T800-07 Multichannel Memory PCB

15 July 1999

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This TN replaces TI-356D. Any part that has changed from the previous issue is indicated by a vertical line in the outer margin of the page. If you have any questions about this TN or the procedures it describes, please contact your nearest Tait Dealer or Customer Service Organisation. If necessary, you can get additional technical help from Customer Support, Radio Systems Division, Tait Electronics Ltd, Christchurch, New Zealand.

Introduction

The T800-07 is a plug-in multichannel memory PCB which allows remote addressing of up to 128 channels. It is intended as a substitute for the standard T800-10 memory PCB supplied with all T800 series receivers and transmitters.

Addressing can be accomplished remotely via such means as BCD thumbwheel switches[1], external data latches, etc, or locally via the on-board DIP switch. No specialised external interface circuitry is necessary. The facility to program the CTCSS tones of the T800-02 CTCSS dencoder is provided, with CTCSS frequencies being stored alongside the channel information within the EPROM.

The T800-01 software must be used to program the EPROM via an IBM[2] or compatible PC and suitable EPROM programmer.

Note: The current software is entitled PGM800. The earlier (and obsolete) BASE-PROG will still program channel frequencies but lacks the CTCSS facility.

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1. Use of BCD thumbwheel switches limits remote addressing to 80 channels. This limitation is outlined in "Addressing via BCD Thumbwheel Switches".

2. IBM is a registered trademark of International Business Machines.

Parts Required

The T800-07 kit will contain the following items:

> T800-07 PCB
> T800-03 D-range parts
> connecting cable

The T800-02 CTCSS PCB may also be required, depending on the application.

Note: T800-07 kits produced before April 1991 will not contain the T800-03 D-range parts. These can be ordered separately as a T800-03 D-range kit.

Method

⚠ *Caution:* **This equipment contains CMOS devices which are susceptible to damage from static charges. Care when handling these devices is essential. Refer to the manufacturers' data books for correct handling procedures.**

Note: If fitting a T800-07 multichannel PCB to a T800 Series I module already fitted with a T800-02 CTCSS PCB, remove C19 from the T800 PCB.

A. Remote Addressing Of 8 Or Fewer Channels - No CTCSS

The following components are required:

> T800-07 multichannel memory kit
> 7/0.2mm tinned copper PVC insulated wire

1. Unplug the standard T800-10 memory PCB and fit the T800-07 PCB in its place.

2. Remove the cover plate from the secondary D-range hole at the rear of the chassis and fit the T800-03 D-range and PCB with the 2 locating pins and nuts supplied.

3. Solder 4 lengths of wire between the T800-03 D-range PCB and the main PCB as follows:

T800-03 PCB	Main PCB
pin 11	CHSEL2
pin 12	CHSEL1
pin 13	CHSEL0
pin 15	GND

Note: The T800-03 pin designations are discretionary.

4. Using PGM800, program the EPROM for up to 8 channels; the channel numbers

should correspond to the table below:

Version	Channel Numbers
PGM800 V2.0	0-7
PGM800 V2.01	1-8
PGM800 V2.21	0-7 or 1-8
PGM800Win V1.0	0-7 or 1-8
PGM800Win V2.0	0-7 or 1-8

The DIP switch is not used and the 3 least significant bits (SW1:1-3) should be in the **off** position. The next 4 bits (4-7) should be **on**, while the most significant bit (8) is selected according to the EPROM used:

        ON = 27C16
        OFF = 27C64

Note: It is possible to address blocks of up to 8 channels throughout the 128 channel EPROM capacity by switching bits 4 to 7 on the DIP switch; e.g. switching bit 4 off would access channels as follows:

Version	Channel Numbers
PGM800 V2.0	8-15
PGM800 V2.01	9-16
PGM800 V2.21	8-15 or 9-16
PGM800Win V1.0	0-7 or 1-8
PGM800Win V2.0	0-7 or 1-8

5.   The T800 unit may now be run up and up to 8 channels addressed by applying a 3-bit binary code to pins 11, 12 and 13 of the secondary D-range connector (pin 13 is the LSB and pin 15 is ground). Check each channel to ensure that the unit is programmed to the correct frequency.

B.   Remote Addressing Of 8 Or Fewer Channels - With CTCSS

The following components are required:

        T800-02 CTCSS kit
        T800-07 multichannel memory kit
        7/0.2mm tinned copper PVC insulated wire

1.   Remove the cover plate from the secondary D-range hole at the rear of the chassis. If there are no access slots between the synthesiser and D-range compartments, drill a 5mm hole through the end wall of the synthesiser compartment; this wall can be reached by passing the drill through the now-uncovered D-range hole.

2.   Fit the T800-03 D-range and PCB with the 2 locating pins and nuts supplied.

3.   Fit the T800-02 PCB to the audio processor according to its instruction leaflet. Ensure that all T800-02 DIP switch bits are in the **off** position. Plug the loom onto the T800-02 PCB and route the wires via the loom channel cast into the chassis to the D-range compartment, and from there through the access slot or drilled hole into the synthesiser compartment.

4.   Solder the T800-02 loom wires to PL3 on the T800-07 PCB as follows:

PL3 Pin No.	T800-02 Wire
1	brown
2	red
3	orange
4	yellow
5	green
6	blue
7	violet
8	grey
9	white
10	black

5.   Unplug the standard T800-10 memory PCB and fit the T800-07 PCB in its place.

6.   Carry out instructions 3, 4 and 5 from section A of this TN. When programming the EPROM, PGM800 will allow you to program a CTCSS tone for each channel. Check each channel to ensure that the unit is programmed to the correct frequency with the appropriate CTCSS tone.

Note: Channels may be programmed without CTCSS tone if PGM800 V2.01 (or later) software is used.

C.   Remote Addressing Of Up To 128 Channels - With CTCSS

The following components are required:

    T800-02 CTCSS kit
    T800-07 multichannel memory kit
    7/0.2mm tinned copper PVC insulated wire

1.   Carry out instructions 1 to 5 from section B of this TN. If the chassis does not already have access slots, drill **two** 5mm holes side-by-side in the wall of the synthesiser compartment.

2.   Plug the T800-07 loom onto PL2 (T800-07 PCB) with the brown wire to pin 1. Feed the other end of the loom through the second access slot or 5mm hole in the synthesiser wall so that the wires will reach the T800-03 D-range connector.

3.   Solder a wire between pin 15 of the T800-03 connector and the GND pad on the main PCB.

4.   Solder the T800-07 wires to the T800-03 PCB pads as follows:

T800-03 Pad	T800-07 Wire	Function
1	brown	address bit 1
2	red	address bit 2
3	orange	address bit 3
4	yellow	address bit 4
5	green	address bit 5
6	blue	address bit 6
7	violet	address bit 7
8	grey	not used
12	white	TX ENABLE or TX KEY

5.   Program the EPROM for up to 128 channels with CTCSS tones as required.

6.   Fit the EPROM to the T800-07 and set all DIP switch bits on the T800-02 and bits 1 to 7 on the T800-07 to the *off* position. Set bit 8 (MSB) on the T800-07 PCB according to the EPROM used:

      ON = 27C16
      OFF = 27C64

7.   The T800 unit may now be run up, with up to 128 channels addressable by applying a 7-bit binary code to pins 1 to 7 (pin 1 LSB) of the T800-03 D-range connector. Check each channel to ensure that the unit is programmed to the correct frequency with the appropriate CTCSS tone.

Note: Channels may be programmed without CTCSS tone if PGM800 V2.01 (or later) software is used.

D.   Remote Addressing Of Up To 128 Channels - No CTCSS

The following components are required:

    T800-07 multichannel memory kit
    7/0.2mm tinned copper PVC insulated wire

1.   Carry out instructions 1 & 2 from section B of this TN to fit the T800-03 connector.

2.   Unplug the standard T800-10 memory PCB and fit the T800-07 PCB in its place.

3.   Carry out instructions 2, 3 & 4 from Section C of this TN.

4.   Program the EPROM for up to 128 channels.

5.   Fit the EPROM to the T800-07 and set DIP switch bits 1 to 7 to the **off** position. Set bit 8 (MSB) according to the EPROM used:

     ON = 27C16
     OFF = 27C64

6.   The T800 unit may now be run up, with up to 128 channels addressable by applying a 7-bit binary code to pins 1 to 7 (pin 1 LSB) of the T800-03 D-range connector. Check each channel to ensure that the unit is programmed to the correct frequency.

E.   Debounce Gate

Half of IC4 is used to debounce any change of state that occurs at the channel address inputs by introducing a 56ms delay. This means that the total time taken for any change in frequency is determined by this delay (56ms) and the T800 synthesiser lock-up time (25ms).

If the channel addressing is by some method without contact bounce (e.g. data latch rather than thumbwheel switch), this 56ms delay can be eliminated by shorting 2 link pads together with a solder blob. This link is situated between IC4 and PL3 on the top side of the T800-07 PCB and is marked 'LINK'.

F.   Transmit Interlock

A change of channel while the unit is transmitting can be prevented by connecting pin 9 of PL2 to the TX KEY or TX ENABLE signal of the transmitter. TX ENABLE must be used if the method of keying the transmitter includes signals other than TX KEY, e.g. OPTO KEY, carrier switch or microphone PTT. This will prevent any channel changes until the transmitter reverts to the standby mode.

Set up the transmit interlock as follows:

1.   Fit the T800-03 D-range and PCB as per instructions 1 and 2 from section B of this TN.

2.   Fit the T800-07 loom as per instructions 2, 3 and 4 from section C of this TN.

3.   Make the following connections on the D-range sockets in the T800 rack guide:

     if TX ENABLE is used: connect pin 12 of the secondary D-range to pin 5 of the primary D-range

     if TX KEY is used: connect pin 12 of the secondary D-range to pin 13 of the primary D-range

Programming

Refer to the T800-01 User's Manual for programming details.

Testing

For details, refer to the appropriate Service Manual. Servicing information for the T800-02 CTCSS kit is contained in TI-346C.

Circuit Operation

Refer to Circuit Diagram IPN 220-01196-02.

In the T800-07 addressing can be accomplished remotely via such means as BCD thumbwheel switches, external data latches, etc, or locally via the on-board DIP switch. No specialised external interface circuitry is necessary.

The EPROM (IC5) stores the division ratio of the programmable divider used in the T800 synthesiser. Up to 128 frequencies can be stored within the EPROM memory and these are addressable either by applying a 7 bit binary code to PL2, pins 1 to 7, or individually by using the 8 bit DIP switch (SW1). The EPROM also contains CTCSS frequency information which is stored in the CTCSS register and can be used when CTCSS is required.

A change of state of any of the address lines commences a programming cycle, during which the frequency data in the EPROM is down-loaded to a divider within the synthesiser IC on the T800 main PCB.

The exclusive OR gates within IC's 1 and 2 form an edge detector with outputs fed to an 8 input NOR gate (IC3). Half of IC4 is used to debounce any change of state that occurs at the channel address outputs by introducing a link selectable 56ms or 1ms delay.

The transmitter key or Tx enable signals can be connected to IC4 pin 13 to prevent frequency information changing while transmission is occurring.

Addressing Via BCD Thumbwheel Switches

Problems can arise when remote addressing more than 10 channels using BCD thumbwheel switches. BCD "0-9" equates to Decimal "0-9", but BCD "10-19" equates to Decimal "16-25". Therefore selection of 10 on a set of BCD thumbwheel switches would address PROM location 16. This means that PROM locations 10-15 are not addressable using the BCD method. The table below shows which channels may be addressed, dependent upon the version of software used. Either sequence of channel numbers may

be used with V2.21 software.

BCD Switch	Channel		BCD Switch	Channel	
	V2	V2.01		V2	V2.01
0	0	1	40	64	65
1	1	2	41	65	66
2	2	3	42	66	67
3	3	4	43	67	68
4	4	5	44	68	69
5	5	6	45	69	70
6	6	7	46	70	71
7	7	8	47	71	72
8	8	9	48	72	73
9	9	10	49	73	74
10	16	17	50	80	81
11	17	18	51	81	82
12	18	19	52	82	83
13	19	20	53	83	84
14	20	21	54	84	85
15	21	22	55	85	86
16	22	23	56	86	87
17	23	24	57	87	88
18	24	25	58	88	89
19	25	26	59	89	90
20	32	33	60	96	97
21	33	34	61	97	98
22	34	35	62	98	99
23	35	36	63	99	100
24	36	37	64	100	101
25	37	38	65	101	102
26	38	39	66	102	103
27	39	40	67	103	104
28	40	41	68	104	105
29	41	42	69	105	106
30	48	49	70	112	113
31	49	50	71	113	114
32	50	51	72	114	115
33	51	52	73	115	116
34	52	53	74	116	117
35	53	54	75	117	118
36	54	55	76	118	119
37	55	56	77	119	120
38	56	57	78	120	121
39	57	58	79	121	122

T800-07 Parts List (IPN 220-01196-02)

Ref	IPN	Description	Ref	IPN	Description
C1	015-24100-08	CAP CER 0805 CHIP 1N 10% X7R 50V			
C2	015-24100-08	CAP CER 0805 CHIP 1N 10% X7R 50V			
C3	015-24100-08	CAP CER 0805 CHIP 1N 10% X7R 50V			
C4	015-24100-08	CAP CER 0805 CHIP 1N 10% X7R 50V			
C5	015-24100-08	CAP CER 0805 CHIP 1N 10% X7R 50V			
C6	015-24100-08	CAP CER 0805 CHIP 1N 10% X7R 50V			
C7	015-24100-08	CAP CER 0805 CHIP 1N 10% X7R 50V			
C8	015-06100-08	CAP CER 1206 CHIP 100N 10% X7R 50V			
C9	015-24100-08	CAP CER 0805 CHIP 1N 10% X7R 50V			
C10	015-06100-08	CAP CER 1206 CHIP 100N 10% X7R 50V			
C11	025-08100-02	CAP TANT BEAD 10M 10% 16V			
D1	001-10000-70	(S) DIODE SMD BAV70 DUAL SW SOT-23 CO			
D2	001-10000-70	(S) DIODE SMD BAV70 DUAL SW SOT-23 CO			
D3	001-10000-70	(S) DIODE SMD BAV70 DUAL SW SOT-23 CO			
D4	001-10000-70	(S) DIODE SMD BAV70 DUAL SW SOT-23 CO			
D5	001-10000-70	(S) DIODE SMD BAV70 DUAL SW SOT-23 CO			
D6	001-10000-70	(S) DIODE SMD BAV70 DUAL SW SOT-23 CO			
D7	001-10000-70	(S) DIODE SMD BAV70 DUAL SW SOT-23 CO			
D8	001-10000-70	(S) DIODE SMD BAV70 DUAL SW SOT-23 CO			
IC1	002-10040-70	(S) IC SMD HEF4070BT QUAD EXCL-OR SO-14			
IC2	002-10040-70	(S) IC SMD HEF4070BT QUAD EXCL-OR SO-14			
IC3	002-10040-78	(S) IC SMD 4078BT 8 INPUT NOR GATE			
IC4	002-10045-38	(S) IC SMD 4538BT DUAL MULTIVIBRATOR			
IC5	002-00018-04	(S) IC 27C64 CMOS 8K*8 UV EPROM 250NS - 150NS			
IC6	002-10401-74	(S) IC SMD 40174BT HEX D TYPE F/F			
IC7	002-10401-74	(S) IC SMD 40174BT HEX D TYPE F/F			
PL1	240-00020-57	HEADER 10 WAY 1 ROW PCB MTG			
PL2	240-00020-57	HEADER 10 WAY 1 ROW PCB MTG			
R1	036-16560-00	RES M/F 0805 CHIP 560K 5%			
R2	036-16560-00	RES M/F 0805 CHIP 560K 5%			
R3	036-16560-00	RES M/F 0805 CHIP 560K 5%			
R4	036-16560-00	RES M/F 0805 CHIP 560K 5%			
R5	036-16560-00	RES M/F 0805 CHIP 560K 5%			
R6	036-16560-00	RES M/F 0805 CHIP 560K 5%			
R7	036-16560-00	RES M/F 0805 CHIP 560K 5%			
R8	036-15100-00	RES M/F 0805 CHIP 10K 5%			
R9	036-16560-00	RES M/F 0805 CHIP 560K 5%			
R10	036-15100-00	RES M/F 0805 CHIP 10K 5%			
R11	036-16560-00	RES M/F 0805 CHIP 560K 5%			
R12	036-15100-00	RES M/F 0805 CHIP 10K 5%			
R13	036-15100-00	RES M/F 0805 CHIP 10K 5%			
R14	036-15100-00	RES M/F 0805 CHIP 10K 5%			
R15	036-15100-00	RES M/F 0805 CHIP 10K 5%			
R16	036-15100-00	RES M/F 0805 CHIP 10K 5%			
R17	036-15100-00	RES M/F 0805 CHIP 10K 5%			
R18	036-15100-00	RES M/F 0805 CHIP 10K 5%			
R19	036-15100-00	RES M/F 0805 CHIP 10K 5%			
R20	036-15100-00	RES M/F 0805 CHIP 10K 5%			
R21	036-15100-00	RES M/F 0805 CHIP 10K 5%			
R22	036-15100-00	RES M/F 0805 CHIP 10K 5%			
R23	036-12220-00	RES M/F 0805 CHIP 22E 5%			
R24	036-15100-00	RES M/F 0805 CHIP 10K 5%			
R25	036-15100-00	RES M/F 0805 CHIP 10K 5%			
R26	036-15100-00	RES M/F 0805 CHIP 10K 5%			
R27	036-15100-00	RES M/F 0805 CHIP 10K 5%			
SK1	240-04020-57	SKT 10 WAY 1ROW PCB MTG TOP ENTRY			
SKT	240-02010-77	SKT RECEPT 10 WAY 1 ROW MTA-100 1-640441-0			
SW1	230-00010-19	SWITCH*8 SPST DIP PKG			

Mechanical & Miscellaneous Parts

IPN	Description	IPN	Description
T800-07 (IPN 220-01196-02)		**T800-03 D-Range**	
201-00030-01	WIRE #1 T/C WIRE 7/0.2MM PVC BROWN	012-04150-01	CAP CER F/THRU 1N5 NO LEAD (C1-C15)
201-00030-02	WIRE #1 T/C WIRE 7/0.2MM PVC RED	065-00010-13	BEAD FERRITE 7D 1.9*0.9*3.8MM STACK POLE
201-00030-03	WIRE #1 T/C WIRE 7/0.2MM PVC ORANGE	220-01190-00	PCB T300 BASE STN CONN
201-00030-04	WIRE #1 T/C WIRE 7/0.2MM PVC YELLOW	240-00010-55	PLUG 15 WAY D RANGE WRE WRP PINS PNL MTG
201-00030-05	WIRE #1 T/C WIRE 7/0.2MM PVC GREEN	240-02010-54	SKT 15WAY DRANGE PNL MTG 105 DEG C
201-00030-06	WIRE #1 T/C WIRE 7/0.2MM PVC BLUE	316-85015-01	PIN A4M775 LOCATING D RANGE
201-00030-07	WIRE #1 T/C WIRE 7/0.2MM PVC VIOLET	319-01152-00	SHIELD A3M2250 F/THRU MTG T857
201-00030-08	WIRE #1 T/C WIRE 7/0.2MM PVC GREY	352-00010-08	NUT M3 COLD FORM HEX ST BZ
201-00030-09	WIRE #1 T/C WIRE 7/0.2MM PVC WHITE	353-00010-12	WASHER M3 SPRING BZ
220-01196-02	PCB T800-07 M/CHAN MEM	399-00010-52	BAG PLASTIC 100*150MM
240-04020-35	SKT 28 PIN DIL IC LO PROF		
303-50078-00	CLIP A4M2630 0.1MM SPR WIRE CABLE CLMP T800		
365-00011-38	LABEL STATIC WARNING YELLOW A4A315		
365-00011-54	LABEL WHITE RW1556/2 SPECIAL ADHESIVE		
369-00010-14	NYLON CABLE TIES X2		
399-00010-86	BAG STATIC SHIELDING 127X203MM		
400-00010-50	SLEEVING X2 20CM		
410-00010-64	PKG HEADER CARD A3M2392		
418-80007-05	FITTING INS T800-07		

220-Ø1196-Ø2 C
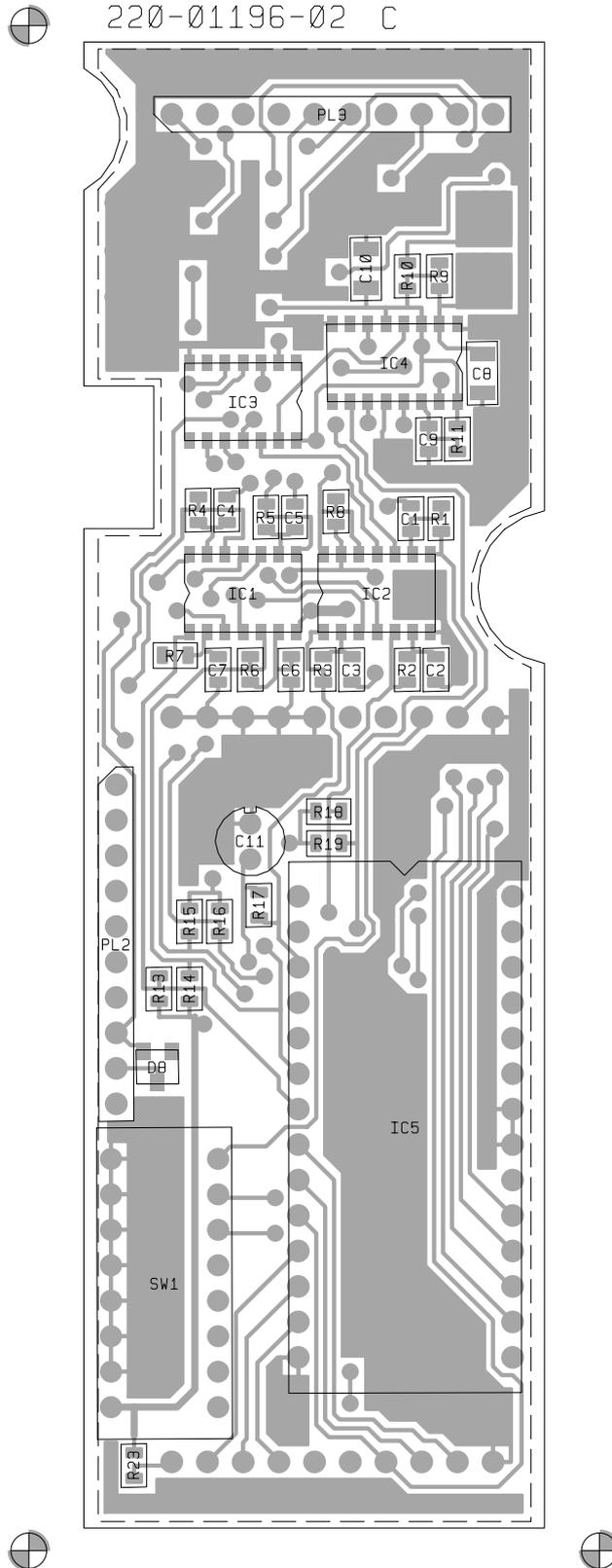
T800-07 Multichannel PCB (IPN 220-01196-02) - Top Side

220-Ø1196-Ø2 C
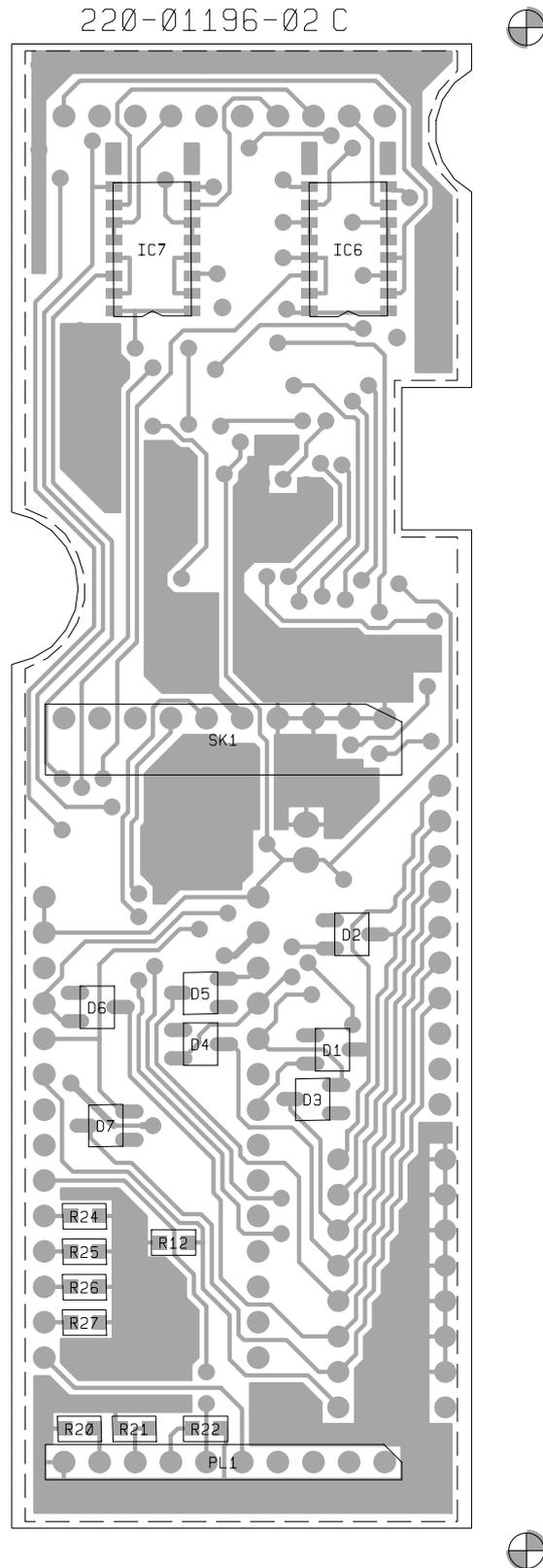
T800-07 Multichannel PCB (IPN 220-01196-02) - Bottom Side

T800-07 Circuit Diagram (IPN 220-01196-02)

Issuing Authority

This TN was issued by: Andreas Becker
RSD Customer Support Manager

Publication History

Publication Date	Author
15 July 1999	K Wilson

Amendment Record

Publication Date	Page	Amendment
15 July 1999		• TI-356D republished as TN-585. • "TI" replaced by "TN" throughout.
	2	• "Note" added about removing C19.
	3	• PGM800Win versions and channel numbers added.
	10	Mechanical & Miscellaneous Parts • Part "369-00010-27" removed. • Part "369-00010-14" added. • Part "400-00010-50" added.