DIP METER

DM-801

TRIO

CONTENTS:

INTRODUCTION

Dip meter is used for accurate adjustment of radio equipment and antennas.
The DM-801 is a self-excited oscillator designed to be attached to the outside of equipment being tested so that the oscillator coil can be easily coupled to a circuit to be measured.
It features inductive coupling and searching needle for measuring coils enclosed in metallic cases and toroidal coils (patent pending) which is not possible with conventional testing instruments.
The DM-801 has the following two functions:

(1) Inductive coupling

As shown in Fig. 1(A), place the coil unit of the dip meter close to a circuit to be measured. Turn the dial and when the oscillation frequency of the dip meter coincides with the resonant frequency of the resonant circuit (tuning circuit) being tested, the oscillating energy is absorbed by the circuit, thus decreasing the oscillation strength.
The oscillation strength is indicated on the meter. The meter pointer swings back momentarily at the resonant point. As the meter pointer dips at a tuned point, this instrument is called the dip meter.

(2) Capacitive coupling

This is a special feature of the DM-801 which is not found in any other dip meter. Resonant frequency can be checked simply by touching the searching needle to hot side of the resonant circuit which you ought to measure, instead of not coupling the DM-801's coil and the measuring circuits coil magnetically. The frequency is directly read on the dial. See Fig. 1(B).
Recently, radio equipment are miniaturized and most of coils are enclosed in metallic cases. Also, toroidal coils are used in many types of radio equipment. These coils cause failure of coupling to conventional dip meters.
The DM-801 has now solved this problem.

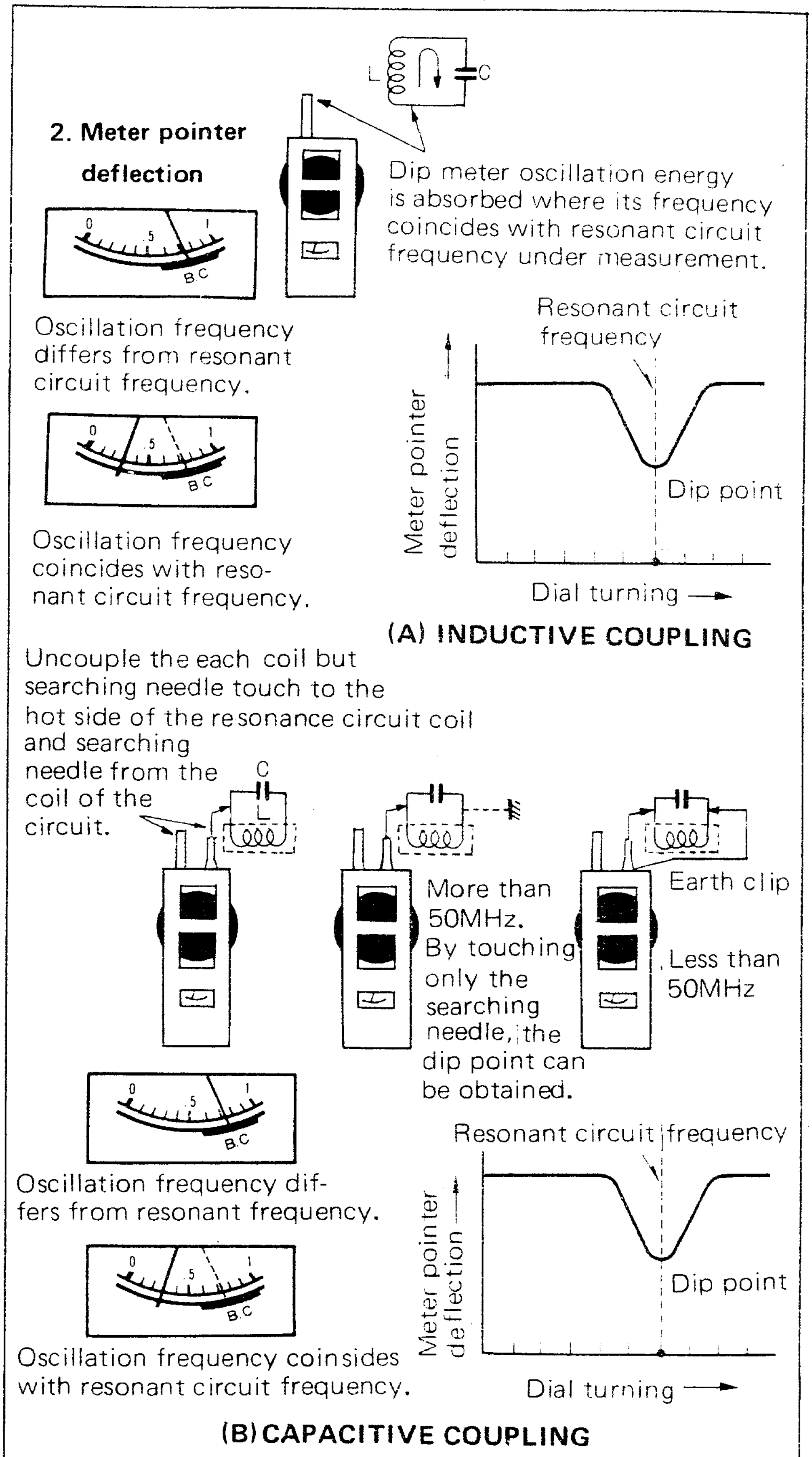


Figure 1. Dip Meter Operation

FEATURES

1. A measurable frequency range is as wide as 700 kHz to 250 MHz in seven bands.
2. All seven dip meter coils, searching needle, earphone and earthclip, can be encased in the main body so that you can easily carry and safely store them without missing.
3. Your DM-801 is convenient both in indoor and outdoor measurements because of all solid-state circuit and built-in battery (006p).
4. A HC-25U socket besides the FT-243 socket enables you to use your DM801 as a crystal checker and marker generator
5. An amplitude modulation is convenient in aligning receivers when using your DM-801 as a signal generator. Also, the amplitude modulation is helpful in precisely calibrating the dial scale even for the receiver having no BFO when it is used as the marker generator.
6. FET and transistors are used in the meter circuit to provide extremely high sensitivity.
7. As an absorption frequency meter, your DM-801 is useful to align transmitters and to measure the field strength.
8. An earphone plugged allows you to monitor transmit signals.
9. Searching needle enables measurement of resonant frequencies without removing coils shielded in metallic case from printed circuit boards.
10. It is also possible to measure frequencies of resonant circuits with toroidal coils, which is not possible with conventional dip meters.

SPECIFICATIONS

Frequency range:	700kHz – 250MHz ±3%
	A band 0.7–1.6MHz
	B band 1.5–3.6MHz
	C band 3.0–7.4MHz
	D band 6.9–17.5MHz
	E band 17–42MHz
	F band 41–110MHz
	G band 83–250MHz
Modulation:	1kHz (sine wave)
Power requirements:	Battery, 9V(006P)
Power consumption:	9 mA
Semi-conductors:	1 FET, 3 transistors, 3 diodes
Crystal oscillator to be used:	HC-25U and FT-243
RF search terminal:	For measuring resonant frequency (capacitive coupling) and checking RF voltage using the supplied searching needle.
Earphone terminal:	Accepts crystal earphone with 3.5ϕ plug for monitoring modulated tone.
Dimensions:	70W x 180H x 45D (mm)
Weight:	Approx. 690g (with accessories)
Accessories:	(1) Coils, A-G bands . . . . . 7 pieces (2) Searching needle . . . . 1 piece (3) Earth clip . . . . 1 piece (4) Crystal earphone (with lead) . . . . 1 piece (5) Battery, 006P . . . . . . 1 piece

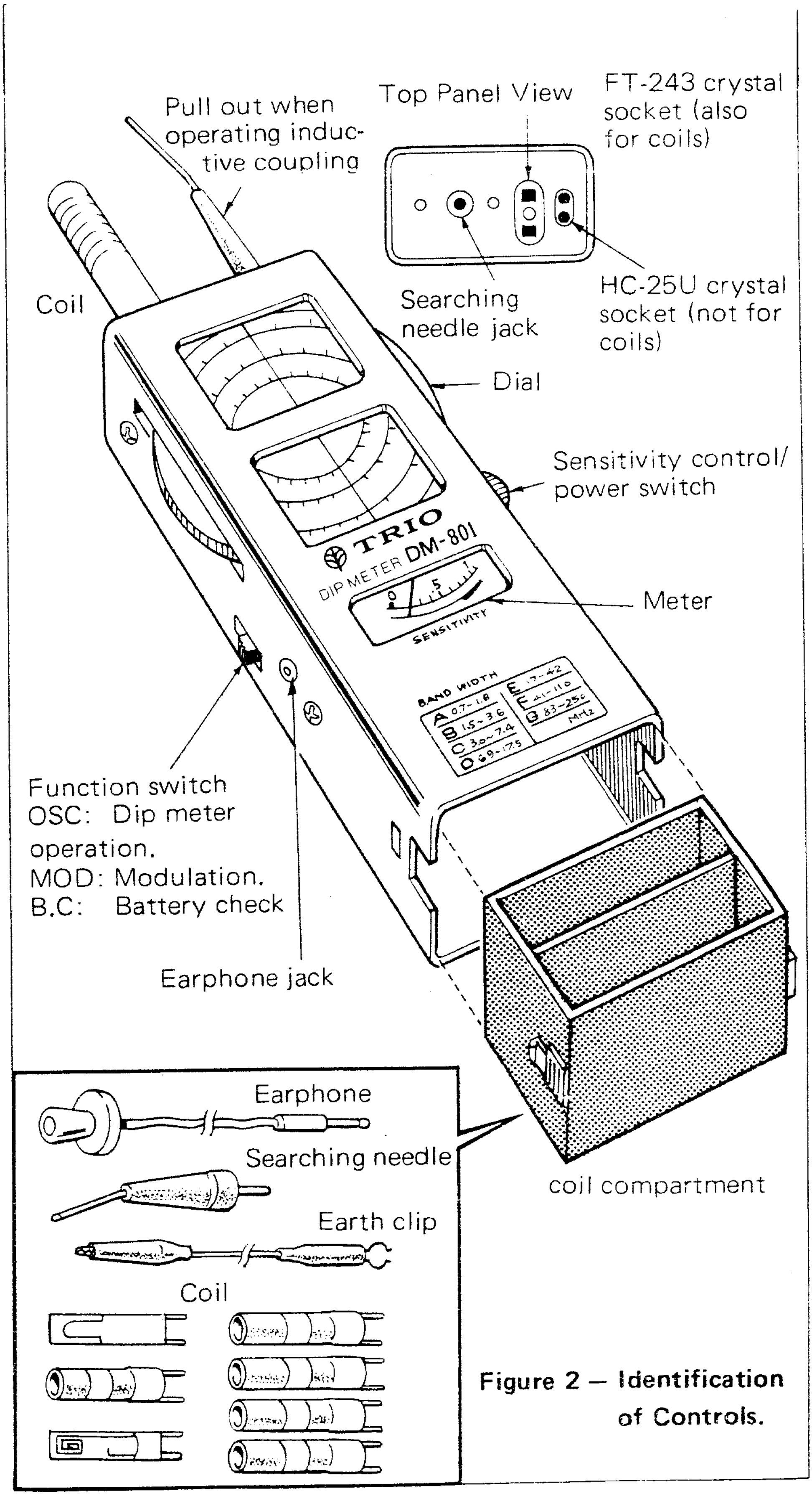


Figure 2 — Identification of Controls.

CAUTIONS FOR USE

1. **Battery and Oscillation Coil Loading**

   Taking the coil compartment out, you will find a battery snap in the inner part from which the compartment has been removed. Firmly fit the snap to the battery. Put the battery take-out ribbon into the battery holder, then insert the battery in place. In turn, put the supplied oscillation coils into the coil compartment and re-attach to the dip meter main body.

   You should assure that the built-in battery is serviceable before operating your DM-801. First, turn the POWER switch on. Set the FUNCTION switch to "BATT CHECK". The battery is available as long as the meter pointer is within the "B.C" zone. Used-up battery results in weak or unsuitable oscillation, oscillation stop, or frequency error increase. In the event, replace the battery.

   After use, be sure to turn the POWER switch off. If your DM-801 will not be used for a long period of time, keep the battery unloaded. You can easily remove it only by pulling the ribbon toward you. Never remove the four screws holding the casing on the both sides.

2. **Caution in Obtaining Dip Point**

   The closer the dip meter and resonant circuit to be checked are brought, the more tight the two are coupled and the deeper the dip point is. However, the tuning point becomes so broad that you cannot find the correct resonant frequency easily. Therefore, it is advisable to bring the dip meter a little away from the given circuit.

   Note that the A band has a large pull-in effect and therefore the dip point becomes broad.

3. **Caution in Measuring Resonant Circuit Loaded on Transistors**

   There is no load problem in measuring vacuum tube resonant circuits. In measuring some resonant circuits (tuning circuits) loaded on their transistors in transistorized transmitters and receivers, each resonant point cannot be found by any measure. In this event, disconnect the transistors temporarily or operate the given resonant circuit with turning the power on.

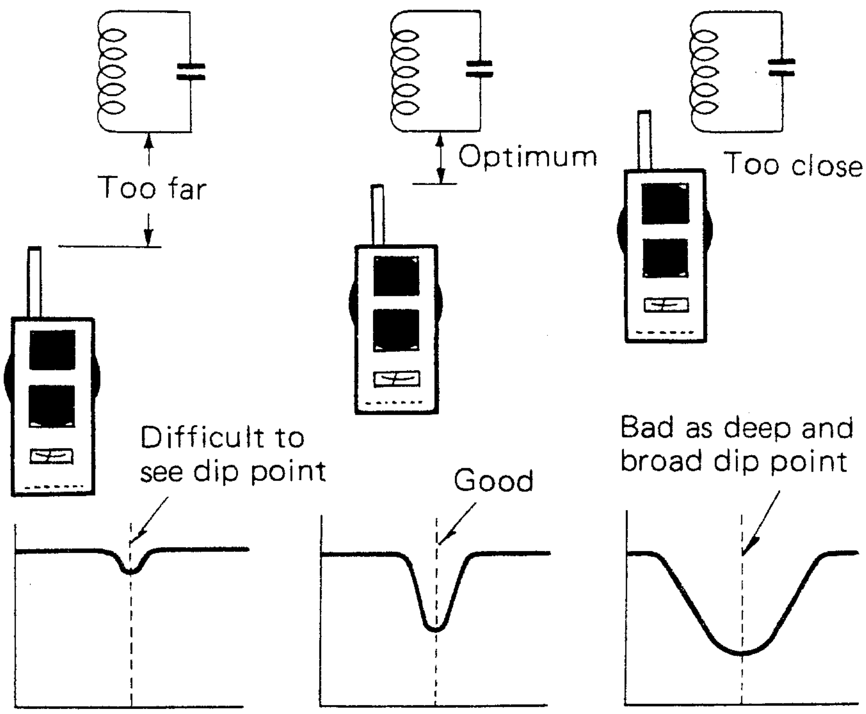


Figure 3 — Distance Adjustment for Accurate Dip Point

4. Caution in Measuring Transmitters

Your DM-801 is available as absorption frequency meter in measuring the frequencies of transmitter power amplifiers, tank circuits, and similar stages producing high RF energy. In measurement, do not bring the dip meter abruptly close to any of such circuits as the transistors and other parts in the dip meter could be burnt out. Take it near the given circuit so slowly that the meter pointer cannot swing out of the scale.

5. Caution in Meter Pointer Deflection Change

The meter pointer swing may change slightly as if the pointer dips in, with the dial turned. This results from a variation of the oscillation signal strength with change of the oscillator circuit variable capacitor value. To find out the real dip, bring the dip meter coil far away from the circuit under measurement. The meter pointer will return toward the full scale for the real dip.

APPLICATIONS

A. How to Operate Your DM-801 as Dip Meter

1. Select an oscillation coil of covering a desired frequency range.
2. Firmly insert the coil into the socket on the top of the dip meter.
3. Set the FUNCTION switch to "OSC".
4. Turn the SENSITIVITY switch to turn the power on.
5. Further, turn the SENSITIVITY control until the meter pointer reads division 0.7. If not to division 0.7, turn the control fully counter clockwise.
6. Bring the dip meter coil near (around 1 cm) the tuning circuit to be measured and turn the dial slowly. The oscillator signal energy will be absorbed by the tuning circuit around the tuning point and the meter point will dip in abruptly (see Figure 3).

   Note: At first, couple the dip meter coil with the given tuning circuit so tightly that you can easily find the dip point. Then, bring the oscillation coil away until the dip is as narrow as appreciable and readjust the dial precisely for accurate dip point. Now, you can read the correct tuning frequency on the dial.

B. Other Frequency Measurements

(1) Resonant circuit measurement

A basic measurement with use of your DM-801 is a frequency check of resonant circuits (tuning circuits) comprised of coils (L) and capacitors (C). In practice, the dip meter is brought near the coil of the resonant circuit to be measured as shown in Figure 1(A). Figure 1(A) illustrates a standard method of resonant frequency measurement.

(2) Use of searching needle

If a coil to be measured is located in a narrow placed and cannot be coupled the dip meter to coil, or if a coil enclosed in a shield case, the searching needle can be used for accurate measurement. See Fig. 4.

The dip point can be obtained by using the earth clip and searching needle for resonant frequency of about 50MHz or lower, and the searching needle only for the frequency of about 50MHz and higher. Toroidal coils can be measured in the same manner. It should be noted that the searching needle should always be connected to the hot side (not earth side) of coils. See the connections (a) through (c) in the illustration. The dip point is sometimes critical depending on the circuit or frequency to be measured. An accurate dip point can be obtained by turning the dial slowly.

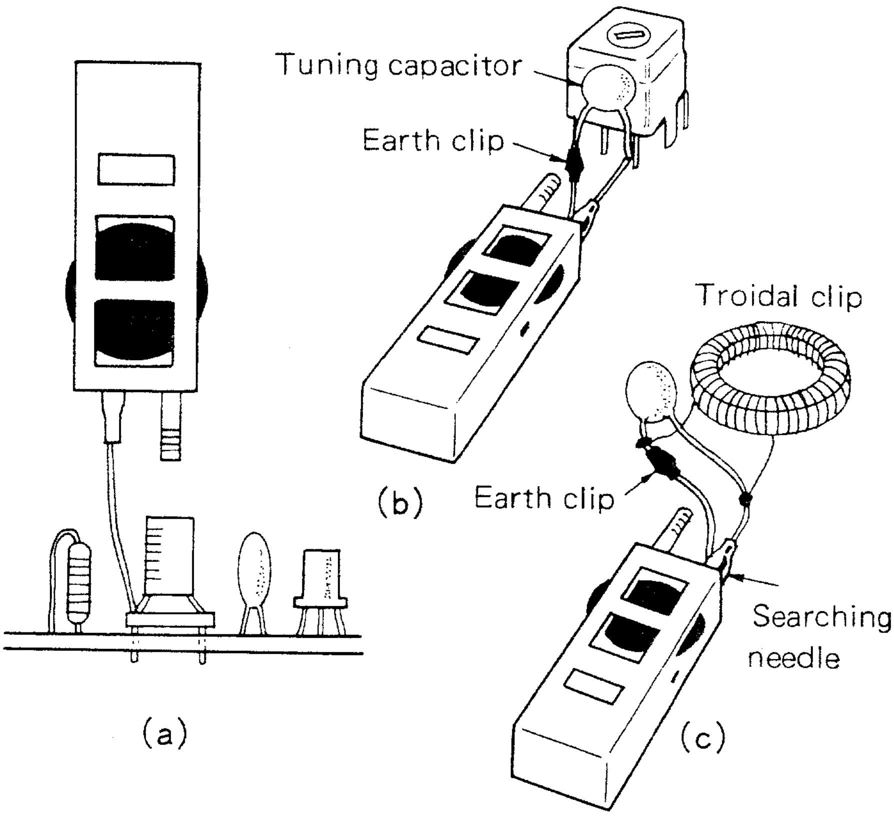


Fig. 4 Figure 4: Use of searching needle

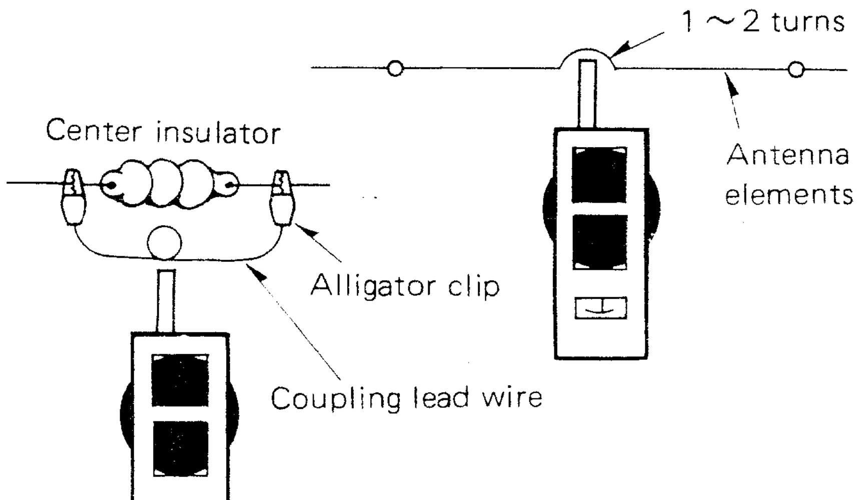


Figure 5 – Antenna Resonant Frequency Measurement.

(2) Antenna resonant frequency measurement

Any antenna can be regarded as a kind of resonant circuit. Its resonant frequency, therefore, can be measured as illustrated in Figure 5. For measurement, connect a one-turn coil to the feeding points at the center of the given antenna. Couple it with the dip meter coil. Now, you can obtain the antenna resonant frequency in a similar manner to Section A, the "How to operate Your DM-801 as Dip Meter".

For a vertical antenna or similar antennas for which the other feeder lead is grounded, place the one-turn coil between the antenna and ground.

Couple the one-turn coil to the dip meter until a dip point is obtained. Then, slowly remove the coil to measure the resonant frequency.

C. Use as Signal Generator

Your DM-801 can be used as a signal generator for aligning receivers and similar equipment. Couple the dip meter with the antenna circuit of a given receiver as illustrated in Figure 6. The dip meter output carrier will enter the receiver. For aligning an AM receiver, set the FUNCTION switch to "MOD". The receiver will sound a 1 kHz tone. Aligning a SSB and CW receivers can be achieved, leaving the switch at "OSC" for no modulation. Adjust the capacitor trimmers and inductor cores for maximum receiver "S" meter read or maximum speaker sound.

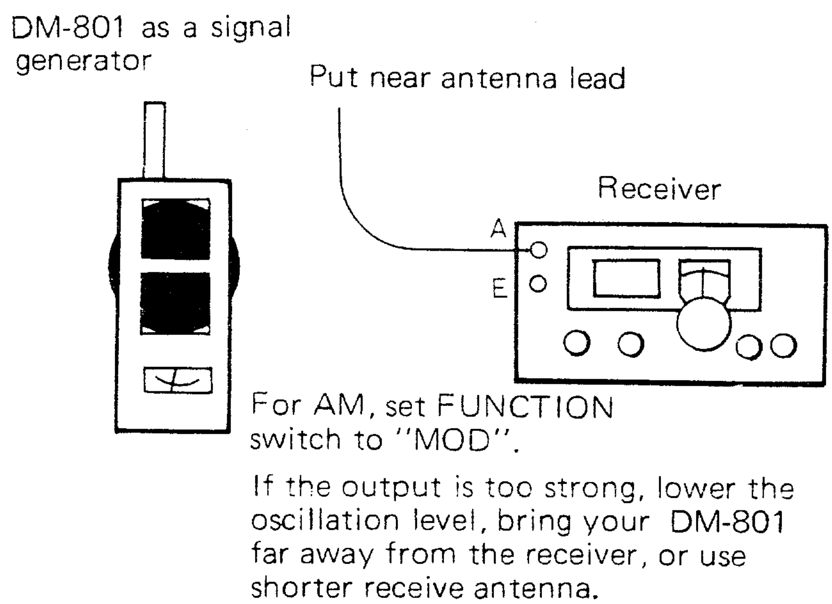
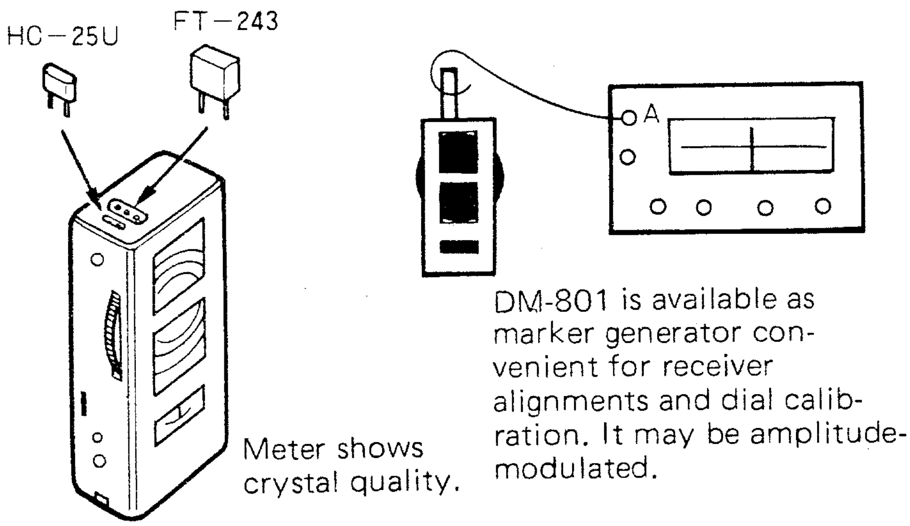


Figure 6 — Use as Signal Generator.

D. Use as Crystal Checker and Marker Generator

Your DM-801 can be modified as a crystal checker by plugging a crystal in place of the supplied oscillation coil (see Figure 7). You may use either HC-25U or FT-243 crystal. Also, a HC-6U crystal can be checked with it plugged in the FT-243 socket. The oscillation signal strength may vary depending on the type and frequency of the crystal used. Adjust the dial for most stable oscillation.

In addition, your DM-801 is applicable as a marker generator by plugging a marker crystal of 1 MHz, 3.5 MHz, or the like. The marker generator is useful for calibrating a receiver dial.



(a) Crystal checking. **(b) Use as marker generator.**

Figure 7 — Use as Crystal-Controlled Signal Generator.

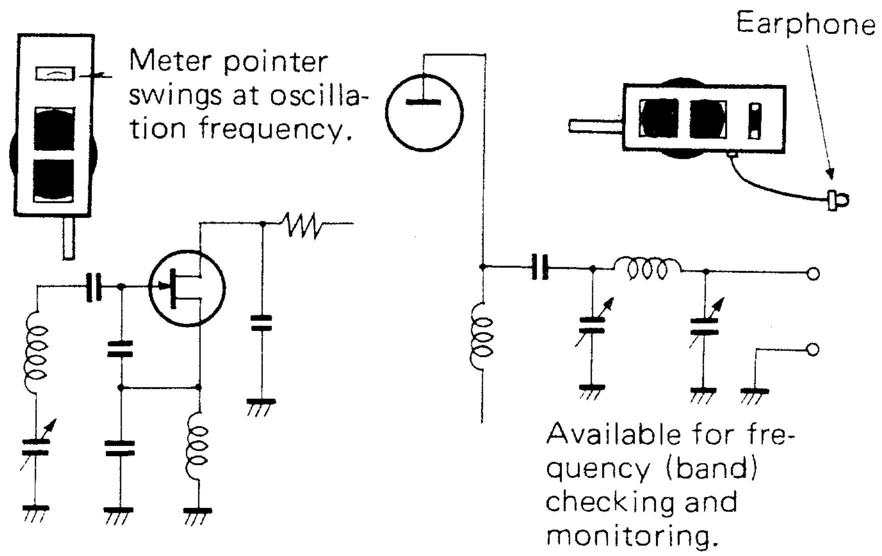
E. Use as Absorption Frequency Meter

Plug an oscillation coil of covering a desired frequency range into the socket. Set the SENSITIVITY switch to ON and obtain the minimum meter deflection (just before the OFF position of the SENSITIVITY switch), then set the FUNCTION switch to OSC. Now, you can use your DM-801 as an absorption frequency meter, which receives an external incoming wave and activates the meter to indicate its frequency.

Figure 8a shows how to measure an oscillator frequency. In the figure, the oscillator coil is coupled with, or brought near, the absorption frequency meter coil. Adjust the dial for maximum meter pointer swing. The dial, then, reads the oscillation frequency. Figure 8b shows that the absorption frequency meter is coupled with a transmitter tank coil. Its radiating frequency can be measured in a similar manner to that in Figure 8a.

CAUTION The transmitter power amplifier stage produces a high RF energy. The absorption frequency meter should be brought near the tank coil so slowly that the meter pointer does not swing out of the scale.

Plugging the earphone allows you to monitor the modulation sound.



a. Oscillation frequency checking. **b. Transmission frequency checking.**

Figure 8 — Use as Absorption Frequency Meter.

F. Use as Field-Strength Meter

Your DM-801 is available to measure the field strength of a wave radiated from a transmit antenna. Set up your DM-801 as directed in Application E, the "Use as Absorption frequency meter". Further, couple an antenna as in Figure 9. Now, you can measure the field strength. This application is convenient for transmit antenna maching, radiation pattern adjustment, and others.

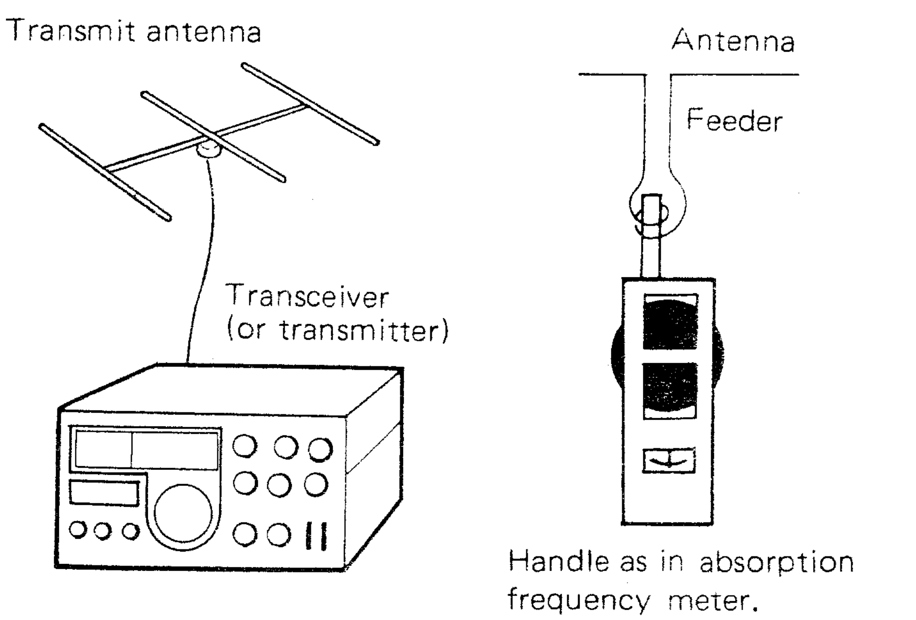


Figure 9 – Use as Field-Strength Meter.

G. Capacitance and Inductance Measurements

The value of an unknown inductor can be obtained in terms of a known capacitor in combination with it and their resonant frequency in the manner illustrated in Figure 10. Similarly, the value of an unknown capacitor can be seen. The inductance, L, capacitance, C, and resonant frequency, f, are related as

$$f = \frac{1}{2\pi\sqrt{LC}}$$

This formula can be rewritten as

$$L(\mu H) = \frac{25{,}400}{f^2\ (MHz)\ C(pF)}, \quad C(pF) = \frac{25{,}400}{f^2\ (MHz)\ L(\mu H)}$$

The inductance and capacitance, therefore, can be easily obtained by substituting the known values into the above equations.
The oscillation coils supplied with your DM-801 are very useful as the known inductors. Their inductances are charted below.

BAND	A	B	C	D	E	F	G
INDUCTANCE (μH)	1,250	160	39	8.4	1.2	0.22	0.047

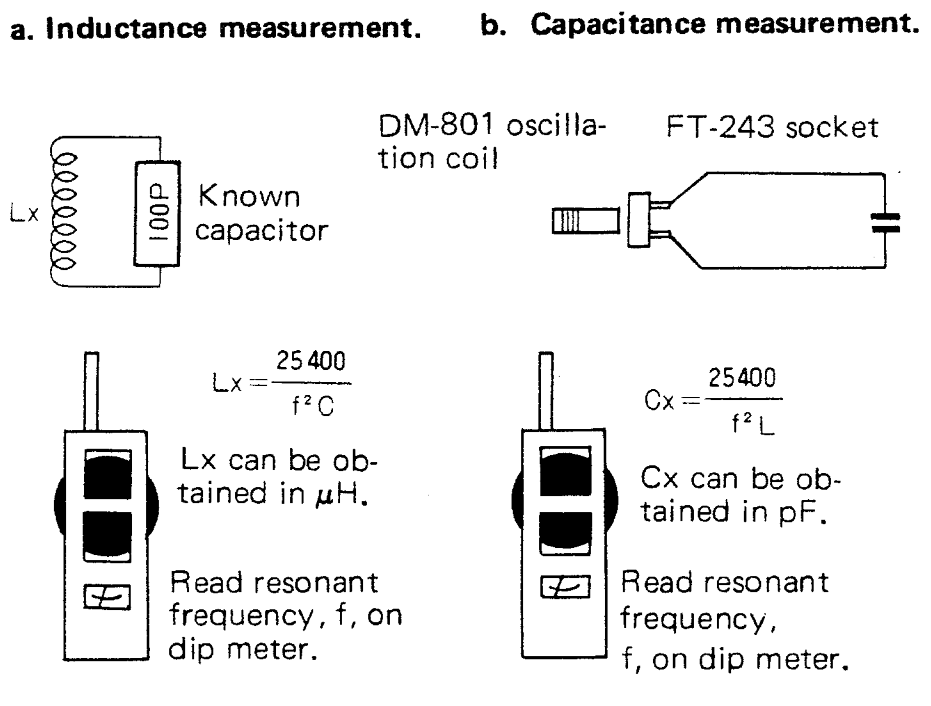


Figure 10 — Inductance and Capacitance Measurements.

In addiiton to the applications stated above, your DM-801 is available in place of a receiver local oscillator in reparing and alignment, instead of a transmitter VFO in test, and as effective means in other services. Also, your DM-801 can serve as a BFO for a receiver of no BFO in receiving a CW or SSB signal. It is useful in a wide variety of other applications. Please, fully understand the principles of your DM-801 operation to extend its capabilities.

PARTS LIST
MAIN CHASSIS

Ref. No.	Parts No.	Description
	A01-0859-08	Case (1)
	A01-0860-08	Case (2)
	A09-0506-08	Coil case
	A10-0471-28	Chassis
	A29-0502-08	Top panel
	B20-0918-08	Dial scale
	B23-0602-08	Front glass
	B31-0719-08	Meter
	B40-0772-08	Name plate (serial No.)
	B50-2920-00	Instruction manual
	C01-0191-08	Variable capacitor
	E11-0061-08	Earphone jack
	E13-0101-05	Phone jack
	E18-0207-08	Crystal socket (FT-243)
	E18-0402-08	Crystal socket (HC-25U)
	E29-0524-08	Searching needle
	E30-1839-08	Earth clip
	E91-0401-08	Battery snap
	F20-0619-08	Insulating plate
	H01-2914-08	Packing case (Inside)
	H03-1855-08	Packing case (Outside)
	H12-0533-08	Pad, (formed styrene)
	H19-0507-08	Accessory box
	H25-0165-08	Polyethylene bag
	H25-0166-08	Polyethylene bag
	J19-0477-08	Battery holder
	J21-1460-08	Coil mounting hardware
	J21-1461-08	Variable capacitor mounting hardware
	J25-1279-08	Printed circuit board
	K29-0254-08	Push-button
	K29-0255-08	Dial

Ref. No.	Parts No.	Description
	L37-0017-08	Coil A
	L37-0018-08	Coil B
	L37-0019-08	Coil C
	L37-0020-08	Coil D
	L37-0021-08	Coil E
	L37-0022-08	Coil F
	L37-0369-08	Coil G
		Battery 006P 9V
C12	CC45SL1H050K	Ceramic capacitor 5pF ±10%
C13	CK45D1H103M	Ceramic capacitor 0.01μF ±20%
R17	RD14BB2E513J	Carbon resistor 51KΩ ±5% 1/4W
	T18-0052-08	Earphone
	S32-2001-15	Slide switch
	X73-1350-00	AMP unit
	X84-1040-00	High frequency unit

AMP UNIT (X73-1350-00)

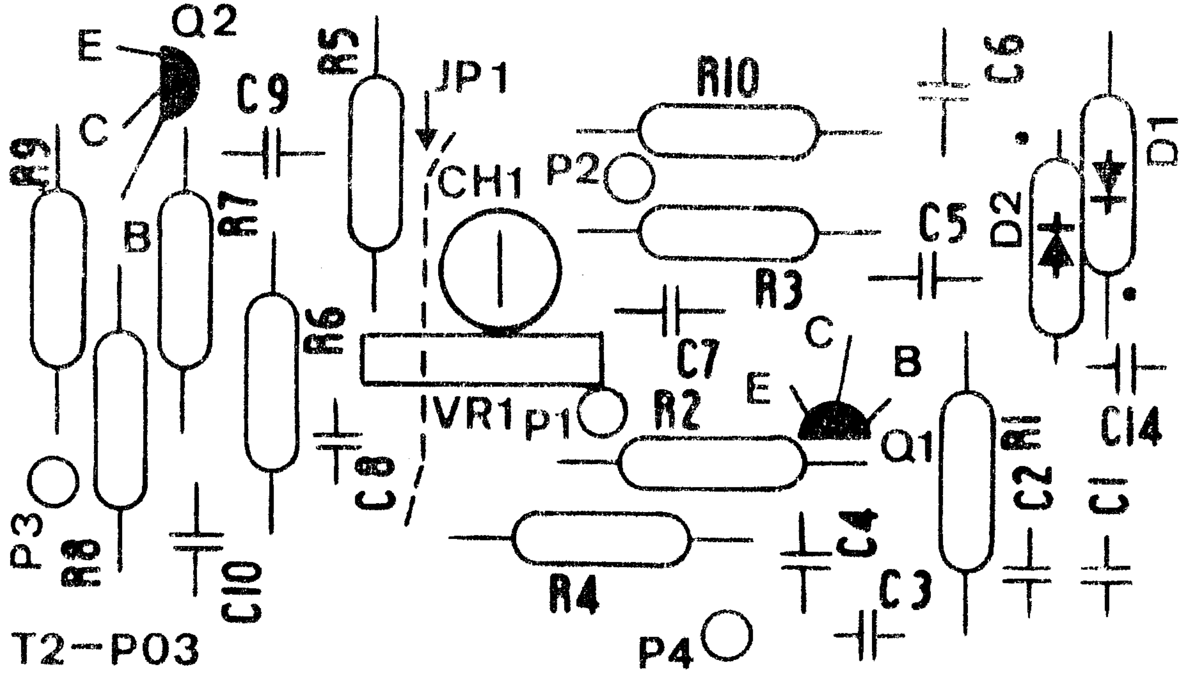
Ref. No.	Parts No.	Description			
		RESISTOR			
R11	RD14BB2E563J	Carbon	56KΩ	±5%	1/4W
R12	RD14BB2E124J	Carbon	120KΩ	±5%	1/4W
R13	RD14BB2E683J	Carbon	68KΩ	±5%	1/4W
R14	RD14BB2E472J	Carbon	4.7KΩ	±5%	1/4W
R15	RD14BB2E222J	Carbon	2.2KΩ	±5%	1/4W
R16	RD14BB2E561J	Carbon	560Ω	±5%	1/4W
VR2	R12-2506-08	Semi-fixed resistor 5KΩ			
VR3	R05-3002-08	Variable resistor (with SW) 10KΩB			
		CAPACITOR			
C11	CE04W1C100	Electrolytic		10μF	16WV
		SEMI-CONDUCTOR			
Q3		FET 2SK19 (GR)			
Q4		Transistor 2SA719			
D3		Zener diode RD-6, 2EB			

Ref. No.	Parts No.	Description
		MISCELLANEOUS
	K29-0256-08	Knob
	J25-2888-08	Printed circuit board

HIGH FREQUENCY UNIT (X84-1040-00)

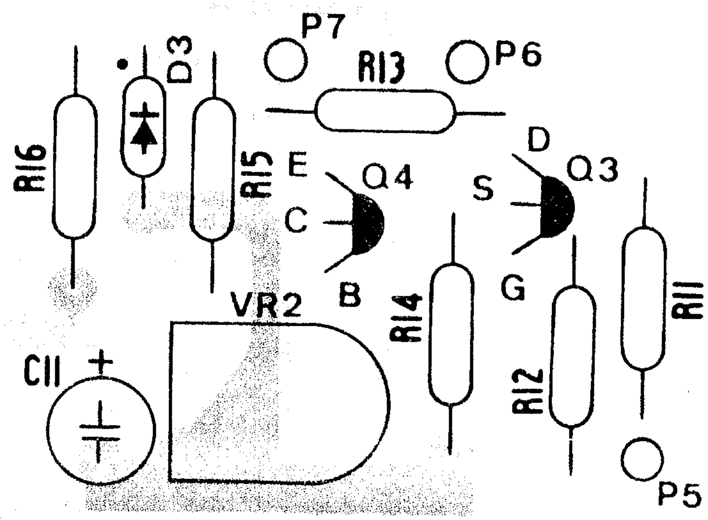
Ref. No.	Parts No.	Description
		RESISTOR
R1	RD14BB2E562J	Carbon 5.6KΩ ±5% 1/4W
R2	RD14BB2E124J	Carbon 120KΩ ±5% 1/4W
R3	RD14BB2E222J	Carbon 2.2KΩ ±5% 1/4W
R4	RD14BB2E471J	Carbon 470Ω ±5% 1/4W
R5	RD14BB2E103J	Carbon 10KΩ ±5% 1/4W
R6,7	RD14BB2E124J	Carbon 120KΩ ±5% 1/4W
R8	RD14BB2E103J	Carbon 10KΩ ±5% 1/4W
R9	RD14BB2E472J	Carbon 4.7KΩ ±5% 1/4W
R10	RD14BB2E221J	Carbon 220Ω ±5% 1/4W
VR1	R12-3511-08	Semi-fixed 10KΩB
		CAPACITOR
C1	CC45SL1H470J	Ceramic 47 pF ±5%
C2	CC45SL1H030J	Ceramic 3 pF ±5%
C3	CC45SL1H010C	Ceramic 1 pF 0.25pF
C4	CK45D1H103M	Ceramic 0.01μF ±20%
C5	CK45D1H102M	Ceramic 0.001μF ±20%
C6	CC45SL1H101J	Ceramic 100 pF ±5%
C7	CK4501H102M	Ceramic 0.001μF ±20%
C8~10	CQ92M1H472K	Mylar 4700 pF ±10%
C14	CC45SL1H050J	Ceramic 5 pF ±5%
		SEMI-CONDUCTOR
Q1		Transistor 2SC1215 (S)
Q2		Transistor 2SC945 (K)
D1,2		Diode 1SS16
		MISCELLANEOUS
	L33-0262-08	Feri-inductor 2mH
	J25-2887-08	Printed circuit board

HIGH FREQUENCY UNIT
(X84-1040-00)

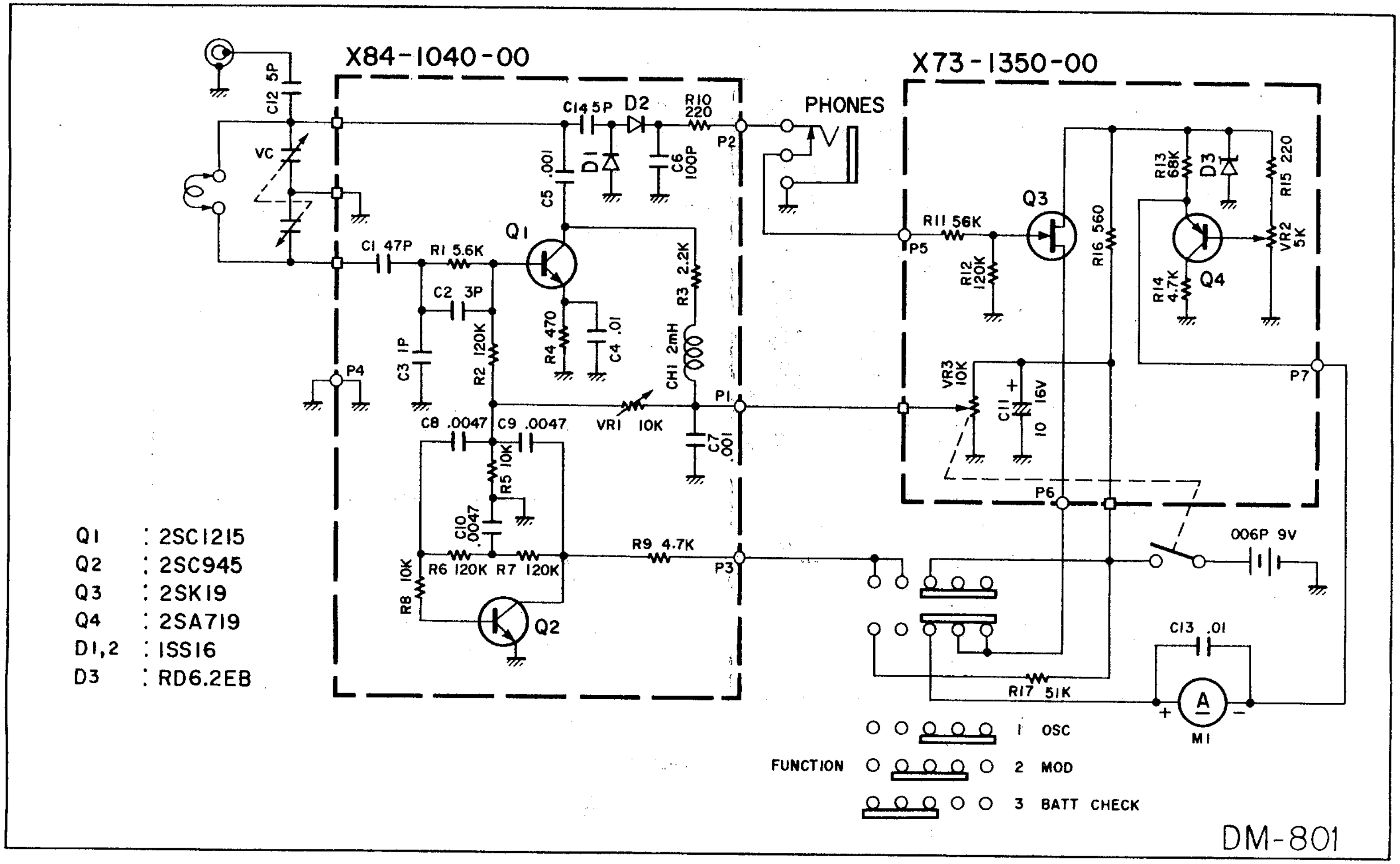


Q1 : 2SC1215
Q2 : 2SC945
D1, 2 : 1SS16

AMP UNIT
(X73-1350-00)



Q3 : 2SK19
Q4 : 2SK719
D3 : RD6, 2EB


X84-1040-00
X73-1350-00
PHONES
Q1 : 2SC1215
Q2 : 2SC945
Q3 : 2SK19
Q4 : 2SA719
D1,2 : 1SS16
D3 : RD6.2EB
C12 5P
VC
C1 47P
R1 5.6K
C2 3P
C3 1P
R2 120K
C14 5P
D2
D1
C5 .001
R10 220
C6 100P
Q1
R4 470
C4 .01
R3 2.2K
CH1 2mH
VR1 10K
C7 .001
C8 .0047
C9 .0047
R5 10K
C10 .0047
R6 120K
R7 120K
R8 10K
Q2
R9 4.7K
P1
P2
P3
P4
P5
P6
P7
R11 56K
R12 120K
Q3
R16 560
R13 68K
D3
R15 220
Q4
R14 4.7K
VR2 5K
VR3 10K
C11 10 16V
006P 9V
C13 .01
M1
R17 51K
FUNCTION
1 OSC
2 MOD
3 BATT CHECK
DM-801