INTRODUCTION
This supplement is for use with all TP-38 Shared Repeater Tone Panels that utilize the TP-DCS Module. The TP-DCS Module is compatible with “Digital Private Line (DPL),” “Digital Channel Guard,” “Digital Call Guard,” etc. This manual supplement provides specifications, repeater interface hints, operation, and DCTCSS programming information. If the TP-DCS Module is installed in the field, please refer to the end of this supplement for the FIELD INSTALLATION PROCEDURE.

SPECIFICATIONS
Subscriber Capacity .......... 14 maximum
DCTCSS Code Range.......... 000-777 Octal
DCTCSS Encoding/Decoding .. by 23 bit Binary Coded Word transmitted at 134.4 Hz. data speed
DCTCSS Polarity .......... normal and inverted codes for encode and decode
Code Translations .......... any code to any code
Decode S/N Ratio .......... better than 4 Db. Sinad
Decode Time .......... 1 DCTCSS word length
Squelch Tail Elimination .. by 134.4 Hz. Turn-off-code
Decode Fade Time .......... 800 ms.

REPEATER INTERFACE
Careful attention must be observed during the installation of the TP-38 into a Digital CTCSS repeater system. Since the frequency spectrum of a Digital CTCSS signal may contain very low frequency components, special attention must be observed when interfacing the TP-38 to the receiver discriminator and the transmitter modulation circuitry in the repeater station. All capacitors in the DCTCSS signal path that connect to the TP-38 must be no less than 1.0 μF. This will preserve the low frequency response necessary to pass the DCTCSS signal to the TP-38 undistorted and unattenuated. Furthermore, only repeater transmitters that utilize a DIRECT FM MODULATOR circuit are compatible with DCTCSS transmissions. The use of a transmitter with a Phase Modulator circuit will not provide satisfactory performance and may have intermittent encode/decode problems. This is because the frequency response of a phase modulated transmitter attenuates low frequencies by 6 db per octave. This makes the conventional phase modulated transmitter unsuitable for passing the DCTCSS signals.

After the TP-38 installation is completed, if you find that the TP-38 works properly with CTCSS tones, but does not work properly with the Digital CTCSS codes, the following items should be checked:

1. Verify that the repeater transmitter has a DIRECT FM MODULATOR circuit.
2. Check the DCTCSS signal path from the TP-38 to the transmitter modulator circuit. Change all capacitors in the transmitter that are in series with the DCTCSS signal path to at least 1.0 μF.
3. Check the DCTCSS signal path from the repeater discriminator to the TP-38 and change all capacitors that are in series with the signal path to at least 1.0 μF.
4. Verify that all programmable parameters have been programmed properly.

OPERATION
User operation and field programming of a TP-38 that is equipped with the TP-DCS Module is identical to that of the “sub-audible tone” unit. Upon successful decoding of a validated DCTCSS signal, the TP-38 will display the three digit number that corresponds to that DCTCSS code. The TP-38 will automatically re-generate the proper DCTCSS code for encoding to the repeater transmitter.

PLEASE NOTE THAT THE CTCSS TONE FREQUENCY OF 67.0 Hz. IS NOT AVAILABLE FOR USE IN A TP-38 THAT IS EQUIPPED WITH THE TP-DCS MODULE. ALSO, THE TONE LOCK-OUT FEATURE IS FUNCTIONAL ONLY WITH CTCSS TONES.
PROGRAMMING DTCSS PARAMETERS

DTCSS code numbers are identified by a 3 digit octal number ranging from 000-777. This range of numbers identifies 512 possible codes. However, less than 100 of these DTCSS code numbers have been found to be usable. Many of these code numbers are duplicates, others contain a frequency spectrum too low to be practical and many of the code numbers contain an imbalance of ones and zeros that make them unusable. If you are selecting a new DTCSS code number for a new subscriber, be sure that the DTCSS code used is from the list below:

```
023  131  261  431  654  212*
025  132  263  432  662  225*
026  134  265  445  664  246*
031  143  271  464  703  252*
032  152  306  465  712  255*
043  155  311  466  723  266*
047  156  315  503  731  274*
051  162  331  506  732  325*
054  165  343  516  734  332*
065  172  346  532  743  356*
071  174  351  546  754  446*
072  205  364  565  036*  452*
073  223  365  606  053*  454*
074  226  371  612  122*  455*
114  243  411  624  145*  462*
115  244  412  627  523*
126  245  413  631  526*
125  251  423  632
```

*GE Codes

Individual DTCSS codes must be enabled in order to access the repeater system. In a similar manner, DTCSS subscribers may be disabled from using the repeater system. Time and Hit data is recorded in the TP-38 ONLY on DTCSS codes that are enabled. The TP-38 WILL NOT display the activity of DTCSS codes that are not enabled. Since all of the DTCSS codes are disabled when you first receive your TP-38, the TP-38 will not display any DTCSS codes until the DTCSS codes are enabled using Parameter 60#. DTCSS translations from one code to another is also available.

The following parameter numbers have been added to the TP-38 for use in shared repeater applications that utilize the TP-DCS Module:

<table>
<thead>
<tr>
<th>PARAMETER</th>
<th>FUNCTION</th>
<th>DEFAULT</th>
</tr>
</thead>
<tbody>
<tr>
<td>060</td>
<td>Enable DTCSS subscribers</td>
<td>all disabled</td>
</tr>
<tr>
<td>061</td>
<td>Disable DTCSS subscribers</td>
<td></td>
</tr>
<tr>
<td>063</td>
<td>DTCSS to DTCSS translations</td>
<td>none</td>
</tr>
<tr>
<td>064</td>
<td>Display enabled DTCSS codes</td>
<td></td>
</tr>
<tr>
<td>065</td>
<td>Display DTCSS time and hit data</td>
<td></td>
</tr>
<tr>
<td>066</td>
<td>Generate a DTCSS test signal</td>
<td></td>
</tr>
</tbody>
</table>

PARAMETER — 60#  ENABLE DTCSS SUBSCRIBER CODES

This parameter number "60#" will enable DTCSS codes for repeater subscribers. This parameter number also programs the data polarity of the encode and decode DTCSS signals that are programmed in the TP-38. Please note that the data polarity ("normal" or "inverted") of a DTCSS signal cannot be easily determined. Therefore, when enabling DTCSS subscribers, a trial and error approach must be used when programming the DTCSS encode and decode signal polarity into the TP-38. Start by using the "normal" DTCSS data polarity. The signal polarity can be individually programmed for all enabled encode and decode DTCSS codes.

To enable a new DTCSS subscriber, first enter the parameter number "60#" followed by the three digit DTCSS code that you want to enable. Follow the DTCSS code number by the "#" key. Now program the decode polarity of the DTCSS signal by entering the number "0" for a normal polarity decode signal, or "1," for an inverted polarity decode signal. Finally, program the encode data polarity by entering in "0" or "1" for a normal polarity or inverted polarity encode signal respectively. Follow this by the "#" key.

For example, to enable the DTCSS code "023" with a normal polarity decode signal, and inverted polarity encode signal, enter the following numbers:

```
60#  023#  01#
```

The repeater subscriber on DTCSS code "023," can now use the repeater. If the wrong programming information is entered at any time, the TP-38 will abort the programming operation, display an Error Code, and wait for a new parameter number to be entered. When DTCSS codes are enabled, any previous translations that have been programmed for that code are cancelled.

PARAMETER — 61#  DISABLE DTCSS SUBSCRIBER CODES

This parameter number "61#," will inhibit a previously enabled DTCSS repeater subscriber from using the repeater station. To deny a particular subscriber from using the repeater, enter in the parameter number "61#," followed by the DTCSS code that is to be disabled. Terminate the code number with the "#" key.

EXAMPLE:

```
61#  023#
```

The subscriber using DTCSS code "023," is now disabled. When the subscriber is disabled, the Time and Hit Accumulators, and Code Translations, are also cleared for that DTCSS code.

PARAMETER — 62#  DTCSS CODE TRANSLATIONS

This parameter tells the TP-38 to re-generate a different DTCSS code than the one currently being received on the input channel of the repeater. The code translation is programmed by first entering in the parameter number "62#," followed by the decoded DTCSS code received by the repeater receiver. Follow this by the "#" key. Then program the decode polarity by entering the number "0" for a normal polarity decode signal, or "1," for an inverted polarity decode signal. Now program the encode polarity for the translation code by entering in "0" or "1" for a normal polarity or inverted polarity encode signal respectively. Follow this by the "#" key. Now enter in the translation code that is to be encoded. Follow this by the "#" key. Notice that the TRANSLATION LED on the front panel of the TP-38 will illuminate in the REPEAT MODE if a DTCSS code translation is programmed for any particular DTCSS code number.

EXAMPLE:

```
62#  023#  00#  123#
```

This instruction will tell the TP-38 to regenerate the code "123" when the code number "023" is decoded. Both the encode signal, and the decode signal are programmed for normal data polarity. To cancel a code translation, use the Parameter Code "61#" to disable and clear the programming data, or use the Parameter Code "60#" to re-enable the DTCSS code without a code translation if desired.
FIELD INSTALLATION PROCEDURE

1. Remove power from the TP-38 and disconnect the interface wires from rear terminal block.

2. Remove the TP-38 from the repeater installation.

3. Remove the top cover from the TP-38 by removing the 8 screws from around the top lid.

4. While grounded to the TP-38 through a 1.0 Megohm resistor, remove the integrated circuits, U10, U11 and U12 from the TP-38 main PCB. Place these components on a piece of conductive foam.

5. Open the conductive bag which contains the TP-DCS Module and the new program memory chip.

6. Install the new 28 pin memory chip into the U12 socket on the TP-38 main PCB. Be sure that pin 1 is oriented properly.

7. Check to see if an IC socket is installed in J2 on the TP-38 main PCB. If this socket is installed, then skip to the next instruction. Otherwise, remove the front panel of the TP-38 by removing the two hex nuts on each side of the front panel. Remove the main PCB from the TP-38 enclosure by removing the four machine screws that support the circuit board, and the screw that holds the regulator IC, VR-2, to the rear panel. Using the 28 pin IC socket supplied with the TP-DCS Module, solder this socket into J2 on the TP-38 main PCB. Be sure to remove the flux residue from the TP-38 circuit board. Now replace and secure the main PCB back into the TP-38 enclosure.

8. Install the front panel using the four hex nuts previously removed. When installing the front panel, be sure that the connector, J1, on the Display PCB fits into the connector, J1 on the main PCB.

9. Now insert the ribbon cable connector on the TP-DCS Module into the socket, J2, on the TP-38 main PCB. Note the proper orientation of pin 1 on J2, and on the ribbon cable plug. Lay the TP-DCS Module board over the four metal stand-offs inside the enclosure. Using the 4 hex head machine screws supplied, secure the TP-DCS Module inside the TP-38 enclosure.

10. Replace the cover on the TP-38 and re-connect the TP-38 to the repeater station.

11. Apply power to the repeater station. All programmable parameters have now been reverted back to those shown at the beginning of the PROGRAMMING SECTION. Now proceed to re-program all CTCSS parameters for your repeater system. Then proceed to program the TP-38 for the DCTCSS parameters as per the instructions in this supplement.

12. After the programming sequence is completed, the TP-38 will be ready for repeater operation.
## PARTS LIST

**MODEL TP-DCS DIGITAL CTCSS MODULE**

**COMPONENTS PARTS LIST REVISION 3-14-86**

<table>
<thead>
<tr>
<th>DESIG.</th>
<th>PART #</th>
<th>DESCRIPTION</th>
<th>VENDOR</th>
<th>PART #</th>
<th>QTY</th>
<th>PRICE</th>
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<tbody>
<tr>
<td>U2</td>
<td>51-4374</td>
<td>OCTAL D-FLIP/FLOP</td>
<td>MOT</td>
<td>MC74HC1374N</td>
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<td>U3</td>
<td>51-6116</td>
<td>2K x 8 CMOS RAM</td>
<td>HITACHI</td>
<td>HM616P-4</td>
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<td>U5</td>
<td>51-7403</td>
<td>QUAD NAND GATE-OPEN DRAIN TRIGGER</td>
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<td>51-7414</td>
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<td>C1,C4</td>
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<td>10 UF RADIAL ELEC. 50V</td>
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<td>22 UF MONO. CAP 50V</td>
<td>CENTRALAB</td>
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<td>84-3810</td>
<td>PRINTED CIRCUIT BOARD</td>
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<tr>
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<td>P2</td>
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<td>30-7012</td>
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<td>J&amp;M</td>
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<td>68-3840</td>
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<td>MBM27C64-30</td>
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<td>25.00 ea.</td>
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**Needed for TP-38 Modification**

| U12    | 51-2764C2 | 8K x 8 EPROM | FUJITSU | MBM27C64-30 | 1 | 25.00 ea. |
| U2*    | 09-8528   | 28 PIN IC SOCKET | WELCON | 802-7281642 | 1 | .38 ea. |

*May be installed in TP-38 if purchased after 3-1-86.*

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**WARRANTY**

The TP-DCS is warranted to be free from defects for a period of one (1) year from the date of purchase. Just return the unit to the factory and we will repair or replace it (at our option) at no charge.