POST OFFICE TELECOMMUNICATIONS HEADQUARTERS

DIAGRAM NOTES AT 60109A

SPECIFICATION T 60109

TEST SELECTOR

U.A.X. No. 13

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1. GENERAL

The diagram shows the circuit arrangement for the test selector designed to cater for the remote testing at a U.A.X. No. 13.

This circuit has been designed to work to an overall loop (i.e. line plus distant termination) of resistance not exceeding 2,400 ohms.

The following typical diagrams, or their equivalents, should be considered in conjunction with this diagram:-

AT 60573	LINES TO REMOTE TEST SELECTOR.
AT 60574	SWITCHING CIRCUIT FOR REMOTE CONTROL OF TEST SELECTOR.
AT 60575	RECEIVER V.F. No. 2/... A FOR REMOTE CONTROL OF TEST SELECTOR.
AT 60110	FINAL SELECTOR. 2-10 TYPE WITH TEST SELECTOR ACCESS. U.A.X. No. 13. (AT 60085 MODIFIED).
AT 3721	UNIT AUTO No. 13. SUBSCRIBER'S LINE, LINEFINDER AND CONTROL RELAY SET.

2. FACILITY SCHEDULE

Provision is made for:-

2.1 Stepping of the uniselector under control of the first pulse train received.

2.2 Testing of the selected outlet to determine if the associated test final selector is free.

2.3 Switching to the selected test final selector if it is free, and busy the associated outlet on the group selector bank multiple.

2.4 Returning busy tone and a supervisory signal if the selected test final selector is engaged.

2.5 Repeating the second and third pulse train received to the selected test final selector if it is free.

2.6 After the test final selector has switched to the outlet associated with the required subscriber's line, switching to the line circuit if it is free and busying the associated outlet on the final selector bank multiple.

2.7 The test selector to 'camp-on' the selected line circuit outlet, returning a supervisory signal and offering monitoring facilities, if the required subscriber's line is engaged.

2.8 If the subscriber's line circuit is free, or when it becomes free, the 'Test' pair is extended to the line from the test desk.

2.9 Stepping the test final selector round a level by dialling single pulses after the third received pulse train has been dialled.

3. CIRCUIT DESCRIPTION

3.1 Location

It should be imagined that this diagram is divided into six equal sections which will be referred to as follows:-

Top left (TL)	Top centre (TC)	Top right (TR)
Bottom left (BL)	Bottom centre (BC)	Bottom right (BR)

Each relay coil and contact is immediately followed by an indication of its location in an abbreviated form as shown in the brackets above.

3.2 Outline

The test selector is seized by a loop on the 'Operate' pair, and is stepped by loop/disconnect pulses. During the first pulse train received, the selector wipers are stepped to the outlet associated with the required test final selector. Should this final selector be engaged, busy tone and a supervisory signal are returned to the distant test desk. If the test final selector is free, it is seized and the subsequent pulses received directly control the vertical and rotary stepping, to position the wipers on the outlets associated with the required subscriber's line. Should the line be busy, a supervisory signal is returned and monitoring facilities of the line are provided. The testing officer may 'camp-on' until a supervisory clear is received, or step on to the next line in the 'tens' group by further dialling a single digit.

When connected to a free subscriber's line, the test desk is directly connected to the line wires and d.c. tests can be made. On operation of the 'Private Control' key an earthed loop connected to the 'Operate' pair removes the guarding earth from the subscriber's line circuit P wire and testing can then be made on the exchange equipment via the subscriber's line circuit.

3.3 General

If in describing the operation or release any relay or contact is not mentioned, it should be assumed that it performs no useful function at that stage.

The following operational details are described:-

3.4.1 Seizure.

3.4.2 First Pulse Train Received.

3.4.3 Test Final Selector Busy.

3.4.4 Release from Test Final Selector Busy.

3.4.5 Test Final Selector Free.

3.4.6 Subscriber's Line Busy.

3.4.7 Step-on from Busy Line.

3.4.8 Subscriber's Line Free.

3.4.9 Step-on from Free Line.

3.4.10 Operation of the 'Private Control' Key.

3.4.11 Release from Free Line.

3.4 Detail

3.4.1 Seizure

A loop extended on the 'Operate' pair from the switching circuit operates relays A and PC.

Relay A	(TL)	operating,
A1	(BL)	operates relay AA.
Relay PC	(TL)	operating,
PC1	(BL)	operates relay PD.
Relay AA	(BL)	operating at contact A1,
AA2	(BR)	operates relay B.
Relay PD	(BL)	operating at contact PC1,
PD2	(BC)	connects a short-circuit across relay CD.
Relay B	(BR)	operating at contact AA2,
B1	(BL)	connects earth to the ST wire.
B2	(BL)	operates relay BA.
B3	(TL)	prepares a masking circuit for relays A and PC (See Design Details).
B4	(TC)	prepares an operate circuit for relay G and the hold circuit for relay H.
B5	(BR)	completes the P wire testing circuit.
B6	(BR)	holds relay B, and prepares the stepping circuit for the uniselector TS.
Relay BA	(BL)	operating,
BA1	(BC)	disconnects the homing circuit for the uniselector TS.
BA2	(BC)	prepares the operate circuit for relay CD.
BA3	(BR)	further prepares the stepping circuit for the uniselector TS. (See Design Details).

The circuit is now ready for the reception of the first train of digits.

3.4.2 First Pulse Train Received

The following relays are held operated at this stage:- A, AA, B, BA, PC and PD.

A train of loop-disconnect pulses is received to pulse relays A and PC.

Relay A	(TL)	pulsing,
A1	(BL)	pulses relay AA.
Relay PC	(TL)	pulsing,
PC1	(BL)	pulses relay PD.
Relay AA	(BL)	pulsing at contact A1,
AA2	(BR)	pulses the uniselector TS magnet.
Relay PD	(BL)	pulsing at contact PC1,
PD2	(BC)	during the first break pulse removes the short-circuit from relay CD which operates and holds for the duration of the pulse train.
Relay CD	(BC)	operating,
CD2	(BL)	operates relay E.
CD4	(TC)	disconnects the P wire testing circuit during pulsing.
Relay E	(BL)	operating,
E1	(TL)	prepares a masking circuit for relay A.
E3	(BC)	prepares an operate circuit for relay G.

The uniselector TS wipers step to the outlet corresponding to the digit dialled, and at the end of the pulse train contact PD2 re-connects the short-circuit across relay CD thus causing it to release.

Relay CD	(BC)	releasing slowly,
CD1	(TL)	connects a short-circuit across the 'Operate' pair to guard against the momentary release of relays A and PG during the change over of contacts G2 and G3, should relay G operate.
CD2	(BL)	releases relay E.
CD3	(BC)	completes an operate circuit for relay G.
CD4	(TC)	re-completes the P wire testing circuit.

During the operate lag of relay G the testing circuit of relay HX is connected to the selector outlet P wire.

3.4.3 Test Final Selector Busy

The following relays are held operated at this stage:- A, AA, B, BA, PC and PD.

If the required test final selector is busy, battery is not encountered on the P wire so relay HX does not operate. Thus, during the release lag of relay E, relay G operates.

Relay G	(BC)	operating slowly,
G1	(BL)	operates relay BT.
G2	(TL)	operates relay GA.
G3	(TL)	spare.
G4	(TL))	introduce the isolating capacitors C1 and C2 into the
G5	(TL))	'Test' pair.
G6	(BC)	connects a hold circuit to relay G against the release of contact E3.
Relay GA	(BL)	operating at contact G2.
GA1	(TL))	reverse the potentials of the 'operate' pair as a super-
GA2	(TL))	visory signal to the distant test desk.

Relay E	(BL)	releasing slowly at contact CD2,
E1	(TL)	removes the short-circuit from the 'Operate' pair.
E3	(BC)	disconnects the operate circuit for relay G.
Relay BT	(BL)	operating at contact G1.
BT1	(BL)	connects earth to the 'Ringer Start' wire.
BT2	(TL)	connects busy tone to the tone windings of relay A and PC.
BT3	(BC)	disconnects the stepping circuit from the uniselector TS magnet.
BT4	(BC)	disconnects the P wire testing circuit.

The selector is held and busy tone returned until the circuit is released.

3.4.4 Release from Test Final Selector Busy

The following relays are held operated at this stage:- A, AA, B, BA, BT, G, PC and PD.

The loop extended on the 'Operate' pair from the switching circuit is removed, releasing relays A and PC.

Relay A	(TL)	releasing,
A1	(BL)	releases relay AA.
Relay PC	(TL)	releasing,
PC1	(BL)	releases relay PD.
Relay AA	(BL)	releasing at contact A1,
AA2	(BR)	short-circuits relay B thus causing it to release.
Relay PD	(BL)	releasing at contact PC1,
PD2	(BC)	removes the short-circuit from relay CD thus allowing it to operate.
Relay CD	(BC)	operating,
CD2	(BL)	operates relay E.
Relay B	(BR)	releasing slowly at contact AA2,
B1	(BL)	disconnects earth from the ST wire.
B2	(BL)	releases relays BT, BA and E.
B4	(TC)	releases relay G.
Relay BT	(BL)	releasing,
BT1	(BL)	disconnects earth from the 'Ringer Start' wire.
BT2	(TL)	disconnects busy tone from the tone windings of relays A and PC.
Relay BA	(BL)	releasing slowly at contact B2,
BA1	(BC)	completes the homing circuit for the uniselector TS.
BA2	(BC)	releases relay CD.
Relay G	(BC)	releasing slowly at contact B4,
G2	(TL)	releases relay GA.
G3	(TL)	spare.
G4	(TL)	short-circuit the isolating capacitors C1 and C2 in the 'Test' pair.
G5	(TL)	

Relay GA	(BL)	releasing at contact G2.
GA1	(TL))	restore the potentials of the 'Operate' pair
GA2	(TL))	to normal.

The uniselector TS self-drive to its home position and the circuit is then fully released and ready for the next call.

3.4.5 Test Final Selector Free

The following relays are held operated at this stage:- A, AA, B, BA, PC and PD.

If the required test final selector is free battery is encountered on the P wire to operate relay HX.

Relay HX	(BR)	operating,
HX1	(TC)	operates relay H.
Relay H	(BC)	operating,
H1	(BL)	disconnects the circuit for relay E and prepares the circuit for relay EA.
H2	(TC)	holds relay H and prevents the operation of relay G.
H3	(TR)	completes the P1 wire testing circuit.
H4	(BR)	switches the pulsing circuit from uniselector TS magnet to uniselector arc TS6 wiper.
H5	(BR)	releases relay HX and connects earth to uniselector arc TS4 wiper to guard the test final selector against seizure from the group selector bank multiple.
H6	(BR)	connects earth to the uniselector arc TS5 wiper to prepare the test final selector.
Relay E	(BL)	releasing slowly at contact CD2.
E1	(TL)	removes the short-circuit from the 'Operate' pair.

The test final selector has now been seized and is ready to receive pulses. The second train of pulses is received to pulse relays A and PC.

Relay A	(TL)	pulsing,
A1	(BL)	pulses relay AA.
Relay PC	(TL)	pulsing,
PC1	(BL)	pulses relay PD.
Relay AA	(BL)	pulsing at contact A1,
AA2	(BR)	repeats the pulses to the test final selector via the VM wire.
Relay PD	(BL)	pulsing at contact PC1,
PD2	(BC)	during the first break pulse removes the short-circuit from relay CD which thus operates and then holds for the duration of the pulse train.
Relay CD	(BC)	operating,
CD2	(BL)	operates relay EA.
CD4	(BL)	disconnects the P1 wire testing circuit during pulsing.
Relay EA	(BL)	operating,
EA1	(BL)	prepares the operate circuit for relay RC.

At the end of the pulse train contact PD2 re-connects the short-circuit across relay CD thus causing it to release.

Relay CD	(BC)	releasing slowly,
CD2	(BL)	releases relay EA and operates relay RC (see Design Details - relay EA).
CD4	(TC)	re-completes the P1 wire testing circuit.
Relay RC	(BL)	operating,
RC1	(BL)	holds relay RC.
RC2	(BL)	disconnects the circuit for relay EA and prepares a circuit for relay E.
RC3	(TC)	prepares an operate circuit for relay G.
RC4	(TC)	extend the incoming 'Test' pair to the uniselector
RC5	(TC)	arc TS1 and TS2 wipers.
RC6	(BR)	switches the pulsing circuit from uniselector arc TS6 wiper to arc TS7 wiper.

The third train of pulses is now received to pulse relays A and PC.

Relay A	(TL)	pulsing,
A1	(BL)	pulses relay AA.
Relay PC	(TL)	pulsing,
PC1	(BL)	pulses relay PD.
Relay AA	(BL)	pulsing at contact A1,
AA2	(BR)	repeats the pulses to the test final selector via the RM wire.
Relay PD	(BL)	pulsing at contact PC1,
PD2	(BC)	during the first break pulse removes the short-circuit from relay CD which thus operates and then holds for the duration of the pulse train.
Relay CD	(BC)	operating,
CD2	(BL)	operates relay E.
CD4	(TC)	disconnects the P1 wire testing circuit during pulsing.
Relay E	(BL)	operating,
E1	(TC)	prepares a masking circuit for relays A and PC.
E3	(BC)	prepares an operate circuit for relay G.

At the end of the pulse train contact PD2 re-connects the short-circuit across relay CD thus causing it to release.

Relay CD	(BC)	releasing slowly,
CD1	(TL)	connects a short-circuit across the 'Operate' pair to guard against the momentary release of relays A and PC during the change over of contacts G2 and G3, should relay G operate.
CD2	(BL)	releases relay E.
CD3	(BC)	completes an operate circuit for relay G.
CD4	(TC)	re-completes the P1 wire testing circuit.

The test final selector has stepped to the outlet associated with the required subscriber's line circuit, and in this circuit the testing circuit of relay PT is applied to the P1 wire to determine whether the subscriber's line is free.

3.4.6 Subscriber's Line Busy

The following relays are held operated at this stage:- A, AA, B, BA, H, PC, PD and RC.

If the required subscriber's line circuit is busy, battery is not encountered on the P1 wire so relay PT does not operate. Thus, during the release lag of relay E, relay G operates.

Relay G	(BC)	operating slowly,
G2	(TL)	operates relay GA.
G3	(TL)	spare.
G4	(TL)	) introduce the isolating capacitors C1 and C2 into the
G5	(TL)	) 'Test' pair.
G6	(BC)	connects a hold circuit to relay G against the release of contact E3.
Relay GA	(BL)	operating at contact G2.
GA1	(TL)	) reverse the potentials of the 'Operate' pair as a super-
GA2	(TL)	) visory signal to the distant test desk.
Relay E	(BL)	releasing slowly at contact CD2,
E1	(TL)	removes the short-circuit from the 'Operate' pair.
E3	(BC)	disconnects the operate circuit for relay G.

The test desk engineer can now decide either to step-on to test the subsequent subscriber's line circuits by the dialling of single digits, or remain camped-on the busy subscriber's line until it becomes free.

3.4.7 Step-on from Busy Line

The following relays are held operated at this stage:- A, AA, B, BA, G, GA, H, PC, PD and RC.

A single break pulse is received from the switching circuit to pulse relays A and PC once.

Relay A	(TL)	pulsing,
A1	(BL)	pulses relay AA.
Relay PC	(TL)	pulsing,
PC1	(BL)	pulses relay PD.
Relay AA	(BL)	pulsing at contact A1,
AA2	(BR)	repeats the pulse to the test final selector via the RM wire.
Relay PD	(BL)	pulsing at contact PC1,
PD1	(TC)	disconnects the circuit for relay G which however holds for the duration of the pulse.
PD2	(BC)	during the pulse removes the short-circuit from relay CD which thus operates.
Relay CD	(BC)	operating,
CD2	(BL)	operates relay E.
CD4	(TC)	disconnects the P1 wire testing circuit during pulsing.
Relay E	(BL)	operating,
E1	(TL)	prepares a masking circuit for relays A and PC.

At the end of the pulse contact PD1 re-connects the circuit for relay G and contact PD2 re-connects the short-circuit across relay CD thus causing it to release.

Relay CD	(BC)	releasing,
CD1	(TL)	connects a short-circuit across the 'Operate' pair to guard against the momentary release of relays A and PC during the change over of contacts G2 and G3 should relay G release.
CD2	(BL)	releases relay E.
CD4	(TC)	re-completes the P1 wire testing circuit.

The test final selector wipers have rotated one step, and in this circuit the testing circuit of relay PT is applied to the P1 wire again to determine whether the subscriber's line associated with the new outlet is free.

3.4.8 Subscriber's Line Free

The following relays are held operated at this stage:- A, AA, B, BA, G (if camped-on a busy line, or after step-on from a busy line), H, PC, PD and RC.

If the required subscriber's line circuit is free, or becomes free, battery is encountered on the P1 wire which operates relay PT.

Relay PT	(TC)	operating,
PT1	(TC)	releases relay G (if it is operated), and extends earth to uniselector arc TS3 wiper to seize and guard the subscriber's line circuit.
PT2	(TR)	holds relay PT and disconnects this relay from the P1 wire.

Relay E	(BL)	releasing slowly at contact CD2,
E1	(TL)	removes the short-circuit from the 'Operate' pair.

Relays G and GA will be operated and now release when the circuit is camped-on a subscriber's line circuit which was busy and has subsequently become free, or when the circuit has stepped-on from a busy line.

Relay G	(BC)	(when operated) releasing slowly,
G2	(TL)	releases relay GA.
G3	(TL)	spare.
G4	(TL)	short-circuit the isolating capacitors C1 and C2 in the 'Test' pair.
G5	(TL)	

Relay GA	(BL)	(when operated) releasing to contact G2,
GA1	(TL)	restore the potentials of the 'Operate' pair to normal.
GA2	(TL)	

The required subscriber's line circuit has now been seized and the 'Test' pair extended.

3.4.9 Step-on from Free Line

The following relays are held operated at this stage:- A, AA, B, BA, H, PC, PD, PT and RC.

A single break pulse is received from the switching circuit to pulse relays A and PC once.

Relay A	(TL)	pulsing,
A1	(BL)	pulses relay AA.

Relay PC	(TL)	pulsing,
PC1	(BL)	pulses relay PD.

Relay PD	(BL)	pulsing at contact RC1,
PD1	(TC)	during the pulse disconnects earth from uniselector arc TS3 wiper to release the subscriber's line circuit and remove the busy condition from the final selector multiple.
PD2	(BC)	during the pulse removes the short-circuit from relay CD which thus operates.

Relay CD	(BC)	operating,
CD2	(TL)	operates relay E.
CD4	(BC)	releases relay PT.

Relay E	(BL)	operating,
E1	(TL)	prepares a masking circuit for relays A and PC.

Relay PT	(TC)	releasing at contact CD4,
PT1	(TC)	prepares an operate circuit for relay G.
PT2	(TR)	prepares to re-connect the P1 wire testing circuit.

At the end of the pulse contact PD2 re-connects the short-circuit across relay CD thus causing it to release.

Relay CD	(BC)	releasing slowly,
CD1	(TL)	connects a short-circuit across the 'Operate' pair to guard against the momentary release of relays A and PC during the change over to contacts G2 and G3, should relay G operate.
CD2	(BL)	releases relay E.
CD3	(BC)	completes an operate circuit for relay G.
CD4	(TC)	re-completes the P1 wire testing circuit.

The test final selector wipers have rotated one step and in this circuit the testing circuit or relay PT is applied to the P1 wire again to determine whether the subscriber's line associated with the new outlet is free.

3.4.10 Operation of the 'Private Control' Key

When the 'Private Control' key at the test desk is operated earth is connected to both wires of the 'Operate' pair, thus relay A holds and relay PC releases. This facility is used in the following circumstances:-

(a) to test the subscriber's exchange equipment when the line is tested free.

and (b) to check a line which is found to be busy but which may in fact be disconnected or faulty.

(a) When a line is tested and found to be free, on operation of the key relay PC releases.

Relay PC	(TL)	releasing slowly,
PC1	(BL)	releases relay PD.

Relay PD	(BL)	releasing,
PD1	(TC)	disconnects earth from uniselector arc TS3 wiper to release the subscriber's line circuit and remove the busy condition from the final selector multiple, and operates relay CH.
PD2	(BC)	removes the short-circuit from relay CD thus allowing it to operate.

Relay CD	(BC)	operating,
CD1	(TL)	prevents the operation of relay PC in series with relay A when contact E1 subsequently operates.
CD2	(BL)	operates relay E.
CD4	(TC)	releases relay PT.
Relay E	(BL)	operating,
E2	(BC)	prepares the hold circuit for relay CH.
Relay PT	(TC)	releasing at contact CD4,
PT2	(TR)	prepares to re-connect the P1 wire testing circuit.
Relay CH	(BC)	operating slowly at contact PD1,
CH1	(BC)	holds relay CH.
CH2	(TC)	prevents the operation of relay G when contact PD1 subsequently re-operates.
CH3	(BR)	disconnects the pulsing circuit from uniselector arc TS7 wiper.

The subscriber's line circuit can now be operated by a loop on the 'Test' pair, and on restoration of the 'Private Control' key relay PC re-operates.

Relay PC	(TL)	operating,
PC1	(BL)	re-operates relay PD.
Relay PD	(BL)	operating,
PD2	(BC)	re-connects the short-circuit across relay CD thus causing it to release.
Relay CD	(BC)	releasing slowly,
CD1	(TL)	connects a short-circuit across the 'Operate' pair, which performs no useful function at this stage.
CD2	(BL)	releases relay E.
CD4	(TC)	re-completes the P1 wire testing circuit.
Relay E	(BL)	releasing slowly,
E1	(TL)	disconnects the short-circuit across the 'Operate' pair.
E2	(BC)	releases relay CH.
E3	(BC)	prevents the operation of relay G when contact CH2 subsequently releases.
Relay CH	(BC)	releasing slowly,
CH3	(BR)	re-connects the pulsing circuit to uniselector arc TS7 wiper.

The exchange switching equipment can now be tested by dialling on the 'Test' pair.

A testing officer will be able to discriminate between a subscriber's line, a disconnected line or a spare line, by observing the conditions found on the negative and positive wires, and listening for N.U. tone.

(b) When a line is tested and found to be busy, on operation of the key relay PC releases.

Relay PC	(TL)	releasing slowly,
PC1	(BL)	releases relay PD.

Relay PD	(BL)	releasing,
PD1	(TC)	releases relay G and operates relay CH.
PD2	(BC)	removes the short-circuit from relay CD thus allowing it to operate.
Relay CD	(BC)	operating,
CD1	(TL)	prevents the operation of relay PC in series with relay A when contact E1 subsequently operates.
CD2	(BL)	operates relay E.
CD4	(TC)	disconnects the P1 wire testing circuit.
Relay E	(BL)	operating,
E2	(BC)	prepares the hold circuit for relay CH.
Relay CH	(BC)	operating slowly at contact PD1,
CH1	(BC)	holds relay CH.
CH2	(TC)	prevents the re-operation of relay G when contact PD1 subsequently re-operates.
CH3	(BR)	disconnects the pulsing circuit from uniselector arc TS3 wiper. (See Design Details).
Relay G	(BC)	releasing slowly at contact PD1,
G2	(TL)	releasing relay GA.
G3	(TL)	spare.
G4	(TL)	short-circuit the isolating capacitors C1 and C2 in the
G5	(TL)	'Test' pair.
Relay GA	(BL)	releasing at contact G2,
GA1	(TL)	restore the potentials of the 'Operate'
GA2	(TL)	pair to normal.

On restoration of the 'Private Control' key relay PC re-operates.

Relay PC	(TL)	operating,
PC1	(BC)	re-operates relay PD.
Relay PD	(BL)	operating,
PD2	(BC)	re-connects the short-circuit across relay CD thus causing it to release.
Relay CD	(BC)	releasing slowly,
CD1	(TL)	connects a short-circuit across the 'Operate' pair, which performs no useful function at this stage.
CD2	(BL)	releases relay E.
CD4	(TC)	re-connects the P1 wire testing circuit.
Relay E	(BL)	releasing slowly,
E1	(TL)	disconnects the short-circuit across the 'Operate' pair.
E2	(BC)	releases relay CH.
E3	(BC)	prevents the operation of relay G when contact CH2 subsequently releases.
Relay CH	(BC)	releasing slowly,
CH3	(BR)	re-connects the pulsing circuit to uniselector arc TS7 wiper.

The subscriber's line conditions can now be tested.

3.4.11 Release from Free Line

The following relays are held operated at this stage:- A, AA, B, BA, H, PC, PD, PT and RC.

The loop extended on the 'Operate' pair from the switching circuit is removed, releasing relays A and PC.

Relay A	(TL)	releasing,
A1	(BL)	releases relay AA.
Relay PC	(TL)	releasing,
PC1	(BL)	releases relay PD.
Relay AA	(BL)	releasing at contact A1,
AA2	(BR)	short-circuits relay B thus causing it to release, and connects earth to the uniselector arc TS7 wiper.
Relay PD	(BL)	releasing at contact PC1,
PD1	(TC)	disconnects earth from uniselector arc TS3 wiper to release the subscriber's line circuit and remove the busy condition from the final selector multiple.
PD2	(BC)	removes the short-circuit from relay CD thus allowing it to operate.
Relay CD	(BC)	operating,
CD2	(BL)	operates relay E.
CD4	(TC)	releases relay PT.
Relay B	(BR)	releasing slowly at contact AA2,
B1	(BL)	disconnects earth from the ST wire.
B2	(BL)	releases relays RC, BA and E.
B4	(TC)	releases relay H.
B5	(BR)	disconnects the P wire testing circuit against the release of contacts CD4 and H5.
B6	(BR)	disconnects earth from uniselector arc TS7 wiper and from relay B to prevent a current drain whilst the circuit is idle.
Relay RC	(BL)	releasing,
RC4	(TC)	disconnects the incoming 'Test' pair from the
RC5	(TC)	uniselector arcs TS1 and TS2 wipers.
Relay H	(BC)	releasing at contact B4,
H3	(TR)	disconnects the P1 wire testing circuit against the release of contact CD4.
H5	(BR)	disconnects earth from the uniselector arc TS4 wiper to remove the guard on the test selector against seizure from the group selector bank multiple.
H6	(BR)	disconnects earth from the uniselector arc TS5 wiper.
Relay BA	(BL)	releasing slowly at contact B2,
BA1	(BC)	completes the homing circuit for the uniselector TS.
BA2	(BC)	releases relay CD.

The uniselector TS self-drives to its home position and the circuit is then fully released and ready for the next call.

4. DESIGN DETAILS

4.1 Relays

The following relays are made slow to operate for the following reasons:-

Relay CH	(BC)	to guard against any misoperation due to the out of sequence of contacts AA1 and PD1.
Relay G	(BC)	to provide an adequate period for the P wire testing circuit of relay HX to be connected to the selector outlet P wire to determine whether the required test final selector is free.

The following relays are made slow to release for the following reasons:-

Relay B	(BR)	by means of a short-circuit connected across its coil, to hold during pulsing.
Relay BA	(BL)	to ensure that relays H and RC release first and remove all conditions from the uniselector TS wipers, before contact BA1 completes the circuit for the uniselector to home.
Relay CD	(BC)	by means of a short-circuit connected across its coil, to hold during pulsing.
Relay CH	(BC)	to prevent the connexion of a possible additional pulse to the test final selector via the RM wire, should relay A momentarily release during the change over of contacts G2 and G3, on operation of the 'Private Control' key, and to prevent the re-operation of relay G on the release of the key.
Relay E	(BL)	to provide a guarding circuit against the momentary release of relays A and PC during the change over of contacts G2 and G3.
Relay EA	(BL)	to ensure that when contact CD2 releases, the operate circuit for relay RC is maintained for sufficient time before being broken at contact EA1.
Relay G	(BC)	to hold during the pulsing of contact PD1 on step-on from a busy line.

To ensure satisfactory operation of the circuit, the lags of relays which having timing requirements should be within the limits shown in the table below, excepting those marked NC. Limits marked NC are not critical for the correct operation of the circuit but will not normally be exceeded. All times quoted are in milli-seconds.

Release	Release Lag		Operate Lag	
	Min.	Max.	Min.	Max.
B	150	225		
BA	250	350		
CD	150	225		
CH	100 NC	200 NC	100	150
E	300	450		
EA	300	450		
G	100 NC	200 NC		

4.2 Contacts

The following contacts, not fully described previously, are provided for the following reasons:-

Contact B3 (TL) during the release of the circuit, ensures that a loop is not connected across the 'Operate' pair to operate relays A and PC when contact CD1 releases.

Contact BA3 (BR) on seizure of the circuit, ensures that the uniselector TS magnet is not energised during the bunching time of contact AA2.

Contact CH3 (BR) guards against the possibility of an extra pulse being connected to the RM wire, should relay A momentarily release during the change over of contacts G2 and G3 on operation of the 'Private Control' key.

4.3 Common Services

This circuit has been designed to work in conjunction with the following common services:-

Ringer start Diagram AT 5406, Figure 1.

Busy tone Diagram AT 5445

5. HISTORY

Date	DGM Suffix	D.N. Issue	Details of Amendment
March 1968	Open	1	
January 1978	A	1	GA relay added. G3 contact made spare. TS wipers renumbered and contact BT2 reversed to agree with the ATW.

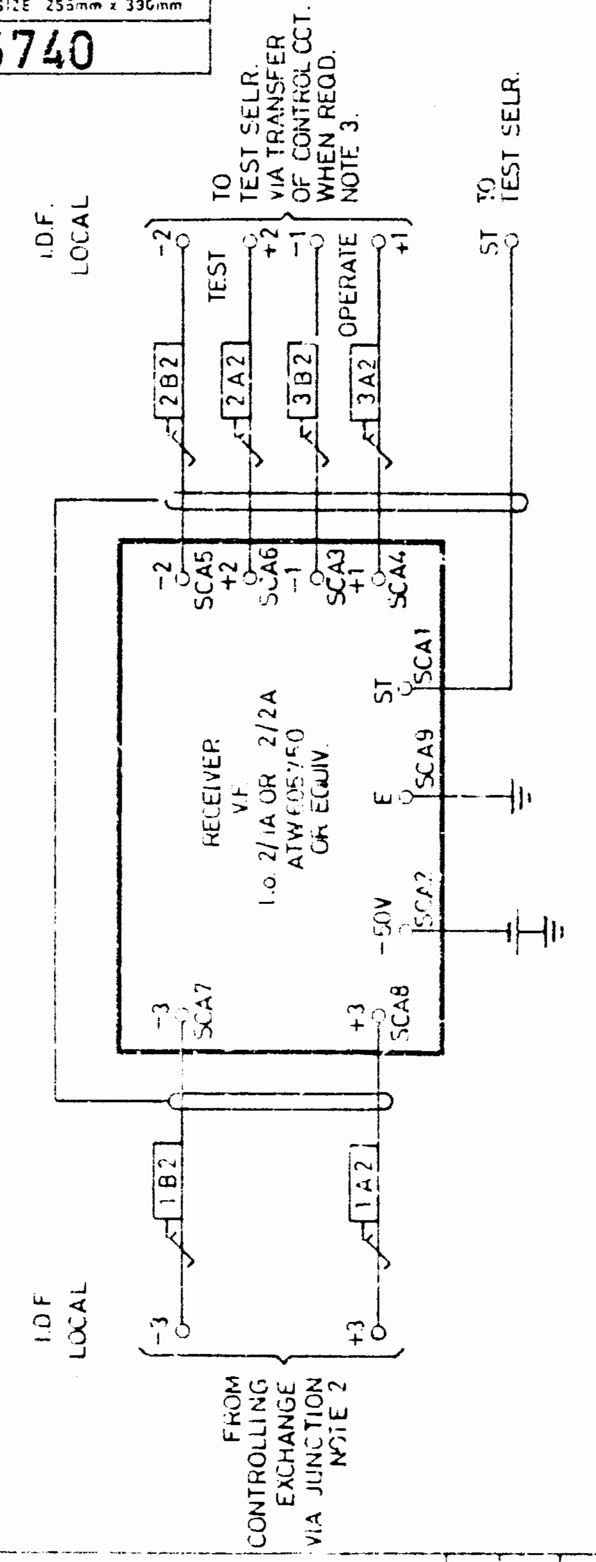
TD1.2.4/PMS

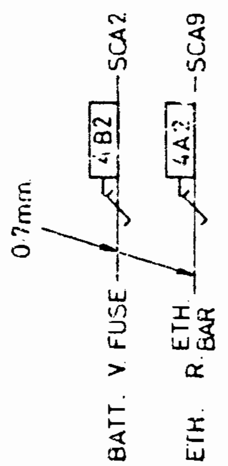
Exchange Switching and Signalling Equipment Development Division
Procter House
100-110 High Holborn
LONDON
EC2V 6LD

END OF DIAGRAM NOTES

ORIGINAL FRAME SIZE 256mm x 330mm

ATW605740





NOTES:-
1. FUSING - 1.5A PER CIRCUIT.
2. CABLED DIRECT FROM MDF FOR UAX13.
3. CABLED DIRECT TO TEST ACCESS SELECTOR FOR UAX13

REF. T60574 | 50V | C

A | 1 | 9.73 | JTH

AMENDMENT | ISS | DATE | APPD

A3 | DRN. S.B. | WRG. R.G.
CKD W.S.F. | CCT
PO CERTIFICATION
A4 | PSS4.2.4.2. 10-9-73 J.T.H.

SWITCHING CIRCUIT FOR REMOTE CONTROL OF TEST SELECTOR.

FRAC. DIMS. | STR. TOL. WIDE
DEC. DIMS. | FLAT. TOL. WIDE
ANGLES | PAR. TOL. WIDE
SQ. TOL. WIDE | CONC. TOL. DIA.
HOLES - DIA. | POSN. TOL. DIA.
SYMMETRY - TOLERANCE OF THE DIMENSIONS SYMMETRIC ABOUT ¢ IS
EQUALLY DIVIDED ABOUT THE ¢

POST OFFICE TELECOMMUNICATIONS HQRS

ATW605740

TEST SELECTOR R/S

~~W/B~~	U 5	−1	PR		B
~~B~~	U 6	+1			Y
~~W/O~~	U 7	−2	PR	FROM SWITCHING CCT	W
~~O~~	U 8	+2			R
~~W/G~~	U 9	ST			G
	U 11	ETH			
	U 12	BATT @ 1.5A			
	U 16	BUSY TONE/ETH			
	U 25	RINGER START			

U 51	−2		U 18	B	~~W/B~~
U 53	+2		U 20	Y	~~B~~
U 55	$P_1/2$	TO TEST	U 22	W	~~W/O~~
U 57	P2	FINAL SELR. LEVEL 2	U 9	R	~~O~~
U 59	G2		U 24	G	~~W/G~~
U 61	VM2		U 26	P	~~G~~
U 63	RM2		U 28	Bk	~~W/Bk~~

U 52	−3		U 18	B	~~W/B~~
U 54	+3		U 20	Y	~~B~~
U 56	$P_1/3$	TO TEST	U 22	W	~~W/O~~
U 58	P/3	FINAL SELR. LEVEL 3	U 9	R	~~O~~
U 60	G3		U 24	G	~~W/G~~
U 62	VM3		U 26	P	~~G~~
U 64	RM3		U 28	Bk	~~W/Bk~~

STANDARD COPY

POST OFFICE TELECOMMUNICATIONS HEADQUARTERS

SPECIFICATION T 60574A

APPARATUS AND CABLING

SWITCHING CIRCUIT FOR

REMOTE CONTROL OF TEST SELECTOR

DIAGRAM AT 60574

I N D E X

1. GENERAL ASSEMBLY DETAILS
2. CABLING AND WIRING
3. LABELLING AND MARKING
4. APPARATUS SCHEDULE
5. HISTORY

1. GENERAL ASSEMBLY DETAILS

The Receiver VF No. 2/1A and 2/2A shall be mounted and equipped as follows:-

UA 13	On the Unit B	(Rec. VF No. 2/1A on 2'6¼" rack)
UA 14	On the Unit C	(Rec. VF No. 2/2A on 2'9" rack)
SAX and ND	On the MAR	(" ")

RELEVANT DOCUMENTS			
Item	Drawing TP	Diagram TPW	Specification T
General	603	-	5252,
Rack UA 13 UA 14 MAR	512 527 64	3001- 3045- 3136-	1393 5263 5008
Receiver VF No. 2/1A No. 2/2A	) Drg. 71277)		60575

2. CABLING AND WIRING

See Specification T 5241.

3. LABELLING AND MARKING

See Specifications T 1559, T 5180.

Marking of connexion strips on IDF

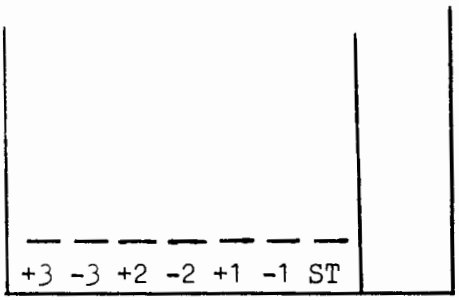
Local Side

SWG
CCT
RMT
CONTL
TSELR

3. LABELLING AND MARKING (CONTD.)

Allocation of tags on Connexion strips on IDF

Local Side



4. APPARATUS SCHEDULE

Item	Code
	Receiver VF No. 2/1A or 2/2A Fuse No. 44A/1.5

5. HISTORY

Date	Issue	Details of Change
March 1966	Open	
June 1974	A	(P & S 74/97) Clause 1. Mounting Arrangements clarified and UAX 13 Drawing corrected.

END OF SPECIFICATION

TD1.2.4/JHH/REP

Exchange Switching and Signalling Equipment Development Division
Post Office Telecommunications Headquarters
Procter House
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LONDON
WC1V 6LD

POST OFFICE TELECOMMUNICATIONS HEADQUARTERS

SPECIFICATION T 62202

APPARATUS AND CABLING

800 Hz ROUTINER ANSWERING EQUIPMENT

AND TRANSMISSION TEST NUMBER EQUIPMENT

UAX 13 EXCHANGES

(DIAGRAM AT 62202)

INDEX

1. GENERAL ASSEMBLY DETAILS
2. APPARATUS SCHEDULE
3. QUANTITIES
4. HISTORY

1. GENERAL ASSEMBLY DETAILS

1.1 The apparatus shall form part of an Answering Equipment Unit which shall also include OSC1 and associated components (Part 1) TN1 and DN1.

1.2 Relevant Documents

	Drawing TP	Specification T
General	5610	5252, 5302
Cabling and Wiring		5241
Labelling and Wiring		4525
Answering Equipment Unit	55118	8255

QUANTITIES

3.

2. APPARATUS SCHEDULE

For Valves Electronic the first tag specified is positive or k.

Circuit Designation	Description	Mounting Position
	Capacitor	
C1	No. 8017B - 1 μf	DN1/5-6
	Fuse	
FS1	No. 44A/1.0	
	Jack Test	
TJ	No. 21G	
	Link N - Red	TJ/7-8
	Relay	
B	No. 4126	
BA	No. 20090	
KR	No. 20122	
TA	No. 3911	
TC	No. 4126	
TD	No. 8242	
TO	No. 7254	
	Resistor (Ohms)	
R1	Code No. 9-270	
R2	Code No. 9-270	
R3	No. 91EF-360	SCA/3-4
R4	No. 91EF-360	SCA/5-6
R5	No. 91EF-1k3	SCA/1-2
R6	No. 91EF-1k3	SCA/7-8
R7	Mullard Type VR37-5M6	DN1/15-16
R8	No. 91EJ-150k	DN1/19-20
R9	No. 91EJ-430k	DN1/11-12
R10	No. 91DJ-3k3	SCA/13-14
	Strip Connexion	
SCA	No. 176A	
SCB	No. 121B	
	Transformer	
T1	No. 3/525A	
	Valve Electronic	
D1	CV 8805	SCA/22-21
D2	CV 8805	SCA/24-23
D3	CV 8805	SCA/25-26
D4	PO No. 24	SCA/29-30
D5	PO No. 24	SCA/27-28

3. QUANTITIES

Item	Total
Fuse	1
Capacitor	1
Jack Test	1
Link N	1
Relays	7
Resistors	10
Strip Connexion	2
Transformer	1
Valves Electronic	5

4. HISTORY

Date	Issue	Details of Changes
August 1979	Open	Nil.

TD1.2.4/EHC/RRB

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Post Office Telecomms Headquarters
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