DD-103
Universal Digital Dial

Instruction Manual

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GENERAL DESCRIPTION

The Model DD-103 Universal Digital Dial works with any receiver and most transmitters by counting only the VFO signal. All of the VFO and band information for many receivers and transmitters is pre-programmed into the display's memory. This allows the operating frequency to be displayed by counting only the VFO signal.

There is also a manual program mode that lets you program the dial for any receiver or transmitter (up to 32 bands) that is not pre-programmed. You can even use the 32 bands to manually program the unit for multiple receivers or transmitters. For example two 16 band, four 8 band, or any other combination totaling 32 or less can be programmed.

Each band can be individually calibrated to allow for crystals that have aged or any other error no matter where is comes from, to 10Hz accuracy. The calibration information is also stored in memory, so that any time you return to that band, the display is automatically calibrated. You only calibrate each band one time.

There is also a BAND “CTR” (COUNTER) that has no offset, that is available any time so the unit can double as a bench counter up to 40MHz.

The DD-103 has two operating controls, BAND and MODE/CAL, on the front panel, and a CALIBRATE button on the rear. Both BAND and MODE/CAL have dual functions as determined by the CALIBRATE button.

The BAND selector is a 3 position switch that is used to select any one of up to 32 bands by stepping up or down until the desired band is reached. The switch is returned to center when the desired band is reached.

The MODE/CAL control is a potentiometer that is used to select AM, CW, LSB or USB.

The CALIBRATE button will be discussed in later sections.

INSTALLATION

Power

Power for the DD-103 is from the receiver 6.3V filament supply. The power cord has a red and a black alligator clip on it. Clip the black one on the chassis. Clip the red alligator clip on the rear connection on the dial lamp. This will only work if one side of the lamp is grounded. **CAUTION, REVERSING THE CONNECTIONS WILL SHORT THE 6.3 VOLT SUPPLY AND COULD DAMAGE THE RECEIVER.** 12VDC can also be used.

Connecting To The VFO

If you have purchased an interface cable for your transceiver simply plug it into the external VFO connector on your radio, and skip to the OPERATION instructions. The cable picks up both signal and power. The the DD-103 is preprogrammed for your transceiver.

Included with the DD-103 is a tube shield and interface circuit assembly. It is used when connecting to high impedance VFO circuits. The interface assembly is not used on radios that have a VFO output jack. If the interface assembly will be used, switch D of S4 must be ON. The switches are ON when the button is pushed toward the front of the cabinet.

If your radio has a VFO output jack, simply connect the DD-103 using the cable supplied. Adjust the input level control, R8, (the black trimpot) for a stable count on the DD-103.

On some transceivers that have an external VFO connector, the VFO signal can be found on that connector. The Kenwood TS-520 is an example. A cable will need to be wired to make the connection.

Two methods for connecting to the VFO of tube receivers are described below. Method 1 is the best if it works over the desired frequency range. It is easy and does not pull the oscillator. Method 2 is also easy but it does pull the oscillator a little.

Method 1) Remove the tube shield from the oscillator tube or the oscillator buffer tube, and replace it with the shield and interface circuit assembly provided with the DD-103. Don't push it all the way down. It must not ground to the chassis. Clip the BLACK wire to ground. Next, plug one end of the gray cable into the interface circuit, and the other end into the VFO input jack. Be sure you don’t push the shield down and ground it to the chassis. The extra cable length is not important. Turn the level control to maximum and check if the display is counting over the desired range. If it is working over the desired range, this is the best method to use. The RED wire is not needed with this method and can be cut off.

Method 2) Remove the interface circuit from the tube shield. There is a loop of green wire on the interface circuit board. Cut the loop at the top. Now twist the green wires together one half turn to form a very small capacitor (called a gimmick). Clip the RED alligator clip to the stationary plates of the oscillator section of the bandspread tuning gang capacitor. It is usually the section nearest the front panel. Clip the BLACK one on the frame of the tuning gang. The RED wire can also connect to a high impedance oscillator output directly. Adjust the input level control to maximum, and check if the DD-103 is counting. If it is not counting or is not counting over the desired frequency range, twist the wires another half turn. Continue this procedure one half turn at a time until the DD-103 is counting over the desired range. Don't twist them more than necessary, it loads the oscillator more than necessary. Insulate the interface board after the final adjustment so it doesn't short to the chassis.

NOTE: When a connection is made to the oscillator it will have the effect of lowering, by a small amount, the maximum frequency that can be tuned on each band. It is a problem only if a frequency that you want is at the extreme high end of the band. The problem can be corrected by realigning the high frequency trimmer for that band with the DD-103 connected, or tuning the frequency on the low end of the next band.

Switch Options

There is a 4 position switch, S4, on the DD-103 main circuit board. They are labeled A, B, C, and D. The switches are ON when the button is pushed toward the front of the cabinet.

S4-A Switch ON to lock the dial in the AM mode. If you will not be programming the SSB or CW offsets this switch should be ON.

S4-B Resolution Select: OFF = 10Hz ON = 100Hz
For shortwave listening, 100Hz is recommended.

S4-C Not Used

S4-D Interface Circuit Power: Switch ON if you will be using the interface circuit.

PROGRAMMING

If your radio model is listed below, use the **Automatic Program Mode**.
The DD-103 is pre-programmed for the following receivers and transmitters

Frequency Counter
Zero offset, for use as test frequency counter up to 40MHz.
Allied
A2515 • A2517
Collins
32S-1 • 32S-2 • 32S-3 • 51J-1 • 51J-2 • 51J-3 • 51J-4 • 51S-1 • 75A-1 • 75A-2 • 75A3
75A-4 • 75S-1 • 75S-2 • 75S-3 • 75S-3A • 75S-3B • 75S-3C
(bands 13-28 are not programmed) See Note Below
KWS-1 • KWM-1 • KWM-2 • (bands 13,14 are not programmed.) See Note Below
R-388 • R-390 • R-390A • R-392
Davco
DR-30
Drake
R1-A • (band 6 not programmed.) See Note Below
R2-A • R2-B • (bands 6-12 are not programmed.) See Note Below
R2-C • (band 6 not programmed.) See Note Below
R-4 • R-4A • R-4B • (bands 6-15 are not programmed.) See Note Below
R-4C • (bands 6-20 are not programmed.) See Note Below
SPR-4 • (bands 11 thru 22 are programmed for ham bands • crystals must be added)
TR4
Galaxy
GT-550
Hallicrafters
HT-44 • S-20R • S-22R • S-38 • S-40 • S-41 • S-47 • S-51 • S-52 • S-53A • S-76 • S-85
S-107 • S-108 • S-118 • S-119 • S-120 • S-125 • S-129 • S-200 • S-210 • S-240
SR-150 • SR-160 • SR-400 • SR-400A • SR-500 • SR-750 • SR-2000 • SX-25 • SX-28
SX-42 • SX-43 • SX-62 • SX-96 • SX-99 • SX-100 • SX-110 • SX-111 • SX-115 • SX-117
Hammarlund
HQ-100 • HQ-105 • HQ-110 • HQ-120 • HQ-129 • HQ-140 • HQ-145 • HQ-150 • HQ-160
HQ-170 • HQ-180 • HQ-200 • HQ-215 • (bands 20-24 not programmed) See Note
SP-400 • SP-600
Heathkit
HW-100 • HW-101 • SB-100 • SB-101 • SB-102 • SB-300 • SB-301 • SB-303 •
SB-310 • SB-313 • SB-400 • SB-401 • HR-1680

Henry
Tempo-1
Kenwood
TS-520 • TS-511 • TS-900
ITT MacKay
3010B • 3010C
National
HRO-50 • HRO-60 • HRO-7 • NC-2-40 • NC-33 • NC-46 • NC-57 • NC-60 • NC-88
NC-98 • NC-105 • NC-109 • NC-125 • NC-140 • NC-155 • NC-173 • NC-183 • NC-188
NC-190 • NC-270 • NC-300 • NC-303 • NC-400 • NCX-1000 • NCX-500 • SW-54
SBE
SB-33
Squires-Sanders
SS-1BS • (band 12 not programmed) See Note Below
SS-1R • SS-1T(band 11 not programmed) See Note Below
Swan
260 • 270 • 270B • 300B • 350 • 350C • 400 • 500 • 500CX • 700CX • 700S • 750CW
Yaesu
FT-101 • FT-101B • FT-101E • Bands for the FT-101 are programmed in the same order as the YC-601 digital display.
FT-101Z • FRG-7 • FTDX400 • FRDX400 • FLDX400 • FTDX560
Note: FT-101 may not have the 160 meter band

Note Bands that are not programmed are auxiliary bands for which crystals were not supplied as standard. They can be manually programmed for whatever crystals you may have installed as follows:

Turn the power OFF, press and release the CALIBRATE button so that it remains pushed in, then turn power back ON, to enter programming mode. Rotate the MODE control left of center. The DD-103 will display the number of bands this radio has. You can reduce this number to blank out any unused bands using the BAND selector. Push and release the CALIBRATE button to exit the programming mode. Using the BAND selector, switch to an unused band. The offset will be zero. DD-103 displays zero if it is not connected to your VFO or your VFO frequency if it is connected. Go to the Manual Program Mode described below to program the band for the crystal you have installed.

Obviously we don't have all of these radios to test with. Auto-program data was taken from specifications for each radio. In the event of a problem with a model or particular band call, e-mail, or write us about it and we will supply an updated chip and correct the error for future production.

Automatic Program Mode (Use this procedure if your radio is **listed above**).
Make sure the **BAND** switch is in the center position.

To enter the program mode, with the power OFF, using a small screwdriver or other tool, press the **CALIBRATE** button on the rear panel. The button will remain pushed in. Now turn ON power.

Turn the **MODE** control fully **CW**. DD-103 displays a radio model**.**

Turn the **BAND** switch to the right to step through the available radio models.

When your model is displayed turn the **BAND** switch back to center. If you pass your model, turn the BAND switch to the left position to step backwards. Stop on your model. Now press and release the **CALIBRATE** button so that the button is in the out position. The unit will auto-program itself for your radio. Allow several seconds for it to complete programming before removing power.

The numbers displayed at this time are the required offsets for each band of the programmed radio.

This may be the only programming necessary. If your crystals are still reasonably accurate and your IF is properly aligned, the accuracy may be acceptable.

Calibrating each band for high accuracy will be discussed in the Calibrate Mode section.

Bands for which crystals were not supplied as standard, are not programmed. They can be manually programmed for whatever crystals you may have installed, using the Manual Program Mode**.**

Manual Program Mode (Use this procedure if your radio is not listed above).
Make sure the **BAND** switch is in the center position.

To enter the program mode, with the power OFF, press the **CALIBRATE** button on the rear panel. The button will remain pushed in. Now turn ON power.

Turn the **MODE** control fully **CCW**. DD-103 displays **BANDS = XX.** (**XX** is a number between 1 and 32)

Turn the **BAND** switch either to the right or left to step through the band numbers. When the number equals the number of bands your radio has, turn the **BAND** switch back to center, and press and release the **CALIBRATE** button.

NOTE If you are programming for a single conversion receiver, set the number of bands to one (1). If you are programming for a receiver that the first oscillator is the VFO, and on some bands the first IF frequency is different than on other bands, set the number of bands to two (2). Examples are the Hammarlund HQ180 and HQ145. You would then calibrate band 1 of the dial for radio bands that use the lower IF frequency, and band 2 for the other radio bands.

The required offset for this type of receiver is the IF frequency and is always forward tuning. Use the "Programming The Offsets" section below to program.

How To Determine The Required Offsets For Radios
That Use Different Crystals On Each Band

You first must determine your VFO frequency at it's high end. Your manual will tell you, or you can use the DD-103 to measure it. Use the "CRT" (COUNTER) band to measure it. Tune the receiver, on any band, to the receiver dial band edge frequency that displays the highest frequency on the DD-103. That is the VFO's high end frequency. It will be a round number like 4.0MHz, or 5.5MHz.

It is also necessary to determine the direction of the tuning. If the receive frequency increase as the VFO is increased, it is forward tuning. If the receive frequency decreases as the VFO is increased, it is reverse tuning. It may not be the same on all bands. If the bands are not all the same, some will be reversed on the receiver dial. Record the tuning direction for all bands using a right arrow **>** for forward and a left arrow **<** for reverse.

If a band is forward tuning, subtract the VFO High End from the High Band Edge. The result is the offset for that band. Example: High Band Edge is 14.5MHz, the VFO High End is 5.5MHz, the difference is 9MHz. The required offset for that band is 9.0MHz **>**.

If a band is reverse tuning, add the VFO High End to the Low Band Edge. The result is the offset for that band. Example: Low Band Edge is 7.0MHz, the VFO High End is 5.5MHz, the sum is 12.5MHz. The required offset for that band is 12.5MHz **<**.

These examples were taken from Drake TR4 data.

Programming The Offsets

Disconnect the input cable from the DD-103 and short the input jack if necessary to prevent any spurious readings.

Using the **BAND** selector, set the band to be programmed. Band numbers are on the far right of the display.

Push and release the **CALIBRATE** button to enter the program mode.

Rotate the **MODE** control to position the cursor under the digit to be changed. Start with the MHz position.

A **">"** indicates a forward tuning VFO (operating frequency increases as the VFO increases) and a **"<"** indicates a reverse tuning VFO (operating frequency decreases as the VFO increases).

Turn the **BAND** selector in the direction that causes the arrow to point the correct direction for that band. When the correct MHz is displayed return the **BAND** selector to center.

Using the above procedure, program all digits to display the correct frequency.

When the correct frequency is displayed turn the **BAND** switch back to center and push and release the **CALIBRATE** button. If you miss it by a little simply repeat the process.

Repeat this procedure for each band. When all bands are programmed, turn DD-103 off and back on. This takes it out of the program mode.

Calibrate Mode (Use this procedure if you are calibrating for accuracy)
The best procedure is to tune your radio to a known frequency near the center of each band. This can be supplied by the crystal calibrator built into your radio, or any other known frequency. Connect DD-103 to your VFO. Allow your radio to warm up to stabilize the VFO.

Turn **ON** power and set the MODE control fully CCW so the band number is displayed at the far right. **This is also the position for AM Mode**.

Turn the **BAND** selector (and your radio) to the band to **program or** calibrate. Tune to the known frequency.

In normal operation the function of the **MODE** control is to set the BFO offset for SSB and CW operation. If on each band you always use the same mode, you can set your radio to the mode you use on each band when doing this procedure. You should then always set the MODE control fully CCW (AM Mode), or lock the DD-103 in AM mode using S4-A. Doing this eliminates the need for the **USB, LSB And CW Offsets Calibration** procedure described below**.**

Set the mode switch on your radio to either AM or the mode you use on that band.
Press the **CALIBRATE** button. The button will remain in.

Rotate the **MODE** control to position the cursor under the digit to be changed.

A **">"** indicates a forward tuning VFO (operating frequency increases as the VFO increases) and a **"<"** indicates a reverse tuning VFO (operating frequency decreases as the VFO increases).

Move the **BAND** selector in the direction of the arrow to increase the number and opposite the arrow to decrease it.

Using the above procedure, program all digits to display the correct frequency.

When the correct frequency is displayed turn the **BAND** switch back to center and push and release the **CALIBRATE** button. If you miss it by a little simply repeat the process.

Repeat this procedure for each band. When all bands are calibrated, turn DD-103 off and back on. This takes it out of the program mode.

Calibrating The USB, LSB And CW Offsets

If you always use the same mode on any band, it is not necessary to program these offsets. For example if you always use LSB on 80 meters, and you always use USB on 20 meters, the individual band calibration cancels any error in the BFO crystals and this procedure is not necessary.

This procedure corrects for any errors in your SSB BFO crystals and sets the displayed frequency to the carrier frequency of the known signal. The resolution of the mode offset is 20 Hz so you should be able to get within 20 Hz of the known frequency.

Do this on only one band, the mode offset applies to all bands.

To calibrate the USB, LSB or CW offsets, turn the **MODE** control (and your radio) to the desired mode.

Zero beat to the known frequency.

Press and release the **CALIBRATE** button. It will remain pushed in.

The process is similar to calibrate/program procedure above except the cursor is forced under the 10Hz digit.

Turn the **BAND** switch in the direction of the arrow to increase or opposite the arrow to decrease the displayed frequency.

When the correct frequency is displayed, turn the **BAND** switch back to center the press and release the **CALIBRATE** button.

Repeat this for each of the three modes**.**

This all sounds a bit complex and it may take a while. You will quickly get used to the operation of DD-103. Remember, it only needs to be done once. The manual programming or calibration will be lost if you reprogram the unit for a different radio.

Remember, you cannot make a mistake that cannot be corrected.

OPERATION

The BAND switch has 3 positions. It is used by turning the switch to the right, or to the left, to step up or down, to the band you want. The DD-103 should display a reading close to the dial reading of your transceiver. When you reach the desired band, return the switch to the center position. To use the DD-103 as a test counter, simply select band CTR.

The MODE control is used to select AM (fully CCW), a band number will be displayed, CW, LSB, or USB. If you change modes you will need to select the correct mode on the DD-103.

If your transceiver crystals have aged you may want to calibrate the DD-103 for higher accuracy. To do this go to the CALIBRATE MODE instructions in this manual.