MDF 1

DEPARTMENT OF TRANSPORT

RADIO DIVISION

REFERENCE DIAGRAMS

AND

OPERATING INSTRUCTIONS

FOR

MARCONI DIRECTION FINDER
TYPE M.D.F. 1

INSTALLATION INSTRUCTIONS FOR MARINE TYPE DIRECTION FINDER - MDF.

The first point to be decided is a suitable position for the loops. It is very desirable to have the loops as near to the position of the ship's wireless office as possible. When absolutely necessary, it is possible to work with the loops as much as 60 feet away from the wireless office, but the shorter the distance the better the results will be. If the loop leads are too long, the bearings are liable to be flat and ill defined.

It is very important that a position be chosen exactly amidships, especially if there is iron or steel superstructure near by, such as ventilators, tanks, stays, etc., as any non-symmetrical metal mass with respect to the loops will cause absorption or re-radiation.

After the site has been chosen, the aerial framework should be erected close to its final position, and the aerials wound on. The aerial wire consists of seven strands of #22 bare copper wire, and each loop consists of five turns of wire lying in alternate grooves in the main insulators. It is essential that both loops be wound in the same relative direction, in order that the phases of the signal currents will be in correct relation to each other. As a check on this, if the wire terminates say at right side of the after insulator, it must terminate at the right side of the starboard, the right side of the port, and the right side of the fore insulators in the same way, or in other words, both loops must be wound in a clockwise direction or both in an anti-clockwise direction. It will be found that when both loops are wound, there will be five wires on top and sides, and four at bottom, the wires at the bottom being slightly off the fore-and-aft line of the ship where they cross to the next line of grooves.

Before wiring the loops the centre grooved insulators should be taken off the wooden framework, leaving the corner insulators to hold the loops. The wire for, say, the fore-and-aft loop is reeved through under the lower insulator and then passed up and around the three other insulators until five turns are completed. The end of the wire is now made fast to the last groove of the other lower insulator by means of a double turn, and then the turns are put in their grooves and tightened back and secured at the other end with a double turn. Be sure to leave enough wire at both ends to join through to the junction box.

The other loop should now be wired and tightened in the same way. When both loops are assembled, the middle insulators may be put back in their places so that they tend to push the loop windings inwards and thoroughly tighten up the strands of the loops.

When both loops are completed, proceed with the screen wires as follows:- Run one turn of wire round each line of insulators so as to make a complete horizontal turn. Twist the two ends of each turn together at the side of one of the insulators, and leave about two or three inches sticking out for soldering. When all the closed turns are on, all the twisted portions should be connected together by means of one continuous piece of wire which should now be well soldered and the loose ends trimmed off. At the same time a lug should be soldered to the earth wire so that it can be bolted under one of the holding-down screws of the loop framework. As much care must be taken with this connection as with the main transmitting earth. The turns are about 4½" apart, the top one going round on single insulators on the tops of the uprights, and the bottom turn being level with the lower edge of the lower horizontal member. Care must be taken that the screen wires do not touch the wood at any point.

The loop should now be aligned up and the holes marked for drilling and tapping. Do not forget at this time to also mark the holes for the junction box which should be placed under the centre of the loop framework.

Great care must be taken to see that the frame is fixed so that the fore-and-aft aerial lies truly fore-and-aft, and the athwartships loop truly at right angles to it. It will be found that the centre wires of the fore-

and-aft loop will be very convenient for sighting purposes, but if a mast or some other object obstructs the view, it will be necessary to measure along the framework of the loop an equal distance from each centre wire, and after making two marks, to sight along these marks instead of the wires.

As the frame will often be placed near to a compass, all metal fittings are made of brass or copper. If steel conduits are fitted to protect the cable they should not come within fourteen feet of the compass. Any extra protection must be of wood.

When the loop framework is bolted down in place, it should be checked for rigidity. It will sometimes be found that it is necessary to bolt to a rather flimsy deck, or a steel deck of thin plating, and should this be so it will be necessary to further strengthen the loops by means of guy wires. Four eyebolts are supplied with each loop and are fitted about three-quarters of the way up the loop at each corner post. If guy wires are necessary, they should be fastened to these eyebolts and from thence to deck. It will make a nice tight job if four turnbuckles are inserted in the guy wires, so that they can be pulled good and taut.

In some cases a metal framework will have to be constructed to support the loops if there is no place on deck available. It should be remembered that if the ship is rolling there is quite a strain on this structure, and all care should be taken to have the framework or platform constructed with adequate strength.

The direction finding instrument should, as a general rule, be placed in the wireless cabin, and the connections from the loops to the instruments in the wireless cabin are made by means of two parts of special paper insulated twin core, lead covered cable. This special cable requires very careful handling in order to prevent any possibility of damp getting at the paper insulation. Whenever a length is cut off the main supply, the ends of the lead cover must be pinched together and soldered up AT ONCE, and great care must be taken not to work at the ends in any place exposed to damp.

The lengths of cable required terminate in the two special junction boxes, one being installed under the loop framework and the other inside the wireless office. The cables may be clipped up to anything that will support them in just the same way as ordinary electric light wires, the construction of the cables being such as to avoid all inductive capacity or receiving effects. Cables should be protected by conduit or casing of some sort if they have to be run where they will be liable to damage. In running the cable through holes in steel bulkheads, if a special gland is not used, some means will have to be provided for protecting the cable against being cut on the sharp edges of the steel bulkhead. A good method is to drill two three-quarter inch holes for the two cables, and when the cables are put through the holes and in place, wrap the cables with one turn of copper sheet, about #20 gauge, putting a piece of friction tape under and over the copper each side of the bulkhead.

It is impossible to give any hard and fast rule for running the special cables, as conditions vary on every ship, and the Installing Engineer will have to make different arrangements for every job. The special cable must not be bent round any curves of less than nine inches radius, and it must always be realised that the utmost care should be taken in carrying out these instructions, as if any damp penetrates to the inside of these cables, the cable will be destroyed and the direction finder will be useless until it is replaced.

One cable is used for the fore-and-aft leads, and the other is used for the athwartships leads. In order to keep the arrangements on each ship the same, the conductors insulated with red paper should be used for the fore and starboard connections, as in this way it is easy to trace leads in case of trouble.

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Before joining up the cables and loop leads in the outside junction box, the special insulating compound should be slowly heated over a stove, taking care to see that it does not catch fire when liquid. If this happens the compound is ruined. After the connections are well soldered in the junction box the compound should be poured in up to the top, and the lid clamped down.

No compound is used in the inside junction box, but the connections are thoroughly taped and shellaced and, after drying, are taped and shellaced again. This insures a good damp proof insulation. Before insulating the joints the cable should be soldered to two pairs of twisted flex which connect up to the four aerial terminals at the right side of the D.F. These twisted pairs should be run down on porcelain insulators separated from themselves and the wall by a short distance.

Place the D. F. in a suitable place, and wire up all the battery supply leads, etc., to the D.F. and charging board, and also replace the existing aerial change-over switch with the special type supplied with the D.F. All battery leads should be run in lead covered rubber covered and braided wire, and the high tension transmitting flex should be altered to suit the switch. One side of the filament supply line to the D.F. should be run in series with the two auxiliary contacts on the aerial change-over switch, so that current is taken off the D.F. when transmitting. Be careful with the aerial lead from the aerial change-over switch to the insulated terminal on the D.F. This lead should not be of lead covered wire; use R.C. & B. wire, and keep it well clear of the front of the D.F. receiver. If the aerial change-over switch is to the right of the D.F. run the aerial lead down and under the D.F., and bring it up to the insulated terminal. Do not run this lead across the top of the D.F. The above precautions are to prevent direct pick-up in the set from the plain aerial when using D.F. Any pick-up received direct will destroy minimums and displace them.

Special care must be taken with the earth lead from the D.F. This must be as short and as direct as possible, and it must be a good electrical connection to the hull of the vessel. The success of the D.F. depends to a large extent upon this connection.

The twisted flex loop leads should be soldered into lugs and connected to the set, making sure to have them perfectly clean. Connect up the 45 V. high tension battery which should be a type 2308 Burgess or any other heavy duty plate battery.

As soon as all wiring is completed and signals have been received on the set, make a preliminary test as follows: With about eighty turns in the calibrating choke, get a bearing from a station in a known direction. If the cable and loop connections have been carefully followed through the station should appear in its right quadrant, but if through some mistake either of the loop leads have been crossed, it will appear in the wrong quadrant (port bow instead of starboard bow, or port quarter instead of starboard quarter). If this is so, cross either the port and starboard or fore-and-aft ends of the loop connections to the set. When certain that stations appear in their right quadrants, observations should be taken on all quadrants, if possible, at least in two adjacent quadrants, and mark the loop leads so that there will be no mistake in future.

Now proceed to set the phasing unit as follows:- Get a zero in the D.F. position and switch to sense. One of five things will be found, viz.,

(1) Switching to sense obliterates the D.F. zero without showing any signs of moving it. This means that the main aerial is not aperiodic and more resistance is required.

(2) The weakest point is moved 90 degrees but is not zero. This means that the all round component is too strong, and the coupling must be weakened. With very strong signals there is too much direct reception for a true sense zero, so reduce on potentiometer, or, if necessary, dim the valves until the signal is of reasonable intensity.

(3) Two weak points can be found close together and moved about 90 degrees from the D.F. zeros. This means that the all round component is too weak, and that the coupling must be tightened or, if necessary

(4) A good sharp zero will be found 90 degrees from the D.F. zero and signals opposite to the zero much stronger than the D.F. maximum positions: this is correct.

(5) Switching to sense makes no difference at all. Phasing circuits broken or aerial not connected.

To make certain that all is well, it should be possible to go from 2 to 3 of the above by moving the coupler dial. Set the coupler for best results on the normal bearing wave, and lock the moving part by tightening up on the set screw located in the shaft collar between the knob and panel. Be sure that the shaft is properly locked. Finally see that the sense is the right direction. If not, loosen the inside coil on its shaft, and rotate it 180 degrees. This will reverse the sense direction 180 degrees.

The ship is now ready for calibration. As a general rule the installing engineer will have to make a trip with the ship, unless the ship will swing on a nearby transmitting station and then land the engineer. The best method of calibration is carried out in conjunction with simultaneous sight and D.F. bearings. For this method a Peloris is used. This instrument is usually found on any ship's bridge or chartroom. The ship should be about two miles or more away from the transmitting station, consistent with good sight bearings on the masts of the station, and should be well clear of land or anything that is likely to cause refraction or shielding. The peloris should be set with its zero aligned with the ship's head, so that sight bearings taken on the station will be in relation to the ship's head only, and entirely independent of magnetic effect or direction. The ship should be manoeuvered so that the station bears about 45 degrees on the bow or quarter, and simultaneous bearings taken by sight and D.F. Any discrepancy between the bearings taken by either method will be the error on the D.F., as the peloris will give a dead correct bearing with relation to the ship's head, The calibrating choke should be altered until bearings by sight and D.F. are exactly alike. If the observed D.F. bearing is being pulled fore-and-aft, the turns in the choke should be decreased, but if the bearing is pulled athwartship, the turns should be increased.

It will often be possible to calibrate while steaming by a station, as long as sight bearings can be taken. In the first quadrant the difference between sight and D.F. bearings should be ascertained, and by making quick adjustments to the calibrating choke, the calibration can be checked in the second quadrant. This requires quick work. In fine weather calibration may often be accomplished without taking sight bearings. This requires an exact knowledge of the ship's position, together with accurate corrections for variation and deviation. Bearings should be taken from stations at moderate distances away, and compared with the correct true bearings as taken from the chart. This latter method will, however, be a somewhat long and tedious task, and should never be resorted to unless sight bearings are impossible.

Providing the installation has been correctly made, if bearings are accurate on the bow or quarter, they may be presumed to be accurate from all other directions.

INSTRUCTIONS FOR THE USE & MAINTENANCE OF THE DIRECTION FINDER TYPE MDF CONVERTED.

The electrical principle of Direction Finding is as follows:

Two loop aerials are erected exactly athwartship and fore-and-aft. The receiving powers of these two loops are made exactly equal, and they are then joined up through a switch to a goniometer. The purpose of this switch is to prevent damage to the D.F. set by induction from the main transmitting set when the latter is in operation.

The goniometer is joined up to an amplifier, so as to increase the strength of signals.

The duties of the operator with regard to Direction Finding are threefold:-

1. To perfect himself in the knack of taking accurate bearings quickly.

2. To keep the instruments and aerials in first-class order.

3. To be able to re-correct the apparatus should this become necessary.

The following instructions will be found to make all three of the above quite simple of attainment.

1. How to Take Bearings.

It is essential that the main aerial be completely disconnected from earth while bearings are being taken. This is automatically taken care of by means of the Type ACOS 10 aerial change-over switch which connects the main aerial direct to the Direction Finder when placed in the D.F. position. It is not possible to take bearings unless the aerial change-over switch is in the D.F. positions, as both the earthing relay and the amplifier filaments will not function when the switch is in any other position but D.F.

If the apparatus is tuned to the desired wavelength, and if the handle of the goniometer is turned round and round fairly slowly, signals will be heard which rise and fall in strength as the pointer sweeps round.

Having picked out the signals from the station whose direction is required, the attention must be fixed on them, and the goniometer handle worked about until two points are found, one on each side of the point of minimum, at which signals are of equal strength.

The reading of the pointer must be noted at which signals are of equal strength, and the mean of these two will be the required direction. This is the whole operation, but it must be practised assiduously until it can be performed with great rapidity and perfect confidence. Rapidity is especially necessary, as a ship at sea is generally yawing slightly and if bearings are not taken very quickly the yaw will interfere with the sharpness of the bearings.

On no account should any attempt be made to find the position of zero strength and then read the pointer. The design of the instrument renders such a method inaccurate, and it is much too slow to be of any use at sea.

Bearings may be considered to be of the highest degree of accuracy provided that the two positions of equal signal strength are not more than 60 degrees apart. Bearings are still useful so long as this angle does not exceed 100 degrees.

When working in this manner it will be found that there appear to be two directions, exactly opposite to one another, that is 180 degrees apart, and we can eliminate the wrong one, that is the direction away from the transmitting station, by means of the sense finder. If the two directions are not

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opposite we know that the instrument is at fault, but it is still possible to arrive at the correct bearing if time permits.

With constant practice the operation of taking bearings with extreme rapidity becomes very easy. If practice is lacking, difficulty will be found in picking out the signal required and in keeping the attention fixed to it as its strength falls to zero and rises again, and there will be some hesitation in deciding on the points of equal signal strength. Further, errors may creep in due to the markings on the scale being wrongly read, 227 being mistaken for 233, and similar classes of errors. All the above vanish with constant practice.

When it is observed that the position of the two bearings obtains on opposite sides of the scale are not exactly 180 degrees apart, both must be observed carefully and the mean of their two values will be 90 degrees from the correct line of bearing. Thus, suppose the two bearings are 50 and 220, the mean of them, viz., 135, is 90 degrees from the correct line of bearing, which is therefore 45.

A switch will be found, having three positions marked "standbi" "D.F." and "sense". This switch will stop in the position marked "D.F." and "standbi", but must be held in the "sense" position. It will fly back to "D.F." directly it is released from "sense". There is a second pointer marked with the word "sense" in red attached to the goniometer. When the switch is in the "standbi" position there is no directive effect, and the signals are rather stronger than they are when read under D.F. conditions. When in the "D.F." position the instrument operates as a simple D.F. instrument and bearings are always to be taken in this position. It will be noticed that there is a small change in tuning due to the movement of the switch from "standbi" to "D.F." Bearings are always to be taken with the switch in the "D.F." position. Swing readings are always to be used.

If it is desired to determine the sense of any distant station as well as its bearing, the switch must be pulled down into the positions marked "sense" and held there by hand. When in this position it will be found that signals are still zero or very near it when the pointer marked "sense" is turned to one of the directions obtained when working with the switch in the "D.F." position, whereas when the sense pointer is turned to the opposite direction signals will be heard clearly. The real direction is that indicated by the sense pointer when the signals under consideration are inaudible, or nearly so. When taking bearings the gong must be sounded each time that a direction is taken in order that the exact direction of the ship's head by compass may be noted.

When directed by the captain to take bearings of any station, in acknowledging the message the operator should ask to have the direction of the ship's head watched. As soon as the station required has been picked up, and all is in readiness to take bearings, the gong should be rung twice as a warning. Each time that the bearing is taken the gong should be rung once. The sense should, as a rule, be determined before the series of bearings is commended. As a general rule bearings should be taken in the quickest possible succession; never less than three.

If the station required is not working when bearings are wanted it must be called up. It is extremely unlikely that any station will send V's if there is any traffic going on, and therefore the bearing must be snapped from the reply to the call. This requires smart work, and emphasizes the necessity for fast working.

If the ship is in fog, the captain may give instructions for all possible bearings to be taken. In this case the same procedure should be followed; ring twice as soon as a station is picked up, once when each bearing is taken, and three times when the set of five is completed. When acting under orders of this nature, stations should not be called up. This should only be done when specific instructions are given to obtain bearings of a particular station.

It may often be of the greatest value to obtain a bearing of another ship during fog, especially if she be on the starboard bow. But in this case

it must be remembered that bearings of distant ships are not required. Operators should, therefore, practise taking bearings of ships in sight, and noting the adjustment of potentiometer necessary to reduce the strength of signals from neighbouring ships to a suitable degree.

A little practise will usually establish a kind of very rough distance scale, of the following nature:-

With the potentiometer at 4 divisions signals from an ordinary full-sized ship will have vanishing points 30 degrees apart if the ship is ten miles off, and 20 degrees apart if she is five miles off, or something of the kind. From this very rough guesses at the distance can be made, the important point being to decide whether she is over ten miles away or close to. If the ship is believed to be near, the matter must be reported by telephone at once, as time is of great importance.

If the bearing of a ship is picked up in this way, instructions to watch the bearing may be expected or to repeat the observation at frequent intervals, as it is important to know if the bearing is drawing ahead, or drawing aft, or steady.

For about half an hour before and after sunrise and sunset it will almost always be found that bearings become erratic. This uncertainty is quite noticeable when taking bearings. The effect is that it becomes difficult to decide on any minimum and the whole operation gives a feeling of uncertainty. The errors introduced in this way are unlikely to be more than 5 degrees, and are generally about 3 degrees, but they are constantly varying both in direction and magnitude, so it is impossible to allow for them. Operators should accustom themselves to these conditions in order to be able to recognize them should they occur at unexpected times, so that the navigator may be warned that bearings are only approximate. These errors, which are generally called "night effect" are due to the effect of sunlight on the upper atmosphere. They sometimes occur at odd moments during the night, and very rarely by day.

Uses of the D.F. for other purposes than Direction Finding.

The direction Finder is essentially designed for taking the direction of spark waves. If acted upon by a local oscillator it would, of course read signals sent by continuous waves, but its construction is not such as to make it give reliable directions under C.W. conditions. Directions will be quite easy to take, but "night effect" is always very prevalent with C.W. Therefore, no attempt should ever be made to obtain navigational fixes from C.W. stations.

The switch arrangements of the Type MDFI being it under the control of the main send-receive switch, and it can be used for the handling of ordinary traffic if it is found convenient to do so. If persistent interference is met from one direction only, differing by a reasonable amount from the direction of the station from which communication is desired, it may often be quite easy to carry on traffic by using the D.F. as the reciever and putting the zero on the interfering station. Under conditions which very often occur in practice, in which it is desired to communicate with a station practically ahead of the ship while interference is coming from astern, the use of the sense finder may often succeed in cutting out interference and leaving the required signal clear. There is no objection to using the instrument in this way, in conjunction with the local oscillator, for continuous wave reception, but it must always be remembered that nothing of the slightest value for navigational purposes can be obtained from the Type MDFI from a continuous wave station.

3. Maintenance of the Instrument.

(1) It is essential that the D.F. Aerials should be kept taut and in exactly the proper place. The aerials should be examined daily and all

accessible insulators wiped over. Care must be taken to guard against any connections working slack, as any slight trace of microphonic contact will make it very difficult, if not impossible, to take bearings.

(2) A six volt storage battery is supplied which should be kept well charged at all times, and care must be taken that the level of electrolyte is always kept more than one half inch above the tops of the plates.

(3) It must be remembered that valves are expensive and their lives are limited, therefore they should not be left alight longer than is necessary, and they must always be handled with great care. Once they have been shipped they should be left alone; the filaments are always liable to injury from the jar of the valves being taken out of their sockets.

(4) Great care must always be taken to see that the terminals on the face of the D.F. are clean and tight. They should be overhauled about once a month.

(5) It is not advisable to take the parts of the D.F. out of the case more often than is necessary. It is necessary that no oil be allowed to get on to the revolving contacts of the goniometer and the tuning condenser.

(6) D.F. switch must always be put to "Receiver" when the D.F. is not in use.

(7) No ammeter is fitted in the filament circuit of the valves, and the fact that they are at their proper brilliancy must be judged by the eye. This presents no difficulty.

4. <u>The Re-correction of a D.F.</u>

The D.F. is only to be re-corrected on receipt of direct orders from the captain to do so. This can only be carried out at sea in close accord with the captain of the vessel. In the event of D.F. bearings being persistently wrong, and if it is decided that the fault lies in the apparatus, it must be searched for defects.

The most probable are faults in insulation or in continuity in the aerial system. These are not easy to track, as the slightest microphonic effect either in continuity or in insulation will make bearings very bad.

The only way to test is to join up a thoroughly reliable cell and a pair of telephones in series with the circuit under consideration, taking great pains with the connections, and to listen to the telephones while some one sways about the connections under test. Any clicks in the telephones will betray microphonic failures in continuity or insulation, as the case may be.

There is also a possiblity of a soldered connection breaking inside the D.F. box. It is quite possible that such a failure may escape notice in harbour but become apparent when the ship is at sea, due to vibration. Trouble may sometimes be found in the turning connections of the search coil. These contacts are made by the rubbing of thin gold wires on a gilt drum. The contacts must be clean but must not be oily.

The principles on which the accuracy of a D.F. depend are as follows:-

(1) The fact that the receiving power of the two loops shall be equal.

(2) The fact that they are exactly fore-and-aft and athwartships and vertical.

(3) The fact that the top of each loop shall be electrically exactly opposite to the earthed centre of the fields coils of the goniometer.

(4) That the shield in the tuning transformer is earthed.

The first of these is assured by arranging the sizes of the two loops. The receiving power of a loop depends upon its area, its width being more important than its height. The bigger the loops the better the signals, but it must be remembered that the ship herself also acts as a receiver and assists the fore-and-aft loop. Therefore, the thwartship loop is made larger than the fore-and-aft loop, so that the receiving power of both loops may be

made approximately the same. The final adjustment is made by the calibrating chokes.

In the event of the aerials being carried away at sea, they should be replaced to the original dimensions, the calibrating chokes will then give sufficient control for the final adjustment.

The second point is assured by careful fitting, and can always be verified. It can be assumed that the ship is built straight and not lopsided.

The third and fourth points are assured by accurate fitting of the aerials, and by the proper construction of the calibrating chokes and D.F. It is harldy possible that it should become necessary to rewind these at sea.

The function of the calibrating chokes is to alter the receiving power of the thwartship by inserting an impedance in it. It is not to be regarded as a tuning inductance, but as a choke. The greater the inductance the greater the choke, and the less the receiving power of the thwartship. Therefore, the effect of increasing the inductance is the same as that of reducing the loop. The resistance is too small to have any material effect upon the phase of the received currents.

Best results are obtained when the correction applied by the calibrating chokes is small, that is to say, the more nearly the system can be made accurate by trimming the size of the fore-and-aft loop, the better the results will be.

The tuning of the whole system is carried out by the tuning transformers and condenser, and the coupling of the goniometer is so tight that the aerial loops are compelled to form part of the same system. If the loops alone, with their field windings, happened to be of such electrical dimensions that they were in tune with the incoming wave without reckoning the effect of the tuning condenser and transformer, complications would arise but under ship conditions this can only take place on very short waves, and we are quite clear of possibilities of this trouble all through the range of 400 to 12,000 metres for which the set is designed.

A failure in the connection between the shield and earth results in bearings on one side of the scale not being opposite to bearings on the other side. Both will be wrong. When a bearing is taken of a station exactly on the bow or quarter, the wave affects the two loops equally, and if they affect the goniometer equally, the bearing will be correct. If it is correct on this bearing it will be correct all the way round, and as the receiving powers of the loops is independent of tuning within the range of waves of the instruments, we can rest assured that if the bearing on the bow or quarter is correct on any wave, the set is in correct adjustment. Therefore, the only essential for re-correcting a set is a station which is steady on the bow or quarter-bearing.

If the ship is secured to a quay, this is a simple matter, but if she is swinging to a buoy or to her anchors, or is at sea, then the operation must be conducted as follows:-

Decide upon some suitable station and take a series of bearings as for service. Work out the mean true bearing as observed and compare it with the correct true bearing.

In the construction of the loops and framework, the thwartship loop necessarily has to be made larger than the fore-and -aft loop, and it will probably be found that the thwartship loop has a greater receiving power than the fore-and-aft loop even though the latter is assisted by the receiving power of the ship as a whole. On account of this the calibrating chokes are inserted in the leads from the thwartship loop. If the observed relative bearing is found to be too near to 90 or 270 the thwartship loop receives too well, and more inductances must be used in the calibrating chokes. If the observed relative bearing is found to be too near to 0 or 180 the chokes must be rewired so that they are connected in the fore-and-aft leads in order that the receiving power of the fore-and-aft loop may be cut down. This should rarely be found necessary with the type of vessel fitted

Adjustments must be repeated in this way until the bearings are correct. It is advisable to correct from a near-by station if possible, so as to avoid the use of gnomonic charts.

The station must be at least one wavelength away for correct calibration, but preferably should be about two miles distance.

CONFIDENTIAL
For use of Radio Inspec'
tors only.

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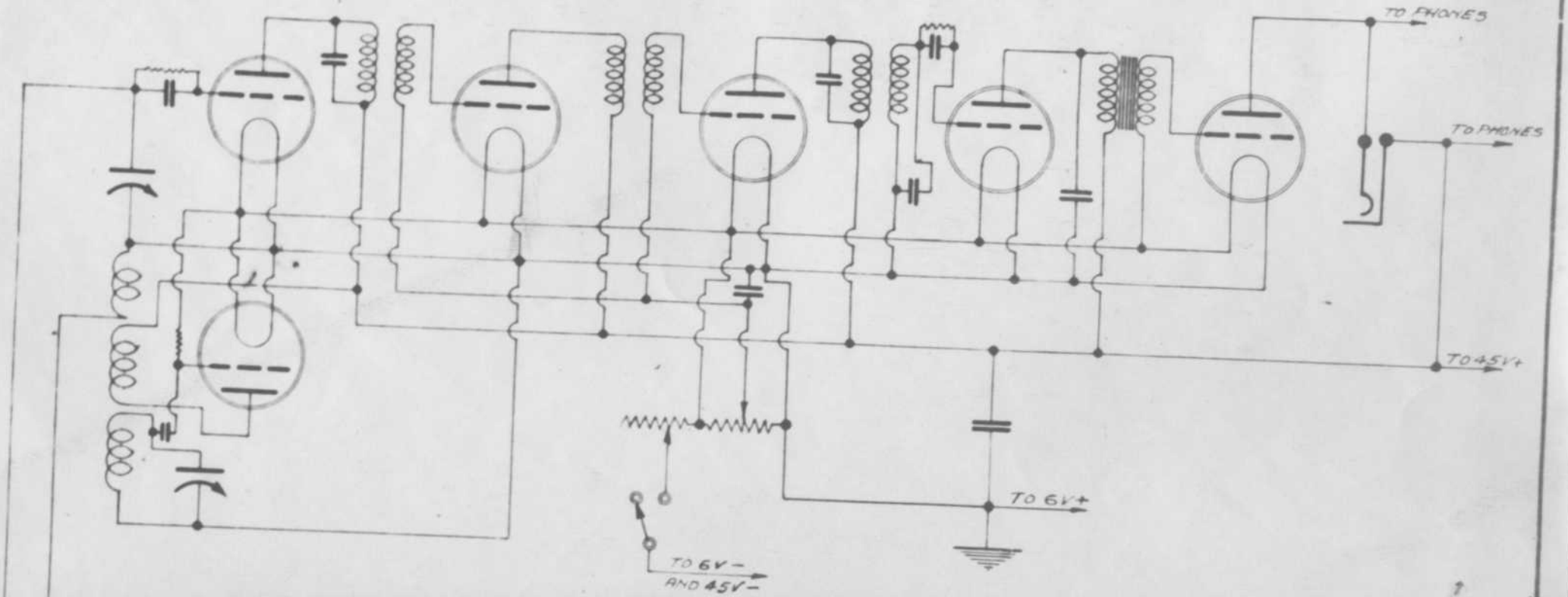
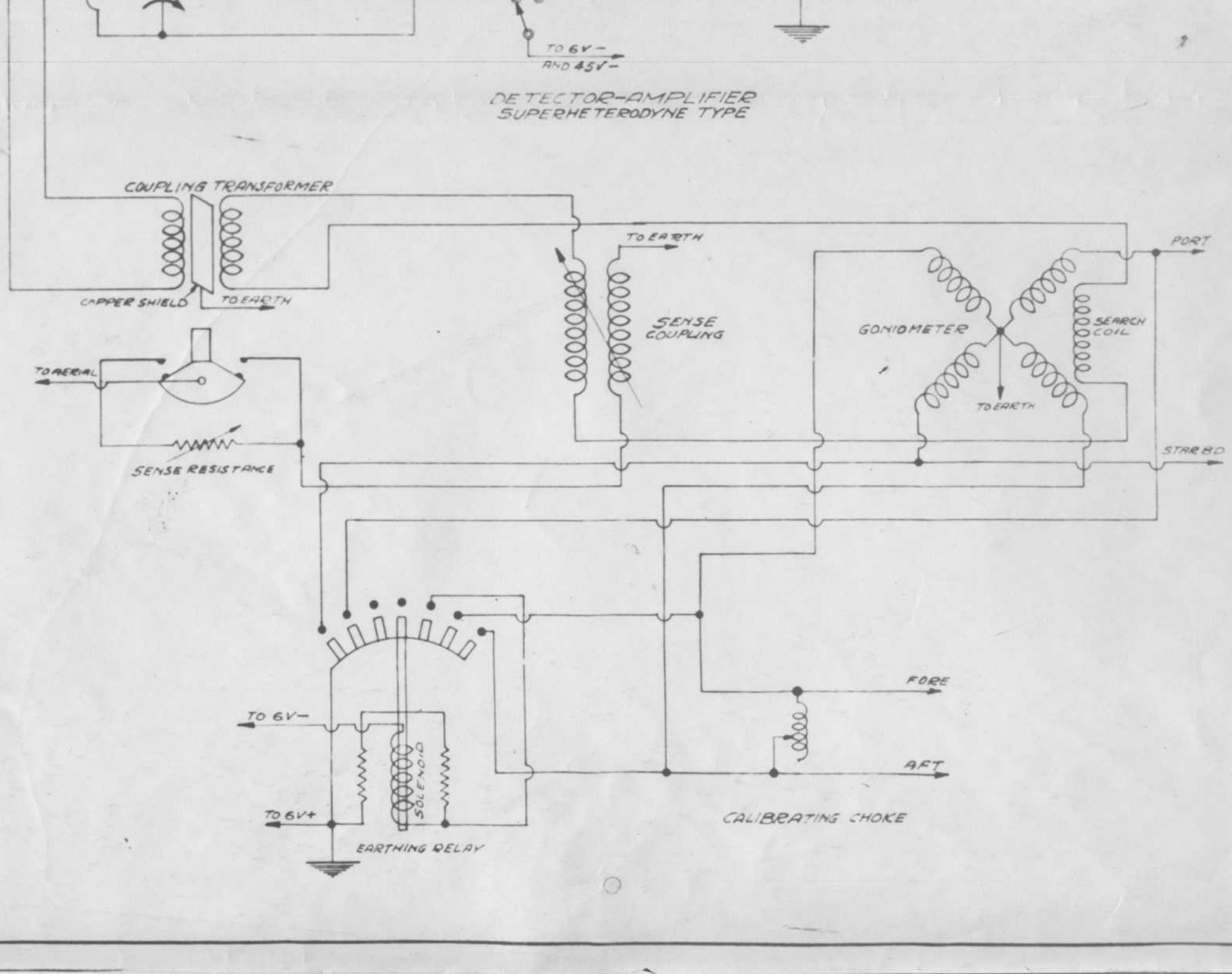
DWG NO.	18843
REQ.	DIAGRAM OF CONNECTIONS DIRECTION FINDER TYPE MDFI
USED ON	APPROVED BY / DRAWN BY / TRACED BY / CHECKED BY

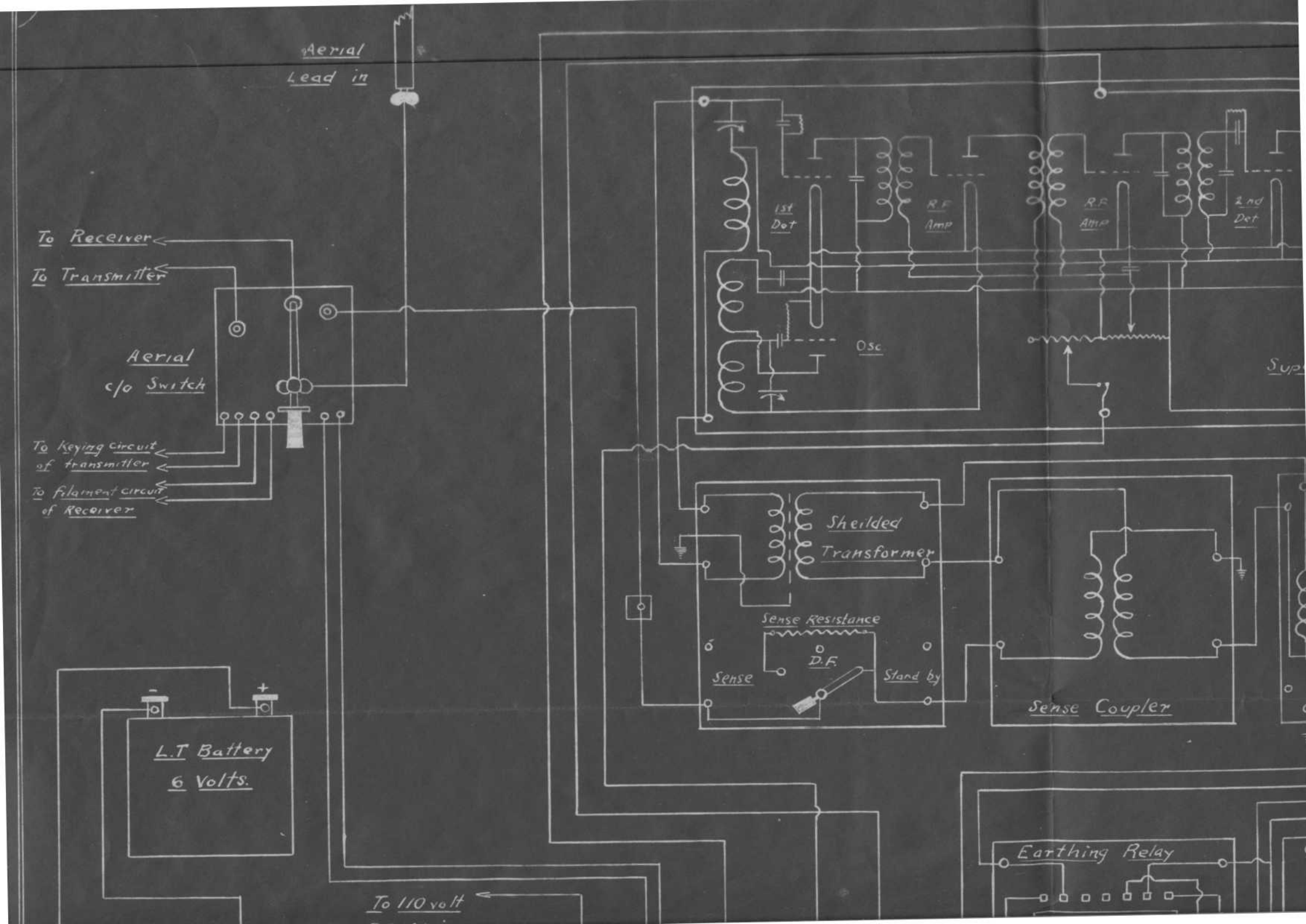
THE MARCONI WIRELESS TELEGRAPH CO. OF CANADA, LIMITED

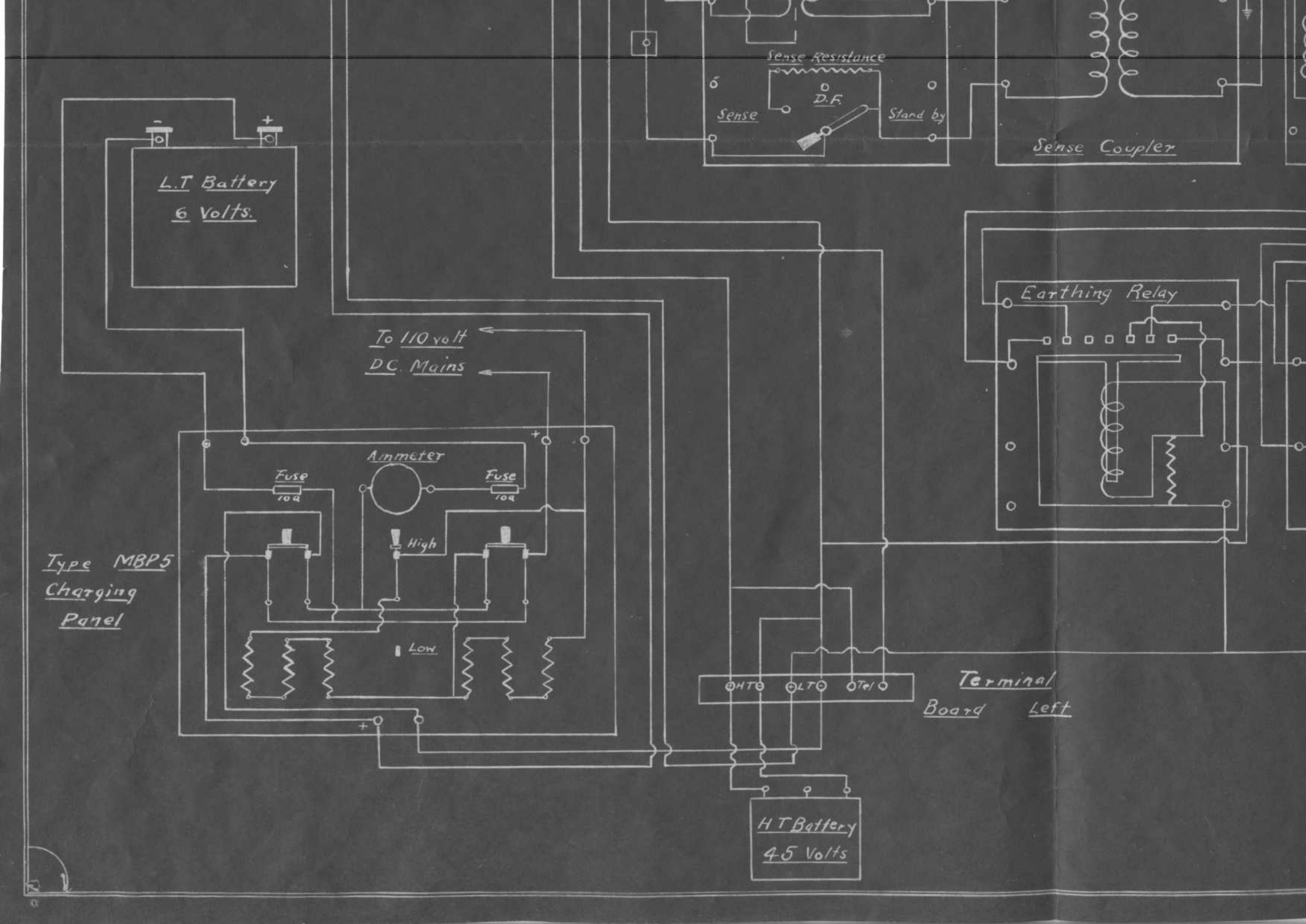


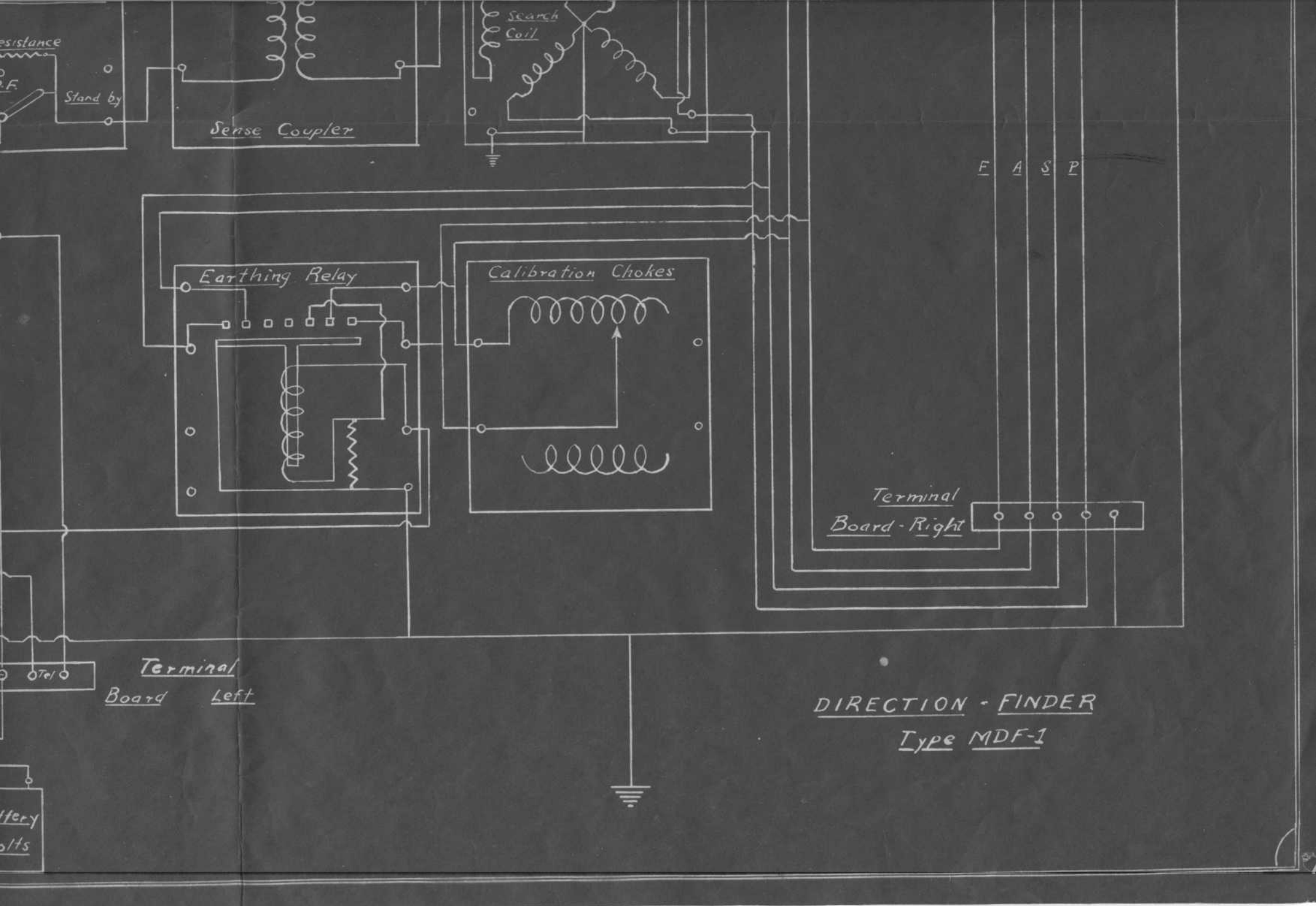
DETECTOR-AMPLIFIER
SUPERHETERODYNE TYPE

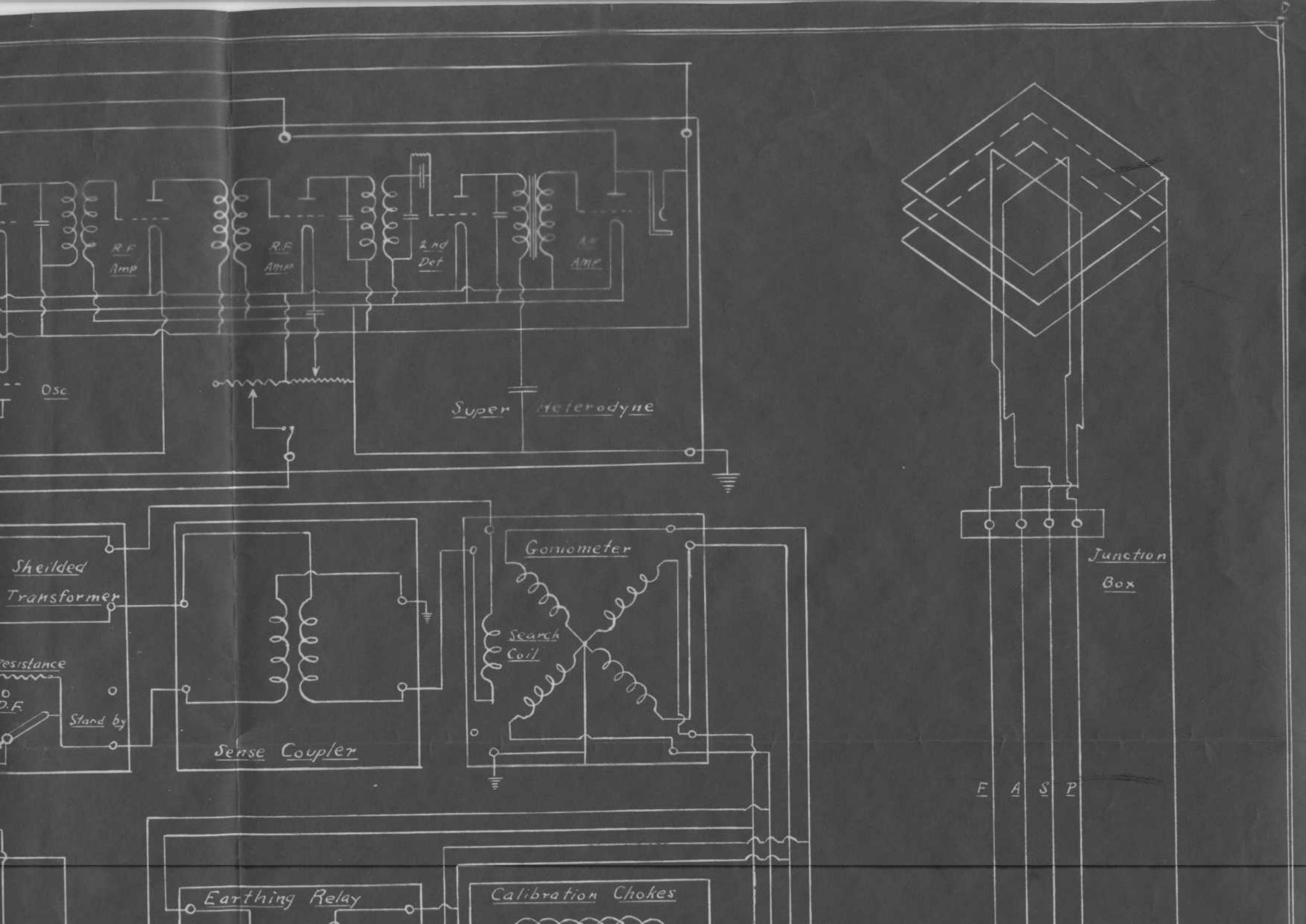
COUPLING TRANSFORMER


TO 6V-
AND 45V-
DETECTOR-AMPLIFIER
SUPERHETERODYNE TYPE
COUPLING TRANSFORMER
COPPER SHIELD
TO EARTH
TO EARTH
SENSE
COUPLING
GONIOMETER
SEARCH
COIL
TO EARTH
PORT
STAR BD
TO AERIAL
SENSE RESISTANCE
FORE
AFT
TO 6V-
SOLENOID
TO 6V+
EARTHING RELAY
CALIBRATING CHOKE


Aerial
Lead in
To Receiver
To Transmitter
Aerial
c/o Switch
To Keying circuit
of transmitter
To filament circuit
of Receiver
1st
Det
R.F.
Amp
Osc
R.F.
Amp
2nd
Det
Sheilded
Transformer
Sense Resistance
D.F.
Sense
Stand by
Sense Coupler
L.T Battery
6 Volts.
To 110 volt
Earthing Relay


Sense Resistance
D.F.
Sense
Stand by
Sense Coupler
L.T Battery
6 Volts.
To 110 volt
D.C. Mains
Earthing Relay
Ammeter
Fuse
10a
Fuse
10a
High
Low
Type MBP5
Charging
Panel
HT
LT
Tel
Terminal
Board
Left
H T Battery
45 Volts


esistance
Stand by
Sense Coupler
Search Coil
F A S P
Earthing Relay
Calibration Chokes
Terminal Board - Right
Terminal Board Left
DIRECTION - FINDER
Type MDF-1


R.F. Amp
R.F. Amp
2nd Det
A.F. Amp
Osc
Super Heterodyne
Sheilded Transformer
resistance
D.F.
Stand by
Sense Coupler
Goniometer
Search Coil
Junction Box
F A S P
Earthing Relay
Calibration Chokes