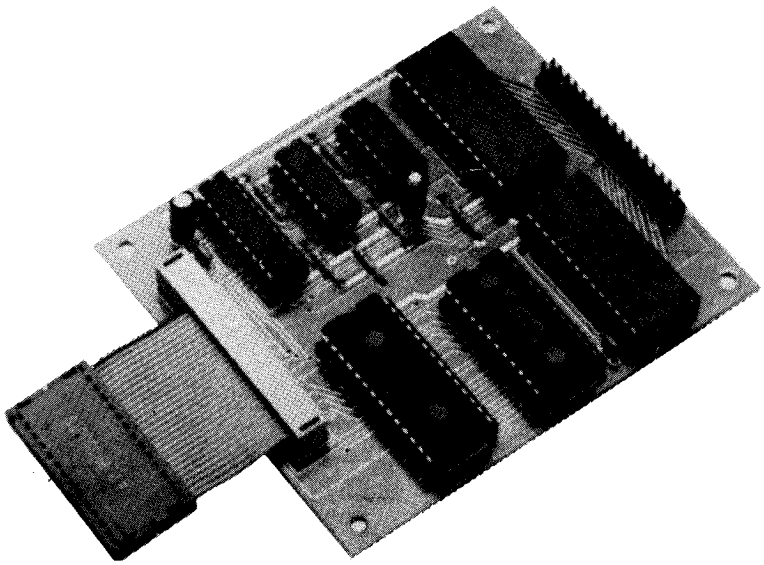
COMMUNICATIONS SPECIALISTS MODEL TP-DCS MANUAL SUPPLEMENT



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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 DCTCSS PARAMETERS

DCTCSS 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 DCTCSS 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 DCTCSS code number for a new subscriber, be sure that the DCTCSS 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*
116	245	413	631		526*
125	251	423	632		

*GE Codes

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

PARAMETER	FUNCTION	DEFAULT
60	Enable DCTCSS subscribers	all disabled
61	Disable DCTCSS subscribers	
62	DCTCSS to DCTCSS translations	none
63	Display enabled DCTCSS codes	
64	Display DCTCSS time and hit data	
65	Generate a DCTCSS test signal	

PARAMETER — 60# ENABLE DCTCSS SUBSCRIBER CODES

This parameter number "60#," will enable DCTCSS codes for repeater subscribers. This parameter number also programs the data polarity of the encode and decode DCTCSS signals that are programmed in the TP-38. Please note that the data polarity ("normal" or "inverted") of a DCTCSS signal cannot

be easily determined. Therefore, when enabling DCTCSS subscribers, a trial and error approach must be used when programming the DCTCSS encode and decode signal polarity into the TP-38. Start by using the "normal" DCTCSS data polarity. The signal polarity can be individually programmed for all enabled encode and decode DCTCSS codes.

To enable a new DCTCSS subscriber, first enter the parameter number "60#" followed by the three digit DCTCSS code that you want to enable. Follow the DCTCSS code number by the "#" key. Now program the decode polarity of the DCTCSS 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 DCTCSS code "023" with a normal polarity decode signal, and inverted polarity encode signal, enter the following numbers:

60# 023# 01#

The repeater subscriber on DCTCSS 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 DCTCSS codes are enabled, any previous translations that have been programmed for that code are cancelled.

PARAMETER — 61# DISABLE DCTCSS SUBSCRIBER CODES

This parameter number "61#," will inhibit a previously enabled DCTCSS 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 DCTCSS code that is to be disabled. Terminate the code number with the "#" key.

EXAMPLE: 61# 023#

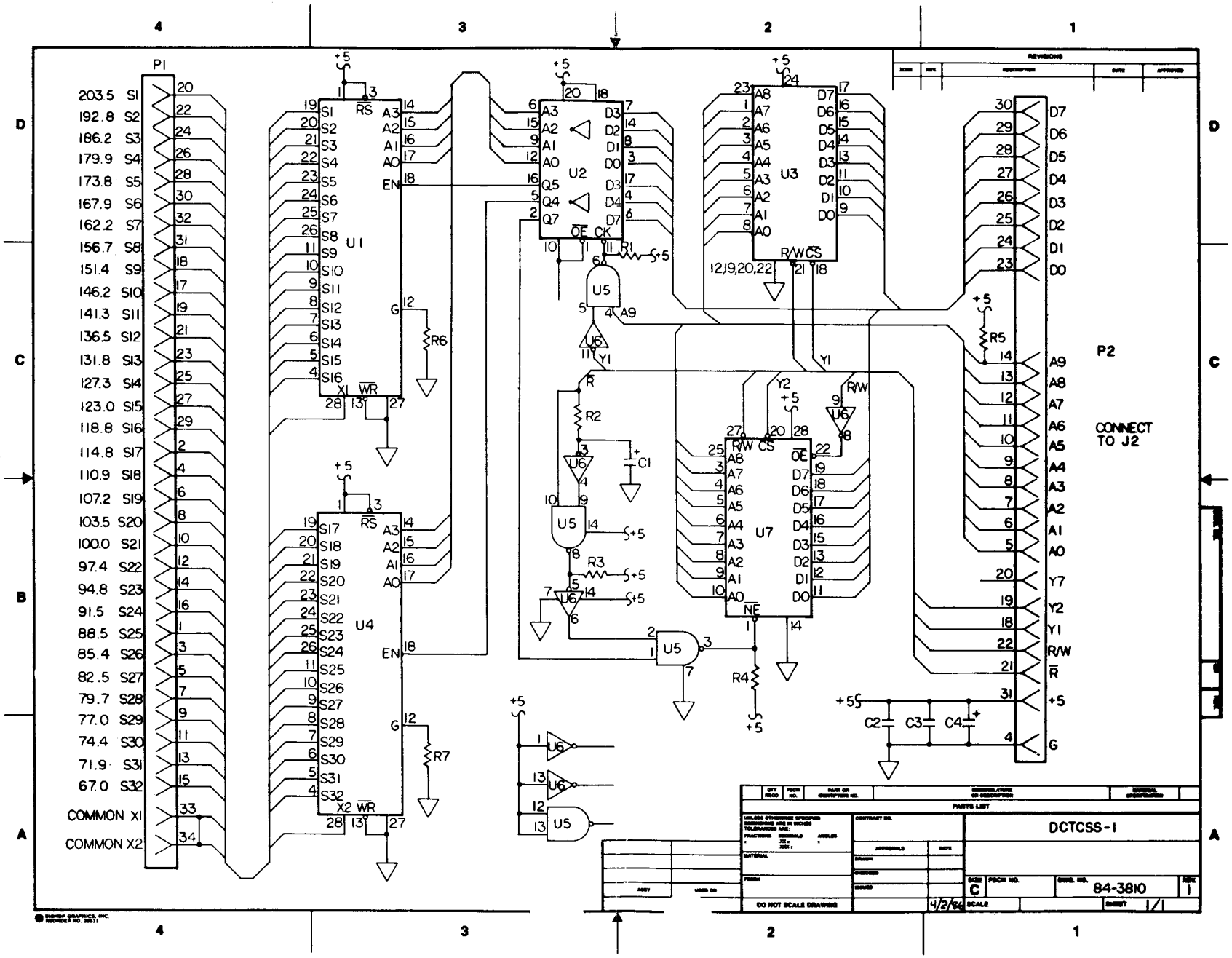
The subscriber using DCTCSS code "023," is now disabled. When the subscriber is disabled, the Time and Hit Accumulators, and Code Translations, are also cleared for that DCTCSS code.

PARAMETER — 62# DCTCSS CODE TRANSLATIONS

This parameter tells the TP-38 to re-generate a different DCTCSS 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 DCTCSS 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 DCTCSS code translation is programmed for any particular DCTCSS 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 DCTCSS code without a code translation if desired.



TP-DCS SCHEMATIC DIAGRAM

PARAMETER — 63# DISPLAY ENABLED DCTCSS SUBSCRIBERS

This parameter will display all of the DCTCSS subscriber codes that will activate the TP-38. To display the codes that are currently enabled, enter in the parameter code "63# " and the TP-38 will display all enabled codes. If this is done by DTMF signaling, the data will be sent on the output channel of the repeater using DTMF to the DI-16 DATA INTERROGATOR.

PARAMETER — 64# RECALLING TIME AND HIT DATA FOR DCTCSS CODES

This parameter will recall the time and hit counter data for any validated DCTCSS codes programmed in the TP-38. The non-volatile memory chips record the data and display it on the 4 digit display. To recall time and hit data, enter in the parameter number "64# " followed by the DCTCSS code number that you want to observe.

EXAMPLE: 64# 123#

The TP-38 will now display the total accumulated time for DCTCSS code number "123," in hours and minutes and then the total accumulated number of hits for that code. Please note that the decimal point separates the hours from the minutes.

EXAMPLE, DISPLAY
READS: 03.21 ---- 4051

This example shows that 3 hours and 21 minutes and 4051 hits have accumulated for the DCTCSS code 123. If this parameter is entered by DTMF signaling, then the TP-38 will display and send the data for the time and hit counters down the repeater output channel, using DTMF signaling. This data will then be displayed and printed on the DI-16 DATA INTERROGATOR, or a DTMF display decoder.

PARAMETER — 65# GENERATE A DCTCSS TEST SIGNAL

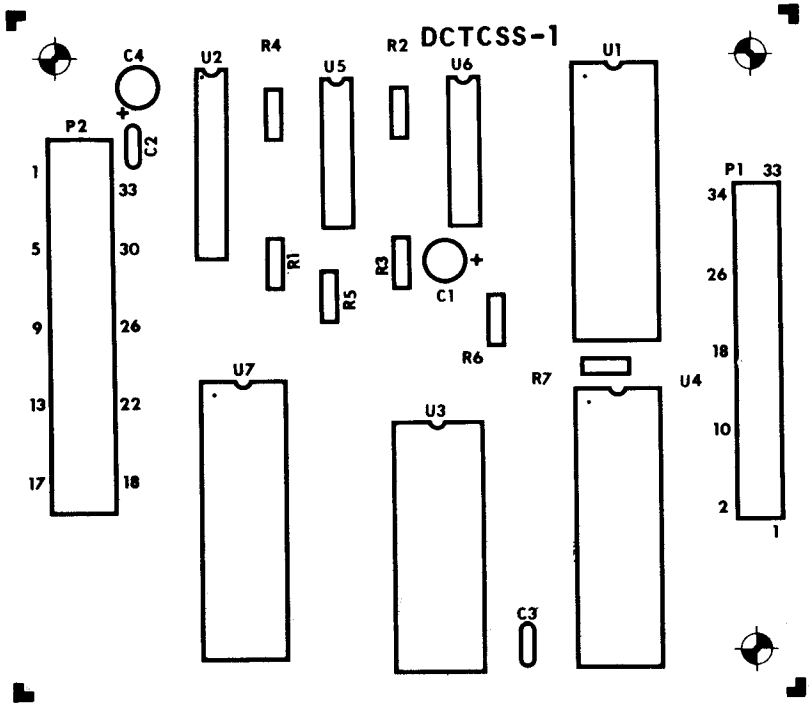
This parameter is used for setting the deviation level of the DCTCSS transmissions. Use this parameter number in conjunction with the other parameter numbers used for level adjustments in the INSTALLATION SECTION of the TP-38 manual. Enter in this parameter number "65# " and the TP-38 will encode a low frequency square wave for deviation adjustment. Now adjust the output pot, R19, for a DCTCSS transmit deviation of .75 Khz. to 1.0 Khz. maximum.

When setting the transmitter DCTCSS deviation level, be sure to use a service monitor that has a deviation scope for level setting. This will allow you to observe the digital waveform that is transmitted. A service monitor with only a deviation meter may not give the proper readings due to the frequency spectrum used in DCTCSS signaling. The waveform generated by the TP-38 should look very much like a square wave with the corners rounded off and a small amount of overshoot. If the signal is distorted, then verify that the interface is correct into the transmitter.

If CTCSS subscribers are enabled in the TP-38, the parameter number "34#" should be used to verify that the DCTCSS deviation is very close to that of the CTCSS deviation.

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. 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.
8. 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.
9. Replace the cover on the TP-38 and re-connect the TP-38 to the repeater station.
10. 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.
11. After the programming sequence is completed, the TP-38 will be ready for repeater operation.



TP-DCS
BOARD LAYOUT

PARTS LIST

MODEL TP-DCS DIGITAL CTCSS MODULE
COMPONENTS PARTS LIST REVISION 3-14-86

DESIG.	CSI PART #	DESCRIPTION	VENDOR	PART #	QTY	PRICE
U2	51-4374	OCTAL D FLIP/FLOP	MOT	MC74HCT374N	1	1.80 ea.
U3	51-6116	2K x 8 CMOS RAM	HITACHI	HM6116P-4	1	4.50 ea.
U5	51-7403	QUAD NAND GATE-OPEN DRAIN	MOT	MC74HC03N	1	.45 ea.
U6	51-7414	HEX SCHMITT TRIGGER	MOT	MC74HC14N	1	2.49 ea.
U7	51-2004	512 x 8 NOVRAM	XICOR	X2004P	1	47.70 ea.
C1,C4	23-1001	10 UF RADIAL ELEC. 50V	PACCOM	EV10M50AA	2	.15 ea.
C2,C3	21-2240	.22 UF MONO. CAP Z5U	CENTRALAB	CZ20C224M	2	.23 ea.
R1,R3,R4, R5	06-4724	4.7K OHM 1/4 WT. CAR. FILM 5%			4	.10 ea.
R2	06-1534	15K OHM 1/4 WT. CAR. FILM 5%			1	.10 ea.
	09-8514	14 PIN IC SOCKET	WELCON	802-0141642	2	.20 ea.
	09-8520	20 PIN IC SOCKET	WELCON	802-0201642	1	.30 ea.
	09-8524	24 PIN IC SOCKET	WELCON	802-7241642	1	.33 ea.
	09-8528	28 PIN IC SOCKET	WELCON	802-7281642	1	.38 ea.
	84-3810	PRINTED CIRCUIT BOARD		84-3810-1	1	10.89 ea.
	03-1002	4-40 1/4" PHIL. P.H. MACHINE SCREW			4	.05 ea.
P2	09-8711	34 PIN TRANSITION	T&B	609-3453	1	5.04 ea.
	09-8710	28 PIN DIP PLUG	AMP	746616-2	1	6.30 ea.
	30-7012	28 COND. CABLE	3M	3365-50	2"	3.00/ft.
	68-3840	TP-DCS MANUAL				3.00 ea.
Needed for TP-38 Modification						
U12	51-2764C2	8K x 8 EPROM	FUJITSU	MBM27C64-30	1	25.00 ea.
J2*	09-8528	28 PIN IC SOCKET	WELCON	802-7281642	1	.38 ea.

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

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.