

**SWITCHING SYSTEMS MANAGEMENT
NO. 4A AND 4M CROSSBAR
TRAFFIC MEASUREMENTS
GENERAL DESCRIPTION**

TABLE OF CONTENTS

CONTENTS	PAGE
1. GENERAL	1
2. NEED FOR TRAFFIC REGISTERS	1
3. TRAFFIC REGISTERS ASSOCIATED WITH ELECTRONIC TRANSLATOR SYSTEM (ETS)	2
4. FUNCTION OF TRAFFIC REGISTERS AND LOAD RECORDING EQUIPMENT	3
A. Peg Count Registers	3
B. Overflow Registers	3
C. Group-Busy Registers	3
D. Group-Busy Time Duration Registers	3
E. Traffic Usage Recorder Registers	3
F. Detector Group Usage Registers	3
G. Sender Attachment Delay Recorder	4
H. Load Meter Equipment	4
I. Pen Recorder	4
5. TRAFFIC REGISTER EQUIPMENT COMPONENTS	4
A. Traffic Register Rack and Cabinets	4
B. Traffic Register Relay Rack	4
C. Traffic Register Distributing Frame	5
D. Traffic Register Types	5
E. Traffic Register Camera	5

SWITCHING SYSTEMS MANAGEMENT
NO. 4A AND 4M CROSSBAR
TRAFFIC MEASUREMENTS
GENERAL DESCRIPTION

1. GENERAL

1.01 This section is intended to give the Dial Administrator and the Network Manager an understanding of the different types of traffic registers. It also covers their importance in assuring effective utilization of the switching equipment and trunks.

1.02 This section covers the various classes of registration recorded on mechanical or software (Electronic Translator System) registers such as overflow peg count, group-busy, group-busy time duration, delay, detector group, usage, load meters, and pen recorders.

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

2. NEED FOR TRAFFIC REGISTERS

2.01 Technological advances in toll switching equipment to meet the increasing demand for telephone service have united the nation into a single interconnected and interdependent network. This network includes the collective total of the switching machines and trunk circuits used to switch both customer dialed (DDD) and operator handled calls. Along with these technical advances and the demand for additional switching equipment came new service problems and increased customer dialing which have resulted in decreased control over the traffic offered to the network. Information concerning traffic flow characteristics and conditions affecting customer service is made available by traffic registers and other load and service indicating devices.

2.02 To ensure the maximum flow of traffic under all conditions, traffic registers (both mechanical and software) provide the means of obtaining data on various components of the switching machine. The data received from these traffic registers, when validated for reasonableness and when there is a clear understanding of the

information recorded, will be used for load balancing, equipment engineering, trunk engineering, service reports, and special studies. The information derived from traffic registers will assist the following groups.

Dial Administration Group

- (a) To keep them aware of the capabilities, limitations, and functions of the equipment administered and to constantly keep them alert to conditions affecting customer service.
- (b) To ensure a balanced load on machine components when making assignments.
- (c) To initiate corrective action when service is unsatisfactory.
- (d) To keep management and other company groups informed of service conditions.

Traffic Facilities Engineering

- (a) To provide accurate data for adequate equipment and trunk circuits to satisfactorily meet the current demands for communication services.
- (b) To provide data for long range planning of equipment requirements and for management decisions concerning implementation of the long range plan and its economic considerations.
- (c) To establish busy-hour patterns and data on other traffic-related components that may not fall within the busy pattern of this office.

Network Management Group

- (a) To keep them aware of the status of the network on a near real-time basis and ensure the early detection of impending overload conditions.

- (b) To provide information to coordinate, initiate, and evaluate traffic controls, as required, to prevent or relieve traffic congestion.
- (c) To initiate other activities which will improve the performance of the network, secure better utilization of facilities, and provide improved customer service.
- (d) To keep System management informed of network conditions.

3. TRAFFIC REGISTERS ASSOCIATED WITH ELECTRONIC TRANSLATOR SYSTEM (ETS)

3.01 In a 4A/4M Switching System equipped with an ETS, traffic measurements are stored on both hardware (electromechanical) and software registers. The ETS will accumulate counts on the following major items which will, for the most part, replace counts recorded on hardware registers in non-ETS offices:

- (a) Trunk group peg count and overflow.
 - (1) Two-way outgoing trunks.
 - (2) One-way outgoing trunks.
- (b) Announcement trunk group peg count and overflow (EA, NCA, SOA, ROA, VCA, UCA, and MCA).
- (c) Traffic separation peg counts.
- (d) In, out, and through peg counts.
- (e) INWATS terminating calls routed and not routed.
- (f) With ETS, a maximum of 31 individual incoming trunk groups or combinations of trunk group peg counts can now be obtained.

See Division H, Section 13e-(2) for detailed information of hardware registers common to both ETS and card translator offices.

3.02 The preceding traffic counts, used for the operation and administration of the 4A/4M switching machine, are under control of the traffic measurement control program (TMCP). The TMCP utilizes the memory and data processing

features of the ETS to accumulate, store, and maintain schedules for the printout of data. As scheduled by local teletypewriter input messages, the TMCP will provide traffic measurement data via a teletypewriter printout or this data can be transmitted via the traffic data transmitter circuit (TDT) to a traffic data recorder (TDR). The software registers are arranged in five separate traffic data blocks of memory and are designated as follows:

- (a) Traffic data block A — machine engineering.
- (b) Traffic data block B — trunk engineering information.
- (c) Traffic data block C — network management information.
- (d) Traffic data block D — traffic administration information.
- (e) Traffic data block E — traffic separation information.

3.03 The traffic data blocks can be printed either on a regularly scheduled basis or on a demand basis. Only traffic data blocks C, D, and E are available on demand. A means is also available to print counts on selected items for network management, traffic data block C, on a 15-minute output schedule. It will be necessary to score announcement trunk group peg count and overflow on hardware registers on calls routed to these trunks by the marker. Therefore, it will be necessary to retain the hardware registers associated with the final reorder announcement (FRA) and no circuit announcement (NCA) trunk peg count and overflow.

3.04 The decoder channel is the only electronic translator equipment whose usage is to be measured on the traffic usage recorder.

4. FUNCTION OF TRAFFIC REGISTERS AND LOAD RECORDING EQUIPMENT

4.01 Traffic register recording information is classified under the following functions:

- (a) Peg count registers.
- (b) Overflow registers.

- (c) Group-busy registers.
- (d) Group-busy time duration registers.
- (e) Traffic usage recorder registers.
- (f) Detector group usage registers.
- (g) Sender attachment delay registers.
- (h) Load meters.
- (i) Pen recorders.

A. Peg Count Registers

4.02 These registers record the number of times individual units of equipment and trunk groups are seized, the number of partial dials and permanent signal attempts, traffic separation counts, and through, in, and out peg counts. INWATS and sender attachment time recorder readings will be recorded on peg count registers.

B. Overflow Registers

4.03 These registers record the number of times there is a failure to find an idle trunk in the selected outgoing and announcement trunk groups. Failure-to-match idle channels (channel overflows) between the incoming and outgoing link frame are recorded on this type register.

C. Group-Busy Registers

4.04 These registers record the number of times all trunks in a group of incoming trunks other than intertoll are busy. These trunk groups include tandem, inward operator, etc, trunk circuits. This register is rated A&M only.

D. Group-Busy Time Duration Registers

4.05 This register is incremented by one every 6 seconds when all trunks are busy in one-way incoming, intertoll groups or subgroups of trunks.

E. Traffic Usage Recorder Registers

4.06 The traffic usage recorder (TUR) scans numerous 4A/4M office circuits once every 100 seconds or 36 scan cycles each hour. During this period, each circuit scanned is checked for busy, and if busy, the busy condition is

recorded on the usage register. Provision can be made to measure units of equipment on a 10-second scan basis. This arrangement is referred to as fast scan. Also, an alternate scan feature is optional to increase the TUR scan interval from 100-second to 200-second scan.

F. Detector Group Usage Register

4.07 The detector group usage (DGU) feature of the TUR permits the totalization of up to 300 usage leads on a single 14-type traffic register. It is of particular value both as an administrative and engineering tool in that it provides a means of accumulating usage counts on a minimum of registers without affecting the simultaneous registration of individual group usage scorings. The DGU feature may be applied to incoming trunk link frames by train.

G. Sender Attachment Delay Recorder

4.08 In No. 4 crossbar offices, one sender attachment delay recorder (SADR) is provided per office. Its purpose is to sample the interval experienced by trunks in getting access to a sender and to record delays in excess of 3 or 7 seconds. The equipment will connect consecutively to each assigned sender link frame and will time for sender attachment exceeding a 3- or 7-second interval. When the last sender link frame has been tested, the equipment resets and starts a new cycle.

4.09 Two registers are provided for each sender group, where required, and for each type of sender. A peg count register is provided to record sender bids; a delay count register is provided to record the number of 3- or 7-second delays encountered.

H. Load Meter Equipment

4.10 A load meter is provided to give a quick check of loads being carried through various parts or selected components of the switching machine.

4.11 TUR registers give more accurate engineering and load balance data than load meter equipment. Most of the load meters provided on earlier 4A/4M installations are now rated Manufacture Discontinued and are not recommended for new installations. The load meters that may be found at 4A/4M locations are as follows:

(a) Recording ammeter, which uses a pen tracing on a circular chart to record the load fluctuations on trunk link frames or sender groups.

(b) Train load meters are permanently associated with some of the incoming trunk link frames of each train. These meters are graphic recording devices which indicate the total train load on a continuously moving tape in terms of percent of engineered trunk link frame capacity.

(c) An instantaneous ammeter secures readings of the loads on the trunk link frames or sender groups on a patching basis.

I. Pen Recorder

4.12 Most No. 4-type offices are provided with Esterline-Angus 20-pen recorders. These recorders are portable types, used by Dial Administration to secure holding time data on common control equipment, as well as to indicate equipment reactions not otherwise disclosed. The 20-pen recorder is also used by Network Management to record current machine and network performance data. Peg count, overflow, SADR delay, or other mechanical registers can be connected to pens. Lamps such as short sender timing, SADR alarm, or all-senders-busy may also be connected.

5. TRAFFIC REGISTER EQUIPMENT COMPONENTS

5.01 Traffic registers can be mounted in various equipment configurations as follows:

- (a) Floor-mounted traffic register rack.
- (b) Floor-mounted traffic register cabinet.
- (c) Wall-mounted traffic register cabinet.

Traffic registers associated with ETS are assigned by teletypewriter input.

A. Traffic Register Rack and Cabinets

5.02 The registers, magnetic counters, control keys, patching jacks, meters, camera power receptacles, and camera control relays are located on the traffic register racks or in cabinets.

5.03 The traffic register rack or the floor-supported traffic register cabinet will accom-

modate three hundred 14-type registers and the wall-supported cabinet will accommodate ninety 14-type registers. When magnetic counters are mixed with the 14-type registers, the capacity for 14-type registers is reduced in proportion to the mounting spaces occupied by the magnetic counters.

B. Traffic Register Relay Rack

5.04 The registers and alarm relays, battery supply relays, meters, and test jacks are located on the traffic register relay rack. The relay circuits are used to connect the various circuits to be studied in the 4A/4M System to the associated registers.

C. Traffic Register Distributing Frame

5.05 The traffic register distributing frame provides a cross-connecting point which allows flexibility in associating registers and register relay circuits to meet traffic requirements.

D. Traffic Register Types

5.06 Mechanical traffic registers provide a means of obtaining data on various components of the 4A/4M crossbar office whether or not the office is equipped with an ETS.

(a) *14-Type* — This register can be employed whenever the number of counts of any one item or group of items will not exceed 9999 during the reading period.

(b) *KS-19798 L1 (Resettable)* — This register can be used in place of the 14-type register to eliminate the need for subtracting the previous reading from the present. This register can be manually set to 0 after each reading.

(c) *KS-16493* — This register is used when the capacity of the 14-type is exceeded. This register will record up to 99,999 counts.

(d) *KS-15947 Totalizer Circuit* — The totalizer circuit is an electronic counting device which will provide on one traffic register the total count accumulated by many individual traffic registers. This register will be incremented by one for every ten inputs to this circuit.

E. Traffic Register Camera

5.07 The KS-14776 camera is arranged for attachment to the traffic register and relay rack and the floor-supported traffic register cabinet on which the traffic registers to be photographed are mounted. Photographs can be taken automatically at desired intervals under control of the TUR frame or the traffic register camera control circuit, or the camera can be operated manually.