

THE NORTH "ALL-RELAY" AUTOMATIC SYSTEM

signals nor distort the dial interruptions. The line insulation to ground may actually drop below 500 ohms without interfering with dialling.

The ability of the "All-Relay" switchboard to operate under adverse line and plant conditions is of great importance in isolated exchanges, or where the maintenance force is limited and immediate repairs cannot be made. It permits service to continue uninterrupted until the trouble can be cleared.

It also permits the economies of dial operations to be realized in advance of complete plant rehabilitation.

Permanents

The "All-Relay" switchboard is also equipped with automatic line lockout facilities and so arranged that a permanent signal, due to a short on the line or of a receiver off without dialling, will not occupy the switching apparatus. As soon as the short is removed from the line, the line is automatically connected to the switchboard and service may proceed. This feature is quite important, especially in unattended exchanges where immediate attention cannot be given to permanent signals. It permits the switchboard to be fully available for traffic, regardless of the number of permanent signals that may be present in the plant.

This feature of automatically restoring the line to service when a "short" is cleared, is of great value as no assistance is needed at the central office for the troublemen. He will receive the dial tone as soon as he has cleared the trouble. Furthermore, many "shorts", such as, "receivers off" clear without the troubleman's assistance.

Dial Speed

For switch type automatic systems close regulation of dial speed is absolutely necessary. The "All-Relay" system does not require close regulation of dial speed as the relays will respond to a very wide range of speed, much greater variations than is possible with switch systems. This wide range of dial speed reduces the dial maintenance costs.

Line Testing

For testing lines from the central office a simple test set is supplied, when requested, mounted on power panel which enables the troubleman to make all the usual voltmeter line tests, by simply pushing a button marked for the test wanted.

Power Plant

The power plant of the "All-Relay" switchboard is the simplest arrangement possible. No moving parts are used, except the vibrator type ringing current generator and it is guarded by a special North "by-pass" starting circuit which insures its proper operation. Because voltage regulation is

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not necessary for "All-Relay" equipment, no end or counter cells are required. The battery is charged by means of rectifiers which contain no moving parts or tubes to burn out, and require the least amount of commercial current for maintaining the battery supply. No voltage relays or reverse current breakers are used. The storage batteries are of the enclosed glass jar type and are supplied in capacities sufficient to carry the exchange for a long period, should the commercial current fail. The charging is done by the trickle method at a low rate, which is conducive to long battery life.

The maintenance required by this power plant arrangement is simply maintaining the electrolyte level in the cells and an occasional check of the charging rate.

The ringing current generators operate only when needed, starting and stopping automatically. This arrangement increases the life and reduces the frequency of adjustment of these devices.

LINE CHARACTERISTICS FOR "ALL-RELAY"

Line Insulation

From the foregoing it will be noted that low line insulation has very little effect on the operation of the switchboard, the ability to talk and ring on the line are the real limiting factors for the minimum line insulation resistance. On metallic lines the insulation to ground may drop below 500 ohms yet not prevent dialling. On single wire grounded lines the insulation must be maintained to common battery standards, or approximately 5000 ohms.

Line Resistance

The "All-Relay" switchboard is normally adjusted for operation with line loops up to 1000 ohms. Special arrangements are made for longer loops, if requested.

Line Joints

Good joints are essential to the successful operation of any system.

Grounded Lines

Grounded lines (single wire) may be used with either the "All-Relay" Automatic or Remote Control switchboards. The line insulation must be maintained to the common battery standard on grounded lines. Where only a few grounded lines are involved, grounded line adapters are used, if a large portion of the lines are grounded, the connecting links are equipped with repeating coils.

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TELEPHONES

For Automatic (Dial) operation either local battery or common battery telephones may be used. Dials may be mounted on magneto telephones and the crank removed from the generator. If condensers are not equipped in the bell circuit, they are also added. This telephone then operates local battery talking and common battery signalling.

Any standard common battery telephone may be equipped with dials, or any standard dial telephone may be used.

Both local battery and common battery telephones may be used on the same line, if desired.

For Remote Control operation, magneto telephones may be used if the bell circuit is equipped with condenser and the crank is removed from the telephone. Ordinary standard common battery telephones may be used without change. Both types may be used on the same line if desired. Remote Control exchanges can be changed to Automatic operation by a few slight changes in wiring, no additional equipment is required.

For Magneto Remote Control "All-Relay" switchboards are supplied for operation with standard magneto telephones, when such class of service is wanted.

RINGING SYSTEMS

"All-Relay" switchboards are supplied for use with any ringing system, Code (1 to 10) or (1 to 20) parties per line, semi-selective (1 to 10) or (1 to 20) parties per line, and full selective harmonic or synchronomic 1 to 10 parties per line. The ringing is entirely automatic and continues until the calling party restores the receiver or the called party answers.

The code rings may be any combination of long and short rings desired.

REVERTING CALLS

The All-Relay system of handling reverting calls is the most convenient yet devised. The call is made in exactly the same manner as a regular call, using the same directory number.

When the busy tone is received the receiver is replaced and ringing on the line proceeds, when the call is answered the switchboard is cleared. Because the switchboard is used only for ringing, an unlimited number of reverting calls may be handled simultaneously. This feature is a great advantage in rural communities where a large portion of the calls are to parties on the same line, as it allows the switchboard to be used to full capacity for line to line calls or line to trunk calls, regardless of the number of reverting calls in progress.

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TOLL AND TRUNK LINES

Trunks from "All-Relay" exchanges to other switchboards may be of any desired type, Automatic Ringdown (magneto), Common Battery or Automatic. Phantom trunks may be used where desired. Where conditions warrant, special dialling circuits are provided that eliminate the necessity for complicated thump absorbing equipment usually provided with phantom common battery dialling. When this arrangement is used, if the Phantom groups are balanced for voice currents, they are also balanced for dialling. "All-Relay" Automatic trunks will function with step-by-step Automatic exchanges.

LIMITED CONVERSATION TIME

A time disconnect feature is available for use in limiting the holding time (length of conversation) in exchanges where excessive long conversations are indulged in. This arrangement is such that when the circuit has been held for a pre-determined length of time a warning tone is imposed upon the line for a few seconds, notifying the subscribers they will be disconnected in, say one minute. If the conversation is not terminated within the given time the circuit is interrupted. The length of time may be varied to suit the local conditions. This feature may be included on free service trunks and omitted on toll trunks.

PAYSTATIONS

Ordinary sound collect paystations may be used with "All-Relay" equipment. The toll operator is warned that the calling station is a paystation by means of a distinctive tone which is imposed upon the line, for a few seconds, at the time the toll operator answers.

Prepay coin boxes and other types may be used, if specified at the time the switchboard is ordered.

FIRE CALLS AND OTHER SPECIAL SERVICE

In many villages the telephone company handles the "fire" calls and operates the Fire Siren or other general signals, and in some cases call the firemen. Such special features can be provided with "All-Relay" switchboards, if specified in detail when the switchboard is ordered.

Other special services, such as, changed number, intercepting service, or group calling may be had.

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ALARMS

Alarm terminals are provided on "All-Relay" switchboards so that alarm signals may be extended to the main office or elsewhere if desired. However, these alarms are generally not used, as the construction of the switchboard is such, that trouble rarely occurs and when it does, is automatically by-passed so that it usually does not interfere with service.

Equipment men operating "All-Relay" switchboards generally concede that extension of alarms is not necessary.

HOUSING OF EQUIPMENT

The "All-Relay" switchboards are housed in dust proof Art Metal cabinets finished in lacquered aluminum. The cabinets have free swinging doors, equipped with locks.

The sizes of the switchboards exclusive of power plant and main distributing frame are as follows.

30 Line Ultimate Capacity	-	4 $\frac{1}{2}$ ft. high, 3 ft. wide & 1 ft. deep.
60 "	"	- 6 $\frac{1}{2}$ ft. high, 3 ft. wide & 1 ft. deep.
100 "	"	- 6 $\frac{1}{2}$ ft. high, 6 ft. wide & 1 ft. deep.
Unlimited	"	- Multiples of 100 line boards.

EXCHANGE BUILDING

The floor space requirements for exchanges up to 100 lines including power plant is approximately 10' x 10'. The building need not be heated, but should be dry and well ventilated. The exchange may be installed in any suitable room in existing buildings or a dwelling house. Generally it is more economical to construct a small fireproof structure. Floor plans and specifications for such structures will be supplied on request.

INSTALLATION

"All-Relay" switchboards are simple to install and no special knowledge of automatic equipment is necessary on the part of the installer. The switchboards are thoroughly tested and adjusted in the factory and no further adjustments will be required. The installation consists of connecting the switchboard terminal strip to the M.D.F. protectors and setting up and connecting the power plant. Complete detailed instructions are furnished with each board.

These switchboards are shipped F.O.B. our factory at Galion, Ohio. The installation is usually made by the telephone company, but the manufacturer will furnish this labor if requested.

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DIAL OR REMOTE CONTROL

The choice of type of operation should depend upon the following factors, (1) The maximum savings to be effected, (2) The reliability of service, (3) The kind and quality of service that will be most satisfactory to the subscriber, (4) The first cost of system.

The "All-Relay" switchboard using the compensated dialling circuit arrangement, places factors 1, 2 and 3 in favor of Automatic operation, as it effects a saving of the entire traffic expense, is much more reliable as it eliminates the control trunk hazard and pleases the subscriber most, because of the instantaneous modern type of service. Factor (4) is even, as the total cost of Automatic or Remote Control is about the same amount. Except in very rare instances Dial operation is the best arrangement from all points of view. More than 95% of "All-Relay" switchboards built since the introduction of the compensated dialling circuit have been automatic.

Magneto Remote Control can seldom, if ever be justified when modern developments in Automatic dialling over poor lines is considered. The magneto service is much inferior and when the control trunk hazard is reckoned is not as reliable as "All-Relay" dial automatic service.

The North Electric Mfg. Company supplies the three types, Dial Automatic, C.B. Remote Control or Magneto Remote Control according to the purchaser's preference.

COST OF ALL-RELAY EQUIPMENT

The cost of "All-Relay" switchboards depends upon a number of variable factors, the ultimate capacity of the board, the number of lines equipped, the amount of traffic to be switched, the kind of ringing system used and the trunks to other offices. A question blank is furnished with this bulletin, which if filled out, and returned to The North Electric Mfg. Co. will enable their engineers to furnish a price on the switchboard that will exactly meet your requirements.

While "All-Relay" equipment is more costly to produce, the prices of "All-Relay" switchboards compare very favorably with the prices of the more complicated switch type systems.

ENGINEERING SERVICE

The North Electric Mfg. Company offers the assistance of its engineering department, without obligation to you, in planning your exchange improvements. Further detailed information will be furnished upon request.

THE NORTH ELECTRIC MFG. CO.
GALION, OHIO

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