MECHANIZED AIDS TO MANAGEMENT
INDIVIDUAL CIRCUIT USAGE RECORDING SUBSYSTEM
DESCRIPTION

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1. GENERAL

1.01 This section provides a general description of the Individual Circuit Usage Recording (ICUR) Subsystem. ICUR is an optional enhancement to the Engineering and Administration Data Acquisition System (EADAS). The ICUR option is a data collection subsystem that utilizes the same minicomputer provided in EADAS (see Fig. 1 for system diagram). EADAS/ICUR is capable of accepting individual circuit usage measurements as a result of modification of the 4A traffic usage recorder (TUR) output and the EADAS traffic data converter (ETDC) and by making certain software and hardware additions at the EADAS central control unit (CCU). In ICUR the word ***circuit*** represents any individual traffic-measured component, including circuits and common control equipment. The distinguishing characteristic of EADAS/ICUR is the fact that in the area of TUR grouping, cross-connections have been eliminated and replaced by a software data base.

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

1.03 Some of the advantages of EADAS/ICUR are as follows:

(a) Greater utilization of ETDCs and data links resulting in a requirement for fewer ETDCs and a savings in associated channels and interface equipment at the CCU

(b) Lower installation costs since grouped register leads no longer need to be cabled to the ETDCs

(c) More efficient administration of the circuit grouping process via a centralized software capability

(d) Improved data quality through the system's TUR fault and grouping error detection features

(e) Detection of equipment and trunk troubles through analysis of individual circuit usage. (Individual circuit data, and other appropriate information, are written on a separate tape for use in a new downstream program, Individual Circuit Analysis [ICAN])

(f) Improved data quality and reduced expense through elimination of hardware grouping cross-connect activity and elimination of the need for cross-connects on the scan side of the TUR

(g) Greater TUR utilization and simpler administration through the elimination of most contact and detector assignment restrictions

(h) More efficient downstream data processing through separate control of data collection intervals and frequency of tape writes for load balance (LB) and non-LB data.

1.04 EADAS, EADAS/ICUR, and EADAS/network management (NM) share a common terminology. The following is a list of terms and descriptions which will help distinguish the differences between the three systems:

(a) ***EADAS:*** The generic term for the PDP 11/40 minicomputer system which is primarily involved in direct data acquisition. Use "EADAS/ICUR" or " basic EADAS" where differentiation is needed. Do not use to include EADAS/NM.

(b) ***ICUR:*** A general term for that option in EADAS.

(c) ***EADAS/ICUR:*** A general term for EADAS with ICUR.

(d) ***Basic EADAS:*** To emphasize EADAS without ICUR.

(e) ***Non-ICUR:*** To differentiate items not arranged for ICUR, such as non-ICUR, non-4A TURs, ETDCs, Traffic Data Recorder System (TDRS) 1A, TUR converter and peg count converter (PCC), pollable data terminal 1A, outside vendor data terminals, etc (the last two converters listed are collectively referred to as other traffic data converters [OTDCs]).

(f) ***ICUR Subsystem:*** To refer specifically to the ICUR portion of EADAS/ICUR.

(g) ***EADAS Subsystem:*** To refer specifically to the portion of EADAS/ICUR which is not the ICUR Subsystem.

(h) ***EADAS/NM:*** The generic term for the minicomputer system which is primarily involved in processing NM-oriented data and controls.

(i) ***Peg Count:*** Any physical input to the ETDC (other than TUR control and alarm leads associated with ICUR and discretes).

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

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

2. DESCRIPTION AND OPERATION

A. Flow of Data in EADAS/ICUR

2.01 Basic EADAS interfaces with the 4A TUR by cabling leads from the TUR grouping terminals to the ETDC instead of to registers. (See Traffic Facilities Practices, Division B, Section 9a, EADAS General Description.) With the ICUR option, the output of the TUR detectors will go directly into an ICUR applique on the ETDC (Fig. 2). Twenty-six leads from sequence circuits on the TUR brought through the ETDC will indicate which crosspoint is being scanned. The six detector leads indicate the usage status, busy or idle, for each of the six circuits brought to that crosspoint (Fig. 2). Usage data are individually obtained for all 3600 inputs (switch, contact, horizontal, vertical [SCHVs]). These data are transmitted to the CCU and accumulated in the ICUR Subsystem.

2.02 With this option, peg count data continue to be collected in the same manner as they are collected in basic EADAS. That is, peg count leads are cabled to ETDC inputs and the real-time counts are transmitted to the CCU where they are accumulated in the EADAS Subsystem.

2.03 The CCU sorts incoming data, based on their word construction, and directs peg count and usage to the EADAS and ICUR Subsystems, respectively.

2.04 The ICUR Subsystem performs the following functions:

(a) Accumulates all usage on an individual circuit basis.

(b) Counts and accumulates TUR transitions on an individual circuit basis. (TUR transitions are changes of state, from busy to idle, or vice versa. Transitions are detected by a "last-look" comparison feature of the software which operates on every scan point on each TUR cycle.)

(c) Segregates LB data from non-LB data to facilitate separate processing.

(d) Groups all usage data according to a software assignment record called the circuit grouping map (CGM). The CGM is maintained by entering punched update cards at the CCU.

(e) Forwards grouped non-LB usage data to EADAS where they are accumulated in data collection devices (DCDs) on the software channels.

(f) Accumulates grouped LB data in special LB DCDs.

(g) Writes scheduled accumulations of grouped LB data directly on the Traffic Data Administration System (TDAS) magnetic tape.

(h) Writes scheduled accumulations of ***all*** individual circuit usage and TUR transitions (changes in usage state—idle to busy to idle), and certain mapping and scheduling data, on the ICAN tape.

2.05 Once EADAS has combined the grouped non-LB usage data and the peg count-type data, it writes the accumulated data on magnetic tape. This magnetic tape then becomes available for downstream processing by TDAS or other downstream equivalents (Fig. 1). This tape will have the same format as the one provided by basic EADAS. The individual circuit usage and other data are written on another magnetic tape for downstream processing by ICAN. The ICAN program will utilize these data to identify trunk and equipment problems and to provide essential administrative reports used in maintenance of the CGM.

2.06 The ICUR Subsystem automatically generates several types of output reports relating to system operation. For example, it provides near real-time reports regarding rejected CGM update cards and unexpected usage on unassigned or unequipped TUR inputs. These reports provide information on certain classes of mapping errors. Another report, pending status flag removals, lists CGM updates which take place dynamically. In addition to these automatic reports, the user can request at the CCU listings from the CGM for either entire TURs, specified DCDs (circuit groups), or specified SCHVs. Certain TUR malfunctions (for example; detector failures, crossed verticals, and skipped crosspoints) are reported in system error messages on the receive only teletypewriter (TTY). Rejected update card messages will appear at the control unit TTY; reports of pending status flag removals, unequipped/unassigned usage reports, and TUR error messages will appear on the receive only TTY; and CGM listings will appear on the high-speed line printer.

B. Other ICUR Subsystem Operations

2.07 The following operations are also performed by the ICUR Subsystem.

(a) Using the CGMs maintained within the ICUR Subsystem, non-LB usage data on individual circuits are grouped at system periods or 5-minute intervals for NM purposes.

(b) LB grouped data are added to special LB accumulators (DCDs) within the ICUR Subsystem. Depending upon user specified schedules, these accumulators can retain data on a half-hourly, hourly, daily, or weekly basis prior to their being written on the TDAS magnetic tape.

(c) Because near real-time reports may require total office usage measurements, LB data may also be summed into as many as seven load grouping code registers per TUR. These load grouping code registers are equivalent to (and replace) detector group usage registers. Load grouping code sums are transmitted to EADAS in the same manner as grouped non-LB data.

(d) A current copy of the updated CGM, images of the update cards that have been accepted by ICUR that day, and copies of ICAN data collection schedules are placed on the ICAN tape when the CGM is updated. This allows the ICAN program to maintain a duplicate data base and check for missing updates and data.

(e) Data on individual circuits are accumulated and written on the ICAN tape for scheduled intervals (hours or multihours).

C. 4A Traffic Usage Recorder in ICUR Environment

2.08 In a non-ICUR environment, TUR cross-connections are routinely checked by running a single TUR scan with all detector inputs in a busy state. These detector-test data provide a direct measure of the current status of the TUR cross-connections. With the ICUR option, this operation is still performed but the busy conditions are grouped according to the CGM and placed in the regular flow of data to TDAS. The matching of detector-test data with group-size information downstream is one of several consistency checks on the CGM.

2.09 The TUR in an ICUR environment is freed from two major restrictions ordinarily associated with the scan-point assignment process. First, any subset of SCHVs can now be mapped into a common DCD. The second TUR assignment restriction has had to do with the existence of the two most prevalent types of detector circuits, the ground-busy and the ground-idle type. The ICUR Subsystem has a software inversion feature that will not only allow all ground idle equipment items to be assigned to ground busy detectors but it is also strongly recommended that ICUR be implemented solely by utilizing ground busy detectors. The inversion feature is user activated on individual SCHVs via entries on CGM input cards. When a ground idle input lead is assigned to a ground busy detector, the ICUR software will invert the ground idle indications to obtain actual usage. With this improved flexibility, cross-connections on distributing frames (TUR distribution frames) can be greatly reduced or eliminated entirely.

2.10 As mentioned previously, when a 4A TUR is modified for ICUR, only the scan switches and detectors need to be utilized. The register switches and register grouping field are not utilized in the flow of ICUR data. The register switches and register grouping field, however, are left in place. Thus, if it is required, TUR data may still be hardware grouped and cabled to the 989 regular ETDC inputs.

2.11 Figure 2 is a block diagram of the TUR modified for ICUR collection of usage data. The leads are brought from the TUR to the ETDC. These leads contain the following information: switch number, horizontal selection, vertical selection, and the state of the six associated detector inputs. This information is uniquely encoded by the ETDC into two data words and transmitted to the CCU. The "trouble lead" is now used to report the end of the scan, at which time the detector states can be checked for trouble. These data are then used for system error messages which are printed on the CCU TTY. Failure of any test will not prevent the TUR from scanning its inputs upon receiving the next scan signal from the CCU. This differs from the non-ICUR situation where any failure will retire the TUR and an associated (paired) TUR for the duration of the data collection interval.

D. EADAS Traffic Data Converter in an ICUR Environment

2.12 Studies have verified that 4A TURs set to a 100-second scan rate enhance the performance of the ICAN abnormally short holding time (ASH) algorithms for those switching systems employing priority trunk selection (No. 1 Crossbar, Crossbar Tandem, and Step-By-Step). The same studies supported the position that TUR wear and ETDC data link capacity are not enhanced by converting to a 200-second scan rate from a 100-second 4A TUR scan rate.

2.13 An ETDC in a non-ICUR environment has the capability for collecting and transmitting data from 989 traffic registers (usage and peg count) over a single data channel to the CCU. Basic ETDCs require both a corresponding software and hardware channel at the CCU. When the ICUR option is utilized, the ETDC can still handle 989 traffic registers (usually peg count only) plus up to four 4A TURs modified for ICUR operation. (See Fig. 2 for ICUR data flow.) Data from peg count leads and TUR leads are transmitted over the same data link. Each TUR has 34 leads: 32 leads for scan point and data indications and 2 control leads (trouble/alarm and synchronization). Under the ICUR option, ETDCs are provided with two additional control cards plus one card per TUR frame to accommodate these leads. An ICUR ETDC also requires both a corresponding software and hardware channel at the CCU and in certain cases may require a second software channel (see 3.17 through 3.21).

E. Central Control Unit in an ICUR Environment

2.14 ***Software:*** A separate series of EADAS generic programs will be issued to provide the ICUR features. The EADAS/ICUR generic program will include all of the basic EADAS features including future EADAS developments and enhancements. The EADAS/ICUR generic will serve both ICUR and non-ICUR ETDCs. Offices without 4A TURs must be served in a non-ICUR mode. Offices equipped with "home" ETDCs associated with 4A TURs may be served in either mode at the option of the system planner.

2.15 ***Hardware:*** Channels from ICUR ETDCs are interfaced at the CCU in the same manner as basic EADAS channels; no new or additional interface equipment is required. Additional hardware items at the CCU include a receive only TTY, a card reader, new disk memory units, and additional core memory. Some basic EADAS components which were optional become mandatory with ICUR (see Dial Facilities Management Practices, Division D, Section 5b). If basic EADAS CCUs are being retrofitted for ICUR, they may require a rearrangement of the cabinet lineup. See Figure 3.

2.16 ***Operation:*** Introduction of the ICUR option has the following effects on operations:

(a) Necessitates the establishment of an administrative group to provide CGM updates.

(b) Requires the daily entering of punched CGM update cards.

(c) Requires one magnetic tape drive to provide ICAN tapes. In effect, this doubles tape handling (TDAS plus ICAN tapes).

Note: This tape drive was optional in basic EADAS.

(d) Expands the system definition process to provide for the control of ICUR, LB, and ICAN features. See Dial Facilities Management Practices, Division D, Section 5g.

F. Circuit Grouping Map

2.17 EADAS/ICUR utilizes an approach to traffic measurement that replaces the use of the register grouping cross-connection field at each ETDC/ICUR 4A TUR site. EADAS/ICUR collects usage data on individual circuits for up to 128 4A TURs. Using a software data base called the CGM, the CCU provides the grouping function for these TURs. Maintaining this map is equivalent to issuing orders for hardware register grouping cross-connections and for wiring them.

2.18 The CGM associates each TUR input (SCHV) with a 4-digit DCD number and a load grouping code. The DCD is a TDAS designated code used to identify software traffic registers. In basic EADAS, DCDs are 3-digit numbers which agree with the ETDC input number. With the ICUR option a combination of the load grouping code and a 4-digit DCD number assigned to every SCHV is used to differentiate LB DCDs and their respective TUR frame (zero through three) from non-LB DCDs. This combination also identifies whether non-LB DCDs are on the first or second software channel. This provides the necessary information for the ICUR Subsystem to segregate, accumulate, group, and transfer data. See Figure 4 for the acceptable DCD assignment ranges.

2.19 A load grouping code (zero through seven) must be assigned to each SCHV in the CGM. All non-LB items are assigned to load grouping code zero. LB items may be assigned to one of seven possible load grouping codes (one through seven). LB load grouping codes would typically be assigned to separate data from different loading divisions; for example, line link frames, trunk link frames, flat line finder groups, coin line finder groups, etc.

2.20 The most critical new function in an EADAS/ICUR operation is the CGM updating procedure. Update records are punched cards that are prepared from official circuit orders and Western Electric drawings on a one-per-circuit basis. Before the CGM is updated, the change is tested with a consistency-check filter provided by the EADAS/ICUR generic program. This filter checks whether the update record has the proper format and is consistent with itself and the existing CGM. Rejected updates are printed out on the CCU TTY. Even if CGM update records are prepared correctly, data accuracy requires that the timing of the updating procedure be synchronized, as nearly as practicable, with the completion of the actual circuit order work in the central office.

G. Individual Circuit Analysis Program

2.21 The downstream ICAN program will read and process the data on the ICAN tape produced by the EADAS/ICUR System. When ICAN is on the same computer as TDAS, it will have access to the TDAS-common update data base. In that case, certain circuit group identification data for the ICAN data base will be obtained directly from common update. When ICAN is not on the same computer as TDAS-common update, these data must be provided via the ICUR CGM update cards.

2.22 The two major functions performed by ICAN are ***administration analysis*** and ***usage analysis.*** Administration analysis supports the EADAS/ICUR System by helping to ensure the integrity of the CGM. Usage analysis is essentially a maintenance function. It identifies abnormal load patterns observed on individual circuits (eg, "killer trunks," always busy trunks, and always idle trunks). Various periodic and demand reports are issued by ICAN in the performance of these two functions.

H. Processing Load Balance Data in an ICUR Environment

2.23 In many crossbar offices, LB measurements on frame switches may constitute 40 percent of the equipped TUR inputs and 80 percent of its circuit groups. In a full-size No. 5 crossbar office (60 line link frames, 30 trunk link frames) LB measurements require 1200 SCHVs and 600 DCDs for line link frames and 1200 SCHVs and 300 DCDs for trunk link frames. In a non-ICUR environment this would consume 55 percent of both the inputs on an ETDC and the DCDs on its associated software channel. There is no need to see these data on EADAS surveillance reports. Furthermore, there is little need for downstream systems to see LB data for any interval less than a total week. Therefore, with the ICUR option, LB data are handled entirely within the ICUR Subsystem. As a result, LB collection intervals and tape writes are scheduled separately from other basic EADAS schedules. By so doing, downstream expenses will be reduced significantly through processing daily or weekly tape writes as compared to quarter-hour, half-hour, or full-hour processing requirements in basic EADAS.

2.24 Summaries only of LB data (load grouping codes) will be available to EADAS for the near real-time surveillance function. ICAN trouble reports will include LB SCHVs and DCDs, thereby affording downstream surveillance.

3. SYSTEM REQUIREMENTS

A. General

3.01 Only 4A TURs that are associated with home-type ETDCs may be modified for ICUR. Specifically excluded from ICUR operation are:

(1) 4A TURs assigned to remote ETDCs or to TDRS-1A TUR converters

(2) All other types of TURs

(3) All auxiliary scanner units associated with 4A TURs.

3.02 Auxiliary scanner units serve short holding time common control equipment in crossbar offices. To acquire the benefits of ICAN where auxiliary scanner units are utilized, arrangements must be made so that each common control item retains one regular scan appearance on the 4A TUR in addition to its appearance on the auxiliary scanner unit.

B. System Capacities

3.03 A fully equipped EADAS/ICUR System has a maximum capacity to serve 128 4A TURs modified for ICUR operation. It is minimally available for 64 4A TURs. Any nonmodified 4A TURs included in an EADAS/ICUR System do not count against this limitation.

3.04 Channel capacity remains at 100 hardware or 100 software channels. These are separate limitations. A second software channel for an ICUR ETDC counts against both of the channel limitations even though only one hardware channel is used.

3.05 Each TUR has access to 600 LB registers (DCDs). This capability enables the system to meet various existing TUR loading arrangements; that is, LB inputs may already be concentrated on one TUR, they may be assigned to two or more TURs, or a growth pattern may already be established which will necessitate the future expansion of LB items to additional TURs. 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 maximum of 900 LB registers each. Hence, in this situation 45,000 LB registers would be its maximum LB register utilization. Thus, practical realities of system loading would prevent reaching the theoretical maximum of 76,800 (600 times 128) LB registers; that is, other system capacities would become the limiting factor first.

3.06 In considering overall capacities, it should be kept in mind that all EADAS and EADAS/ICUR generics will also 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 terminals and data accumulation offices such as low-speed electronic switching system and the pollable data terminal-1A. This capacity is ***not*** affected by the ICUR Subsystem.

3.07 It may also be helpful to know the following: fixed-head and moving-head disk capacities are not additive; hardware channels are consumed in accessing the moving-head disk. Hence, fixed-head disk capacity is offset as the moving-head disk capacity is used up. The amount of offset 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 that can be practically utilized by a given system configuration.

C. Central Control Unit Requirements

3.08 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 9-b). With an ICUR Subsystem, an additional 32,000 words of core memory must be provided for ICUR. Thus an EADAS/ICUR System may have up to 112,000 words of core memory.

3.09 As described in 2.08 of Traffic Facilities Practices, Division B, Section 9-b, a second backup magnetic tape recorder may be provided in a basic EADAS System. This second magnetic tape recorder ***must*** be provided for ICUR and is located in the sixth cabinet. See Figure 3 for the overall cabinet configuration. Earlier EADAS CCUs being retrofitted to ICUR must reconfigure their cabinets accordingly. The regular EADAS data (TDAS tape) are written by one magnetic tape drive (set to UNIT 0) and the ICUR data (ICAN tape) are written by the other magnetic tape drive (set to UNIT 1). In addition, the second magnetic tape recorder may continue to be used as an optional backup for TDAS tape writing so long as the minimum ICAN data requirements are met.

3.10 One fixed-head double-density disk drive and a disk controller must be provided if an ICUR capacity of 64 4A TURs is to be realized. If there are more than 64 4A TURs in the ICUR Subsystem, a second disk drive is required. This equipment will also require an additional cabinet. As shown in Figure 3, this cabinet is number five in the lineup. Therefore, in EADAS/ICUR there is a total of ten cabinets. Thus, when retrofitting to an EADAS/ICUR the provision of adequate floor space is a major consideration.

3.11 Two other items of peripheral equipment are also required for ICUR at the CCU. A punched card reader is required for entering circuit-grouping information on the ICUR CGM. Also required is a receive-only TTY in order that messages may be printed at the CCU separately from regular EADAS information which is printed on the main CCU TTY. A TELETYPE® controller and null-modem are required to interface the receive-only TTY. This channel is implemented via an EIA RS232 interface in order that it may be remotely located, if desired.

D. 4A Traffic Usage Recorder Requirements

3.12 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. 2). Since all 4A TURs are minimally equipped with six detectors, only these ground busy detectors are utilized. A software inversion feature provided in the CGM will invert idle or busy indications, if necessary. This will aid in maximizing utilization of TUR inputs.

3.13 If the TUR has been previously modified for basic EADAS, only the ICUR modifications need be applied (when converting to ICUR). If the TUR has not been previously modified, then 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.

3.14 Six hundred registers per TUR frame have been designated for LB in the ICUR Subsystem. In those cases where there are more than 600 LB registers assigned per TUR frame it is preferable to rearrange the excess so that the 600 maximum may be adhered to. In addition, there are two methods by which such rearrangements may be avoided.

(a) Treat the excess registers, all over 600, as non-LB items. (Note that the limitation of 3.20(a) will still apply.)

(b) Treat the excess registers as a peg count register; that is, hardware group and cable to ETDC inputs. (See 2.10 and 3.20[h].)

Note: Each of these could possibly lead to scheduling problems.

E. EADAS Traffic Data Converter 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, it is modified by adding up to six new cards. Space has been provided on the ETDC for these additional cards. One card for each TUR associated with the ETDC (maximum of four) and two control cards are required. (See Fig. 6.)

3.17 When the ETDC is modified for ICUR operation, it will accept ICUR usage data from as many as four 4A TURs modified for ICUR operation. ETDC inputs that would otherwise have served as 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. The net effect is a substantial increase in the capacity of the ETDC to replace traffic registers. Consequently, fewer ETDCs need to be purchased and installed.

3.20 An ETDC and channel associated with three or less 4A TURs arranged for 100-second scan or four or less 4A TURs arranged for 200-second scan are not likely to be word limited.

3.21 An ETDC and channel associated with four 4A TURs arranged for 100-second scan in a crossbar office may be word limited. A study is recommended to ensure that the peak-hour occupancy of the data link does not exceed 90 percent. See Dial Facilities Management Practices, Division D, Section 5c, for a suggested method for making a study.

F. Assignment Considerations

3.20 When making ETDC and 4A TUR assignments in an ICUR environment, the following constraints must be observed.

(a) Each 4A TUR has access to a maximum of 320 non-LB DCDs which are resident on an EADAS software channel. These DCDs must be arranged in 10 groups of 32, each of which corresponds to ETDC input card ranges. These groups, which are selected during channel definition, are called equivalent input cards. Peg count inputs only should be assigned to 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 channels. Equivalent input cards may be designated in any of the first 31 input-card ranges, 000 through 991.

Note: EADAS input cards should be assigned first, according to Traffic Facilities Practices, Division B, Section 9-b, giving due regard to specialized input card locations. Equivalent input cards should then be designated from the remaining ranges.

Actual assignment of these DCDs is done in the CGM (see [c] below for exception).

(b) Each 4A TUR has access to 600 LB DCDs which are resident in the ICUR Subsystem. These DCDs are automatically provided in software and assigned in the CGM.

(c) Each 4A TUR has access to as many as eight (zero through seven) load grouping codes. These load grouping codes are assigned in the CGM. Each LB load grouping code (zero through seven) which is activated is assigned to one of the 320 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 individual 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 the use of the DCDs on the associated software channels, there are two key objectives: maximum utilization of DCDs and physical input cards and flexibility in assigning SCHVs to DCDs where members of a group are spread over more than one TUR.

(1) Where the 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 requirement exceeds 320 DCDs, sufficient equivalent input cards must be assigned ***individually*** to TURs to provide the required number of DCDs. Figure 5 shows how a channel with three TURs might be assigned to accept the 416 DCDs. This approach provides a high degree of 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 the respective TUR and which will not be subject to future rearrangements. Candidates for such assignment may be subscriber line usage, miscellaneous trunk groups, markers, sender groups, incoming register groups, etc.

(4) Groups which will be subject to future rearrangements or 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. Candidates for such assignments may be message trunk groups, originating registers, etc.

(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.

(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, only ***one*** additional software channel may be designated per hardware channel. In this case, all 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 (see 2.10) and may be used if desired. 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 TURs. ICUR would permit outputs from all four TURs to be assigned to one DCD. In TDAS, however, only two TURs can share 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/NM should be concentrated on as few equivalent input cards as practical. This will maximize the potential use of data supplied to EADAS/NM.

(k) It is recommended, but ***not*** required, that SCHVs for subscriber line usage be treated as non-LB items. Therefore, DCDs on the software channel should be allowed for these items.

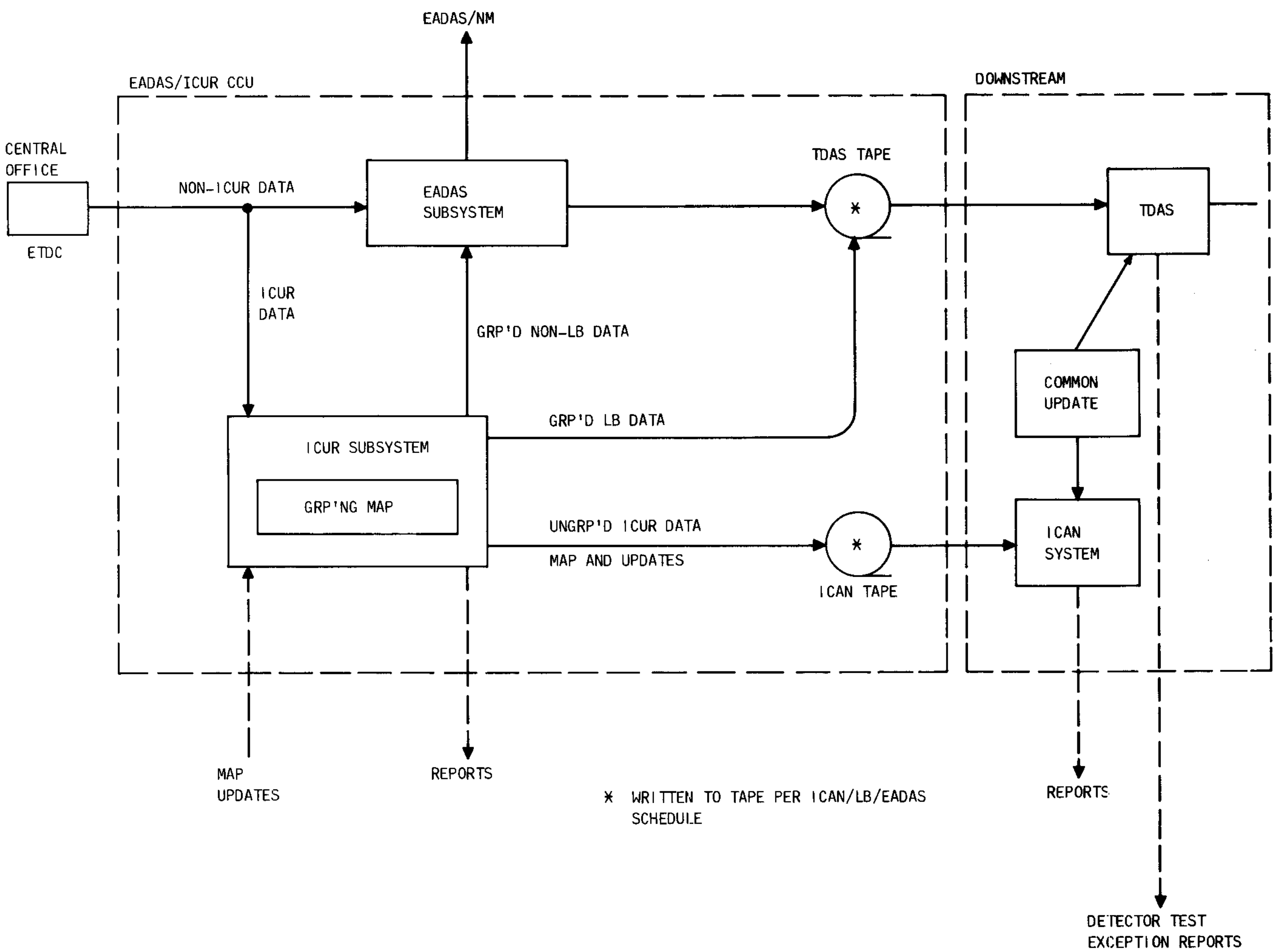

Fig. 1—Simplified Diagram of an EADAS/ICUR System (1.01, 2.05)

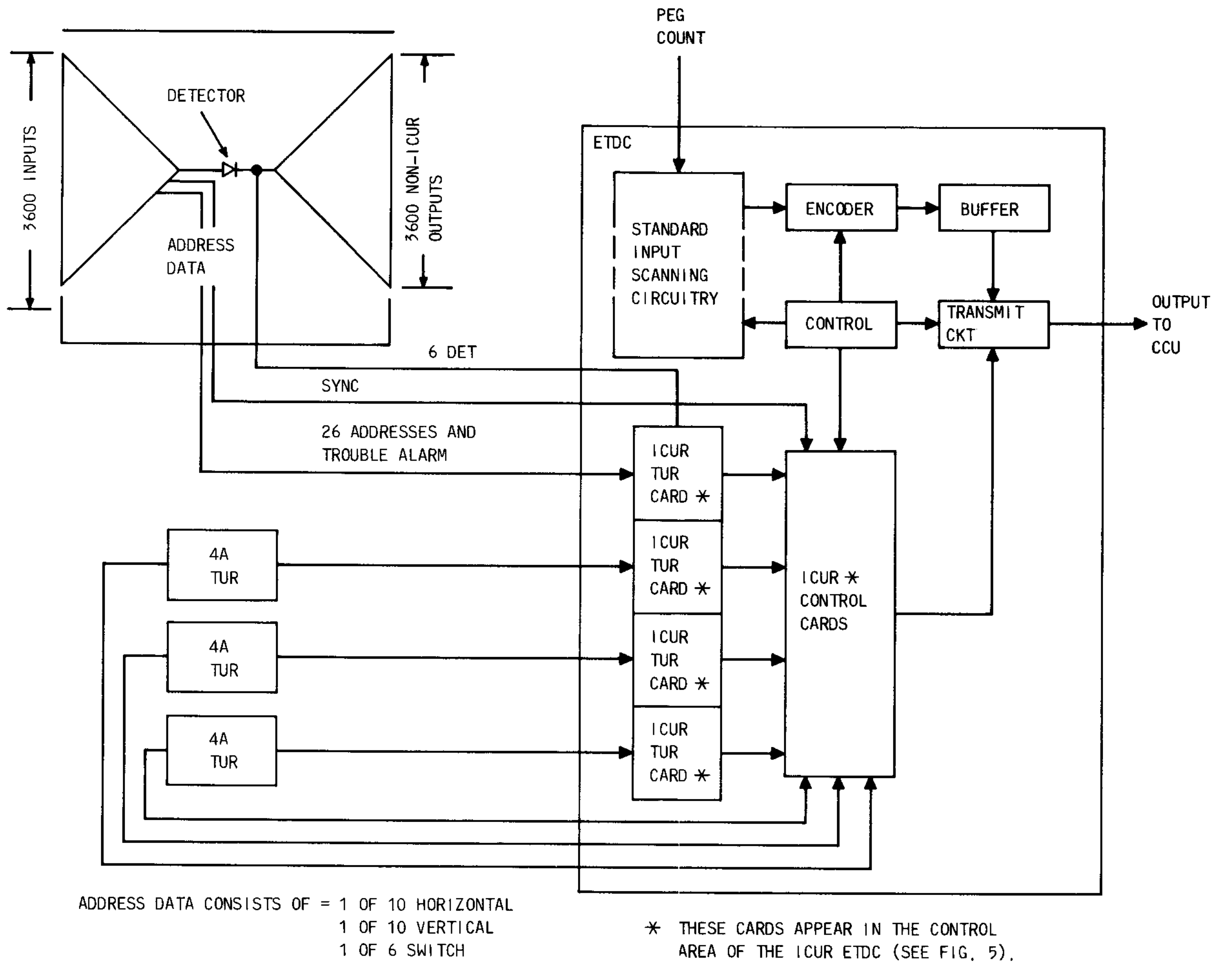

Fig. 2—ETDC With ICUR Option (2.01, 2.11, 2.13, 3.13)

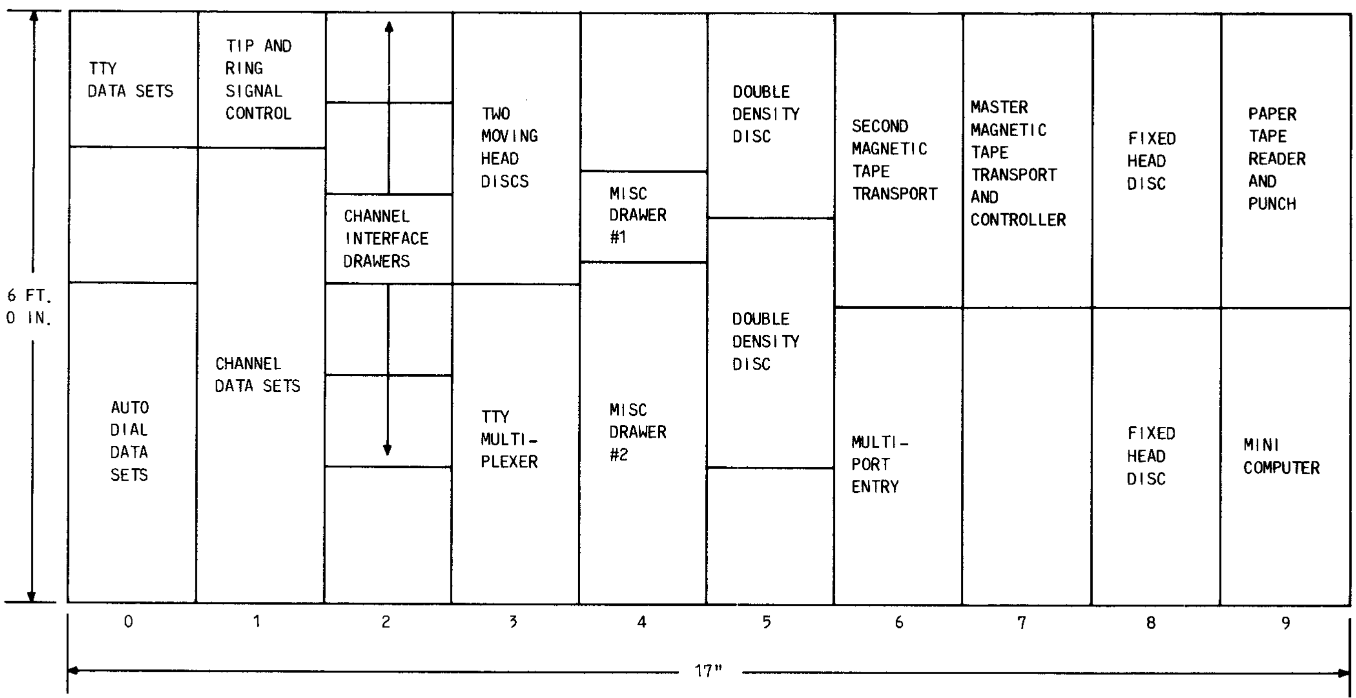

Fig. 3—EADAS/ICUR CCU (2.15, 3.09, 3.10)

NON-LOAD BALANCE DCDs

LGC	SOFTWARE CHANNEL NO.	DCD RANGE	DCU (NOTE 3)
0	First (xx) (Note 1, 3)	0000-0991	SXX
0	Second (yy) (Note 2)	1000-1991	SXX

LOAD BALANCE DCDs

LGC	TUR NO.	DCD RANGE	DCU (NOTE 3)
1-7	0	0000-0599	IXX
1-7	1	1000-1599	IXX
1-7	2	2000-2599	IXX
1-7	3	3000-3599	IXX

Note 1: XX is the number (00-99) of the first software channel and agrees with the hardware channel number.

Note 2: YY is the number (00-99) of the second software channel.

Note 3: Data collection units (DCUs) uniquely identify groups of DCDs. "S" indicates non-LB, "I" indicates LB; second and third digits must be the hardware channel number.

Fig. 4—Association of DCDs and LGCs (2.18)

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
		416

I = Individual
S = Shared

Fig. 5—Individual and Shared Assignments of Equivalent Input Cards (3.16)

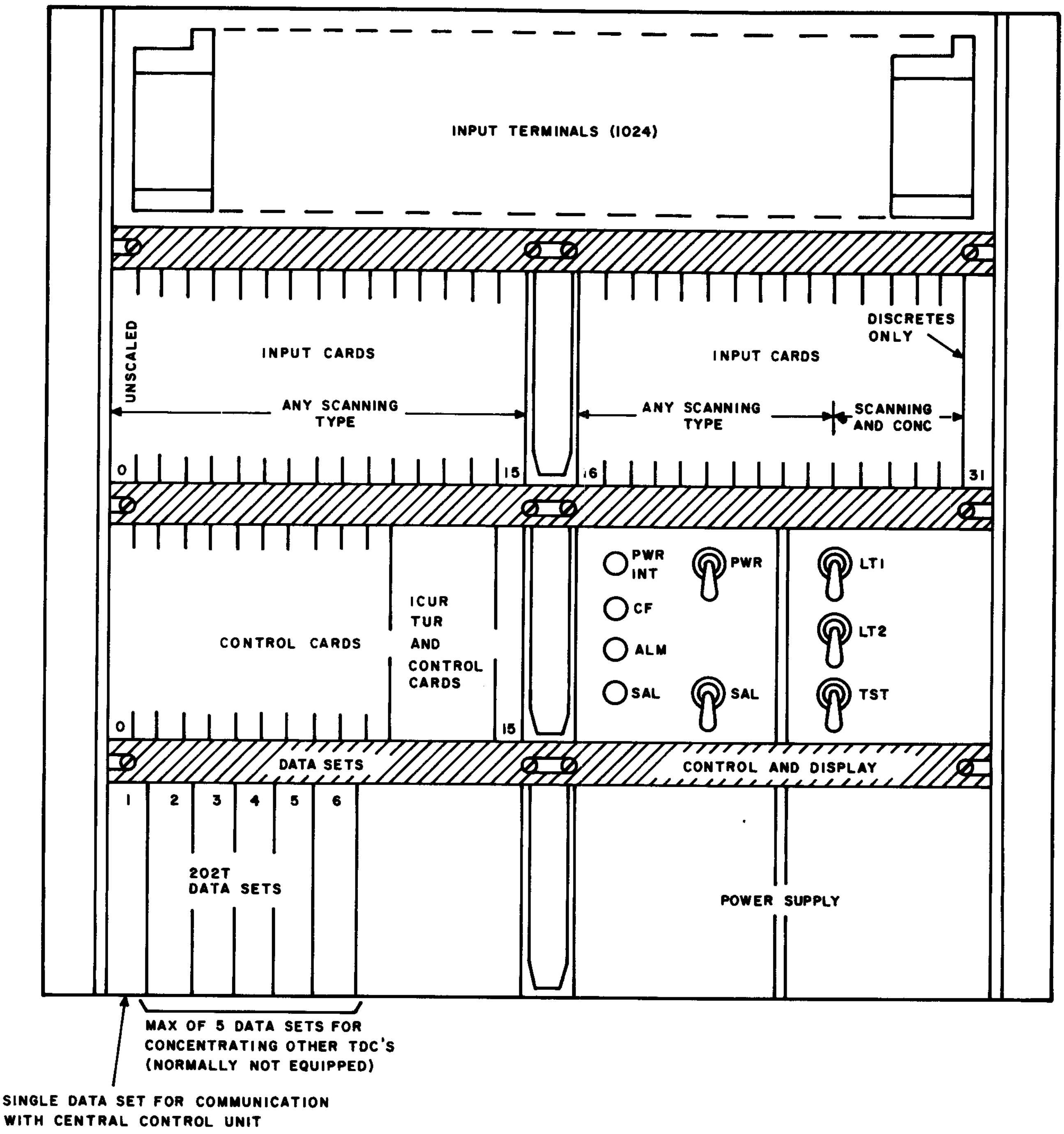

Fig. 6—ETDC Equipment Layout (3.18)