

Lydney Signal Box 22 Line Exchange

Introduction

A small 22 line strowger exchange based on uniselector switching at Lydney Signal Box was brought fully into service on the 10th July 2013

All outgoing calls are connected via linefinders and outgoing junction relay sets to first selectors at Norchard. Dial tone is obtained from the Norchard selector. The caller from Lydney Signal Box is therefore be able to dial anything that a Norchard customer can.

Incoming calls arrive via junctions from level 6 circuits at Norchard exchange. The recent changes made to Parkend open this level to Parkend telephones. The final two digits are received at Lydney Signal Box and position a uniselector onto the required telephone circuit.

The exchangel initially has 11 line circuits provided plus the final complement of two incoming final selectors and two combined linefinders and outgoing junction relay sets. The common equipment, ie battery power, ringer and tones and alarms was already available and working at Lydney Signal Box.

An S and Z generator producing pulses at 11 minute intervals has been installed. This circuit provides the time interval during which a call may be held. After a time, generally two periods of S & Z pulses totalling 22 minutes, the call is force released and the caller is held on the P relay in the line circuit. This should ensure that faults do not cause the junctions to be held for an unduly long length of time.

The transmission bridges provided at Lydney Signal Box are of the transformer type in order that any earth hums will be eliminated.

Operation

Getting Dial Tone

On an outgoing call, the line receives a loop from the caller. This operates relay L.

L2 earths the PF wire to the final selector banks and busies the number. L1 extends a battery condition to mark the T bank outlet for the caller and also to start whichever linefinder is currently allocated by the allotter.

Relay ST operates in the chosen linefinder to the battery condition on the start wire.

ST2 starts the linefinder hunting around the bank. ST1 connects the T relay to the T arc wiper.

The finder drives around the bank and each time the magnet releases the wipers step to the next outlet. When the marked outlet is reached, relay T operates to the marking battery. Relay T is a high speed relay to ensure that it operates quickly enough to disconnect the drive before a further step is taken.

T1 cuts the drive circuit and also holds T.

T2 operates relay TA slowly due to the armature end slug on relay TA.

TA2 prevents any movement of the allotter at this stage. TA3 disconnects the T relay hold circuit but T will remain held until relay L releases in the line circuit. TA4 maintains the disconnection of the drive circuit.

TA1 operates relay H. H5 operates the K relay in the calling line circuit. H6 releases relay ST.

Relay K in the line circuit at K2 and K4 disconnects relay L and extends the loop into the linefinder.

Relay L releases and at L1 removes the start battery condition from the start lead and the T bank outlet. Although L2 now releases, the earth to busy the final selector multiple P wire now comes from The B4 earth via H1 and H5.

Relay T releases and at T2 starts the slow release of relay TA.

Before relay TA releases, relay A operates to the loop now extended into the line finder via H2 and H3. A1 operates relay B. B5 extends a loop to the outgoing junction to seize the distant first selector at Norchard. This selector returns dial tone to the caller.

When TA finally releases, Relay H remains held to the B4 earth, the drive is disconnected at ST2, and at TA2 (released) and H4 (operated), an earth is extended to the outlet on the allotter bank marking it as busy. All busy outlets are earthed and the allotter drives to find a free linefinder, denoted by a "dis" on the arc 4 bank outlet. B4 also lights the lamp on the relay set for the duration of the call.

Note that if both linefinders are in use, the allotter can only stop on outlet 23. If a further (third) outgoing call is attempted then the start battery is extended to operate the overflow meter. If either linefinder is free then outlet 23 will be earthed so that the allotter stops only on outlet 1 or 3 as appropriate.

Dialling

The linefinder includes the elements of an auto-auto relay set. Relay A responds to dial pulses by releasing and reoperating.

Relay A releases and at A2 repeats the disconnection to the junction. A1 places a short circuit across relay B. However Relay B holds during pulsing as the short has a major slugging effect on the relay. The B relay has a very full winding to produce the long release lag when short circuited. At the same time A1 (released) removes a short circuit from the CD relay and also provides a circuit to operate relay CD. CD also holds during the pulse train due to the short circuit obtained during the operate phase of relay A.

CD1 operates the slow to release CA relay.

Relay B therefore holds during pulsing. Relay CD operates during for the length of the pulse train. relay CA also holds during the pulse train but releases sometime after relay CD.

During pulsing, A2 repeats the pulses to the junction and the distant selectors. CA2 provides a zero ohm loop to the junction to provide the best possible pulsing conditions.

There is an error in the diagram over the connections to the CD2 and CA2 contacts which needs resolving.

At the end of dialling, the A relay battery and earth are fed to the caller and relay A monitors the caller. A2 and B5 maintain a low resistance loop (around 24 ohms) from the transformer to hold the call over the junction.

The transformer bridge virtually eliminates longitudinal noise, mostly generated by the mains earth used at each end of the call. However any circulatory noise will still be faithfully reproduced.

Release

Only the caller can release the connection normally. When the caller hangs up, relay A releases. A2 disconnects the junction and the distant equipment at Norchard also clears down. A1 short circuits relay B which eventually releases.

B4 releases relay H and also relay K in the line circuit. The earth is also removed from the final selector multiple P wire to show the number as free again. The relay set lamp dims.

Relay K reconnects relay L to the line ready for a further call.

Failure to release call

If the call persists for a long period, then the junction is probably being held by a fault on the caller's line eg handset not replaced etc. This sequence force releases the call to free the junction leaving the call locked into its line circuit P relay.

When the relay set is taken into use, B3 extends an earth on the S & Z start wire to start the S & Z generator timing.

Eventually a Z and then an S pulse arrive. The first Z pulse is ignored as S2 disconnects its path. However the S pulse operates relay S which then hold via its second winding to the B3 earth. S2 now connects a path for the next Z pulse (approximately 11 minutes later) to operate the P relay in the caller's line circuit.

P1 and P2 disconnect the line from the linefinder (which restores) and connect the P relay battery and earth to line instead. Relay P holds to the line current flowing to the caller's condition. P4 maintains the earth on the final selector multiple P wire to maintain the busy condition on that number. P3 places an earth on the PG alarm wire which will eventually result in the alarm condition being sent to Norchard.

Generally the timer does not start until a call is made on the exchange. It takes around 11 minutes for the first Z, then S, pulse sequence to arrive. This only results in the S relay operating. A further Z (and S) pulse arrives another 11 minutes later which actually causes the forced release of the call. Most faulty lines would hold a junction for about 22 minutes before it would be released for use by others. Of course a genuine 22 minute call would also result in the equipment timing out and the call would be cut off. To date there have been no complaints, particularly as the call could be redialled immediately.

Lydney Sig Box - Linefinder Notes		
DFR ex110a		
ISSUE A	19/02/2018	Opening Issue
<i>Dean Forest Railway</i>		