T880 Series II

Base Station Equipment

800-960MHz

Service Manual

Issue 200

March 2001

M880-00-200

T800*II*

Corporate Head Office

Tait Electronics Ltd
175 Roydvale Avenue
P.O. Box 1645
Christchurch
New Zealand

Customer Support Enquiries

Phone: 64 3 357 9991
Fax: 64 3 358 0320
E-mail: support@taitworld.com

Internet

http://www.taitworld.com

New Zealand

Tait Communications Ltd
540 Wairakei Road
P.O. Box 1185
Christchurch
Phone: 64 3 357 2750
Fax: 64 3 358 2029
E-mail: headoffice@tcl.tait.co.nz

Australia

Tait Electronics (Aust) Pty Ltd
186 Granite Street
Geebung
Queensland 4034
P.O. Box 679
Virginia
Queensland 4014
Australia
Phone: 61 7 3865 7799
Toll Free: 1 300 304 344
Fax: 61 7 3865 7990
E-mail: australia@taitworld.com

North Asia

Regional Head Office
Hong Kong

Tait Mobile Radio (HK) Ltd
Unit 2216, North Tower
Concordia Plaza
No. 1 Science Museum Road
Tsim Sha Tsui East
Kowloon
Phone: 852 2369 3040
Fax: 852 2369 3009
E-mail: hongkong@taitworld.com

Beijing

Tait Mobile Radio (HK) Ltd
Beijing Representative Office
Room 610, Tower 2
Beijing Henderson Centre
No. 18 Jianguomennei Da Jie
Doncheng District
Beijing
China 100005
Phone: 86 10 6518 6290
Fax: 86 10 6518 6296
E-mail: beijing@taitworld.com

Taiwan

Tait Mobile Radio (Taiwan) Ltd
5Fl., No. 159, Keelung Road
Sec. 1
Taipei 110
Taiwan
Phone: 886 2 2768 6600
Fax: 886 2 2761 9970
E-mail: taiwan@taitworld.com

South East Asia

Regional Head Office
Singapore

Tait Electronics (Far East) Pte Ltd
491B River Valley Road
#09-02 Valley Point Office Tower
Singapore 248373
Phone: 65 471 2688
Fax: 65 479 7778
E-mail: singapore@taitworld.com

Thailand

Tait Mobile Radio Ltd
14/1 Suwan Tower
Third Floor
North Sathorn Road
Soi Saladaeng 1
Bangrak
Bangkok 10500
Thailand
Phone: 662 267 6290
Fax: 662 267 6293
E-mail: thailand@taitworld.com

Europe

Regional Head Office
United Kingdom

Tait Europe Ltd
Ermine Business Park
Ermine Road
Huntingdon
Cambridgeshire PE29 6WT
United Kingdom
Phone: 44 1480 52 255
Fax: 44 1480 411 996
E-mail: unitedkingdom@taitworld.com

France

Antenne Française
E-mail: france@taitworld.com

Germany

Zweigstelle Deutschland
E-mail: germany@taitworld.com

North America

Regional Head Office
Canada

Tait Mobile Radio Inc.
Unit 5, 158 Anderson Avenue
Markham
Ontario L6E 1A9
Canada
Phone: 1 905 472 1100
Toll Free: 1 800 890 TAIT (8248)
Fax: 1 905 472 5300
E-mail: canada@taitworld.com

USA

Toll Free: 1 800 890 TAIT (8248)
E-mail: usa@taitworld.com

Latin America

E-mail: latinamerica@taitworld.com

About This Manual

Scope

This manual contains general, technical and servicing information on T880 Series II 5W and 70W base stations which comprise the following equipment:

5W base station	T885 receiver T881 5W transmitter
70W base station	T885 receiver T881 transmitter T889 70W power amplifier

Format

We have published this manual in a ring binder so that "revision packages" containing additional information pertaining to new issues of PCBs can be added as required.

Revision Packages

Revision packages will normally be published to coincide with the release of information on a new PCB, and may also contain additions or corrections pertaining to other parts of the manual.

You may order as many packages as you require from your local Tait Dealer or Customer Service Organisation. Revision packages are supplied ready-punched for inclusion in your manual.

Revision Control

Each page in this manual has a date of issue. This is to comply with various Quality Standards, but will also serve to identify which pages have been updated and when. Each page and its publication date is listed in the "List of Effective Pages", and a new list containing any new/revised pages and their publication dates will be sent with each revision package.

2

Any portion of text that has been changed is marked by a vertical line (as shown at left) in the outer margin of the page or column. Where the removal of an entire paragraph means there is no text left to mark, an arrow (as shown at left) will appear in the outer margin. The number beside the arrow will indicate how many paragraphs have been deleted. Changes to diagrams that cannot be marked by these methods will be explained in an Amendments Box added to the diagram.

The manual issue and revision status are indicated by the last three digits of the manual product code. These digits start at 200 and will increment through 201, 202, 203, etc., as revision packages are published, e.g:

2 0 3

issue status — revision status

Thus, issue 203 indicates the third revision to issue 2 and means that three packages should have been added to the manual. The issue digit will only change if there is a major product revision, or if the number of revision packages to be included means that the manual becomes difficult to use, at which point a new issue manual will be published in a new ring binder.

PCB Information

PCB information is provided for all current issue PCBs, as well as all previous issue PCBs manufactured in production quantities, and is grouped according to PCB. Thus, you will find the parts list, grid reference index (if necessary), PCB layouts and circuit diagram(s) for each individual PCB grouped together.

Errors

If you find an error in this manual, or have a suggestion on how it might be improved, please do not hesitate to contact Customer Support, Tait Electronics Ltd, Christchurch, New Zealand (full contact details are on page 2).

Updating Equipment And Manuals

In the interests of improving performance, reliability or servicing, Tait Electronics Ltd reserve the right to update their equipment and/or manuals without prior notice.

Copyright

Ordering Tait Service Manuals

You can order additional copies of this service manual from your nearest Tait Dealer or Customer Service Organisation. When ordering, make sure you quote the correct Tait product code ("M" number). Note that only the latest issue of the manual will be available for order.

Publication Information

T880 Series II Service Manual			
Issue	Publication Date	Product Code	Incorporates Revision Package
200	March 2001	M880-00-200	—

Table Of Contents

This manual is divided into nine parts as listed below, with each part being further subdivided into sections. There is a detailed table of contents at the start of each part and/or section.

List Of Effective Pages

The total number of pages in this Manual is 358, as listed below.

Page	Issue Date
1	26/02/01
2	26/02/01
3	26/02/01
4	26/02/01
5	26/02/01
6	26/02/01
7	26/02/01
8	26/02/01
9	26/02/01
10	26/02/01

Part A

Page	Issue Date
I	26/02/01
II	26/02/01
1.1	26/02/01
1.2	26/02/01
2.1	26/02/01
2.2	26/02/01
2.3	26/02/01
2.4	26/02/01
2.5	26/02/01
2.6	26/02/01 (blank)
3.1	26/02/01
3.2	26/02/01
4.1	26/02/01
4.2	26/02/01

Part B

Page	Issue Date
I	26/02/01
II	26/02/01 (blank)
1.1	26/02/01
1.2	26/02/01 (blank)
1.3	26/02/01 (fold-out)
1.4	26/02/01 (fold-out)
1.5	26/02/01
1.6	26/02/01
1.7	26/02/01
1.8	26/02/01
1.9	26/02/01
1.10	26/02/01
1.11	26/02/01
1.12	26/02/01
1.13	26/02/01
1.14	26/02/01 (blank)
2.1	26/02/01
2.2	26/02/01 (blank)
2.3	26/02/01
2.4	26/02/01
2.5	26/02/01
2.6	26/02/01
2.7	26/02/01
2.8	26/02/01
2.9	26/02/01
2.10	26/02/01
2.11	26/02/01
2.12	26/02/01
3.1	26/02/01
3.2	26/02/01
3.3	26/02/01
3.4	26/02/01
3.5	26/02/01
3.6	26/02/01
3.7	26/02/01
3.8	26/02/01
3.9	26/02/01
3.10	26/02/01
3.11	26/02/01
3.12	26/02/01
3.13	26/02/01
3.14	26/02/01
4.1	26/02/01
4.2	26/02/01 (blank)
4.3	26/02/01
4.4	26/02/01
4.5	26/02/01
4.6	26/02/01
4.7	26/02/01
4.8	26/02/01 (blank)
4.9	26/02/01 (fold-out)
4.10	26/02/01 (fold-out) (blank)

Page	Issue Date
5.1	26/02/01
5.2	26/02/01
5.3	26/02/01
5.4	26/02/01
5.5	26/02/01
5.6	26/02/01
5.7	26/02/01
5.8	26/02/01
5.9	26/02/01
5.10	26/02/01
5.11	26/02/01
5.12	26/02/01
5.13	26/02/01
5.14	26/02/01
5.15	26/02/01
5.16	26/02/01
5.17	26/02/01
5.18	26/02/01
5.19	26/02/01
5.20	26/02/01 (blank)
6.1.1	26/02/01
6.1.2	26/02/01 (blank)
6.1.3	26/02/01
6.1.4	26/02/01
6.1.5	26/02/01
6.1.6	26/02/01
6.2.1	26/02/01
6.2.2	26/02/01 (blank)
6.2.3	26/02/01
6.2.4	26/02/01
6.2.5	26/02/01
6.2.6	26/02/01
6.2.7	26/02/01
6.2.8	26/02/01
6.2.9	26/02/01
6.2.10	26/02/01
6.2.11	26/02/01 (blank)
6.2.12	26/02/01
6.2.13	26/02/01 (fold-out)
6.2.14	26/02/01 (fold-out) (blank)
6.2.15	26/02/01
6.2.16	26/02/01
6.2.17	26/02/01
6.2.18	26/02/01
6.2.19	26/02/01 (fold-out)
6.2.20	26/02/01 (fold-out)
6.2.21	26/02/01 (fold-out)
6.2.22	26/02/01 (fold-out)
6.2.23	26/02/01 (fold-out)
6.2.24	26/02/01 (fold-out)

Page	Issue Date
6.2.25	26/02/01 (fold-out)
6.2.26	26/02/01 (fold-out)
6.2.27	26/02/01 (fold-out)
6.2.28	26/02/01 (fold-out)
6.2.29	26/02/01 (fold-out)
6.2.30	26/02/01 (fold-out)
6.2.31	26/02/01 (fold-out)
6.2.32	26/02/01 (fold-out) (blank)

Part C

I	26/02/01
II	26/02/01 (blank)
1.1	26/02/01
1.2	26/02/01 (blank)
1.3	26/02/01 (fold-out)
1.4	26/02/01 (fold-out)
1.5	26/02/01
1.6	26/02/01
1.7	26/02/01
1.8	26/02/01
1.9	26/02/01
1.10	26/02/01
1.11	26/02/01
1.12	26/02/01
2.1	26/02/01
2.2	26/02/01
2.3	26/02/01
2.4	26/02/01
2.5	26/02/01
2.6	26/02/01
2.7	26/02/01
2.8	26/02/01
2.9	26/02/01
2.10	26/02/01
2.11	26/02/01
2.12	26/02/01
3.1	26/02/01
3.2	26/02/01
3.3	26/02/01
3.4	26/02/01
3.5	26/02/01
3.6	26/02/01
3.7	26/02/01
3.8	26/02/01
3.9	26/02/01
3.10	26/02/01
3.11	26/02/01

Page	Issue Date
3.12	26/02/01
3.13	26/02/01
3.14	26/02/01
4.1	26/02/01
4.2	26/02/01 (blank)
4.3	26/02/01
4.4	26/02/01
4.5	26/02/01
4.6	26/02/01
4.7	26/02/01
4.8	26/02/01 (blank)
4.9	26/02/01 (fold-out)
4.10	26/02/01 (fold-out) (blank)
5.1	26/02/01
5.2	26/02/01
5.3	26/02/01
5.4	26/02/01
5.5	26/02/01
5.6	26/02/01
5.7	26/02/01
5.8	26/02/01
5.9	26/02/01
5.10	26/02/01
5.11	26/02/01
5.12	26/02/01
5.13	26/02/01
5.14	26/02/01
5.15	26/02/01
5.16	26/02/01
5.17	26/02/01
5.18	26/02/01 (blank)
6.1.1	26/02/01
6.1.2	26/02/01 (blank)
6.1.3	26/02/01
6.1.4	26/02/01
6.1.5	26/02/01
6.1.6	26/02/01
6.2.1	26/02/01
6.2.2	26/02/01 (blank)
6.2.3	26/02/01
6.2.4	26/02/01
6.2.5	26/02/01
6.2.6	26/02/01
6.2.7	26/02/01
6.2.8	26/02/01
6.2.9	26/02/01
6.2.10	26/02/01
6.2.11	26/02/01 (fold-out)

Page	Issue Date
6.2.12	26/02/01 (fold-out) (blank)
6.2.13	26/02/01
6.2.14	26/02/01
6.2.15	26/02/01
6.2.16	26/02/01
6.2.17	26/02/01 (fold-out)
6.2.18	26/02/01 (fold-out)
6.2.19	26/02/01 (fold-out)
6.2.20	26/02/01 (fold-out)
6.2.21	26/02/01 (fold-out)
6.2.22	26/02/01 (fold-out)
6.2.23	26/02/01 (fold-out)
6.2.24	26/02/01 (fold-out)
6.2.25	26/02/01 (fold-out)
6.2.26	26/02/01 (fold-out)
6.2.27	26/02/01 (fold-out)
6.2.28	26/02/01 (fold-out)
6.2.29	26/02/01 (fold-out)
6.2.30	26/02/01 (fold-out) (blank)

Part D

I	26/02/01
II	26/02/01 (blank)
1.1	26/02/01
1.2	26/02/01 (blank)
1.3	26/02/01 (fold-out)
1.4	26/02/01 (fold-out)
1.5	26/02/01
1.6	26/02/01
1.7	26/02/01
1.8	26/02/01
1.9	26/02/01
1.10	26/02/01 (blank)
2.1	26/02/01
2.2	26/02/01 (blank)
2.3	26/02/01
2.4	26/02/01
2.5	26/02/01
2.6	26/02/01
2.7	26/02/01
2.8	26/02/01 (blank)
3.1	26/02/01
3.2	26/02/01 (blank)
3.3	26/02/01
3.4	26/02/01
3.5	26/02/01
3.6	26/02/01

Page	Issue Date
3.7	26/02/01 (fold-out)
3.8	26/02/01 (fold-out) (blank)
4.1	26/02/01
4.2	26/02/01 (blank)
4.3	26/02/01
4.4	26/02/01
4.5	26/02/01 (fold-out) (blank)
4.6	26/02/01 (fold-out)
4.7	26/02/01
4.8	26/02/01
4.9	26/02/01
4.10	26/02/01
4.11	26/02/01
4.12	26/02/01
4.13	26/02/01
4.14	26/02/01 (blank)
5.1.1	26/02/01
5.1.2	26/02/01 (blank)
5.1.3	26/02/01
5.1.4	26/02/01
5.1.5	26/02/01
5.1.6	26/02/01
5.2.1	26/02/01
5.2.2	26/02/01 (blank)
5.2.3	26/02/01
5.2.4	26/02/01
5.2.5	26/02/01
5.2.6	26/02/01
5.2.7	26/02/01 (blank)
5.2.8	26/02/01
5.2.9	26/02/01 (fold-out)
5.2.10	26/02/01 (fold-out) (blank)
5.2.11	26/02/01
5.2.12	26/02/01
5.2.13	26/02/01 (fold-out)
5.2.14	26/02/01 (fold-out)
5.2.15	26/02/01 (fold-out)
5.2.16	26/02/01 (fold-out)

Part E

I	26/02/01
II	26/02/01 (blank)

Page	Issue Date

Part F

I	26/02/01
II	26/02/01
1.1	26/02/01 (fold-out)
1.2	26/02/01 (fold-out)
2.1	26/02/01 (fold-out)
2.2	26/02/01 (fold-out)
3.1	26/02/01 (fold-out)
3.2	26/02/01 (fold-out)
4.1	26/02/01
4.2	26/02/01 (blank)

Part G

I	26/02/01
II	26/02/01
1.1	26/02/01
1.2	26/02/01
1.3	26/02/01
1.4	26/02/01 (blank)
2.1	26/02/01
2.2	26/02/01
2.3	26/02/01
2.4	26/02/01 (blank)
3.1	26/02/01
3.2	26/02/01 (blank)
4.1	26/02/01
4.2	26/02/01
5.1	26/02/01
5.2	26/02/01

Part H

I	26/02/01
II	26/02/01 (blank)
1	26/02/01
2	26/02/01
3	26/02/01
4	26/02/01

Page	Issue Date
5	26/02/01
6	26/02/01
7	26/02/01
8	26/02/01
9	26/02/01
10	26/02/01
11	26/02/01
12	26/02/01
13	26/02/01
14	26/02/01

Part I

I	26/02/01
II	26/02/01 (blank)
1.1	26/02/01
1.2	26/02/01 (blank)
2.1	26/02/01
2.2	26/02/01
2.3	26/02/01
2.4	26/02/01
2.5	26/02/01
2.6	26/02/01
3.1	26/02/01
3.2	26/02/01 (blank)

Part A Introduction To Servicing

This part of the manual is divided into the sections listed below. These sections provide some general and advisory information on servicing procedures, and a brief history of PGM800Win programming software.

1 General

1.1 Additional Technical Information

If you have any questions about this manual or the equipment it describes, please contact your nearest Tait Dealer or Customer Service Organisation. If necessary, you can get additional technical help from Customer Support, Radio Systems Division, Tait Electronics Ltd, Christchurch, New Zealand (full contact details are on page 2).

When requesting information, please quote either the manual product code (e.g. M880-00-200), or the equipment product code and serial number which are printed on a label on the back of the product (as shown in Figure 1.1).

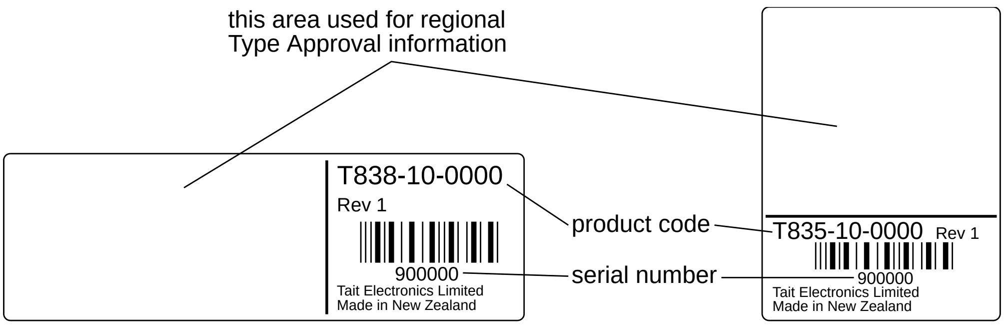


Figure 1.1 Typical Product Code & Serial Number Labels

If you require information about a particular PCB, please quote the full PCB internal part number (IPN) which is screen printed onto the top side of the board (refer to the appropriate PCB Information section in this manual for more details).

1.2 Caution: CMOS Devices

This equipment contains CMOS Devices which are susceptible to damage from static charges. You must handle these devices carefully and according to the procedures described in the manufacturers' data books.

We recommend you purchase an anti-static bench kit from a reputable manufacturer and install and test it according to the manufacturer's instructions. Figure 1.2 shows a typical anti-static bench set-up.

You can obtain further information on anti-static precautions and the dangers of electrostatic discharge (ESD) from standards such as ESD S4.1-1997 (revised) or BS EN 100015-4 1994.

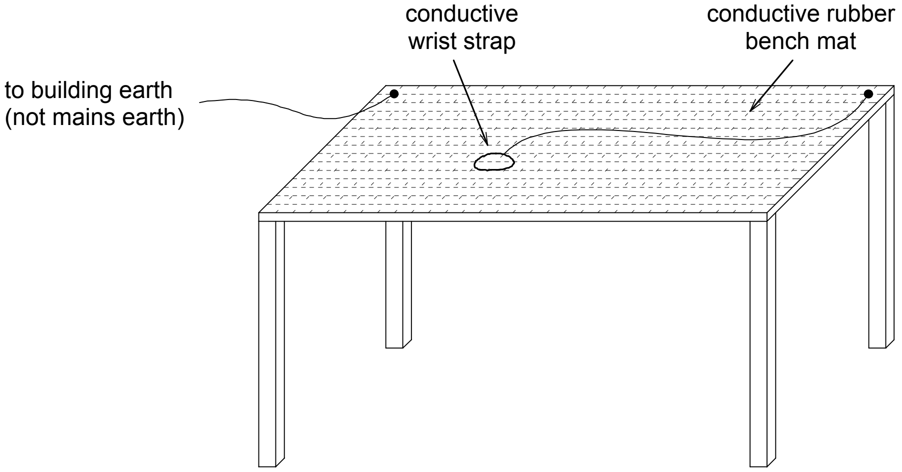


Figure 1.2 Typical Anti-static Bench Set-up

1.3 Caution: Aerial Load

The equipment has been designed to operate safely under a wide range of aerial loading conditions. However, we strongly recommend that the transmitter should always be operated with a suitable load to prevent damage to the transmitter output power stage.

1.4 Caution: Beryllium Oxide & Power Transistors

The RF power transistors in current use all contain some beryllium oxide. This substance, while perfectly harmless in its normal solid form, can become a severe health hazard when it has been reduced to dust. For this reason the RF power transistors should not be broken open, mutilated, filed, machined, or physically damaged in any way that can produce dust particles.

2 Mechanical

2.1 Torx Recess Head Screws

Torx recess head screws are becoming the standard screw head type in all T800 Series II equipment, with Pozidriv and Philips recess head screws being used in fewer applications.

The Torx recess head has the advantage of improved screwdriver tip location, reducing the chances of screw head damage caused by the driver tip rotating within the recess. In addition, using a ball-tip Torx screwdriver allows you to drive a Torx head screw with the driver on a slight angle, which can be useful in situations where access is restricted.

It is important that you use the correct Torx screwdriver tip:

M3 screws - T10
M4 screws - T20.

Figure 2.1 below shows a typical Torx recess head screw (actual hardware may differ slightly from this illustration due to variations in manufacturing techniques).

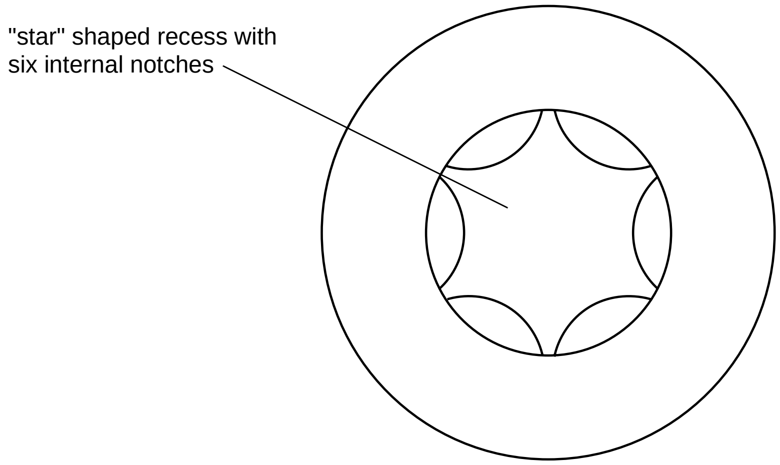


Figure 2.1 Torx Screw Identification

2.2 Pozidriv & Philips Recess Head Screws

Pozidriv and Philips recess head screws will continue to be used in T800 Series II equipment in a few special applications. It is important that you use the correct type and size screwdriver for each screw type to avoid damaging the screw head.

It is particularly important that you do not use Philips screwdrivers on Pozidriv screw heads as the tapered driving flutes of the Philips screwdriver do not engage correctly with the parallel-sided slots in the Pozidriv screw head. This can result in considerable damage to the screw head if the screwdriver tip turns inside the recess.

Note: If you find you need excessive downwards pressure to keep the screwdriver tip in the Pozidriv screw head, you are probably using the wrong type and/ or size screwdriver.

Figure 2.2 below shows the main differences between typical Pozidriv and Philips screw heads and screwdriver tips (actual hardware may differ slightly from these illustrations due to variations in manufacturing techniques).

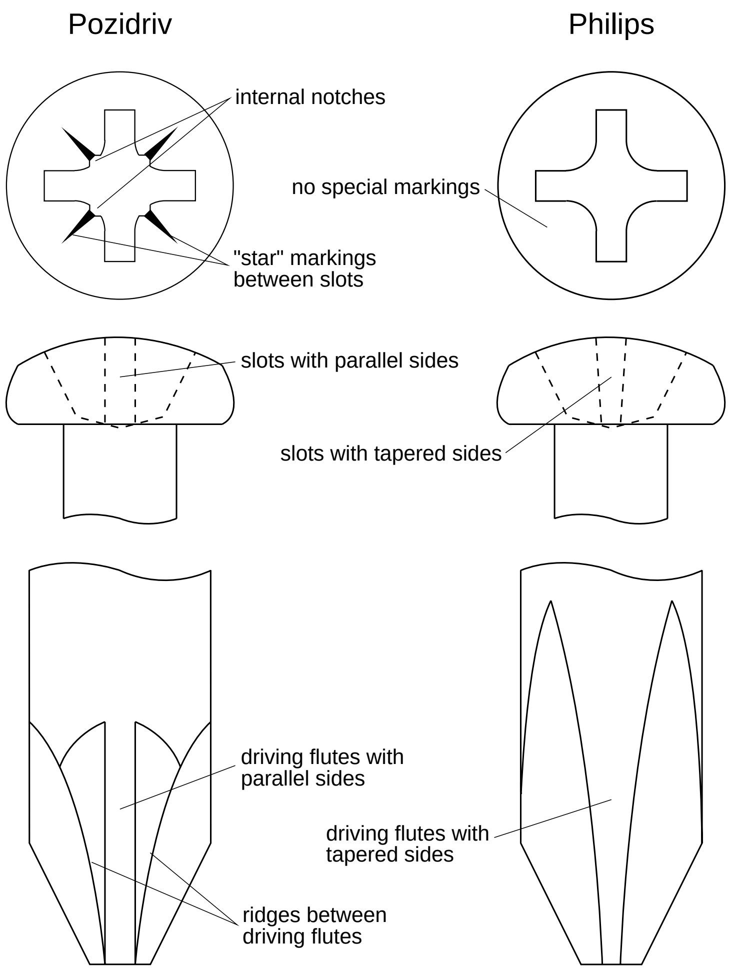


Figure 2.2 Pozidriv & Philips Screw & Screwdriver Identification

2.3 Disassembly/Reassembly

2.3.1 Receivers/Transmitters

To carry out alignment or change option links, you need to remove only the top cover, i.e. the one adjacent to the front panel handle and on the opposite side to the main D-range connector (D-range 1/PL100).

You need to remove the bottom cover to:

- access the transmitter RF power module;
- change solder blob links;
- fit test leads to circuit block access points.

2.3.2 Power Amplifiers

You should carry out the tuning and power output level setting procedures with the cover on.

Note: All black finish Pozidriv screws used in the T889 are 4-40 UNC thread and cannot be interchanged with M3 screws. Note that different lengths are used in different applications.

2.4 Cover Screw Torques

Receivers/Transmitters	.. 2.0Nm/18in.lbf.
Power Amplifiers	.. 0.9Nm/8in.lbf.

Note: To ensure that the receiver and transmitter will continue to meet their performance specifications, you must tighten the screws securing the bottom cover (the one furthest from the handle) to the correct torque, and in the correct order, as shown below.

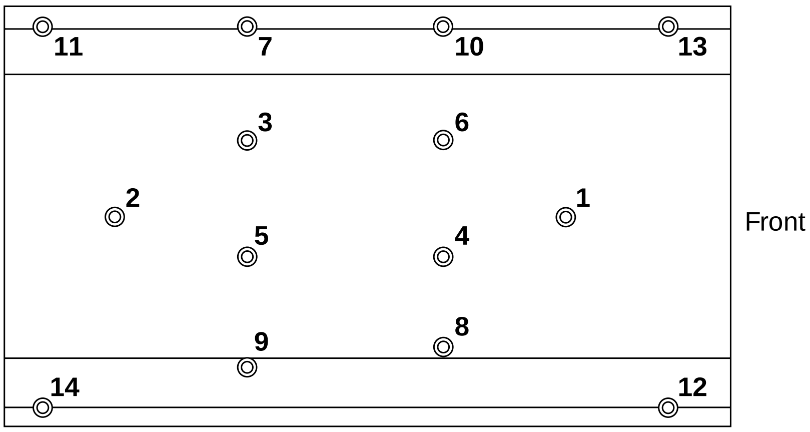


Figure 2.3 Receiver/Transmitter Bottom Cover Screw Tightening Order

2.5 Chassis & Cover Compatibility

The chassis and covers used in T800 Series II modules incorporate a number of design changes to improve Electro-Magnetic Compatibility (EMC) performance. It is important that only the new-design covers are fitted to the new chassis to ensure correct mechanical fit and continued compliance with appropriate EMC Type Approval regulations.

Figure 2.4 below shows some of the main features which can be used to identify the new-design chassis and covers.

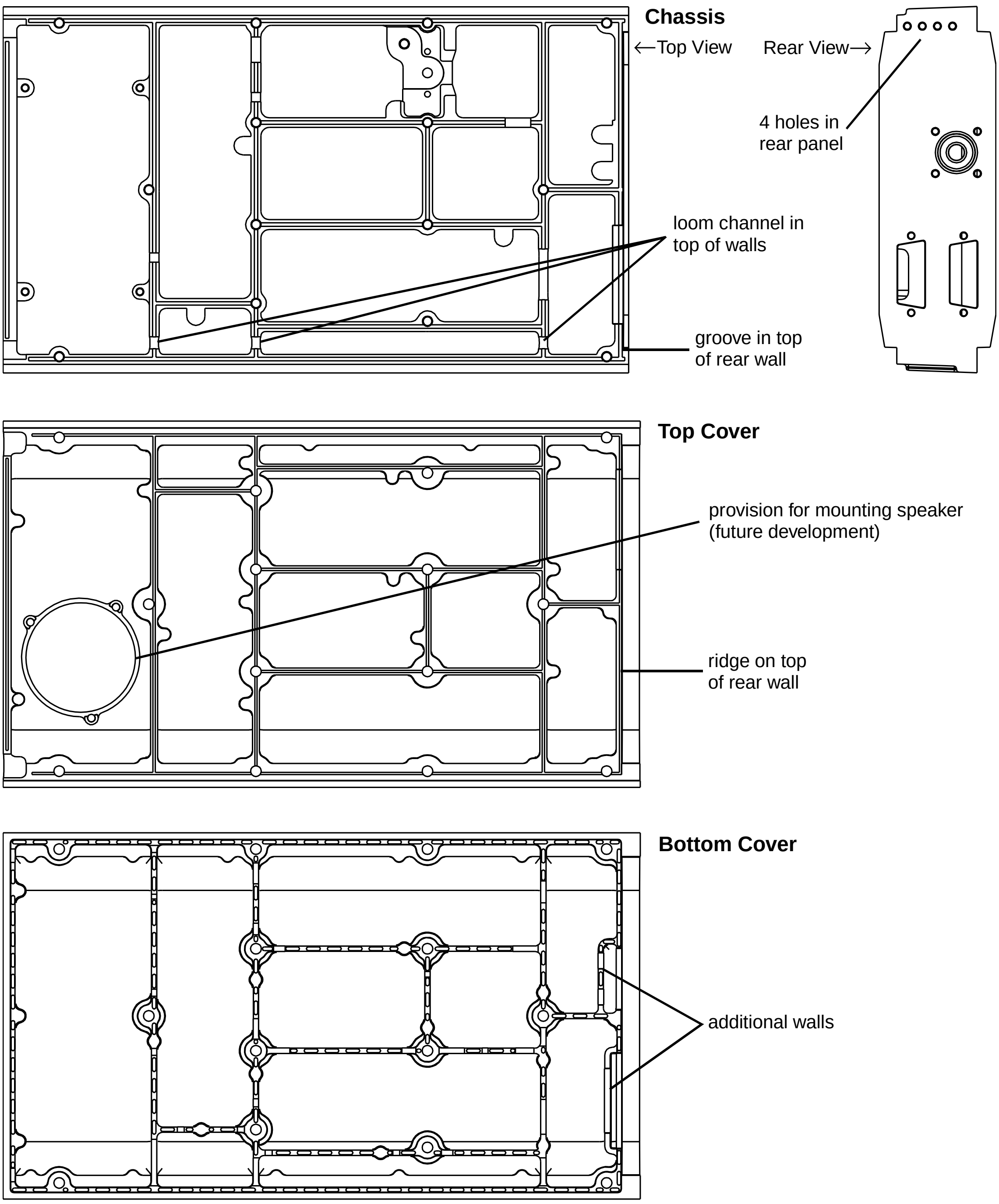


Figure 2.4 Identification Of New-Design Chassis & Covers

3 Component Replacement

3.1 Leaded Components

Whenever you are doing any work on the PCB that involves removing or fitting components, you must take care not to damage the copper tracks. The two satisfactory methods of removing components from plated-through hole (PTH) PCBs are detailed below.

Note: The first method requires the use of a desoldering station, e.g. Philips SBC 314 or Pace MBT-100E.

3.1.1 Desoldering Iron Method

Place the tip over the lead and, as the solder starts to melt, move the tip in a circular motion.

Start the suction and continue the movement until 3 or 4 circles have been completed.

Remove the tip while continuing suction to ensure that all solder is removed from the joint, then stop the suction.

Before pulling the lead out, ensure it is not stuck to the plating.

If the lead is still not free, resolder the joint and try again.

Note: The desoldering iron does not usually have enough heat to desolder leads from the ground plane. Additional heat may be applied by holding a soldering iron on the tip of the desoldering iron (this may require some additional help).

3.1.2 Component Cutting Method

Cut the leads on the component side of the PCB.

Heat the solder joint ***sufficiently*** to allow ***easy*** removal of the lead by drawing it out from the component side: do ***not*** use undue force.

Fill the hole with solder and then clear with solderwick.

3.2 Surface Mount Devices

Caution: **Surface mount devices (SMDs) require special storage, handling, removal and replacement techniques. This equipment should be serviced only by an approved Tait Dealer or Customer Service Organisation equipped with the necessary facilities. Repairs attempted with incorrect equipment or by untrained personnel may result in permanent damage. If in doubt, contact your nearest Tait Dealer or Customer Service Organisation.**

3.3 Cased Mica Capacitors

Cased mica capacitors can be removed by heating the top with a heavy-duty soldering iron and gently lifting the capacitor off the PCB with a solder-resistant spike or equivalent.

4 Software History

28/06/96	PGM800Win Version 1.0
18/08/97	PGM800Win Version 2.00
11/07/00	PGM800Win Version 3.00

4.1 PGM800Win V1.0

PGM800Win V1.0 is different in concept from DOS versions of PGM800 in that it is Windows[1] based. It also includes many new and improved features over DOS versions of PGM800.

The major changes are outlined below:

- The Windows™ environment makes data entry and editing significantly easier.
- PGM800Win includes several new radio models which are not programmable with DOS versions of PGM800.
- Out of range frequencies will result in warning messages and will not be accepted for entry into the standard library module. User defined modules can be created, however, allowing variation from the standard library module.
- Channel numbers default to 0-127 to match the EPROM memory locations. However, the user can change this setting so that the channel numbers run from 1-128 to suit his/her particular needs.

Note: The data files produced by BASEPROG V1.0 and all DOS versions of PGM800 are still compatible with PGM800Win V1.0.

4.2 PGM800Win V2.00

PGM800Win V2.00 is an upgraded and expanded version of PGM800Win V1.0. It has been developed specifically for T800 Series II base stations, but retains the ability to program Series I equipment.

The major changes are outlined below:

- PGM800Win V2.0 will program T800 Series II base station modules via serial communications.
- Deviation and reference modulation settings are written automatically to the radio.

1. Windows is a registered trademark of the Microsoft Corporation.

- Extra information that is not stored in the radio (but which is still relevant to the radio) can be saved to a file on disk (e.g. note field, auxiliary pin names, etc.).

Note: The data files produced by BASEPROG V1.0, all DOS versions of PGM800, and PGM800Win V1.0 are still compatible with PGM800Win V2.00.

4.3 PGM800Win V3.00

PGM800Win V3.00 is the latest version of the Tait T800 programming application and has the following improvements over version 2.00:

- a new user interface which now includes the configuration software for the T803 tone remote module;
- an expanded database which includes T800 Series I and Series II modules, and also allows the addition of custom modules;
- the ability to program modules with 8 digit serial numbers.

Note: The data files produced by BASEPROG V1.0, all DOS versions of PGM800, and all versions of PGM800Win are still compatible with PGM800Win V3.00. PGM800Win V3.00 can still be used to program T800 Series I equipment.

Part B T885 Receiver

This part of the manual is divided into six sections, as listed below. There is a detailed table of contents at the start of each section.

1 T885 General Information

This section provides a brief description of the T885 receiver, along with detailed specifications and a list of types available.

The following topics are covered in this section.

replace A4 pages B1.3/B1.4 with A3 pages B1.3/B1.4

replace A4 pages B1.3/B1.4 with A3 pages B1.3/B1.4

1.1 Introduction

The T885 is a high performance microprocessor controlled FM base station receiver designed for single or multichannel operation in the 800 to 960MHz frequency range[1].

The receiver is a dual conversion superhet with a synthesised local oscillator. The first IF is 45.0MHz, allowing exceptionally high spurious signal rejection to be achieved in the receiver front end. The second IF section (455kHz) combines amplitude limiting, detection, audio preamplification and RSSI within a single integrated circuit. This IC also drives a noise level detector for gating the audio output. RSSI can also be used to drive a carrier mute for audio output gating (link selectable).

The audio section output can be adjusted to deliver >+10dBm to a 600 ohm balanced output, and 1W to a local monitor speaker. A flat or de-emphasised audio response is link selectable.

The synthesiser frequency is programmed via the serial communications port. Eight channel select lines are accessible via an additional D-range connector (D-range 2 - T800-03-0000) at the rear of the set.

All components are mounted on a single PCB. This is secured to a die-cast chassis which is divided into compartments to individually shield each section of circuitry. Access to both sides of the main PCB is obtained by removing each of the two chassis covers. There is provision within the chassis to mount small option PCBs.

The front panel controls include gating sensitivity, line level, monitor volume and a monitor mute switch.

The T885 has a width of 60mm and occupies a single space in a Tait rack frame, which has the ability to accommodate up to seven standard modules.

1. Although capable of operating over the 800-960MHz frequency range, the T885 has a 6MHz switching range (see Section 1.2.3 and Section 3.1).

1.2 Specifications

1.2.1 Introduction

The performance figures given are minimum figures, unless otherwise indicated, for equipment tuned with the maximum switching range and operating at standard room temperature (+22°C to +28°C) and standard test voltage (13.8V DC).

Where applicable, the test methods used to obtain the following performance figures are those described in the EIA specification. However, there are several parameters for which performance according to the CEPT specification is given. Refer to Section 1.2.6 for details of test standards.

Details of test methods and the conditions which apply for Type Approval testing in all countries can be obtained from Tait Electronics Ltd.

The terms "wide bandwidth" and "narrow bandwidth" used in this and following sections are defined in the following table.

	Channel Spacing	Modulation 100% Deviation	Receiver IF Bandwidth
Wide Bandwidth	25kHz	±5.0kHz	15.0kHz
Narrow Bandwidth	12.5kHz	±2.5kHz	7.5kHz

Sensitivity and distortion figures are stated for standard operating conditions which includes audio de-emphasis. Note that the sensitivity and distortion figures will be degraded when flat audio is selected.

	Link PL210[a]	Link PL220[a]
De-emphasised Audio	1-2	2-3
Flat Audio	2-3	1-2

a. Pin 1 is identified by the number "1" screen printed onto the PCB beside each set of links.

1.2.2 General

Number Of Channels	..	128 (standard)[1]

Supply Voltage:

Operating Voltage	..	10.8 to 16V DC
Standard Test Voltage	..	13.8V DC
Polarity	..	negative earth only
Polarity Protection	..	crowbar diode

Supply Current:

Standby	..	350mA
Full Audio	..	800mA

Operating Temperature Range	..	-30°C to +60°C

Dimensions:

Height	..	183mm
Width	..	60mm
Length	..	322mm

Weight	..	2.13kg

1.2.3 RF Section

Frequency Range	..	800-960MHz
Type	..	dual conversion superheterodyne
Frequency Increment	..	5 or 6.25kHz
Switching Range	..	6MHz (i.e. ±3MHz from the centre frequency)
Input Impedance	..	50 ohms
Frequency Stability	..	±1ppm, -20°C to +60°C
(see also Section 1.4)	..	±1.5ppm, -30°C to +60°C
Signal Strength Indicator (RSSI optional)	..	-115dBm to -70dBm, 0 to 5V at approx. 10dB/V

1. Additional channels may be factory programmed. Contact your nearest Tait Dealer or Customer Service Organisation.

IF Amplifiers:		
Frequencies	..	45MHz and 455kHz
Bandwidths-		
Narrow Bandwidth (NB)	..	7.5kHz
Wide Bandwidth (WB)	..	15kHz
Sensitivity (De-emphasised Response):		
Single Channel	..	-117dBm
Bandspread (12dB Sinad)	..	-115dBm (across switching range)
Sensitivity (Flat Response):		
Single Channel	..	-111dBm
Bandspread (12dB Sinad)	..	-109dBm (across switching range)
Signal+Noise To Noise Ratio (De-emphasised):		
RF Level -107dBm	..	24dB typical (NB)
		29dB typical (WB)
RF Level -83dBm (CEPT)	..	44dB minimum, 46dB typical (NB)
RF Level -57dBm (EIA)	..	46dB minimum, 48dB typical (WB)
Signal+Noise To Noise Ratio (Flat):		
RF Level -107dBm	..	14dB typical (NB)
		19dB typical (WB)
RF Level -83dBm (CEPT)	..	42dB typical (NB)
RF Level -57dBm (EIA)	..	49dB typical (WB)
Selectivity:		
Narrow Bandwidth (±12.5kHz)	..	79dB minimum, 80dB typical (CEPT)
Wide Bandwidth (±25kHz)	..	85dB minimum, 88dB typical (EIA)
Offset Selectivity (Canada only)	..	20dB
Spurious Response Attenuation	..	100dB (typical)
Intermodulation Response Attenuation:		
Narrow Bandwidth	..	75dB CEPT (typical)
Wide Bandwidth	..	80dB EIA
Blocking	..	100dB
Co-channel Rejection	..	6dB
Amplitude Characteristic	..	3dB
Spurious Emissions:		
Conducted	..	-90dBm to 4GHz
Radiated	..	-57dBm to 1GHz
		-47dBm to 4GHz
Group Delay	..	+200/OFS (300Hz to 3kHz)

1.2.4 Audio Section

1.2.4.1 General

Outputs Available	..	line and monitor
Frequency Response	..	flat or de-emphasised (750µs) (link selectable)

Flat Response:

Bandwidth	..	67 to 3400Hz
Response	..	within +1, -2dB of output level at 1kHz

De-emphasised Response:

Bandwidth	..	300 to 3400Hz
Response	..	within +1, -3dB of a -6dB/octave de-emphasis characteristic (ref. 1kHz)

Line Output:

Power	..	adjustable to >+10dBm
Load Impedance	..	600 ohms

Distortion (@ -70dBm signal level):

		De-emphasised	Flat
Wide Bandwidth	..	≤2%	≤2%
Mid & Narrow Bandwidth	..	≤2%	≤4%

Monitor Output:

Power	..	1W
Speaker Impedance	..	4 ohms
Distortion	..	≤3%

(@ -70dBm signal level, links set to de-emphasis)

1.2.4.2 CTCSS

Linkable High Pass Filter:

Bandwidth	..	350 to 3400Hz
Response	..	within +1, -3dB of level at 1kHz
Hum And Noise (1kHz at 60% system deviation CTCSS at 10% system deviation)	..	30dB min. at 250.3Hz 35dB typical (67 to 240Hz)

Tone Detect:

Tone Squelch Opening	..	better than 6dB sinad 3dB sinad at 250.3Hz (typical) 4dB sinad at 100Hz (typical)
Tone Detect Bandwidth	..	±2.1Hz accept (typical) ±3.0Hz reject (typical)
Response Time	..	150ms open and close (typical)

1.2.4.3 Mute Operation

Systems Available	.. noise mute and carrier mute

Noise Mute:

Operating Range	.. 6-20dB sinad
Hysteresis	.. 1.5 to 6dB
Threshold	.. adjustable to -105dBm
Opening Time	.. 20ms
Closing Time	.. 50ms

Carrier Mute (Optional):

Operating Range	.. -115 to -80dBm
Hysteresis	.. 2 to 10dB
Opening Time	.. 5ms
Closing Time	.. 50ms

Note: The opening and closing times given above are for the standard setup (SL210 linked and SL220 not linked - refer to Section 3.8).

1.2.5 Microprocessor Controller

Auxiliary Ports:

Open Drain Type	.. capable of sinking 2.25mA via 2k2Ω
V_{ds} max.	.. 5V

1.2.6 Test Standards

Where applicable, this equipment is tested in accordance with the following standards.

1.2.6.1 DTI CEPT Recommendation T/R-24-01

Annex I: 1988

Technical characteristics and test conditions for radio equipment in the land mobile service intended primarily for analogue speech.

Annex II: 1988

Technical characteristics of radio equipment in the land mobile service with regard to quality and stability of transmission.

1.2.6.2 Telecommunications Industry Association

ANSI/TIA/EIA-603-1992

Land mobile FM or PM communications equipment measurement and performance standards.

1.3 Product Codes

The three groups of digits in the T880 Series II product code provide information about the model, type and options fitted, according to the conventions described below.

The following explanation of T880 Series II product codes is not intended to suggest that any combination of features is necessarily available in any one product. Consult your nearest Tait Dealer or Customer Service Organisation for more information regarding the availability of specific models, types and options.

Model

The Model group indicates the basic function of the product, as follows:

T88X-XX-XXXX	T885 receiver T881 5W transmitter T889 70W power amplifier

Type

The Type group uses two digits to indicate the basic RF configuration of the product.

The first digit in the Type group designates the frequency range:

T88X-**X**X-XXXX	'1' for 800-870MHz '2' for 860-910MHz '3' for 890-960MHz

The second digit in the Type group indicates the channel spacing:

T88X-X**X**-XXXX	'0' for wide bandwidth (25kHz) '5' for narrow bandwidth (12.5kHz)

Options

T88X-XX-**XXXX**	The Options group uses four digits and/or letters to indicate any options that may be fitted to the product. This includes standard options and special options for specific customers. '0000' indicates a standard Tait product with no options fitted. The large number of options precludes listing them here.

1.4 Standard Product Range

The following table lists the range of standard T885 types (i.e. no options fitted) available at the time this manual was published. Consult your nearest Tait Dealer or Customer Service Organisation for more information.

Frequency Range (MHz)		800-870	
IF Bandwidth (kHz)		7.5	15
TCXO	±1ppm -20°C to +60°C ±1.5ppm -30°C to +60°C	•	•
Receiver Type: T885-		15-0000	10-0000

Frequency Range (MHz)		860-910	
IF Bandwidth (kHz)		7.5	15
TCXO	±1ppm -20°C to +60°C ±1.5ppm -30°C to +60°C	•	•
Receiver Type: T885-		25-0000	20-0000

Frequency Range (MHz)		890-960	
IF Bandwidth (kHz)		7.5	15
TXCO	±1ppm -20° to +60°C ±1.5ppm -30°C to +60°C	•	•
Receiver Type: T885-		35-0000	30-0000

You can identify the receiver type by checking the product code printed on a label on the rear of the chassis (Figure 1.1 in Part A shows typical labels). You can further verify the receiver type by checking the placement of an SMD resistor in the table that is screen printed onto the PCB (refer to Section 6.1 for more details).

2 T885 Circuit Operation

This section provides a basic description of the circuit operation of the T885 receiver.

Note: Unless otherwise specified, the term "PGM800Win" used in this and following sections refers to version 3.00 and later of the software.

Refer 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 following topics are covered in this section.

2.1 Introduction

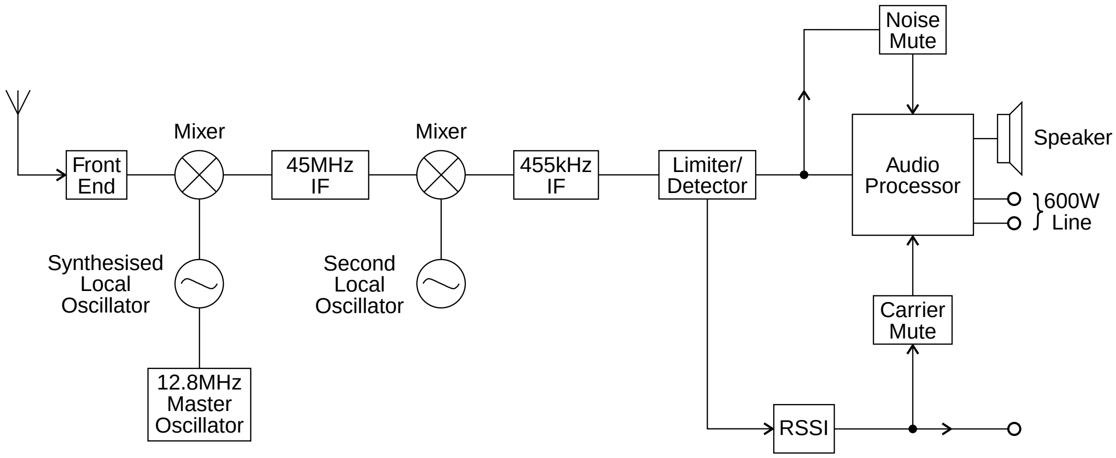


Figure 2.1 T885 High Level Block Diagram

The T885 receiver consists of a number of distinct stages:

- front end
- mixer
- synthesised local oscillator
- IF
- audio processor
- mute (squelch)
- regulator circuits
- received signal strength indicator (RSSI).

These stages are clearly identifiable in Figure 2.1. Refer to the circuit diagrams in Section 6 for further detail.

2.2 Receiver Front End

(Refer to the front end, IF section and audio processor circuit diagrams (sheets 4, 3 and 2 respectively) in Section 6.2.)

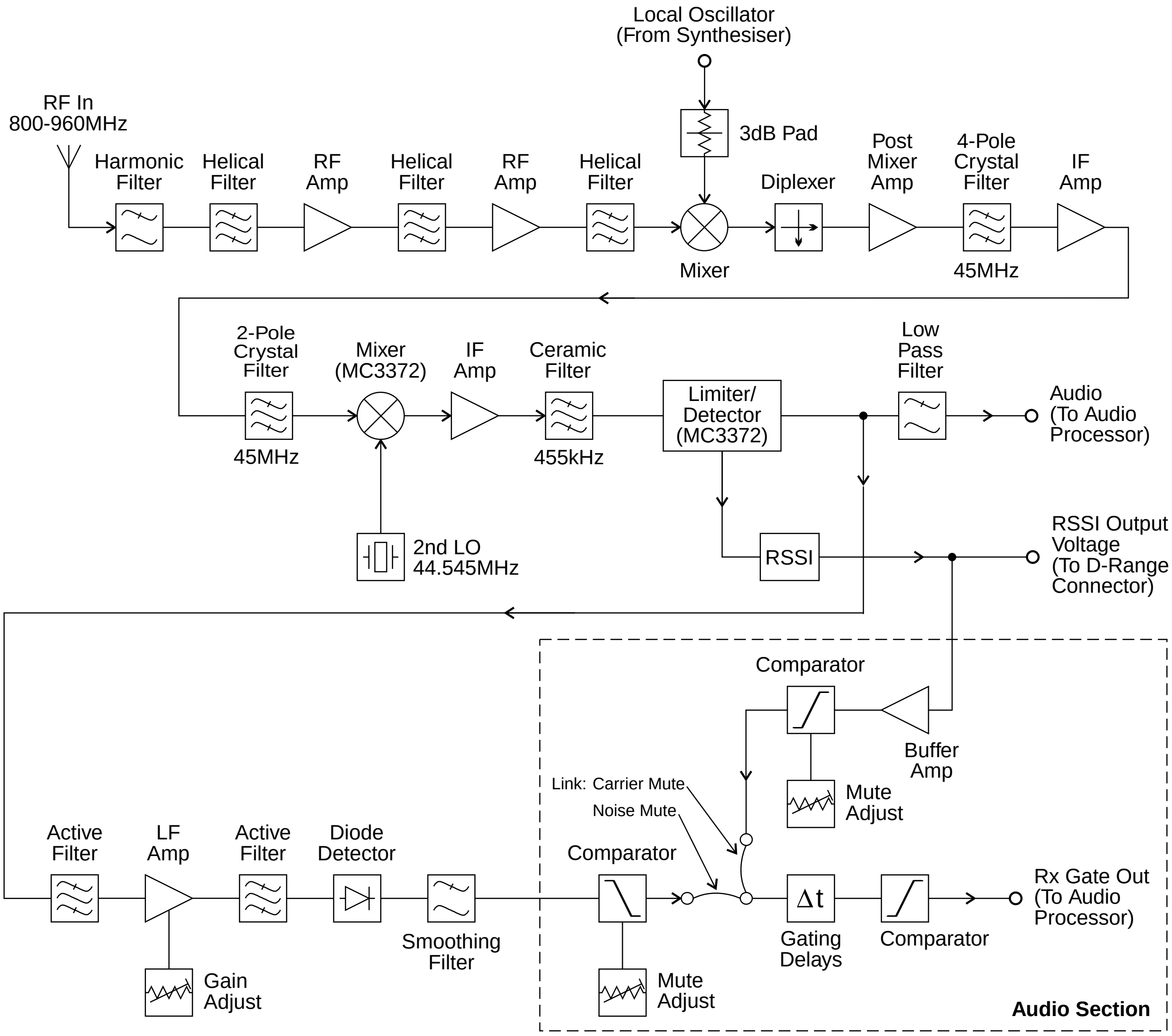


Figure 2.2 T885 Front End, IF and Mute Block Diagram

The incoming signal from the N-type antenna socket is fed through a 7-pole, low pass filter with a cut frequency of approximately 1.2GHz. This low loss filter (typically less than 0.5dB over 800-960MHz) provides excellent immunity to interference from high frequency signals.

The signal is filtered again, using a high performance helical resonator doublet (#H900) which provides exceptional image rejection, before being amplified by approximately 7dB (Q401). The signal is then passed through a further helical filter doublet (#H400), after which it is amplified again by 8dB (Q403). It is finally filtered by #H401 before being presented to the mixer.

Each sub-block within the front end has been designed with 50 ohm terminations for ease of testing and fault finding. The overall gain from the antenna socket to the mixer input is approximately 8dB.

2.3 Mixer

(Refer to the front end circuit diagram (sheet 4) in Section 6.2 and Figure 2.2.)

IC410 is a high level mixer requiring a local oscillator (LO) drive level of +17dBm (nominal). The voltage controlled oscillator (VCO) generates a level of +20dBm (typical) and this is fed to the mixer via a 3dB attenuator pad. A diplexer terminates the IF port of the mixer in a good 50 ohms, thus preventing unnecessary intermodulation distortion.

2.4 IF Circuitry

(Refer to the IF section circuit diagram (sheet 3) in Section 6.2 and Figure 2.2.)

Losses in the mixer are made up for in a tuned, common gate, post mixer amplifier (Q300). Several stages of amplification and filtering are employed in the IF circuitry. The first crystal filter is a 4-pole device (&XF300) which is matched into 50 ohms on its input and directly to the impedance of the next stage on its output. This stage is followed by a cascode amplifier (Q302) whose output is matched into a 2-pole crystal filter (&XF302). The signal is then mixed down to 455kHz with the second crystal local oscillator (44.545MHz).

The 455kHz signal is filtered using a 6-pole ceramic filter (IC345) before being limited and detected.

The second IF mixer, limiter and detector is in a 16-pin IC (IC300). This IC also provides an RSSI signal on pin 13. Quadrature detection is employed, using L345, and the recovered audio on pin 9 of IC300 is typically 1V p-p for 60% system deviation.

2.5 Noise Mute (Squelch)

(Refer to the audio processor and IF section circuit diagrams (sheets 2 and 3 respectively) in Section 6.2 and Figure 2.2.)

The noise mute operates on the detected noise outside the audio bandwidth. Two operational amplifiers in IC330 are used as an active band-pass filter centred on 70kHz to filter out audio components and provide gain. Between the active filter stages is a variable gain stage which utilises one of the remaining operational amplifiers in IC330. The noise is then rectified (D330) and filtered to produce a DC voltage proportional to the noise amplitude. The lowest average DC voltage corresponds to a high RF signal strength and the highest DC voltage corresponds to no signal at the RF input.

The rectified noise voltage is compared with a threshold voltage set up on RV230, the front panel "Gating Sensitivity" potentiometer. Hysteresis is provided by the feedback resistor (R267) to prevent the received message from being chopped when the average noise voltage is close to the threshold. R281 and R280 determine the mute opening and closing times and, in combination with solder links SL210 and SL220, provide three time delay options (SL210 is linked as standard - refer to Section 3.8). The mute control signal at pin 7 of IC270 is used to disable the speaker and line audio outputs. The speaker output can be separately enabled for test purposes by operating the front panel mute disable switch, SW201.

2.6 Carrier Mute

(Refer to the audio processor and IF section circuit diagrams (sheets 2 and 3 respectively) in Section 6.2 and Figure 2.2.)

A high level carrier mute facility is also available. The RSSI (refer to Section 2.12) provides a DC voltage proportional to the signal strength. This voltage is compared with a preset level, set up on RV235, and may be linked into the mute timing circuit using PL250. PL250 selects either the noise mute or the carrier mute. From this point both the noise and carrier mute circuits operate in the same manner, using common circuitry.

2.7 Audio Processor

(Refer to the audio processor circuit diagram (sheet 2) in Section 6.2.)

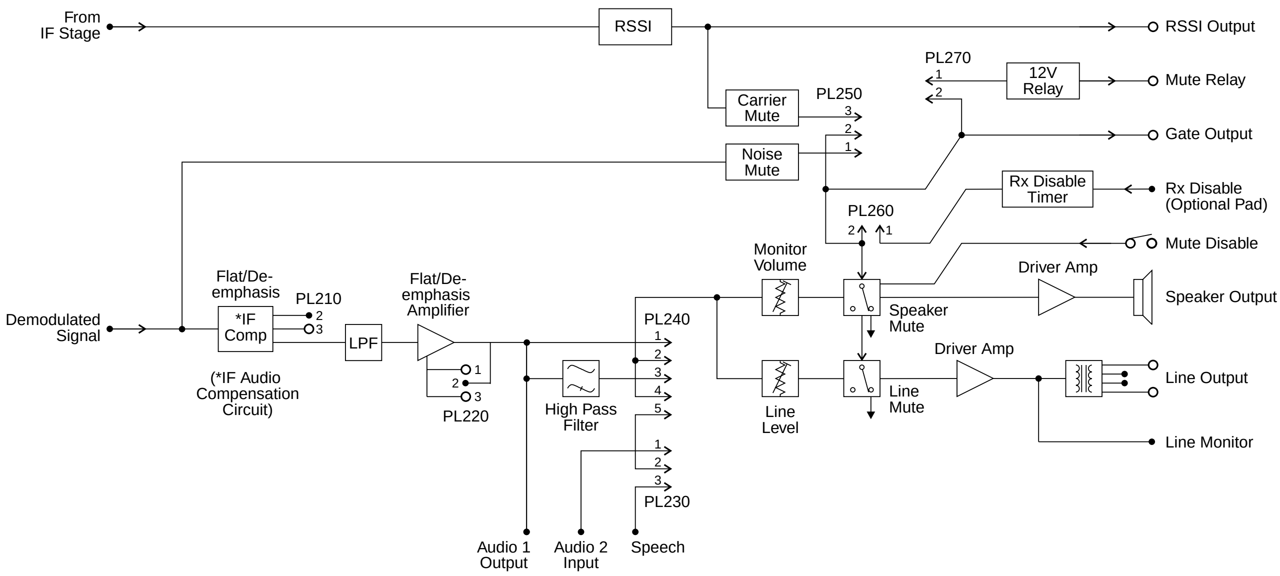


Figure 2.3 T885 Audio Processor Block Diagram

The recovered audio on pin 9 of IC310 is passed through a compensation network and processed in a third order elliptic active filter to give the required response. Linking (PL220 & PL210) is available to give either a flat or de-emphasised audio response, with de-emphasis giving a -6dB/octave roll off. The output of IC210 is split to provide separate paths for the speaker and line outputs. The "Audio 1", Audio 2" and "Speech" lines allow access to the receiver's audio path for external signalling purposes (refer to Section 3.5).

The signals are passed to audio drive amplifiers IC240 and IC260. Under muted conditions the inputs of these amplifiers are shunted to ground via transistors Q230 and Q290 respectively. The audio output of IC240 has a DC component which is removed by C249, and this then drives a speaker directly. The output of IC260 is fed into a line transformer to provide a balanced 2-wire or 4-wire, 600 ohm output.

The speaker volume is set using the front panel "Monitor Volume" knob (RV205) and the line level is set using the recessed "Line Level" potentiometer (RV210).

The red front panel "Gate" LED (D250) indicates the status of the mute circuit. When a signal above the mute threshold is received, the LED is illuminated. The "Monitor Mute" switch (SW201) on the front panel opens the mute, allowing continuous monitoring of the audio signal (on = audio muted; off = audio unmuted).

The mute control line is available on pad 234 ("RX GATE OUT") for control of external circuitry. A high (9V) on pad 234 indicates that the audio is disabled and a low (0V) indicates that a signal above the mute threshold level is being received.

The audio can also be disabled using the "RX-DISABLE" inputs, pads 225 or 228, having connected the "RX-DISABLE" link between pins 1 & 2 of PL260. An adjustable time delay (RV220) is provided on these lines. In order to disable the audio, either pad must be pulled to 0V (refer to Section 1.4 in Part G).

An undedicated relay is provided (RL210) for transmitter keying or other functions and this can be operated from the mute line by linking PL270.

2.8 Power Supply And Regulators

(Refer to the regulators circuit diagram (sheet 6) in Section 6.2.)

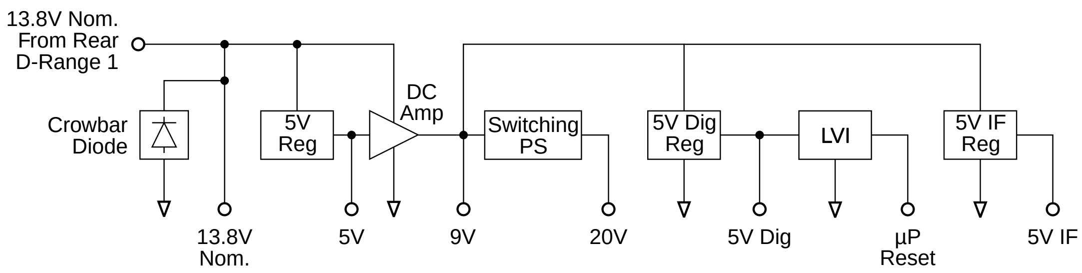


Figure 2.4 T885 Power Supply And Regulators Block Diagram

The T885 is designed to operate off a 10.8-16V DC supply (13.8V nominal). A 5.3V regulator (IC630) runs directly from the 13.8V rail, driving much of the synthesiser circuitry. It is also used as the reference for a DC amplifier (IC640, Q630 & Q620) which provides a medium current capability 9V supply.

A switching power supply, based on Q670 and Q660, runs off the 9V supply and provides a low current capability +20V supply. This is used to drive the synthesiser loop filter (IC740), giving a VCO control voltage of up to 20V.

The 13.8V supply drives both output audio amplifiers without additional regulation. A separate 5V regulator (IC610) drives the microprocessor and associated digital circuitry. The output of this regulator is monitored by the Low Voltage Interrupt (LVI) circuit (IC650). An additional 5V regulator (located in the IF cavity) supplies the first IF amplifier (Q301, Q302) and the demodulator IC (IC300).

A crowbar diode is fitted for protection against connection to a power supply of incorrect polarity. It also provides transient overvoltage protection.

Note: A fuse must be fitted in the power supply line for the diode to provide effective protection.

2.9 Microcontroller

(Refer to the microcontroller circuit diagram (sheet 8) in Section 6.2.)

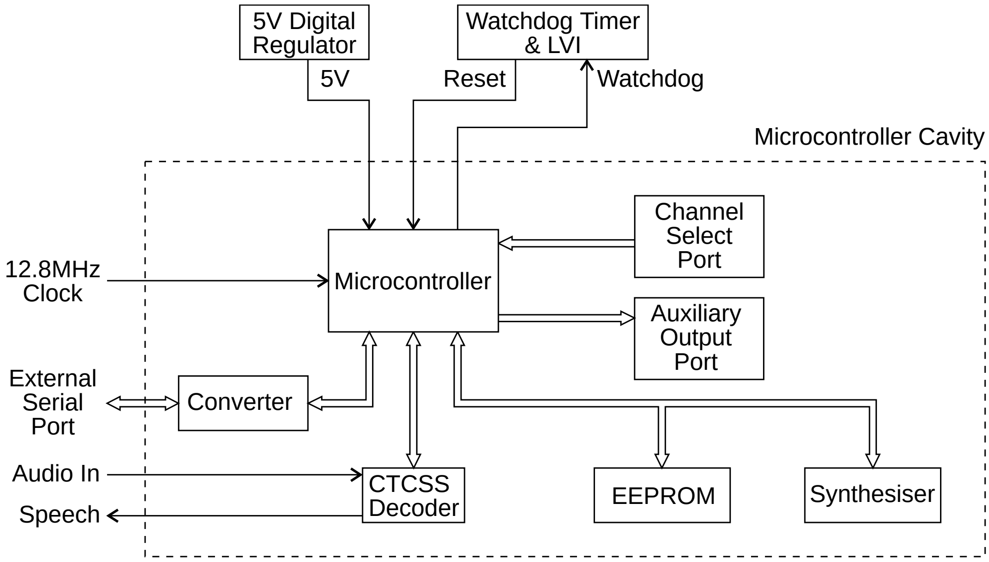


Figure 2.5 T885 Microcontroller Block Diagram

Overall system control of the T885 is accomplished by the use of a member of the 80C51 family of microcontrollers (IC810) which runs from internal ROM and RAM. Four ports are available for input/output functions.

Non-volatile data storage is achieved by serial communication with a 16kBit EEPROM (IC820). This serial bus is also used by the microcontroller to program the synthesiser (IC740).

The main tasks of the microcontroller are as follows:

- program the synthesiser;
- interface with the PGM800Win programming software at 9600 baud via the serial communication lines on D-range 1 (PL100) & D-range 2;
- monitor channel change inputs from D-range 2;
- generate timing waveforms for CTCSS detection;
- coordinate and implement timing control of the receiver;
- control the front panel "Supply" LED (refer to Section 5.3).

2.10 Synthesised Local Oscillator

(Refer to the synthesiser circuit diagram (sheet 7) and the VCO circuit diagram (sheet 5) in Section 6.2.)

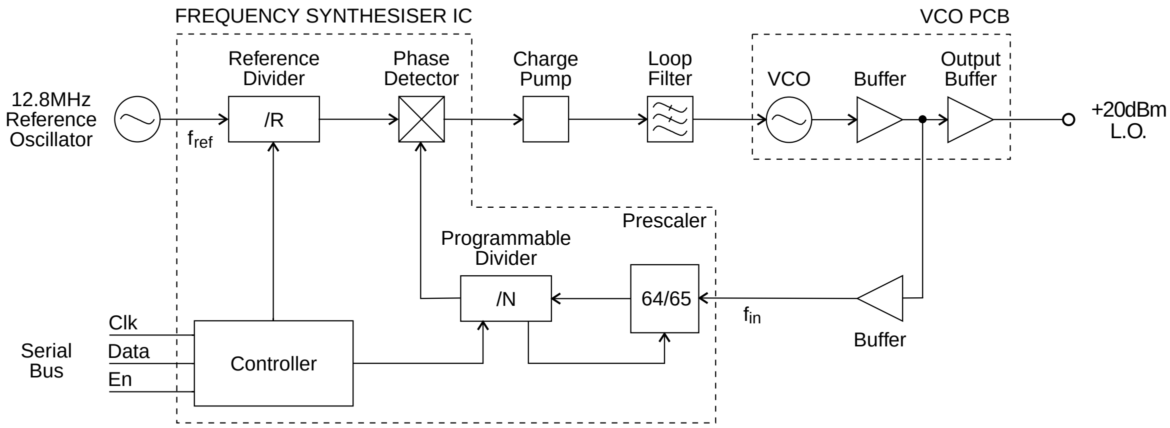


Figure 2.6 T885 Synthesiser Block Diagram

The synthesiser (IC740) employs a phase-locked loop (PLL) to lock a voltage controlled oscillator (VCO) to a given reference frequency. The synthesiser receives the divider information from the control microprocessor via a 3-wire serial bus (clock, data, enable). When the data has been latched in, the synthesiser processes the incoming signals from the VCO buffer (f_{in}) and the reference oscillator (f_{ref}).

A reference oscillator at 12.8MHz (IC700) is buffered (IC710) and divided down to 6.25kHz or 5kHz within the synthesiser IC (IC740).

A buffered output of the VCO is divided with a prescaler and programmable divider which is incorporated into the synthesiser chip (IC740). This signal is compared with the reference signal at the phase detector (also part of the synthesiser chip). The phase detector outputs drive a balanced charge pump circuit (Q760, Q770, Q775, Q780, Q785) and active loop filter (IC750, Q790) which produces a DC voltage between 0V and 20V to tune the VCO. This VCO control line is further filtered to attenuate noise and other spurious signals. Note that the VCO frequency increases with increasing control voltage.

2.11 VCO

(Refer to the VCO circuit diagram (sheet 5) in Section 6.2.)

The VCO consists of several stages: oscillator, cascode buffer, broadband amplifier and output buffer. The oscillator transistor (Q504) operates in a common base Colpitts configuration and is capacitively coupled to a short-circuited coaxial resonator (&TL500). The resonator frequency is capacitively tuned by varicaps (D501, D502, D509, D505) and coarse manual tuning is provided by the sapphire trimcap (CV500).

The cascode buffer (Q540, Q541) provides the signal to the divider buffer in the synthesiser circuit as well as 0dBm to the broadband amplifier (Q543). The broadband amplifier provides +10dB of gain, as does the output buffer stage (T540), which brings the VCO output up to +20dBm.

The VCO operates at the actual frequency required by the first mixer, i.e. there are no multiplier stages.

The VCO frequency spans from either 755-825MHz, 815-865MHz or 845-915MHz according to product type (refer to Section 1.4). The VCO is tuned to 45MHz below the desired receive frequency (low side injection) to produce a 45MHz IF signal at the output of the mixer.

2.12 Received Signal Strength Indicator (RSSI)

(Refer to the IF section circuit diagram (sheet 3) in Section 6.2.)

The RSSI provides a DC voltage proportional to the signal level at the receiver input and is an on-chip function of the demodulator IC (IC300). Circuitry external to IC300 conditions the RSSI signal and the voltage is available at D-range 1 (PL100 pin 5).

The RSSI also provides the capability for high level signal strength muting, which may be selected on PL250 (refer to Section 3.5). The mute threshold may be set between -115dBm and -70dBm by RV235.

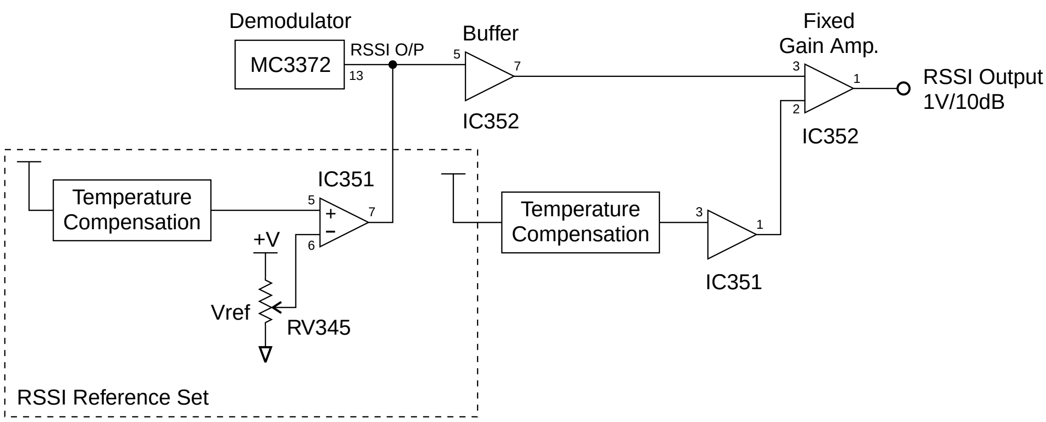


Figure 2.7 T885 RSSI Block Diagram

The voltage offset of the RSSI signal (IC300 pin 13) is adjusted by RV345. This adjustment is temperature compensated by an operational amplifier (IC351 pins 5, 6 & 7). The signal passes through a buffer amplifier (IC352 pins 5, 6 & 7) before being amplified (IC352 pins 1, 2 & 3) to give the correct volts per dB. The amplifier is temperature compensated by IC351 pins 1, 2 & 3 and its associated circuitry.

3 T885 Initial Tuning & Adjustment

Caution: **This equipment contains CMOS devices which are susceptible to damage from static charges. Refer to Section 1.2 in Part A for more information on anti-static procedures when handling these devices.**

Note: To ensure that the T885 will continue to meet its performance specifications, you must tighten the bottom cover screws to the correct torque, and in the correct order, as described in Section 2.4 in Part A.

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

- channel programming
- selecting the required audio links
- synthesiser alignment
- receiver front end and IF alignment
- noise and carrier level mute adjustment
- setting the line and monitor output levels
- setting up the RSSI.

Note: Unless otherwise specified, the term "PGM800Win" used in this and following sections refers to version 3.00 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.

3.1 Introduction

When you receive your T885 receiver 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 6MHz switching range (i.e. ±3MHz from the factory programmed frequency), you should only need to reprogram the receiver 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 6MHz switching range, you will have to reprogram and re-tune the receiver 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 receiver's EEPROM memory (IC820) by using the PGM800Win software package and an IBM™ PC. You can also use PGM800Win to select the receiver's current operating frequency (or "default channel").

If the receiver is installed in a rack frame, you can program it via the programming port in the speaker panel. However, you can also program the receiver before it is installed in a rack frame as follows:

- by using a T800-01-0010 calibration test unit;
- via D-range 1;
- via D-range 2 (standard T800-03-0000 auxiliary D-range only);
- via SK805 (internal Micromatch connector).

If you do not use the T800-01-0010, you will have to connect the PC to the receiver via a module programming interface (such as the T800-01-0004).

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

Note: When an auxiliary D-range kit (D-range 2 - T800-03-0000) 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 Customer Service Organisation for further details.

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
- module programming interface (e.g. T800-01-0004 - optional)
- 13.8V power supply
- digital multimeter
- audio signal generator
- RF signal generator
- audio voltmeter
- sinad meter

  } or RF test set (optional)
- oscilloscope
- distortion meter

  } not needed for short tuning procedure
- T800-01-0010 calibration test unit (optional)
- 4Ω speaker (not needed if the calibration test unit is used)

Figure 3.1 and Figure 3.2 show typical test equipment set-ups (with and without a T800-01-0010 calibration test unit).

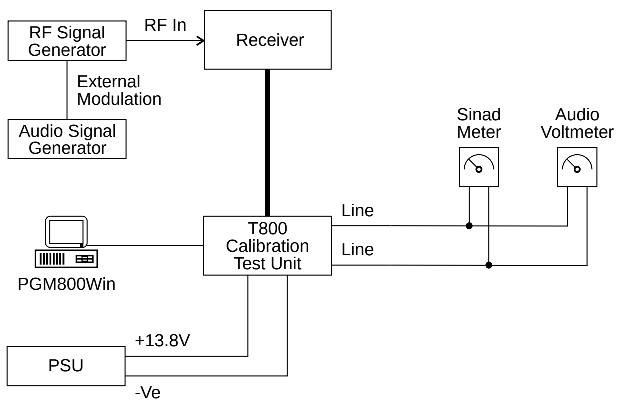


Figure 3.1 T885 Test Equipment Set-up For Short Tuning Procedure

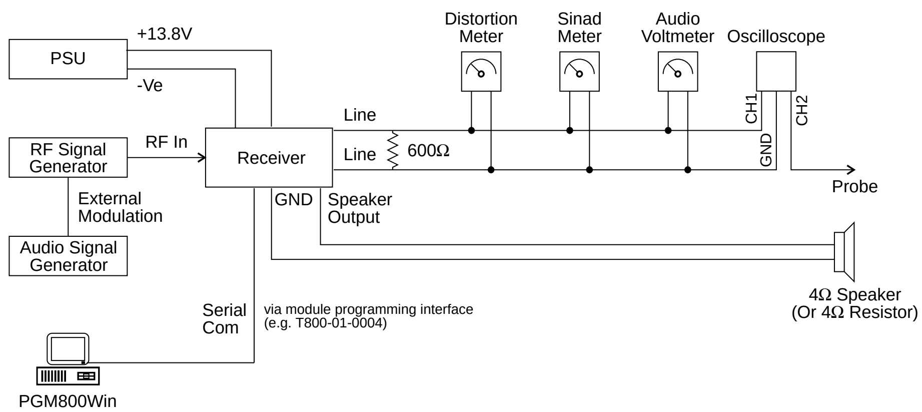


Figure 3.2 T885 Test Equipment Set-up For Full Tuning & Adjustment Procedure

3.4 Short Tuning Procedure

Use this procedure only if you want to reprogram the receiver to a frequency outside the 6MHz 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 via next to R520 in the VCO cavity (this measures the synthesiser loop voltage).

- **Single Channel** Tune VCO trimmer CV500 for a synthesiser loop voltage of 10V.

  Multichannel Tune VCO trimmer CV500 for a synthesiser loop voltage of 10V on the middle channel.

  If there is no middle channel, tune CV500 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 6MHz.

3.4.3 Front End Alignment

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: For multichannel operation align the receiver on a frequency in the middle of the required band.

Set RV230 (front panel gating sensitivity) fully clockwise.

Inject a strong on-channel RF signal with ±3kHz deviation [±1.5kHz] at 1kHz into the antenna socket and adjust the helical resonators (#H900, #H400 and #H401) to give best sinad.

Continually decrease the RF level to maintain 12dB sinad.

Readjust #H900, #H400 and #H401 to give best sinad.

With PL210 and PL220 connected for de-emphasised audio response, the receiver sensitivity should be better than -117dBm, assuming that the audio levels are not being overdriven (refer to Section 3.4.5).

3.4.4 Mute Adjustment

3.4.4.1 Noise Mute

Connect pins 1 & 2 of PL250 to enable the noise mute.

Set the RF level to -105dBm with ±3kHz deviation [±1.5kHz] at 1kHz.

Set RV230 (front panel gating sensitivity) fully anticlockwise.

Adjust RV346 (noise mute gain) fully anticlockwise to close the mute (if necessary turn off the RF signal and then turn it on again).

Rotate RV346 clockwise until the mute just opens.

Reset the signal generator for the required opening sinad and adjust RV230 clockwise until the mute just opens.

3.4.4.2 Carrier Level Mute

Connect pins 2 & 3 of PL250 to enable the carrier mute and disable the noise mute.

Apply an on-channel signal from the RF generator at the required mute opening level with ±3kHz deviation [±1.5kHz] at ±1kHz.

Adjust RV235 (carrier mute) anticlockwise to close the mute (if necessary, momentarily turn off the RF), then slowly adjust it clockwise until the mute just opens. The mute should now open at this preset level.

3.4.5 Line Amplifier Output

Apply an on-channel signal from the RF generator at a level of -70dBm with ±3kHz deviation [±1.5kHz] at 1kHz.

Adjust RV210 (front panel line level) to set the line level to the required output level.

3.4.6 CTCSS

3.4.6.1 Decoder Operation

Program a CTCSS tone on the default channel using PGM800Win.

Set the RF signal generator output to -70dBm.

Modulate the generator with both:

- a 1kHz tone at ±3kHz deviation [±1.5kHz]
- and a CTCSS tone at the programmed frequency at ±500Hz deviation [±300Hz].

Check that the receiver gate opens and the front panel "Gate" LED is on.

3.4.6.2 Opening Sinad

Adjust RV230 (front panel gating sensitivity) fully clockwise.

Reduce the RF signal level to -110dBm.

Observe the sinad meter and reduce the RF level until the receiver mute closes.

Slowly increase the signal level until the receiver mute just opens and stays open.

With PL240 pins 1 & 2 linked (high pass filter bypassed), check that the sinad is less than 6dB.

Reset the signal generator for the required opening sinad, adjust RV230 fully anti-clockwise, then clockwise until the mute just opens.

3.4.6.3 High Pass Filter

Set the audio processor links as follows:

Plug	Link	Function
PL210	1 - 2	de-emphasised response
PL230	2 - 3	audio from internal CTCSS speech filter
PL240	4 - 5	audio input via PL230 or I/O pad

Reset the RF signal generator output to -70dBm and note the line level (measurement A).

Reduce the 1kHz generator to zero output and measure the line level again (measurement B).

Check that measurement B is at least 30dB below measurement A.

3.4.7 RSSI (If Used)

Apply an on-channel signal from the RF generator at a level of -95dBm with ±3kHz deviation [±1.5kHz] at 1kHz.

Adjust RV345 (RSSI level) to give 2.0V RSSI output on pin 5 of D-range 1 (PL100) when measured with a high impedance DMM.

3.5 Audio Processor Links

3.5.1 General

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 the receiver alignment. The factory settings are shown in brackets [ ].

Plug	Link[a]	Function
PL210	[1 - 2] 2 - 3	de-emphasised response flat response
PL220	1 - 2 [2 - 3]	flat response de-emphasised response
PL230[b]	1 - 2 [2 - 3] 3 - 4	audio input via AUDIO-2 pad audio from internal CTCSS speech filter audio input via I/O pad P250
PL240[b]	1 - 2 [2 - 3] or 3 - 4 4 - 5	bypass high pass filter 300Hz high pass filter in circuit audio input via PL230 or I/O pad
PL250	[1 - 2] 2 - 3	noise mute carrier mute
PL260[c]	1 - 2 [2 - 3]	RX-DISABLE link not connected
PL270	[1 - 2] 2 - 3	relay link not connected

a. Pin 1 is identified by the number "1" screen printed onto the PCB beside each set of links.

b. Refer to Section 3.5.2 for further details.

c. Refer to Section 1.4 in Part G for further details.

3.5.2 Audio Processor Linking Details For CTCSS

You must connect the audio processor links correctly according to the CTCSS option used, as shown in the table below.

CTCSS Option	PL230[a]	PL240[a]
standard, no CTCSS	2 - 3	2 - 3
received CTCSS + speech passed to line output	3 - 4	1 - 2
high pass filtered speech, internal CTCSS detection	2 - 3	4 - 5
external CTCSS detection	1 - 2	4 - 5

a. Pin 1 is identified by the number "1" screen printed onto the PCB beside each set of links.

The conditions stated in the above table are defined as follows:

- standard, no CTCSS
  - no CTCSS or other sub-audio signalling used
  - audio bandwidth 300Hz to 3kHz
  - hum & noise -48dB
- received CTCSS tone + speech to line output
  - tone and speech transmitted down 600 ohm line
  - audio bandwidth 10Hz to 3kHz
  - hum & noise -45dB
- high pass filtered speech + internal CTCSS detection
  - 400Hz to 3kHz
  - hum & noise -25dB with 250.3Hz tone present
- external CTCSS detection
  - decoding performed through the receiver (but externally)
  - speech injected back into receiver via "AUDIO-2" and sent down 600 ohm line

Note 1: AUDIO-2 is available on D-range 1 (PL100) pin 7 via the link resistor R160. Although PL100 pin 7 is already assigned to SERIAL-COM, this can be disabled by removing R808.

Note 2: External CTCSS units can connect in series with the audio chain via AUDIO-1 and AUDIO-2.

3.6 Synthesiser Alignment

- Ensure that the receiver has been programmed with the required frequencies using the PGM800Win software.
- Connect a high impedance voltmeter to the via next to R520 in the VCO cavity (this measures the synthesiser loop voltage).
- **Single Channel** Tune VCO trimmer CV500 for a synthesiser loop voltage of 10V.

  Multichannel Tune VCO trimmer CV500 for a synthesiser loop voltage of 10V on the middle channel.

  If there is no middle channel, tune CV500 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 programme channels with a greater frequency separation than the specified switching range of 6MHz.
- The TCXO =(IC700) output frequency should be trimmed when the IF is tuned - refer to Section 3.7.

3.7 Alignment Of Receiver Front End And IF

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

Align the synthesiser as instructed in Section 3.6. For multichannel operation align the receiver on a frequency in the middle of the required band.

Set RV230 (front panel gating sensitivity) fully clockwise.

Inject a strong on-channel RF signal with ±3kHz deviation [±1.5kHz] at 1kHz into the antenna socket.

Connect a voltmeter to the RSSI output (D-range 1 [PL100] pin 5 or P238 in the audio processor cavity) and adjust the helicals (#H900, #H400 and #H401) to give maximum RSSI voltage. While adjusting the helicals, decrease the RF level to keep the RSSI voltage below 7V.

Adjust L345 coarsely for maximum line level.

While maintaining a low level unmodulated RF input to the receiver, loosely couple into the first IF an additional high level signal at 45MHz - you will hear a beat note.

Trim the synthesiser TCXO (=IC700) for zero beat.

Note: If a second oscillator is not available, you can connect a frequency counter to IC710 pin 8 (i.e. after the TCXO buffer) via an oscilloscope probe to measure the TCXO frequency directly (12.8MHz). At this point the voltage level is approximately 4V p-p.

Readjust the front end helicals (#H900, #H400 and #H401) to give the best sinad.

Change the RF signal level to -75dBm and modulate with ±3kHz deviation [±1.5kHz] at 1kHz.

Note: If you would like a more accurate method of tuning the IF, refer to the sweep tuning method described in Section 5.5.5.

Adjust L345 and then L301 for minimum distortion. If the distortion is still >2%, you may have to adjust L345 and L301 alternately until you reach the true minimum.

Check that the distortion reading is:

wide bandwidth	<2%
narrow bandwidth	<4%.

If required, reconnect plugs PL210 and PL220 to give a de-emphasised audio response and check that the distortion reading is <2% (all bandwidths).

Reduce the RF level until 12dB sinad is reached. The receiver sensitivity should be better than -117dBm (de-emphasised) or -111dBm (flat), assuming that the audio levels are not being overdriven (refer to Section 3.12).

3.8 Gating Delay

Two solder links (SL210 & SL220) are provided in the audio processor cavity to allow three gate delay time options, as shown in the table below.

SL210	SL220	Closing Delay
linked	not linked	<50ms*
not linked	linked	<25ms
not linked	not linked	<20ms

*Factory setting.

3.9 Noise Mute Adjustment

Connect pins 1 & 2 of PL250 to enable the noise mute.

Align the receiver as instructed in Section 3.6 and Section 3.7.

Set the RF level to -105dBm with ±3kHz deviation [±1.5kHz] at 1kHz.

Set RV230 (front panel gating sensitivity) fully anticlockwise.

Adjust RV346 (noise mute gain) fully anticlockwise to close the mute (if necessary turn off the RF signal and then turn it on again).

Rotate RV346 clockwise until the mute just opens.

Reset the signal generator for the required opening sinad and adjust RV230 clockwise until the mute just opens.

3.10 RSSI

Align the receiver as instructed in Section 3.6 and Section 3.7.

Apply an on-channel signal from the RF generator at a level of -95dBm with ±3kHz deviation [±1.5kHz] at 1kHz.

Adjust RV345 (RSSI level) to give 2.0V RSSI output on pin 5 of D-range 1 (PL100) when measured with a high impedance DMM.

3.11 Carrier Level Mute

Connect pins 2 & 3 of PL250 to enable the carrier mute and disable the noise mute.

Apply an on-channel signal from the RF generator at the required mute opening level with ±3kHz deviation [±1.5kHz] at ±1kHz.

Adjust RV235 (carrier mute) anticlockwise to close the mute (if necessary, momentarily turn off the RF), then slowly adjust it clockwise until the mute just opens. The mute should now open at this preset level.

3.12 Audio Processor

3.12.1 Line Amplifier Output

Apply an on-channel signal from the RF generator at a level of -70dBm with ±3kHz deviation [±1.5kHz] at 1kHz.

Adjust RV210 (front panel line level) to give an output of +10dBm on the 600 ohm line.

Check for any clipping or distortion on the oscilloscope.

Set the line level to the required output level.

3.12.2 Monitor Amplifier Output (Speaker Output)

Adjust RV205 (front panel monitor volume) to give an output of 2V rms into a 4 ohm resistive load.

Check for any clipping or distortion on the oscilloscope.

Switch to a 4 ohm speaker and adjust RV205 to the required level.

3.13 CTCSS

3.13.1 Decoder Operation

Program a CTCSS tone on the default channel using PGM800Win.

Set the RF signal generator output to -70dBm.

Modulate the generator with both:

- a 1kHz tone at ±3kHz deviation [±1.5kHz]
- and a CTCSS tone at the programmed frequency at ±500Hz deviation [±300Hz].

Check that the receiver gate opens and the front panel "Gate" LED is on.

3.13.2 Opening Sinad

Adjust RV230 (front panel gating sensitivity) fully clockwise.

Reduce the RF signal level to -110dBm.

Observe the sinad meter and reduce the RF level until the receiver mute closes.

Slowly increase the signal level until the receiver mute just opens and stays open.

With PL240 pins 1 & 2 linked (high pass filter bypassed), check that the sinad is less than 6dB.

Reset the signal generator for the required opening sinad, adjust RV230 fully anti-clockwise, then clockwise until the mute just opens.

3.13.3 High Pass Filter

Set the audio processor links as follows:

Plug	Link	Function
PL210	1 - 2	de-emphasised response
PL230	2 - 3	audio from internal CTCSS speech filter
PL240	4 - 5	audio input via PL230 or I/O pad

Reset the RF signal generator output to -70dBm and note the line level (measurement A).

Reduce the 1kHz generator to zero output and measure the line level again (measurement B).

Check that measurement B is at least 30dB below measurement A.

4 T885 Functional Testing

Caution: **This equipment contains CMOS devices which are susceptible to damage from static charges. Refer to Section 1.2 in Part A for more information on anti-static procedures when handling these devices.**

The following test procedures will confirm that the T885 has been tuned and adjusted correctly and is fully operational.

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: Unless otherwise specified, the term "PGM800Win" used in this and following sections refers to version 3.00 and later of the software.

Refer to Figure 4.3 for the location of the main tuning and adjustment controls, and to Section 3.3 for the test equipment set-up. 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 following topics are covered in this section.

4.1 Current Consumption

Connect the T885 to a 13.8V power supply.

Rotate RV230 (front panel gating sensitivity) anticlockwise until the "Gate" LED is extinguished.

Set switch SW201 (front panel monitor mute) to the ***on*** position.

Check that the current in the 13.8V power cable is less than 350mA.

Rotate the RV230 clockwise until the "Gate" LED is lit.

Rotate RV210 (front panel line level) and RV205 (front panel monitor volume) to give maximum outputs.

Check that the current is less than 800mA.

Reset the front panel controls to the required settings.

4.2 Sensitivity

If CTCSS is enabled, disable the CTCSS tone by either programming the T885 for "No Tone" on the set channel, or by pulling pin 10 of D-range 2 (CTCSS ENABLE) low.

Apply an on-channel signal from the RF generator with ±3kHz deviation [±1.5kHz] at 1kHz.

Adjust the RF level to give 12dB audio sinad.

Check that the sensitivity is -117dBm or better.

4.3 Switching Range

Apply an on-channel signal from the RF generator at various frequencies within the 5MHz switching range (front end bandwidth), corresponding to pre-programmed channels.

Measure the sensitivity at each frequency as described in Section 4.2.

Ensure that the sensitivity is -115dBm or better across the whole switching range.

4.4 Audio Distortion

The level of distortion measured at the line output (refer to Figure 1.3 in Part F) gives an indication of the accuracy of the IF alignment.

Apply an accurate on-channel signal from the RF generator at a level of -70dBm with ±3kHz deviation [±1.5kHz] at 1kHz.

Adjust RV210 (front panel line level) to give +10dBm into 600 ohms.

Check that the distortion is approximately 1% THD.

Note: For a flat response, the distortion should always be better than 2% for wide bandwidth sets or 4% for narrow bandwidth sets.

Adjust RV205 (front panel monitor volume) to give 2V rms into a 4 ohm resistive load.

Check that the distortion at the monitor output is better than 2% THD.

Reset the controls before proceeding to the next set of tests.

4.5 Ultimate Signal-To-Noise Ratio

Apply a signal from the RF generator at a level of -57dBm with ±3kHz deviation [±1.5kHz] at 1kHz.

Select de-emphasis on the links provided in the audio processor (refer to Section 3.5), and link pins 2 & 3 of PL240 to include the 300Hz filter.

Adjust RV210 (front panel line level) to provide +10dBm output.

Switch off the modulation, checking that the residual noise is lower than -36dBm [-28dBm] at the line output (this corresponds to S/N of 46dB [38dB] and is in accordance with EIA measurement conditions).

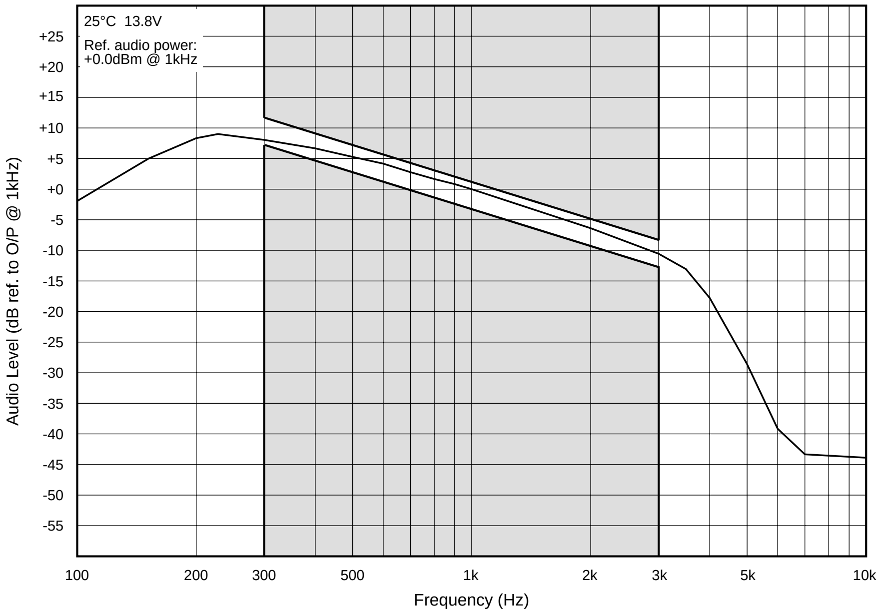
Note: You can make the measurement without the 300Hz high pass filter, but the result will be 10dB worse.

4.6 De-emphasised Audio Frequency Response

Set RV210 (front panel line level) to provide 0dBm output at 1kHz modulating frequency.

Sweep the modulating frequency, checking that the line audio response closely follows that shown in Figure 4.1 - the limits should not be exceeded.

Wide Bandwidth



Narrow Bandwidth

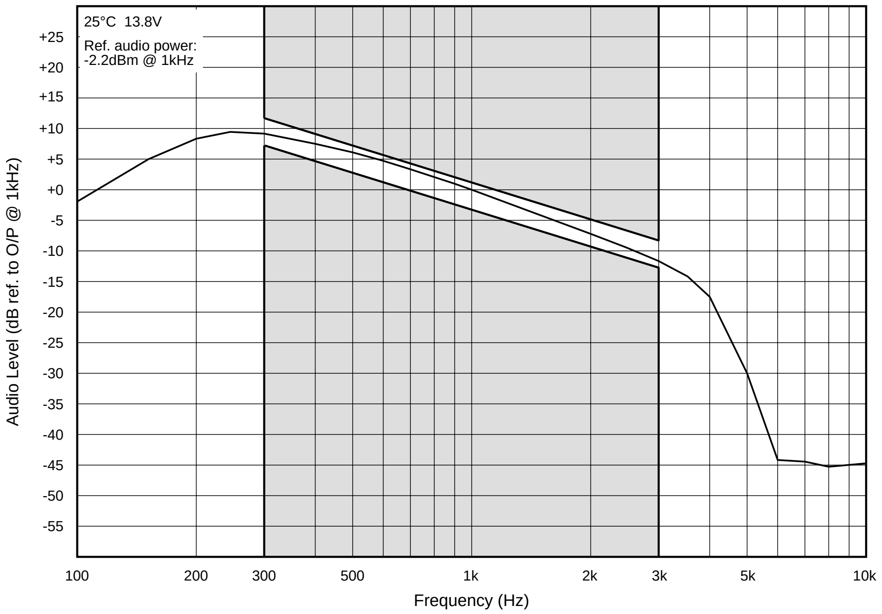


Figure 4.1 T885 De-emphasised Audio Frequency Response

4.7 Noise Mute (If Linked In)

Rotate RV230 (front panel gating sensitivity) fully anticlockwise.

Apply an on-channel signal from the RF generator at a level of -110dBm with ±3kHz deviation [±1.5kHz] at 1kHz.

Increase the RF level in 1dB steps, checking that the mute opens for an RF input level of approximately -105dBm.

Turn the RF off and check that the mute closes.

Rotate RV230 clockwise and check that the mute opens.

Reset RV230 to give the required opening sinad.

Caution: **Some RF generators can cause a false opening of the mute because the generator produces a burst of noise when the attenuation range changes. To correct the problem you will have to change generators.**

4.8 RSSI

Apply an on-channel signal from the RF generator at a level of -95dBm with ±3kHz deviation [±1.5kHz] at 1kHz.

Using a high impedance DMM, check that the RSSI output voltage on pin 5 of D-range 1 (PL100) is 2V (nominal).

Vary the RF level in 5dB steps and check that the RSSI output voltage changes at a rate of approximately 10dB/V over the range of -115dBm to -70dBm (refer to Figure 4.2 for RSSI voltage vs signal strength).

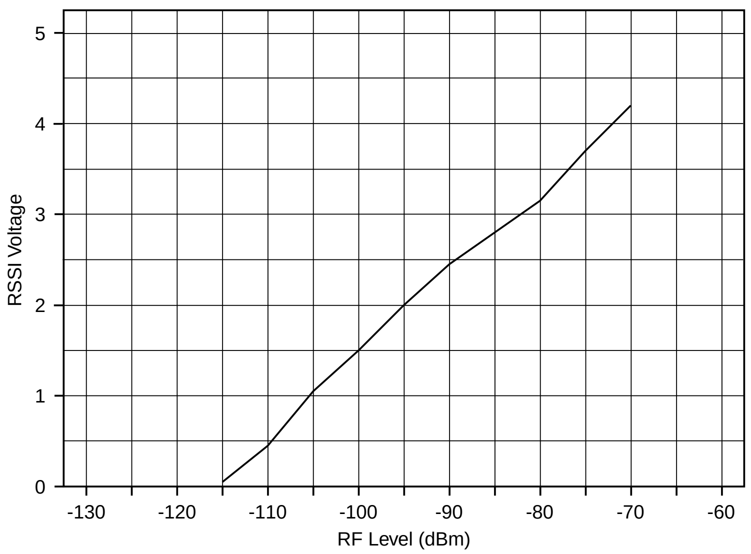


Figure 4.2 T885 RSSI Voltage vs Signal Strength

4.9 Carrier Level Mute (Carrier Mute Linked In)

Apply an on-channel signal from the RF generator at a level of -120dBm with ±3kHz deviation [±1.5kHz] at 1kHz.

Increase the RF level in 2dB steps and check that the mute opens at an RF level which corresponds with the preset level on RV235 (carrier mute), i.e. between -115dBm and -70dBm.

5 T885 Fault Finding

Caution: **This equipment contains CMOS devices which are susceptible to damage from static charges. Refer to Section 1.2 in Part A for more information on anti-static procedures when handling these devices.**

The following test procedures and fault finding flow charts may be used to help locate a hardware problem, however they are by no means a complete fault finding procedure. If you still cannot trace the fault after progressing through them in a logical manner, contact your nearest Tait Dealer or Customer Service Organisation. If necessary, you can get additional technical help from Customer Support, Tait Electronics Ltd, Christchurch, New Zealand (full contact details are on page 2).

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: Unless otherwise specified, the term "PGM800Win" used in this and following sections refers to version 3.00 and later of the software.

Refer 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 following topics are covered in this section.

5.1 Visual Checks

Remove the covers from the T885 and inspect the PCB for damaged or broken components, paying particular attention to the surface mounted devices (SMDs).

Check for defective solder joints. If repair or replacement of components is considered necessary, refer to Section 3 of Part A.

5.2 Component Checks

If you suspect a transistor is faulty, you can assess its performance by measuring the forward and reverse resistance of the junctions. Unless the device is completely desoldered, first make sure that the transistor is not shunted by some circuit resistance. Use a good quality EVM (e.g. Fluke 75) for taking the measurements (or a 20k ohm/V or better multimeter, using only the medium or low resistance ranges).

The collector current drawn by multi-junction transistors is a further guide to their performance.

If an IC is suspect, the most reliable check is to measure the DC operating voltages. Due to the catastrophic nature of most IC failures, the pin voltages will usually be markedly different from the recommended values in the presence of a fault. The recommended values can be obtained from either the circuit diagram or the component data catalogue.

5.3 Front Panel LED Indicator

The green "Supply" LED on the receiver front panel will flash according to the conditions described in the following table:

Flash Rate		Condition
fast	(⅓ sec. on/⅓ sec. off approx.)	receiver is linked with PGM800Win
slow	(1 sec. on/1 sec. off approx.)	VCO is out of lock - refer to Section 5.4.2
unequal	(⅓ sec. on/1 sec. off approx.)	microcontroller has detected an internal communications error - refer to Section 5.7.1

Where two or more conditions occur at the same time, the precedence is in the order shown above (i.e. receiver linked has the highest priority, followed by VCO error, then internal error).

5.4 DC Checks

5.4.1 Power Rails

Refer to the test points & options diagrams in Section 6 for test point locations, and to the regulator fault finding chart (Section 5.7.2) for fault diagnosis.

Check the 9V (TP602) and 13.8V (TP601) power supply test points in the regulator compartment with a DMM.

Check the 20V regulator output at the test point (TP603) in the regulator compartment.

Check the 5V regulator output at the test point (TP604) in the regulator compartment and on IC310 pin 4.

Check the 5V digital regulator output at the junction of C611A (+) and IC610 pin 2 in the regulator compartment.

Check the 5V regulator output on IC360 pin 1 in the IF compartment.

5.4.2 VCO Locking

Using a DMM, monitor the VCO control voltage on the via next to R520 in the VCO compartment.

If the synthesiser is locked and the VCO aligned, the voltage at this point should be between 3 and 16V.

If the VCO is not locked, refer to the synthesiser fault finding charts (Section 5.7.3).

5.4.3 Mute Operation

The front panel "Gate" LED will show the status of the mute circuitry and will turn on when a signal is received above the threshold level.

Check that PL250 is linked correctly:

noise mute	1-2
carrier mute	2-3.

Check that the mute gate opens as follows:

noise mute -	rotate RV230 (front panel gating sensitivity) fully clockwise and check that the front panel "Gate" LED turns on;
carrier mute -	rotate RV235 (carrier mute) fully clockwise and check that the front panel "Gate" LED turns on.

If the mute fails to operate correctly, refer to the noise mute fault finding chart (Section 5.7.4) or the carrier mute fault finding chart (Section 5.7.5).

5.5 RF Checks

5.5.1 VCO Frequency

Check that the VCO is phase locked (refer to Section 5.4.2).

Connect a frequency counter (level +20dBm) to the VCO input to the mixer (TP401).

Monitor the local oscillator frequency and check that it is 45MHz ***below*** the required receive frequency.

Refer to the synthesiser fault finding charts (Section 5.7.3) for further information.

5.5.2 RF Sensitivity

Ensure that the VCO is on the correct frequency and the receiver correctly aligned.

Check that the 12dB sinad sensitivity into the front end is as follows:

-117dBm (de-emphasised response)
-111dBm (flat response).

If the sensitivity is poor, you can trace the fault by measuring the sensitivity into successive circuit blocks. Prepare a test cable by connecting a 1nF capacitor to the end of a length of coax cable as shown in Figure 5.1.

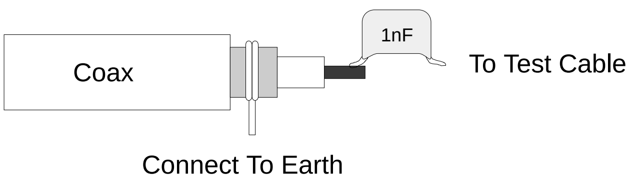


Figure 5.1 RF Test Cable

Note: Before using the test cable, ensure the coax braid is connected to an earth point on the PCB.

Using the RF test cable, apply a modulated 45MHz signal to the test breaks in the IF section, or an on-channel RF signal to the front end test breaks.

Check that the sensitivity at each test break is within 2dB of the levels shown on the circuit diagram.

Poor sensitivity indicates a fault in one of the circuit blocks following the test break.

Note: Poor sensitivity into the mixer can be caused by lack of drive level from the VCO (the drive level should be >+20dBm at TP401).

Refer to the receiver fault finding charts (Section 5.7.6) for further information.

5.5.3 TCXO Stability

While maintaining a low level unmodulated RF input to the receiver, loosely couple into the first IF an additional high level signal at 45MHz - you should now hear a constant low frequency beat note.

Tap the TCXO with a finger and replace it if the beat note permanently changes.

5.5.4 Demodulator Output

Apply an on-channel RF signal modulated by 1kHz with ±3kHz [±1.5kHz] deviation at an amplitude of -65dBm.

Connect an oscilloscope probe (DC coupled) to IC300 pin 9 (audio output).

Check that an audio signal of approximately 800mV peak to peak is present.

Optimum tuning of the quad coil (L345) for minimum audio distortion (with a "flat" audio response) should coincide with maximum audio amplitude and a DC level of approximately 1.7V.

5.5.5 IF Distortion

If the audio distortion is still high after careful IF alignment (Section 3.7), sweep the IF to investigate the bandpass response.

Apply an on-channel RF signal modulated at 10Hz (sine wave) with ±12kHz [±6kHz] deviation at an amplitude of -80dBm.

Connect the modulating 10Hz audio signal to the "X" input of an oscilloscope and observe the 455kHz IF input to IC300 pin 5 via a suitable RF probe on the "Y" input. Alternatively, use an oscilloscope probe for the "Y" input to monitor the RSSI output voltage at pad P238 (RSSI test point) or pin 5 of D-range 1 (PL100). This will give a demodulated log response and only the top half of the wave forms shown in Figure 5.2 and Figure 5.3 will be displayed on the oscilloscope screen.

Note: The "X" input should be DC coupled.

Check that the swept response has a rounded top and no sharp non-linearities (refer to Figure 5.2).

Increase the RF level to -50dBm; the trace will now show the shape of the 455kHz ceramic filter (&XF302).

Check that the response has no sharp non-linearities.

If sharp non-linearities do occur, replace the filter and sweep again to confirm a satisfactory solution (refer to Figure 5.3).

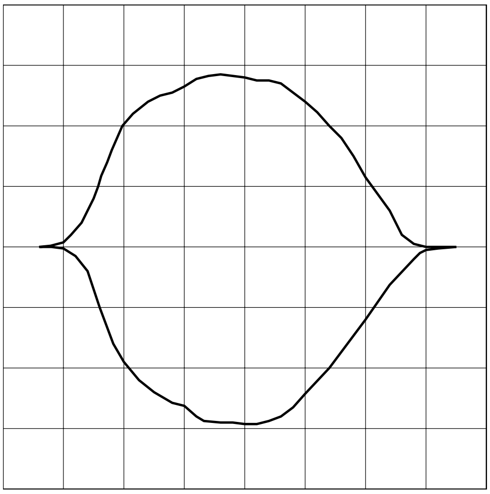


Figure 5.2 IF Swept Response

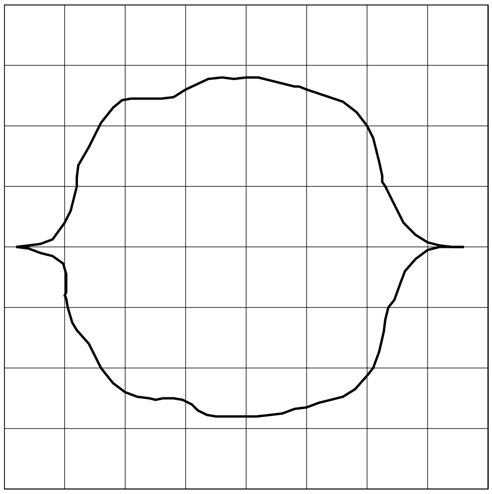


Figure 5.3 Ceramic Filter Swept Response

5.6 PGM800Win Generated Errors

The following errors are those most likely to occur using PGM800Win. Refer to the PGM800Win software user's manual for a complete list of error messages.

Channel Switch Set

The (programmed) default channel change was not accepted by the base station because a channel is selected externally. Try turning the external channel switch off to change the default channel in PGM800Win.

Synth Out Of Lock

The synthesiser received incorrect data, or the data was corrupted. Enter a frequency within the VCO switching range, or tune the VCO.

Internal Error

Data could not be read from the base station due to an internal error. Check for shorts or open circuits on the SDA, SCK, SYNTH and EPOT lines. The SDA, SCK and SYNTH are normally high.

Write/Read To An Unlinked Module

The link to the module does not exist. Undefined error.

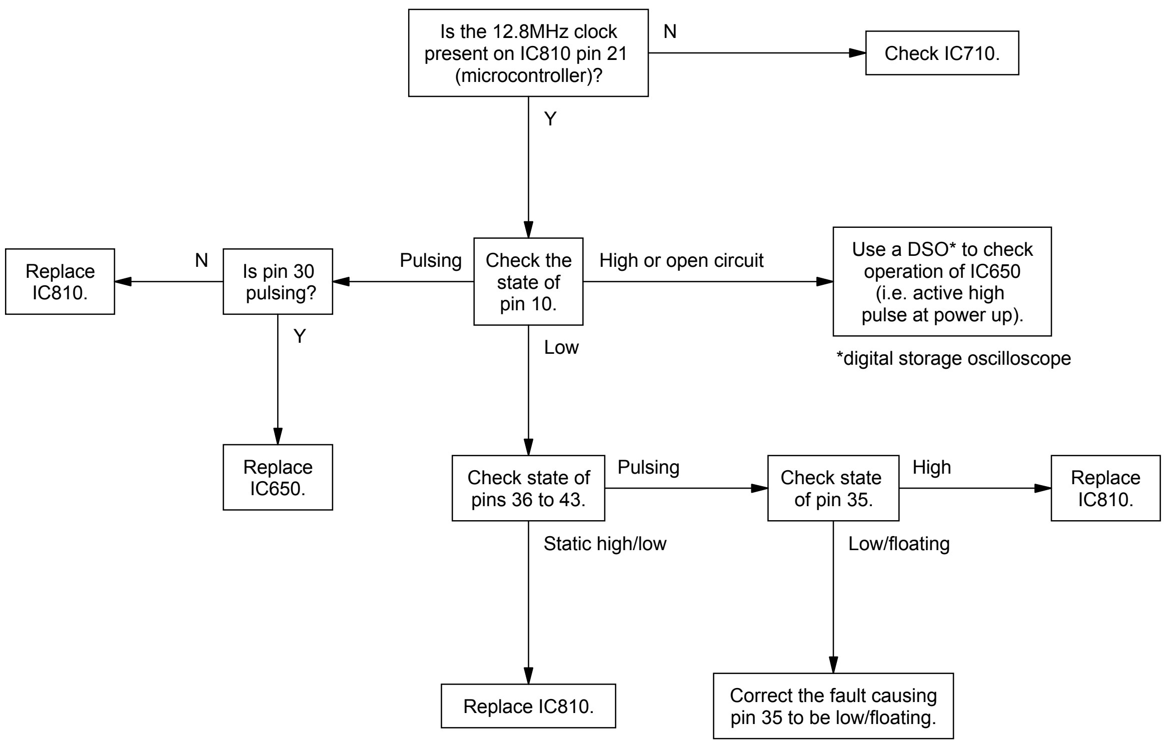
5.7 Fault Finding Charts

Note: The standard test point designations used in this section are as follows:

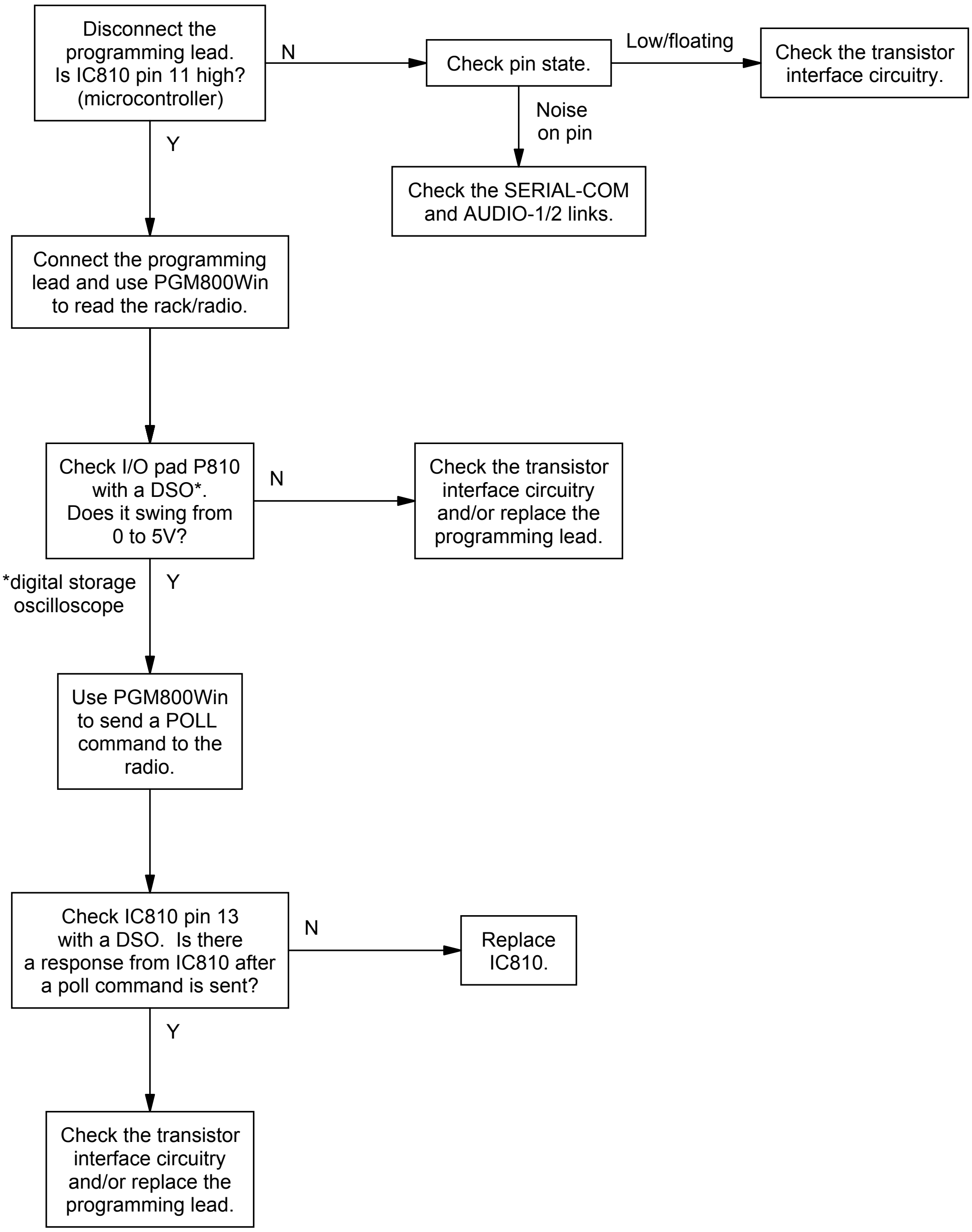
TP601	13.8V
TP602	9V
TP603	20V
TP604	5V

5.7.1 Microcontroller (IC810)

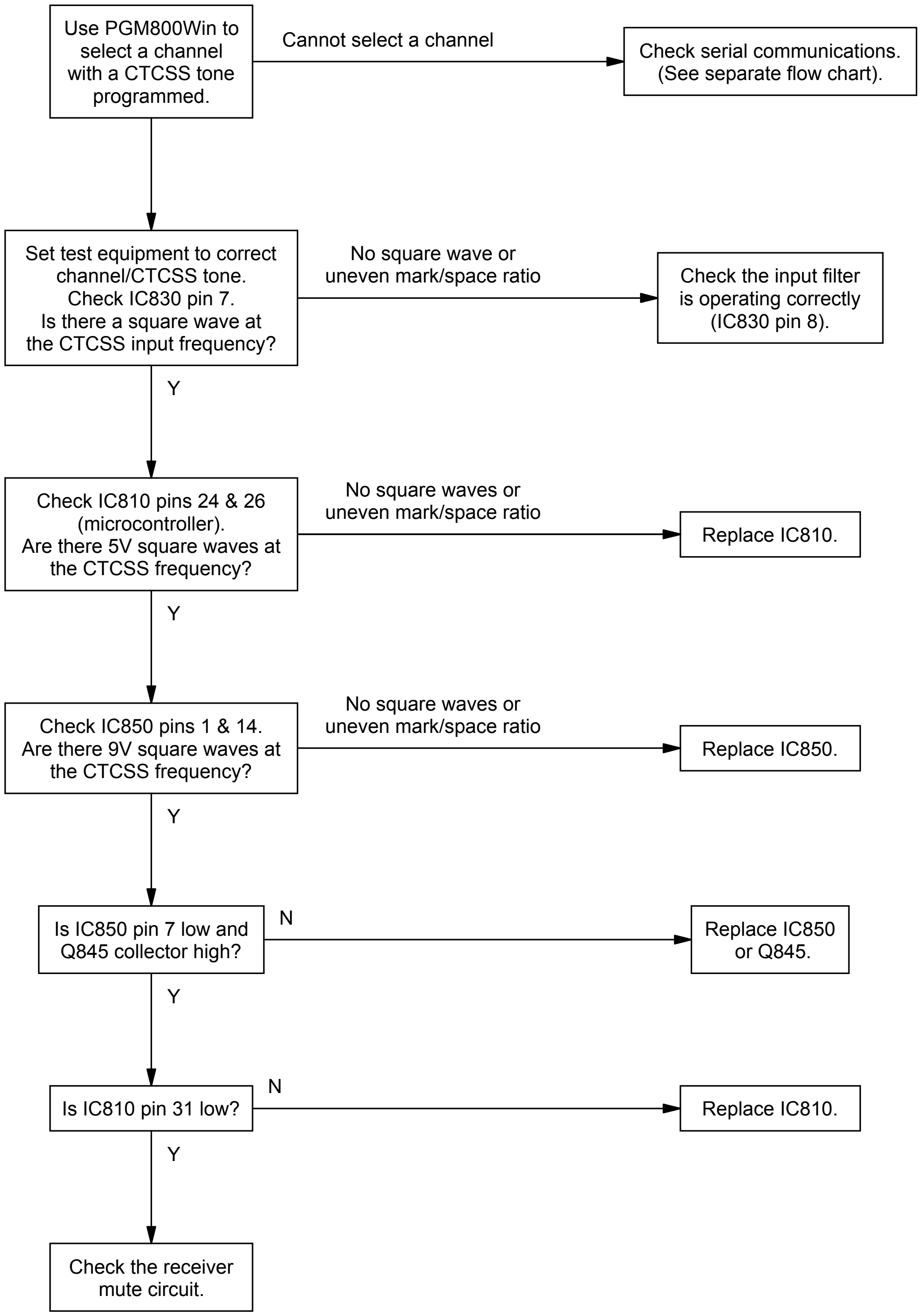
5.7.1.1 Basic Checks



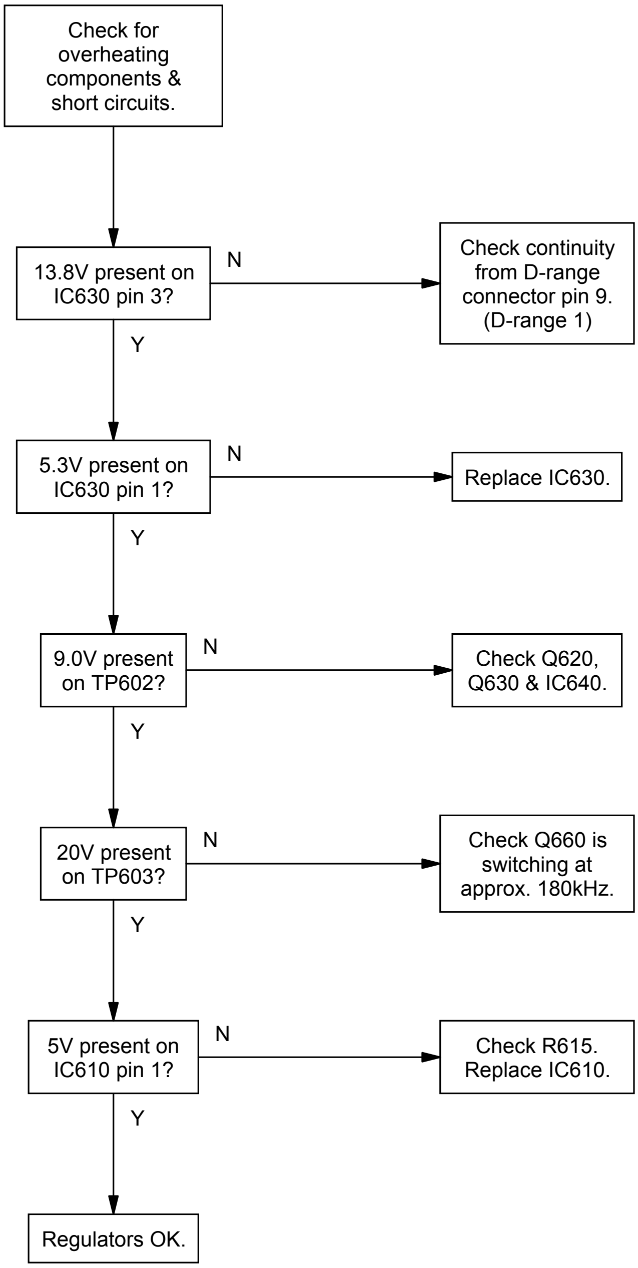
5.7.1.2 Serial Communication



5.7.1.3 CTCSS Decode

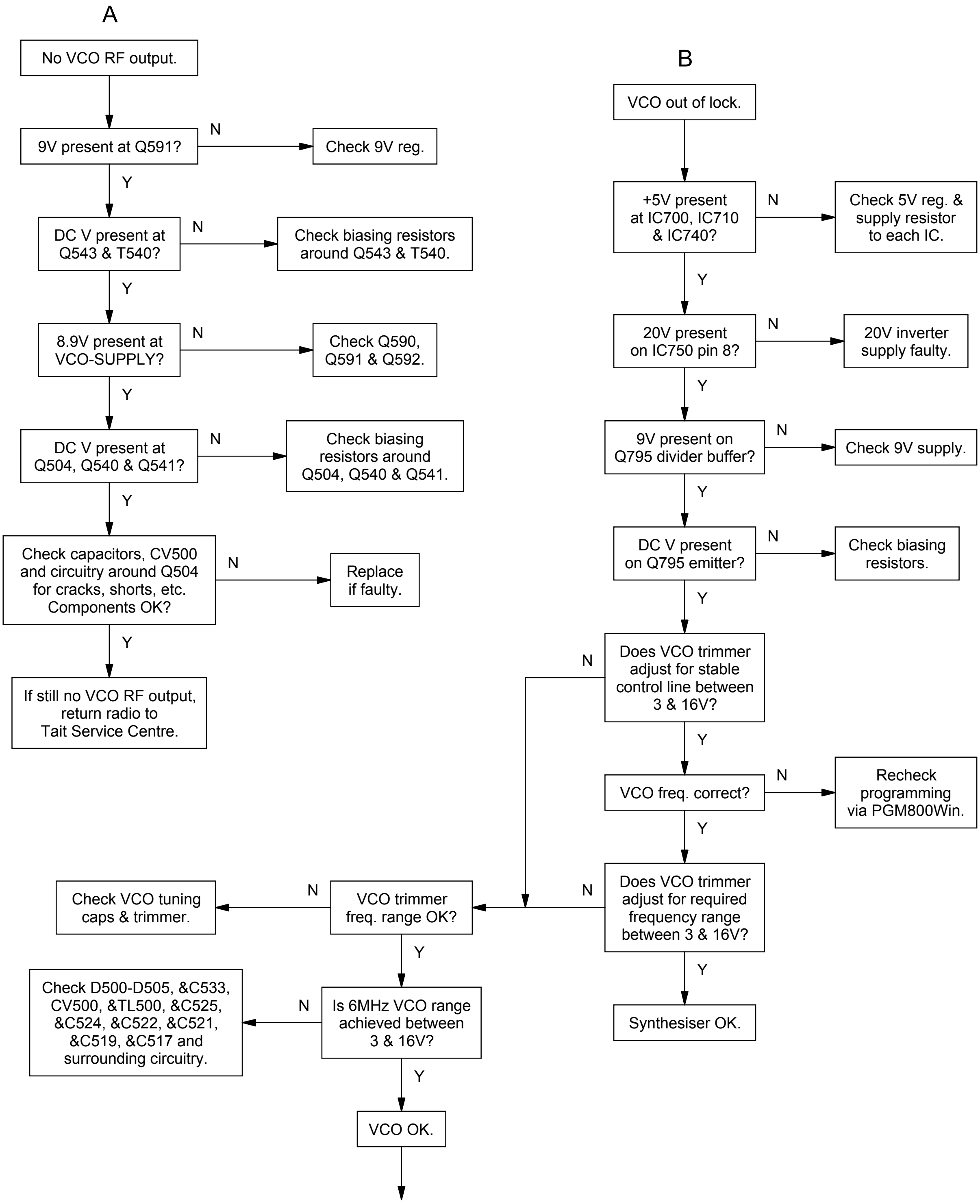


5.7.2 Regulator

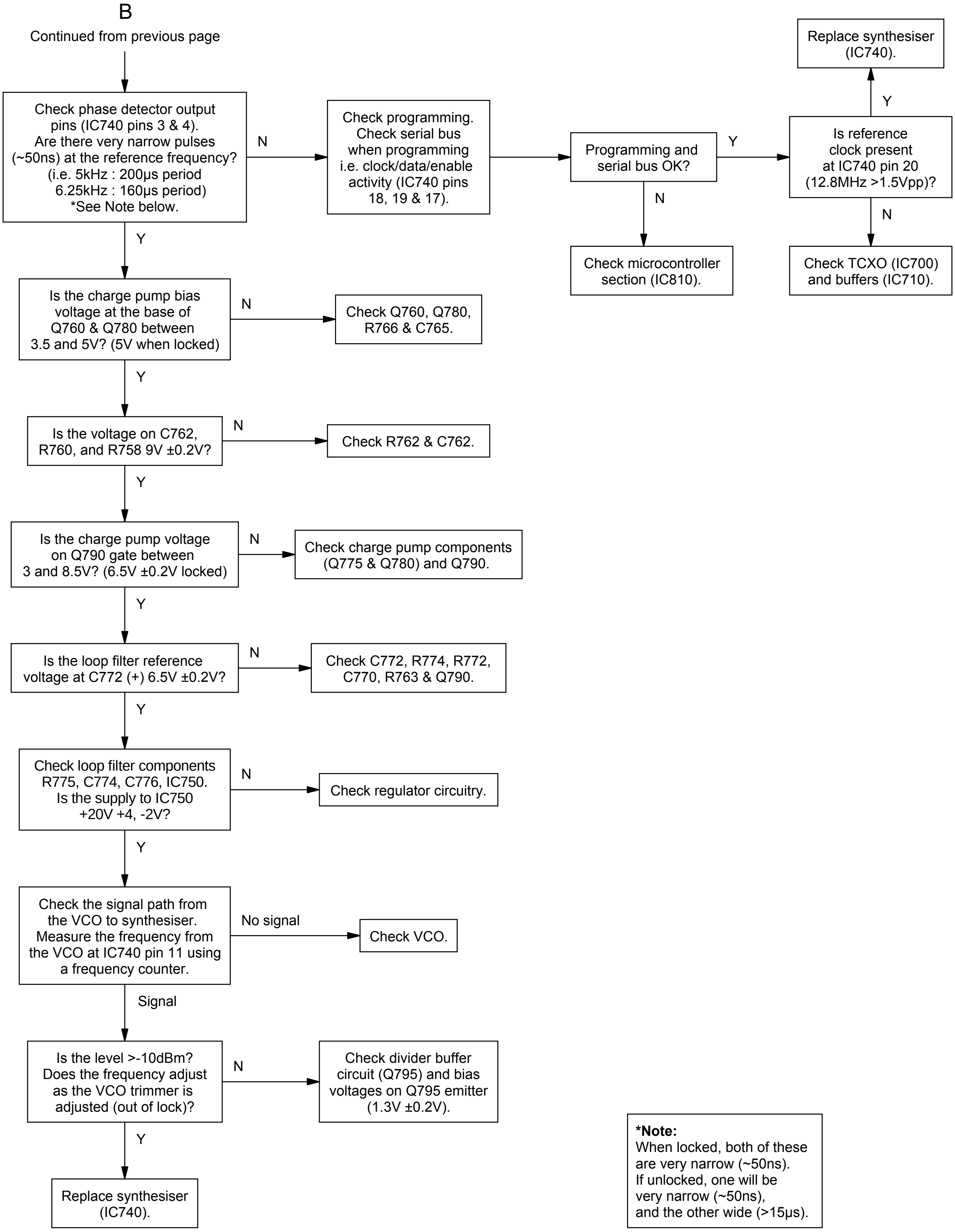


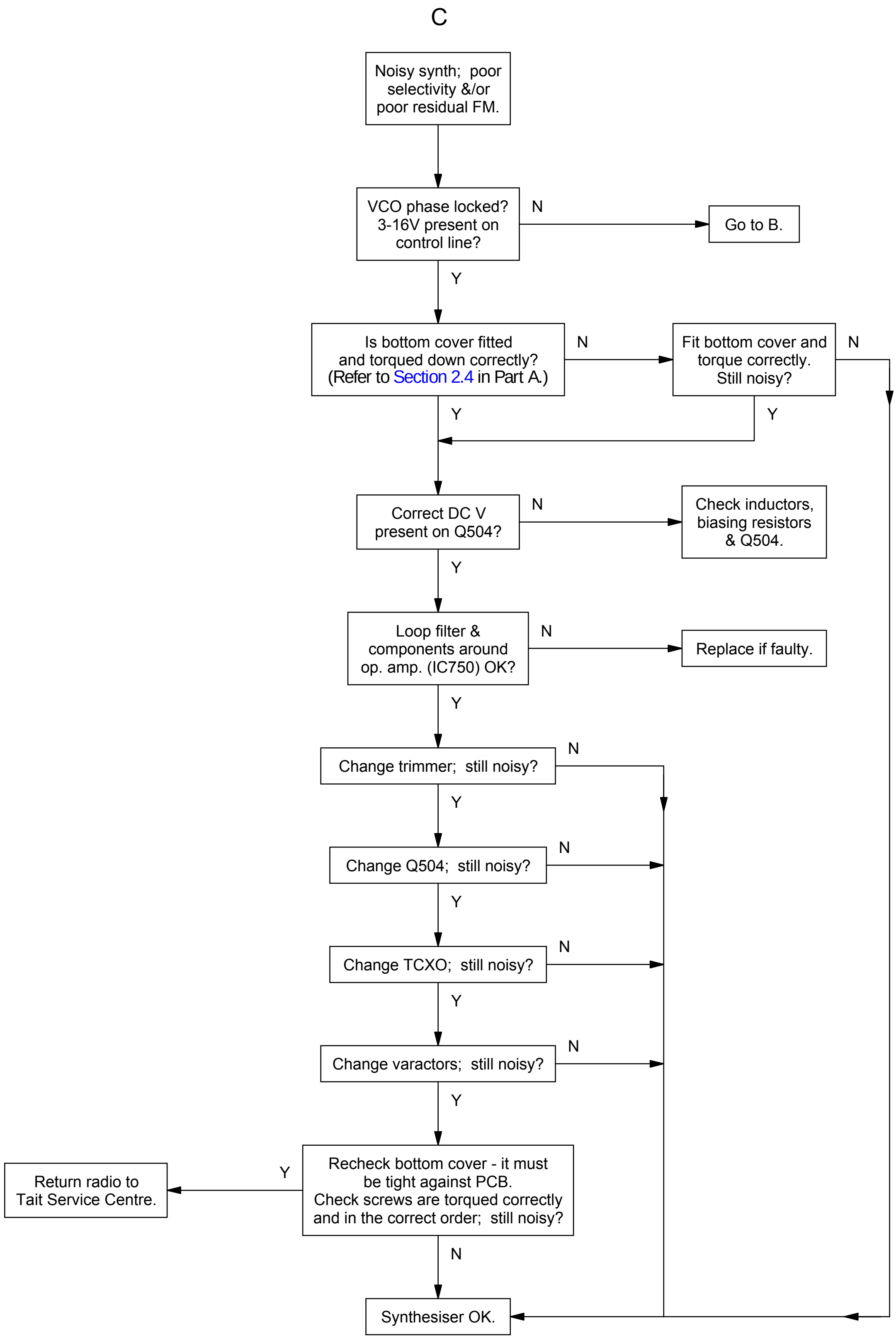
5.7.3 Synthesiser

Refer to the VCO (sheet 5) and synthesiser (sheet 7) circuit diagrams in Section 6.

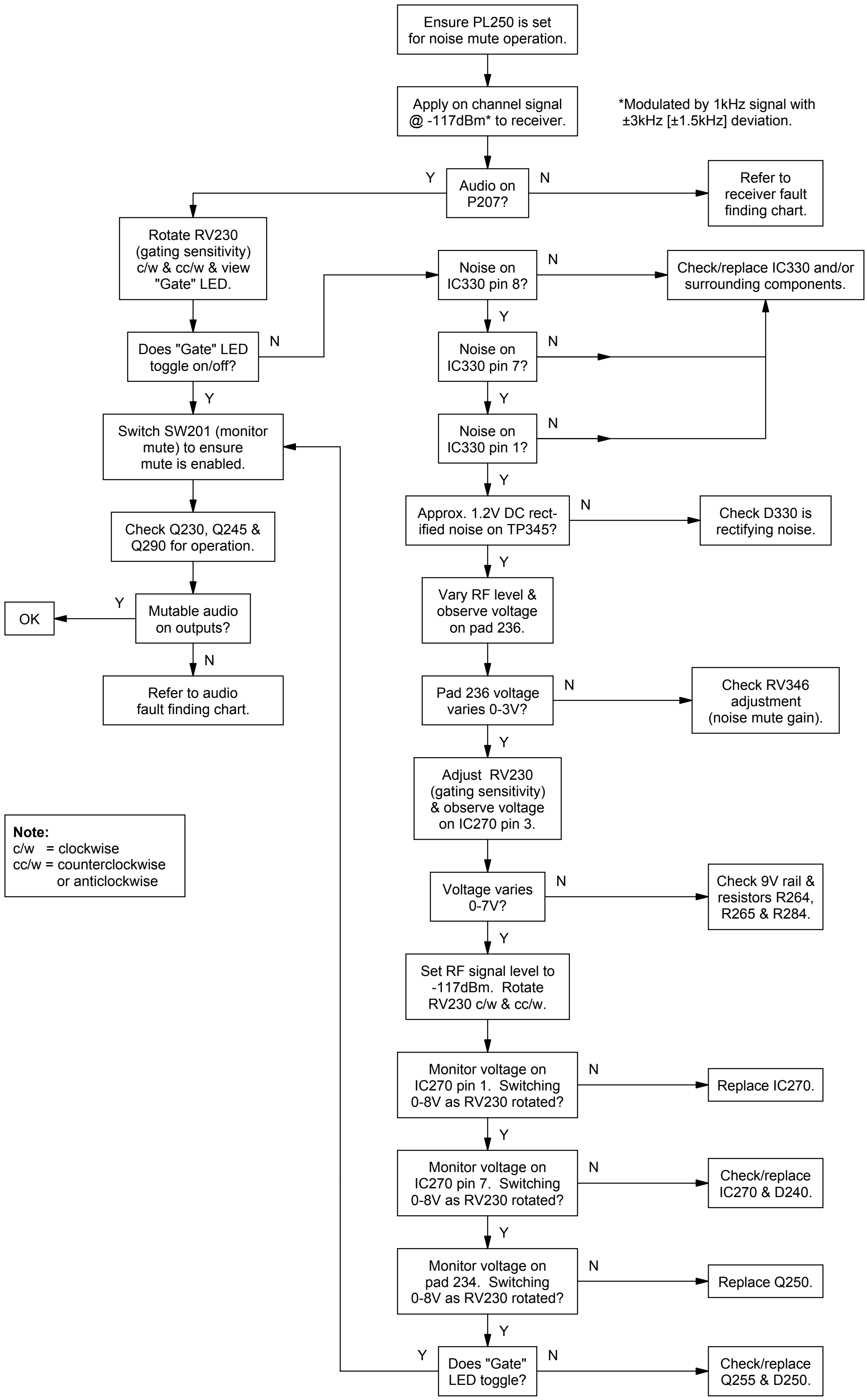


Continued on the next page

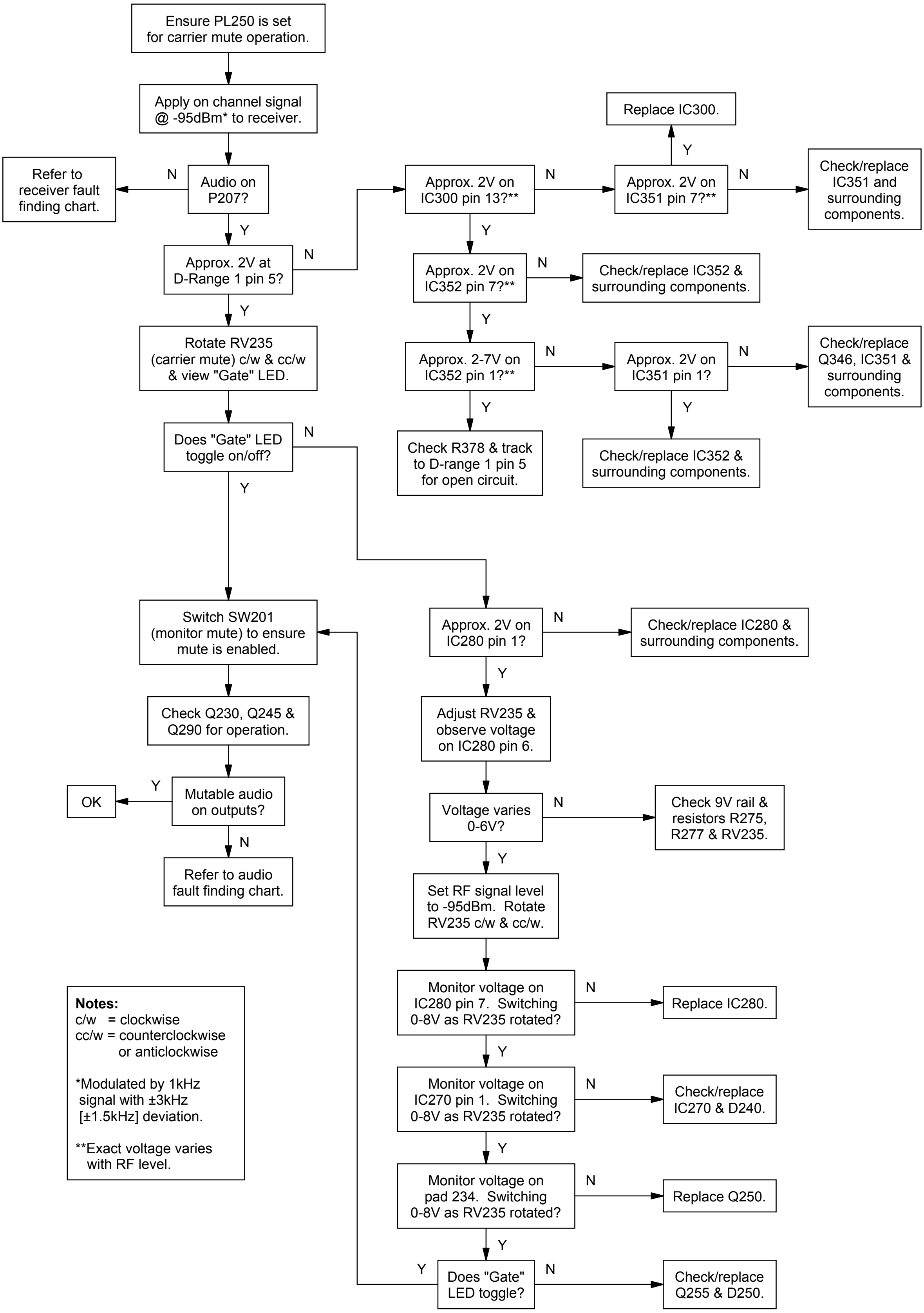

B
Continued from previous page
Check phase detector output pins (IC740 pins 3 & 4). Are there very narrow pulses (~50ns) at the reference frequency? (i.e. 5kHz : 200µs period 6.25kHz : 160µs period) *See Note below.
N
Check programming. Check serial bus when programming i.e. clock/data/enable activity (IC740 pins 18, 19 & 17).
Programming and serial bus OK?
Y
Is reference clock present at IC740 pin 20 (12.8MHz >1.5Vpp)?
Y
Replace synthesiser (IC740).
N
Check TCXO (IC700) and buffers (IC710).
N
Check microcontroller section (IC810).
Y
Is the charge pump bias voltage at the base of Q760 & Q780 between 3.5 and 5V? (5V when locked)
N
Check Q760, Q780, R766 & C765.
Y
Is the voltage on C762, R760, and R758 9V ±0.2V?
N
Check R762 & C762.
Y
Is the charge pump voltage on Q790 gate between 3 and 8.5V? (6.5V ±0.2V locked)
N
Check charge pump components (Q775 & Q780) and Q790.
Y
Is the loop filter reference voltage at C772 (+) 6.5V ±0.2V?
N
Check C772, R774, R772, C770, R763 & Q790.
Y
Check loop filter components R775, C774, C776, IC750. Is the supply to IC750 +20V +4, -2V?
N
Check regulator circuitry.
Y
Check the signal path from the VCO to synthesiser. Measure the frequency from the VCO at IC740 pin 11 using a frequency counter.
No signal
Check VCO.
Signal
Is the level >-10dBm? Does the frequency adjust as the VCO trimmer is adjusted (out of lock)?
N
Check divider buffer circuit (Q795) and bias voltages on Q795 emitter (1.3V ±0.2V).
Y
Replace synthesiser (IC740).
*Note:
When locked, both of these are very narrow (~50ns).
If unlocked, one will be very narrow (~50ns), and the other wide (>15µs).


C
Noisy synth; poor selectivity &/or poor residual FM.
VCO phase locked? 3-16V present on control line?
N
Go to B.
Y
Is bottom cover fitted and torqued down correctly? (Refer to Section 2.4 in Part A.)
N
Fit bottom cover and torque correctly. Still noisy?
N
Y
Y
Correct DC V present on Q504?
N
Check inductors, biasing resistors & Q504.
Y
Loop filter & components around op. amp. (IC750) OK?
N
Replace if faulty.
Y
Change trimmer; still noisy?
N
Y
Change Q504; still noisy?
N
Y
Change TCXO; still noisy?
N
Y
Change varactors; still noisy?
N
Y
Recheck bottom cover - it must be tight against PCB. Check screws are torqued correctly and in the correct order; still noisy?
Y
Return radio to Tait Service Centre.
N
Synthesiser OK.

5.7.4 Noise Mute

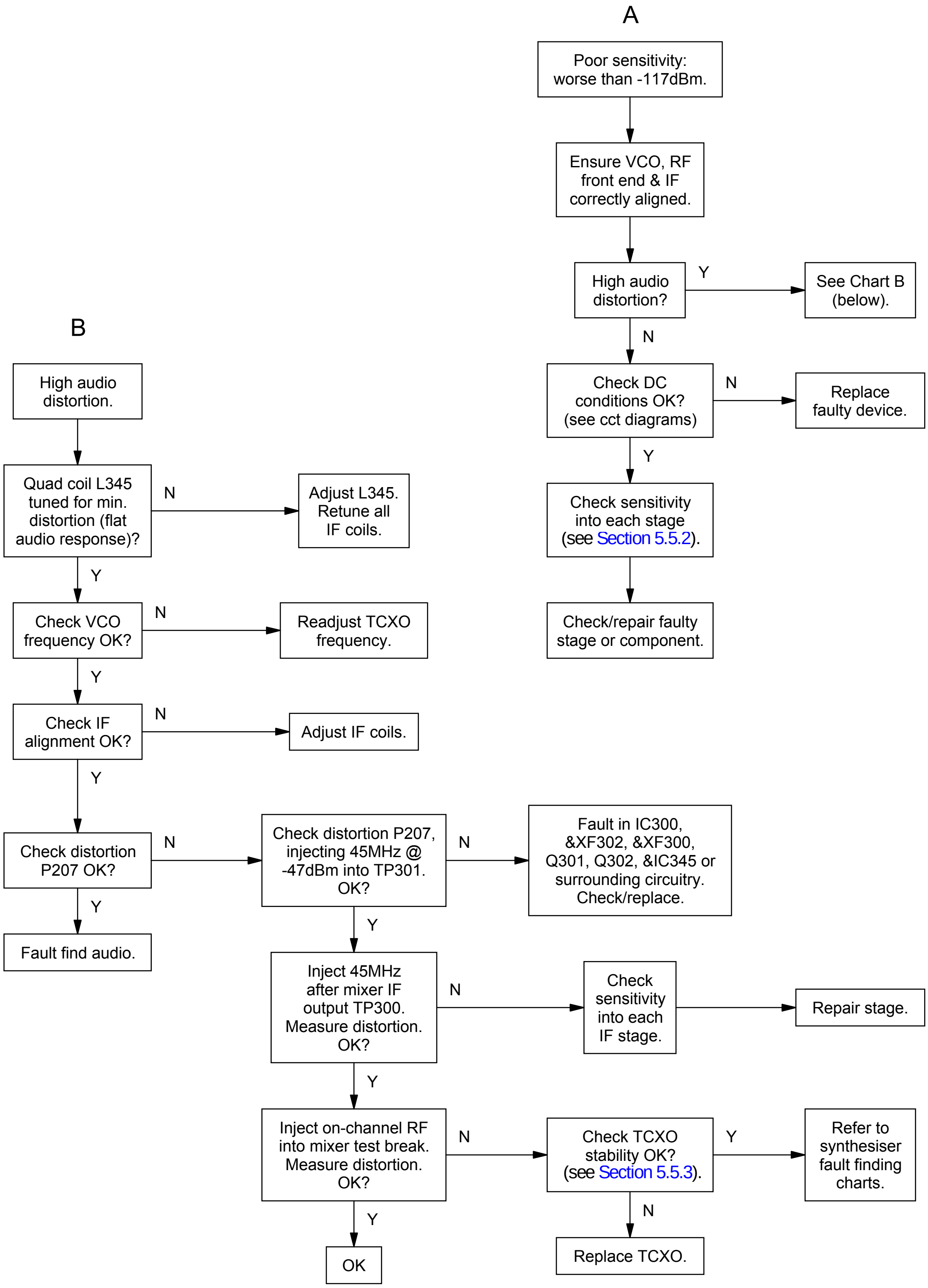


5.7.5 Carrier Mute

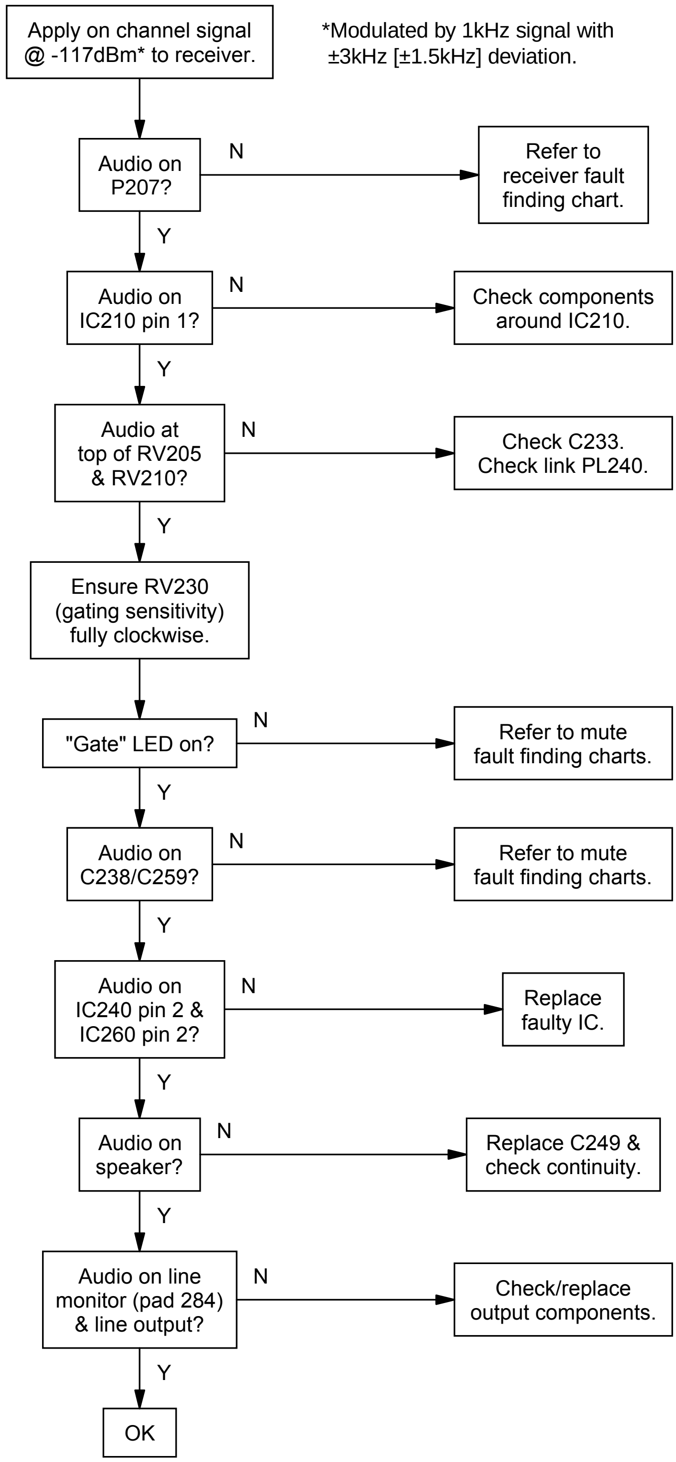


5.7.6 Receiver

Refer to the receiver IF and front end circuit diagrams (sheets 3 & 4) in Section 6.



5.7.7 Audio


Apply on channel signal @ -117dBm* to receiver.
*Modulated by 1kHz signal with ±3kHz [±1.5kHz] deviation.
Audio on P207?
N
Refer to receiver fault finding chart.
Y
Audio on IC210 pin 1?
N
Check components around IC210.
Y
Audio at top of RV205 & RV210?
N
Check C233. Check link PL240.
Y
Ensure RV230 (gating sensitivity) fully clockwise.
"Gate" LED on?
N
Refer to mute fault finding charts.
Y
Audio on C238/C259?
N
Refer to mute fault finding charts.
Y
Audio on IC240 pin 2 & IC260 pin 2?
N
Replace faulty IC.
Y
Audio on speaker?
N
Replace C249 & check continuity.
Y
Audio on line monitor (pad 284) & line output?
N
Check/replace output components.
Y
OK

6 T885 PCB Information

Caution: **This equipment contains CMOS devices which are susceptible to damage from static charges. Refer to Section 1.2 in Part A for more information on anti-static procedures when handling these devices.**

Note: To ensure that the T885 will continue to meet its performance specifications, you must tighten the bottom cover screws to the correct torque, and in the correct order, as described in Section 2.4 in Part A.

This section provides the following information on the T885 receiver:

- parts lists
- grid reference index
- mechanical assembly drawing
- PCB layouts
- test points & options connections drawing
- circuit diagrams.

6.1 Introduction

Product Type Identification

You can identify the receiver type by checking the product code printed on a label on the rear of the chassis (product codes are explained in Section 1.3 in this Part of the manual, and Figure 1.1 in Part A shows typical labels). You can further verify the receiver type by checking the placement of an SMD resistor in the table that is screen printed onto the top side of the PCB, similar to the example drawn below. In this example, the resistor indicates that the product was built as a T885-10-XXXX.

885-	
885-30	
885-35	
PRODUCT TYPE	

PRODUCT TYPE			
	885-10		885-20
	885-13		885-23
	885-15		885-25

Note: The only function of this resistor is to indicate the product type. It has no effect on the circuitry or operation of the receiver.

PCB Identification

All PCBs are identified by a unique 10 digit "internal part number" (IPN), e.g. 220-12345-00, which is screen printed onto the PCB (usually on the top side), as shown in the example below:

The last 2 digits of this number define the issue status, which starts at 00 and increments through 01, 02, 03, etc. as the PCB is updated. Some issue PCBs never reach full production status and are therefore not included in this manual. A letter following the 10 digit IPN has no relevance in identifying the PCB for service purposes.

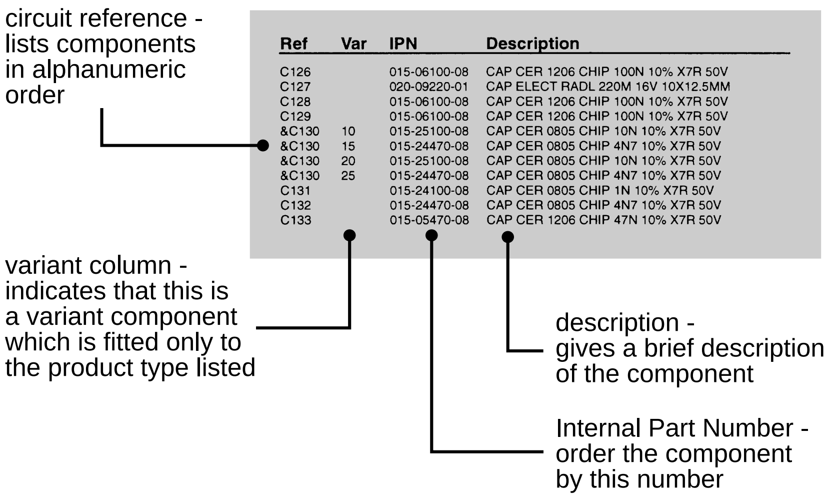
Note: It is important that you identify which issue PCB you are working on so that you can refer to the appropriate set of PCB information.

Parts Lists

The 10 digit numbers (000-00000-00) in this Parts List are “internal part numbers” (IPNs). We can process your spare parts orders more efficiently and accurately if you quote the IPN and provide a brief description of the part.

The components listed in this parts list are divided into two main types: those with a circuit reference (e.g. C2, D1, R121, etc.) and those without (miscellaneous and mechanical).

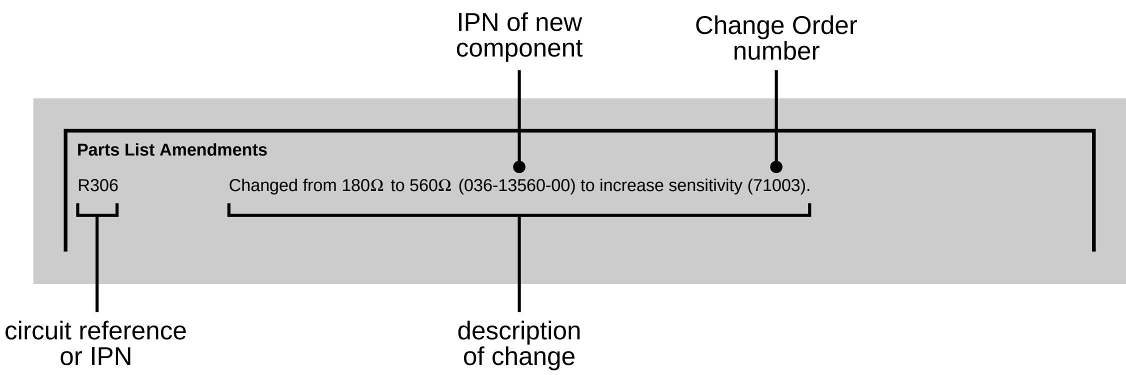
Those with a circuit reference are grouped in alphabetical order and then in numerical order within each group. Each component entry comprises three or four columns, as shown below:



The mechanical and miscellaneous section lists the variant and common parts in IPN order.

Parts List Amendments

At the front of the parts list is the Parts List Amendments box (an example of which is shown below). This box contains a list of component changes which took place after the parts list and diagrams in this section were compiled. These changes (e.g. value changes, added/deleted components, etc.) are listed by circuit reference in alphanumeric order and supersede the information given in the parts list or diagrams. Components without circuit references are listed in IPN order. The number in brackets at the end of each entry refers to the Tait internal Change Order document.



Variant Components

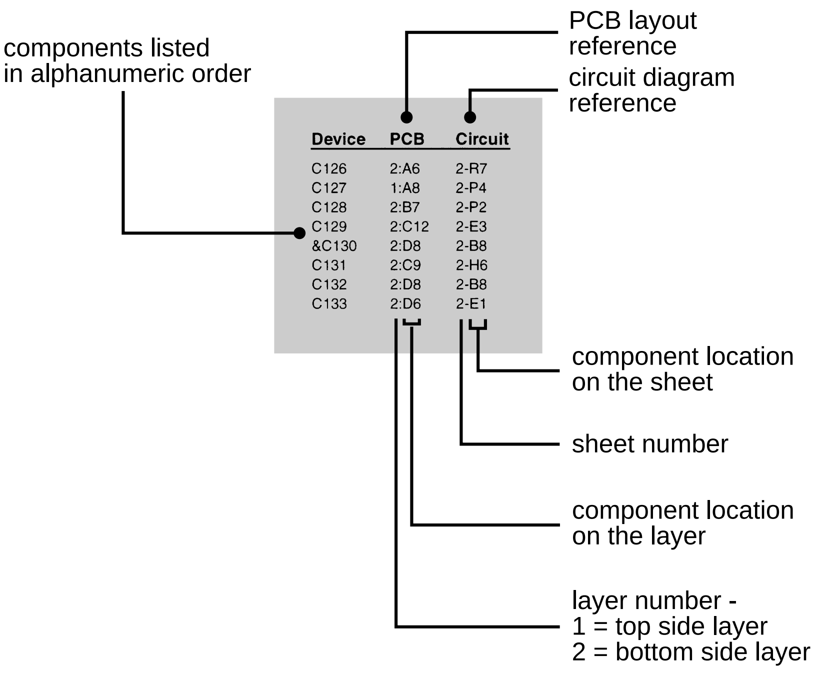
A variant component is one that has the same circuit reference but different value or specification in different product types. Where two products share the same PCB, the term "variant" is also used to describe components unplaced in one product. Variant components have a character prefix, such as "&", "=" or "#", before the circuit reference (e.g. &R100).

The table below explains the variant prefixes used in T800 Series II products:

If the variant prefix is. . .	the component will. . .
&	change according to channel spacing
=	change according to frequency stability
#	change according to frequency range
%	change or be placed/unplaced for special applications
*	be unplaced in one product (where two products share the same PCB)

Grid Reference Index

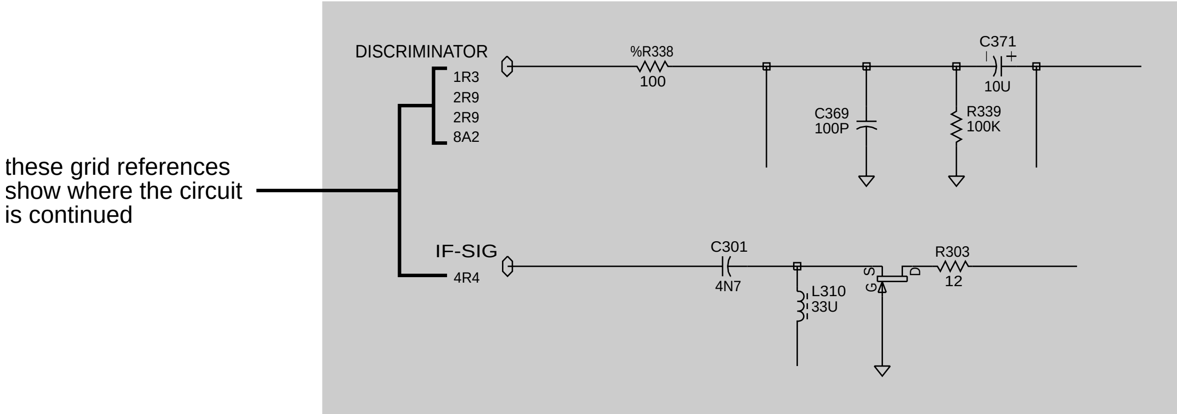
This section contains a component grid reference index to help you find components and labelled pads on the PCB layouts and circuit diagrams. This index lists the components and pads in alphanumeric order, along with the appropriate alphanumeric grid references, as shown below:



Using CAD Circuit Diagrams

Reading a CAD circuit diagram is similar to reading a road map, in that both have an alphanumeric border. The circuit diagrams in this manual use letters to represent the horizontal axis, and numbers for the vertical axis. These circuit diagram “grid references” are useful in following a circuit that is spread over two or more sheets.

When a line representing part of the circuitry is discontinued, a reference will be given at the end of the line to indicate where the rest of the circuitry is located, as shown below. The first digit refers to the sheet number and the last two characters refer to the location on that sheet of the continuation of the circuit (e.g. 1R3).



6.2 T885 Receiver PCB

This section contains the following information.

T885 Parts List (IPN 220-01595-03)

How To Use This Parts List

The components listed in this parts list are divided into two main types: those with a circuit reference (e.g. C2, D1, R121, etc.) and those without (miscellaneous and mechanical).

Those with a circuit reference are grouped in alphabetical order and then in numerical order within each group. Each component entry comprises three or four columns: the circuit reference, variant (if applicable), IPN and description. A number in the variant column indicates that this is a variant component which is fitted only to the product type listed. Static sensitive devices are indicated by an (S) at the start of the description column.

The miscellaneous and mechanical section lists the variant and common parts in IPN order. Where possible, a number in the legend column indicates their position in the mechanical assembly drawing.

The Parts List Amendments box below lists component changes that took place after the parts list and diagrams in this section were compiled. These changes (e.g. value changes, added/deleted components, etc.) are listed by circuit reference in alphanumeric order and supersede the information given in the parts list or diagrams. Components without circuit references are listed in IPN order.

Parts List Amendments

C5XX	All 18pF capacitors in the VCO have been changed from 5% (IPN 015-22180-01) to 1% (IPN 015-22180-05) to ensure consistent signal-to-noise performance (711471).
IC740	Changed to MC145193F (IPN 002-14519-30) because MC145191F (IPN 002-14519-10) obsolete (711438-43).

Parts List Amendments - Continued

This page is provided for entering future amendments to the parts list.

Ref	Var	IPN	Description
C201		014-08100-00	CAP TANT CHIP 10M 16VW +-20%
C203		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C205		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C207		014-07100-02	CAP TANT CHIP 1U0 3.2X1.6M 16V
C209		016-08470-03	CAP SMD ELEC 47mF 20% 25v 8.3m
C210		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C211		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C212		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C213		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C215		015-21220-01	CAP CER 0805 2P2+-0.25 NPO 50V
C217		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C219		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C221		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C222		014-08100-00	CAP TANT CHIP 10M 16VW +-20%
C223		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C225		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C227		015-23100-01	CAP CER 0805 100P 5% NPO 50V
C229		014-08100-00	CAP TANT CHIP 10M 16VW +-20%
C231		014-08100-00	CAP TANT CHIP 10M 16VW +-20%
C233		014-08100-00	CAP TANT CHIP 10M 16VW +-20%
C235		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C237		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C238		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C239		016-09100-05	CAP SMD ELECT 100U 25V 20%
C240A		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C240B		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C240C		016-09470-01	CAP ELECT 470U 20% SMD
C249		016-09470-01	CAP ELECT 470U 20% SMD
C251		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C253		016-09100-05	CAP SMD ELECT 100U 25V 20%
C255		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C257		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C259		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C260A		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C260B		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C260C		016-09470-01	CAP ELECT 470U 20% SMD
C261		016-09100-05	CAP SMD ELECT 100U 25V 20%
C262		016-09100-05	CAP SMD ELECT 100U 25V 20%
C264		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C266		016-07470-06	CAP SMD ELECT BI-P 4U7 50V 20%
C268		016-07470-06	CAP SMD ELECT BI-P 4U7 50V 20%
C270		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C272		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C273		014-08100-00	CAP TANT CHIP 10M 16VW +-20%
C274		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C276		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C278		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C280		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C286		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C300		015-23100-01	CAP CER 0805 100P 5% NPO 50V
C302		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C303		015-22150-01	CAP CER 0805 15P 5% NPO 50V
C304		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C307		014-08100-00	CAP TANT CHIP 10M 16VW +-20%
C308		015-24100-08	CAP CER 0805 1N 10% X7R 50V
&C309	10	015-22220-01	CAP CER 0805 22P 5% NPO 50V
&C309	15	015-22270-01	CAP CER 0805 27P 5% NPO 50V
&C309	20	015-22220-01	CAP CER 0805 22P 5% NPO 50V
&C309	25	015-22270-01	CAP CER 0805 27P 5% NPO 50V
&C309	30	015-22220-01	CAP CER 0805 22P 5% NPO 50V
&C309	35	015-22270-01	CAP CER 0805 27P 5% NPO 50V
C310		015-25100-08	CAP CER 0805 10N 10% X7R 50V
&C311	10	015-22100-01	CAP CER 0805 10P+-0.5P NPO 50V
&C311	15	015-21820-02	CAP 0805 8P2 0.1 NPO 50V
&C311	20	015-22100-01	CAP CER 0805 10P+-0.5P NPO 50V
&C311	25	015-21820-02	CAP 0805 8P2 0.1 NPO 50V
&C311	30	015-22100-01	CAP CER 0805 10P+-0.5P NPO 50V
&C311	35	015-21820-02	CAP 0805 8P2 0.1 NPO 50V
&C314	10	015-21820-02	CAP 0805 8P2 0.1 NPO 50V
&C314	15	015-22180-01	CAP CER 0805 18P 5% NPO 50V
&C314	20	015-21820-02	CAP 0805 8P2 0.1 NPO 50V
&C314	25	015-22180-01	CAP CER 0805 18P 5% NPO 50V
&C314	30	015-21820-02	CAP 0805 8P2 0.1 NPO 50V
&C314	35	015-22180-01	CAP CER 0805 18P 5% NPO 50V
&C315	10	015-21820-02	CAP 0805 8P2 0.1 NPO 50V
&C315	15	015-21560-01	CAP CER 0805 5P6+-0.25 NPO 50V
&C315	20	015-21820-02	CAP 0805 8P2 0.1 NPO 50V
&C315	25	015-21560-01	CAP CER 0805 5P6+-0.25 NPO 50V
&C315	30	015-21820-02	CAP 0805 8P2 0.1 NPO 50V
&C315	35	015-21560-01	CAP CER 0805 5P6+-0.25 NPO 50V
C316		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C317		015-22470-01	CAP CER 0805 47P 5% NPO 50V
&C318	10	015-21560-01	CAP CER 0805 5P6+-0.25 NPO 50V
&C318	15	015-21680-01	CAP CER 0805 6P8+-0.25 NPO 50V
&C318	20	015-21560-01	CAP CER 0805 5P6+-0.25 NPO 50V
&C318	25	015-21680-01	CAP CER 0805 6P8+-0.25 NPO 50V
&C318	30	015-21560-01	CAP CER 0805 5P6+-0.25 NPO 50V
&C318	35	015-21680-01	CAP CER 0805 6P8+-0.25 NPO 50V
C321		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C322		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C324		015-23100-01	CAP CER 0805 100P 5% NPO 50V
C325		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C328		015-25100-08	CAP CER 0805 10N 10% X7R 50V
&C329	10		NOT FITTED
&C329	15	015-21330-05	CAP CER 0805 3P3+-0.1PF 200V
&C329	20		NOT FITTED
&C329	25	015-21330-05	CAP CER 0805 3P3+-0.1PF 200V
&C329	30		NOT FITTED
&C329	35	015-21330-05	CAP CER 0805 3P3+-0.1PF 200V
&C330	10	015-25100-08	CAP CER 0805 10N 10% X7R 50V
&C330	15	015-22100-01	CAP CER 0805 10P+-0.5P NPO 50V
&C330	20	015-25100-08	CAP CER 0805 10N 10% X7R 50V
&C330	25	015-22100-01	CAP CER 0805 10P+-0.5P NPO 50V
&C330	30	015-25100-08	CAP CER 0805 10N 10% X7R 50V
&C330	35	015-22100-01	CAP CER 0805 10P+-0.5P NPO 50V
&C331	10	015-21680-01	CAP CER 0805 6P8+-0.25 NPO 50V
&C331	15	015-21330-05	CAP CER 0805 3P3+-0.1PF 200V
&C331	20	015-21680-01	CAP CER 0805 6P8+-0.25 NPO 50V
&C331	25	015-21330-05	CAP CER 0805 3P3+-0.1PF 200V
&C331	30	015-21680-01	CAP CER 0805 6P8+-0.25 NPO 50V
&C331	35	015-21330-05	CAP CER 0805 3P3+-0.1PF 200V
&C332	10		NOT FITTED
&C332	15	015-21270-05	CAP CER 0805 CHIP 2P7 +0.1PF 2
&C332	20		NOT FITTED
&C332	25	015-21270-05	CAP CER 0805 CHIP 2P7 +0.1PF 2
&C332	30		NOT FITTED
&C332	35	015-21270-05	CAP CER 0805 CHIP 2P7 +0.1PF 2
&C335	10		NOT FITTED
&C335	15	015-21330-01	CAP CER 0805 3P3+-0.25 NPO 50V
&C335	20		NOT FITTED
&C335	25	015-21330-05	CAP CER 0805 3P3+-0.1PF 200V
&C335	30		NOT FITTED
&C335	35	015-21330-01	CAP CER 0805 3P3+-0.25 NPO 50V
C336		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C337		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C338		015-22270-01	CAP CER 0805 27P 5% NPO 50V
C339		015-22220-01	CAP CER 0805 22P 5% NPO 50V
C340		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C341		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C342		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C343		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C345		014-07470-01	CAP 4U7 'B'CASE 25V +-10% 267
C346		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C347		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C348		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C349		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C350		015-22100-01	CAP CER 0805 10P+-0.5P NPO 50V
C351		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C352		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C353		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C354		015-22560-01	CAP CER 0805 56P 5% NPO 50V
C355		015-22560-01	CAP CER 0805 56P 5% NPO 50V
C356		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C357		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C358		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C359		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C360		015-23120-01	CAP CER 0805 120P 5% NPO 50V
C361		015-22560-01	CAP CER 0805 56P 5% NPO 50V
C362		015-22560-01	CAP CER 0805 56P 5% NPO 50V
C364		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C365		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C366		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C367		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C368		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C369		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C371		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C385		014-08100-00	CAP TANT CHIP 10M 16VW +-20%
C386		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C387		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C389		014-08100-00	CAP TANT CHIP 10M 16VW +-20%
C390		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C400		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C401		015-25150-08	CAP CER 0805 15N 10% X7R 50V
C402		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C403		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C404		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C407		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C408		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C409		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C410		015-25150-08	CAP CER 0805 15N 10% X7R 50V
C411		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C414		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C415		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C417		015-21330-05	CAP CER 0805 3P3+-0.1PF 200V
C418		015-22390-05	CAP 0805 39P 1% 200V
C422		015-22390-05	CAP 0805 39P 1% 200V
C500		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C501		014-08220-01	CAP TANT 22UF 10V 276MSER
C502		014-08220-01	CAP TANT 22UF 10V 276MSER
C503		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C504		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C505		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C506		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C507		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C508		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C509		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C510		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C516		014-08220-01	CAP TANT 22UF 10V 276MSER
&C517	10	015-22180-01	CAP CER 0805 18P 5% NPO 50V
&C517	15	015-22180-01	CAP CER 0805 18P 5% NPO 50V
&C517	20	015-22180-01	CAP CER 0805 18P 5% NPO 50V
&C517	25	015-22180-01	CAP CER 0805 18P 5% NPO 50V
&C517	30	015-22180-01	CAP CER 0805 18P 5% NPO 50V
&C517	35	015-22180-01	CAP CER 0805 18P 5% NPO 50V
C518		015-26100-08	CAP CER 0805 100N 10% X7R 50V
&C519	10	015-22390-05	CAP 0805 39P 1% 200V

Ref	Var	IPN	Description
&C519	15	015-22390-05	CAP 0805 39P 1% 200V
&C519	20	015-22390-05	CAP 0805 39P 1% 200V
&C519	25	015-22390-05	CAP 0805 39P 1% 200V
&C519	30	015-22330-01	CAP CER 0805 33P 5% NPO 50V
&C519	35	015-22330-01	CAP CER 0805 33P 5% NPO 50V
C520		015-22180-01	CAP CER 0805 18P 5% NPO 50V
&C521	10	015-23330-08	CAP CER 0805 330P 10% X7R 50V
&C521	15	015-23330-08	CAP CER 0805 330P 10% X7R 50V
&C521	20	015-23330-08	CAP CER 0805 330P 10% X7R 50V
&C521	25	015-23330-08	CAP CER 0805 330P 10% X7R 50V
&C521	30	015-23330-08	CAP CER 0805 330P 10% X7R 50V
&C521	35	015-23330-08	CAP CER 0805 330P 10% X7R 50V
&C522	10	015-21150-05	CAP CER 0805 CHIP 1P5+0.1PF 2
&C522	15	015-21150-05	CAP CER 0805 CHIP 1P5+0.1PF 2
&C522	20	015-21150-05	CAP CER 0805 CHIP 1P5+0.1PF 2
&C522	25	015-21150-05	CAP CER 0805 CHIP 1P5+0.1PF 2
&C522	30	015-21150-05	CAP CER 0805 CHIP 1P5+0.1PF 2
&C522	35	015-21150-05	CAP CER 0805 CHIP 1P5+0.1PF 2
&C524	10	015-21120-05	CAP CER 0805 CHIP 1P2 +0.1PF 2
&C524	15	015-21120-05	CAP CER 0805 CHIP 1P2 +0.1PF 2
&C524	20	015-21120-05	CAP CER 0805 CHIP 1P2 +0.1PF 2
&C524	25	015-21120-05	CAP CER 0805 CHIP 1P2 +0.1PF 2
&C524	30	015-21100-05	CAP CER 0805 1P0 +-0.1PF 200V
&C524	35	015-21100-05	CAP CER 0805 1P0 +-0.1PF 200V
&C525	10	015-21100-05	CAP CER 0805 1P0 +-0.1PF 200V
&C525	15	015-21100-05	CAP CER 0805 1P0 +-0.1PF 200V
&C525	20	015-21100-05	CAP CER 0805 1P0 +-0.1PF 200V
&C525	25	015-21100-05	CAP CER 0805 1P0 +-0.1PF 200V
&C525	30	015-20075-05	CAP CER 0805 CHIP OP75+-0.1PF
&C525	35	015-20075-05	CAP CER 0805 CHIP OP75+-0.1PF
C531		015-22180-01	CAP CER 0805 18P 5% NPO 50V
&C533	10	015-21180-05	CAP CER 0805 1P8 +-0.1 200V
&C533	15	015-21180-05	CAP CER 0805 1P8 +-0.1 200V
&C533	20	015-21180-05	CAP CER 0805 1P8 +-0.1 200V
&C533	25	015-21180-05	CAP CER 0805 1P8 +-0.1 200V
&C533	30	015-21150-05	CAP CER 0805 CHIP 1P5+0.1PF 2
&C533	35	015-21150-05	CAP CER 0805 CHIP 1P5+0.1PF 2
C536		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C537		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C540		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C541		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C542		014-08220-01	CAP TANT 22UF 10V 276MSER
C543		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C544		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C545		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C548		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C549		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C555		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C556		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C557		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C558		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C559		014-07470-01	CAP 4U7 'B'CASE 25V +-10% 267
C560		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C561		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C562		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C563		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C564		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C569		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C570		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C571		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C572		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C573		014-07470-01	CAP 4U7 'B'CASE 25V +-10% 267
C574		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C575		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C576		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C577		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C578		015-21270-05	CAP CER 0805 CHIP 2P7 +0.1PF 2
C579		015-21330-05	CAP CER 0805 3P3+-0.1PF 200V
C585		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C586		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C587		015-21470-05	CAP CER 0805 4P7+-0.1PF 200V
C588		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C590		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C591		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C592		014-08220-01	CAP TANT 22UF 10V 276MSER
C593		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C594		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C595		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C596		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C597		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C610A		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C610B		014-09100-00	CAP TANT SMD 100U 16V 20%
C611A		014-09100-00	CAP TANT SMD 100U 16V 20%
C611B		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C623		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C625		020-09470-07	CAP ELEC RADL 470M 16V 20% 3.5
C626		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C628		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C630		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C631A		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C631B		014-08100-03	CAP TANT SMD 10U 35V 20%
C637		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C640		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C650		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C651		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C658		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C660		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C665		014-08100-03	CAP TANT SMD 10U 35V 20%

Ref	Var	IPN	Description
C670		014-07330-10	CAP TANT SMD 3U3 35V 10%
C673		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C677		014-07100-02	CAP TANT CHIP 1U0 3.2X1.6M 16V
C681		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C684		014-08100-03	CAP TANT SMD 10U 35V 20%
C687		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C690		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C693		014-08100-03	CAP TANT SMD 10U 35V 20%
C700		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C702		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C703		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C705		015-21820-02	CAP 0805 8P2 0.1 NPO 50V
C707		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C708		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C709		015-22100-01	CAP CER 0805 10P+-0.5P NPO 50V
C710A		014-07470-01	CAP 4U7 'B'CASE 25V +-10% 267
C710B		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C710C		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C711		015-22220-01	CAP CER 0805 22P 5% NPO 50V
C712		015-22220-01	CAP CER 0805 22P 5% NPO 50V
C713		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C735		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C736		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C740A		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C740B		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C741A		014-07470-01	CAP 4U7 'B'CASE 25V +-10% 267
C741B		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C742A		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C742B		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C743		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C745		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C750		014-08100-03	CAP TANT SMD 10U 35V 20%
C757		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C759		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C761		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C762		014-08220-01	CAP TANT 22UF 10V 276MSER
C764		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C765		014-07470-01	CAP 4U7 'B'CASE 25V +-10% 267
C767		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C769		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C770		014-08220-01	CAP TANT 22UF 10V 276MSER
C772		014-08220-01	CAP TANT 22UF 10V 276MSER
C774		013-06100-10	CAP SMD PPS 100N 100V 10%
C776		015-24680-08	CAP CER 0805 6N8 10% X7R 50V
C780		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C782		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C784		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C786		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C788		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C790		015-21330-05	CAP CER 0805 3P3+-0.1PF 200V
C792		015-21560-01	CAP CER 0805 5P6+-0.25 NPO 50V
C810		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C812		015-23100-01	CAP CER 0805 100P 5% NPO 50V
C813		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C814		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C815		015-05100-07	CAP 1206 CHIP NPO 10nF 25V
C816		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C818		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C819		015-22330-01	CAP CER 0805 33P 5% NPO 50V
C820		015-23220-01	CAP CER 0805 220P 5% NPO 50V
C822		015-25220-08	CAP CER 0805 22N 10% X7R 50V
C824		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C826		015-05100-07	CAP 1206 CHIP NPO 10nF 25V
C828		015-05100-07	CAP 1206 CHIP NPO 10nF 25V
C830		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C832		014-07100-02	CAP TANT CHIP 1U0 3.2X1.6M 16V
C833		015-25220-08	CAP CER 0805 22N 10% X7R 50V
C834		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C836		015-05100-07	CAP 1206 CHIP NPO 10nF 25V
C837		015-05100-07	CAP 1206 CHIP NPO 10nF 25V
C838		015-05100-07	CAP 1206 CHIP NPO 10nF 25V
C840		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C842		014-07100-02	CAP TANT CHIP 1U0 3.2X1.6M 16V
C844		014-07100-02	CAP TANT CHIP 1U0 3.2X1.6M 16V
C846		014-07100-02	CAP TANT CHIP 1U0 3.2X1.6M 16V
C848		014-07100-02	CAP TANT CHIP 1U0 3.2X1.6M 16V
C850		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C873		015-25220-08	CAP CER 0805 22N 10% X7R 50V
C876		014-09100-00	CAP TANT SMD 100U 16V 20%
C879		014-08100-00	CAP TANT CHIP 10M 16VW +-20%
C900		015-21220-01	CAP CER 0805 2P2+-0.25 NPO 50V
C901		015-21390-01	CAP CER 0805 3P9+-0.25 NPO 50V
C902		015-21390-01	CAP CER 0805 3P9+-0.25 NPO 50V
C903		015-21220-01	CAP CER 0805 2P2+-0.25 NPO 50V
CV500		028-11500-00	CAP TRIM 0.6/4.5 P SAPPHIRE
%D111A		001-10015-50	DIODE SMD ZENER 1.5SMC22AT3
D220		001-10000-56	DIODE SMD BAW56 D-SW SOT23
D230		001-10000-70	DIODE SMD BAV70 D-SW SOT23
D240		001-10000-99	DIODE SMD BAV99 D-SW SOT23
D250		008-00014-79	LED 3MM RED WITH WIRE
D260		001-10084-33	DIODE ZENSMD BZX84C3V3 SOT23
D270		001-10000-70	DIODE SMD BAV70 D-SW SOT23
D280		008-00014-80	LED 3MM GREEN WITH WIRE
D285		001-10011-73	DIODE SMD MRA4003T3 1A/300V SM
D289		001-10011-73	DIODE SMD MRA4003T3 1A/300V SM
D290		001-10011-73	DIODE SMD MRA4003T3 1A/300V SM

Ref	Var	IPN	Description
D295		001-10011-73	DIODE SMD MRA4003T3 1A/300V SM
D330		001-10000-99	DIODE SMD BAV99 D-SW SOT23
D501		001-10005-35	DIODE SMD VCAP BB535 SOD323
D502		001-10005-35	DIODE SMD VCAP BB535 SOD323
D504		001-10005-35	DIODE SMD VCAP BB535 SOD323
D505		001-10005-35	DIODE SMD VCAP BB535 SOD323
D610		001-10000-99	DIODE SMD BAV99 D-SW SOT23
D640		001-10000-70	DIODE SMD BAV70 D-SW SOT23
D645		001-10010-40	DIODE SMD ZENER 33V BZG03-C33
D730A		001-10165-00	DIODE BAT165 SCHOTTKY SOD-323
D740A		001-10165-00	DIODE BAT165 SCHOTTKY SOD-323
D820A		001-10165-00	DIODE BAT165 SCHOTTKY SOD-323
D860		001-10000-70	DIODE SMD BAV70 D-SW SOT23
D880		001-10000-70	DIODE SMD BAV70 D-SW SOT23
#H400	10	051-00564-00	COIL HELC RES 2.625T 1.2MMSF
#H400	15	051-00564-00	COIL HELC RES 2.625T 1.2MMSF
#H400	20	051-00565-00	COIL HELC RES 2.428T 1.2MMSF
#H400	25	051-00565-00	COIL HELC RES 2.428T 1.2MMSF
#H400	30	051-00565-00	COIL HELC RES 2.428T 1.2MMSF
#H400	35	051-00565-00	COIL HELC RES 2.428T 1.2MMSF
#H401	10	051-00564-00	COIL HELC RES 2.625T 1.2MMSF
#H401	15	051-00564-00	COIL HELC RES 2.625T 1.2MMSF
#H401	20	051-00565-00	COIL HELC RES 2.428T 1.2MMSF
#H401	25	051-00565-00	COIL HELC RES 2.428T 1.2MMSF
#H401	30	051-00565-00	COIL HELC RES 2.428T 1.2MMSF
#H401	35	051-00565-00	COIL HELC RES 2.428T 1.2MMSF
#H900	10	051-00564-00	COIL HELC RES 2.625T 1.2MMSF
#H900	15	051-00564-00	COIL HELC RES 2.625T 1.2MMSF
#H900	20	051-00565-00	COIL HELC RES 2.428T 1.2MMSF
#H900	25	051-00565-00	COIL HELC RES 2.428T 1.2MMSF
#H900	30	051-00565-00	COIL HELC RES 2.428T 1.2MMSF
#H900	35	051-00565-00	COIL HELC RES 2.428T 1.2MMSF
IC210		002-10003-58	IC SMD LM358 DUAL O-AMP
IC240		002-00014-05	IC TDA7231 1.6W AF PWR
IC260		002-00014-05	IC TDA7231 1.6W AF PWR
IC270		002-10003-58	IC SMD LM358 DUAL O-AMP
IC280		002-10003-58	IC SMD LM358 DUAL O-AMP
IC300		002-10337-20	IC MC3372D SMD IF DETECTOR
IC330		002-10008-40	IC SMD TL084CD 4X O-AMP JFET
&IC345	10	276-10010-14	FLTR CER SMD 455KHz E15KHz B/W
&IC345	15	276-10010-13	FLTR CER SMD 455KHz G 9KHz B/W
&IC345	20	276-10010-14	FLTR CER SMD 455KHz E15KHz B/W
&IC345	25	276-10010-13	FLTR CER SMD 455KHz G 9KHz B/W
&IC345	30	276-10010-14	FLTR CER SMD 455KHz E15KHz B/W
&IC345	35	276-10010-13	FLTR CER SMD 455KHz G 9KHz B/W
IC351		002-10003-58	IC SMD LM358 DUAL O-AMP
IC352		002-10003-58	IC SMD LM358 DUAL O-AMP
IC360		002-10078-05	IC SMD 78L05 5V REG
IC610		002-10078-05	IC SMD 78L05 5V REG
IC630		002-12523-17	IC LM317L REG TO-252 0.5A
IC640		002-10003-58	IC SMD LM358 DUAL O-AMP
IC650		002-10012-32	SMD DS1232LPS-2 LP RESET&W-DOG
=IC700		539-00010-55	TCXO 12.8M 1PPM-20+70/2PPM -30
IC710		002-74900-04	IC SMD 74HC04D 6X INV BUFFD
IC740		002-14519-10	IC MC145191F SMD SYNTH
IC750		002-10330-78	IC MC33078D 2X AMP LO NOISE
IC810		002-08951-20	IC AT89C51 PLCC44 MIC 12MHZ
IC820		002-12416-00	IC SMD AT24C16N-10SC EEPROM
IC830		002-10003-24	IC SMD 324 4X O-AMP SO14
IC840		002-10040-53	IC 4053B SMD BREAK B4 MAKE
IC850		002-10003-24	IC SMD 324 4X O-AMP SO14
L230		057-10100-60	IND SHLD 100UH SMD 600MA
L300		050-00016-22	COIL TAIT NO 622 20-120M
L301		050-00016-22	COIL TAIT NO 622 20-120M
L302		059-16470-10	IND FXD 1008CS 470NH 5%
&L303	10	056-14150-02	IND SMD 1.5UH SIMID02
&L303	15	056-10820-02	IND SMD 820NH SIMID02
&L303	20	056-14150-02	IND SMD 1.5UH SIMID02
&L303	25	056-10820-02	IND SMD 820NH SIMID02
&L303	30	056-14150-02	IND SMD 1.5UH SIMID02
&L303	35	056-10820-02	IND SMD 820NH SIMID02
&L304	10		NOT FITTED
&L304	15	056-10820-02	IND SMD 820NH SIMID02
&L304	20		NOT FITTED
&L304	25	056-10820-02	IND SMD 820NH SIMID02
&L304	30		NOT FITTED
&L304	35	056-10820-02	IND SMD 820NH SIMID02
&L307	10	056-14330-02	IND SMD 3.3UH SIMID02
&L307	15	056-14150-02	IND SMD 1.5UH SIMID02
&L307	20	056-14330-02	IND SMD 3.3UH SIMID02
&L307	25	056-14150-02	IND SMD 1.5UH SIMID02
&L307	30	056-14330-02	IND SMD 3.3UH SIMID02
&L307	35	056-14150-02	IND SMD 1.5UH SIMID02
L308		056-10820-00	IND FXD SMD 820NH 3.2*2.5*1.6
L345		050-15119-75	COIL SMD 455KHz IF 5119-T075
L400		056-10330-02	IND SMD 330NH SIMID02
L404		056-10330-02	IND SMD 330NH SIMID02
L410		056-10330-02	IND SMD 330NH SIMID02
L414		056-10330-02	IND SMD 330NH SIMID02
L500		065-10004-20	BEAD FE SMD CBD 4.6/3/3-4S2
L501		056-10100-02	IND SMD 100NH SIMID02
L502		056-10100-02	IND SMD 100NH SIMID02
L503		065-10004-20	BEAD FE SMD CBD 4.6/3/3-4S2
L504		056-10100-02	IND SMD 100NH SIMID02
L505		065-10004-20	BEAD FE SMD CBD 4.6/3/3-4S2
L540		056-10082-02	IND SMD 82NH SIMID02
L541		056-10015-03	IND SMD 0805 15NH 20%
L543		056-10006-83	IND SMD 0805 6.8NH 20%
L700		056-10006-83	IND SMD 0805 6.8NH 20%
L900		052-08120-15	COIL A/W 1.5T/2MM HOR 0.8MM
L901		052-08125-15	COIL A/W 1.5T/2.5MM HOR 0.8MM
L902		052-08120-15	COIL A/W 1.5T/2MM HOR 0.8MM
M400		002-10000-13	MIXER DBL BALANCE 5-1500MHz
PL100		070-01001-00	D-RANGE 15 WAY COMPL T800
PL200		240-10000-16	HEADER 4W PCB MTG SMD
PL210		240-10000-16	HEADER 4W PCB MTG SMD
PL220		240-10000-16	HEADER 4W PCB MTG SMD
PL230		240-10000-16	HEADER 4W PCB MTG SMD
PL240		240-10005-00	HEADER 5W PCB MTG SMD
PL250		240-10000-16	HEADER 4W PCB MTG SMD
PL260		240-10000-16	HEADER 4W PCB MTG SMD
PL270		240-10000-16	HEADER 4W PCB MTG SMD
Q210		000-10008-47	XSTR BC847B NPN SOT23
Q220		000-10008-47	XSTR BC847B NPN SOT23
Q230		000-10008-47	XSTR BC847B NPN SOT23
Q240		000-10008-57	XSTR SMD BCW70 PNP SOT23 SS
Q245		000-10008-57	XSTR SMD BCW70 PNP SOT23 SS
Q250		000-10008-47	XSTR BC847B NPN SOT23
Q255		000-10008-57	XSTR SMD BCW70 PNP SOT23 SS
Q260		000-10008-47	XSTR BC847B NPN SOT23
Q270		000-10008-17	XSTR SMD BC817-25 NPN SOT23
Q280		000-10008-47	XSTR BC847B NPN SOT23
Q290		000-10008-47	XSTR BC847B NPN SOT23
Q300		000-10003-10	XSTR SMD BFJ310 JFET UHF
Q301		000-10008-92	XSTR SMD BFS17 NPN SOT23
Q302		000-10009-41	XSTR SMD BR941L SOT23
Q340		000-10008-47	XSTR BC847B NPN SOT23
Q346		000-10008-47	XSTR BC847B NPN SOT23
Q400		000-10008-57	XSTR SMD BCW70 PNP SOT23 SS
Q401		000-10009-30	XSTR SMD BFR93A NPN SOT23
Q402		000-10008-57	XSTR SMD BCW70 PNP SOT23 SS
Q403		000-10009-30	XSTR SMD BFR93A NPN SOT23
Q500		000-10008-47	XSTR BC847B NPN SOT23
Q501		000-10008-47	XSTR BC847B NPN SOT23
Q502		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q503		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q504		000-10009-30	XSTR SMD BFR93A NPN SOT23
Q540		000-10009-41	XSTR SMD BR941L SOT23
Q541		000-10009-41	XSTR SMD BR941L SOT23
Q542		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q543		002-10003-18	IC BGA318 MMIC AMPLIFIER
Q544		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q545		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q546		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q590		000-10008-47	XSTR BC847B NPN SOT23
Q591		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q592		000-10008-47	XSTR BC847B NPN SOT23
Q620		000-00033-12	XSTR BD242 TO-220 PNP ISOLTD
Q630		000-10003-00	XSTR BSR30 PNP AF SOT-89
Q660		000-10008-17	XSTR SMD BC817-25 NPN SOT23
Q670		000-10008-57	XSTR SMD BCW70 PNP SOT23 SS
Q750		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q760		000-10008-47	XSTR BC847B NPN SOT23
Q770		000-10008-57	XSTR SMD BCW70 PNP SOT23 SS
Q775		000-10008-57	XSTR SMD BCW70 PNP SOT23 SS
Q780		000-10008-47	XSTR BC847B NPN SOT23
Q785		000-10008-57	XSTR SMD BCW70 PNP SOT23 SS
Q790		000-10003-12	XSTR SMD BFR31 N JFET SOT23
Q795		000-10009-30	XSTR SMD BFR93A NPN SOT23
Q810		000-10008-17	XSTR SMD BC817-25 NPN SOT23
Q820		000-10008-57	XSTR SMD BCW70 PNP SOT23 SS
Q840		000-10008-57	XSTR SMD BCW70 PNP SOT23 SS
Q850		000-10008-47	XSTR BC847B NPN SOT23
Q860		000-10008-57	XSTR SMD BCW70 PNP SOT23 SS
Q870		000-10008-47	XSTR BC847B NPN SOT23
Q880		000-10008-47	XSTR BC847B NPN SOT23
Q890		000-10008-47	XSTR BC847B NPN SOT23
Q895		000-10008-47	XSTR BC847B NPN SOT23
R160		036-12100-10	RES M/F 0805 10E 1%
R201		036-14470-10	RES M/F 0805 4K7 1%
R202		036-14470-10	RES M/F 0805 4K7 1%
R204		036-15100-10	RES M/F 0805 10K 1%
R205		036-16220-00	RES M/F 0805 220K 5%
R207		036-14820-10	RES M/F 0805 8K2 1%
&R209	10	036-15220-00	RES M/F 0805 22K 5%
&R209	15	036-15180-10	RES M/F 0805 18K 1%
&R209	20	036-15220-00	RES M/F 0805 22K 5%
&R209	25	036-15180-10	RES M/F 0805 18K 1%
&R209	30	036-15220-00	RES M/F 0805 22K 5%
&R209	35	036-15180-00	RES M/F 0805 18K 5%
R210		036-15150-00	RES M/F 0805 15K 5%
R211		036-15390-10	RES M/F 0805 39K 1%
R213		036-14270-10	RES M/F 0805 2K7 1%
R215		036-15150-00	RES M/F 0805 15K 5%
R218		036-14390-10	RES M/F 0805 3K9 1%
&R219	10	036-15100-10	RES M/F 0805 10K 1%
&R219	15	036-14820-10	RES M/F 0805 8K2 1%
&R219	20	036-15100-10	RES M/F 0805 10K 1%
&R219	25	036-14820-10	RES M/F 0805 8K2 1%

Ref	Var	IPN	Description
&R219	30	036-15100-10	RES M/F 0805 10K 1%
&R219	35	036-14820-10	RES M/F 0805 8K2 1%
R221		036-15470-10	RES M/F 0805 47K 1%
R222		036-16100-10	RES M/F 0805 100K 1%
%R223		036-12100-10	RES M/F 0805 10E 1%
R224		036-14390-10	RES M/F 0805 3K9 1%
R225		036-13470-00	RES M/F 0805 470E 5%
R227		036-14270-10	RES M/F 0805 2K7 1%
R229		036-14470-10	RES M/F 0805 4K7 1%
R230		036-14470-10	RES M/F 0805 4K7 1%
R232		036-15470-10	RES M/F 0805 47K 1%
R233		036-14820-10	RES M/F 0805 8K2 1%
R234		036-15470-10	RES M/F 0805 47K 1%
R236		036-15470-10	RES M/F 0805 47K 1%
R238		036-11470-00	RES M/F 0805 4E7 5%
R239		036-14100-10	RES M/F 0805 1K 1%
R241		036-14100-10	RES M/F 0805 1K 1%
R242		036-13100-10	RES M/F 0805 100E 1%
R244		036-14680-10	RES M/F 0805 6K8 1%
R245		036-14100-10	RES M/F 0805 1K 1%
R247		036-14220-00	RES M/F 0805 2K2 5%
R249		036-15100-10	RES M/F 0805 10K 1%
R251		036-15390-10	RES M/F 0805 39K 1%
R252		036-14470-10	RES M/F 0805 4K7 1%
R254		036-14820-10	RES M/F 0805 8K2 1%
R255		036-15470-10	RES M/F 0805 47K 1%
R256		036-14270-10	RES M/F 0805 2K7 1%
R258		036-15470-10	RES M/F 0805 47K 1%
R260		036-11470-00	RES M/F 0805 4E7 5%
R261		036-13150-10	RES M/F 0805 150E 1%
R262		036-14100-10	RES M/F 0805 1K 1%
R264		036-15150-00	RES M/F 0805 15K 5%
R265		036-13100-10	RES M/F 0805 100E 1%
R266		036-15470-10	RES M/F 0805 47K 1%
R267		036-16390-00	RES M/F 0805 390K 5%
R269		036-14220-00	RES M/F 0805 2K2 5%
R271		036-16100-10	RES M/F 0805 100K 1%
R272		036-15470-10	RES M/F 0805 47K 1%
R273		036-15150-00	RES M/F 0805 15K 5%
R274		036-13120-00	RES M/F 0805 120E 5%
R275		036-13100-10	RES M/F 0805 100E 1%
R276		036-13120-00	RES M/F 0805 120E 5%
R277		036-14560-00	RES M/F 0805 5K6 5%
R278		036-16220-00	RES M/F 0805 220K 5%
R279		036-12270-00	RES M/F 0805 27E 5%
R280		036-16100-10	RES M/F 0805 100K 1%
R281		036-14470-10	RES M/F 0805 4K7 1%
R282		036-16100-10	RES M/F 0805 100K 1%
R284		036-13100-10	RES M/F 0805 100E 1%
R285		036-15470-10	RES M/F 0805 47K 1%
R287		036-15100-10	RES M/F 0805 10K 1%
R288		036-14470-10	RES M/F 0805 4K7 1%
R289		036-14680-10	RES M/F 0805 6K8 1%
R290		036-14100-10	RES M/F 0805 1K 1%
R292		036-14680-10	RES M/F 0805 6K8 1%
R293		036-13560-10	RES M/F 0805 560E 1%
R294		036-14100-10	RES M/F 0805 1K 1%
R295		036-14680-10	RES M/F 0805 6K8 1%
R296		036-14120-00	RES M/F 0805 1K2 5%
R297		030-52100-20	RES FILM AI 10E 5% 0.4W 4X1.6
R298		036-15470-10	RES M/F 0805 47K 1%
R299		036-15470-10	RES M/F 0805 47K 1%
R300		036-12820-00	RES M/F 0805 82E 5%
R301		036-12100-10	RES M/F 0805 10E 1%
R302		036-13100-10	RES M/F 0805 100E 1%
R303		036-14270-10	RES M/F 0805 2K7 1%
R304		036-14220-00	RES M/F 0805 2K2 5%
R307		036-13100-10	RES M/F 0805 100E 1%
R308		036-15150-00	RES M/F 0805 15K 5%
R309		036-15100-10	RES M/F 0805 10K 1%
R310		036-15100-10	RES M/F 0805 10K 1%
R311		036-13100-10	RES M/F 0805 100E 1%
&R312	10	036-12470-00	RES M/F 0805 47E 5%
&R312	15	036-12220-00	RES M/F 0805 22E 5%
&R312	20	036-12470-00	RES M/F 0805 47E 5%
&R312	25	036-12220-00	RES M/F 0805 22E 5%
&R312	30	036-12470-00	RES M/F 0805 47E 5%
&R312	35	036-12220-00	RES M/F 0805 22E 5%
R314		036-14150-10	RES M/F 0805 1K5 1%
R315		036-14330-10	RES M/F 0805 3K3 1%
R316		036-14100-10	RES M/F 0805 1K 1%
R338		036-15180-10	RES M/F 0805 18K 1%
R339		036-14680-10	RES M/F 0805 6K8 1%
R340		036-14270-10	RES M/F 0805 2K7 1%
R341		036-14330-10	RES M/F 0805 3K3 1%
R342		036-14270-10	RES M/F 0805 2K7 1%
R344		036-13120-00	RES M/F 0805 120E 5%
R345		036-10000-00	RES M/F 0805 ZERO OHM
R347		036-12220-00	RES M/F 0805 22E 5%
&R349	10	036-15560-10	RES MF 0805 56K 1%
&R349	15	036-16100-10	RES M/F 0805 100K 1%
&R349	20	036-15560-10	RES MF 0805 56K 1%
&R349	25	036-16100-10	RES M/F 0805 100K 1%
&R349	30	036-15560-10	RES MF 0805 56K 1%
&R349	35	036-16100-10	RES M/F 0805 100K 1%
R350		036-14150-10	RES M/F 0805 1K5 1%
R351		036-14100-10	RES M/F 0805 1K 1%
R352		036-14220-00	RES M/F 0805 2K2 5%

Ref	Var	IPN	Description
R353		036-15820-00	RES M/F 0805 82K 5%
R354		036-16560-00	RES M/F 0805 560K 5%
R355		036-15470-10	RES M/F 0805 47K 1%
R356		036-15220-00	RES M/F 0805 22K 5%
R357		036-16120-10	RES M/F 0805 120K 1%
R358		036-15100-10	RES M/F 0805 10K 1%
R359		036-15100-10	RES M/F 0805 10K 1%
R362		036-15270-10	RES M/F 0805 27K 1%
R363		036-14820-10	RES M/F 0805 8K2 1%
R364		036-14560-00	RES M/F 0805 5K6 5%
R365		036-15100-10	RES M/F 0805 10K 1%
R366		036-16220-00	RES M/F 0805 220K 5%
R367		045-15100-00	RES NTC SMD 10K 5%
R368		036-16390-00	RES M/F 0805 390K 5%
R369		036-14560-00	RES M/F 0805 5K6 5%
R370		036-14390-10	RES M/F 0805 3K9 1%
R371		036-16220-00	RES M/F 0805 220K 5%
R372		036-14100-10	RES M/F 0805 1K 1%
R373		036-16220-00	RES M/F 0805 220K 5%
R374		036-15100-10	RES M/F 0805 10K 1%
R375		036-15100-10	RES M/F 0805 10K 1%
R376		036-15100-10	RES M/F 0805 10K 1%
R377		036-16390-00	RES M/F 0805 390K 5%
R378		036-14220-00	RES M/F 0805 2K2 5%
R379		036-14820-10	RES M/F 0805 8K2 1%
R380		036-14100-10	RES M/F 0805 1K 1%
R381		036-14560-00	RES M/F 0805 5K6 5%
R382		036-14820-10	RES M/F 0805 8K2 1%
R384		036-16390-00	RES M/F 0805 390K 5%
R385		036-16390-00	RES M/F 0805 390K 5%
R387		036-15100-10	RES M/F 0805 10K 1%
R388		036-15470-10	RES M/F 0805 47K 1%
R389		036-15470-10	RES M/F 0805 47K 1%
R391		036-13220-10	RES 0805 220E 1%
R392		036-14330-10	RES M/F 0805 3K3 1%
R393		036-16220-00	RES M/F 0805 220K 5%
R394		036-14100-10	RES M/F 0805 1K 1%
R395		036-14220-00	RES M/F 0805 2K2 5%
R396		036-15820-00	RES M/F 0805 82K 5%
R397		036-16560-00	RES M/F 0805 560K 5%
R400		036-14100-10	RES M/F 0805 1K 1%
R401		036-14390-10	RES M/F 0805 3K9 1%
R402		036-14220-00	RES M/F 0805 2K2 5%
R403		036-12100-10	RES M/F 0805 10E 1%
R404		036-12330-00	RES M/F 0805 33E 5%
R407		036-13180-00	RES M/F 0805 180E 5%
R408		036-17100-10	RES M/F 0805 1M 1%
R409		036-10000-00	RES M/F 0805 ZERO OHM
R410		036-12100-10	RES M/F 0805 10E 1%
R411		036-17100-10	RES M/F 0805 1M 1%
R414		036-12100-10	RES M/F 0805 10E 1%
R415		036-14100-10	RES M/F 0805 1K 1%
R416		036-14390-10	RES M/F 0805 3K9 1%
R417		036-14220-00	RES M/F 0805 2K2 5%
R418		036-12100-10	RES M/F 0805 10E 1%
R421		036-12330-00	RES M/F 0805 33E 5%
R422		036-13470-00	RES M/F 0805 470E 5%
R424		036-10000-00	RES M/F 0805 ZERO OHM
R428		036-13470-00	RES M/F 0805 470E 5%
R429		036-13470-00	RES M/F 0805 470E 5%
R430		036-12120-00	RES M/F 0805 12E 5%
R431		036-12470-00	RES M/F 0805 47E 5%
R500		036-12100-10	RES M/F 0805 10E 1%
R501		036-15390-10	RES M/F 0805 39K 1%
R502		036-13330-00	RES M/F 0805 330E 5%
R503		036-13220-10	RES 0805 220E 1%
R505		036-13820-00	RES M/F 0805 820E 5%
&R506	10	036-12470-00	RES M/F 0805 47E 5%
&R506	15	036-12470-00	RES M/F 0805 47E 5%
&R506	20	036-12470-00	RES M/F 0805 47E 5%
&R506	25	036-12470-00	RES M/F 0805 47E 5%
&R506	30	036-12470-00	RES M/F 0805 47E 5%
&R506	35	036-12470-00	RES M/F 0805 47E 5%
&R507	10	036-12470-00	RES M/F 0805 47E 5%
&R507	15	036-12470-00	RES M/F 0805 47E 5%
&R507	20	036-12470-00	RES M/F 0805 47E 5%
&R507	25	036-12470-00	RES M/F 0805 47E 5%
&R507	30	036-12470-00	RES M/F 0805 47E 5%
&R507	35	036-12470-00	RES M/F 0805 47E 5%
R508		036-11470-00	RES M/F 0805 4E7 5%
R509		036-12100-10	RES M/F 0805 10E 1%
R511		036-14180-00	RES M/F 0805 1K8 5%
&R516	10	036-11470-00	RES M/F 0805 4E7 5%
&R516	15	036-11470-00	RES M/F 0805 4E7 5%
&R516	20	036-11470-00	RES M/F 0805 4E7 5%
&R516	25	036-11470-00	RES M/F 0805 4E7 5%
&R516	30	036-11470-00	RES M/F 0805 4E7 5%
&R516	35	036-11470-00	RES M/F 0805 4E7 5%
R517		036-13120-00	RES M/F 0805 120E 5%
R518		036-12330-00	RES M/F 0805 33E 5%
R520		036-14220-00	RES M/F 0805 2K2 5%
R540		036-12330-00	RES M/F 0805 33E 5%
R541		036-11470-00	RES M/F 0805 4E7 5%
R542		036-11470-00	RES M/F 0805 4E7 5%
R543		036-14180-00	RES M/F 0805 1K8 5%
R544		036-14220-00	RES M/F 0805 2K2 5%
R545		036-14100-10	RES M/F 0805 1K 1%
R546		036-12270-00	RES M/F 0805 27E 5%

Ref	Var	IPN	Description
R547		036-12680-00	RES M/F 0805 68E 5%
R548		036-10000-00	RES M/F 0805 ZERO OHM
R549		036-12120-00	RES M/F 0805 12E 5%
R550		036-12560-00	RES M/F 0805 56E 5%
R554		036-12680-00	RES M/F 0805 68E 5%
R557		036-13120-00	RES M/F 0805 120E 5%
R558		036-12100-10	RES M/F 0805 10E 1%
R560		036-11470-00	RES M/F 0805 4E7 5%
R561		036-14330-10	RES M/F 0805 3K3 1%
R562		036-15150-00	RES M/F 0805 15K 5%
R563		036-16180-00	RES M/F 0805 180K 5%
R564		036-12330-00	RES M/F 0805 33E 5%
R571		036-11470-00	RES M/F 0805 4E7 5%
R572		036-13820-00	RES M/F 0805 820E 5%
R573		036-11470-00	RES M/F 0805 4E7 5%
R574		036-13820-00	RES M/F 0805 820E 5%
R575		036-14150-10	RES M/F 0805 1K5 1%
R576		036-14680-10	RES M/F 0805 6K8 1%
R578		036-12270-00	RES M/F 0805 27E 5%
R579		036-14100-10	RES M/F 0805 1K 1%
R580		036-10000-00	RES M/F 0805 ZERO OHM
R586		036-13470-00	RES M/F 0805 470E 5%
R590		036-14100-10	RES M/F 0805 1K 1%
R591		036-15220-00	RES M/F 0805 22K 5%
R592		036-14220-00	RES M/F 0805 2K2 5%
R615		036-13100-10	RES M/F 0805 100E 1%
R617		036-10000-00	RES M/F 0805 ZERO OHM
R619		036-01100-10	RES 1 OHM 1 WATT 2512 CHIP
R621		036-01100-10	RES 1 OHM 1 WATT 2512 CHIP
R625		036-14100-10	RES M/F 0805 1K 1%
R629		036-03270-10	RES 270 OHM 1 WATT 2512 CHIP
R633		036-14680-10	RES M/F 0805 6K8 1%
R636		036-12220-00	RES M/F 0805 22E 5%
R637		036-12220-00	RES M/F 0805 22E 5%
R640		036-12100-10	RES M/F 0805 10E 1%
R641		036-14150-10	RES M/F 0805 1K5 1%
R645		036-13470-00	RES M/F 0805 470E 5%
R649		036-14470-10	RES M/F 0805 4K7 1%
R653		036-15100-10	RES M/F 0805 10K 1%
R681		036-13100-10	RES M/F 0805 100E 1%
R685		036-15150-00	RES M/F 0805 15K 5%
R689		036-12100-10	RES M/F 0805 10E 1%
R693		036-16100-10	RES M/F 0805 100K 1%
R696		036-15560-10	RES MF 0805 56K 1%
R701		036-12220-00	RES M/F 0805 22E 5%
R702		036-17100-10	RES M/F 0805 1M 1%
R703		036-17100-10	RES M/F 0805 1M 1%
R706		036-15150-00	RES M/F 0805 15K 5%
R707		036-15470-10	RES M/F 0805 47K 1%
R708		036-13100-10	RES M/F 0805 100E 1%
R709		036-13100-10	RES M/F 0805 100E 1%
R710		036-13100-10	RES M/F 0805 100E 1%
R711		036-13100-10	RES M/F 0805 100E 1%
R712		036-12100-10	RES M/F 0805 10E 1%
R730		036-13470-00	RES M/F 0805 470E 5%
R731		036-13470-00	RES M/F 0805 470E 5%
R732		036-13470-00	RES M/F 0805 470E 5%
R742		036-13150-10	RES M/F 0805 150E 1%
R743		036-13150-10	RES M/F 0805 150E 1%
R744		036-12220-00	RES M/F 0805 22E 5%
R746		036-12220-00	RES M/F 0805 22E 5%
R747		036-12220-00	RES M/F 0805 22E 5%
R748		036-15470-10	RES M/F 0805 47K 1%
R749		036-15470-10	RES M/F 0805 47K 1%
R750		036-12220-00	RES M/F 0805 22E 5%
R752		036-12220-00	RES M/F 0805 22E 5%
R753		036-17100-10	RES M/F 0805 1M 1%
R754		036-14100-10	RES M/F 0805 1K 1%
R756		036-16470-00	RES M/F 0805 470K 5%
R757		036-16470-00	RES M/F 0805 470K 5%
R758		036-14120-00	RES M/F 0805 1K2 5%
R759		036-13330-00	RES M/F 0805 330E 5%
R760		036-13180-00	RES M/F 0805 180E 5%
R762		036-13100-10	RES M/F 0805 100E 1%
R763		036-13100-10	RES M/F 0805 100E 1%
R765		036-13680-00	RES M/F 0805 680E 5%
R766		036-14100-10	RES M/F 0805 1K 1%
R767		036-13680-00	RES M/F 0805 680E 5%
R769		036-13180-00	RES M/F 0805 180E 5%
R771		036-14820-10	RES M/F 0805 8K2 1%
R772		036-15220-00	RES M/F 0805 22K 5%
R774		036-14820-10	RES M/F 0805 8K2 1%
R775		036-15180-10	RES M/F 0805 18K 1%
R784		036-12680-00	RES M/F 0805 68E 5%
R785		036-14330-10	RES M/F 0805 3K3 1%
R786		036-12100-10	RES M/F 0805 10E 1%
R787		036-12100-10	RES M/F 0805 10E 1%
R790		036-13390-10	RES M/F 0805 390E 1%
R791		036-14100-10	RES M/F 0805 1K 1%
R793		036-12180-00	RES M/F 0805 18E 5%
R794		036-13120-00	RES M/F 0805 120E 5%
R804		036-15470-10	RES M/F 0805 47K 1%
R805		036-13470-00	RES M/F 0805 470E 5%
R808		036-12100-10	RES M/F 0805 10E 1%
R809		036-14470-10	RES M/F 0805 4K7 1%
R810		036-14470-10	RES M/F 0805 4K7 1%
R811		036-14470-10	RES M/F 0805 4K7 1%
R812		036-14470-10	RES M/F 0805 4K7 1%

Ref	Var	IPN	Description
R813		036-14470-10	RES M/F 0805 4K7 1%
R815		036-15470-10	RES M/F 0805 47K 1%
R816		036-16150-00	RES M/F 0805 150K 5%
R818		036-14470-10	RES M/F 0805 4K7 1%
R819		036-14470-10	RES M/F 0805 4K7 1%
R820		036-15470-10	RES M/F 0805 47K 1%
R821		036-15470-10	RES M/F 0805 47K 1%
R822		036-15470-10	RES M/F 0805 47K 1%
R823		036-15470-10	RES M/F 0805 47K 1%
R824		036-14220-00	RES M/F 0805 2K2 5%
R825		036-14220-00	RES M/F 0805 2K2 5%
R826		036-14220-00	RES M/F 0805 2K2 5%
R827		036-14220-00	RES M/F 0805 2K2 5%
R828		036-14220-00	RES M/F 0805 2K2 5%
R829		036-14220-00	RES M/F 0805 2K2 5%
R830		036-14220-00	RES M/F 0805 2K2 5%
R831		036-14220-00	RES M/F 0805 2K2 5%
R832		036-14220-00	RES M/F 0805 2K2 5%
R833		036-14220-00	RES M/F 0805 2K2 5%
R835		036-14220-00	RES M/F 0805 2K2 5%
R836		036-14220-00	RES M/F 0805 2K2 5%
R837		036-14220-00	RES M/F 0805 2K2 5%
R838		036-14470-10	RES M/F 0805 4K7 1%
R839		036-14470-10	RES M/F 0805 4K7 1%
R840		036-14220-00	RES M/F 0805 2K2 5%
R841		036-14220-00	RES M/F 0805 2K2 5%
R842		036-14220-00	RES M/F 0805 2K2 5%
R843		036-14220-00	RES M/F 0805 2K2 5%
R844		036-15470-10	RES M/F 0805 47K 1%
R845		036-16150-00	RES M/F 0805 150K 5%
R846		036-14470-10	RES M/F 0805 4K7 1%
R847		036-14470-10	RES M/F 0805 4K7 1%
R848		036-13470-00	RES M/F 0805 470E 5%
R852		036-14470-10	RES M/F 0805 4K7 1%
R853		036-13470-00	RES M/F 0805 470E 5%
R854		036-16330-00	RES M/F 0805 330K 5%
R855		036-15470-10	RES M/F 0805 47K 1%
R856		036-16150-00	RES M/F 0805 150K 5%
R857		036-16150-00	RES M/F 0805 150K 5%
R858		036-15270-10	RES M/F 0805 27K 1%
R859		036-17120-10	RES M/F 0805 1M2 1%
R860		036-16820-10	RES M/F 0805 820K 1%
R861		036-14510-10	RES M/F 0805 5K1 1%
R863		036-14470-10	RES M/F 0805 4K7 1%
R865		036-14270-10	RES M/F 0805 2K7 1%
R866		036-16820-10	RES M/F 0805 820K 1%
R867		036-16820-10	RES M/F 0805 820K 1%
R868		036-14470-10	RES M/F 0805 4K7 1%
R869		036-15270-10	RES M/F 0805 27K 1%
R870		036-17120-10	RES M/F 0805 1M2 1%
R871		036-16820-10	RES M/F 0805 820K 1%
R872		036-14510-10	RES M/F 0805 5K1 1%
R873		036-14220-00	RES M/F 0805 2K2 5%
R875		036-14470-10	RES M/F 0805 4K7 1%
R876		036-16100-10	RES M/F 0805 100K 1%
R877		036-16100-10	RES M/F 0805 100K 1%
R878		036-16100-10	RES M/F 0805 100K 1%
R879		036-16100-10	RES M/F 0805 100K 1%
R881		036-15470-10	RES M/F 0805 47K 1%
R882		036-15470-10	RES M/F 0805 47K 1%
R884		036-16150-00	RES M/F 0805 150K 5%
R885		036-16150-00	RES M/F 0805 150K 5%
R886		036-15100-10	RES M/F 0805 10K 1%
R887		036-14100-10	RES M/F 0805 1K 1%
R888		036-14820-10	RES M/F 0805 8K2 1%
R889		036-16100-10	RES M/F 0805 100K 1%
R890		036-16150-00	RES M/F 0805 150K 5%
R891		036-16100-10	RES M/F 0805 100K 1%
R892		036-16330-00	RES M/F 0805 330K 5%
R894		036-14470-10	RES M/F 0805 4K7 1%
R895		036-15100-10	RES M/F 0805 10K 1%
R897		036-15100-10	RES M/F 0805 10K 1%
R898		036-16470-00	RES M/F 0805 470K 5%
R900		036-15100-10	RES M/F 0805 10K 1%
RL210		237-10010-00	RELAY 12V DPDT 10PIN SMD
RV205		040-05100-22	POT 10K LOG DUAL PCB 6 OD SFT
RV210		040-05100-23	POT 10K LOG PCB 15MM SLOT SFT
RV220		042-05100-05	RES PRESET SMD 10K CER 4MM SQ
RV230		040-05100-21	POT 10K LIN PCB 15MM SLOT SFT
RV235		042-05100-05	RES PRESET SMD 10K CER 4MM SQ
RV345		042-04220-05	RES PRESET SMD 2K CER 4MM SQ
RV346		042-05100-05	RES PRESET SMD 10K CER 4MM SQ
SHLD610		062-00010-13	CAN 10MMSQ*11MM CAN SANWA 613
SK805		240-10000-07	CONN SMD SKT 16W 2R M-MATCH
SK810		240-04020-42	SKT 44 PIN SMD PLCC
SW201		230-00010-30	SWITCH TOG SPDT R-ANG PCB MTG
T210		053-00010-17	XFMR T4030 LINE MATCH POTCORE
#TL500	10	051-10950-00	COAX RES 950 MHZ 6X6 SMD
#TL500	15	051-10950-00	COAX RES 950 MHZ 6X6 SMD
#TL500	20	051-11000-00	COAX RES 1000MHZ 6X6 SMD
#TL500	25	051-11000-00	COAX RES 1000MHZ 6X6 SMD

Ref	Var	IPN	Description
#TL500	30	051-11050-00	COAX RES 1050MHz 6x6 SMD
#TL500	35	051-11050-00	COAX RES 1050MHz 6x6 SMD
T540		000-10080-00	XSTR SMD BLT80 UHF PWR SOT223
T610		050-15119-52	COIL SMD 680uH XFMR 5119-T052
X300		274-00010-22	XTAL 44.545MHZ TE/22 HC45/U
&XF300A	10	276-00010-91	FLTR XTAL 45MHZ 15KHZ 4P IM100
&XF300A	15	276-00010-92	FLTR XTAL 45MHZ 7.5KHZ4P IM100
&XF300A	20	276-00010-91	FLTR XTAL 45MHZ 15KHZ 4P IM100
&XF300A	25	276-00010-92	FLTR XTAL 45MHZ 7.5KHZ4P IM100
&XF300A	30	276-00010-91	FLTR XTAL 45MHZ 15KHZ 4P IM100
&XF300A	35	276-00010-92	FLTR XTAL 45MHZ 7.5KHZ4P IM100
&XF300B	10	276-00010-91	FLTR XTAL 45MHZ 15KHZ 4P IM100
&XF300B	15	276-00010-92	FLTR XTAL 45MHZ 7.5KHZ4P IM100
&XF300B	20	276-00010-91	FLTR XTAL 45MHZ 15KHZ 4P IM100
&XF300B	25	276-00010-92	FLTR XTAL 45MHZ 7.5KHZ4P IM100
&XF300B	30	276-00010-91	FLTR XTAL 45MHZ 15KHZ 4P IM100
&XF300B	35	276-00010-92	FLTR XTAL 45MHZ 7.5KHZ4P IM100
&XF302	10	276-00010-68	FLTR XTL 45MHZ 15KHZ 2 POLE
&XF302	15	276-00010-69	FLTR XTL 45MHZ 7.5KHZ 2 POLE
&XF302	20	276-00010-68	FLTR XTL 45MHZ 15KHZ 2 POLE
&XF302	25	276-00010-69	FLTR XTL 45MHZ 7.5KHZ 2 POLE
&XF302	30	276-00010-68	FLTR XTL 45MHZ 15KHZ 2 POLE
&XF302	35	276-00010-69	FLTR XTL 45MHZ 7.5KHZ 2 POLE

T885 Mechanical & Miscellaneous Parts (220-01595-03)

IPN	Legend	Description
066-00010-20	1	SLUG BRASS A4M764 HELIC RESNTR
070-01001-00	2	D-RANGE 15 WAY COMPL T800 PL100
220-01595-03		PCB T885 RX SERIES II
230-00010-31	3	SWITCH COVER FOR 230-00010-30
240-02100-06	4	SKT COAX N TYPE PNL MTG OP-TER
240-04020-62		SKT 2 W RECEP SHORTING LINK PL210-270
303-11169-04	5	CHASSIS PAINTED T800 SER II
303-23118-00	6	COVER A3M2247 D RANGE T855/7
303-50074-00	7	CLIP SPRING XSTR CLAMP T857
308-01007-01	8	HANDLE BS SII 2 WASHERS INC
308-01048-00	9	HOUSING A3M2378 DOUBLET H/RES
311-01015-00	10	KNOB 15MM & SKIRT 6MM SHAFT
312-01052-02	11	LID TOP T800 SER II PTND
312-01053-02	21	LID BOTTOM T800 SER II PNTD
316-06622-00	12	PNL FRT RX T800 SERIES II
349-00020-36	13	SCREW TT M3X8m PANTORX BLK
349-00020-55	22	SCRW M3X8 P/P T/T BLCKZNC CHRM
349-20430-00	14	SCRW T/T M4X12MM P/TORX BLK
349-20450-00	15	SCRW T/T M4X20MM P/TORX BLK
352-00010-29	16	NUT M4 NYLOC HEX
352-00010-54	17	NUT Brass hex 1/4" UNF 3mm
353-00010-24	18	WSHR M4x8mm Flat ST BZ
356-00010-03		TAG SOLDER 3MM LONG M614/3.2 Main PCB to chassis earth strap (via D-range shield).
362-00010-33	19	GROMMET LED MTG 3MM
365-00011-53		LABEL WHITE RW2365/1 104X37MM
399-00010-51		BAG PLASTIC 75X100MM

Note

The following electrical components are also included in the mechanical assembly drawing.

000-00033-12	20	XSTR BD242 TO-220 PNP ISOLTD Q620

replace A4 pages B6.2.13/B6.2.14 with A3 pages B6.2.13/B6.2.14

replace A4 pages B6.2.13/B6.2.14 with A3 pages B6.2.13/B6.2.14

T885 Grid Reference Index (IPN 220-01595-03)

How To Use This Grid Reference Index

The first digit in the PCB layout reference is a "1" or "2", indicating the top or bottom side layout respectively, and the last two characters give the location of the component on that diagram.

The first digit in the circuit diagram reference is the sheet number, and the last two characters give the location of the component on that sheet.

Device	PCB	Circuit	Device	PCB	Circuit	Device	PCB	Circuit	Device	PCB	Circuit
C201	1:B5	2-B9	&C315	1:E7	3-G7	C409	1:K7	4-G3	C576	1:G5	5-N4
C203	1:C5	2-B8	C316	1:F7	3-G8	C410	1:K8	4-G4	C577	1:G6	5-N2
C205	1:D5	2-B8	C317	1:F7	3-H8	C411	1:J8	4-H5	C578	1:H6	5-N2
C207	1:C5	2-C8	&C318	1:E7	3-H7	C414	1:J8	4-H4	C579	1:H6	5-N2
C209	1:C6	2-E8	C321	1:E7	3-H7	C415	1:J8	4-H4	C585	1:G6	5-N2
C210	1:C5	2-D7	C322	1:E7	3-H7	C417	1:H8	4-L3	C586	1:G5	5-N4
C211	1:C4	2-D7	C324	1:E7	3-J7	C418	1:H8	4-M3	C587	1:G6	5-Q2
C212	1:C5	2-E8	C325	1:F7	3-J8	C422	1:G8	4-M4	C588	1:G6	5-Q2
C213	1:C5	2-E7	C328	1:E6	3-J8	C500	1:J4	5-D8	C590	1:J6	5-A8
C215	1:C4	2-E7	&C329	1:E7	3-K8	C501	1:J4	5-E8	C591	1:K6	5-B8
C217	1:C4	2-E7	&C330	1:E6	3-K8	C502	1:J5	5-E8	C592	1:K6	5-B8
C219	1:C5	2-H6	&C331	1:F6	3-L8	C503	1:J4	5-E8	C593	1:J6	5-B8
C221	1:C5	2-H6	&C332	1:E6	3-L8	C504	1:J5	5-F7	C594	1:J6	5-C8
C222	1:B5	2-J9	&C335	1:E6	3-M8	C505	1:K5	5-G7	C595	1:J6	5-C8
C223	1:B5	2-H8	C336	1:E6	3-M8	C506	1:J5	5-G6	C596	1:J5	5-C8
C225	1:B5	2-J8	C337	1:E6	3-M7	C507	1:J4	5-G7	C597	1:J5	5-D8
C227	1:B5	2-J8	C338	1:E5	3-M8	C508	1:J5	5-G7	C610A	1:M5	6-B6
C229	1:B6	2-K8	C339	1:E6	3-N8	C509	1:J5	5-G6	C610B	1:M5	6-B6
C231	1:B6	2-K8	C340	1:E3	3-N0	C510	1:J5	5-G7	C611A	1:M5	6-D6
C233	1:B5	2-J7	C341	1:E3	3-N0	C516	1:J5	5-G6	C611B	1:M4	6-D6
C235	1:B6	2-M6	C342	1:E5	3-B3	&C517	1:J5	5-H6	C623	1:N6	6-N8
C237	1:B6	2-M5	C343	1:E5	3-C3	C518	1:K5	5-J7	C625	1:M6	6-Q8
C238	1:B6	2-N7	C345	1:F4	3-D4	&C519	1:J5	5-J6	C626	1:M6	6-R8
C239	1:C6	2-P6	C346	1:F3	3-G0	C520	1:K5	5-J7	C628	1:M6	6-R8
C240A	1:D5	2-Q8	C347	1:E4	3-D4	&C521	1:J5	5-J5	C630	1:N5	6-K4
C240B	1:D5	2-R8	C348	1:E5	3-E4	&C522	1:J5	5-J6	C631A	1:M5	6-M6
C240C	1:D6	2-R8	C349	1:E5	3-E3	&C524	1:K5	5-K6	C631B	1:N4	6-M6
C249	1:D6	2-Q7	C350	1:E5	3-E4	&C525	1:K5	5-K6	C637	1:M6	6-P5
C251	1:C6	2-R7	C351	1:F3	3-E0	C531	1:J5	5-K6	C640	1:M5	6-G0
C253	1:D4	2-G5	C352	1:E3	3-F2	&C533	1:K5	5-L6	C650	1:N5	6-L4
C255	1:C7	2-L2	C353	1:F5	3-F3	C536	1:K4	5-Q6	C651	1:M5	6-M4
C257	1:C7	2-M2	C354	1:F4	3-G3	C537	1:K5	5-Q6	C658	1:L5	6-K1
C259	1:C7	2-M3	C355	1:F4	3-H2	C540	1:H6	5-D2	C660	1:L5	6-K1
C260A	1:D7	2-N4	C356	1:F4	3-H3	C541	1:H6	5-D1	C665	1:L5	6-L1
C260B	1:D7	2-M4	C357	1:F4	3-G4	C542	1:H6	5-E3	C670	1:L5	6-L1
C260C	1:D8	2-M4	C358	1:F4	3-L5	C543	1:J6	5-E2	C673	1:L5	6-N2
C261	1:C7	2-N2	C359	1:E3	3-H4	C544	1:H5	5-E1	C677	1:L6	6-P1
C262	1:D7	2-P3	C360	1:F3	3-J3	C545	1:J6	5-E2	C681	1:L6	6-Q2
C264	1:C7	2-P2	C361	1:E4	3-K3	C546	1:J5	5-F1	C684	1:M6	6-Q2
C266	1:D2	2-R3	C362	1:E4	3-K3	C547	1:J5	5-F0	C687	1:L6	6-P1
C268	1:D3	2-R3	C364	1:E4	3-M3	C548	1:J5	5-F0	C690	1:L6	6-Q1
C270	1:C8	2-E3	C365	1:E4	3-N3	C549	1:J6	5-F2	C693	1:L6	6-Q1
C272	1:C8	2-D2	C366	1:D5	3-M2	C555	1:J5	5-F0	C700	1:J4	7-A8
C273	1:C9	2-C1	C367	1:E3	3-K4	C556	1:H5	5-G3	C702	1:J4	7-B8
C274	1:C8	2-E2	C368	1:E4	3-L4	C557	1:J5	5-G0	C703	1:J3	7-B8
C276	1:D8	2-B0	C369	1:E4	3-L3	C558	1:J5	5-G0	C705	1:J3	7-C7
C278	1:D8	2-C0	C371	1:F3	3-E1	C559	1:H5	5-H4	C707	1:J2	7-B5
C280	1:D9	2-F1	C385	1:F8	3-P8	C560	1:G5	5-J4	C708	1:J3	7-C5
C286	1:B8	2-F1	C386	1:F8	3-P8	C561	1:H6	5-J2	C709	1:H3	7-C5
C300	1:F8	3-C7	C387	1:F7	3-R8	C562	1:G5	5-K4	C710A	1:H3	7-P7
C302	1:F8	3-D6	C389	1:F7	3-R8	C563	1:G5	5-L2	C710B	1:J4	7-Q7
C303	1:F8	3-E7	C390	1:E4	3-M0	C564	1:G5	5-K4	C710C	1:J3	7-P7
C304	1:E8	3-E8	C400	1:N8	4-C3	C569	1:G5	5-L4	C711	1:J2	7-E7
C307	1:E8	3-E8	C401	1:N8	4-D4	C570	1:H5	5-L2	C712	1:H2	7-E7
C308	1:E8	3-E8	C402	1:N8	4-D5	C571	1:G5	5-J2	C713	1:H2	7-E7
&C309	1:F8	3-E7	C403	1:M8	4-E4	C572	1:H6	5-L2	C735	1:J2	7-A1
C310	1:E8	3-E8	C404	1:N8	4-E3	C573	1:H5	5-M4	C736	1:H2	7-B1
&C311	1:F8	3-F7	C407	1:N7	4-E5	C574	1:G6	5-M4	C740A	1:H2	7-B4
&C314	1:E8	3-G7	C408	1:K7	4-G5	C575	1:H6	5-N2	C740B	1:G2	7-B3

Device	PCB	Circuit
C741A	1:H2	7-C4
C741B	1:G2	7-C3
C742A	1:H2	7-D4
C742B	1:H2	7-D3
C743	1:H2	7-B1
C745	1:G3	7-D1
C750	1:H4	7-R7
C757	1:G4	7-G5
C759	1:G4	7-G4
C761	1:G3	7-J4
C762	1:G3	7-K4
C764	1:G3	7-J2
C765	1:G3	7-J2
C767	1:H3	7-K3
C769	1:H3	7-M4
C770	1:H3	7-M4
C772	1:G3	7-M2
C774	1:H4	7-N2
C776	1:H4	7-M1
C780	1:G3	7-N1
C782	1:G2	7-N0
C784	1:G3	7-Q1
C786	1:G3	7-Q1
C788	1:G3	7-P0
C790	1:G4	7-Q0
C792	1:G4	7-Q0
C810	1:L4	8-J8
C812	1:K2	8-F4
C813	1:J3	8-J5
C814	1:L2	8-F6
C815	1:N3	8-B1
C816	1:N3	8-B1
C818	1:N3	8-C1
C819	1:N3	8-C1
C820	1:N4	8-D1
C822	1:N3	8-D2
C824	1:N3	8-D2
C826	1:N3	8-D0
C828	1:N3	8-D0
C830	1:M4	8-K0
C832	1:M3	8-E2
C833	1:M4	8-E2
C834	1:M3	8-F1
C836	1:M3	8-E0
C837	1:M3	8-E0
C838	1:N4	8-F0
C840	1:M2	8-K2
C842	1:N2	8-L0
C844	1:N3	8-L0
C846	1:N2	8-M0
C848	1:N2	8-M0
C850	1:M2	8-N0
C873	1:M3	8-N2
C876	1:M4	8-P2
C879	1:M4	8-Q1
C900	1:P7	9-E4
C901	1:P6	9-F4
C902	1:P6	9-G4
C903	1:P6	9-H4
CV500	1:K5	5-L6
%D111	1:P4	1-R1
%D111A	1:P5	1-Q1
D220	1:C4	2-E4
D220	1:C4	2-E4
D230	1:C6	2-J5
D230	1:C6	2-J5
D240	1:C8	2-D2
D240	1:C8	2-D3
D250	1:B7	2-H1
D260	1:B7	2-H1
D270	1:B7	2-J1
D270	1:B7	2-J1
D280	1:B7	2-K1
D285	1:D2	2-L1

Device	PCB	Circuit
D289	1:B2	2-K0
D290	1:B2	2-L0
D295	1:B2	2-L0
D330	1:E4	3-L4
D330	1:E4	3-L3
D500	1:K5	5-N7
D501	1:K5	5-N6
D502	1:K5	5-N6
D503	1:K5	5-N6
D504	1:K5	5-P6
D505	1:K5	5-P6
D610	1:N6	6-L6
D610	1:N6	6-M6
D640	1:L5	6-M1
D640	1:L5	6-M2
D645	1:M5	6-H0
D730A	1:H3	7-H1
D740A	1:H3	7-K2
D820A	1:J3	8-B7
D860	1:M2	8-P0
D860	1:M2	8-P0
D880	1:M2	8-R2
D880	1:M2	8-R2
#H400	1:M8	4-F4
#H401	1:J8	4-K4
#H900	1:P8	9-D5
IC210	1:C5	2-F7
IC210	1:C5	2-G7
IC210	1:C5	2-C7
IC240	1:C6	2-P7
IC260	1:C7	2-N2
IC270	1:C8	2-B2
IC270	1:C8	2-F3
IC270	1:C8	2-E2
IC280	1:D8	2-E1
IC280	1:D8	2-B0
IC280	1:D8	2-D0
IC300	1:E5	3-K0
IC300	1:E5	3-M8
IC300	1:E5	3-K0
IC300	1:E5	3-D3
IC330	1:E4	3-J3
IC330	1:E4	3-P1
IC330	1:E4	3-K3
IC330	1:E4	3-M0
IC330	1:E4	3-G3
&IC345	1:E5	3-D3
IC351	1:E3	3-N0
IC351	1:E3	3-E1
IC351	1:E3	3-G0
IC352	1:E3	3-H1
IC352	1:E3	3-F1
IC352	1:E3	3-M0
IC360	1:F8	3-Q8
IC610	1:M5	6-C6
IC630	1:N5	6-K5
IC640	1:M5	6-N5
IC640	1:M5	6-J0
IC640	1:M5	6-G0
IC650	1:L5	6-C2
=IC700	1:J3	7-A8
IC710	1:H3	7-P7
IC710	1:H3	7-J0
IC710	1:H3	7-D7
IC710	1:H3	7-C6
IC710	1:H3	7-D6
IC710	1:H3	7-D6
IC710	1:H3	7-C6
IC740	1:H2	7-D1
IC750	1:H4	7-M3
IC750	1:H4	7-Q7
IC750	1:H4	7-H5
IC820	1:L4	8-N4
IC830	1:N4	8-F0

Device	PCB	Circuit
IC830	1:N4	8-K0
IC830	1:N4	8-D0
IC830	1:N4	8-F2
IC830	1:N4	8-D2
IC840	1:M2	8-L0
IC850	1:M3	8-P1
IC850	1:M3	8-Q2
IC850	1:M3	8-M2
IC850	1:M3	8-M2
IC850	1:M3	8-M0
L230	1:D2	2-K2
L300	1:F8	3-D7
L301	1:E8	3-E8
L302	1:F8	3-E7
&L303	1:E7	3-H7
&L304	1:E6	3-K8
&L307	1:E6	3-L8
L308	1:E6	3-M8
L345	1:F5	3-E4
L400	1:N8	4-D4
L401	1:N7	4-D3
L402	2:M7	4-F3
L403	2:M8	4-F3
L404	1:K8	4-H4
L407	1:K7	4-H3
L408	2:J7	4-K3
L409	2:J8	4-K3
L410	1:H8	4-L3
L414	1:G8	4-L4
L500	1:K5	5-J7
L501	1:K5	5-J7
L502	1:K5	5-M6
L503	1:K5	5-M6
L504	1:K5	5-P6
L505	1:K5	5-P6
L540	1:H6	5-K2
L541	1:H6	5-N2
L543	1:G6	5-P2
L700	1:G4	7-Q0
L900	1:P6	9-F5
L901	1:P6	9-F5
L902	1:P6	9-G5
L904	2:P8	9-D4
L905	2:P7	9-E4
LINK1	1:B3	2-Q3
LINK2	1:A4	2-Q2
M400	1:G8	4-L3
P100	1:P6	1-R8
P160	1:P2	1-Q4
P170	1:P2	1-R4
P201	1:C8	2-A9
P204	1:D4	2-A9
P207	1:C5	2-A8
P210	1:D5	2-C7
P213	1:D3	2-A7
P216	1:D4	2-A7
P219	1:D3	2-A7
P222	1:B9	2-A6
P225	1:C4	2-A4
P228	1:C4	2-A4
P231	1:C9	2-A4
P234	1:C4	2-A3
P236	1:C8	2-A1
P238	1:D8	2-A1
P240	1:C7	2-G2
P242	1:C4	2-G1
P244	1:C4	2-G8
P246	1:B5	2-H9
P248	1:A5	2-H9
P249	1:A5	2-K9
P250	1:B2	2-K9
P252	1:B2	2-K9

Device	PCB	Circuit
P254	1:B2	2-K9
P256	1:B2	2-L8
P258	1:D3	2-P8
P260	1:D3	2-P7
P263	1:C2	2-R6
P266	1:C2	2-R5
P268	1:C2	2-R5
P270	1:C1	2-R5
P280	1:C2	2-R4
P282	1:C2	2-R4
P284	1:B4	2-R4
P287	1:B2	2-R0
P810	1:K2	8-A5
P815	1:L4	8-C4
P820	1:K4	8-L8
P825	1:K4	8-L8
P830	1:K4	8-L8
P835	1:K4	8-L7
P840	1:K4	8-L7
PIN4	1:J4	7-B8
PL100	1:P3	1-A0
PL200	1:C6	2-R7
PL210	1:C5	2-B8
PL220	1:B5	2-H7
PL230	1:B2	2-L8
PL240	1:B6	2-K7
PL250	1:C8	2-C3
PL260	1:C4	2-H3
PL270	1:C2	2-L1
Q210	1:B5	2-J8
Q220	1:B6	2-M6
Q230	1:B6	2-N6
Q240	1:C4	2-H4
Q245	1:B6	2-J4
Q250	1:C8	2-G2
Q255	1:C7	2-H2
Q260	1:B7	2-K0
Q270	1:B8	2-K0
Q280	1:B7	2-L2
Q290	1:B7	2-M2
Q300	1:F8	3-D7
Q301	1:F7	3-J8
Q302	1:E7	3-J7
Q340	1:E5	3-B3
Q346	1:F3	3-G0
Q400	1:N8	4-C4
Q401	1:N7	4-D3
Q402	1:K8	4-G4
Q403	1:K7	4-H3
Q500	1:J5	5-D6
Q501	1:J5	5-E7
Q502	1:J5	5-F7
Q503	1:K5	5-G7
Q504	1:K5	5-J6
Q540	1:J6	5-E1
Q541	1:J5	5-E0
Q542	1:G5	5-J3
Q543	1:H6	5-J1
Q544	1:G5	5-K3
Q545	1:G6	5-M3
Q546	1:G6	5-P3
Q590	1:J6	5-C8
Q591	1:J6	5-C8
Q592	1:J6	5-C8
Q620	1:N6	6-P8
Q630	1:M6	6-P5
Q660	1:L5	6-N1
Q670	1:L6	6-P2
Q750	1:G4	7-G3
Q760	1:G3	7-J3
Q770	1:H3	7-J1
Q775	1:H3	7-K3
Q780	1:H3	7-K3

Device	PCB	Circuit
Q785	1:H3	7-K2
Q790	1:H3	7-L3
Q795	1:G3	7-P0
Q810	1:K2	8-B6
Q820	1:K2	8-B6
Q840	1:K2	8-F5
Q850	1:L2	8-G5
Q860	1:K4	8-B4
Q870	1:L4	8-C3
Q880	1:L2	8-Q3
Q890	1:L4	8-H3
Q895	1:M3	8-P2
R160	1:P2	1-Q4
R201	1:C5	2-B8
R202	1:C5	2-B7
R204	1:C5	2-C9
R205	1:C5	2-C8
R207	1:C5	2-D8
&R209	1:C4	2-D8
R210	1:C5	2-D8
R211	1:C5	2-E8
R213	1:C5	2-G6
R215	1:B5	2-G9
R218	1:C5	2-G8
&R219	1:C5	2-G7
R221	1:C5	2-H7
R222	1:C5	2-H7
%R223	1:A5	2-J9
R224	1:B5	2-J8
R225	1:B5	2-J8
R227	1:B5	2-J7
R229	1:B6	2-L6
R230	1:C6	2-M5
R232	1:B5	2-M7
R233	1:B6	2-M7
R234	1:B6	2-N7
R236	1:B5	2-N7
R238	1:C6	2-R6
R239	1:C6	2-R7
R241	1:D4	2-G5
R242	1:C4	2-G4
R244	1:C4	2-G4
R245	1:C4	2-H5
R247	1:C7	2-J5
R249	1:C6	2-J4
R251	1:B7	2-L3
R252	1:C6	2-L3
R254	1:B7	2-L3
R255	1:B7	2-L3
R256	1:C6	2-M3
R258	1:C7	2-M3
R260	1:C7	2-P2
R261	1:C7	2-P3
R262	1:B4	2-P3
%R263	1:C4	2-Q3
R264	1:B8	2-B3
R265	1:B8	2-B2
R266	1:B8	2-B2
R267	1:C8	2-C3
%R268	1:C3	2-Q2
R269	1:C8	2-B1
R271	1:D8	2-A0
R272	1:D8	2-B1
R273	1:D8	2-C1
R274	1:B3	2-P3
R275	1:D8	2-C1
R276	1:B3	2-Q3
R277	1:D8	2-C0
R278	1:D8	2-D1
R279	1:B3	2-Q2
R280	1:C8	2-D3
R281	1:C8	2-D2
R282	1:C8	2-E2
R284	1:C8	2-F3
R285	1:B8	2-F2
R287	1:C8	2-F2
R288	1:B8	2-F1
R289	1:C4	2-G3
R290	1:C4	2-H4
R292	1:C7	2-G2
R293	1:B7	2-H1
R294	1:B8	2-H0
R295	1:B6	2-J1
R296	1:B7	2-K1
R297	1:B2	2-M0
R298	1:B7	2-J0
R299	1:B7	2-J0
R300	1:F8	3-D6
R301	1:E9	3-E9
R302	1:E8	3-E8
R303	1:E8	3-E8
R304	1:F7	3-G8
R307	1:F7	3-H8
R308	1:E7	3-H8
R309	1:E7	3-H7
R310	1:E7	3-J7
R311	1:F7	3-J9
&R312	1:E7	3-J8
R314	1:F7	3-J8
R315	1:E6	3-L8
R316	1:E6	3-N7
R338	1:E5	3-B3
R339	1:E5	3-B2
R340	1:E5	3-B3
R341	1:E5	3-C3
R342	1:E5	3-C3
R344	1:E5	3-B2
R345	1:E5	3-B3
R347	1:F5	3-B4
&R349	1:E5	3-F4
R350	1:E5	3-D3
R351	1:F3	3-G0
R352	1:F3	3-G1
R353	1:D3	3-G1
R354	1:E3	3-H1
R355	1:E5	3-E4
R356	1:E3	3-F2
R357	1:E3	3-E2
R358	1:E3	3-H0
R359	1:E3	3-F2
R362	1:D3	3-F1
R363	1:F5	3-G3
R364	1:F4	3-G3
R365	1:D3	3-G2
R366	1:F3	3-D1
R367	1:F3	3-D1
R368	1:F4	3-H3
R369	1:F3	3-E0
R370	1:F3	3-E0
R371	1:F3	3-E0
R372	1:F4	3-H3
R373	1:E3	3-E1
R374	1:F4	3-K5
R375	1:F4	3-K5
R376	1:E3	3-J1
R377	1:E4	3-G4
R378	1:E3	3-J1
R379	1:F3	3-J3
R380	1:F3	3-J3
R381	1:F3	3-J3
R382	1:E3	3-H4
R384	1:E3	3-K4
R385	1:E4	3-K3
R387	1:E4	3-M3
R388	1:E4	3-M4
R389	1:E4	3-M4
%R390	1:D5	3-M2
R391	1:D5	3-M2
R392	1:F3	3-D2
R393	1:F3	3-D1
R394	1:F3	3-D1
R395	1:F3	3-D1
R396	1:E3	3-H1
R397	1:E3	3-H1
R400	1:N8	4-C4
R401	1:N8	4-C4
R402	1:N8	4-C4
R403	1:N7	4-D5
R404	1:N8	4-D4
R407	1:M8	4-D4
R408	1:M8	4-E3
R409	1:N7	4-E3
R410	1:N7	4-E5
R411	1:M7	4-E3
R414	1:K7	4-F5
R415	1:K8	4-G5
R416	1:K8	4-G4
R417	1:K8	4-G4
R418	1:K7	4-H5
R421	1:J8	4-H5
R422	1:J8	4-H4
R423	1:J8	4-J3
R424	1:J7	4-J4
R425	1:J7	4-J3
R428	1:G8	4-L5
R429	1:G8	4-L4
R430	1:G8	4-L4
R431	1:G8	4-L3
R500	1:J5	5-D8
R501	1:J5	5-D7
R502	1:J5	5-E6
R503	1:J5	5-F8
R505	1:J5	5-G7
&R506	1:J4	5-G8
&R507	1:J4	5-G8
R508	1:K5	5-H7
R509	1:J5	5-H6
R511	1:J5	5-F6
&R516	1:J5	5-J6
R517	1:J5	5-K6
R518	1:J5	5-K5
R520	1:K4	5-Q6
R540	1:J5	5-E0
R541	1:J6	5-E3
R542	1:H6	5-E3
R543	1:J6	5-E2
R544	1:J5	5-E1
R545	1:J5	5-E0
R546	1:H6	5-E1
R547	1:J6	5-E2
R548	1:J6	5-E2
R549	1:J5	5-E1
R550	1:J5	5-E0
R554	1:H5	5-F3
R556	1:J6	5-F2
R557	1:H5	5-G2
R558	1:H6	5-G2
R559	1:H6	5-G2
R560	1:G5	5-H4
R561	1:G5	5-J4
R562	1:G5	5-J2
R563	1:G5	5-K2
R564	1:G5	5-K4
R571	1:G5	5-L4
R572	1:H6	5-M2
R573	1:H6	5-M2
R574	1:H6	5-M2
R575	1:G5	5-M4
R576	1:G5	5-M2
R577	1:G6	5-P2
R578	1:G5	5-P4
R579	1:G6	5-P2
R580	1:H6	5-N2
R585	1:G6	5-P4
R586	1:G6	5-P2
R590	1:J6	5-B8
R591	1:J6	5-C8
R592	1:J6	5-C7
R615	1:M5	6-B6
R617	1:M5	6-D5
R619	1:N6	6-L8
R621	1:N6	6-L8
R625	1:N6	6-L7
R629	1:M6	6-P6
R633	1:M5	6-Q8
R636	1:M5	6-K6
R637	1:N5	6-K5
R640	1:M5	6-G0
R641	1:N5	6-L4
R645	1:N5	6-L5
R649	1:M5	6-M5
R653	1:M5	6-Q4
R681	1:L5	6-L2
R685	1:L5	6-N2
R689	1:L6	6-Q3
R693	1:L5	6-P1
R696	1:L6	6-P1
R701	1:J4	7-A9
R702	1:J4	7-B9
R703	1:H4	7-B8
R706	1:J3	7-C6
R707	1:J3	7-C7
R708	1:J2	7-D7
R709	1:J2	7-E7
R710	1:J3	7-B6
R711	1:J3	7-C6
R712	1:J3	7-P8
R730	1:J2	7-A2
R731	1:J2	7-A2
R732	1:J2	7-A2
R742	1:G2	7-C4
R743	1:H2	7-C4
R744	1:G2	7-D4
R746	1:H2	7-D4
R747	1:H3	7-D4
R748	1:J2	7-A1
R749	1:H2	7-B1
R750	1:H4	7-Q8
R752	1:G4	7-F5
R753	1:G4	7-F3
R754	1:G3	7-F3
R756	1:G3	7-G5
R757	1:G4	7-H4
R758	1:H3	7-J4
R759	1:H3	7-J4
R760	1:H3	7-K4
R762	1:H3	7-K4
R763	1:H3	7-L4
R765	1:H3	7-J2
R766	1:G3	7-J3
R767	1:H3	7-K2
R769	1:H3	7-K3
R771	1:H4	7-L3
R772	1:G3	7-L2
R774	1:H3	7-L2
R775	1:H3	7-M2
R784	1:G3	7-P1
R785	1:G3	7-P1
R786	1:G3	7-Q1
R787	1:G3	7-Q1
R790	1:G3	7-P0
R791	1:G4	7-P0
R793	1:G3	7-P0
R794	1:G3	7-P1
R804	1:J3	8-B7
R805	1:J3	8-B7
R808	1:K2	8-A6
R809	1:K2	8-B6
R810	1:L2	8-C6
R811	1:L2	8-C6
R812	1:K2	8-B6
R813	1:K2	8-B5
R815	1:K2	8-F4

Device	PCB	Circuit
R816	1:K2	8-F4
R818	1:K2	8-G5
R819	1:L2	8-G4
R820	1:K4	8-B4
R821	1:L4	8-B4
R822	1:L4	8-C3
R823	1:L4	8-D3
R824	1:K4	8-L8
R825	1:K4	8-L8
R826	1:K4	8-L8
R827	1:K4	8-L7
R828	1:K4	8-L7
R829	1:K4	8-Q9
R830	1:K3	8-Q9
R831	1:K3	8-Q9
R832	1:K3	8-Q8
R833	1:K3	8-Q8
R835	1:K3	8-Q8
R836	1:K3	8-Q8
R837	1:K3	8-Q7
R838	1:L4	8-K6
R839	1:L4	8-L6
R840	1:K3	8-Q7
R841	1:K3	8-Q7
R842	1:K3	8-Q6
R843	1:K3	8-Q6
R844	1:L2	8-R3
R845	1:L2	8-R3
R846	1:L4	8-L6
R847	1:L4	8-L6
R848	1:L4	8-R5
R852	1:L2	8-G6
R853	1:L2	8-F6
R854	1:N3	8-C2
R855	1:N3	8-C1
R856	1:N3	8-C1
R857	1:N4	8-D1
R858	1:N3	8-C0
R859	1:N3	8-D0
R860	1:N3	8-D0
R861	1:M3	8-D0
R863	1:N3	8-D1
R865	1:M3	8-E2
R866	1:M3	8-F1
R867	1:M3	8-F2
R868	1:N4	8-E0
R869	1:M3	8-E0
R870	1:M3	8-E0
R871	1:N3	8-F0
R872	1:N4	8-F0
R873	1:N4	8-G0
R875	1:M4	8-F2
R876	1:M3	8-K1
R877	1:M2	8-K1
R878	1:M2	8-K0
R879	1:M2	8-K0
R881	1:L4	8-H3
R882	1:M4	8-H3
R884	1:M3	8-N3
R885	1:M3	8-N2
R886	1:M3	8-P3
R887	1:M3	8-P3
R888	1:M3	8-P2
R889	1:M3	8-N1
R890	1:M3	8-P1
R891	1:M2	8-P1
R892	1:M2	8-P0
R894	1:M2	8-Q1
R895	1:M2	8-Q1
R897	1:M2	8-Q2
R898	1:M2	8-Q2
R900	1:P6	9-H4
RL210	1:C2	2-Q4
RL210	1:C2	2-K1
RL210	1:C2	2-Q5

Device	PCB	Circuit
RV205	1:B5	2-M7
RV210	1:B7	2-K3
RV220	1:D4	2-G5
RV230	1:B8	2-B2
RV235	1:D9	2-C0
RV345	1:F3	3-E0
RV346	1:F3	3-J3
SHLD610	1:L6	6-J3
SK805	1:K3	8-Q9
SK805	1:K3	8-Q6
SK805	1:K3	8-Q9
SK805	1:K3	8-Q7
SK805	1:K3	8-Q6
SK805	1:K3	8-Q9
SK805	1:K3	8-Q7
SK805	1:K3	8-Q8
SK805	1:K3	8-Q6
SK805	1:K3	8-Q8
SK805	1:K3	8-Q6
SK805	1:K3	8-Q8
SK805	1:K3	8-Q7
SK805	1:K3	8-Q8
SK805	1:K3	8-Q7
SK805	1:K3	8-Q5
SK810	1:L3	8-H5
SL210	1:C8	2-E2
SL220	1:C8	2-D2
SW201	1:B4	2-A6
T210	1:C3	2-Q2
T540	1:G6	5-P2
T610	1:L6	6-N2
#TL500	1:K6	5-K6
TP202	1:C8	2-D9
TP211	1:D3	2-P8
TP300	1:F8	3-C8
TP301	1:E8	3-E7
TP345	1:E4	3-M4
TP400	1:G8	4-M4
TP401	2:G6	4-M5
TP601	1:N5	6-K9
TP602	1:L5	6-R9
TP603	1:L5	6-J2
TP604	1:L4	6-N6
TP607	1:M4	6-E6
TP710	1:G4	7-J5
X300	1:E6	3-M7
&XF300A	1:E8	3-F7
&XF300B	1:E8	3-G7
&XF302	1:E6	3-L8

Device	PCB	Circuit	Device	PCB	Circuit

Part C T881 Transmitter

This part of the manual is divided into six sections, as listed below. There is a detailed table of contents at the start of each section.

1 T881 General Information

This section provides a brief description of the T881 transmitter, along with detailed specifications and a list of types available.

The following topics are covered in this section.

replace A4 pages C1.3/C1.4 with A3 pages C1.3/C1.4

replace A4 pages C1.3/C1.4 with A3 pages C1.3/C1.4

1.1 Introduction

The T881 is a synthesised, microprocessor controlled FM base station transmitter designed for single or multichannel operation in the 800 to 960MHz frequency range[1] with a standard power output of 5W. The RF section of the transmitter comprises a frequency synthesiser which provides 100mW of frequency modulated RF drive to a 5W RF power module. A thermal shutdown feature is provided in the T881 in case operating temperatures exceed acceptable levels.

A wide selection of audio characteristics may be obtained from the audio processor. Optional circuit blocks are an audio compressor and a pre-emphasis stage. They can be bypassed or linked to one or both audio inputs, and then back into the remaining audio circuitry in almost any combination. All audio processor options are link selectable.

The synthesiser frequency is programmed via the serial communications port. Eight channel select lines are accessible via an optional D-range connector (D-range 2 - T800-03-0000) at the rear of the set.

All components are mounted on a single PCB. This is secured to a die-cast chassis which is divided into compartments to individually shield each section of circuitry. Access to both sides of the main circuit board is obtained by removing each of the chassis lids. There is provision within the chassis to mount small option PCBs.

The front panel controls include line sensitivity, microphone socket and carrier switch. This switch turns on the carrier (unmodulated) as an aid to servicing.

The T881 is 60mm wide and occupies a single space in a Tait rack frame, which has the ability to accommodate up to seven standard modules.

1. Although capable of operating over the 800-960MHz frequency range, the T881 has an 8MHz switching range (see Section 1.2.3 and Section 3.1).

1.2 Specifications

1.2.1 Introduction

The performance figures given are minimum figures, unless otherwise indicated, for equipment tuned with the maximum switching range and operating at standard room temperature (+22°C to +28°C) and standard test voltage (13.8V DC).

Where applicable, the test methods used to obtain the following performance figures are those described in the EIA specification. However, there are several parameters for which performance according to the CEPT specification is given. Refer to Section 1.2.6 for details of test standards.

Details of test methods and the conditions which apply for Type Approval testing in all countries can be obtained from Tait Electronics Ltd.

The terms "wide bandwidth" and "narrow bandwidth" used in this and following sections are defined in the following table.

	Channel Spacing	Modulation 100% Deviation	Receiver IF Bandwidth
Wide Bandwidth	25kHz	±5.0kHz	15.0kHz
Narrow Bandwidth	12.5kHz	±2.5kHz	7.5kHz

1.2.2 General

Number Of Channels .. 128 (standard)[1]

Supply Voltage:

- Operating Voltage .. 10.8 to 16V DC
- Standard Test Voltage .. 13.8V DC
- Polarity .. negative earth only
- Polarity Protection .. crowbar diode
- Line Keying Supply (if required) .. -50V DC

Supply Current:

- Transmit .. 1.8A
- Standby .. 160mA

Operating Temperature Range .. -30°C to +60°C

1. Additional channels may be factory programmed. Contact your nearest Tait Dealer or Customer Service Organisation.

Dimensions:

Height	..	183mm
Width	..	60mm
Length	..	322mm

Weight	..	2.1kg
Time-Out Timer (optional)	..	0 to 10 minutes adjustable in 10 second steps
Tail Timer	..	0 to 5 seconds adjustable in 20ms steps
Transmit Key Time	..	<30ms
Transmit Lockout Timer	..	0 to 1 minute adjustable in 10 second steps

1.2.3 RF Section

Frequency Range	..	800-960MHz (refer to Section 1.4)
Modulation Type	..	FM
Frequency Increment	..	5 or 6.25kHz
Switching Range	..	8MHz (i.e. ±4MHz from the centre frequency)
Load Impedance	..	50 ohms
Frequency Stability	..	±1ppm, -20°C to +60°C
(see also Section 1.4)	..	±1.5ppm, -30°C to +60°C

Adjacent Channel Power (full deviation):

Wide Bandwidth (WB) (±25kHz/15kHz B/W)	..	-75dBc
Narrow Bandwidth (NB) (±12.5kHz/7.5kHz B/W)	..	-65dBc

Transmitter Side Band Noise:
(no modulation, 15kHz bandwidth)

At ±25kHz	..	-88dBc
At ±1MHz	..	-100dBc

Intermodulation	.. -40dBc with interfering signal of -30dBc
	.. -70dBc with 25dB isolation & interfering signal of -30dBc (PA with output isolator)
Mismatch Capability:	
Ruggedness	.. refer to your nearest Tait Dealer or Customer Service Organisation
Stability	.. 3:1 VSWR (all phase angles)
Radiated Spurious Emissions:	
Transmit	.. -36dBm to 1GHz -30dBm 1GHz to 3.2GHz
Standby	.. -57dBm to 1GHz -47dBm 1GHz to 3.2GHz
Conducted Spurious Emissions:	
Transmit	.. -36dBm to 1GHz -30dBm 1GHz to 3.2GHz
Standby	.. -57dBm to 1GHz -47dBm 1GHz to 3.2GHz
Power Output:	
Rated Power	.. 5W
Range Of Adjustment	.. 1-5W
Duty Cycle	.. 100% @ 5W at +60°C

1.2.4 Audio Processor

1.2.4.1 Inputs

Inputs Available	.. line, microphone and CTCSS
Line Input:	
Impedance	.. 600 ohms (balanced)
Sensitivity (60% modulation @ 1kHz)-	
With Compressor	.. -50dBm
Without Compressor	.. -30dBm
Microphone Input:	
Impedance	.. 600 ohms
Sensitivity (60% modulation @ 1kHz)-	
With Compressor	.. -70dBm
Without Compressor	.. -50dBm

1.2.4.2 Modulation Characteristics

Frequency Response (below limiting)	.. flat or pre-emphasised (optional)
Line And Microphone Inputs:	
Pre-emphasised Response- Bandwidth	.. 300Hz to 3kHz (WB)
	.. 300Hz to 2.55kHz (NB)
Below Limiting	.. within +1, -3dB of a 6dB/octave pre-emphasis characteristic
Flat Response	.. within +1, -2dB of output at 1kHz
Above Limiting Response	.. within +1, -2dB of a flat response (ref. 1kHz)
Distortion	.. 2% max.
Hum And Noise:	
Wide Bandwidth	.. -48dB (300Hz to 3kHz [EIA]) typical
Narrow Bandwidth	.. -48dB (CEPT) typical
Compressor (optional):	
Attack Time	.. 10ms
Decay Time	.. 800ms
Range	.. 50dB

1.2.4.3 CTCSS

Standard Tones	.. all 37 EIA group A, B and C tones plus 13 commonly used tones
Frequency Error (from EIA tones)	.. 0.08% max.
Generated Tone Distortion	.. 1.2% max.
Generated Tone Flatness	.. flat across 67 to 250.3Hz to within 1dB
Modulation Level	.. adjustable
Modulated Distortion	.. <5%

1.2.5 Microcontroller

Auxiliary Ports:	
Open Drain Type	.. capable of sinking 2.25mA via 2k2Ω
V_{ds} max.	.. 5V

1.2.6 Test Standards

Where applicable, this equipment is tested in accordance with the following standards.

1.2.6.1 DTI CEPT Recommendation T/R-24-01

Annex I: 1988

Technical characteristics and test conditions for radio equipment in the land mobile service intended primarily for analogue speech.

Annex II: 1988

Technical characteristics of radio equipment in the land mobile service with regard to quality and stability of transmission.

1.2.6.2 Telecommunications Industry Association

ANSI/TIA/EIA-603-1992

Land mobile FM or PM communications equipment measurement and performance standards.

1.3 Product Codes

The three groups of digits in the T880 Series II product code provide information about the model, type and options fitted, according to the conventions described below.

The following explanation of T880 Series II product codes is not intended to suggest that any combination of features is necessarily available in any one product. Consult your nearest Tait Dealer or Customer Service Organisation for more information regarding the availability of specific models, types and options.

Model

The Model group indicates the basic function of the product, as follows:

T88X-XX-XXXX	T885 receiver T881 5W transmitter T889 70W power amplifier

Type

The Type group uses two digits to indicate the basic RF configuration of the product.

The first digit in the Type group designates the frequency range:

T88X-**X**X-XXXX	'1' for 800-870MHz '2' for 860-910MHz '3' for 890-960MHz

The second digit in the Type group indicates the channel spacing:

T88X-X**X**-XXXX	'0' for wide bandwidth (25kHz) '5' for narrow bandwidth (12.5kHz)

Options

T88X-XX-**XXXX**	The Options group uses four digits and/or letters to indicate any options that may be fitted to the product. This includes standard options and special options for specific customers. '0000' indicates a standard Tait product with no options fitted. The large number of options precludes listing them here.

1.4 T881 Standard Product Range

The following table lists the range of standard T881 types (i.e. no options fitted) available at the time this manual was published. Consult your nearest Tait Dealer or Customer Service Organisation for more information.

Frequency Range (MHz)		800-870	
Deviation (kHz)		2.5	5
TCXO	±1ppm -20°C to +60°C ±1.5ppm -30°C to +60°C	•	•
Transmitter Type: T881-		15-0000	10-0000

Frequency Range (MHz)		860-910	
Deviation (kHz)		2.5	5
TCXO	±1ppm -20°C to +60°C ±1.5ppm -30°C to +60°C	•	•
Transmitter Type: T881-		25-0000	20-0000

Frequency Range (MHz)		890-960	
Deviation (kHz)		2.5	5
TXCO	±1ppm -20° to +60°C ±1.5ppm -30°C to +60°C	•	•
Transmitter Type: T881-		35-0000	30-0000

You can identify the transmitter type by checking the product code printed on a label on the rear of the chassis (Figure 1.1 in Part A shows typical labels). You can further verify the transmitter type by checking the placement of an SMD resistor in the table that is screen printed onto the PCB (refer to Section 6.1 for more details).

2 T881 Circuit Operation

This section provides a basic description of the circuit operation of the T881 transmitter.

Note: Unless otherwise specified, the term "PGM800Win" used in this and following sections refers to version 3.00 and later of the software.

Refer 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 following topics are covered in this section.

2.1 Introduction

The individual circuit blocks which make up the T881 are:

- synthesiser
- VCO
- audio processor
- power amplifier (RF power module)
- voltage regulators.

Each of these circuit blocks is set in its own shielded compartment, formed as an integral part of the main chassis.

The configuration of the circuit blocks may be seen on a functional level in Figure 2.1. Refer to the circuit diagrams in Section 6.2 for more detail.

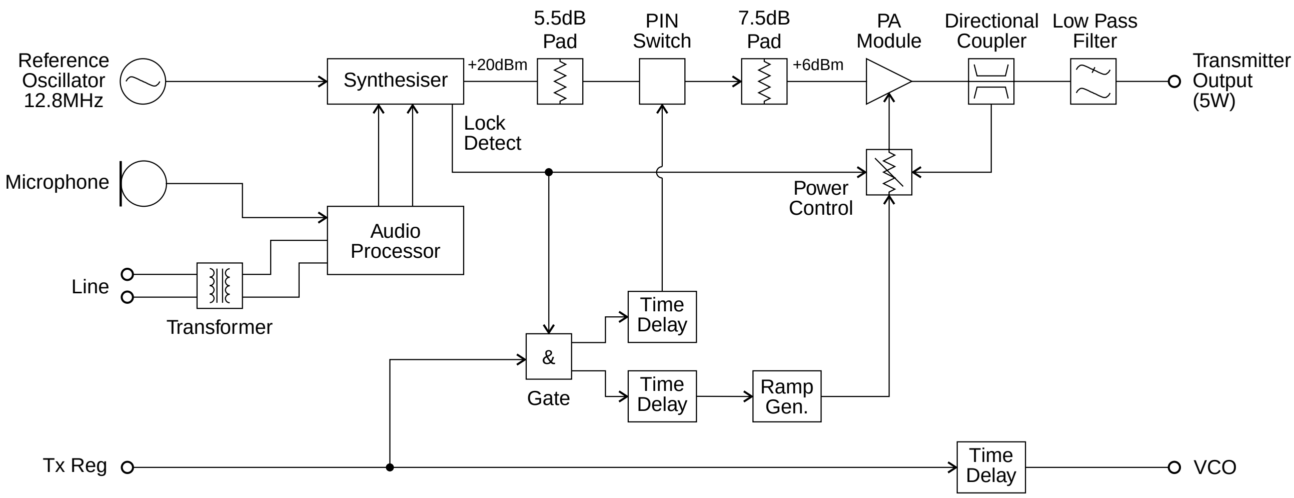


Figure 2.1 T881 High Level Block Diagram

2.2 Microcontroller

(Refer to the microcontroller circuit diagram (sheet 8) in Section 6.2.)

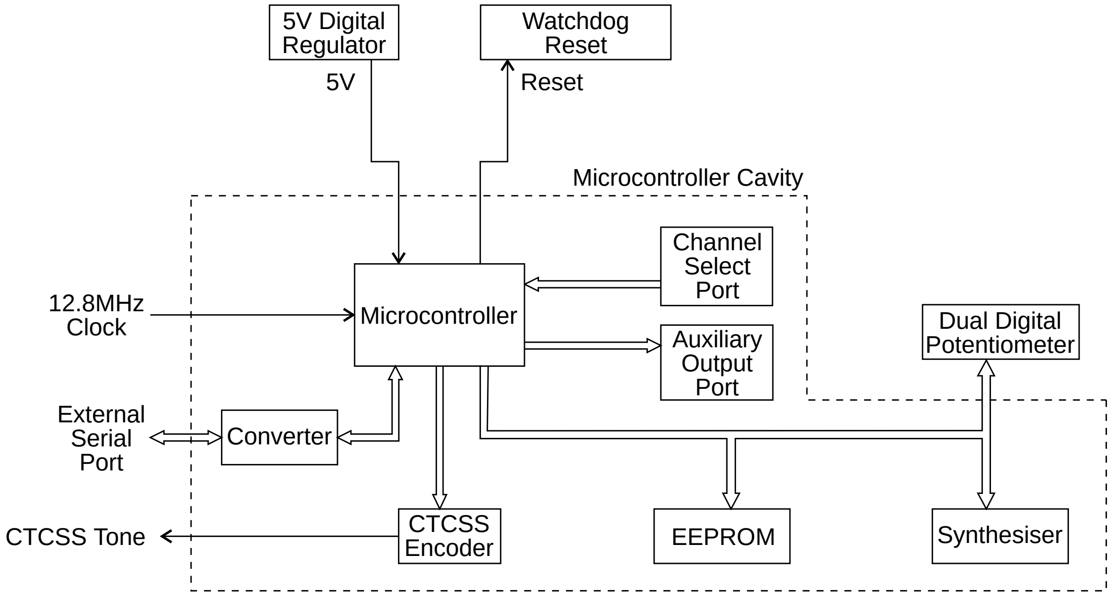


Figure 2.2 T881 Microcontroller Block Diagram

Overall system control of the T881 is accomplished by the use of a member of the 80C51 family of microcontrollers (IC810). It runs from internal ROM and RAM, thus leaving all four ports free for input/output functions.

Non-volatile data storage is achieved by serial communication with a 16kBit EEPROM (IC820). This serial bus is also used by the microcontroller to program the synthesiser (IC740) and deviation control EPOTS (IC220).

The main tasks of the microcontroller are as follows:

- program the synthesiser and EPOT;
- interface with the PGM800Win programming software at 9600 baud via the serial communication lines on D-range 1 (PL100) & D-range 2;
- monitor channel change inputs from D-range 2;
- generate timing waveforms for CTCSS encoding;
- coordinate and implement timing control of the exciter/transmitter.
- control the front panel "Supply" LED (refer to Section 5.3).

2.3 Synthesised Local Oscillator

(Refer to the synthesiser circuit diagram (sheet 7) and the VCO circuit diagram (sheet 3) in Section 6.2.)

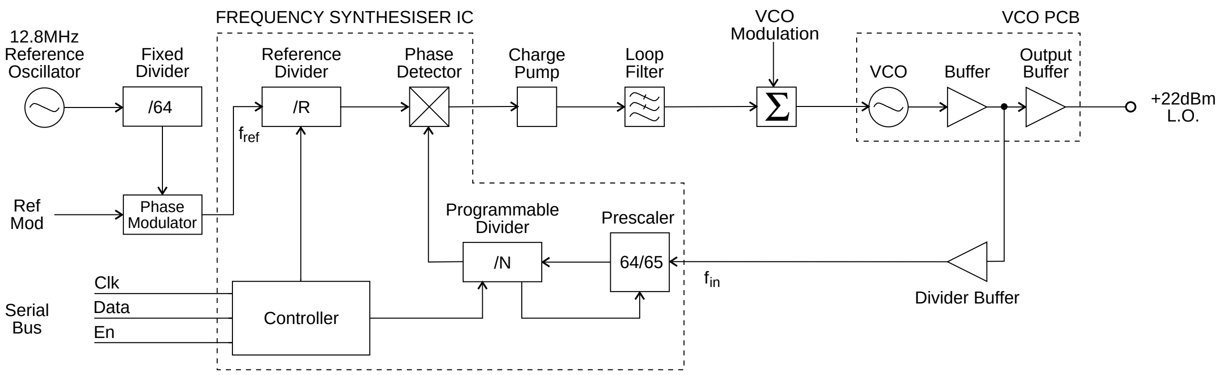


Figure 2.3 T881 Synthesiser Block Diagram

The synthesiser (IC740) employs a phase-locked loop (PLL) to lock a voltage controlled oscillator (VCO) to a given reference frequency. The synthesiser receives the divider information from the control microprocessor via a 3 wire serial bus (clock, data, enable). When the data has been latched in, the synthesiser processes the incoming signals from the VCO buffer (f_{in}) and the phase modulator (f_{ref}).

A reference oscillator at 12.8MHz (=IC700) is buffered (IC710 pins 5 & 6) and divided down to 200kHz (IC730). This 200kHz square wave is then summed with the modulating audio and passed to an integrator (IC720 pins 13 & 12, Q710, Q720). This produces a ramping waveform which is centred around a DC level determined by the incoming audio. IC720 pins 10 & 11 perform as a comparator, ultimately producing a phase-modulated 200kHz square wave. This is followed by another phase shifting stage (IC720 pins 8 & 9, Q730, Q740), before being divided down to 6.25kHz or 5kHz within the synthesiser IC (IC740).

A buffered output of the VCO (Q795) is divided with a prescaler and programmable divider which is incorporated into the synthesiser chip (IC740). This signal is compared with the phase modulated reference signal at the phase detector (also part of the synthesiser chip). The phase detector outputs drive a balanced charge pump circuit (Q760, Q770, Q775, Q780, Q785) and active loop filter (IC750 pins 5, 6 & 7, Q790) which produces a DC voltage between 0V and 20V to tune the VCO. This VCO control line is further filtered to attenuate noise and other spurious signals. Note that the VCO frequency increases with increasing control voltage.

If the synthesiser loop loses lock, a pulsed signal appears at LD (pin 2) of IC740. This signal is filtered and buffered by IC750 pins 1, 2 & 3, producing the Lock-Detect signal used to shut off the power supply to the drive amplifier. IC750 pin 1 is at 20V when the synthesiser is out of lock.

2.3.1 Two Point Modulation

Frequency modulation occurs by modulating both the VCO input and the synthesiser reference input. This process is called two point modulation and ensures a flat modulation response from 67Hz to 3kHz (2.55kHz for narrow bandwidth).

The PLL has a fast response time, allowing a Tx key-up time of <30ms. Because of this fast response time the PLL sees lower modulation frequencies superimposed on the VCO as an error and corrects for it, resulting in no modulation on the carrier. At modulation frequencies greater than 300Hz the loop cannot correct fast enough and modulation is seen on the carrier. The response of the loop to VCO modulation is shown by f_2 in Figure 2.4 below.

To achieve low frequency modulation, the reference oscillator is also modulated so that the phase detector of IC740 detects no frequency error under modulation. Thus, the synthesiser loop will not attempt to correct for modulation and the audio frequency response of the transmitter remains unaffected. The response of the loop to reference frequency modulation is shown by f_1 in Figure 2.4.

The reference modulation is controlled by a 256-step 10k electronic potentiometer (EPOT) which is adjustable via PGM800Win. The EPOT is made up of 256 resistive sections (representing approximately 39Ω each) which can be individually addressed by the microcontroller. Each section can be switched in or out of circuit to achieve the required total resistance, thus giving control of the reference modulation.

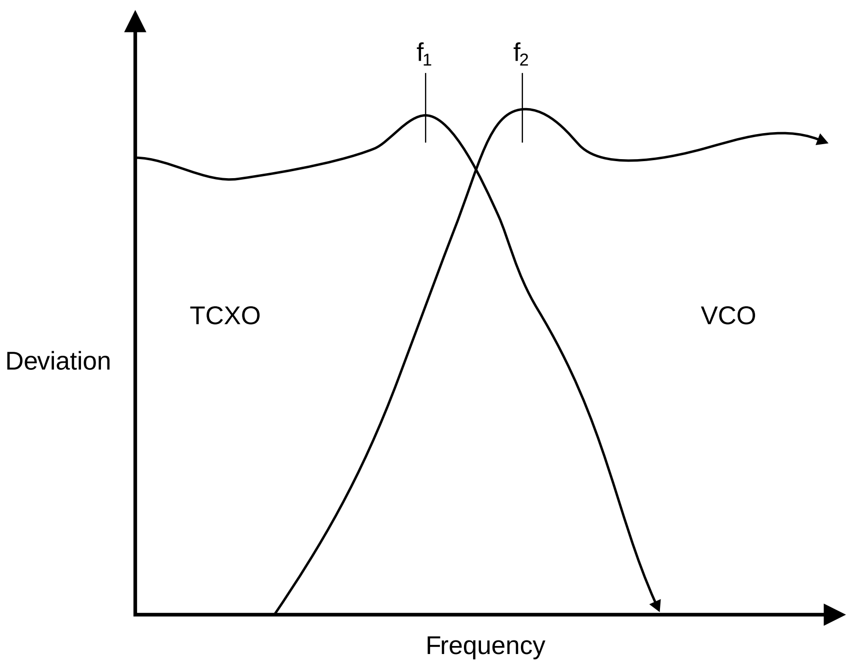


Figure 2.4 T881 Two Point Modulation

2.4 VCO

(Refer to the VCO circuit diagram (sheet 3) in Section 6.2.)

The VCO comprises the oscillator and three stages of buffer and gain to achieve the required power level and reverse isolation at the output of the VCO.

The oscillator transistor (Q309) operates in a common-base configuration, utilising a quarter-wave square ceramic resonator coupled between its collector and emitter to provide the feedback necessary for oscillation. The VCO control voltage from the loop filter (IC750) is applied to the varicaps (D300-D303, D305 & D307) to facilitate tuning within an 8MHz band of frequencies. A high-Q sapphire trimcap (CV300) is used for coarse tuning of the VCO. The typical output power at the oscillator stage is 0dBm.

The output from the oscillator drives a cascode amplifier stage (Q302, Q303) which is designed to provide good reverse isolation from variable impedances of the following stages. The isolation of the circuit is typically 40dB, including 0-3dB of associated gain. An attenuated sample of the cascode output (Q302) is fed back to the synthesiser (IC740) through a divider buffer (Q795) for phase-locking.

Following the buffer is a broadband MMIC amplifier (Q308) which functions as a gain block to provide the drive to the final power stage (Q319). This stage typically provides approximately 10dB of gain.

The final stage of the VCO is a power amplification stage. The power transistor (Q319) and its associated circuitry increases the output power of the VCO to approximately +20dBm. The output power is then attenuated to +6dBm (approximately), which is the input level required to drive the RF power module.

Note: This power stage (Q319) is retained in the T881 transmitter to keep the VCO architecture the same as the T885 receiver, which does require a +20dBm output.

The VCO is an on-channel design, i.e. there are no multiplier stages to obtain the on-channel frequency. It is modulated by superimposing the audio signal onto the control voltage and by phase-modulating the reference signal.

2.4.1 VCO Supply

The VCO is supplied from two switched +9V supplies under the control of the Tx-Reg. supply.

The VCO and cascode amplifier are supplied from one +9V switched supply by Q321 via the C multiplier (Q316, C365).

The MMIC and final amplifier are supplied from the other +9V supply by Q314.

A delay circuit holds the VCO on for a short time after the Tx-Reg. supply has been switched off. This is to allow the RF power circuits to ramp down in the correct manner before the VCO is switched off.

2.5 Audio Processor

(Refer to the audio processor circuit diagram (sheet 2) in Section 6.2.)

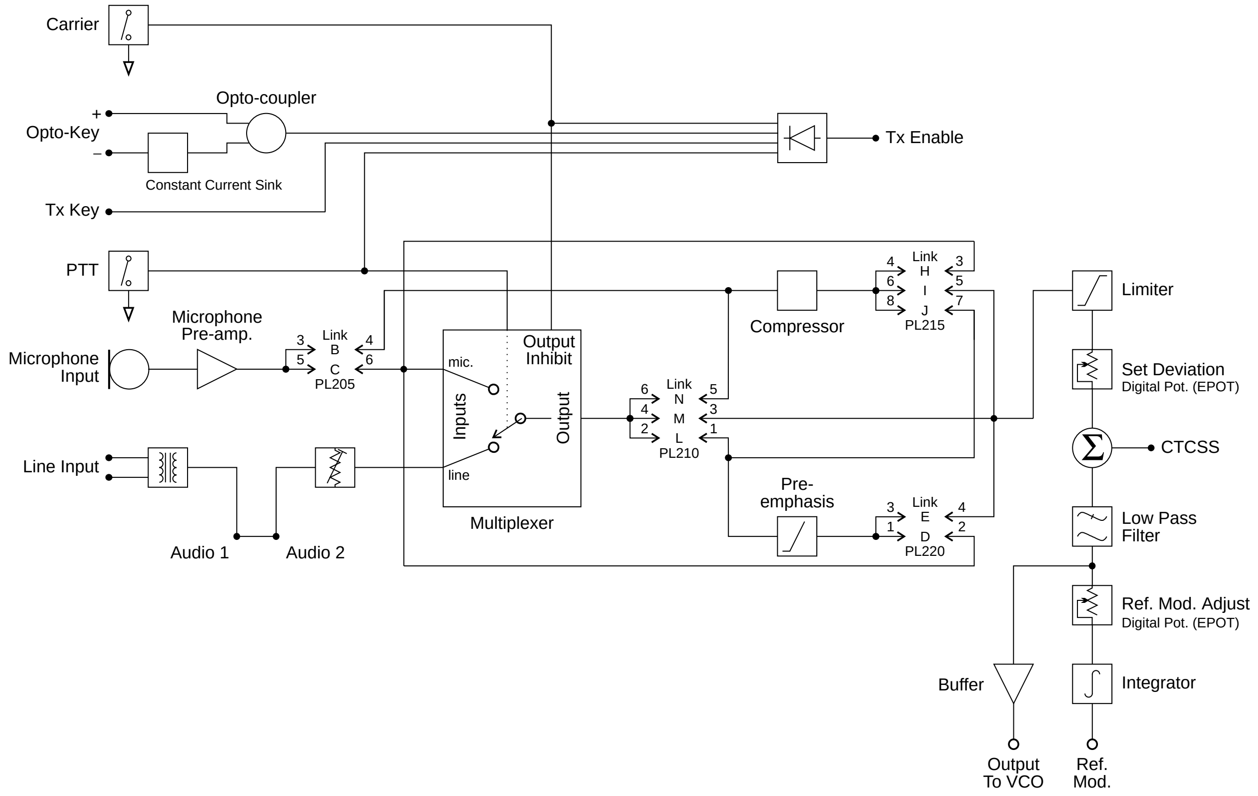


Figure 2.5 T881 Audio Processor Block Diagram

2.5.1 General

The audio processor comprises several link selectable circuit blocks which may be configured in a variety of combinations to suit individual requirements. The pre-emphasis network and compressor may be linked individually or cascaded between either or both audio inputs and the limiter.

Refer to Section 3.5.1 for linking details.

2.5.2 Audio Inputs

Two audio inputs are available: one from a 600 ohm balanced (or unbalanced) line, and the other from a local microphone. The microphone signal is passed first to a pre-amplifier (Q210) and ultimately to a multiplexer (IC240), but in between may pass through the compressor (depending on the linking details). The line transformer is also connected to the multiplexer and is disabled by the microphone PTT switch.

A third input for external CTCSS tones is also provided.

2.5.3 Keying Inputs

There are four ways to key the exciter:

- pulling the Tx-Key line low (pin 13 on D-range 1 [PL100]) at the rear of the set);
- pushing the "Carrier" button on the front panel - this will inhibit all audio;
- using the PTT button on the local microphone, disabling audio from the line;
- via the opto-key inputs (pins 11 and 12 on D-range 1 [PL100]) when electrical isolation is required. This features a constant current sink (Q270) to ensure reliable activation of the opto-coupler (IC250) at low keying voltages.

2.5.4 Compressor (Automatic Level Control (ALC))

The input signal is fed via a current controlled attenuator (Q230, Q220) to a high gain stage (IC230) from which the output signal is taken. This signal is passed to a comparator (IC230) which toggles whenever the audio signal exceeds a DC threshold determined by RV220. Thus, the comparator produces a square wave whose mark-space ratio is determined by the amplitude of the audio signal. This square wave pumps up the reservoir capacitor (C233) which controls the attenuator (Q230, Q220), thus completing the feedback loop.

The compression level is set by adjustment of the comparator threshold (RV220).

Note: Although the high dynamic range of the compressor allows the use of very low audio signal levels, such conditions will be accompanied by a degradation of the signal-to-noise ratio. Very low audio input levels should therefore be avoided where possible.

2.5.5 Outputs To Modulators

The output signal from the limiter (IC210, IC230) is summed with a CTCSS tone at a summing amplifier (IC260). The signal is then low pass filtered (IC260) and split to supply the two modulators.

Since the VCO modulator is a true frequency modulator, its audio is simply buffered (IC260). The reference modulator, however, is a phase modulator and its audio must first be integrated (IC210).

It is vital that the audio levels to the modulators are accurately set, ***relative to each other***. Hence the inclusion of level adjustment in the reference modulator path. Once set, adjustments to absolute deviation may be made only by IC220, a 256-step 10k electronic potentiometer (EPOT), which is controlled via PGM800Win. The EPOT is made up of 256 resistive sections (representing approximately 39Ω each) which can be individually addressed by the microcontroller. Each section can be switched in or out of circuit to achieve the required total resistance, thus adjusting the absolute deviation level.

2.6 Power Supply & Regulator Circuits

(Refer to the regulators circuit diagram (sheet 6) in Section 6.2.)

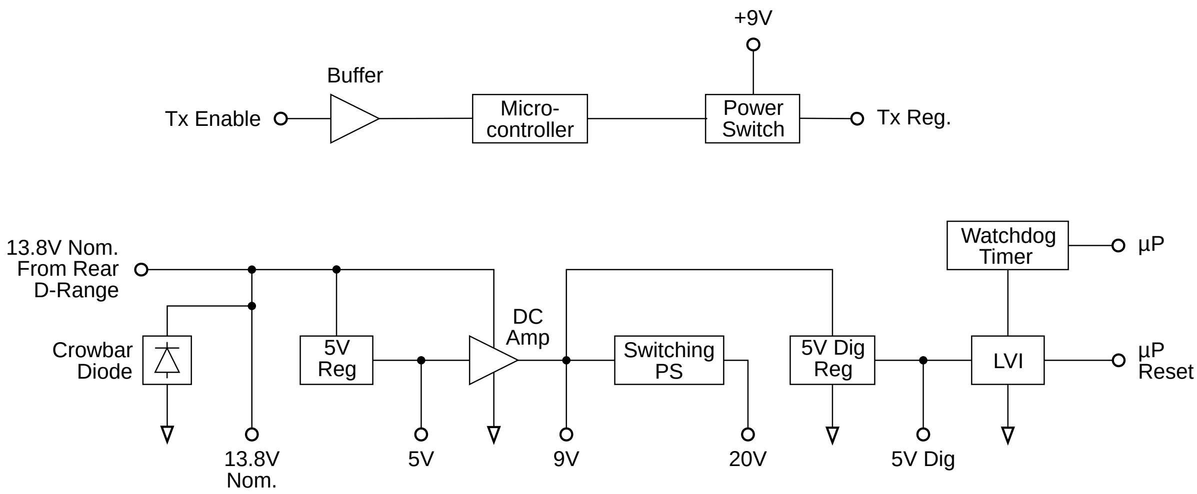


Figure 2.6 T881 Power Supply & Regulators Block Diagram

The T881 is designed to operate from a 10.8-16V DC supply (13.8V nominal). A 5.3V regulator (IC630) runs directly from the 13.8V rail, driving much of the synthesiser circuitry. It is also used as the reference for a DC amplifier (IC640, Q630, Q620) which provides a medium current capability 9V supply.

A switching power supply (Q660, Q670) runs from the 9V supply and provides a low current capability +20V supply. This is used to drive the synthesiser loop filter (IC750), giving a VCO control voltage range of up to 20V.

Ultimate control of the transmitter is via the Tx-Reg. supply, switched from 9V by Q610. This is enabled via the Tx-Enable signal from the audio processor, and microprocessor.

A crowbar diode is fitted for protection against connection to a power supply of incorrect polarity. It also provides transient overvoltage protection.

Note: A fuse must be fitted in the power supply line for the diode to provide effective protection.

2.7 Transmit Timers

The transmit tail timer, transmit time-out timer and transmit lockout timer can all be set from PGM800Win. The fields for setting these are found on the system information page. These three timers operate as follows (refer also to Figure 2.7):

Timer	Function	Adjustment
Transmit Tail	Sets the tail time during which the transmitter stays keyed after the external key source has been removed.	0-5 seconds in 20ms steps
Transmit Timeout	Sets the maximum continuous transmission time. Once the timer has timed out, the transmitter must be keyed again, unless prevented by the transmit lockout timer.	0-600 seconds in 10 second steps
Transmit Lockout	Sets the period of time that must elapse after a timeout before the transmitter can re-transmit. Once the timer has timed out, the transmitter can be keyed again.	0-60 seconds in 10 second steps

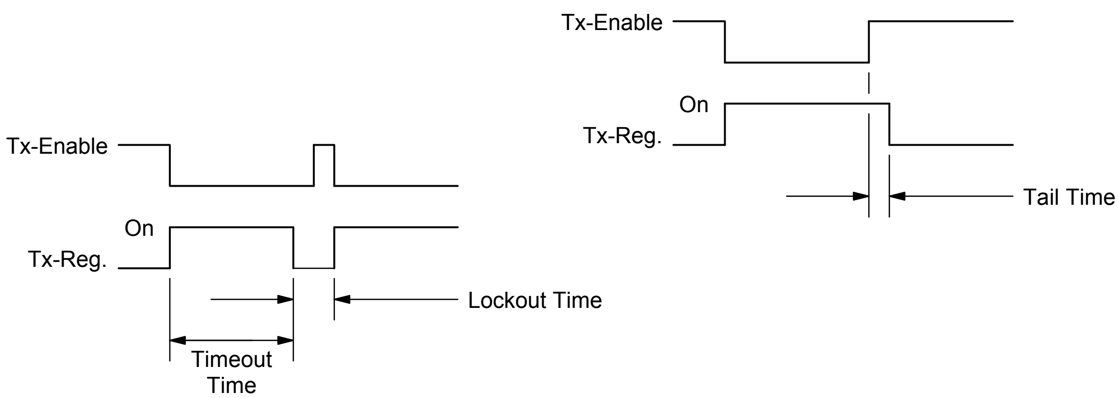


Figure 2.7 T881 Transmit Timers

2.8 Power Control Circuit & PA

(Refer to Figure 2.1 and the power control and PA circuit diagrams (sheets 5 & 4) in Section 6.2.)

The output power of the PA is maintained at a constant level via a power control loop applied to the bias pin of the RF power module (#IC400 pin 2). The forward and reverse RF power levels are sensed via a dual directional coupler and detector diodes (D400, D401 in the PA cavity). The detected DC signals are buffered (IC500 pins 3 & 5), summed with a very small bias current and then fed to the control integrator op-amp (IC510 pin 9). The purpose of the small bias current (provided by R559) is to raise the voltage potential slightly at the summed node. This is necessary to ensure the output voltage at IC510 pin 8 is zero when the transmitter is not keyed on.

Note: Forward and reflected power signals are summed so that, under high VSWR, the power control will turn the output RF level down.

To reduce the spurious output level when the synthesiser is out-of-lock, the Tx-Reg. and Lock-Detect signals are gated to inhibit the PA control circuit and to switch off the RF signal at the input to the RF power module. This is achieved by a PIN diode switch (D308). There is a 5.5dB (R370, R372, R373) and a 7.5dB (R390, R391, R392) pi-attenuator at the input and output of the PIN switch to attenuate the level of the VCO output and also provide good isolation between the VCO and RF power module. A level shifter is also implemented to enhance the transient performance by improving the dynamic range of the module bias voltage.

Cyclic keying control is provided by additional circuitry consisting of a ramp, several gate and time delay stages:

- Q505, Q508, IC510 — trapezoidal power ramping generator
- Q500, Q501 — Tx-Reg. and $\overline{\text{Lock-Detect}}$ gate
- Q502, Q506, Q510, Q512, Q513 — PIN switch drive plus delay
- Q507, Q511, Q515 — level shifter plus delay.

This is to allow the RF power circuits to ramp up and down in a controlled manner so that minimal adjacent channel interference is generated during the transition.

A temperature sensor (R450) is mounted on the input flange of the RF power module to monitor the flange operating temperature. When a pre-determined temperature threshold is exceeded, a protection circuit (IC510 pin 7, Q516) switches on to reduce the RF output power to a preset level. The purpose of the protection circuit is to prevent overheating, as the RF power module is rated for a maximum flange temperature of 100°C.

The RF power module is a 5W device which requires an input drive of approximately +6dBm. L402 and C430 are provided to match the impedance of the output low pass filter to the impedance of the module. A DC control signal is applied to the RF signal path via %L405 if cyclic keying is required with a Tait power amplifier.

3 T881 Initial Tuning & Adjustment

Caution: **This equipment contains CMOS devices which are susceptible to damage from static charges. Refer to Section 1.2 in Part A for more information on anti-static procedures when handling these devices.**

Note: To ensure that the T881 will continue to meet its performance specifications, you must tighten the bottom cover screws to the correct torque, and in the correct order, as described in Section 2.4 in Part A.

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
- 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 3.00 and later of the software.

Refer to Figure 4.4 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.

3.1 Introduction

When you receive your T881 transmitter 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 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 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's EEPROM memory (IC820) by using the PGM800Win software package and an IBM™ PC. You can also use PGM800Win to select the transmitter's current operating frequency (or "default channel").

If the transmitter is installed in a rack frame, you can program it via the programming port in the speaker panel. However, you can also program the transmitter before it is installed in a rack frame as follows:

- by using a T800-01-0010 calibration test unit;
- via D-range 1;
- via D-range 2 (standard T800-03-0000 auxiliary D-range only);
- via SK805 (internal Micromatch connector).

If you do not use the T800-01-0010, you will have to connect the PC to the transmitter via a module programming interface (such as the T800-01-0004).

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

Note: When an auxiliary D-range kit (D-range 2 - T800-03-0000) 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 Customer Service Organisation for further details.

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
- module programming interface (e.g. T800-01-0004 - optional)
- 13.8V power supply
- digital multimeter
- audio signal generator
- RF power meter
- audio voltmeter x 2
- modulation meter
- oscilloscope (digital preferred)
- 30dB pad
- T800-01-0010 calibration test unit (optional)

(audio signal generator, RF power meter, audio voltmeter x 2, modulation meter, oscilloscope and 30dB pad: or RF test set (optional))

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

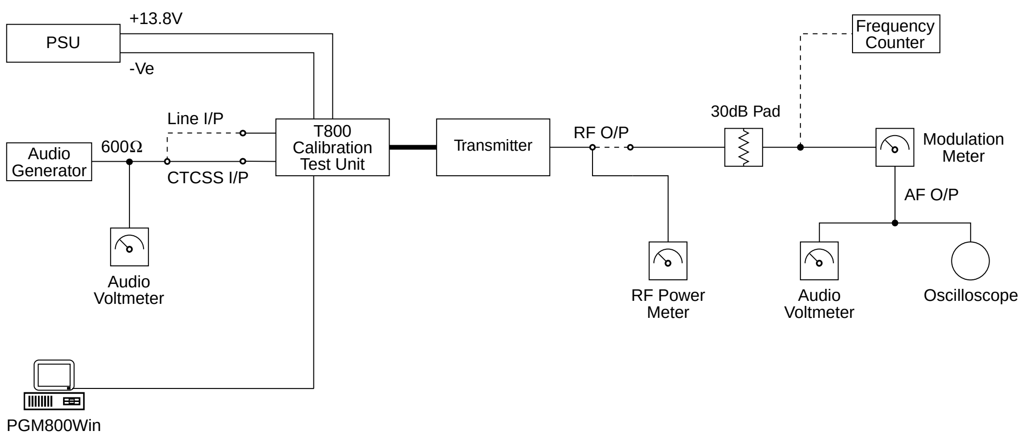


Figure 3.1 T881 Test Equipment Set-up With T800-01-0010

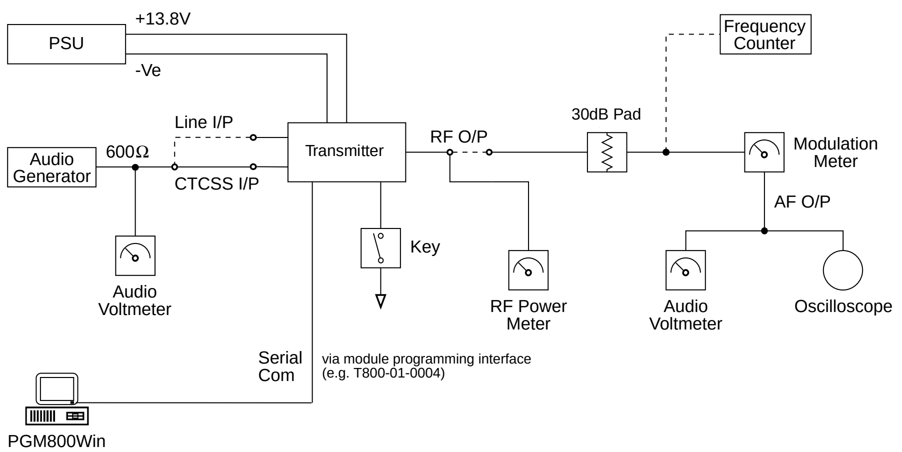


Figure 3.2 T881 Test Equipment Set-up Without T800-01-0010

3.4 Short Tuning Procedure

Use this procedure only if you want to reprogram the T881 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 TP300 (control voltage) in the VCO (this measures the synthesiser loop voltage).
- Key the transmitter by earthing the Tx-Key line.
- **Single Channel** Tune VCO trimmer CV300 for a synthesiser loop voltage of 10V.

  Multichannel Tune VCO trimmer CV300 for a synthesiser loop voltage of 10V on the middle channel.

  If there is no middle channel, tune CV300 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

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

Adjust RV502 (power control) for the required output power (between 1 and 5W).

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: The reference modulation and limiter adjustments are controlled by 256-step electronic potentiometers (EPOTs), which are adjusted via the “Reference Modulation” and “Deviation” settings in PGM800Win. This allows the two point modulation and deviation settings to be adjusted for each channel.

Note 3: To optimise the modulation response across the switching range, 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 use this value for all other channels[1].

Note 4: If you are using an RF test set, turn the low pass filter off and set the high pass filter to 15kHz ***before*** beginning this procedure.

1. Inject an audio signal of 300Hz 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 300Hz.

3. Change the input frequency to 100Hz and, using PGM800Win, adjust the value of the “Reference Modulation” EPOT setting for the current channel to obtain ±3kHz [±1.5kHz] deviation.

4. Change the input frequency back to 300Hz.

   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.

1. Refer to the T800 Programming Application User’s Manual for information on adjusting EPOTs with PGM800Win.

3.4.5 CTCSS Encoder (If Used)

Program a CTCSS tone on the default channel using PGM800Win.

If you are using an RF test set, turn off the 300Hz high pass filter.

Key the T881 with the front panel "Carrier" switch.

Adjust RV805 (CTCSS level adjust) to give ±500Hz [±250Hz] deviation.

Set the maximum deviation as per Section 3.4.6.

3.4.6 FM Deviation (Limiter) Adjustment

Note: If the T881 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.

Inject 1kHz at -10dBm into the line input (D-range 1 (PL100) pins 1 & 4; pins 2 & 3 shorted; refer to Section 2.2 of Part F).

Adjust RV210 (line sensitivity) fully clockwise and key the transmitter by earthing the Tx-Key line. Using PGM800Win, adjust the value of the “Deviation” EPOT setting for the current channel to obtain a deviation limit of ±4.7kHz [±2.3kHz].

Sweep the audio frequency from 100Hz to 4kHz and ensure that the maximum deviation does not exceed ±4.7kHz [±2.3kHz]. Readjust “Deviation” if necessary via PGM800Win.

3.4.7 Line-in Level Adjustment

Remove the CTCSS signal (if used).

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] deviation.

Reapply the CTCSS signal (if required).

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
PL201	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
	7-8	D	pre-emphasis output to multiplexer input
	[9-10]	E	pre-emphasis output to limiter input
	11-12	F	not connected
	13-14	G	not connected
PL202	[1-2]	H	compressor output to multiplexer input
	3-4	I	compressor output to limiter input
	5-6	J	compressor output to pre-emphasis input
	7-8	K	not connected
	[9-10]	L	multiplexer output to pre-emphasis input
	11-12	M	multiplexer output to limiter input
	13-14	N	multiplexer output to compressor input

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

	PL201		PL202	
microphone pre-amp. compressed and pre-emphasised; line input pre-emphasised (standard set-up)	[3-4] B	[9-10] E	[1-2] H	[9-10] L
microphone pre-amp. compressed and pre-emphasised; line input unprocessed	3-4 B	7-8 D	5-6 J	11-12 M
line and microphone compressed and pre-emphasised	5-6 C	9-10 E	5-6 J	13-14 N
microphone pre-amp. compressed; line and microphone flat response	3-4 B	11-12 F	1-2 H	11-12 M

3.6 Synthesiser Alignment

- Ensure that the T881 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 TP300 (control voltage) in the VCO (this measures the synthesiser loop voltage).

- Key the transmitter by earthing the Tx-Key line.

  Single Channel Tune VCO trimmer CV300 for a synthesiser loop voltage of 10V.

  Multichannel Tune VCO trimmer CV300 for a synthesiser loop voltage of 10V on the middle channel.

  If there is no middle channel, tune CV300 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 (8MHz).

  Measure the transmitter 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.**

3.7 PA Alignment

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

Key the transmitter by earthing the Tx-Key line.

Adjust RV502 (power control) to 5W.

3.8 Thermal Shutdown

Key the transmitter by earthing the Tx-Key line and set the output power to 5W as described in Section 3.7.

Short L450 to ground.

Set RV501 (shutdown power level) for an output power of 1W.

3.9 Audio Processor & CTCSS

3.9.1 Two Point Modulation

The T881 utilises 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. ΔF>±4MHz).

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: The reference modulation and limiter adjustments are controlled by 256-step electronic potentiometers (EPOTs), which are adjusted via the "Reference Modulation" and "Deviation" settings in PGM800Win. This allows the two point modulation and deviation settings to be adjusted for each channel.

Note 3: To optimise the modulation response across the switching range, 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 use this value for all other channels.[1]

Note 4: If you are using an RF test set, turn the low pass filter off and set the high pass filter to 15kHz ***before*** beginning this procedure.

3.9.2 Modulator Adjustment

1. Inject an audio signal of 300Hz 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 300Hz.

3. Change the input frequency to 100Hz and, using PGM800Win, adjust the value of the "Reference Modulation" EPOT setting for the current channel to obtain ±3kHz [±1.5kHz].

1. Refer to the T800 Programming Application User's Manual for information on adjusting EPOTs with PGM800Win.

4. Change the input frequency back to 300Hz.

   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.

3.9.3 CTCSS Encoder (If Used)

Program a CTCSS tone on the default channel using PGM800Win.

If you are using an RF test set, turn off the 300Hz high pass filter.

Key the T881 with the front panel "Carrier" switch.

Adjust RV805 (CTCSS level adjust) to give ±500Hz [±250Hz] deviation.

Set the maximum deviation as per Section 3.9.4.

3.9.4 Limiter Adjustment

Note: If the T881 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.

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 2.2 of Part F).

Adjust RV210 (line sensitivity) fully clockwise and key the transmitter by earthing the Tx-Key line. Using PGM800Win, adjust the value of the “Deviation” EPOT setting for the current channel to obtain a deviation limit of ±4.7kHz [±2.3kHz].

Sweep the audio frequency from 100Hz to 4kHz and ensure that the maximum deviation does not exceed ±4.7kHz [±2.3kHz]. Readjust “Deviation” if necessary via PGM800Win.

3.9.5 Line Level Without Compressor

This section assumes that the compressor is not used. If the compressor is required, refer to Section 3.9.6.

Remove the CTCSS signal (if used).

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] deviation.

Reapply the CTCSS signal (if required).

3.9.6 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 following sections as appropriate.

3.9.6.1 Compressor On Line Input Only

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

Reduce the line level to -50dBm at 1kHz and set RV220 (compression level) fully clockwise.

Check that ±3kHz deviation [±1.5kHz] is still available.

Slowly increase the audio input level until the demodulated waveform shows significant signs of clipping (approximately ±4.5kHz [±2.3kHz] deviation).

Adjust RV220 anticlockwise until the demodulated waveform is just clipping (approximately ±4kHz [±2kHz] deviation).

Increase the input level to -10dBm and check that the test tone is still held just into clipping. The input line level should be typically -10 to -20dBm.

3.9.6.2 Compressor On Microphone Input Only

Key the transmitter by earthing the Tx-Key line and plug a microphone jack into the front panel socket.

Adjust RV220 (compression level) fully clockwise.

Acoustically couple the microphone to a tone box (1kHz) and close the PTT switch.

Increase the audio level until the demodulated waveform shows significant signs of clipping (approximately ±4.5kHz [±2.3kHz] deviation).

Adjust RV220 anticlockwise until the demodulated waveform is just clipping (approximately ±4kHz [±2kHz] deviation).

Increase the audio level by 10dB and verify that the test tone is held just into clipping.

Whistle steadily into the microphone, checking that approximately ±4kHz [±2kHz] deviation is produced. The modulated waveform should be basically sinusoidal.

Speak into the microphone, checking that the modulation peaks reach about ±5kHz [±2.5kHz] deviation.

As the line is to be used without compression, set RV210 (line sensitivity) as described in Section 3.9.5.

3.9.6.3 Compressor On Both Line & Microphone Inputs

Set up as described in Section 3.9.6.1.

4 T881 Functional Testing

Caution: **This equipment contains CMOS devices which are susceptible to damage from static charges. Refer to Section 1.2 in Part A for more information on anti-static procedures when handling these devices.**

The following test procedures will confirm that the T881 has been tuned and adjusted correctly and is fully operational.

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: Unless otherwise specified, the term "PGM800Win" used in this and following sections refers to version 3.00 and later of the software.

Refer to Figure 4.4 for the location of the main tuning and adjustment controls, and to Section 3.3 for the test equipment set-up. 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 following topics are covered in this section.

4.1 Current Consumption

Connect the T881 to a 13.8V power supply.

Connect an RF power meter with suitable attenuation to the T881 output socket.

Check that the current in the 13.8V power cable is less than 160mA.

Key the T881 by earthing the Tx-Key line (the carrier "On" LED should light).

Adjust RV502 (power control) to obtain 5W output power.

Check that the current is <1.8A.

4.2 Output Power

Connect an RF power meter with suitable attenuation to the T881 output socket.

Key the T881 by earthing the Tx-Key line.

Check that the output power adjusts to ≥5W with RV502 (power control) turned fully clockwise.

4.3 Output Frequency

Connect the T881 output to a frequency counter via a 40dB attenuator pad.

Measure the output frequency and, if necessary, adjust the TCXO (=IC700) to trim to the nominal frequency (±100Hz).

4.4 Timers

The transmit tail timer, transmit timeout timer and transmit lockout timer can all be set from PGM800Win. The fields for setting these are found on the system information page. These three timers operate as follows (refer also to Figure 4.1):

Timer	Function	Adjustment
Transmit Tail	Sets the tail time during which the transmitter stays keyed after the external key source has been removed.	0-5 seconds in 20ms steps
Transmit Timeout	Sets the maximum continuous transmission time. Once the timer has timed out, the transmitter must be keyed again, unless prevented by the transmit lockout timer.	0-600 seconds in 10 second steps
Transmit Lockout	Sets the period of time that must elapse after a timeout before the transmitter can re-transmit. Once the timer has timed out, the transmitter can be keyed again.	0-60 seconds in 10 second steps

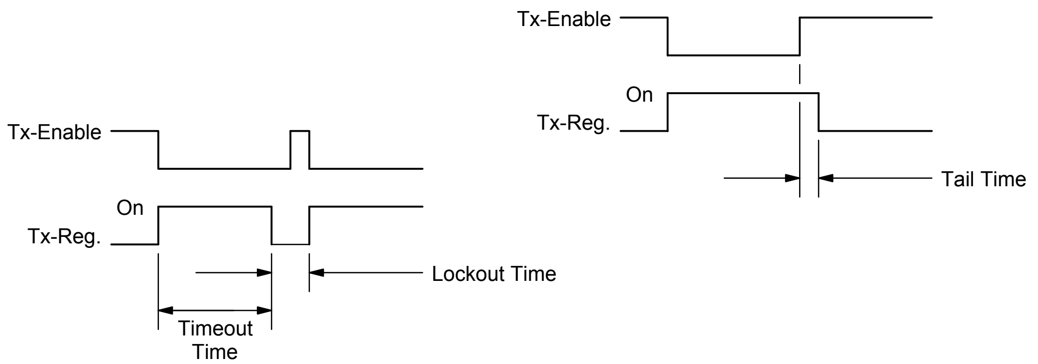


Figure 4.1 T881 Transmit Timers

4.5 Frequency Response

If the T881 has been correctly adjusted, the pre-emphasis and limiting responses should closely match those shown in Figure 4.2 and Figure 4.3 respectively.

Note: The limits shown on these graphs should not be exceeded.

- If you are using an RF test set, turn off all filters.
- Measure the pre-emphasis response as follows:

  Reduce the line level to give ±1kHz [±0.5kHz] deviation at 1kHz.

  Sweep the modulation frequency.

  The response should closely match that shown in Figure 4.2.

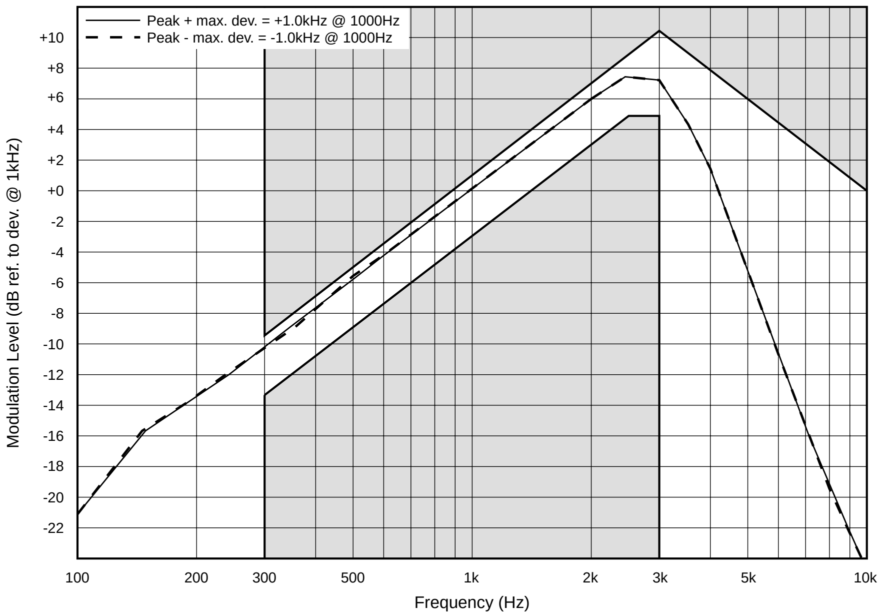
- Measure the limiting response as follows:

  Set the line level to give ±3kHz [±1.5kHz] deviation at 1kHz.

  Increase the line level 20dB and sweep the modulation frequency.

  The response should closely match that shown in Figure 4.3.

Wide Bandwidth



Narrow Bandwidth

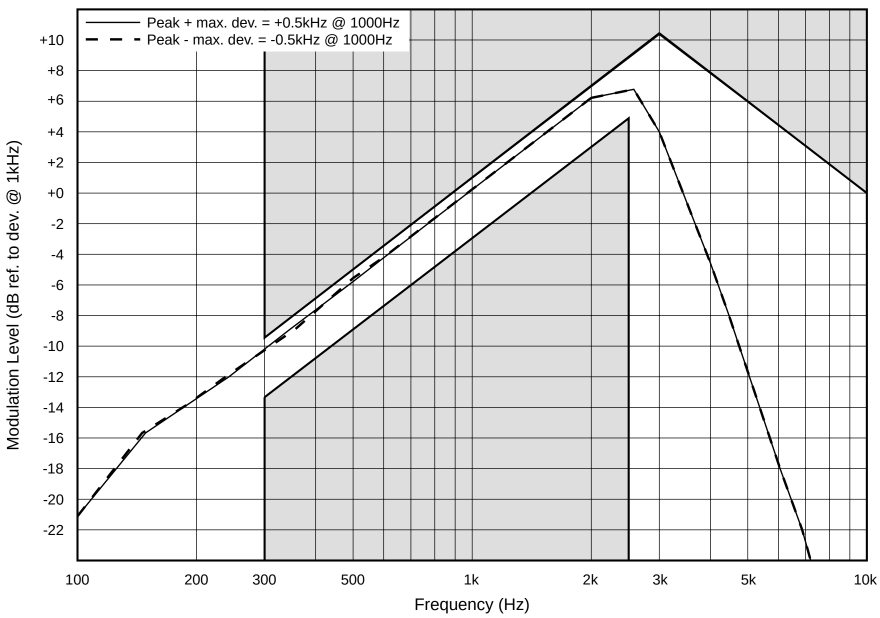
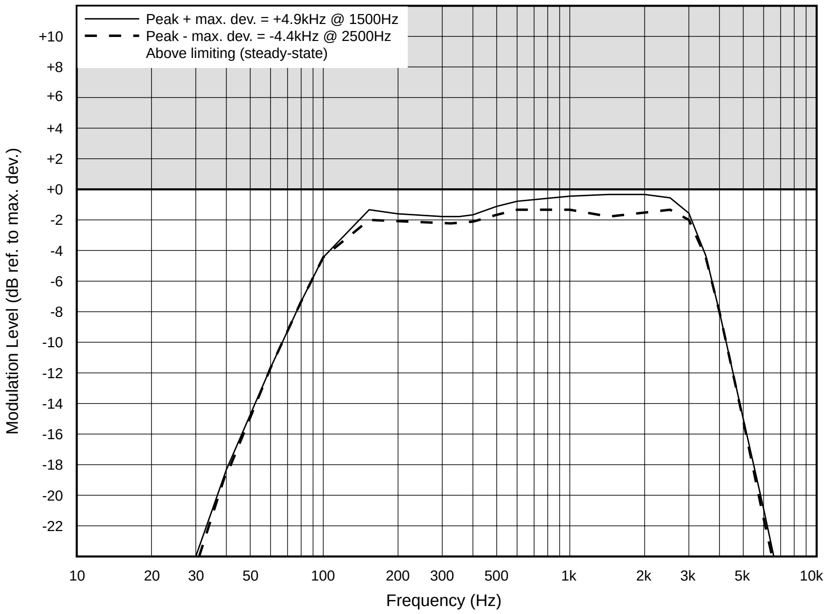


Figure 4.2 T881 Pre-emphasis Response

Wide Bandwidth



Narrow Bandwidth

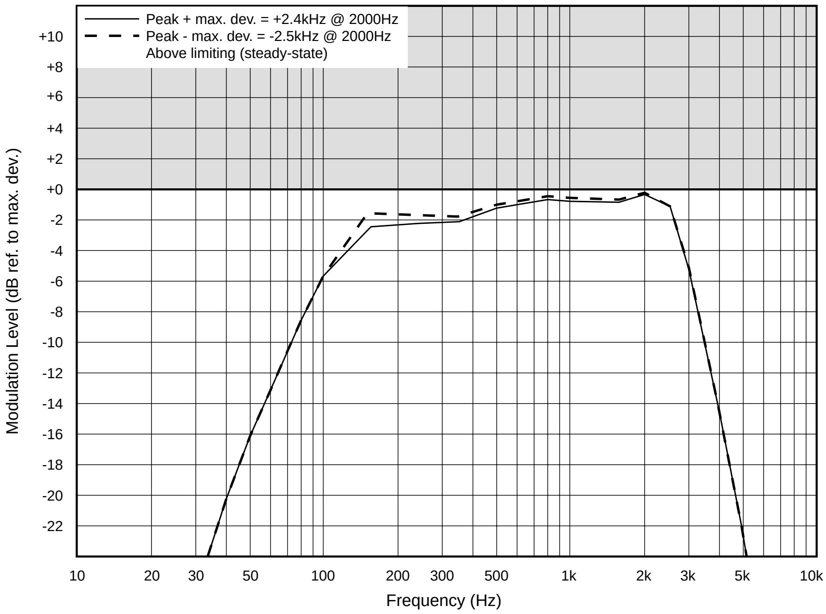


Figure 4.3 T881 Limiting Response

4.6 Audio Level Input Sensitivity

- Adjust RV210 (line sensitivity) fully clockwise.
- Check that the input sensitivities are better than those specified below:

Line Input	600 ohms, ±3kHz [±1.5kHz] deviation at 1kHz:	
	with compressor	-50dBm
	without compressor	-30dBm
Microphone Input	600 ohms, ±3kHz [±1.5kHz] deviation at 1kHz:	
	with compressor	-70dBm
	without compressor	-50dBm
CTCSS Input	1kHz deviation at 150Hz	500mV rms

Note: A degraded signal to noise ratio can be expected with the compressor selected. The extent of the degradation is dependent on the audio input level.

5 T881 Fault Finding

Caution: **This equipment contains CMOS devices which are susceptible to damage from static charges. Refer to Section 1.2 in Part A for more information on anti-static procedures when handling these devices.**

The following test procedures and fault finding flow charts may be used to help locate a hardware problem, however they are by no means a complete fault finding procedure. If you still cannot trace the fault after progressing through them in a logical manner, contact your nearest Tait Dealer or Customer Service Organisation. If necessary, you can get additional technical help from Customer Support, Tait Electronics Ltd, Christchurch, New Zealand (full contact details are on page 2).

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: Unless otherwise specified, the term "PGM800Win" used in this and following sections refers to version 3.00 and later of the software.

Refer 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 following topics are covered in this section

5.1 Visual Checks

Remove the covers from the T881 and inspect the PCB for damaged or broken components, paying particular attention to the surface mounted devices (SMDs).

Check for defective solder joints. If repair or replacement is considered necessary, refer to Section 3 of Part A.

5.2 Component Checks

If you suspect a transistor is faulty, you can assess its performance by measuring the forward and reverse resistance of the junctions. Unless the device is completely desoldered, first make sure that the transistor is not shunted by some circuit resistance. Use a good quality EVM (e.g. Fluke 75) for taking the measurements (or a 20k ohm/V or better multimeter, using only the medium or low resistance ranges).

The collector current drawn by multi-junction transistors is a further guide to their performance.

If an IC is suspect, the most reliable check is to measure the DC operating voltages. Due to the catastrophic nature of most IC failures, the pin voltages will usually be markedly different from the recommended values in the presence of a fault. The recommended values can be obtained from either the circuit diagram or the component data catalogue.

5.3 Front Panel LED Indicator

The green "Supply" LED on the T881 front panel will flash according to the conditions described in the following table:

Flash Rate		Condition
fast	(⅓ sec. on/⅓ sec. off approx.)	T881 is linked with PGM800Win
unequal	(⅓ sec. on/1 sec. off approx.)	microcontroller has detected an internal communications error - refer to Section 5.7.1

Where two or more conditions occur at the same time, the precedence is in the order shown above (i.e. T881 linked has the highest priority, followed by internal error).

5.4 DC Checks

5.4.1 Power Rails

Refer to the test points and options diagrams in Section 6 for test point locations, and to the regulator fault finding chart (Section 5.7.2) for fault diagnosis.

Check the 13.8V (TP601) and 9V (TP602) supplies at their test points in the regulator compartment with a DMM.

Check the 5V (TP604) and 20V (TP603) rails at their respective test points in the regulator compartment.

Check that Tx-Reg. (TP501 in the power control compartment) comes up to 8.8V when the transmitter is keyed.

Check the +5V digital regulator output (TP607 in the regulator compartment).

Check the 13.8V supply to the RF power module (#IC400 pin 3) with a DMM.

Check for short circuits.

5.4.2 VCO Locking

Key the transmitter.

Using a DMM, monitor the VCO control voltage at TP300 in the VCO compartment.

If the synthesiser is locked and the VCO aligned, the voltage at this point should be between 3 and 16V.

If the VCO is not locked, refer to the synthesiser fault finding chart (Section 5.7.3).

5.5 RF Checks

In-circuit RF levels may be measured with an RF probe on which the earth lead has been shortened to a minimum (i.e. 13mm). Refer to the circuit diagrams for typical levels.

Figure 5.1 shows a suitable RF probe circuit..

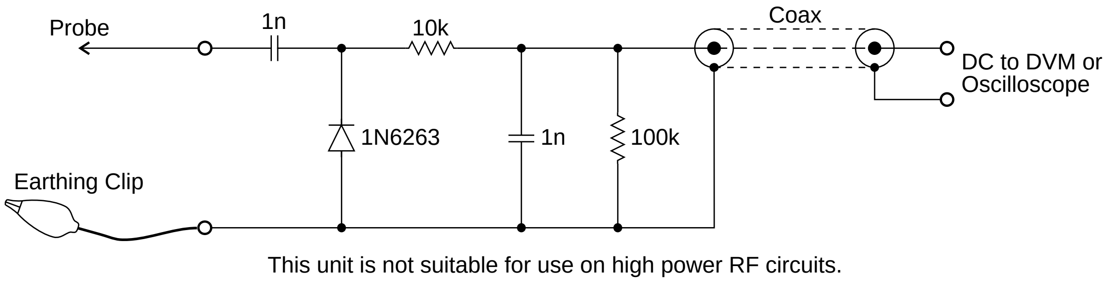


Figure 5.1 RF Diode Probe Circuit

5.5.1 VCO Output Signal

Refer to the synthesiser fault finding chart (Section 5.7.3).

Ensure that the VCO locks (refer to Section 5.4.2).

Key the transmitter.

Using a frequency counter, probe as closely as possible to the output of the VCO (C387, R370) without actually touching any of the components in the circuit.

Check that the frequency measured corresponds to the frequency programmed with PGM800Win. This confirms that the VCO and phase-locked loop are operational and that there is a drive signal to the PA.

Note: If the synthesiser is out of lock, the lock detector (synthesiser IC740 and comparator IC750) will prevent the RF signal from reaching the PA by inhibiting the Lock-Detect signal (Q500) to the power control circuit.

5.5.2 PA Output Power

Connect an RF power meter with suitable attenuation to the T881 output socket and key the transmitter.

Check that the output power is >5W with RV502 (power control) adjusted fully clockwise.

5.5.3 Audio And Modulation

Refer to the audio processor fault finding chart (Section 5.7.5).

Set up the audio processor as described in Section 3.9.

Check that the demodulated RF output has the frequency response referred to in Section 4.5 with at least ±5kHz [±2.5kHz] deviation available at 1kHz modulating frequency.

If the above result is not achieved, either the two modulators are incorrectly adjusted or a fault condition exists.

5.6 PGM800Win Generated Errors

The following errors are those most likely to occur using PGM800Win. Refer to the PGM800Win software user's manual for a complete list of error messages.

Channel Switch Set

The programmed default channel change was not accepted by the base station because a channel is selected externally. Try turning the external channel switch off to change the default channel in PGM800Win.

Synth Out Of Lock

The synthesiser received incorrect data, or the data was corrupted. Enter a frequency within the VCO switching range, or tune the VCO.

Internal Error

Data could not be read from the base station due to an internal error. Check for shorts or open circuits on the SDA, SCK, SYNTH and EPOT lines. The SDA, SCK and SYNTH are normally high, and the EPOT is normally low.

Write/Read To An Unlinked Module

The link to the module does not exist. Undefined error.

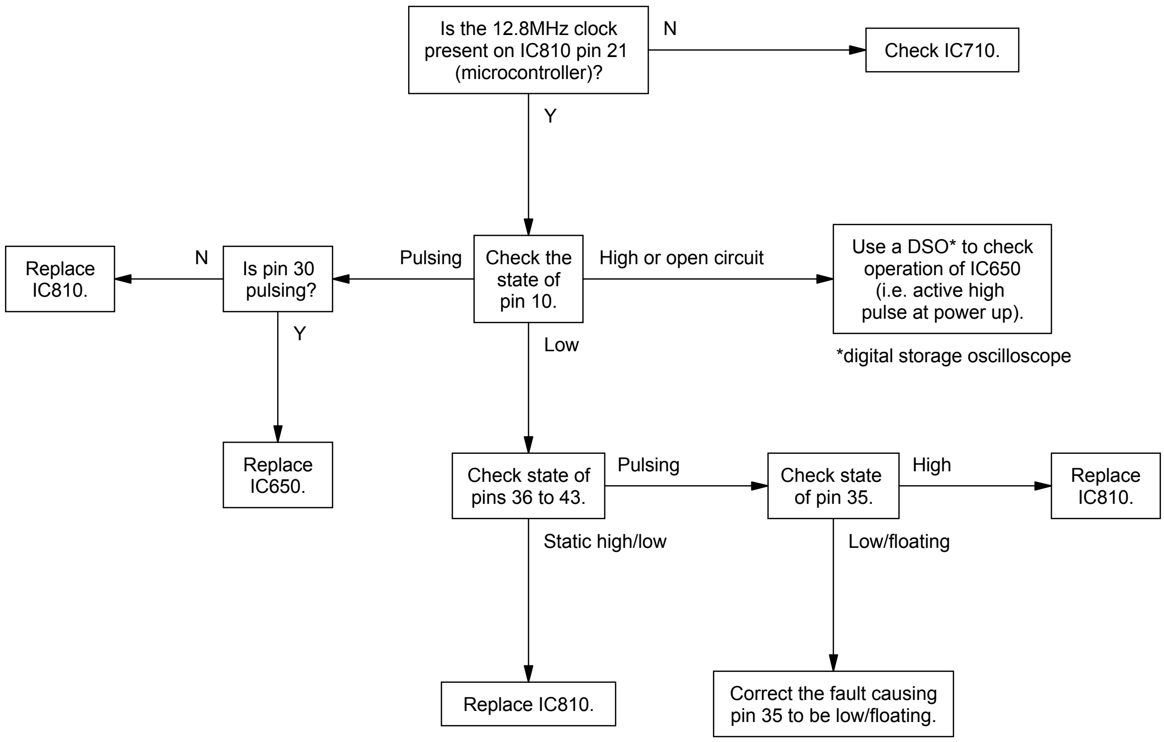
5.7 Fault Finding Charts

Note: The standard test point designations used in this section are as follows:

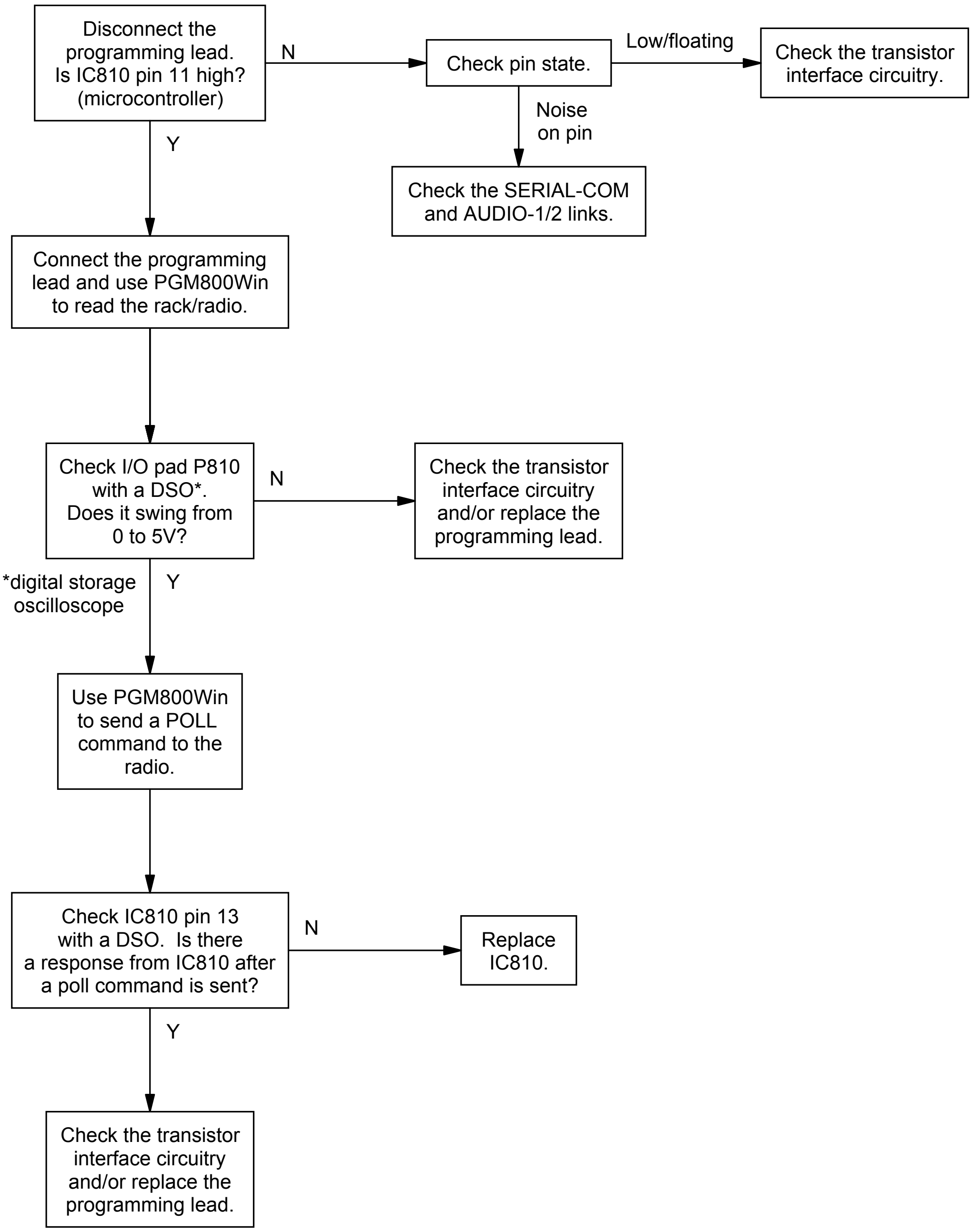
TP601	13.8V
TP602	9V
TP603	20V
TP604	5V

5.7.1 Microcontroller (IC810)

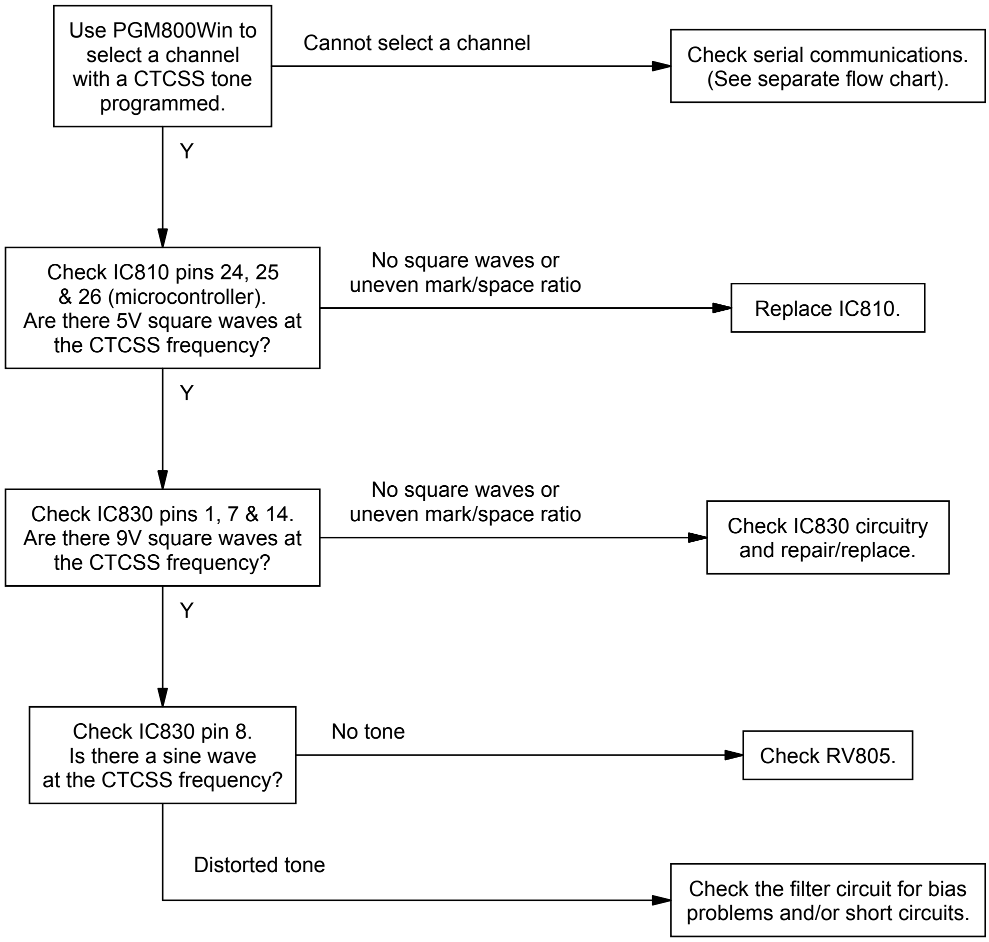
5.7.1.1 Basic Checks



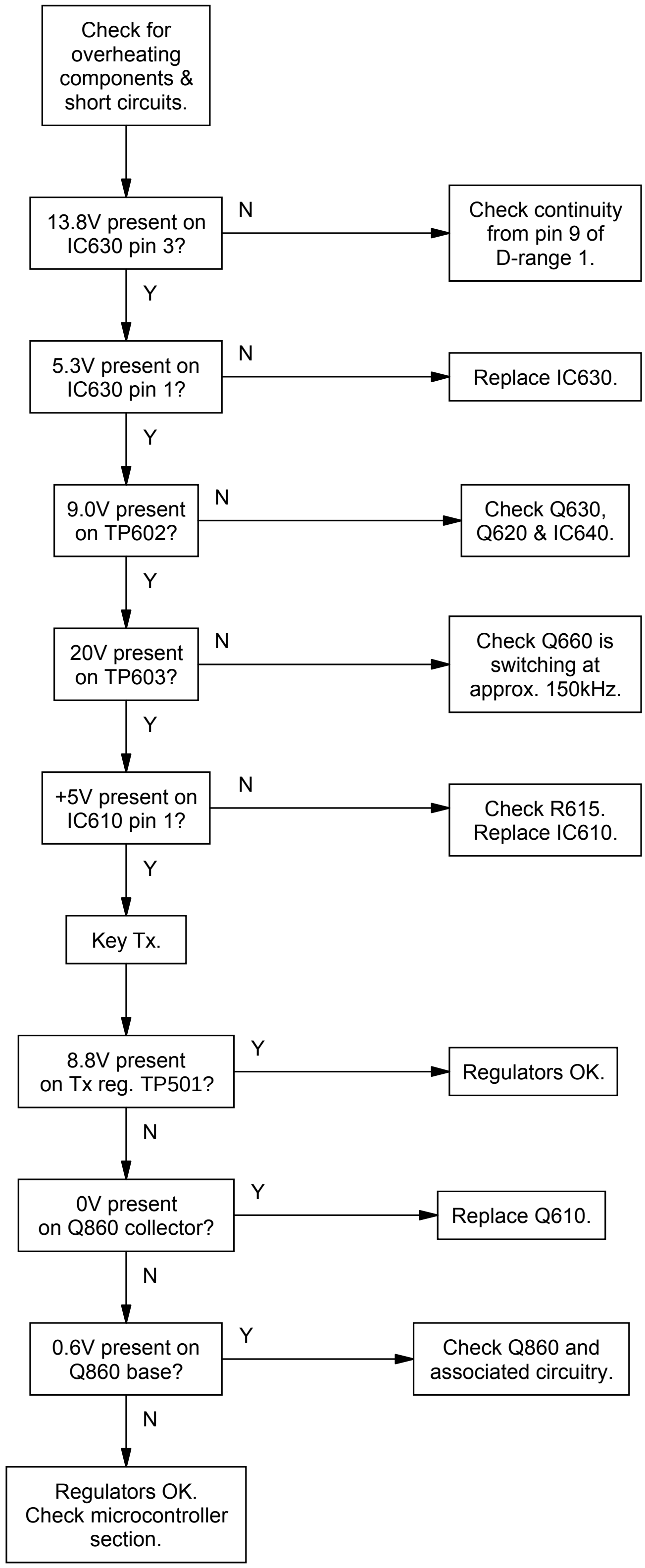
5.7.1.2 Serial Communication



5.7.1.3 CTCSS Encode

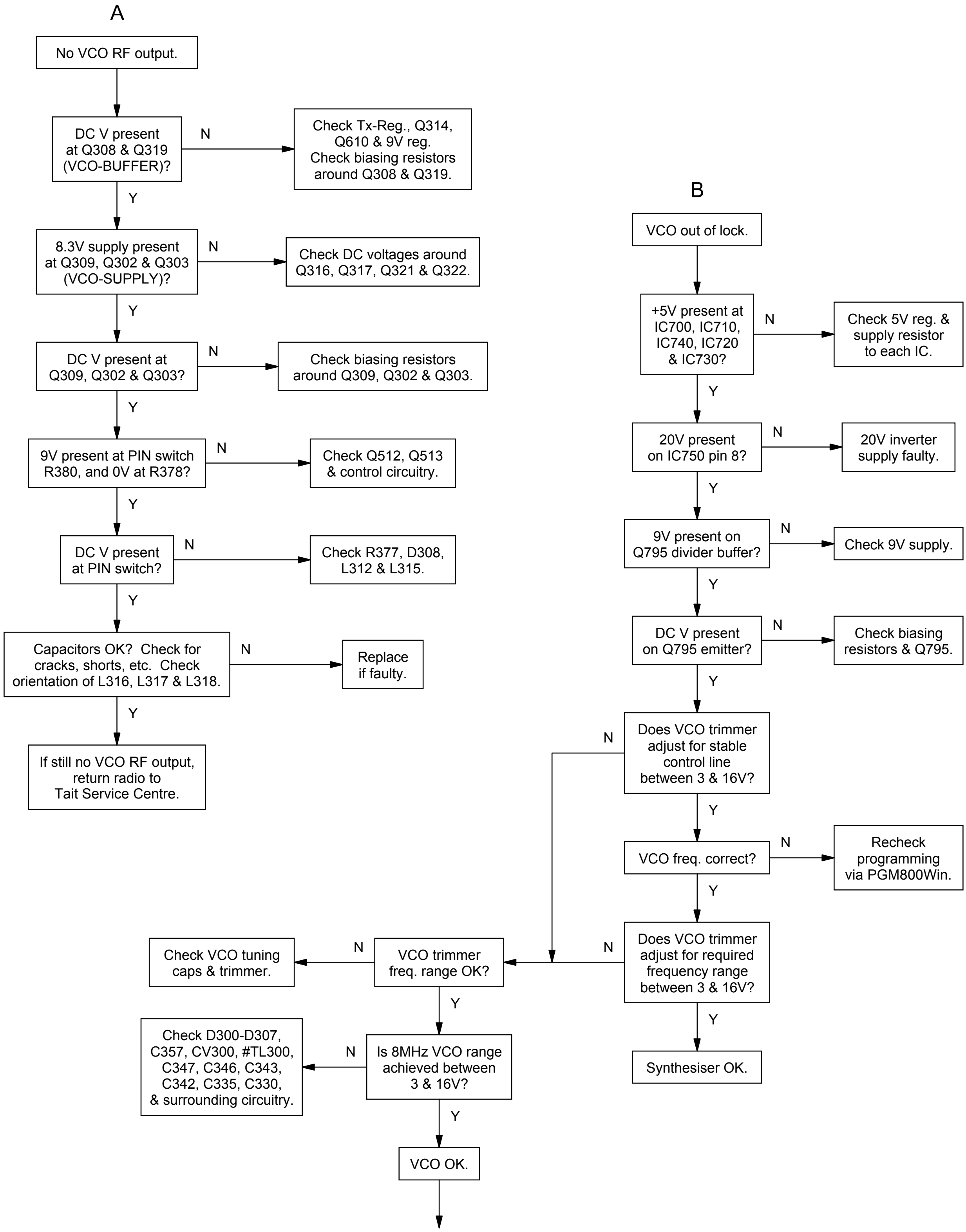


5.7.2 Regulator

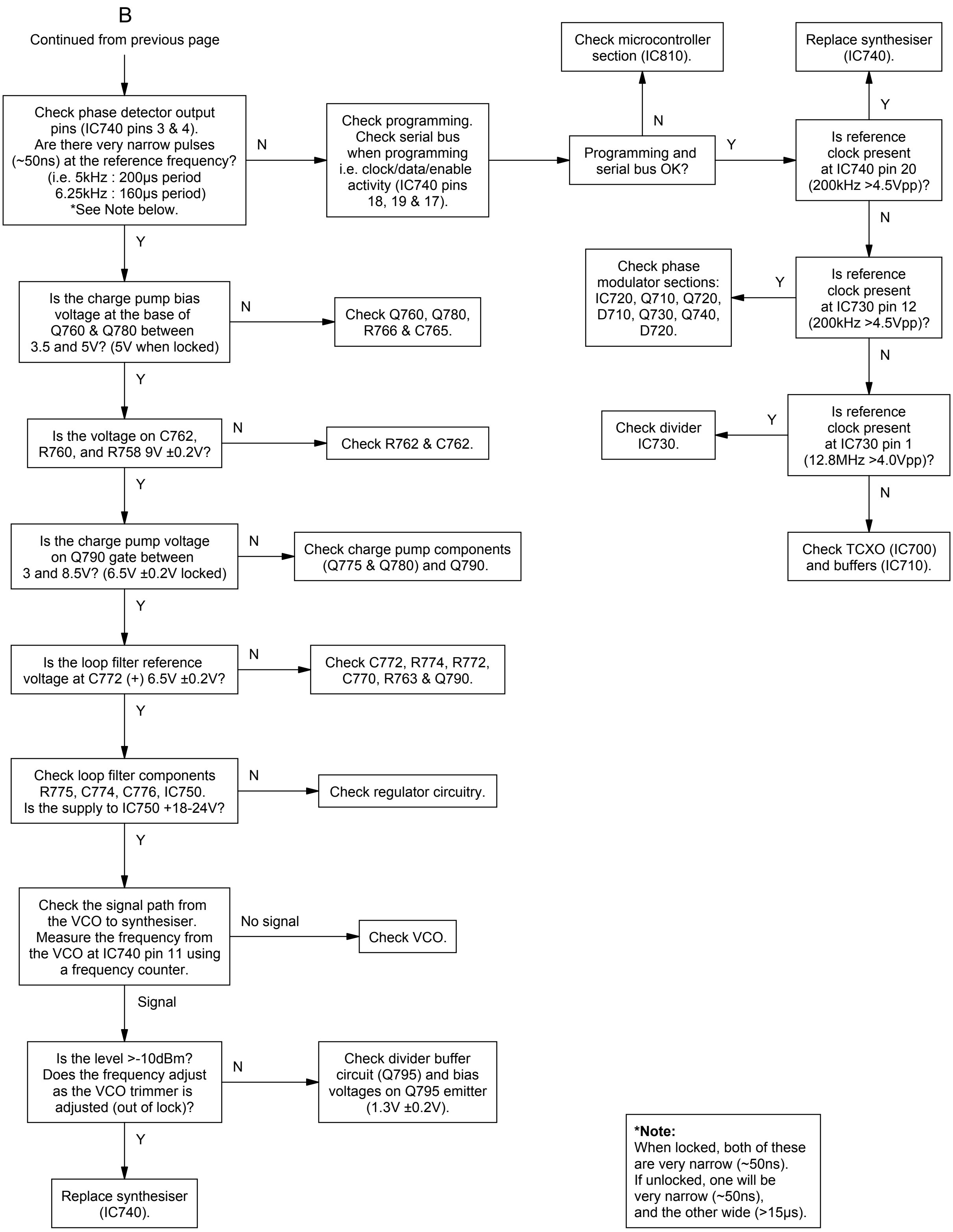


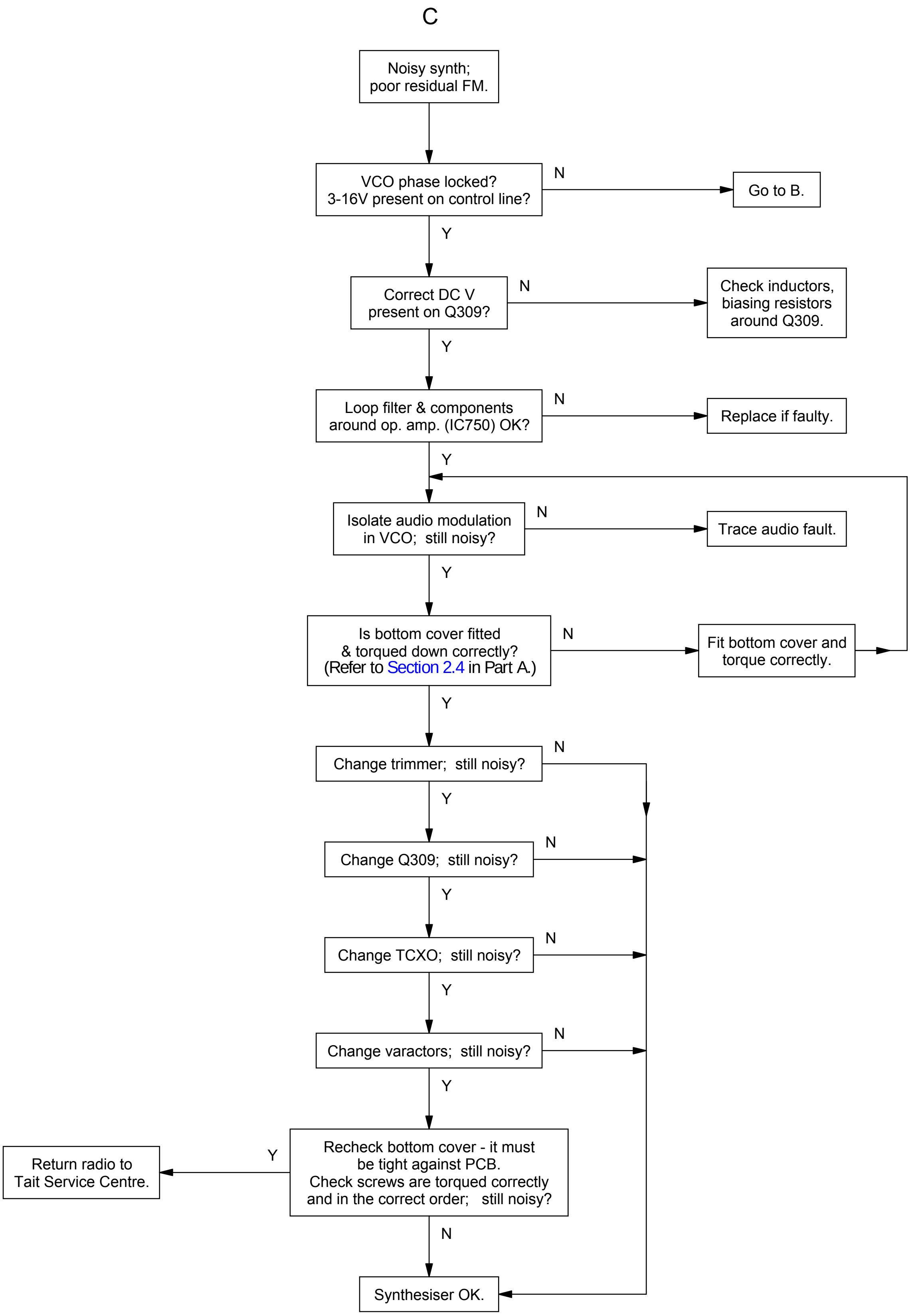
5.7.3 Synthesiser

Refer to the circuit diagrams for the VCO (sheet 3) and synthesiser (sheet 7) in Section 6.



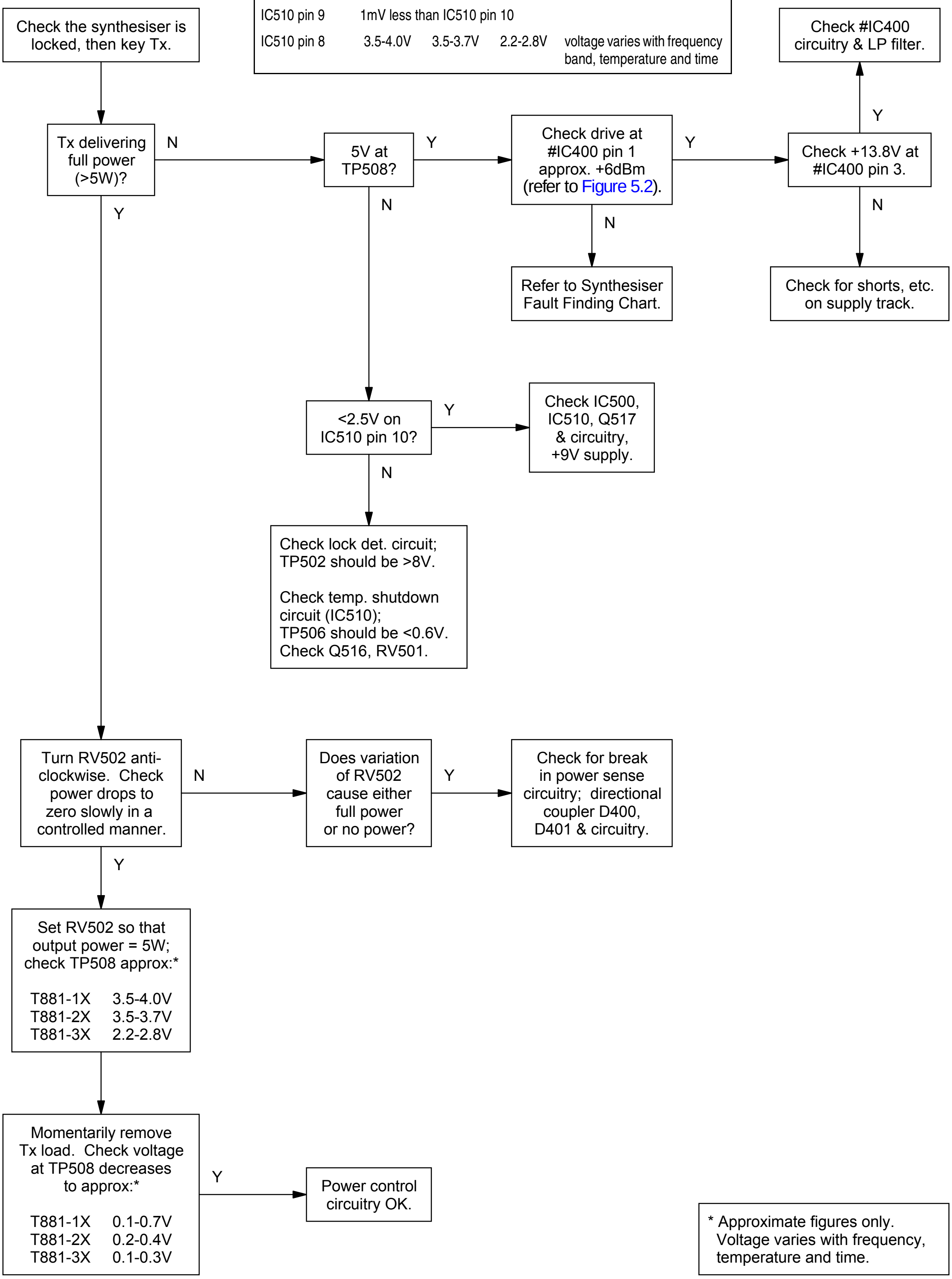
Continued on the next page


B
Continued from previous page
Check phase detector output pins (IC740 pins 3 & 4). Are there very narrow pulses (~50ns) at the reference frequency? (i.e. 5kHz : 200µs period 6.25kHz : 160µs period) *See Note below.
N
Check programming. Check serial bus when programming i.e. clock/data/enable activity (IC740 pins 18, 19 & 17).
Programming and serial bus OK?
N
Check microcontroller section (IC810).
Y
Is reference clock present at IC740 pin 20 (200kHz >4.5Vpp)?
Y
Replace synthesiser (IC740).
N
Is reference clock present at IC730 pin 12 (200kHz >4.5Vpp)?
Y
Check phase modulator sections: IC720, Q710, Q720, D710, Q730, Q740, D720.
N
Is reference clock present at IC730 pin 1 (12.8MHz >4.0Vpp)?
Y
Check divider IC730.
N
Check TCXO (IC700) and buffers (IC710).
Y
Is the charge pump bias voltage at the base of Q760 & Q780 between 3.5 and 5V? (5V when locked)
N
Check Q760, Q780, R766 & C765.
Y
Is the voltage on C762, R760, and R758 9V ±0.2V?
N
Check R762 & C762.
Y
Is the charge pump voltage on Q790 gate between 3 and 8.5V? (6.5V ±0.2V locked)
N
Check charge pump components (Q775 & Q780) and Q790.
Y
Is the loop filter reference voltage at C772 (+) 6.5V ±0.2V?
N
Check C772, R774, R772, C770, R763 & Q790.
Y
Check loop filter components R775, C774, C776, IC750. Is the supply to IC750 +18-24V?
N
Check regulator circuitry.
Y
Check the signal path from the VCO to synthesiser. Measure the frequency from the VCO at IC740 pin 11 using a frequency counter.
No signal
Check VCO.
Signal
Is the level >-10dBm? Does the frequency adjust as the VCO trimmer is adjusted (out of lock)?
N
Check divider buffer circuit (Q795) and bias voltages on Q795 emitter (1.3V ±0.2V).
Y
Replace synthesiser (IC740).
*Note:
When locked, both of these are very narrow (~50ns).
If unlocked, one will be very narrow (~50ns), and the other wide (>15µs).


C
Noisy synth; poor residual FM.
VCO phase locked? 3-16V present on control line?
N
Go to B.
Y
Correct DC V present on Q309?
N
Check inductors, biasing resistors around Q309.
Y
Loop filter & components around op. amp. (IC750) OK?
N
Replace if faulty.
Y
Isolate audio modulation in VCO; still noisy?
N
Trace audio fault.
Y
Is bottom cover fitted & torqued down correctly? (Refer to Section 2.4 in Part A.)
N
Fit bottom cover and torque correctly.
Y
Change trimmer; still noisy?
N
Y
Change Q309; still noisy?
N
Y
Change TCXO; still noisy?
N
Y
Change varactors; still noisy?
N
Y
Recheck bottom cover - it must be tight against PCB. Check screws are torqued correctly and in the correct order; still noisy?
Y
Return radio to Tait Service Centre.
N
Synthesiser OK.

5.7.4 PA & Power Control

Normal Operating Conditions				
	T881-1X	T881-2X	T881-3X	
Forward Power	3.6V	3.8V	3.7V	±0.2V for variations across frequency band
Reverse Power	0.3V	0.6V	0.7V	±0.2V for variations across frequency band
IC510 pin 10	2.03V	2.15V	2.15V	±0.1V for variations across frequency band
IC510 pin 9	1mV less than IC510 pin 10			
IC510 pin 8	3.5-4.0V	3.5-3.7V	2.2-2.8V	voltage varies with frequency band, temperature and time



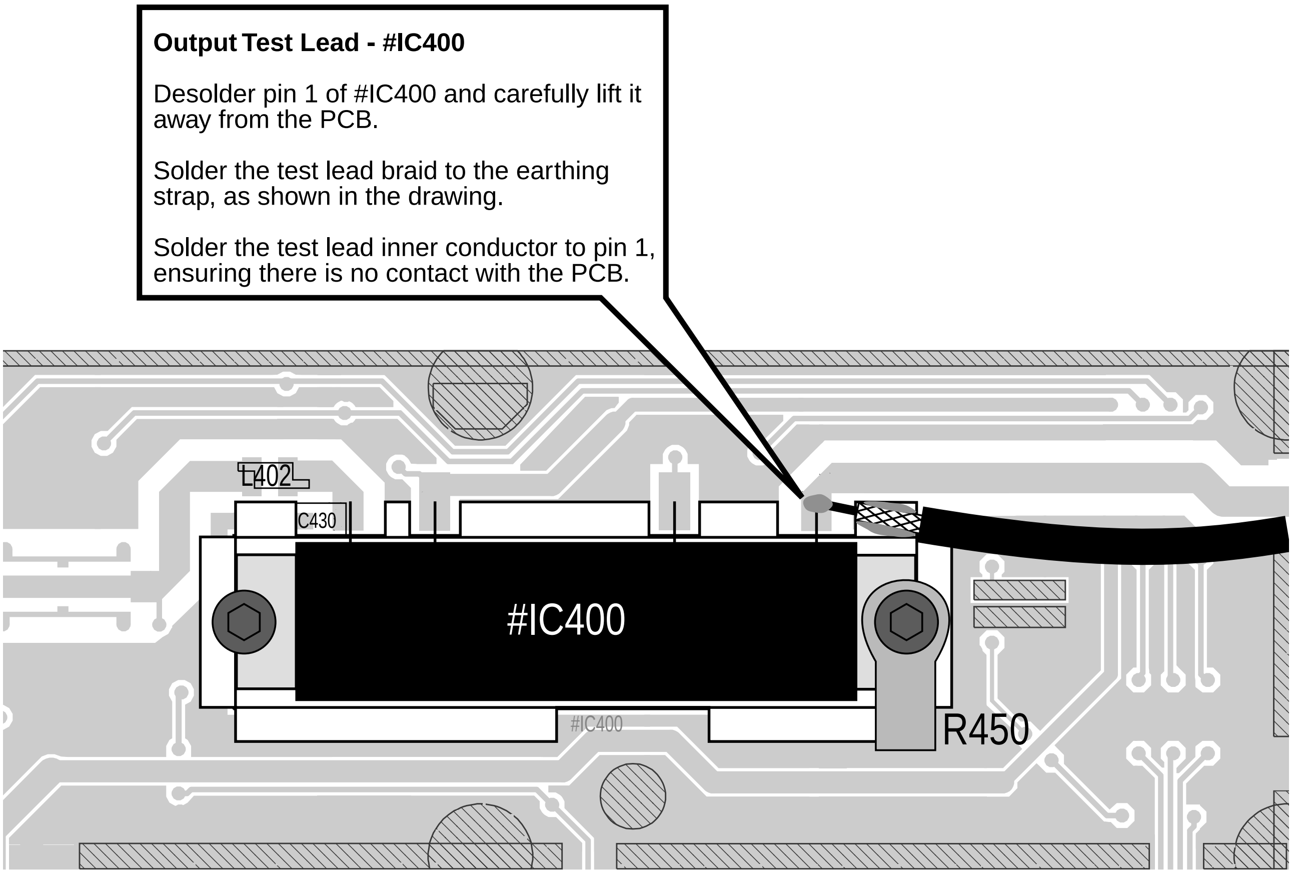
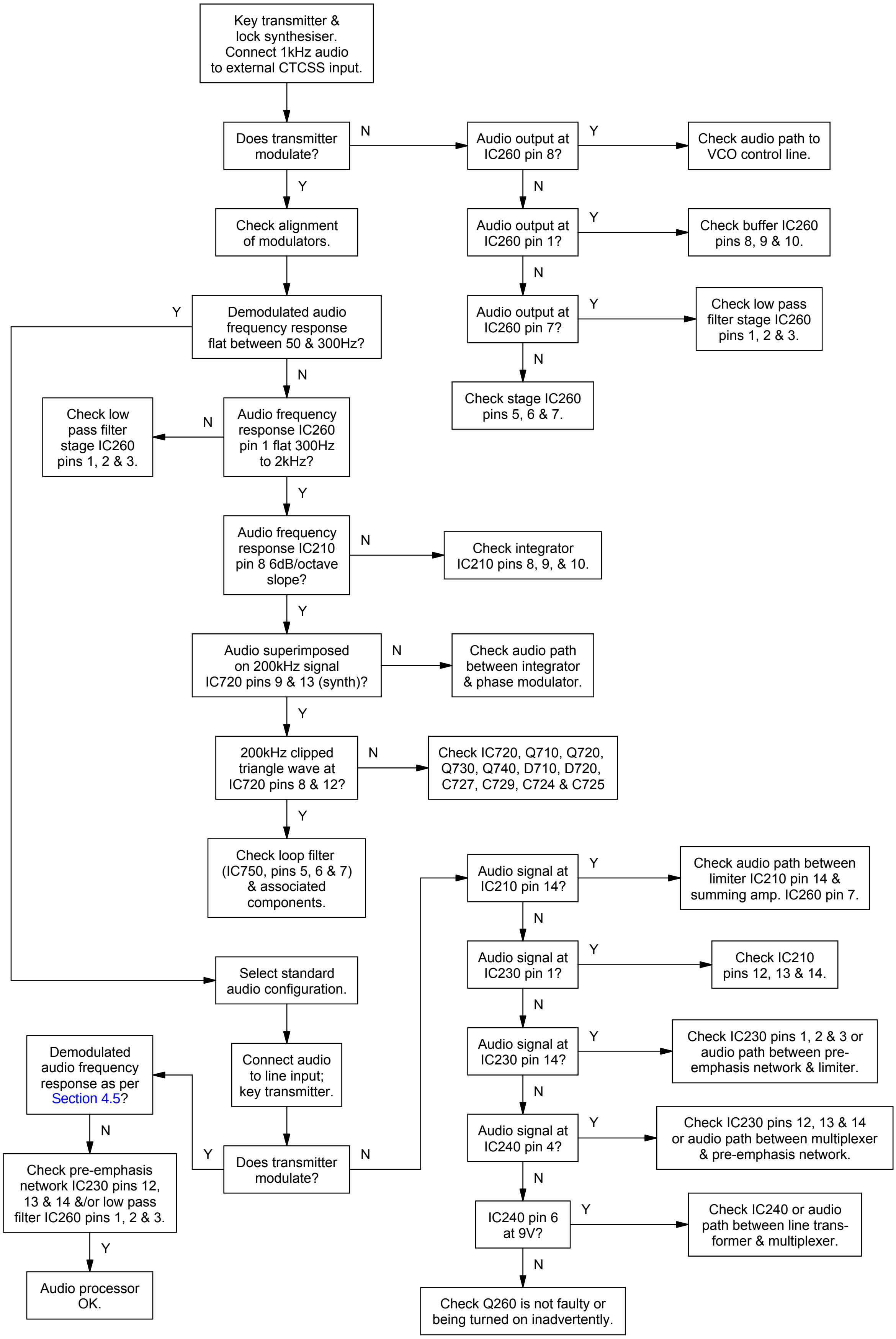


Figure 5.2 T881 Output Test Lead Location

Note 1: Use good quality 50Ω coax for the output test lead (e.g. RG316), and terminate the lead in a 50Ω load of the correct power rating.

Note 2: Be careful that the heat from the soldering iron does not melt the plastic case of #IC400.

5.7.5 Audio Processor



5.8 Replacing RF Power Modules

Caution: **Follow these instructions carefully, otherwise the module can fail because of poor heatsinking or cracked substrates.**

Desolder the module legs by heating with a soldering iron and lifting away from the PCB with a screwdriver or thin stainless steel spike.

Undo the module screws and remove the thermistor assembly.

Gently lift the module away from the heatsink.

Note: The module may be stuck down quite firmly with heatsink compound. You may need to carefully prise it away from the heatsink with a small screwdriver. Keep the heatsink compound clean while the module is detached.

Apply a small amount of heatsink compound (Dow-Corning 340 or equivalent) to the replacement module mounting surface. Use enough compound to ensure an even film over the entire mounting surface.

Reposition the module in the correct orientation and ensure it is well pasted to the heatsink.

Replace the thermistor assembly in its original position and hand-tighten the screws, ensuring the thermistor remains in place. Alternately tighten each screw evenly, finally torquing them down to 56N.cm/5in.lbf. with an accurate torque driver.

Caution: **It is essential that you apply the correct torque to these screws to allow the module flange to expand and contract under temperature cycling. Also, do not solder any module legs before torquing down otherwise the device may be broken.**

Solder all module legs to the PCB.

6 T881 PCB Information

Caution: **This equipment contains CMOS devices which are susceptible to damage from static charges. Refer to Section 1.2 in Part A for more information on anti-static procedures when handling these devices.**

Note: To ensure that the T881 will continue to meet its performance specifications, you must tighten the bottom cover screws to the correct torque, and in the correct order, as described in Section 2.4 in Part A.

This section provides the following information on the T881 transmitter:

- parts lists
- grid reference index
- mechanical assembly drawing
- PCB layouts
- test points & options connections drawing
- circuit diagrams.

6.1 Introduction

Product Type Identification

You can identify the transmitter type by checking the product code printed on a label on the rear of the chassis (product codes are explained in Section 1.3 in this Part of the manual, and Figure 1.1 in Part A shows typical labels). You can further verify the product type by checking the placement of an SMD resistor in the table that is screen printed onto the top side of the PCB, similar to the example drawn below. In this example, the resistor indicates that the product was built as a T881-10-XXXX.

PRODUCT TYPE			
	-10		-15
	-20		-25
	-30		-35

Note: The only function of this resistor is to indicate the product type. It has no effect on the circuitry or operation of the transmitter.

PCB Identification

All PCBs are identified by a unique 10 digit "internal part number" (IPN), e.g. 220-01390-02, which is screen printed onto the PCB (usually on the top side), as shown in the example below:

The last 2 digits of this number define the issue status, which starts at 00 and increments through 01, 02, 03, etc. as the PCB is updated. Some issue PCBs never reach full production status and are therefore not included in this manual. A letter following the 10 digit IPN has no relevance in identifying the PCB for service purposes.

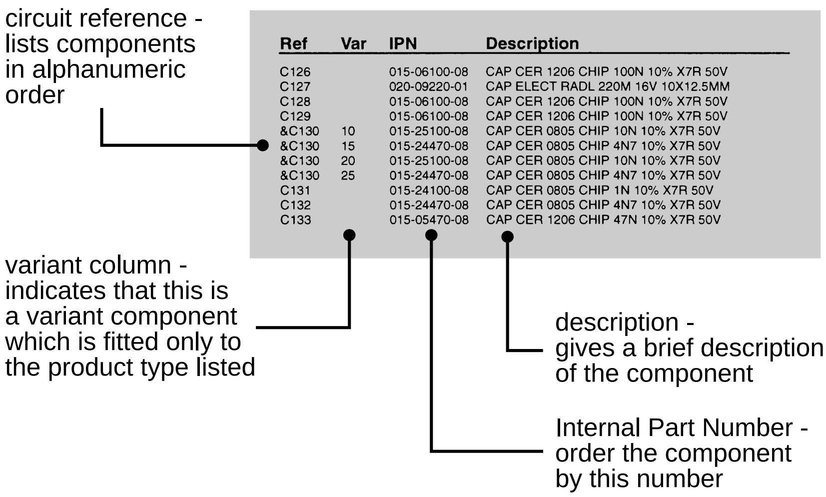
Note: It is important that you identify which issue PCB you are working on so that you can refer to the appropriate set of PCB information.

Parts Lists

The 10 digit numbers (000-00000-00) in this Parts List are “internal part numbers” (IPNs). We can process your spare parts orders more efficiently and accurately if you quote the IPN and provide a brief description of the part.

The components listed in this parts list are divided into two main types: those with a circuit reference (e.g. C2, D1, R121, etc.) and those without (miscellaneous and mechanical).

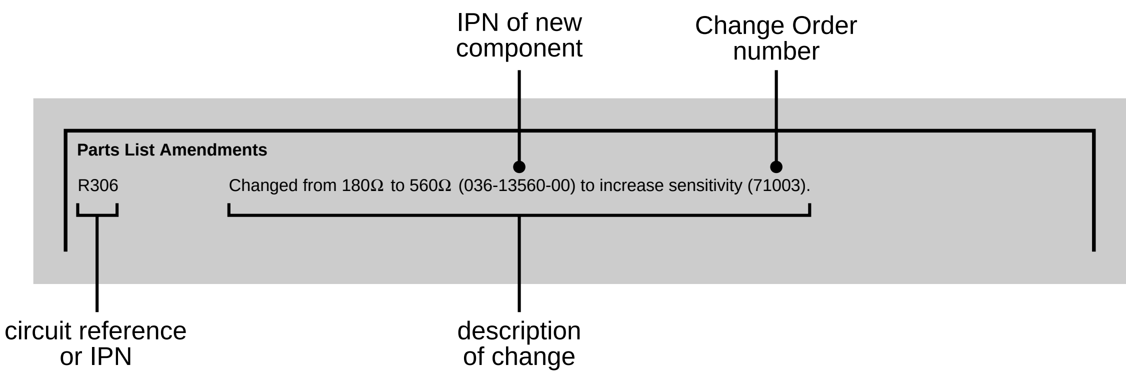
Those with a circuit reference are grouped in alphabetical order and then in numerical order within each group. Each component entry comprises three or four columns, as shown below:



The miscellaneous and mechanical section lists the variant and common parts in IPN order.

Parts List Amendments

At the front of the parts list is the Parts List Amendments box (an example of which is shown below). This box contains a list of component changes which took place after the parts list and diagrams in this section were compiled. These changes (e.g. value changes, added/deleted components, etc.) are listed by circuit reference in alphanumeric order and supersede the information given in the parts list or diagrams. Components without circuit references are listed in IPN order. The number in brackets at the end of each entry refers to the Tait internal Change Order document.



Variant Components

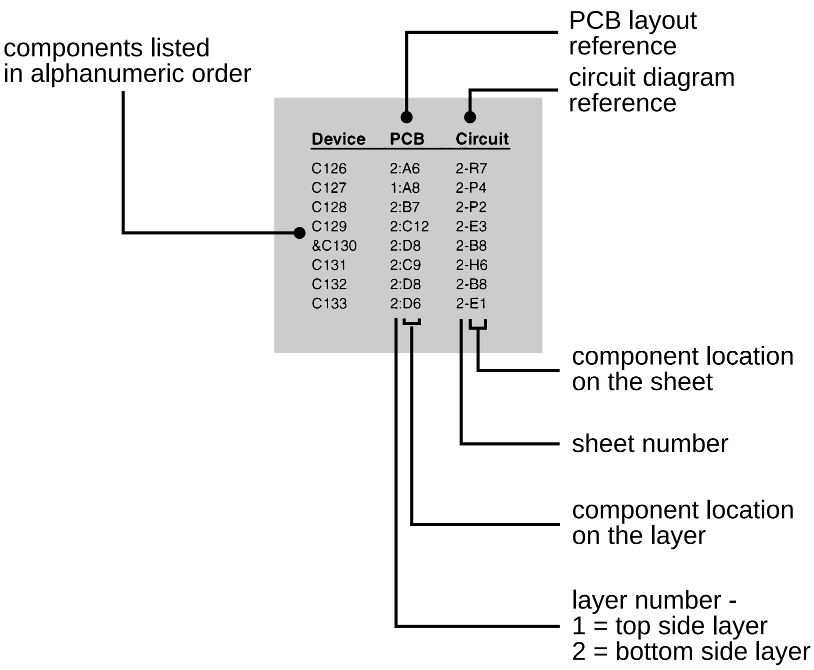
A variant component is one that has the same circuit reference but different value or specification in different product types. Where two products share the same PCB, the term “variant” is also used to describe components unplaced in one product. Variant components have a character prefix, such as “&”, “=” or “#”, before the circuit reference (e.g. &R100).

The table below explains the variant prefixes used in T800 Series II products:

If the variant prefix is. . .	the component will. . .
&	change according to channel spacing
=	change according to frequency stability
#	change according to frequency range
%	change or be placed/unplaced for special applications
*	be unplaced in one product (where two products share the same PCB)

Grid Reference Index

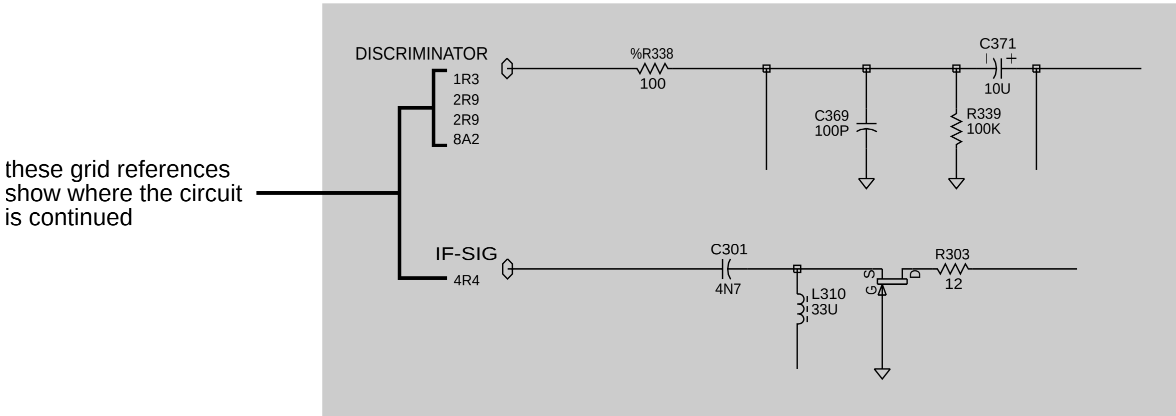
This section contains a component grid reference index to help you find components and labelled pads on the PCB layouts and circuit diagrams. This index lists the components and pads in alphanumeric order, along with the appropriate alphanumeric grid references, as shown below:



Using CAD Circuit Diagrams

Reading a CAD circuit diagram is similar to reading a road map, in that both have an alphanumeric border. The circuit diagrams in this manual use letters to represent the horizontal axis, and numbers for the vertical axis. These circuit diagram “grid references” are useful in following a circuit that is spread over two or more sheets.

When a line representing part of the circuitry is discontinued, a reference will be given at the end of the line to indicate where the rest of the circuitry is located, as shown below. The first digit refers to the sheet number and the last two characters refer to the location on that sheet of the continuation of the circuit (e.g. 1R3).



6.2 T881 Transmitter PCB

This section contains the following information.

T881 Parts List (IPN 220-01575-02)

How To Use This Parts List

The components listed in this parts list are divided into two main types: those with a circuit reference (e.g. C2, D1, R121, etc.) and those without (miscellaneous and mechanical).

Those with a circuit reference are grouped in alphabetical order and then in numerical order within each group. Each component entry comprises three or four columns: the circuit reference, variant (if applicable), IPN and description. A number in the variant column indicates that this is a variant component which is fitted only to the product type listed. Static sensitive devices are indicated by an (S) at the start of the description column.

The miscellaneous and mechanical section lists the variant and common parts in IPN order. Where possible, a number in the legend column indicates their position in the mechanical assembly drawing.

The Parts List Amendments box below lists component changes that took place after the parts list and diagrams in this section were compiled. These changes (e.g. value changes, added/deleted components, etc.) are listed by circuit reference in alphanumeric order and supersede the information given in the parts list or diagrams. Components without circuit references are listed in IPN order.

Parts List Amendments

IC740	Changed to MC145193F (IPN 002-14519-30) because MC145191F (IPN 002-14519-10) obsolete (711438-43).	
R567	T881-3X-XXXX Only:	Changed from 22k (IPN 036-15220-00) to 15k (IPN 036-15150-00) to increase the maximum output power. Circuit refererence changed to #R567 (711363).

Parts List Amendments - Continued

This page is provided for entering future amendments to the parts list.

Note: %D205 and %D210 are optional level limiting diodes for special applications.

=R705 (47 ohm) and =SK710 are fitted in place of =IC700 when an external frequency reference is used. These two components are supplied with the auxiliary D-range kits (T800-06-0000 & T800-06-0001).

Ref	Var	IPN	Description
C201		016-07470-06	CAP SMD ELECT BI-P 4U7 50V 20%
C202		016-07470-06	CAP SMD ELECT BI-P 4U7 50V 20%
C204		016-07470-06	CAP SMD ELECT BI-P 4U7 50V 20%
C205		016-07470-06	CAP SMD ELECT BI-P 4U7 50V 20%
C207		014-07470-01	CAP 4U7 'B'CASE 25V +-10% 267
C209		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C210		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C211		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C213		014-08100-00	CAP TANT CHIP 10M 16VW +-20%
C215		014-08220-01	CAP TANT 22UF 10V 276MSER
C217		015-24220-08	CAP CER 0805 2N2 10% X7R 50V
C219		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C221		014-08220-01	CAP TANT 22UF 10V 276MSER
C223		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C225		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C227		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C229		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C230		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C232		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C233		016-08470-01	CAP EL SMD 6*4 47UF 16V
C235		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C237		014-07100-02	CAP TANT CHIP 1U0 3.2X1.6M 16V
C239		016-07470-06	CAP SMD ELECT BI-P 4U7 50V 20%
C240		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C241		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C242		014-08100-00	CAP TANT CHIP 10M 16VW +-20%
C243		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C245		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C247		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C249		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C251		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C253		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C255		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C257		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C259		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C260		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C261		014-07470-01	CAP 4U7 'B'CASE 25V +-10% 267
C263		016-09100-05	CAP SMD ELECT 100U 25V 20%
C265		016-07470-06	CAP SMD ELECT BI-P 4U7 50V 20%
C267		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
&C269	10	015-21150-05	CAP CER 0805 CHIP 1P5+0.1PF 2
&C269	15	015-21470-05	CAP CER 0805 4P7+-0.1PF 200V
&C269	20	015-21150-05	CAP CER 0805 CHIP 1P5+0.1PF 2
&C269	25	015-21470-05	CAP CER 0805 4P7+-0.1PF 200V
&C269	30	015-21150-05	CAP CER 0805 CHIP 1P5+0.1PF 2
&C269	35	015-21470-05	CAP CER 0805 4P7+-0.1PF 200V
&C271	10	015-22470-01	CAP CER 0805 47P 5% NPO 50V
&C271	15	015-22470-01	CAP CER 0805 47P 5% NPO 50V
&C271	20	015-22470-01	CAP CER 0805 47P 5% NPO 50V
&C271	25	015-22470-01	CAP CER 0805 47P 5% NPO 50V
&C271	30	015-22470-01	CAP CER 0805 47P 5% NPO 50V
&C271	35	015-22470-01	CAP CER 0805 47P 5% NPO 50V
C273		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C275		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C277		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C279		015-23820-08	CAP CER 0805 820P 10% X7R 50V
C281		015-25220-08	CAP CER 0805 22N 10% X7R 50V
C283		015-21470-05	CAP CER 0805 4P7+-0.1PF 200V
C285		015-21470-05	CAP CER 0805 4P7+-0.1PF 200V
C287		016-09100-05	CAP SMD ELECT 100U 25V 20%
&C289	10	015-25470-08	CAP CER 0805 47N 10% X7R 50V
&C289	15	015-25470-08	CAP CER 0805 47N 10% X7R 50V
&C289	20	015-25470-08	CAP CER 0805 47N 10% X7R 50V
&C289	25	015-25470-08	CAP CER 0805 47N 10% X7R 50V
&C289	30	015-25470-08	CAP CER 0805 47N 10% X7R 50V
&C289	35	015-25470-08	CAP CER 0805 47N 10% X7R 50V
C291		014-08220-01	CAP TANT 22UF 10V 276MSER
C293		015-27100-10	CAP CER 0805 1M+80-20% Y5V 16V
%C294		015-22470-01	CAP CER 0805 47P 5% NPO 50V
%C295		013-06470-00	CAP SMD POLYESTER 470N 63V 10%
C300		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C301		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C302		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C303		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C304		014-08220-01	CAP TANT 22UF 10V 276MSER
C305		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C306		014-08220-01	CAP TANT 22UF 10V 276MSER
C307		015-22180-01	CAP CER 0805 18P 5% NPO 50V
%C308		014-08220-01	CAP TANT 22UF 10V 276MSER
C309		015-22180-01	CAP CER 0805 18P 5% NPO 50V
%C310		014-08220-01	CAP TANT 22UF 10V 276MSER
C311		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C315		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C316		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C317		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C318		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C319		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C321		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C322		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C323		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C324		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C325		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C326		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C328		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C329		014-08220-01	CAP TANT 22UF 10V 276MSER
C330		015-22330-01	CAP CER 0805 33P 5% NPO 50V
C331		014-07470-01	CAP 4U7 'B'CASE 25V +-10% 267
C332		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C335		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C336		015-25330-08	CAP CER 0805 CHIP 33NF
C337		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C338		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C339		015-25330-08	CAP CER 0805 CHIP 33NF
C340		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C342		015-23330-08	CAP CER 0805 330P 10% X7R 50V
C343		015-21180-05	CAP CER 0805 1P8 +-0.1 200V
C345		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C346		015-21100-05	CAP CER 0805 1P0 +-0.1PF 200V
C347		015-20075-05	CAP CER 0805 CHIP OP75+-0.1PF
C349		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C350		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C351		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C352		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C353		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C356		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C357		015-21150-05	CAP CER 0805 CHIP 1P5+0.1PF 2
C359		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C360		014-07470-01	CAP 4U7 'B'CASE 25V +-10% 267
C361		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C363		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C364		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C365		014-08100-00	CAP TANT CHIP 10M 16VW +-20%
C366		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C367		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C368		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C370		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C371		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C372		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C373		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C374		015-21470-05	CAP CER 0805 4P7+-0.1PF 200V
C375		015-21470-05	CAP CER 0805 4P7+-0.1PF 200V
C377		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C378		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C379		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C380		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C381		015-21330-05	CAP CER 0805 3P3+-0.1PF 200V
C382		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C383		014-08220-01	CAP TANT 22UF 10V 276MSER
C384		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C385		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C386		015-23100-01	CAP CER 0805 100P 5% NPO 50V
C387		015-22120-05	CAP 0805 12P 1% 200V
C388		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C389		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C390		015-21150-05	CAP CER 0805 CHIP 1P5+0.1PF 2
C391		015-23100-01	CAP CER 0805 100P 5% NPO 50V
C392		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C393		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C394		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C395		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C396		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C397		015-21330-05	CAP CER 0805 3P3+-0.1PF 200V
C398		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C399		015-21150-05	CAP CER 0805 CHIP 1P5+0.1PF 2
C400		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C401		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C402		014-18220-02	CAP TANT SMD 22U 20% 35V
C403		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C404		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C406		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C407		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C408		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C409		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C410		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C411		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C412		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C413		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C415		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C416		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C417		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C418		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C419		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C420		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C421		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C422		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C423		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C424		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C425		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C426		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C427		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C428		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C430		015-01100-03	CAP CER 1P0 +/-.1P 500V GRH111
C432		015-22180-01	CAP CER 0805 18P 5% NPO 50V

Ref	Var	IPN	Description
C450		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C451		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C452		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C453		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C500		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C501		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C502		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C503		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C505		015-25220-08	CAP CER 0805 22N 10% X7R 50V
C506		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C507		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C508		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C510		015-25330-08	CAP CER 0805 CHIP 33NF
C511		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C512		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C513		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C515		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C516		015-24100-08	CAP CER 0805 1N 10% X7R 50V
%C517		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C518		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C519		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C520		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C521		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C523		014-08100-00	CAP TANT CHIP 10M 16VW +-20%
C525		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C526		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C527		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C530		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C531		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C532		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C535		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C537		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C538		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C541		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C542		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C543		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C545		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C546		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C547		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C548		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C551		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C559		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C605		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C607		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C608		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C610A		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C610B		014-09100-00	CAP TANT SMD 100U 16V 20%
C611A		014-09100-00	CAP TANT SMD 100U 16V 20%
C611B		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C623		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C625		020-09470-07	CAP ELEC RADL 470M 16V 20% 3.5
C626		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C627		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C628		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C629		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C630		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C631A		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C634		014-08100-00	CAP TANT CHIP 10M 16VW +-20%
C636		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C638		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C640		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C655		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C660		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C665		014-08100-03	CAP TANT SMD 10U 35V 20%
C670		014-07330-10	CAP TANT SMD 3U3 35V 10%
C673		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C677		014-07100-02	CAP TANT CHIP 1U0 3.2X1.6M 16V
C681		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C684		014-08100-00	CAP TANT CHIP 10M 16VW +-20%
C687		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C690		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C693		014-08100-00	CAP TANT CHIP 10M 16VW +-20%
C700		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C703		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C706		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C708		014-07470-01	CAP 4U7 'B'CASE 25V +-10% 267
C709		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C710		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C711		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C712		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C714		014-07470-01	CAP 4U7 'B'CASE 25V +-10% 267
C719		014-07470-01	CAP 4U7 'B'CASE 25V +-10% 267
C720		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C722		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C724		014-08220-01	CAP TANT 22UF 10V 276MSER
C725		014-08220-01	CAP TANT 22UF 10V 276MSER
C726		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C727		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C729		015-22470-01	CAP CER 0805 47P 5% NPO 50V
%C733		015-23470-08	CAP CER 0805 470P 10% X7R 50V
C735		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C736		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C740A		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C740B		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C741A		014-07470-01	CAP 4U7 'B'CASE 25V +-10% 267
C741B		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C742A		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C742B		015-25100-08	CAP CER 0805 10N 10% X7R 50V

Ref	Var	IPN	Description
C743		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C745		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C750		014-08100-03	CAP TANT SMD 10U 35V 20%
C757		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C759		015-25680-08	CAP CER 0805 68N 10% X7R 50V
C761		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C762		014-08220-01	CAP TANT 22UF 10V 276MSER
C764		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C765		014-07470-01	CAP 4U7 'B'CASE 25V +-10% 267
C767		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C769		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C770		014-08220-01	CAP TANT 22UF 10V 276MSER
C772		014-08220-01	CAP TANT 22UF 10V 276MSER
C774		013-06100-10	CAP SMD PPS 100N 100V 10%
C776		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C782		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C784		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C785		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C786		015-26100-08	CAP CER 0805 100N 10% X7R 50V
C788		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C790		015-21330-05	CAP CER 0805 3P3+-0.1PF 200V
C792		015-21560-05	CAP CER 0805 CHIP 5P6+0.1PF 2
C810		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C812		015-23100-01	CAP CER 0805 100P 5% NPO 50V
C813		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C822		014-07470-01	CAP 4U7 'B'CASE 25V +-10% 267
C823		015-25220-08	CAP CER 0805 22N 10% X7R 50V
C824		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C826		015-23220-01	CAP CER 0805 220P 5% NPO 50V
C827		015-22330-01	CAP CER 0805 33P 5% NPO 50V
C828		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C830		015-25470-08	CAP CER 0805 47N 10% X7R 50V
C838		014-09100-00	CAP TANT SMD 100U 16V 20%
C841		014-09100-00	CAP TANT SMD 100U 16V 20%
C844		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C880		015-22180-01	CAP CER 0805 18P 5% NPO 50V
C910		015-01270-06	CAP CER 1210 2P7 NPO200V GRM42
C920		015-01560-02	CAP CERHIQ 1210 5P6 5% NPO200V
C930		015-01560-02	CAP CERHIQ 1210 5P6 5% NPO200V
C940		015-01270-06	CAP CER 1210 2P7 NPO200V GRM42
CV300		028-11500-00	CAP TRIM 0.6/4.5 P SAPPHIRE
%D111A		001-10015-50	DIODE SMD ZENER 1.5SMC22AT3
D211		008-00014-80	LED 3MM GREEN WITH WIRE
D212		008-00014-79	LED 3MM RED WITH WIRE
D220		001-10000-99	DIODE SMD BAV99 D-SW SOT23
D230		001-10010-40	DIODE SMD ZENER 33V BZG03-C33
D240		001-10000-56	DIODE SMD BAW56 D-SW SOT23
D250		001-10000-56	DIODE SMD BAW56 D-SW SOT23
D260		001-10000-56	DIODE SMD BAW56 D-SW SOT23
D270		001-10000-99	DIODE SMD BAV99 D-SW SOT23
D300		001-10005-35	DIODE SMD VCAP BB535 SOD323
D301		001-10005-35	DIODE SMD VCAP BB535 SOD323
D305		001-10005-35	DIODE SMD VCAP BB535 SOD323
D307		001-10005-35	DIODE SMD VCAP BB535 SOD323
D308		001-10063-05	DIODE SMD BAR63-05W SOT323
D400		001-10066-00	DIODE SCHOTTKY HSMS2815
D401		001-10066-00	DIODE SCHOTTKY HSMS2815
D610		001-10000-99	DIODE SMD BAV99 D-SW SOT23
D620		001-10000-70	DIODE SMD BAV70 D-SW SOT23
D630		001-10000-70	DIODE SMD BAV70 D-SW SOT23
D635A		001-10165-00	DIODE BAT165 SCHOTTKY SOD-323
D640		001-10000-70	DIODE SMD BAV70 D-SW SOT23
D645		001-10010-40	DIODE SMD ZENER 33V BZG03-C33
D710		001-10000-99	DIODE SMD BAV99 D-SW SOT23
D720		001-10000-99	DIODE SMD BAV99 D-SW SOT23
D730		001-10165-00	DIODE BAT165 SCHOTTKY SOD-323
D732		001-10165-00	DIODE BAT165 SCHOTTKY SOD-323
D810		001-10165-00	DIODE BAT165 SCHOTTKY SOD-323
IC210		002-10003-24	IC SMD 324 4X O-AMP SO14
IC220		002-10126-70	IC SMD DS1267S10K 2XDIG POT
IC230		002-10003-24	IC SMD 324 4X O-AMP SO14
IC240		002-10040-53	IC 4053B SMD BREAK B4 MAKE
IC250		002-10020-50	IC SMD 4N25A OPTOCOUPLER
IC260		002-10003-24	IC SMD 324 4X O-AMP SO14
#IC400	10	004-68701-00	MODULE M68701 806-870MHZ 6W
#IC400	15	004-68701-00	MODULE M68701 806-870MHZ 6W
#IC400	20	004-68701-01	MODULE M68701M 860-910MHZ 6W
#IC400	25	004-68701-01	MODULE M68701M 860-910MHZ 6W
#IC400	30	004-68701-02	MODULE M68701H 890-960MHZ 6W
#IC400	35	004-68701-02	MODULE M68701H 890-960MHZ 6W
IC500		002-10003-58	IC SMD LM358 DUAL O-AMP
IC510		002-10006-60	IC SMD LMC660CM O-AMP 4X
IC610		002-10078-05	IC SMD 78L05 5V REG
IC630		002-12523-17	IC LM317L REG TO-252 0.5A
IC640		002-10003-58	IC SMD LM358 DUAL O-AMP
IC650		002-10012-32	SMD DS1232LPS-2 LP RESET&W-DOG
=IC700		539-00010-55	TCXO 12.8M 1PPM-20+70/2PPM -30
IC710		002-74904-00	IC SMD 74HC04A 6X INV BUFFD
IC720		002-74910-04	IC SMD 74HCU04 6X INV
IC730		002-10045-20	IC SMD 74HC4520T 2XCTR 4BIT
IC740		002-14519-10	IC MC145191F SMD SYNTH
IC750		002-10330-78	IC MC33078D 2X AMP LO NOISE
IC810		002-08951-20	IC AT89C51 PLCC44 MIC 12MHZ
IC820		002-12416-00	IC SMD AT24C16N-10SC EEPROM
IC830		002-10003-24	IC SMD 324 4X O-AMP SO14

Ref	Var	IPN	Description
L300		056-14150-02	IND SMD 1.5UH SIMID02
L301		065-10004-20	BEAD FE SMD CBD 4.6/3/3-4S2
L302		056-10100-02	IND SMD 100NH SIMID02
L303		056-10082-02	IND SMD 82NH SIMID02
L304		056-10100-02	IND SMD 100NH SIMID02
L305		065-10004-20	BEAD FE SMD CBD 4.6/3/3-4S2
L307		056-10015-03	IND SMD 0805 15NH 20%
L308		056-10006-83	IND SMD 0805 6.8NH 20%
L309		056-10100-02	IND SMD 100NH SIMID02
L310		065-10004-20	BEAD FE SMD CBD 4.6/3/3-4S2
L311		057-10120-03	IND 0805 EMI SUP 120E@100M 0.2
L312		056-10100-02	IND SMD 100NH SIMID02
L314		056-10100-02	IND SMD 100NH SIMID02
L315		056-10100-02	IND SMD 100NH SIMID02
L316		059-14820-10	IND FXD 1008CT 8.2NH 5%
L317		059-14820-10	IND FXD 1008CT 8.2NH 5%
L318		059-14820-10	IND FXD 1008CT 8.2NH 5%
L401		056-10100-02	IND SMD 100NH SIMID02
L402		052-08320-20	COIL A/W 2T/2.0MM SMD 0.8MM
L403		056-10100-02	IND SMD 100NH SIMID02
L404		056-10100-02	IND SMD 100NH SIMID02
L406		056-10100-02	IND SMD 100NH SIMID02
L407		056-10100-02	IND SMD 100NH SIMID02
L408		056-10100-02	IND SMD 100NH SIMID02
L450		056-10100-02	IND SMD 100NH SIMID02
L451		056-10100-02	IND SMD 100NH SIMID02
L601		057-10120-03	IND 0805 EMI SUP 120E@100M 0.2
L602		057-10120-03	IND 0805 EMI SUP 120E@100M 0.2
PL100		070-01001-00	D-RANGE 15 WAY COMPL T800
PL201		240-00021-03	HEADER 2X7 WAY SMD
PL202		240-00021-03	HEADER 2X7 WAY SMD
Q210		000-10008-47	XSTR BC847B NPN SOT23
Q220		000-10008-17	XSTR SMD BC817-25 NPN SOT23
Q230		000-10008-47	XSTR BC847B NPN SOT23
Q240		000-10008-47	XSTR BC847B NPN SOT23
Q250		000-10008-17	XSTR SMD BC817-25 NPN SOT23
Q260		000-10008-57	XSTR SMD BCW70 PNP SOT23 SS
Q270		000-10004-10	XSTR SMD MJD41C NPN SW DPAK
Q300		000-10008-47	XSTR BC847B NPN SOT23
Q301		000-10008-47	XSTR BC847B NPN SOT23
Q302		000-10009-41	XSTR SMD BR941L SOT23
Q303		000-10009-41	XSTR SMD BR941L SOT23
Q304		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q305		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q307		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q308		002-10003-18	IC BGA318 MMIC AMPLIFIER
Q309		000-10009-30	XSTR SMD BFR93A NPN SOT23
Q310		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q311		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q312		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q313		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q314		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q316		000-10008-47	XSTR BC847B NPN SOT23
Q317		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q318		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q319		000-10080-00	XSTR SMD BLT80 UHF PWR SOT223
Q321		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q322		000-10008-47	XSTR BC847B NPN SOT23
Q500		000-10008-47	XSTR BC847B NPN SOT23
Q501		000-10008-47	XSTR BC847B NPN SOT23
Q502		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q503		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q505		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q506		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q507		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q508		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q510		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q511		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q512		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q513		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q515		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q516		000-10008-47	XSTR BC847B NPN SOT23
Q517		000-10008-47	XSTR BC847B NPN SOT23
Q610		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q620		000-00033-12	XSTR BD242 TO-220 PNP ISOLTD
Q630		000-10003-00	XSTR BSR30 PNP AF SOT-89
Q660		000-10008-17	XSTR SMD BC817-25 NPN SOT23
Q670		000-10008-57	XSTR SMD BCW70 PNP SOT23 SS
Q710		000-10008-47	XSTR BC847B NPN SOT23
Q720		000-10008-57	XSTR SMD BCW70 PNP SOT23 SS
Q730		000-10008-47	XSTR BC847B NPN SOT23
Q740		000-10008-57	XSTR SMD BCW70 PNP SOT23 SS
Q750		000-10008-07	XSTR SMD BC807 PNP SOT23 AF
Q760		000-10008-47	XSTR BC847B NPN SOT23
Q770		000-10008-57	XSTR SMD BCW70 PNP SOT23 SS
Q775		000-10008-57	XSTR SMD BCW70 PNP SOT23 SS
Q780		000-10008-47	XSTR BC847B NPN SOT23
Q785		000-10008-57	XSTR SMD BCW70 PNP SOT23 SS
Q790		000-10003-12	XSTR SMD BFR31 N JFET SOT23
Q795		000-10009-30	XSTR SMD BFR93A NPN SOT23
Q810		000-10008-47	XSTR BC847B NPN SOT23
Q820		000-10008-17	XSTR SMD BC817-25 NPN SOT23
Q830		000-10008-57	XSTR SMD BCW70 PNP SOT23 SS
Q840		000-10008-57	XSTR SMD BCW70 PNP SOT23 SS
Q850		000-10008-47	XSTR BC847B NPN SOT23
Q860		000-10008-47	XSTR BC847B NPN SOT23

Ref	Var	IPN	Description
R160		036-12100-10	RES M/F 0805 10E 1%
R201		036-13560-10	RES M/F 0805 560E 1%
R202		036-14100-10	RES M/F 0805 1K 1%
R204		036-14220-00	RES M/F 0805 2K2 5%
R205		036-13220-10	RES 0805 220E 1%
R206		036-14100-10	RES M/F 0805 1K 1%
R207		036-14390-10	RES M/F 0805 3K9 1%
R208		036-13560-10	RES M/F 0805 560E 1%
R209		036-15100-10	RES M/F 0805 10K 1%
R210		036-14220-00	RES M/F 0805 2K2 5%
R211		036-13470-00	RES M/F 0805 470E 5%
R212		036-16100-10	RES M/F 0805 100K 1%
R213		036-15100-10	RES M/F 0805 10K 1%
R214		036-14820-10	RES M/F 0805 8K2 1%
R215		036-16100-10	RES M/F 0805 100K 1%
R216		036-16100-10	RES M/F 0805 100K 1%
R217		036-14100-10	RES M/F 0805 1K 1%
R218		036-16150-00	RES M/F 0805 150K 5%
R219		036-14220-00	RES M/F 0805 2K2 5%
R220		036-13470-00	RES M/F 0805 470E 5%
R221		036-14150-10	RES M/F 0805 1K5 1%
R223		036-17100-10	RES M/F 0805 1M 1%
R224		036-14680-10	RES M/F 0805 6K8 1%
R225		036-17100-10	RES M/F 0805 1M 1%
R226		036-15100-10	RES M/F 0805 10K 1%
R227		036-14180-00	RES M/F 0805 1K8 5%
R228		036-13120-00	RES M/F 0805 120E 5%
R229		036-16470-00	RES M/F 0805 470K 5%
R230		036-16100-10	RES M/F 0805 100K 1%
R231		036-15100-10	RES M/F 0805 10K 1%
R232		036-16330-00	RES M/F 0805 330K 5%
R233		036-16100-10	RES M/F 0805 100K 1%
R235		036-14470-10	RES M/F 0805 4K7 1%
R237		036-15470-10	RES M/F 0805 47K 1%
R238		036-15470-10	RES M/F 0805 47K 1%
R239		036-14150-10	RES M/F 0805 1K5 1%
R241		036-14470-10	RES M/F 0805 4K7 1%
R242		036-14220-00	RES M/F 0805 2K2 5%
R244		036-15100-10	RES M/F 0805 10K 1%
R245		036-16100-10	RES M/F 0805 100K 1%
R247		036-15100-10	RES M/F 0805 10K 1%
R248		036-16100-10	RES M/F 0805 100K 1%
R249		036-16100-10	RES M/F 0805 100K 1%
R251		036-16100-10	RES M/F 0805 100K 1%
R253		036-16100-10	RES M/F 0805 100K 1%
R254		036-16100-10	RES M/F 0805 100K 1%
R255		036-15100-10	RES M/F 0805 10K 1%
R256		036-15560-10	RES MF 0805 56K 1%
R257		036-16560-00	RES M/F 0805 560K 5%
R258		036-16150-00	RES M/F 0805 150K 5%
R259		036-15220-00	RES M/F 0805 22K 5%
R260		036-15470-10	RES M/F 0805 47K 1%
R262		036-15470-10	RES M/F 0805 47K 1%
R263		036-14470-10	RES M/F 0805 4K7 1%
&R264	10	036-15220-00	RES M/F 0805 22K 5%
&R264	15	036-15270-10	RES M/F 0805 27K 1%
&R264	20	036-15220-00	RES M/F 0805 22K 5%
&R264	25	036-15270-10	RES M/F 0805 27K 1%
&R264	30	036-15220-00	RES M/F 0805 22K 5%
&R264	35	036-15270-10	RES M/F 0805 27K 1%
&R265	10	036-15150-00	RES M/F 0805 15K 5%
&R265	15	036-15180-10	RES M/F 0805 18K 1%
&R265	20	036-15150-00	RES M/F 0805 15K 5%
&R265	25	036-15180-10	RES M/F 0805 18K 1%
&R265	30	036-15150-00	RES M/F 0805 15K 5%
&R265	35	036-15180-10	RES M/F 0805 18K 1%
&R266	10	036-15560-10	RES MF 0805 56K 1%
&R266	15	036-15560-10	RES MF 0805 56K 1%
&R266	20	036-15560-10	RES MF 0805 56K 1%
&R266	25	036-15560-10	RES MF 0805 56K 1%
&R266	30	036-15560-10	RES MF 0805 56K 1%
&R266	35	036-15560-10	RES MF 0805 56K 1%
R267		036-14220-00	RES M/F 0805 2K2 5%
R268		036-13100-10	RES M/F 0805 100E 1%
R269		036-15100-10	RES M/F 0805 10K 1%
R270		036-14120-00	RES M/F 0805 1K2 5%
R271		036-17100-10	RES M/F 0805 1M 1%
R272		036-13560-10	RES M/F 0805 560E 1%
R273		036-15180-10	RES M/F 0805 18K 1%
R274		036-15180-10	RES M/F 0805 18K 1%
R275		036-14270-10	RES M/F 0805 2K7 1%
R277		036-16100-10	RES M/F 0805 100K 1%
R278		036-16120-10	RES M/F 0805 120K 1%
R279		036-17100-10	RES M/F 0805 1M 1%
R280		036-15100-10	RES M/F 0805 10K 1%
R282		036-15560-10	RES MF 0805 56K 1%
R283		036-15560-10	RES MF 0805 56K 1%
R284		036-17100-10	RES M/F 0805 1M 1%
R285		036-10000-00	RES M/F 0805 ZERO OHM
R286		036-14220-00	RES M/F 0805 2K2 5%
R287		036-15100-10	RES M/F 0805 10K 1%
R288		036-15180-10	RES M/F 0805 18K 1%
R289		036-16100-10	RES M/F 0805 100K 1%
&R290	10	036-13560-10	RES M/F 0805 560E 1%
&R290	15	036-13560-10	RES M/F 0805 560E 1%
&R290	20	036-13560-10	RES M/F 0805 560E 1%
&R290	25	036-13560-10	RES M/F 0805 560E 1%
&R290	30	036-13560-10	RES M/F 0805 560E 1%

Ref	Var	IPN	Description
&R290	35	036-13560-10	RES M/F 0805 560E 1%
R291		036-10000-00	RES M/F 0805 ZERO OHM
R292		036-14470-10	RES M/F 0805 4K7 1%
R293		036-15470-10	RES M/F 0805 47K 1%
R294		036-14470-10	RES M/F 0805 4K7 1%
R295		036-14270-10	RES M/F 0805 2K7 1%
R296		036-14100-10	RES M/F 0805 1K 1%
R297		036-14560-00	RES M/F 0805 5K6 5%
%R298		036-16100-10	RES M/F 0805 100K 1%
R299		036-14270-10	RES M/F 0805 2K7 1%
R300		036-12680-00	RES M/F 0805 68E 5%
%R301		036-12100-10	RES M/F 0805 10E 1%
R302		036-15390-10	RES M/F 0805 39K 1%
R303		036-12330-00	RES M/F 0805 33E 5%
R304		036-11470-00	RES M/F 0805 4E7 5%
R305		036-11470-00	RES M/F 0805 4E7 5%
R307		036-14180-00	RES M/F 0805 1K8 5%
R308		036-14220-00	RES M/F 0805 2K2 5%
R309		036-14100-10	RES M/F 0805 1K 1%
R310		036-12270-00	RES M/F 0805 27E 5%
R311		036-13330-00	RES M/F 0805 330E 5%
R312		036-12680-00	RES M/F 0805 68E 5%
R314		036-10000-00	RES M/F 0805 ZERO OHM
R315		036-12120-00	RES M/F 0805 12E 5%
R316		036-12560-00	RES M/F 0805 56E 5%
R318		036-13220-10	RES 0805 220E 1%
R321		036-13120-00	RES M/F 0805 120E 5%
R322		036-12100-10	RES M/F 0805 10E 1%
R323		036-13820-00	RES M/F 0805 820E 5%
R324		036-12470-00	RES M/F 0805 47E 5%
R326		036-12470-00	RES M/F 0805 47E 5%
R328		036-11470-00	RES M/F 0805 4E7 5%
R329		036-12100-10	RES M/F 0805 10E 1%
R330		036-14180-00	RES M/F 0805 1K8 5%
R331		036-11470-00	RES M/F 0805 4E7 5%
R332		036-16120-10	RES M/F 0805 120K 1%
R333		036-14330-10	RES M/F 0805 3K3 1%
R335		036-15150-00	RES M/F 0805 15K 5%
R336		036-15470-10	RES M/F 0805 47K 1%
R337		036-15330-10	RES M/F 0805 33K 1%
R338		036-12100-10	RES M/F 0805 10E 1%
R339		036-13100-10	RES M/F 0805 100E 1%
R340		036-12470-00	RES M/F 0805 47E 5%
R342		036-16180-00	RES M/F 0805 180K 5%
R343		036-15150-00	RES M/F 0805 15K 5%
R344		036-12330-00	RES M/F 0805 33E 5%
R346		036-11470-00	RES M/F 0805 4E7 5%
R347		036-14220-00	RES M/F 0805 2K2 5%
R349		036-13270-00	RES M/F 0805 270E 5%
R350		036-12180-00	RES M/F 0805 18E 5%
R351		036-14100-10	RES M/F 0805 1K 1%
R352		036-13270-00	RES M/F 0805 270E 5%
R353		036-14150-10	RES M/F 0805 1K5 1%
R354		036-14680-10	RES M/F 0805 6K8 1%
R356		036-15220-00	RES M/F 0805 22K 5%
R357		036-14220-00	RES M/F 0805 2K2 5%
R358		036-14220-00	RES M/F 0805 2K2 5%
%R359		036-14220-00	RES M/F 0805 2K2 5%
R363		036-12270-00	RES M/F 0805 27E 5%
R364		036-14100-10	RES M/F 0805 1K 1%
R365		036-14470-10	RES M/F 0805 4K7 1%
R367		036-13470-00	RES M/F 0805 470E 5%
R368		036-15150-00	RES M/F 0805 15K 5%
R370		036-13180-00	RES M/F 0805 180E 5%
R371		036-12120-00	RES M/F 0805 12E 5%
R372		036-12330-00	RES M/F 0805 33E 5%
R373		036-13180-00	RES M/F 0805 180E 5%
R374		036-13680-00	RES M/F 0805 680E 5%
R375		036-13330-00	RES M/F 0805 330E 5%
R376		036-14220-00	RES M/F 0805 2K2 5%
R377		036-13820-00	RES M/F 0805 820E 5%
R378		036-15100-10	RES M/F 0805 10K 1%
R379		036-12470-00	RES M/F 0805 47E 5%
R380		036-15100-10	RES M/F 0805 10K 1%
R381		036-10000-00	RES M/F 0805 ZERO OHM
R390		036-13120-00	RES M/F 0805 120E 5%
R391		036-12470-00	RES M/F 0805 47E 5%
R392		036-13120-00	RES M/F 0805 120E 5%
R399		036-12100-10	RES M/F 0805 10E 1%
R400		036-13100-10	RES M/F 0805 100E 1%
R401		036-13100-10	RES M/F 0805 100E 1%
R410		036-14100-10	RES M/F 0805 1K 1%
R450		045-05100-02	RES NTC 10K 2% Metal tagged
R500		036-15150-00	RES M/F 0805 15K 5%
R501		036-15150-00	RES M/F 0805 15K 5%
R502		036-15150-00	RES M/F 0805 15K 5%
R503		036-15100-10	RES M/F 0805 10K 1%
R505		036-15470-10	RES M/F 0805 47K 1%
R506		036-16120-10	RES M/F 0805 120K 1%
R510		036-15470-10	RES M/F 0805 47K 1%
R511		036-15470-10	RES M/F 0805 47K 1%
R512		036-15220-00	RES M/F 0805 22K 5%
R515		036-14100-10	RES M/F 0805 1K 1%
R516		036-15470-10	RES M/F 0805 47K 1%
R517		036-16120-10	RES M/F 0805 120K 1%
R518		036-15100-10	RES M/F 0805 10K 1%
R520		036-15470-10	RES M/F 0805 47K 1%
R521		036-15220-00	RES M/F 0805 22K 5%
R522		036-15470-10	RES M/F 0805 47K 1%
R523		036-14820-10	RES M/F 0805 8K2 1%
R525		036-14100-10	RES M/F 0805 1K 1%
R526		036-14120-00	RES M/F 0805 1K2 5%
R527		036-15150-00	RES M/F 0805 15K 5%
R528		036-15100-10	RES M/F 0805 10K 1%
R530		036-15100-10	RES M/F 0805 10K 1%
R531		036-14820-10	RES M/F 0805 8K2 1%
R532		036-15100-10	RES M/F 0805 10K 1%
R533		036-14100-10	RES M/F 0805 1K 1%
R535		036-14470-10	RES M/F 0805 4K7 1%
R536		036-15470-10	RES M/F 0805 47K 1%
R537		036-15100-10	RES M/F 0805 10K 1%
R538		036-15100-10	RES M/F 0805 10K 1%
R540		036-15220-00	RES M/F 0805 22K 5%
R541		036-14100-10	RES M/F 0805 1K 1%
R542		036-14470-10	RES M/F 0805 4K7 1%
R543		036-14470-10	RES M/F 0805 4K7 1%
R544		036-14100-10	RES M/F 0805 1K 1%
R546		036-13100-10	RES M/F 0805 100E 1%
R547		036-12100-10	RES M/F 0805 10E 1%
R548		036-14820-10	RES M/F 0805 8K2 1%
R550		036-14100-10	RES M/F 0805 1K 1%
R551		036-14100-10	RES M/F 0805 1K 1%
R552		036-15100-10	RES M/F 0805 10K 1%
R553		036-15100-10	RES M/F 0805 10K 1%
R555		036-15100-10	RES M/F 0805 10K 1%
R556		036-14470-10	RES M/F 0805 4K7 1%
R558		036-14470-10	RES M/F 0805 4K7 1%
R559		036-16220-00	RES M/F 0805 220K 5%
R560		036-14470-10	RES M/F 0805 4K7 1%
R565		036-13220-10	RES 0805 220E 1%
R566		036-10000-00	RES M/F 0805 ZERO OHM
R567		036-15220-00	RES M/F 0805 22K 5%
R568		036-15330-10	RES M/F 0805 33K 1%
R569		036-10000-00	RES M/F 0805 ZERO OHM
R570		036-15560-10	RES MF 0805 56K 1%
R571		036-15390-10	RES M/F 0805 39K 1%
R572		036-14220-00	RES M/F 0805 2K2 5%
R573		036-13100-10	RES M/F 0805 100E 1%
R575		036-14470-10	RES M/F 0805 4K7 1%
R576		036-14100-10	RES M/F 0805 1K 1%
R609		036-14100-10	RES M/F 0805 1K 1%
R613		036-13560-10	RES M/F 0805 560E 1%
R615		036-13100-10	RES M/F 0805 100E 1%
R617		036-10000-00	RES M/F 0805 ZERO OHM
R619		036-01100-10	RES 1 OHM 1 WATT 2512 CHIP
R621		036-01100-10	RES 1 OHM 1 WATT 2512 CHIP
R625		036-14100-10	RES M/F 0805 1K 1%
R629		036-03270-10	RES 270 OHM 1 WATT 2512 CHIP
R633		036-14680-10	RES M/F 0805 6K8 1%
R637		036-12220-00	RES M/F 0805 22E 5%
R638		036-12220-00	RES M/F 0805 22E 5%
R640		036-12100-10	RES M/F 0805 10E 1%
R641		036-14150-10	RES M/F 0805 1K5 1%
R645		036-13470-00	RES M/F 0805 470E 5%
R649		036-14470-10	RES M/F 0805 4K7 1%
R651		036-10000-00	RES M/F 0805 ZERO OHM
R652		036-10000-00	RES M/F 0805 ZERO OHM
R653		036-15100-10	RES M/F 0805 10K 1%
R657		036-15100-10	RES M/F 0805 10K 1%
R661		036-15100-10	RES M/F 0805 10K 1%
R665		036-16100-10	RES M/F 0805 100K 1%
R669		036-15470-10	RES M/F 0805 47K 1%
R673		036-16100-10	RES M/F 0805 100K 1%
R677		036-15470-10	RES M/F 0805 47K 1%
R681		036-13100-10	RES M/F 0805 100E 1%
R685		036-15150-00	RES M/F 0805 15K 5%
R689		036-12100-10	RES M/F 0805 10E 1%
R693		036-16100-10	RES M/F 0805 100K 1%
R696		036-15560-10	RES MF 0805 56K 1%
R701		036-12220-00	RES M/F 0805 22E 5%
R702		036-17100-10	RES M/F 0805 1M 1%
R703		036-17100-10	RES M/F 0805 1M 1%
R706		036-12100-10	RES M/F 0805 10E 1%
R707		036-15100-10	RES M/F 0805 10K 1%
R708		036-17100-10	RES M/F 0805 1M 1%
R709		036-12100-10	RES M/F 0805 10E 1%
R710		036-13100-10	RES M/F 0805 100E 1%
R711		036-13100-10	RES M/F 0805 100E 1%
R712		036-12100-10	RES M/F 0805 10E 1%
R713		036-10000-00	RES M/F 0805 ZERO OHM
%R715		036-14100-10	RES M/F 0805 1K 1%
R717		036-14270-10	RES M/F 0805 2K7 1%
R718		036-15270-10	RES M/F 0805 27K 1%
R719		036-15270-10	RES M/F 0805 27K 1%
R720		036-15390-10	RES M/F 0805 39K 1%
R721		036-15100-10	RES M/F 0805 10K 1%
R722		036-15100-10	RES M/F 0805 10K 1%
R723		036-14270-10	RES M/F 0805 2K7 1%
R725		036-15390-10	RES M/F 0805 39K 1%
%R726		036-13100-10	RES M/F 0805 100E 1%
R727		036-15100-10	RES M/F 0805 10K 1%
R728		036-15100-10	RES M/F 0805 10K 1%
R730		036-13470-00	RES M/F 0805 470E 5%
R731		036-13470-00	RES M/F 0805 470E 5%
R732		036-13470-00	RES M/F 0805 470E 5%
R742		036-13150-10	RES M/F 0805 150E 1%

Ref	Var	IPN	Description
R743		036-13150-10	RES M/F 0805 150E 1%
R744		036-12220-00	RES M/F 0805 22E 5%
R746		036-12220-00	RES M/F 0805 22E 5%
R747		036-12220-00	RES M/F 0805 22E 5%
R748		036-15470-10	RES M/F 0805 47K 1%
R749		036-15470-10	RES M/F 0805 47K 1%
R750		036-12220-00	RES M/F 0805 22E 5%
R752		036-12220-00	RES M/F 0805 22E 5%
R753		036-17100-10	RES M/F 0805 1M 1%
R754		036-14100-10	RES M/F 0805 1K 1%
R756		036-15120-00	RES M/F 0805 12K 5%
R757		036-15120-00	RES M/F 0805 12K 5%
R758		036-14120-00	RES M/F 0805 1K2 5%
R759		036-13330-00	RES M/F 0805 330E 5%
R760		036-13180-00	RES M/F 0805 180E 5%
R762		036-13100-10	RES M/F 0805 100E 1%
R763		036-13100-10	RES M/F 0805 100E 1%
R765		036-13680-00	RES M/F 0805 680E 5%
R766		036-14100-10	RES M/F 0805 1K 1%
R767		036-13680-00	RES M/F 0805 680E 5%
R769		036-13180-00	RES M/F 0805 180E 5%
R771		036-14820-10	RES M/F 0805 8K2 1%
R772		036-15220-00	RES M/F 0805 22K 5%
R774		036-14820-10	RES M/F 0805 8K2 1%
R775		036-15180-10	RES M/F 0805 18K 1%
R780		036-12680-00	RES M/F 0805 68E 5%
R782		036-12180-00	RES M/F 0805 18E 5%
R784		036-13120-00	RES M/F 0805 120E 5%
R785		036-14330-10	RES M/F 0805 3K3 1%
R786		036-12100-10	RES M/F 0805 10E 1%
R787		036-12100-10	RES M/F 0805 10E 1%
R790		036-13390-10	RES M/F 0805 390E 1%
R791		036-14100-10	RES M/F 0805 1K 1%
R801		036-16150-00	RES M/F 0805 150K 5%
R802		036-15470-10	RES M/F 0805 47K 1%
R808		036-12100-10	RES M/F 0805 10E 1%
R809		036-14470-10	RES M/F 0805 4K7 1%
R810		036-14470-10	RES M/F 0805 4K7 1%
R811		036-14470-10	RES M/F 0805 4K7 1%
R812		036-14470-10	RES M/F 0805 4K7 1%
R813		036-14470-10	RES M/F 0805 4K7 1%
R815		036-15470-10	RES M/F 0805 47K 1%
R816		036-16150-00	RES M/F 0805 150K 5%
R818		036-14470-10	RES M/F 0805 4K7 1%
R819		036-14470-10	RES M/F 0805 4K7 1%
R821		036-15470-10	RES M/F 0805 47K 1%
R822		036-15470-10	RES M/F 0805 47K 1%
R824		036-14220-00	RES M/F 0805 2K2 5%
R825		036-14220-00	RES M/F 0805 2K2 5%
R826		036-14220-00	RES M/F 0805 2K2 5%
R827		036-14220-00	RES M/F 0805 2K2 5%
R828		036-14220-00	RES M/F 0805 2K2 5%
R829		036-14220-00	RES M/F 0805 2K2 5%
R830		036-14220-00	RES M/F 0805 2K2 5%
R831		036-14220-00	RES M/F 0805 2K2 5%
R832		036-14220-00	RES M/F 0805 2K2 5%
R833		036-14220-00	RES M/F 0805 2K2 5%
R835		036-14220-00	RES M/F 0805 2K2 5%
R836		036-14220-00	RES M/F 0805 2K2 5%
R837		036-14220-00	RES M/F 0805 2K2 5%
R840		036-14220-00	RES M/F 0805 2K2 5%
R841		036-14220-00	RES M/F 0805 2K2 5%
R842		036-14220-00	RES M/F 0805 2K2 5%
R843		036-14220-00	RES M/F 0805 2K2 5%
R845		036-13470-00	RES M/F 0805 470E 5%
R847		036-13470-00	RES M/F 0805 470E 5%
R848		036-14470-10	RES M/F 0805 4K7 1%
R849		036-13470-00	RES M/F 0805 470E 5%
R850		036-13470-00	RES M/F 0805 470E 5%
R853		036-14470-10	RES M/F 0805 4K7 1%
R854		036-14470-10	RES M/F 0805 4K7 1%
R855		036-14470-10	RES M/F 0805 4K7 1%
R859		036-16150-00	RES M/F 0805 150K 5%
R861		036-16150-00	RES M/F 0805 150K 5%
R863		036-16150-00	RES M/F 0805 150K 5%
R865		036-16100-10	RES M/F 0805 100K 1%
R867		036-16100-10	RES M/F 0805 100K 1%
R871		036-15470-10	RES M/F 0805 47K 1%
R872		036-14470-10	RES M/F 0805 4K7 1%
R873		036-15330-10	RES M/F 0805 33K 1%
R874		036-14470-10	RES M/F 0805 4K7 1%
R875		036-15470-10	RES M/F 0805 47K 1%
R876		036-14470-10	RES M/F 0805 4K7 1%
R877		036-14470-10	RES M/F 0805 4K7 1%
R879		036-15100-10	RES M/F 0805 10K 1%
R880		036-14470-10	RES M/F 0805 4K7 1%
R881		036-14470-10	RES M/F 0805 4K7 1%
R882		036-13470-00	RES M/F 0805 470E 5%
RV210		040-05100-23	POT 10K LOG PCB 15MM SLOT SFT
RV220		042-05500-05	RES PRESET SMD 50K CER 4MM SQ
RV501		042-05200-05	RES PRESET SMD 20K CER 4MM SQ
RV502		042-05100-05	RES PRESET SMD 10K CER 4MM SQ
RV805		042-05200-05	RES PRESET SMD 20K CER 4MM SQ
SK200		240-10000-05	CONN SMD SKT 8W 2R M-MATCH
SK205		240-02020-05	SKT STEREO PHONE JACK PCB MTG
SK805		240-10000-07	CONN SMD SKT 16W 2R M-MATCH
SK810		240-04020-42	SKT 44 PIN SMD PLCC
SW230		232-00010-26	SWITCH PUSH SPDT R-ANG PCB MTG
T210		053-00010-17	XFMR T4030 LINE MATCH POTCORE
T610		050-15119-52	COIL SMD 680uH XFMR 5119-T052
#TL300	10	051-11000-00	COAX RES 1000MHZ 6X6 SMD
#TL300	15	051-11000-00	COAX RES 1000MHZ 6X6 SMD
#TL300	20	051-11050-00	COAX RES 1050MHz 6x6 SMD
#TL300	25	051-11050-00	COAX RES 1050MHz 6x6 SMD
#TL300	30	051-11100-00	COAX RES 1100MHZ 6X6 SMD
#TL300	35	051-11100-00	COAX RES 1100MHZ 6X6 SMD

T881 Mechanical & Miscellaneous Parts (220-01575-02)

IPN	Legend	Description
070-01001-00	1	D-RANGE 15 WAY COMPL T800 PL100
220-01575-02		PCB T881 SERIES II 800-960M TX
232-00020-26	2	BUTTON 232-00010-26 SWITCH
240-02100-06	3	SKT COAX N TYPE PNL MTG OP-TER
240-04020-62		SKT 2 W RECEP SHORTING LINK PL201/202
303-11169-04	4	CHASSIS PAINTED T800 SER II
303-23118-00	5	COVER A3M2247 D RANGE T855/7
303-50074-00	6	CLIP SPRING XSTR CLAMP T857
308-01007-01	7	HANDLE BS SII 2 WASHERS INC
308-13133-01	8	HEATSINK T881 MODULE
312-01052-02	9	LID TOP T800 SER II PTND
312-01053-02	10	LID BOTTOM T800 SER II PNTD
316-06621-00	11	PNL FRT TX T800 SERIES II
319-40015-00	12	STRAP EARTHING T881
349-00020-36	13	SCREW TT M3X8m PANTORX BLK
349-00020-55	22	SCRW M3X8 P/P T/T BLCKZNC CHRM
349-20430-00	14	SCRW T/T M4X12MM P/TORX BLK
349-20450-00	15	SCRW T/T M4X20MM P/TORX BLK
352-00010-04	16	NUT M2.5 MACH HEX ST BZ
352-00010-29	17	NUT M4 NYLOC HEX
353-00010-10	18	WSHR M3 FLAT 7MMX0.6MM ST BZ
353-00010-24	19	WSHR M4x8mm Flat ST BZ
362-00010-33	20	GROMMET LED MTG 3MM
399-00010-51		BAG PLASTIC 75X100MM

Note

The following electrical components are also included in the mechanical assembly drawing.

000-00033-12	21	XSTR BD242 TO-220 PNP ISOLTD Q620

replace A4 pages C6.2.11/C6.2.12 with A3 pages C6.2.11/C6.2.12

replace A4 pages C6.2.11/C6.2.12 with A3 pages C6.2.11/C6.2.12

T881 Grid Reference Index (IPN 220-01575-02)

How To Use This Grid Reference Index

The first digit in the PCB layout reference is a "1" or "2", indicating the top or bottom side layout respectively, and the last two characters give the location of the component on that diagram.

The first digit in the circuit diagram reference is the sheet number, and the last two characters give the location of the component on that sheet.

Device	PCB	Circuit
C201	1:C1	2-B3
C202	1:C1	2-C3
C204	1:B3	2-F3
C205	1:A3	2-E3
C207	1:C7	2-G0
C209	1:C6	2-T0
C210	1:C7	2-J0
C211	1:B7	2-H3
C213	1:A6	2-C5
C215	1:A6	2-D5
C217	1:B6	2-C5
C219	1:B6	2-C5
C221	1:C5	2-L8
C223	1:D4	2-J6
C225	1:B3	2-N7
C227	1:B4	2-O6
C229	1:B4	2-O6
C230	1:B4	2-J0
C232	1:B4	2-P6
C233	1:B3	2-P7
C235	1:B5	2-N5
C237	1:B4	2-N5
C239	1:B4	2-O4
C240	1:D2	2-T6
C241	1:B4	2-P5
C242	1:B4	2-P5
C243	1:B4	2-R5
C245	1:C5	2-B5
C247	1:C5	2-B5
C249	1:D4	2-E6
C251	1:C4	2-C9
C253	1:D3	2-E8
C255	1:D3	2-E8
C257	1:D4	2-C8
C259	1:C7	2-J2
C260	1:C8	2-I0
C261	1:C7	2-K2
C263	1:D6	2-M2
C265	1:D8	2-M1
C267	1:C8	2-O2
&C269	1:C8	2-O2
&C271	1:C8	2-P2
C273	1:C8	2-P2
C275	1:C3	2-E7
C277	1:B4	2-I4
C279	1:B5	2-I4
C281	1:B5	2-I3
C283	1:B5	2-J2
C285	1:C7	2-K2
C287	1:C6	2-L3
&C289	1:C8	2-Q2
C291	1:C7	2-T2
C293	1:D7	2-T2
%C294	1:C7	2-U2
%C295	1:C7	2-U2
C300	1:F3	3-B9
C301	1:E4	3-B5
C302	1:E4	3-B4
C303	1:E4	3-B2
C304	1:E4	3-B4
C305	1:E4	3-B4
C306	1:F5	3-M1
C307	1:E4	3-B2
%C308	1:F3	3-C9
C309	1:E4	3-C4
%C310	1:F3	3-C9
C311	1:F3	3-D9
%C312	1:E4	3-D2
%C314	1:E4	3-D2
C315	1:E4	3-D1
C316	1:F4	3-D8
C317	1:E4	3-D4
C318	1:E4	3-D1
C319	1:E4	3-D1
C321	1:F4	3-E8
C322	1:E4	3-E7
C323	1:E4	3-E1
C324	1:F3	3-E8
C325	1:F4	3-E7
C326	1:E4	3-E7
C328	1:E4	3-F7
C329	1:E3	3-F7
C330	1:E3	3-F7
C331	1:F5	3-F5
C332	1:E5	3-F3
%C333	1:E3	3-G8
C335	1:E3	3-G7
C336	1:F6	3-G0
C337	1:F5	3-F5
C338	1:E5	3-F4
C339	1:F6	3-G1
C340	1:E3	3-G8
C342	1:E4	3-G6
C343	1:E3	3-G7
C345	1:F5	3-G5
C346	1:E3	3-H7
C347	1:E3	3-H7
C349	1:E5	3-G5
C350	1:E4	3-H7
C351	1:E5	3-H3
C352	1:F5	3-H1
C353	1:E5	3-H4
C356	1:E5	3-H4
C357	1:E3	3-J7
C359	1:F4	3-J2
C360	1:F6	3-H5
C361	1:F4	3-K2
C363	1:F5	3-K0
C364	1:F5	3-J5
C365	1:F5	3-K1
C366	1:F5	3-K0
C367	1:F4	3-K1
C368	1:F5	3-K0
C370	1:E5	3-J3
C371	1:F5	3-K0
C372	1:E6	3-J5
C373	1:E6	3-J4
C374	1:E5	3-J3
C375	1:E5	3-K3
C377	1:E5	3-K4
C378	1:F4	3-L1
C379	1:F4	3-L2
C380	1:E6	3-K5
C381	1:F7	3-P3
C382	1:F4	3-L1
C383	1:F5	3-M1
C384	1:F4	3-M0
C385	1:E4	3-M0
C386	1:E4	3-M0
C387	1:E6	3-L3
C388	1:F3	3-N7
C389	1:E6	3-L4
C390	1:F7	3-Q3
C391	1:E4	3-N0
C392	1:F3	3-N7
C393	1:F3	3-P8
C394	1:E6	3-M3
C395	1:F6	3-N4
C396	1:F6	3-N3
C397	1:F7	3-R3
C398	1:F7	3-P4
C399	1:F7	3-Q3
C400	1:N7	4-D3
C401	1:G8	4-E4
C402	1:J9	4-E3
C403	1:K9	4-E4
C404	1:J9	4-D3
C406	1:K7	4-D6
C407	1:G7	4-C4
C408	1:G7	4-D4
C409	1:J9	4-D4
C410	1:J7	4-C3
C411	1:N7	4-C3
C412	1:G8	4-D3
C413	1:L7	4-F3
C415	1:L8	4-F3
C416	1:M9	4-H3
C417	1:M8	4-H3
C418	1:N7	4-J5
C419	1:N7	4-K5
C420	1:N8	4-K5
C421	1:G8	4-L5
C422	1:L9	4-L5
C423	1:G7	4-M5
C424	1:G7	4-M5
C425	1:G8	4-J3
C426	1:L9	4-J3
C427	1:G7	4-K3
C428	1:G7	4-K3
C430	2:L8	4-G5
C432	1:M7	4-G6
C450	1:H8	4-N8
C451	1:H8	4-P8
C452	1:H7	4-P8
C453	1:G7	4-P8
C500	1:H5	5-B8
C501	1:H5	5-B7
C502	1:G6	5-C8
C503	1:H5	5-C8
C505	1:H5	5-D8
C506	1:G5	5-E7
C507	1:K5	5-K0
C508	1:J6	5-G2
C510	1:K5	5-K0
C511	1:H6	5-F8
C512	1:H6	5-H2
C513	1:G5	5-G8
C515	1:K5	5-L0
C516	1:K6	5-M0
%C517	1:J6	5-K1
C518	1:G5	5-H8
C519	1:K6	5-D6
C520	1:G6	5-J8
C521	1:K6	5-M0
C523	1:J5	5-J4
C525	1:J5	5-J3
C526	1:J5	5-K3
C527	1:J5	5-J3
%C528	1:J5	5-J1
C530	1:H6	5-K6
C531	1:H6	5-K5
C532	1:J5	5-L3
C535	1:K5	5-L5
C537	1:K5	5-M5
C538	1:K5	5-L4
C541	1:K6	5-P3
C542	1:H6	5-A0
C543	1:J6	5-P5
C545	1:J6	5-P4
C546	1:J5	5-B0
C547	1:K5	5-M5
C548	1:G6	5-Q4
C551	1:G6	5-R4
C559	1:J6	5-P4
C605	1:L6	6-C8
C607	1:L6	6-D8
C608	1:L6	6-D8
C610A	1:M5	6-F8
C610B	1:L5	6-F8
C611A	1:M6	6-H8
C611B	1:M5	6-H8
C623	1:N6	6-P7
C625	1:M6	6-Q6
C626	1:M6	6-Q6
C627	1:M6	6-R6
C628	1:M6	6-Q6
C629	1:M6	6-R6
C630	1:M5	6-J5
C631A	1:N5	6-L6
C634	1:N5	6-L5
C636	1:M5	6-M5
C638	1:M5	6-N5
C640	1:M5	6-R4
C655	1:M4	6-C1
C660	1:L5	6-Q1
C665	1:L5	6-P1

Device	PCB	Circuit
C670	1:L5	6-N1
C673	1:L5	6-K2
C677	1:L6	6-K1
C681	1:L6	6-J2
C684	1:L6	6-H2
C687	1:L6	6-J1
C690	1:L6	6-J1
C693	1:L6	6-H1
C700	1:K4	7-A8
C703	1:J3	7-B7
C706	1:J2	7-B5
%C707	1:K4	7-B8
C708	1:J2	7-D9
C709	1:K4	7-D9
C710	1:J3	7-D8
C711	1:J3	7-B6
C712	1:H2	7-D7
%C713	1:H2	7-E6
C714	1:J2	7-E8
C719	1:J4	7-F8
C720	1:J4	7-F8
C722	1:J4	7-G8
C724	1:J4	7-H6
C725	1:J3	7-J6
C726	1:J4	7-J6
C727	1:J3	7-K8
C729	1:J3	7-M8
%C733	1:H2	7-E3
C735	1:J2	7-A1
C736	1:J2	7-B1
C740A	1:H2	7-B4
C740B	1:H2	7-B3
C741A	1:H2	7-C4
C741B	1:G2	7-C3
C742A	1:H2	7-D4
C742B	1:H3	7-D3
C743	1:H2	7-B1
C745	1:G3	7-D1
C750	1:G4	7-K0
C757	1:G4	7-F4
C759	1:G4	7-F5
C761	1:G3	7-K4
C762	1:G3	7-K4
C764	1:H3	7-K2
C765	1:G3	7-K2
C767	1:H3	7-L3
C769	1:H4	7-M4
C770	1:H4	7-N4
C772	1:G4	7-M2
C774	1:H4	7-N2
C776	1:H4	7-N2
C782	1:G2	7-P1
C784	1:G2	7-Q1
C785	1:G3	7-P1
C786	1:G2	7-R1
C788	1:G3	7-P0
C790	1:G3	7-Q0
C792	1:G4	7-R0
C810	1:L3	8-H8
C812	1:L2	8-D5
C813	1:K2	8-G5
C822	1:N2	8-Q1
C823	1:M3	8-Q1
C824	1:M2	8-Q1
C826	1:N3	8-P0
C827	1:N3	8-P1
C828	1:N3	8-P0
C830	1:N3	8-J0
C838	1:N4	8-N0
C841	1:N2	8-K2
C844	1:M2	8-K2
C880	1:M2	8-K3
C910	1:P8	9-D5
C920	1:P7	9-E5
C930	1:P7	9-F5
C940	1:P6	9-G5

Device	PCB	Circuit
CV300	1:E3	3-J7
%D111	1:P5	1-M0
%D111A	1:P5	1-R1
%D205	1:B2	2-D3
%D210	1:B2	2-D3
D211	1:B7	2-U6
D212	1:B7	2-T5
D220	1:B4	2-R5
D220	1:B4	2-R7
D230	1:B7	2-U5
D240	1:D4	2-E7
D240	1:D4	2-E7
D250	1:D3	2-E8
D250	1:D3	2-E8
D260	1:C2	2-B8
D260	1:C2	2-C8
D270	1:C2	2-C7
D270	1:C2	2-B7
D300	1:E3	3-L8
D301	1:E3	3-L7
%D302	1:E3	3-L7
%D303	1:E3	3-L7
D305	1:E3	3-M7
D307	1:E3	3-M7
D308	1:E6	3-N3
D308	1:E6	3-P3
D400	1:M8	4-H4
D401	1:N8	4-J5
D610	1:N6	6-N7
D610	1:N6	6-N7
D620	1:N4	6-B1
D620	1:N4	6-B1
D630	1:M5	6-E2
D630	1:M5	6-E2
D635A	1:M5	6-F2
D640	1:L5	6-N1
D640	1:L5	6-N1
D645	1:M5	6-R4
D710	1:J3	7-L8
D710	1:J3	7-L8
D720	1:J3	7-N8
D720	1:J3	7-N8
D730	1:H3	7-J1
D732	1:H3	7-K2
D810	1:M2	8-B2
IC210	1:C7	2-J0
IC210	1:C7	2-U2
IC210	1:C7	2-G0
IC210	1:C7	2-K1
IC210	1:C7	2-K2
IC220	1:C6	2-T2
IC220	1:C6	2-L3
IC220	1:C6	2-T0
IC230	1:B4	2-O5
IC230	1:B4	2-I0
IC230	1:B4	2-Q5
IC230	1:B4	2-I2
IC230	1:B4	2-I4
IC240	1:C4	2-J5
IC250	1:D3	2-D7
IC260	1:C8	2-T3
IC260	1:C8	2-H0
IC260	1:C8	2-S2
IC260	1:C8	2-P2
IC260	1:C8	2-N2
#IC400	2:K8	4-E4
IC500	1:H6	5-K5
IC500	1:H6	5-A0
IC500	1:H6	5-K4
IC510	1:J5	5-B0
IC510	1:J5	5-K2
IC510	1:J5	5-J3
IC510	1:J5	5-M5
IC510	1:J5	5-N4

Device	PCB	Circuit
IC610	1:L5	6-G8
IC630	1:N5	6-K5
IC640	1:M5	6-M5
IC640	1:M5	6-Q4
IC640	1:M5	6-E1
IC650	1:L5	6-C4
=IC700	1:K3	7-A8
IC710	1:J2	7-C6
IC710	1:J2	7-D8
IC710	1:J2	7-D5
IC710	1:J2	7-D7
IC710	1:J2	7-D6
IC710	1:J2	7-C5
IC710	1:J2	7-C6
IC720	1:H3	7-L7
IC720	1:H3	7-H0
IC720	1:H3	7-K7
IC720	1:H3	7-E8
IC720	1:H3	7-M7
IC720	1:H3	7-N6
IC720	1:H3	7-J0
IC730	1:J4	7-H8
IC730	1:J4	7-G7
IC740	1:H2	7-D1
IC750	1:H4	7-M3
IC750	1:H4	7-G5
IC750	1:H4	7-K0
IC810	1:M3	8-G5
IC820	1:L4	8-K5
IC830	1:N3	8-L0
IC830	1:N3	8-H0
IC830	1:N3	8-L0
IC830	1:N3	8-L1
IC830	1:N3	8-Q0
L300	1:F6	3-F0
L301	1:E3	3-H8
L302	1:E3	3-H8
L303	1:E5	3-H4
L304	1:F3	3-K7
L305	1:F3	3-K7
L307	1:E5	3-J3
L308	1:E6	3-K4
L309	1:F3	3-M7
L310	1:F3	3-N7
L311	1:E4	3-N0
L312	1:E6	3-N3
L314	1:F6	3-N4
L315	1:F7	3-P4
L316	1:E7	3-P3
L317	1:E7	3-Q3
L318	1:E7	3-Q3
L401	1:J8	4-E4
L402	2:M8	4-G5
L403	1:M8	4-H4
L404	1:N7	4-J6
%L405	1:M7	4-G5
L406	1:G7	4-C4
L407	1:G7	4-M6
L408	1:G7	4-K4
L450	1:H8	4-N8
L451	1:G7	4-P8
L601	1:L6	6-D8
L602	1:M6	6-R6
L910	1:P8	9-E6
L920	1:P7	9-E6
L930	1:P6	9-F6
LINK1	2:B2	2-E3
LINK2	2:A2	2-E3
P100	1:Q6	1-R8
P150	1:P2	1-Q4
P160	1:P2	1-Q4
P170	1:P2	1-Q3
P204	1:D1	2-A3

Device	PCB	Circuit
P208	1:D1	2-A3
P215	1:D4	2-A7
P217	1:D4	2-A7
P219	1:D2	2-A8
P225	1:D2	2-A7
P230	1:B5	2-M9
P231	1:D7	2-M9
P233	1:C1	2-F3
P235	1:C1	2-F3
P237	1:B7	2-G3
P239	1:B6	2-M9
P240	1:B7	2-M9
P245	1:B8	2-S5
P249	1:B7	2-V5
P251	1:B7	2-V5
P255	1:C4	2-L1
P257	1:C2	2-L1
P259	1:B8	2-L0
P261	1:B8	2-L0
P263	1:B1	2-L0
P267	1:C9	2-Q2
P269	1:C9	2-S3
P271	1:C9	2-R2
P273	1:C9	2-S3
P275	1:C7	2-U2
P290	1:D5	2-R1
P291	1:D5	2-S1
P805	1:M2	8-A2
P810	1:L3	8-B6
P820	1:L4	8-J8
P825	1:L4	8-J8
P830	1:L4	8-J8
P835	1:L4	8-J7
P840	1:L4	8-J7
PL100	1:P3	1-F0
PL201	1:C4	2-K5
PL202	1:C3	2-K4
Q210	1:B6	2-D5
Q220	1:B4	2-O6
Q230	1:B4	2-P7
Q240	1:B7	2-U6
Q250	1:B7	2-U5
Q260	1:C4	2-C9
Q270	1:D2	2-D7
Q300	1:F4	3-C7
Q301	1:F4	3-C7
Q302	1:E4	3-C3
Q303	1:E4	3-C2
Q304	1:F4	3-D8
Q305	1:F4	3-E8
Q307	1:F5	3-F4
Q308	1:E5	3-F3
Q309	1:E3	3-H7
Q310	1:F5	3-H1
Q311	1:E5	3-G4
Q312	1:F5	3-J0
Q313	1:E6	3-J4
Q314	1:F5	3-K0
Q316	1:F4	3-L1
Q317	1:F4	3-L2
Q318	1:E6	3-K4
Q319	1:E6	3-K3
Q321	1:F4	3-M0
Q322	1:F4	3-L1
Q500	1:H5	5-C7
Q501	1:H5	5-D8
Q502	1:H6	5-E8
Q503	1:G5	5-E7
Q505	1:H6	5-H2
Q506	1:G6	5-F8
Q507	1:K5	5-L0
Q508	1:J6	5-J2
Q510	1:G5	5-G8
Q511	1:K6	5-M0

Device	PCB	Circuit
Q512	1:G5	5-H7
Q513	1:G6	5-J7
Q515	1:K6	5-N0
Q516	1:J5	5-L3
Q517	1:J6	5-Q4
Q610	1:L6	6-D8
Q620	1:N6	6-P6
Q630	1:M6	6-N5
Q660	1:L5	6-M1
Q670	1:L6	6-K1
Q710	1:J3	7-K8
Q720	1:J4	7-K8
Q730	1:J3	7-M8
Q740	1:J3	7-M8
Q750	1:G4	7-F4
Q760	1:H3	7-J3
Q770	1:H3	7-J1
Q775	1:H3	7-K3
Q780	1:H3	7-K3
Q785	1:H3	7-K2
Q790	1:H3	7-M3
Q795	1:G3	7-P0
Q810	1:M2	8-C3
Q820	1:L2	8-C5
Q830	1:L2	8-C6
Q840	1:L2	8-E5
Q850	1:M2	8-E5
Q860	1:L4	8-B3
%R150	1:P2	1-R4
R160	1:P2	1-R3
%R200	1:B2	2-C3
R201	1:B3	2-E3
R202	1:C1	2-F3
%R203	1:B3	2-C2
R204	1:C7	2-F0
R205	1:C7	2-H0
R206	1:B6	2-D6
R207	1:B6	2-D5
R208	1:B6	2-C5
R209	1:B6	2-C5
R210	1:B6	2-D5
R211	1:B2	2-E3
R212	1:C4	2-I6
R213	1:D4	2-L8
R214	1:D4	2-L8
R215	1:C4	2-J6
R216	1:B4	2-N7
R217	1:B4	2-P7
R218	1:B3	2-P7
R219	1:B3	2-Q7
R220	1:B2	2-E3
R221	1:B7	2-U6
R223	1:B4	2-N5
R224	1:B4	2-N5
R225	1:B4	2-O5
R226	1:B4	2-O4
R227	1:B4	2-O4
R228	1:A2	2-E3
R229	1:A4	2-P6
R230	1:B4	2-P6
R231	1:B4	2-P5
R232	1:B4	2-P5
R233	1:B4	2-P5
R235	1:B4	2-Q5
R237	1:B7	2-U6
R238	1:B7	2-U6
R239	1:B8	2-T5
R241	1:B8	2-T5
R242	1:B7	2-T5
R244	1:C6	2-B5
R245	1:D4	2-J6
R247	1:C3	2-B9
R248	1:C3	2-C9
R249	1:D4	2-C9
R251	1:C4	2-K6
R253	1:C7	2-K2
R254	1:C6	2-K2
R255	1:C7	2-L1
R256	1:D8	2-M2
R257	1:D8	2-M1
R258	1:D8	2-M1
R259	1:D8	2-M1
R260	1:C8	2-M2
R262	1:D8	2-N2
R263	1:D8	2-N2
&R264	1:C8	2-O2
&R265	1:C8	2-O2
&R266	1:C8	2-P2
R267	1:C8	2-Q2
R268	1:C2	2-C7
R269	1:C2	2-C8
R270	1:C3	2-D8
R271	1:C3	2-D7
R272	1:C4	2-I4
R273	1:B4	2-I5
R274	1:B5	2-I4
R275	1:B5	2-J5
R277	1:B5	2-I3
R278	1:B5	2-I2
R279	1:B5	2-J2
R280	1:B5	2-J2
R282	1:D7	2-J3
R283	1:C7	2-J3
R284	1:C7	2-K2
R285	1:C9	2-R2
R286	1:C7	2-K3
R287	1:C8	2-S2
R288	1:C6	2-L3
R289	1:C9	2-R2
&R290	1:C8	2-Q2
R291	1:C9	2-R2
R292	1:C9	2-S3
R293	1:C9	2-S3
R294	1:D8	2-T3
R295	1:D8	2-U3
R296	1:D6	2-T2
R297	1:C7	2-T2
%R298	1:C7	2-U2
R299	1:C6	2-V2
R300	1:E5	3-B5
%R301	1:F3	3-B9
R302	1:F4	3-C8
R303	1:E4	3-B2
R304	1:E4	3-C5
R305	1:E4	3-C4
R307	1:E5	3-C4
R308	1:E4	3-C2
R309	1:E4	3-C1
R310	1:E4	3-C3
R311	1:F4	3-C7
R312	1:E4	3-C4
R314	1:E4	3-C3
R315	1:E4	3-C2
R316	1:E5	3-C1
%R317	1:E4	3-D4
R318	1:F3	3-D9
R321	1:E4	3-D4
R322	1:E4	3-E3
R323	1:E4	3-E7
R324	1:F3	3-E9
%R325	1:E4	3-E4
R326	1:F3	3-E9
R328	1:F3	3-F8
R329	1:E4	3-F7
R330	1:E4	3-E7
R331	1:F5	3-F6
R332	1:F5	3-G1
R333	1:F5	3-F5
R335	1:F5	3-F4
R336	1:F5	3-G1
R337	1:F6	3-G0
R338	1:E3	3-H7
R339	1:E3	3-H7
R340	1:E3	3-H6
R342	1:E5	3-G4
R343	1:F5	3-H1
R344	1:E5	3-G5
R346	1:E6	3-H6
R347	1:F5	3-J0
R349	1:E5	3-H3
R350	1:E5	3-J3
R351	1:F4	3-K2
R352	1:E5	3-J3
R353	1:E5	3-J5
R354	1:E6	3-J4
R356	1:F4	3-L2
R357	1:F4	3-L1
R358	1:F4	3-L0
%R359	1:F4	3-L0
%R360	1:F4	3-L0
%R361	1:E5	3-K3
R363	1:E6	3-K5
R364	1:E5	3-K4
R365	1:F4	3-M1
%R366	1:E6	3-K5
R367	1:E6	3-L4
R368	1:F3	3-N8
R370	1:E6	3-M3
R371	1:F3	3-N7
R372	1:E6	3-M3
R373	1:E6	3-M3
R374	1:F3	3-P7
R375	1:F3	3-P8
R376	1:F3	3-Q7
R377	1:E6	3-N3
R378	1:F6	3-N4
R379	1:F6	3-N2
R380	1:F7	3-P4
R381	1:E5	3-K3
R390	1:E8	3-R3
R391	1:F8	3-R3
R392	1:E8	3-R3
R399	1:F4	3-M1
R400	1:M8	4-H5
R401	1:N8	4-J4
R410	1:M7	4-F6
R450	2:J7	4-N8
R500	1:H5	5-B7
R501	1:H5	5-B7
R502	1:H5	5-B8
R503	1:H5	5-D8
R505	1:H6	5-G2
R506	1:H6	5-D8
%R508	1:H5	5-D7
R510	1:H6	5-G2
R511	1:H5	5-D8
R512	1:H5	5-D8
%R513	1:H5	5-E8
R515	1:G5	5-E7
R516	1:H6	5-H1
R517	1:K5	5-K0
R518	1:H6	5-E8
R520	1:K5	5-K0
R521	1:K5	5-K0
R522	1:J6	5-H2
R523	1:G6	5-F7
R525	1:G5	5-F8
R526	1:J6	5-J1
R527	1:K5	5-L0
R528	1:J6	5-J1
R530	1:J6	5-J2
R531	1:G5	5-G7
R532	1:J6	5-K2
R533	1:G5	5-G7
R535	1:J6	5-K2
R536	1:K6	5-M0
R537	1:J6	5-K2
R538	1:J6	5-K1
R540	1:K6	5-M0
R541	1:G6	5-H7
R542	1:J5	5-H4
R543	1:J5	5-H4
R544	1:J5	5-H4
%R545	1:J5	5-H4
R546	1:J5	5-G3
R547	1:J5	5-J4
R548	1:J5	5-J4
R550	1:H6	5-K6
R551	1:H6	5-K5
R552	1:H6	5-K6
R553	1:H6	5-K5
R555	1:J5	5-K3
R556	1:J5	5-L3
R558	1:K6	5-L6
R559	1:K5	5-L6
R560	1:K5	5-L5
R565	1:K5	5-L5
R566	1:K5	5-M4
R567	1:K5	5-L2
R568	1:J5	5-N5
R569	1:J5	5-N5
R570	1:K6	5-N3
R571	1:K6	5-N3
R572	1:J6	5-P4
R573	1:J6	5-Q5
R575	1:J6	5-Q4
R576	1:G6	5-R4
R609	1:L6	6-B8
R613	1:L6	6-C8
R615	1:M5	6-F9
R617	1:M5	6-H8
R619	1:N6	6-P7
R621	1:N6	6-P7
R625	1:N6	6-P7
R629	1:M6	6-N6
R633	1:M5	6-P5
R637	1:M5	6-J6
R638	1:M5	6-J6
R640	1:M5	6-Q4
R641	1:N5	6-K5
R645	1:N5	6-L5
R649	1:M5	6-M5
R651	1:L4	6-B4
R652	1:L4	6-B4
R653	1:M5	6-P5
R657	1:M5	6-C1
R661	1:M5	6-D2
R665	1:M5	6-D1
R669	1:M5	6-D2
R673	1:M5	6-D0
R677	1:M4	6-F2
R681	1:L5	6-P1
R685	1:L5	6-L2
R689	1:L6	6-J3
R693	1:L5	6-N1
R696	1:L5	6-N0
R701	1:K4	7-A9
R702	1:K4	7-B9
R703	1:J3	7-B8
=R705	1:K3	7-A7
R706	1:H3	7-B6
R707	1:J3	7-B6
R708	1:J3	7-B6
R709	1:J3	7-D9
R710	1:H2	7-D7
R711	1:J2	7-C5
R712	1:K4	7-E9
R713	1:J4	7-F8
%R715	1:J4	7-H6
R717	1:H4	7-H7
R718	1:J4	7-H7
R719	1:J3	7-J6
R720	1:H3	7-K7

Device	PCB	Circuit
R721	1:J3	7-K9
R722	1:J4	7-K8
R723	1:J3	7-L7
R725	1:J3	7-M7
%R726	1:H3	7-M6
R727	1:J3	7-M9
R728	1:J3	7-M8
R730	1:K2	7-A2
R731	1:K2	7-A2
R732	1:K2	7-A2
R742	1:H2	7-C4
R743	1:H2	7-C4
R744	1:G2	7-D4
R746	1:H3	7-D4
R747	1:H3	7-D4
R748	1:J2	7-A1
R749	1:J2	7-B1
R750	1:H4	7-K0
R752	1:G4	7-F4
R753	1:G4	7-F4
R754	1:G3	7-F4
R756	1:G3	7-F5
R757	1:G4	7-F5
R758	1:H3	7-J4
R759	1:H3	7-J4
R760	1:H3	7-K4
R762	1:H3	7-L4
R763	1:H3	7-L4
R765	1:H3	7-J2
R766	1:G3	7-K3
R767	1:H3	7-K2
R769	1:H3	7-L3
R771	1:H4	7-M3
R772	1:G4	7-M2
R774	1:H4	7-M3
R775	1:H4	7-N2
R780	1:G2	7-P1
R782	1:G3	7-P1
R784	1:G3	7-P1
R785	1:G3	7-Q1
R786	1:G2	7-Q1
R787	1:G2	7-R2
R790	1:G3	7-P0
R791	1:G3	7-Q0
R801	1:M2	8-C3
R802	1:M2	8-C2
R808	1:M2	8-B5
R809	1:L2	8-C6
R810	1:L3	8-C6
R811	1:L2	8-D6
R812	1:L2	8-C5
R813	1:L2	8-C5
R815	1:L2	8-D5
R816	1:L2	8-D5
R818	1:M2	8-E5
R819	1:M2	8-E4
R821	1:L4	8-B3
R822	1:M4	8-C3
R824	1:L4	8-J8
R825	1:L4	8-J8
R826	1:L4	8-J8
R827	1:L4	8-J7
R828	1:L4	8-J7
R829	1:L4	8-Q9
R830	1:L3	8-Q9
R831	1:L3	8-Q9
R832	1:L3	8-Q8
R833	1:L3	8-Q8
R835	1:L3	8-Q8
R836	1:L3	8-Q8
R837	1:L3	8-Q7
R840	1:L3	8-Q7
R841	1:L3	8-Q7
R842	1:L3	8-Q6
R843	1:L3	8-Q6
R845	1:M4	8-R4

Device	PCB	Circuit
R847	1:L2	8-R3
R848	1:L2	8-K3
R849	1:L2	8-R3
R850	1:K2	8-R3
R853	1:M4	8-L6
R854	1:M4	8-L6
R855	1:M2	8-Q0
R859	1:N2	8-P1
R861	1:N2	8-P1
R863	1:N3	8-N1
R865	1:N4	8-N0
R867	1:N3	8-N1
R871	1:N3	8-M2
R872	1:M4	8-L1
R873	1:N3	8-M1
R874	1:N3	8-L0
R875	1:N3	8-M0
R876	1:N3	8-L0
R877	1:N2	8-K2
R879	1:N2	8-K2
R880	1:M4	8-J6
R881	1:M4	8-L6
R882	1:M2	8-K3
RV210	1:B7	2-G3
RV220	1:A4	2-P6
RV501	1:K5	5-L3
RV502	1:K5	5-L1
RV805	1:N4	8-N1
SK200	1:C5	2-R1
SK205	1:B5	2-A5
=SK710	1:K3	7-A7
SK805	1:K3	8-Q9
SK805	1:K3	8-Q7
SK805	1:K3	8-Q5
SK805	1:K3	8-Q7
SK805	1:K3	8-Q8
SK805	1:K3	8-Q7
SK805	1:K3	8-Q8
SK805	1:K3	8-Q6
SK805	1:K3	8-Q8
SK805	1:K3	8-Q6
SK805	1:K3	8-Q6
SK805	1:K3	8-Q9
SK805	1:K3	8-Q6
SK805	1:K3	8-Q9
SK805	1:K3	8-Q7
SK805	1:K3	8-Q8
SK810	1:M3	8-G5
SL201	2:D1	2-B3
SL202	2:D1	2-B3
SL203	2:D2	2-B8
SL204	2:D2	2-B7
SL345	1:F5	3-J1
SL506	1:G5	5-D7
SL810	1:M2	8-B3
SW230	1:B8	2-B9
T210	1:B2	2-C3
T610	1:L6	6-M2
#TL300	1:E3	3-H7
TP206	1:B5	2-M8
TP300	1:F3	3-R8
TP500	1:H5	5-B7
TP501	1:H5	5-B8
TP502	1:H6	5-C8
TP503	1:J6	5-L2
TP505	1:J5	5-H3
TP506	1:J5	5-K3
TP508	1:J6	5-Q4
TP601	1:N5	6-J6

Device	PCB	Circuit
TP602	1:M6	6-Q6
TP603	1:L5	6-Q1
TP604	1:L4	6-L6
TP607	1:L5	6-J9
TP710	1:G4	7-G5
TP715	1:J2	7-C5

Device	PCB	Circuit

Part D T889 Power Amplifier

Caution: **There are no user serviceable components in these power amplifiers. Refer all servicing to your nearest Tait Dealer or Customer Service Organisation.**

This part of the manual is divided into five sections, as listed below. There is a detailed table of contents at the start of each section.

1 T889 General Information

This section provides a brief description of the T889 power amplifier, along with detailed specifications and a list of types available.

The following topics are covered in this section.

replace A4 pages D1.3/D1.4 with A3 pages D1.3/D1.4

replace A4 pages D1.3/D1.4 with A3 pages D1.3/D1.4

1.1 Introduction

The T889 is an FM base station power amplifier designed for single or multichannel operation within the 850 to 870MHz frequency range. The rated output power capability is 20 to 70W.

The PA comprises a broad band, two stage drive amplifier whose output is split to drive four separate output stages. The outputs from these final stages are then recombined and filtered before being fed to the output socket. This type of balanced output stage offers two advantages over single ended types:

- improved intermodulation performance in the presence of high signal levels from adjacent transmitters;
- enhanced reliability: if one of the four output stages fails, the transmitter can still produce half its rated power.

VSWR and thermal protection are incorporated into the basic design, while monitoring and alarm signals are available for both forward and reverse power. The output power is adjustable from the front panel.

The main PCB is mounted directly on a die-cast chassis/heatsink. For long-term reliability, five high quality, low loss Teflon PCBs are sweated to the main PCB in areas of high RF current. Extensive use is also made of the latest surface mount technology.

Forced air cooling for the heatsink is provided on the T889 by a fan, which is activated whenever the transmitter is keyed. Thermal sensors will also activate the fan automatically if the internal temperature reaches an unacceptable level.

The T889 has a width of 120mm and occupies a double space in a Tait rack frame, which has the ability to accommodate up to seven standard modules.

1.2 Specifications

1.2.1 Introduction

The performance figures given are minimum figures, unless otherwise indicated, for equipment operating at standard room temperature (+22°C to +28°C) and standard test voltage (13.8V DC).

Ambient temperature is defined as the temperature of the air at the input to the cooling fan mounted on the heatsink.

Where applicable, the test methods used to obtain the following performance figures are those described in the EIA specification. Refer to Section 1.2.3 for details of test standards.

Details of test methods and the conditions which apply for Type Approval testing in all countries can be obtained from Tait Electronics Ltd.

1.2.2 General

Frequency Range	.. 850-870MHz
Power Output:	
Rated Power	.. 70W
Range Of Adjustment	.. 20 to 100W (typical)
Input Power	.. 4-5W
Duty Cycle Rating	.. 70W continuous to +60°C ambient temperature .. 100W continuous to +25°C ambient temperature .. 100W @ 55% duty cycle to +60°C ambient temperature
Intermodulation (PA with output isolator)	.. -70dBc or -40dBi[1] with 25dB isolation & interfering signal of -30dBc (ETS 300 086)
Mismatch Capability:	
Ruggedness	.. refer to your nearest Tait Dealer or Customer Service Organisation
Stability	.. 5:1 VSWR (all phase angles)

1. dBi denotes the level of intermodulation product relative to the interfering signal.

Supply Voltage:

Operating Voltage	..	10.8 to 16V DC
Standard Test Voltage	..	13.8V DC
Polarity	..	negative earth only
Polarity Protection	..	crowbar diode

Maximum Supply Current (@ 100W):

Standby	..	50mA
Transmit	..	27A (22A typical @ 850MHz)

Operating Temperature Range	..	-30°C to +60°C ambient temperature

Dimensions:

Height	..	183mm
Width	..	120mm
Length	..	340mm

Weight	..	3.5kg

1.2.3 Test Standards

Where applicable, this equipment is tested in accordance with the following standards.

1.2.3.1 European Telecommunication Standard

ETS 300 086 January 1991

Radio equipment and systems; land mobile service; technical characteristics and test conditions for radio equipment with an internal or external RF connector intended primarily for analogue speech.

1.2.3.2 Telecommunications Industry Association

ANSI/TIA/EIA-603-1992

Land mobile FM or PM communications equipment measurement and performance standards.

1.3 Product Codes

The three groups of digits in the T880 Series II product code provide information about the model, type and options fitted, according to the conventions described below.

The following explanation of T880 Series II product codes is not intended to suggest that any combination of features is necessarily available in any one product. Consult your nearest Tait Dealer or Customer Service Organisation for more information regarding the availability of specific models, types and options.

Model

The Model group indicates the basic function of the product, as follows:

T88X-XX-XXXX	T885 receiver T881 5W transmitter T889 70W power amplifier

Type

The Type group uses two digits to indicate the basic RF configuration of the product.

The first digit in the Type group designates the frequency range:

T88X-**X**X-XXXX	'1' for 800-870MHz '2' for 860-910MHz '3' for 890-960MHz

The second digit in the Type group indicates the channel spacing and is not applicable to power amplifiers:

T88X-X**X**-XXXX	'0' for all power amplifiers

Options

T88X-XX-**XXXX**	The Options group uses four digits and/or letters to indicate any options that may be fitted to the product. This group is currently not used for the T889 power amplifier.

1.4 Standard Product Range

The following table lists the range of standard T889 types (i.e. no options fitted) available at the time this manual was published. Consult your nearest Tait Dealer or Customer Service Organisation for more information.

Frequency Range (MHz)	850-870
PA Type: T889-	10

You can identify the PA type by checking the product code printed on a label on the rear of the heatsink (Figure 1.1 in Part A shows typical labels).

2 T889 Circuit Operation

This section provides a basic description of the circuit operation of the T889 PA.

Refer to Section 5 where the parts lists, grid reference index and diagrams will provide detailed information on identifying and locating components.

The following topics are covered in this section.

2.1 Introduction

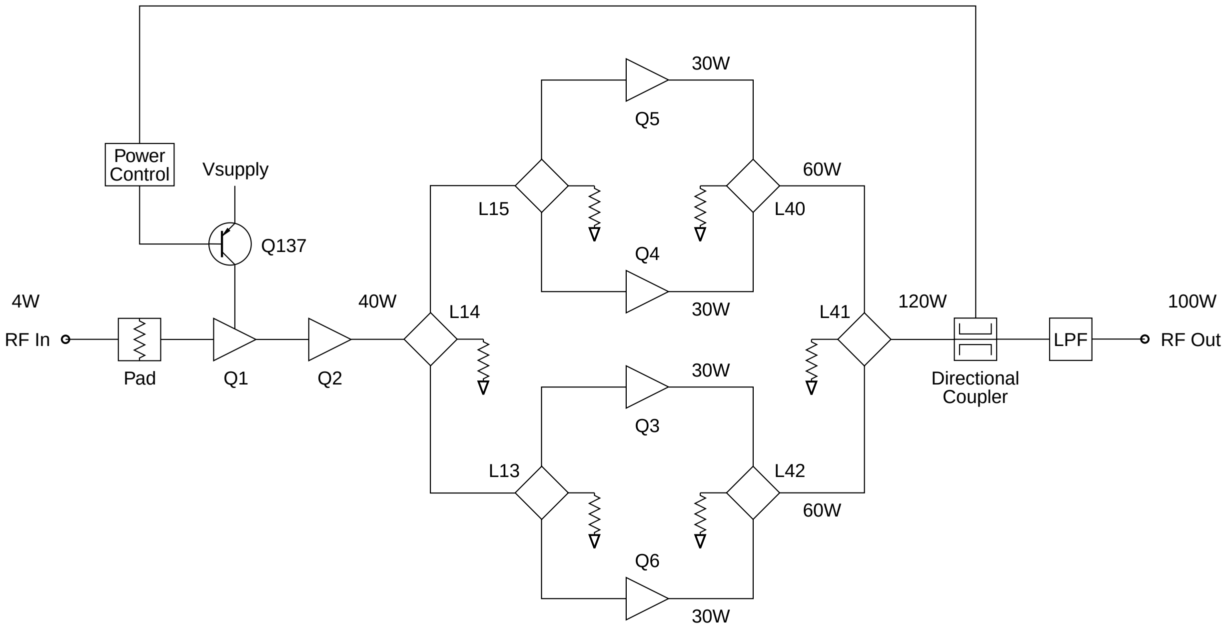


Figure 2.1 T889 High Level Block Diagram

The T889 comprises a three stage RF power amplifier with extensive control circuitry. The final stage is composed of four transistors (Q3, Q4, Q5 & Q6) whose outputs are combined to provide the rated output power.

The configuration of each of the main circuit blocks may be seen on a functional level in Figure 2.1.

2.2 RF Circuitry

(Refer to the RF section circuit diagram in Section 5.)

The driver stage of the T889 consists of a two stage transistor amplifier (Q1, Q2) which delivers a minimum of 40W. This signal is split via three 3dB couplers (L13, L14 & L15) and used to drive the four final amplifiers (Q3, Q4, Q5 & Q6). These outputs are recombined by L40, L41 & L42 and passed to the antenna socket via the directional coupler and low pass filter.

The directional coupler senses forward and reflected power, which is rectified (DCIC1, DCIC2) and passed to the control circuitry for metering, alarm and power control purposes.

Power control is via a series pass transistor (Q137), which controls the supply voltage on the collector of the driver transistor (Q1).

2.3 Control Circuitry

(Refer to the control section circuit diagram in Section 5.)

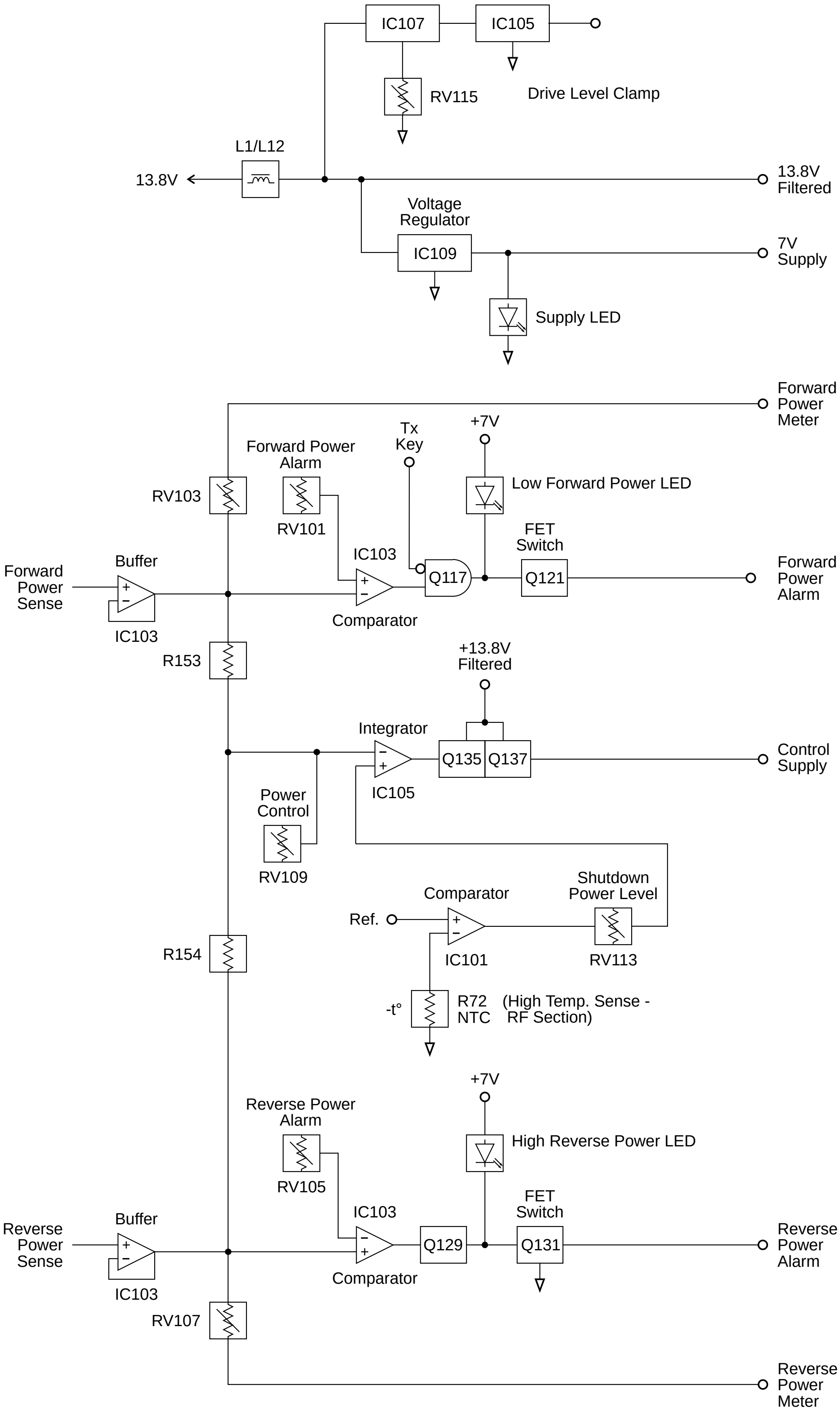


Figure 2.2 T889 Control Circuitry Block Diagram

2.3.1 Power Control

The DC voltages from the directional coupler representing forward and reflected power are buffered by the two voltage followers, IC103 pins 1, 2 & 3 and pins 8, 9 & 10. Their outputs are summed at an integrator (IC105 pins 1, 2 & 3), which drives the series pass control element (Q137).

Forward and reflected power are summed so that, under high output VSWR, the power control turns the PA down. This is because the control loop adjusts for the same DC voltage from the directional coupler that would have been present if there were no reflected power.

2.3.2 Driver Power Level

The maximum output power of the T889 can be limited by placing a ceiling on the driver output power level using RV115 (accessible through the side cover). For example, if RV115 is set for a maximum output power of 90W, the range of adjustment using RV109 (front panel power adjust) will be 20 to 90W.

Note: You must make this adjustment at the operating frequency of the PA. If you change the operating frequency, you must readjust RV115 to clamp the power at the new frequency.

⚠ ***Caution:*** **You must set the driver power level clamp (RV115) according to the operational output power and ambient temperature, as described in** **Section 3.3****. The unit may be damaged if RV115 is not set correctly.**

2.3.3 Thermal Protection

At excessively high temperatures, the output power will automatically reduce to a preset level (set by RV113), thus preventing the PA from overheating.

A thermistor controlled voltage divider (R168, R72) applies a voltage to a comparator with hysteresis (IC101 pins 8, 9 & 10).

The output current from the comparator is summed into the power control network via RV113 so that the power level to which the PA must turn down may be set.

2.3.4 Forward And Reverse Power Alarms

If forward power drops below, or reverse power rises above, presettable limits, alarms may be triggered.

The alarm outputs are open drain configuration and are low under normal conditions (i.e. forward and reverse power levels are normal).

IC103 pins 12, 13 & 14 and pins 5, 6 & 7 form comparators with thresholds adjusted via RV101 and RV105 respectively. The inputs are from the forward and reverse power signals from the directional coupler, buffered by IC103 pins 1, 2 & 3 and pins 8, 9 & 10. Thus, the power levels at which the forward and reverse power alarms are triggered are defined by RV101 and RV105 respectively.

2.3.5 Forward And Reverse Power Metering

Forward and reverse power signals from the two IC103 buffers are available for metering purposes. The output currents are adjustable via RV103 (forward power) and RV107 (reverse power).

2.3.6 Fan Control Circuitry

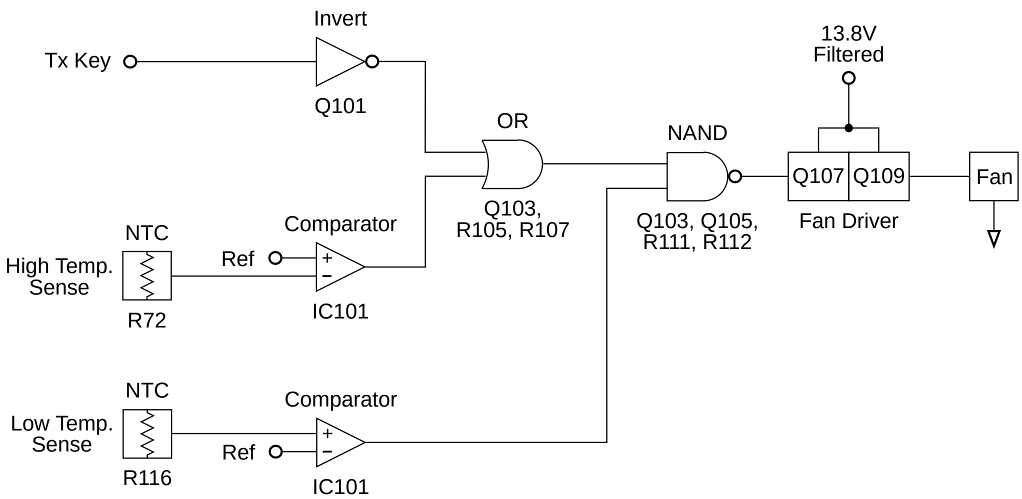


Figure 2.3 T889 Fan Control Logic Diagram

Comparator IC101 pins 12, 13 & 14 are set to trigger at heatsink temperatures greater than +70°C, and pins 1, 2 & 3 at temperatures greater than -10°C.

A logic AND function is applied to the comparator outputs by Q103 and Q105, thereby turning on the fan unconditionally (via Q107 and Q109) if the heatsink temperature exceeds +70°C.

A logic OR function is applied to comparator IC101 pins 12, 13 & 14 and Tx-Key signals, thereby turning on the fan when the transmitter is keyed and the temperature is between -10°C and +70°C.

If the temperature drops below -10°C, Q105 is turned off, preventing either Q101 or Q103 from activating the fan.

Fan operation may be summarised as follows:

T < -10°C	- fan unconditionally turned off
-10°C < T < +70°C	- fan turned on only when transmitter keyed
T > +70°C	- fan unconditionally turned on.

2.4 Power Supply & Regulator Circuits

(Refer to the control section circuit diagram in Section 5.)

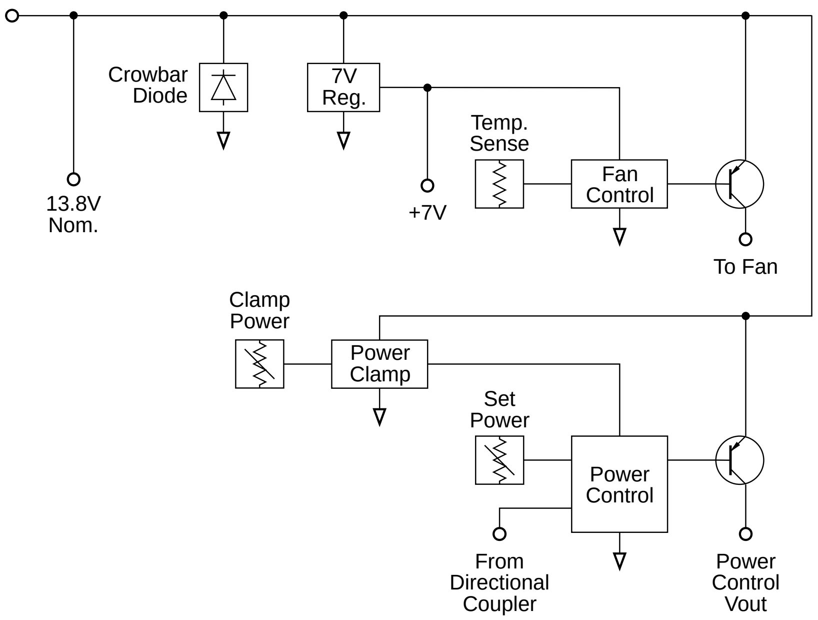


Figure 2.4 T889 Power Supply & Regulator Circuitry Block Diagram

The T889 is designed to operate off a 10.8-16V DC supply (13.8V nominal). A 7V supply runs directly off the 13.8V rail, driving the fan control, power control and alarm circuitry.

A crowbar diode is fitted for protection against connection to a power supply of incorrect polarity. It also provides transient overvoltage protection.

Note: A fuse must be fitted in the power supply line for the diode to provide effective protection.

3 T889 Initial Adjustment

Caution: **This equipment contains CMOS devices which are susceptible to damage from static charges. Refer to Section 1.2 in Part A for more information on anti-static procedures when handling these devices.**

The following section describes the full adjustment procedure to be carried out before operating the T889.

Note: The T889 requires no RF tuning or alignment.

Refer to Section 5 where the parts lists, grid reference index and diagrams will provide detailed information on identifying and locating components. Refer also to Figure 3.2 which shows the location of the main adjustment controls.

The following topics are covered in this section.

3.1 Test Equipment Required

- DC power supply capable of delivering 30A at 13.8V.
- Multimeter or DMM (e.g. Fluke 77).
- RF power meter (e.g. HP 435 series or Bird Wattmeter).
- 250W 40dB attenuator.
- 150W 3dB 50 ohm pad.
- 'BNC' to 'N' type adaptors (e.g. Amphenol, Greenpar).
- Appropriate trimming tools.

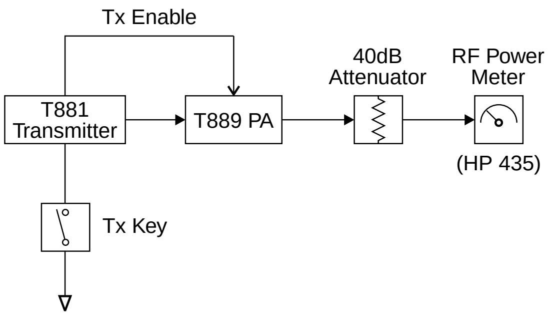


Figure 3.1 T889 Test Equipment Set-up

Caution: **Do not connect attenuators or DC blocks between the T881 and T889 or the cyclic keying circuitry will not function correctly.**

3.2 Preliminary Checks

Check for short circuits between the positive rail and earth.

Set up the test equipment as in Figure 3.1.

Connect the T889 to a 13.8V DC supply.

Check that the quiescent current is <50mA.

Key the transmitter by earthing the key line (D-range 1 [PL100] pin 13).

Check that the power supply is still at 13.8V under load.

Check that the regulated power control supply is approximately 7V.

Note: The output power and alarm levels should be set with the side cover on. If the cover is removed for other adjustment procedures, make a final check of the output power and alarm levels with the side cover on.

3.3 Setting The Output Power

Caution: **If the high temperature shutdown power level has not yet been set or is unknown, check that the unit does not overheat while setting the output power.**

Note 1: You must set up the T889 according to the following instructions ***before*** operation in a radio system. ***Do not*** use the factory default settings as they may not suit your operating frequency.

To obtain optimum performance from the T889, ensure that the T881 transmitter used in this set-up procedure is the one that will be used with the PA in the radio system.

Note 2: Cables and connectors can easily cause a power loss of several watts if either too long or poorly terminated. Always use the shortest possible leads (or connectors instead of leads) between the T889 and power meter set-up.

You will need appropriate extension leads if you wish to carry out the adjustment procedures with the T889 withdrawn from the rack in the latched position. Alternatively, disconnect and withdraw the T889 and reconnect it behind the rack.

Note 3: The actual power used may be limited by regulatory requirements.

Set the transmitter to the required operating frequency.

Connect the transmitter output to the PA input via a thru-line wattmeter with a 10W full scale reading. Special BNC/N leads will be required.

Connect an RF power meter to the PA output connector via a 40dB attenuator.

With the transmitter ***not*** keyed, set RV115 (driver power clamp) to maximum (fully clockwise).

Set RV109 (front panel power control) to maximum (fully clockwise).

Key on the transmitter.

Quickly (within 30 seconds) adjust RV115 to the required power setting, according to the values given in Table 3.1.

Adjust RV109 to set the power output to the required level, according to Table 3.1.

Caution: ***Do not*** **allow the output power to exceed these levels as this will seriously reduce the reliability of the PA.**

Do not **use RV115 to set the output power as this will disable the thermal protection circuitry. The power clamp must always be set to 100W or otherwise be 20W above the set output power (refer to Table 3.1).**

Ambient Temperature (°C)[a]	Maximum Continuous Output Power (W)	Power Setting For RV115 (W)
≤+25	100	120
+30	96	116
+35	91	111
+40	87	107
+45	83	103
+50	78	100
+55	74	100
+60[b]	70	100

a. Ambient temperature is defined as the temperature of the air at the input to the cooling fan mounted on the heatsink.

b. The T889 is also rated at 100W @ 55% duty cycle to +60°C.

Table 3.1 T889 Rated Output Power vs Ambient Temperature

3.4 High Temperature Shutdown Power Level

Set RV109 (front panel power control) to the required output power.

Earth pin 9 of IC101.

Adjust RV113 (shutdown power level) for an output power of 20W.

Remove the earth from pin 9 of IC101.

3.5 Remote Forward Power Meter Calibration

If a remote meter is connected, adjust RV103 (forward power meter calibration) for the remote reading to agree with the RF power meter reading.

3.6 Remote Reverse Power Meter Calibration

If a remote meter is connected, connect a 50 ohm 3dB pad (with the output open circuit) to the PA output.

Apply RF drive and Tx-Key.

Adjust RV107 (reverse power meter calibration) for a quarter of the forward power reading.

3.7 Setting Alarm Levels

Note: If forward and reverse power metering is being used, set up their calibration (Section 3.5 and Section 3.6) before setting the alarm levels.

3.7.1 Forward Power

Power up the T889 and adjust RV109 (front panel power control) so that the output power is at the alarm level required (e.g. 80W if the T889 normally operates at 100W).

Adjust RV101 (forward power alarm set) so that the forward power alarm LED lights.

Check the alarm level setting by adjusting the power up and down and observing the alarm LED. A few watts hysteresis can be expected.

Readjust RV109 for the normal operating level.

Note: Remote indication is available at pin 3 of the D-range connector.

3.7.2 Reverse Power

Power up the T889 and adjust RV109 (front panel power control) for the normal operating power level.

Place a known mismatch of the required value (e.g. 3:1 VSWR) and adjust RV105 (reverse power alarm set) so that the reverse power alarm LED lights.

Example: A VSWR of 3:1 can be simulated by connecting an unterminated 150W 3dB pad to the PA output. This will result in a return loss of 6dB.

Note: Remote indication is available at pin 4 of the D-range connector.

4 T889 Fault Finding

Caution: **This equipment contains CMOS devices which are susceptible to damage from static charges. Refer to Section 1.2 in Part A for more information on anti-static procedures when handling these devices.**

The following test procedures and fault finding flow charts may be used to help locate a hardware problem, however they are by no means a complete fault finding procedure. If you still cannot trace the fault after progressing through them in a logical manner, contact your nearest Tait Dealer or Customer Service Organisation. If necessary, you can get additional technical help from Customer Support, Radio Systems Division, Tait Electronics Ltd, Christchurch, New Zealand (full contact details are on page 2).

Refer to Section 5 where the parts lists, grid reference index and diagrams will provide detailed information on identifying and locating components.

The following topics are covered in this section.

4.1 Visual Checks

Remove the side cover from the T889 and inspect the PCB for damaged or broken components, paying particular attention to the surface mounted devices (SMDs). Also check for defective solder joints.

Refer to Section 4.7, Section 4.8 and Section 3 of Part A for more details on repair and replacement of components.

4.2 UNC Thread Screws

All black finish Pozidriv screws used in the T889 are 4-40 UNC thread and cannot be interchanged with M3 screws. Note that different lengths are used in different applications.

4.3 Component Checks

If you suspect a transistor is faulty, you can assess its performance by measuring the forward and reverse resistance of the junctions. Unless the device is completely desoldered, first make sure that the transistor is not shunted by some circuit resistance. Use a good quality EVM (e.g. Fluke 75) for taking the measurements (or a 20k ohm/V or better multimeter, using only the medium or low resistance ranges). The collector current drawn by multi-junction transistors is a further guide to their performance.

Note: Q1 (2SC2933) and Q2-Q6 (SD1414) are common base transistors.

If an IC is suspect, the most reliable check is to measure the DC operating voltages. Due to the catastrophic nature of most IC failures, the pin voltages will usually be markedly different from the recommended values in the presence of a fault. The recommended values can be obtained from either the circuit diagram or the component data catalogue.

4.4 DC Checks

Note: No RF power is to be applied during these checks.

Check that +13.8V is present on the collectors of Q2, Q3, Q4, Q5 and Q6. Make this measurement when the transmitter is not keyed.

Check that approximately 8-13.8V is present on the collector of Q1 (the level is dependent on RV115 being set to maximum).

Check that +13.8V is present at pin 4 of IC103 and pin 4 of IC101.

Check that approximately 8-13.8V is present at pin 8 of IC105 (the level is dependent on RV115 being set to maximum).

Check that +7.0V is present at the output of regulator IC109 (pin 7).

4.5 RF Checks

The PA Fault Finding Chart (Section 4.6.1) provides a systematic approach for locating a fault in the RF circuitry. Use this chart in conjunction with Figure 4.1, which shows the locations of the 50Ω input and output test points for RF transistors Q1-Q6.

Transistor	Input Transmission Line	Output Transmission Line
Q1-Q2	L16 (Q1)	L21 (Q2)
Q3	L24	L23
Q4	L26	L32
Q5	L33	L39
Q6	L43	L49

Note 1: *Always* test individual PA stages at the 50Ω test points, located at the ends of the semi-rigid transmission lines furthest away from the RF transistors.

Note 2: *Always* test Q1 and Q2 as a pair.

Note 3: Use 50Ω semi-rigid coax for the flying test leads. Ensure each output is terminated in a 50Ω load of the correct power rating.

For problems with the power control circuitry, refer to the Power Control Fault Finding Chart (Section 4.6.2).

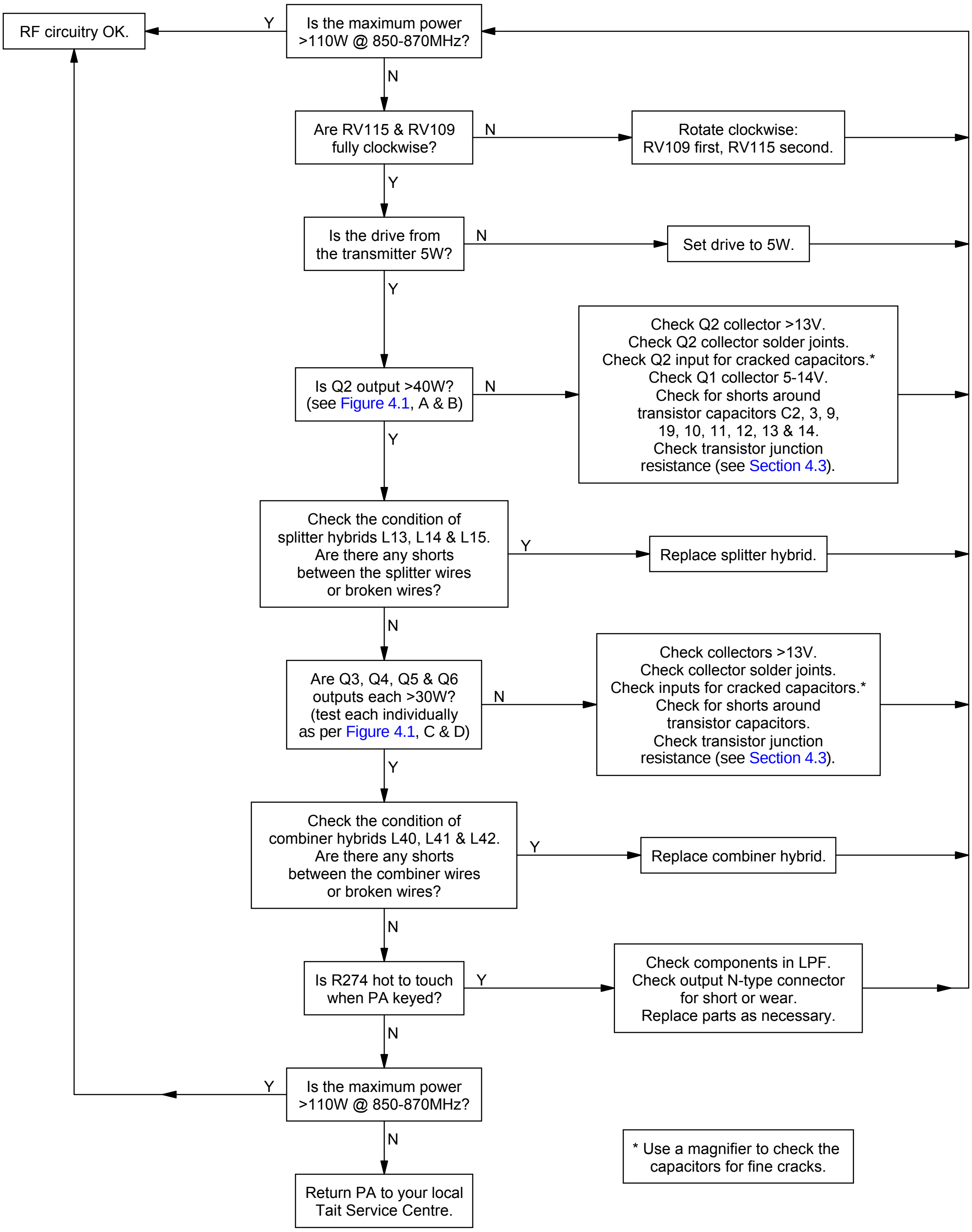
replace A4 pages D4.5/D4.6 with A3 pages D4.5/D4.6

Figure 4.1 T889 Test Break Point Location

replace A4 pages D4.5/D4.6 with A3 pages D4.5/D4.6

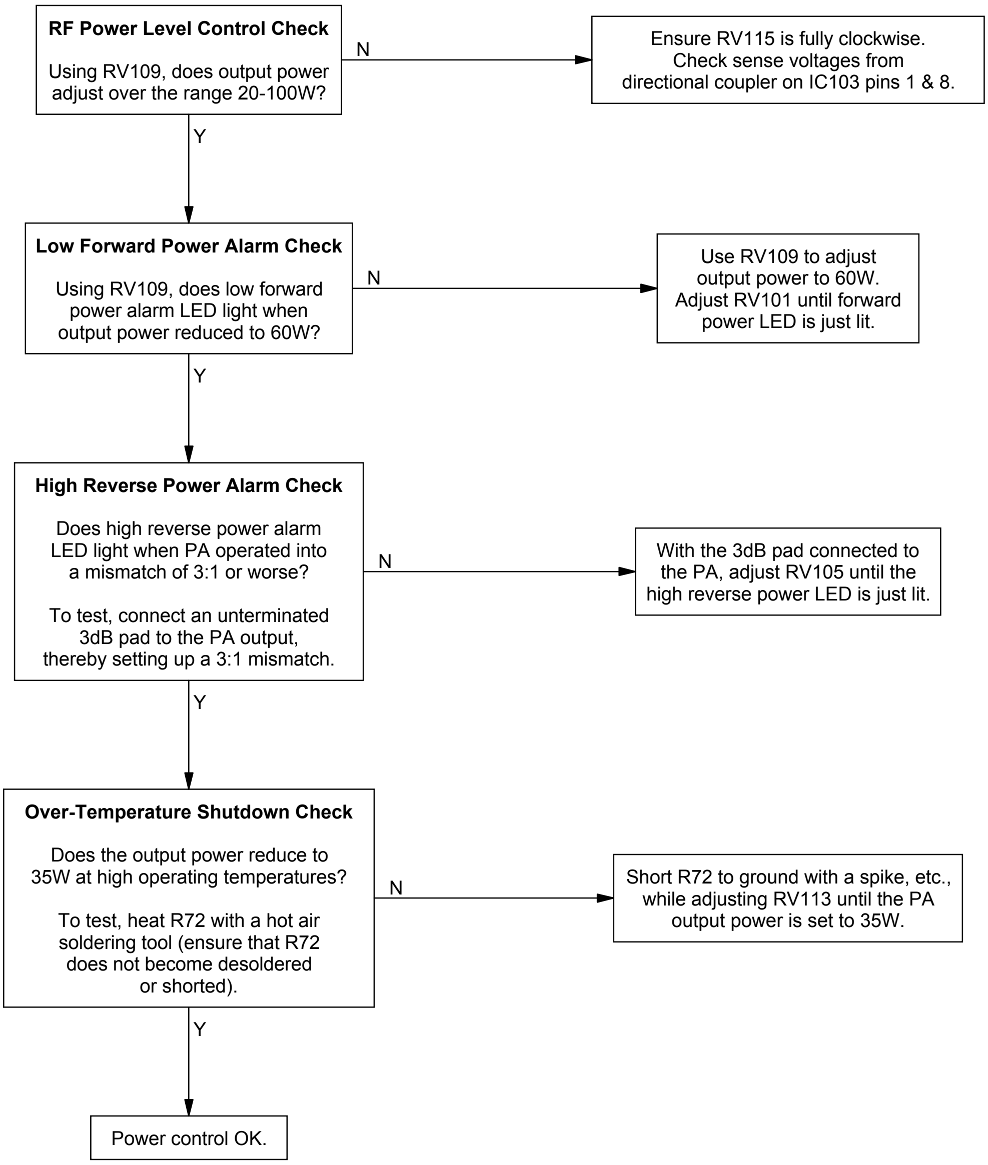
4.6 Fault Finding Charts

4.6.1 PA

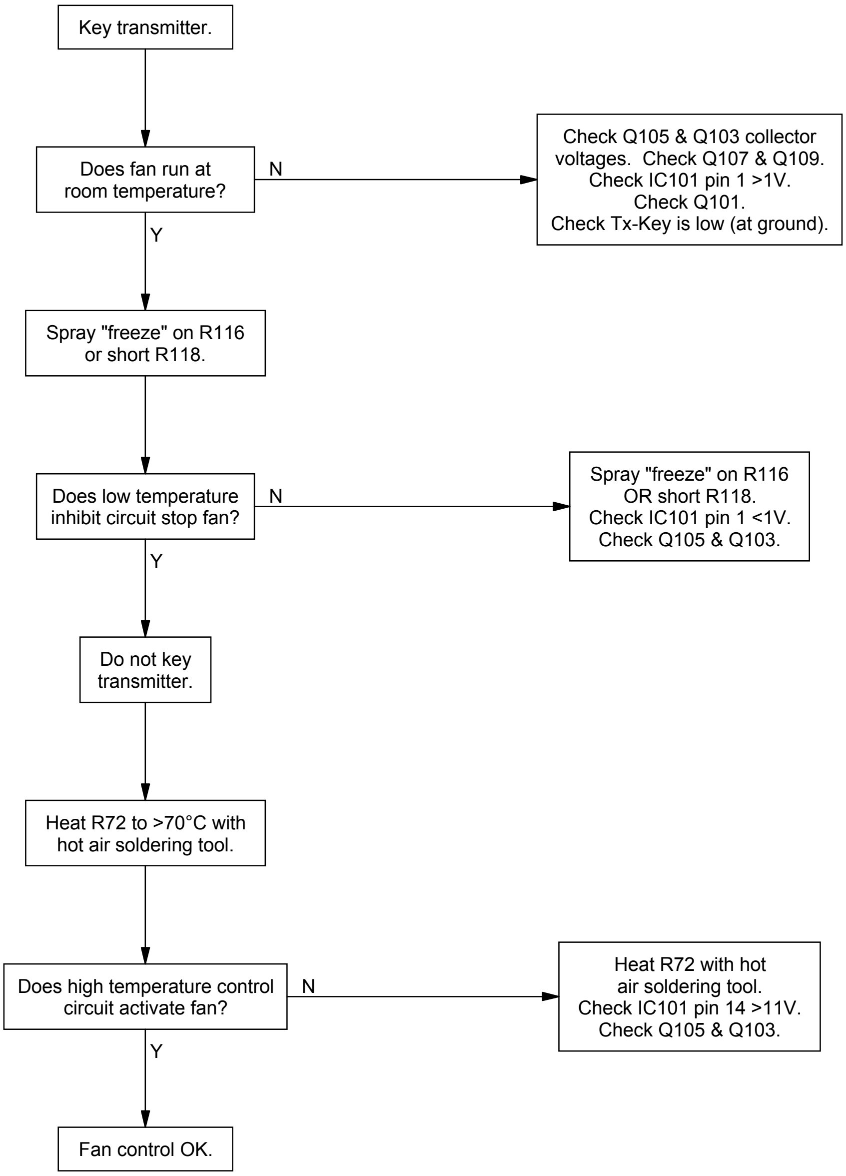


4.6.2 Power Control

Caution
The following voltage checks are all done with RV115 (driver power clamp) set to maximum. When these tests are finished, reset RV115 to the required power setting (refer to Section 3.3).



4.6.3 Fan Control Circuitry



4.7 Replacing RF Power Transistors

Caution: **Failure to comply with the following procedure can result in failure of the device due to poor heatsinking, or worse, can endanger the health of the assembler if the beryllium oxide die carrier is smashed during assembly.**

Caution: **As the location of certain components in the PA is critical to performance, it is important that any components removed or disturbed are refitted in *exactly* the same position.**

Caution: **Do not apply too much heat or pressure to the PCB pads and tracks as you may damage them or lift them from the PCB, causing permanent damage to the PA.**

4.7.1 Transistor/Capacitor Spacing

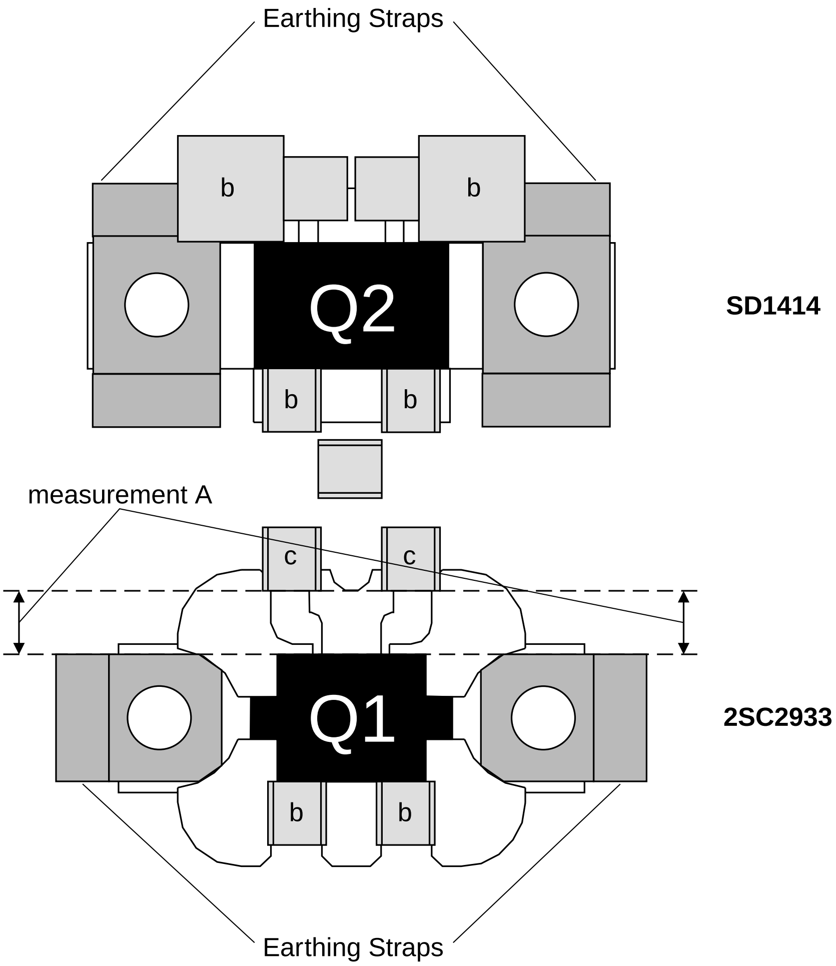


Figure 4.2 T889 Typical Transistor/Capacitor Spacing (Q1 & Q2 Shown)

4.7.1.1 Q1 (2SC2933 Pre-Driver)

Refer to Figure 4.2.

Position the capacitors labelled "b" hard up against the transistor body.

The exact positioning of the capacitors labelled "c" is important in order to achieve at least 40W output power from Q2. You may need to readjust their positioning after replacing Q1 to achieve the required output power level. We therefore suggest the following procedure:

- before removing Q1, measure the distance between the capacitors labelled "c" and the transistor body (measurement "A");
- after you have replaced Q1, replace these capacitors in the same position, using measurement "A" as a reference;
- measure the output power from Q2 and adjust the exact positioning of these capacitors to achieve at least 40W.

4.7.1.2 Q2, Q3, Q4, Q5 & Q6 (SD1414)

Refer to Figure 4.2.

Position all capacitors labelled "b" hard up against the transistor body.

4.7.2 Replacement Procedure

Note: This procedure requires high quality solder joints. We strongly recommend that you use a 100W soldering iron and low melting point solder (62% tin, 36% lead, 2% silver).

Desolder and remove the components from around the transistor.

Desolder the transistor tabs and earthing straps by heating with a soldering iron and lifting away from the PCB with a screwdriver or thin stainless steel spike.

Remove the transistor retaining screws and remove the transistor.

Remove any excess solder from the PCB pads with solder wick.

Lightly tin the underside of the tabs on the replacement transistor and earthing straps. Remove any excess solder to leave a thin, even layer on the tabs.

Apply a small amount of heatsink compound (Dow-Corning 340 or equivalent) to the transistor mounting surface. Sufficient compound should be used to ensure an even film over the entire mounting surface.

Place the transistor on the PCB in the correct orientation (ensuring the tabs are flush to the surface), fit the new earthing straps and torque down the retaining screws to the correct torque (0.7Nm/6in.lbf.).

Solder all transistor tabs and earthing straps to the PCB.

Caution: **Do not solder the transistor tabs before torquing down otherwise the device may be broken.**

Replace all other components in exactly the same positions as noted previously.

4.8 Removing The PCB From The Heatsink

Note 1: This is a lengthy procedure and should be considered only after all other checks have been carried out. There are no components on the bottom of the PCB.

Note 2: T889 PAs manufactured after August 25th 2000 will have a heatspreader fitted between the main PCB and the heatsink to help dissipate the heat generated by transistors Q2-Q6. Refer to TN-632 for more details.

Remove the harmonic filter shield lid.

Desolder the power feed to the fan from the PCB.

Remove the 50 ohm output N-type connector by unscrewing it from the heatsink casting and desoldering it from the PCB.

Unplug the 50 ohm input coaxial cable from the PCB, unscrew the BNC connector from the heatsink, and remove the connector and cable (cutting cable ties as required).

Desolder the positive and negative power feed wires from the PCB.

Disconnect the ribbon cable from the D-range PCB.

Remove the 2 screws securing the D-range connector and PCB to the heatsink and withdraw the assembly and wires from the heatsink.

Remove the mounting screws for the following transistors:

Q1, Q2, Q3, Q4, Q5, Q6 and Q137.

Remove the mounting screws for the termination resistors:

R276, R277, R278, R272, R274 and R275.

Remove the retaining screws for the wireline couplers:

L13, L14, L15, L40, L41 and L42.

Remove the 13 PCB retaining screws.

Push the three LEDs out of their front panel grommets.

Lift the PCB gently from the heatsink to gain access to the underside of the board.

Note: R272-278 and Q1-Q6 may be stuck down with heatsink compound. You may need to carefully prise them away from the heatsink with a small screwdriver.

Caution: **Keep the heatsink compound clean while the PCB is detached. Any objects caught in the heatsink compound underneath the device which prevent effective earthing and/or heatsinking may cause the device to fail.**

Caution: **Do not operate the PA with the PCB detached as the heatsink is used for earthing and heat dissipation.**

To replace the PCB, reverse the order of removal, taking care that the wiring is correctly positioned and not 'pinched'.

Note: Torque down the transistor and termination resistor mounting screws to the correct torque (90N.cm/8in.lbf.).

Make sure that the heatsink compound has stayed clean, and that the insulating pad for Q137 is not damaged.

If you have difficulty refitting the LEDs, try pushing the body of the LED back into the grommet with a thin screwdriver or spike.

5 T889 PCB Information

Caution: **This equipment contains CMOS devices which are susceptible to damage from static charges. Refer to Section 1.2 in Part A for more information on anti-static procedures when handling these devices.**

This section provides the following information:

- parts lists
- grid reference index
- mechanical assembly drawing
- PCB layouts
- circuit diagrams.

5.1 Introduction

Product Type Identification

You can identify the PA type by checking the product code printed on a label on the rear of the chassis/heatsink (product codes are explained in Section 1.3 in this Part of the manual, and Figure 1.1 in Part A shows typical labels).

PCB Identification

All PCBs are identified by a unique 10 digit "internal part number" (IPN), e.g. 220-01390-02, which is screen printed onto the PCB (usually on the top side), as shown in the example below:

The last 2 digits of this number define the issue status, which starts at 00 and increments through 01, 02, 03, etc. as the PCB is updated. Some issue PCBs never reach full production status and are therefore not included in this manual. A letter following the 10 digit IPN has no relevance in identifying the PCB for service purposes.

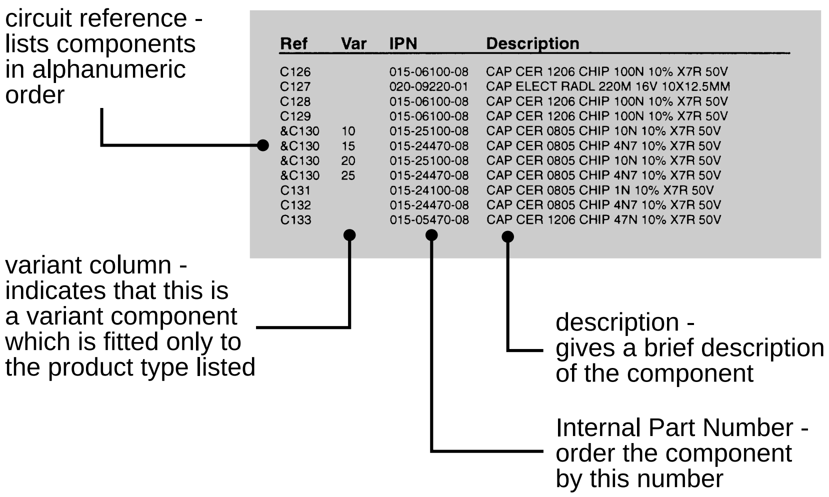
Note: It is important that you identify which issue PCB you are working on so that you can refer to the appropriate set of PCB information.

Parts Lists

The 10 digit numbers (000-00000-00) in this Parts List are "internal part numbers" (IPNs). We can process your spare parts orders more efficiently and accurately if you quote the IPN and provide a brief description of the part.

The components listed in this parts list are divided into two main types: those with a circuit reference (e.g. C2, D1, R121, etc.) and those without (miscellaneous and mechanical).

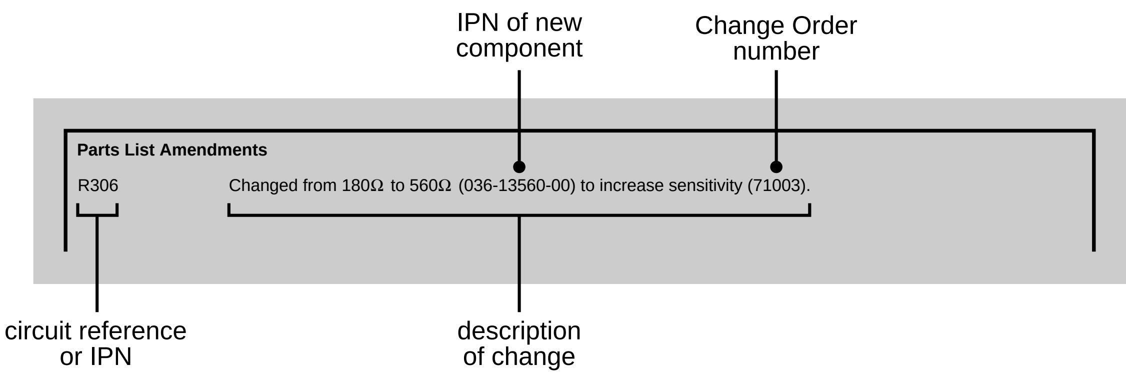
Those with a circuit reference are grouped in alphabetical order and then in numerical order within each group. Each component entry comprises three or four columns, as shown below:



The miscellaneous and mechanical section lists the variant and common parts in IPN order.

Parts List Amendments

At the front of the parts list is the Parts List Amendments box (an example of which is shown below). This box contains a list of component changes which took place after the parts list and diagrams in this section were compiled. These changes (e.g. value changes, added/deleted components, etc.) are listed by circuit reference in alphanumeric order and supersede the information given in the parts list or diagrams. Components without circuit references are listed in IPN order. The number in brackets at the end of each entry refers to the Tait internal Change Order document.

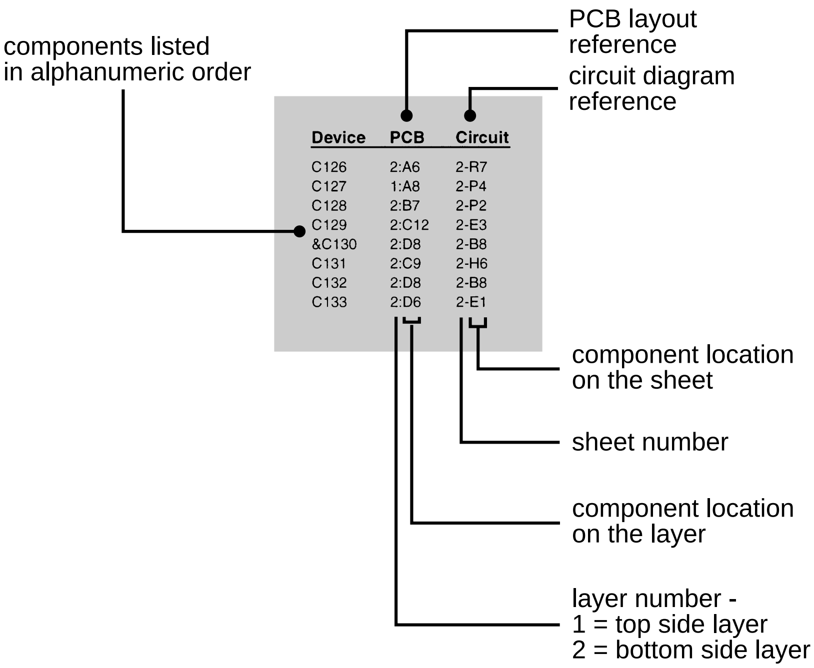


Variant Components

A variant component is one that has the same circuit reference but different value or specification in different product types. Where two products share the same PCB, the term “variant” is also used to describe components unplaced in one product. Variant components have a character prefix, such as “&”, “=” or “#”, before the circuit reference (e.g. &R100).

Grid Reference Index

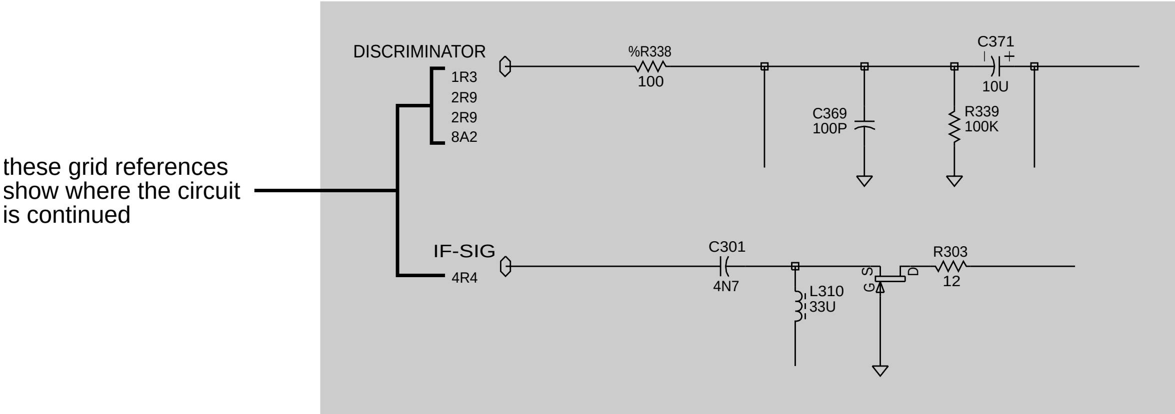
This section contains a component grid reference index to help you find components and labelled pads on the PCB layouts and circuit diagrams. This index lists the components and pads in alphanumeric order, along with the appropriate alphanumeric grid references, as shown below:



Using CAD Circuit Diagrams

Reading a CAD circuit diagram is similar to reading a road map, in that both have an alphanumeric border. The circuit diagrams in this manual use letters to represent the horizontal axis, and numbers for the vertical axis. These circuit diagram "grid references" are useful in following a circuit that is spread over two or more sheets.

When a line representing part of the circuitry is discontinued, a reference will be given at the end of the line to indicate where the rest of the circuitry is located, as shown below. The first digit refers to the sheet number and the last two characters refer to the location on that sheet of the continuation of the circuit (e.g. 1R3).



5.2 T889 Power Amplifier PCB

This section contains the following information.

T889 Parts List (IPN 220-01326-04)

How To Use This Parts List

The components listed in this parts list are divided into two main types: those with a circuit reference (e.g. C2, D1, R121, etc.) and those without (miscellaneous and mechanical).

Those with a circuit reference are grouped in alphabetical order and then in numerical order within each group. Each component entry comprises three or four columns: the circuit reference, variant (if applicable), IPN and description. A number in the variant column indicates that this is a variant component which is fitted only to the product type listed. Static sensitive devices are indicated by an (S) at the start of the description column.

The miscellaneous and mechanical section lists the variant and common parts in IPN order. Where possible, a number in the legend column indicates their position in the mechanical assembly drawing.

The Parts List Amendments box below lists component changes that took place after the parts list and diagrams in this section were compiled. These changes (e.g. value changes, added/deleted components, etc.) are listed by circuit reference in alphanumeric order and supersede the information given in the parts list or diagrams. Components without circuit references are listed in IPN order.

Parts List Amendments

C130, C159	Deleted to reduce the effects of internal RF circulation on forward and reverse power meter calibration (711128).
C199	Changed from a 16V part (IPN 014-07470-00) to a 25V part (IPN 014-07470-01) of the same value because of component standardisation (750334).
D101, D105	Removed from the main PCB and replaced by two 1N4148 diodes (IPN 001-50012-00) placed on the D-range PCB: one soldered between PL101 pins 5 and 7 (cathode), the other between PL101 pins 6 and 8 (cathode). To allow external power meters to read zero and still provide meter overvoltage protection (710978).
DCR1, DCR2	Changed from 100Ω (IPN 036-13100-00) to 270Ω (IPN 036-13270-00) to improve the directivity of the directional coupler (710959).
Q135	SMD transistor (IPN 000-10008-17) replaced with a leaded BD139 (IPN 000-00011-91) as the SMD part is underrated and prone to failure - refer to TN-604 for the replacement procedure (711147).
Q137	Changed to a higher gain transistor - IPN changes from 000-00030-95 to 000-00030-97 (711292).
R123, R158	Changed from 1k resistors (IPN 036-14100-00) to BA592 diodes (IPN 001-10059-20) to allow external power meters to read zero (710978).
R149	Changed from 12k (IPN 036-15120-00) to 6k8 (IPN 036-14680-00) to increase the reverse power sense gain to improve alarm operation (710958).
R154	Changed from 4k7 (IPN 036-14470-10) to 10k (IPN 036-15100-10) to ensure stability if the PA is disconnected from the antenna (711422).
219-02600-00	RF input coax: changed to a longer cable (IPN 219-02710-00) to improve input matching (740271).
258-00010-03	Cooling fan: some T889 PAs may be fitted with a different fan (IPN 258-00010-06). If so, a 100µH inductor (IPN 056-00021-02) may be fitted in series in the fan power feed wire with a 10µF capacitor (IPN 025-08100-03) fitted in parallel with this inductor (710921). Later T889 PAs are fitted with an improved fan (IPN 258-00010-08) that does not need these extra components (711435).

Parts List Amendments - Continued

This page is provided for entering future amendments to the Parts List.

Ref	Var	IPN	Description
C1		015-02470-03	CAP CER 47P 5% 500V GRH111
*C2		015-02120-07	CAP CER CHIP 12P 5% 500V MULTI
*C3		015-02120-07	CAP CER CHIP 12P 5% 500V MULTI
C4		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C6		015-02470-03	CAP CER 47P 5% 500V GRH111
C7		015-06100-08	CAP CER 1206 100N 10% X7R 50V
*C9		015-02100-07	CAP CER CHIP 10P 5% 500V MULTI
*C10		015-02100-07	CAP CER CHIP 10P 5% 500V MULTI
*C11		015-02120-07	CAP CER CHIP 12P 5% 500V MULTI
*C12		015-02120-07	CAP CER CHIP 12P 5% 500V MULTI
*C13		029-02200-02	CAP MICA 5 CASE 20P 5%
C14		029-02220-02	CAP MICA 5 CASE 22P 5%
C16		015-02470-03	CAP CER 47P 5% 500V GRH111
C17		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C18		014-07470-03	L) CAP TANT SMD 4U7 35V 20%
*C19		015-02120-07	CAP CER CHIP 12P 5% 500V MULTI
C20		015-02150-07	CAP CER CHIP 15P 5% 500V MULTI
*C21		015-02120-07	CAP CER CHIP 12P 5% 500V MULTI
C22		029-02180-02	CAP MICA 5 CASE 18P 5%
C23		029-02220-02	CAP MICA 5 CASE 22P 5%
C24		015-02470-03	CAP CER 47P 5% 500V GRH111
C26		015-02150-07	CAP CER CHIP 15P 5% 500V MULTI
*C27		015-02120-07	CAP CER CHIP 12P 5% 500V MULTI
C28		029-02180-02	CAP MICA 5 CASE 18P 5%
C29		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C30		029-02220-02	CAP MICA 5 CASE 22P 5%
C31		015-02470-03	CAP CER 47P 5% 500V GRH111
C33		015-02150-07	CAP CER CHIP 15P 5% 500V MULTI
*C34		015-02120-07	CAP CER CHIP 12P 5% 500V MULTI
C35		029-02180-02	CAP MICA 5 CASE 18P 5%
C36		029-02220-02	CAP MICA 5 CASE 22P 5%
C37		015-02470-03	CAP CER 47P 5% 500V GRH111
C39		014-07470-03	L) CAP TANT SMD 4U7 35V 20%
C40		015-02150-07	CAP CER CHIP 15P 5% 500V MULTI
*C41		015-02120-07	CAP CER CHIP 12P 5% 500V MULTI
C42		029-02180-02	CAP MICA 5 CASE 18P 5%
C43		029-02220-02	CAP MICA 5 CASE 22P 5%
C44		015-02470-03	CAP CER 47P 5% 500V GRH111
C46		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C47		014-07470-03	L) CAP TANT SMD 4U7 35V 20%
C48		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C52		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C58		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C59		014-07470-03	L) CAP TANT SMD 4U7 35V 20%
C60		014-07470-03	L) CAP TANT SMD 4U7 35V 20%
C66		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C67		015-02470-03	CAP CER 47P 5% 500V GRH111
C68		015-02470-03	CAP CER 47P 5% 500V GRH111
C72		015-02470-03	CAP CER 47P 5% 500V GRH111
C73		015-02470-03	CAP CER 47P 5% 500V GRH111
C74		015-02470-03	CAP CER 47P 5% 500V GRH111
C75		014-07470-03	L) CAP TANT SMD 4U7 35V 20%
C97		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C98		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C101		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C103		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C105		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C107		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C109		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C111		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C113		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C115		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C117		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C119		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C121		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C123		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C125		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C127		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C129		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C130		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C131		014-07100-02	CAP TANT CHIP 1U0 3.2 X 1.6MM
C132		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C133		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C139		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C143		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C145		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C147		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C149		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C151		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C153		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C155		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C159		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C161		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C162		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C164		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C167		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C169		014-07470-03	L) CAP TANT SMD 4U7 35V 20%
C171		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C173		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C174		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C176		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C177		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C178		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C179		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C180		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C181		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C182		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C183		015-22470-01	CAP CER 0805 47P 5% NPO 50V

Ref	Var	IPN	Description
C185		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C187		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C189		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C190		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C192		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C193		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C195		014-08100-00	CAP TANT CHIP 10M 16VW +-20%
C196		014-07100-02	CAP TANT CHIP 1U0 3.2 X 1.6MM
C197		015-25100-08	CAP CER 0805 10N 10% X7R 50V
C198		015-06100-08	CAP CER 1206 100N 10% X7R 50V
C199		014-07470-00	CAP TANT CHIP 4U7 3.5 X 2.8MM
C200		015-24470-08	CAP CER 0805 4N7 10% X7R 50V
C201		014-07470-03	L) CAP TANT SMD 4U7 35V 20%
C203		015-24100-08	CAP CER 0805 1N 10% X7R 50V
C204		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C205		015-22470-01	CAP CER 0805 47P 5% NPO 50V
C206		015-23100-01	CAP CER 0805 100P 5% NPO 50V
C207		015-23100-01	CAP CER 0805 100P 5% NPO 50V
C210		015-23100-01	CAP CER 0805 100P 5% NPO 50V
C211		015-23100-01	CAP CER 0805 100P 5% NPO 50V
C225		015-02470-03	CAP CER 47P 5% 500V GRH111
C245		015-02470-03	CAP CER 47P 5% 500V GRH111
C250		015-02470-03	CAP CER 47P 5% 500V GRH111
C252		015-02470-03	CAP CER 47P 5% 500V GRH111
C258		015-02470-03	CAP CER 47P 5% 500V GRH111
D101		001-50012-00	S) DIODE AI 1N4148 SI
D103		008-00014-79	S)LED 3MM RED WITH WIRE
D105		001-50012-00	S) DIODE AI 1N4148 SI
D107		008-00014-80	S)LED 3MM GREEN WITH WIRE
D109		008-00014-79	S)LED 3MM RED WITH WIRE
D113		001-00012-90	S) DIODE MR2520L O-VOLT SUPP
DCC1		015-22470-01	CAP CER 0805 47P 5% NPO 50V
DCC4		015-22470-01	CAP CER 0805 47P 5% NPO 50V
DCIC1		001-10066-00	DIODE SCHOTTKY HSMS2815
DCIC2		001-10066-00	DIODE SCHOTTKY HSMS2815
DCR1		036-13270-00	RES M/F 0805 270E 5%
DCR2		036-13270-00	RES M/F 0805 270E 5%
FTC		012-04100-05	CAP F/THRU 1N SUPPR FLTR S-MTG
IC101		002-10003-24	S) IC SMD 324 4X O-AMP SO14
IC103		002-10003-24	S) IC SMD 324 4X O-AMP SO14
IC105		002-10003-58	S) IC SMD LM358 DUAL O-AMP
IC107		002-12951-00	IC SMD LP2951CM ADJ VLTGE REG
IC109		002-10003-17	(S) IC LM317L REG S0-8 100MA
L1		065-10004-20	BEAD FE SMD CBD 4.6/3/3-4S2
L2		051-00644-00	IND HAIRPIN 17MM TALL T889
L3		065-10004-20	BEAD FE SMD CBD 4.6/3/3-4S2
L4		051-00644-00	IND HAIRPIN 17MM TALL T889
L5		052-08160-55	COIL A/W 5.5T/6.0MM HOR 0.8MM
L6		065-10004-20	BEAD FE SMD CBD 4.6/3/3-4S2
L7		051-00644-00	IND HAIRPIN 17MM TALL T889
L8		065-10004-20	BEAD FE SMD CBD 4.6/3/3-4S2
L9		051-00643-00	IND HAIRPIN 10MM TALL T889
L10		052-08160-55	COIL A/W 5.5T/6.0MM HOR 0.8MM
L12		065-10004-20	BEAD FE SMD CBD 4.6/3/3-4S2
L13		051-00619-00	COUPLR WRELNE 53MM JCKT STRGT
L14		051-00619-00	COUPLR WRELNE 53MM JCKT STRGT
L15		051-00619-00	COUPLR WRELNE 53MM JCKT STRGT
L16		051-00626-00	COAX 1/4 WAVE XFMR 35E HELI LH
L17		051-00648-00	IND ETCH HAIRPIN 14.3NH POWF
L18		065-10004-20	BEAD FE SMD CBD 4.6/3/3-4S2
L19		051-00643-00	IND HAIRPIN 10MM TALL T889
L20		052-08160-55	COIL A/W 5.5T/6.0MM HOR 0.8MM
L21		051-00623-00	COAX 1/4 WAVE XFMR 25E HAIRPIN
L23		051-00624-00	COAX 1/4 WAVE XFMR 25E HCKY LH
L24		051-00629-00	COAX 1/4 WAVE XFMR 35E HCKY RH
L26		051-00627-00	COAX 1/4 WAVE XFMR 35E HELI RH
L27		051-00648-00	IND ETCH HAIRPIN 14.3NH POWF
L28		065-10004-20	BEAD FE SMD CBD 4.6/3/3-4S2
L29		051-00643-00	IND HAIRPIN 10MM TALL T889
L30		052-08160-55	COIL A/W 5.5T/6.0MM HOR 0.8MM
L32		051-00621-00	COAX 1/4 WAVE XFMR 25E HELI LH
L33		051-00626-00	COAX 1/4 WAVE XFMR 35E HELI LH
L34		051-00648-00	IND ETCH HAIRPIN 14.3NH POWF
L35		065-10004-20	BEAD FE SMD CBD 4.6/3/3-4S2
L36		051-00643-00	IND HAIRPIN 10MM TALL T889
L37		052-08160-55	COIL A/W 5.5T/6.0MM HOR 0.8MM
L39		051-00622-00	COAX 1/4 WAVE XFMR 25E HELI RH
L40		051-00619-00	COUPLR WRELNE 53MM JCKT STRGT
L41		051-00619-00	COUPLR WRELNE 53MM JCKT STRGT
L42		051-00619-00	COUPLR WRELNE 53MM JCKT STRGT
L43		051-00628-00	COAX 1/4 WAVE XFMR 35E HCKY LH
L44		051-00648-00	IND ETCH HAIRPIN 14.3NH POWF
L45		065-10004-20	BEAD FE SMD CBD 4.6/3/3-4S2
L46		051-00643-00	IND HAIRPIN 10MM TALL T889
L47		052-08160-55	COIL A/W 5.5T/6.0MM HOR 0.8MM
L49		051-00645-00	COAX 1/4 WAVE XFMR 25E HCKY RH
L50		056-10330-02	(L) IND SMD 330NH
L51		056-10330-02	(L) IND SMD 330NH
L52		056-10330-02	(L) IND SMD 330NH
L55		051-00646-00	IND ETCHED HAIRPIN 13NH LPF
L57		051-00647-00	IND ETCHED HAIRPIN 14.6NH LPF
L59		051-00647-00	IND ETCHED HAIRPIN 14.6NH LPF
L61		051-00646-00	IND ETCHED HAIRPIN 13NH LPF

Ref	Var	IPN	Description
L63		052-56130-85	COIL A/W 8.5T/3.0MM HOR 0.56MM
L64		051-00632-00	LNK 15MM 1.4MM2 COP STP 1.5SLV
L65		051-00632-00	LNK 15MM 1.4MM2 COP STP 1.5SLV
L66		051-00632-00	LNK 15MM 1.4MM2 COP STP 1.5SLV
L175		051-00638-01	COAX T889 SEMI-RIG N-TYPE EXTN
L200		065-10004-20	BEAD FE SMD CBD 4.6/3/3-4S2
L201		065-10004-20	BEAD FE SMD CBD 4.6/3/3-4S2
LINK2		036-10000-00	RES M/F 0805 ZERO OHM
P1		240-02100-44	SKT COAX MINI JACK PCB MT ANG.
Q1		000-00293-30	S) XSTR 2SC2933 NPN 900MHZ 14W
Q2		000-00141-40	LS) XSTR SD1414 6LFL UHF 45W
Q3		000-00141-40	LS) XSTR SD1414 6LFL UHF 45W
Q4		000-00141-40	LS) XSTR SD1414 6LFL UHF 45W
Q5		000-00141-40	LS) XSTR SD1414 6LFL UHF 45W
Q6		000-00141-40	LS) XSTR SD1414 6LFL UHF 45W
Q101		000-10008-57	S) XSTR SMD BCW70 PNP SOT23 SS
Q103		000-10008-17	S) XSTR SMD BC817-25 NPN SOT23
Q105		000-10008-17	S) XSTR SMD BC817-25 NPN SOT23
Q107		000-10008-57	S) XSTR SMD BCW70 PNP SOT23 SS
Q109		000-10008-69	S) XSTR SMD BC869 PNP 1W SOT89
Q111		000-10008-57	S) XSTR SMD BCW70 PNP SOT23 SS
Q115		000-10008-57	S) XSTR SMD BCW70 PNP SOT23 SS
Q117		000-10008-17	S) XSTR SMD BC817-25 NPN SOT23
Q119		000-10008-48	S) XSTR SMD BCW60 NPN SOT23 SS
Q121		000-10017-00	LS) XSTR SMD BF170LT1 SOT23
Q123		000-10008-57	S) XSTR SMD BCW70 PNP SOT23 SS
Q125		000-10008-57	S) XSTR SMD BCW70 PNP SOT23 SS
Q127		000-10008-57	S) XSTR SMD BCW70 PNP SOT23 SS
Q129		000-10008-17	S) XSTR SMD BC817-25 NPN SOT23
Q131		000-10017-00	LS) XSTR SMD BF170LT1 SOT23
Q133		000-10008-48	S) XSTR SMD BCW60 NPN SOT23 SS
Q135		000-10008-17	S) XSTR SMD BC817-25 NPN SOT23
Q137		000-00030-95	S) XSTR 2N6107 PNP TO220 AF
Q138		000-10008-48	S) XSTR SMD BCW60 NPN SOT23 SS
R1		036-02100-03	L) RES 1218 PWR 10E 20% 1W
R2		036-02100-03	L) RES 1218 PWR 10E 20% 1W
R3		036-02100-02	RES 10E 1206 200V 250MW RC01
R4		036-02100-03	L) RES 1218 PWR 10E 20% 1W
R5		036-02100-03	L) RES 1218 PWR 10E 20% 1W
R6		036-02100-02	RES 10E 1206 200V 250MW RC01
R10		036-02100-03	L) RES 1218 PWR 10E 20% 1W
R11		036-02100-03	L) RES 1218 PWR 10E 20% 1W
R12		036-02100-03	L) RES 1218 PWR 10E 20% 1W
R13		036-02100-03	L) RES 1218 PWR 10E 20% 1W
R14		036-02100-03	L) RES 1218 PWR 10E 20% 1W
R15		036-02100-03	L) RES 1218 PWR 10E 20% 1W
R19		036-02100-03	L) RES 1218 PWR 10E 20% 1W
R20		036-02100-03	L) RES 1218 PWR 10E 20% 1W
R21		036-02100-02	RES 10E 1206 200V 250MW RC01
R24		036-02100-02	RES 10E 1206 200V 250MW RC01
R29		036-02100-02	RES 10E 1206 200V 250MW RC01
R59A		036-01560-03	L) RES 1218 PWR 5E6 20% 1W
R60		036-03820-03	L) RES 1218 PWR 820E 20% 1W
R60A		036-03820-03	L) RES 1218 PWR 820E 20% 1W
R72		045-04470-00	RES NTC SMD 4K7 5% 20MW
R101		036-14100-10	RES M/F 0805 1K 1%
R102		036-16220-00	RES M/F 0805 220K 5%
R103		036-15330-00	RES M/F 0805 33K 5%
R104		036-16470-00	RES M/F 0805 470K 5%
R105		036-15150-00	RES M/F 0805 15K 5%
R106		036-15150-00	RES M/F 0805 15K 5%
R107		036-14390-10	RES M/F 0805 3K9 1%
R108		036-14330-10	RES M/F 0805 3K3 1%
R109		036-15100-10	RES M/F 0805 10K 1%
R111		036-14820-10	RES M/F 0805 8K2 1%
R112		036-14680-10	RES M/F 0805 6K8 1%
R113		036-14100-10	RES M/F 0805 1K 1%
R114		036-16100-00	RES M/F 0805 100K 5%
R115		036-16220-00	RES M/F 0805 220K 5%
R116		045-04470-00	RES NTC SMD 4K7 5% 20MW
R117		036-16220-00	RES M/F 0805 220K 5%
R118		036-15270-00	RES M/F 0805 27K 5%
R119		036-16470-00	RES M/F 0805 470K 5%
R120		036-15220-00	RES M/F 0805 22K 5%
R121		036-15150-00	RES M/F 0805 15K 5%
R122		036-14390-10	RES M/F 0805 3K9 1%
R123		001-10059-20	LS) DIODE SMD BA592 SW SOD323
R124		036-16100-00	RES M/F 0805 100K 5%
R125		036-15100-10	RES M/F 0805 10K 1%
R126		036-14100-10	RES M/F 0805 1K 1%
R127		036-15100-10	RES M/F 0805 10K 1%
R129		036-17100-10	RES M/F 0805 1M 1%
R130		036-14220-00	RES M/F 0805 2K2 5%
R131		036-16180-00	RES M/F 0805 180K 5%
R132		036-14100-10	RES M/F 0805 1K 1%
R133		036-15100-10	RES M/F 0805 10K 1%
R134		036-13470-00	RES M/F 0805 470E 5%
R135		036-13680-00	RES M/F 0805 680E 5%
R136		036-15100-10	RES M/F 0805 10K 1%
R137		036-14220-00	RES M/F 0805 2K2 5%
R138		036-15100-10	RES M/F 0805 10K 1%
R141		036-15100-10	RES M/F 0805 10K 1%
R142		036-15100-10	RES M/F 0805 10K 1%
R143		036-15100-10	RES M/F 0805 10K 1%

Ref	Var	IPN	Description
R144		036-15820-00	RES M/F 0805 82K 5%
R145		036-15470-10	RES M/F 0805 47K 1%
R146		036-14180-00	RES M/F 0805 1K8 5%
R148		036-15120-00	RES M/F 0805 12K 5%
R149		036-14680-10	RES M/F 0805 6K8 1%
R151		036-15100-10	RES M/F 0805 10K 1%
R152		036-15100-10	RES M/F 0805 10K 1%
R153		036-14470-10	RES M/F 0805 4K7 1%
R154		036-14470-10	RES M/F 0805 4K7 1%
R155		036-13220-00	RES M/F 0805 220E 5%
R156		036-13100-10	RES M/F 0805 100E 1%
R158		001-10059-20	LS) DIODE SMD BA592 SW SOD323
R159		036-15100-10	RES M/F 0805 10K 1%
R160		036-14470-10	RES M/F 0805 4K7 1%
R162		036-17100-10	RES M/F 0805 1M 1%
R164		036-14220-00	RES M/F 0805 2K2 5%
R165		036-14100-10	RES M/F 0805 1K 1%
R166		036-13680-00	RES M/F 0805 680E 5%
R168		036-15100-10	RES M/F 0805 10K 1%
R169		036-14100-10	RES M/F 0805 1K 1%
R170		036-14100-10	RES M/F 0805 1K 1%
R171		036-14100-10	RES M/F 0805 1K 1%
R172		036-15100-10	RES M/F 0805 10K 1%
R173		036-13470-00	RES M/F 0805 470E 5%
R174		036-13220-00	RES M/F 0805 220E 5%
R175		036-16220-00	RES M/F 0805 220K 5%
R176		036-15100-10	RES M/F 0805 10K 1%
R177		036-14470-10	RES M/F 0805 4K7 1%
R178		036-16100-00	RES M/F 0805 100K 5%
R179		036-15100-10	RES M/F 0805 10K 1%
R180		036-16150-00	RES M/F 0805 150K 5%
R181		036-14390-10	RES M/F 0805 3K9 1%
R182		036-16100-00	RES M/F 0805 100K 5%
R183		036-14470-10	RES M/F 0805 4K7 1%
R184		036-14100-10	RES M/F 0805 1K 1%
R185		036-14220-00	RES M/F 0805 2K2 5%
R186		036-13100-10	RES M/F 0805 100E 1%
R187		036-12220-00	RES M/F 0805 22E 5%
R188		036-16100-00	RES M/F 0805 100K 5%
R189		036-14150-00	RES M/F 0805 1K5 5%
R190		036-12220-00	RES M/F 0805 22E 5%
R191		036-14100-10	RES M/F 0805 1K 1%
R192		036-13220-00	RES M/F 0805 220E 5%
R193		036-12100-00	RES M/F 0805 10E 5%
R194		036-12220-00	RES M/F 0805 22E 5%
R271		036-13680-00	RES M/F 0805 680E 5%
R272		039-50500-00	RES TERM 50E 50W RFP50-50TCG
R274		039-00100-50	RES TERM 50E 100W RFP-100-50TW
R275		039-50500-00	RES TERM 50E 50W RFP50-50TCG
R276		039-02050-00	RES TERM 50E 20W RFP20-50TPC
R277		039-50500-00	RES TERM 50E 50W RFP50-50TCG
R278		039-02050-00	RES TERM 50E 20W RFP20-50TPC
R280		036-14100-10	RES M/F 0805 1K 1%
R285		036-13560-00	RES M/F 0805 560E 5%
RV101		042-04500-05	RES PRESET SMD 5K CER 4MM SQ
RV103		042-05500-05	RES PRESET SMD 50K CER 4MM SQ
RV105		042-04500-05	RES PRESET SMD 5K CER 4MM SQ
RV107		042-05500-05	RES PRESET SMD 50K CER 4MM SQ
*RV109		044-04200-06	RES PRE MULT 2K 15T PNL MTG
RV113		042-06500-05	RES PRESET SMD 500K CER 4MM SQ
RV115		042-05200-05	RES PRESET SMD 20K CER 4MM SQ
SHIELD1		319-01219-00	SHIELD WALL T889 LOW PASS FILT
SK101		240-10000-05	CONN SMD SKT 8W 2R M-MATCH
SK103		240-10000-05	CONN SMD SKT 8W 2R M-MATCH
SK105		240-10000-05	CONN SMD SKT 8W 2R M-MATCH
SK107		240-10000-05	CONN SMD SKT 8W 2R M-MATCH

T889 Mechanical & Miscellaneous Parts (220-01326-04)

IPN	Legend	Description
012-04100-05	1	CAP F/THRU 1N SUPPR FLTR S-MTG
044-04200-07		RES POT COVER H-83P Fitted to *RV109.
070-01001-00	42	D-RANGE 15 WAY COMPL T800
201-00030-02		WIRE T/C WIRE 7/0.2MM PVC RED Power feed for fan.
201-00050-25		CABLE AUTO 154 RED 41/0.3M PVC DC+ from D-range PCB.
201-00050-26		CABLE AUTO 154 BLCK 41/0.3 PVC DC– from D-range PCB.
219-02591-01	3	LOOM RIBBON 8 WAY FOR T839PA
219-02593-01	4	LOOM RIBBON ASSY FOR T889PA
219-02639-00		CABLE ASSEMBLY RG223/UN TO BNC Transmitter/PA connecting cable assembly.
219-02710-00		RG316 CABLE ASSEMBLY T838/839 BNC to P1 cable assembly with connectors.
220-01326-04	5	PCB T889 90W PA SERIES II
220-01336-04	6	PCB T889 DIR COUPLER/SPLITTER
240-02010-54		SKT 15W DRANGE PNL MTG 125 C Matching socket for D-range plug PL101.
240-02100-17	7	SKT COAX BNC PNL JAC CRP RG316 Part of 219-02710-00 sub-assembly.
240-02100-51	8	SKT N-TYPE FLANGE FEM SEMI-RIG
240-06010-14		CLAMP LATCHING 15 W D RANGE Cover for D-range socket.
240-06010-15	9	BLOCK LATCHING 15W D RANGE
258-00010-08	10	FAN 12V 119 x 119 x 25 (PAPST)
302-05204-00	13	BRKT A3M2314 F/THRU MTG T859
303-11182-02	14	HEATSINK T889 MECH DRILLED
303-23146-00	15	COVER SIDE T869PA
308-01007-01	16	HANDLE BS SII 2 WASHERS INC
308-13139-01		HSINK AL TRANSFER PLT 2.5 THK Fits around Q3-Q6 under PCB.
316-06651-00	17	PNL PA NO INP DRV SER II DBL
319-01152-00	18	SHIELD A3M2250 F/THRU MTG T857 Part of 070-01001-00 sub-assembly.
319-01202-00	19	SHIELD T869PA CONTROL CIRCUIT
319-01219-00	20	SHIELD WALL T889 LOW PASS FILT SHIELD1
319-01220-00	21	SHIELD LID T889 LOW PASS FILTE
319-30061-00	22	SPACER PLATE T889 WIRELINE Fitted to L13/14/15 and L40/41/42 above and below PCB.
319-30062-00	23	SPACER T889 PRE DRIVER XSTR
319-40009-00	24	STRAP RF PWR XSTR EARTHING 889
345-00040-16	25	SCRW M3X20MM P/POZI ST BZ
349-00020-07	26	SCRW T/T 4-40X5/16" P/POZI BLK
349-00020-09	27	SCRW T/T 4-40X3/8" P/POZI BLK
349-00020-36	28	SCREW TT M3X8m PANTORX BLK
349-00020-49	29	SCRW T/T M4X35MM P/POZ BZ
349-00020-50	30	SCRW T/T 4-40 X 5/8 P/POZ BLK
349-00020-55	44	SCRW M3X8 P/P T/T BLCKZNC CHRM
349-20430-00	31	SCRW T/T M4X12MM P/TORX BLK
352-00010-29	32	NUT M4 NYLOC HEX
353-00010-10	33	WSHR M3 FLAT 7MMX0.6MM ST BZ
353-00010-24	34	WSHR M4x8mm Flat ST BZ
356-00010-01	35	TAG SOLDER 3MM SHORT M6132/3.2
356-00010-03	36	TAG SOLDER 3MM LONG M614/3.2
356-00010-26		PIN TRACK HARWIN FOR 1.6MM PCB
357-00010-45	37	CLAMP CABLE 4.8MM P CLIP
360-00010-41	38	BUSH SHORTY BLK
362-00010-07	39	GASKET SIL INSULATING TO-220
362-00010-13	40	BUSH INSULATING 1.1MM TOP HAT
362-00010-33	41	GROMMET LED MTG 3MM
369-00010-14		TIE CABLE NYLON 100X2.6MM
399-00010-56		BAG PLASTIC 200X250MM
400-00020-07		SLEEVING 2MM SIL RUBBER
400-00020-30		HEATSHRINK 3MM

Note

The following electrical components are also included in the mechanical assembly drawing.

039-00100-50	2	RES TERM 50E 100W RFP-100-50TW R274
000-00030-95	11	S) XSTR 2N6107 PNP TO220 AF Q137
000-00293-30	12	S) XSTR 2SC2933 NPN 900MHZ 14W Q1
000-00141-40	43	LS) XSTR SD1414 6LFL UHF 45W Q2-Q6

replace A4 pages D5.2.9/D5.2.10 with A3 pages D5.2.9/D5.2.10

replace A4 pages D5.2.9/D5.2.10 with A3 pages D5.2.9/D5.2.10

T889 Grid Reference Index (IPN 220-01326-04)

How To Use This Grid Reference Index

The first digit in the PCB layout reference is a "1" or "2", indicating the top or bottom side layout respectively, and the last two characters give the location of the component on that diagram.

The first digit in the circuit diagram reference is the sheet number, and the last two characters give the location of the component on that sheet.

Device	PCB	Circuit
C1	1:R2	2-B4
*C2	1:Q5	2-D3
*C3	1:Q5	2-D3
C4	1:A1	1-N7
C6	1:S6	2-D4
C7	1:S4	2-C4
*C9	1:Q6	2-E3
*C10	1:Q6	2-F4
*C11	1:Q6	2-F3
*C12	1:Q6	2-G3
*C13	1:Q7	2-H3
C14	1:Q7	2-H3
C16	1:R8	2-G4
C17	1:Q8	2-G4
C18	1:P8	2-F4
*C19	1:Q6	2-E3
C20	1:K1	2-K7
*C21	1:K2	2-L7
C22	1:J2	2-M7
C23	1:J1	2-M7
C24	1:J1	2-O7
C26	1:K4	2-K5
*C27	1:K4	2-L5
C28	1:J4	2-M5
C29	1:J1	2-N6
C30	1:J4	2-M5
C31	1:J5	2-O5
C33	1:K6	2-K3
*C34	1:K6	2-L3
C35	1:J6	2-M3
C36	1:J6	2-M3
C37	1:J5	2-N4
C39	1:H1	2-O6
C40	1:K8	2-K1
*C41	1:K8	2-L1
C42	1:J8	2-M1
C43	1:J9	2-M1
C44	1:J9	2-N2
C46	1:J9	2-O2
C47	1:H9	2-O2
C48	1:E7	2-U5
C52	1:C9	2-T3
C58	1:J6	2-O4
C59	1:H7	2-O4
C60	1:H3	2-O4
C66	1:S3	2-B4
C67	1:H2	2-O6
C68	1:H6	2-P4
C72	1:H8	2-P2
C73	1:Q8	2-F4
C74	1:S4	2-B4
C75	1:R4	2-C4
C97	1:P1	2-U9
C98	1:P1	2-V9
C101	1:D4	1-B7
C103	1:D5	1-B8
C105	1:A3	1-D8
C107	1:A3	1-D9
C109	1:A3	1-D8

Device	PCB	Circuit
C111	1:A3	1-D7
C113	1:A2	1-F8
C115	1:A2	1-F8
C117	1:A2	1-F9
C119	1:A2	1-G8
C121	1:B5	1-B6
C123	1:B5	1-B6
C125	1:A3	1-D6
C127	1:B3	1-D6
C129	1:A3	1-Q4
C130	1:B3	1-J5
C131	1:A1	1-K6
C132	1:A2	1-L7
C133	1:B1	1-M7
C139	1:A1	1-N6
C143	1:B3	1-D5
C145	1:B3	1-E5
C147	1:E5	1-F4
C149	1:E4	1-F5
C151	1:B2	1-B4
C153	1:A1	1-B3
C155	1:D4	1-G3
C159	1:A5	1-K2
C161	1:A2	1-M4
C162	1:B3	1-N4
C164	1:B2	1-P4
C167	1:U4	1-P2
C169	1:U3	1-P2
C171	1:U4	1-Q2
C173	1:D4	1-B0
C174	1:C5	1-C0
C176	1:E3	1-E0
C177	1:C1	1-F0
C178	1:E5	1-G0
C179	1:C3	1-G2
C180	1:T8	2-D5
C181	1:T7	2-D5
C182	1:T8	2-C6
C183	1:S8	2-C5
C185	1:T8	2-C6
C187	1:D2	1-J1
C189	1:D3	1-N1
C190	1:D3	1-N1
C192	1:C2	1-N0
C193	1:C4	1-P0
C195	1:C3	1-Q0
C196	1:C2	1-J1
C197	1:C2	1-L1
C198	1:D2	1-L1
C199	1:D3	1-M1
C200	1:T7	2-D6
C201	1:T6	2-D6
C203	1:T7	2-C6
C204	1:A1	1-N7
C205	1:A1	1-P7
C206	1:T7	2-E5
C207	1:S7	2-D5
C210	1:D1	1-G1
C211	1:C1	1-H1

Device	PCB	Circuit
C225	1:N7	2-I4
C245	1:F2	2-P7
C250	1:G2	2-P5
C252	1:G7	2-P3
C258	1:F7	2-P1
D101	1:B4	1-H5
D101	1:B4	1-H5
D103	1:V8	1-M8
D105	1:A5	1-K2
D105	1:A5	1-L2
D107	1:V9	1-L4
D109	1:V8	1-N5
D113	1:P1	1-Q1
DCC1	1:E7	2-S4
DCC4	1:D7	2-S3
DCC100	1:D6	2-T4
DCC101	1:C6	2-U4
DCC102	1:C8	2-U4
DCC103	1:B8	2-V4
DCC104	1:B6	2-V4
DCIC1	1:D7	2-S4
DCIC2	1:E8	2-S4
DCR1	1:D8	2-S4
DCR2	1:E7	2-S4
IC101	1:D5	1-G0
IC101	1:D5	1-B6
IC101	1:D5	1-M0
IC101	1:D5	1-B7
IC101	1:D5	1-C1
IC103	1:B1	1-C3
IC103	1:B1	1-K8
IC103	1:B1	1-F0
IC103	1:B1	1-L4
IC103	1:B1	1-C2
IC105	1:D3	1-G2
IC105	1:D3	1-N0
IC105	1:D3	1-M0
IC107	1:D2	1-K1
IC109	1:C2	1-N1
L1	1:U3	1-P2
L2	1:Q5	2-C3
L3	1:P4	2-C3
L4	1:R6	2-D4
L5	1:S5	2-D4
L6	1:S5	2-C5
L7	1:R6	2-F3
L8	1:S7	2-F3
L9	1:Q8	2-H4
L10	1:R8	2-H4
L11	1:Q6	2-E4
L12	1:U3	1-Q2
L13	1:N5	2-I4
L14	1:N5	2-I5
L15	1:M5	2-J5
L16	1:R4	2-C4

Device	PCB	Circuit
L17	1:L2	2-K7
L18	1:K2	2-K7
L19	1:J1	2-N7
L20	1:H1	2-N7
L21	1:P8	2-I4
L23	1:G2	2-O7
L24	1:M2	2-J7
L26	1:L3	2-J5
L27	1:L4	2-K5
L28	1:K5	2-K5
L29	1:J4	2-N5
L30	1:H4	2-N5
L32	1:H3	2-O5
L33	1:L7	2-J3
L34	1:L6	2-K3
L35	1:K5	2-K3
L36	1:J6	2-N4
L37	1:H5	2-N4
L39	1:H7	2-O3
L40	1:G5	2-Q4
L41	1:F5	2-Q5
L42	1:F5	2-R5
L43	1:M8	2-J1
L44	1:L8	2-K1
L45	1:L7	2-K1
L46	1:J9	2-N2
L47	1:H9	2-N2
L49	1:G8	2-O1
L50	1:E7	2-T5
L51	1:N1	2-U9
L52	1:D9	2-T3
L55	1:D6	2-T4
L57	1:C7	2-U4
L58	1:F2	2-R5
L59	1:B8	2-U4
L61	1:B7	2-V4
L63	1:S2	2-A4
L64	1:H7	2-P3
L65	1:H2	2-O7
L66	1:Q2	2-F5
L175		2-W4
L200	1:T6	2-D7
L201	1:T7	2-D7
LINK2	1:V7	1-D1
P1	1:R2	2-A4
P4	1:A7	2-W4
P101	1:A5	1-R9
P112	1:U4	1-R0
P113	1:U2	1-R1
PL101	2:V3	2-D0
Q1	1:Q5	2-D4
Q2	1:Q7	2-G4
Q3	1:K1	2-M7
Q4	1:K4	2-M5

Device	PCB	Circuit
Q5	1:K6	2-M3
Q6	1:K8	2-M1
Q101	1:A3	1-C8
Q103	1:A3	1-D8
Q105	1:B2	1-D6
Q107	1:A2	1-F8
Q109	1:A2	1-G8
Q111	1:A5	1-K7
Q115	1:A2	1-M7
Q117	1:B1	1-M7
Q119	1:A3	1-M6
Q121	1:A1	1-P8
Q123	1:B3	1-E5
Q125	1:B3	1-E5
Q127	1:E4	1-F4
Q129	1:B2	1-N4
Q131	1:B3	1-P4
Q133	1:C5	1-E0
Q135	1:S8	2-C5
Q137	1:T8	2-B5
Q138	1:A1	1-K6
R1	1:P5	2-C3
R2	1:S5	2-D4
R3	1:S5	2-C4
R4	1:R6	2-F3
R5	1:R8	2-G4
R6	1:Q8	2-G4
R10	1:L2	2-J7
R11	1:H1	2-N7
R12	1:L5	2-J5
R13	1:H4	2-N5
R14	1:L5	2-J3
R15	1:H5	2-N4
R19	1:L7	2-J1
R20	1:H9	2-N2
R21	1:H9	2-O2
R24	1:H6	2-O4
R29	1:H1	2-N6
R59A	1:R3	2-B4
R60	1:R3	2-B3
R60A	1:R3	2-B3
R72	1:P1	2-T9
R101	1:C4	1-A7
R102	1:E4	1-A9
R103	1:E5	1-A7
R104	1:D4	1-B9
R105	1:A5	1-C8
R106	1:A3	1-C8
R107	1:A5	1-D7
R108	1:A3	1-D9
R109	1:A3	1-D8
R111	1:A3	1-E8
R112	1:A2	1-E8
R113	1:A2	1-F9
R114	1:B4	1-A6
R115	1:B5	1-A6
R116	1:B4	1-A6
R117	1:B5	1-A6
R118	1:B5	1-B6
R119	1:B4	1-C6
R120	1:A5	1-K7
R121	1:B4	1-C6
R122	1:B5	1-D6
R123	1:B2	1-H7
R124	1:B1	1-K8
R125	1:B2	1-K8
R126	1:B4	1-J5
R127	1:A4	1-J7
R129	1:B1	1-L8
R130	1:B1	1-L8
R131	1:A2	1-K7
R132	1:B1	1-L8
R133	1:A2	1-K7
R134	1:A1	1-K6
R135	1:V9	1-M9

Device	PCB	Circuit
R136	1:A2	1-L7
R137	1:A2	1-L6
R138	1:A3	1-M6
R141	1:B3	1-D5
R142	1:B3	1-E5
R143	1:A3	1-E4
R144	1:B4	1-F4
R145	1:E4	1-F5
R146	1:E4	1-F5
R148	1:B2	1-A4
R149	1:B4	1-A3
R151	1:B2	1-B4
R152	1:A1	1-B3
R153	1:B2	1-E4
R154	1:A2	1-E3
R155	1:D4	1-G2
R156	1:D4	1-F3
R158	1:A1	1-K3
R159	1:A1	1-L4
R160	1:C3	1-K4
R162	1:A1	1-L3
R164	1:B2	1-M4
R165	1:B2	1-M3
R166	1:V8	1-N5
R168	1:C4	1-A1
R169	1:C5	1-A0
R170	1:C4	1-B1
R171	1:C5	1-B0
R172	1:B4	1-B1
R173	1:V7	1-C1
R174	1:V7	1-C1
R175	1:C4	1-C0
R176	1:D4	1-D0
R177	1:D5	1-D0
R178	1:D3	1-E1
R179	1:D3	1-E0
R180	1:E3	1-E0
R181	1:D4	1-E2
R182	1:E3	1-E0
R183	1:E3	1-F1
R184	1:S7	2-D5
R185	1:D4	1-H2
R186	1:T8	2-C6
R187	1:C1	1-F0
R188	1:D2	1-L1
R189	1:C3	1-L0
R190	1:E4	1-G0
R191	1:C2	1-P0
R192	1:B2	1-P0
R193	1:B3	1-Q1
R194	1:D3	1-M1
R271	1:V9	1-L5
R272	1:F9	2-Q4
R274	1:G1	2-Q5
R275	1:F1	2-R5
R276	1:N9	2-I4
R277	1:N1	2-I5
R278	1:L1	2-J5
R280	1:A4	1-L3
R285	1:D1	1-H1
RV101	1:C4	1-J8
RV103	1:C4	1-H5
RV105	1:C3	1-K4
RV107	1:C2	1-K3
*RV109	1:V6	1-C2
RV111	1:V6	1-D2
RV113	1:C3	1-E1
RV115	1:C2	1-L1
S3	1:E8	2-T4
S4	1:D9	2-T3
SHIELD1	1:C7	2-C0
SK101	1:U3	2-K0

Device	PCB	Circuit
SK103	1:A4	2-F0
SK105	1:C1	2-I0
SK107	1:Q1	2-G0
TB1		2-I4
TB2		2-I4
TB3		2-P7
TB4		2-Q7
TB5		2-P5
TB6		2-P5
TB7		2-P3
TB8		2-P3
TB9		2-P1
TB10		2-Q1

Device	PCB	Circuit

Part E T880 VCO

In the Series II T885 receiver and T881 transmitter the VCO circuitry is located on the main PCB, and not on a separate PCB as in other T800 Series II modules.

Refer to the appropriate sections in Part B (T885) and Part C (T881) for information on the VCO.

Part F Installation

This part of the manual is divided into the sections listed below. These sections give a brief description of the basic rack mounting and wiring procedures for the T885 receiver, T881 transmitter and T889 power amplifier.

4 N-Type Connector Assembly

Make sure that any N-type plugs connected to Tait equipment are assembled according to the manufacturer's instructions. It is particularly important that the centre pin in the plug is positioned correctly:

- if the pin is positioned too far back in the plug, it may not make good contact with the socket;
- if the pin protrudes too far (as shown in Figure 4.1), or is not straight, it may damage the socket when the plug is screwed in.

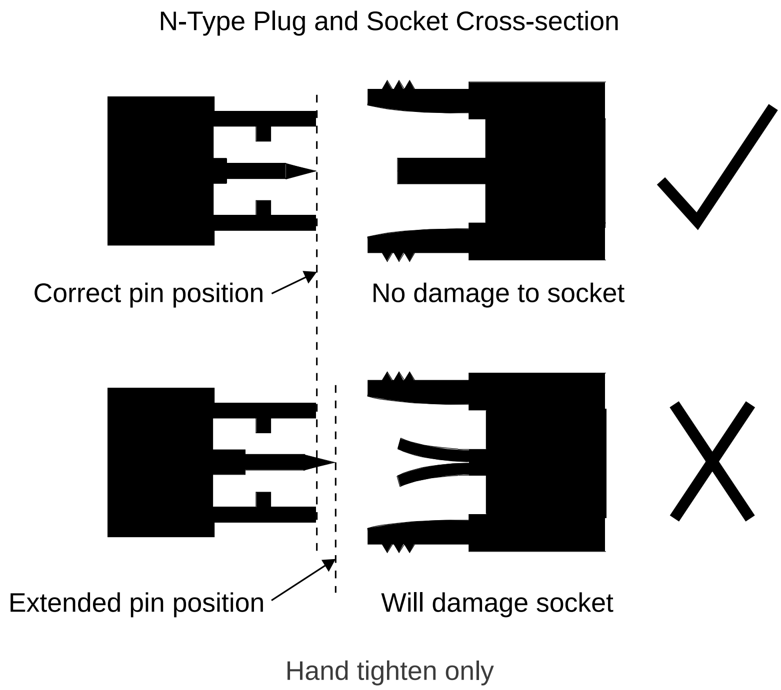


Figure 4.1 N-Type Plug Assembly Details

Part G System Configurations

This part of the manual is divided into the sections listed below. These sections provide some brief information on basic system types and how to configure T880 Series II equipment for use in them.

1 T885 Link Selectable Features

1.1 Flat Or De-emphasised Response

The links of PL210 and PL220 may be set to give either a flat or de-emphasised audio frequency response (refer to Section 1.7 for further details).

1.2 Mute Relay Control

A relay with undedicated contacts (RL210) is available in the audio processor circuit block for various switching applications. A link (PL270) is available for control of the relay from the mute circuit (refer to Section 1.7). This makes the relay suitable for controlling the keying of a transmitter in repeater applications.

1.3 Mute Selection

Link PL250 may be set to operate with noise mute or carrier mute (refer to Section 1.7).

1.4 Receiver Disable

The receiver audio can be disabled by pulling the RX-DISABLE line low. When the circuit is pulled from low to high, the receiver audio cannot be re-enabled until the disable timer completes its operation. This time is variable from 15ms to 200ms by adjusting RV220 in the audio processor section.

If required, the operation of this circuit can be disabled by changing the link of PL260 from 1-2 to 2-3.

Typical applications of the receiver disable are as an extra mute for signalling purposes, or when the T885 is configured as a line controlled base station (refer to Section 4).

1.5 CTCSS Configuration

Links PL230 & PL240 select various CTCSS options (refer to Section 1.7.2).

1.6 300Hz High Pass Filter

Link PL240 also allows the insertion of this filter to improve ultimate signal-to-noise performance.

1.7 Audio Processor Links

The tables in this section are the same as those in Section 3.5 in Part B. They have been repeated here for ease of reference.

1.7.1 General

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 the receiver alignment. The factory settings are shown in brackets [ ].

Plug	Link[a]	Function
PL210	[1 - 2] 2 - 3	de-emphasised response flat response
PL220	1 - 2 [2 - 3]	flat response de-emphasised response
PL230[b]	1 - 2 [2 - 3] 3 - 4	audio input via AUDIO-2 pad audio from internal CTCSS speech filter audio input via I/O pad P250
PL240[b]	1 - 2 [2 - 3] or 3 - 4 4 - 5	bypass high pass filter 300Hz high pass filter in circuit audio input via PL230 or I/O pad
PL250	[1 - 2] 2 - 3	noise mute carrier mute
PL260	1 - 2 [2 - 3]	RX-DISABLE link not connected
PL270	[1 - 2] 2 - 3	relay link not connected

a. Pin 1 is identified by the number "1" screen printed onto the PCB beside each set of links.

b. Refer to Section 1.7.2 for further details.

1.7.2 Audio Processor Linking Details For CTCSS

You must connect the audio processor links correctly according to the CTCSS option used, as shown in the table below.

CTCSS Option	PL230[a]	PL240[a]
standard, no CTCSS	2 - 3	2 - 3
received CTCSS + speech passed to line output	3 - 4	1 - 2
high pass filtered speech, internal CTCSS detection	2 - 3	4 - 5
external CTCSS detection	1 - 2	4 - 5

a. Pin 1 is identified by the number "1" screen printed onto the PCB beside each set of links.

The conditions stated in the above table are defined as follows:

- standard, no CTCSS
  - no CTCSS or other sub-audio signalling used
  - audio bandwidth 300Hz to 3kHz
  - hum & noise -48dB
- received CTCSS tone + speech to line output
  - tone and speech transmitted down 600 ohm line
  - audio bandwidth 10Hz to 3kHz
  - hum & noise -45dB
- high pass filtered speech + internal CTCSS detection
  - 400Hz to 3kHz
  - hum & noise -25dB with 250.3Hz tone present
- external CTCSS detection
  - decoding performed through the receiver (but externally)
  - speech injected back into receiver via "AUDIO-2" and sent down 600 ohm line

Note 1: AUDIO-2 is available on D-range 1 (PL100) pin 7 via the link resistor R160. Although PL100 pin 7 is already assigned to SERIAL-COM, this can be disabled by removing R808.

Note 2: External CTCSS units can connect in series with the audio chain via AUDIO-1 and AUDIO-2.

2 T881 Optional Features

2.1 Audio Processor

The T881 comes with a number of link selectable features which give added system flexibility.

Note: The tables in this section are the same as those in Section 3.5 in Part C. They have been repeated here for ease of reference.

2.1.1 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
PL201	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
	7-8	D	pre-emphasis output to multiplexer input
	[9-10]	E	pre-emphasis output to limiter input
	11-12	F	not connected
	13-14	G	not connected
PL202	[1-2]	H	compressor output to multiplexer input
	3-4	I	compressor output to limiter input
	5-6	J	compressor output to pre-emphasis input
	7-8	K	not connected
	[9-10]	L	multiplexer output to pre-emphasis input
	11-12	M	multiplexer output to limiter input
	13-14	N	multiplexer output to compressor input

a. The letters in this column and in the table in Section 2.1.2 below refer to the identification letters screen printed onto the PCB beside each pair of pins.

2.1.2 Typical Options

	PL201		PL202	
microphone pre-amp. compressed and pre-emphasised; line input pre-emphasised (standard set-up)	[3-4] B	[9-10] E	[1-2] H	[9-10] L
microphone pre-amp. compressed and pre-emphasised; line input unprocessed	3-4 B	7-8 D	5-6 J	11-12 M
line and microphone compressed and pre-emphasised	5-6 C	9-10 E	5-6 J	13-14 N
microphone pre-amp. compressed; line and microphone flat response	3-4 B	11-12 F	1-2 H	11-12 M

2.2 Line Transformer Inputs And Outputs

The line transformer (T210) is designed to provide a balanced interface to 600 ohm lines. For normal operation the two centre connections (LINE I/P 2, LINE I/P 3) are shorted together, and the 600 ohm line is connected between LINE I/P 1 and LINE I/P 4.

The secondary winding of the transformer is connected via 1k and 10Ω (R160) resistors to pin 6 (AUDIO-2) of D-range 1 and may be used to monitor audio on the line. Pin 7 of D-range 1 can be reconfigured as AUDIO-1 by removing R808 and R160, and placing %R150 (refer to Section 2 in Part I for more details).

2.3 Opto Key

The keying circuitry may be completely isolated from the rest of the system by means of the optocoupler (IC250) connected between pins 11 and 12 of the D-range connector. A constant current source (Q270) allows keying voltages between 6 and 50V.

2.4 Relay Driver

A dedicated transistor (Q250) is provided for the purpose of switching an external (e.g. coaxial) relay. The output is open collector and is activated by the Tx-Reg rail. This output is available on pin 9 of the T800-03-0000 auxiliary D-range connector (D-range 2).

2.5 Local Microphone

Use of the local microphone (via the front panel stereo socket) will disable the audio input from the line. The audio switching occurs when the PTT switch is closed.

2.6 Keying With Option PCBs

If an option PCB is fitted, the exciter may be keyed via the TX-ENB-OPT pad in the audio processor. The line must be pulled low to key.

2.7 Transmit Key Time

(Refer to the appropriate test points & options connections drawing in Section 6 of Part C.)

A solder link (SL345) is provided in the VCO cavity to allow two transmit key time options, as shown in the table below.

Transmit Key Time	SL345
standard - 30ms (approx.)	not linked
short* - <5ms	linked

*In this configuration the standby spurious emissions should be <-65dBm.

3 Talk Through Repeater

In this configuration the receiver directly keys the transmitter when the signal is received. The demodulated audio is fed via 600 ohm lines to the transmitter to modulate the carrier. The receiver and transmitter operate simultaneously and must therefore be on different frequencies. The minimum frequency separation depends on the duplexer used.

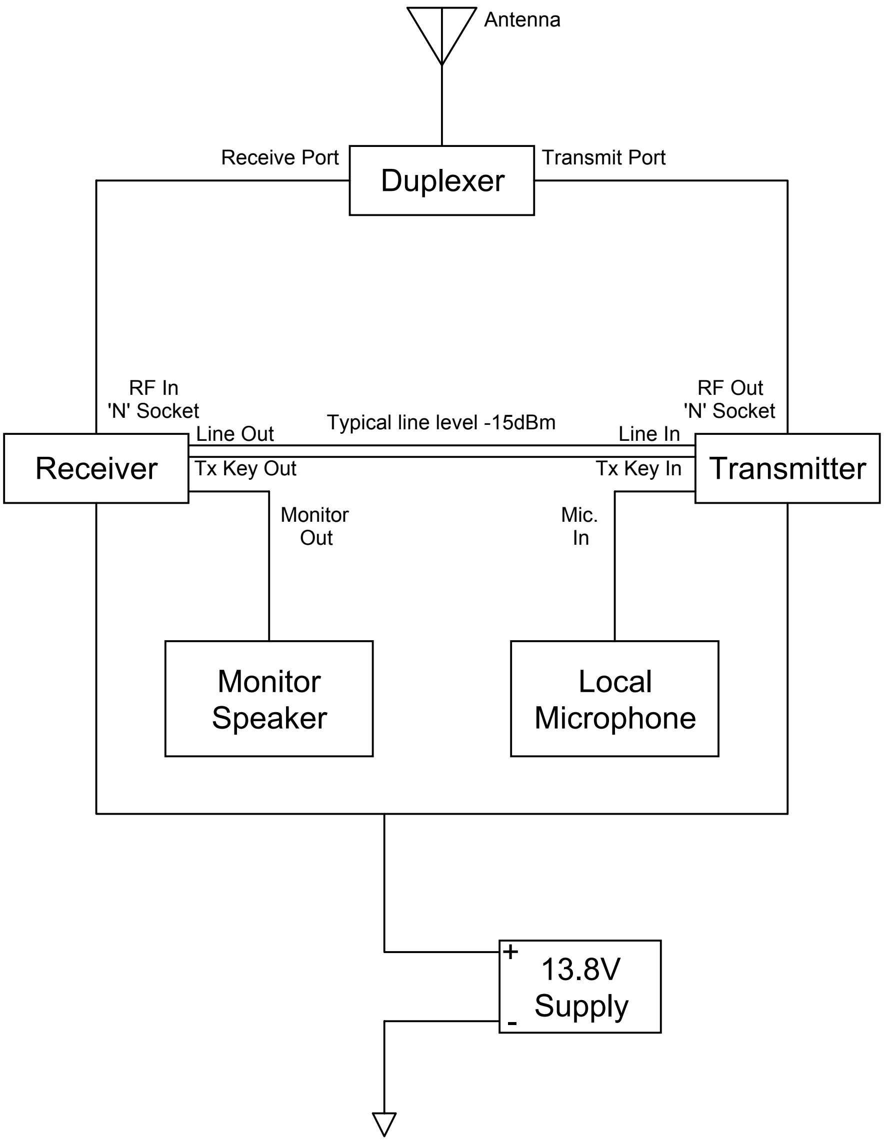


Figure 3.1 Talk Through Repeater

4 Line Controlled Base Without Talk Through

4.1 General

This installation contains a transmitter and receiver which may or may not be on the same frequency, thus simultaneous transmission and reception is not possible. When the transmitter is keyed, the coaxial relay is also energised. When the relay is in its rest position, signals from the aerial are passed to the receiver and the demodulated output is fed via 600 ohm lines to the RCU.

The receiver is disabled when the transmitter is energised to prevent the receiver mute opening from RF due to lack of isolation in the relay, direct radiation or the noise skirt of the dual frequency link.

Since the base station may be controlled via a 2-wire line and a 4-wire to 2-wire hybrid, there is a possibility of system oscillation if the receiver is not disabled during transmit. This occurs when the transmit energy enters the receiver and produces an audio response which can pass from the receive to the transmit audio part of the hybrid (impedance imbalance, etc).

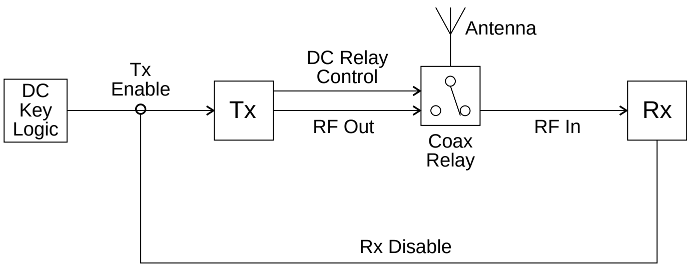


Figure 4.1 Basic Configuration

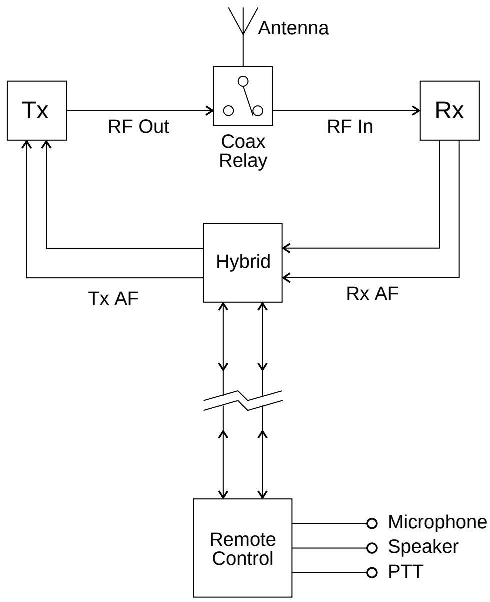


Figure 4.2 Remote Line Controlled Base Station

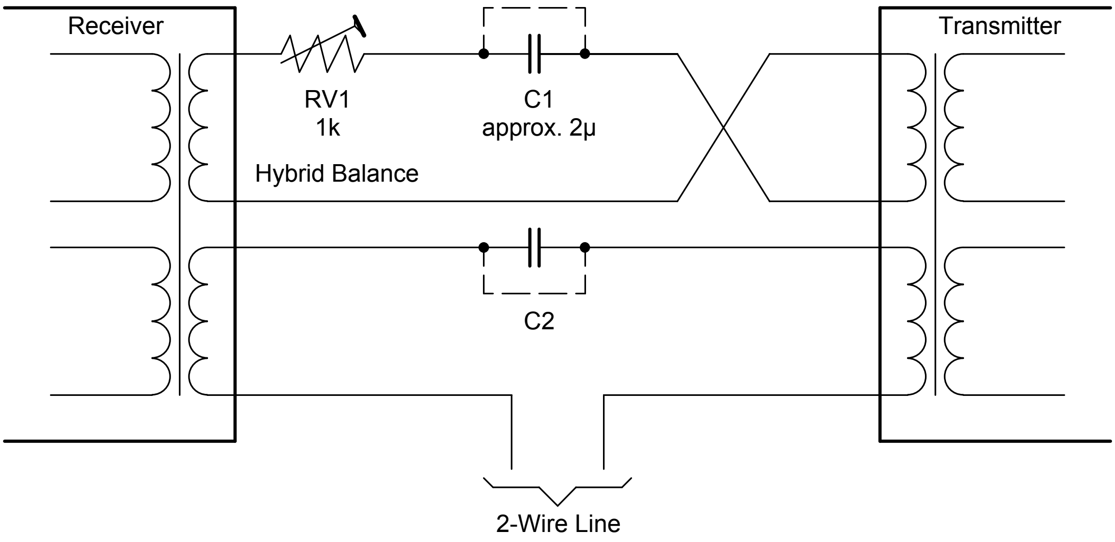


Figure 4.3 4-Wire to 2-Wire Converter

4.2 Transmitter Tail Timer

If the transmitter has the tail timer enabled:

- the receiver disable timer must be set so that ^{t}Rx/Dis > ^{t}Tx/Tail;

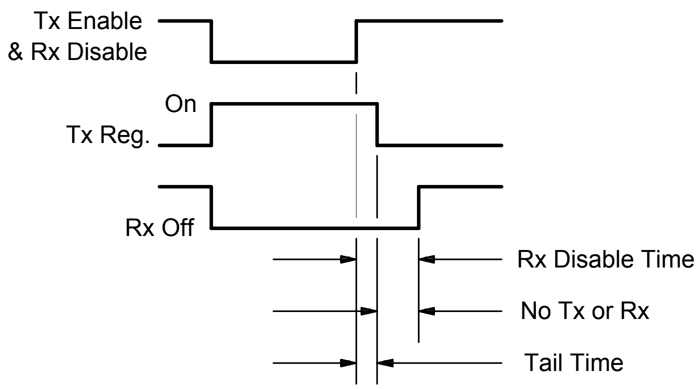


Figure 4.4 Receiver Disable Time vs Tail Time

- if the system configuration also uses an aerial changeover relay as well as the tail timer, the changeover relay must be driven from the relay driver (Q250) in the audio processor, rather than by Tx-Key or Tx-Enable; this output is available on pin 9 of the T800-03-000 auxiliary D-range (D-range 2);

- depending on tail time requirements, it is possible for the transmitter tail time to exceed the receiver disable time capability; in this situation the receiver disable line should also be driven from relay driver Q250 (D-range 2 pin 9).

5 DC Line Keying

Where the transmitter and receiver are separated by only a short distance and DC isolation is not required, DC loop keying may be employed.

A small DC current (usually less than 10mA) can be fed via the balanced 2-wire line to provide remote control of various functions.

In a duplex system the receiver mute is used to key a transmitter, provided there is a common earth between the two units (refer to Figure 5.1).

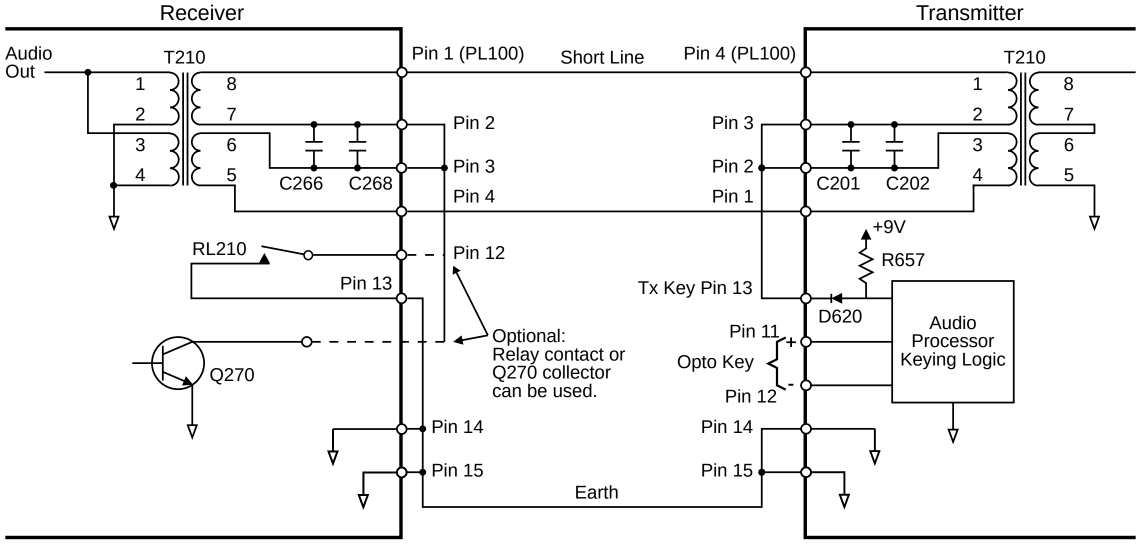


Figure 5.1 DC Loop Keying With Common Earth

Where the receiver and transmitter (or remote control) are distant, DC loop keying is provided by an isolated supply, driver and detector because an earth cannot be relied on (refer to Figure 5.2, Figure 5.3 & Figure 5.4).

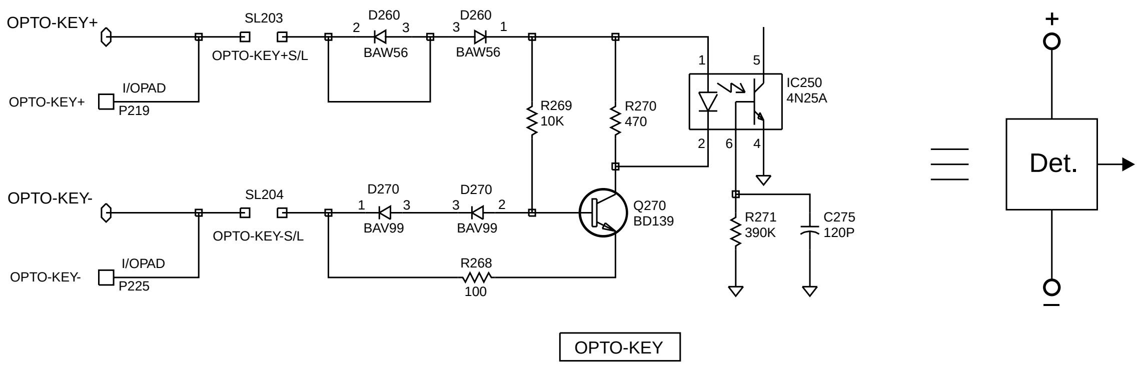


Figure 5.2 Isolated Constant Current Loop Current Detector (Opto-key input on T881)

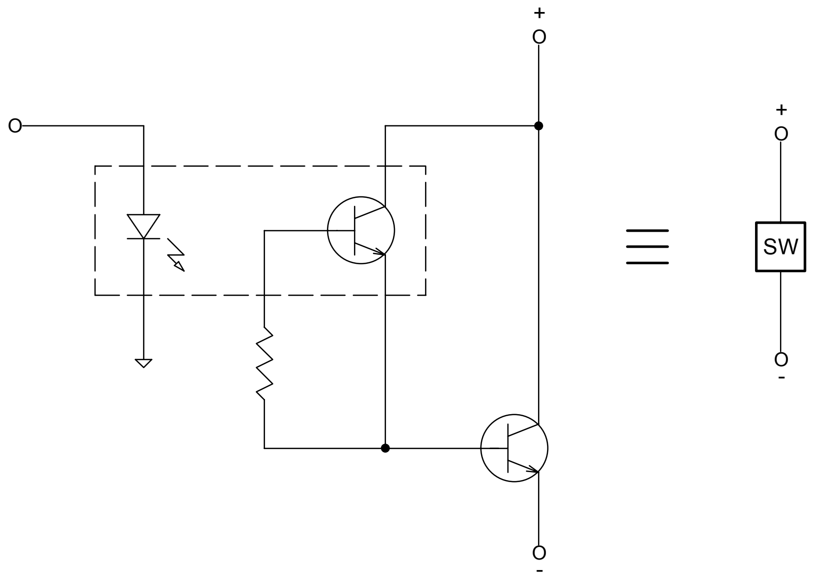


Figure 5.3 Isolated Loop Current Switch

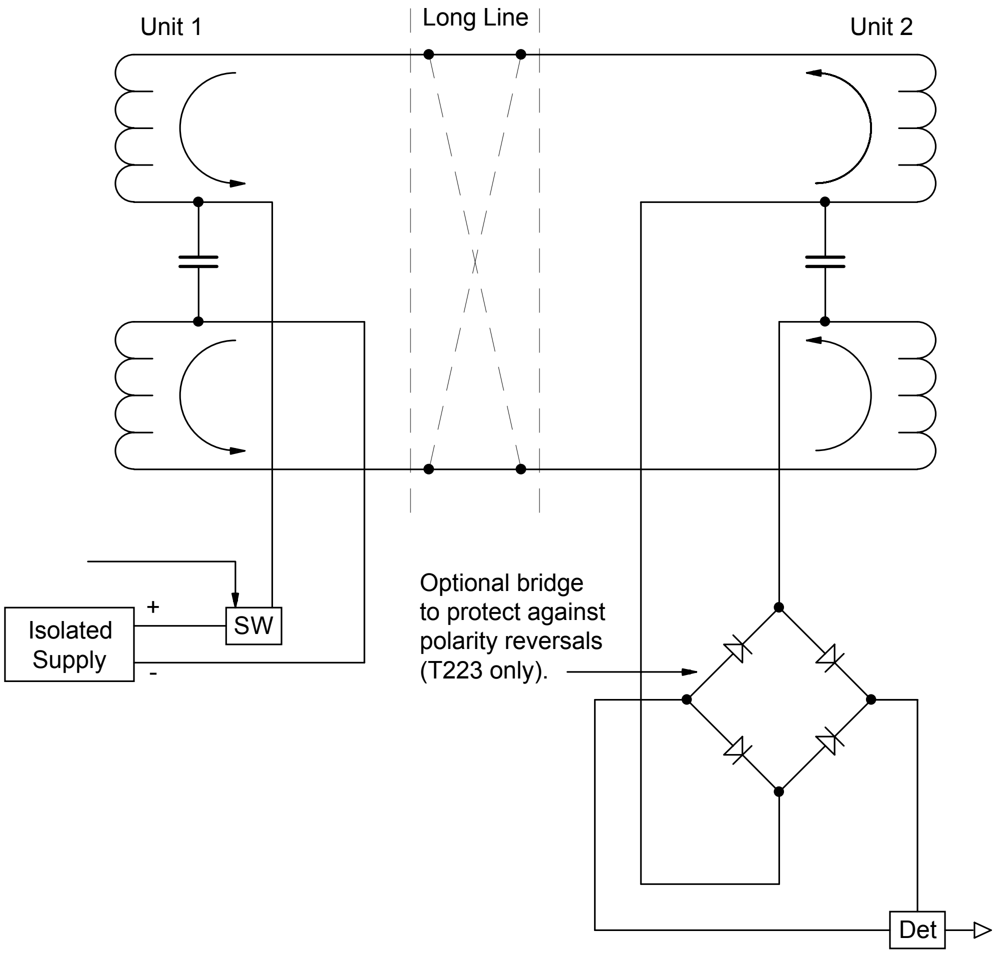


Figure 5.4 Typical System

Part H T800 Ancillary Equipment

This Part of the manual features a brief description of the major ancillaries that may be used with T800 Series II equipment. For a comprehensive list of available ancillary equipment, please contact your nearest Tait Dealer or Customer Service Organisation.

T800 Ancillary Equipment

Programming Kits

T800-01-0002

The T800-01-0002 programming cable connects the PC directly to the programming socket on the T800 Series II rack frame speaker panel or backplane PCB, thus enabling T800 Series II modules to be read or programmed while in the rack frame. It can also connect to the programming socket on the T800-01-0004 programming module interface if the module is to be read or programmed while out of the rack frame.

T800-01-0003

The T800-01-0003 programming kit contains a T800-01-0002 programming cable and a T800-01-0004 programming module interface.

T800-01-0004

The T800-01-0004 programming module interface is designed to allow a PC to connect directly to a T800 Series II module. It comprises a small PCB on which is mounted a D-range socket, a programming socket, a Micromatch socket and a DC input connector.

The T800-01-0004 plugs directly into D-range 1 or D-range 2 (selected by a switch on the PCB), or into SK805 in the microcontroller compartment via the supplied ribbon cable loom, and is then connected to the PC with a T800-01-0002 programming cable.

Refer to the T800 Ancillary Equipment Service Manual for more information.

T800-01-0005

The T800-01-0005 kit is used for programming T800 Series II base station equipment using a standard IBM™ (or compatible) PC.

The kit comprises the following items:

PGM800Win Windows™ based programming software on CD
PGM800Win programming software user's manual on CD
T800-01-0002 programming cable.

T800-01-0006

The T800-01-0006 kit is the same as the T800-01-0005 kit described above, but with the addition of the T800-01-0004 module programming interface.

General Ancillaries

T800-01-0010 Calibration Test Unit

The T800-01-0010 provides all inputs and outputs necessary to carry out the full tuning and adjustment procedure for T800 Series I and II receivers, exciters and transmitters. It provides a convenient method of connecting test equipment, including a PC and power supply, to a T800 Series I or II module (via D-range 1) without the need to construct custom wiring looms.

The T800-01-0010 also has a built-in speaker, a switch for selecting Series I or II modules, and uses standard BNC and "banana plug" sockets.

Refer to the T800 Ancillary Equipment Service Manual for more information.

T800-03 Auxiliary D-Range

The T800-03 is an additional D-range kit comprising one D-range plug assembly and two locating pins, nuts & washers. Although originally a T800 Series I ancillary, it can be used in T800 Series II products for special applications requiring custom internal wiring.

T800-03-0000 Auxiliary D-Range

The T800-03-0000 is an additional D-range kit (normally fitted as D-range 2) comprising one D-range plug assembly complete with connecting loom and mounting screws. The ribbon cable loom connects the D-range PCB to the Micromatch socket (SK805) in the microcontroller compartment. Typical uses of the T800-03-0000 are in paging applications and where external channel control is required. Refer to Figure 1.4 and Figure 2.4 in Part F for the T800-03-0000 pin connections.

T800-04-0000 RSSI

The T800-04 RSSI option PCB plugs directly into the main PCB (support circuitry being fitted as standard). It is fitted to the T855 and T875 whenever receiver signal strength monitoring is required, e.g. trunking or voting. Its function is to provide a DC voltage proportional to the signal level at the receiver input.

Refer to the appropriate service manual.

T800-08-0000 Ancillary Chassis

The T800-08-0000 is a general purpose chassis designed to be mechanically and electronically compatible with a T800 Series II rack frame. It comprises the following items:

- top and bottom chassis rails
- side panels
- rear panel
- PCB mounting brackets
- double D-range plug assembly (for mounting directly on a PCB)
- T800 Series II blank front panel complete with handle.

Custom designed PCBs for special applications can be mounted in several positions inside the chassis to provide a convenient, plug-in module that interfaces directly with a T800 Series II rack frame.

Refer to Application Note AN-RSD-002 for further information.

T800-09-0000 RF Coaxial Relay

The T800-09-0000 (formerly T004-72) is an RF coaxial relay assembly fitted with three female N-type connectors, and comes complete with a mounting bracket and two coaxial cables terminated in male N-type connectors. It can be used, for example, in base station applications where the receiver and transmitter share the same antenna, in which case it can be driven by the T800 Series II transmitter/exciter relay driver (refer to Section 2.4 in Part G for more information).

T800-10-0000 Channel Select PCB

The T800-10-0000 is a small PCB that plugs into the Micromatch connector (SK805) in the microcontroller compartment of a T800 Series II receiver, exciter or transmitter. It is fitted with an eight-switch DIP switch which allows the manual selection of any one of the channels already programmed into the module by PGM800Win. The T800-10-0000 is also fitted with a Micromatch socket to provide access to SK805 for programming purposes.

T800-80 Local Microphone

A 600Ω microphone complete with 300mm cord terminated in a ¼" stereo plug.

T818-01-0000 Receiver/Transmitter Monitor

The T818-01-0000 (formerly T318-02) is designed to monitor the basic operational functions of one T800 receiver and transmitter. The meter and selector switches for monitoring the required functions are mounted on the front panel, as is the monitor speaker which is driven by a built-in amplifier. An optional mute circuit may be used to silence the audio when no carrier is present.

Refer to M318-02.

Paging

T800-30-0000 & T800-30-0002 DFSK Modulators

The T800-30-0000 (formerly T800-30) and T800-30-0002 (formerly T800-35) are DFSK modulators for T800 Series II transmitters, suitable for POCSAG or similar paging data formats. Analogue transmissions (e.g. tone or speech) are still possible by disabling the data path via a control line. 512 or 1200 baud data rates are link selectable. The T800-30-0002 is adapted for use with an external reference oscillator for simulcast transmission. The T800-30-0000 and T800-30-0002 are not designed for use with 66 to 88MHz equipment.

Refer to the T800 Ancillary Equipment Service Manual for more information.

T800-32-0000 & T800-32-0010 DFSK Modulators

The T800-32-0000 and T800-32-0010 are DFSK modulator PCBs which can be fitted to T800 Series II transmitters to enable them to function as low-speed paging transmitters. These new PCBs have been specifically designed for Series II transmitters and will be much easier to fit into the latest design transmitters.

Both PCBs are suitable for POCSAG or similar paging data formats, but are not designed for analogue transmissions (e.g. tone or speech). The T800-32-0010 is adapted for use with an external reference oscillator for simulcast transmission. The T800-32-0000 and T800-32-0010 are not designed for use with 66 to 88MHz equipment.

External Frequency Reference

T800-06-0000 External Frequency Reference Kit

The T800-06-0000 kit provides an additional D-range plug/PCB assembly which incorporates a miniature RF connector to carry an externally generated 12.8MHz reference signal into a T800 Series II module. This enables the use of very high stability external reference oscillators for special applications.

The D-range PCB is also fitted with a Micromatch socket which can be connected to SK805 in the microcontroller section via the supplied loom to provide access to the channel change lines.

The kit comes complete with fitting instructions and all installation hardware.

T800-06-0001 External Frequency Reference Kit

The T800-06-0001 is the same as the T800-06-0000 kit with the addition of a special coax cable for external frequency reference input. One end of this coax is terminated with a miniature RF connector which fits into the D-range socket in an appropriate backplane PCB (e.g. T800-52-0000) to connect to a T800 Series II module fitted with a T800-06-0000 kit. The other end is terminated with a BNC connector which can be mounted on the rack frame.

T801-00 Frequency Reference Module

The T801-00 frequency reference module provides a high stability frequency source to which the synthesiser within a T800 Series II base station can be locked. The master standard within the T801-00 is primarily intended to be rubidium, although high quality ovenised crystal oscillators can also be used in applications where more frequent readjustment of frequency is acceptable. The T801-00 converts the output frequency from its master standard to the 12.8MHz required by the T800 Series II base station.

Refer to M801-00.

T801-10 OCXO Module

The T801-10 OCXO module provides a high stability frequency source to which the synthesiser within a T800 Series II base station can be locked. This will provide T800 Series II transmitters with the frequency stability required for simulcast transmission. The master standard within the T801-10 is a high quality ovenised crystal oscillator (OCXO). Three outputs are provided on the rear panel, which allows up to three T800 Series II transmitters to be referenced to the source oscillator.

Refer to M801-10.

Rack Frames

T800-22-0000

The T800-22-0000 is a standard 5U high rack frame complete with wiring loom which is designed to accommodate one 25, 50 or 100W base station or repeater. It comes fully assembled with the following items:

T800-15-0000 speaker panel with programming port
T800-40-0001 blank panel (x2)
T800-41-0002 double module guide
T800-44-0000 power supply guide
T800-45-0000 PA guide
T800-50-0000 standard rack frame backplane PCB.

Refer to the T800 Ancillary Equipment Service Manual for more information.

T800-22-0001

The T800-22-0001 is the same as the T800-22-0000, but is supplied packed flat in disassembled form for ease of transport. The wiring loom and backplane PCB are, however, supplied complete and ready for installation.

T800-22-0003

The T800-22-0003 is a standard 5U high rack frame without wiring loom which is designed to accommodate one 25, 50 or 100W base station or repeater. It s supplied packed flat in disassembled form for ease of transport and comprises the following items:

T800-15-0000 speaker panel with programming port
T800-40-0001 blank panel (x2)
T800-41-0002 double module guide
T800-44-0000 power supply guide
T800-45-0000 PA guide.

T800-22-0004

The T800-22-0004 is a standard 5U high rack frame without wiring loom, guides or front panels which comes fully assembled.

T800-22-0005

The T800-22-0005 is the same as the T800-22-0004, but is supplied packed flat in disassembled form for ease of transport.

T800-23-0000 Slimline Repeater Mounting Kit

The T800-23-0000 Slimline Repeater kit enables one T800 Series II receiver and one T800 Series II transmitter to be mounted horizontally side-by-side in a standard 483mm rack frame. The kit contains a front panel complete with speaker, programming port, an options tray (for mounting a power supply, duplexer, etc.), and a wiring loom to connect the two T800 modules to the terminal blocks mounted on the rear of the options tray. The T800-23-0010 mains power supply (available separately) is designed for use with the T800-23-0000. The rack height of the assembled unit is 2U.

T800-23-0001 Slimline Repeater Mounting Kit

The T800-23-0001 Slimline Repeater kit is the same as the T800-23-0000, but is supplied with a T800-23-0010 power supply and no options tray.

Rack Frame Guides

T800-41-0001

The T800-41-0001 rack frame guide is designed to fit into a T800 Series II rack frame and will accept one T800 Series II module (except for power supplies and power amplifiers which must use their own guides). It is supplied disassembled and comprises a top and bottom rail, a rear panel, two D-range sockets and mounting screws.

T800-41-0002

The T800-41-0002 rack frame guide is designed to fit into a T800 Series II rack frame and will accept two T800 Series II modules (except for power supplies and power amplifiers which must use their own guides). It is supplied disassembled and comprises two top and bottom rails, a double width rear panel, four D-range sockets and mounting screws.

T800-41-0003

The T800-41-0003 rack frame guide is designed to fit into a T800 Series II rack frame and will accept three T800 Series II modules (except for power supplies and power amplifiers which must use their own guides). It is supplied disassembled and comprises three top and bottom rails, a triple width rear panel, six D-range sockets and mounting screws.

T800-41-0004

The T800-41-0004 rack frame guide is designed to fit into a T800 Series II rack frame and will accept four T800 Series II modules (except for power supplies and power amplifiers which must use their own guides). It is supplied disassembled and comprises four top and bottom rails, a four-module wide rear panel, eight D-range sockets and mounting screws.

T800-42-0000

The T800-42-0000 rack frame guide will allow a duplexer to be mounted in a T800 Series II rack frame. It occupies a single module space and comprises a folded metal chassis, mounting brackets and screws.

T800-42-0001

The T800-42-0001 rack frame guide is the same as the T800-42-0000 described above, but with the addition of a duplexer front panel.

T800-42-0002

The T800-42-0002 rack frame guide is the same as the T800-42-0000 described above, but with the addition of a blank front panel.

T800-43-0000

The T800-43-0000 rack frame guide is designed to fit into a T800 Series II rack frame and will accept one T300 or T1500 Series module (e.g. T318-02, T1511). It is supplied disassembled and comprises a top and bottom rail, two T300 D-range socket boxes and mounting screws. The T800-43-0000 is not compatible with the T800 Series II rack frame backplane PCB. Consult your nearest Tait Dealer or Customer Service Organisation for more details about T300/T1500 Series compatibility with T800 Series II rack frames.

T800-43-0001

The T800-43-0001 is the same as the T800-43-0000 but is supplied with only one D-range socket box.

T800-44-0000

The T800-44-0000 rack frame guide is designed to fit into a T800 Series II rack frame and will accept one T800 Series II power supply. It comprises a top and bottom rail and mounting screws.

T800-45-0000

The T800-45-0000 rack frame guide is designed to fit into a T800 Series II rack frame and will accept one T800 Series II 50W power amplifier. It comprises a top guide stop, a bottom guide rail and mounting screws.

T800-45-0001

The T800-45-0001 rack frame guide is designed to fit into a T800 Series II rack frame and will accept one T800 Series II 100W power amplifier. It comprises a top guide stop, a bottom guide rail, extra mounting brackets for the double width front panel and mounting screws.

Rack Frame PCBs

T800-50-0000

The T800-50-0000 backplane PCB is designed to allow a T800-22-0000 rack frame to be easily configured as either a base station or repeater. The PCB mounts across the rear panel of the T800-41-0002 double module rack frame guide, enabling a T800 Series II receiver and exciter/transmitter to plug directly into the D-range sockets provided on the inner side of the PCB (both D-range 1 and D-range 2 are provided for). The other side of the PCB features a programming port, D-range connectors which provide all module inputs and outputs, and two DIP switches for external channel selection.

Refer to the T800 Ancillary Equipment Service Manual for more information.

T800-50-0001

The T800-50-0001 is similar in function and design to the T800-50-0000, but is designed to allow connection of TA087 or TA387 channel select panels. It has one 25-way OEM D-range connector, but will not accept personality PCBs.

T800-52-0000

The T800-52-0000 is similar in function and design to the T800-50-0000, but is designed for use in Quasi-Sync applications. The PCB has an external reference D-range fitted and has provision for connecting TA087 or TA387 channel change/speaker panels and a TA136 alarm panel. The T800-52-0000 will not accept personality PCBs.

T800-60-0000

The T800-60-0000 personality PCB is designed to plug into the two 25-way D-range sockets on the T800-50-0000 backplane PCB. The T800-60-0000 provides channel selection for both receiver and exciter/transmitter via a single DIP switch, remote channel selection and alarm monitoring via Micromatch sockets, and receiver and exciter/transmitter inputs and outputs via a 25-way D-range socket.

Rack Frame Ancillaries

T800-13-0000 Extender Rail

The T800-13-0000 extender rail allows a T800 Series II receiver, exciter or transmitter to be operated out of the rack frame with the covers off for tuning purposes. It is fitted with two 15-way D-range connectors.

T800-14-0000 Extender Rail

The T800-14-0000 extender rail is the same as the T800-13-0000, but is intended for equipment using an external reference (e.g. Quasi-Sync). It thus has one 15-way D-range, and one 11-way D-range incorporating a miniature RF connector.

T800-19-0000 Rack Mounting Fan

The T800-19-0000 fan is designed to fit into the base of any standard 483mm rack frame without affecting its ability to house seven modules. The two mounting rails are secured to the rack frame side panels, and the fan is screwed onto the rails under the required module. The kit contains all mounting hardware.

T800-19-0010 Rack Mounting Fan

The T800-19-0010 fan is designed to fit into the base of any standard 483mm rack frame without affecting its ability to house seven modules. The fan is mounted directly onto the underside of the bottom guide rails with two mounting brackets. The kit contains all mounting hardware.

Front Panels

T800-15-0000 Speaker Panel

A 60mm speaker panel fitted with a 4Ω speaker and programming socket. It comes complete with mounting hardware and a cable to connect the programming socket to the backplane PCB.

T800-15-0001 Speaker Panel

A 60mm speaker panel fitted with a 4Ω speaker, complete with mounting hardware.

T800-17-0010 Circuit Breaker Panel

A 60mm front panel fitted with a 10A magnetic circuit breaker. The circuit breaker also functions as an on/off switch to control the supply of power to the rack frame. The T800-17-0010 is intended primarily for use with rack frames powered by batteries (or with a battery back-up supply) and comes complete with mounting hardware.

T800-17-0020 Circuit Breaker Panel

The same as the T800-17-0010, but fitted with a 20A circuit breaker.

T800-40-0000 Blank Panel Fitting Kit

The mounting brackets and screws necessary to fit a T800 Series II 60mm blank front panel into a T800 Series II rack frame.

T800-40-0001 Blank Panel

A T800 Series II 60mm blank panel complete with mounting brackets and screws.

Power Supplies

T800-23-0010 Mains Power Supply

The T800-23-0010 mains power supply is designed to power the T800-23-0000/0001 Slimline Repeaters and mounts on the front panel instead of the options tray. It requires a mains input voltage (auto range) of 85-132/170-264V AC at 47-440Hz.

Refer to the T800 Ancillary Equipment Service Manual for more information.

T807-10-0000 Mains Power Supply

The T807-10-0000 is a switching power supply capable of supplying up to 15A at 11-14V DC. It requires a mains supply of 230V/50Hz or 115V/60Hz (nominal values) which can be internally selected with a switch. The T807-10-0000 is designed to power T800 Series II 50W transmitters (plus receivers, etc.) and requires a T800-44-0000 guide to fit into a T800 Series II rack frame.

Refer to the T800 Ancillary Equipment Service Manual for more information.

T808-10-0000 Mains Power Supply

The T808-10-0000 is a switching power supply capable of supplying up to 25A at 11-14V DC. It requires a mains supply of 230V/50Hz or 115V/60Hz (nominal values) which can be internally selected with a switch. The T808-10-0000 is designed to power T800 Series II 100W transmitters (plus receivers, etc.) and requires a T800-44-0000 guide to fit into a T800 Series II rack frame.

Refer to the T800 Ancillary Equipment Service Manual for more information.

Part I Using T880 Series II Equipment In A Series I Rack Frame

This part of the manual describes how to modify T880 Series II equipment for operation in a T800 Series I rack frame.

1 Tools Required

Tool	Size	
Allen Head Screwdriver	2mm AF	
Flat Blade Screwdriver	3mm AF	
Torx Screwdrivers	T10 for M3 screws	T20 for M4 screws
Spanner	1/4″ AF for D-range locating pins	
Solder		
Soldering Iron		

2 T885/881 SII - SI Conversion

2.1 Introduction

You must make a number of modifications to enable a T880 Series II receiver or transmitter to operate in a Series I rack frame. These changes can be split into two groups, mechanical and electrical, as described below.

Mechanical	These changes involve: • putting on a new front panel because of the differences in height and width between a Series II and Series I panel; • adding D-range locating pins as the Series I rack requires them for alignment.
Electrical	These changes involve: • making sure there is pin compatibility for D-range 1 pin 7 between the Series II module and the Series I rack frame; in Series I, pin 7 is allocated to audio 1 for the transmitter, and audio 2 for the receiver.

This procedure assumes you have already purchased the appropriate Series I conversion kit:

- T885 - T800-70-0085
- T881 - T800-70-0081.

If not, you should purchase one from your nearest Tait Dealer or Customer Service Organisation before beginning the procedure.

It should take approximately 15-20 minutes per module to perform these steps.

2.2 Method

Step	Action
1	Remove the Series II front panel from the module as follows: • remove the volume knob (T885 only); • remove the four screws using a Torx screwdriver; • push the LEDs from the front of the panel to remove them from their grommets.
2	Remove the top cover from the module.
3	Remove the M3 screws from D-range 1.
4	Replace the M3 screws with the locating pins and M3 spring washers.
5	**If you are modifying a T885, follow this step; otherwise go to Step 6.** Remove R808 (10Ω), as shown in Figure 2.1. Ensure that R160 (10Ω) is placed, as shown in Figure 2.1. This will convert D-range 1 pin 7 from serial com to audio 2. Go to Step 7.

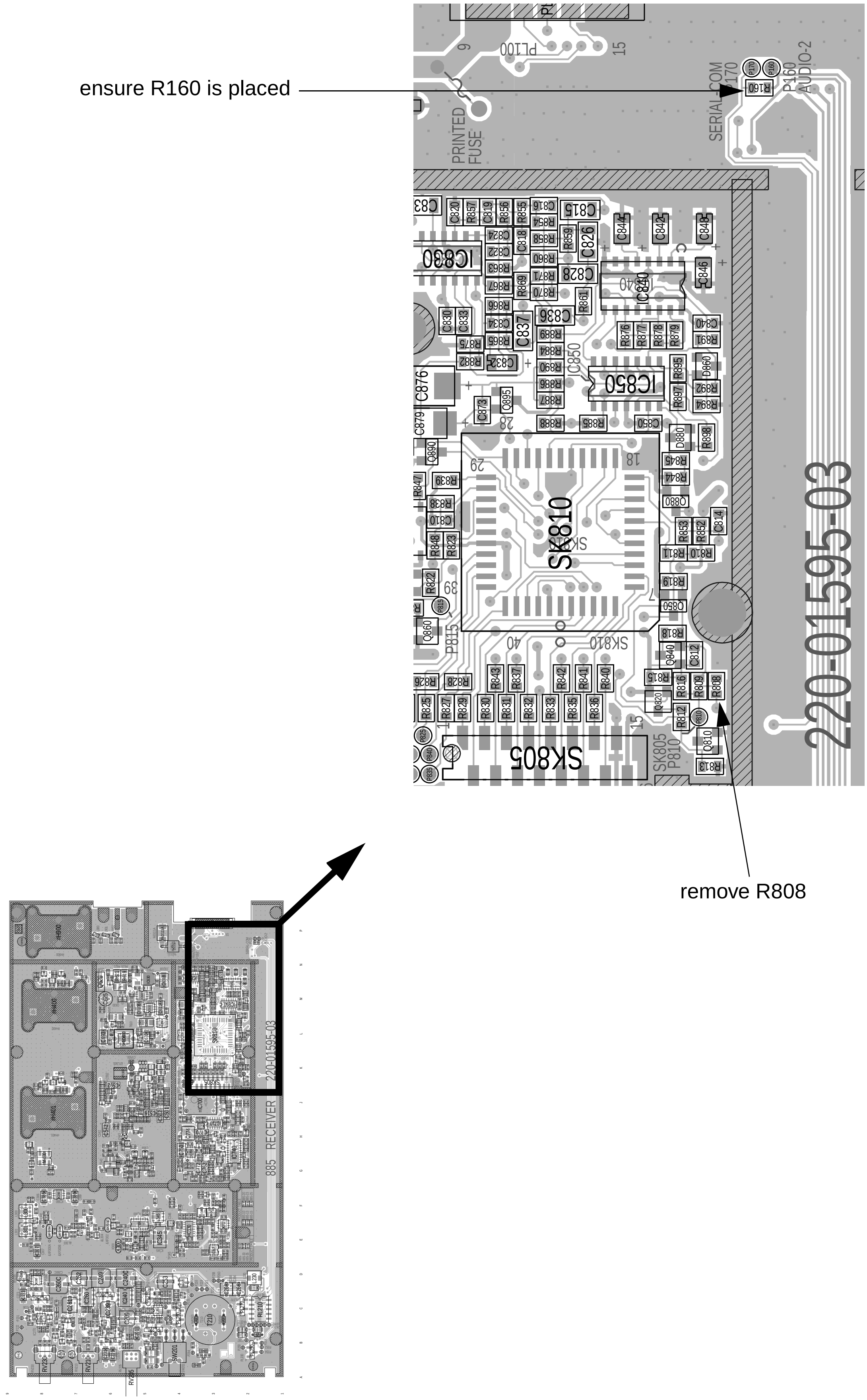


Figure 2.1 T885 Component Changes

Step	Action
6	**If you are modifying a T881, follow these steps (refer to Figure 2.2):** • remove R808 (10Ω) • remove R160 (10Ω) • place %R150 (10Ω). converts D-range 1 pin 7 from serial com to audio 1 Continue with Step 7.

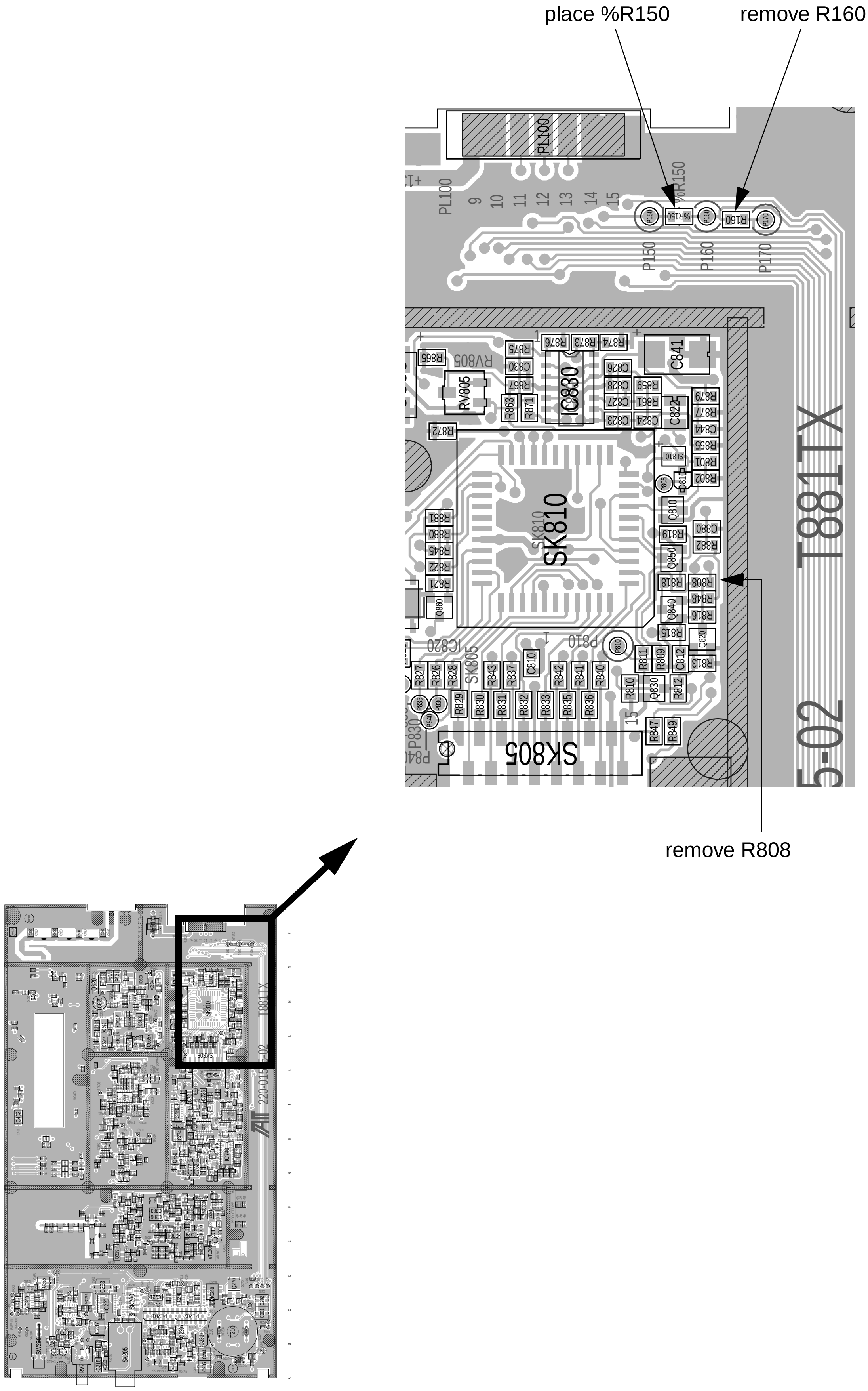


Figure 2.2 T881 Component Changes

Step	Action
7	Fit all parts of the Series I front panel, following Step 1 in reverse order. Secure the panel with the black Allen head screws supplied in the kit if you want to match the other modules in the rack frame. ***Note:*** If you have difficulty refitting the LEDs, try pushing the body of the LED back into the grommet with a thin screwdriver or spike. Be very careful while doing this as the legs of the LED are very easy to break.
8	Replace the cover.
9	**Programming** Once you have carried out this conversion procedure, you will no longer be able to program the T880 Series II module via D-range 1. In order to program the module now, you will need to use a programming module interface, such as the T800-01-0004. This device is fitted with a programming socket and can be connected to the module via SK805 in the microcontroller section. You will have to remove the top cover (closest to the handle) to gain access to SK805. ***Note:*** You may still be able to program the module by connecting the T800-01-0004 to a T800-03-0000 auxiliary D-range fitted as D-range 2, but only if pins 8 (ground) and 12 (serial com) of D-range 2 are not used in the Series I configuration.

3 T889 SII - SI Conversion

3.1 Introduction

The only modification required to enable a T880 Series II PA to operate in a Series I rack frame is to change the front panel. This is because of the differences in height and width between a Series II and Series I panel. There are no electrical changes required.

This procedure assumes you have already purchased the T800-70-0089 Series I conversion kit. If not, you should purchase one from your nearest Tait Dealer or Customer Service Organisation before beginning the procedure.

It should take approximately 5-10 minutes per module to perform these steps.

3.2 Method

Step	Action
1	Remove the Series II front panel from the PA as follows: • remove the four screws using a Torx screwdriver, and carefully pull the panel away from the chassis/heatsink; • push the LEDs from the front of the panel to remove them from their grommets. ***Note:*** If you have difficulty removing the LEDs by hand, try removing them gently from the rear of the panel with long-nose pliers. Be very careful while doing this as the legs of the LED are very easy to break.
2	Fit all parts of the Series I front panel, following Step 1 in reverse order. Secure the panel with the black Allen head screws supplied in the kit if you want to match the other modules in the rack frame. ***Note:*** If you have difficulty refitting the LEDs, try pushing the body of the LED back into the grommet with a thin screwdriver or spike. Be very careful while doing this as the legs of the LED are very easy to break.