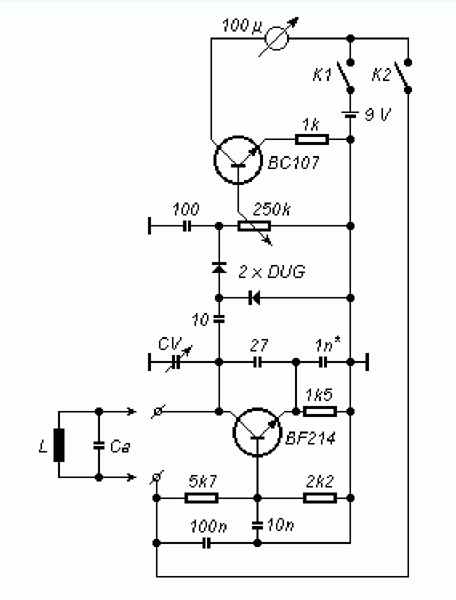
GRID DIP METER

Short description

A very useful instrument into the every respectable ham workshop is, without any doubts, the grid-dip-meter. This name came from the golden age of tubes, but today, in the era of semiconductors, that name became gate-dip-meter, dip-meter or simple, dipper.
Under various appearances, the GDM, in essence, is just a variable frequency oscillator tuned in a wide range using additional plug-in coils, connected to an electronic voltmeter. If the coil is coupled to a LC circuit, at resonance, this will suck the RF energy, and suddenly, the pointer of the voltmeter will come down **deep**.
When the oscillator is switch off, we'll have an absorbtion wavemeter for the high signal level circuits.
If the voltmeter is serial plugg-in with the headphones, then could be heared the AM signals (oscillator off) or the CW-SSB (oscillator on).
Nobody can speak about "the best" in this case. All GDM's are the same, in principle. Excepting the internal structure, users, function by their purposes, makes the differences.

Schematics

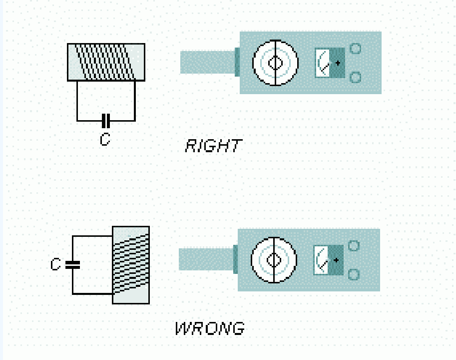
Using bipolar tranzistors



Here, the circuit is a Colpitts common base

Appliances

1. **Resonance measurements for LC circuits**
   That's the most common use of a GDM. Close de GDM coil to the testing circuit. Turn the scale until the FA-meter will show a **dip**. Read the value and then move away the dipper turning the scale close around until you'll have a low dip. Here is the right resonance frequency.



2. **Q factor measurements**
   Every operator had point out that a sharp dip answer to a high Q level.
   For those who want a numeric value:
   a. Having the FA-meter pointer at the end of the scale, close the dipper coil to the tested circuit. Note the resonance frequency as F1.
   b. Re-tune the dipper, at the same couple, to have a value of pointer by 70,7%. Note the new frequency as F2

$$Q = \frac{F_1}{2 \cdot (F_1 - F_2)}$$

3. **Absorbtion wave meter**
   The tuned L-Ca-CV group capture the RF energy that is straight by the 2 x DUG, then is show a high at the FA-meter.
   a. For low level signals, having the oscillator turned on, the pointer to minimum and using the headphones, close the coil to the oscillator. At detection, the pointer will show a little increase of it or in the headphones could be heard a signal.
   b. For high levels, at transmitters, turn off the oscilator, and close the dipper to it. At resonance, the FA-meter will show that.
4. **Field detector**
   An asbsorbtion wavemeter using a short wire (abt. 1 m) connected to the oscillant circuit.
5. **Signal generator**
   Switch on the dipper, tuned it on the choose frequency and place it to the room corner. Simple, isn't?
6. **Inductance and capacitors measurements**
   For this case must to have a known inductance or a capacitor (under 5% tolerance). Proceed as at the resonance measurements and use one of the below math formula:

$$f^2 = \frac{25330}{L \cdot C}$$

$$L = \frac{25330}{f^2 \cdot C}$$

$$C = \frac{25330}{f^2 \cdot L}$$

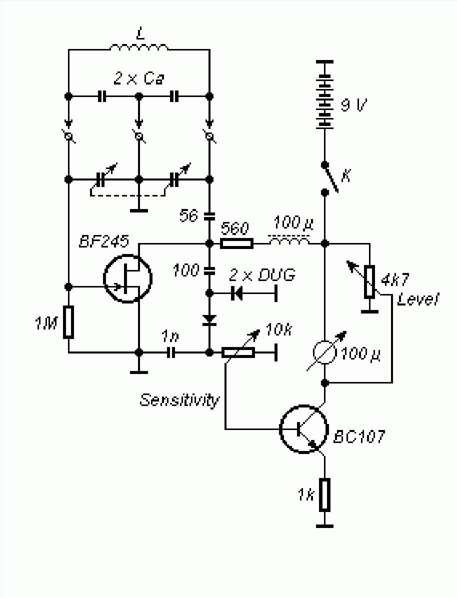
   For shielded coils, if the dipper has a external connector for RF, then connect it through a low capacitor (1 - 5 pF) to the tested

Hull Match

In spite of an apparently simplicity, to construct a dipper is a difficult work, that involving not only electrical and electronic knowledgements but a little mechanical skill, because, looking of all those appliances, this instrument claims solidity and stability to get preciseness results.
To rather avoid the hand-held effect, the dipper is matched in a metallic case. For homebrewers, alluminium sheet thick as 1.5 - 2 mm is reccommended. Succesfuly could be used and the printed board, the same thickness.
Hull dimensions: 120 x 60 x 40 mm
To me, the perfect solution for the socket of the plug-in coils is an audio DIN female one.
The coils with the additional capacitors are soldered on the male socket and, as much possibile, protected to avoid damages.
The variable capacitor is solid fasten into the case using screws and as much possible, Grower washers. The circuit board is also solid connected to the variable capacitor. Don't be stingy with those Grower's, you'll be assured to a solid contact. The jacks for supply and headphones are lateral placed.
On the lid are placed the scale, the FA-meter, buttons for the signal level and sensitivity, the on-off and the wavemeter-dipmeter switch.

oscillator. The range is from 3 to 30 MHz using three coils:
3.5-7 MHz: 32 tns, CuEm 0.3 mm, Ca=50 pF
7-18 MHz: 18 tns, CuEm 0.5 mm, Ca=30 pF
17-30 MHz: 7 tns, CuEm 0.8 mm, Ca=10 pF.
The coils support is PVC pipe, ?=12 mm.
The value of CV is 100 pF.
Through K1, switch on-off the general start and K2 turns off the oscillator, that be could use as absorbtion wave meter. Works and as X-tal tester replacing the plug-in coil.
This variant is very sensitive as dipper and as wave meter. Takes a few time to stabilize the frequency and generate a lot of harmonics, that could jam the home TV or radio.

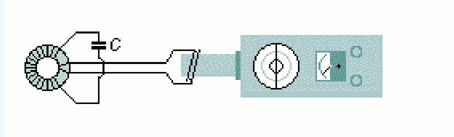
Using FET



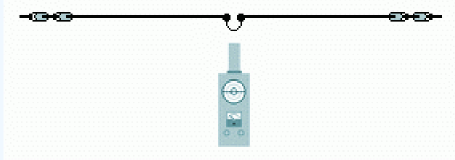
A wide range and high stability, owing to a Vackar-Tesla oscillator, that's the characteristics of this schematic.
I had whip up this scheme, a few years ago, from the former Galaţi County Radioclub and the document notes that could works from 200 kHz to 200 MHz, but without any dates about the coils. The original FET was 2N4416 but I replaced with BF245. The value for the variable capacitor is 2 x 100 pF and the RF choke is canibalized from an old TV-set, comb coil. The Ca are from 10 to 40 pF, function by range.
I use this dipper for a long time, through 1.4 to 28 MHz, using various homebrew coils, for differend ranges, helped by a frequency meter.

Using MOS-FET

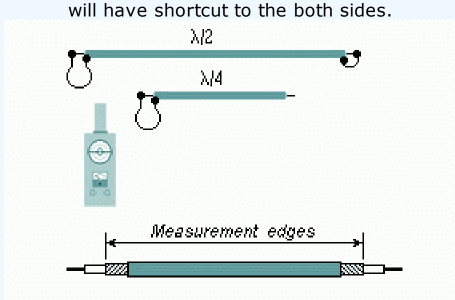
circuit.
For a toroidal coil use a link:



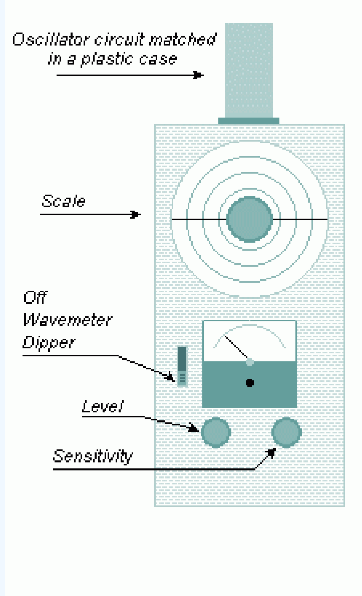
7. **Determination the resonance frequency of an antenna**
   An antenna is a resonant circuit isn't? So, must to find a way to couple the dipper to it.
   The correct way for this is to do this at the feed point of it using a turn, before to place it in the final position. Sometimes, to avoid the debase of results due to proximity is necessary to do this using a inductive link, even through the feeder. It is a solution, but the answer will include and the feeder dates, thus, in time, when the feeder parameters will be debase, all will be changed.



8. **Feeder measurements**
   To construct and tune an antenna, is necessary to know the wave length of the feeder. The physical length could be easy to determinate but the electrical length is something else because of the velocity factor.
   a. For a E/4 wavelength line, cut a little more than the calculated length (including the velocity factor). Shortcut it one of the extremities using a loop to link the dipper. Step by step, cut to adjust the line to the resonance. So you can have any odd multiple of E/4.
   b. For a E/2 wavelength line, proceed as the precedent, but now its necessary to shotcut and the other extremity. So you will have shortcut to the both sides.



9. **Velocity factor of feeders**
   To determine this parameter will need an impedance-meter or a Z-meter.
   Generally speaking, the impedance of coaxial feeder is 0.66. In case of an unknown or an urcertain one use this way. Take a piece at a known length and couple it at a Z-meter. Shortcut the opposite edge. The dipper will induce the RF through a coil by 2-3 turns. Close the couple that the pointer of Z-meter to touch



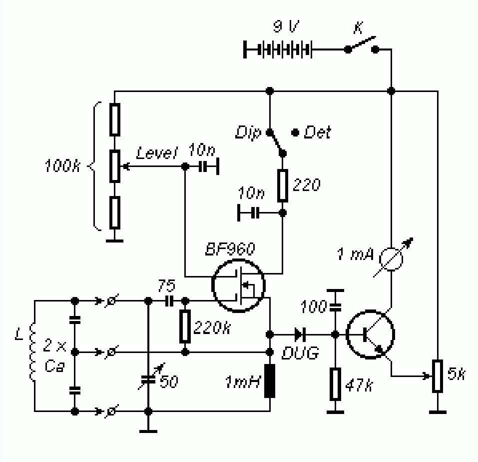
Calibration

To calibrate a dipper, isn't so easy! But, into the ham laboratory are some opportunities that should be counted:

1. Using a calibrate receiver, turning the scale, listen the frequencies, and note them on the dipper's scale; to avoid a wrong answer because of harmonics, determine the lower that.
2. Use another dipper, turned on as wavemeter, or as dipper, close the coils and...
3. Wire 2-3 turns over plug-in coil and link to a frequency counter. An unfailing method.

Links about dip-meter

- GATE DIP METER : a very useful tool for hams
by Talino Tribuzio, IZ7ATH
- Grid Dip Oscillator by Harry Lythal, SMOVPO
- Grid Dip Meter and Another GDO by John, G3PTO



That's the only MOS-FET schematic in my collection. I didn't use yet and I don't have not any data about the coils.

the end of the scale. Use the dipper to look a deep of Z-meter pointer. Note the frequency. Calculate the E/2. The velocity factor is :

$$v = \frac{\text{phisical length}}{\lambda/2}$$

10. **Neutralizer indicator**

    For a tubes power amplifier, a correct neutralization will exonerate by a lot of troubles. In this case, bring close the dipper to the anodic circuit (cut off the high-voltage) and tune the grid circuit to avoid a sharp dip.

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*Far away of that **"under construction"**, for this subject, more schematics will be placed soon here*

The list of appliances is far out of dead-beat. Every ham in his ingeniousness will find new utilizations for it.

YO4RLP 25 Jan 2003