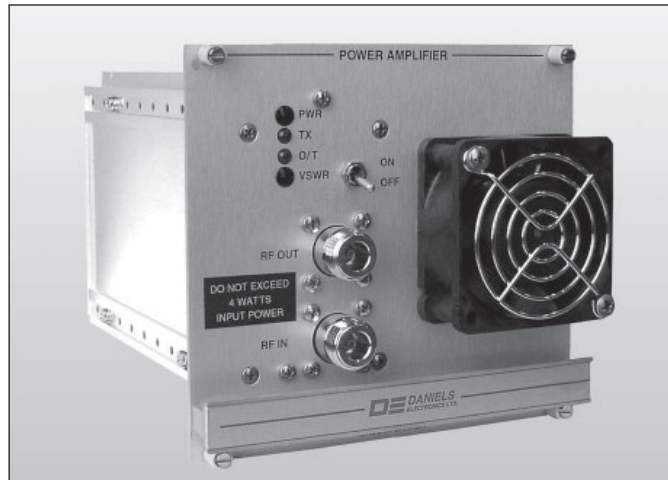




VHF AMP-2 30 W POWER AMPLIFIER INSTRUCTION MANUAL 136 - 174 MHz

Covers Models:

AMP-2/145-30-00

AMP-2/155-30-00

AMP-2/170-30-00

Copyright © 2004 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.

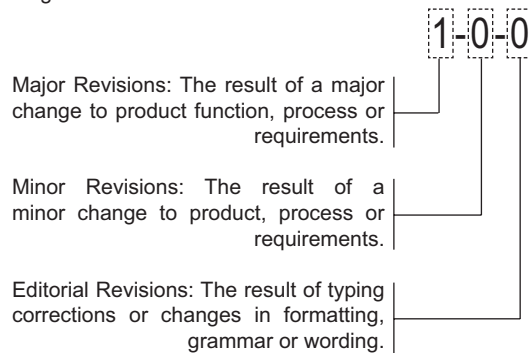
DOCUMENT CONTROL

This document has been produced, verified and controlled in accordance with Daniels Electronics' Quality Management System requirements.

Please report any errors or problems to Daniels Electronics' Customer Service Department.

DOCUMENT REVISION
DEFINITION

Daniels Electronics Ltd. utilizes a three-level revision system. This system enables Daniels to identify the significance of a revision. Each element of the revision number signifies the scope of change as described in the diagram below.



Three-level revision numbers start at 1-0-0 for the first release. The appropriate element of the revision number is incremented by 1 for each subsequent revision, causing any digits to the right to be reset to 0.

For example:

If the current revision = 2-1-1 Then the next major revision = 3-0-0

If the current revision = 4-3-1 Then the next minor revision = 4-4-0

If the current revision = 3-2-2 Then the next editorial revision = 3-2-3

The complete revision history is provided at the back of the document.

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.

RF Exposure Warning

Exposure to radio frequency (RF) energy has been identified as a potential environmental factor that must be considered before a radio transmitter can be authorized or licensed. The FCC has therefore developed maximum permissible exposure (MPE) limits for field strength and power density, listed in FCC 47 CFR § 1.1310. The FCC has furthermore determined that determination of compliance with these exposure limits, and preparation of an Environmental Assessment (EA) if the limits are exceeded, is necessary only for facilities, operations and transmitters that fall into certain risk categories, listed in FCC 47 CFR § 1.1307 (b), Table 1. All other facilities, operations and transmitters are categorically excluded from making such studies or preparing an EA, except as indicated in FCC 47 CFR §§ 1.1307 (c) and (d).

Revised FCC OET Bulletin 65 (Edition 97-01) provides assistance in determining whether a proposed or existing transmitting facility, operation or device complies with RF exposure limits. In accordance with OET Bulletin 65 and FCC 47 CFR § 1.1307 (b), this Daniels Electronics Ltd. transmitter is categorically excluded from routine evaluation or preparing an EA for RF emissions and this exclusion is sufficient basis for assuming compliance with FCC MPE limits. This exclusion is subject to the limits specified in FCC 47 CFR §§ 1.1307 (b) and 1.1310. Daniels Electronics Ltd. has no reason to believe that this excluded transmitter encompasses exceptional characteristics that could cause non-compliance.

Notes:

- The FCC's exposure guidelines constitute exposure limits, not emission limits. They are relevant to locations that are accessible to workers or members of the public. Such access can be restricted or controlled by appropriate means (i.e. fences, warning signs, etc.).
- The FCC's limits apply cumulatively to all sources of RF emissions affecting a given site. Sites exceeding these limits are subject to an EA and must provide test reports indicating compliance.

RF Safety Guidelines and Information

Base and Repeater radio transmitters are designed to generate and radiate RF energy by means of an external antenna, typically mounted at a significant height above ground to provide adequate signal coverage. The following antenna installation guidelines are extracted from Appendix A to OET Bulletin 65 and must be adhered to in order to ensure RF exposure compliance:

Non-building-mounted Antennas:

Height above ground level to lowest point of antenna ≥ 10 m or
Power ≤ 1000 W ERP (1640 W EIRP)

Building-mounted Antennas:

Power ≤ 1000 W ERP (1640 W EIRP)

The following RF Safety Guidelines should be observed when working in or around transmitter sites:

- Do not work on or around any transmitting antenna while RF power is applied.
- Before working on an antenna, disable the appropriate transmitter and ensure a "DO NOT USE" or similar sign is placed on or near the PTT or key-up control.
- Assume all antennas are active unless specifically indicated otherwise.
- Never operate a transmitter with the cover removed.
- Ensure all personnel entering a transmitter site have electromagnetic energy awareness training.

For more information on RF energy exposure and compliance, please refer to the following:

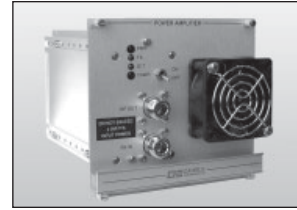
- 1) FCC Code of Regulations; 47 CFR §§ 1.1307 and 1.1310.
- 2) FCC OET Bulletin 65, Edition 97-01, "Evaluating Compliance with FCC Guidelines for Human Exposure to Radiofrequency Electromagnetic Fields".
- 3) <http://www.fcc.gov/oet/rfsafety/>



Contents

General Information	1
Introduction	1
Performance Specifications	2
Physical Specifications	3
Theory of Operation	5
General	5
RF Sensor Circuitry	5
RF Circuitry	6
Installation and Site Operation	7
VHF AMP-2 Alignment	9
Test Equipment List	9
Amplifier Alignment	10
Illustrations and Schematics	13
Printed Circuit Board Numbering Convention	13
VHF AMP-2 Power Amplifier Block Diagram	14
VHF AMP-2 Power Amplifier Exploded View	15
136 - 150 MHz VHF AMP-2 Amplifier Board Component Layout	16
136 - 150 MHz VHF AMP-2 Amplifier Board Schematic Diagram	17
150 - 162 MHz VHF AMP-2 Amplifier Board Component Layout	18
150 - 162 MHz VHF AMP-2 Amplifier Board Schematic Diagram	19
162 - 174 MHz VHF AMP-2 Amplifier Board Component Layout	20
162 - 174 MHz VHF AMP-2 Amplifier Board Schematic Diagram	21
VHF AMP-2 RF Sensor Board Component Layout	22
VHF AMP-2 Sensor Board Schematic Diagram	23
Parts Lists	25
Amplifier Board Electrical Parts List	25
Amplifier Board Mechanical Parts List	27
RF Sensor Board Electrical Parts List	29
Sensor Board Mechanical Parts List	30
Front Panel Parts List	31
Revision History	33





GENERAL INFORMATION

INTRODUCTION

The MT-3 / MT-4 repeater system is a VHF / UHF radio system which is characterized by high performance and reliability under the most severe environmental conditions. The total system is designed to provide dependable, low maintenance performance, even in the most difficult circumstances.

The MT-3 / MT-4 series of modules are packaged in the compact Euro standard (5"h x 2.8"w x 7.5"d) housing, and are robustly designed for urban, remote or transportable applications. Voltage stress testing is done over the range of +11 to +16 VDC which is followed by 24 hours of continuous operation at maximum rated power output.

When the VT-3 / VT-4 transmitter is used as an exciter for the VHF AMP-2 power amplifier (PA) module, it will provide an adjustable 20 to 30 W RF output over the 136 - 174 MHz VHF frequency range.

The VHF AMP-2 family contains three models (AMP-2/145-30, AMP-2/155-30, AMP-2/170-30) covering three frequency bands 136 - 150 MHz, 150 - 162 MHz and 162 - 174 MHz respectively. The VHF AMP-2 power amplifier (PA) mates with either of the MT-3 / MT-4 VHF transmitter exciter modules (the VT-3 transmitter exciter module or the VT-4 transmitter exciter module).

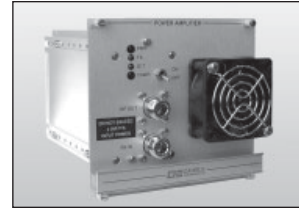
PERFORMANCE SPECIFICATIONS

Type:	MT-2 Series Power Amplifier
Family:	AMP-2/150
Models:	AMP-2/145-30-00 AMP-2/155-30-00 AMP-2/170-30-00
Compatibility:	MT-3 and MT-4 Series Transmitter Exciters
Frequency Range:	136 - 174 MHz
Frequency Bands:	136 - 150 MHz 150 - 162 MHz 162 - 170 MHz
RF Input Power:	2 - 4 W
RF Output Power:	Adjustable: 20 - 30 Watts (set by MT-3 or MT-4 exciter)
Output Impedance:	50 Ω
Conducted Spurious & Harmonics:	< -80 dBc (at 30 W output) Less than 0.3 μ W (-35 dBm) absolute level
Operating Voltage:	+13.8 VDC nominal, range +11 to +16 VDC
Transmit Current:	3.5 to 5.5 A at 30 W 136 - 174 MHz
Standby Current:	Minimum 2 mA options 20 mA
Thermal:	Thermal interlock disables at 80°C (175°F) Fan activated at 40°C (105°F)
Duty Cycle:	• Continuous (with Fan) -40°C to +60°C Operation
Exciter	VT-3 and VT-4 4 W max. output for 30 W P.A.
IC Number:	• 142A-AMP2150
FCC ID:	• H4JVT-30
Emission Designator:	F1D, F1E, F3D, F3E

PHYSICAL SPECIFICATIONS

Physical Dimensions:	Width: 14.2 cm (5.6")	Height: 12.8 cm (5.05")	Depth: 20.5 cm (8.1")
Weight:	1.6 kg (3.5 lb)		
Operating Temperature Range:	-40°C to +60°C		
Operating Humidity:	Up to 95% R.H. at 25°C		
RF Connectors:	Type N Standard		
Corrosion Prevention:	Anodized aluminum construction. Stainless steel hardware.		
Features:	• Heavy Duty Aluminum Heatsink • Thermal switched Fan (at 40°C) • RF Power and Over temp Indicators • Optional Unit Power Indicator		





INSTALLATION AND SITE OPERATION

The VHF AMP-2 RF power amplifier is approved for operation with the VT-3 or VT-4 exciter. Complete MT-3 subracks shipped directly from the factory are normally set to the appropriate options and O/P power calibration as requested by the customer. These units require no recalibration.

For VHF AMP-2 RF power amplifiers shipped separately from the MT-3/MT-4 racks, install as outlined in this section.

-
- 1) Confirm exciter and PA are aligned for the same frequency. (See Alignment Procedure).
-
- 2) Remove the blank cover plates or TX-RX pair in the "B" System subrack slots.
-
- 3) Install the VHF AMP-2 in slot 36 (visible via the marker hole on the upper left VHF AMP-2 front panel).
-

Note: If the unit is set up with the extender card there will be a voltage drop of +1 to +1.5 VDC when the power amplifier is transmitting. This voltage drop must be compensated for valid power O/P readings. Adjust the power supply for +13.8 VDC at the power amplifier.

- 4) Connect the output of the exciter to the input of the VHF AMP-2 power amplifier with the cable provided.
-
- 5) Connect the antenna system and key the transmitter. The LED indicators are defined as follows:

Power Indicator: (optional)

Indicates +13.8 VDC is applied to the transmitter when the ON-OFF switch is activated. An internal connector on the sensor PCB disables the power indicator LED in the event standby LED current drain must be eliminated.

TX Indicator:

Indicates that a preset forward RF power level is present at the transmitter output. The threshold level is internally adjustable for various RF output levels over the 20 - 30 W range.

OT Indicator: (Over Temperature)

A thermostat control switch interrupts the input supply voltage (nominally +13.8 VDC) to the PA when the heat sink temperature exceeds 175°F (80°C). The over temp thermostat will reset at 145°F (63°C), thus providing hysteresis. The OT indicator is only operational when exciter drive is present.

The fan is activated automatically when the VHF PA O/P transistor temperature sensor reaches +40°C. The fan's operating temperature range is -20°C to +60°C. The fan sensor will not activate the fan when ambient temperature is below -20°C.