MECHANIZED AIDS TO MANAGEMENT
INDIVIDUAL CIRCUIT USAGE RECORDER IMPLEMENTATION
JOB ORDERING AND COORDINATION

CONTENTS PAGE

1. GENERAL

1.01 This section provides the necessary information to assist in coordinating the ordering of the equipment for implementing the Individual Circuit Usage Recorder (ICUR) Subsystem of the Engineering and Administration Data Acquisition System (EADAS). It also provides information for coordinating the initiating of an ICUR Subsystem. The ICUR Subsystem may be installed coincident with a new EADAS as an optional enhancement or may be added to an existing EADAS. Dial Facilities Management Practices, Division D, Section 5a contains a general EADAS/ICUR System description. Figure 1 is a simplified diagram of an EADAS/ICUR System.

1.02 When this section is reissued this paragraph will contain the reason for reissue.

1.03 References in this section to methods, planning, data requirements, service levels, and equipment quantities are based on American Telephone and Telegraph Company recommendations.

1.04 The title of each figure includes a number(s) in parentheses. This number(s) identifies the paragraph(s) in which the figure is referenced.

2. JOB ORDERING

2.01 Significant portions of this phase of the implementation of an EADAS/ICUR System depends upon the traffic engineer. Preparation of the proper traffic orders for the central control unit (CCU) and the EADAS traffic data converter (ETDC) traffic usage recorder (TUR) locations to be included in the ICUR Subsystem are critical. It is suggested that the appropriate staff or line (CCU) administrator be involved in the decisions concerning the ICUR equipments and the timing of their installation.

2.02 The traffic order or its equivalent is the basic source document for the preparation of the Western Electric Company EADAS Questionnaire, Form E-8109. This form is used for ordering EADAS/ICUR equipment (including quantities,

features, and options). Accordingly, the questionnaire format is recommended as a guide for use by the traffic engineer in furnishing the appropriate information in the traffic order. It is suggested that the designated CCU administrator and staff dial administration personnel obtain or have direct access to a completed Form E-8109. This will ensure firsthand knowledge of the types and quantities of various equipment configurations for which operations will be responsible.

2.03 Traffic Facilities Practices, Division B, Section 9b, for basic EADAS provides a comprehensive description of the types of information that the traffic order must provide to Western Electric. Adequate quantities of spare parts should be included in the traffic order. The CCU administrator and the respective dial administrators should be fully aware of the spare parts provision and should be in agreement on it.

2.04 As described in detail later in this section the following items of equipment need to be provided to implement the ICUR Subsystem:

(1) ***At the CCU:***

- An additional 32,000 words of core memory
- An additional cabinet
- The optional tape drive in basic EADAS and an additional moving-head disk are mandatory
- One or two fixed-head double-density disk drives
- A disk controller
- A card reader
- A receive only teletypewriter (TTY)

(2) ***At the ICUR ETDC location:***

- In the ETDC: up to six new cards
- From a modified 4A TUR: 34 leads to the ICUR-ETDC.

3. SYSTEM CAPACITIES

3.01 A fully equipped EADAS/ICUR System can serve a maximum of 128 4A TURs modified for ICUR operation. Any 4A TURs which are modified but which are still within the EADAS/ICUR collection system do not count against this capacity limitation.

3.02 Channel capacity remains at 100 hardware and 100 software channels. These are separate limitations. A second software channel for an ICUR ETDC counts against both channel limitations even though only one hardware channel is actually used. (See 3.14[g].)

3.03 Each TUR has access to 600 load balance (LB) registers (data collection devices [DCDs]). Access to 600 LB registers per TUR is allowed to meet various existing TUR loading arrangements; that is, LB inputs may be concentrated on one TUR, assigned to two or more TURs, or a growth pattern may already be established where it will become necessary in the future to expand LB items to additional TURs. In actuality, system loading is not likely to reach a total of 76,800 LB DCDs due to the limiting factors of other system capacities. Maximum utilization of LB registers might be reached in a system primarily serving full-size No. 5 crossbar marker groups averaging two or three TURs. In such a case, the 128-TUR limit might be reached with approximately 50 marker groups having a minimum of 900 LB registers each. Hence, 45,000 LB registers (50 times 900) may be maximum utilization in this application.

3.04 Register capacity of the 100 EADAS Subsystem fixed-head disk software channels remains unchanged at approximately 100,000 (100 channels times a nominal 1000 registers per channel).

3.05 All EADAS and EADAS/ICUR generics will continue to provide a separate 60,000-register capacity, available in 250-register blocks, on the EADAS Subsystem moving-head disk. These registers will serve certain polled offices, store-and-forward offices, terminals such as low-speed Electronic Switching System (ESS), and the pollable data terminal-1A (PDT-1A).

3.06 Fixed-head and moving-head disk capacities are not additive. Hardware channels are consumed in accessing the moving-head disk. The corresponding fixed-head disk software channels

therefore become unavailable. Hence, fixed-head disk capacity is used up as the moving-head disk capacity is utilized. The amount of use will depend upon the actual system configuration. Taking these factors into consideration, the capacity of an EADAS/ICUR System is best stated as nominally 100,000 registers plus those ICUR LB registers than can be practically utilized by a given system configuration. When planning a given system and determining its particular capacity it must be recognized that No. 1 ESS offices are initially served via a low-speed interface (110 baud) and use registers on the moving-head disk (precentrex 8, Issue 2). No. 1 ESS offices with the centrex 8, Issue 2 generic and later, may be served by an optional high-speed interface (1200 baud) which will use registers and software channels on the fixed-head disk.

A. CCU Requirements

3.07 In basic EADAS, a maximum of 80,000 words of core memory may be provided. (See 2.05 of Traffic Facilities Practices, Division B, Section 9b.) When an ICUR Subsystem is added or provided on the initial job an additional 32,000 words of core memory must be provided for ICUR. Thus an EADAS/ICUR System may have a maximum of 112,000 words of core memory. Sixteen thousand of the 32,000 additional words of core memory required for ICUR must be of the double-entry port type.

3.08 As described in Dial Facilities Management Practices, Division D, Section 4i, a second (backup) magnetic tape recorder may be optionally provided in basic EADAS. This second magnetic tape recorder must be provided for ICUR. See Figure 2 for the overall CCU cabinet configuration. Earlier EADAS being retrofitted to ICUR must be rearranged to this cabinet lineup. The regular EADAS data (Traffic Data Administrative System [TDAS] tape) are written by one magnetic tape recorder (set to UNIT 0) and the ICUR data (Individual Circuit Analysis [ICAN] program tape) are written by the other magnetic tape recorder (set to UNIT 1). The second magnetic tape recorder may still be used as backup for TDAS tape writing so long as minimum ICAN data requirements are met.

3.09 A disk controller and one fixed-head double-density disk drive must be provided. This equipment will provide the capacity to serve 64 4A TURs. More than 64 4A TURs in an EADAS/ICUR System make it necessary to install a second disk drive. This equipment will also require an additional cabinet. As a result, ten cabinets will be used for EADAS/ICUR. Floor space requirements for this subsystem should be fully resolved. See Figure 2 for a general view of the CCU.

3.10 Two additional pieces of peripheral equipment are required for ICUR at the CCU. A punched-card reader is required for entering circuit-grouping information (additions and changes) to the ICUR circuit grouping map (CGM). A receive only TTY is also required in order for messages to be printed at the CCU separately from regular EADAS Subsystem information which is printed on the main CCU TTY. This receive only TTY should be ordered using the standard local company service order procedure. The Western Electric Questionnaire provides for the receive only TTY interface at the CCU. A TELETYPE® controller and a null modem are required to interface the receive only TTY.

B. 4A TUR Requirements

3.11 When a 4A TUR is modified for ICUR, 34 new leads are provided from the TUR to the ETDC. These leads provide the detector outputs; switch, horizontal, and vertical select outputs; and trouble alarm and synchronization indications to the ETDC (Fig. 3). It is recommended that ground busy detectors be provided. A software inversion feature is provided at the CCU to invert idle or busy indications, if necessary. This will maintain consistency in having TUR assignments accomplished in software rather than hardware. It will also aid in obtaining maximum utilization of TUR inputs.

3.12 If the TUR has been previously modified for basic EADAS, when converting to ICUR only the ICUR modifications need to be applied. If the TUR has not been previously modified, the basic EADAS and ICUR modifications must be applied. These include disabling the circuit layout timer, connecting scan controls to the ETDC, and abandoning the register switches. These modifications will be available on Issue 40B or later of SD-95738-01 of the 4A TUR.

3.13 Each TUR frame in the ICUR Subsystem may have up to 600 LB registers designated. In those instances where an existing TUR frame

exceeds 600 LB registers, it will be necessary to reassign the surplus registers to another TUR frame with LB register capacity or to use other options. One option would be to treat the registers in excess of 600 as non-LB items. Another would be to treat the excess as peg count registers; that is, hardware group and cable to ETDC inputs. (See 3.15 in Dial Facilities Management Practices, Division D, Section 5a.)

C. Assignment Consideration

3.14 When making ETDC and 4A TUR assignments in an ICUR, the following constraints must be observed:

(a) Each 4A TUR has access to a maximum of 320 non-LB DCDs which are collected on an EADAS software channel. These DCDs must be arranged in 10 groups of 32 each which correspond to ETDC input card ranges. These groups, which are selected during channel definition, are called ***equivalent input cards.*** The traffic engineer will assign only the peg count inputs of the ETDC, but in planning the overall layout of the ETDC, allowance must be made for accommodating both the peg count and non-LB usage DCDs on the software channel(s). Equivalent input cards may be designated in any of the first 31 input card ranges, 000 through 991. Actual assignment of these DCDs is made in the CGM (see 3.15[c] for an exception).

> ***Note:*** ETDC input cards should be assigned first, according to instructions in Traffic Facilities Practices, Division D, Section 9b, giving proper attention to specialized input card locations. Then equivalent input cards should be designated from the remaining ranges.

(b) Each 4A TUR has access to 600 DCDs which are available in the ICUR Subsystem. These DCDs require no assignment or planning in the traffic order. They are automatically provided in software and assigned in the CGM.

(c) Each 4A TUR may be associated with a maximum of eight (zero through seven) load grouping codes (LGCs). These LGCs are assigned in the CGM. Each LB LGC (one through seven) which is activated is assigned to one of the 310 non-LB DCDs during channel definition.

(d) Any of the four 4A TURs per ETDC channel may share in the use of equivalent input cards, in any pattern, or may be assigned to inidividual ones. Whether equivalent input cards are shared or not, the limit of 320 registers per TUR is based on the total to which a given TUR has access.

(e) In planning the overall layout of an ETDC and use of the DCDs on the associated software channels, the traffic engineer and dial administrator must also plan for the assignment and sharing of equivalent input cards among TURs. There are two key objectives:

- Maximum utilization of DCDs and physical input cards
- Flexibility in assignment of switch, contact, horizontal, verticals (SCHVs) (a TUR input) to DCDs where members of a group are spread over more than one TUR.

(1) Where the basic requirement for non-LB usage DCDs will not exceed 320 for an ETDC channel, all TURs may share all equivalent input cards. Assign only the number of cards (ten or less) that will eventually be required.

(2) Where the basic requirement exceeds 320 DCDs, sufficient equivalent input cards must be assigned ***individually*** to TURs to provide the required number of DCDs. Figure 4 demonstrates how a channel with three TURs might be assigned to support 416 DCDs and yet maintain high flexibility through the sharing of cards.

(3) When assigning groups to DCDs on individual equivalent input cards, try to fill such cards with ***groups*** which are totally contained on a particular TUR and presumably will not be subject to future rearrangements. Candidates for such assignment may be subscriber line usage, miscellaneous trunk groups, sender groups, incoming register groups, etc.

(4) Groups which will be subject to future rearrangements on quantity changes involving inputs from more than one TUR should, if possible, be assigned to shared cards. This will minimize cases where more than one DCD has to be assigned to a group.

(f) ETDC input cards ordinarily should not be installed in ranges that are assigned to equivalent input cards since peg count data and grouped non-LB usage cannot be assigned to the same DCDs on the software channel. If these two items (peg count and non-LB usage) are inadvertently combined on a DCD, their respective results will be combined.

(g) When ETDC inputs used for peg count items plus grouped non-LB usage registers reach 989 registers the software channel (associated with the hardware channel and ETDC) is exhausted. When this occurs, one additional software channel may be designated per hardware channel. In this case, all the ***software grouped*** usage items must be assigned to the second software channel and all peg count items must remain on the first software channel. The second software channel is assigned during channel definition. It should be given the highest unequipped hardware channel number (that is, assign from 99 downward). This will maximize the fill of channel interface drawers with working hardware channels.

(h) A ***hardware grouping*** capability is retained and may be utilized if desired (see 2.10 in Dial Facilities Management Practices, Division D, Section 5a). Any hardware-grouped usage is processed in the same manner as peg count data and cannot benefit from any ICUR features.

(i) The output of different TURs may be assigned to the same DCD provided the TURs share access to the equivalent input card which includes the DCD. This will accommodate, for example, a case where a trunk group has members spread over more than one TUR. ICUR would permit outputs from all four TURs to be assigned to one DCD. TDAS, however, has a current limitation of only two TURs sharing a DCD. Therefore, if a group is spread over three or four TURs it will be necessary to use at least two DCDs.

(j) Usage DCDs containing data which are to be provided to EADAS/network mangement (NM) should be segregated on separate equivalent input cards.

(k) SCHVs for subscriber line usage are treated as either LB or non-LB items. The dependency is that if the subscriber line usage collection requirements coincide with LB schedules they may be LB. If they do not, they should be treated as non-LB. In the former case (LB assignment), the effect is to conserve software channel capacity. In the latter instance, DCDs on the software channel must be used for these items.

D. ETDC Requirements

3.15 The ETDC in basic EADAS requires the use of input data cards to collect, encode, and transmit peg count and usage data from TURs to the CCU. In the EADAS/ICUR System the data from the TUR are sent directly from the TUR detectors to the ICUR applique circuit on the ETDC, thus eliminating the need for many of the input cards. The overall result is a savings because fewer input cards need to be purchased.

3.16 When converting a basic ETDC to ICUR operation, the ETDC is modified by adding a maximum of six new cards. Space has been provided on the ETDC (Fig. 5) for these additional cards. One card is required for each TUR associated with the ETDC (maximum of four) and two control cards are required. These cards may be ordered with an initial system or may be ordered individually on a conversion.

3.17 When the ETDC is modified for ICUR operation, it will accept ICUR usage data from as many as four 4A TURs that have been modified for ICUR operation. ETDC inputs that would otherwise have been used for usage registers are now freed for additional peg count measurements. ETDCs modified for ICUR operation are capable of encoding and transmitting ***usage*** data words in a more efficient manner than the existing ones can. The net effect is a substantial increase in the capacity of the ETDC to replace traffic registers; this means that fewer ETDCs need be purchased and installed.

3.18 The ***physical*** input lead capacity of an ETDC is the same for a basic EADAS and an EADAS/ICUR: 989 leads. When the ICUR option is utilized the ETDC can still handle 989 traffic register leads (peg count only usually, plus up to four 4A TURs which have 34 leads each for a total of 136 leads). These 136 TUR leads do not reduce the original 989 input capacity. Auxiliary scanners are always treated as peg count registers and thus do impact the 989 register capacity on an ETDC.

3.19 The maximum capacity per data link (channel) is 8000 words for every 100-second interval (1000 msec — 12.5 m/sec/word × 100). In order to provide the desired grade of service of P.001, it is recommended that the level of loading occupancy during the busiest hour of the busiest day be 90 percent. Each TUR scanning at 100-second intervals will transmit 1200 words per scan, regardless of whether the contacts on the TUR switches are idle or busy, equipped or nonequipped. This is determined by two words per six contacts times ten verticals per switch times ten horizontals per switch times six switches. As a result, two words transmit the busy/idle indications and counts for six circuits. Since a TUR scan may be completed in 92 seconds versus 100 seconds, the actual word rate during scanning may be as high as 1304 (1200/92 times 100).

3.20 When counting engineering ETDCs for ICUR it will be necessary to first determine the peg count event rate. This is accomplished by the following steps.

(a) For each individual item determine the actual busy hour peg count level.

(b) Ratio the item to peak day (busiest day of the year).

(c) Total and divide by 36 for total peg count event rate per 100 seconds.

(d) Adjust for noncoincidence of busy periods.

3.21 When approximating data link occupancy for TURs and peg count events, each TUR frame is equal to 15 percent of total data link occupancy (1200/8000 times 100). For example, in an office with three TUR frames and a peg count event rate of 2000 counts (words) per 100 seconds, the occupancy would be determined as follows: add the three TURs at 15 percent occupancy each to the 25 percent occupancy for the peg count words (2000/8000 times 100). The sum of these equals 70 percent occupancy. If the result exceeds 90 percent, peg count words (as described in Traffic Facilities Practices, Division D, Section 9b) should be scaled so that occupancy is safely below 90 percent. After service begins, if actual occupancy begins to approach 90 percent, compute an adjusted occupancy for TURs to allow for actual scan rates as described in 3.19.

3.22 An ETDC and channel associated with the maximum of four 4A TURs arranged for 100-second scans are likely to be word-limited. A detailed study will be required as described in 3.20 and 3.21. These studies may be validated on working ETDCs by monitoring buffer overflows and summing registers on the busiest days of the year.

3.23 An ETDC and channel associated with three TURs arranged for 100-second scans are not likely to be word-limited.

3.24 An ETDC and channel associated with two 4A TURs or less arranged for 100-second scans or associated with four 4A TURs or less arranged for 200-second scans will not usually be limited on record inputs.

3.25 An ETDC and channel associated with four 4A TURs arranged for 100-second scan in a crossbar office are likely to be word-limited, and a study is recommended to insure that the peak-hour occupancy of the data link does not exceed 90 percent. See 3.21 for a suggested study procedure.

4. COORDINATION

4.01 Dial Facilities Management Practices, Division D, Section 4d, contains a description of all aspects of basic EADAS implementation/coordination and applies to an ICUR being added to an existing EADAS or to one being cutover with a new EADAS.

4.02 One of the most significant functions resulting from the implementation of an ICUR Subsystem is the establishment of a CGM organization. It is mandatory that the CGM procedures and concepts be fully understood by all the EADAS/ICUR administrators. Dial Facilities Management Practices, Division D, Section 5g, System Definitions, contains a brief description of the CGM in an EADAS/ICUR System. The appendices attached to Dial Facilities Management Practices, Division D, Section 5d, Record Conversion, are position practices that spell out the specific clerical procedures for constructing the CGM. The CCU administrator and all dial administrators who have ICUR ETDCs should be thoroughly familiar with these documents in order to carry out their responsibilities.

4.03 In the Implementation Committee for the ICUR Subsystem certain groups have a

greater involvement in the areas identified and described in Section 4d.

(a) ***Operations/Service/Maintenance:***

(1) The use of the CGM will require a different set of procedures to be designed and implemented from the ICUR ETDC location to the group which will produce the documents to be submitted to the keypunching production group. This indicates the need for documentation to fit a particular operating telephone company organizational plan, additional personnel to accomplish this CGM (preferably on a centralized basis), and a training program to adequately prepare the CGM group and field personnel with ICUR responsibilities to transmit their data for the production of the CGM.

(2) Maintenance representatives at the CCU and ICUR ETDC locations should know the equipment which is required to be maintained with the ICUR Subsystem. At the ICUR ETDC offices, there will be a significantly reduced demand for maintenance services on TURs.

(3) If the EADAS/NM data base group is a separate organization, they should know what effect the implementation of ICUR will have on their data base assignments.

(b) ***Engineering:***

(1) The building engineering group at the CCU should clearly identify floor space and related items to accommodate the additional cabinet and peripheral equipment.

(2) The equipment engineer should follow the incremental equipment requirements specified in the traffic order for implementation of ICUR.

(c) The accounting/comptroller's groups have a greater responsibility in EADAS/ICUR than they have in basic EADAS. In addition to the increased demands on their central processing unit they will also keypunch the CGM input documents. Where an ICUR is added to an existing EADAS, a review of the magnetic tape administration, the production and distribution of the ICAN reports, and other similar administrative items is required.

4.04 The application of the program evaluation review technique (PERT) chart or project list as suggested in Section 4d should be expanded to provide for each of the ICUR ETDC locations and the CCU's additional equipment and peripheral units. Training for ICUR applications from CGM through the ICAN-type reports may be treated separately or as an additional module to the basic EADAS training. The operating telephone company should make its own training plans based on its own needs.

4.05 Because many ICUR and ICAN printouts are available, the downstream user community should be expanded to include the testboard maintenance group at the ICUR ETDC location. In addition to all the other features of ICUR, the ICAN "killer trunk" analysis has provided local maintenance with an effective tool for improving the utilization of "working" trunks. It is, therefore, essential that the maintenance group fully understand these reports and that the techniques for their proper application be put into effect prior to cutover of EADAS/ICUR.

4.16 The steering committee, as described in 4.01 of Section 4d, need not be materially changed with the ICUR option. The major impact that the ICUR option will have on this committee is to make them aware of the effect of reduced administrative and maintenance responsibilities at the ICUR ETDC location. It will also indicate the necessity for establishing a functional group to maintain the CGM.

5. CENTRAL CONTROL UNIT ORGANIZATION

5.01 Depending upon where the operating telephone company decides to locate the CGM functions, the tasks to be performed in the CCU organization may be significantly increased. The actual number of CGM personnel is directly related to the number of ICUR ETDCs, the number of 4A TURs included in them, and the frequency of updating requirements.

5.02 The CCU organization's ICUR/ICAN role may be similarly increased if the operating telephone company assigns the responsibility for analyzing the reports to them. This consideration is also affected by the frequency of the related analysis reports and the responsibility for their distribution.

6. CUTOVER METHOD OF PROCEDURE

6.01 Implementation of the ICUR option will create a greater need for designing methods and procedures for the administration of ICUR/ICAN tapes than is required by basic EADAS. Thus, the impact of ICUR on TDAS and the central processing unit (comptroller's/accounting) for servicing needs to be designed so as to maximize ICURs features.

6.02 Where ICUR is added to an existing EADAS, a transitional plan should be devised in conjunction with the involved groups and the data users in order that the loss of data may be kept to a minimum.

7. CENTRAL OFFICE CUTOVER METHOD OF PROCEDURE

7.01 The cutover schedules included in 7.02 of Section 4d are still applicable in that ICUR ETDCs should be programmed at a rate of one per week. It is also recommended that the TUR verification tests be equally applied in the ICUR ETDC office and the non-ICUR offices.

7.02 Since the ICUR implementation transfers significant amounts of the administration of TUR assignments to software assignments (ie, CGM), early training and construction of the data base should be a significant part of the cutover method of procedure.

7.03 In establishing ICUR ETDC assignments for the CGM, user requirements should be fully considered. For example, EADAS/NM will present certain considerations and the frequency and periods of collection may be of concern to the appropriate maintenance groups.

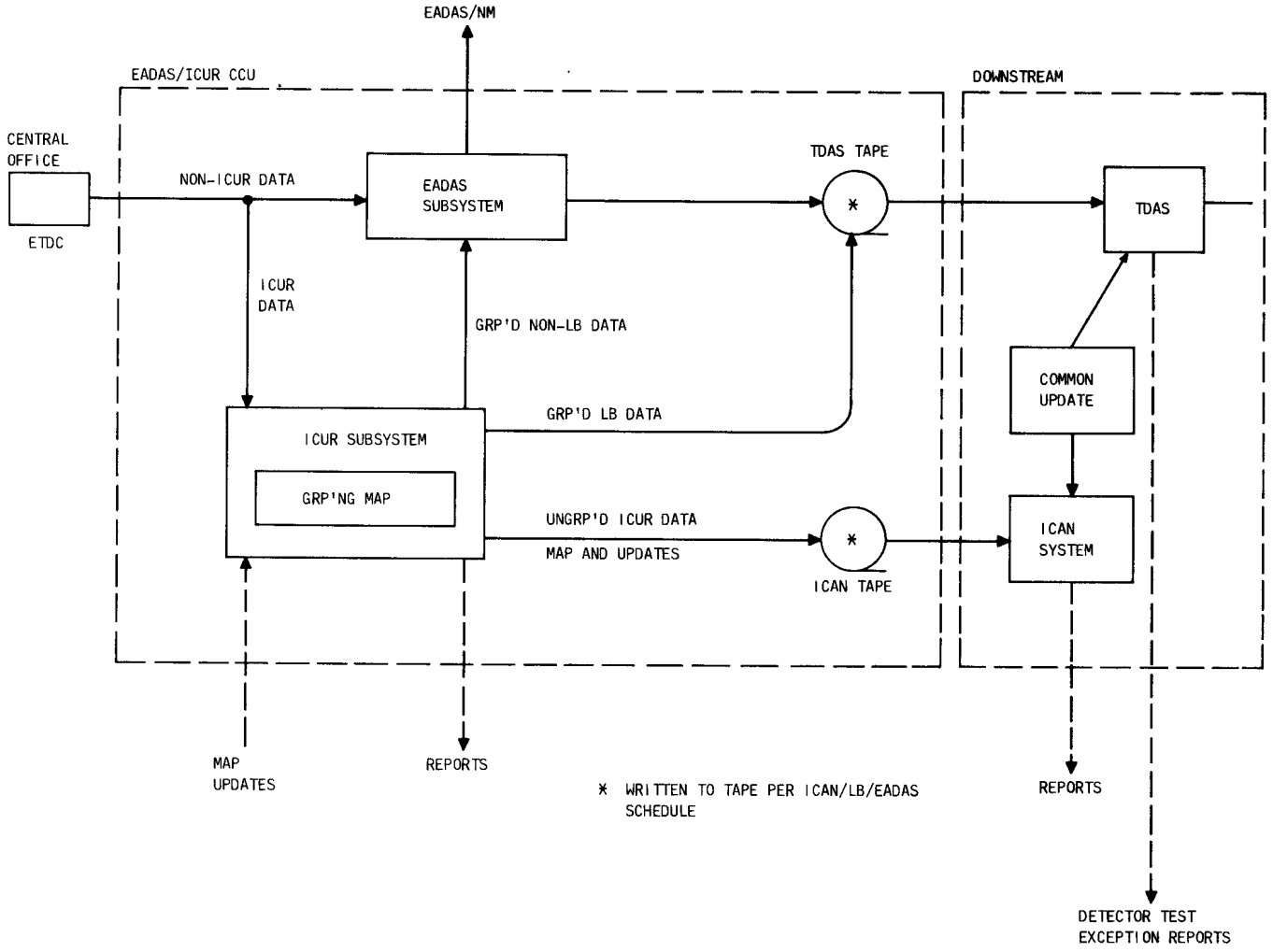

Fig. 1—Simplified Diagram of an EADAS/ICUR System (1.01)

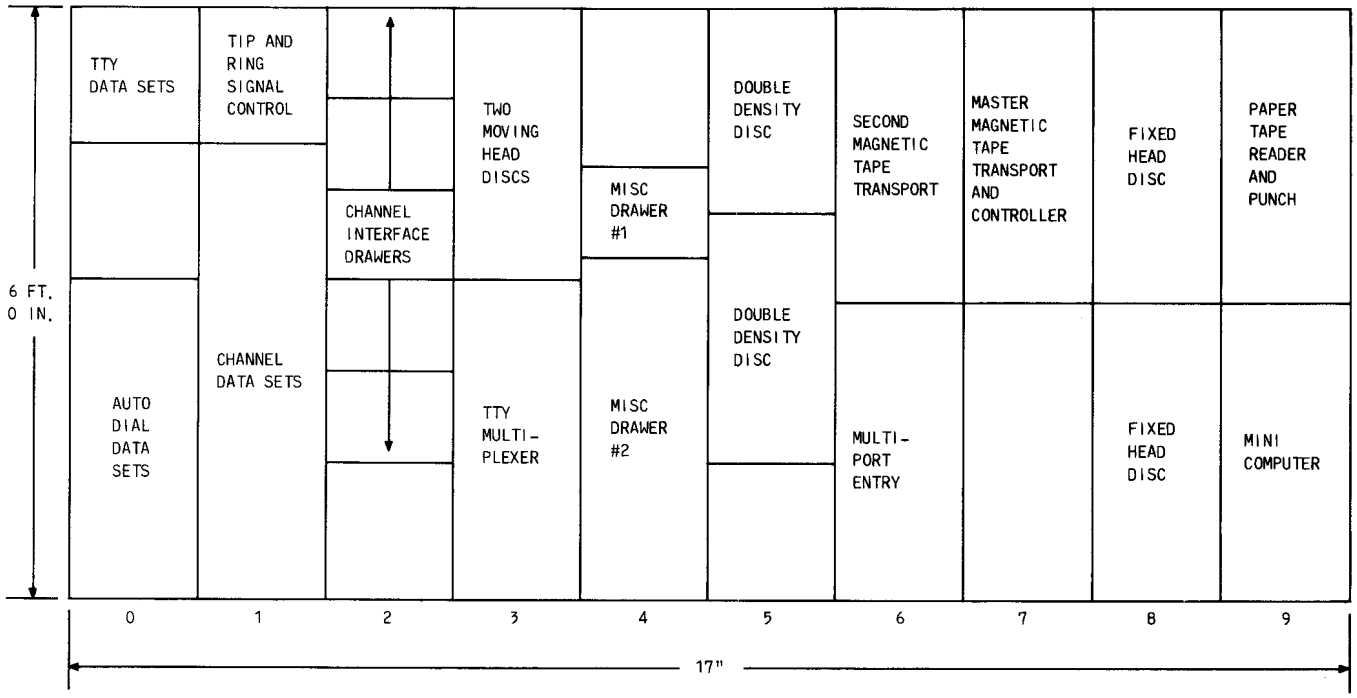

Fig. 2—EADAS/ICUR CCU—General View (3.08, 3.09)

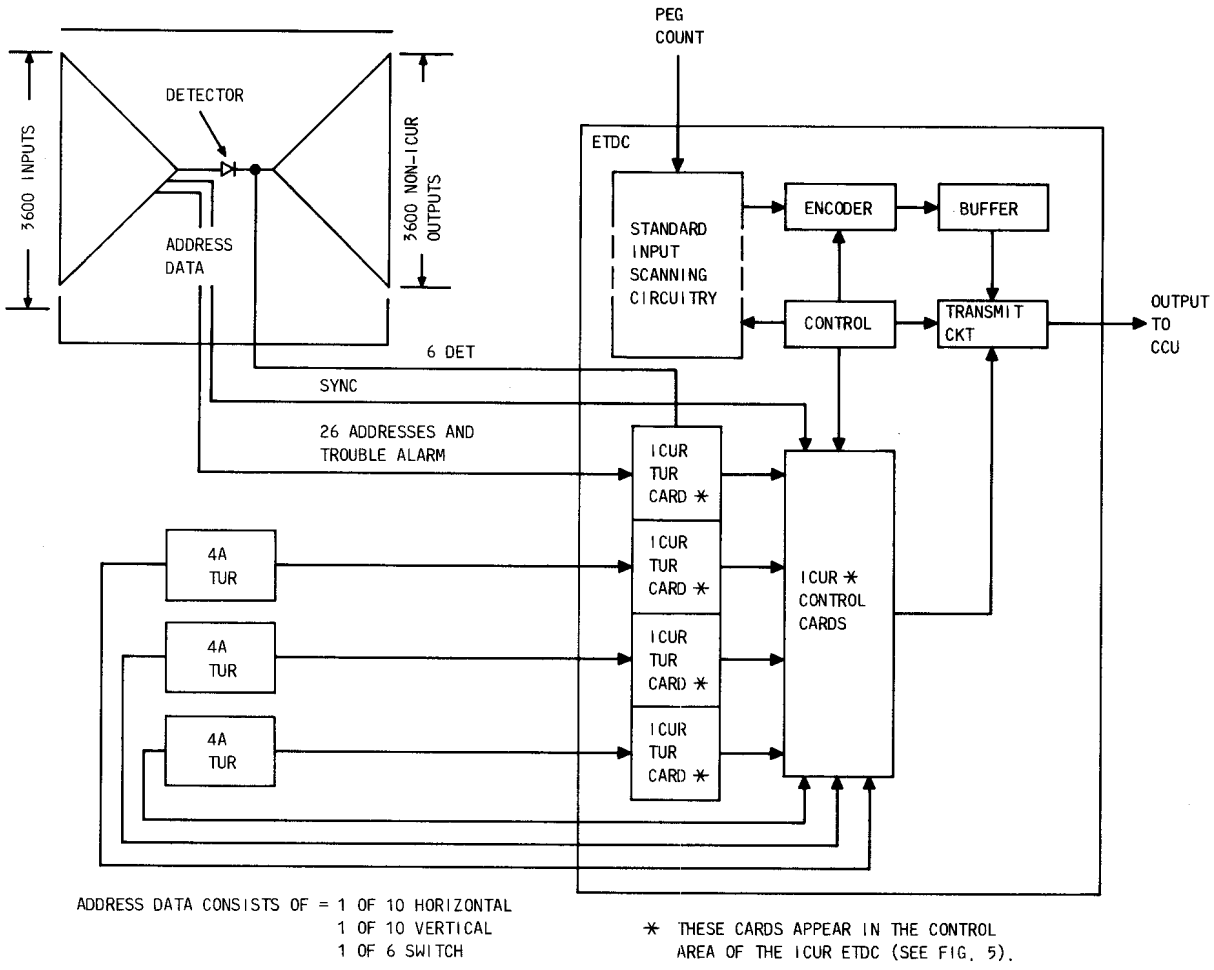

Fig. 3—ETDC With ICUR Option (3.11)

EQUIVALENT CARD NO.	TUR 0	TUR 1	TUR 2	AVAILABLE DCDs
13	I	—	—	32
14	—	I	—	32
15	—	—	I	32
16	I	—	—	32
17	—	S	S	32
18	S	S	S	32
19	S	S	S	32
20	S	S	S	32
21	S	S	S	32
22	S	S	S	32
23	S	S	S	32
24	S	S	S	32
25	S	S	S	32
				416

DCDs Individual to TUR 0	=	64
DCDs Individual to TUR 1	=	32
DCDs Individual to TUR 2	=	32
DCDs Shared by TURs 1 and 2	=	32
DCDs Shared by TURs 0, 1, and 2	=	256

*I = Individual
**S = Shared

Fig. 4—Individual and Shared Assignments of Equivalent Input Cards (3.14)

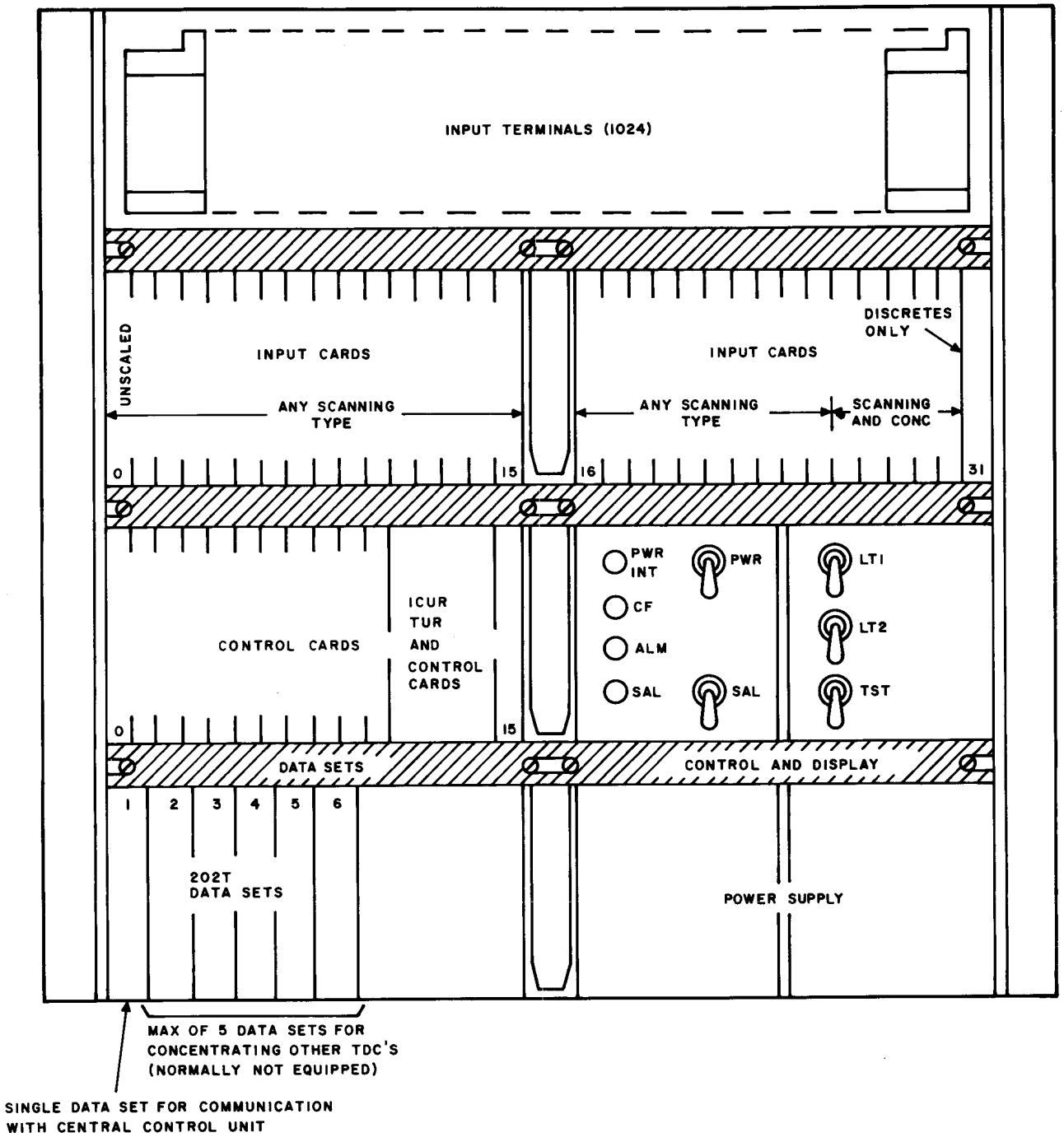

Fig. 5—ETDC Equipment Layout (3.16)