Norchard Telecoms to PA Interconnect Relay Circuit

Introduction

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

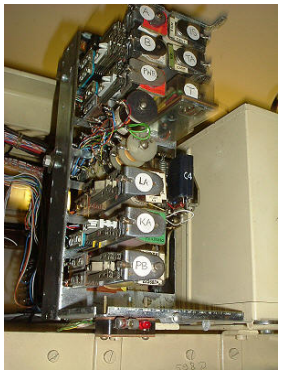
This then required a piece of relay equipment that would provide line current to operate the telephone and produce the necessary signals to switch on the PA amplifier and connect it to the correct loudspeaker group.

The final circuit provided for four such remote telephones to be connected to the spare PA microphone input. A linefinder was used to search for a calling line and connect it to the input and to extend the discriminating signal to the PA rack to switch the announcement to the correct speaker group.

A similar circuit had been in use previously which allowed certain telephones to dial 595 and gain access to the PA. This facility has been retained.

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.

Linefinder and PA Interconnections



The linefinder has five inputs connected to the bank of its uniselector. Outlets 2, 4, 6 and 8 are connected to four direct access telephone circuits. Outlet 10 is connected to the 595 access circuit. Outlet 0 is the home position and is used to position the linefinder away from the working outlets when the PA is "called" from a microphone position. (non adjacent outlets have been used as the linefinder wipers are of the bridging type and the use of adjacent outlets would produce clicks as the wipers rotate).

PA Called By A Microphone

Should the PA equipment be "called" by a microphone position, an earth appears on the IS lead which operates relay IS. This action over rules any callers on 595 or the direct access telephones.

IS2 prepares the testing circuit.

IS4 removes any earths on the CR leads so that there will be no interference with the PA equipment.

IS5 completes the drive circuit for the linefinder uniselector.

IS6 earths the incoming 595 P wire to busy the number.

The linefinder rotates until the wipers reach outlet 0. The earth on arc 5 outlet 0 operates the T relay.

T1 disconnects the drive circuit, stopping the linefinder on outlet 0 and operates relays TA and TB.

TB operates first.

TB1, TB2, TB3 and TB5 changeover the direct access line circuits to send busy tone if called.

TB4 earths the ring start lead to start the ringing machine.

TB6 disconnects the linefinder stepping circuit.

TA operates a little later due to the slug fitted to the relay.

TA1, TA2 and TA4 have no function on outlet 0.

TA3 prepares the linefinder stepping circuit.

TA5 changes over the tone available to the 595 LA relay to busy tone.

TA6 ensures that the drive magnet circuit is disconnected.

At this point the linefinder is locked to outlet 0 until relay IS releases. 595 and the direct access telephones are inoperative during this period.

When the microphone position clears, relay IS releases.

IS2 releases relay T

IS4 and IS5 have no function at this point.

IS6 unbusies the 595 P wire.

T1 releases relays TA (slowly) and TB (quickly)

Relay TB releases.

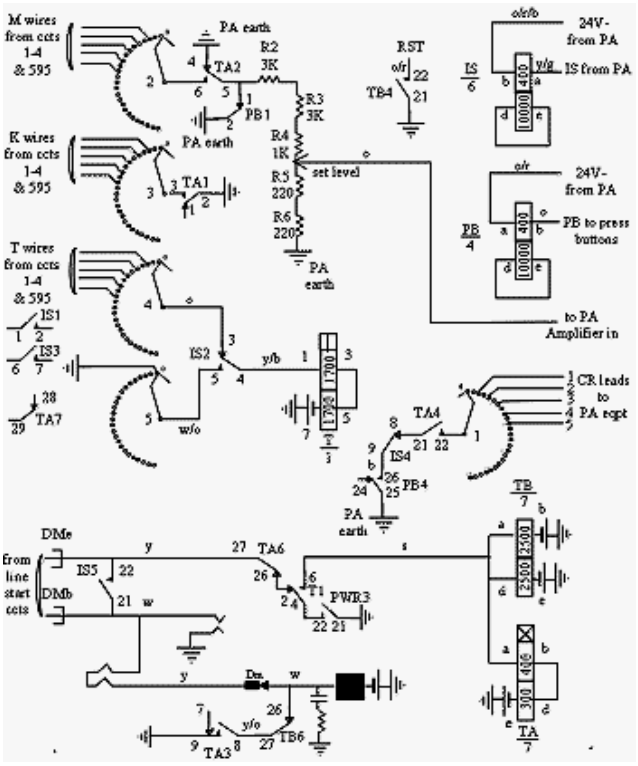
TB4 removes the earth from the ring start lead.

TB6 energises the linefinder magnet.

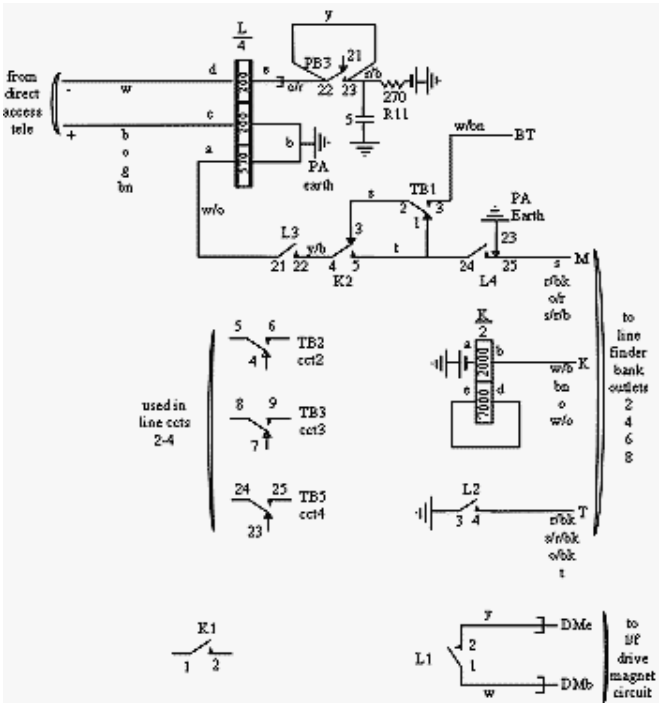
Relay TA releases

TA3 disconnects the drive magnet and the wipers step forward once to outlet 1.

This single step ensures that the linefinder has to hunt every time for the next use of the PA and so ensure that the wipers do not sit on one point continuously. It was felt that should the banks not be swept regularly then dirty contacts could affect the speech path.



PA Called By A Direct Access Telephone



Assuming that the relay set is free, a calling direct access telephone or a caller on 595 will cause the linefinder to rotate to the required outlet and stop there to switch the speech circuit through to the PA equipment. On release of the call, the linefinder steps once onto an unused outlet.

A loop from a direct access telephone will operate relay L.

L1 connects the drive circuit of the linefinder if no other caller is using the circuit.

L2 earths the T wire on the linefinder bank outlet 2,4,6, or 8.

Relay T operates to this earth.

T! disconnects the drive circuit, stopping the linefinder on the marked outlet and also operates relays TA and TB.

The linefinder extends an earth on the K wire.

TB operates first.

TB1, TB2, TB3 and TB5 changeover the direct access line circuits to send busy tone if called.

TB4 earths the ring start lead to start the ringing machine.

TB6 disconnects the linefinder stepping circuit.

TA operates a little later due to the slug fitted to the relay.

TA1 earths the K wire to operate the K relay in the calling line circuit.

TA2 prepares to connect the speech path from the M wire to the PA equipment.

TA3 prepares the linefinder stepping circuit.

TA4 prepares the appropriate CR lead which informs the PA equipment which microphone and speaker groups to use.

TA5 changes over the tone available to the 595 LA relay to busy tone.
TA6 ensures that the drive magnet circuit is disconnected.

The K wire earth operates relay K.

K2 extends the speech circuit through the M wire to the linefinder.
note : if the relay set is in use by another caller, then K would not operate and TB would already be operated. This would cause the return of busy tone to the caller.

Note that the operated relay TB in the linefinder circuit busies other line circuits.

The caller pushes his press button; this operates relay PB in the linefinder circuit and connects the speech circuit through the linefinder and PA equipment via the M wire. PB1 removes the earth from the speech path allowing the caller to speak to the PA equipment. PB4 also earths the appropriate CR lead to switch on the correct microphone and speaker groups.

When the caller releases the press button, relay PB releases and cuts off the speech circuit to the PA equipment.
Relay L will be released when the caller clears.
L2 releases the linefinder via the T wire.
L3 and L4 ensure that the speech circuit is removed.

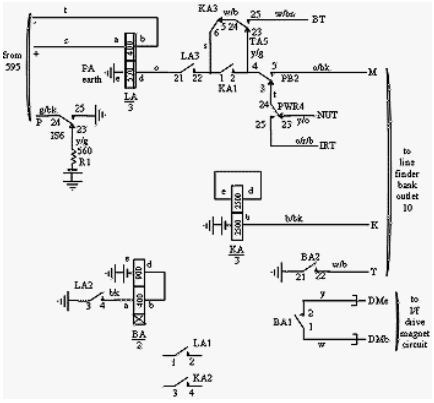
note : if the PA equipment is "called" from a microphone position, an earth is applied by the PA equipment to the IS lead, operating relay IS. This causes the linefinder to home and cause the forced release of the call from the direct access telephone.

The caller will generally release the press button first, cutting off the path to the PA equipment and will then clear the call releasing the calling L relay. This removes the earth from the T wire, thus releasing relay T.

T1 releases relays TA (slowly) and TB (quickly)
Relay TB releases.
TB4 removes the earth from the ring start lead.
TB6 energises the linefinder magnet.
Relay TA releases
TA1 removes the holding earth from the K wire releasing the K relay in the line circuit.
TA3 disconnects the drive magnet and the wipers step forward once to the next spare outlet.
TA4 removes the earth from the CR lead.

The circuit has now restored to normal.

595 Access Circuit



This circuit allows anyone equipped with a telephone and a calling press button to access the PA equipment.

The circuit normally provides a 560 ohm battery onto the P wire of number 595 to indicate that the circuit is free.

When 595 is dialled, the final selector sees the 560 ohm battery and switches to the line. This causes a battery and earth (and ringing) to be connected to the - and + wires which operates relay LA.
note : the LA relay loop will trip the ringing and cause the reversal of the battery and earth from the final selector. This will cause the A relay to momentarily release but this will be ineffective due to the slow operate and release feature of the BA relay.

LA2 operates relay BA which holds for the duration of the call.
LA3 normally connects inverse ringing tone to the caller.
note : If the relay set is already in use by another caller then relay TA will be operated and TA5 will return busy tone to the caller.
note : if the PA equipment is not switched on, PWR would be released and PWR4 would connect NU tone in place of the inverse ringing tone.

BA1 connects the drive circuit of the linefinder if no other caller is using the circuit.
BA2 earths the T wire on the linefinder bank outlet 10

When the linefinder reaches outlet 10 it will stop and extend an earth on the K wire. This operates relay KA.

KA1 and KA3 connect inverse ringing tone to the caller.
note : If the PA is not powered up, then PWR4 will be released and NU tone will be returned to the caller.

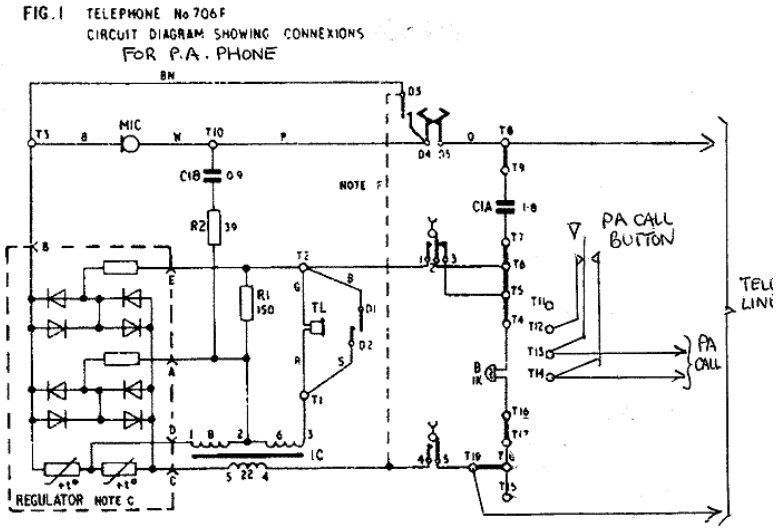
When the caller pushes his press button, this operates relay PB in the linefinder circuit. PB2 disconnects the tone and connects the speech circuit through to the linefinder and PA equipment via the M wire.

Should the caller release the press button, relay PB releases and PB2 cuts off the speech circuit to the PA equipment and reconnects inverse ringing tone.

The circuit is released by the caller clearing and removing the battery and earth from the - & + wires thus releasing relay LA.
LA2 releases relay BA slowly
LA3 ensures that the speech circuit is removed.

BA2 removes the earth from the T wire to the linefinder and this releases the linefinder.

note : if the PA equipment is "called" from a microphone position, an earth is applied by the PA equipment to the IS lead, operating relay IS. This causes the linefinder to home and the 595 P wire to be busied by the application of an earth.



The diagram shows the modification needed for a 700 type telephone to act as a 595 PA Access Phone. This particular phone is situated in the Signal Box.

The Music Channel

One of the direct access line circuits is used as a music on PA channel. The circuit is extended to the shop, along with the press button circuit, and is connected to a box with a circuit that interfaces the earphone output of a CD player with the telephone line to the PA equipment.

The earphone output is connected to a 36 ohm load and thence via a 500 ohm potentiometer to the primary of a telephone line transformer. The output windings of the transformer are all connected in series and loaded with a 500 ohm resistor. This resistor provides a loop condition to the PA direct access line circuit to operate the L relay and call the line finder. The 1 microfarad capacitor prevents the DC flowing through the transformer and saturating its core.

The double pole switch connects the loop to the PA line circuit when required and also completes the "press button" circuit to turn the PA amplifier on.

It has been found that the music can stop and the shop staff do not switch off the music channel. This holds the linefinder and prevents any other direct access telephone or 595 telephone from accessing the PA.

note : Should a microphone position "call" the PA then they overide the music channel by operating the IS relay in the relay set and sending the linefinder home. On completion of the announcement the music channel recalls the linefinder and continues to broadcast.