

# FT-411

## TECHNICAL SUPPLEMENT



MANUALE DI SERV. X  
FT-411

05910801



2 005910 801004

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This manual is intended to serve as a supplement to the FT-411 Operating Manual. Specifications and details of operation and options are provided in the Operating Manual, and are not reprinted herein. Therefore, this manual is not intended to serve as an independent reference, but to be used in conjunction with the information provided in the Operating Manual.

Two layout diagrams are provided for each double-sided glass-epoxy circuit board in the FT-411. Each side of the board is identified by the type of the majority of components installed on that side. In most cases one side has only chip components, and the other has either a mixture of both chip and lead components (trimmers, coils, electrolytic capacitors, packaged ICs, etc.), or leaded components only.

While we believe the technical information in this manual is correct, Yaesu assumes no liability for damage that may occur as a result of typographical or other errors that may be present. Your cooperation in pointing out any inconsistencies in the technical information would be appreciated.

Yaesu Musen reserves the right to make changes in the circuitry of this transceiver, in the interest of technological improvement, without notification of the owners.

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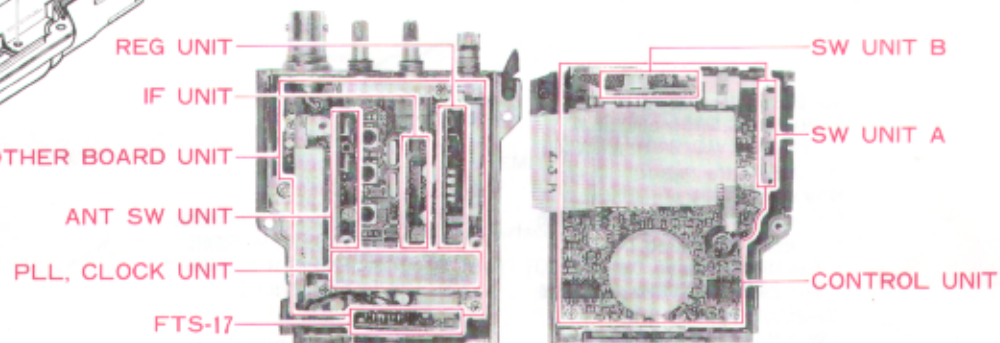
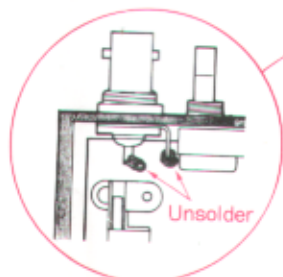
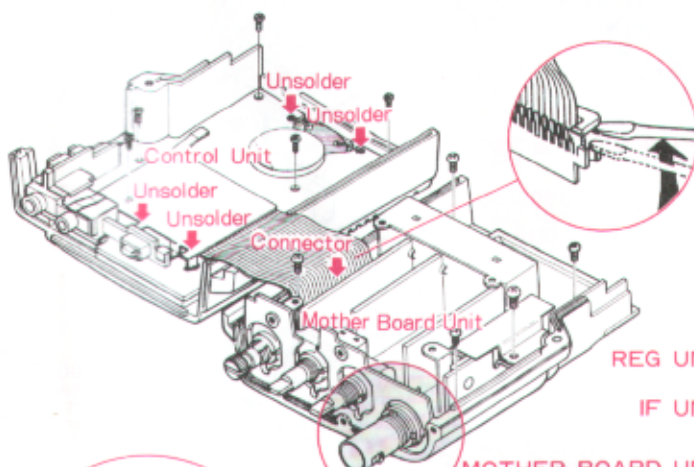
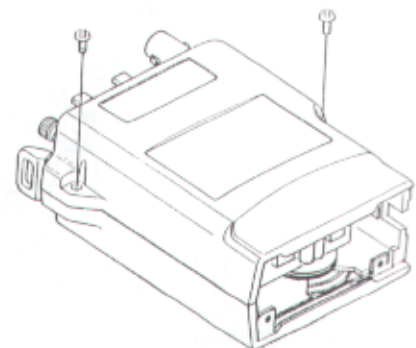
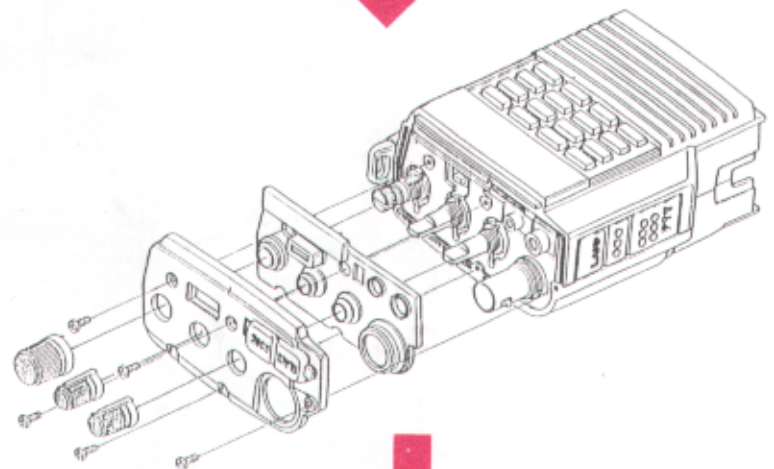
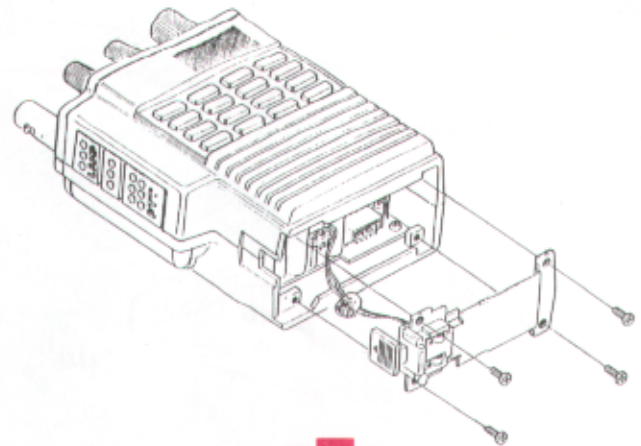
# CIRCUIT BOARD ACCESS

- 1) Make sure the transceiver is off. Remove the hard or soft case, if used, and remove the battery pack. Also remove the antenna.
- 2) Remove the four screws affixing the battery spring plate on the bottom of the transceiver, and carefully remove the plate and the battery catch button.
- 3) Pull off the three knobs on the top panel. Then remove the five screws affixing the panel and carefully remove it and the rubber gasket underneath.
- 4) Remove the two screws affixing the front and rear halves of the case, and slowly separate the halves, using care not to stress the inter-connecting cable.

To separate the front and rear halves of the chassis, use a small screwdriver to pry up one side of the plug on the "rear panel end" of the flat cable (see upper inset in diagram below), and then gently pull the plug out of its jack.

To remove the Control Unit from the front half of the chassis, remove the five screws indicated in the diagram, and unsolder the shield plate (2 places) and the loudspeaker wires (2 places).

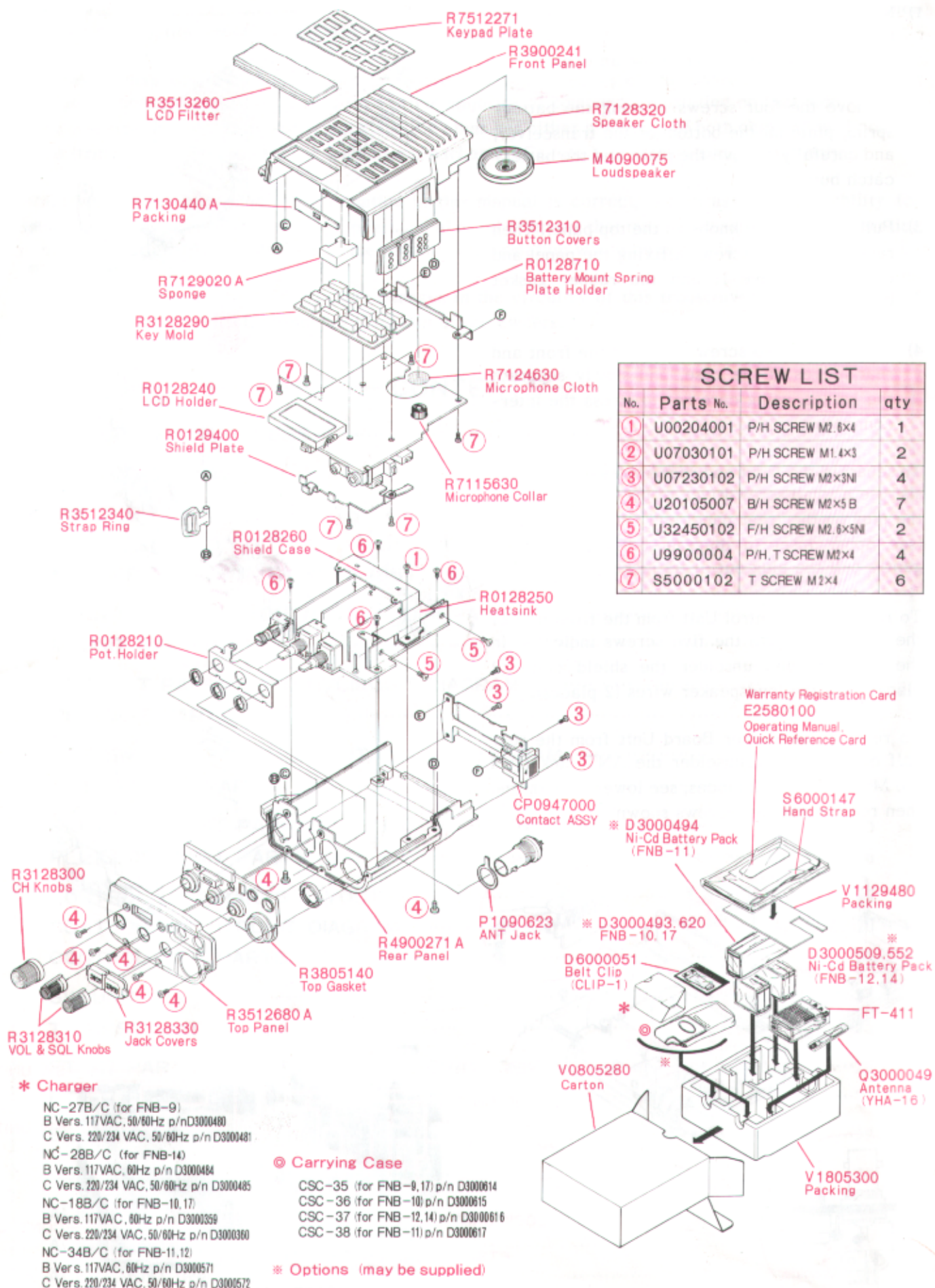
To remove the Mother Board Unit from the rear half of the chassis, unsolder the ANT jack from the Mother Board (2 places, see lower inset), and then remove the five screws shown.



BOARD LOCATIONS



# EXPLODED VIEW



| SCREW LIST |           |                    |     |
|------------|-----------|--------------------|-----|
| No.        | Parts No. | Description        | Qty |
| ①          | U00204001 | P/H SCREW M2.6x4   | 1   |
| ②          | U07030101 | P/H SCREW M1.4x3   | 2   |
| ③          | U07230102 | P/H SCREW M2x3NI   | 4   |
| ④          | U20105007 | B/H SCREW M2x5 B   | 7   |
| ⑤          | U32450102 | F/H SCREW M2.6x5NI | 2   |
| ⑥          | U9900004  | P/H, T SCREW M2x4  | 4   |
| ⑦          | S5000102  | T SCREW M1x4       | 6   |

**\* Charger**

- NC-27B/C (for FNB-9)
- B Vers. 117VAC, 50/60Hz p/n D3000480
- C Vers. 220/234 VAC, 50/60Hz p/n D3000481
- NC-28B/C (for FNB-14)
- B Vers. 117VAC, 60Hz p/n D3000484
- C Vers. 220/234 VAC, 50/60Hz p/n D3000485
- NC-18B/C (for FNB-10, 17)
- B Vers. 117VAC, 60Hz p/n D3000359
- C Vers. 220/234 VAC, 50/60Hz p/n D3000360
- NC-34B/C (for FNB-11, 12)
- B Vers. 117VAC, 60Hz p/n D3000571
- C Vers. 220/234 VAC, 50/60Hz p/n D3000572

**◎ Carrying Case**

- CSC-35 (for FNB-9, 17) p/n D3000614
- CSC-36 (for FNB-10) p/n D3000615
- CSC-37 (for FNB-12, 14) p/n D3000616
- CSC-38 (for FNB-11) p/n D3000617

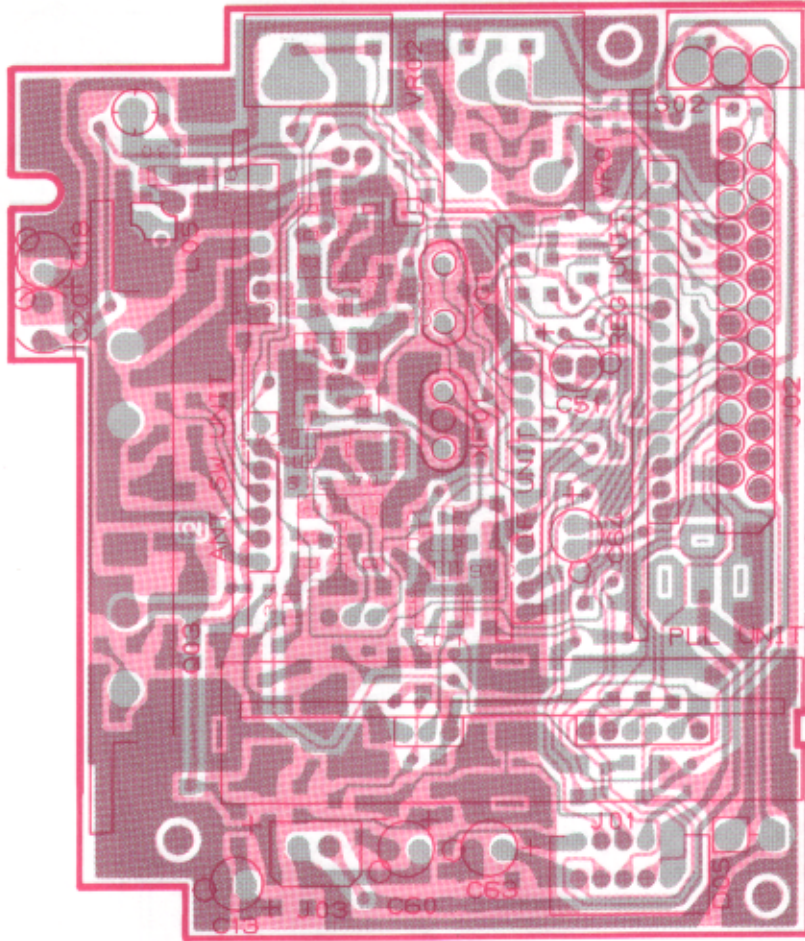
**\* Options (may be supplied)**

- Warranty Registration Card
- E2580100
- Operating Manual
- Quick Reference Card
- S6000147 Hand Strap
- V1129480 Packing
- \* D3000494 Ni-Cd Battery Pack (FNB-11)
- \* D3000493, 620 FNB-10, 17
- D6000051 Belt Clip (CLIP-1)
- \* D3000509, 552 Ni-Cd Battery Pack (FNB-12, 14)
- FT-411
- Q3000049 Antenna (YHA-16)
- V1805300 Packing
- V0805280 Carton

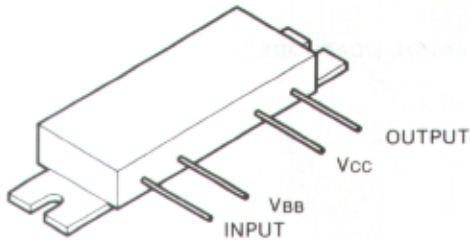


# MOTHER BOARD UNIT PARTS LAYOUT

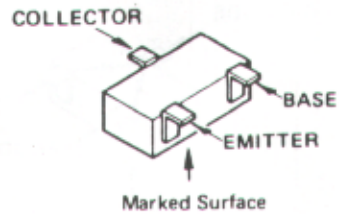
MOTHER BOARD UNIT (No. 1 XX)



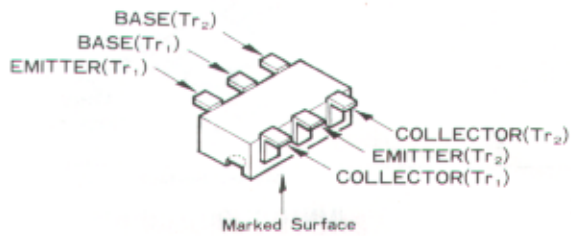
obverse view of "component" side



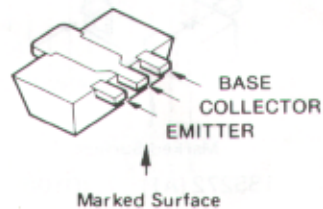
M57796MA (Q103)



- |                |               |            |
|----------------|---------------|------------|
| 2SC2712GR (LG) | DTA124EK (15) | (Q110)     |
| (Q106,112,113) | DTC124TK (05) | (Q109)     |
| 2SC2714Y (QY)  | DTC144EK (26) | (Q104,105) |
| (Q101,107)     |               |            |
| 2SC3120 (HB)   | (Q108)        |            |

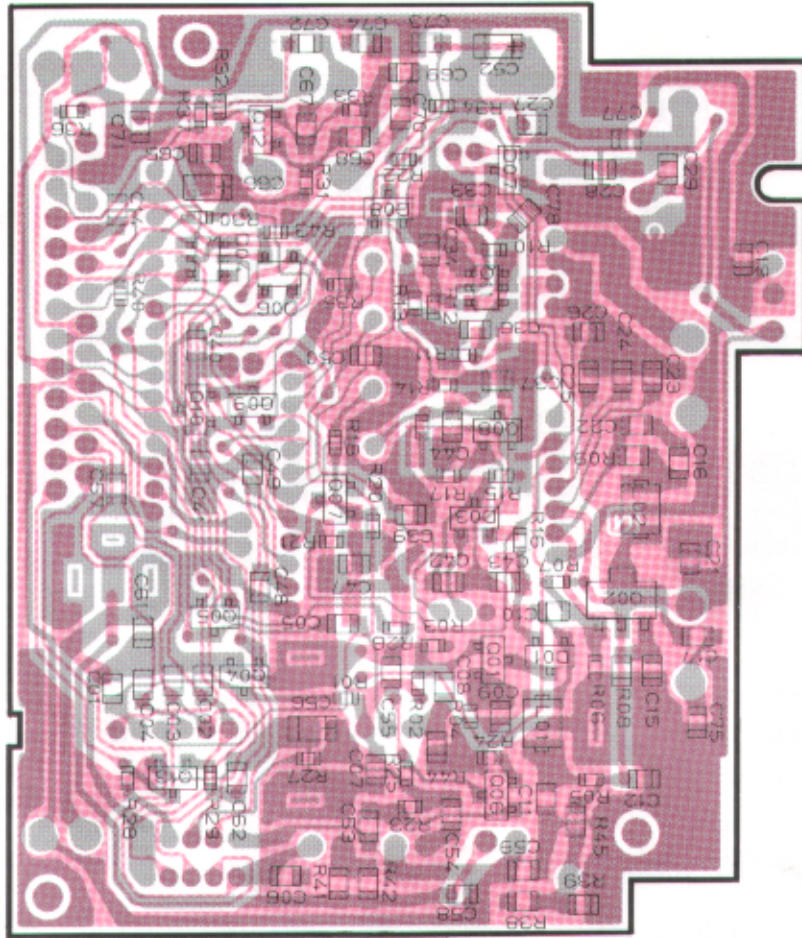


IMX5 (X5) (Q111)

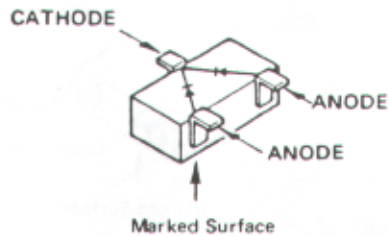


2SC2954 (0K) (Q102)

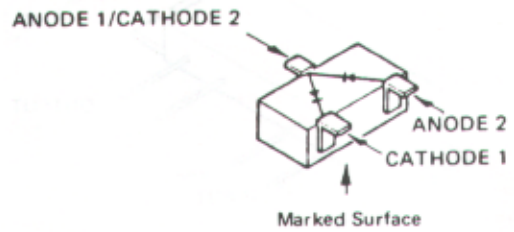
# MOTHER BOARD UNIT PARTS LAYOUT



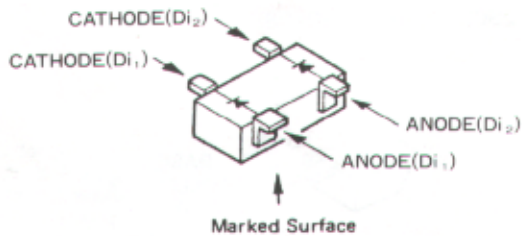
obverse view of "chip-only" side



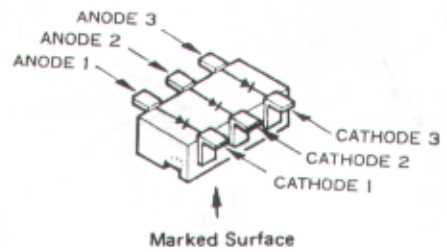
1SS184 (B3) (D101,103)



1SS226 (C3)  
(D101,107,108)



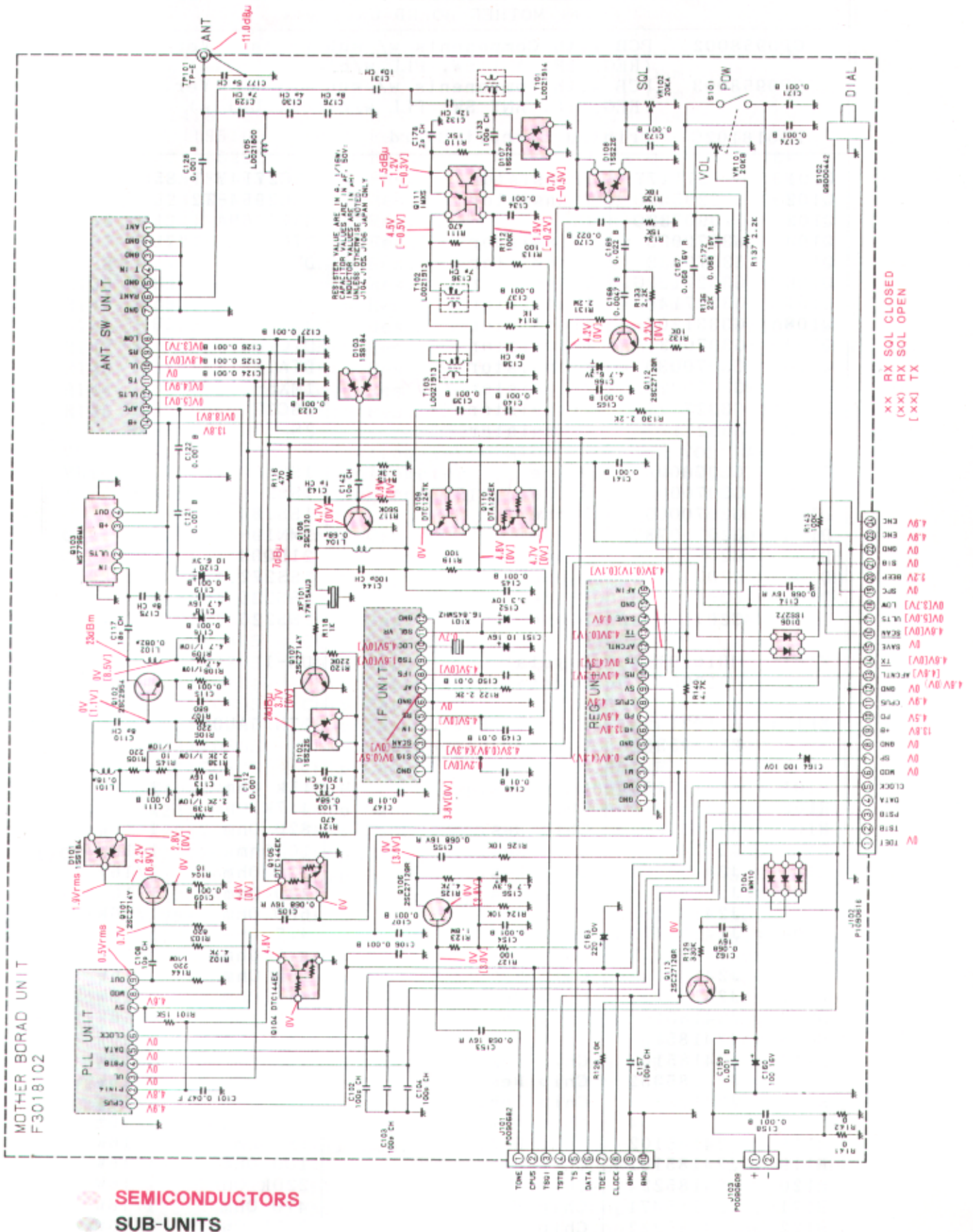
1SS272 (A1) (D106)



IMN10 (N10) (D104)



# MOTHER BOARD UNIT CIRCUIT DIAGRAM





# MOTHER BOARD UNIT PARTS LIST

| *** MOTHER BOARD UNIT *** |                                       |                                  |                           |
|---------------------------|---------------------------------------|----------------------------------|---------------------------|
| CP0958002                 | PCB with Components w/ sub-units      |                                  | Vers. A, B                |
|                           | (REG, IF, ANT SW, PLL w/clock, Units) |                                  |                           |
| CP0958003                 | PCB with Components w/ sub-units      |                                  | Ver. USA                  |
|                           | (REG, IF, ANT SW, PLL w/clock, Units) |                                  |                           |
| F3018102C                 | Printed Circuit Board                 |                                  |                           |
| Q101                      | G3327147Y                             | Transistor                       | 2SC2714Y TE85R            |
| Q102                      | G3329547                              | Transistor                       | 2SC2954-T2                |
| Q103                      | G1090732                              | IC                               | M57796MA                  |
| Q104                      | G3070033                              | Transistor                       | DTC144EK-T97              |
| Q105                      | G3070033                              | Transistor                       | DTC144EK-T97              |
| Q106                      | G3327127G                             | Transistor                       | 2SC2712GR TE85R           |
| Q107                      | G3327147G                             | Transistor                       | 2SC2714Y TE85R            |
| Q108                      | G3331207                              | Transistor                       | 2SC3120 TE85R             |
| Q109                      | G3070031                              | Transistor                       | DTC124TK-T97              |
| Q110                      | G3070030                              | Transistor                       | DTA124EK-T97              |
| Q111                      | G3070028                              | Transistor                       | IMX5-T108                 |
| Q112                      | G3327127G                             | Transistor                       | 2SC2712GR TE85R           |
| Q113                      | G3327127G                             | Transistor                       | 2SC2712GR TE85R           |
| D101                      | G2070009                              | Diode                            | 1SS184 TE85R              |
| D102                      | G2070003                              | Diode                            | 1SS226 TE85R              |
| D103                      | G2070009                              | Diode                            | 1SS184 TE85R              |
| D104                      | G2070078                              | Diode                            | 1MN10-T108                |
| D105                      | G2090317                              | Diode                            | 21DQ04                    |
| D106                      | G2070048                              | Diode                            | 1SS272 TE85R              |
| D107                      | G2070003                              | Diode                            | 1SS226 TE85R              |
| D108                      | G2070003                              | Diode                            | 1SS226 TE85R              |
| X101                      | H0102913<br>R3129530                  | Crystal<br>Crystal Dumper        | UM-1            16.845MHz |
| XF101                     | H1102149<br>R3129530                  | Crystal Filter<br>Crystal Dumper | 17N15AU3                  |
| R101                      | J24185153                             | Chip Res.                        | 15k Ohm        1/16W      |
| R102                      | J24185472                             | Chip Res.                        | 4.7k Ohm       1/16W      |
| R103                      | J24185821                             | Chip Res.                        | 820 Ohm        1/16W      |
| R104                      | J24185100                             | Chip Res.                        | 10 Ohm         1/16W      |
| R105                      | J24185221                             | Chip Res.                        | 220 Ohm        1/16W      |
| R106                      | J24185221                             | Chip Res.                        | 220 Ohm        1/16W      |
| R107                      | J24185681                             | Chip Res.                        | 680 Ohm        1/16W      |
| R108                      | J24205479                             | Chip Res.                        | 4.7 Ohm        1/10W      |
| R109                      | J24205479                             | Chip Res.                        | 4.7 Ohm        1/10W      |
| R110                      | J24185153                             | Chip Res.                        | 15k Ohm        1/16W      |
| R111                      | J24185471                             | Chip Res.                        | 470 Ohm        1/16W      |
| R112                      | J24185104                             | Chip Res.                        | 100k Ohm       1/16W      |
| R113                      | J24185101                             | Chip Res.                        | 100 Ohm        1/16W      |
| R114                      | J24185102                             | Chip Res.                        | 1k Ohm          1/16W     |
| R115                      | J24185332                             | Chip Res.                        | 3.3k Ohm       1/16W      |
| R116                      | J24185471                             | Chip Res.                        | 470 Ohm        1/16W      |
| R117                      | J24185564                             | Chip Res.                        | 560k Ohm       1/16W      |
| R118                      | J24185102                             | Chip Res.                        | 1k Ohm          1/16W     |
| R119                      | J24185101                             | Chip Res.                        | 100 Ohm        1/16W      |
| R120                      | J24185224                             | Chip Res.                        | 220k Ohm       1/16W      |
| R121                      | J24185471                             | Chip Res.                        | 470 Ohm        1/16W      |
| R122                      | J24185222                             | Chip Res.                        | 2.2k Ohm       1/16W      |
| R123                      | J24185185                             | Chip Res.                        | 1.8M Ohm       1/16W      |
| R124                      | J24185103                             | Chip Res.                        | 10k Ohm        1/16W      |
| R125                      | J24185472                             | Chip Res.                        | 4.7k Ohm       1/10W      |

# MOTHER BOARD UNIT PARTS LIST

|       |           |                      |          |       |    |
|-------|-----------|----------------------|----------|-------|----|
| R126  | J24185103 | Chip Res.            | 10k Ohm  | 1/16W |    |
| R127  | J24185101 | Chip Res.            | 100 Ohm  | 1/16W |    |
| R128  | J24185103 | Chip Res.            | 10k Ohm  | 1/16W |    |
| R129  | J24185334 | Chip Res.            | 330k Ohm | 1/16W |    |
| R130  | J24185222 | Chip Res.            | 2.2k Ohm | 1/16W |    |
| R131  | J24185225 | Chip Res.            | 2.2M Ohm | 1/16W |    |
| R132  | J24185103 | Chip Res.            | 10k Ohm  | 1/16W |    |
| R133  | J24185222 | Chip Res.            | 2.2k Ohm | 1/16W |    |
| R134  | J24185153 | Chip Res.            | 15k Ohm  | 1/16W |    |
| R135  | J24185183 | Chip Res.            | 18k Ohm  | 1/16W |    |
| R136  | J24185223 | Chip Res.            | 22k Ohm  | 1/16W |    |
| R137  | J24185222 | Chip Res.            | 2.2k Ohm | 1/16W |    |
| R138  | J24205222 | Chip Res.            | 2.2k Ohm | 1/10W |    |
| R139  | J24205222 | Chip Res.            | 2.2k Ohm | 1/10W |    |
| R140  | J24185472 | Chip Res.            | 4.7k Ohm | 1/16W |    |
| R141  | J24205000 | Chip Res.            | 0 Ohm    | 1/10W |    |
| R142  | J24205000 | Chip Res.            | 0 Ohm    | 1/10W |    |
| R143  | J24185104 | Chip Res.            | 100k Ohm | 1/16W |    |
| R144  | J24205101 | Chip Res.            | 100 Ohm  | 1/10W |    |
| R145  | J24205100 | Chip Res.            | 10 Ohm   | 1/10W |    |
| VR101 | J60800149 | Potentiometer w/S101 | 20k Ohm  | VOL   | A  |
| VR102 | J60800150 | Potentiometer        | 20k Ohm  | SQL   | B  |
|       | R7130330  | Washer for VR101,102 |          |       |    |
| C101  | K22171008 | Chip Cap.            | 0.047uF  | 50V   | F  |
| C102  | K22170235 | Chip Cap.            | 100pF    | 50V   | CH |
| C103  | K22170235 | Chip Cap.            | 100pF    | 50V   | CH |
| C104  | K22170235 | Chip Cap.            | 100pF    | 50V   | CH |
| C105  | K22120805 | Chip Cap.            | 0.068uF  | 16V   | R  |
| C106  | K22170805 | Chip Cap.            | 0.001uF  | 50V   | B  |
| C107  | K22170805 | Chip Cap.            | 0.001uF  | 50V   | B  |
| C108  | K22170211 | Chip Cap.            | 10pF     | 50V   | CH |
| C109  | K22170805 | Chip Cap.            | 0.001uF  | 50V   | B  |
| C110  | K22170209 | Chip Cap.            | 8pF      | 50V   | CH |
| C111  | K22170805 | Chip Cap.            | 0.001uF  | 50V   | B  |
| C112  | K22170805 | Chip Cap.            | 0.001uF  | 50V   | B  |
| C113  | K40129012 | Al Electro Cap.      | 10uF     | 16V   |    |
| C114  | K22120805 | Chip Cap.            | 0.068uF  | 16V   | R  |
| C115  | K22170805 | Chip Cap.            | 0.001uF  | 50V   | B  |
| C116  | K22170805 | Chip Cap.            | 0.001uF  | 50V   | B  |
| C117  | K22170217 | Chip Cap.            | 18pF     | 50V   | CH |
| C118  | K40129059 | Al Electro Cap.      | 4.7uF    | 16V   |    |
| C119  | K22170805 | Chip Cap.            | 0.001uF  | 50V   | B  |
| C120  | K70087106 | Tantalum Cap.        | 10uF     | 6.3V  |    |
| C121  | K22170805 | Chip Cap.            | 0.001uF  | 50V   | B  |
| C122  | K22170805 | Chip Cap.            | 0.001uF  | 50V   | B  |
| C123  | K22170805 | Chip Cap.            | 0.001uF  | 50V   | B  |
| C124  | K22170805 | Chip Cap.            | 0.001uF  | 50V   | B  |
| C125  | K22170805 | Chip Cap.            | 0.001uF  | 50V   | B  |
| C126  | K22170805 | Chip Cap.            | 0.001uF  | 50V   | B  |
| C127  | K22170805 | Chip Cap.            | 0.001uF  | 50V   | B  |
| C128  | K22170805 | Chip Cap.            | 0.001uF  | 50V   | B  |
| C129  | K22170208 | Chip Cap.            | 7pF      | 50V   | CH |
| C130  | K22170205 | Chip Cap.            | 4pF      | 50V   | CH |
| C131  | K22170211 | Chip Cap.            | 10pF     | 50V   | CH |
| C132  | K22170213 | Chip Cap.            | 12pF     | 50V   | CH |
| C133  | K22170235 | Chip Cap.            | 100pF    | 50V   | CH |
| C134  | K22170805 | Chip Cap.            | 0.001uF  | 50V   | B  |
| C136  | K22170208 | Chip Cap.            | 7pF      | 50V   | CH |
| C137  | K22170805 | Chip Cap.            | 0.001uF  | 50V   | B  |
| C138  | K22170209 | Chip Cap.            | 8pF      | 50V   | CH |

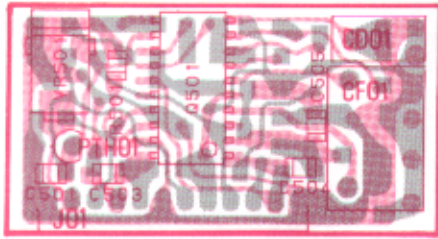
# MOTHER BOARD UNIT PARTS LIST

|      |                      |                                   |                |          |    |
|------|----------------------|-----------------------------------|----------------|----------|----|
| C139 | K22170805            | Chip Cap.                         | 0.001uF        | 50V      | B  |
| C140 | K22170805            | Chip Cap.                         | 0.001uF        | 50V      | B  |
| C141 | K22170805            | Chip Cap.                         | 0.001uF        | 50V      | B  |
| C142 | K22170211            | Chip Cap.                         | 10pF           | 50V      | CH |
| C143 | K22170202            | Chip Cap.                         | 1pF            | 50V      | CK |
| C144 | K22170235            | Chip Cap.                         | 100pF          | 50V      | CH |
| C145 | K22170805            | Chip Cap.                         | 0.001uF        | 50V      | B  |
| C146 | K22170237            | Chip Cap.                         | 120pF          | 50V      | CH |
| C147 | K22170817            | Chip Cap.                         | 0.01uF         | 50V      | B  |
| C148 | K22170817            | Chip Cap.                         | 0.01uF         | 50V      | B  |
| C149 | K22170817            | Chip Cap.                         | 0.01uF         | 50V      | B  |
| C150 | K22170817            | Chip Cap.                         | 0.01uF         | 50V      | B  |
| C151 | K40129012            | Al Electro Cap.                   | 10uF           | 16V      |    |
| C152 | K78100002            | Tantalum Chip Cap.                | 3.3uF          | 10V      |    |
| C153 | K22120805            | Chip Cap.                         | 0.068uF        | 16V      | R  |
| C154 | K22170805            | Chip Cap.                         | 0.001uF        | 50V      | B  |
| C155 | K22120805            | Chip Cap.                         | 0.068uF        | 16V      | R  |
| C156 | K78080002            | Tantalum Chip Cap.                | 4.7uF          | 6.3V     |    |
| C157 | K22170235            | Chip Cap.                         | 100pF          | 50V      | CH |
| C158 | K22170805            | Chip Cap.                         | 0.001uF        | 50V      | B  |
| C159 | K22170805            | Chip Cap.                         | 0.001uF        | 50V      | B  |
| C160 | K40129060            | Al Electro Cap.                   | 100uF          | 16V      |    |
| C161 | K22170805            | Chip Cap.                         | 0.001uF        | 50V      | B  |
| C162 | K22120805            | Chip Cap.                         | 0.068uF        | 16V      | B  |
| C163 | K40109027            | Al Electro Cap.                   | 220uF          | 10V      |    |
| C164 | K40109026            | Al Electro Cap.                   | 100uF          | 10V      |    |
| C165 | K22170805            | Chip Cap.                         | 0.001uF        | 50V      | B  |
| C166 | K78080002            | Tantalum Chip Cap.                | 4.7uF          | 6.3V     |    |
| C167 | K22120805            | Chip Cap.                         | 0.068uF        | 16V      | R  |
| C168 | K22170813            | Chip Cap.                         | 0.0047uF       | 50V      | B  |
| C169 | K22170821            | Chip Cap.                         | 0.022uF        | 50V      | B  |
| C170 | K22170821            | Chip Cap.                         | 0.022uF        | 50V      | B  |
| C171 | K22170805            | Chip Cap.                         | 0.001uF        | 50V      | B  |
| C172 | K22120805            | Chip Cap.                         | 0.068uF        | 16V      | R  |
| C173 | K22170805            | Chip Cap.                         | 0.001uF        | 50V      | B  |
| C174 | K22170805            | Chip Cap.                         | 0.001uF        | 50V      | B  |
| C175 | K22170209            | Chip Cap.                         | 8pF            | 50V      | CH |
| C176 | K22170209            | Chip Cap.                         | 8pF            | 50V      | CH |
| C177 | K22170206            | Chip Cap.                         | 5pF            | 50V      | CH |
| C178 | K22170203            |                                   | 2pF            |          |    |
| L101 | L1690014             | RFC                               | 0.18uH         |          |    |
| L102 | L1690010             | RFC                               | 82nH           |          |    |
| L103 | L1690067             | RFC                               | 0.68uH         |          |    |
| L104 | L1690067             | RFC                               | 0.68uH         |          |    |
| L105 | L0021800A            | Coil                              |                |          |    |
| T101 | L0021914             | Coil                              |                | 2276-202 |    |
| T102 | L0021913             | Coil                              |                | 2276-201 |    |
| T103 | L0021913             | Coil                              |                | 2276-201 |    |
| S101 | -----                | Switch                            | w/VR101        |          |    |
| S102 | Q9000442<br>R7130330 | Rotary Encoder<br>Washer for S102 | EC09P20-04     |          |    |
| J101 | P0090682             | Connector                         | 53020-1010     |          |    |
| J102 | P1090626             | Connector                         | 53020-2420     |          |    |
| J103 | P0090609             | Connector                         | SB20-02WS      |          |    |
| J104 | P1090683             | Connector                         | HEC1781-01-520 |          |    |
| J105 | P1090614             | Connector                         | 53020-0210     |          |    |
| J106 | P1090615             | Connector                         | 53020-0310     |          |    |
|      | Q5000016             | Terminal Post                     | TP-E MS-60124  |          |    |

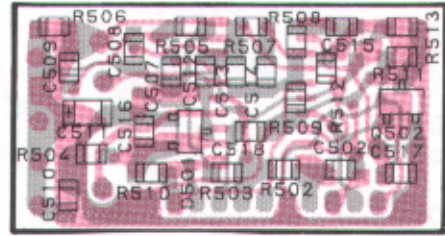


# IF UNIT PARTS LAYOUT/CIRCUIT DIAGRAM

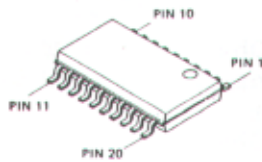
IF UNIT (No. 5 XX)



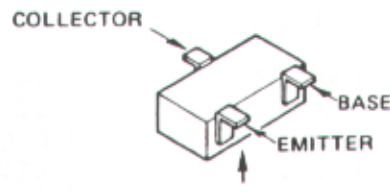
obverse view of "mixed-component" side



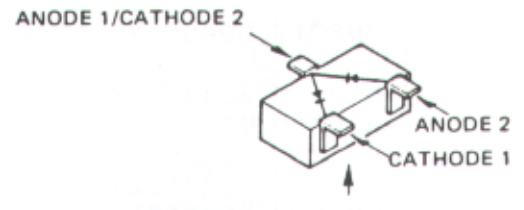
obverse view of "chip-only" side



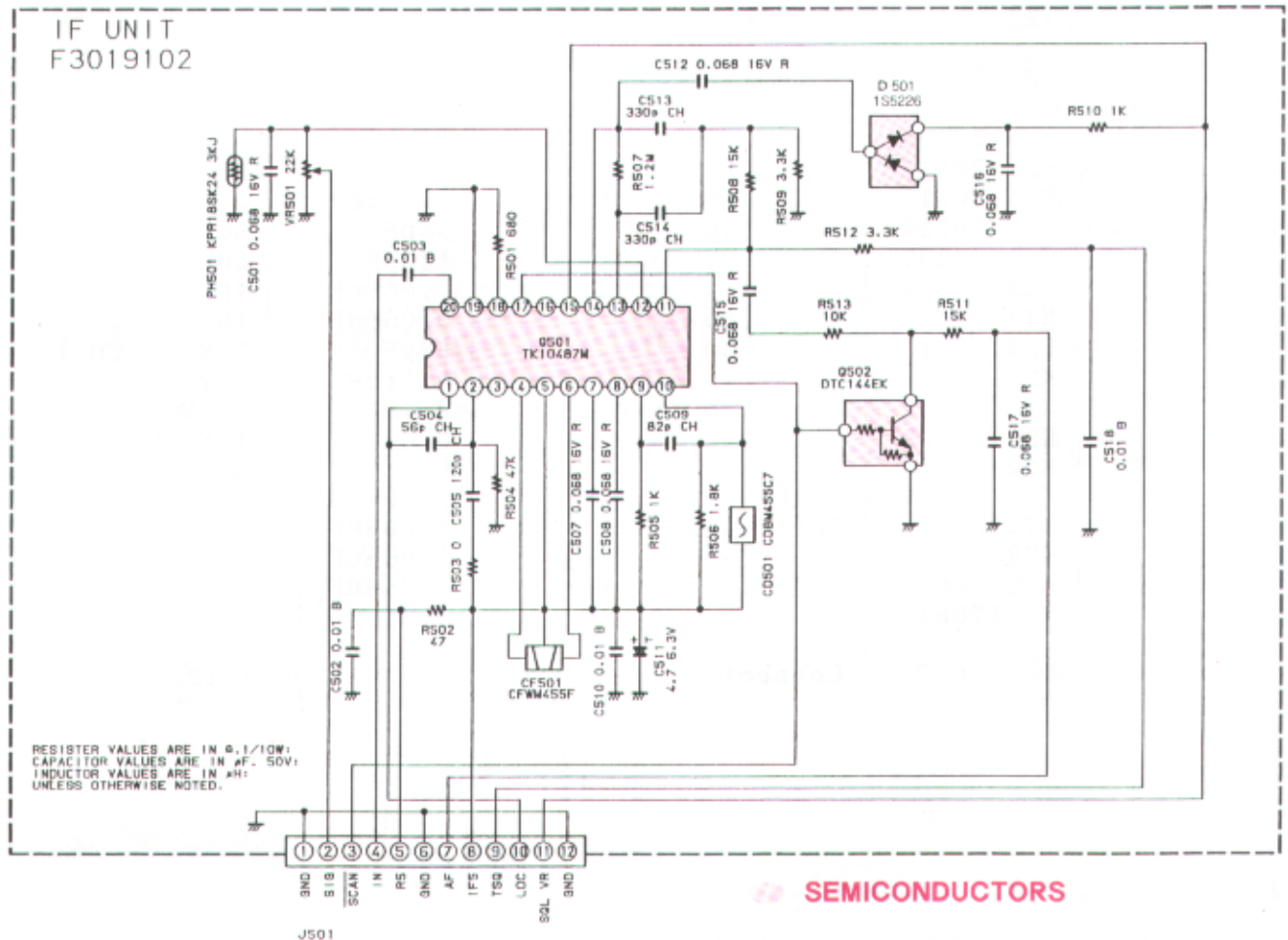
TK10487M (Q501)



DTC144EK (26) (Q502)



1SS226 (C3) (D501)

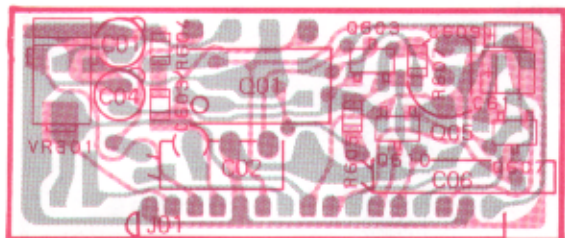


# IF UNIT PARTS LIST

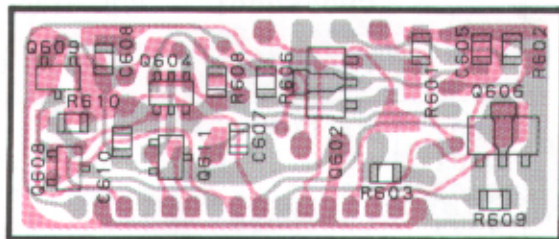
| *** IF UNIT *** |           |                       |                       |            |    |
|-----------------|-----------|-----------------------|-----------------------|------------|----|
| CP0961001       |           | PCB with Components   |                       |            |    |
| F3019102A       |           | Printed Circuit Board |                       |            |    |
| Q501            | G1090859  | IC                    | TK10487M              |            |    |
| Q502            | G3070033  | Transistor            | DTC144EK-T97          |            |    |
| D501            | G2070003  | Diode                 | 1SS226 TE85R          |            |    |
| CF501           | H3900395  | Ceramic Filter        | CWFM455F              |            |    |
| CD501           | H7900480  | Ceramic Disc          | CDBM455C7             |            |    |
| PH501           | G9090036  | Posistor              | KPR18SK24             | 3KJ        |    |
| R501            | J24205681 | Chip Res.             | 680 Ohm               | 1/10W      |    |
| R502            | J24205470 | Chip Res.             | 47 Ohm                | 1/10W      |    |
| R503            | J24205000 | Chip Res.             | 0 Ohm                 | 1/10W      |    |
| R504            | J24205473 | Chip Res.             | 47k Ohm               | 1/10W      |    |
| R505            | J24205102 | Chip Res.             | 1k Ohm                | 1/10W      |    |
| R506            | J24205182 | Chip Res.             | 1.8k Ohm              | 1/10W      |    |
| R507            | J24205125 | Chip Res.             | 1.2M Ohm              | 1/10W      |    |
| R508            | J24205682 | Chip Res.             | 6.8k Ohm              | 1/10W      |    |
| R509            | J24205392 | Chip Res.             | 3.9k Ohm              | 1/10W      |    |
| R510            | J24205102 | Chip Res.             | 1k Ohm                | 1/10W      |    |
| R511            | J24205153 | Chip Res.             | 15k Ohm               | 1/10W      |    |
| R512            | J24205332 | Chip Res.             | 3.3k Ohm              | 1/10W      |    |
| R513            | J24205103 | Chip Res.             | 10k Ohm               | 1/10W      |    |
| VR501           | J50779223 | Potentiometer         | 22k Ohm               | RH04AVCJ4W |    |
| C501            | K22120805 | Chip Cap.             | 0.068uF               | 16V        | R  |
| C502            | K22170817 | Chip Cap.             | 0.01uF                | 50V        | B  |
| C503            | K22170817 | Chip Cap.             | 0.01uF                | 50V        | B  |
| C504            | K22170229 | Chip Cap.             | 56pF                  | 50V        | CH |
| C505            | K22170237 | Chip Cap.             | 120pF                 | 50V        | CH |
| C507            | K22120805 | Chip Cap.             | 0.068uF               | 16V        | R  |
| C508            | K22120805 | Chip Cap.             | 0.068uF               | 16V        | R  |
| C509            | K22170233 | Chip Cap.             | 82pF                  | 50V        | CH |
| C510            | K22170817 | Chip Cap.             | 0.01uF                | 50V        | B  |
| C511            | K78080002 | Tantalum Chip Cap.    | 4.7uF                 | 6.3V       |    |
| C512            | K22120805 | Chip Cap.             | 0.068uF               | 16V        | R  |
| C513            | K22170805 | Chip Cap.             | 0.001uF               | 50V        | B  |
| C514            | K22170239 | Chip Cap.             | 150pF                 | 50V        | CH |
| C515            | K22120805 | Chip Cap.             | 0.068uF               | 16V        | R  |
| C516            | K22120805 | Chip Cap.             | 0.068uF               | 16V        | R  |
| C517            | K22120805 | Chip Cap.             | 0.068uF               | 16V        | R  |
| C518            | K22170817 | Chip Cap.             | 0.01uF                | 50V        | B  |
| J501            | P0090677  | Connector             | IMSA-9230B-1-12Z009-T |            |    |

# REG UNIT PARTS LAYOUT/CIRCUIT DIAGRAM

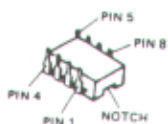
## REG UNIT (No. 6 XX)



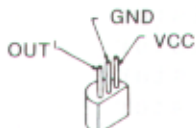
obverse view of "mixed-component" side



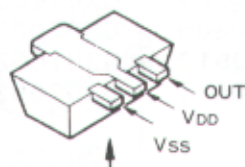
obverse view of "chip-only" side



NJM386D (Q601)



LM2931AZ (Q605)



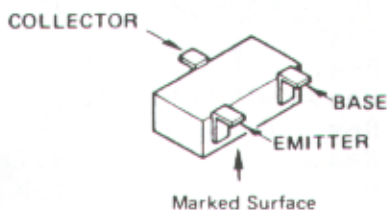
Marked Surface

RH5VA45AA (D5) (Q606)



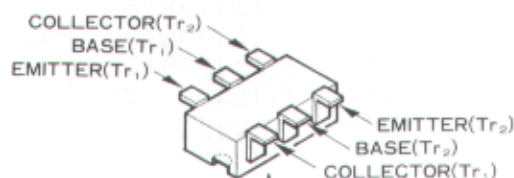
Marked Surface

2SB799 (ML) (Q602)



Marked Surface

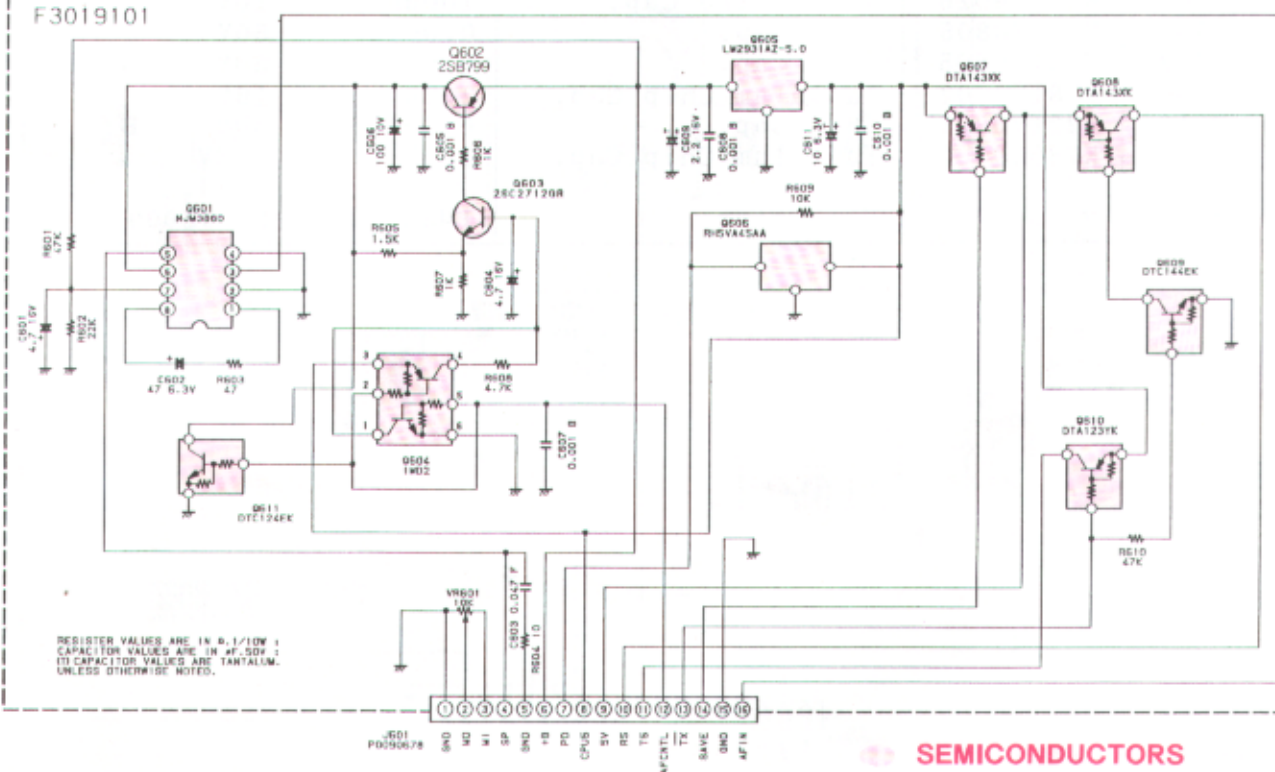
- 2SC2712GR (LG) (Q603)
- DTA143XK (33) (Q607,608)
- DTC144EK (26) (Q609)
- DTA123YK (52) (Q610)
- DTC124EK (25) (Q611)



Marked Surface

IMD2 (D2) (Q604)

### REG UNIT F3019101



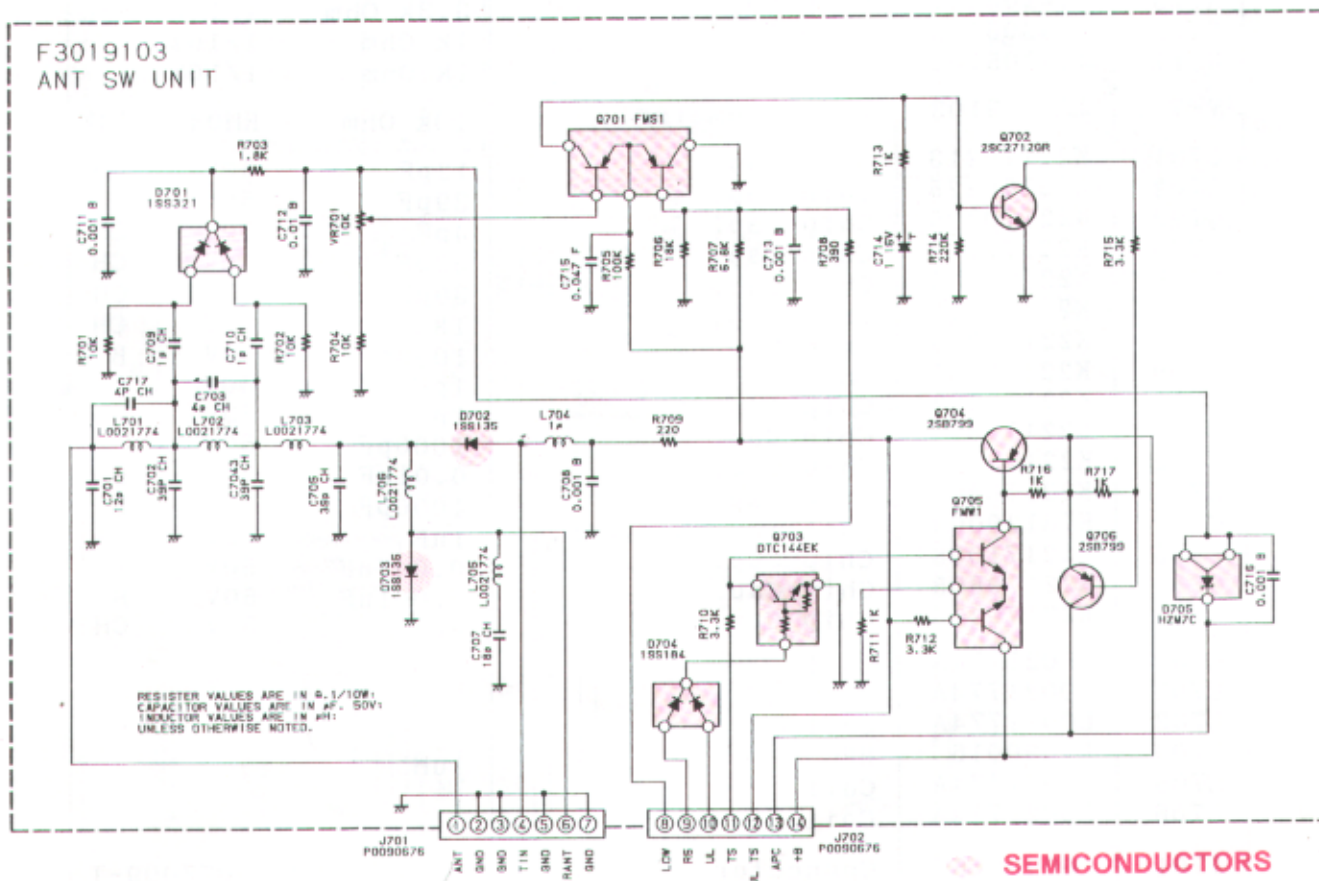
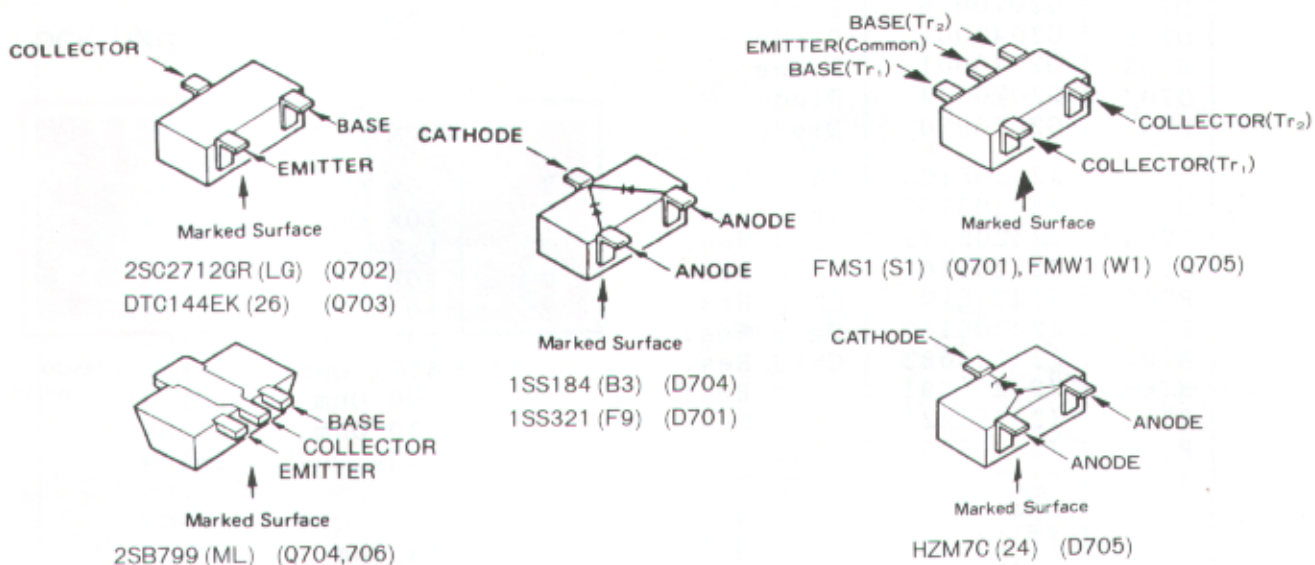
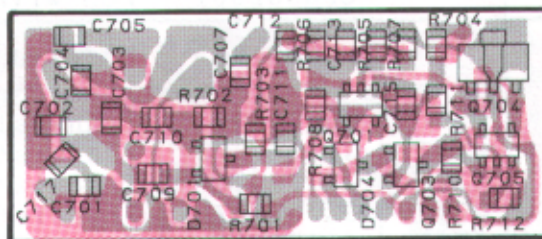
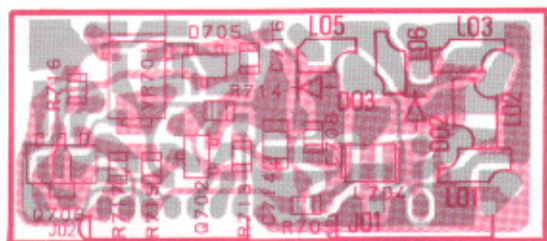


# REG UNIT PARTS LIST

| *** REG UNIT *** |           |                       |                       |
|------------------|-----------|-----------------------|-----------------------|
| CP0960001        |           | PCB with Components   |                       |
| F3019101A        |           | Printed Circuit Board |                       |
| Q601             | G1090920  | IC                    | NJM386D               |
| Q602             | G3207997L | Transistor            | 2SB799-T2ML           |
| Q603             | G3327127G | Transistor            | 2SC2712GR TE85R       |
| Q604             | G3070026  | Transistor            | IMD2-T108             |
| Q605             | G1090785  | IC                    | LM2931AZ-5.0          |
| Q606             | G1090966  | IC                    | RH5VA45AA-T1          |
| Q607             | G3070032  | Transistor            | DTA143XK-T97          |
| Q608             | G3070032  | Transistor            | DTA143XK-T97          |
| Q609             | G3070033  | Transistor            | DTC144EK-T97          |
| Q610             | G3070029  | Transistor            | DTA123YK-T97          |
| Q611             | G3070034  | Transistor            | DTC124EK-T97          |
| R601             | J24205473 | Chip Res.             | 47k Ohm 1/10W         |
| R602             | J24205223 | Chip Res.             | 22k Ohm 1/10W         |
| R603             | J24205470 | Chip Res.             | 47 Ohm 1/10W          |
| R604             | J24205100 | Chip Res.             | 10 Ohm 1/10W          |
| R605             | J24205152 | Chip Res.             | 1.5k Ohm 1/10W        |
| R606             | J24205102 | Chip Res.             | 1k Ohm 1/10W          |
| R607             | J24205102 | Chip Res.             | 1k Ohm 1/10W          |
| R608             | J24205472 | Chip Res.             | 4.7k Ohm 1/10W        |
| R609             | J24205103 | Chip Res.             | 10k Ohm 1/10W         |
| R610             | J24205473 | Chip Res.             | 47k Ohm 1/10W         |
| VR601            | J50779103 | Potentiometer         | 10k Ohm RH04AVC14W    |
| C602             | K40089023 | Al Electro Cap.       | 47uF 6.3V             |
| C603             | K22171008 | Chip Cap.             | 0.047uF 50V F         |
| C604             | K40129059 | Al Electro Cap.       | 4.7uF 16V             |
| C605             | K22170805 | Chip Cap.             | 0.001uF 50V B         |
| C606             | K40109026 | Al Electro Cap.       | 100uF 10V             |
| C607             | K22170805 | Chip Cap.             | 0.001uF 50V B         |
| C608             | K22170805 | Chip Cap.             | 0.001uF 50V B         |
| C609             | K78120002 | Tantalum Chip Cap.    | 2.2uF 16V             |
| C610             | K22170805 | Chip Cap.             | 0.001uF 50V B         |
| C611             | K78080003 | Tantalum Chip Cap.    | 10uF 6.3V             |
| J601             | P0090678  | Connector             | IMSA-9230B-1-16Z009-T |

# ANT SW UNIT PARTS LAYOUT/CIRCUIT DIAGRAM

ANT SW UNIT (No.7XX)



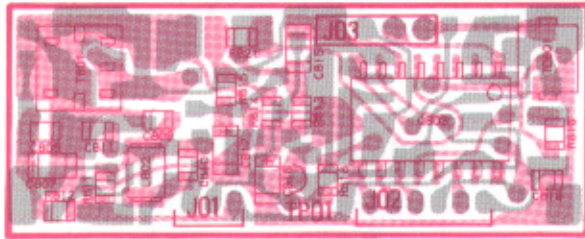
# ANT SW UNIT PARTS LIST

| *** ANT SW UNIT *** |           |                       |                       |
|---------------------|-----------|-----------------------|-----------------------|
| CP0962001           |           | PCB with Components   |                       |
| F3019103            |           | Printed Circuit Board |                       |
| Q701                | G3070008  | Transistor            | FMS1-T98              |
| Q702                | G3327127G | Transistor            | 2SC2712GR TE85R       |
| Q703                | G3070033  | Transistor            | DTC144EK-T97          |
| Q704                | G3207997L | Transistor            | 2SB799-T2ML           |
| Q705                | G3070009  | Transistor            | FMW1-T98              |
| Q706                | G3207997L | Transistor            | 2SB799-T2ML           |
| D701                | G2070076  | Diode                 | 1SS321 TE85R          |
| D702                | G2040001  | Diode                 | 1SS135-T91            |
| D703                | G2040001  | Diode                 | 1SS135-T91            |
| D704                | G2070009  | Diode                 | 1SS184 TE85R          |
| D705                | G2070070  | Diode                 | HZM7C-TR              |
| R701                | J24205103 | Chip Res.             | 10k Ohm 1/10W         |
| R702                | J24205103 | Chip Res.             | 10k Ohm 1/10W         |
| R703                | J24205182 | Chip Res.             | 1.8k Ohm 1/10W        |
| R704                | J24205103 | Chip Res.             | 10k Ohm 1/10W         |
| R705                | J24205104 | Chip Res.             | 100k Ohm 1/10W        |
| R706                | J24205183 | Chip Res.             | 18k Ohm 1/10W         |
| R707                | J24205682 | Chip Res.             | 6.8k Ohm 1/10W        |
| R708                | J24205391 | Chip Res.             | 390 Ohm 1/10W         |
| R709                | J24205221 | Chip Res.             | 220 Ohm 1/10W         |
| R710                | J24205332 | Chip Res.             | 3.3k Ohm 1/10W        |
| R711                | J24205102 | Chip Res.             | 1k Ohm 1/10W          |
| R712                | J24205332 | Chip Res.             | 3.3k Ohm 1/10W        |
| R713                | J24205102 | Chip Res.             | 1k Ohm 1/10W          |
| R714                | J24205224 | Chip Res.             | 220k Ohm 1/10W        |
| R715                | J24205332 | Chip Res.             | 3.3k Ohm 1/10W        |
| R716                | J24205102 | Chip Res.             | 1k Ohm 1/10W          |
| R717                | J24205102 | Chip Res.             | 1k Ohm 1/10W          |
| VR701               | J50779103 | Potentiometer         | 10k Ohm RH04AVC14W    |
| C701                | K22170213 | Chip Cap.             | 12pF 50V CH           |
| C702                | K22170225 | Chip Cap.             | 39pF 50V CH           |
| C703                | K22170205 | Chip Cap.             | 4pF 50V CH            |
| C704                | K22170225 | Chip Cap.             | 39pF 50V CH           |
| C705                | K22170225 | Chip Cap.             | 39pF 50V CH           |
| C707                | K22170217 | Chip Cap.             | 18pF 50V CH           |
| C708                | K22170805 | Chip Cap.             | 1000pF 50V B          |
| C709                | K22170202 | Chip Cap.             | 1pF 50V CH            |
| C710                | K22170202 | Chip Cap.             | 1pF 50V CH            |
| C711                | K22170805 | Chip Cap.             | 1000pF 50V B          |
| C712                | K22170817 | Chip Cap.             | 0.01uF 50V B          |
| C713                | K22170805 | Chip Cap.             | 1000pF 50V B          |
| C714                | K78120009 | Tantalum Chip Cap.    | 1uF 16V               |
| C715                | K22171008 | Chip Cap.             | 0.047uF 50V F         |
| C716                | K22170805 | Chip Cap.             | 0.001uF 50V B         |
| C717                | K22170205 | Chip Cap.             | 4pF 50V CH            |
| L701                | L0021774A | Coil                  |                       |
| L702                | L0021774A | Coil                  |                       |
| L703                | L0021774A | Coil                  |                       |
| L704                | L1690016  | RFC                   | 1uH                   |
| L705                | L0021774A | Coil                  |                       |
| L706                | L0021774A | Coil                  |                       |
| J701                | P0090676  | Connector             | 1MSA-9230B-1-07Z009-T |
| J702                | P0090676  | Connector             | 1MSA-9230B-1-07Z009-T |

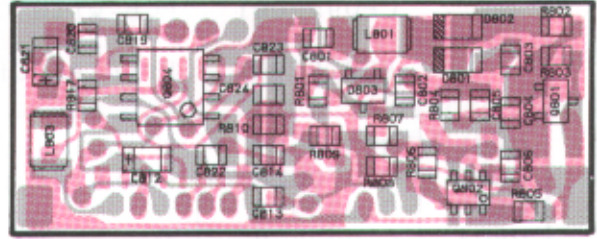


# PLL,CLOCK UNIT PARTS LAYOUT/CIRCUIT DIAGRAM

## PLL UNIT (No. 8 X X)

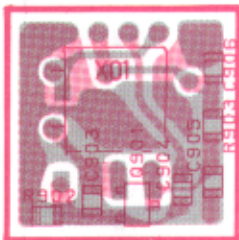


obverse view of "mixed-component" side

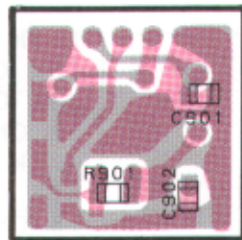


obverse view of "chip-only" side

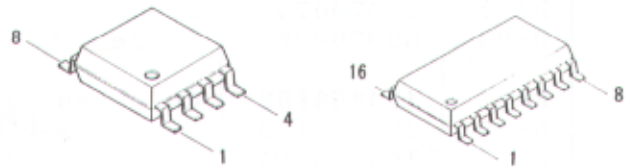
## CLOCK UNIT (No. 9 X X)



obverse view of "mixed-component" side

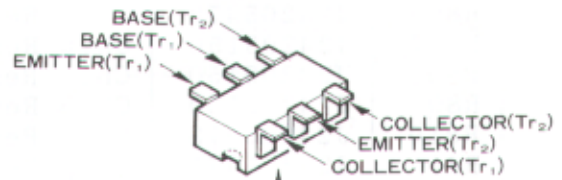


obverse view of "chip-only" side



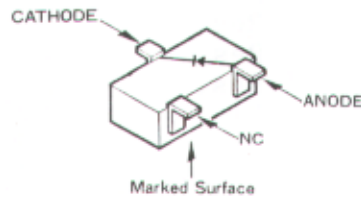
μPB569G (Q804)

MB87076PF (Q803)

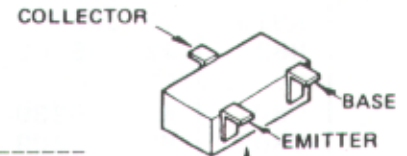


Marked Surface

IMX5 (X5) (Q805)



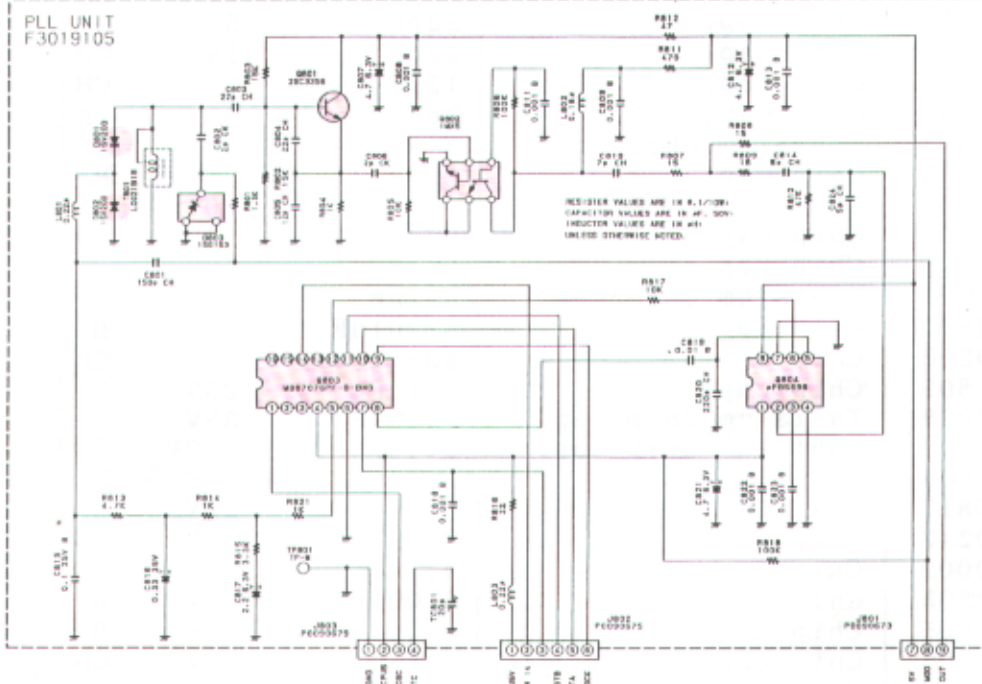
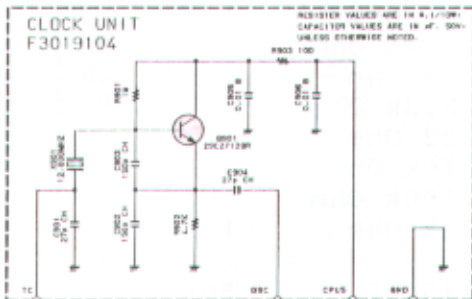
1SS153 (A9) (D803)



Marked Surface

2SC2712GR (LG) (Q901)

2SC3356 (R24) (Q801)



# PLL,CLOCK UNIT PARTS LIST

| *** PLL UNIT *** |           |                                   |                    |       |    |
|------------------|-----------|-----------------------------------|--------------------|-------|----|
| CP0959001        |           | PCB with Components w/ CLOCK Unit |                    |       |    |
| F3019105A        |           | Printed Circuit Board             |                    |       |    |
| Q801             | G3333567  | Transistor                        | 2SC3356-T2B        |       |    |
| Q802             | G3070028  | Transistor                        | IMX5-T108          |       |    |
| Q803             | G1090934  | IC                                | MB87076PF-G-BND-TF |       |    |
| Q804             | G1090870  | IC                                | uPB569G            |       |    |
| D801             | G2070074  | Diode                             | 1SV200-TR          |       |    |
| D802             | G2070074  | Diode                             | 1SV200-TR          |       |    |
| D803             | G2070032  | Diode                             | 1SS153-T2B         |       |    |
| R801             | J24205152 | Chip Res.                         | 1.5k Ohm           | 1/10W |    |
| R802             | J24205153 | Chip Res.                         | 15k Ohm            | 1/10W |    |
| R803             | J24205153 | Chip Res.                         | 15k Ohm            | 1/10W |    |
| R804             | J24205102 | Chip Res.                         | 1k Ohm             | 1/10W |    |
| R805             | J24205472 | Chip Res.                         | 4.7k Ohm           | 1/10W |    |
| R806             | J24205473 | Chip Res.                         | 47k Ohm            | 1/10W |    |
| R807             | J24205150 | Chip Res.                         | 15 Ohm             | 1/10W |    |
| R808             | J24205150 | Chip Res.                         | 15 Ohm             | 1/10W |    |
| R809             | J24205150 | Chip Res.                         | 15 Ohm             | 1/10W |    |
| R810             | J24205473 | Chip Res.                         | 47k Ohm            | 1/10W |    |
| R811             | J24205471 | Chip Res.                         | 470 Ohm            | 1/10W |    |
| R812             | J24205470 | Chip Res.                         | 47 Ohm             | 1/10W |    |
| R813             | J24205472 | Chip Res.                         | 4.7k Ohm           | 1/10W |    |
| R814             | J24205102 | Chip Res.                         | 1k Ohm             | 1/10W |    |
| R815             | J24205332 | Chip Res.                         | 3.3k Ohm           | 1/10W |    |
| R816             | J24205220 | Chip Res.                         | 22 Ohm             | 1/10W |    |
| R817             | J24205103 | Chip Res.                         | 10k Ohm            | 1/10W |    |
| R818             | J24205104 | Chip Res.                         | 100k Ohm           | 1/10W |    |
| R821             | J24205102 | Chip Res.                         | 1k Ohm             | 1/10W |    |
| C801             | K22170239 | Chip Cap.                         | 150pF              | 50V   | CH |
| C802             | K22170203 | Chip Cap.                         | 2pF                | 50V   | CK |
| C803             | K22170219 | Chip Cap.                         | 22pF               | 50V   | CH |
| C804             | K22170219 | Chip Cap.                         | 22pF               | 16V   | CH |
| C805             | K22170213 | Chip Cap.                         | 12pF               | 50V   | CH |
| C806             | K22170203 | Chip Cap.                         | 2pF                | 50V   | CK |
| C807             | K78080002 | Tantalum Chip Cap.                | 4.7uF              | 6.3V  |    |
| C808             | K22170805 | Chip Cap.                         | 0.001uF            | 50V   | B  |
| C809             | K22170805 | Chip Cap.                         | 0.001uF            | 50V   | B  |
| C810             | K22170208 | Chip Cap.                         | 7pF                | 50V   | CH |
| C811             | K22170805 | Chip Cap.                         | 0.001uF            | 50V   | B  |
| C812             | K78080002 | Tantalum Chip Cap.                | 4.7uF              | 6.3V  |    |
| C813             | K22170805 | Chip Cap.                         | 0.001uF            | 50V   | B  |
| C814             | K22170206 | Chip Cap.                         | 5pF                | 50V   | CH |
| C815             | K22141809 | Chip Cap.                         | 0.1uF              | 25V   | B  |
| C816             | K78160028 | Tantalum Chip Cap.                | 0.33uF             | 35V   |    |
| C817             | K78080009 | Tantalum Chip Cap.                | 2.2uF              | 6.3V  |    |
| C818             | K22170805 | Chip Cap.                         | 0.001uF            | 50V   | B  |
| C819             | K22170817 | Chip Cap.                         | 0.01uF             | 50V   | B  |
| C820             | K22170243 | Chip Cap.                         | 220pF              | 50V   | CH |
| C821             | K78080002 | Chip Cap.                         | 4.7uF              | 6.3V  |    |
| C822             | K22170805 | Chip Cap.                         | 0.001uF            | 50V   | B  |
| C823             | K22170805 | Chip Cap.                         | 0.001uF            | 50V   | B  |
| C824             | K22170206 | Chip Cap.                         | 5pF                | 50V   | CH |
| TC801            | K91000151 | Trimmer Cap.                      | 20pF               |       |    |

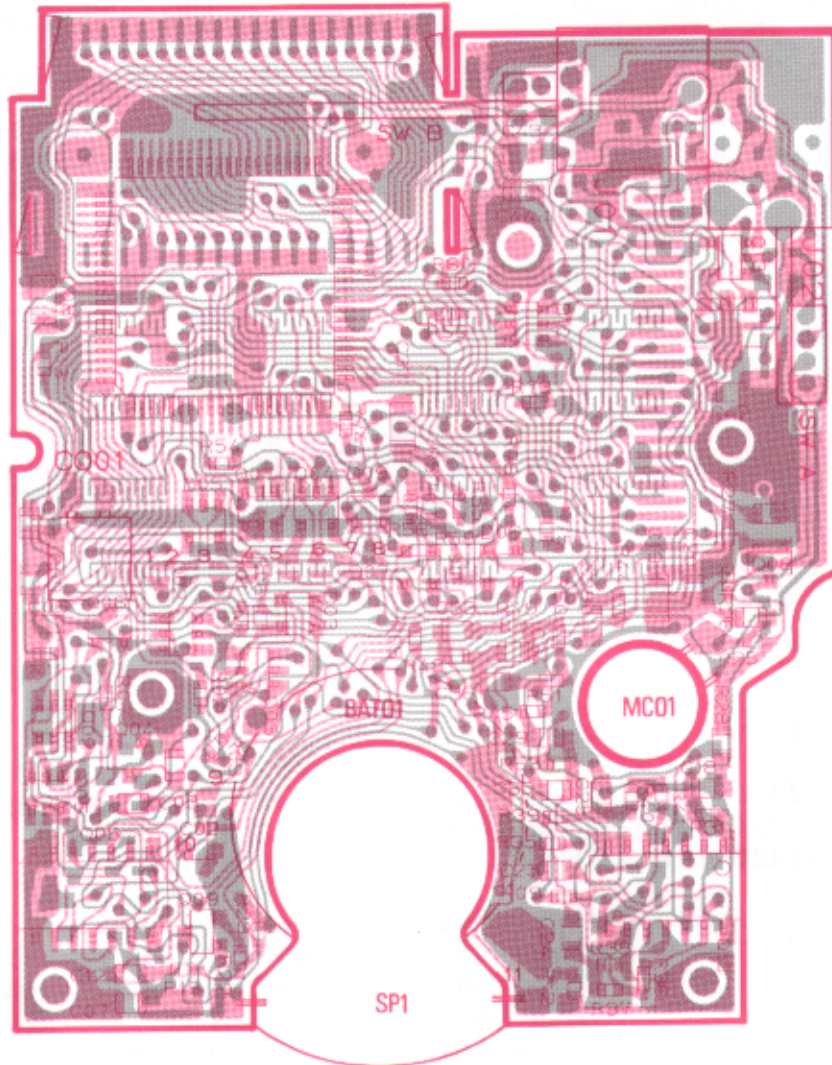
# PLL,CLOCK UNIT PARTS LIST

|                    |           |                       |                       |          |
|--------------------|-----------|-----------------------|-----------------------|----------|
| L801               | L1690003  | RFC                   | 0.22uH                |          |
| L802               | L1690014  | RFC                   | 0.18uH                |          |
| L803               | L1690003  | RFC                   | 0.22uH                |          |
| T801               | L0021915  | Coil                  |                       | 2276-215 |
| J801               | P0090673  | Connector             | IMSA-9230B-1-03Z009-T |          |
| J802               | P0090675  | Connector             | IMSA-9230B-1-06Z009-T |          |
| J803               | P0090679  | Connector             | IMSA-9210B-1-04-T     |          |
| TP801              | Q5000052  | Terminal Post         | TP-M                  |          |
|                    | R0128230  | Shield Case           |                       |          |
|                    | R0128220  | Shield Case Cover     |                       |          |
| *** CLOCK UNIT *** |           |                       |                       |          |
|                    | CP0964001 | PCB with Components   |                       |          |
|                    | F3019104  | Printed Circuit Board |                       |          |
| Q901               | G3327127G | Transistor            | 2SC2712GR TE85R       |          |
| X901               | H0102911  | Crystal               | UM-1                  | 12.8MHz  |
|                    | R3129530  | Crystal Dumper        |                       |          |
| R901               | J24205105 | Chip Res.             | 1M Ohm                | 1/10W    |
| R902               | J24205473 | Chip Res.             | 4.7k Ohm              | 1/10W    |
| R903               | J24205101 | Chip Res.             | 100 Ohm               | 1/10W    |
| C901               | K22170221 | Chip Cap.             | 27pF                  | 50V CH   |
| C902               | K22170239 | Chip Cap.             | 150pF                 | 50V CH   |
| C903               | K22170239 | Chip Cap.             | 150pF                 | 50V CH   |
| C904               | K22170221 | Chip Cap.             | 27pF                  | 50V CH   |
| C905               | K22170817 | Chip Cap.             | 0.01uF                | 50V B    |
| C906               | K22170817 | Chip Cap.             | 0.01uF                | 50V B    |

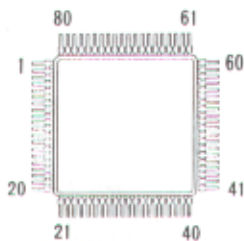


# CONTROL UNIT PARTS LAYOUT

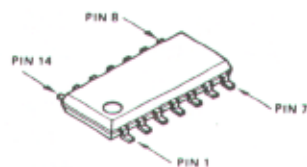
CONTROL UNIT (No. 2 X X)



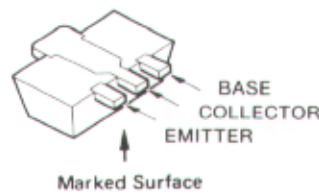
obverse view of "microprocessor" side



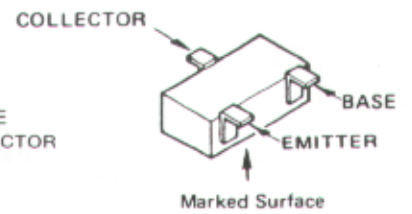
HD404608-A05H (Q201)



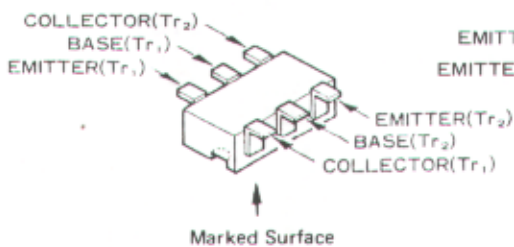
μPD4013BG (Q208)  
NJM2902M (Q210)



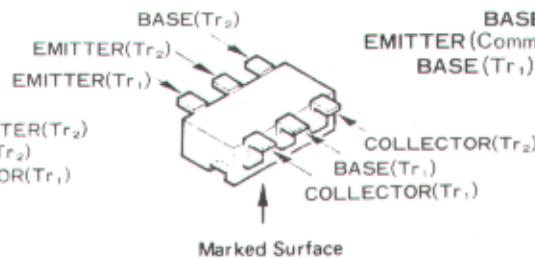
2SB799 (ML) (Q212)



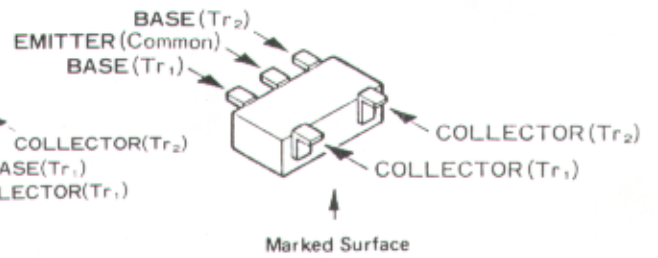
2SC2712GR (LG) (Q209)  
DTA124EK (15) (Q206,211)  
DTC124TK (05) (Q204)



IMZ1 (Z1) (Q202,203)  
IMD2 (D2) (Q205)



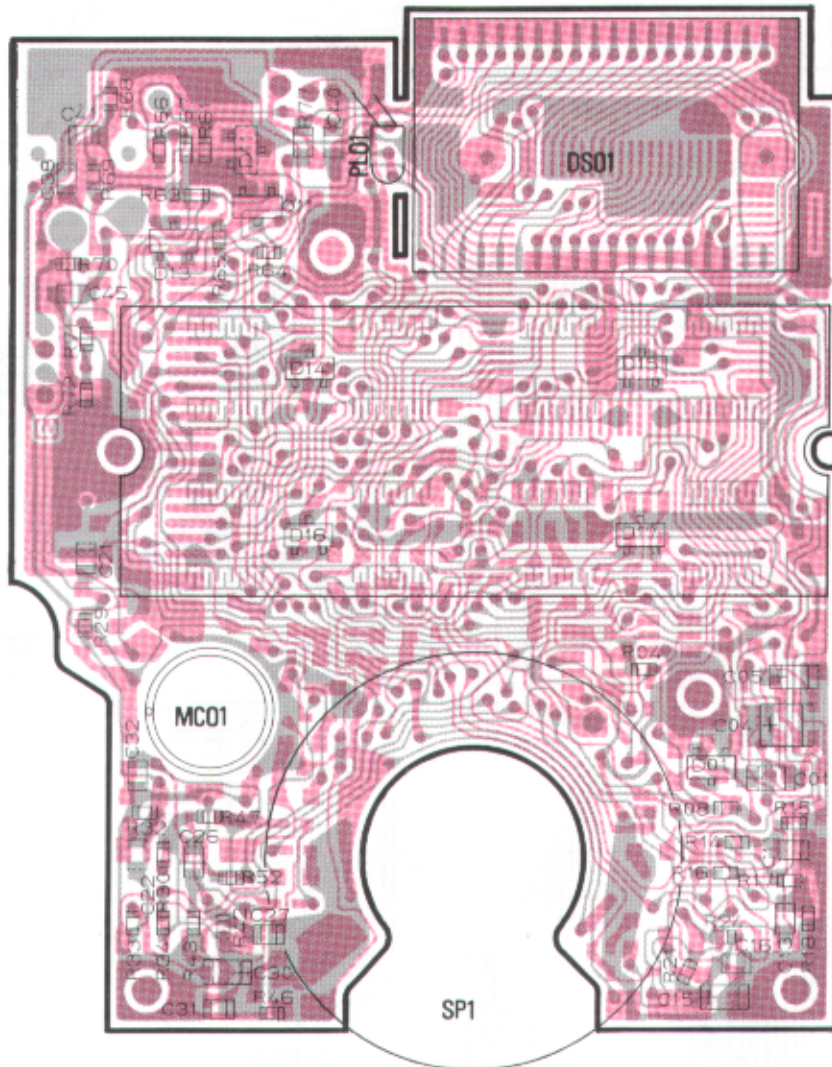
IMH5 (H5) (Q207)



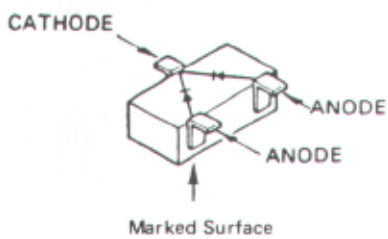
FMW1 (W1) (Q213)



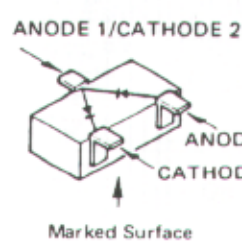
# CONTROL UNIT PARTS LAYOUT



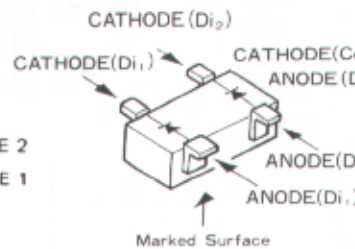
obverse view of "display" side



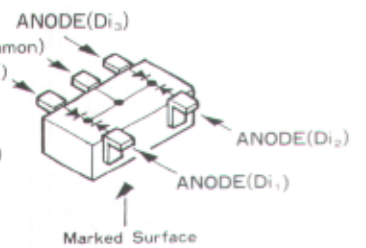
1SS184 (B3) (D208)  
SLM-23VMWS (D213)



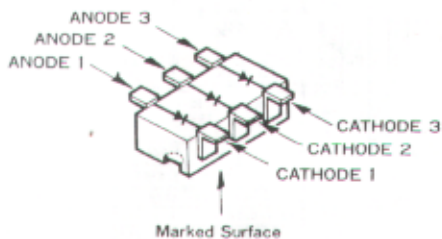
1SS226 (C3)  
(D201,209,211)



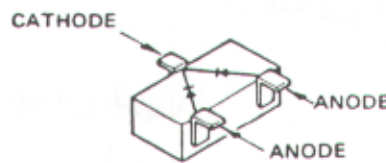
1SS272 (A1) (D206,207)  
1SS319 (A4) (D203)



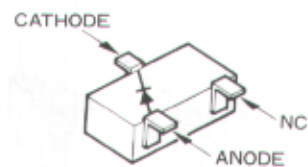
FMN1 (N1) (D204,205)



IMN10 (N10) (D202,210)



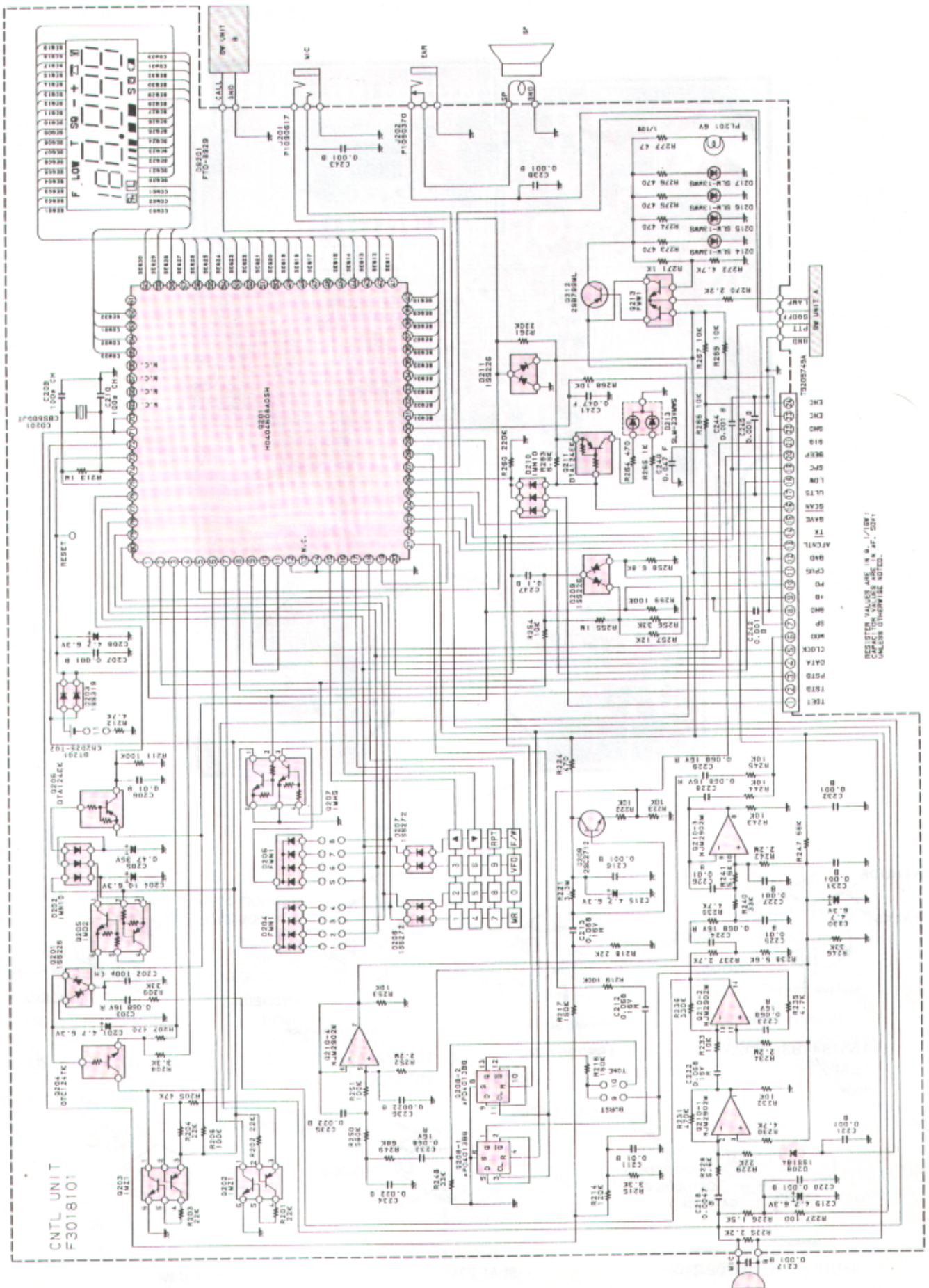
SLM-23VMWS (D213)



SLM-13MWS  
(D214,215,216,217)



# CONTROL UNIT CIRCUIT DIAGRAM



RESISTOR VALUES ARE IN  $\Omega$ ,  $k\Omega$ ,  $M\Omega$ , UNLESS OTHERWISE NOTED.

CNTL UNIT  
F3018101

SEMICONDUCTORS  
SUB-UNITS



# CONTROL UNIT PARTS LIST

## \*\*\* CNTL UNIT \*\*\*

|           |                        |          |              |
|-----------|------------------------|----------|--------------|
| CS0027002 | PCB with Components w/ | Sub-unit | Ver.A1       |
| CS0027003 | PCB with Components w/ | Sub-unit | Ver.A2       |
| CS0027004 | PCB with Components w/ | Sub-unit | Ver.A2 (USA) |
| CS0027005 | PCB with Components w/ | Sub-unit | Ver.A3       |
| CS0027006 | PCB with Components w/ | Sub-unit | Ver.B1       |
| CS0027007 | PCB with Components w/ | Sub-unit | Ver.B2       |
| CS0027008 | PCB with Components w/ | Sub-unit | Ver.B3       |

## F3018101C Printed Circuit Board

|       |           |              |                 |
|-------|-----------|--------------|-----------------|
| Q201  | G1090919  | IC           | HD404608-A05H   |
| Q202  | G3070025  | Transistor   | 1MZ1-T108       |
| Q203  | G3070025  | Transistor   | 1MZ1-T108       |
| Q204  | G3070031  | Transistor   | DTC124TK-T97    |
| Q205  | G3070026  | Transistor   | 1MD2-T108       |
| Q206  | G3070030  | Transistor   | DTA124EK-T97    |
| Q207  | G3070027  | Transistor   | 1MH5-T108       |
| Q208  | G1090668  | IC           | uPD4013BG       |
| Q209  | G3327127G | Transistor   | 2SC2712GR TE85R |
| Q210  | G1090908  | IC           | NJM2902M        |
| Q211  | G3070030  | Transistor   | DTA124EK-T97    |
| Q212  | G3207997L | Transistor   | 2SB799-T2ML     |
| Q213  | G3070009  | Transistor   | FMW1-T98        |
| D201  | G2070003  | Diode        | 1SS226 TE85R    |
| D202  | G2070078  | Diode        | 1MN10-T108      |
| D203  | G2070080  | Diode        | 1SS319 TE85R    |
| D204  | G2070068  | Diode        | FMNi-T99        |
| D205  | G2070068  | Diode        | FMN1-T99        |
| D206  | G2070048  | Diode        | 1SS272 TE85R    |
| D207  | G2070048  | Diode        | 1SS272 TE85R    |
| D208  | G2070009  | Diode        | 1SS184 TE85R    |
| D209  | G2070003  | Diode        | 1SS226 TE85R    |
| D210  | G2070078  | Diode        | 1MN10-T108      |
| D211  | G2070003  | Diode        | 1SS226 TE85R    |
| D213  | G2070096  | Diode        | SLM-23VMWS-T97  |
| D214  | G2070098  | Diode        | SLM-13MWS-T97   |
| D215  | G2070098  | Diode        | SLM-13MWS-T97   |
| D216  | G2070098  | Diode        | SLM-13MWS-T97   |
| D217  | G2070098  | Diode        | SLM-13MWS-T97   |
| DS201 | G6090075  | LCD          | FSD-8929A       |
| CO201 | H7900530  | Ceramic Osc. | CSB800JT        |
| R201  | J24185223 | Chip Res.    | 22k Ohm 1/16W   |
| R202  | J24185223 | Chip Res.    | 22k Ohm 1/16W   |
| R203  | J24185223 | Chip Res.    | 22k Ohm 1/16W   |
| R204  | J24185223 | Chip Res.    | 22k Ohm 1/16W   |
| R205  | J24185473 | Chip Res.    | 47k Ohm 1/16W   |
| R206  | J24185104 | Chip Res.    | 100k Ohm 1/16W  |
| R207  | J24185471 | Chip Res.    | 470 Ohm 1/16W   |
| R208  | J24185332 | Chip Res.    | 3.3k Ohm 1/16W  |
| R209  | J24185333 | Chip Res.    | 33k Ohm 1/16W   |
| R211  | J24185104 | Chip Res.    | 100k Ohm 1/16W  |
| R212  | J24185472 | Chip Res.    | 4.7k Ohm 1/16W  |
| R213  | J24185105 | Chip Res.    | 1M Ohm 1/16W    |
| R214  | J24185124 | Chip Res.    | 120k Ohm 1/16W  |
| R215  | J24185332 | Chip Res.    | 3.3k Ohm 1/16W  |

# CONTROL UNIT PARTS LIST

|      |           |                    |           |       |
|------|-----------|--------------------|-----------|-------|
| R216 | J24185151 | Chip Res.          | 150k Ohm  | 1/16W |
| R217 | J24185154 | Chip Res.          | 150k Ohm  | 1/16W |
| R218 | J24185223 | Chip Res.          | 22k Ohm   | 1/16W |
| R219 | J24185104 | Chip Res.          | 100k Ohm  | 1/16W |
| R221 | J24185335 | Chip Res.          | 3.3M Ohm  | 1/16W |
| R222 | J24185103 | Chip Res.          | 10k Ohm   | 1/16W |
| R223 | J24185103 | Chip Res.          | 10k Ohm   | 1/16W |
| R224 | J24185471 | Chip Res.          | 470 Ohm   | 1/16W |
| R225 | J24185222 | Chip Res.          | 2.2k Ohm  | 1/16W |
| R226 | J24185152 | Chip Res.          | 1.5k Ohm  | 1/16W |
| R227 | J24185101 | Chip Res.          | 100 Ohm   | 1/16W |
| R228 | J24205562 | Chip Res.          | 5.6k Ohm  | 1/10W |
| R229 | J24185223 | Chip Res.          | 22k Ohm   | 1/16W |
| R230 | J24185472 | Chip Res.          | 4.7k Ohm  | 1/16W |
| R231 | J24185474 | Chip Res.          | 470k Ohm  | 1/16W |
| R232 | J24185103 | Chip Res.          | 10k Ohm   | 1/16W |
| R233 | J24185103 | Chip Res.          | 10k Ohm   | 1/16W |
| R234 | J24185225 | Chip Res.          | 2.2M Ohm  | 1/16W |
| R235 | J24185472 | Chip Res.          | 4.7k Ohm  | 1/16W |
| R236 | J24185334 | Chip Res.          | 330k Ohm  | 1/16W |
| R237 | J24185272 | Chip Res.          | 2.7k NOhm | 1/16W |
| R238 | J24185562 | Chip Res.          | 5.6k Ohm  | 1/16W |
| R239 | J24185472 | Chip Res.          | 4.7k Ohm  | 1/16W |
| R240 | J24185333 | Chip Res.          | 33k Ohm   | 1/16W |
| R241 | J24185562 | Chip Res.          | 5.6k Ohm  | 1/16W |
| R242 | J24185225 | Chip Res.          | 2.2M Ohm  | 1/16W |
| R243 | J24185103 | Chip Res.          | 10k Ohm   | 1/16W |
| R244 | J24185103 | Chip Res.          | 10k Ohm   | 1/16W |
| R245 | J24185103 | Chip Res.          | 10k Ohm   | 1/16W |
| R246 | J24185333 | Chip Res.          | 33k Ohm   | 1/16W |
| R247 | J24185563 | Chip Res.          | 56k Ohm   | 1/16W |
| R248 | J24185333 | Chip Res.          | 33k Ohm   | 1/16W |
| R249 | J24185683 | Chip Res.          | 68k Ohm   | 1/16W |
| R250 | J24185564 | Chip Res.          | 560k Ohm  | 1/16W |
| R251 | J24185104 | Chip Res.          | 100k Ohm  | 1/16W |
| R252 | J24185225 | Chip Res.          | 2.2M Ohm  | 1/16W |
| R253 | J24185103 | Chip Res.          | 10k Ohm   | 1/16W |
| R254 | J24185103 | Chip Res.          | 10k Ohm   | 1/16W |
| R255 | J24185105 | Chip Res.          | 1M Ohm    | 1/16W |
| R256 | J24185333 | Chip Res.          | 33k Ohm   | 1/16W |
| R257 | J24185123 | Chip Res.          | 12k Ohm   | 1/16W |
| R258 | J24185682 | Chip Res.          | 6.8k Ohm  | 1/16W |
| R259 | J24185104 | Chip Res.          | 100k Ohm  | 1/16W |
| R260 | J24185224 | Chip Res.          | 220k Ohm  | 1/16W |
| R261 | J24185224 | Chip Res.          | 220k Ohm  | 1/16W |
| R263 | J24185682 | Chip Res.          | 6.8k Ohm  | 1/16W |
| R264 | J24185471 | Chip Res.          | 470 Ohm   | 1/16W |
| R265 | J24185102 | Chip Res.          | 1k Ohm    | 1/16W |
| R266 | J24185103 | Chip Res.          | 10k Ohm   | 1/16W |
| R267 | J24185103 | Chip Res.          | 10k Ohm   | 1/16W |
| R268 | J24185103 | Chip Res.          | 10k Ohm   | 1/16W |
| R269 | J24185103 | Chip Res.          | 10k Ohm   | 1/16W |
| R270 | J24185222 | Chip Res.          | 2.2k Ohm  | 1/16W |
| R271 | J24185102 | Chip Res.          | 1k Ohm    | 1/16W |
| R272 | J24185472 | Chip Res.          | 4.7k Ohm  | 1/16W |
| R273 | J24185471 | Chip Res.          | 470 Ohm   | 1/16W |
| R274 | J24185471 | Chip Res.          | 470 Ohm   | 1/16W |
| R275 | J24185471 | Chip Res.          | 470 Ohm   | 1/16W |
| R276 | J24185471 | Chip Res.          | 470 Ohm   | 1/16W |
| R277 | J24205470 | Chip Res.          | 47 Ohm    | 1/10W |
| C201 | K78080002 | Tantalum Chip Cap. | 4.7uF     | 6.3V  |

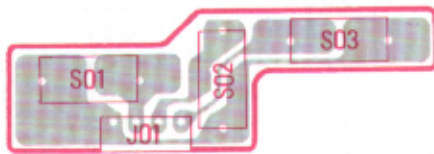
# CONTROL UNIT PARTS LIST

|        |  |   |                    |      |    |
|--------|--|---|--------------------|------|----|
| C202   | K22170235  | Chip Cap.   | 100pF              | 50V  | CH |
| C203   | K22120805  | Chip Cap.   | 0.068uF            | 16V  | R  |
| C204   | K78080003  | Tantalum Chip Cap.  | 10uF               | 6.3V |    |
| C205   | K78160005  | Tantalum Chip Cap.  | 0.47uF             | 35V  |    |
| C206   | K22170817  | Chip Cap.   | 0.01uF             | 50V  | B  |
| C207   | K22170805  | Chip Cap.   | 0.001uF            | 50V  | B  |
| C208   | K78080002  | Tantalum Chip Cap.  | 4.7uF              | 6.3V |    |
| C209   | K22170235  | Chip Cap.   | 100pF              | 50V  | CH |
| C210   | K22170235  | Chip Cap.   | 100pF              | 50V  | CH |
| C211   | K22170817  | Chip Cap.   | 0.01uF             | 50V  | B  |
| C212   | K22120805  | Chip Cap.   | 0.068uF            | 25V  | R  |
| C213   | K22120805  | Chip Cap.   | 0.068uF            | 50V  | R  |
| C215   | K78080002  | Tantalum Chip Cap.  | 4.7uF              | 6.3V |    |
| C216   | K22170805  | Chip Cap.   | 0.001uF            | 50V  | B  |
| C217   | K10176102  | Ceramic Cap.  | 0.001uF            | 50V  | B  |
| C218   | K22170813  | Chip Cap.   | 0.0047uF           | 50V  | B  |
| C219   | K78080002  | Tantalum Chip Cap.  | 4.7uF              | 6.3V |    |
| C220   | K22170805  | Chip Cap.   | 0.001uF            | 50V  | B  |
| C221   | K22170805  | Chip Cap.   | 0.001uF            | 50V  | B  |
| C222   | K22120805  | Chip Cap.   | 0.068uF            | 6.3V |    |
| C223   | K22120805  | Chip Cap.   | 0.068uF            | 50V  | R  |
| C224   | K22120805  | Chip Cap.   | 0.068uF            | 50V  | R  |
| C225   | K22170817  | Chip Cap.   | 0.01uF             | 50V  | B  |
| C226   | K22170817  | Chip Cap.   | 0.01uF             | 50V  | B  |
| C227   | K22170805  | Chip Cap.   | 0.001uF            | 50V  | B  |
| C228   | K22120805  | Chip Cap.   | 0.068uF            | 50V  | R  |
| C229   | K22120805  | Chip Cap.   | 0.068uF            | 50V  | R  |
| C230   | K78080002  | Tantalum Chip Cap.  | 4.7uF              | 6.3V |    |
| C231   | K22170805  | Chip Cap.   | 0.001uF            | 50V  | B  |
| C232   | K22170805  | Chip Cap.   | 0.001uF            | 50V  | B  |
| C233   | K22120805  | Chip Cap.   | 0.068uF            | 50V  | R  |
| C234   | K22170821  | Chip Cap.   | 0.022uF            | 50V  | B  |
| C235   | K22170821  | Chip Cap.   | 0.022uF            | 50V  | B  |
| C236   | K22170809  | Chip Cap.   | 0.0022uF           | 50V  | B  |
| C237   | K22141809  | Chip Cap.   | 0.1uF              | 25V  | B  |
| C238   | K22170805  | Chip Cap.   | 0.001uF            | 50V  | B  |
| C240   | K22141003  | Chip Cap.   | 0.047uF            | 25V  | F  |
| C241   | K22141003  | Chip Cap.   | 0.047uF            | 25V  | F  |
| C242   | K22170805  | Chip Cap.   | 0.001uF            | 50V  | B  |
| C243   | K22170805  | Chip Cap.   | 0.001uF            | 50V  | B  |
| C244   | K22170805  | Chip Cap.   | 0.001uF            | 50V  | B  |
| C245   | K22170805  | Chip Cap.   | 0.001uF            | 50V  | B  |
| MC201  | M3290008   | Microphone  | EM-78CYE           |      |    |
| J201   | P1090617   | Connector (EXT Mic)   | HSJ1102-01-540     |      |    |
| J202   | P1090370   | Connector (Ear)   | HSJ0836-01-010     |      |    |
| BAT201 | Q9000366<br>R7130220   | Lithium Battery<br>Insulator Sheet  | CR2025-T02         |      |    |
| PL201  | Q1000060<br><br>S6000146<br>R0128240<br>S2000030<br>R0129400<br>R0128690 | Lamp<br><br>Diffusor<br>Holder<br>Rubber Conductor<br>Shield Plate<br>SW Spring | KD-0001-01 6V 40mA |      |    |

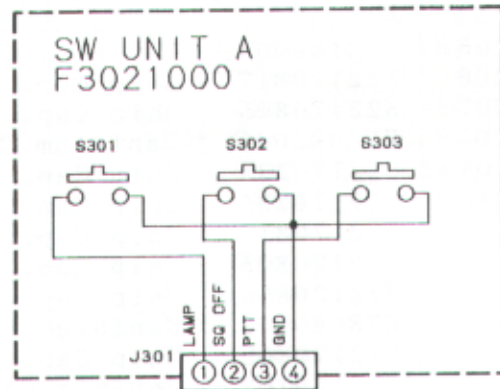


# SW UNIT A & B

## SW UNIT A (No. 3 × ×)



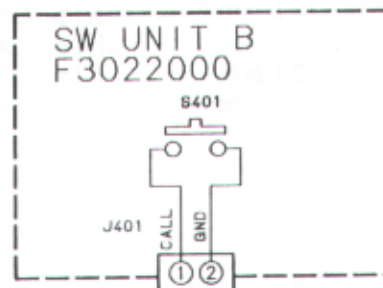
obverse view of "sw" side



## SW UNIT B (No. 4 × ×)



obverse view of "sw" side



### \*\*\* SW UNIT A \*\*\*

CP0952001 PCB w/Components

F3021000 Printed Circuit Board

|      |          |             |                       |
|------|----------|-------------|-----------------------|
| S301 | N5090027 | TACT Switch | SKHLAB                |
| S302 | N5090027 | TACT Switch | SKHLAB                |
| S303 | N5090027 | TACT Switch | SKHLAB                |
| J301 | P0090674 | Connector   | IMSA-9230B-1-04Z009-T |

### \*\*\* SW UNIT B \*\*\*

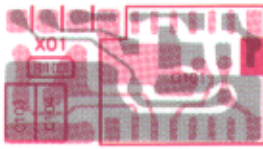
CP0951001 PCB w/Components

F3022000 Printed Circuit Board

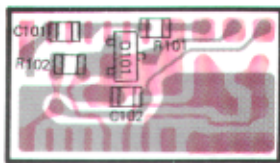
|      |          |             |                       |
|------|----------|-------------|-----------------------|
| S401 | N5090027 | TACT Switch | SKHLAB                |
| J401 | P0090672 | Connector   | IMSA-9230B-1-02Z009-T |

# (Version B, Only) T-BURST UNIT

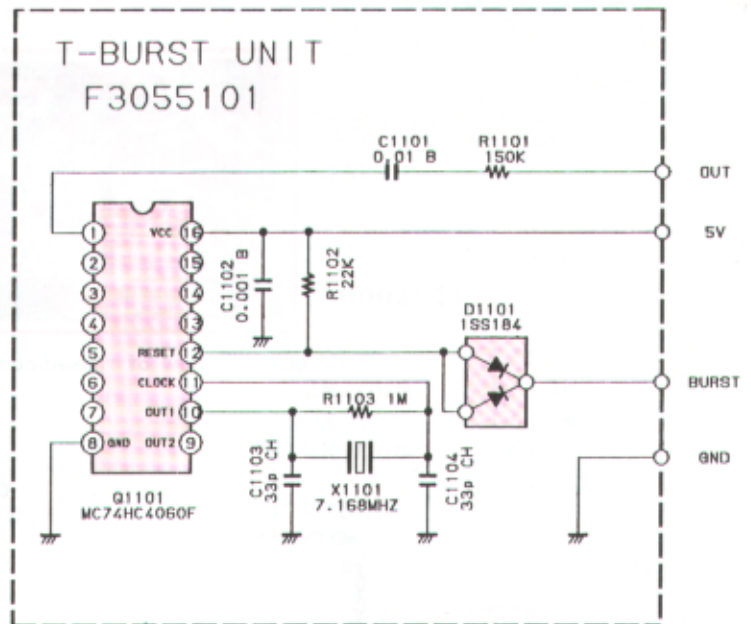
## T-BURST UNIT (No.11XX)



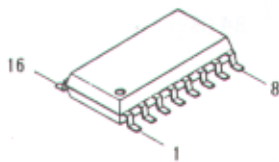
obverse view of "IC" side



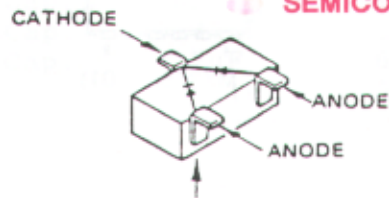
obverse view of "Diode" side



### SEMICONDUCTORS



MC74HC4060F (Q1101)



1SS184 (B3) (D1101)

### \*\*\* T-BURST UNIT \*\*\*

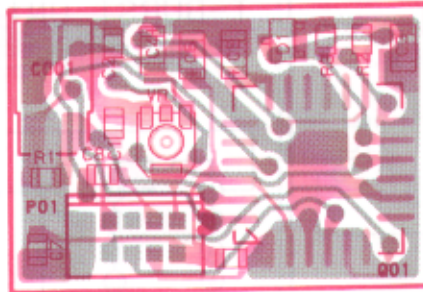
CP1934001 PCB with Components

F3055101 Printed Circuit Board

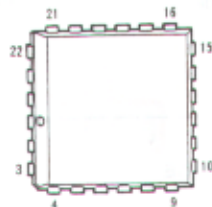
|       |           |           |                |
|-------|-----------|-----------|----------------|
| Q1101 | G1090984  | IC        | MC74HC4060FL   |
| D1101 | G2070009  | Diode     | 1SS184 TE85R   |
| X1101 | H0102930  | Crystal   | UM-1 7.168MHz  |
| R1101 | J24185151 | Chip Res. | 150k ohm 1/16W |
| R1102 | J24185223 | Chip Res. | 22k ohm 1/16W  |
| R1103 | J24185105 | Chip Res. | 1M ohm 1/16W   |
| C1101 | K22170817 | Chip Cap. | 0.01uF B       |
| C1102 | K22174809 | Chip Cap. | 0.001uF B      |
| C1103 | K22170223 | Chip Cap. | 33pF CH        |
| C1104 | K22170223 | Chip Cap. | 33pF CH        |

# FTS-17 PARTS LAYOUT/CIRCUIT DIAGRAM (OPTION)

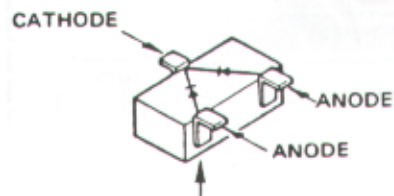
FTS-17 (No.XX)



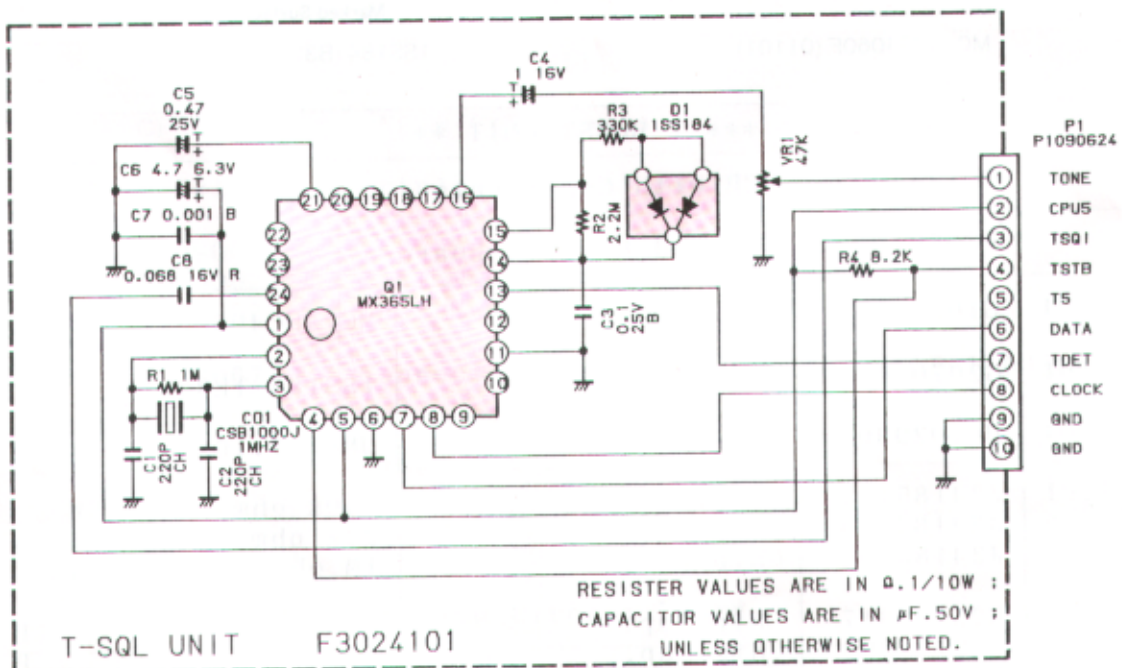
obverse view of "mixed-component" side



MX365LH (Q1)



1SS184 (B3) (D1)



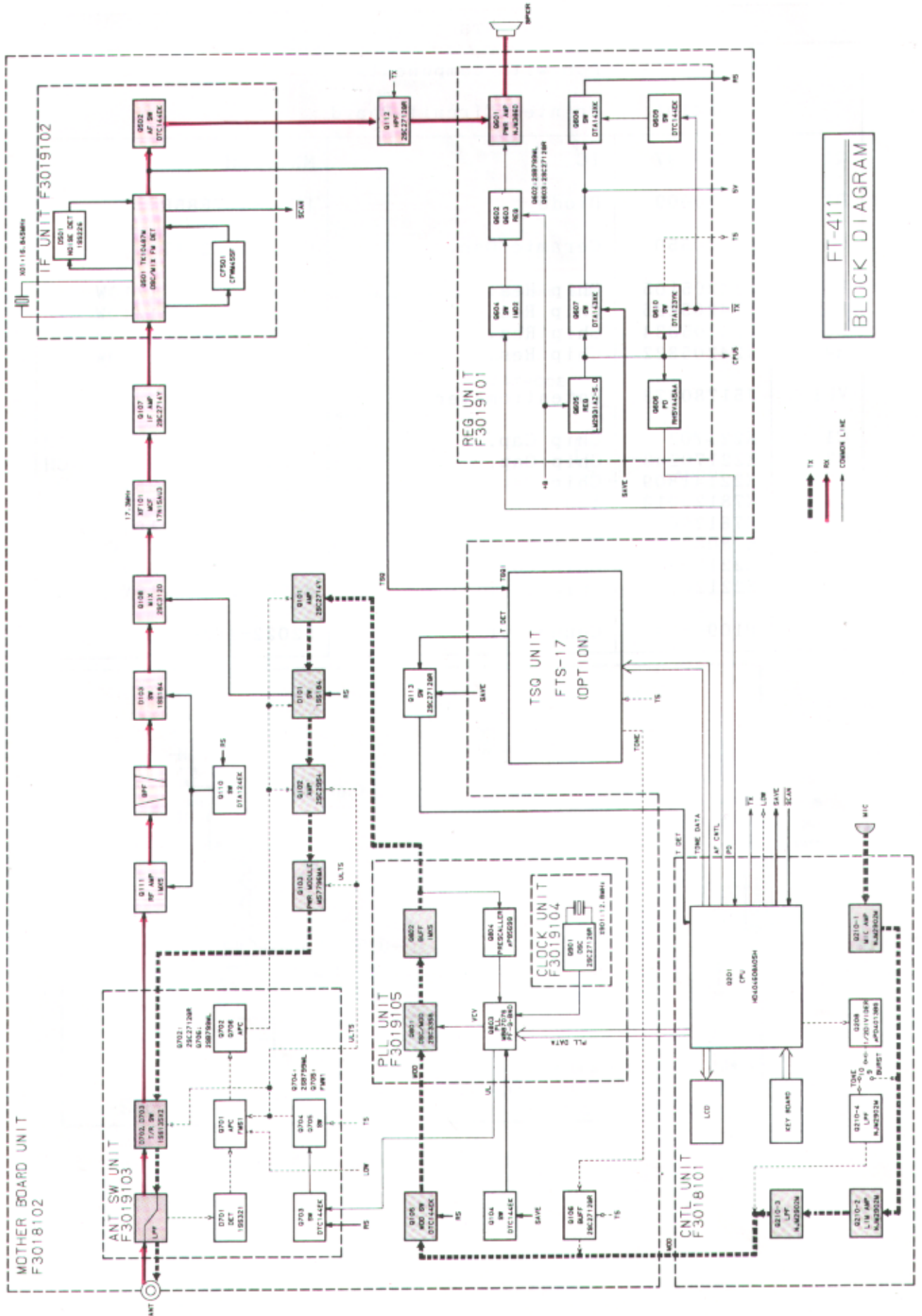
SEMICONDUCTORS



# FTS-17 PARTS LIST

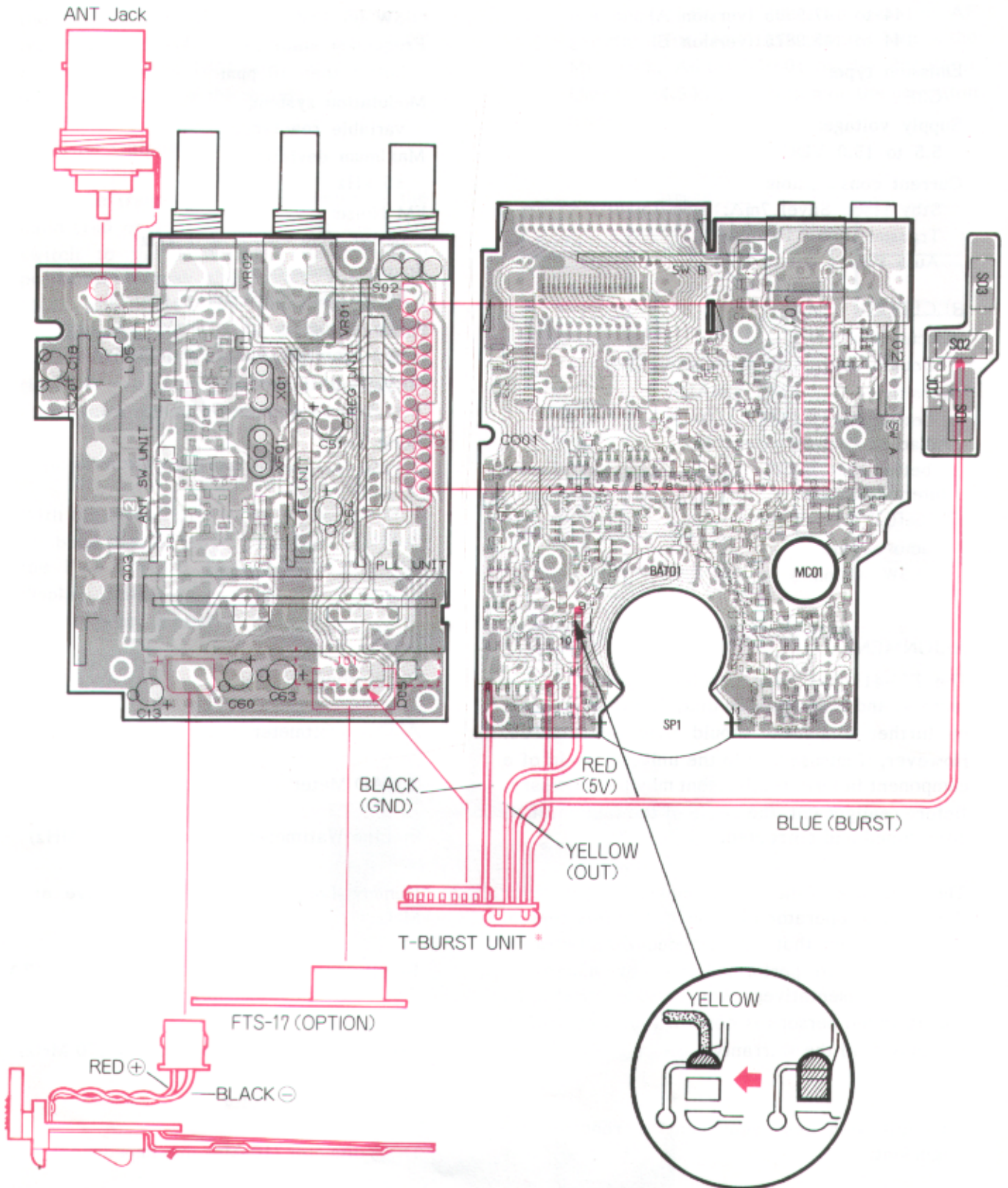
| ***** FTS-17 ***** |           |                       |              |       |    |
|--------------------|-----------|-----------------------|--------------|-------|----|
| CP1645001          |           | PCB with Components   |              |       |    |
| F3024101           |           | Printed Circuit Board |              |       |    |
| Q1                 | G1090897  | IC                    | MX365LH      |       |    |
| D1                 | G2070009  | Diode                 | 1SS184 TE85R |       |    |
| CO1                | H7900550  | Ceramic Osc.          | CSB1000J221T |       |    |
| R1                 | J24205105 | Chip Res.             | 1M Ohm       | 1/10W |    |
| R2                 | J24205225 | Chip Res.             | 2.2M Ohm     | 1/10W |    |
| R3                 | J24205334 | Chip Res.             | 330k Ohm     | 1/10W |    |
| R4                 | J24205822 | Chip Res.             | 8.2k Ohm     | 1/10W |    |
| VR1                | J51780473 | Potentiometer         | 47k Ohm      |       |    |
| C1                 | K22170243 | Chip Cap.             | 220pF        | 50V   | CH |
| C2                 | K22170243 | Chip Cap.             | 220pF        | 50V   | CH |
| C3                 | K22141809 | Chip Cap.             | 0.1uF        | 25V   | B  |
| C4                 | K78120013 | Tantalum Chip Cap.    | 1uF          | 16V   |    |
| C5                 | K78120012 | Tantalum Chip Cap.    | 0.47uF       | 16V   |    |
| C6                 | K78080002 | Tantalum Chip Cap.    | 4.7uF        | 6.3V  |    |
| C7                 | K22170805 | Chip Cap.             | 0.001uF      | 50V   | B  |
| C8                 | K22120805 | Chip Cap.             | 0.068uF      | 16V   | B  |
| P1                 | P1090624  | Connector             | 52022-1010   |       |    |

# BLOCK DIAGRAM



FT-411  
BLOCK DIAGRAM

# CONNECTION DIAGRAM





# SPECIFICATIONS/ALIGNMENT

## SPECIFICATIONS

### GENERAL

**Frequency coverage (MHz):**

144 to 147.9995 (version A)

144 to 145.9875 (version B)

**Emission type:**

G3E

**Supply voltage:**

5.5 to 15.0 VDC

**Current consumption:**

Stby (1sec Save) 7mA; Rcv: 150mA;

Transmit (6W): 1300 mA;

Auto Power Off: 6 mA

### RECEIVER

**Circuit type:**

Double-conversion superheterodyne

**Sensitivity (for 12dB SINAD):**

better than 0.158uV (-10dBu)

**Adjacent channel selectivity:**

better than 60dB

**Intermodulation:**

better than 65dB

**Audio output:**

0.5W @8 ohms for 5% THD (12V)

### ALIGNMENT

The FT-411 has been carefully aligned at the factory, and is designed so that, during proper use, no further alignment should ever be required. However, if misused, or in the unlikely event of a component failure, realignment may be necessary. Before realignment, the cause of the fault must be determined and corrected.

The small size of the FT-411 makes it difficult for the average operator to service. For this reason, we recommend that all component replacement and service be performed only by authorized Yaesu representatives. Any service attempt by unauthorized persons is done at the owner's risk, and may void the warranty.

The following test equipment is required for alignment:

RF Signal Generator with calibrated output level at 170 MHz

Deviation Meter (linear detector)

### TRANSMITTER

**Power output:**

5W @ 12V

**Frequency stability:**

better than 10 ppm

**Modulation system:**

variable reactance

**Maximum deviation:**

±5 kHz

**FM Noise:**

better than -40dB @ 1 kHz

**Spurious emissions:**

better than 60dB below carrier

**Audio distortion (@ 1 kHz):**

less than 5%, w/3 kHz deviation

**Microphone type:**

2-kilohm condenser

**Burst tone:**

1750 Hz (except version A)

Oscilloscope

AF Millivoltmeter

SINAD Meter

In-Line Wattmeter (accurate at 170 MHz)

Dummy Load (50-ohm, non-reactive at 170 MHz)

Regulated, Adjustable DC Power Supply (2A @ 4 to 17V) with Ammeter

Frequency Counter (±0.2 ppm @ 170 MHz)

AF Signal Generator

DC Voltmeter (10-Megohm impedance)

### CAUTION!

The FT-411 cannot be properly aligned with an antenna, because of interaction between the antenna and the transceiver circuitry.

# (PLL & Transmitter) ALIGNMENT

## PLL VCV (Varactor Control Voltage)

Connect the DC voltmeter between L801 on the PLL Unit and Chassis Ground. Tune the transceiver to 144.000 MHz, close the PTT switch and adjust T801 on the PLL Unit for  $0.05 \pm 0.05$  VDC on the meter.

## Transmitter Output Power

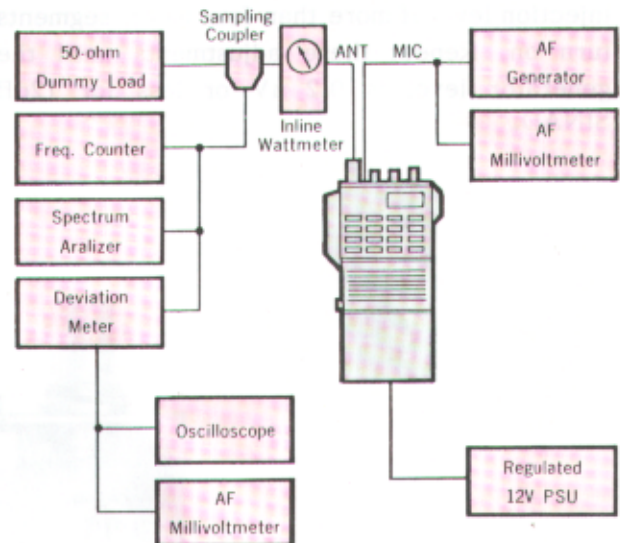
Tune the transceiver to the center of the band (145 or 146 MHz), and set the LOW switch to the high power (undeepressed) position. Increase the supply voltage to 13.8V, and adjust VR701 on the Antenna SW Unit for peak output power (at least 5 watts with less than 1.5A supply current). Press the LOW switch and confirm 0.3 to 1.0 watt, then return the supply voltage to 12V.

## PLL Reference Frequency

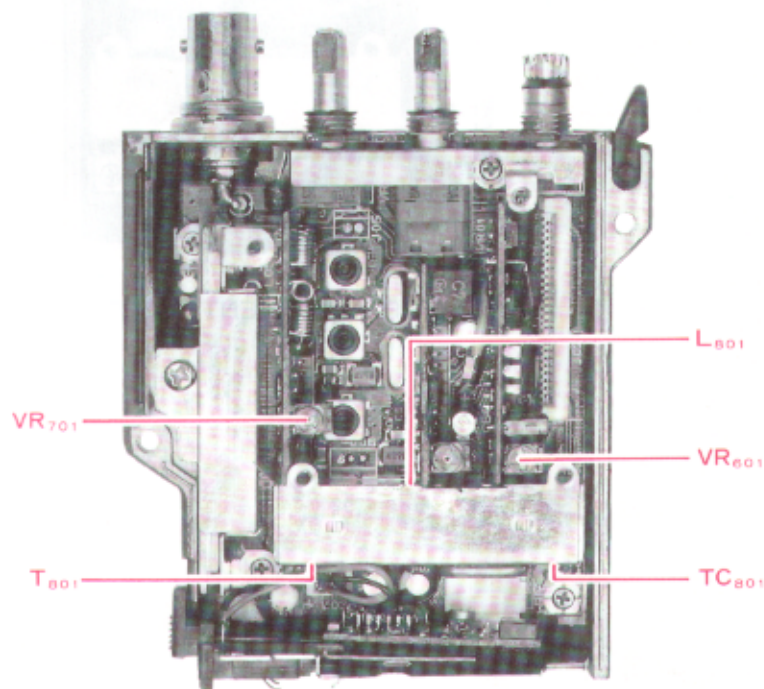
With the transceiver tuned to the center of the band (145 or 146 MHz), adjust TC801 on the PLL Unit, if necessary, so that the display frequency matches the frequency counter when transmitting.

## Modulation Level

With the transceiver tuned to the center of the band (145 or 146 MHz), set the AF generator for 25mV injection at 1 kHz to the MIC jack. Adjust VR601 on the Regulator Unit for  $\pm 4.5$  kHz deviation on the deviation meter.



PLL & TRANSMITTER ALIGNMENT SETUP



PLL & TRANSMITTER ALIGNMENT POINTS

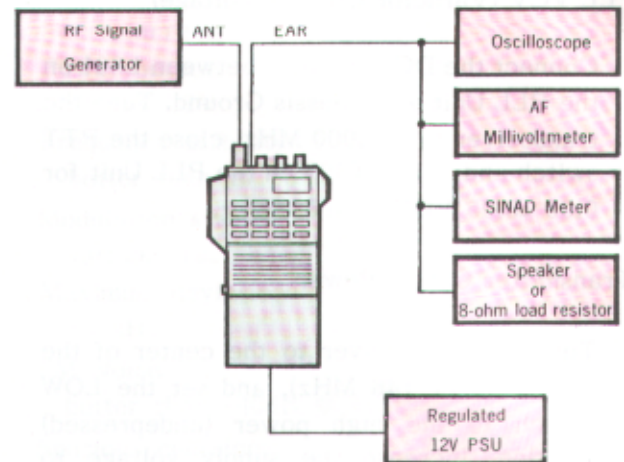


# ALIGNMENT (Receiver)

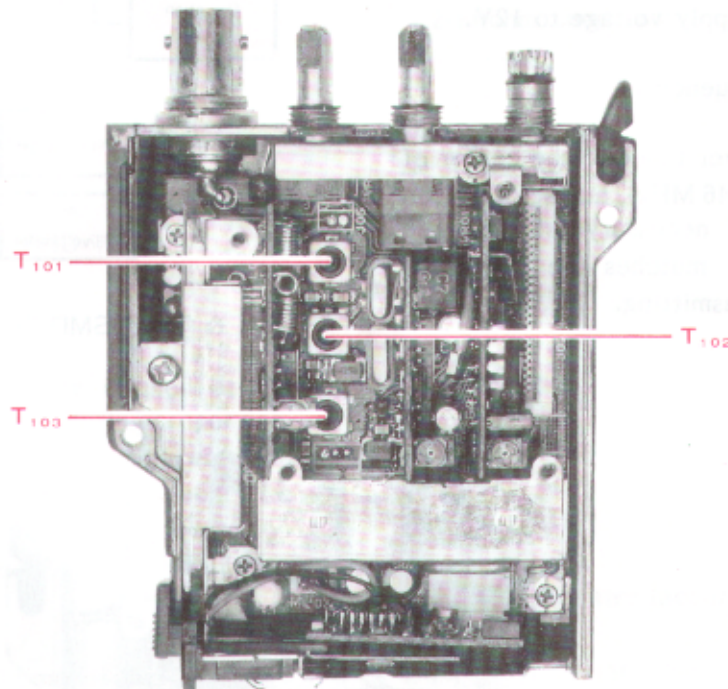
Set up the test equipment as shown above for receiver alignment.

With the transceiver and RF signal generator both tuned to the center of coverage (145 or 146 MHz), inject a 1 kHz tone with  $\pm 3.5$  kHz deviation at 40 dBu to the antenna jack.

Adjust T101 through T103 on the Mother Board for maximum S-meter indication, reducing the injection level if more than four meter segments turn on. Repeat these adjustments until the generator level is 0.2  $\mu$ V or less for 12dB SINAD.



RECEIVER ALIGNMENT SETUP



RECEIVER ALIGNMENT POINTS