# 3.4 Short Tuning Procedure

Use this procedure only if you want to reprogram the T856/857 to a frequency outside the 8MHz switching range and do not intend to carry out any other major adjustments or repairs.

## 3.4.1 Introduction

Reprogram the operating frequency as described in the PGM800Win programming kit (refer to Section 3.2).

Remove the top cover (nearest the handle).

Set up the test equipment as described in Section 3.3.

Set the links in the audio processor section as required (refer to Section 3.5).

## 3.4.2 Synthesiser Alignment

• Connect a high impedance voltmeter to the junction of L1 & R1 in the VCO (this measures the synthesiser loop voltage).

• Key the transmitter by earthing the Tx key line.

• **Single Channel**     Tune VCO trimmer C6 for a synthesiser loop voltage of 9V.

   **Multichannel**       Tune VCO trimmer C6 for a synthesiser loop voltage of 10V on the middle channel.

   If there is no middle channel, tune C6 so that the channels are symmetrically placed around a loop voltage of 10V.

   All channels should lie within the upper and lower limits of 16V and 3V respectively.

   Do not attempt to program channels with a greater frequency separation than the specified switching range of 8MHz.

## 3.4.3 Output Power Adjustment (T856 Only)

Connect an RF power meter to the output socket and key the transmitter.

Turn RV320 (power adjust) fully clockwise.

Tune CV451 (output power trim) for maximum output power and check that this is >30W.

Adjust RV320 for the required output power (between 5 and 25W).

Readjust CV451 to reduce the supply current by up to 0.5A.

### 3.4.4     Two Point Modulation Adjustment

*Note 1:*      In this and following sections deviation settings are given first for wide bandwidth sets, followed by settings in brackets for narrow bandwidth sets [ ].

*Note 2:*      Reference modulation and limiter adjustment are controlled by PGM800Win. Electronic potentiometers (256 step) are used to allow channel-by-channel adjustment of deviation and two point modulation.

*Note 3:*      To optimise the modulation response across the switching band, repeat steps 1-4 below for each channel that will be used (usually needed only for data applications). In applications where the modulation response is less critical (e.g. voice use only), carry out steps 1-4 below on the middle channel and cut and paste the value to all other channels.

1.     Inject an audio signal of 250Hz 1.5V rms (+5dBm) into the CTCSS input (D-range 1 (PL100) pin 8).

       Key the transmitter by earthing the Tx key line.

2.     Adjust the output from the audio generator to obtain ±3kHz [±1.5kHz] deviation at 250Hz.

3.     Change the input frequency to 100Hz and adjust IC220 via PGM800Win "reference modulation" to obtain ±3kHz [±1.5kHz] deviation (you can use either the mouse or up and down arrow keys).

4.     Change the input frequency back to 250Hz.

       Repeat steps 2 and 3 above until the deviations achieved at the two input frequencies are within 0.2dB of each other. You will need to do this at least four times.

5.     Sweep the audio between 50 and 300Hz for peaks.

*Note:*        A peak between 50 and 300Hz will indicate a fault condition, i.e:

                   - incorrect set-up
       or      - modulation circuitry fault.

       The specification window is ±1dB relative to 150Hz from 67 to 260Hz.

### 3.4.5     FM Deviation (Limiter) Adjustment

*Note:*        If the T856/857 will be used over the whole 8MHz switching range, you must set the deviation for each channel. However, if the module will be used on frequencies that cover only a 1MHz (or less) switching range, you can set the deviation on the middle channel and use this value for all other channels with the "fill" option in PGM800Win.

       Inject 1kHz at -10dBm into the line input (D-range 1 (PL100) pins 1 & 4; pins 2 & 3 shorted).

Adjust RV210 (line sensitivity) fully clockwise and key the transmitter by earthing the Tx key line.  Adjust IC220 via PGM800Win "deviation" to set the peak deviation to ±4.7kHz [±2.3kHz] (you can use either the mouse or up and down arrow keys).

Sweep the audio frequency from 100Hz to 4kHz and ensure that the maximum deviation does not exceed 4.7kHz [2.3kHz] (3.8kHz).  Readjust IC220 if necessary via PGM800Win "deviation".

### 3.4.6    Line-in Level Adjustment

Set the injected signal at the line input to the required line level (typically -10 to -20dBm).

Adjust RV210 (line sensitivity) to provide ±3kHz [±1.5kHz] (±2.4kHz) deviation.

# 3.7      PA Alignment (T856 Only)

Check that the exciter is connected to the PA with the coaxial link.

Connect an RF power meter to the PA output (use appropriate attenution as necessary).

Turn RV310 (power adjust) fully clockwise.

*Note:*      Before the following measurement is taken enusre the heatsink is at ambiant temperature (20-25°C).

Measure and record the voltage (VL) at L481; perform this measurement at room temperature so that the NTC (R481) is close to 25°C.

Key the transmitter by earthing the Tx key line.

Tune #CV475 until maximum power is obtained. Check that the power exceeds 30W.

Adjust RV310 (power control) to 25W.

Re-adjust #CV475 to reduce the supply currant by up to 0.5A.

# 3.8      Thermal Shutdown (T856 Only)

Key the transmitter by earthing the Tx key line and set the output power to 25W as described in Section 3.7.

Short L481 to ground.

Set RV330 (shutdown power level) for an output power of 5W.

Set RV210 (shutdown temperature) to 0.16VL volts (measured at IC350 pin 3), where VL is the voltage measured at L481 in Section 3.7. This sets the thermal shutdown at 85°C at NTC R481.

# 3    T856/857 Initial Tuning & Adjustment

The following section describes both short and full tuning and adjustment procedures and provides information on:

- channel programming
- selecting required audio links
- synthesiser alignment
- PA alignment (T856 only)
- modulator adjustment
- limiter adjustment
- setting line level
- compressor adjustment
- timer adjustment.

**Note:**    Unless otherwise specified, the term "PGM800Win" used in this and following sections refers to version 2.00 and later of the software.

Refer to Figure 4.3 which shows the location of the main tuning and adjustment controls. Refer also to Section 6 where the parts lists, grid reference index and diagrams will provide detailed information on identifying and locating components and test points on the main PCB. The parts list and diagrams for the VCO PCB are in Part E.

# 3.1      Introduction

When you receive your T856 transmitter or T857 exciter it will be run up and working on a particular frequency (the "default channel")[1]. If you want to switch to a frequency that is within the 8MHz switching range (i.e. ±4MHz from the factory programmed frequency), you should only need to reprogram the transmitter/exciter with the PGM800Win software (refer to the PGM800Win programming kit and Section 3.2 below).

However, if you want to switch to a frequency outside the 8MHz switching range, you will have to reprogram and re-tune the transmitter/exciter to ensure correct operation. In this case you should carry out the short tuning procedure described in Section 3.4.

If you have carried out repairs or other major adjustments, you must carry out the full tuning and adjustment procedure described in this section (except for Section 3.4).

# 3.2      Channel Programming

You can program up to 128 channel frequencies into the transmitter/exciter's EEPROM memory (IC820) by using the PGM800Win software package and an IBM™ PC. You can also use PGM800Win to select the transmitter/exciter's current operating frequency (or "default channel").

For a full description of the channel programming procedure, refer to the PGM800Win programming software user's manual.

**?**  *Note:*        When an ancillary D-range kit is fitted, you can also select a channel with an external switch, such as the DIP switch on the rack frame backplane PCB. Refer to Part C in the T800 Series Ancillary Equipment Service Manual (M800-00-101 or later issue) or consult your nearest Tait Dealer or Subsidiary for further details.

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1.  Use the "Read Module" function in PGM800Win to find out what the default channel is.

# ? 3.3     Test Equipment Required

You will need the following test equipment:

- computer with PGM800Win installed
- T800 programming kit
- 13.8V power supply
- digital multimeter
- audio signal generator
- RF power meter
- audio voltmeter x 2                          } or RF test set (optional)
- modulation meter
- oscilloscope (digital preferred)
- 20dB pad

? 
- T800-<u>XX</u> calibration test unit (optional)

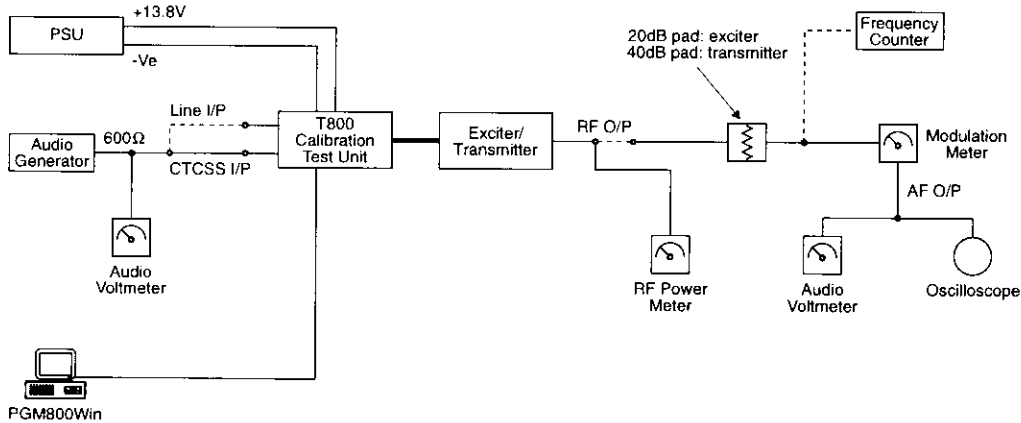Figure 3.1 and Figure 3.2 show typical test equipment set-ups.



*Figure 3.1   T856/857 Test Equipment Set-up With T800-XX*
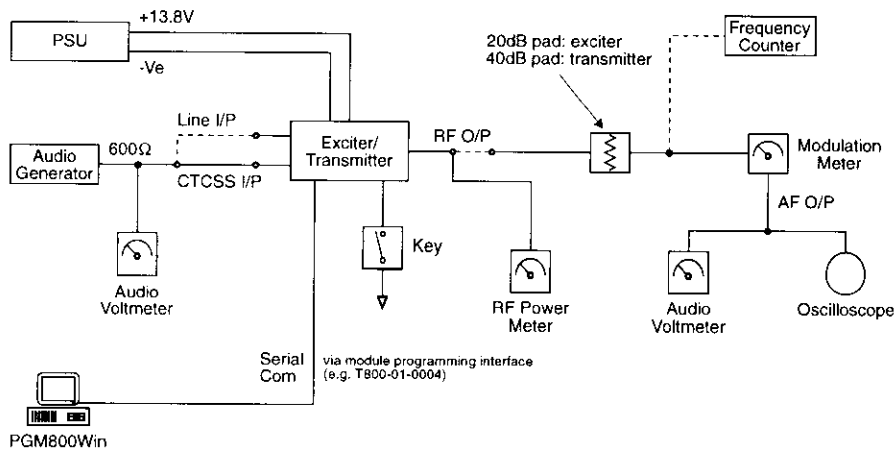


*Figure 3.2   T856/857 Test Equipment Set-up Without T800-XX*

# 3.5     Audio Processor Links

## 3.5.1     Link Details

Use the following table to set up the audio processor to the configuration you require. You should set the audio processor links before carrying out any of the tuning and adjustment procedures. The factory settings are shown in brackets [ ].

| Plug | Link[a] | | Function |
|---|---|---|---|
| PL205 | 1-2 | A | not connected |
| | [3-4] | B | microphone pre-amp. output to compressor input |
| | 5-6 | C | microphone pre-amp. output to multiplexer input |
| PL210 | [1-2] | L | multiplexer output to pre-emphasis input |
| | 3-4 | M | multiplexer output to limiter input |
| | 5-6 | N | multiplexer output to compressor input |
| PL215 | 1-2 | G | not connected |
| | [3-4] | H | compressor output to multiplexer input |
| | 5-6 | I | compressor output to limiter input |
| | 7-8 | J | compressor output to pre-emphasis input |
| | 9-10 | K | not connected |
| PL220 | 1-2 | D | pre-emphasis output to multiplexer input |
| | [3-4] | E | pre-emphasis output to limiter input |
| | 5-6 | F | not connected |

a.  The letters in this column and in the table in Section 3.5.2 below refer to the identification letters screen printed onto the PCB beside each pair of pins.

## 3.5.2     Typical Options

| | PL205 | PL210 | PL215 | PL220 |
|---|---|---|---|---|
| microphone pre-amp. compressed and pre-emphasised; line input pre-emphasised (standard set-up) | [3-4] B | [1-2] L | [3-4] H | [3-4] E |
| microphone pre-amp. compressed and pre-emphasised; line input unprocessed | 3-4 B | 3-4 M | 7-8 J | 1-2 D |
| line and microphone compressed and pre-emphasised | 5-6 C | 5-6 N | 7-8 J | 3-4 E |
| microphone pre-amp. compressed; line and microphone flat response | 3-4 B | 3-4 M | 3-4 H | 5-6 F |

## ? 3.6    Synthesiser Alignment

- Ensure that the T856/857 has been programmed with the required frequencies using PGM800Win software.

- **Single Channel**       Select a channel using PGM800Win.

  **Multichannel**        Select the middle channel via PGM800Win.

- Connect a high impedance voltmeter to the junction of L1 and R1 in the VCO (this measures the synthesiser loop voltage).

- Key the transmitter by earthing the Tx key line.

  **Single Channel**       Tune VCO trimmer C6 for a synthesiser loop voltage of 9V.

  **Multichannel**        Tune VCO trimmer C6 for a synthesiser loop voltage of 9V on the middle channel.

                                 If there is no middle channel, tune CV1 so that the channels are symmetrically placed around a loop voltage of 9V.

                                 All channels should lie within the upper and lower limits of 15V and 5V respectively.

                                 Do not attempt to program channels with a greater frequency separation than the specified switching range (8MHz).

- Check that the exciter output power is 1W±300mW (**T857 only**).

- Measure the exciter output frequency and adjust the TCXO (IC700) trimmer if required.

⚠ *Caution:*       **This trimmer is susceptible to physical damage. Do not exert a downward force of more than 500g (1lb) when adjusting.**

# 3.9      Audio Processor

## 3.9.1      Two Point Modulation

The T856 and T857 utilise two point modulation to obtain a wide audio bandwidth independent of the synthesiser loop filter response. This is achieved by simultaneously frequency modulating the VCO and phase modulating the synthesiser reference frequency. The relative signal levels fed to the two modulators are quite critical and cause interaction when setting up.

Both modulating signals require readjustment when the exciter is shifted in frequency greater than the switching range (i.e. $\Delta F > \pm 4MHz$).

**?** **Note 1:**      In this and following sections deviation settings are given first for wide bandwidth sets, followed by settings in square brackets for narrow bandwidth sets [ ] and round brackets ( ) for mid bandwidth sets.

**Note 2:**      Reference modulation and limiter adjustment are controlled by PGM800Win. Electronic potentiometers (256 step) are used to allow channel-by-channel adjustment of deviation and two point modulation.

**Note 3:**      To optimise the modulation response across the switching band, repeat steps 1-4 below for each channel that will be used (usually needed only for data applications). In applications where the modulation response is less critical (e.g. voice use only), carry out steps 1-4 below on the middle channel and cut and paste the value to all other channels.

## 3.9.2      Modulator Adjustment

1.    Inject an audio signal of 600Hz 1.5V rms (+5dBm) into the CTCSS input (D-range 1 (PL100) pin 8).

      Key the transmitter by earthing the Tx key line.

2.    Adjust the output from the audio generator to obtain ±3kHz [±1.5kHz] deviation at 600Hz.

3.    Change the input frequency to 120Hz and adjust IC220 via PGM800Win "reference modulation" to obtain ±3kHz [±1.5kHz] deviation.

4.    Change the input frequency back to 600Hz.

      Repeat steps 2 and 3 above until the deviations achieved at the two input frequencies are within 0.2dB of each other. You will need to do this at least four times.

5.    Sweep the audio between 50 and 300Hz for peaks.

**Note:**      A peak between 50 and 300Hz will indicate a fault condition, i.e:

             - incorrect set-up
      or     - modulation circuitry fault.

The specification window is ±1dB relative to 150Hz from 65 to 260Hz.

### 3.9.3    Limiter Adjustment

*Note:*        If the T856/857 will be used over the whole 8MHz switching range, you
              must set the deviation for each channel.  However, if the module will be
              used on frequencies that cover only a 1MHz (or less) switching range, you
              can set the deviation on the middle channel and use this value for all other
              channels with the "fill" option in PGM800Win.

Set the links in the audio processor section as required (refer to Section 3.5).

Inject 1kHz at -10dBm into the line input (D-range 1 (PL100) pins 1 & 4; and pins 2
& 3 shorted; refer to Section 1.2 of Part F).

Adjust RV210 (line sensitivity) fully clockwise and key the transmitter by earthing
the Tx key line.  Adjust IC220 via PGM800Win "deviation" to set the peak devia-
tion to ±4.7kHz [±2.3kHz] (you can use either the mouse or up and down arrow
keys).

Sweep the audio frequency from 100Hz to 4kHz and ensure that the maximum
deviation does not exceed 4.7kHz [2.3kHz] (3.8kHz).  Readjust IC220 if necessary
via PGM800Win "deviation".

### 3.9.4    Line Level Without Compressor

This section assumes that the compressor is not used.  If the compressor is required,
refer to Section 3.9.5.

Adjust the line sensitivity as follows:

* set the injected signal at the line input to the required line level (typically -10 to
  -20dBm);

* adjust RV210 (line sensitivity) to provide ±3kHz [±1.5kHz] (±2.4kHz) devia-
  tion.

### 3.9.5    Compressor

The compressor may be used on the line input only, the microphone input only, or on
both the line and microphone inputs.  If the compressor is used, refer to one of the fol-
lowing sections as appropriate.

#### 3.9.5.1    Compressor On Line Input Only

Set RV210 (line sensitivity) fully clockwise and key the transmitter by earthing the
Tx key line.

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## T856 TRANSMITTER - LIST OF ACTIVE DEVICES

| Designation | IPN | Comp. Code | Description |
|---|---|---|---|
| #L355 | 052-08125-15 | 15H25 | COIL A/W 1.5T/2.5MM HOR 0.8MM |
| #L910 | 052-08145-15 | 15H45 | COIL A/W 1.5T/4.5MM HOR 0.8MM |
| #L930 | 052-08150-15 | 15H50 | COIL A/W 1.5T/5.0MM HOR 0.8MM |
| #L940 | 052-08145-15 | 15H45 | COIL A/W 1.5T/4.5MM HOR 0.8MM |
| =IC700 | 539-00010-47 | GFS-415 | TCXO GFS-415 12.8MHZ +/-2PPM -25 TO +75C |
| IC210 | 002-10003-24 | LM324D | IC LM324D QUAD OP AMP  SO14 |
| IC220 | 002-10126-70 | DS1267S | IC DS1267S DUAL DIGITAL POT  SOL16 |
| IC230 | 002-10003-24 | LM324D | IC LM324D QUAD OP AMP  SO14 |
| IC240 | 002-10040-53 | 4053BD | IC 4053BD 2CH MUX/DEMUX SO16 |
| IC250 | 002-00020-50 | 4N25 | IC 4N25A OPTO COUPLER  DIP6 |
| IC260 | 002-10003-24 | LM324D | IC LM324D QUAD OP AMP  SO14 |
| IC330 | 002-10003-58 | 358D | IC 358D DUAL OP AMP SO8 |
| IC350 | 002-10003-58 | 358D | IC 358D DUAL OP AMP  SO8 |
| IC370 | 002-12951-00 | LP2951M | IC LP2951M REGULATOR 100MA SMD  SO8 |
| IC610 | 002-00014-58 | 78L05 | IC 78L05 REG 5V 100MA  TO-92 |
| IC630 | 002-00014-62 | LM317L | IC LM317L REGULATOR 100MA  TO-92 |
| IC640 | 002-10003-58 | 358D | IC 358D DUAL OP AMP  SO8 |
| IC650 | 002-10012-32 | DS1232 | IC DS1232LPS-2  LO-PWR RESET WATCHDOG  SO8 |
| IC710 | 002-74910-04 | 74HCU04T | IC 74HCU04T HEX INVERTER CMOS UNBUFFERED SO14 |
| IC720 | 002-74910-04 | 74HCU04T | IC 74HCU04T HEX INVERTER CMOS UNBUFFERED  SO14 |
| IC730 | 002-10045-20 | 74HC4520T | IC 74HC4520T  DUAL BINARY COUNTER 4BIT  SO16 |
| IC740 | 002-14519-10 | 145191F | IC MC145191F SYNTHESIZER  SOG20 |
| IC750 | 002-10330-78 | 33078D | IC 33078D-R2 DUAL OP AMP LOW NOISE SO8 |
| IC820 | 002-12416-00 | 24C01A16 | IC 24C01A16 16K LO-VOLT SERIAL EEPROM      SO8 |

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## T856 TRANSMITTER -- LIST OF ACTIVE DEVICES

| Ref | Part Number | Type | Description | Pkg |
|---|---|---|---|---|
| IC830 | 002-10003-24 | LM324D | IC LM324D QUAD OP AMP | SO14 |
| L302 | 057-10120-03 | BLM21A05 | INDUCTOR SOLID CHIP EMI SUPPRESSION 200MA | 0805 |
| L303 | 057-10120-03 | BLM21A05 | INDUCTOR SOLID CHIP EMI SUPPRESSION 200MA | 0805 |
| L304 | 056-10330-02 | 330NHU2 | INDUCTOR FXD 330NH | SIEMENS SIMID02 1210 |
| L305 | 065-00010-04 | F8 | BEAD FERRITE 4*2*5/NEOSID F8/9.5MM& 7.5MM | |
| L310 | 065-00010-04 | F8 | BEAD FERRITE 4*2*5/NEOSID F8/9.5MM& 7.5MM | |
| L315 | 052-08130-65 | 65H30 | COIL A/W 6.5T/3.0MM HOR 0.8MM | |
| L320 | 056-10330-02 | 330NHU2 | INDUCTOR FXD 330NH | SIEMENS SIMID02 1210 |
| L325 | CU-ON-PCB | PRINTED | PRINTED INDUCTOR (MADE INTO THE PCB) | |
| L330 | CU-ON-PCB | PRINTED | PRINTED INDUCTOR (MADE INTO THE PCB) | |
| L333 | 057-10120-03 | BLM21A05 | INDUCTOR SOLID CHIP EMI SUPPRESSION 200MA | 0805 |
| L334 | 057-10120-03 | BLM21A05 | INDUCTOR SOLID CHIP EMI SUPPRESSION 200MA | 0805 |
| L335 | 052-08130-25 | 25H30 | COIL A/W 2.5T/3.0MM HOR 0.8MM | |
| L340 | CU-ON-PCB | PRINTED | PRINTED INDUCTOR (MADE INTO THE PCB) | |
| L345 | 065-00010-01 | 3B | BEAD 3B 6 HOLE | |
| L350 | CU-ON-PCB | PRINTED | PRINTED INDUCTOR (MADE INTO THE PCB) | |
| L405 | 052-08125-15 | 15H25 | COIL A/W 1.5T/2.5MM HOR 0.8MM | |
| L410 | 052-08160-15 | 15H60 | COIL A/W 1.5T/6.0MM HOR 0.8MM | |
| L415 | 065-00010-04 | F8 | BEAD FERRITE 4*2*5/NEOSID F8/9.5MM& 7.5MM | |
| L418 | CU-ON-PCB | PRINTED | PRINTED INDUCTOR (MADE INTO THE PCB) | |
| L420 | 065-00010-04 | F8 | BEAD FERRITE 4*2*5/NEOSID F8/9.5MM& 7.5MM | |
| L425 | 056-00021-04 | 330NHW | FXD INDUCTOR TYPE 104 330NH | |
| L430 | 065-00010-04 | F8 | BEAD FERRITE 4*2*5/NEOSID F8/9.5MM& 7.5MM | |
| L435 | 052-08160-15 | 15H60 | COIL A/W 1.5T/6.0MM HOR 0.8MM | |
| L440 | CU-ON-PCB | PRINTED | PRINTED INDUCTOR (MADE INTO THE PCB) | |
| L445 | 052-08130-35 | 35H30 | COIL A/W 3.5T/3.0MM HOR 0.8MM | |

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| | | |
|---|---|---|
| L450 | 065-00010-04 | F8 | BEAD FERRITE 4*2*5/NEOSID F8/9.5MM& 7.5MM |
| L455 | CU-ON-PCB | PRINTED | PRINTED INDUCTOR (MADE INTO THE PCB) |
| L460 | 065-00010-04 | F8 | BEAD FERRITE 4*2*5/NEOSID F8/9.5MM& 7.5MM |
| L465 | 051-00020-02 | 2002 | TAIT COIL 2002 A/W 10MM (0.4") LINK (INDUCTOR) |
| L470 | CU-ON-PCB | PRINTED | PRINTED INDUCTOR (MADE INTO THE PCB) |
| L475 | 051-00556-00 | 556 | TAIT COIL #556 INDUCTOR (COPPER SLOT CAR TRACK) |
| L480 | 056-10330-02 | 330NHU2 | INDUCTOR FXD 330NH        SIEMENS SIMID02 1210 |
| L481 | 056-10330-02 | 330NHU2 | INDUCTOR FXD 330NH        SIEMENS SIMID02 1210 |
| L485 | 056-10330-02 | 330NHU2 | INDUCTOR FXD 330NH        SIEMENS SIMID02 1210 |
| L520 | 057-10120-03 | BLM21A05 | INDUCTOR SOLID CHIP EMI SUPPRESSION 200MA   0805 |
| L610 | 056-00021-04 | 330NHV | FXD INDUCTOR TYPE 104 330NH VERT |
| L620 | 065-00010-04 | F8 | BEAD FERRITE 4*2*5/NEOSID F8/9.5MM& 7.5MM |
| L750 | 052-08125-15 | 15H25 | COIL A/W 1.5T/2.5MM HOR 0.8MM |
| L920 | 052-08150-15 | 15H50 | COIL A/W 1.5T/5.0MM HOR 0.8MM |
| Q210 | 000-10008-48 | BC848 | TRANSISTOR BCW60/BC848 NPN AF SMALL SIG  SOT-23 |
| Q220 | 000-10008-17 | BC817 | TRANSISTOR BCX19/BC817 NPN AF LOW POWER  SOT-23 |
| Q230 | 000-10008-48 | BC848 | TRANSISTOR BCW60/BC848 NPN AF SMALL SIG  SOT-23 |
| Q240 | 000-10008-48 | BC848 | TRANSISTOR BCW60/BC848 NPN AF SMALL SIG  SOT-23 |
| Q250 | 000-10008-17 | BC817 | TRANSISTOR BCX19/BC817 NPN AF LOW POWER  SOT-23 |
| Q260 | 000-10008-57 | BC857 | TRANSISTOR BCW70/BC857 PNP AF SMALL SIG  SOT-23 |
| Q270 | 000-00011-91 | BD139V | TRANSISTOR BD139 NPN AF PWR          TO-126 |
| Q310 | 000-10008-17 | BC817 | TRANSISTOR BCX19/BC817 NPN AF LOW POWER  SOT-23 |
| Q315 | 000-00012-15 | BD234 | TRANSISTOR BD234 PNP AF PWR          TO-126 |
| Q320 | 000-10008-48 | BC848 | TRANSISTOR BCW60/BC848 NPN AF SMALL SIG  SOT-23 |
| Q325 | 000-10008-48 | BC848 | TRANSISTOR BCW60/BC848 NPN AF SMALL SIG  SOT-23 |
| Q330 | 000-10008-07 | BC807 | TRANSISTOR BC807 PNP AF LOW POWER          SOT-23 |

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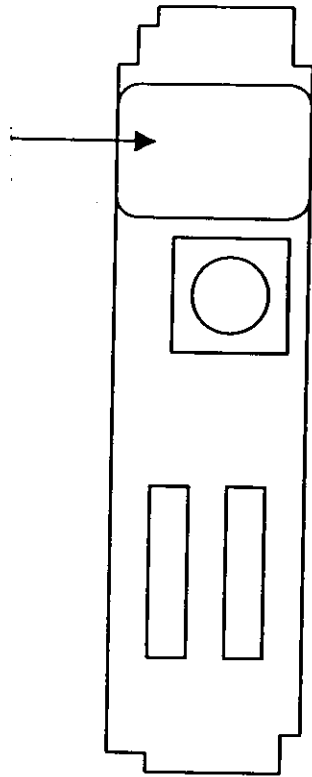
| | | | | |
|---|---|---|---|---|
| Q335 | 000-10008-07 | BC807 | TRANSISTOR BC807 PNP AF LOW POWER | SOT-23 |
| Q340 | 000-10008-07 | BC807 | TRANSISTOR BC807 PNP AF LOW POWER | SOT-23 |
| Q345 | 000-10008-07 | BC807 | TRANSISTOR BC807 PNP AF LOW POWER | SOT-23 |
| Q350 | 000-00005-55 | MRF555 | TRANSISTOR MRF555 NPN VHF MACRO-X | CASE 317D-02 |
| Q355 | 000-00032-56 | MRF630 | TRANSISTOR MRF630 NPN UHF POWER 3W | TO-39 |
| Q410 | 000-00022-75 | SD1433 | TRANSISTOR SD1433 NPN UHF PWR 10W .280 4L | CB-312 |
| Q420 | 000-00022-80 | SD1488 | TRANSISTOR SD1488 NPN UHF POWER 40W | 6LFL |
| Q505 | 000-10008-48 | BC848 | TRANSISTOR BCW60/BC848 NPN AF SMALL SIG | SOT-23 |
| Q510 | 000-10008-07 | BC807 | TRANSISTOR BC807 PNP AF LOW POWER | SOT-23 |
| Q520 | 000-10008-07 | BC807 | TRANSISTOR BC807 PNP AF LOW POWER | SOT-23 |
| Q530 | 000-10008-07 | BC807 | TRANSISTOR BC807 PNP AF LOW POWER | SOT-23 |
| Q540 | 000-10008-07 | BC807 | TRANSISTOR BC807 PNP AF LOW POWER | SOT-23 |
| Q550 | 000-10008-48 | BC848 | TRANSISTOR BCW60/BC848 NPN AF SMALL SIG | SOT-23 |
| Q610 | 000-10008-07 | BC807 | TRANSISTOR BC807 PNP AF LOW POWER | SOT-23 |
| Q620 | 000-00012-15 | BD234 | TRANSISTOR BD234 PNP AF PWR | TO-126 |
| Q630 | 000-50011-30 | BC557 | TRANSISTOR BC557B AI PNP AF SMALL SIG | TO-92 |
| Q660 | 000-10008-17 | BC817 | TRANSISTOR BCX19/BC817 NPN AF LOW POWER | SOT-23 |
| Q670 | 000-10008-57 | BC857 | TRANSISTOR BCW70/BC857 PNP AF SMALL SIG | SOT-23 |
| Q710 | 000-10008-48 | BC848 | TRANSISTOR BCW60/BC848 NPN AF SMALL SIG | SOT-23 |
| Q720 | 000-10008-57 | BC857 | TRANSISTOR BCW70/BC857 PNP AF SMALL SIG | SOT-23 |
| Q730 | 000-10008-48 | BC848 | TRANSISTOR BCW60/BC848 NPN AF SMALL SIG | SOT-23 |
| Q740 | 000-10008-57 | BC857 | TRANSISTOR BCW70/BC857 PNP AF SMALL SIG | SOT-23 |
| Q750 | 000-10008-07 | BC807 | TRANSISTOR BC807 PNP AF LOW POWER | SOT-23 |
| Q760 | 000-10008-48 | BC848 | TRANSISTOR BCW60/BC848 NPN AF SMALL SIG | SOT-23 |
| Q770 | 000-10008-57 | BC857 | TRANSISTOR BCW70/BC857 PNP AF SMALL SIG | SOT-23 |
| Q775 | 000-10008-57 | BC857 | TRANSISTOR BCW70/BC857 PNP AF SMALL SIG | SOT-23 |

FCCID: CASTEL0009 and CASTEL0010

IPN: 220-01397-02

## T856 TRANSMITTER - LIST OF ACTIVE DEVICES

| Q780 | 000-10008-48 | BC848 | TRANSISTOR BCW60/BC848 NPN AF SMALL SIG  SOT-23 |
| Q785 | 000-10008-57 | BC857 | TRANSISTOR BCW70/BC857 PNP AF SMALL SIG  SOT-23 |
| Q790 | 000-10003-12 | BFR31 | TRANSISTOR BFR31 N-CHANNEL JFET  UHF     SOT-23 |
| Q795 | 000-10057-10 | MMBR571 | TRANSISTOR MMBR571 NPN UHF LOW POWER    SOT-23 |
| Q810 | 000-10008-48 | BC848 | TRANSISTOR BCW60/BC848 NPN AF SMALL SIG  SOT-23 |
| Q820 | 000-10008-17 | BC817 | TRANSISTOR BCX19/BC817 NPN AF LOW POWER  SOT-23 |
| Q830 | 000-10008-57 | BC857 | TRANSISTOR BCW70/BC857 PNP AF SMALL SIG  SOT-23 |
| Q840 | 000-10008-57 | BC857 | TRANSISTOR BCW70/BC857 PNP AF SMALL SIG  SOT-23 |
| Q850 | 000-10008-48 | BC848 | TRANSISTOR BCW60/BC848 NPN AF SMALL SIG  SOT-23 |
| Q860 | 000-10008-48 | BC848 | TRANSISTOR BCW60/BC848 NPN AF SMALL SIG  SOT-23 |

Receiver/Transmitter/Exciter

PA