

PROVISIONAL DESCRIPTION AND OPERATING INSTRUCTIONS

for

TRANSMITTING SET

ADMIRALTY TYPE 610

Ref. No. T. 1824.

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Note:

A full technical description and list of operating instructions on the Transmitter, type 8D (A.M. type T.1154E) is contained under the relevant chapters of Air Publication 1186. The Transmitter is herein only described as far as special modifications are concerned.

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TRANSMITTING SET, TYPE 610.

GENERAL NOTES. This installation is designed around the Transmitter, type 8D, and is arranged for Crystal Drive and remote control of keying on "C.W.", "M.C.W." and "Telephony". Arrangements are also made for the Transmitter to work into a remote quarter-wave vertical aerial, fed by means of a coaxial feeder. The installation is complete with a plug type 161, A.M. ref. 10H/184 for connecting the coaxial cable type P.T.7C to the Transmitter.

INSTALLATION NOTES. The disposition of the apparatus is a matter of convenience within the limits of the lengths of cable provided. Special quick-release mountings are included with the equipment for base mounting the Transmitter. The use of these mountings is advised as if any vibration be communicated to the Transmitter it may cause some measure of frequency drift. Particulars of the lay-out of these mountings are shown on A.M. drawings S.I.S.2651, sheets 1 and 2.

The Auxiliary Crystal Drive Unit must be positioned near to the left-hand side of the Transmitter, and the connecting leads between the two must not exceed 12 inches in length.

The contacts on the Keying Relay, A.P. W.211 must be so adjusted that a good clean make-and-break action is provided.

DESCRIPTION. A diagram of the complete installation Drawing WZ.1661, is included at the end of this book. Power is supplied to the Transmitter by a Power Unit, type 114, A.M. ref. 10K/350, which is energised from 200-250 volt, single phase, 50 cycle A.C. mains. The Transmitter is remote controlled for keying and control of transmitting frequency is attained by the use of an Auxiliary Crystal Drive Unit. Remote control of keying is effected by means of a Relay, A.P. W.211, mounted in the Switch and Relay Unit, A.P.53913. This relay requires 2.2 - 2.5 volts across its coils for energising. As the length and resistance of the remote lines are variable according to the requirements of the particular installation, 6 - 2 volt units are supplied for the relay. These must be adjusted so that, with the telegraph key and remote lines in circuit, the voltage across the relay coils is between the limits of 2.2 and 2.5 volts.

For telephony a Microphone, A.P.54165, and a Microphone Transformer Unit, A.P.53911, are provided for use at the remote end of the installation. The Microphone Transformer Unit contains 6 $1\frac{1}{2}$ volt cells - 4 working and 2 spare - for energising the Microphone. It is important to remember that the switch on the Unit must be placed in the "Off" position when the Microphone is not in use. During "Telephony" the Telegraph Key must be depressed.

THE TRANSMITTER. The Transmitter, type 8D, is the A.M. type T.1154B, stores ref. 10D/196, modified for use with the Crystal Drive Unit and for remote control. Three groups of modifications have been carried out and are listed below.

- (a) The standard H.F. Aerial plug has been replaced by a socket, A.M. type 56, ref. 10H/10330, for use with the coaxial cable plug.

p.t.o.

- (b) The Send/Receive Relay has been rewired to bring the valve biasing line out direct to the Relay, A.P. W.211. The previous keying line has been deleted and the termination on the S/R Relay earthed - see Drawing W.Z.1660/C at end of book. The S/R Relay will now move to the "Send" position as soon as power is switched on to the Transmitter and will stay there while that condition holds. Keying is effected by the key shorting out the bias resistance R.9.
- (c) The modifications made in order to allow of control by the Auxiliary Crystal Drive Unit are shown on Drawing W.Z.1659/C at the end of this book. Three 2-way sockets have been added to the Transmitter. Socket "3" or "4" has been wired into the anode circuit of the Master Oscillator Valve and the top connection of this socket is utilised to carry H.T. to the Crystal Drive Unit and to feed back the Crystal Drive Unit R.F. output. When using Crystal Control the Master Oscillator Valve is thus inoperative, the M.O. Tuning Circuit being used as a harmonic selector circuit. Socket "4" when engaged by the 2-point Plug provided, shorts out part of R.3 in order to adjust the H.T. to the correct value for the K.T.61 Valve of the Crystal Drive Unit.

The top pin of Socket 5 is wired to the 6 volt + supply of the Transmitter, while the lower pin serves to connect the grid of the K.T.61 to the Transmitter valve biasing line when it is desired to key the Crystal Drive Unit. Further reference will be made to this later. It is essential to note that a connector A.P.54019 is provided and must be used to bond the chassis of the Transmitter and the Crystal Drive Unit together. Unless this is done the equipment will not function.

If for any reason it is desired to revert from Crystal to M.O. Control, disconnect the leads between the Transmitter and the Crystal Drive Unit and remove the 2 pt. Plug "4" from its socket, replacing it in Socket "3" or "4". The changeover takes no more than 5 seconds.

THE SWITCH & RELAY UNIT. The Switch and Relay Unit, A.P.53913, is provided to house the Relay, A.P. W.211, and also contains a switch which may be used for testing and setting up the Transmitter locally. Internal and external connections are shown on Drawing W.Z.1661. After testing and setting up the Transmitter, always remember to place the Test Switch in the "Off" position, so that the equipment is ready for use when required.

NOTE: The Unit is now provided with two links connecting the "TEST" and "XTR" terminals together and they must always be left in position.

AUXILIARY CRYSTAL DRIVE UNIT. MARCONI TYPE 859. A.P.53910.

1. FUNCTION. This Unit has been designed to provide facilities for crystal controlling the A.M. T.1154, ADMIRALTY TYPE 8D, A.D.77 or similar transmitters, on a number of frequencies within the H.F. band. This is made possible with a minimum of alteration to the existing transmitter with which the Unit is used. Rapid change from normal to crystal controlled operation is obtained by means of a simple plug and socket arrangement on the

transmitter front panel. For any particular transmitter fundamental, 2nd, 3rd and 4th harmonic working of crystals is possible within the normal H.F. band of the transmitter, but it is recommended that, above 5 mc/s., fundamental frequencies should not be used. Twelve crystals can be used with the Unit, giving a possible 36 to 48 crystal controlled frequencies.

2. GENERAL DESCRIPTION. The Unit is housed in a steel cabinet approximately 8 inches x 6 $\frac{3}{4}$ inches x 6 $\frac{1}{4}$ inches deep, which contains 12 pairs of sockets for the plug-in type crystals, a KT.61 valve and associated components, and a rotary 12-way switch which is operated from the front panel to select any desired crystal. The unit has been especially designed for mounting close to the left-hand side of the Transmitter for reasons of compactness and electrical efficiency.

The crystals are numbered 1 to 12 and a calibration slip is mounted on the front panel of the Unit so that the frequencies obtainable with the various crystals installed may be read off against the selector switch setting.

Suitable crystal-holders are the standard Air Ministry type which are fitted with 6 B.A. pins for use with the crystal holder sockets provided in the Unit. In certain cases it may be found that oversize pins are fitted to A.M. type holders, if this is so the sockets provided on the Unit should be drilled out with a No.30 drill (.1285" dia.)

3. TECHNICAL DESCRIPTION. The circuit of the Auxiliary Crystal Drive Unit is as shown on Drawing WSK.12351, sheet 2 - at the end of this book - and consists essentially of a modified Colpitts crystal controlled oscillator utilizing the cathode, control grid and screen grid of a KT.61 beam tetrode. The anode is connected to a harmonic selector circuit (located in the Transmitter to which the Unit is attached), and H.T. for it and the screen grid is also obtained via this circuit.

Provision is made for the crystal to be kept in oscillation or to be "keyed" by means of a changeover switch on the left-hand side of the Crystal Unit panel. Where local circumstances permit it is preferable to keep the crystal oscillating during the time that power is switched on to the Transmitter. Where, however, the Transmitter S/R Relay is arranged to hold on send - as is the case with this equipment - there will be a small amount of signal passed to the aerial despite the "backing-off" of the magnifier valves during non-sending periods. Under certain circumstances this may cause some interference e.g. if an H.F. D.F. Station in the vicinity happens to be working the same frequency. Where this arises the switches should be placed in the "Crystal Keyed" position.

The R.F. crystal current is maintained at a safe value at all times and excellent Transmitter frequency stability under telegraphy or telephony is assured.

4. SUPPLIES. Total D.C. feed to the KT.61 valve (including screen grid current) is approximately 25 m/a. at 450 volts H.T. L.T. required is 6.3 volts at 0.95 amperes normally. Both H.T. and L.T. supplies are obtained from the Transmitter after modification.
5. ADJUSTMENT & PERFORMANCE. The adjustment of the Transmitter when used in conjunction with the Auxiliary Crystal Drive Unit is quite simple. The switch on the Crystal Unit is set to select the crystal number which, according to the calibration chart, gives the desired frequency. The Transmitter Master

Oscillator dial is set to the frequency selected and the Power Amplifier output circuit is set approximately to a corresponding position. The key is now pressed (or the Test Switch placed in the "On" position) and the Master Oscillator dial readjusted to obtain minimum anode current as indicated on the Transmitter feed meter. Next, the Power Amplifier output circuit is readjusted to obtain the lowest possible dip. Finally, the aerial tap is advanced, commencing from tap No. 1, and the Power Amplifier output circuit readjusted each time for minimum dip until normal working feed current is obtained; this will be approximately 65 m/a in the "Tune" position.

The Transmitter may now be switched to C.W., M.C.W. or R/T for operation as desired. The magnifier feed should be approximately 100 m/a for C.W. and 65 m/a for M.C.W. or R/T.

The R.F. driving power supplied by the Crystal Unit is equivalent to that produced by the VT.105 Master Oscillator during normal operation so that power output in the aerial will be similar when using either Crystal or Master Oscillator control. Excellent frequency stability and freedom from chirp on keying C.W., or scintillation on R/T will be obtained when using crystal control.

6. INTERCONNECTING ITEMS. The following items are required to provide connection between the Crystal Drive Unit and the Transmitter:-

- (a) 1 Connector, A.P.54017.
- (b) 1 Connector, A.P.54018.
- (c) 1 Connector, A.P.54019.
- (d) 1 Plug, A.P.54164.

Details of interconnection are shown on Drawing W.Z.1137C at the end of this book.

POWER UNIT, TYPE 114.

1. The power supplies for the T.1154B transmitter are derived from power unit T.114 (Ref. 10K/350) which is designed to provide a smoothed direct current output from single phase 50 c/s A.C. mains of any voltage between 200 and 250.
2. The unit is made in two sections fitted with carrying handles. These sections are referred to as the transmitter section and the main section. The former provides 1,200 volts, 200 mA, for the H.T. supply to the transmitter T.1154B (modified) when used on the ground. The main section gives an output of 7.3 volts, 13 amps. for the transmitter.

Rectification is effected throughout by full-wave bridge-connected rectifiers of the selenium type.

3. The main section has the following dimensions:-
height 1ft. 7ins., width 1ft. 7ins., depth 1ft. 1in.
This section weighs approximately 65 lbs.

The transmitter section weighs approximately 55 lbs. and has the following dimensions:-
height 1ft. 7ins., width 1ft. 7ins., depth 10½ ins.

GENERAL DESCRIPTION.

4. The main section contains a double pole main switch S1, controlling the AC power supply to both sections. This section embodies the following:-

- (a) The L.T. power supply.

- (b) An H.T. power supply of 250 volts for receiver, when required.
- (c) A separate transformer supplying a rectifier which energizes a relay operated by external means. When this relay operates, it closes the contacts connecting the incoming AC power supply to the transformers which supply the L.T.

The L.T. and H.T. power supplies each consist of a double wound transformer, a bridge connected selenium metal rectifier and a smoothing unit. This smoothing unit consists of two stages of choke capacitance with bleeder resistances.

- 5. The transmitter H.T. section comprises a double wound transformer, a full wave rectifier, and a two stage smoothing circuit. This latter consists of a choke-capacitance with a bleeder resistance to restrict the open-circuit voltage. A relay included in this section derives its coil current from the L.T. rectifier in the main section. When this relay is energized, its contacts close and complete the circuit from the incoming A.C. mains to a transformer supplying the transmitter H.T. circuit. An interlock is provided on the H.T. transmitter section whereby the removal of the cover, which carries a shorting plug, breaks the relay coil circuit, and thus isolates the transformer and subsequent components from the mains.
- 6. The input from the A.C. mains is applied at a socket SK1 in the main unit and thence through two 5 amp fuses F1 and F2 and a bridging Neon pilot lamp PL1 to the primary of a transformer T2. The induced secondary voltage from T2 is rectified at a full wave rectifier, RECT1 and a D.C. supply of 7 volts at 100 MA. is provided for actuation of a two contact relay RP/2. The theory of metal rectification can be found in A.P.1095 Vol.1, Section 11, Chap. 3.
- 7. The circuit associated with T2 may be regarded as a pilot circuit which is part of the transmitter at its master or operational switch, in positions other than OFF: the voltage is developed across the points 3 and 4, of an eight way Jones plug P1 in the main unit and is taken through an octocoremet cable connector, normally used in airborne installations between the transmitter and the rotary transformer power unit.

A skeleton diagram of the interconnection is shown in Drawing WZ.1661 at the end of this book.

- 8. When the circuit is closed and the relay contacts r1 and rf2 are made, the A.C. is applied to the primary of a transformer T1. This pilot circuit associated with rf2 serves to economise cathode and heater current during the OFF condition of the transmitter. The secondary voltage from T1 is rectified at RECT2. Some measure of voltage regulation is afforded by two choke coils L1 and L2, the value of which may be between 0.004 and 0.006H in conjunction with a 10 ohm resistance R1. The resistance R1 permits the current to remain at a level higher than the critical minimum at which the output voltage would begin to take a sharp upward bend.
- 9. Smoothing of the output voltage is provided by a two stage choke-capacitance filter comprising the chokes L1 and L2 with two condensers C2 and C1. The condensers are, physically, each composed of two parallel condensers of 2,000 uF. The D.C. voltage of 7 volts 13 amps, appears across the points 5 and 6 of the Plug P1 and constitutes the cathodes and heater voltage for the transmitter.
- 10. The 7 volt D.C. obtained from the T1 circuit is also used to actuate via a six-way Plug P2, a sextocoremet cable connector

and a plug P3 of the transmitter H.T. unit, a relay circuit consisting of the two contact relay PO/2.

Closing of the contacts po1 and po2 of this circuit permits application of the A.C. supply across the points 10 and 12 of P3 and thence via two 30 amp fuses F3 and F4 and a NEON pilot lamp PL2 to the primary of a transformer T4.

11. The secondary voltage from T4 is rectified at RECT4, and smoothed through a two stage choke-capacitance filter consisting of two choke coils L5 and L6 each of 12 to 14 H at 200 MA, with two condensers C5 and C6 each of 8 uF. A bleeder resistance R4 of 50,000 ohms. is across the output, the positive of which is applied to the transmitter through a single point plug P4 and the unplugmet connector normally employed in the airborne installation. The negative returns through the point 7 of P3.

CONSTRUCTIONAL DETAILS.

12. The power unit is made in two sections. Both sections are constructed of folded steel sheet with reinforced welded corners. The unit is designed for floor or bench mounting, four 3/8 inch holes being provided on angle iron spacer strips.

The fixing holes are 1ft. 0in. between centres on the sides and 1ft. 5 3/4 in. front to rear. The sides of the units are constructed of honeycombed wire mesh and the removable top covers are louvred for ventilation.

13. The front panel of the main unit carries the double pole tumbler type ON-OFF switch S1, the two slide lock 5 amp BS fuse plugs and sockets, and a viewing bezel for the pilot lamp PL1. The input leads are wired to a two pin socket SK1 attached to the cover and this engages with a two pin plug in the instrument when the cover is in position.
14. The eight way output socket (Ref. 10H/438) is also situated at the top of the unit and provides the following output leads:-

Points.

- 3 and 4 Control circuit to complete relay rf2 circuit externally.
- 5 and 6 L.T. to transmitter.
- 1 and 2 H.T. to Receiver (not used).
- 7 H.T. negative to transmitter.
- 8 and 5 Control circuit of H.T. section to complete relay PO/2 circuit externally.

The six way plug P2 (Ref. 10H/426) affords the connection, via a connector, to the H.T. transmitter unit.

15. The main unit components are assembled in two compartments. The upper comprises three sub-assemblies which taken from front to rear are as follows:-

- (a) The pilot rf2 circuit.
- (b) The transmitter L.T., receiver L.T. and receiver H.T. circuit (N.B. the two latter are not used).

(c) The receiver H.T. filter circuit.

The transformers, chokes and condensers are grouped in the lower compartment.

16. The H.T. transmitter unit has a two-pin plug, P.5, provided on the cover to mate with a two-pin socket SK2 in the instrument when the cover is in place. A six-way input plug P3 (Ref. 10H/426) provides the following input leads from the plug P2 on the mains unit:-

10 and 12 Input.

9 and 8 Input to relay P0/2.

7 H.T. transmitter negative.

11 Earth.

A one-way output plug P4 (Ref. 10H/430) provides the H.T. transmitter output to the uniplugmet cable connector. This plug is shielded by a small hinged door.

17. The transformer T4 and chokes L5 and L6 are mounted in the upper compartment of the unit, the lower compartment housing the six units of the rectifier RECT4. The pilot lamp PL2 is mounted in the rear of the top compartment.
18. The transformer primaries are tapped for adjustment as to input voltage. Two taps, zero and 10, are situated at one end and three for 200, 220 and 240 volts, at the opposite end of the winding.

The secondaries have three tapplings grouped at one end. Two of these are used as assembly tapplings for varying rectifier characteristics and one serves as an "age" tap to compensate for any change in the selenium rectifier.

INSTALLATION OF THE POWER UNIT, TYPE 114.

19. Details of the correct octocoremet, sextocoremet, and uniplugmet cable connectors can be found in AP.1186, Vol. 1, Sec. 1, Chap. VII.

Input from the A.C. mains should be made with 7/0.029" cable.

20. The unit is designed for use indoors under conditions where the ambient temperature is between the limits of -20 deg. C (-4 deg. F) and +50 deg. C (122 deg. F). It is designed for tropical use but should be kept under as dry conditions as possible. When mounted on the floor or on a bench there should be an all round clearance of 6 inches.
21. It is not intended that the units should be disassociated from each other.
22. To make adjustments for the supply mains voltage and for the receiver R.1155 (which is not being used with present equipments) the L.T. output of the power unit must be adjusted so that it is 7.5 volts on "Stand by" and not less than 5.9 volts on the "C.W.", "M.C.W." or "R/T" position of the transmitter master switch. To do this remove the cover and adjust the tapplings of the control (T2) and lower tension (T1) as indicated in the accompanying tables:-

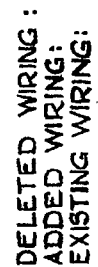
22.(contd.)

<u>Supply voltage.</u>		<u>Use Taps.</u>
200	...	0 and 200.
210	...	10 and 200.
220	...	0 and 220.
230	...	10 and 220.
240	...	0 and 240.
250	...	10 and 240.

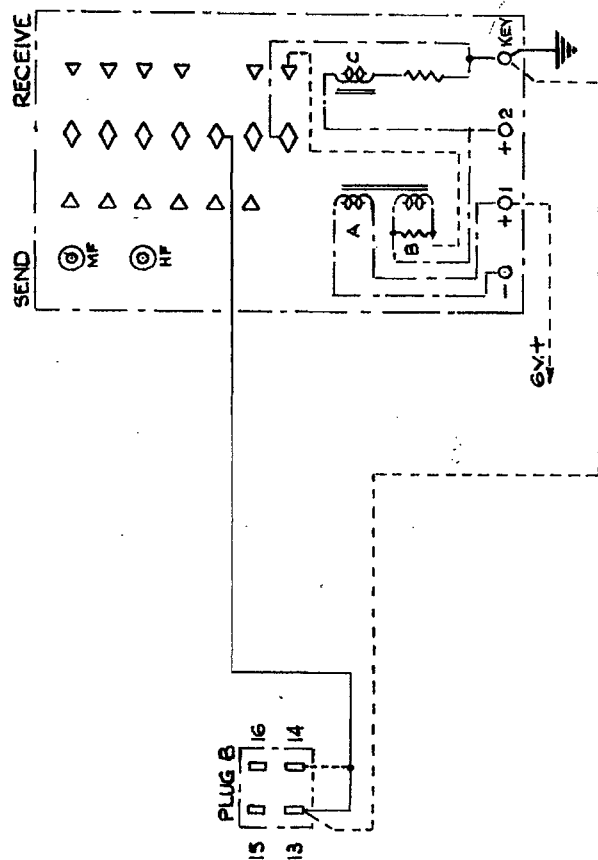
The tapings of the transmitter H.T. unit transformer are similarly marked.

PRECAUTIONS AND MAINTENANCE.

23. To ensure proper ventilation, do not sit on the power units or place anything on top or around them. It is most important that no water should find its way into the power unit.
24. It should not be necessary to clean the relay contacts. To replace a fuse, slide the cover about a quarter inch upwards and then withdraw the fuse replacing it with 36 SWG copper wire. To replace a pilot lamp remove the cover and insert a new NEON indicating lamp suitable for a 250 volt supply. Always check the mains voltage before connecting the units to it. Switch off mains before connecting the units. Switch off the mains before making any internal adjustment or replacement, and before inserting the H.T. plug, in the transmitter unit.



ISSUE No.									SHEET No.	1
C.N. No.										
DATE 27-10-43									CONTIN. ON	
MODS. TO T.1154 B WHEN USED WITH CRYSTAL DRIVE UNIT, TYPE 859.									W.Z. 1659 /c	



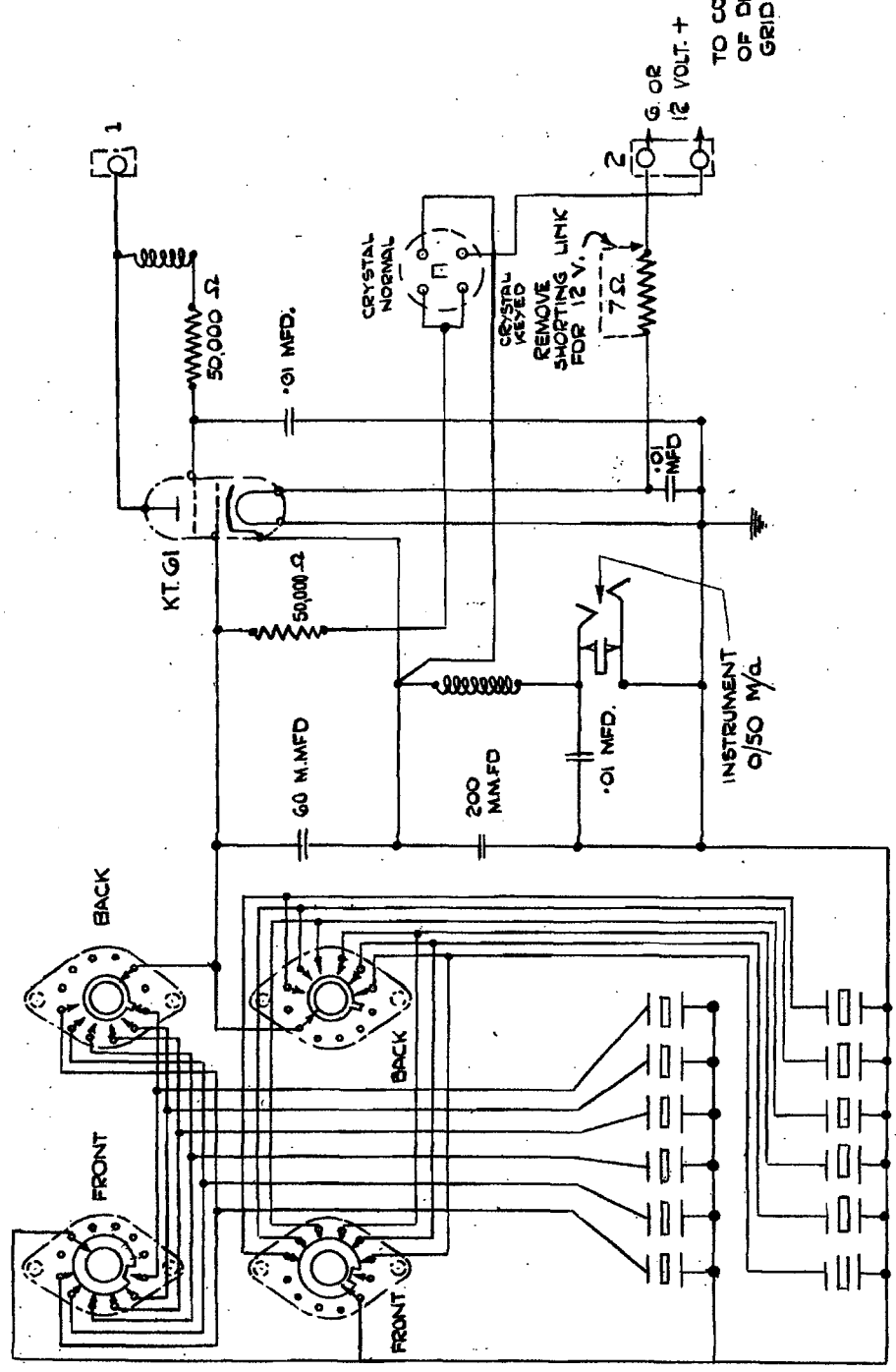
----- DELETED WIRING
 ----- ADDED WIRING
 ----- EXISTING WIRING

ALL OTHER RELAY CONNS: AS SHOWN ON AP 1186.

ISSUE No.	1																	SHEET No. 1
C.N. No.																		CONTIN. ON -
DATE	27-10-43																	
MODS. TO T.1154B S/R. RELAY CIRCUIT FOR REMOTE CONTROL.																	W.Z. 1660 /c	

No. WSK 12351 SH 2

ISSUE No. 1
18-12-42



TO COMMON POINT
OF DRIVE & MAG
GRID BIAS RES.

DUPLICATED	X
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DATA FILE	
INDEX REF.	

W. 5872 Ed B
USED ON

SHEET No. 2
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DRAWN
CHECKED
APPROVED

TITLE DIAGRAM OF CONNECTIONS, AUX. CRYSTAL DRIVE UNIT TYPE 859 Ed: B
FIN.

No. WSK 12351

