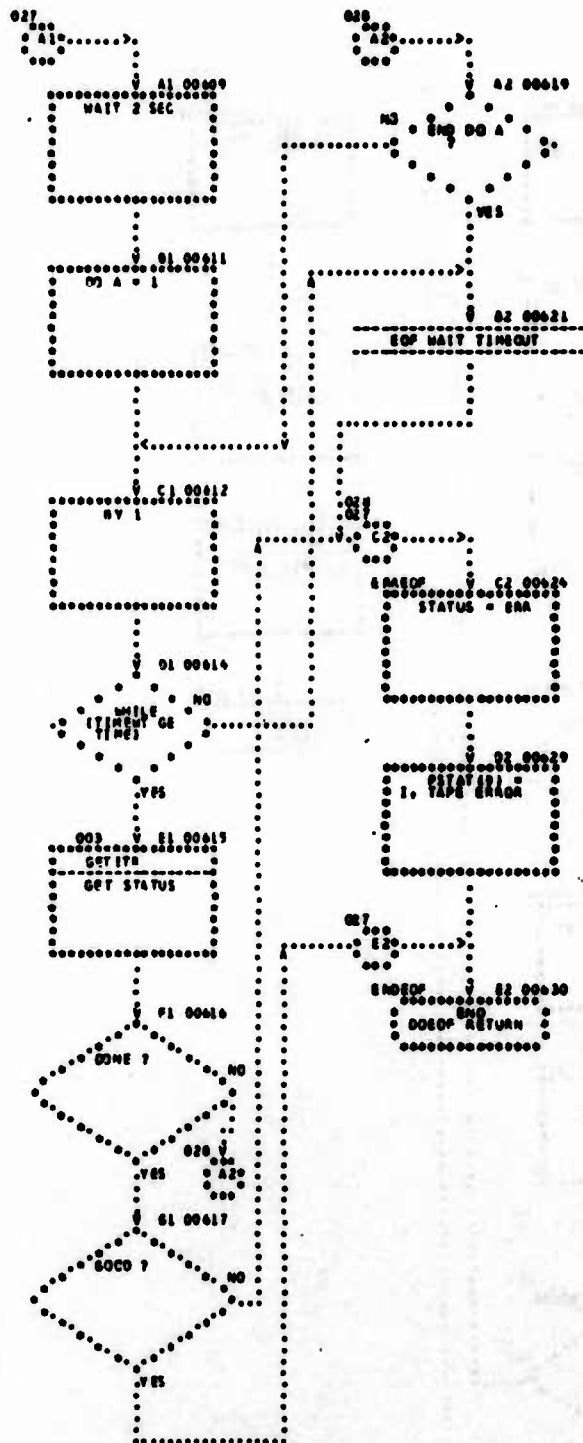


FIGURE 11/2/75 OF FLOWCHART

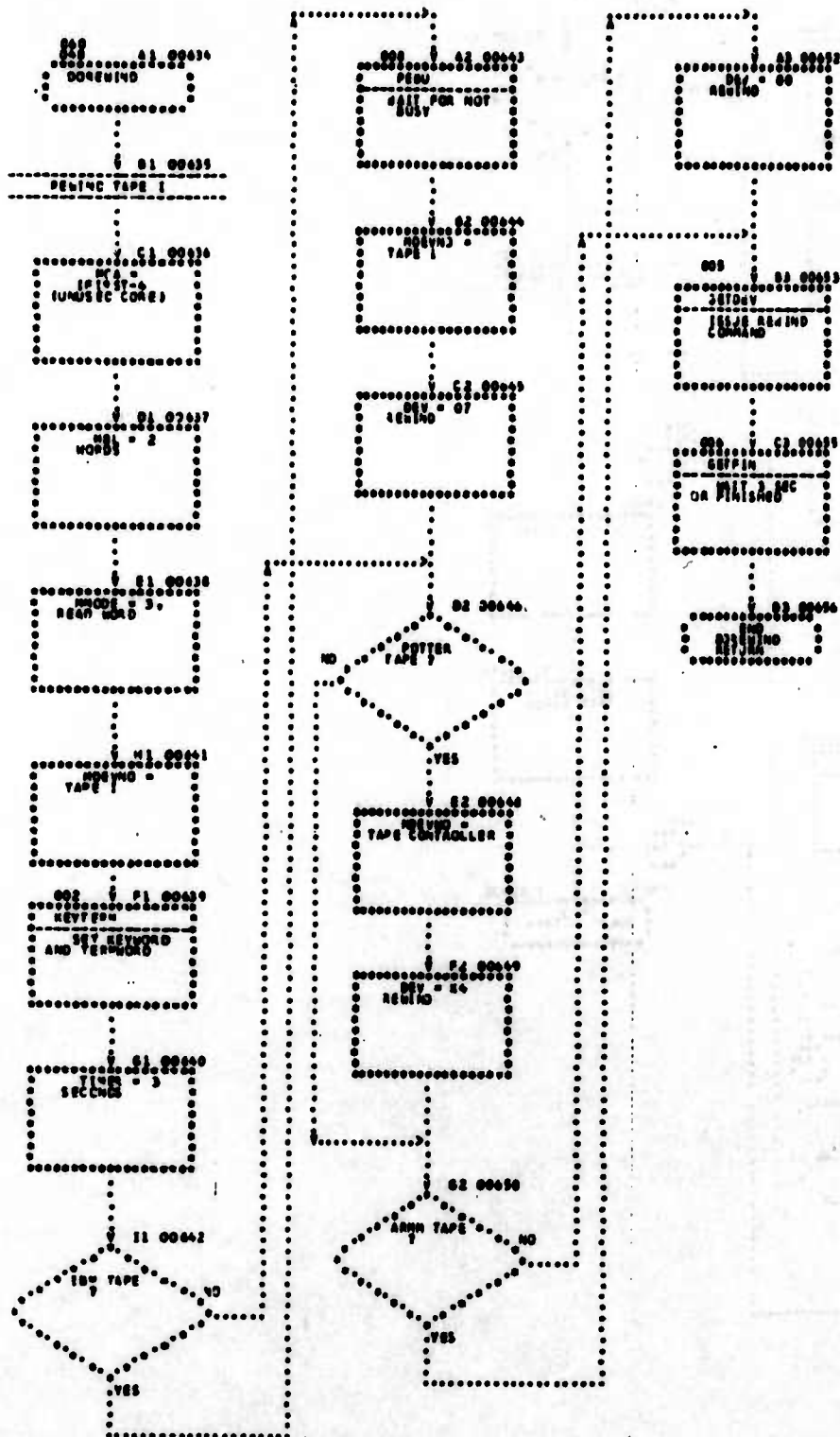


FIGURE 1. SWEEP NET OF PLUMCHART

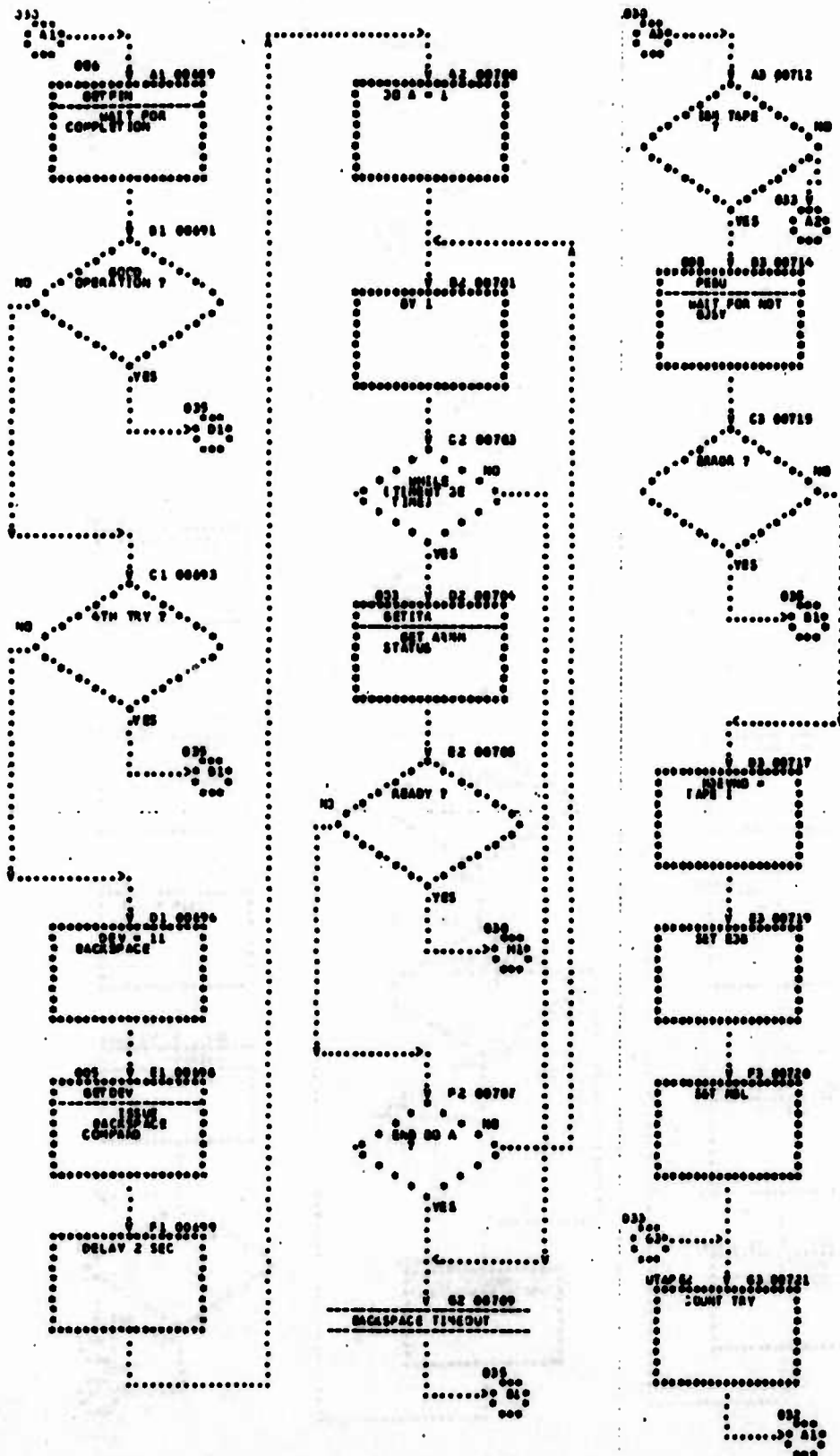


FIGURE 10-1 SIOP FLOWCHART

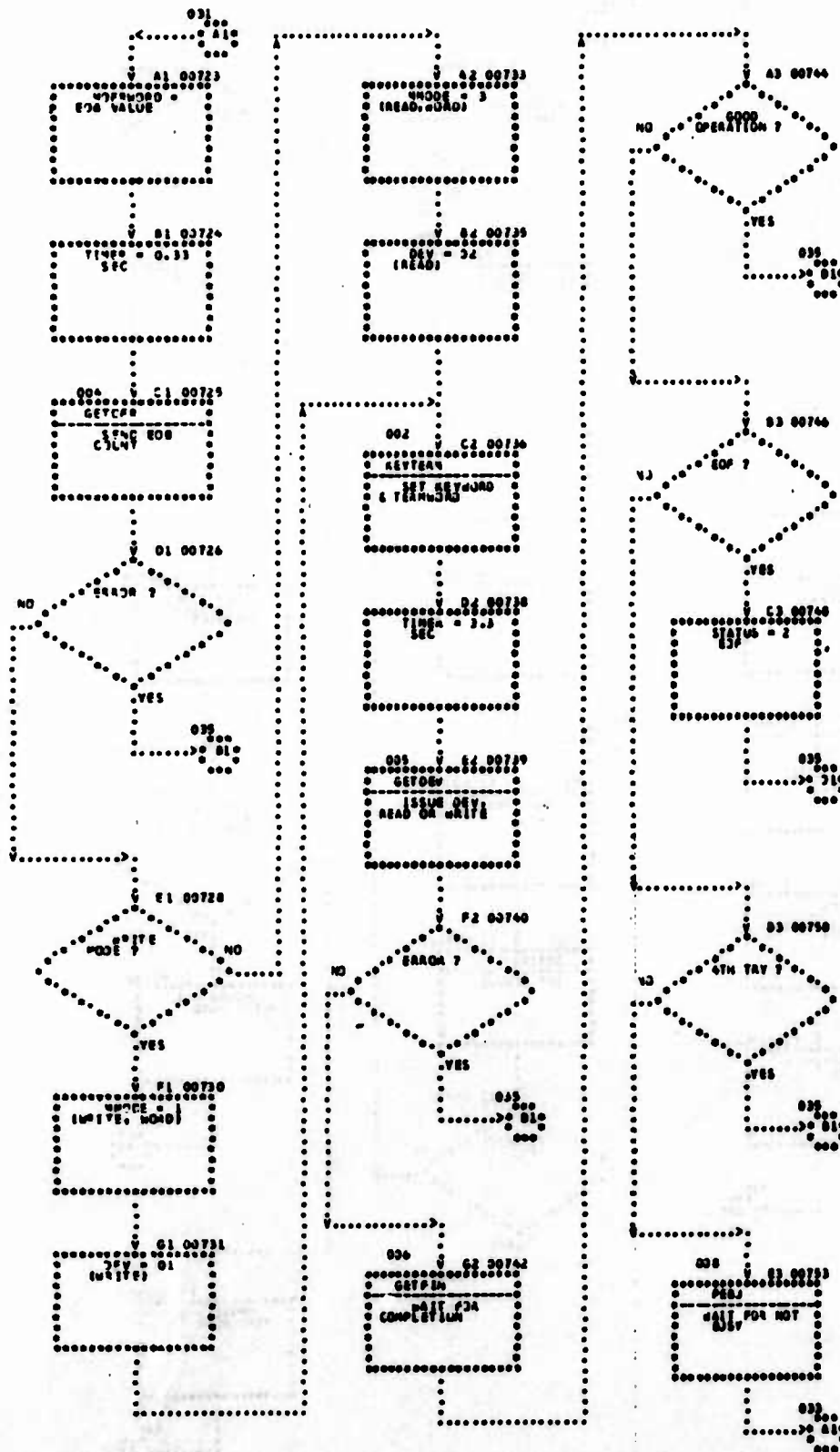


FIGURE SHEET 11/96/75 FLOWCHART

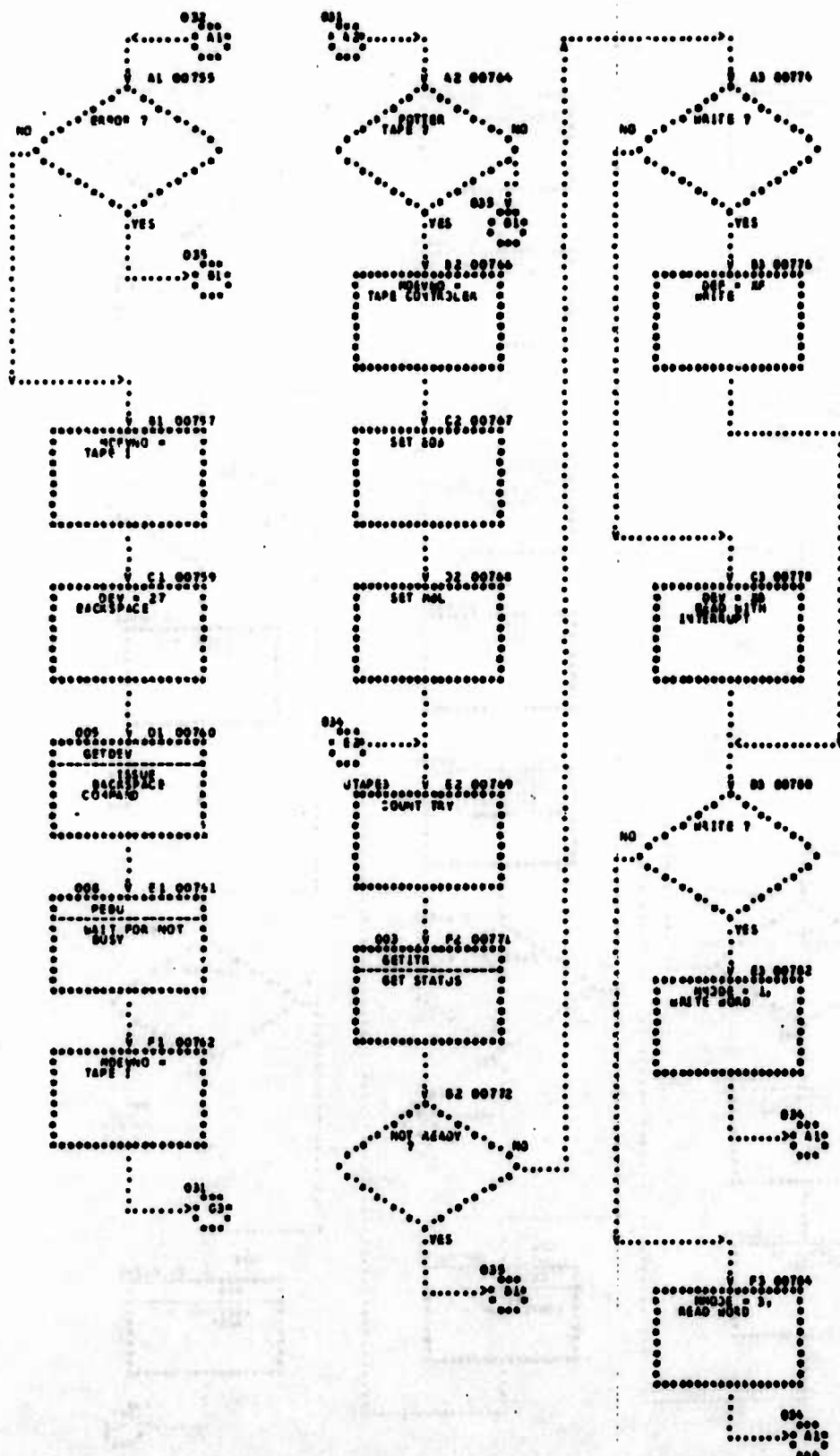


FIGURE SHEET 11 OF 12 FLOWCHART

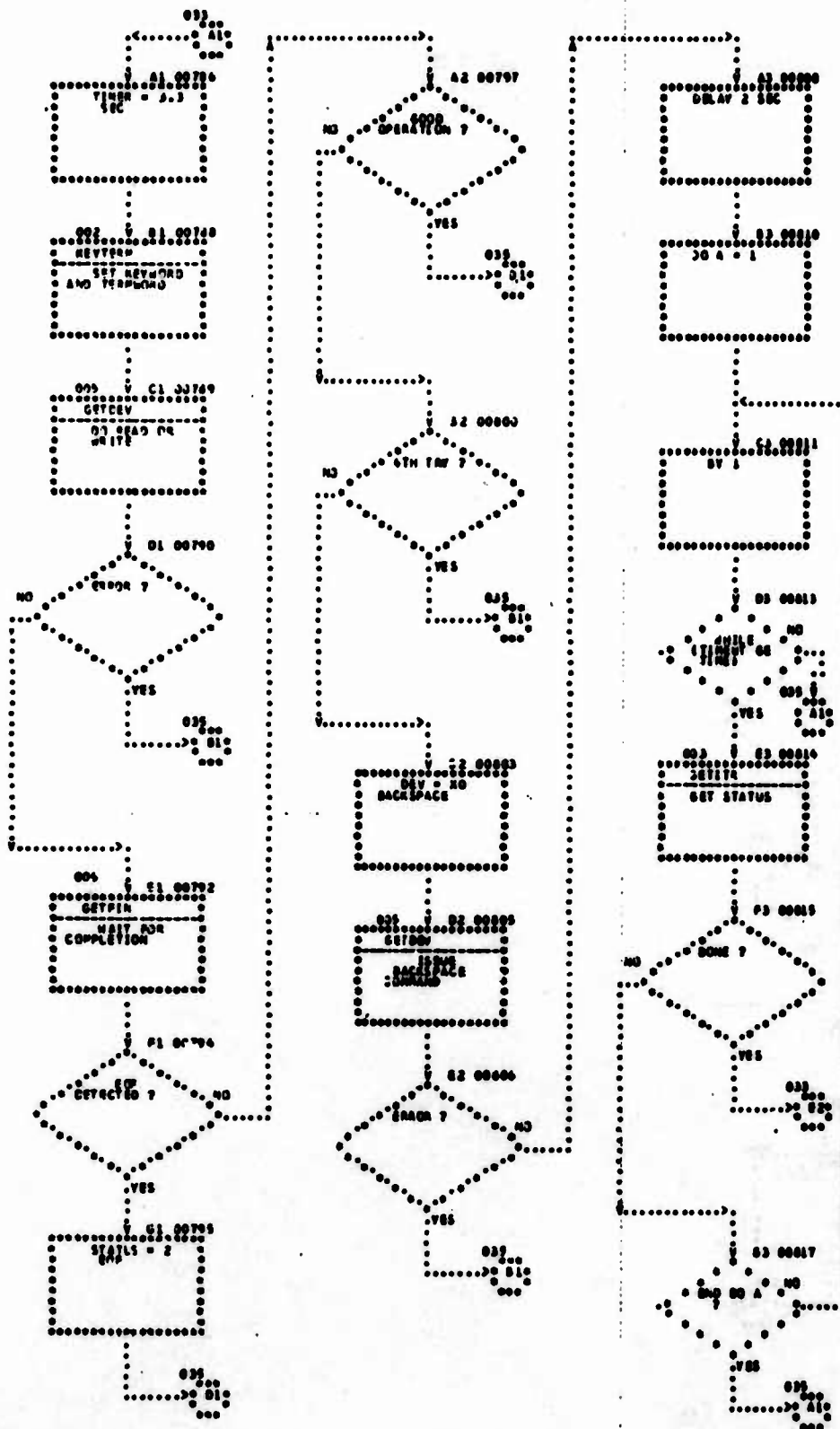


FIGURE 1102
Sheet 1102 of 000
FLOWCHART

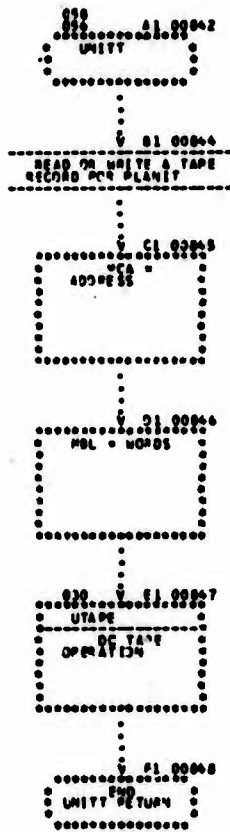


FIGURE SHEET 2192 3P 000 FLOWCHART

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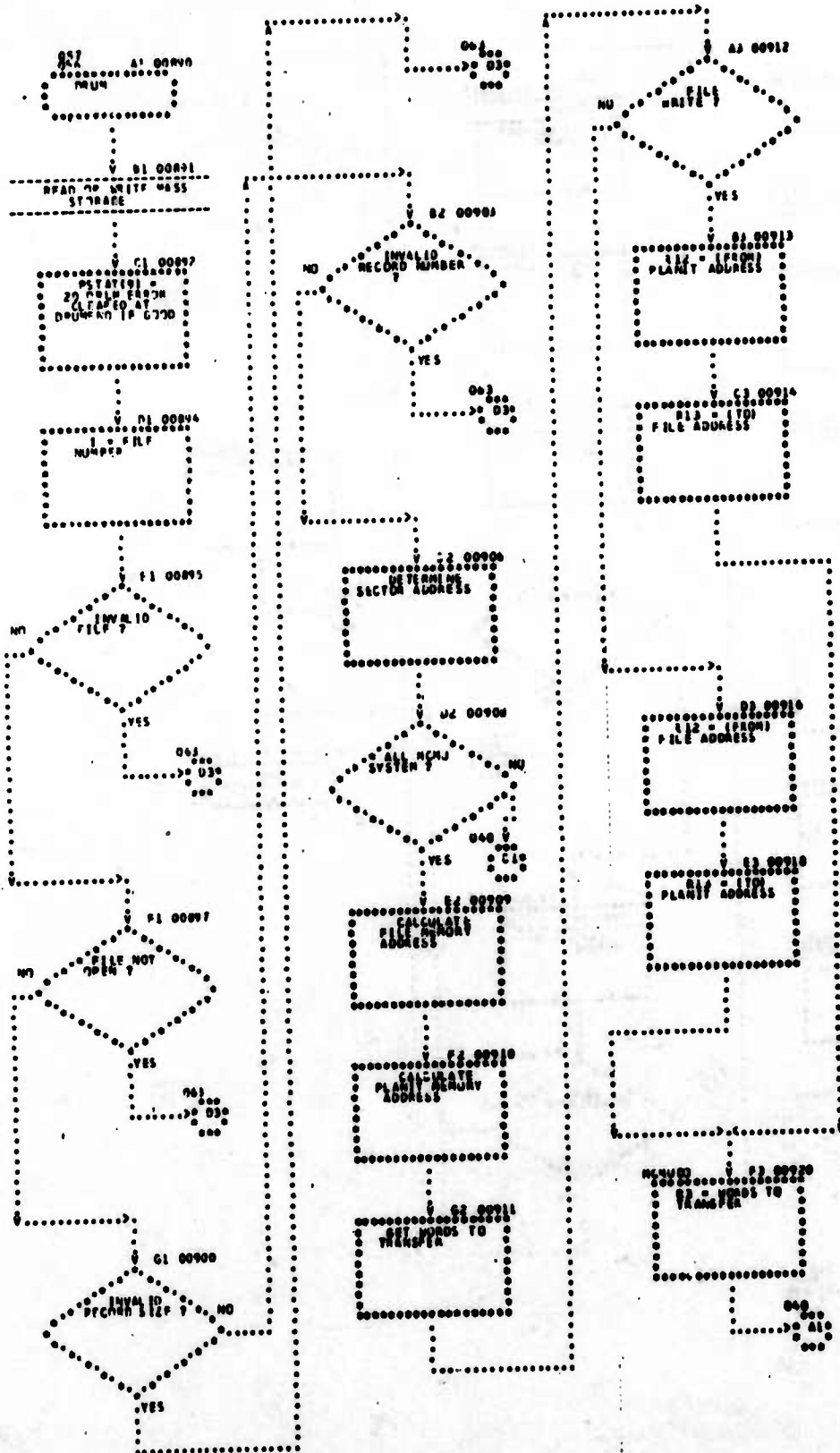
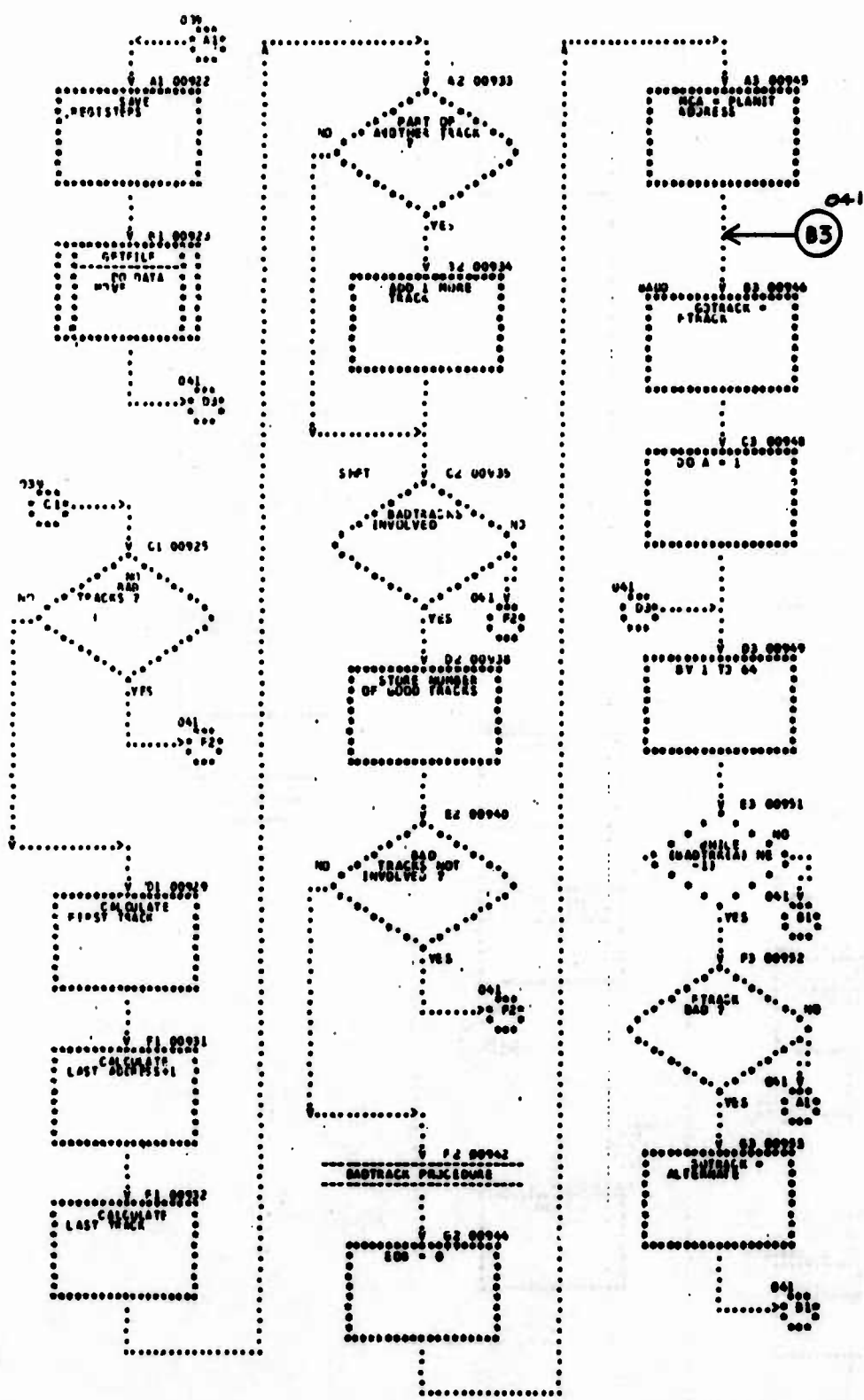


FIGURE SHEET NIP FLOWCHART
SHEET 000 OF 000



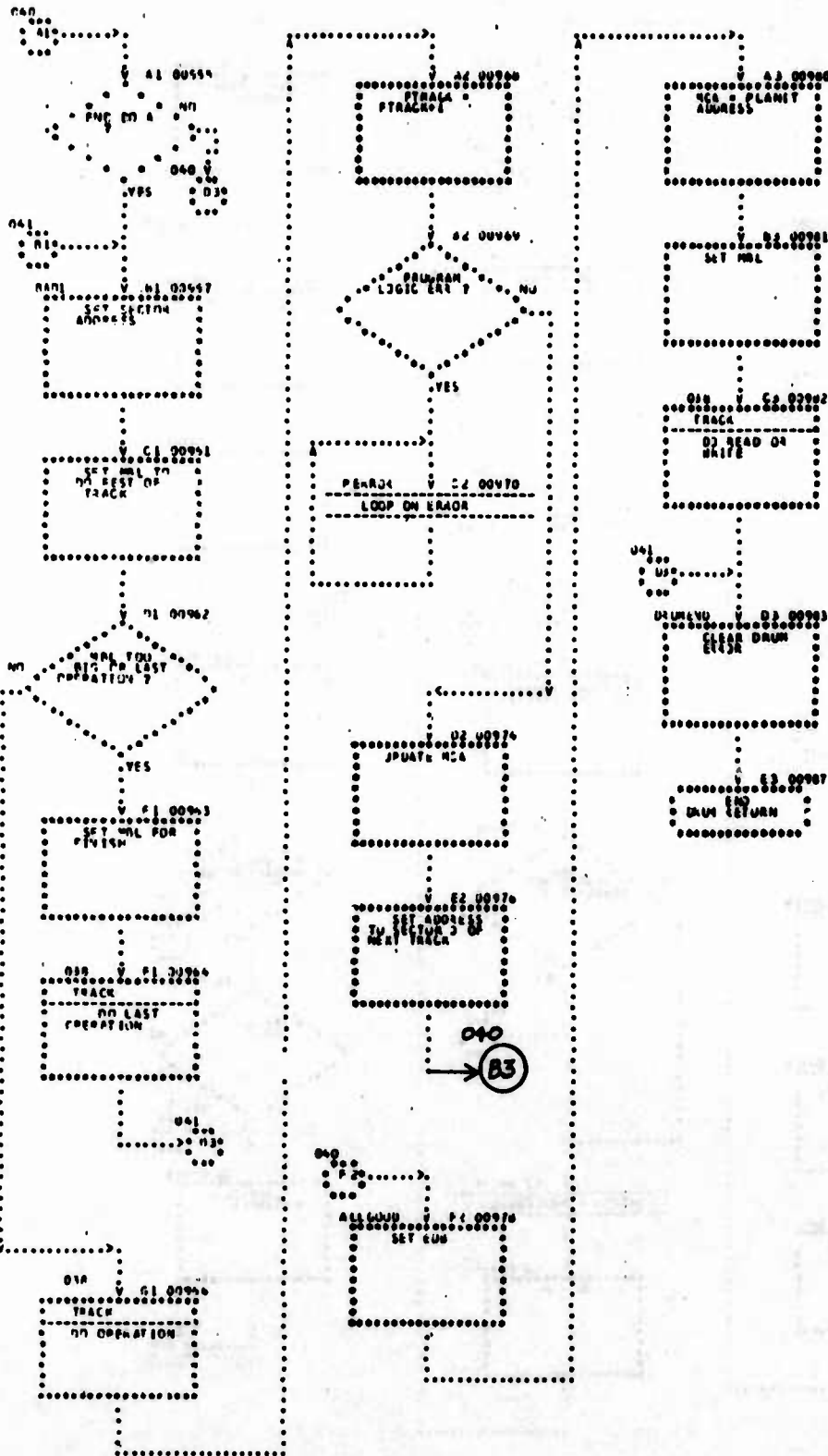


FIGURE SHEET 041 OF 040 MIDP FLOWCHART

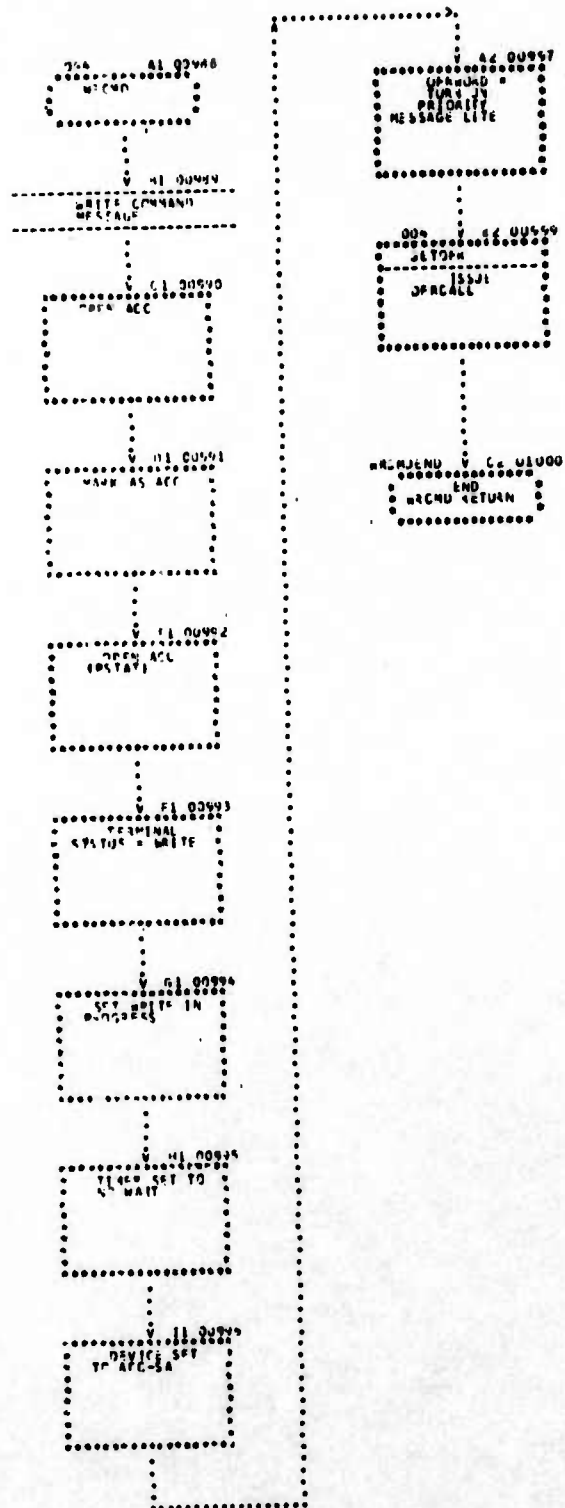
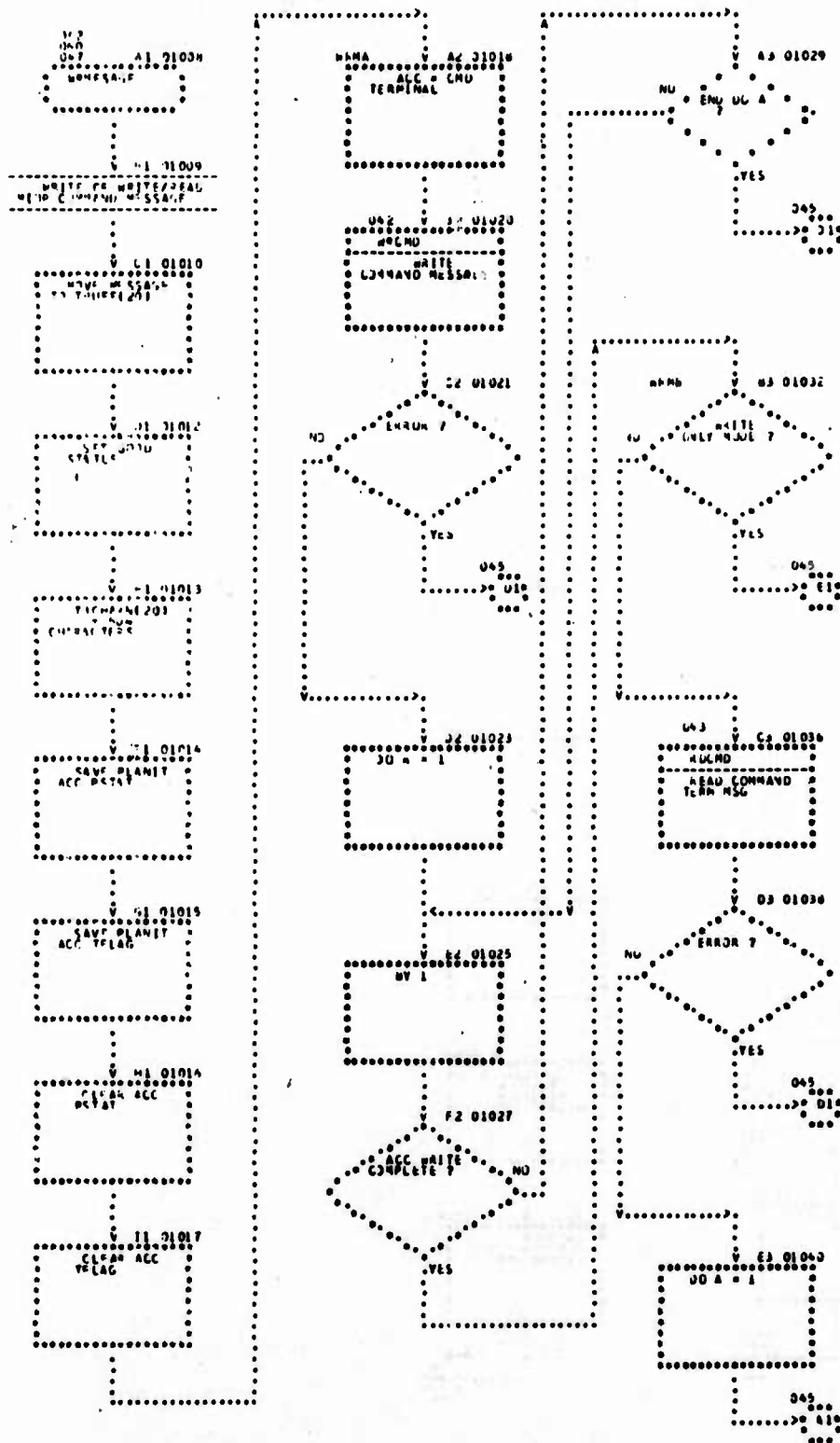


FIGURE 5: HUP FLOWCHART
SHEET 042 IN 000

FIGURE 01 0101 FLOWCHART
SHEET 045 0101

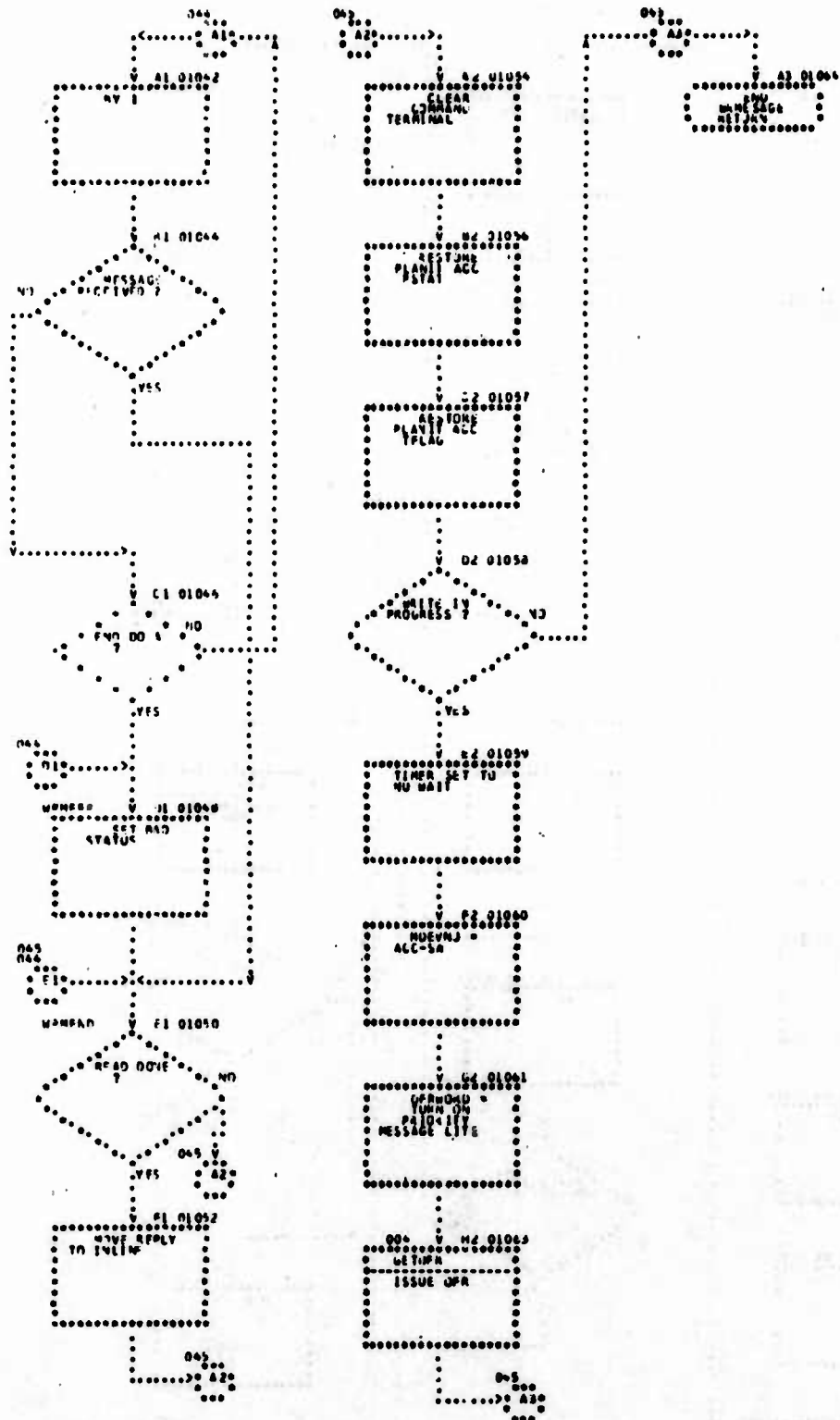


FIGURE SHEET 01 OF 01 FLOWCHART

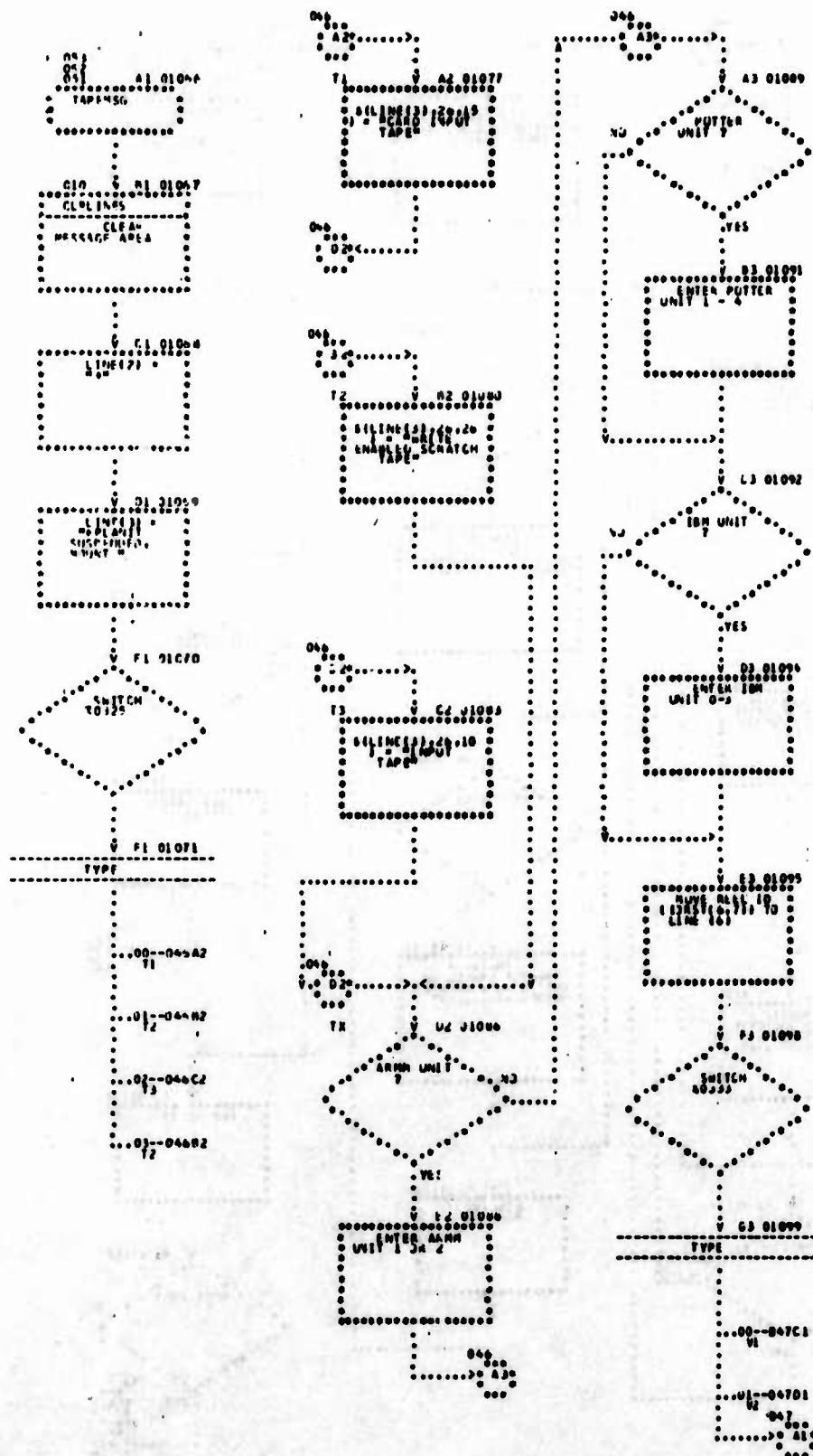
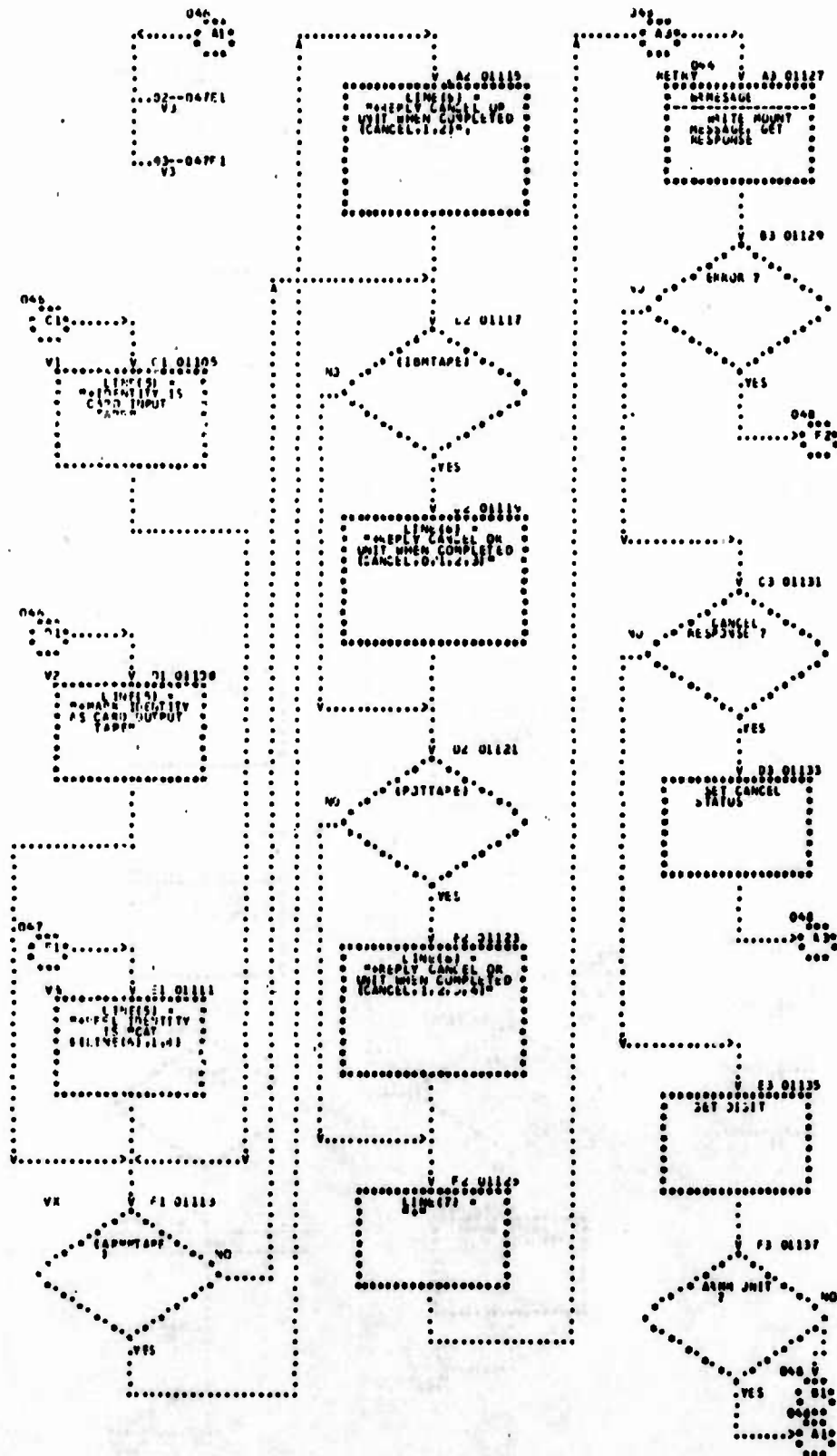
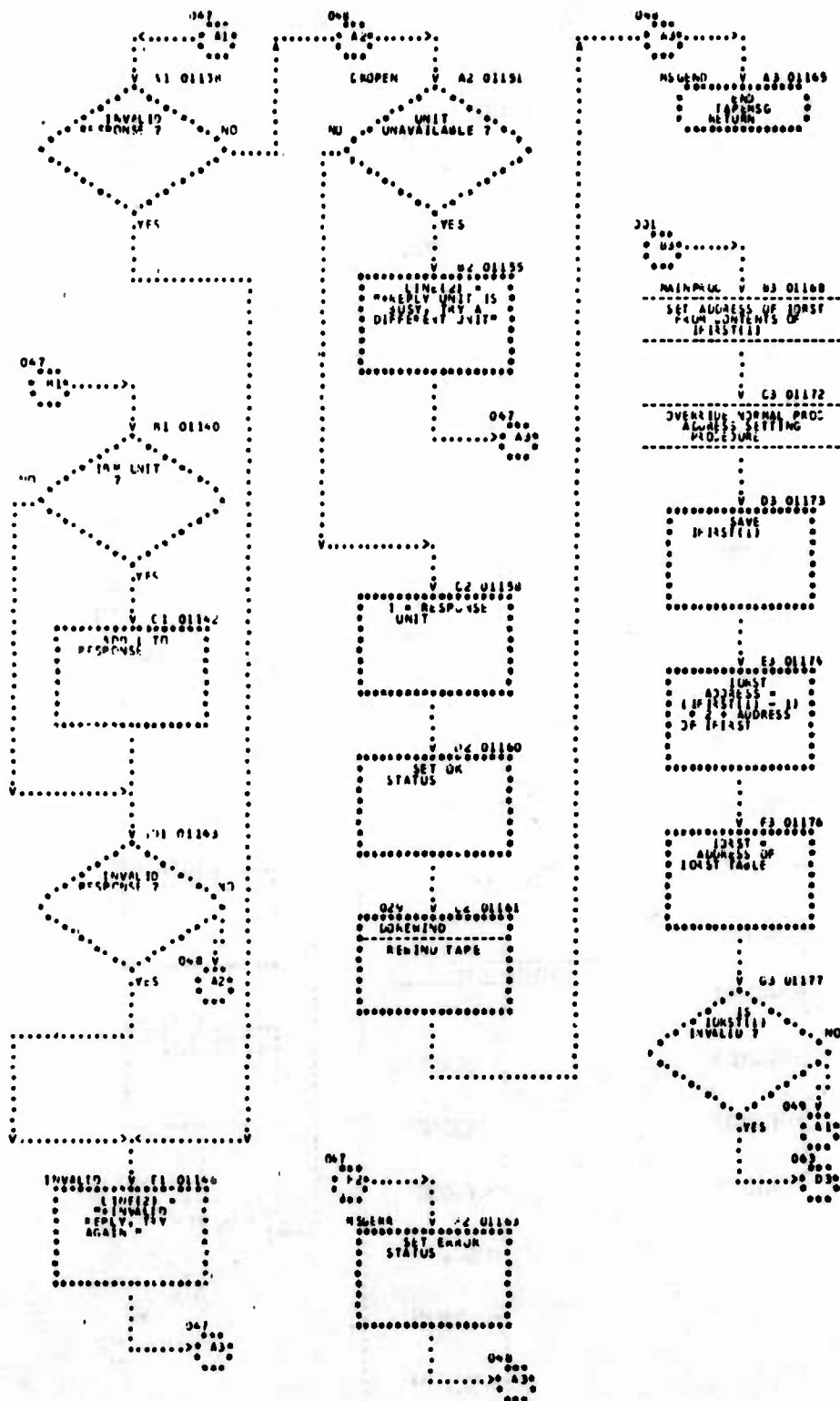


FIGURE SHEET 045 J1 000 FLOWCHART





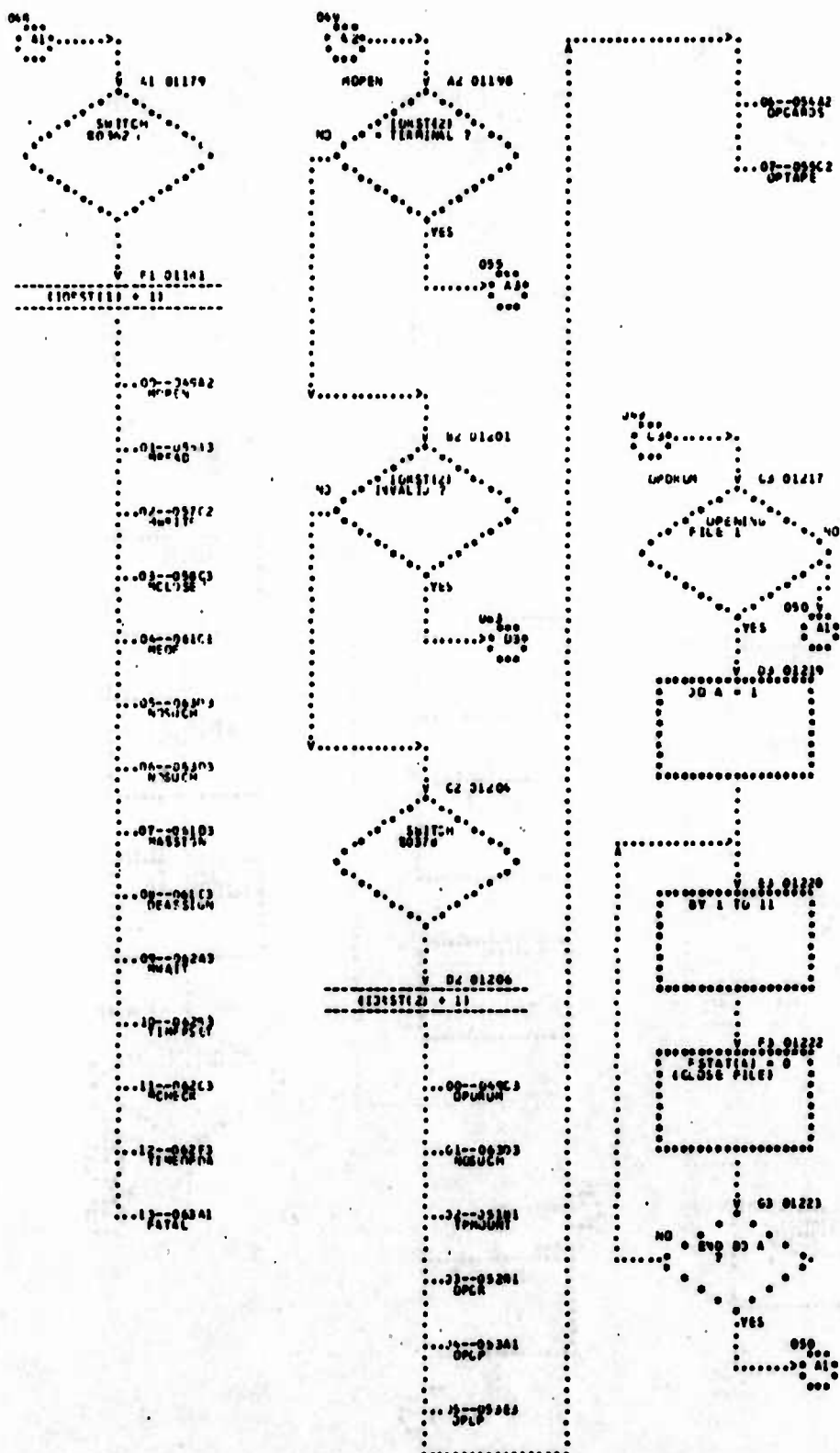


FIGURE SHEET 4129 OF 606 FLOWCHART

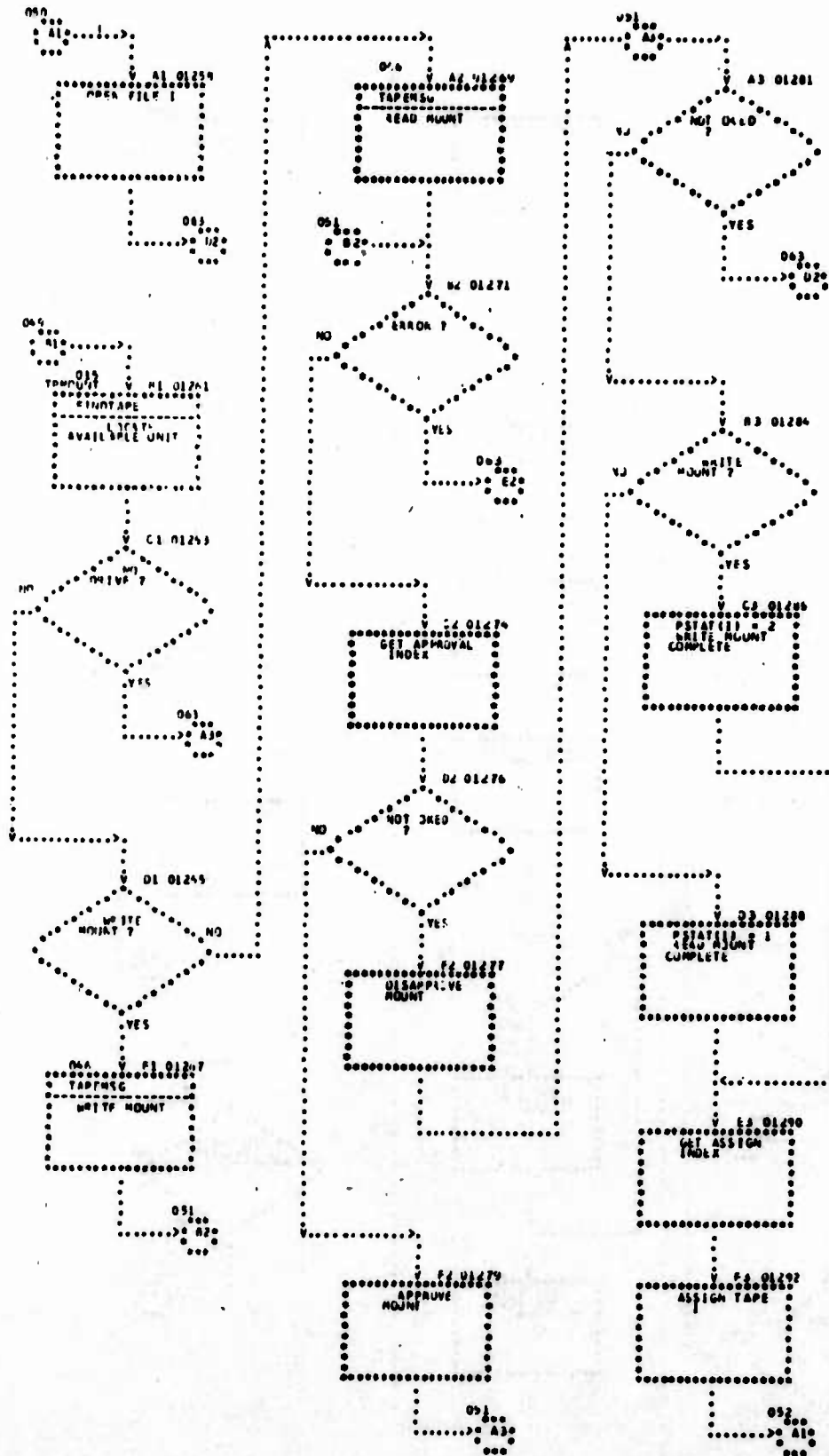


FIGURE 8-111P
SHEET 001 OF 006
FLOWCHART

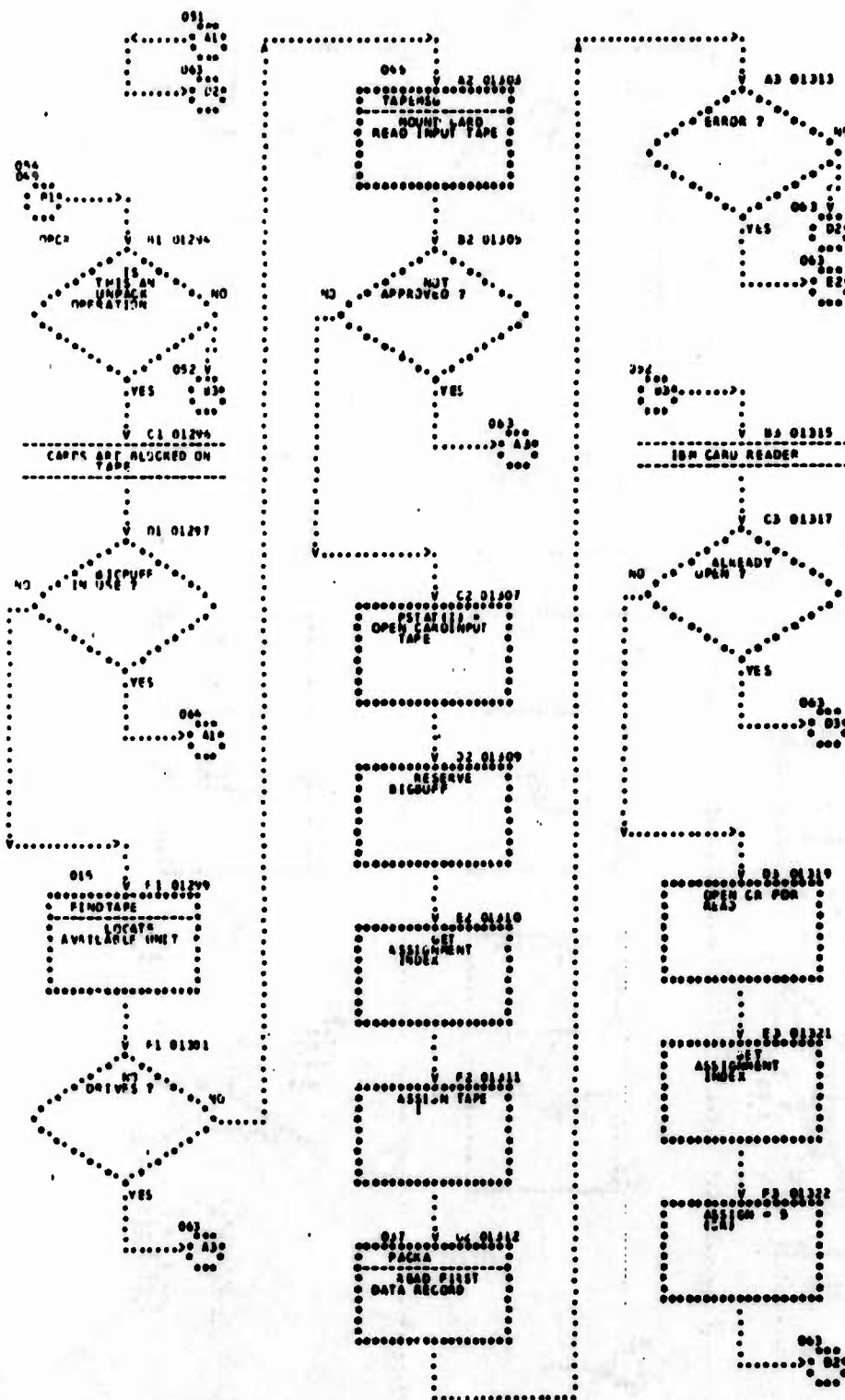


FIGURE SHEET 001 OF 002 FLOWCHART

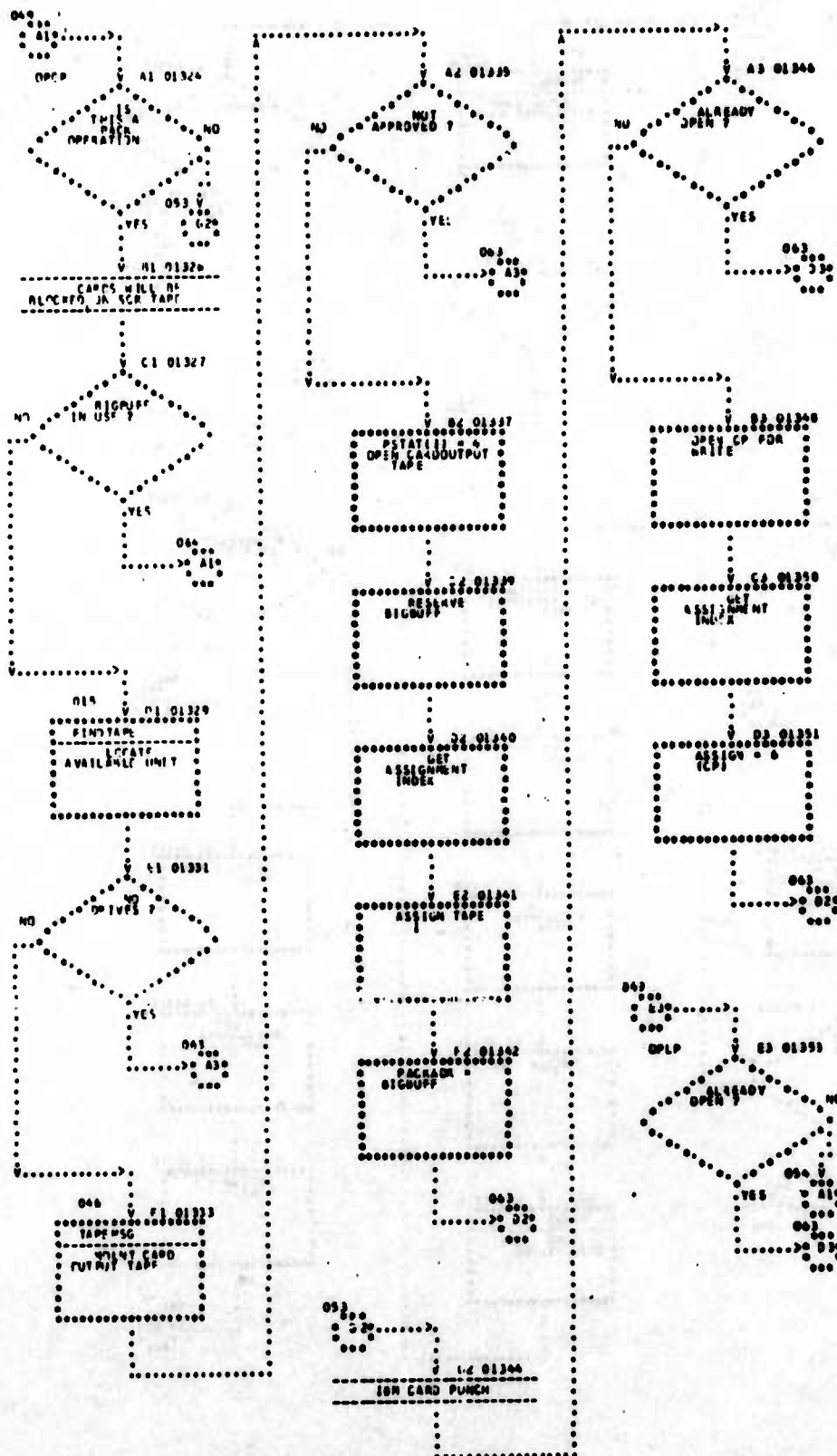


FIGURE SHEET 510P FLOWCHART
05/05/75

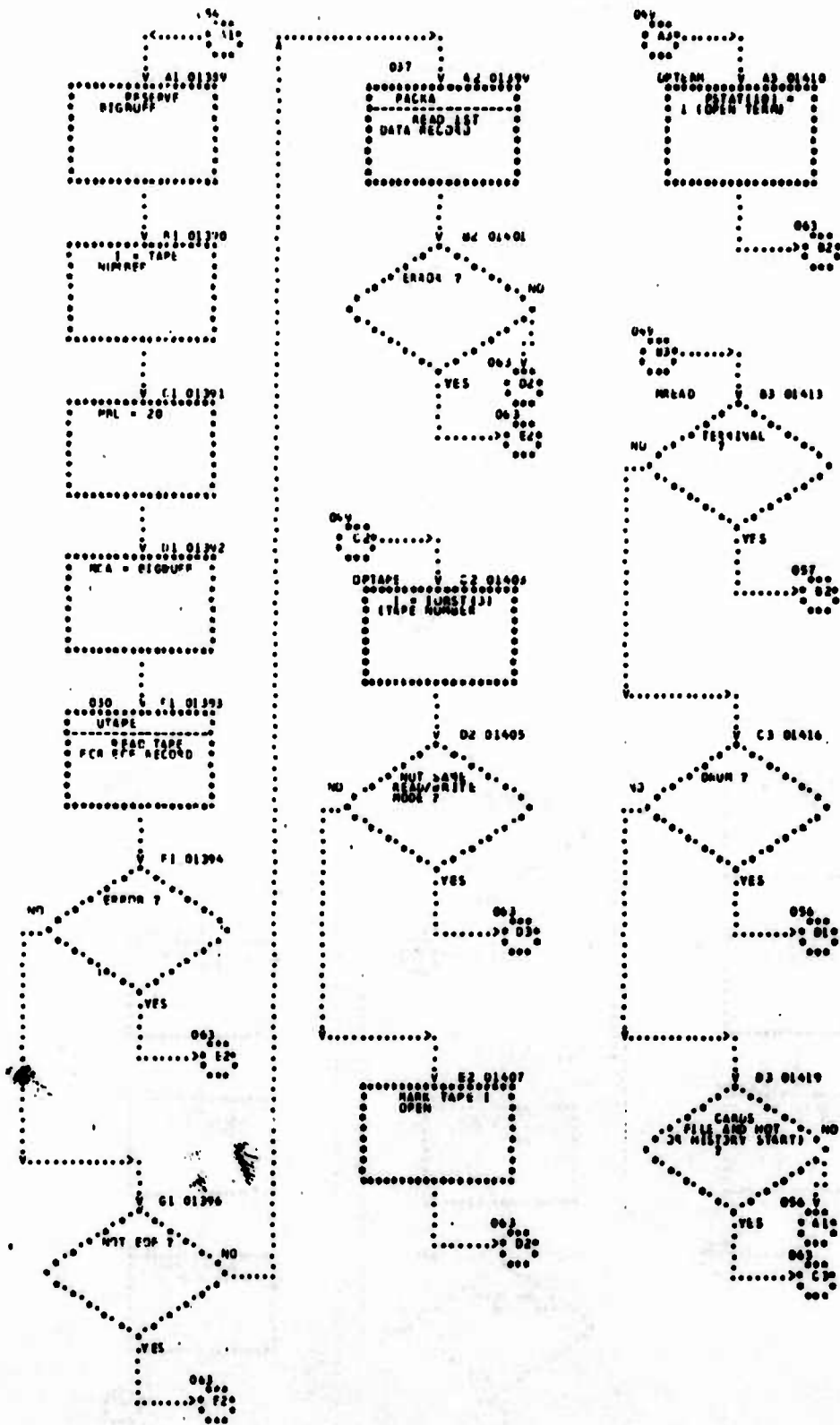
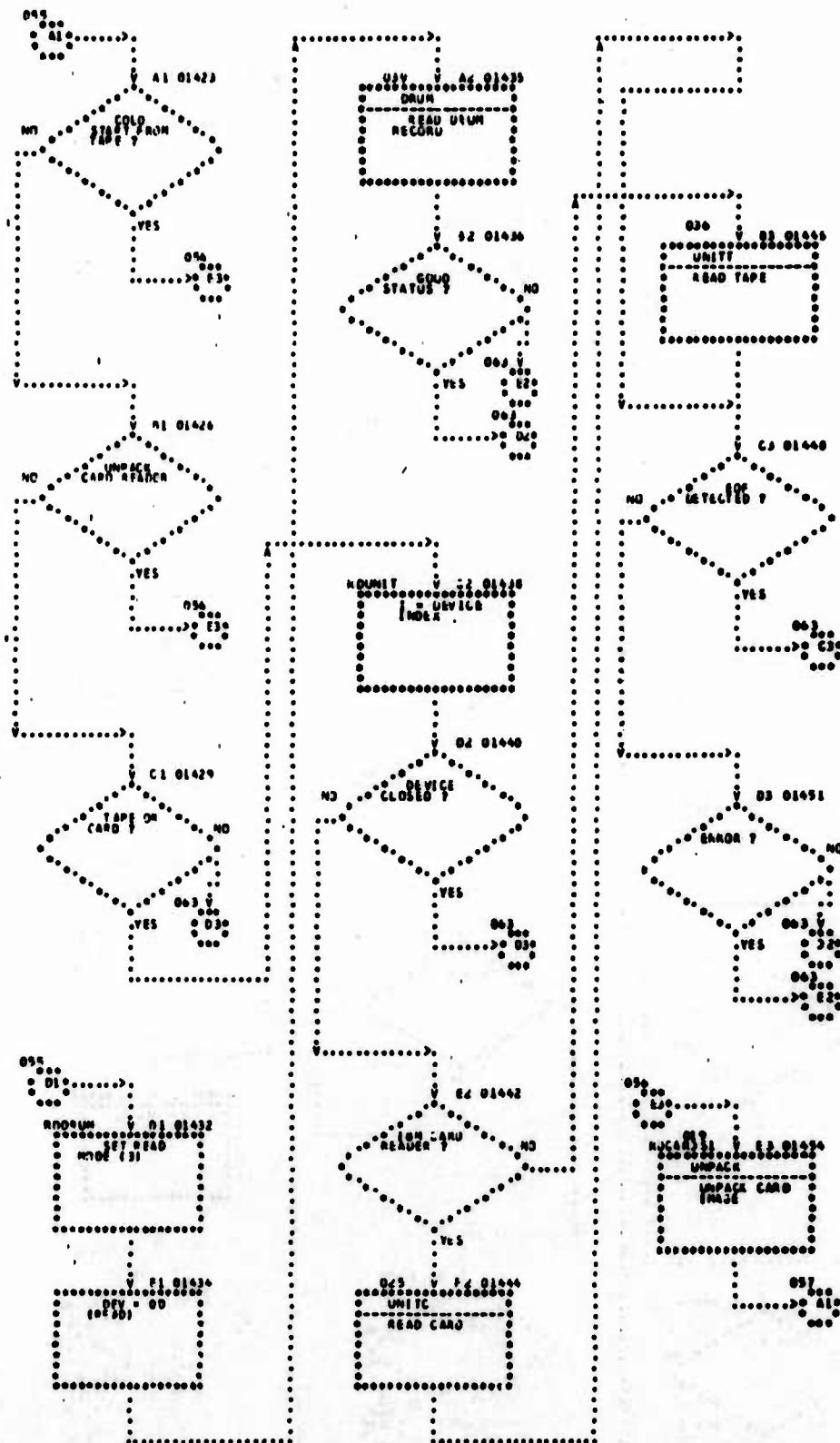
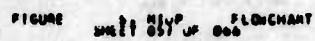
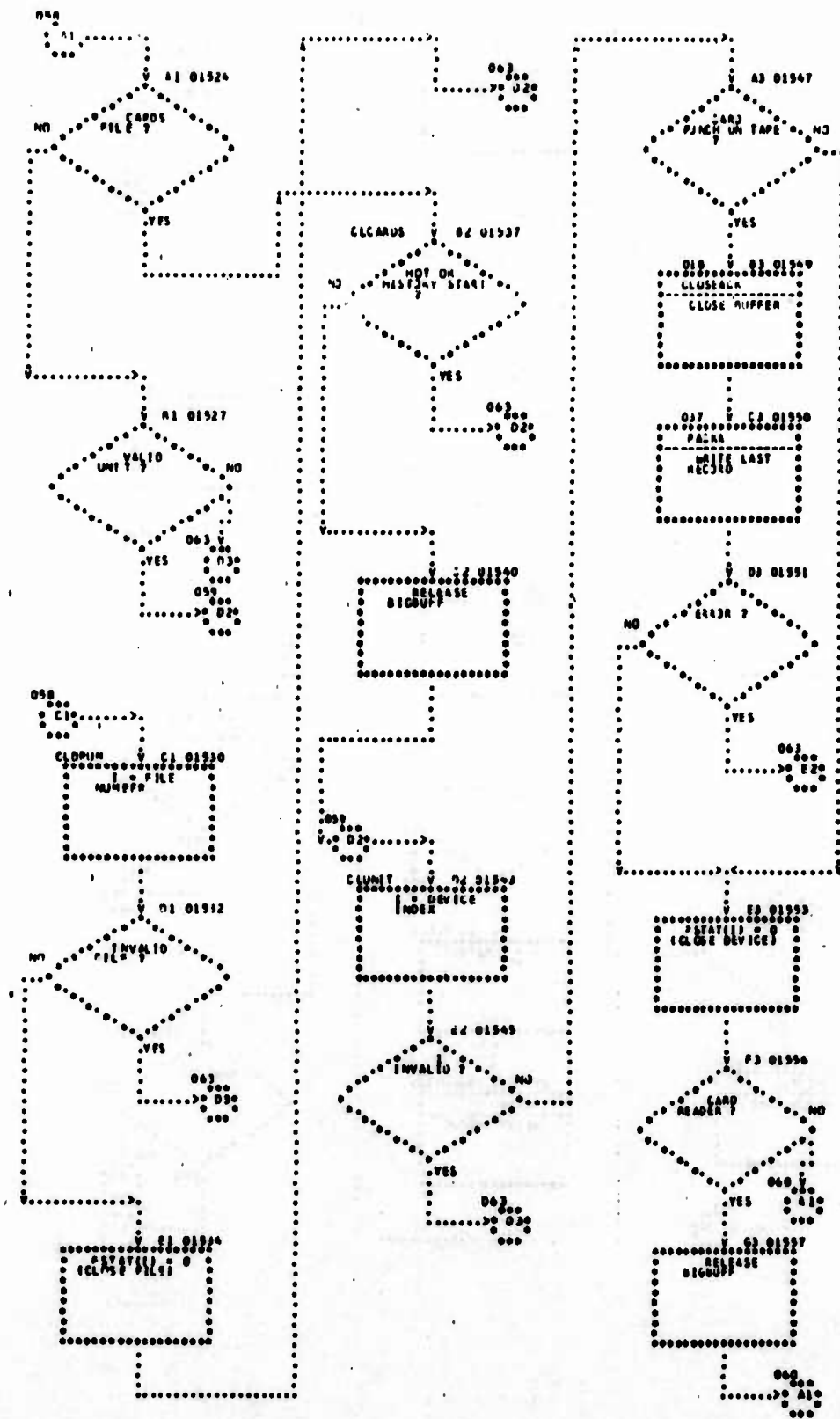


FIGURE 3-112P FLOWCHART
SHEET 015 OF 044







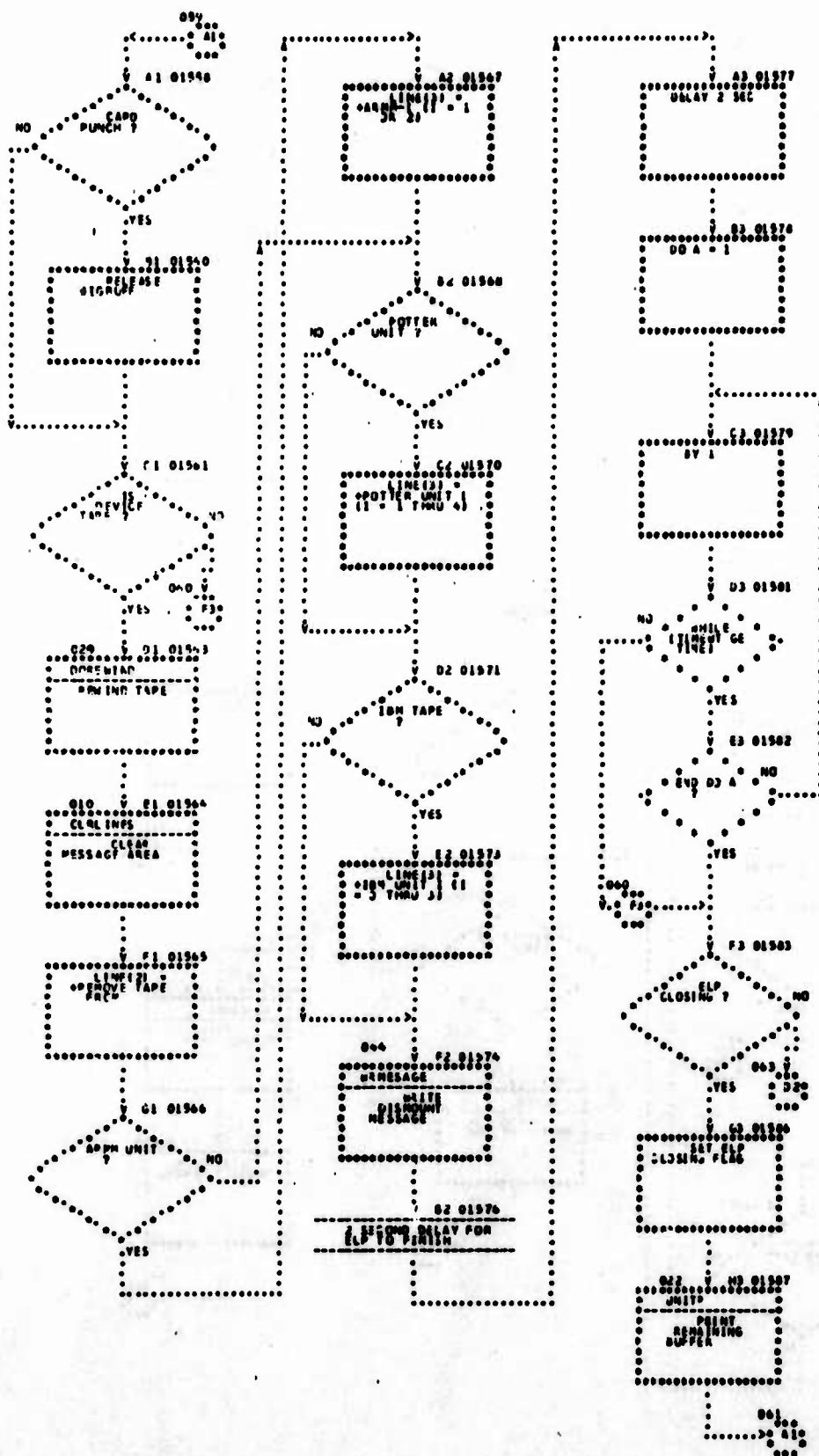


FIGURE 110P SHEET 003 OF 003 FLOWCHART

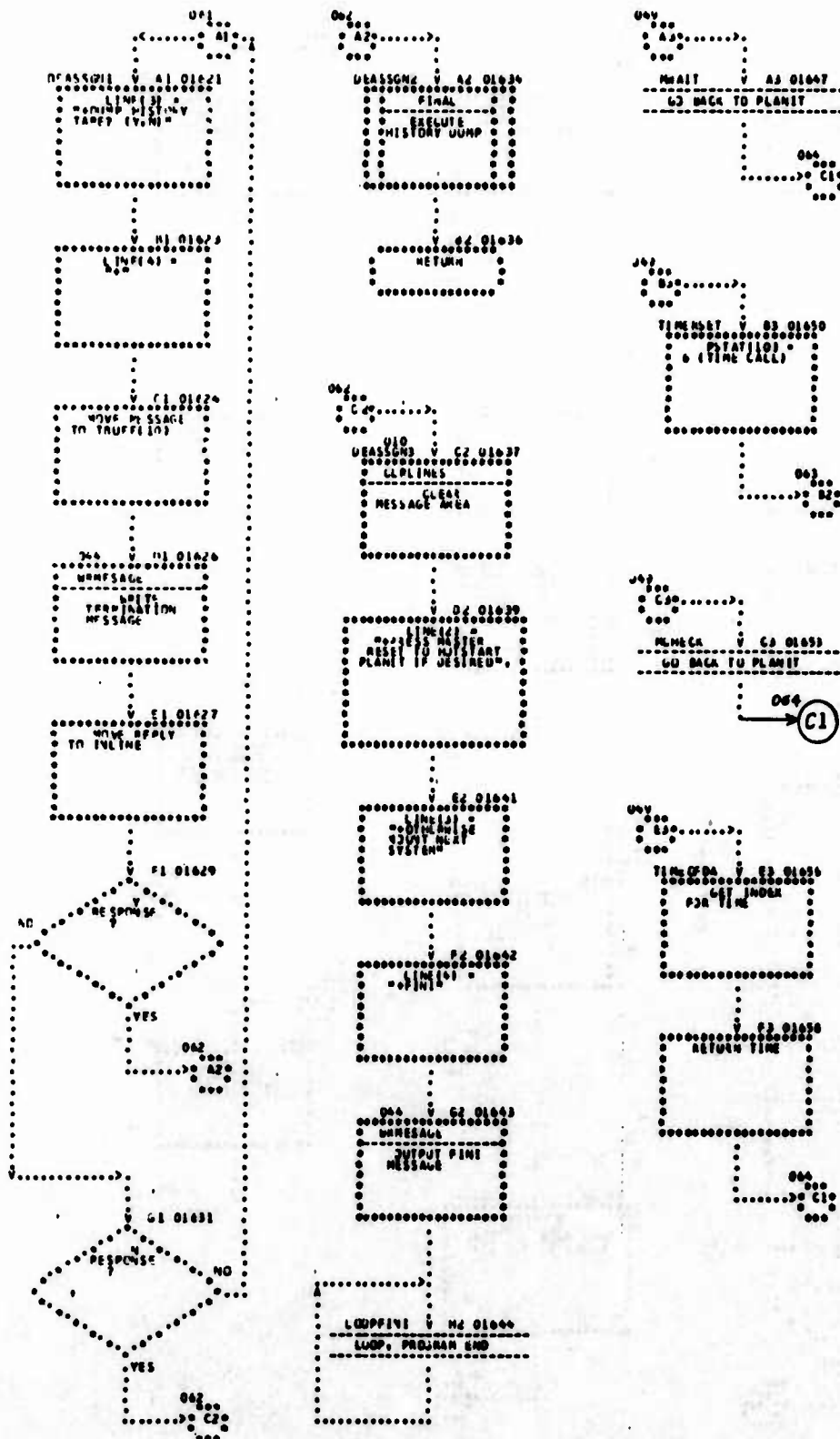


FIGURE 1 RIOP PLANCHART
SHEET 002 OF 000

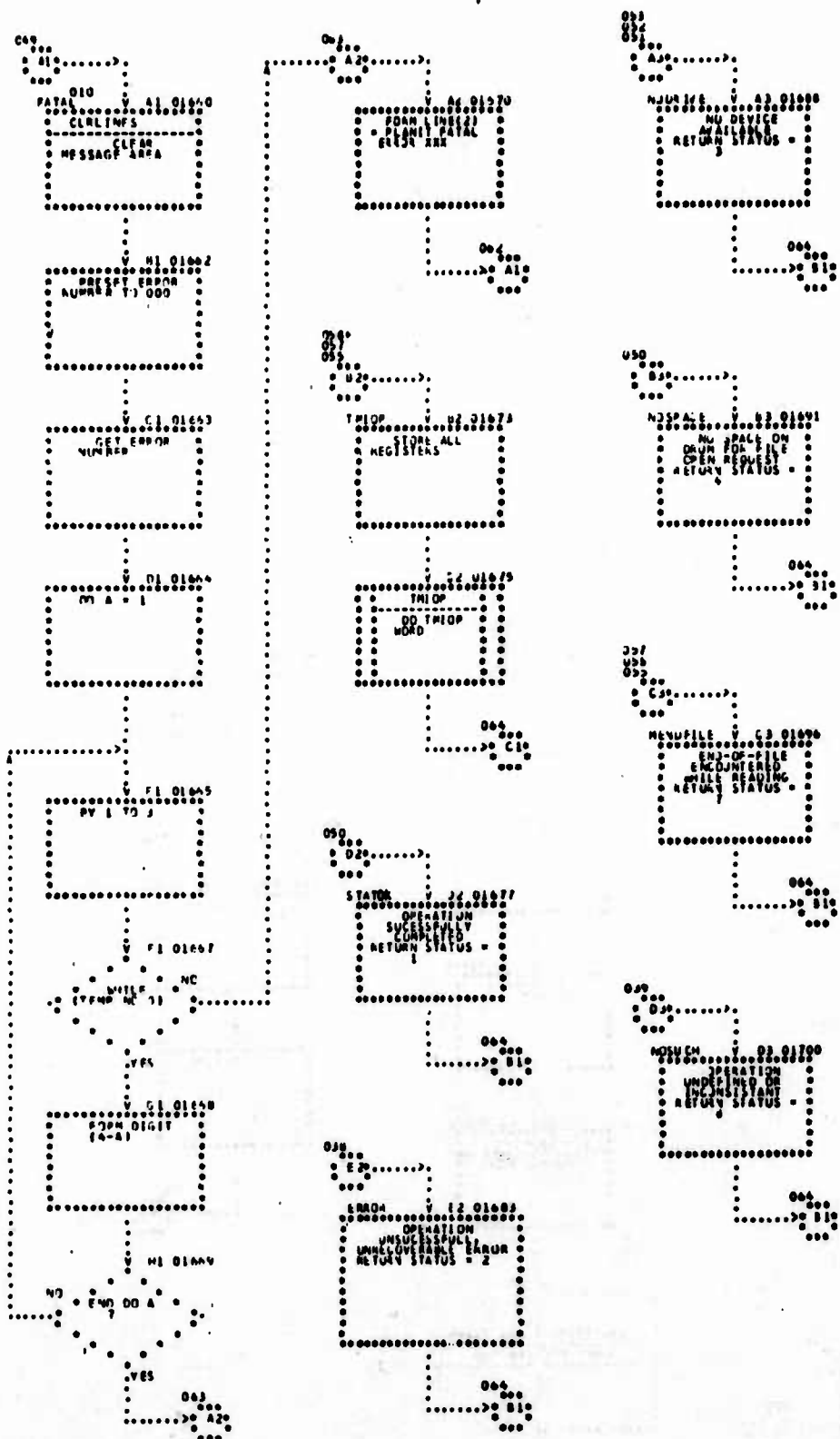


FIGURE 2. NIOP FLOWCHART
SHEET 003 OF 006

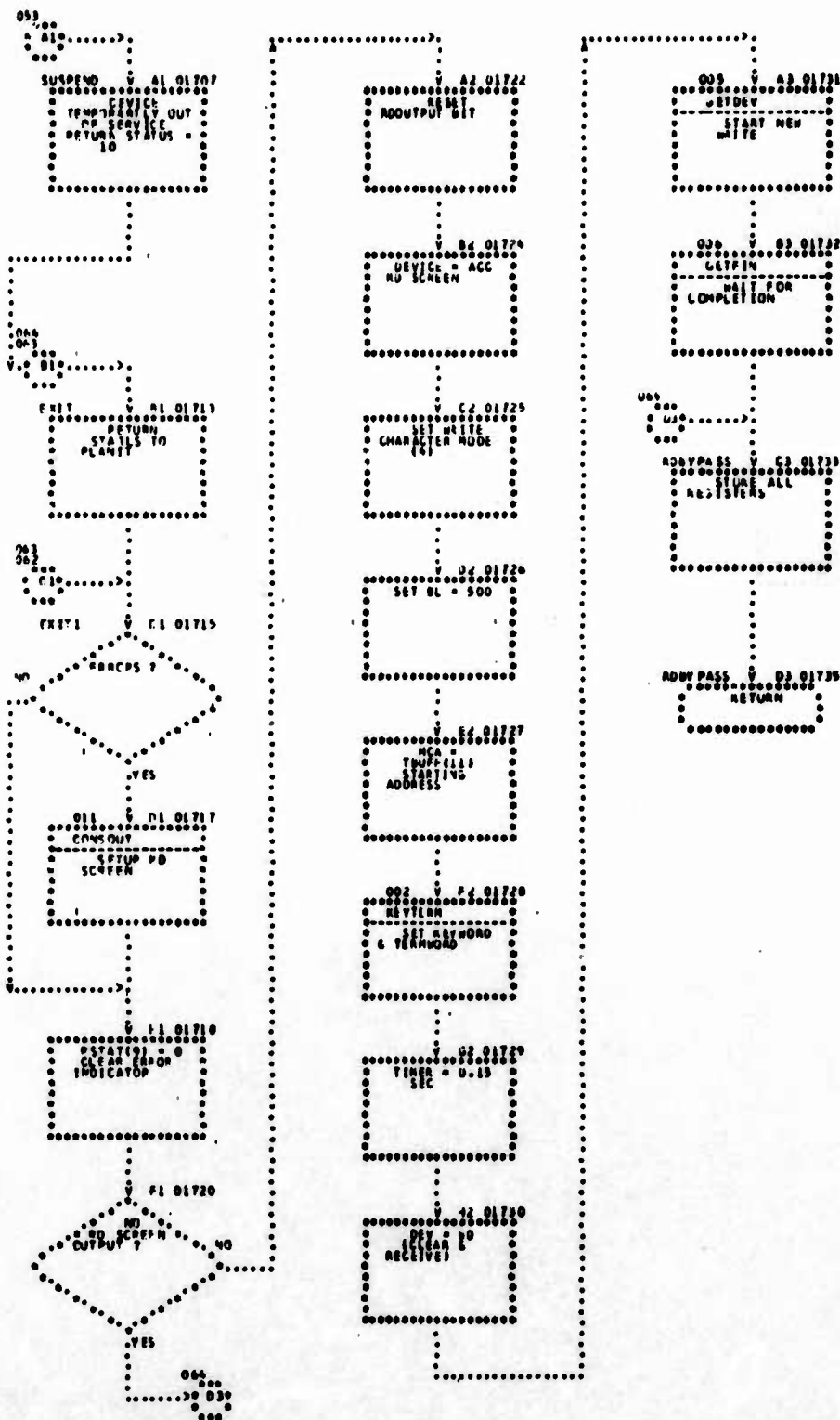


FIGURE 1 NIOP FLOWCHART
SHEET 004 OF 006

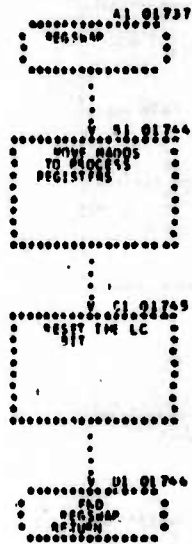
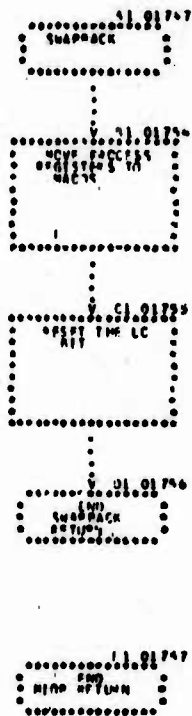
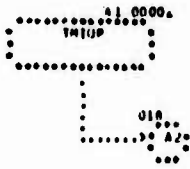


FIGURE SHEET 005 OF 006 FLOWCHART





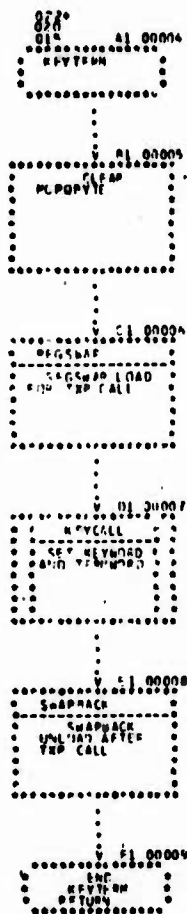


FIGURE SHEET TH10P 03/04/75 PLUMCHART

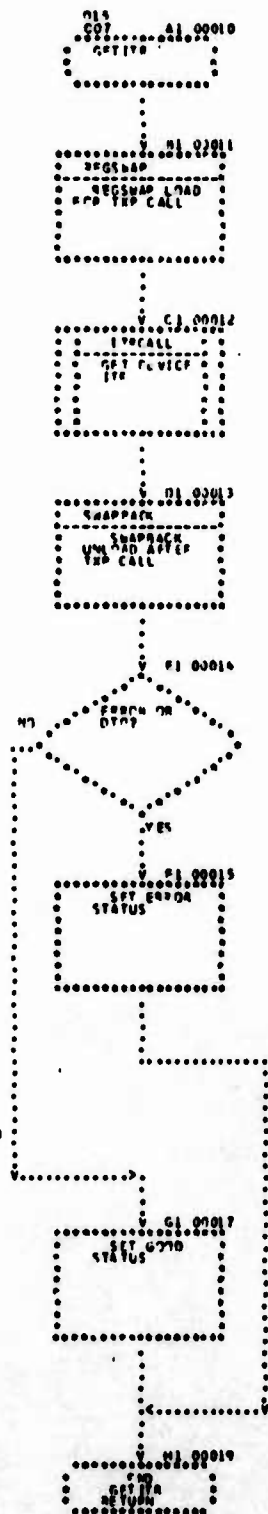
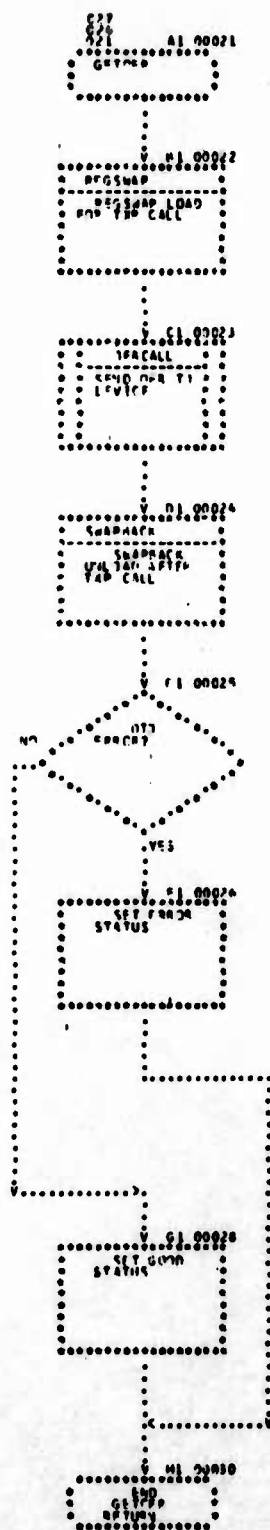
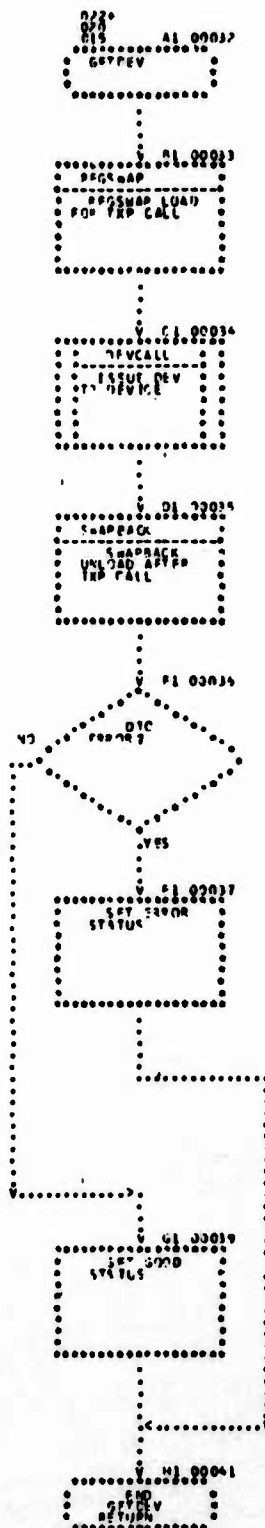


FIGURE SHEET 001 OF 001 FLOWCHART





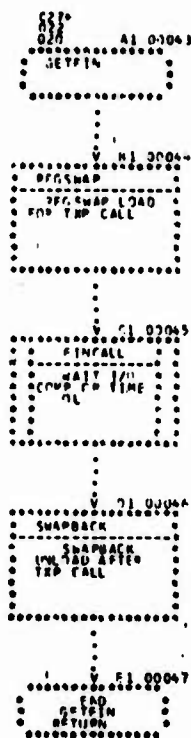


FIGURE SHEET 006 OF 001 PLANCHART

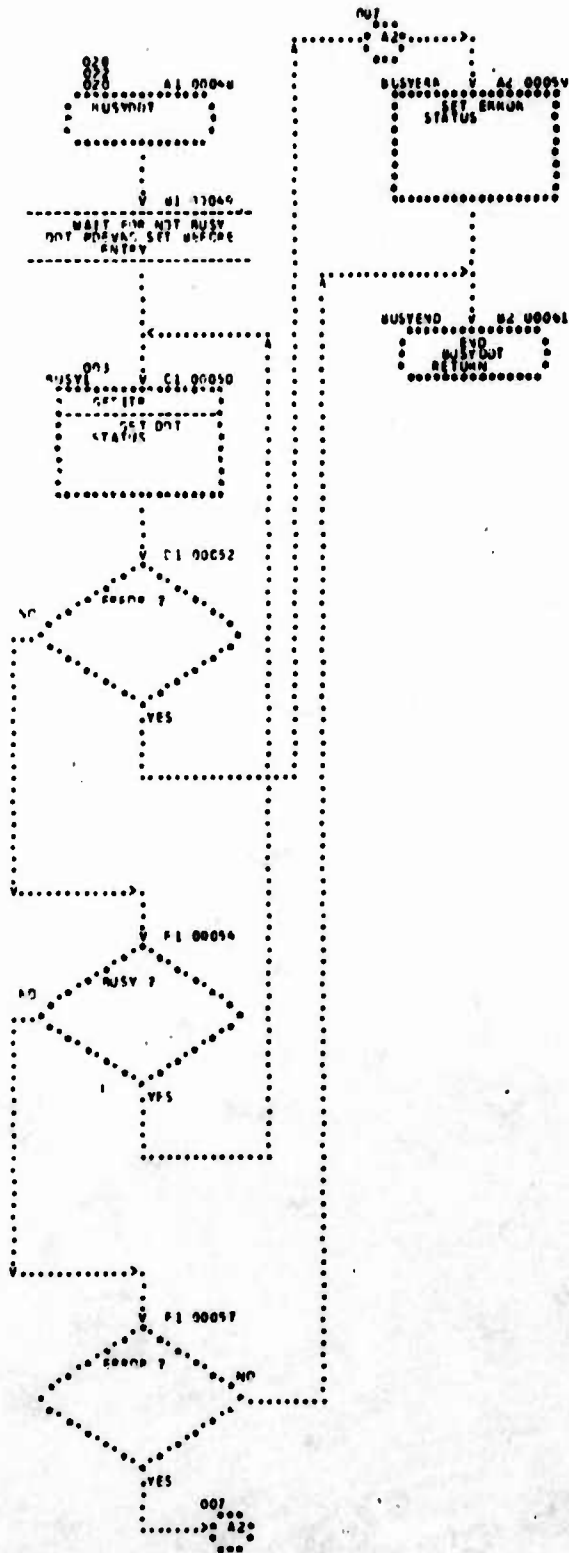
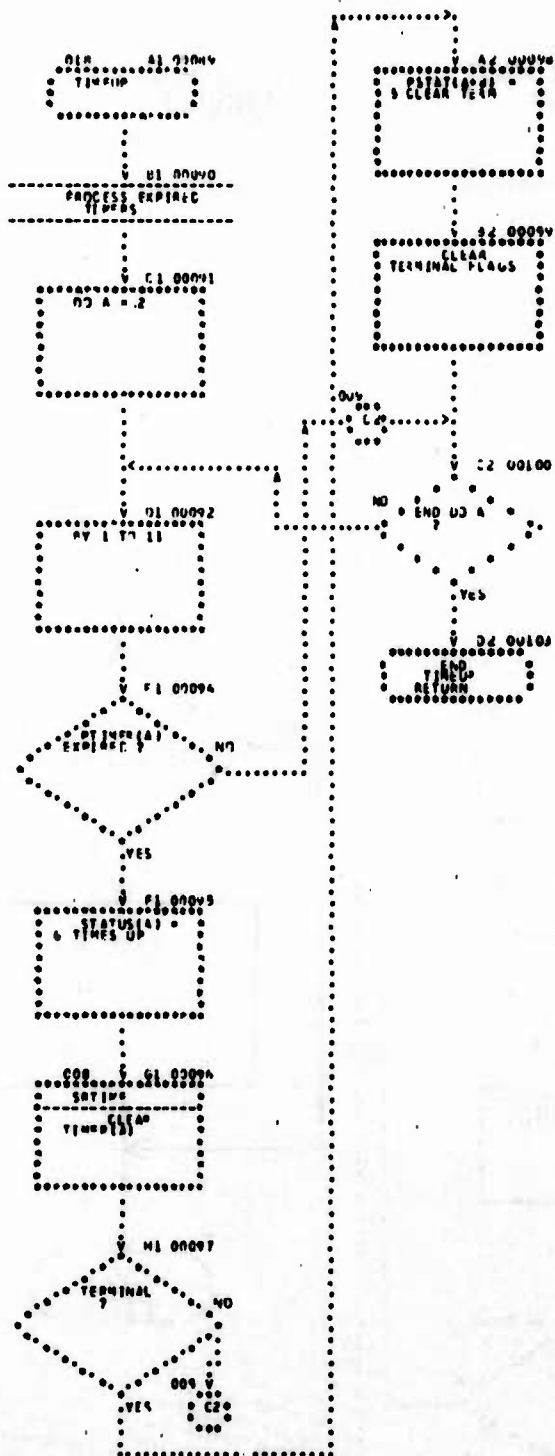


FIGURE SHEET INIDP FLOW-CHART
100 001 001

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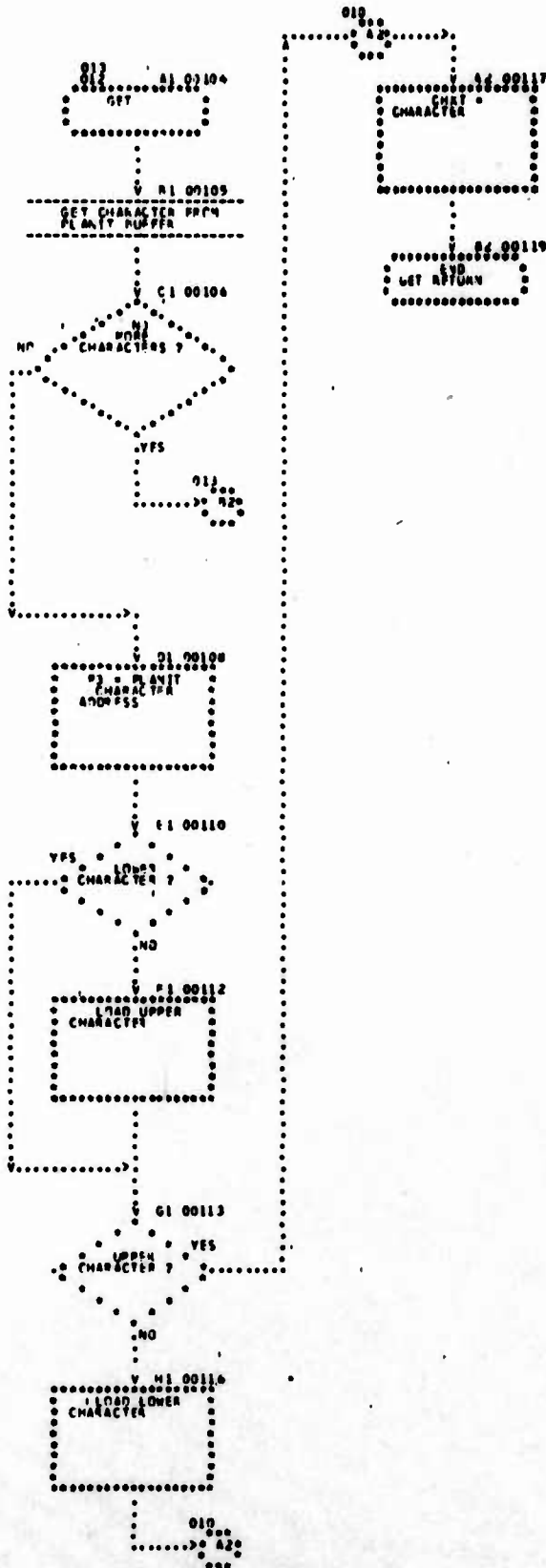


FIGURE 1 INJOP FLOWCHART
SHEET 013 OF 031

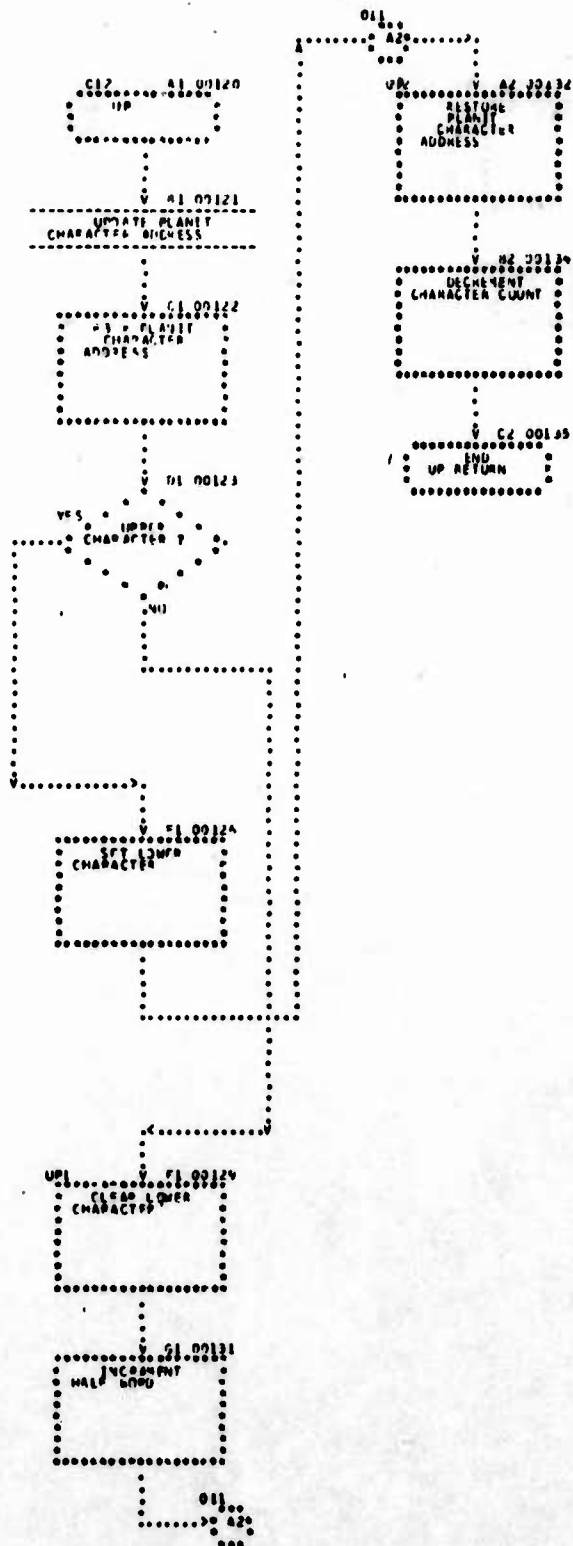


FIGURE 1. TH10P PLUNCHART
SHEET 011 OF 021

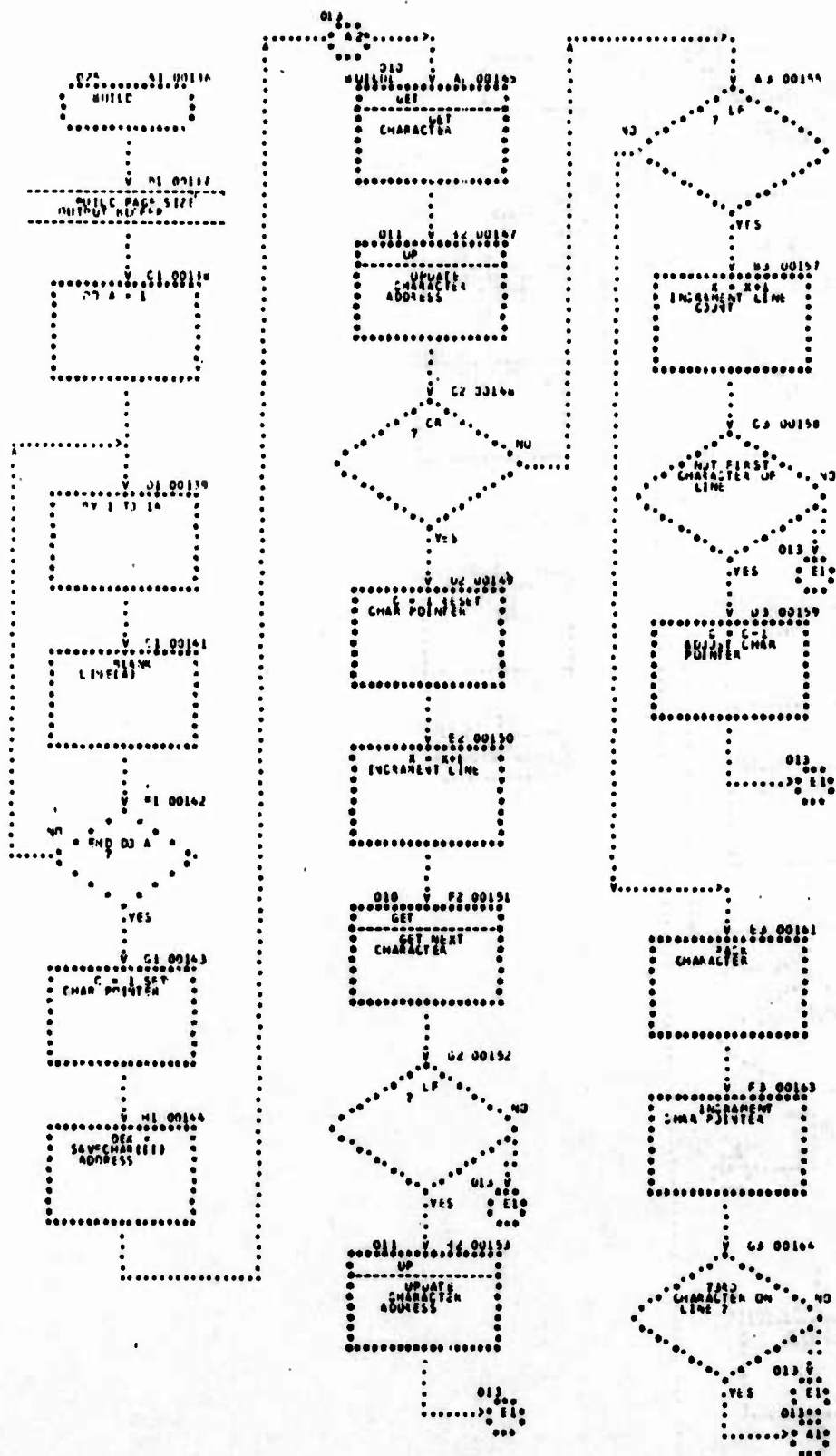


FIGURE 1 TH10P, PLUM-100T
Sheet 012 of 081

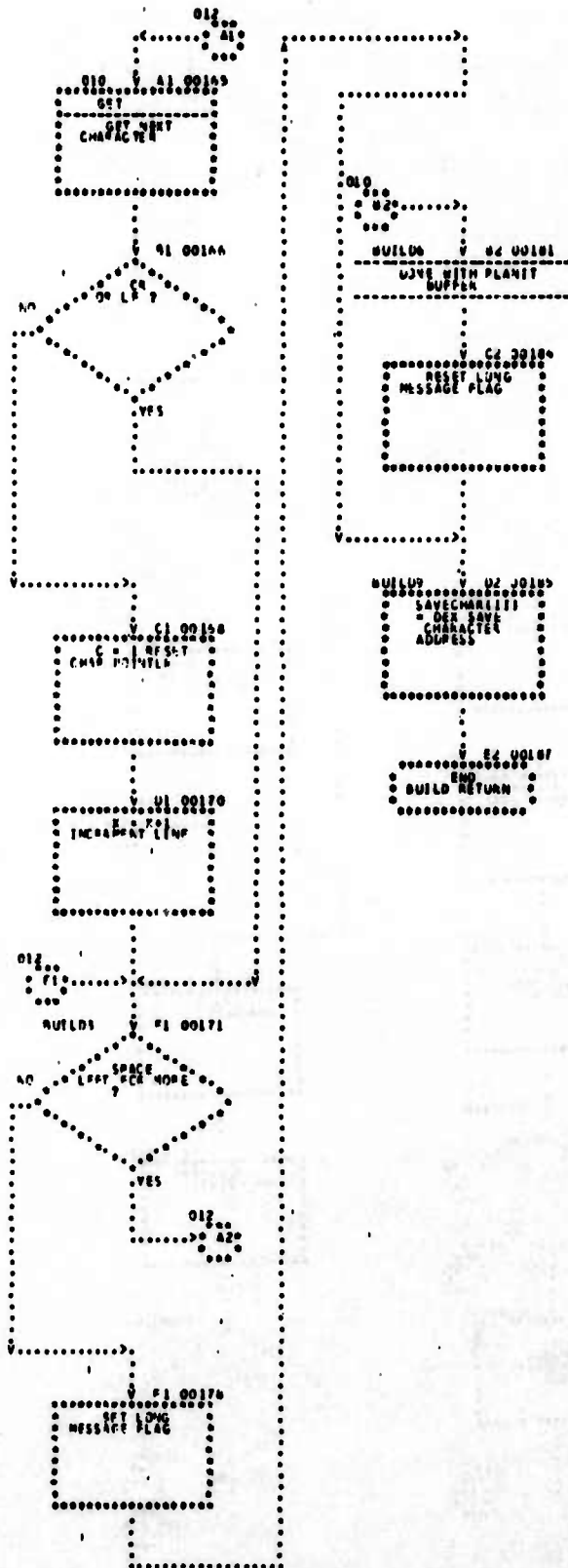
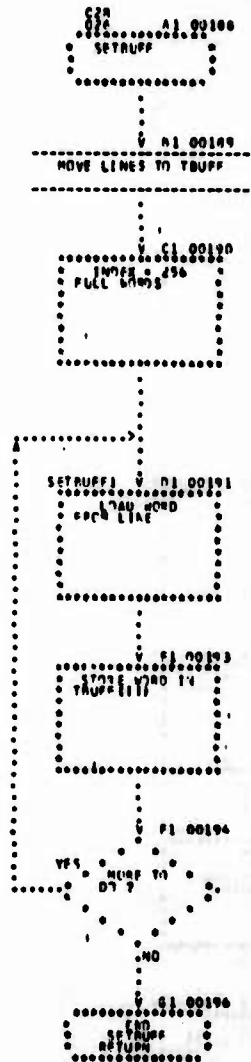


FIGURE 1 INJOP FLOWCHART
SHEET 013 OF 031



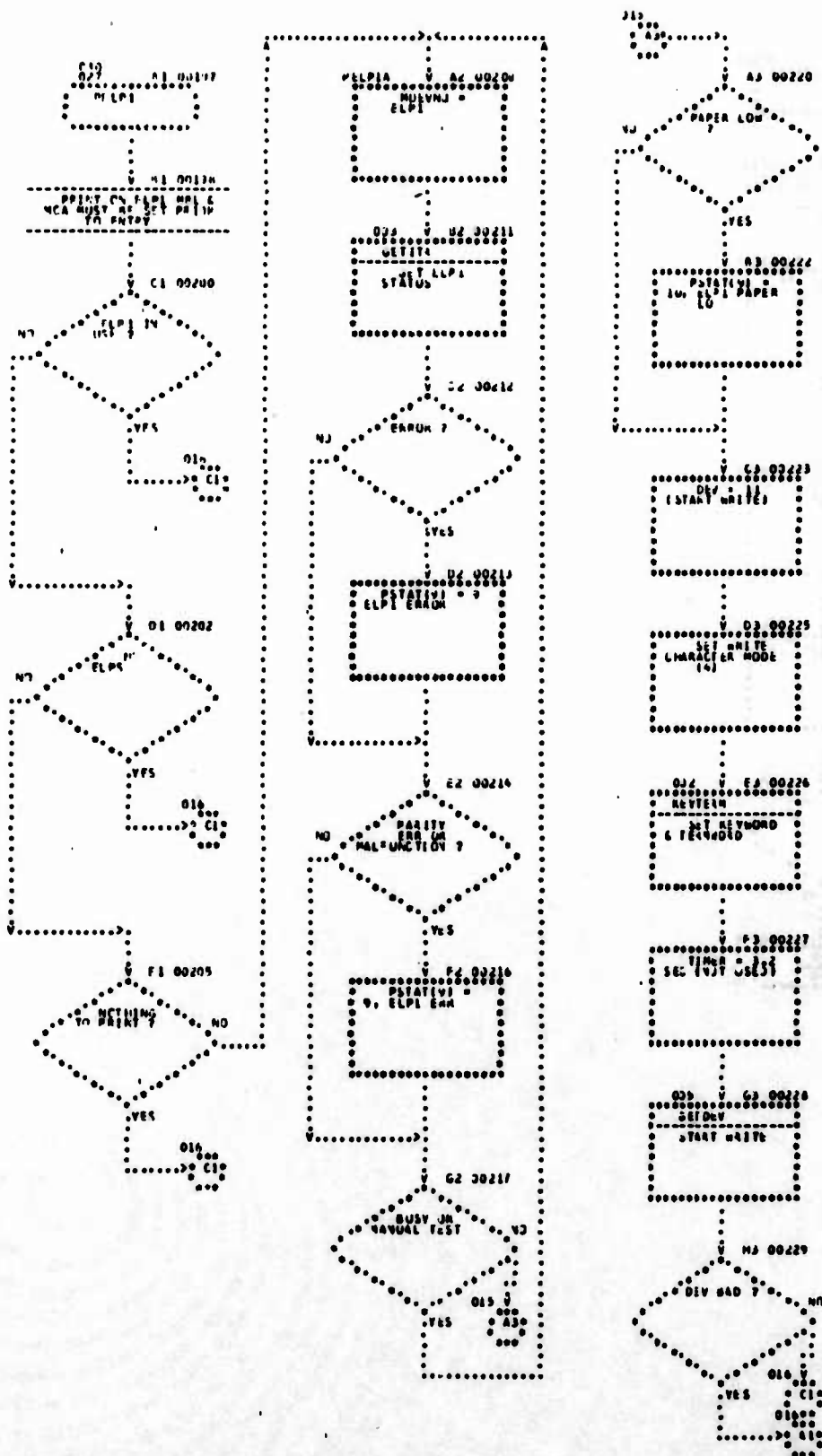


FIGURE 7. THE FLUCTUANT
SHEET OF THE

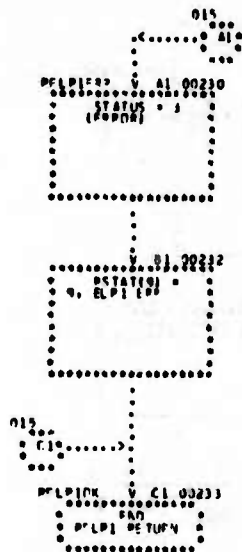


FIGURE 1 T410P FLOWCHART
SHEET 010 OF 031

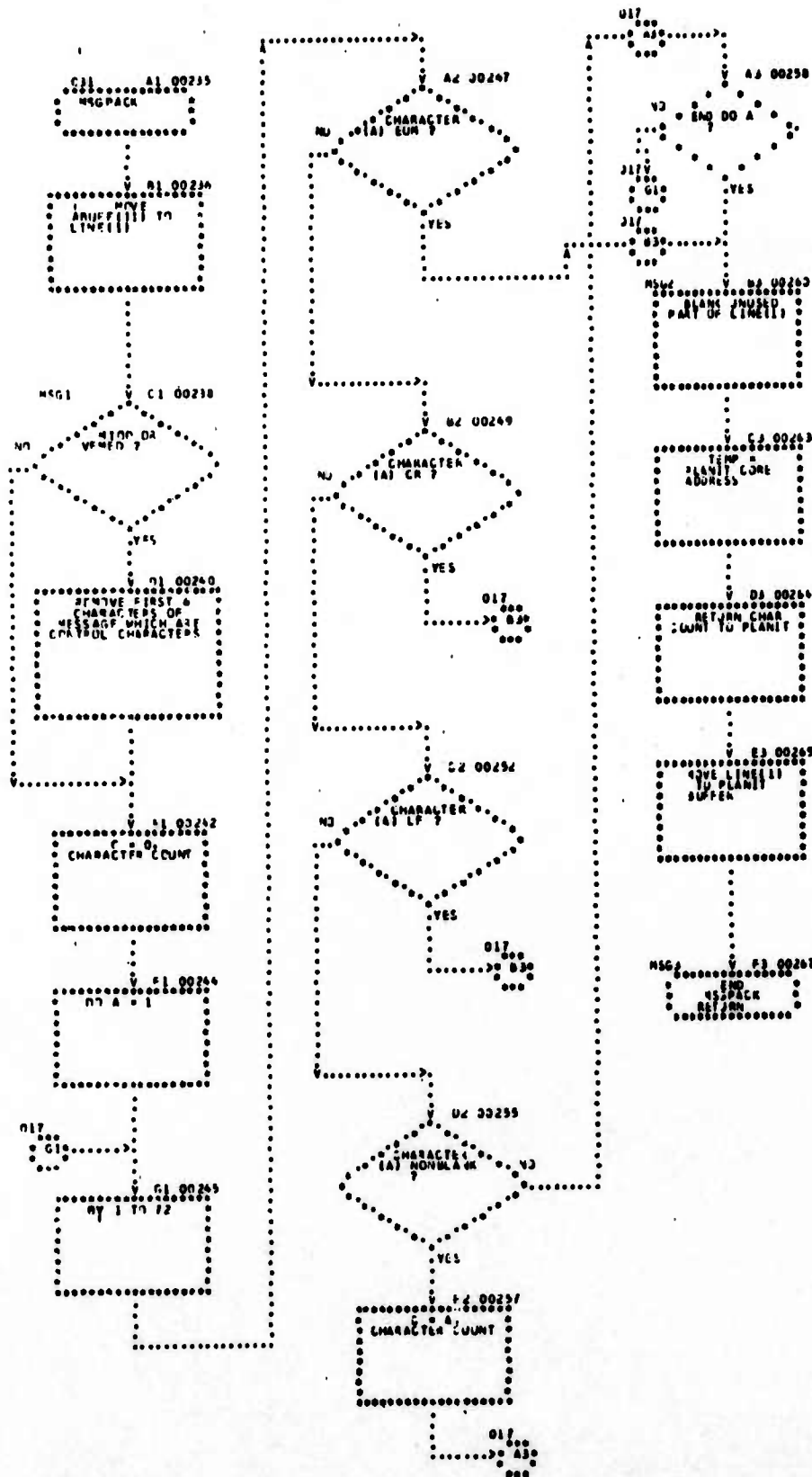


FIGURE 1 TH10P FLOWCHART
SHEET 017 OF 031

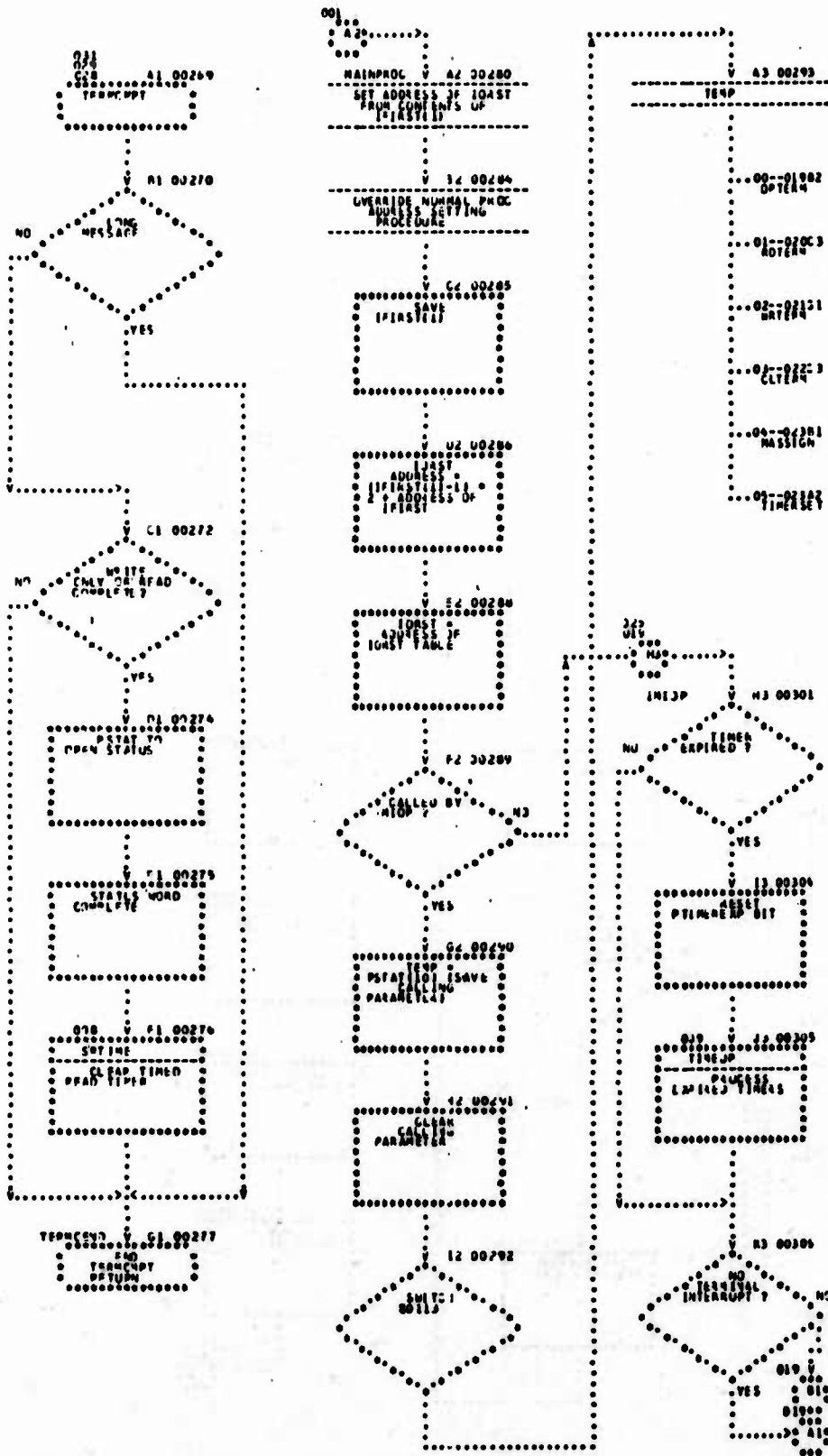


FIGURE 7 TH10P FLOWCHART
SHEET 010 OF 031

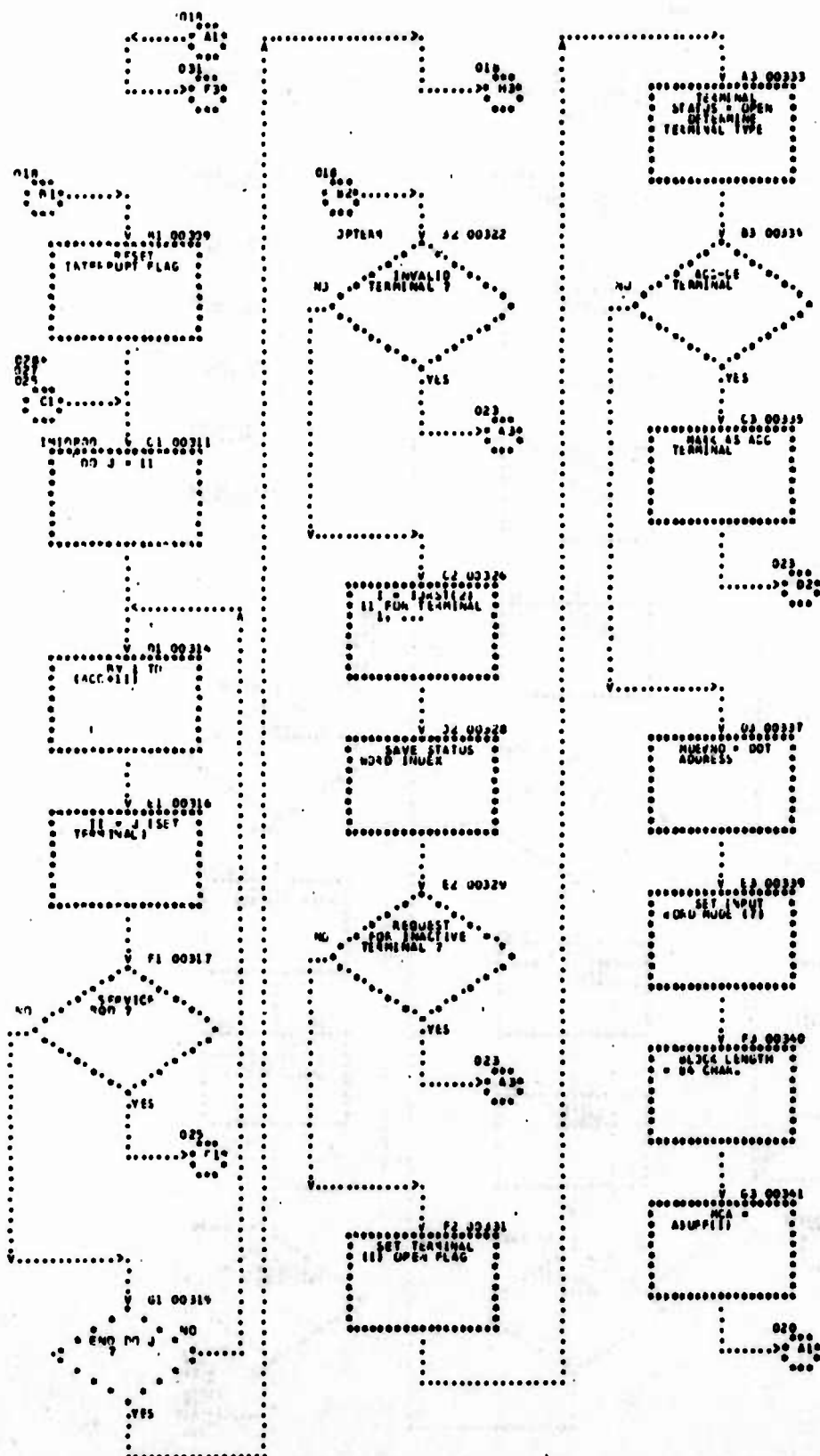


FIGURE SHEET 7, THIS OLD UP OLD FLOWCHART

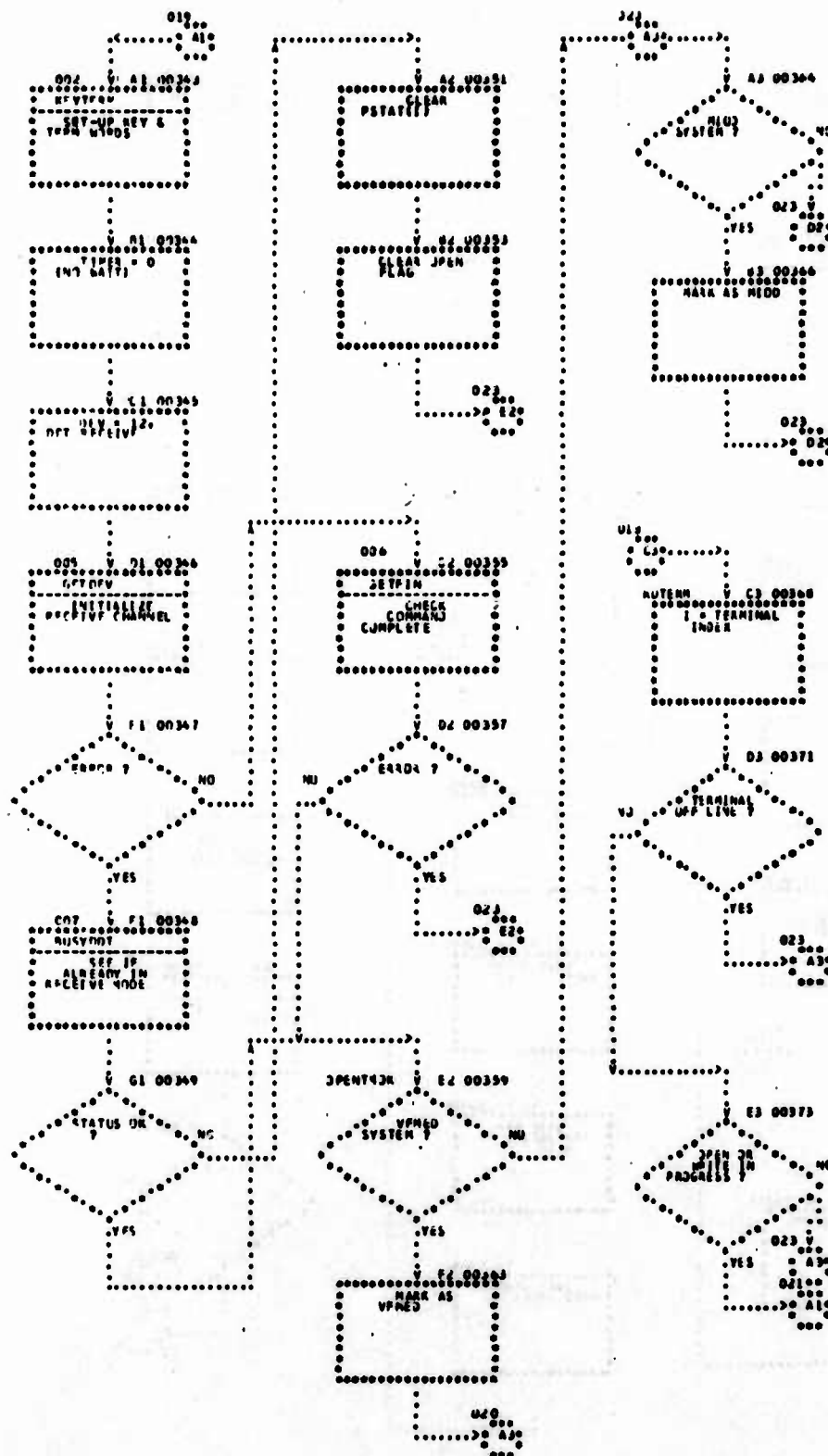


FIGURE 2 THIS FLUORANT
SHEET 020 OF 031

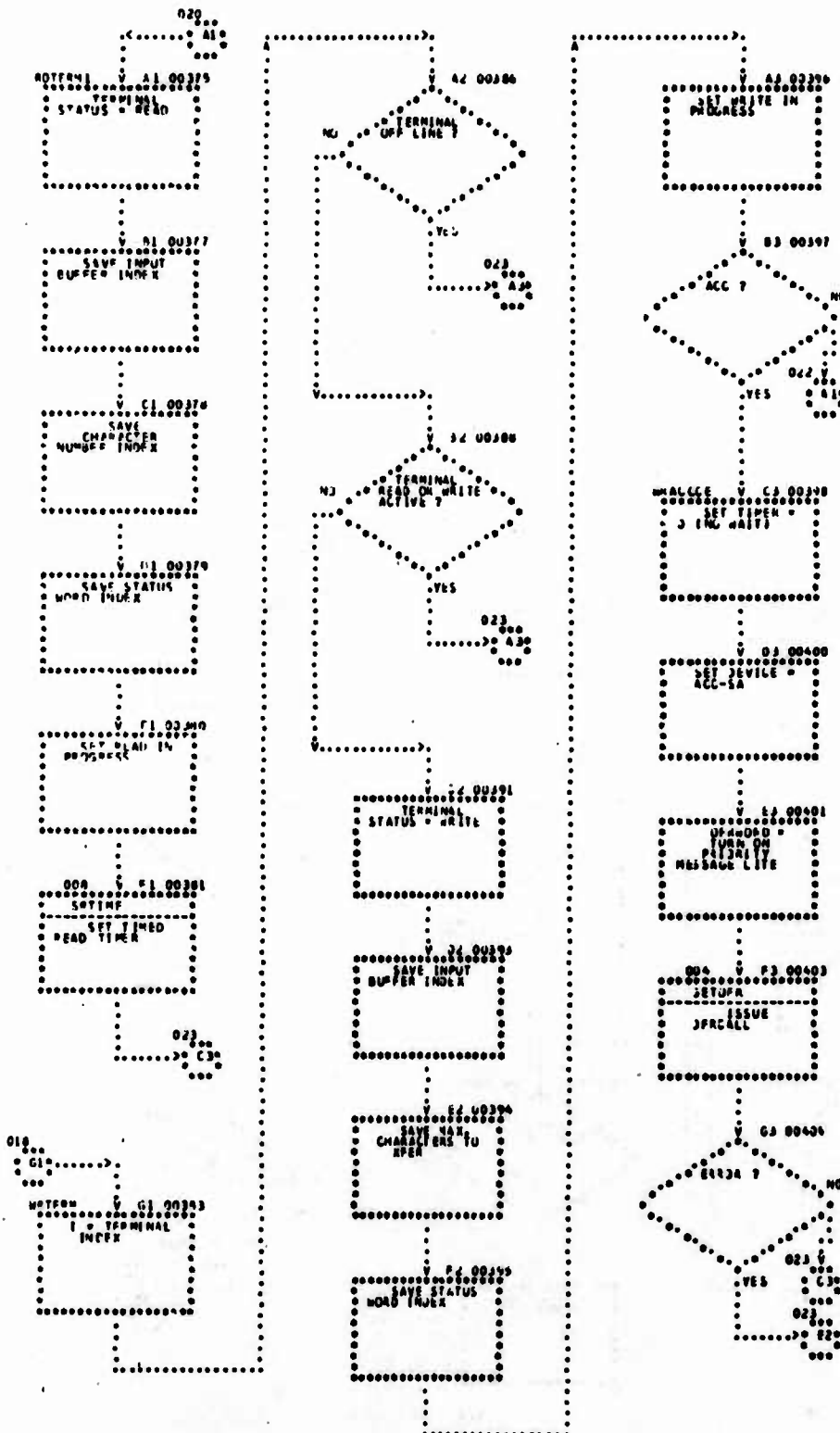


FIGURE 1 THIDP FLOWCHART
SHEET 021 OF 031

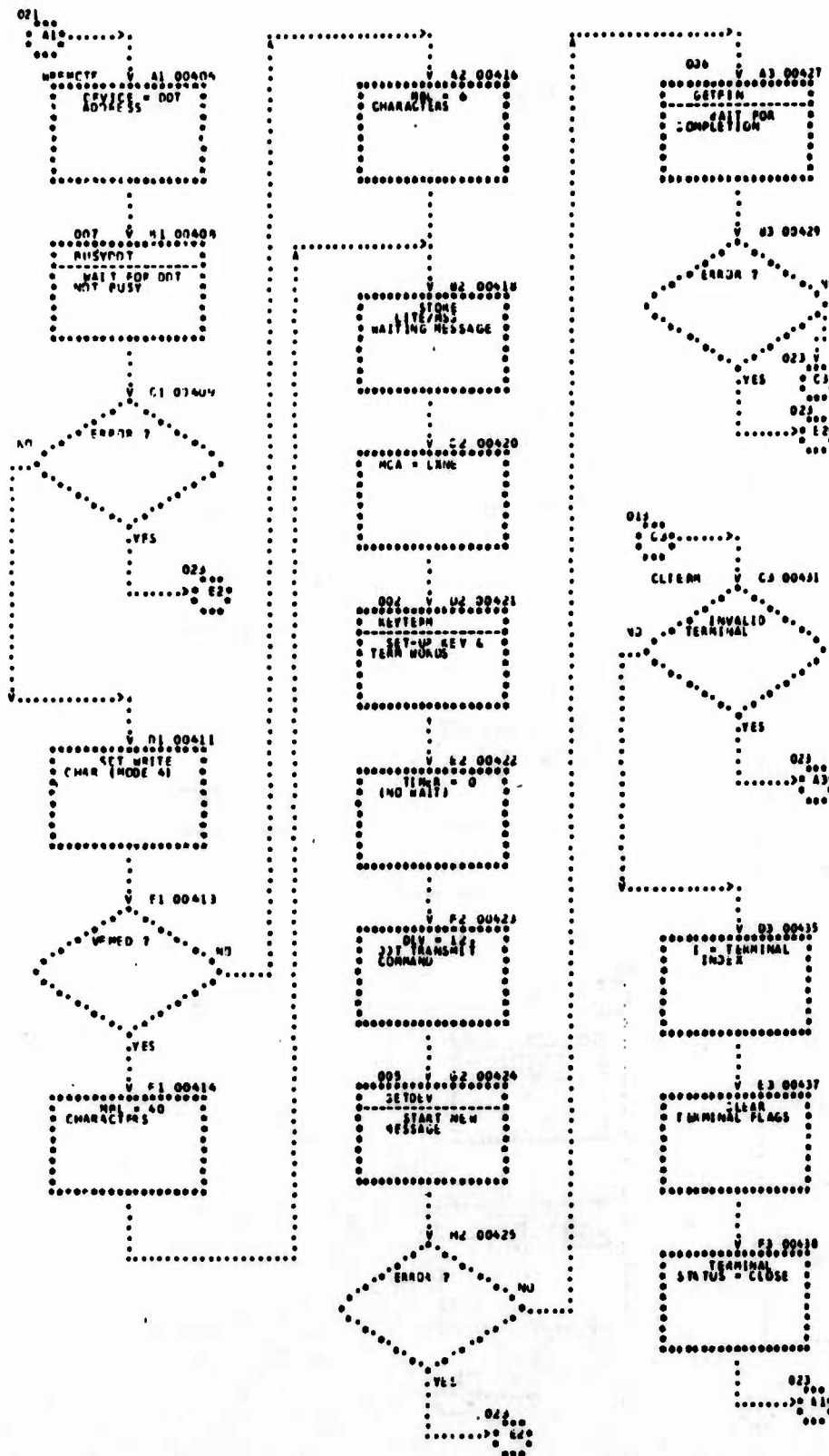


FIGURE 7 TR10P FLOWCHART
SHEET 022 OF 031





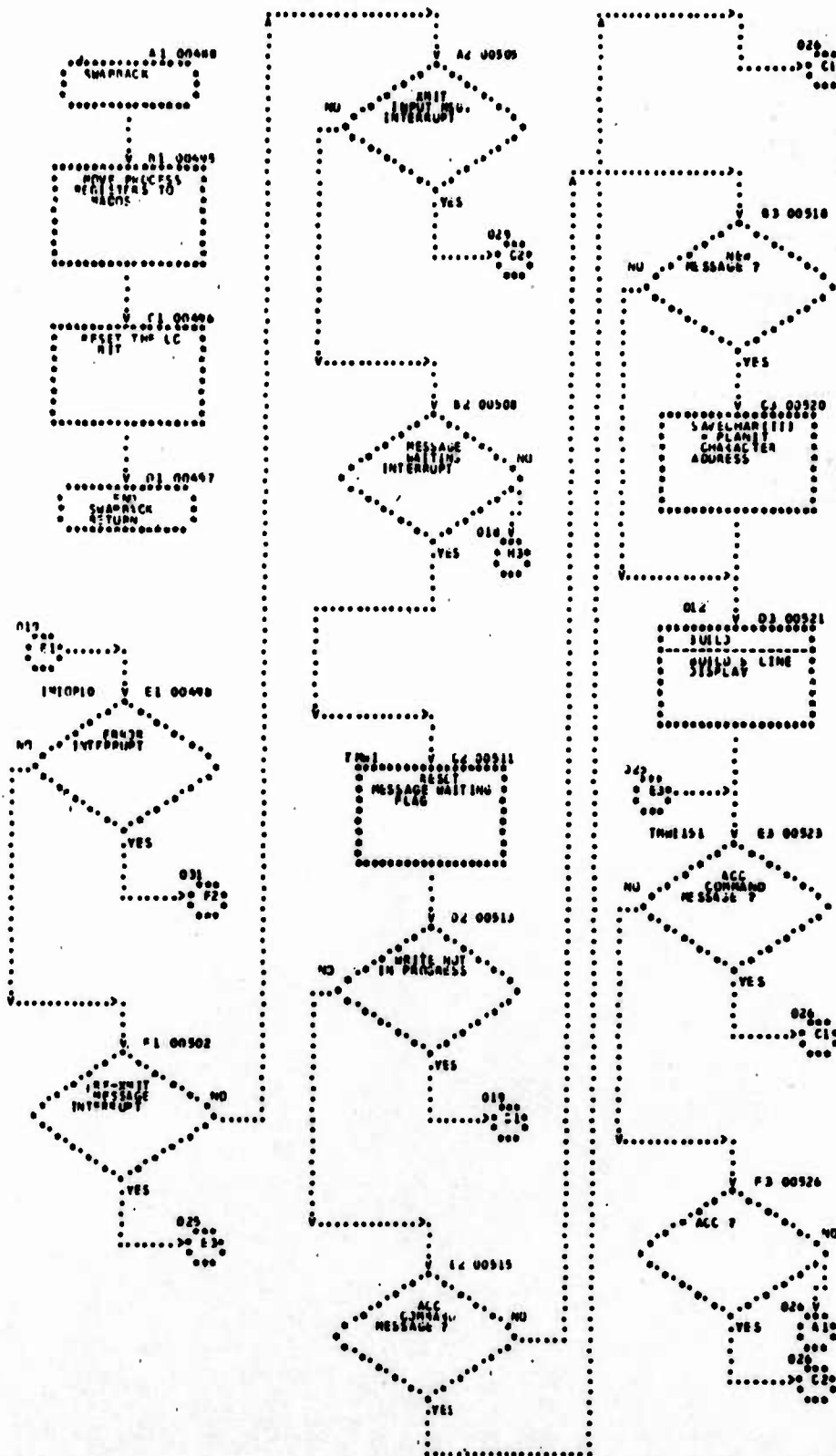
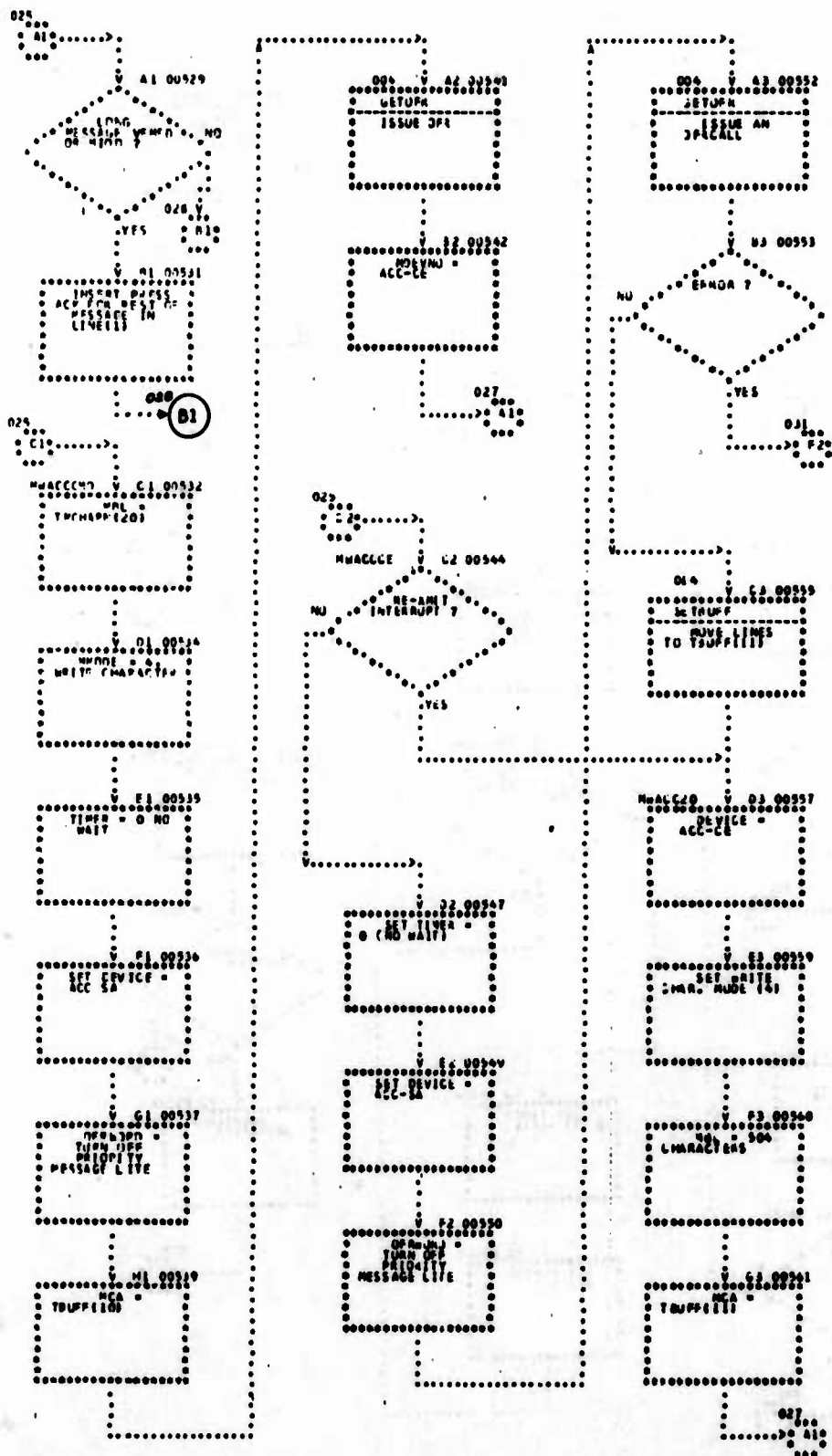


FIGURE 1. TAIL OF FLOWCHART
SHEET 025 OF 031



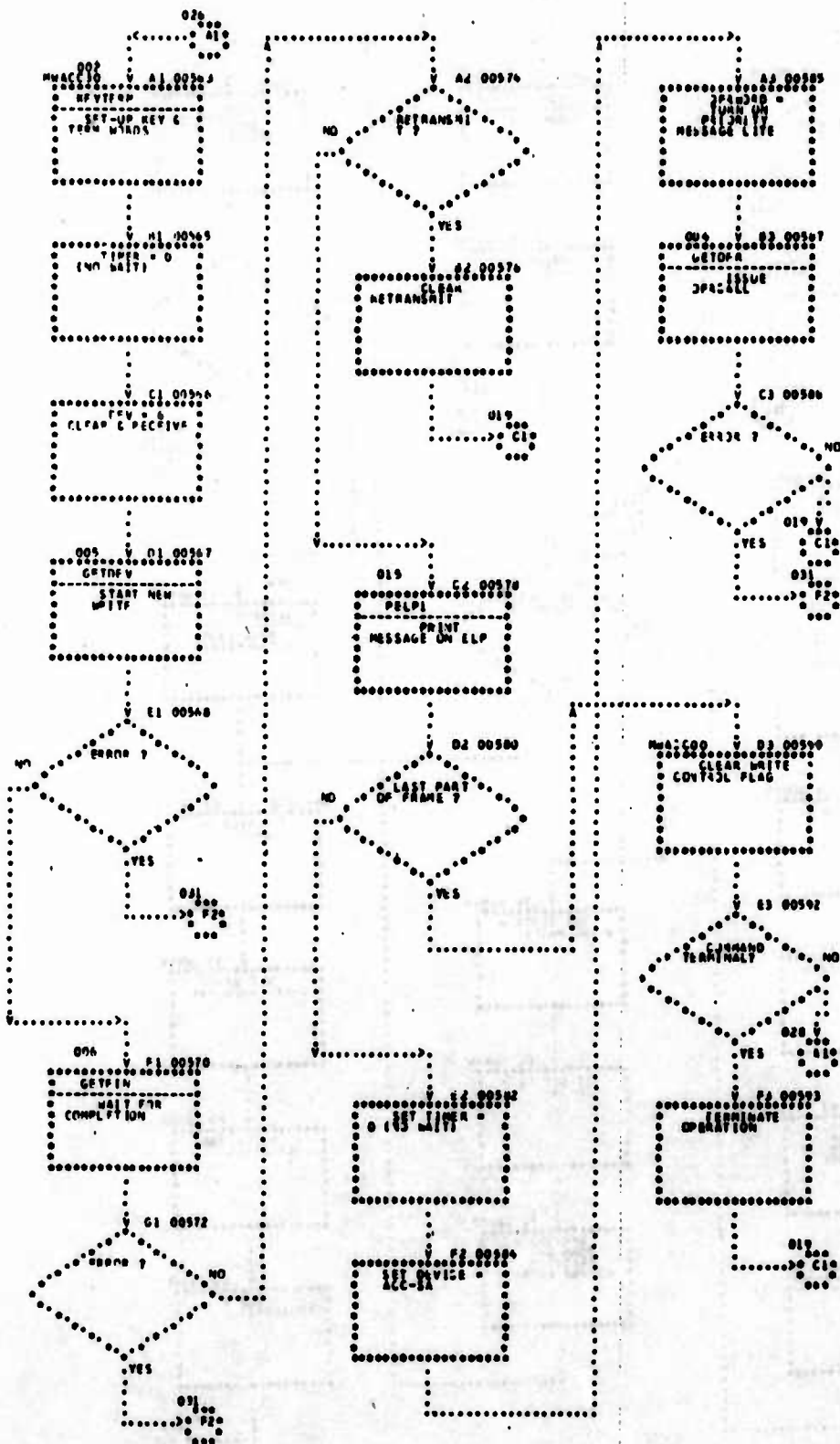


FIGURE 1000 TR1000 FLUNCHART
SHEET 03 OF 03

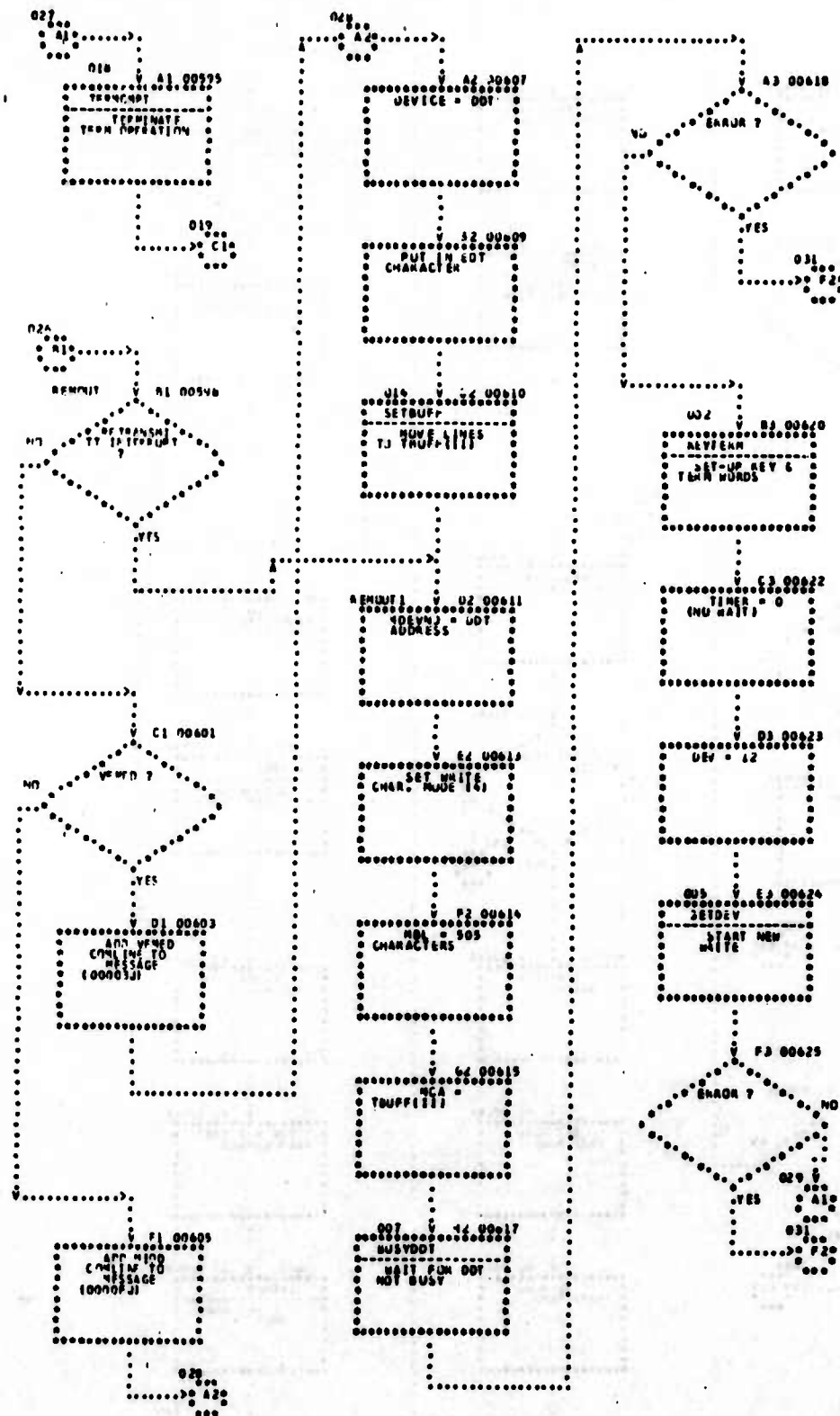


FIGURE SHEET 020 OF 021 FLOWCHART

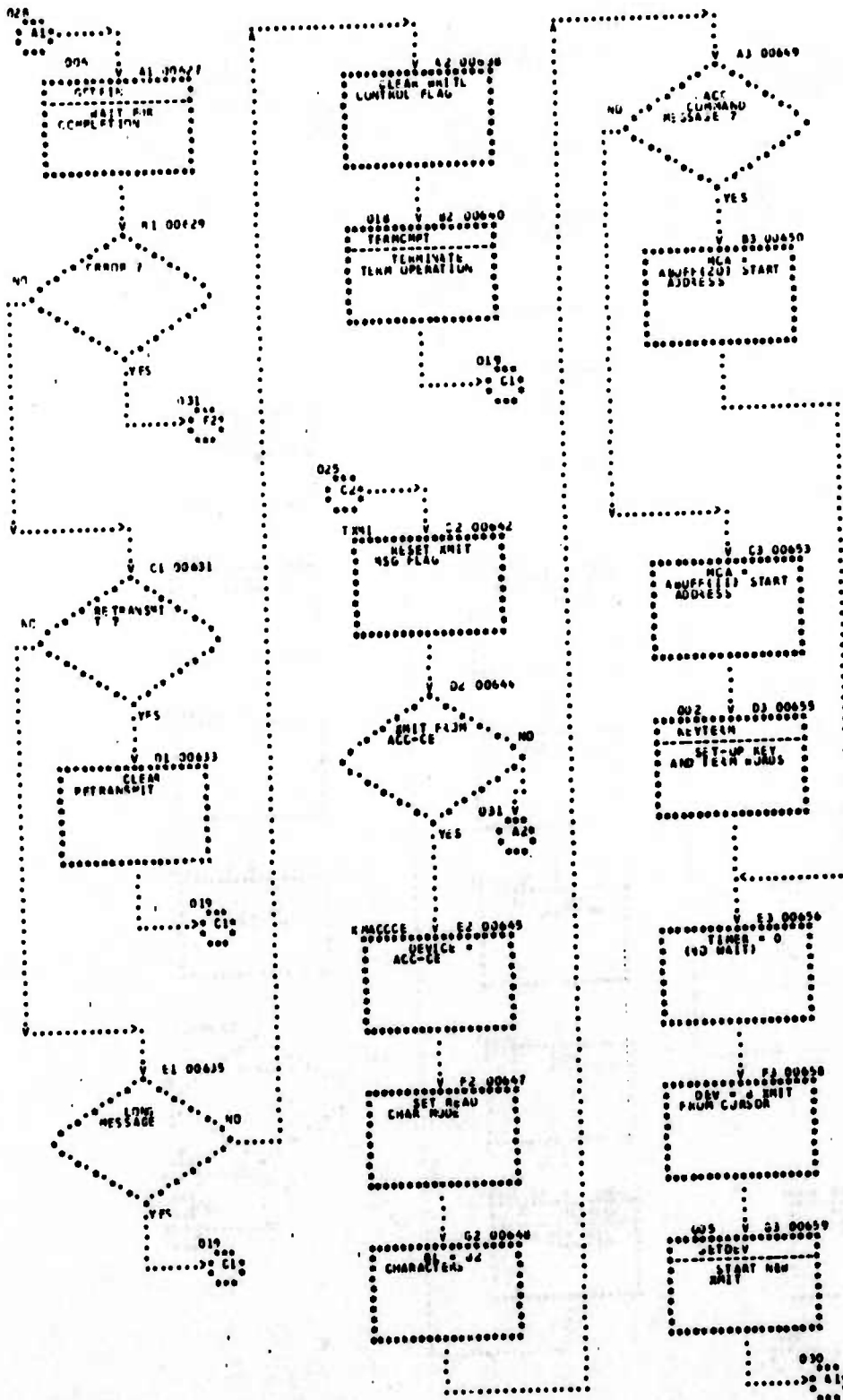


FIGURE 1
SHEET 021 OF 031 FLOWCHART

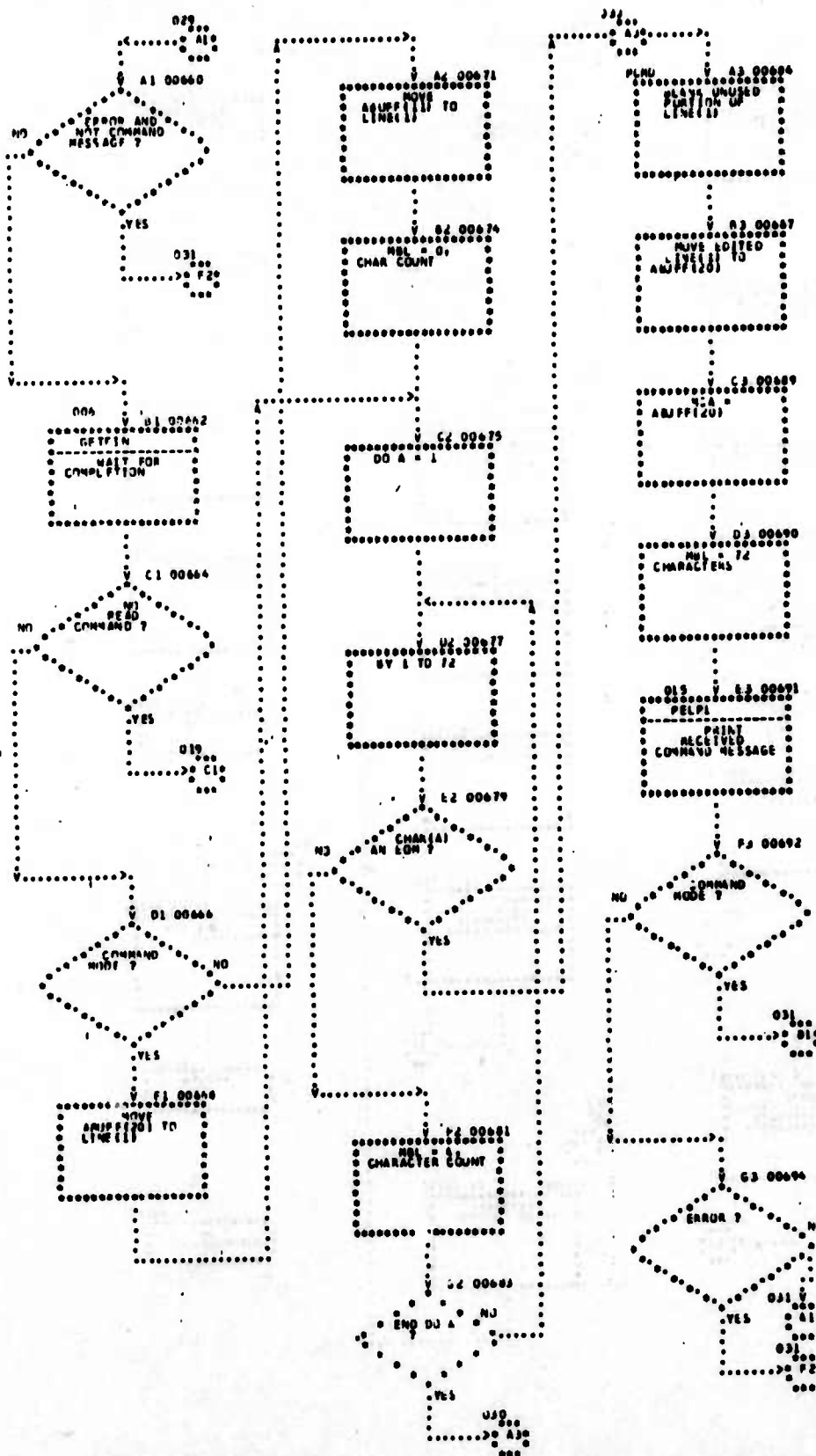


FIGURE SHEET THUP FLOWCHART



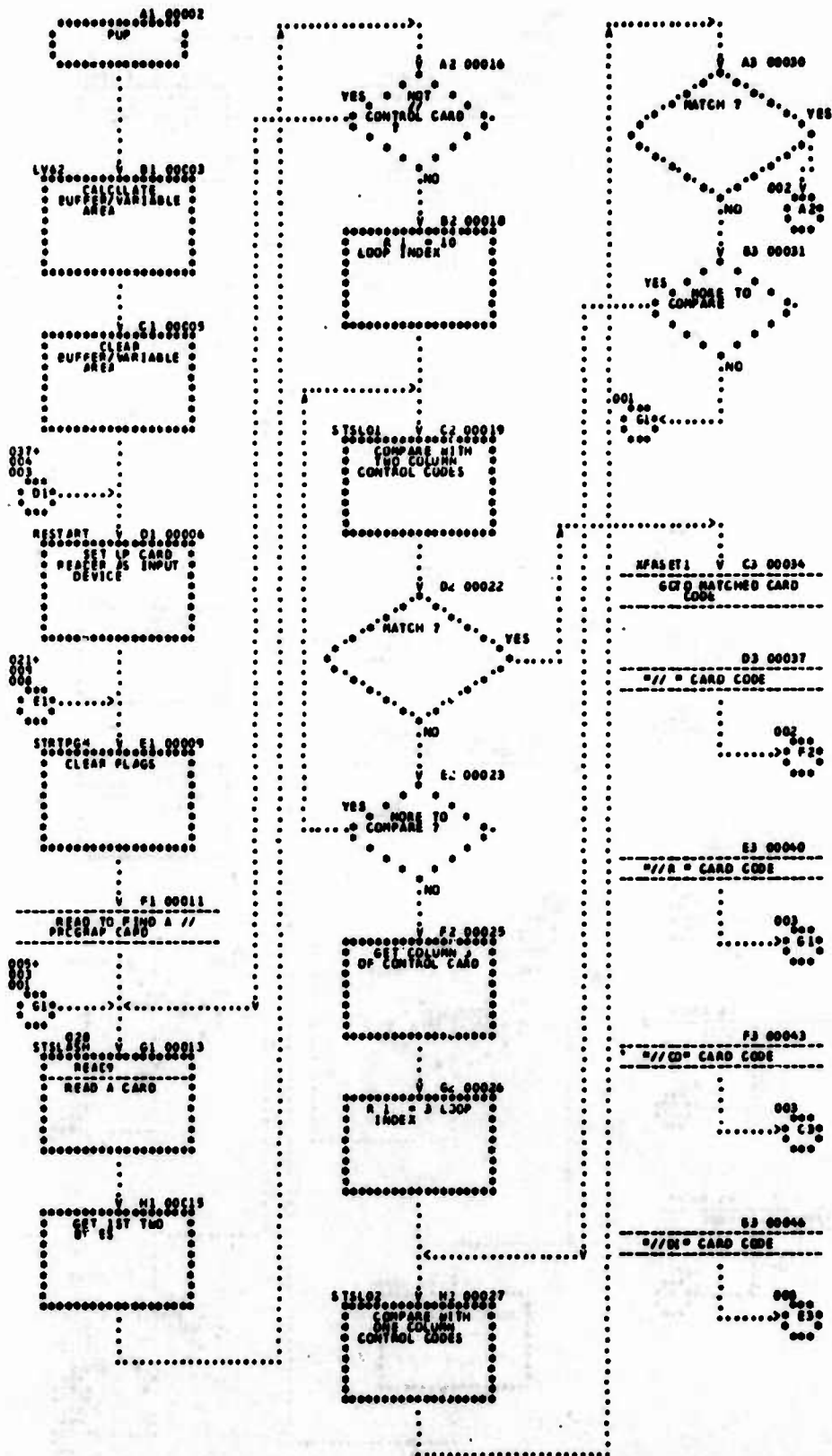


FIGURE 1-281 PUP FLOWCHART

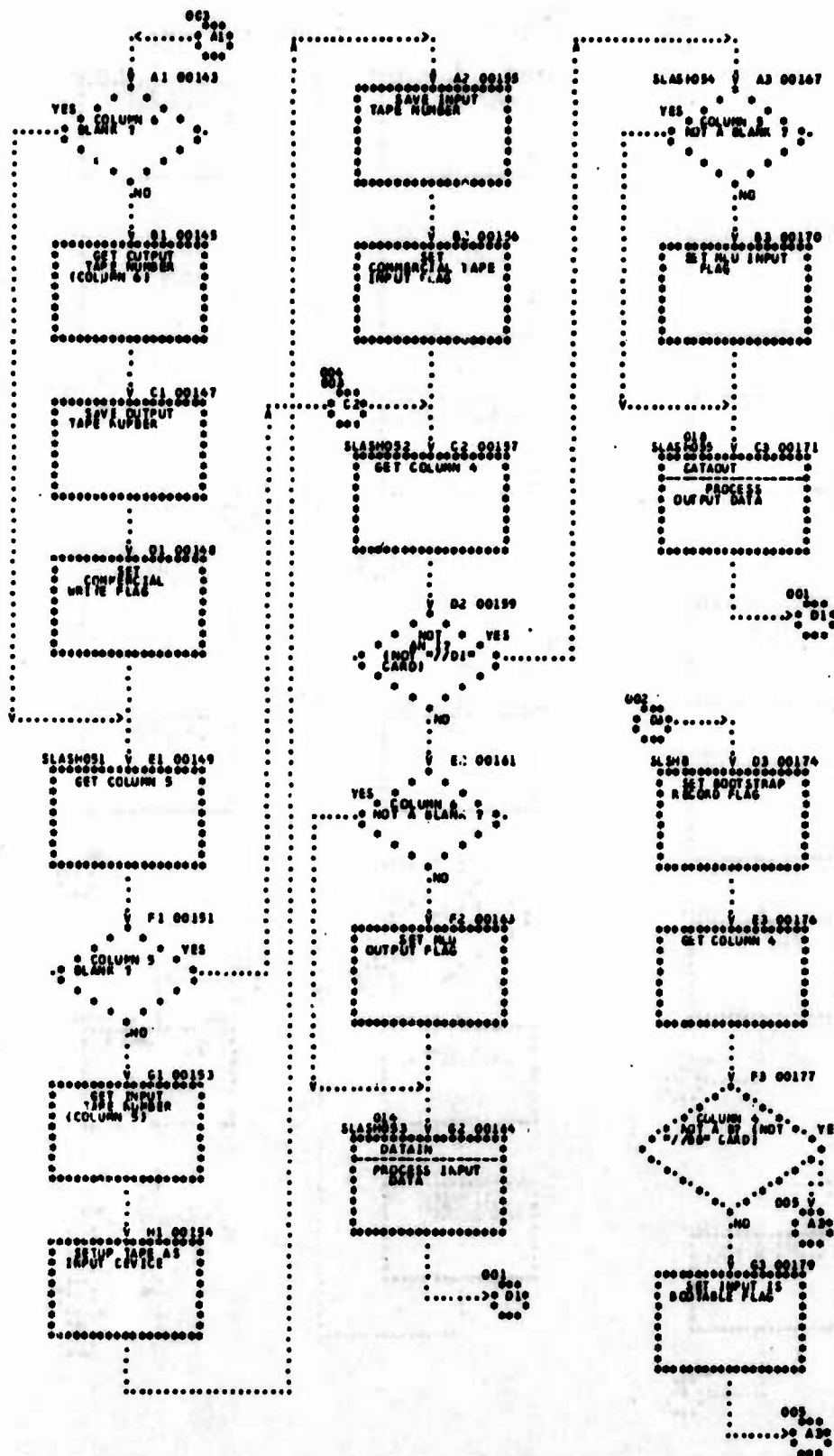


FIGURE 1-10 PUP 00155 FLOWCHART

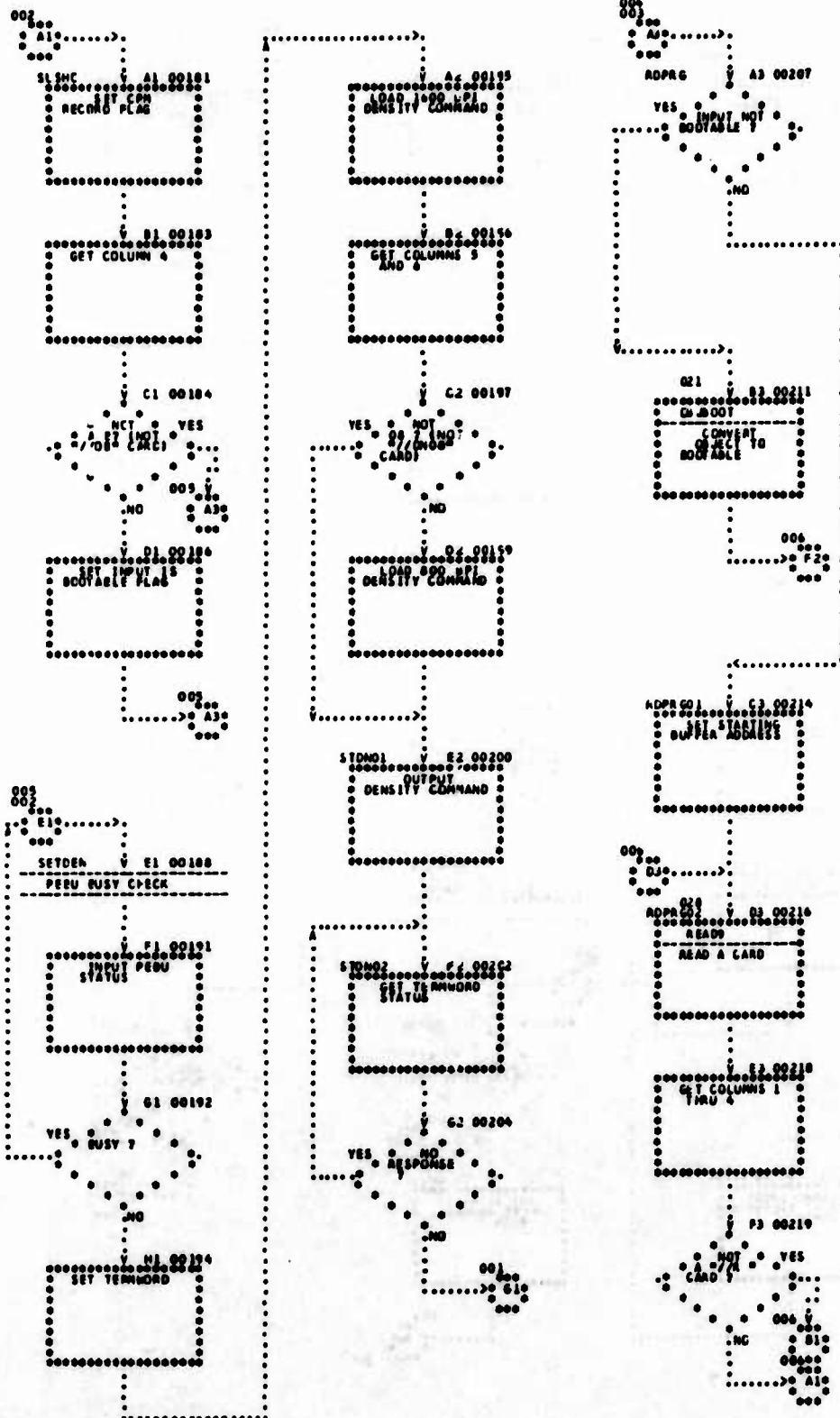


FIGURE 2-21 BUS OF 001 FLOWCHART

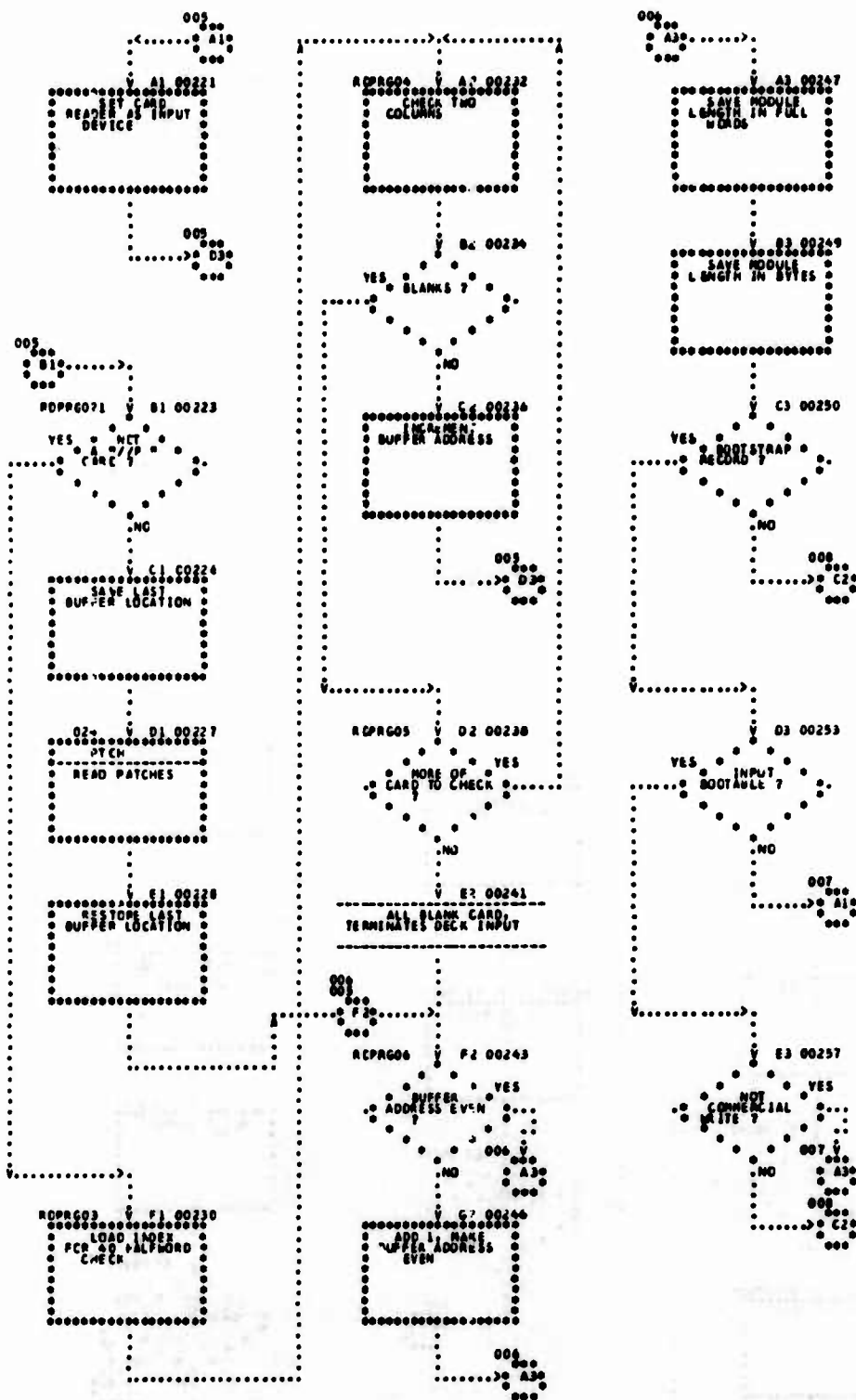
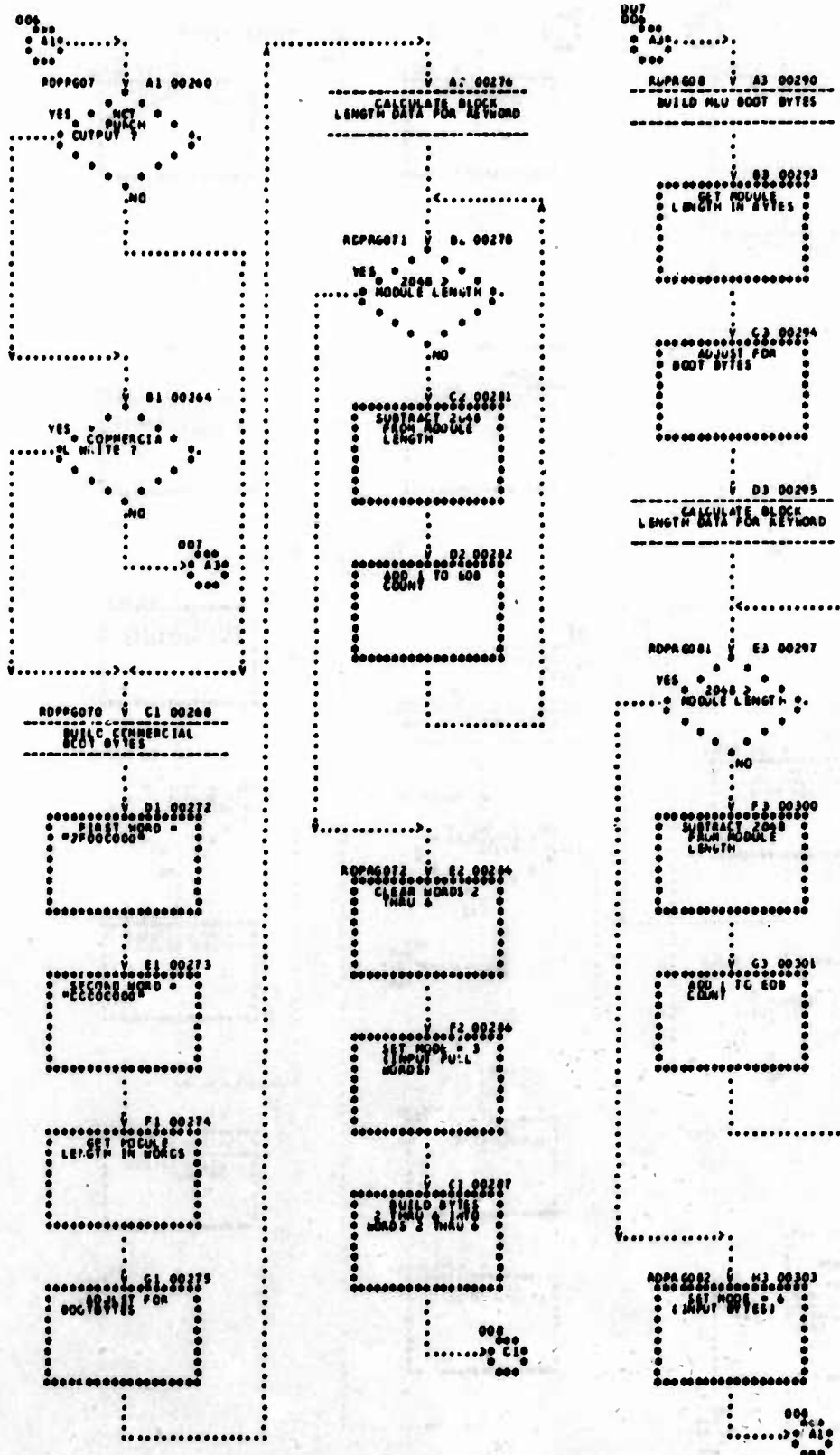


FIGURE 20 PUP FLOWCHART
SHEET 006 OF 056



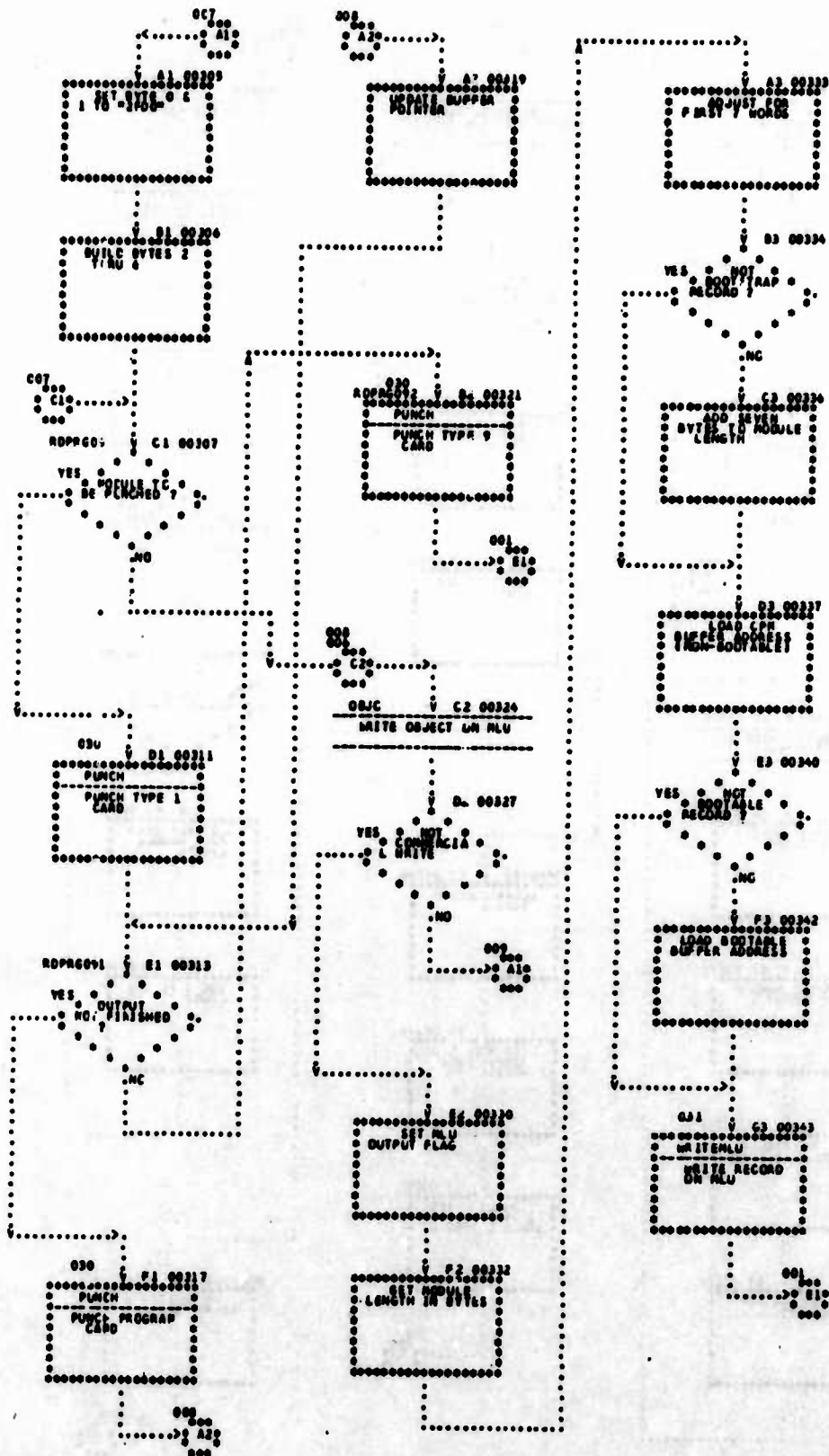
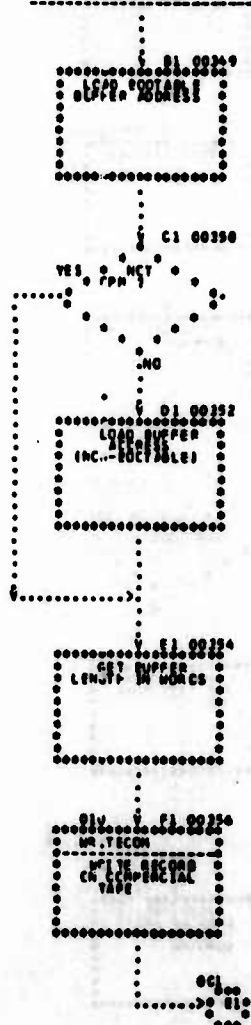


FIGURE SHEET ONE OF TWO FLOWCHART



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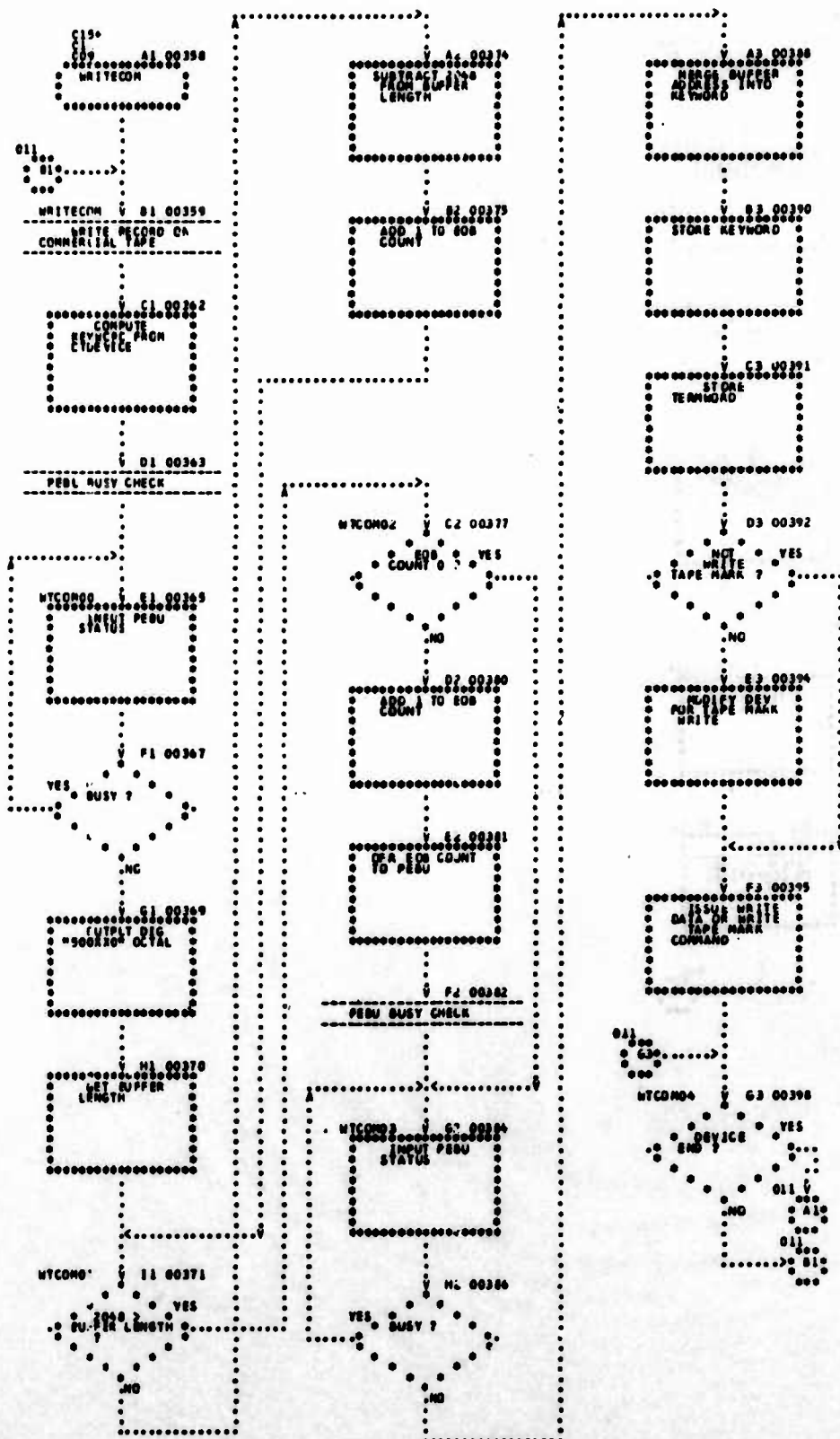


FIGURE 20: PUP
SHEET 010 OF 050 FLOWCHART

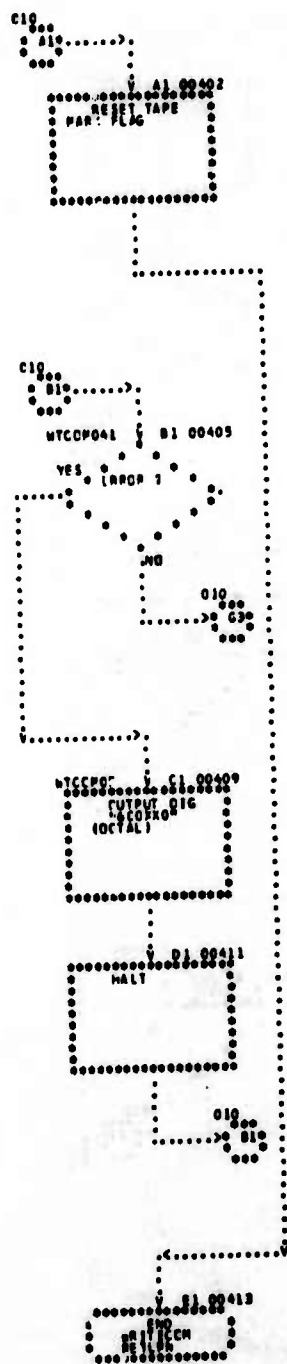


FIGURE 20 RVP
SHEET 011 OF 056 FLOWCHART

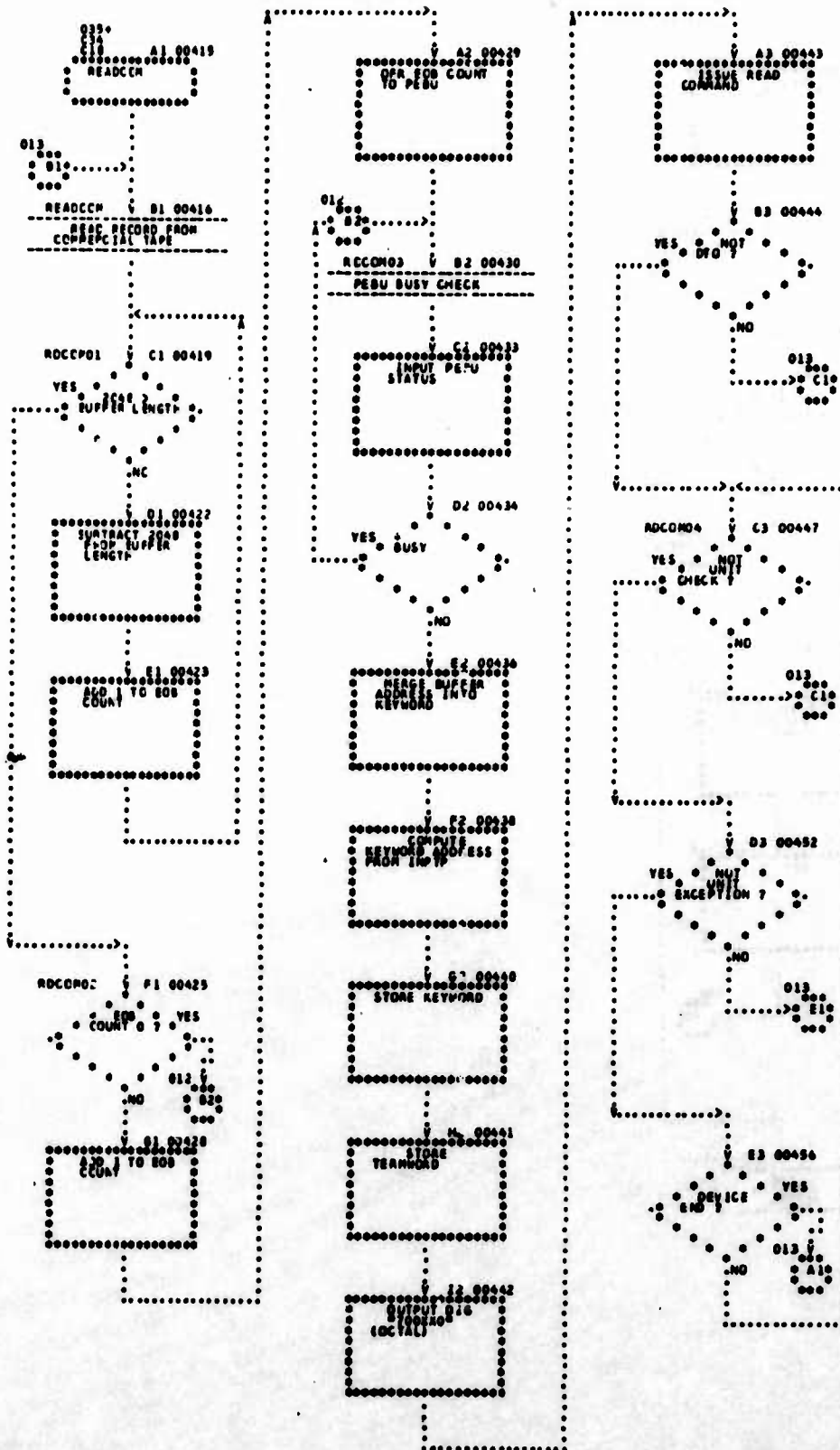


FIGURE 3-20 PUP
SHEET 512 OF 035 FLOWCHART

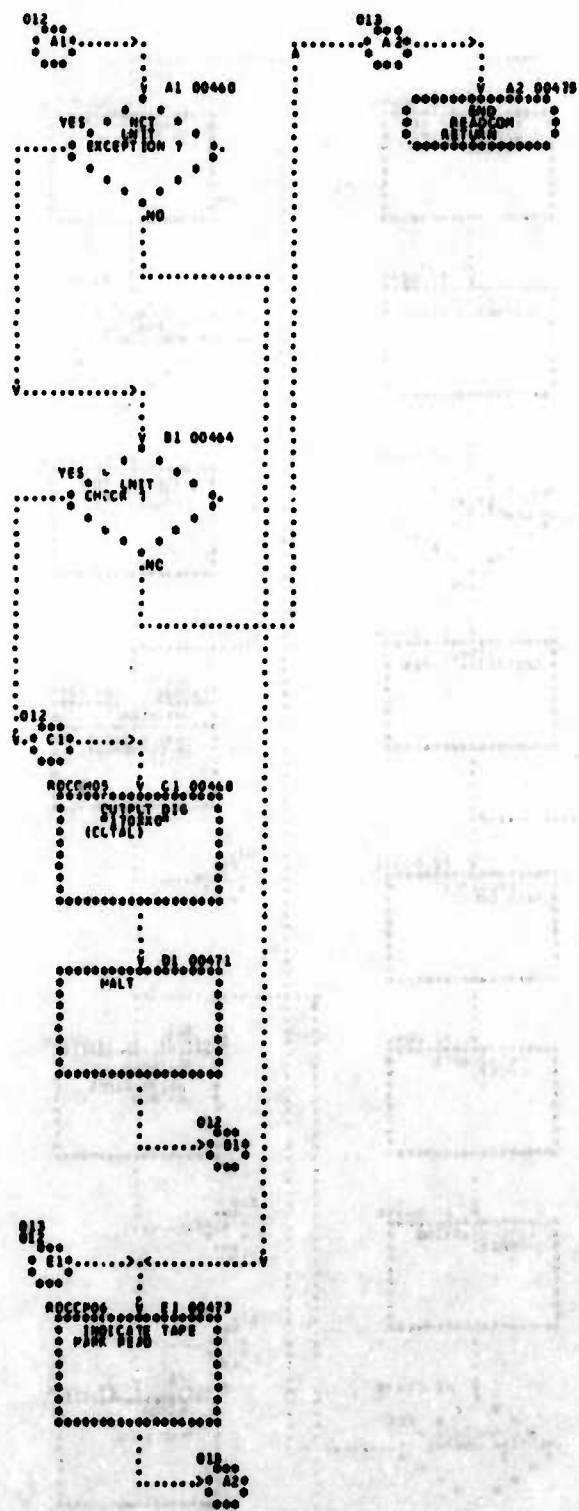


FIGURE 2-201 515 OF 605 PLANCHART

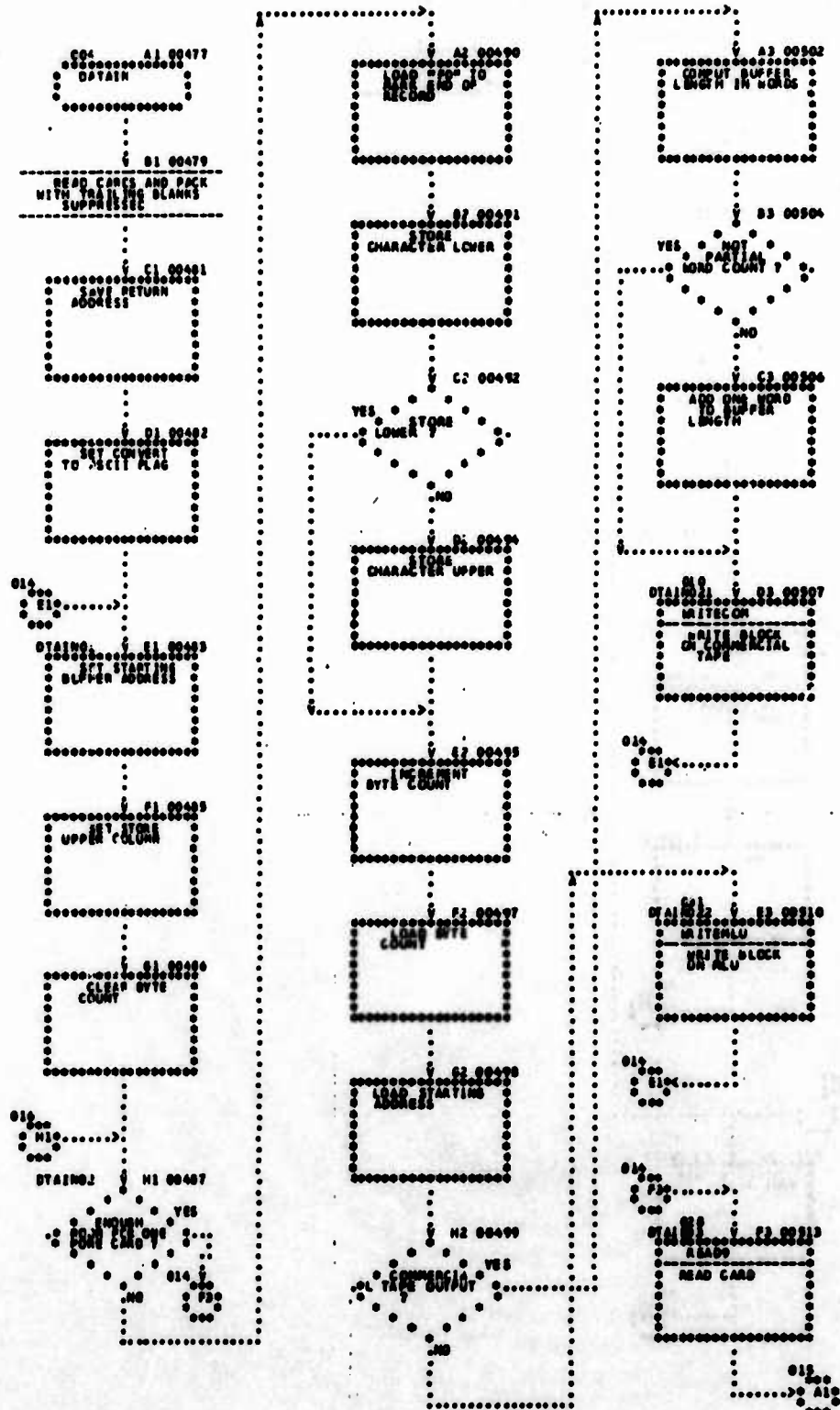
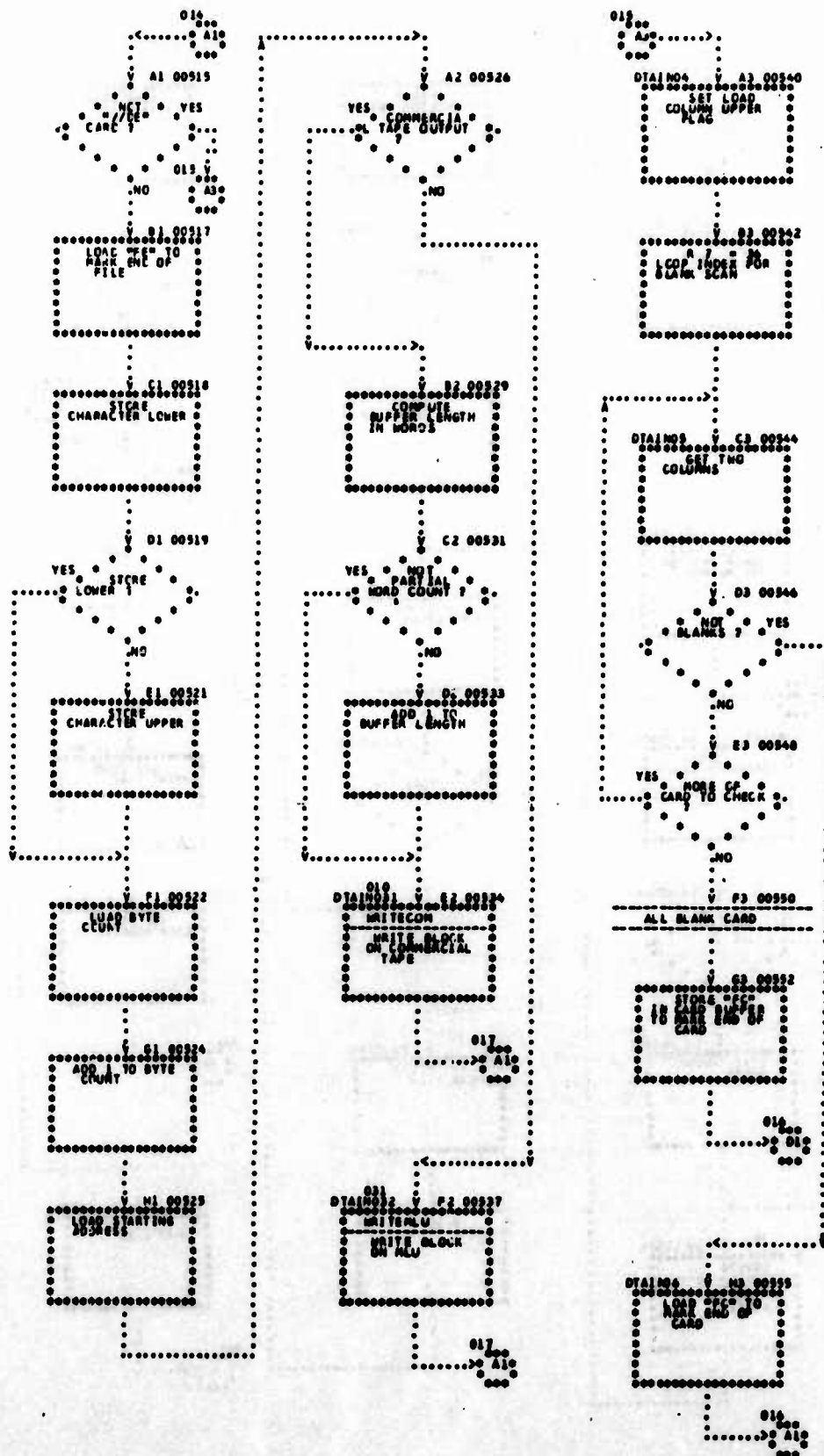


FIGURE 2-27 PUP
END OF PUP



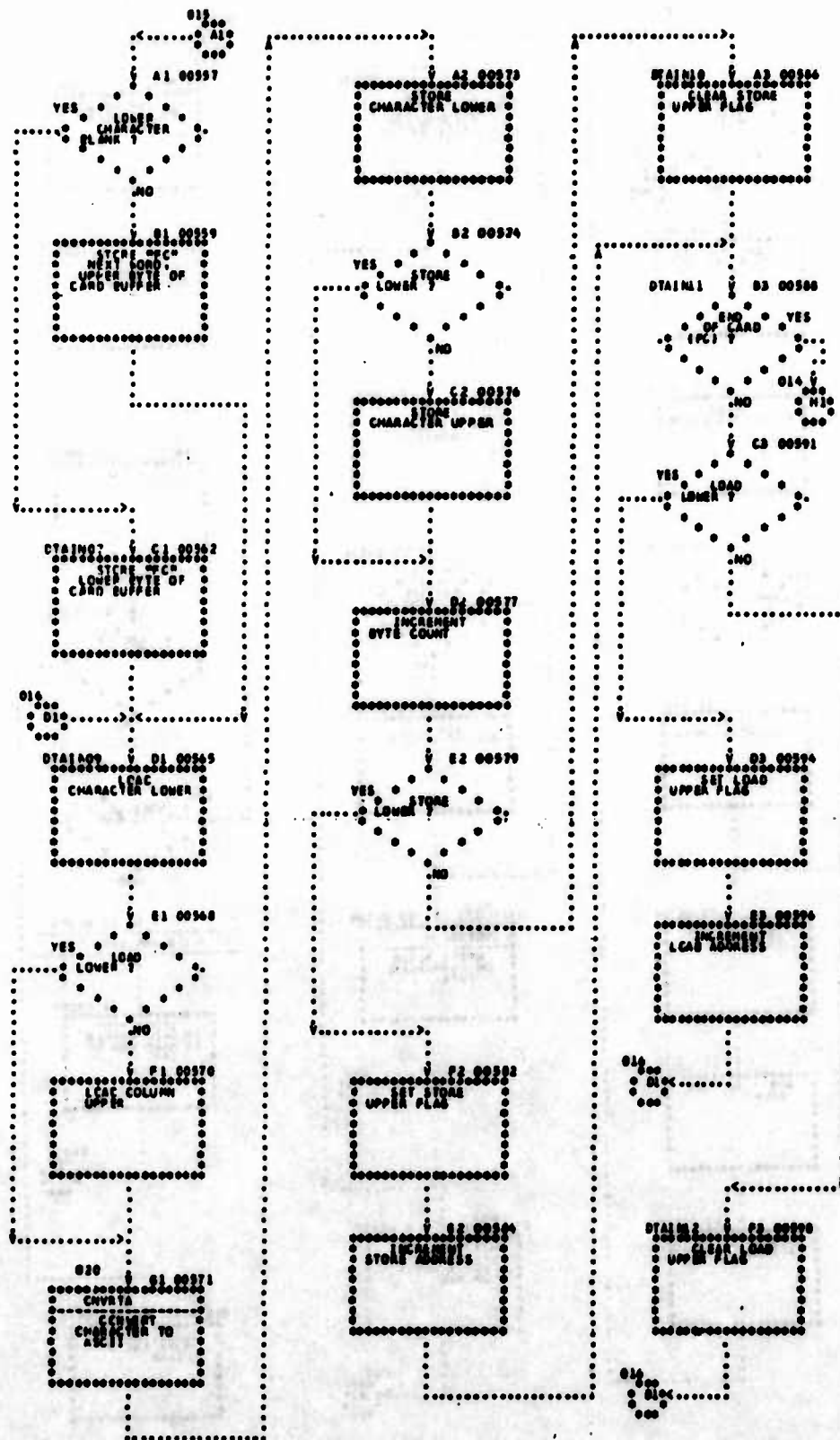


FIGURE 1-10 SETTING OF CHARACTER FLAGS



FIGURE 11-17 OF 11-17

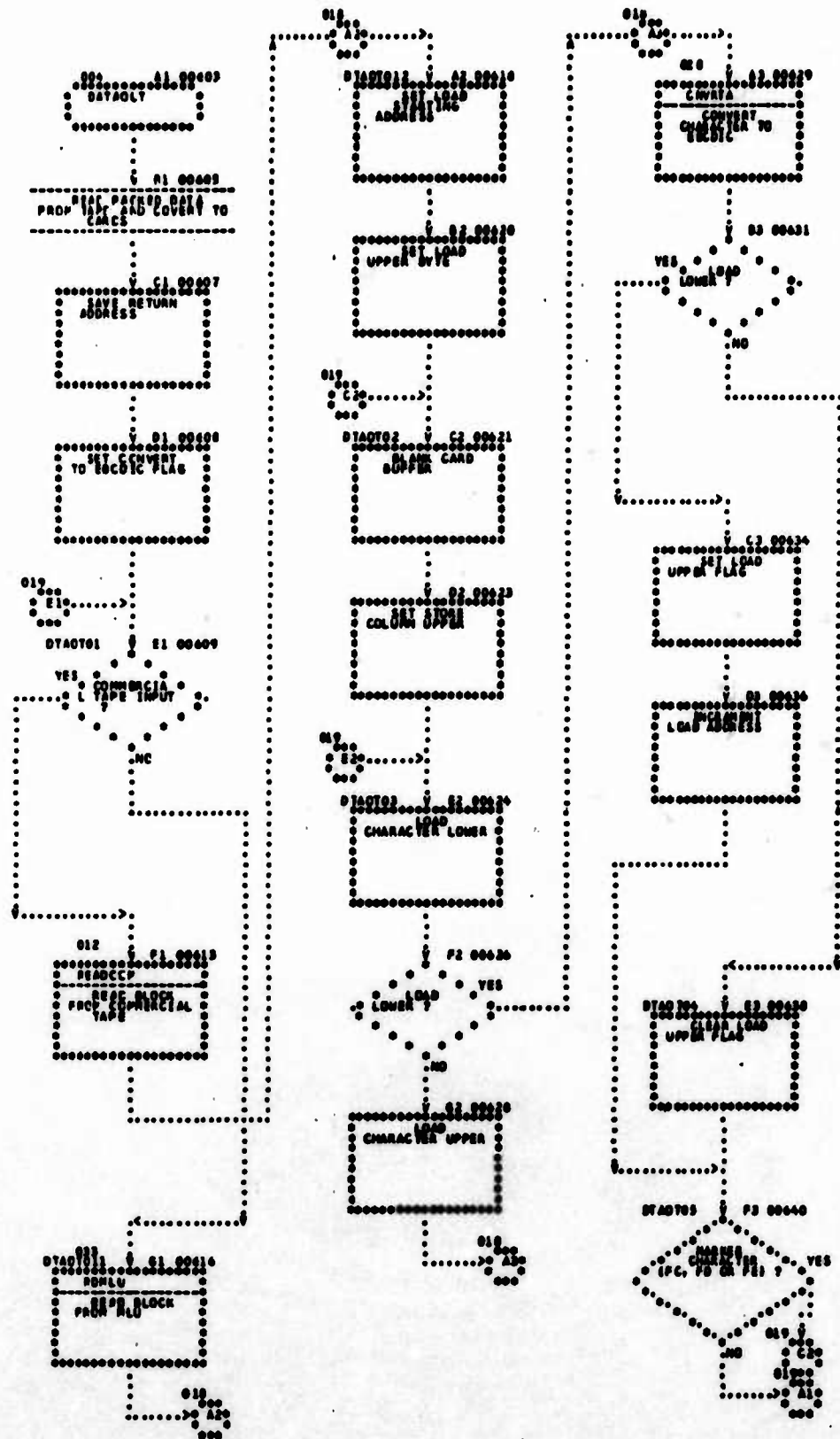


FIGURE 207 012 OF 005 FLOWCHART

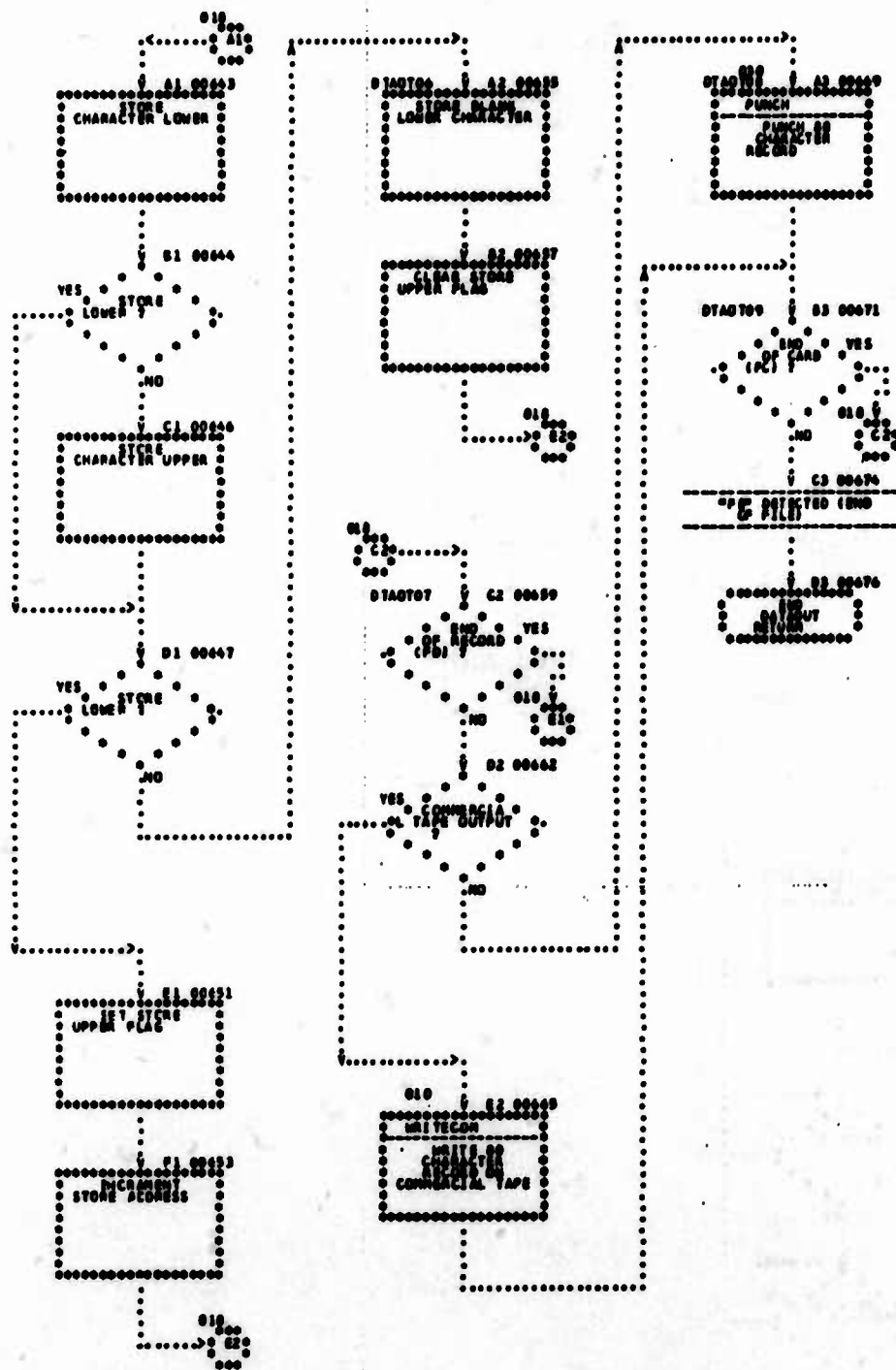


FIGURE 20. CVC FLOWCHART
SHEET 010 OF 055

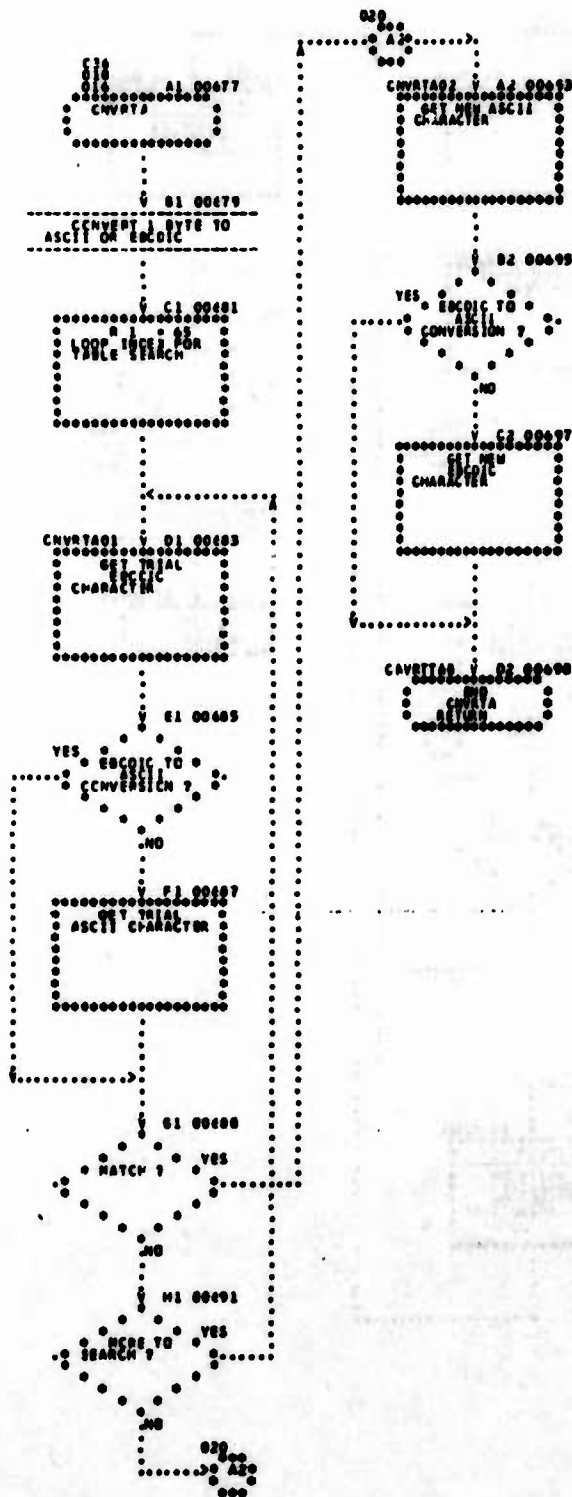


FIGURE 1. SET NEW OF EBC

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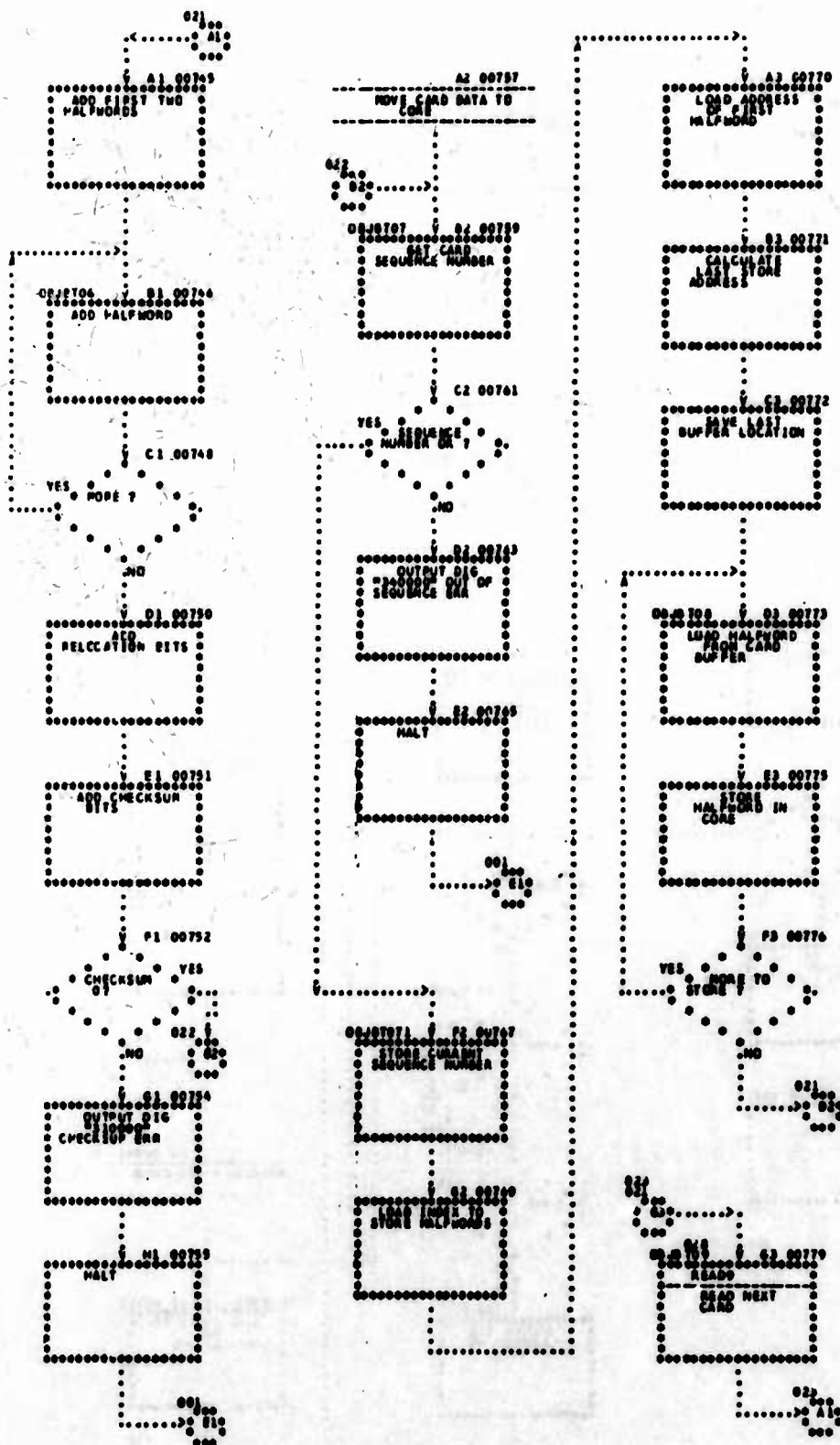


FIGURE 11 SHEET ONE OF TWO PLANCHART

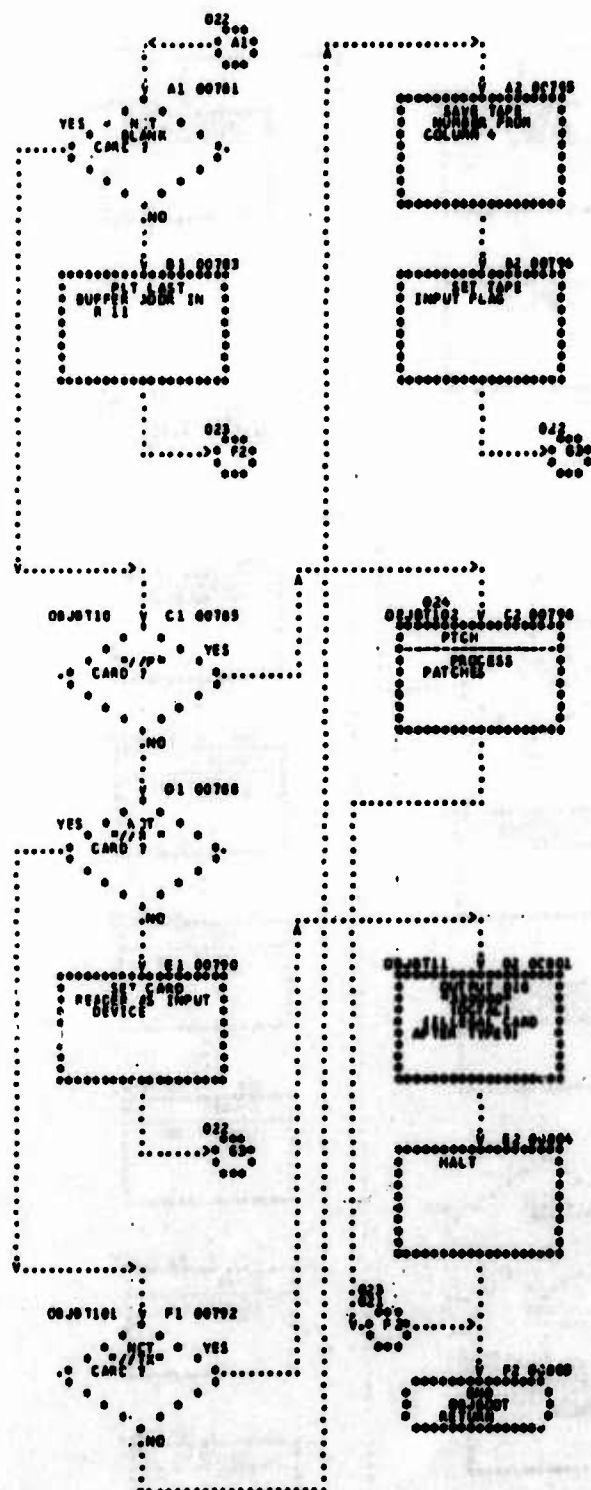


FIGURE 20 SHEET 203 OF 200 "LUNCHART"

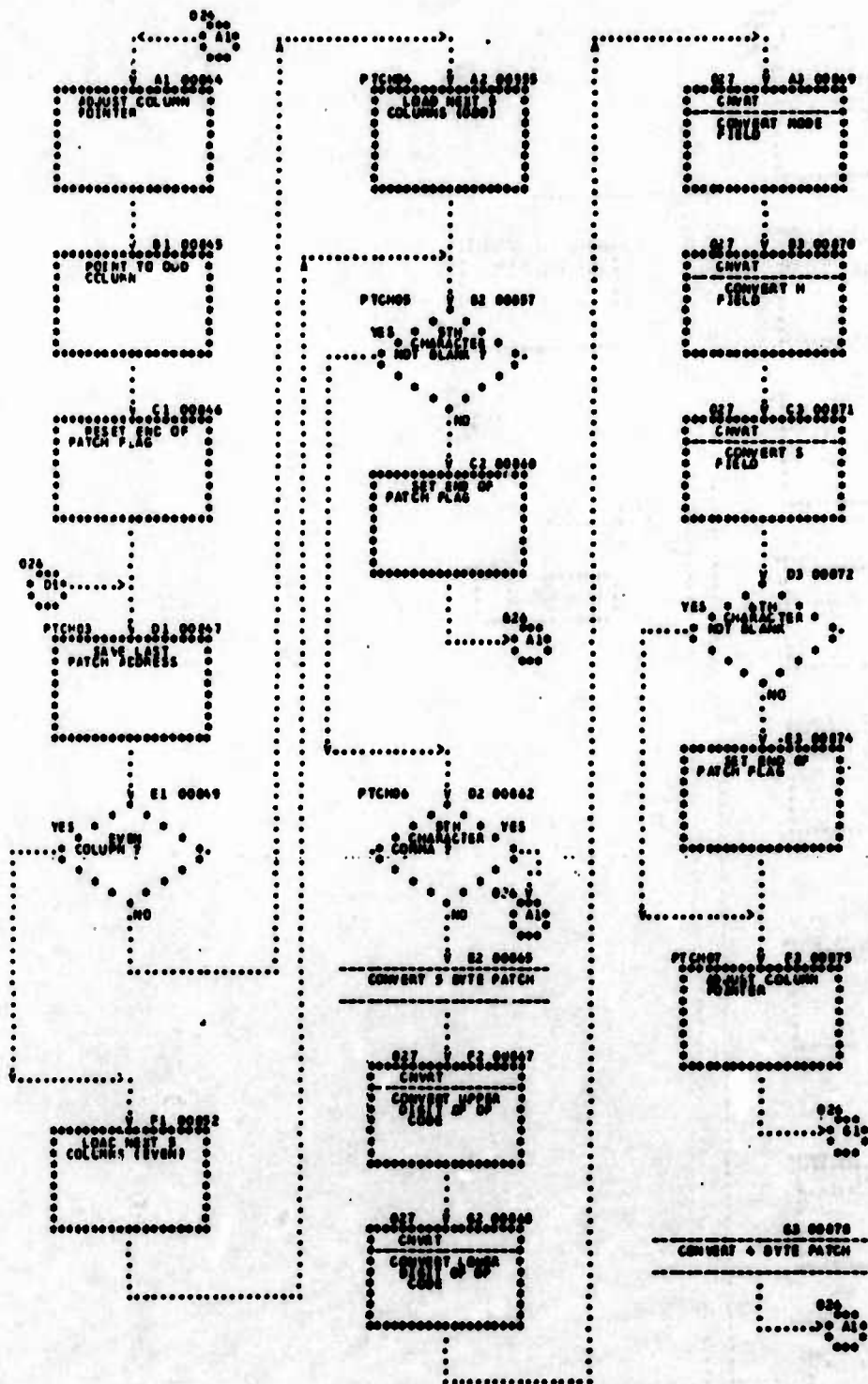


FIGURE 20: SHEET 2 OF 001 FLOWCHART

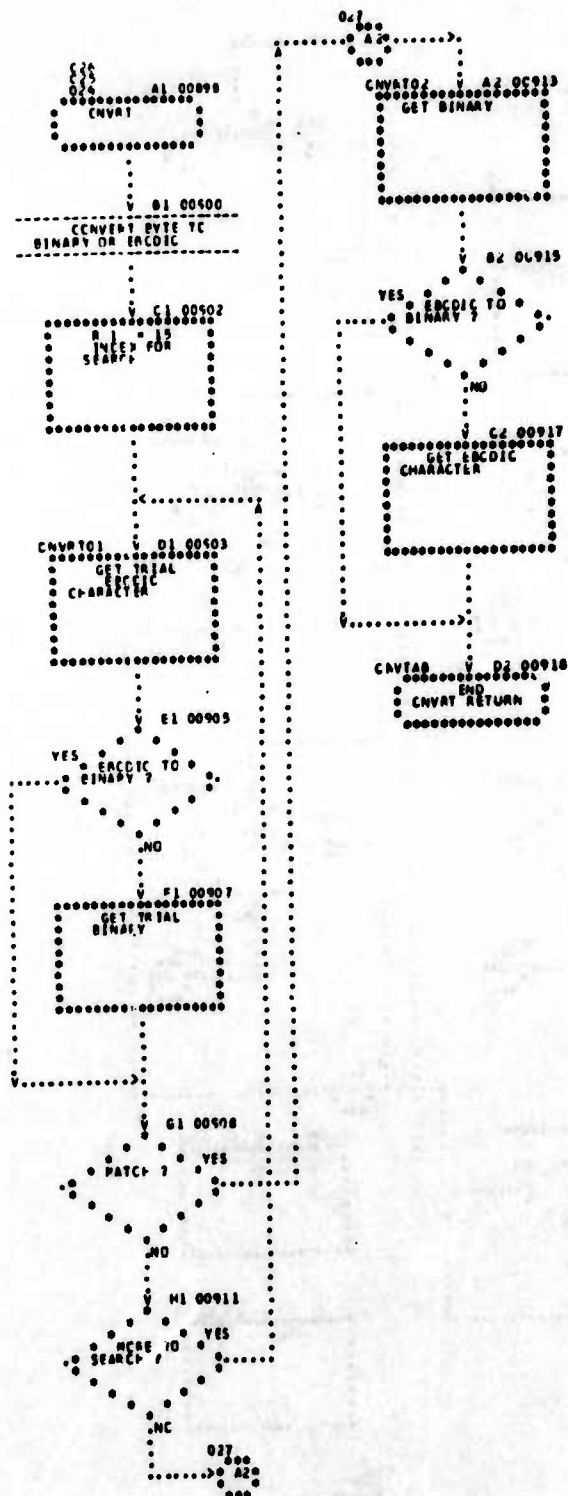


FIGURE 20. PMP FLOWCHART
SHEET 027 OF 036

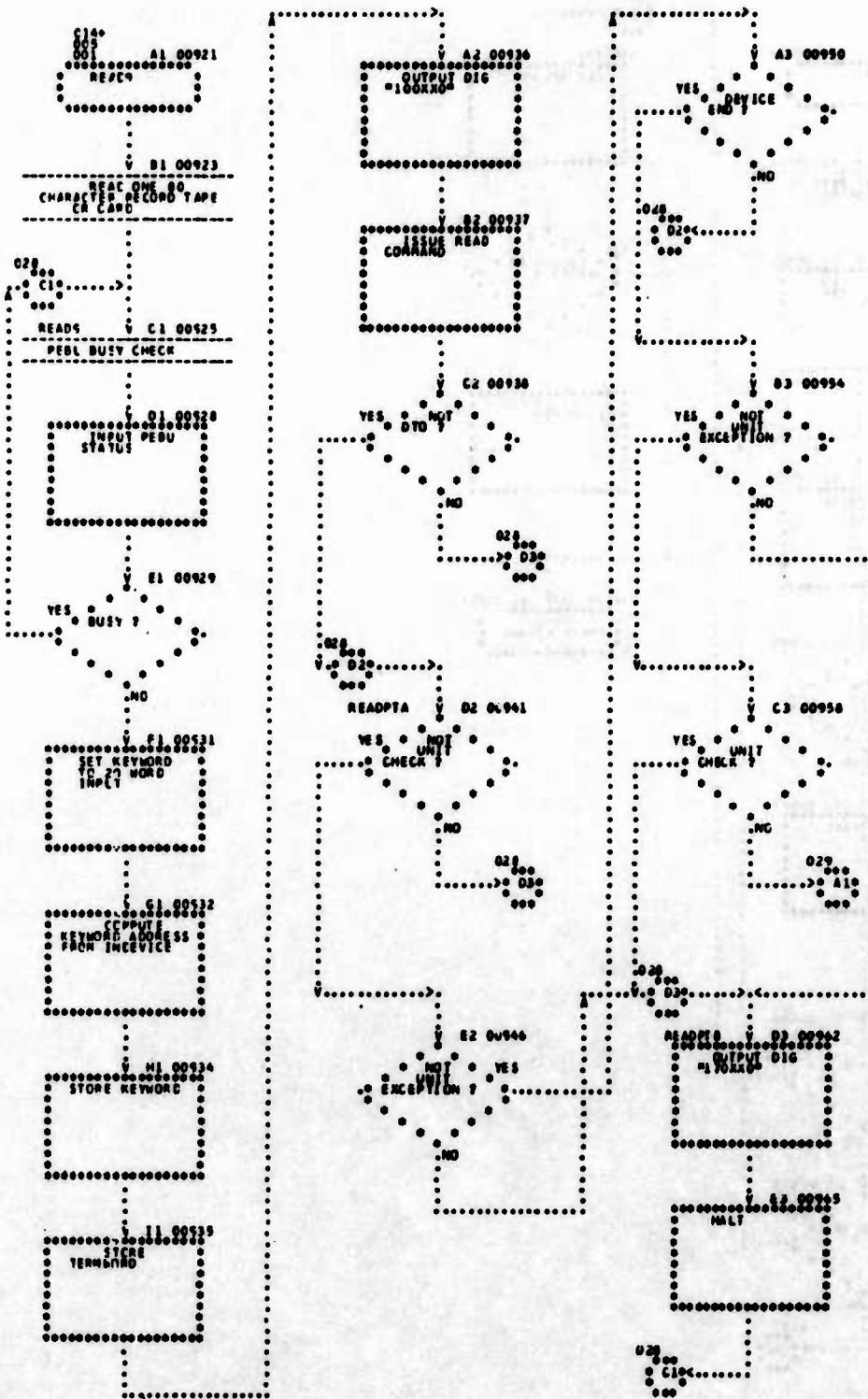


FIGURE 20 PUP FLOWCHART
SHEET 030 OF 030

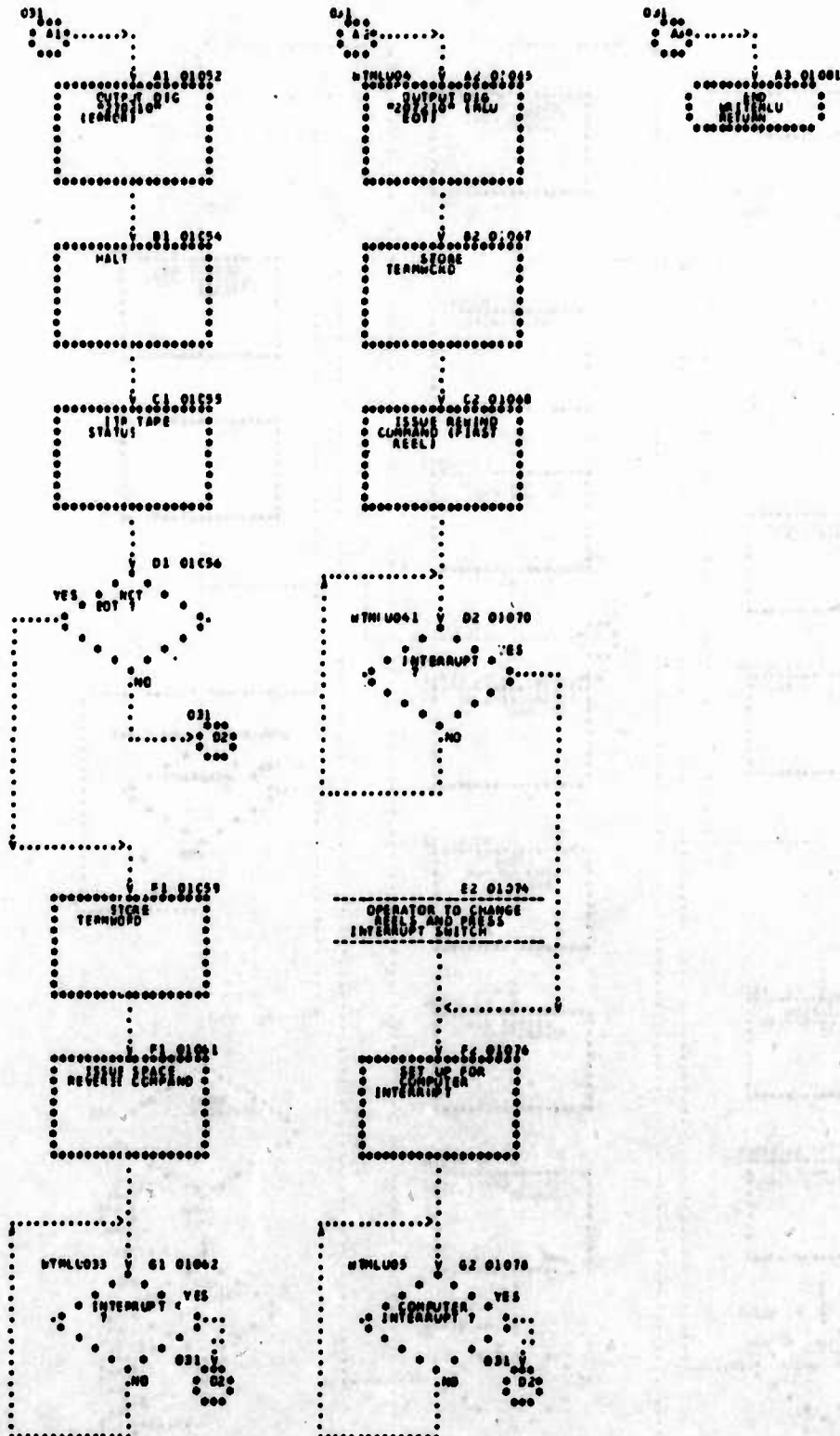


FIGURE 1-10 PUP
PAGE 10 OF 10 FLOWCHART

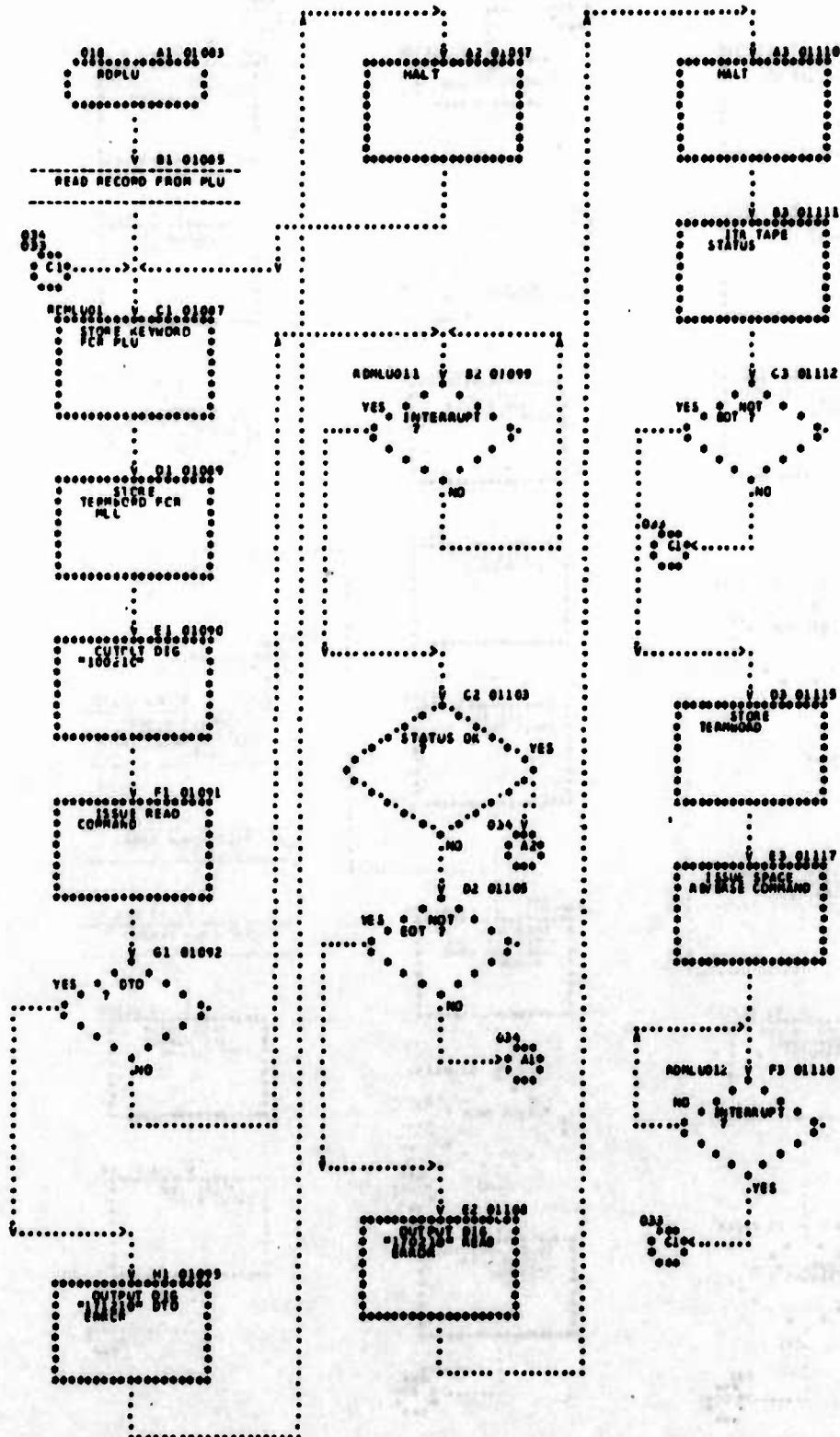


FIGURE 101 015 OF 005 FLOWCHART



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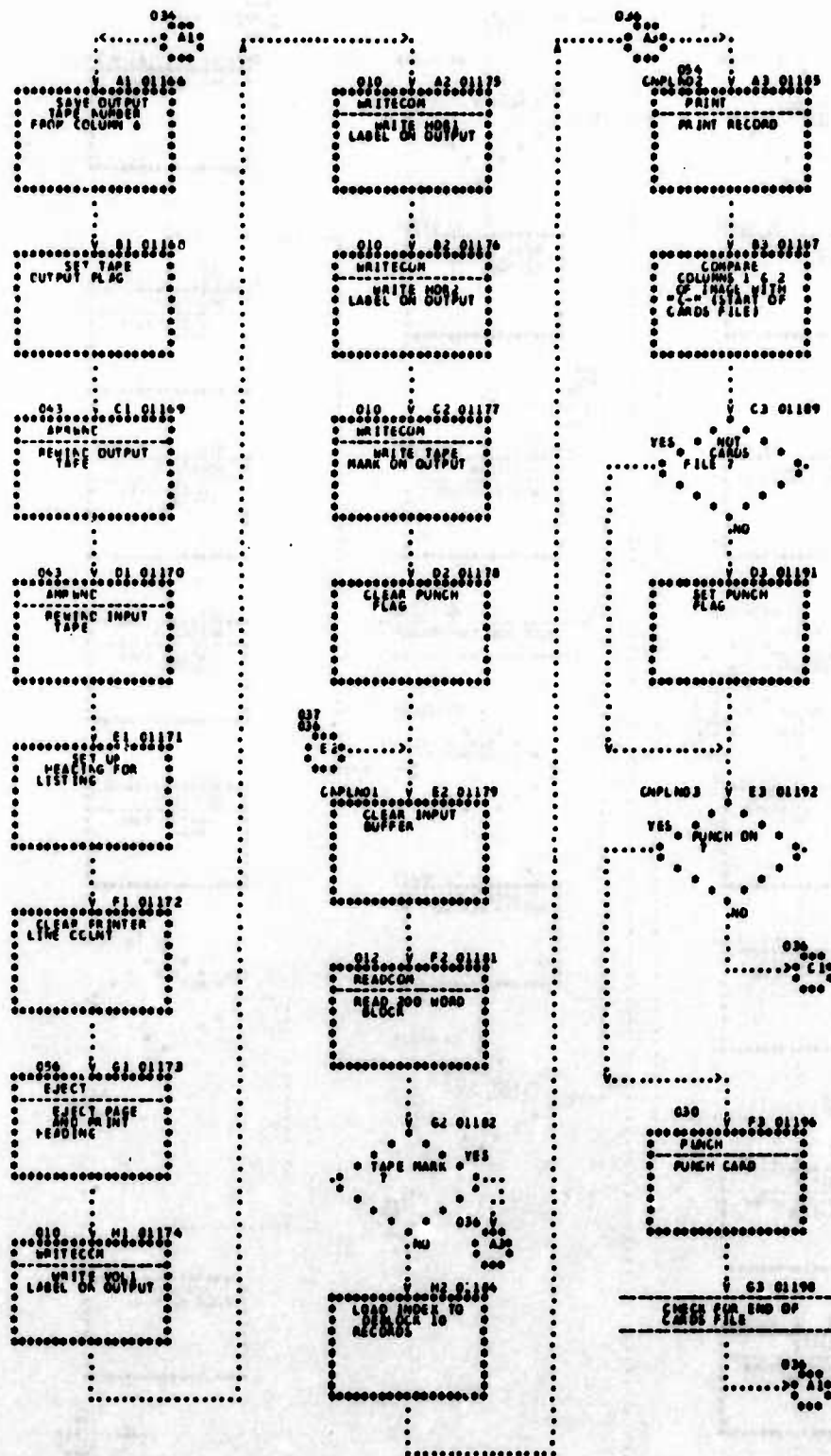


FIGURE 20 PUP
SHEET 005 OF 005 PLOWCHART

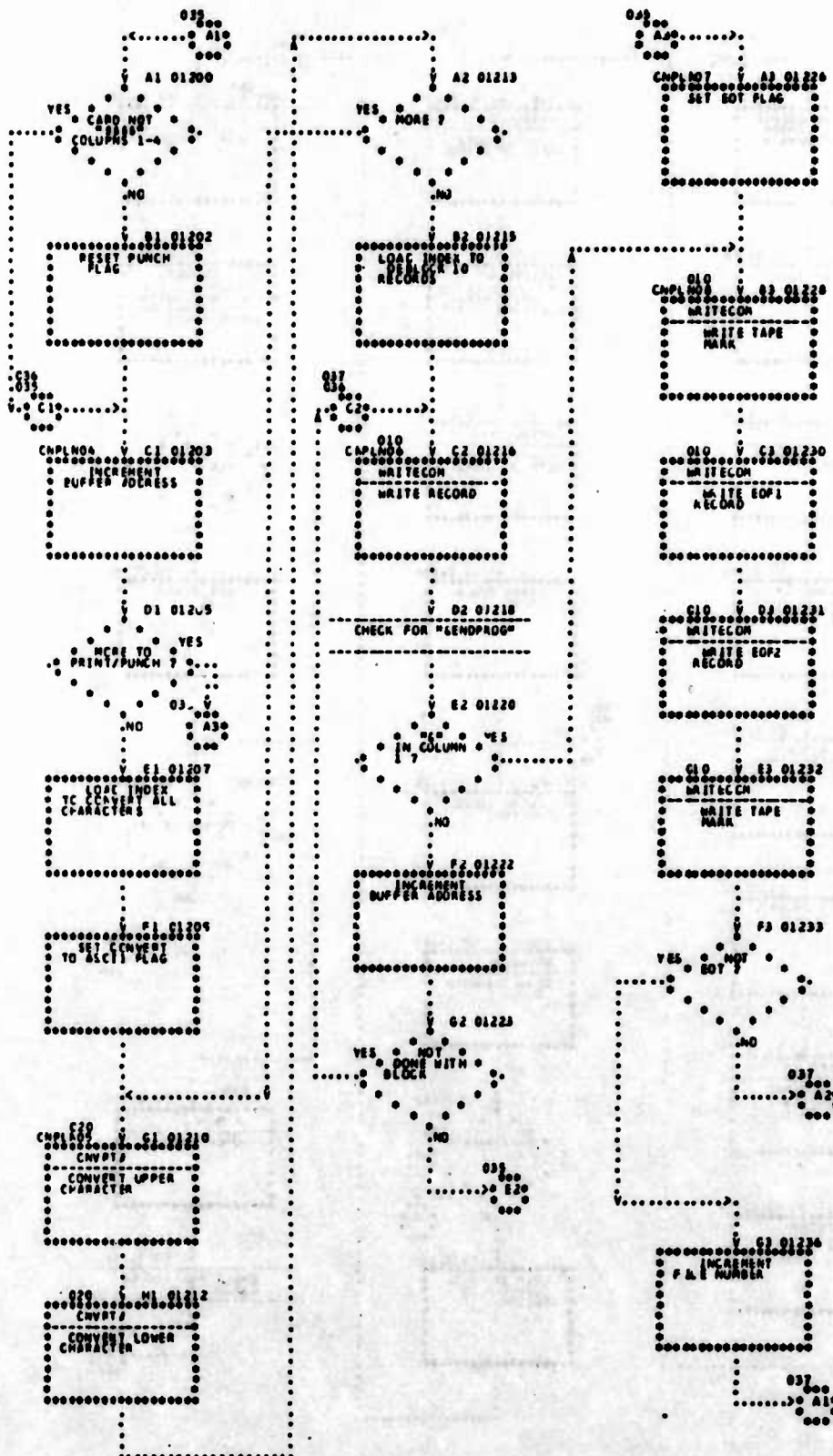
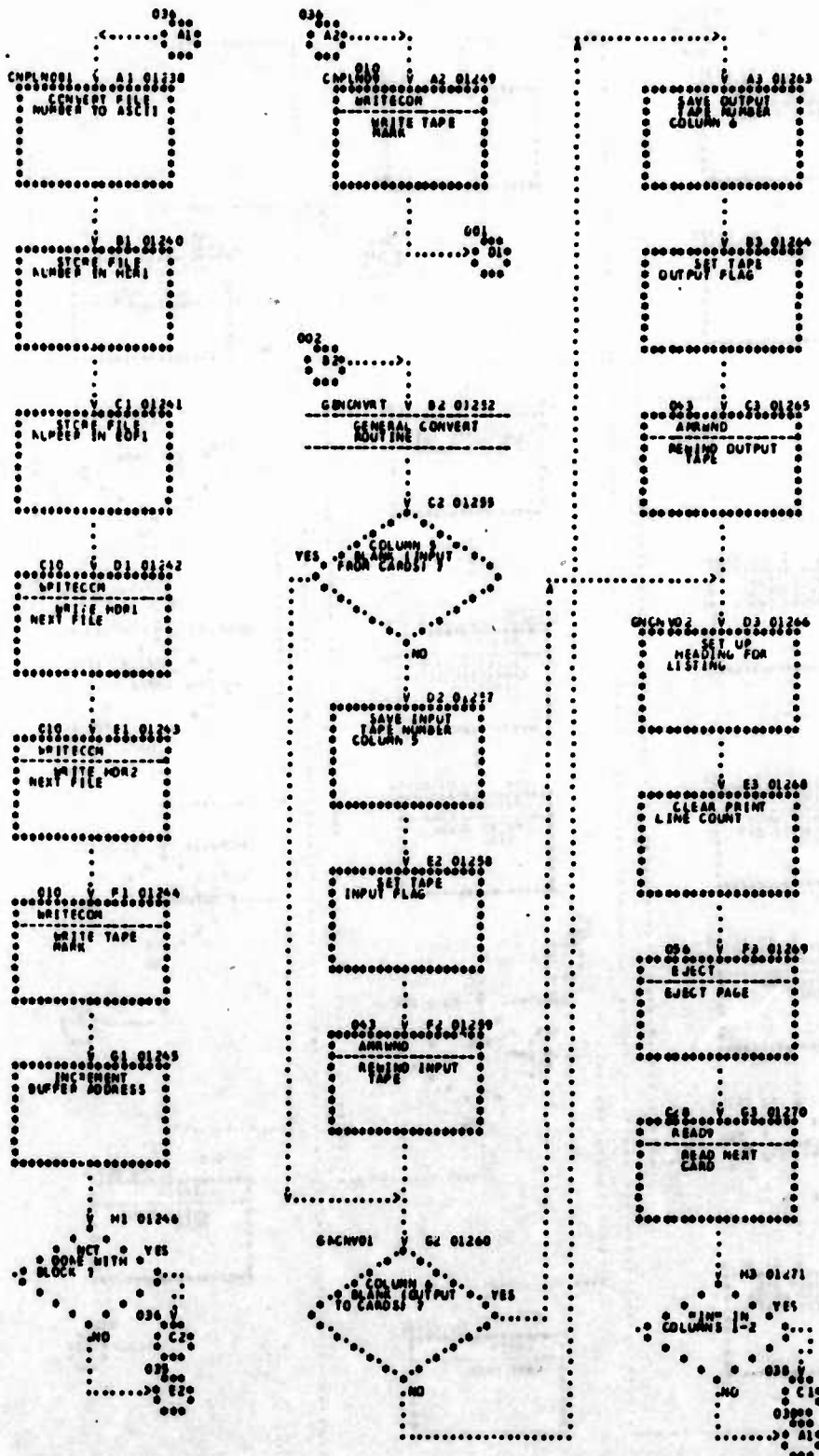


FIGURE 28 CPM FLOWCHART
SHEET 006 OF 056



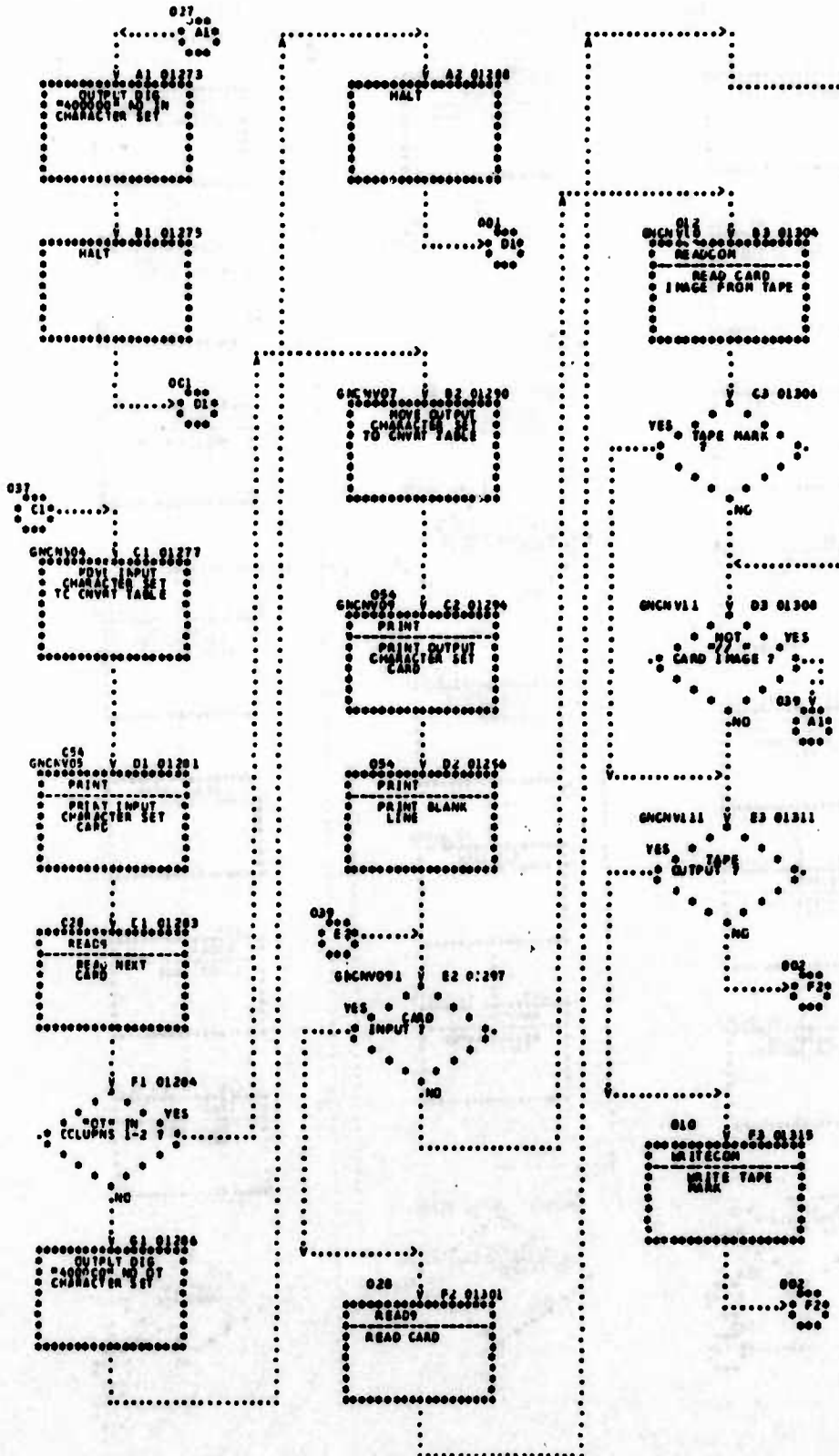


FIGURE SHEET 201 OF 206 FLOWCHART

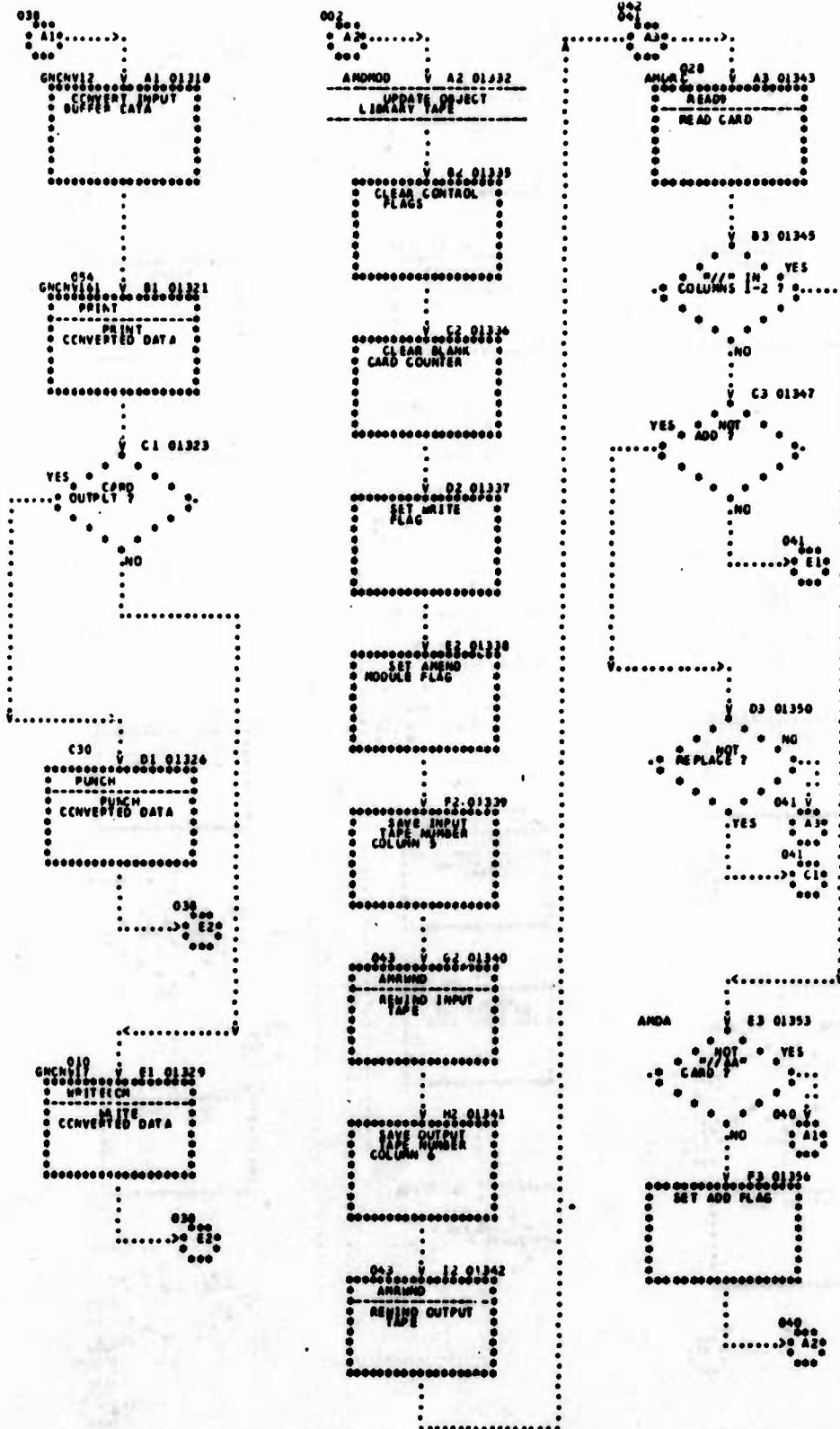


FIGURE 20 PUP
SHEET 035 OF 036 FLOWCHART

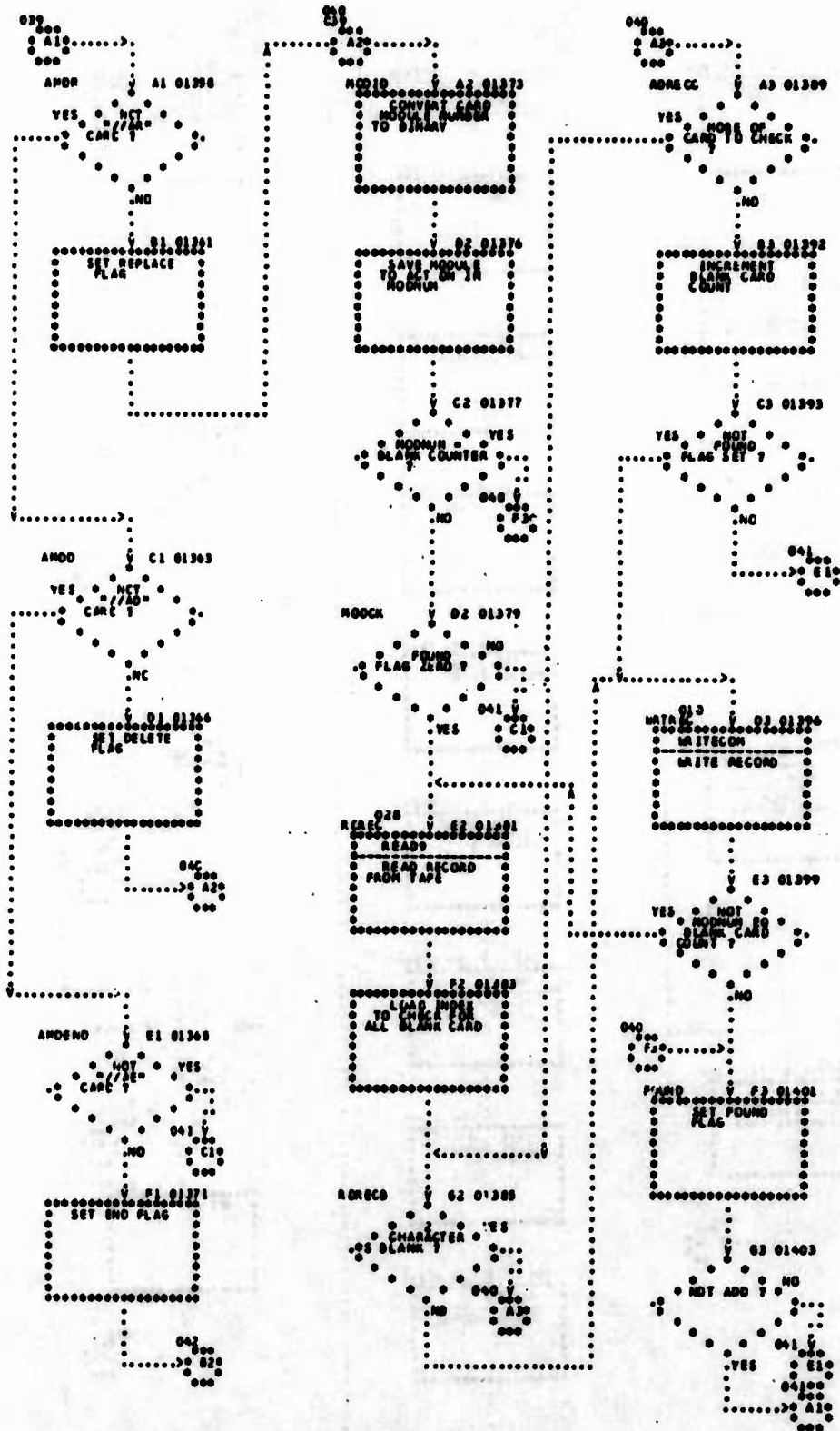


FIGURE : 201 PVE OF 221 FLOWCHART

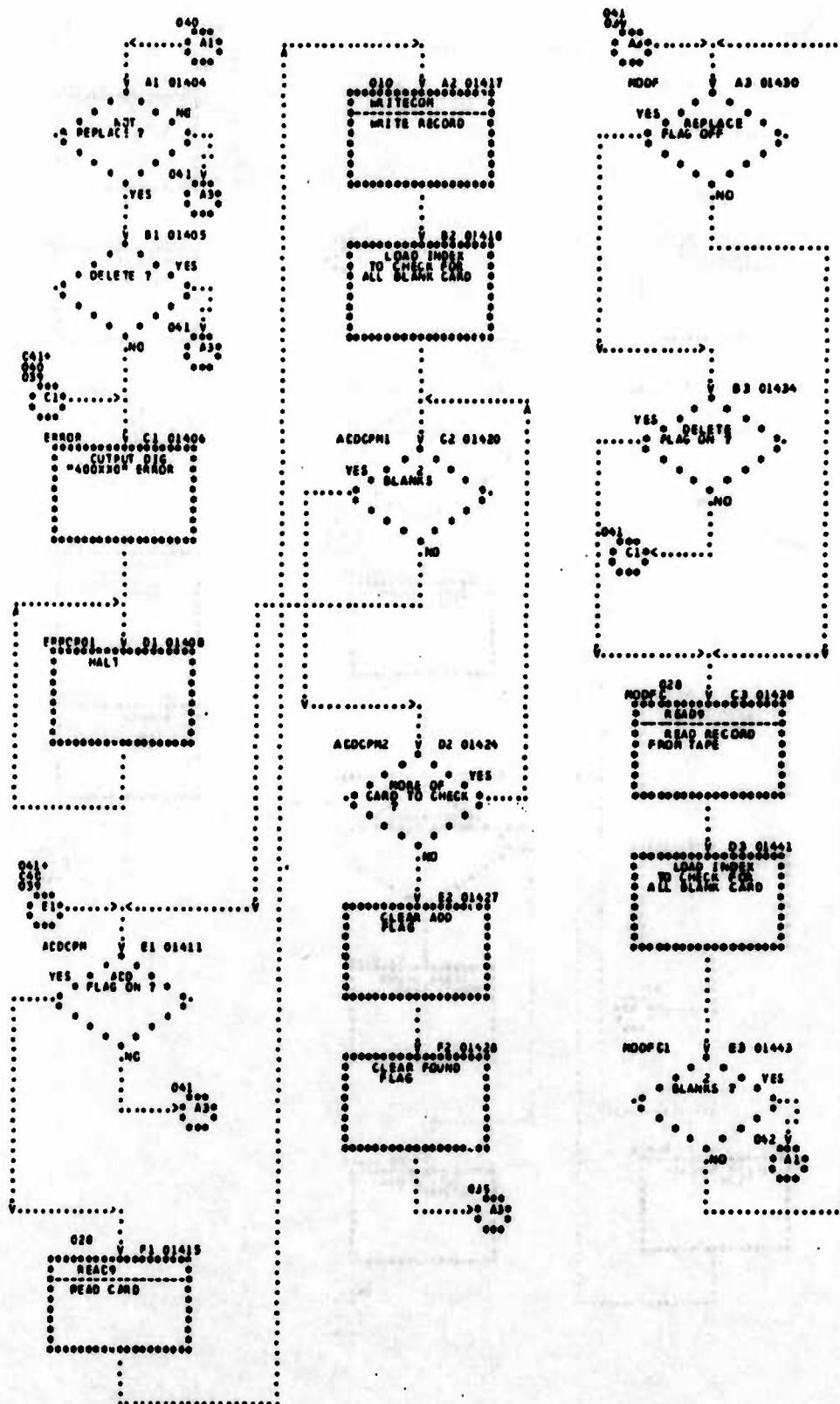


FIGURE 20 PUP FLOWCHART
SHEET 041 OF 045

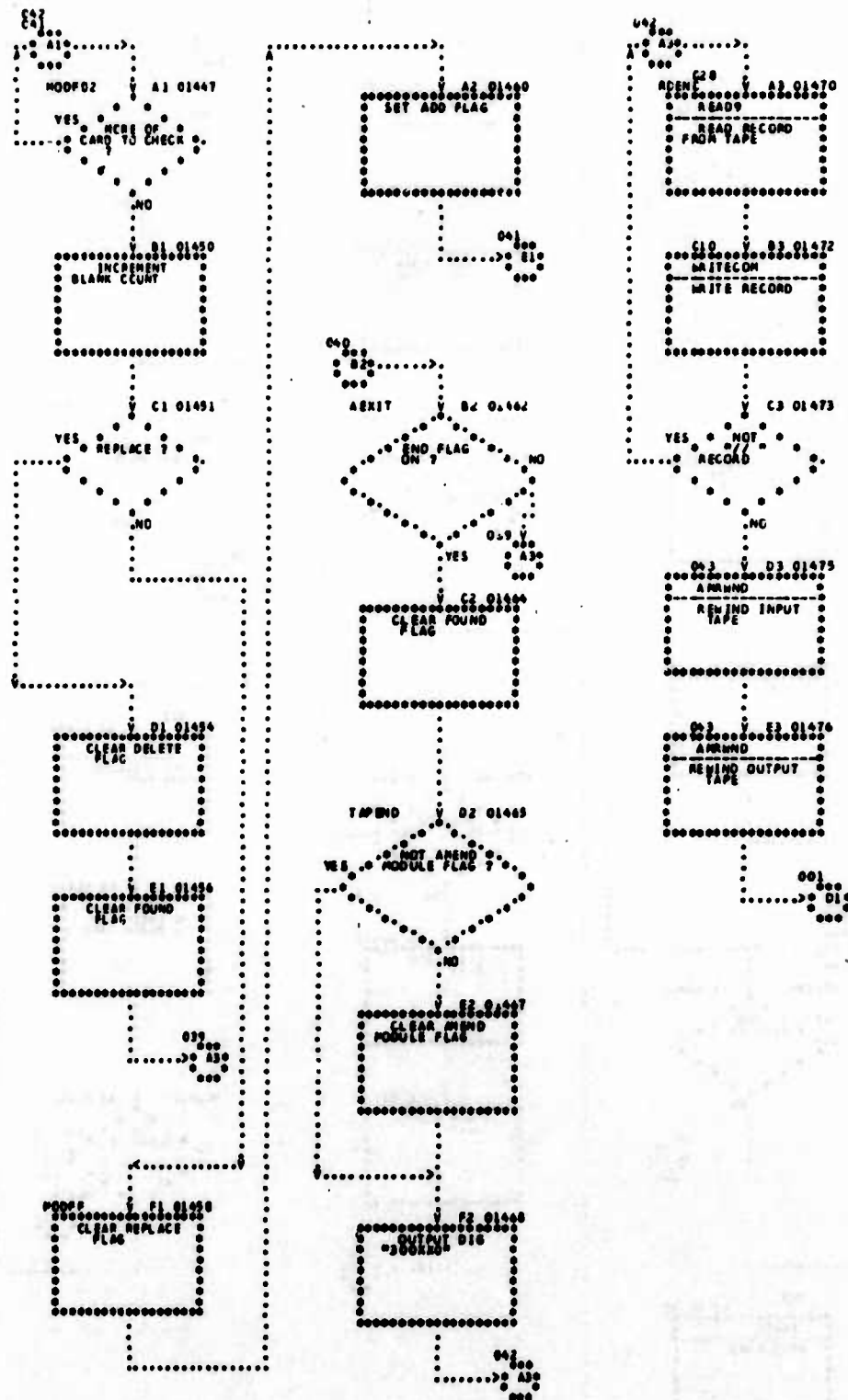


FIGURE 20 PUP SHEET 045 OF 055 FLOWCHART

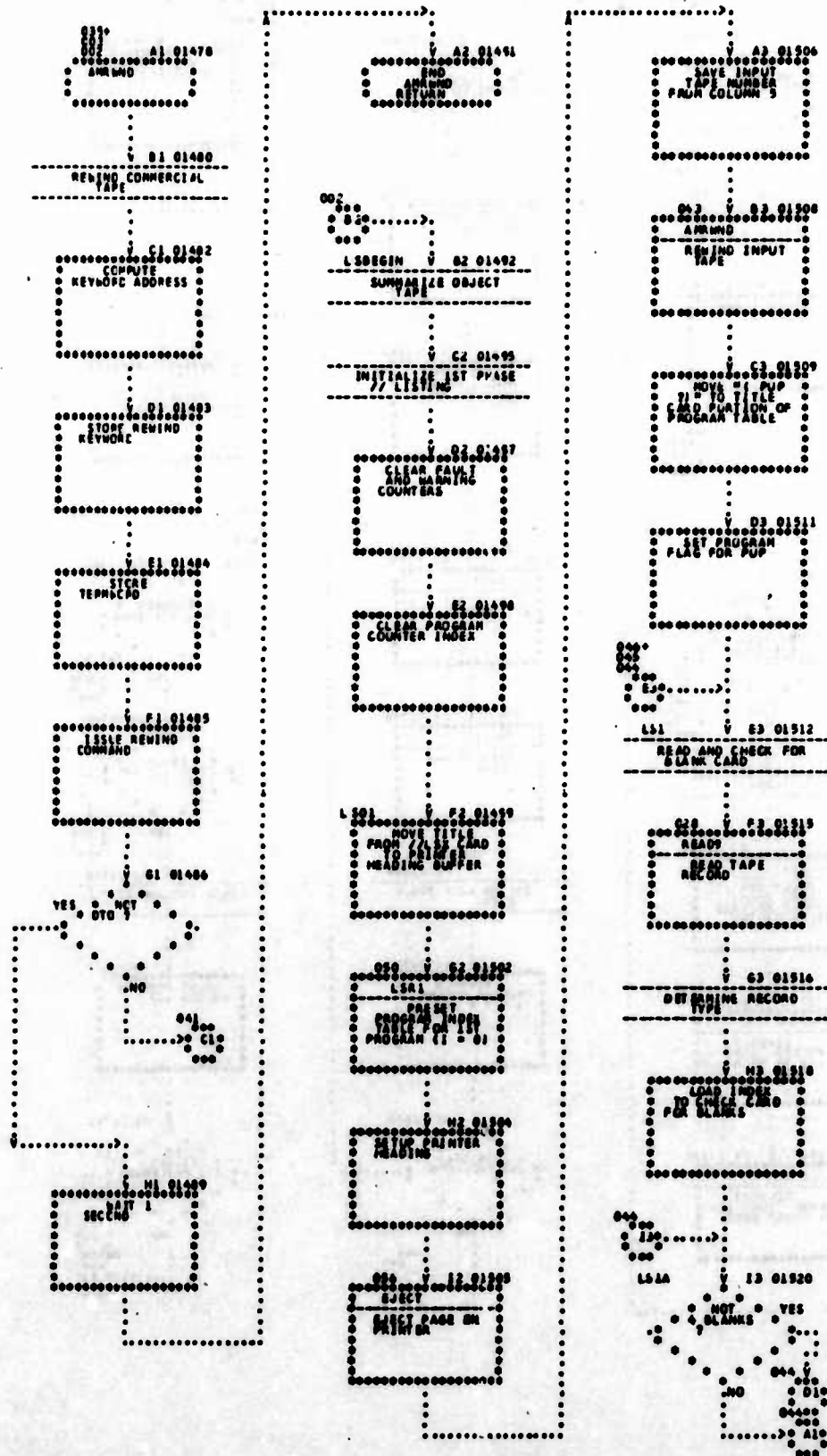
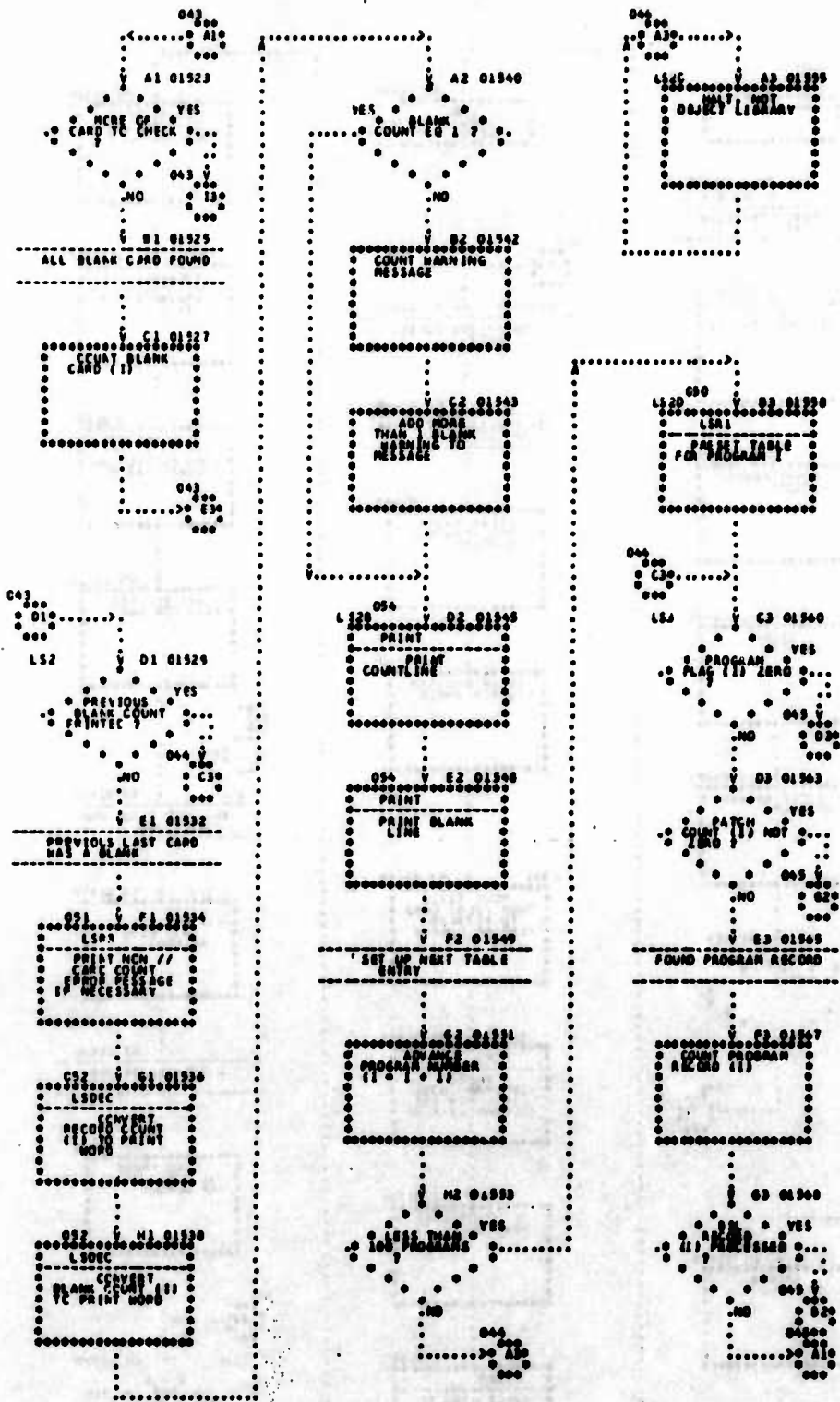


FIGURE 20 PUP
SHEET 045 OF 046



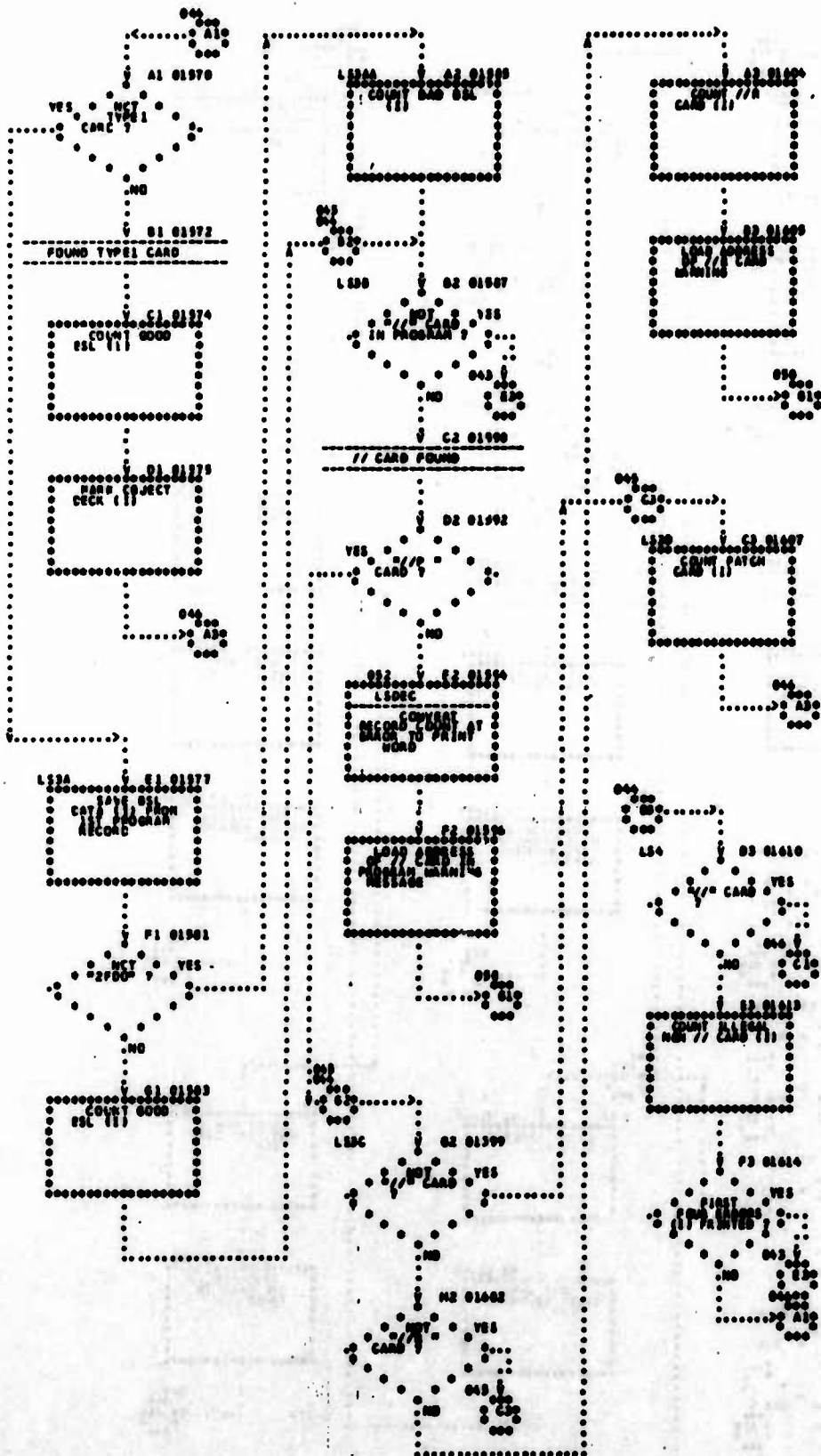


FIGURE 10. FLOWCHART

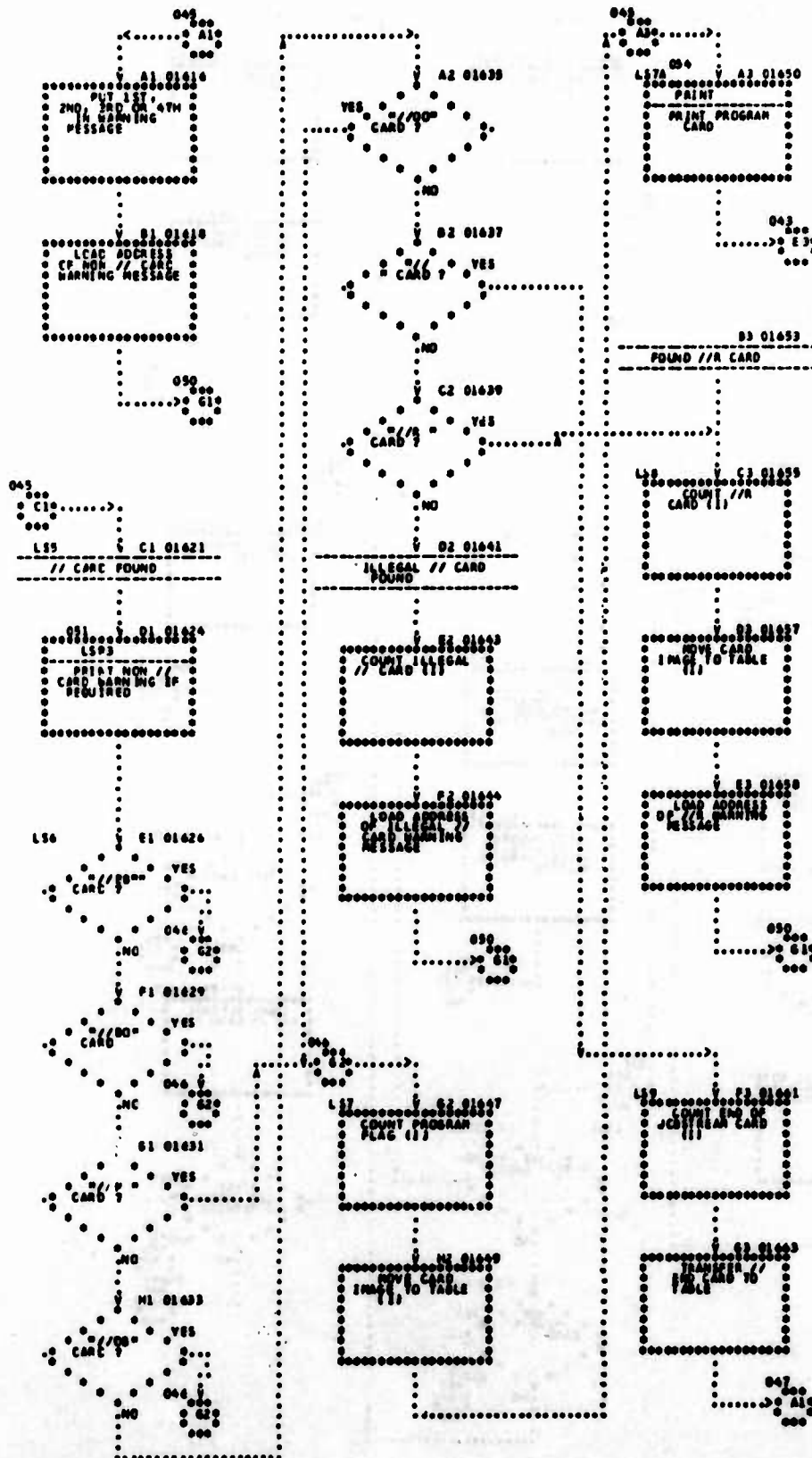


FIGURE 2-11 FLOWCHART

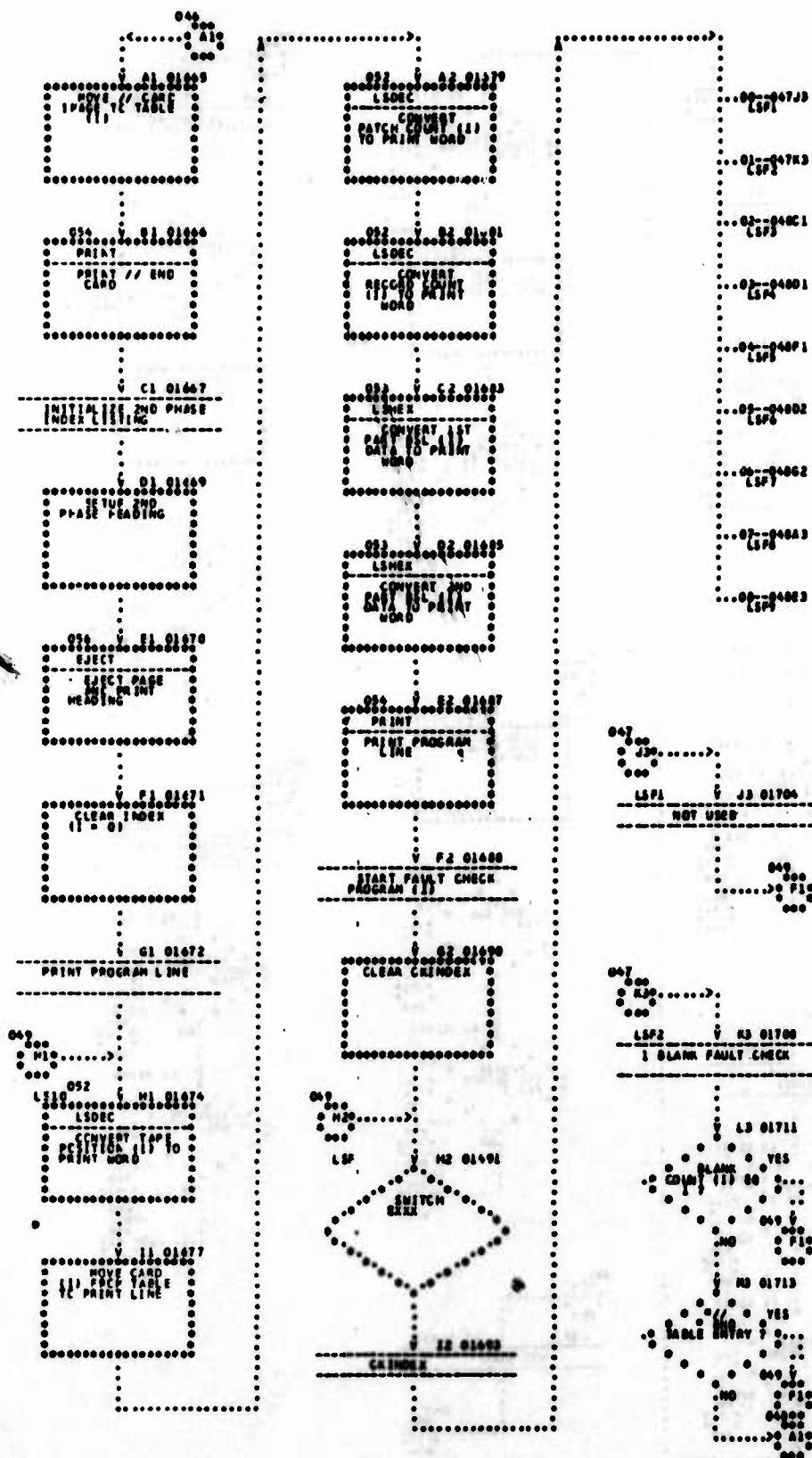


FIGURE SHEET 24 OF 25 - FLOWCHART





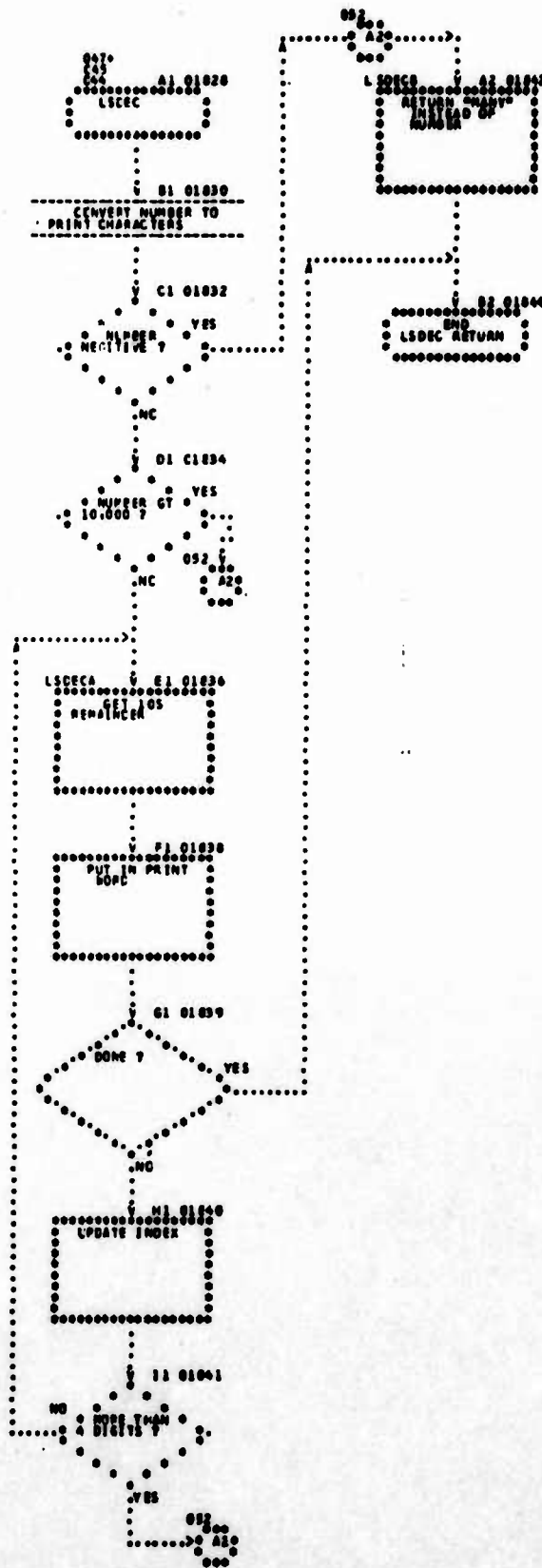


FIGURE 20-10-1 FLOWCHART

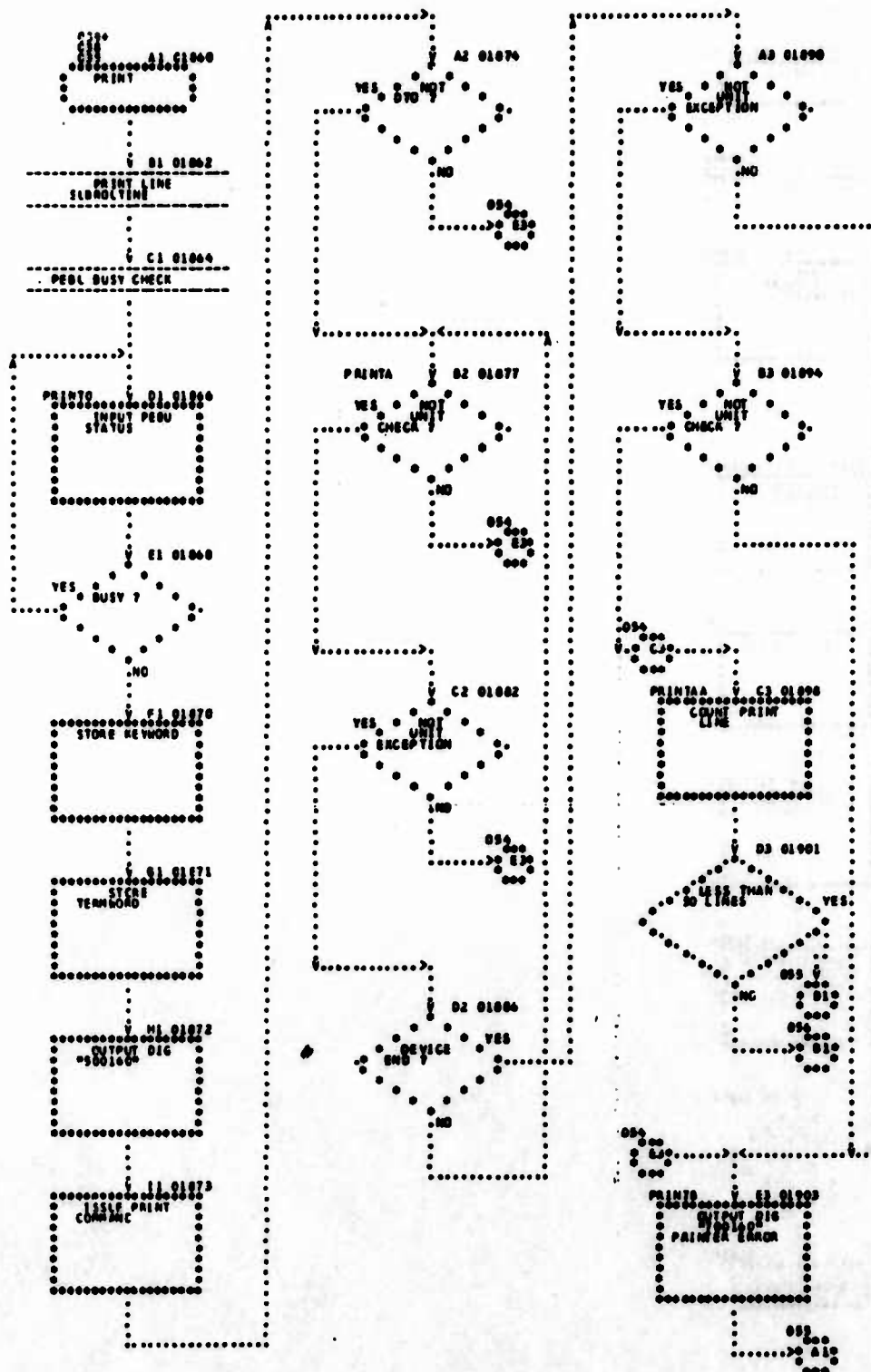


FIGURE 20 PIP FLOWCHART
SHEET 004 OF 006

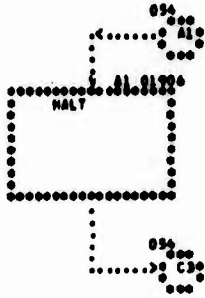


FIGURE 20-500 CVC FLOWCHART
SHEET 500 OF 500

