

Return to Mr. Conwin
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with thanks

THE NORTH "ALL-RELAY" AUTOMATIC SYSTEM

FOREWORD

The North Electric Mfg. Company has been engaged continuously in the manufacture of the highest quality of telephone equipment since 1884. Not only has it contributed indispensable developments to the art of automatic telephony, but has pioneered the use of automatic equipment in small exchanges, and produced the first remote control and "All-Relay" exchanges. The quality and long life of North equipment is well known to all.

The North "All-Relay" Automatic Telephone System is the culmination of the experience and developments in the art of telephony. It is the embodiment of the best principles of construction, materials and methods of operation, carefully selected over a period of many years. It is designed on the basic principle to give the highest quality of service with the least amount of attention and expense. This principle has been adhered to not only, with respect to the central office equipment, but careful consideration has been given to the conditions to be met within the plant outside of the exchange.

Magneto service, although the most expensive to operate, has survived in many communities for years after the advent of common battery and other improved types of telephone service because of its extreme reliability under severe plant and weather conditions. With this fact in mind, the designers of "All-Relay" equipment set out to produce an automatic system that would parallel the reliability of magneto equipment, yet supply a quality of service and effect all the operating economies of the automatic systems.

PURPOSE OF THE "ALL-RELAY" SYSTEM

General

The purpose of the "All-Relay" system is to give service that will please the public and make a maximum profit for the telephone company. The "All-Relay" system is designed to give the highest quality of quick reliable service, twenty four hours a day, under all conditions of traffic, plant and weather, with the least amount of attention and expense to the operating company.

For Small Exchanges

The "All-Relay" switchboards were originally designed for use in small unattended exchanges. For this purpose, the utmost reliability, lowest possible maintenance and wide margins of operation are essential. That "All-Relay" exchanges are the solution to the small exchange problem is proven by the fact that it has been selected as standard equipment for small exchanges by a number of the most successful telephone operating companies.

For Larger Exchanges

The results obtained in small exchanges have been so satisfactory that operating executives have reached the conclusion that these principles are just as important in larger exchanges. "All-Relay" switchboards are now supplied for any size exchange from 10 lines upward.

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Deferred Plant Reconstruction

The ability of the "All-Relay" switchboard to operate in conjunction with a plant in mediocre condition, thus permitting the realization of a savings of automatic operation in advance of plant rehabilitation has also increased the demand.

Plant Economy

The use of "All-Relay" switching equipment makes possible large savings in the cost of plant construction, as these switching units may be located at any point of line concentration in the system regardless of the location of the existing exchange. Many miles of wire and cable can be dispensed with by this method, yet the subscribers will be provided with a higher class of service and much better transmission, as well as effecting a maximum saving in traffic expense.

PRINCIPLES OF CONSTRUCTION

As its name implies, the "All-Relay" equipment is composed exclusively of relays, no other complicated mechanical device is used. Simplicity of construction is synonymous with reliability and low maintenance. The "All-Relay" switchboard is constructed on this principle in every detail.

The relay is the simplest and oldest electro-mechanical device and its present state of perfection is the result of almost a hundred years of study and development.

The perfection of a well designed relay is unsurpassed by any item of telephone apparatus. This statement is borne out by a survey of maintenance and repairs of manual boards where cords, plugs, lamps, jacks and keys, each require more attention and repairs than the simple relays associated with the line circuits. They are never replaced because of wear, and only a very small portion receive any attention during 20 or 30 years of service. The soundness of the principle of "All-Relay" systems is therefore proven beyond question of doubt.

The "All-Relay" system thus consists of a number of simple stationary structures, permanently wired in position, performing all the multiplicity of switching by the simple rocking motion of the relay armature, free from friction and wear and unchanging throughout years of service.

NORTH RELAY DESIGN

"North" relays are the acme of design and selection of best materials. Each item of material is selected as the best available for the purpose. The design is the knife-edge bearing type. The coils are generous in size to permit use of large wire, thus providing ample radiating surface, and abundant reserve power. Contacts are the most vital part of the relay. Fundamentally "North" relay contacts are of the self cleaning type, that is, the contact surfaces roll after contact is made.

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Furthermore, each contact is provided with two separate and independent points of contact and the circuit closed is provided with two distinct paths through the relay contact. The result of the use of this type of contact is absolute contact reliability. The contact materials are chosen as the best for the character current to be carried through them and vary at various positions in the switchboard. The contact springs are cut with careful relation to the grain of the metal, to insure a permanent life-time adjustment. The insulating material used in the construction of these relays is the best quality obtainable

"North" relays are selected by the country's largest engineering organizations for special purposes, such as, power control where failure would produce disastrous results.

"North" "All-Relay" circuits are simple because they have only one function to perform, that is, energize relays. The circuits are no more complicated than the circuits in the later types of manual boards. Marginal currents and trick circuits are not used. All the relays have wide operating margins with respect to current and time constants. Complete detailed circuit descriptions are provided with all switchboards, describing each circuit function.

ADVANTAGES OF "ALL-RELAY" EQUIPMENT

Service

The "All-Relay" Automatic switchboards provide the highest quality of telephone service obtainable. It is almost instantaneous in its functions and is subject to less interruption in service due to faults in equipment, plant or line conditions than any other type. Temperature, voltage, dial speed variations and excessive line leakage do not interrupt service, faults which normally put other types of switchboards out of service.

"All-Relay" switchboards will furnish automatic service with local battery or common battery telephones and provide code ringing, semi-selective ringing up to 20 parties per line, and full selective ringing up to 10 parties per line. Grounded lines may be used where the occasion demands.

All service features such as paystations of the various types, measured service, time limit on conversations, trunk line selection, intercepting and changed number service or special service facilities can be provided, many of which are not available on the usual automatic systems.

The method of operation from the subscriber's point of view is simple and conforms with standard practice. The operation is the same whether the telephones be local battery or common battery and the lines metallic or grounded.

Details concerning these service facilities are described elsewhere in this bulletin.

Financial Advantages.

The "All-Relay" system permits the reaping of the maximum benefits of automatic service. The automatic switchboard is a labor saving machine, and as such the expense of operation consists of fixed carrying charges and

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maintenance costs. The fixed carrying charge on "All-Relay" automatic equipment is only a small amount in excess of manual board carrying charges and the maintenance expense is less. The savings made in traffic costs are pure gain. These savings usually vary from \$6.00 to \$12.00 per telephone per year or from 20% to 50% per year of the cost of the switchboard. The amount varies with local conditions, such as wage scales, contract or agency operating arrangements, supplying heat, light and rent and other variable factors. These variable factors are entirely eliminated by the use of "All-Relay" automatic switchboards and the exact cost of operation can be determined in advance. Definite operating costs will take the guess work out of budgeting expenses.

Regardless of the times, the operating company using "All-Relay" Automatic equipment, is in a much better financial position, than a company furnishing manual service. During periods of reduced revenues, the margin between income and expenses is sufficiently great for "All-Relay" equipment, to hold even the smallest exchange on a profitable operating basis. In better times this ratio still prevails and operating expense does not increase with the traffic load or wage scale.

MAINTENANCE ADVANTAGES

Switchboard Maintenance

The "All-Relay" Automatic System is the embodiment of a basically simple principle, carefully executed in skillful workmanship along lines designed to obtain unattended operation without maintenance. This ideal has been achieved by the elimination of all complicated and delicate step-by-step switch mechanisms, and by using in their stead a combination of simple telephone relays.

These well constructed relays are free from friction and wearing parts and when once adjusted remain so through years of service. The switchboard requires no routine testing and adjusting and will operate for months and even years without any attention whatever, other than the care of the battery. The reasons for the low maintenance cost for "All-Relay" equipment is given in the following facts.

Reasons for "No Maintenance"

1. No moving parts, except simple relay armatures.
2. No lubrication required, or gummed oil to remove.
3. No bank contacts to clean or burnish.
4. No wiper cords or cordage to repair.
5. No plungers or wipers to line up.
6. No switches to stick or jam.
7. No motor coils to overheat, no master switches.
8. No contact failures due to dust, self cleaning contacts used.
9. No dialling failure due to leakage to ground, within limits of ability to ring and talk.

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10. No marginal current relays.
11. No wearing parts to replace.
12. No temperature regulation required, no heat required.
13. No voltage regulation required, no end or C.E.M.F. cells required.
14. No close dial speed regulation required.
15. No switching equipment occupied by permanents.
16. No hunting action in selection, direct selection only is used.
17. No double selection by line equipment, no line switches.
18. No regular routine testing or adjustments to make.
19. No special training required for maintenance.
20. No repeated errors due to faults. Traffic is rotated.

To those familiar with machine switching equipment, a study of the above facts will disclose that all of the troublesome features have been eliminated, and it will be easily understood why this equipment is the best type adapted for unattended exchanges, or at any location where low maintenance and reliable service is the important factors. Equipment men operating both types, state that switch type requires from 10 to 20 times as much maintenance as the "All-Relay" type.

Repair Parts.

Because there are no wearing parts to be replaced in the "All-Relay" switchboard, it is not necessary to carry a stock of repair parts. Accidental damage is the only occasion for replacing parts in this type of equipment.

Routine Testing & Adjustment.

Routine testing and adjustment is not required for "All-Relay" switchboards. There are no wearing parts, that need adjustment to compensate for wear, and no lubrication or cleaning of contact surfaces to be done. Just care of battery and an occasional check on the charging rate is all that is required. The traffic rotation system used, permits complete and constant supervision of the switchboard from the main exchange at all times. The complete operation of all channels can be checked in a few minutes from the main offices.

PLANT MAINTENANCE

Line Leakage

As has been indicated in the foregoing, much attention has been given to the ideal of low plant maintenance. Other automatic systems have been so sensitive to line disturbances, particularly line leakage, that only a plant in first class condition could be used for dial automatic service. The "All-Relay" switchboard is so constructed that line leakage within the limits of ability to ring, will not interfere with reliable operation of the switchboard. The line and dialling circuits are compensated against ground leakage in such a way that ground leakage does not cause permanent