

# Norchard Main PA Equipment

## Introduction

The present Public Address amplifiers use three microphone inputs. Two are used with CB Radio type microphones with shielded cable running to the equipment. However there is a distinctly short limit to the length of microphone cable that can be used. When, in the past, a requirement came to be able to use the PA from a new and distant platform, it was decided to provide a telephone as the microphone and get the telephone speech back to the PA in normal cable.

This required a piece of relay equipment that would provide line current to operate the telephone and produce the necessary signals to connect to the PA amplifier and select the correct loudspeaker group.

The final circuit has provided for five such remote telephones to be connected to the PA input. A linefinder is used to search for a calling line, connect it to the PA input and to switch the announcement to the correct speaker group. It will be noted that the linefinder does not switch audio signals via the wipers. This approach with small speech signals would produce variable speech levels and noise. The linefinder instead operates a switching relay with excellent contacts to perform the connection of the speech signals.

A similar circuit allows certain telephones to dial 595 and gain access to the PA. To prevent any telephone from dialling 595 and successfully obtaining access to the PA, authorised phones and the direct access phones are supplied with a button that completes the switch on process.

A music channel and an output from the fire warning system also have access to the amplifiers via the telephone access equipment.

### The Access Relay Equipment

The right hand relay set has 3000 type calling relays to provide line current to distant teles and to start the uniselector which is a linefinder. The relays also act as audio transformers to deliver the speech to the amplifier. The small relays on the veroboard are operated by the linefinder and switch through the appropriate speech channel to the audio switching relay set on the left.

The linefinder also extends a condition into the audio switching relay set to operate the correct input and output relays. The matrix has diodes connected to select the correct microphone input and loud speaker group output for the calling line.

The small relays in the equipment are operated from a 24 volt supply provided by a mains unit. This 24 volt supply also circulates via switches on the microphones to operate the appropriate switching relays. The large choke and capacitors had to be added to further smooth the output of the 24 volt unit as the ripple was inducing considerable hum on the microphone inputs.

The two black boxes beneath the power unit and mains socket strip are microphone pre-amplifiers. The microphone switching is completed after the signals have been boosted in the pre-amps.

## Miscellaneous Equipment

A CD player can be connected to the PA equipment for use on those days when Thomas or Father Christmas visit us. We also have a fire warning system which connects a warbling tone to the PA if set off.

The equipment has been designed so that various callers have differing priorities. eg :

The music channel has the lowest priority and is over ridden by any other caller.

Telephones connecting to the PA have the next level of priority ie they will switch off the music during an announcement.

The Fire warning system has high priority and will over ride the music or any telephone caller, but it can be over ridden by a microphone so that information can be disseminated even though the fire warning is attempting to sound.

## Circuit Operation

Relay PWR is operated so long as the 24 volt supply is available. Should the power be removed, the release of PWR at PWR1 prevents the operation of the linefinder.

**The music channel** makes the simplest connection to the PA. To enable the music channel, the switch on the shop equipment (pa007b) must be operated. This operates relay PB which at PB2 removes the quieting earth from the M lead between the two relay sets. Relay MA operates to the loop from the transformer circuit in the shop equipment. MA also acts as a transformer to apply the music to the M wire via MA1. MA2 earths the CR1 wire to the matrix and operates relays 3M, 1LS and 2LS. 3M1 connects the M wire music signal to the PA amplifier via the mic2 input. 1LS1 and 2LS1 connect the PA output to the loudspeaker groups 1 and 2.

Note that this has not involved the use of the linefinder.

Note also that while the music switch is on, all telephones would be able to dial 595 and make a PA call. In practice this has not happened, but it is a design flaw.

**A dedicated PA telephone**, of which there may be up to four, is connected to the PA by lifting the phone and simultaneously holding the press button down whilst making the announcement. Looping the phone line operates relay 2L - 5L as appropriate. Contact 2L1 - 5L1 starts the linefinder rotating. Contact 2L2 - 5L2 marks the T bank of the linefinder with an earth. When the linefinder steps onto the marked outlet, relay T operates and at T1 stops the drive and operates relays TA and TB. TB4 prepares to operate the audio switching relays. TB5 operates relay 2K - 5K which in turn connect the signal path through from the 2L -5L relays which are acting as a speech transformer. When the user presses the push button and operates the PB relay, PB1 and TB4 operate the microphone and loudspeaker group relays. PB2 takes the quieting earth off the M wire.

Note that T2 disconnects the music channel to allow the announcement to be made without interference.

When the press button is released, PB places the quieting earth back onto the M wire. When the calling telephone replaces the handset, relay 2L - 5L releases. This in turn releases relay T. T releases TA and then TB. TB4 releases the audio switching relays. TA3 and TB2 generate a pulse which steps the linefinder off the outlet used. The step after use, ensures that the linefinder is kept moving and that the banks are continually swept by making the linefinder hunt for every call.

**595 Telephones** can make an announcement by dialing 595 and then pressing their buttons to operate the PB relay. Such calls arrive so long as the line is free, indicated by the 500 ohm battery on the P wire to the final mult. LA trips the ring and operates to the battery and earth from the calling final selector. LA1 operates relay BA. BA3 earths the incoming P wire to busy 595. From here the operation is similar to the above with BA2 starting the linefinder, BA1 marking the outlet and relay KA operating to extend the speech signal when the outlet has been reached.

**The 222 Fire Warning Signal** also operates in a similar manner. The 222 equipment loops the connection to operate relay 1L. 1L4 operates relay CO. 1L1 starts the linefinder. 1L2 marks the required outlet and 1K operates when the linefinder reaches the marked outlet.

**Microphones** act rather differently. Microphones have a double switch, one side connects the mike to the screened lead to the amplifier equipment, the other extends an earth into the diode switching matrix to operate 1M or 2M as appropriate. The shop mike also operates 1LS, 2LS and 3LS thereby connecting all speakers to the amplifier. The station master's mike however has a two way switch which can direct the earth to either 2LS and 3LS which connects up only the platform speakers, or to 1LS, 2LS and 3LS which covers the whole site.

The mikes are routed to a pair of preamplifiers on the wall so that any subsequent switching takes place at a much higher signal strength. The outputs of the preamps are connected via 1M1&2 or 2M1&2 to one or other of the auxiliary inputs on the amplifier. This leads to mikes being connected to auxiliary inputs and telephones being connected to microphone inputs.

At the same time the telephone access relay set is busied out, as the mike buttons also operate relay IS via the diode matrix. IS1 operates relay ISA in the telephone access relay set. ISA1 starts the linefinder hunting, ISA4 changes over the T relay from the T arc to the IS arc which means that the linefinder will only see an earth on outlet 25, thus operating T and stopping the hunting. Whilst ISA is operated, all telephone access will be barred as T, TA and TB will all be held via this 25th outlet. When the announcement is finished, ISA will be released, T will release, TA and TB will release and the linefinder will take one step onto outlet 1.

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