# T830 Series II

# Base Station Equipment

# 136-174MHz

# Service Manual

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**T800** *II*

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# About This Manual

**Scope**
This manual contains general, technical and servicing information on T830 Series II 25W, 50W and 100W base stations which comprise the following equipment:

| 25W base station | T835 receiver T836 25W transmitter |
|---|---|
| 50W base station | T835 receiver T837 exciter T838 50W power amplifier |
| 100W base station | T835 receiver T837 exciter T839 100W 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.

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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.

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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

| T830 Series II Service Manual | | | |
|---|---|---|---|
| Issue | Publication Date | Product Code | Incorporates Revision Package |
| 200 | April 1998 | M830-00-200 | — |
| 201 | August 1999 | M830-00-201 | R830-00-201 |
| 202 | March 2001 | M830-00-202 | R830-00-202 |

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| 2.6 | 30/04/98 | 4.2 | 30/04/98 |
| 2.7 | 30/04/98 | | |
| 2.8 | 30/04/98 | 5.1 | 30/04/98 |
| 2.9 | 30/04/98 (fold-out) | 5.2 | 30/04/98 |
| 2.10 | 30/04/98 (fold-out) (blank) | | |
| 2.11 | 31/03/01 | | |
| 2.12 | 31/03/01 | **Part H** | |
| 2.13 | 31/03/01 | | |
| 2.14 | 31/03/01 | I | 23/07/99 |
| 2.15 | 31/03/01 | II | 30/04/98 (blank) |
| 2.16 | 31/03/01 | | |
| 2.17 | 31/03/01 (fold-out) | 1 | 23/07/99 |
| 2.18 | 31/03/01 (fold-out) (blank) | 2 | 30/04/98 |
| | | 3 | 31/03/01 |
| | | 4 | 30/04/98 |
| **Part F** | | 5 | 23/07/99 |
| | | 6 | 23/07/99 |
| I | 23/07/99 | 7 | 23/07/99 |
| II | 23/07/99 | 8 | 23/07/99 |
| | | 9 | 23/07/99 |

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| 10 | 23/07/99 | | |
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| 13 | 23/07/99 | | |
| 14 | 23/07/99 | | |

**Part I**

| Page | Issue Date |
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| I | 30/04/98 |
| II | 30/04/98 (blank) |
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| 1.1 | 30/04/98 |
| 1.2 | 30/04/98 (blank) |
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| 2.1 | 23/07/99 |
| 2.2 | 30/04/98 |
| 2.3 | 30/04/98 |
| 2.4 | 30/04/98 |
| 2.5 | 23/07/99 |
| 2.6 | 30/04/98 |
| 2.7 | 30/04/98 |
| 2.8 | 30/04/98 (blank) |
| | |
| 3.1 | 23/07/99 |
| 3.2 | 31/03/01 |
| 3.3 | 31/03/01 |
| 3.4 | 30/04/98 |
| 3.5 | 30/04/98 |
| 3.6 | 30/04/98 (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, 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. M830-00-200), 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).
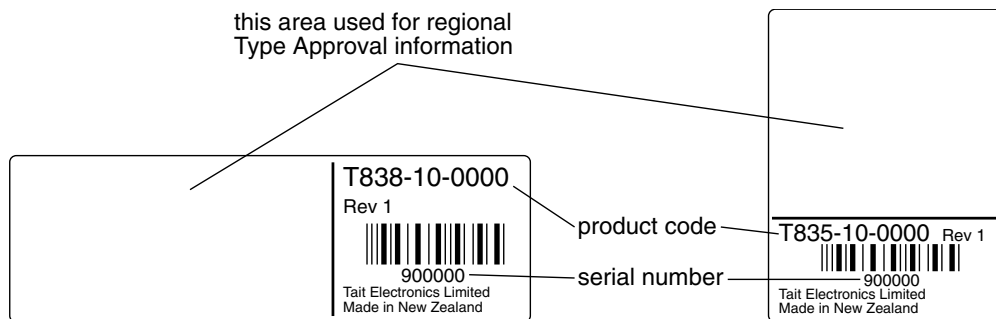


*Figure 1.1  Typical Product Code & Serial Number Labels*

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.
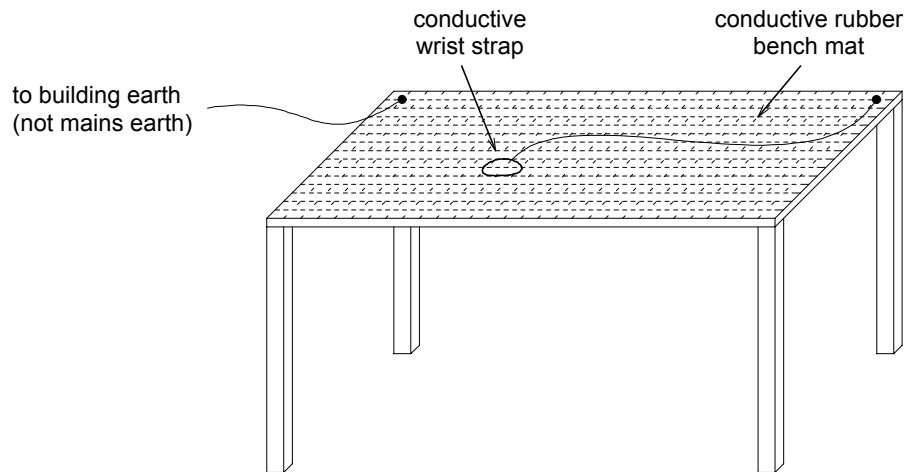
*Figure 1.2   Typical Anti-static Bench Set-up*

# ⚠ 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).
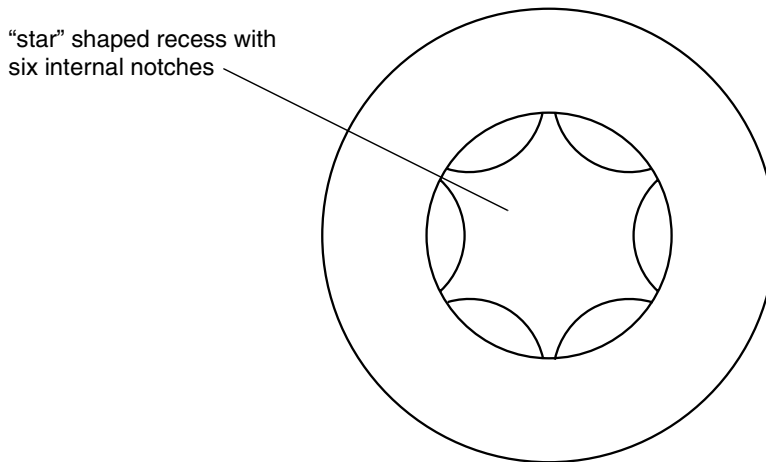


"star" shaped recess with
six internal notches

**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).
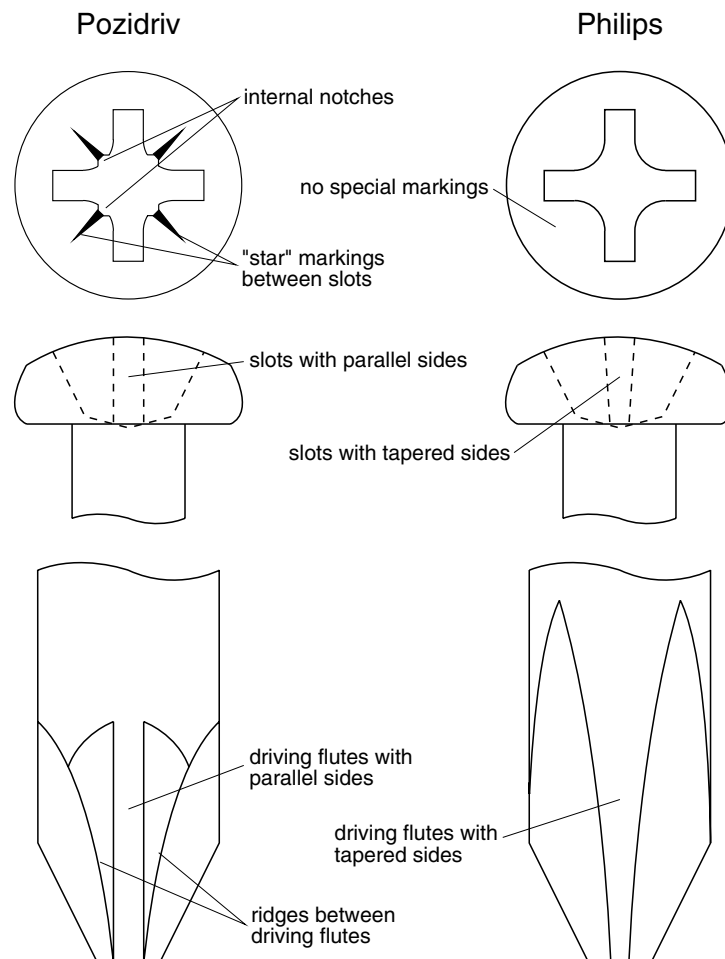


*Figure 2.2   Pozidriv & Philips Screw & Screwdriver Identification*

## 2.3      Disassembly/Reassembly

### 2.3.1      Receivers/Exciters/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 transmitter RF power transistors and many SMD components
- 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.

## 2.4      Cover Screw Torques

Receivers/Exciters/Transmitters                    ..   2.03Nm/18in.lbf.

Power Amplifiers                                            ..   0.9Nm/in.lbf.

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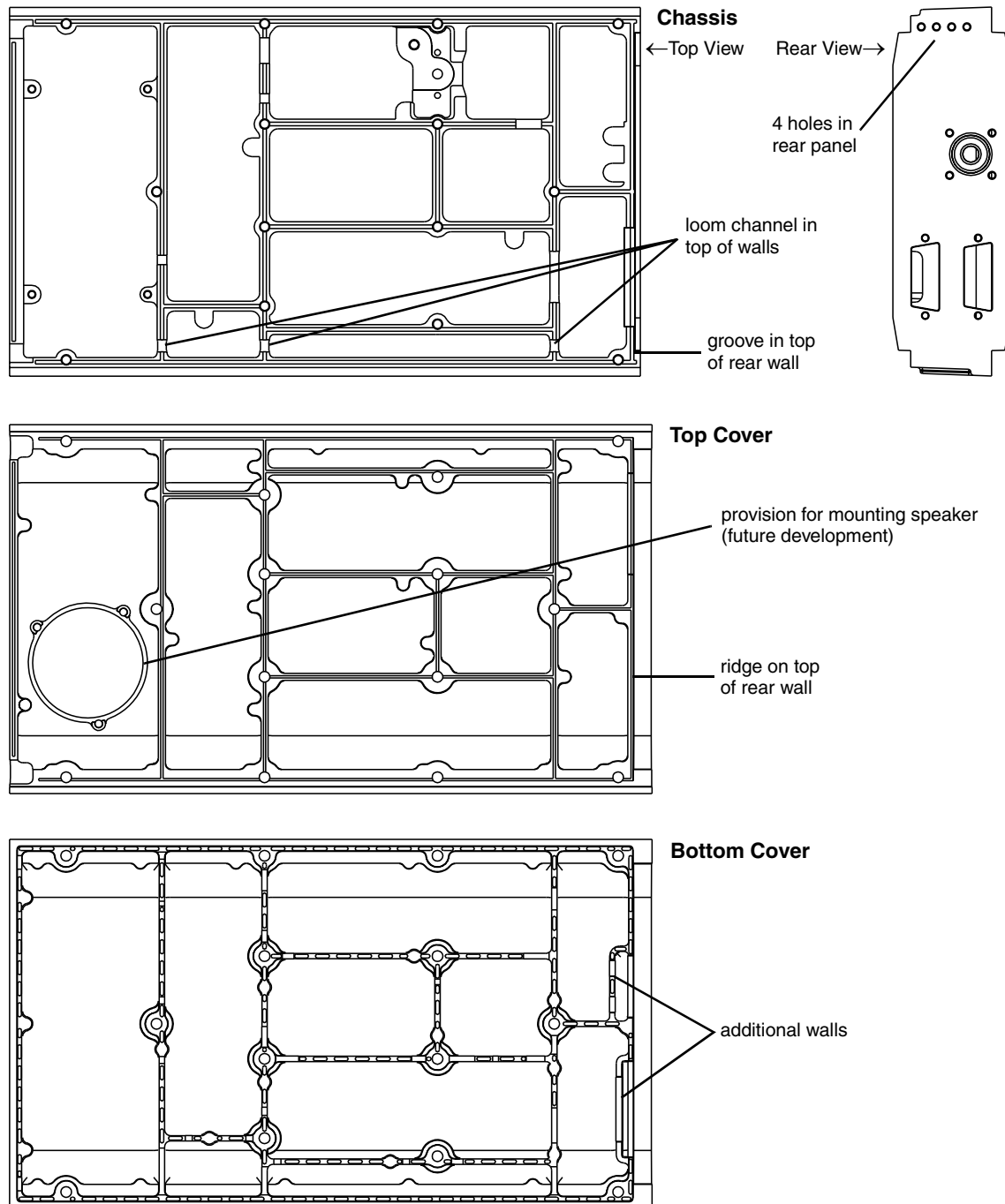


**Figure 2.3  Identification Of New-Design Chassis & Covers**

# 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.

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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.