

## Switching Products



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In addition to switching systems, Northern manufactures associated equipment which also has a history of proven reliability. It includes:

- Toll switchboards which facilitate operator toll service or combined toll and dial service assistance and also centralized accounting services.
- Operating room desks, dedicated to auxiliary services for incoming calls, such as rate and route, toll information, intercept and local information.
- Private branch exchange switchboards which have the same operating features as large switchboard installations.
- Local test desks for use in test centers for testing subscriber lines and helping to maintain the high level of service which is inherent with Northern switching systems.
- Traffic usage recording equipment for accumulating statistical information concerning system operations.
- Call measuring and recording equipment that provides information on the number of unanswered calls in a given time interval.

More detailed information on each type of equipment is to be found in the following pages.

### NE-3CL Toll Switchboard

The NE-3CL switchboard is intended for toll services or for combined toll, dial service assistance, and central automatic message accounting services. It can be used with Step-by-Step, Crossbar and electronic switching exchanges.

It is an assembly of lower and upper units arranged side-by-side in one or more rows to provide the required number of operating positions. Each position is composed of one lower unit, 25½ in (648 mm) wide and an equivalent width, three-panel upper unit. In addition, head and foot-end units may be required and a cable is normally arranged for each row of switchboard positions. The assembled height is 64 in (1.63 m) and the maximum depth is 52 in (1.32 m).

#### Upper Units

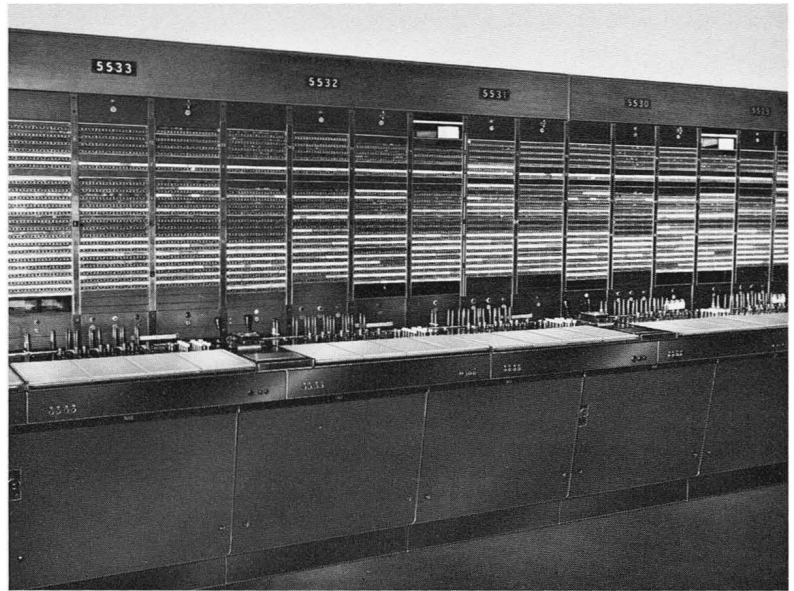
The upper units hold the jacks, lamps, miscellaneous apparatus, and slots for tickets, arranged as specified for a particular application. The majority of lamps and jacks may be connected in a multiple at six or seven panel intervals along the length of the switchboard line-up, within the reach of any operating position. Head and foot-end units are normally included, especially in larger installations or for seven-panel multiples. End units are non-operating positions with equipment for dial or key monitoring, etc.

Although the main types of multiples and a few of their uses are listed below, other arrangements are available to suit many applications.

■ **Miscellaneous Answering Jack Multiple.**  
Information, intercepting, official PBX, verification request, manual lines, interposition trunks, TX trunks, etc.

■ **Intertoll Answering Jack Multiple.**  
Toll incoming calls.

■ **Recording Trunk Multiple.**  
Subscriber recording-completing trunks.





### NE-3CL Toll Switchboard

- Intertoll and Tributary Outgoing Trunk Multiple.
- Intertoll and tributary trunks, tandem trunks, etc.
- Toll Switching Trunk Multiple. Outgoing to toll switching offices.
- Miscellaneous Trunk Multiple. Conference operator, verification, miscellaneous communication trunks.

#### Lower Units

The lower units of the switchboard contain the operating control facilities. Included is the keyshelf at convenient desk-top height, 30 in (762 mm), for mounting the plug-ended cords and supervisory lamps, monitoring, talking and ringing keys, and optional features such as a dial or keyset, a peg count key and tone removal key. They also have slots for storage of calls-in-progress tickets, space for bulletin holders and a switchboard clock or calculagraph, which is shared by two operators. Apparatus for switchboard circuitry, terminal strips and fuse panels are located in the rear of the unit. Jacks on the front of the keyshelf (the lockrail) are for operators' or supervisors' headsets.

Lower operating units are available with a capacity of 12 or 15 cords for inward positions or up to 10 cords for outward positions. Head and foot-end units are available with miscellaneous non-operating facilities.

#### Power Requirements

—24 and —48-Vdc power is usually combined with the power sources for the central office equipment. Other power, such as 22 Vac for clocks and/or the calculagraph is made available as required.

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### NE-608A Private Branch Exchange Switchboard

The NE-608A PBX is designed to provide efficient operating features which in the past were only incorporated in large switchboard installations. It is equipped with fast-operating, illuminated, non-locking pushbutton keys. An up-to-date appearance is achieved with all-metal construction.

The switchboard is adaptable to various office sizes and varying traffic conditions. It can be used on either a multiple or non-multiple basis, as a manual PBX or as an attendant position associated with a dial-type PBX or NE-5 Crossbar Centrex.

A cable turning section is also available where multiple boards of over 300 lines are required.

A fine integration of aesthetic and practical design has been attained by sloping the jackfield toward the back of the board and the keyshelf downward. These slopes enhance the smooth, clean lines of the board and provide a comfortable operating position.

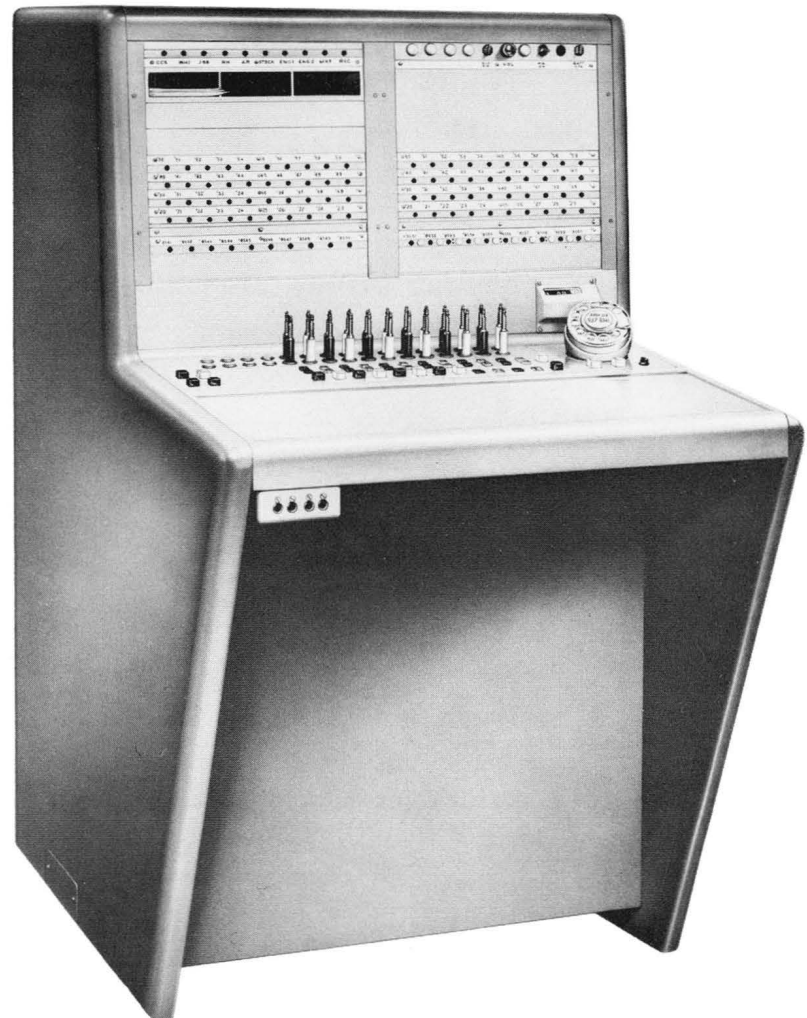
The utilization of equipment on a modular-unit and plug-in basis represents significant savings in installation and necessitates minimal maintenance effort.

The NE-608A PBX is intended for universal application throughout a wide range of customer switchboard use.

#### Features

In addition to the standard features the following are also available:

- Machine ringing on the front cord.
- Manual ringing on both cords.
- Audible flashing recall on both cords.
- Distinctive supervisory flashing signal.
- Individual station through dialing.
- Cord splitting.
- Illuminated pushbutton non-locking keys.
- Automatic disconnect.
- Transfer of attendant's circuit.
- Standard conference circuits.



## Switching Products



## NE-608A Private Branch Exchange Switchboard

### Technical Data

#### Capacity

	Manual Operation				Dial Operation			
	Station Lines		Trunks		Station Lines		Trunks	
	10 per	20 per	10 per	20 per	10 per	20 per	10 per	20 per
<b>Low Section</b>								
1-position non-multiple	180	360	40	80	160 <sup>†</sup>	300 <sup>†</sup>	40	80
3-panel multiple	—	580	60	120	—	900	90	180
4-panel multiple	—	800	80	160	—	1200	120	240
<b>High Section</b>								
4-panel multiple	—	1600	80	160	—	2400	240	480

**Cord Circuits per Position**  
16

<sup>†</sup>With designation strips

#### Operating Range

Conductor Loop	CO Type	Manual Switchboard Resistance (Ω)	Dial Att. Switchboard Resistance (Ω)
Station	NE-5 Crossbar	1215	885
Trunk	NE-5 Crossbar	1280	1330
Overall (Station and Trunk)	NE-5 Crossbar	1410	1330
Station	Step-by-Step	1280	885
Trunk	Step-by-Step	1000	1200
Overall (Station and Trunk)	Step-by-Step	1280	1200
<b>Operator Station Signaling</b> Rotary dial or DIGITONE*	<b>Operating Voltage</b> —48 Vdc	<b>Synchronous Electric Clock Supply</b> 22 Vac, 60 Hz	

#### Physical Data

Low Section		High Section	
Height	4 ft (1.22 m)	Height	4 ft 8 in (1.42 m)
Width	2 ft 3½ in (698.5 mm)	Width	2 ft 3½ in (698.5 mm)
Depth (including keyshelf)	3 ft (914.4 mm)	Depth (including keyshelf)	3 ft (914.4 mm)
Jackfield opening	11½ in (292.1 mm)	Jackfield opening	1 ft 7½ in (495.3 mm)
Weight	500 lb (226.8 kg)	Weight	600 lb (272.1 kg)

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### NE-23A Operating Room Desk

The NE-23A Operating Room Desk is a flexible centralized control center for auxiliary services provided for incoming calls, such as rate and route, toll information, intercept, and local information. Each unit consists of a maximum of 36 operator and four supervisory positions, 140 incoming trunks (which by the use of concentrators can be increased to 240), five preference groups and six outgoing trunks or trunk groups. It is adaptable for either single- or multi-service operation. Calls requiring supervisory attention are transferred by operation of a key.

Automatic call distribution is available, as is a centralized supervisory console, which will reduce supervisory positions by two, increasing operator positions to 38.

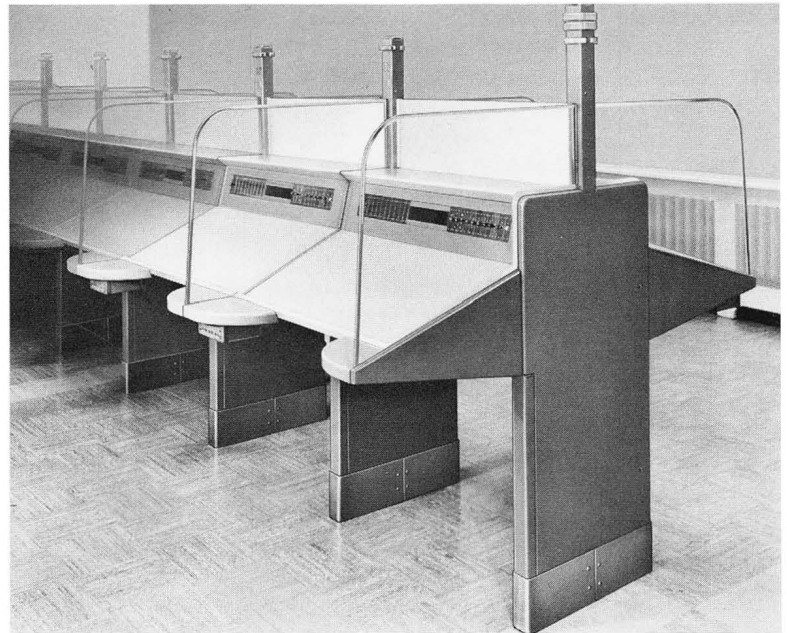
Load balancing facilities can be provided for installation of two or more desk units. A temporary traffic overload is automatically transferred between units if idle occupied positions are available. This feature permits a reduction of operators from 38 to 33 per unit.

A force administration data system has been designed to provide improved traffic administration for systems using automatic call distribution. In light traffic periods the unit may be vacated, incoming traffic being transferred to other facilities.

Frame and relay rack equipment is mounted on bulb-angle relay rack bays and shop-wired, excepting trunk equipment. The equipment quantity depends on the number of trunks, position increments, type of operation, and whether manual outgoing or trunk hunting arrangements prevail.

#### Auxiliary Equipment

- A key-controlled flexible arrangement for outgoing trunk assignment.
- Lamp signal cabinet indicates trunks awaiting service, positions available or busy.





NE-23A Operating Room Desk

- Preference key control cabinet provides a key per class of service for each of 10 positions. Facilitates rapid preference shifting, dependent on traffic load.
- Traffic register cabinet provides registration for group preference, position, and position transfer.
- Listening jack cabinet permits monitoring of operator and/or supervisory positions.
- Fuse board provides desk circuit fusing; power is obtained from local power plant.
- Automatic load balance control circuit.
- Force administration data system.

Maintenance Features

- Trouble-indicating panel facilitates monitoring of call from origination to an operator. Indicates potential critical relay failure and switching relays in operation.
- Maintenance talking trunk provides trouble hunting without disturbing working positions.
- Incoming trunk testing enables routing of test calls to operators.

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Physical Data			
<b>Color Choice</b> Gray enamel Green or Ivory semi-gloss	<b>Framework</b> Formed sheet-steel uprights joined by a cable trough and two back-to-back directory bookshelves	<b>Growth</b> From a basic two-position increment to a maximum of 20 increments	<b>Lamp Signal Standards</b> Located at each end of a line-up or between sections
<b>Height</b> 3 ft 4 <sup>7</sup> / <sub>8</sub> in (1.04 m)	<b>Width</b> 2 ft 7 in (787 mm)	<b>Depth</b> 4 ft 10 <sup>1</sup> / <sub>8</sub> in (1.49 m)	<b>Weight</b> 165 lb (74.8 kg)



### NE-14 Local Test Desk

The NE-14 Local Test Desk is used to provide accurate and efficient testing facilities on subscriber lines and incoming and outgoing trunks in all types of telephone exchanges. It has an operating range that can cover local offices and offices at unlimited distances resulting in economy in test center operation.

#### Range of Operation

- The full complement of test facilities can serve the exchanges in the building in which the test center is located and in addition can serve other exchanges in the surrounding area.
- The primary or important test facilities can be further extended to unlimited distances via a remote testing facility. Tests are made via telemetering equipment over any dedicated or non-dedicated trunk, or voice message frequency trunk.
- A remote tandem testing feature can provide further extensions of the remote testing facilities. By means of an applique circuit located with the far end telemetering equipment, tests can be made via dedicated facilities to a maximum of ten satellite offices.

#### Configurations

Test desks, furnished in sections, may be arranged in a continuous line-up of up to 20 sections or positions with a cable turning section at one end and an end panel at the other. Large installations include one supervisory and light-load position with the regular test positions. In small installations the regular test positions may accommodate the supervisory and light-load facilities. The two types of position include the same facilities, but the supervisory position has access to all trunks in the line-up.





## Switching Products



### NE-14 Local Test Desk

Each section has four vertical panels to house the jacks, lamps, keys, voltmeter, rheostats, relays, and other miscellaneous apparatus. The keyshelf is located 36 in (914 mm) from the floor and is composed of three parts. To the left on one or two positions in a line-up a Wheatstone bridge may be located. Alternatively, the left end may have a card file compartment. In the center or keyshelf proper, the primary and secondary test circuit, howler, breakdown test, and ringing keys are located. To the right is a bulletin holder.

#### Test Facilities

The primary test facilities included in local, remote, and tandem testing features include station signaling, talking, monitoring, volt-

meter, and milliammeter tests, resistance measurements, and continuity or ballistic tests. Coin collect and coin return tests, foreign EMF tests, line relay tests, DIGITONE\* station test, receiver off-hook tone application, control of automatic line insulation testing, and permanent signal release features are included.

Other facilities for local testing include testing for dial speed, and line insulation breakdown, electronic voltmeter and Wheatstone bridge tests.

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#### Technical Data

	Capacity (per position)	
	Regular Positions	Supervisory Positions
Test Trunks†	30	—
Test Trunk Multiples (6-panel)	150	150
Talking Trunks	29	—
Talking Trunk Multiple (R to L growth)		160
(L to R growth)		120
Loudspeaker Trunks	20	20
Test Trunks to MDF	10	
Test Trunks to MDF Multiple (5-panel)	40	40
Code Ringing Trunks	10	10
Monitoring Jack Trunks	—	40
Telephone Circuit	1	1
Primary and Secondary	1	1
Secondary Ringing Circuit	1	1
Primary Ringing Circuit	1	1
Howler Circuit	1	1
Breakdown Test Circuit	1	1
Position Clock Circuit	1	1
MF Keyset Circuit	1	1
Auxiliary Signal Circuit (per line-up)	1	1

†The capacity of the test trunks per position may be increased from 150 to a maximum of 160 when the MF keypulsing key located on the keyshelf is not required

#### Physical Data

Height	4 ft 6½ in (1.384 m)
Width	3 ft 5 in (1.041 m)
Depth	3 ft 6 in (1.067 m)
Weights (approx.)	
One section	675 lb (306 kg)
Cable turning section (large)	85 lb (39 kg)
Cable turning section (small)	75 lb (34 kg)

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### NE-1 Portable Traffic Usage Recorder

The NE-1 Traffic Usage Recorder is a portable assembly designed to record traffic data on Step-by-Step and Crossbar-type switching systems and associated switchboards. The information obtained is used for engineering, administrative, and division of revenue studies. The NE-1 will procure and record, accurately, automatically, and directly, for any predetermined period, the load data in units of ccs\* (hundred call-seconds) per hour, or erlangs. Traffic can be measured on circuits such as trunks, links, selectors, subscriber lines, senders, and other system components. While designed principally for use in small unattended offices, it can be used in larger offices where a permanently installed traffic recorder frame is not available.

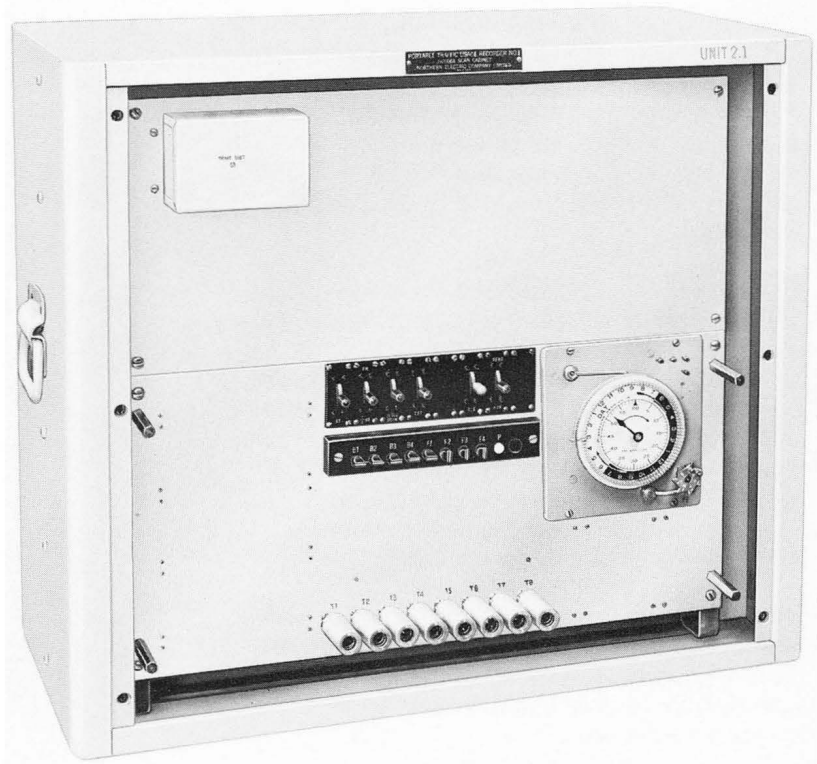
The NE-1 Portable Traffic Recorder consists of two main parts, a scanner unit and a register unit mounted in separate cabinets. The cabinets, finished in green enamel, are equipped with front and rear cover plates and carrying handles. A camera unit attaches to the register cabinet for recording the register readings. Power cables, and interconnecting and input-connecting cables are included.

The scanner unit contains the scan switches, program timer, electronic detectors, control keys, and multi-contact input and output jacks.

The register unit houses the traffic registers, the cross-connection field, and patch jacks for scanner connections.

Twenty-conductor input-connecting cords are available with one end terminated in a plug to patch into the recorder. The other end may be terminated as follows:

1. With individual test clips;
2. In a multi-contact shoe for direct clamping on a distributing frame terminal strip;
3. In a 20-point female socket for extension cord runs.



Scanner Unit



## Switching Products



### NE-1 Portable Traffic Usage Recorder

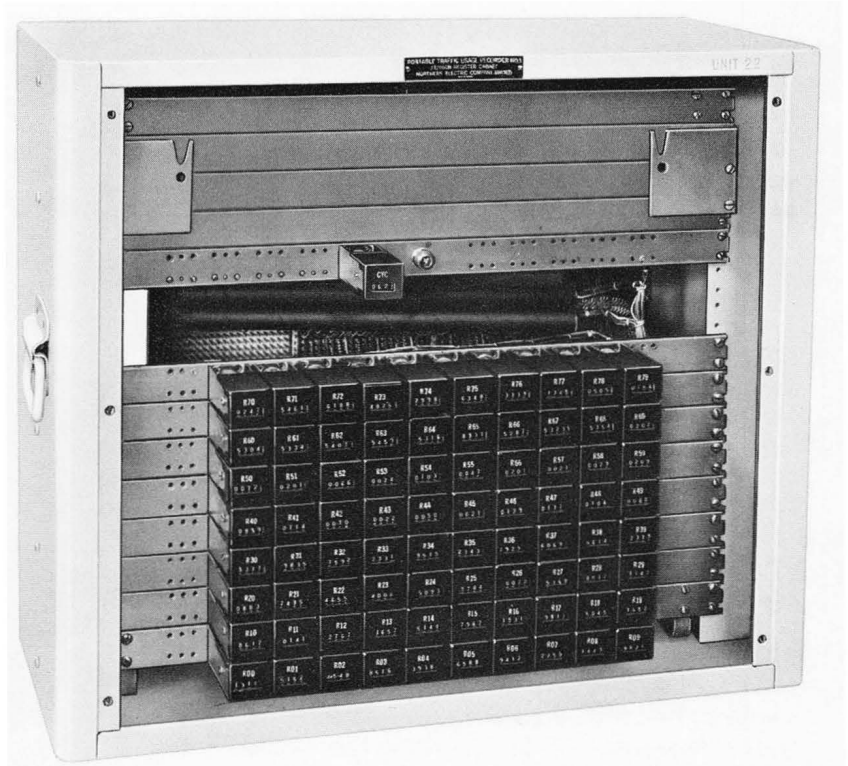
The NE-1 Portable Traffic Recorder can handle either a maximum of eight groups of up to 100 input circuits each with a cross-connection to one output register per group; or a maximum of 400 input circuits, the outputs of which can be cross-connected by key manipulation on a flexible basis to 100 output registers.

Test leads may be scanned once every 100 seconds, or at a rate of 36 scanning cycles per hour, for measurements in ccs units. In addition to this basic 100-second scan rate, by means of a key control, 20% of the terminals may be scanned at 10-second intervals. A separate register records the number of scanning cycles. For measurements in erlangs, all test leads are scanned every 36 seconds (100 cycles per hour).

An automatic program-timer provides pre-determined interval timing during each day as well as for predetermined days during the week. A manual key is provided to stop the recorder operation.

The register camera assembly consists of a camera mounted on the outside of a hood, with a pilot lamp, a manual push-button switch for camera operation, an exposure counter, and an on-off camera-control switch. Included within the hood are the clock (photographed with registers to show time of exposure), the holder for register designations cards, illumination lamps, mirrors, and control apparatus.

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Register Unit

#### Physical Data

Height	Width	Depth	Weight
22-9/16 in (571 mm)	25 3/4 in (654 mm)	12 3/4 in (324 mm)	Scanner Unit 80 lb (36 kg)
			Register Unit 100 lb (45 kg)
			Cables and Patch Cords (approx.) 70 lb (32 kg)

**Power Input**  
110 Vac, 60 Hz; 48 Vdc (Also available for use on 230 Vac, 50 Hz, with Output in erlangs but without fast scan — 10 second interval)



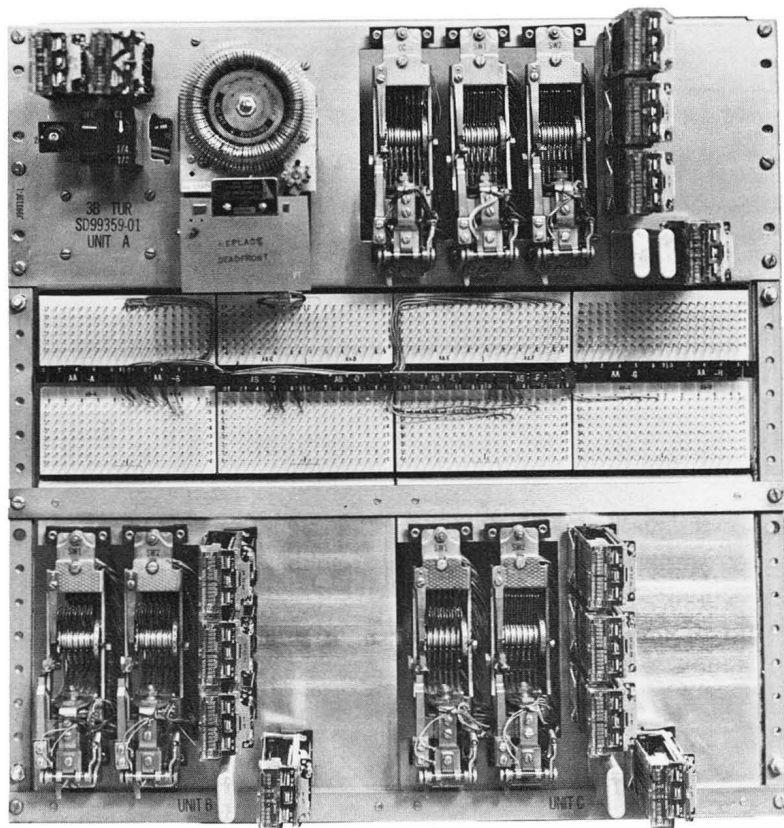
### NE-3B Traffic Usage Recorder

The NE-3B Traffic Usage Recorder (TUR) is intended for installation in telephone offices to obtain and record traffic load information on trunks or traffic handling components of switching systems. It consists of a scanner assembly, a register assembly, and an optional camera unit. The NE-3B provides, automatically, accurate traffic data in terms of CCS (hundred call seconds) for predetermined time intervals. Up to 600 inputs can be accommodated. Each input may be scanned once every 100 seconds and is repeated 36 times per hour.

The basic NE-3B, equipped with a single line-scan unit, can accommodate up to 200 inputs divided into a maximum of 20 groups. With up to two additional line scan units, the capacity can be increased to 600 inputs divided into 60 groups maximum, in increments of 20 inputs per scan unit. The basic unit is arranged on a relay rack mounting bar assembly that will accommodate two additional line scan units. It is equipped with the basic apparatus, an optional program timer, relays, and the stepping switches. The space requirements are twelve, 2-in by 23-in (50 mm x 580 mm) relay rack spaces.

For additional flexibility the following optional items are available:

1. A high impedance detector unit with transistorized circuitry to insure that circuits to be scanned are not affected by low impedance detector relay circuits. This unit will accommodate the full complement of scanning circuits. The rack space requirements are 2 in by 23 in (50 mm x 580 mm).
2. A horizontal scan unit to permit the combining of groups that are simultaneously vertically scanned. Rack space requirements are 4 in by 23 in (101 mm x 580 mm).
3. A sample links unit, that accommodates 80 inputs with individual outputs. This unit can







### NE-3B Traffic Usage Recorder

be connected in random fashion to provide grand totals and sub-totals. This unit is used when the line links capacity is 400 inputs or less and mounts in place of one line links unit.

A program timer is included with the TUR. It can start and stop the recorder at pre-determined intervals within one day. The same operation may be repeated on a pre-selected day or days during the week. Normally included with the basic NE-3B scanner unit, it may also be located with the registers or with the optional camera unit.

Registers may be the electrically resettable type used in the force administrative data system (FADS) or the NE-14 type. The FADS provides data for use in estimating operator requirements. The FADS administrative cabinet, intended for manual recording, employs two groups of automatic resetting registers. Register groups alternately record data for a predetermined time, hold the reading until the beginning of the next period and automatically reset to zero and start recording again. A pilot lamp indicates the set of registers to be read.

When a camera is used for recording, the NE-14 four-digit registers may be arranged on rack mounting plates in a sufficient quantity to suit the application.

The optional camera can be arranged to record the register readings automatically and is controlled by the program timer. Photographs may be made at the beginning of the scan period at half- or one-hour intervals during scanning and at the end of the last scan. The camera uses 35 mm film. Standard 20- or 36-exposure rolls accommodate about 33 or 59 register pictures respectively.

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### Answering Time Recorder and Traffic Weighting Applique

#### Answering Time Recorder

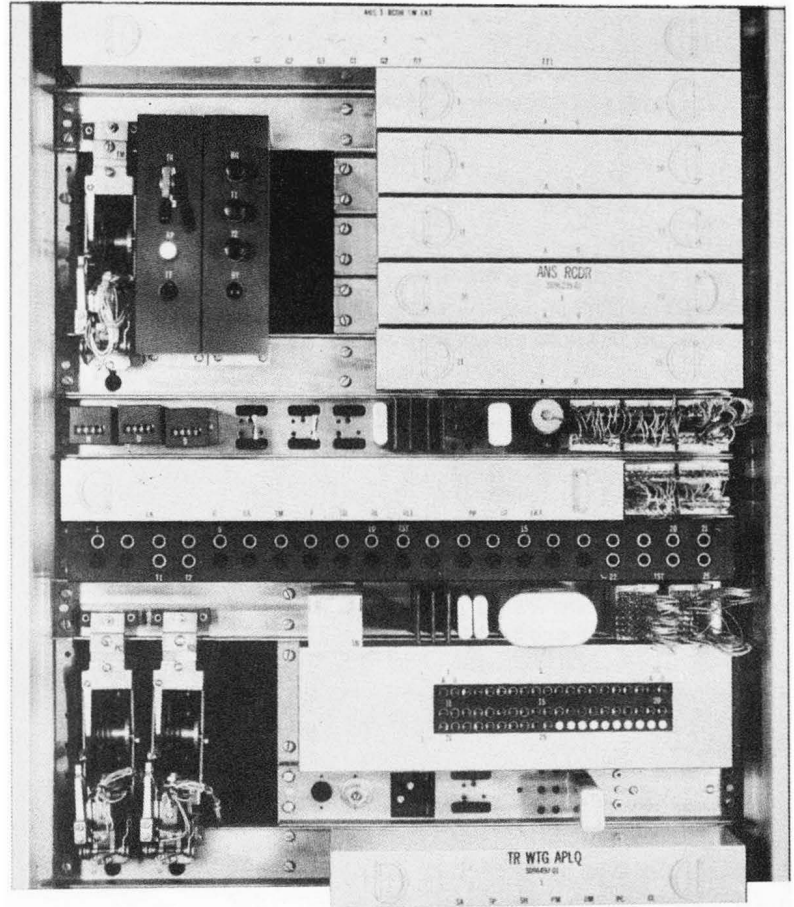
The Answering Time Recorder (ATR) is a device used to measure and record the total number of calls in a given group of lines or trunks associated with the recorder, and the number of these calls that are not answered by the operator in a predetermined time interval. The equipment provides a means for connecting a group of 25 lines or trunks to the recorder, a means of registering the total number of calls occurring when so connected, a register for indicating the number of these calls not answered within the prescribed time (as determined by the timing control arrangement), and a test circuit for testing the performance of the recorders.

The ATR may be arranged so that it can be transferred from one group of trunks to another by means of a switching circuit. The recording registers may appear at a relay rack and either at the switchboard or in the traffic register cabinet. The recording equipment is wired directly to the distributing frames and cross-connected to the trunks selected for the time study either directly or through the switching circuit.

This recorder is provided with a time transfer key which is used to vary the answering time interval permitted to elapse before the delayed answer register operates. The key is located on the timing unit if the switching feature is not provided. When the switching feature is provided, the time transfer is effected by the switch which changes the recorder from one group of lines to another.

#### Traffic Weighting Applique

The Traffic Weighting Applique (TWA) is a peg count storage device that can be attached to a multi-line Answering Time Recorder in such a manner that the calls which occur on the lines or trunks while a given call is being timed are taken into consideration in determining the per cent slow answer for the office.







# Answering Time Recorder and Traffic Weighting Applique

When the Answering Time Recorder is modified to include the Traffic Weighting Applique, three registers (designated N, D, and S), a peg count storage circuit, and a count storage circuit are provided.

The registers and storage circuits operate as follows:

**N register** — Scores the total number of calls counted on the 25 attachments.

**D register** — Scores the number of delayed calls counted on the 25 attachments.

**S register** — Scores the number of signals actually timed by the Answering Time Recorder. These data may be used to help determine whether the size of the sample is large enough to provide a reasonable degree of accuracy.

The peg count pulser circuit recognizes every signal that appears on the lines of trunks under observation. The storage device stores the peg count from the peg count pulser and passes the count into the N register if the call being timed is not delayed; or into both the N and the D registers if the call being timed is delayed.

The Answering Time Recorder that is modified to work with the Traffic Weighting Applique circuit should be arranged for constant holding time operation. This type of recorder will not release itself from the line trunk on which it has timed a signal until the expiration of the objective timing interval.

The Traffic Weighting Applique may be used with any line or trunk circuit with which the corresponding Answering Time Recorder is used. However, it is not designed to operate with certain circuits having undesirable characteristics such as momentary flash on operator disconnect. It is therefore necessary to check all circuits with which the TWA is to be associated in order to insure that it will function properly.

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