



MT-3 RADIO SYSTEMS

PAGING MODULATOR INSTRUCTION MANUAL CI-PM-3

Covers models: CI-PM-3-00

Copyright © 2002 Daniels Electronics Ltd. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or other wise, without the prior written consent of Daniels Electronics Ltd.

DE™ is a registered trademark of Daniels Electronic Ltd. registered in the United States Patent and Trademark Office.

Printing Date: Dec 2002

Issue Date: **February 2002**

Issue: **4 Rev A**

Part No.: **IM55-CIPM3**

Previous Issue Date: Nov 99

Previous Issue: 3

Daniels Electronics Ltd.

Victoria, BC

PRINTED IN CANADA

Reviewed By:

Quality Assurance:

CLAUDIABOORMAN

Quality Administrator

C. Boorman

Signature

FEB 12, 2002

Date

NOTE:

The user's authority to operate this equipment could be revoked through any changes or modifications not expressly approved by Daniels Electronics Ltd.

The design of this equipment is subject to change due to continuous development. This equipment may incorporate minor changes in detail from the information contained in this manual.

TABLE OF CONTENTS

	Page
1 GENERAL.....	1-1
1.1 Introduction	1-1
1.2 Construction	1-2
1.3 Printed Circuit Board Numbering Convention.....	1-2
1.4 Specifications.....	1-2
1.4.1 General Specifications	1-2
1.4.2 CTCSS Decoder/Encoder (Option)	1-4
1.4.3 Physical Specifications	1-5
2 THEORY OF OPERATION.....	2-1
2.1 Paging Signal Path.....	2-1
2.1.1 2-Level Digital Paging	2-1
2.1.1.1 Self Test Circuitry.....	2-2
2.1.2 4-Level Digital Paging	2-2
2.1.3 Analog Paging	2-3
2.1.4 Front Panel Indicator Circuitry	2-4
2.1.4.1 Data Indicator Circuitry	2-4
2.1.4.2 Analog / Digital Indicator Circuitry.....	2-4
2.1.4.3 LED Power.....	2-4
2.2 OCXO/PLL	2-5
2.2.1 Standard Frequency Reference	2-5
2.2.2 High Stability Frequency Reference	2-5
2.3 Configuration Options.....	2-6
2.3.1 Simultaneous Broadcasting (2 Level Paging Only).....	2-6
3 ALIGNMENT PROCEDURE AND INSTALLATION	3-1
3.1 General	3-1
3.2 Repair Notes.....	3-1
3.3 Recommended Equipment List	3-1
3.4 Installation	3-2
3.5 Alignment	3-2
3.6 Frequency (Digital Paging) Adjustment.....	3-2
3.7 Reference (Analog Paging) Adjustment.....	3-3
3.8 Test Data Symmetry Adjustment	3-3
3.9 2 And 4 Level Deviation Adjustment.....	3-3
3.10 PLL Setup.....	3-4
3.11 Data Delay Setup.....	3-5
3.12 Simulcast Delay Setup.....	3-6

ALIGNMENT PROCEDURE AND INSTALLATION CONTINUED

3.13	Repeater Configuration.....	3-8
3.13.1	Base Transmitter Site CI-PM-3 Configuration	3-8
3.13.1.1	Digital-Only Paging.....	3-8
3.13.1.2	Analog/Digital Paging.....	3-8
3.13.2	Repeater Site CI-PM-3 Configuration	3-8
3.13.2.1	Digital-Only Repeater.....	3-9
3.13.2.2	Analog/Digital Repeater.....	3-9
3.13.3	TS-64 Configuration.....	3-9
4	CONNECTOR PIN FUNCTIONS AND JUMPER FUNCTIONS.....	4-1
4.1	Data / Control Port (Connector J1) Pin Functions.....	4-1
4.2	Motherboard Interface (Connector P1) Pin Functions.....	4-1
4.3	CI-PM-3 Data Delay Jumper Settings.....	4-3
4.4	CI-PM-3 Circuit Board Jumpers	4-4
4.5	TS-64 MOD1 Jumper Settings - (If installed).....	4-5
4.6	4-Level Modulation Bit Pattern.....	4-5
4.7	Receiver IF / Audio PCB Jumper Settings.....	4-5
4.8	Transmitter Audio Processor Jumper Settings.....	4-6
4.9	Transmitter Synthesizer Jumper Settings.....	4-9
4.10	CI-PM-3 Test Points	4-10
5	ILLUSTRATIONS AND SCHEMATIC DIAGRAMS	5-1
5.1	CI-PM-3 Front Panel Controls.....	5-1
5.2	Simulcast Paging Example.....	5-2
5.3	CI-PM-3 Component Layout (Through-Hole Side)	5-3
5.4	CI-PM-3 Component Layout (Surface-Mount Side).....	5-4
5.5	CI-PM-3 Schematic Diagram	5-5
5.6	CI-PM-3 Schematic Diagram	5-6
5.7	CI-PM-3 Schematic Diagram Component Location Table.....	5-7
6	PARTS LISTS	6-1
6.1	CI-PM-3 Electrical Parts List.....	6-1
6.2	CI-PM-3 Mechanical Parts List.....	6-5
7	REVISION HISTORY.....	7-1

LIST OF TABLES

	Page
Table 4-1	Data / Control Port (Connector J1) Pin Functions..... 4-1
Table 4-2	Motherboard Interface Connector P1 Pin Functions..... 4-1
Table 4-3	Delay Settings..... 4-3
Table 4-4	CI-PM-3 Default Jumper Settings..... 4-4
Table 4-5	CTCSS Jumper Settings..... 4-5
Table 4-6	4-Level Modulation Bit Pattern..... 4-5
Table 4-9	Receiver IF / Audio PCB Jumper Settings..... 4-5
Table 4-7	Transmitter Audio Processor V1.6 Jumper Settings 4-6
Table 4-8	Transmitter Audio Processor V1.8 Jumper Settings 4-6
Table 4-9	Transmitter Audio Processor V2.3 Jumper Settings 4-8
Table 4-10	CI-PM-3 Test Points 4-10
Table 4-11	Component Location Table Schematic..... 5-7

LIST OF ILLUSTRATIONS

	Page
Figure 4-1	Transmitter Audio Processor V1.6 Jumper Settings 4-6
Figure 4-2	Transmitter Audio Processor V1.8 Jumper Settings 4-6
Figure 4-3	Transmitter Audio Processor V2.3 Jumper Settings 4-8
Figure 4-4	VHF and (400 MHz) UHF Synthesizer Analog PCB Jumper Settings..... 4-9
Figure 4-5	VHF and (400 MHz) UHF Synthesizer Digital PCB Jumper Settings 4-9
Figure 4-5	800MHz and 900MHz Transmitter Synthesizer Jumper Settings 4-9
Figure 5-1	CI-PM-3 Front Panel Controls..... 5-1
Figure 5-2	Simulcast Paging Example..... 5-2
Figure 5-3	CI-PM-3 Circuit Board (Through-Hole Side) 5-3
Figure 5-4	CI-PM-3 Circuit Board (Surface-Mount Side)..... 5-4
Figure 5-5	CI-PM-3 Circuit Board Schematic Diagram..... 5-5

1 GENERAL

1.1 Introduction

2 THEORY OF OPERATION

3 ALIGNMENT PROCEDURE AND INSTALLATION

3.1 General

4 CONNECTOR PIN FUNCTIONS AND JUMPER FUNCTIONS

4.1 Data / Control Port (Connector J1) Pin Functions

5 ILLUSTRATIONS AND SCHEMATIC DIAGRAMS

5.1 CI-PM-3 Front Panel Controls

6 PARTS LISTS

6.1 CI-PM-3 Electrical Parts List

7 REVISION HISTORY

Issue	Issued	Revised	Details
3	Nov 99	N/A	All prototype updates incorporated in this issue. All previous revision history in preliminary issue 3 (Pre3).
		Jan 02	New CI-PM-3 version to accommodate multiple footprints for U4 (AD9901), and incorporate changes to the reference input circuit (MMIC removed).
4	Jan 02		New Issue, incorporates all changes since release of Issue 3.
4 A		Dec 02	Correct component layout (bottom CIPM3M4E) <ul style="list-style-type: none">- TP14 & TP15 locations corrected- JU56 designation removed



MT-3 RADIO SYSTEMS

UHF SYNTHESIZED TRANSMITTER INSTRUCTION MANUAL UT-3/400 406 - 512 MHz

Covers models:

UT-3/420-SNC2, UT-3/420-SWC2, UT-3/420-SNC8, UT-3/420-SWC8,
UT-3/460-SNC2, UT-3/460-SWC2, UT-3/460-SNC8, UT-3/460-SWC8,
UT-3/480-SNC2, UT-3/480-SWC2, UT-3/480-SNC8, UT-3/480-SWC8,
UT-3/500-SNC2, UT-3/500-SWC2, UT-3/500-SNC8, UT-3/500-SWC8,

Copyright © 1998 Daniels Electronics Ltd. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior written consent of Daniels Electronics Ltd.

DE™ is a registered trademark of Daniels Electronic Ltd. registered in the United States Patent and Trademark Office.

Issue:	4	Previous Issue:	3	
Issue Date:	December 98	Previous Issue Date:	August 98	Daniels Electronics Ltd.
Printing Date:	December 98			Victoria, BC
Part No.:	IM23-UT3400			PRINTED IN CANADA

Reviewed By:

Quality Assurance:

Larry Freeman

Name

Signature

Date

NOTE:

The user's authority to operate this equipment could be revoked through any changes or modifications not expressly approved by Daniels Electronics Ltd.

The design of this equipment is subject to change due to continuous development. This equipment may incorporate minor changes in detail from the information contained in this manual.

TABLE OF CONTENTS

	Page
1	GENERAL..... 1-1
1.1	Introduction..... 1-1
1.2	Manual Organization..... 1-1
1.3	UT-3 406 - 512 MHz Transmitter Family Models..... 1-2
1.4	Performance Specifications..... 1-3
1.4.1	General..... 1-3
1.4.2	Audio Specifications 1-4
1.4.3	Physical Specifications..... 1-5
2	SYSTEM OVERVIEW..... 2-1
2.1	Transmitter Operation 2-1
2.2	Frequency Selection..... 2-3
2.2.1	Synthesizer Transmitter 2-3
2.3	Transmitter Assembly and Adjustment..... 2-3
2.3.1	Complete Transmitter Alignment..... 2-3
2.3.2	Frequency Change 2-4
2.3.3	Output Power Adjustment..... 2-5
2.3.4	Deviation Setting..... 2-5
2.3.5	Setting RF Alarm Thresholds..... 2-5
2.4	Recommended Test Equipment List..... 2-6
2.5	Repair Note..... 2-6
2.6	Printed Circuitboard Numbering Convention..... 2-6
3	ILLUSTRATIONS 3-1
3.1	MT-3 Transmitter Front Panel 3-1
3.2	MT-3 Transmitter Case - Exploded View..... 3-2
4	PARTS LIST 4-1
5	REVISION HISTORY 5-1

MODULE MANUALS

Transmitter Main Board Instruction Manual	IM20-MT3TXMN
UHF Amplifier Instruction Manual UT-3 406 - 512 MHz	IM23-UT3400AMP
Enhanced Synthesizer Instruction Manual OS(R/T)-3A/H 29-470 MHz ..	IM10-OS3AH
UHF Transmitter Channel Designation Table	IM23-UT3400CT

RF Exposure Warning

This transmitting equipment conforms to SAR (Specific Absorption Rate) limits regarding exposure of human beings to radio frequency electromagnetic energy, as defined in the following national and international standards and guidelines:

1. Industry Canada Radio Standards Specification 102 (RSS-102), *Evaluation Procedure for Mobile and Portable Radio Transmitters with respect to Health Canada's Safety Code 6 for Exposure of Humans to Radio Frequency Fields*;
2. Health Canada Safety Code 6, *Limits of Human Exposure to Radiofrequency Electromagnetic Fields in the Frequency Range from 3 kHz to 300 GHz*¹;
3. United States Federal Communications Commission, Code of Federal Regulations; 47 CFR Part 1, § 1.1310 *Radiofrequency radiation exposure limits*; and
4. American National Standards Institute (ANSI) criteria for localized SAR in Section 4.2 of "*IEEE Standard for Safety Levels with Respect to Human Exposure to Radio Frequency Electromagnetic Fields, 3 kHz to 300 GHz*"².

Notes:

- A. The SAR limit for uncontrolled exposure of persons not classed as RF and microwave exposed workers (including the general public) for transmitter equipment operating below 10 GHz, as defined in the references above, is **2 W/m²** (0.2 mW/cm²).
- B. This transmitting equipment is designed for use with an outdoor antenna with a characteristic antenna gain of **10 dBi**, typically mounted at a significant height above ground to provide for adequate signal coverage. To ensure that the general public is not exposed to a power density above the recommended limit of 2 W/m² (0.2 mW/cm²), the equipment must be installed such that the following minimum safe distances from the antenna are maintained:

6.3 m (20.7 ft)	when configured with	100 W PA
3.5 m (11.3 ft)	when configured with	30 W PA
1.8 m (5.9 ft)	standalone (i.e. no PA)	8 W TX

- C. The following power density formula has been utilized in determining minimum safe distances:

$$S = \frac{PG}{4\pi R^2}$$

where: S = Power density (in appropriate units, e.g. W/m²)

P = Power input to the Antenna (in appropriate units, e.g., W)

G = Power gain of the antenna in the direction of interest relative to an isotropic radiator

R = Distance to the center of radiation of the antenna (appropriate units, e.g., m)

¹Minister of Public Works and Government Services, Canada 1999, Cat. H46- 2/ 99- 237E, ISBN 0- 662- 28032- 6

²ANSI/IEEE C95.1–1992, Copyright 1992 by the Institute of Electrical and Electronics Engineers, Inc., New York, New York 10017

1 GENERAL

1.1 Introduction

2 SYSTEM OVERVIEW

2.1 Transmitter Operation

3 ILLUSTRATIONS

3.1 MT-3 Transmitter Front Panel

4 PARTS LIST

5 REVISION HISTORY

ISSUE	DATE	DESCRIPTION AND (REASON)
3	August 98	• Manual formatted to modular style. All previous revision history in issue 2
4	December 98	• Added an advisory to our customers in section 1.1 and 1.4.1 that this transmitter is not to be operated within the 406 to 406.1 MHz frequency band.

This Page Intentionally Left Blank



MT-3 RADIO SYSTEMS

TRANSMITTER MAIN BOARD INSTRUCTION MANUAL

Covers: Version 1.7 of the Transmitter Main Board
Version 1.6 & 1.8 of the FM Audio Processor Board

Copyright © 1998 Daniels Electronics Ltd. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior written consent of Daniels Electronics Ltd.

DE™ is a registered trademark of Daniels Electronics Ltd. registered in the United States Patent and Trademark Office.

Issue: 3 Previous Issue: 2
Issue Date: November 98
Printing Date: NA
Part No.: IM20-MT3TXMN

Previous Issue Date: May 98

Daniels Electronics Ltd.
Victoria, B.C.
PRINTED IN CANADA

Reviewed By:

Quality Assurance:

Larry Freeman _____

Name

Signature

Date

NOTE:

The user's authority to operate this equipment could be revoked through any changes or modifications not expressly approved by Daniels Electronics Ltd.

The design of this equipment is subject to change due to continuous development. This equipment may incorporate minor changes in detail from the information contained in this manual.

TABLE OF CONTENTS

	Page
1 GENERAL	1-1
1.1 Introduction.....	1-1
1.2 Performance Specifications.....	1-1
1.2.1 General.....	1-1
1.2.2 Audio Specifications	1-2
2 THEORY OF OPERATION	2-1
2.1 Transmitter Main Board.....	2-1
2.1.1 General.....	2-1
2.1.2 Transmitter Push-To-Talk.....	2-1
2.1.2.1 Microphone PTT.....	2-1
2.1.2.2 PTT With Time-Out-Timer.....	2-2
2.1.2.3 PTT No Time-Out-Timer.....	2-2
2.1.2.4 Optional Relay	2-2
2.1.2.5 PTT Output.....	2-3
2.1.2.6 PTT Voltage Switching	2-3
2.1.2.7 Transmitter Standby Modes.....	2-3
2.1.3 Audio Circuits.....	2-4
2.1.3.1 Microphone Audio.....	2-5
2.1.3.2 Received Audio	2-5
2.1.4 Channel Selection.....	2-5
2.1.4.1 Synthesized Transmitter.....	2-5
2.1.4.2 Crystal Controlled Transmitter.....	2-6
2.1.5 Amplifier Circuits.....	2-6
2.1.6 Time-Out-Timer Circuitry.....	2-6
2.2 MT-3 Front Panel Board.....	2-8
2.3 MT-3 Audio Processor (Version 1.6)	2-8
2.3.1 General.....	2-8
2.3.2 Power Requirements	2-8
2.3.3 Audio Processor Turn-on Time.....	2-9
2.3.4 Audio Processor Signals.....	2-9
2.3.4.1 Audio Processor Outputs.....	2-9
2.3.4.2 Audio Processor Modulation Output	2-10
2.3.4.3 Audio Processor Low Frequency / Direct Mod. Output.....	2-10
2.3.4.4 Audio Processor Inputs.....	2-10
2.3.4.5 Audio Processor Microphone Input.....	2-11
2.3.4.6 Audio Processor Balanced Input.....	2-11
2.3.4.7 Audio Processor Auxiliary Input.....	2-11
2.3.4.8 Audio Processor Subtone Inputs.....	2-11
2.3.4.9 Audio Processor Direct Modulation Input	2-12
2.4 MT-3 Audio Processor (Version 1.8)	2-12

2.4.1	General.....	2-12
2.4.2	Power Requirements	2-12
2.4.3	Audio Processor Turn-on Time.....	2-13
2.4.4	Audio Processor Signals.....	2-13
2.4.4.1	Audio Processor Outputs	2-13
2.4.4.2	Audio Processor Modulation Output	2-14
2.4.4.3	Audio Processor Low Frequency / Direct Mod. Output.....	2-14
2.4.4.4	Audio Processor Inputs.....	2-14
2.4.4.5	Audio Processor Microphone Input.....	2-15
2.4.4.6	Audio Processor Balanced Input.....	2-15
2.4.4.7	Audio Processor Auxiliary Input.....	2-15
2.4.4.8	Audio Processor Subtone Inputs.....	2-15
2.4.4.9	Audio Processor Direct Modulation Input	2-16
2.5	Low Frequency Modulation.....	2-16
3	TRANSMITTER ALIGNMENT	3-1
3.1	General.....	3-1
3.2	Repair Note.....	3-1
3.3	Printed Circuitboard Numbering Convention.....	3-1
3.4	Recommended Test Equipment List.....	3-1
3.5	Standard Factory Settings and Jumper Configuration.....	3-2
3.5.1	MT-3 Transmitter Board Factory Configuration.....	3-2
3.5.2	MT-3 Audio Processor Factory Configuration	3-3
3.6	MT-3 Transmitter Board Alignment.....	3-4
3.6.1	General.....	3-4
3.6.2	MT-3 Transmitter Board Test Points	3-5
3.7	Module Installation and Removal.....	3-5
3.8	MT-3 Audio Processor Alignment.....	3-6
3.8.1	General.....	3-6
3.8.2	MT-3 Audio Processor Standard Deviation Adjustment	3-6
3.9	Standard Factory Settings and Jumper Configuration.....	3-8
3.9.1	MT-3 Audio Processor Factory Configuration (Version 1.8)	3-8
3.10	MT-3 Audio Processor Alignment (Version 1.8).....	3-10
3.10.1	General.....	3-10
3.10.2	MT-3 Audio Processor Standard Deviation Adjustment	3-10
3.11	Low Frequency Modulation Configuration.....	3-11
3.11.1	MT-3 Transmitters.....	3-11
3.11.2	MT-3 Transmitter Audio Processors.....	3-12
3.11.3	Synthesizer and Crystal Controlled Oscillator.....	3-13
3.11.4	Tuning the Transmitter.....	3-14
4	TRANSMITTER INTERCONNECT PIN DEFINITIONS	4-1
5	ILLUSTRATIONS AND SCHEMATIC DIAGRAMS.....	5-1
5.1	Transmitter Block Diagram.....	5-1
5.2	Transmitter Main Board Electrical Assembly.....	5-3

5.2.1	Transmitter Main Board Top Side Component Layout	5-3
5.2.2	Transmitter Main Board Bottom Side Component Layout	5-4
5.2.3	Transmitter Main Board Schematic Diagram	5-5
5.3	Front Panel Board.....	5-6
5.3.1	Front Panel Board Component Layout.....	5-6
5.3.2	Front Panel Board Schematic.....	5-7
5.4	Audio Processor Electrical Assembly (Version 1.6).....	5-8
5.4.1	Audio Processor Component Layout	5-8
5.4.2	Audio Processor Schematic Diagram.....	5-9
5.5	Audio Processor Electrical Assembly (Version 1.8).....	5-10
5.5.1	Audio Processor Component Layout	5-10
5.5.2	Audio Processor Schematic Diagram.....	5-11
5.5.3	TX Time-Out-Timer Electrical Assembly.....	5-12
5.5.3.1	TX Time-Out-Timer Component Layout.....	5-12
5.5.3.2	TX Time-Out-Timer Schematic Diagram	5-12
6	PARTS LISTS.....	6-1
6.1	Transmitter Main Board Parts List.....	6-1
6.1.1	Transmitter Main Board Electrical Parts List.....	6-1
6.1.2	Transmitter Main Board Mechanical Parts List.....	6-3
6.1.3	MT-3 Front Panel Board Electrical Parts List	6-4
6.2	MT-3 Audio Processor Parts List (Version 1.7)	6-4
6.2.1	MT-3 Audio Processor Electrical Parts List (Version 1.6).....	6-4
6.3	MT-3 Audio Processor Parts List (Version 1.8)	6-6
6.3.1	MT-3 Audio Processor Electrical Parts List (Version 1.8).....	6-6
7	REVISION HISTORY	7-1

1 GENERAL

1.1 Introduction

2 THEORY OF OPERATION

2.1 Transmitter Main Board

2.1.1 General

3 TRANSMITTER ALIGNMENT

3.1 General

4 TRANSMITTER INTERCONNECT PIN DEFINITIONS

5 ILLUSTRATIONS AND SCHEMATIC DIAGRAMS

5.1 Transmitter Block Diagram

6 PARTS LISTS

6.1 Transmitter Main Board Parts List

7 REVISION HISTORY

ISSUE	DATE	REVISION
-------	------	----------

- | | | |
|---|-----------|--|
| 1 | August 97 | First Issue. |
| | Sept. 97 | Included PCB version 1.4 Component Layout and Schematic diagrams. |
| 2 | Dec 97 | Main PCB version now 1.7 (ECO 515). <ul style="list-style-type: none">• BCD Switches changed from Surface Mount Part to Through Hole Part.• Audio Amplifier was removed because this option was never used.• Added Timer Out Timer circuitry to Main Tx Board.• TOT PCB no longer installed on Audio Processor. For
A21-TX3-00 TX MAIN/FP, MT-3, STANDARD
A21-TX3-30 TX MAIN/FP, MT-3, + REF. INPUT
TUBING, TFE-260C,14AWG T/W,CLR 7610-260C14TW
18mm Long and Consummable Buss Wire 16 Awg 40mm Long
NOW NOT INSTALLED |
| | Dec 97 | For
A21-TX3-01 TX MAIN/FP, MT-3, WITH FUSE
A21-TX3-02 TX MAIN/FP, MT-3, + DC RELAY
A21-TX3-03 TX MAIN/FP, MT-3, + FUSE,RELAY <ul style="list-style-type: none">• Removed Jumpers J1, J5, J8, J10, J11.• Added Jumpers J22 - J29, J31 - J35.• Added Test Points TP28 - TP34 |
| | Dec 97 | Front Panel Board version now 1.2 (ECO 521).
Modified MT-3 Tx Front Panel Board (FPB) to support all options on the New Transmitter Main Board . Also, the Front Panel Board is now easier to configure if new microphones (other than Daniels microphones) are used. The new FPB can be used on the old TX-3 main - all options will function. However, the old version of FPB will NOT work with the new version TX-3 Main PCB (unless you hard wire one of the microphone pins into the main PCB (13.8V line.)
Added J2 SM Jumper. This jumper now selects Rx Audio or 13.8V to Pin 4 of the Microphone. This capability used to be selected by a jumper on the Main Tx Board. For Normal Opertion J2 'x' position must be installed
Options - This is for future use (not used now). Added 2x4 header land pattern to Tx Front Panel Board. A 2x4 header can be installed to make other microphones compatible with Daniels Transmitters. |
| 3 | Nov 98 | MT-3 FM Audio Processor now version 1.8
The MT-3 FM Audio Processor was re-designed because the IC, XXXXXX, XXXXX, SO-8 is no longer available from the supplier. Also, the new design improves the flat and 300Hz Pre-emphasis audio responses.
Included PCB version 1.8 Component Layout, Schematic diagram, Parts List and Section 2.4, 3.9 and 3.10. |

ISSUE	DATE	REVISION
3	Nov 98	Updated the DE logo and added the statutory trademark statement to the title page. Updated the Low Frequency Modulation section 3.11 to reflect the in house document A0361-06.



MT-3 RADIO SYSTEMS

Audio Processor Instruction Manual For AM/FM Transmitters

Covers the following
V 2.2 and V2.3 of the FM Audio Processor Board
used in the VT-3/xxx, UT-3/xxx, VT-3Hxxx and
A22-VAP130 AM Audio Processor Version 04

Copyright © 2000 Daniels Electronics Ltd. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior written consent of Daniels Electronics Ltd.

DE™ is a registered trademark of Daniels Electronic Ltd. registered in the U.S. Patent and Trademark Office.

Issue:	2	Previous Issue:	1
Issue Date:	November 2000	Previous Issue Date:	October 2000
Printing Date:	January 2001		Daniels Electronics Ltd. Victoria, BC.
Part No.:	IM20-AP3		PRINTED IN CANADA

Reviewed By:

Quality Assurance:

Larry Freeman
Name

Larry Freeman
Signature

12 May 98
Date

NOTE:

The user's authority to operate this equipment could be revoked through any changes or modifications not expressly approved by Daniels Electronics Ltd.

The design of this equipment is subject to change due to continuous development. This equipment may incorporate minor changes in detail from the information contained in this manual.

TABLE OF CONTENTS

	Page
1	FM AUDIO PROCESSOR 1-1
1.1	Introduction 1-1
1.2	Block Diagram (FM Audio Processor)..... 1-3
1.3	FM Audio Processor Board Pin Connections..... 1-4
1.4	Factory Configuration..... 1-4
1.5	Turn-on Time..... 1-5
1.6	Low Frequency Modulation..... 1-5
1.7	Transmitter Standby Modes..... 1-5
2	SIGNALS..... 2-1
2.1	FM Audio Processor Outputs..... 2-1
2.2	Modulation Output 2-1
2.3	Low Frequency / Direct Mod. Output..... 2-1
2.4	Microphone Input..... 2-1
2.5	Balanced Input..... 2-1
2.6	Auxiliary Input..... 2-2
2.7	Subtone Inputs..... 2-2
2.8	Direct Modulation Input 2-2
3	THEORY OF OPERATION 3-1
4	ALIGNMENT 4-1
4.1	Standard Deviation Adjustment..... 4-1
4.2	Balanced Input Setup..... 4-1
4.3	Microphone Input Setup..... 4-1
4.4	Subtone Input Setup 4-2
4.5	Balanced Input Frequency Response..... 4-2
5	TROUBLESHOOTING - TEST EQUIPMENT NEEDED 5-1
5.1	Balanced Input Test 5-1
5.2	Frequency Response Test..... 5-1
5.3	Subtone Input Test..... 5-2
5.4	Audio benchmarks 5-2
6	TEMPERATURE COMPENSATION 6-1
7	ILLUSTRATIONS, TABLES AND SCHEMATIC DIAGRAMS 7-1
7.1	Special Jumper Configuration Table..... 7-1
7.2	FM Audio Processor Component Layout..... 7-2
7.3	FM Audio Processor Schematic Diagram..... 7-3
8	FM AUDIO PROCESSOR PARTS LIST..... 8-1
9	AM AUDIO PROCESSOR..... 9-5
9.1	Introduction 9-5
9.2	Performance Specifications..... 9-5
9.3	Audio Specifications 9-6

9.4	Audio Circuits.....	9-6
9.5	Power Requirements.....	9-6
9.6	Transmitter Standby Modes.....	9-6
9.7	Audio Circuitry.....	9-7
9.8	AM Audio Processor Factory Configuration.....	9-8
9.9	AM Audio Processor Alignment.....	9-8
9.10	AM Audio Processor Electrical Parts List.....	9-11
9.11	AM Audio Processor Component Layout.....	9-14
9.12	AM Audio Processor Schematic Diagram.....	9-15
10	REVISION HISTORY.....	10-1

LISTS OF FIGURES

Figure 1	Block Diagram - Audio Processor.....	1-3
Figure 2	Pin Connection Diagram.....	1-4
Figure 3	Microphone and Balanced Input Circuitry.....	3-1
Figure 4	Limiter and Splatter Filter.....	3-2
Figure 5	Bypassing Compression.....	3-3
Figure 6	TX Audio Control Circuitry.....	3-4

LIST OF TABLES

Table 1	Bandwidth Definition.....	1-1
Table 2	Factory Configuration.....	1-4
Table 3	Turn On Time.....	1-5
Table 4	Mode Condition Table.....	1-6
Table 5	Standby Mode Selection Table.....	1-6
Table 6	MT-3 Audio Processor Total Current Consumption.....	1-6
Table 7	Operating Current.....	5-1
Table 8	Waveform Levels.....	5-2

1 EM AUDIO PROCESSOR

1.1 Introduction

2 SIGNALS

3 THEORY OF OPERATION

4 ALIGNMENT

5 TROUBLESHOOTING - TEST EQUIPMENT NEEDED

6 TEMPERATURE COMPENSATION

7 ILLUSTRATIONS, TABLES AND SCHEMATIC DIAGRAMS

7.1 Special Jumper Configuration Table

8 FM AUDIO PROCESSOR PARTS LIST

9 AM AUDIO PROCESSOR

9.1 Introduction

10 REVISION HISTORY

ISSUE	DATE	REVISION
1	Oct 2000	First Issue.
2	Nov 2000	Second Issue Incorporated the AM Audio Processor documentation into this manual. For specific AM revision history, see manual IM22-MT3AMTXMN-4IM

This Page Intentionally Left Blank

DANIELS ELECTRONICS LTD. ®

MT-3 RADIO SYSTEMS

UHF AMPLIFIER INSTRUCTION MANUAL UT-3 406 - 512 MHz

Covers models:
UT-3/400 Amplifier

Copyright © 1998 Daniels Electronics Ltd. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior written consent of Daniels Electronics Ltd.

Issue: 1 Previous Issue: N/A
Issue Date: May 98 Previous Issue Date: N/A
Printing Date: May 98
Part No.: IM23-UT3400AMP

Daniels Electronics Ltd.
Victoria, B.C.
PRINTED IN CANADA

Reviewed By:

Quality Assurance:

Name

Signature

Date

NOTE:

The user's authority to operate this equipment could be revoked through any changes or modifications not expressly approved by Daniels Electronics Ltd.

The design of this equipment is subject to change due to continuous development. This equipment may incorporate minor changes in detail from the information contained in this manual.

TABLE OF CONTENTS

	Page
1	GENERAL..... 1-1
1.1	Introduction..... 1-1
1.2	Performance Specification..... 1-1
2	THEORY OF OPERATION 2-1
2.1	Amplifier Operation 2-1
2.2	Power Requirements 2-2
2.3	RF Circuitry 2-2
2.3.1	UT-3/400 Lowpass Filter 2-2
2.4	Power Control Circuitry 2-3
2.5	Power Sensing Circuitry 2-3
2.5.1	Output Power Sense..... 2-3
2.5.2	VSWR Sense..... 2-4
2.5.3	VSWR Overload..... 2-4
3	UT-3/400 AMPLIFIER ALIGNMENT..... 3-1
3.1	General..... 3-1
3.2	Repair Note..... 3-1
3.3	Recommended Test Equipment List..... 3-1
3.4	Printed Circuitboard Numbering Convention..... 3-2
3.5	Standard Factory Settings and Jumper Configuration..... 3-2
3.6	UT-3/400 Amplifier Alignment..... 3-2
3.6.1	General..... 3-2
3.6.2	UT-3/400 Amplifier Adjustment 3-3
3.6.2.1	General Set-Up 3-3
3.6.2.2	Output Power Alarm (Forward Power) 3-4
3.6.2.3	Output Power..... 3-5
3.6.2.4	Antenna VSWR Alarm (Reverse Power)..... 3-5
3.6.2.5	Antenna VSWR Overload..... 3-6
3.6.2.6	Procedure Verification..... 3-6
4	ILLUSTRATIONS AND SCHEMATIC DIAGRAMS..... 4-1
4.1	UT-3/400 UHF Amplifier Component Layout..... 4-2
4.2	UT-3/400 UHF Amplifier Schematic Diagram 4-3
4.3	UT-3/400 UHF Lowpass Filter Component Layout 4-5
4.4	UT-3/400 UHF Lowpass Filter Schematic Diagram..... 4-5

5	PARTS LISTS.....	5-1
5.1	UT-3/400 UHF Amplifier Electrical Parts List.....	5-1
5.2	UT-3/400 UHF Amplifier Mechanical Parts List.....	5-4
5.3	UT-3/400 UHF Low Pass Filter Electrical Parts List.....	5-4
6	REVISION HISTORY	6-1

1 GENERAL

1.1 Introduction

2 THEORY OF OPERATION

2.1 Amplifier Operation

3 UT-3/400 AMPLIFIER ALIGNMENT

3.1 General

4 ILLUSTRATIONS AND SCHEMATIC DIAGRAMS

This Page Intentionally Left Blank

5 PARTS LISTS

5.1 UT-3/400 UHF Amplifier Electrical Parts List

NOTE: Reference Designators labeled with an asterisk (*) are used only in 2.0 - 8.0 Watts amplifiers.

6 REVISION HISTORY

ISSUE	DATE	REVISION
-------	------	----------

1	JUL 97	First Issue.
---	--------	--------------



MT-3 RADIO SYSTEMS

ENHANCED AM/FM SYNTHESIZER INSTRUCTION MANUAL

OS(R/T)-3(A/H) 29 - 470 MHz

Covers models:

OST-3H035, OST-3H045, OSR-3H061
OST-3A128, OSR-3A149
OST-3H141, OST-3H162, OSR-3H141, OSR-3H162
OST-3H440, OSR-3H440

Copyright © 2000 Daniels Electronics Ltd. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior written consent of Daniels Electronics Ltd.

DE™ is a registered trademark of Daniels Electronics Ltd. registered in the United States Patent and Trademark Office.

Issue:	4	Previous Issue:	3	Daniels Electronics Ltd. Victoria, BC. PRINTED IN CANADA
Issue Date:	September 2000	Previous Issue Date:	March 2000	
Printing Date:	January 2001			
Part No.:	IM10-OS3AH			

Reviewed By:

Quality Assurance:

Larry Freeman
Name

Larry Freeman
Signature

12 May 98
Date

NOTE:

The user's authority to operate this equipment could be revoked through any changes or modifications not expressly approved by Daniels Electronics Ltd.

The design of this equipment is subject to change due to continuous development. The equipment covered by this manual may incorporate minor changes in detail from the information contained in this manual.

TABLE OF CONTENTS

	Page
1 GENERAL.....	1-1
1.1 Introduction	1-1
1.2 OS(R/T)-3(A/H) Enhanced Synthesizer Family Models	1-1
1.3 Performance Specifications.....	1-3
1.4 Printed Circuit Board Numbering Convention.....	1-5
2 THEORY OF OPERATION.....	2-1
2.1 Internal Power and Control (Digital Board).....	2-1
2.2 Synthesizer Analog Circuitry (Analog Board)	2-1
2.2.1 Common Analog Board Circuitry	2-1
2.2.2 29 - 71.4 MHz Analog Board Circuitry	2-3
2.2.3 118 - 159.4 MHz Multichannel AM Analog Board Circuitry.....	2-3
2.2.4 128 - 174 MHz Analog Board Circuitry	2-4
2.2.5 406 - 470 MHz Analog Board Circuitry	2-5
2.3 Synthesizer Digital Circuitry (Digital Board).....	2-6
2.4 Frequency Control.....	2-6
2.4.1 BCD Switch Frequency Control.....	2-6
2.4.2 Frequency Select Handle Frequency Control.....	2-7
2.5 Synthesizer Base and Frequency Increment Table.....	2-7
2.6 5.0/6.25 kHz Channelization.....	2-8
2.7 8.333 kHz Channelization.....	2-8
2.8 12.5 kHz Channelization.....	2-9
3 SYNTHESIZER ALIGNMENT.....	3-1
3.1 General.....	3-1
3.2 Repair Note.....	3-1
3.3 Recommended Test Equipment.....	3-1
3.4 OS(R/T)-3(A/H) Synthesizer Factory Configuration.....	3-1
3.5 OS(R/T)-3(A/H) Synthesizer Alignment	3-2
3.5.1 General.....	3-2
3.5.2 Synthesizer Test Points.....	3-2
3.5.3 Synthesizer Removal and Installation.....	3-3
3.5.4 Circuit Board Removal.....	3-3
3.5.5 Frequency Adjustment and Channel Selection.....	3-3
3.5.5.1 VHF OS(R/T)-3H 29 - 71.4 MHz VCO Alignment.....	3-4
3.5.5.2 VHF OS(R/T)-3A 118 - 159.4 MHz Alignment.....	3-5
3.5.5.3 VHF OS(R/T)-3H 128 - 174 MHz VCO Alignment.....	3-5
3.5.5.4 UHF OS(R/T)-3H 406 - 470 MHz VCO Alignment.....	3-6
3.5.5.5 Reference Frequency Alignment.....	3-6
3.5.6 Jumper Configuration.....	3-7

4	ILLUSTRATIONS AND SCHEMATIC DIAGRAMS	4-1
4.1	OS(R/T)-3H 29 - 71.4 MHz Analog Board Diagrams	4-1
4.1.1	OS(R/T)-3H 29 - 71.4 MHz Analog Board Component Layout (Bottom)	4-1
4.1.2	OS(R/T)-3H 29 - 71.4 MHz Analog Board Component Layout (Top)	4-2
4.1.3	OS(R/T)-3H 29 - 71.4 MHz Analog Board Schematic Diagram.....	4-3
4.2	OS(R/T)-3A 118 - 159.4 MHz Analog Board Diagrams.....	4-5
4.2.1	OS(R/T)-3A 118 - 159.4 MHz Analog Board Component Layout (Bottom)	4-5
4.2.2	OS(R/T)-3A 118 - 159.4 MHz Analog Board Component Layout (Top)	4-6
4.2.3	OS(R/T)-3A 118 - 159.4 MHz Analog Board Schematic Diagram....	4-7
4.3	OS(R/T)-3H 128 - 174 MHz Analog Board Diagrams	4-9
4.3.1	OS(R/T)-3H 128 - 174 MHz Analog Board Component Layout (Bottom)	4-9
4.3.2	OS(R/T)-3H 128 - 174 MHz Analog Board Component Layout (Top)	4-10
4.3.3	OS(R/T)-3H 128 - 174 MHz Analog Board Schematic Diagram.....	4-11
4.4	OS(R/T)-3H 406 - 470 MHz Analog Board Diagrams	4-13
4.4.1	OS(R/T)-3H 406 - 470 MHz Analog Board Component Layout (Bottom)	4-13
4.4.2	OS(R/T)-3H 406 - 470 MHz Analog Board Component Layout (Top)	4-14
4.4.3	OS(R/T)-3H 406 - 470 MHz Analog Board Schematic Diagram.....	4-15
4.5	OS(R/T)-3(A/H) Digital Board Diagrams	4-17
4.5.1	OS(R/T)-3(A/H) Digital Board Component Layout (Bottom).....	4-17
4.5.2	OS(R/T)-3(A/H) Digital Board Component Layout (Top)	4-18
4.5.3	OS(R/T)-3(A/H) Digital Board Schematic Diagram.....	4-19
5	PARTS LISTS	5-1
5.1	OS(R/T)-3H 29 - 71.4 MHz Analog Board Electrical Parts List	5-1
5.2	OS(R/T)-3A 118 - 159.4 MHz Analog Board Electrical Parts List.....	5-5
5.3	OS(R/T)-3H 128 - 174 MHz Analog Board Electrical Parts List	5-8
5.4	OS(R/T)-3H 406 - 470 MHz Analog Board Electrical Parts List	5-11
5.5	OS(R/T)-3(A/H) Digital Board Electrical Parts List	5-14
5.6	OS(R/T)-3(A/H) Synthesizer Mechanical Parts List.....	5-15
6	REVISION HISTORY.....	1

1. GENERAL

1.1 Introduction

2. THEORY OF OPERATION

2.1 Internal Power and Control (Digital Board)

3. SYNTHESIZER ALIGNMENT

3.1 General

4 ILLUSTRATIONS AND SCHEMATIC DIAGRAMS

4.1 OS(R/T)-3H 29 - 71.4 MHz Analog Board Diagrams

4.1.1 OS(R/T)-3H 29 - 71.4 MHz Analog Board Component Layout (Bottom)

5. PARTS LISTS

5.1 OS(R/T)-3H 29 - 71.4 MHz Analog Board Electrical Parts List

6. REVISION HISTORY

ISSUE	DATE	REVISION
-------	------	----------

- | | | |
|---|--------|--|
| 1 | May 97 | • Issue 1 |
| 2 | Mar 98 | • Changes to the AM Analog board (OST-3A128) to improve performance ECO #547.
C37 was XXX nF is now XXX nF and C40 was XXX pF is now not installed
C45 was XXX nF is now XXX nF and C49 was XXX nF is now XXX nF
R32 was XXX k Ω is now XXX k Ω and R36 was XXX Ω is now XXX Ω |
| 3 | Mar 00 | • Changes to the AM Analog board to improve performance at -40°C. ECO #565.
L4 was XXX μ H is now XXX μ H

• Changes to the FM Analog boards to improve manufacturing. ECO #572
C32 & C33 were XXX μ F through hole tantalums are now XXX μ F surface mount tantalums

• Changes to the OS-3A/H Digital board for compatibility with the new AM wideband Synthesizers. ECO #579.
Added C15 (XXX μ F) and R41 (XXX k Ω).
JU1 was added and is installed for AM modules only.
PCB, DIGITAL, OS-3H/P SYNTH was version 2 now version 3.

• Added the new component layouts, schematic diagram and parts lists for the new AM wideband synthesizer. Wideband referring to only having to be tune once and working over the whole AM band (118-138 MHz). |
| 4 | May 00 | • Changes to the OS-3H 128-174 MHz Analog board. ECO #603.
R29 was XXX is now XXX, U10 was XXXXX is now XXXXX.

• Changes to the OSR-3H 128-174 MHz Analog board. ECO #609.
R22 was XXX R is now XXX R.

• Changes to the OS-3A 118-159.4 Analog board. ECO #601.
R42 & R53 were XXX k Ω are now XXX k Ω . |
| | Jul 00 | • Corrected the SELECT table on the OS(R/T)-3H 128-174 MHz Schematic diagram (section 4.3.3). |

ISSUE DATE REVISION

- 4 Aug 00 • Changes to the OS(R/T)-3(A/H) Digital board. ECO #599.
R30, R31 & R32 were XXX R are now XXX R.
- Changes to the OS-3H 406-470 MHz Analog board. ECO # 597.
R48 was XXX R is now XXX R, R49 was XXX R is now XXX R.
R52 was XXX R is now Not Installed.



MT-3 RADIO SYSTEMS

UHF SYNTHESIZED TRANSMITTER CHANNEL DESIGNATION TABLES

UT-3/400 406 - 470 MHz

Covers models:

UT-3/420-SNC2, UT-3/420-SWC2, UT-3/420-SNC8, UT-3/420-SWC8,
UT-3/460-SNC2, UT-3/460-SWC2, UT-3/460-SNC8, UT-3/460-SWC8,

Copyright © 1998 Daniels Electronics Ltd. All rights reserved. No part of this publication may be reproduced, stored in a retrieval system or transmitted in any form or by any means, electronic, mechanical, photocopying, recording or otherwise, without the prior written consent of Daniels Electronics Ltd.

DE™ is a registered trademark of Daniels Electronic Ltd. registered in the United States Patent and Trademark Office.

Issue:	1	Previous Issue:	N/A	
Issue Date:	September 1998	Previous Issue Date:	N/A	Daniels Electronics Ltd.
Printing Date:	September 1998			Victoria, BC.
Part No.:	IM23-UT3400CT			PRINTED IN CANADA

Reviewed By:

Quality Assurance:

LARRY FREEMAN

Name

Signature

Date

NOTE:

The user's authority to operate this equipment could be revoked through any changes or modifications not expressly approved by Daniels Electronics Ltd.

The design of this equipment is subject to change due to continuous development. This equipment may incorporate minor changes in detail from the information contained in this manual.

TABLE OF CONTENTS

	Page
1. UT-3/420 Channel Designation Table: 406-430MHz, 12.5kHz Increments	1-1
2. UT-3/460 Channel Designation Table: 450-470MHz, 12.5kHz Increments	2-1
3. REVISION HISTORY	3-1

This Page Intentionally Left Blank

1. UT-3/420 Channel Designation Table: 406-430MHz, 12.5kHz Increments

2 UT-3/460 Channel Designation Table: 450-470MHz, 12.5kHz Increments

3 REVISION HISTORY

ISSUE	DATE	REVISION
-------	------	----------

1	September 98	Issue 1
---	--------------	---------

This Page Intentionally Left Blank.