RITRON, INC.

RITRON MODEL: DTXM-465-0BN6I-M

PROGRAMMABLE

FM TRANSCEIVER MODULE

USER MANUAL

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1   INTRODUCTION

1.1   GENERAL

The RITRON DTXM Plus modules are programmable 2-way radios, which operate either in the VHF or UHF professional FM communications bands as well as a number of other bands in the 220 MHz and 350 MHz region. Each of four channels can be programmed to contain a unique set of operating frequencies. The DTXM Plus module is made up of two PC boards, an RF board and a control/loader board. These two boards are enclosed in a metal case with two connectors on one end; a 50 ohm BNC connector for connection to an antenna and a DB-15 sub-miniature connector for power and control input/output.

In addition, the RF board is available as a stand-alone unit for system integrators.

1.2   MODEL IDENTIFICATION

The DTXM has a part number in the form of "DTXM-A60-BCDEF"

Where:

A is the major frequency band designator:

> 1=VHF (136-174 MHz)
> 2=217-245 MHz
> 3=340-400 MHz
> 4=UHF (400-520 MHz)

B is the sub-band designator:

> G=340-360 and 400-420
> A=420-440
> B=430-450
> 0=136-174, 217-245, 360-380, and 450-470
> M=380-400
> C=470-490
> T=490-512

C is the connector designator:

> B=BNC connector
> M= MCX connector
> S=SMA connector

D designates the channel bandwidth:

> S=6.25 kHz
> N=12.5 kHz
> W=25 kHz

E designates the maximum power level:

> 3=3 watts
> 6=6 watts
> 9=10 watts

F designates the regulator option

        I=Internal regulator (10-16 VDC operation with regulated RF power amplifier)
        D=No regulator (7.5 VDC operation)
        L=RF PA is unregulated, but the remainder of the modem is regulated (10-watt versions)

Example: A DTXM-465-OBN6I would be a UHF module for operation between 450 and 470 MHz with a BNC RF connector, narrow (12.5 kHz channel spacing) IF bandwidth, 30 watts maximum output power, and an internal regulator to allow operation from 10 to 15 volts.

1.3   FCC/IC REGULATIONS

1.3.1   LICENSING

For those frequency bands governed by FCC rules, the FCC requires that the radio owner obtain a station license for his radio before using the equipment to transmit, but does not require an operating license or permit. The station licensee is responsible for proper operation and maintenance of his radio equipment, and for ensuring that transmitter power, frequency and deviation are within the limits specified by the station license. This includes checking the transmitter frequency and deviation periodically using appropriate methods. Note also, that wideband operation (25/30 kHz channel bandwidth) may not be permitted.

1.3.2   PRODUCT CERTIFICATION

The DTXM modules are certified by the FCC for operation in the United States and by Industry Canada for operation in Canada on certain frequency bands and sub-bands for transmission of either voice or data signals when aligned according to the alignment procedure for the proper bandwidth and when operated as a complete unit in the metal case. Operation of the RF board as a stand-alone unit or in combination with any other equipment, in any mode outside the alignment procedure, or with the clipper filter electronically disabled will require the filing of a new type acceptance application with the FCC by the user.

1.3.3   SAFETY STANDARDS-RF EXPOSURE

RF ENERGY EXPOSURE AWARENESS AND CONTROL INFORMATION, AND OPERATIONAL INSTRUCTIONS FOR FCC OCCUPATIONAL USE REQUIREMENTS:

BEFORE USING THIS 2-WAY RADIO, READ THIS IMPORTANT RF ENERGY AWARENESS AND CONTROL INFORMATION AND OPERATIONAL INSTRUCTIONS TO ENSURE COMPLIANCE WITH THE FCC'S AND IC'S RF EXPOSURE GUIDELINES.

 THIS DEVICE COMPLIES WITH PART 15 OF THE FCC RULES. OPERATION IS SUBJECT TO THE FOLLOWING TWO CONDITIONS: (1) THIS DEVICE MAY NOT CAUSE HARMFUL INTERFERENCE, AND (2) THIS DEVICE MUST ACCEPT ANY INTERFERENCE RECEIVED, INCLUDING INTERFERENCE THAT MAY CAUSE UNDESIRED OPERATION.

NOTE: THE GRANTEE IS NOT RESPONSIBLE FOR ANY CHANGES OR MODIFICATIONS NOT EXPRESSLY APPROVED BY THE PARTY RESPONSIBLE FOR COMPLIANCE. SUCH MODIFICATIONS COULD VOID THE USER'S AUTHORITY TO OPERATE THE EQUIPMENT.

NOTICE: This radio is intended for use in general population/uncontrolled conditions, where users do not have full knowledge of their exposure and cannot exercise control over their exposure to meet FCC/IC limits.

This 2-way radio uses electromagnetic energy in the radio frequency (RF) spectrum to provide communications between two or more users over a distance. It uses radio frequency (RF) energy or radio waves to send and receive calls. RF energy is one form of electromagnetic energy. Other forms include, but are not limited to, electric power, sunlight and x-rays. RF energy, however, should not be confused with these other forms of electromagnetic energy, which when used improperly can cause biological damage. Very high levels of x-rays, for example, can damage tissues and genetic material.

Experts in science, engineering, medicine, health and industry work with organizations to develop standards for exposure to RF energy. These standards provide recommended levels of RF exposure for both workers and the general public. These recommended RF exposure levels include substantial margins of protection. All 2-way radios marketed in North America are designed, manufactured and tested to ensure they meet government established RF exposure levels. In addition, manufacturers also recommend specific operating instructions to users of 2-way radios. These instructions are important because they inform users about RF energy exposure and provide simple procedures on how to control it. Please refer to the following websites for more information on what RF energy exposure is and how to control your exposure to assure compliance with established RF exposure limits.

http://www.fcc.gov/oet/rfsafety/rf-faqs.html
http://www.osha.gov/SLTC/radiofrequencyradiation/index.html

Federal Communications Commission Regulations:

The FCC rules require manufacturers to comply with the FCC RF energy exposure limits for mobile 2-way radios before they can be marketed in the U.S. When 2-way radios are used as a consequence of employment, the FCC requires users to be fully aware of and able to control their exposure to meet occupational requirements. Exposure awareness can be facilitated by the use of a label directing users to specific user awareness information.

The DTXM 2-way radio has an RF exposure product label. Also, this DTXM manual includes information and operating instructions required to control your RF exposure and to satisfy compliance requirements.

Compliance with RF Exposure Standards:

The DTXM two-way radio is designed and tested to comply with a number of national and international standards and guidelines (listed below) regarding human exposure to radio frequency electromagnetic energy. This radio complies with the IEEE and ICNIRP exposure limits for occupational/controlled RF exposure environment at duty factors of up to 50% talk and 50% listen and is authorized by the FCC for occupational use. In terms of measuring RF energy for compliance with the FCC exposure guidelines, your radio antenna radiates measurable RF energy only while it is transmitting (during talking), not when it is receiving (listening) or in standby mode.

The DTXM two-way radio complies with the following RF energy exposure standards and guidelines, and when used as directed, the DTXM radio is designed to comply with ISED RSS-102 Exposure Limits. In addition, the DTXM radio is designed to comply with the following Standards and Guidelines:

• United States Federal Communications Commission, Code of Federal Regulations; 47 CFR JJ 1.1307, 1.1310, 2.1091 and 2.1093.

• American National Standards Institute (ANSI) / Institute of Electrical and Electronic Engineers (IEEE) C95. 3-2003.

• Institute of Electrical and Electronic Engineers (IEEE) C95.3-2003 Edition.
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To control exposure to yourself and others and ensure compliance with the general population/uncontrolled environment exposure limits always adhere to the following procedures:

Guidelines:
• User awareness instructions should accompany device when transferred to other users.

• Do not use this device if the operational requirements described herein are not met.

Instructions:

• Transmit no more than the rated duty factor of 50% of the time. To transmit (talk or send data), assert the PTT input pin. To receive calls, un-assert the PTT input. Transmitting 50% of the time, or less, is important because this radio generates measurable RF energy exposure only when transmitting (in terms of
measuring for standards compliance).

• Transmit only when people are at least the recommended minimum lateral distance away, as shown in Table 1, from a properly installed according to installation instructions, externally-mounted antenna.

NOTE - Table 1 lists the recommended minimum lateral distance for bystanders in an uncontrolled environment from transmitting types of antennas (i.e., monopoles over a ground plane, or dipoles) at several different ranges of rated radio power for mobile radios installed on a vehicle.

Table 1. Rated Power and Recommended Lateral Distance for quarter-wave, unity gain, ground plane antenna:

Rated Power of DTXM-465-0BN30I Radio	Recommended Minimum Lateral Distance from Transmitting Antenna
30 watts	17.4 inches (44.3 cm)

Antennas

• Install antennas taking into account the recommended minimum lateral distances listed above. These antenna installation guidelines are limited to antennas with appropriate ground planes. The antenna installation should additionally be in accordance with:

    a.) The requirements of the antenna manufacturer/supplier.
    b.) Instructions in this manual including minimum antenna cable lengths.
    c.) Antennas other than those shown in Table 1 must be tested with the DTXM module
    for RF exposure compliance in the environment in which it is to be used per the FCC's
    OET Bulletin 65, Edition 97-01 or Industry Canada RSS-102.

• Use only a UHF quarterwave antenna or equivalent antenna or other antennas as described above. Unauthorized antennas, modifications, or attachments could damage the radio and may violate FCC regulations.

Approved Accessories

• This radio has been tested and meets the FCC RF exposure guidelines when used with the Ritron accessories supplied or designated for this product. Use of other accessories may not ensure compliance with the FCC's RF exposure guidelines, and may violate FCC regulations.

• For a list of Ritron approved accessories see this user manual, or visit the following website which lists approved accessories: www.ritron,com

Contact Information:

For additional information on exposure requirements or other information, contact Ritron at (317) 846-1201 or at www.ritron.com.

INFORMATIONS DE SENSIBILISATION ET DE CONTRÔLE À L'EXPOSITION AUX ÉNERGIES RF, ET INSTRUCTIONS OPÉRATIONNELLES POUR LES EXIGENCES D'UTILISATION PROFESSIONNELLE DE LA FCC:

AVANT D'UTILISER CETTE RADIO À 2 VOIES, LISEZ CES INFORMATIONS IMPORTANTES SUR LA SENSIBILISATION ET LE CONTRÔLE À L'ÉNERGIE RF ET LES INSTRUCTIONS OPÉRATIONNELLES POUR VOUS ASSURER LA CONFORMITÉ AVEC LES DIRECTIVES D'EXPOSITION AUX RF DE LA FCC ET DES IC.

CET APPAREIL EST CONFORME À LA PARTIE 15 DES RÈGLES FCC. LE FONCTIONNEMENT EST SOUMIS AUX DEUX CONDITIONS SUIVANTES: (1) CET APPAREIL NE PEUT PAS CAUSER DES INTERFÉRENCES DANGEREUSES, ET (2) CET APPAREIL DOIT ACCEPTER TOUTE INTERFÉRENCE REÇUE, Y COMPRIS LES INTERFÉRENCES POUVANT CAUSER UN FONCTIONNEMENT INDÉSIRABLE.

REMARQUE: LE BÉNÉFICIAIRE N'EST PAS RESPONSABLE DES CHANGEMENTS OU MODIFICATIONS NON EXPRESSÉMENT APPROUVÉS PAR LA PARTIE RESPONSABLE DE LA CONFORMITÉ. DE TELLES MODIFICATIONS POURRAIENT ANNULER L'AUTORITÉ DE L'UTILISATEUR DE FAIRE FONCTIONNER L'ÉQUIPEMENT.

AVIS: Cette radio est destinée à être utilisée dans la population générale / dans des conditions non contrôlées, où les utilisateurs n'ont pas une connaissance complète de leur exposition et ne peuvent pas contrôler leur exposition pour respecter les limites FCC / IC.

Cette radio bidirectionnelle utilise l'énergie électromagnétique dans le spectre des radiofréquences (RF) pour fournir des communications entre deux ou plusieurs utilisateurs à distance. Il utilise l'énergie des radiofréquences (RF) ou des ondes radio pour envoyer et recevoir des appels. L'énergie RF est une forme d'énergie électromagnétique. D'autres formes comprennent, mais sans s'y limiter, l'énergie électrique, la lumière du soleil et les rayons X. L'énergie RF, cependant, ne doit pas être confondue avec ces autres formes d'énergie électromagnétique qui, lorsqu'elles sont mal utilisées, peuvent causer des dommages biologiques. Des niveaux très élevés de rayons X, par exemple, peuvent endommager les tissus et le matériel génétique.

Des experts en science, ingénierie, médecine, santé et industrie travaillent avec des organisations pour développer des normes d'exposition à l'énergie RF. Ces normes fournissent des niveaux recommandés d'exposition aux RF pour les travailleurs et le grand public. Ces niveaux d'exposition RF recommandés incluent des marges de protection substantielles. Toutes les radios bidirectionnelles commercialisées en Amérique du Nord sont conçues, fabriquées et testées pour garantir qu'elles respectent les niveaux d'exposition aux RF établis par le gouvernement. En outre, les fabricants recommandent également des instructions d'utilisation spécifiques aux utilisateurs de radios bidirectionnelles. Ces instructions sont importantes car elles informent les utilisateurs sur l'exposition à l'énergie RF et fournissent des procédures simples sur la façon de la contrôler. Veuillez consulter les sites Web suivants pour plus d'informations sur ce qu'est l'exposition à l'énergie RF et comment contrôler votre exposition pour assurer la conformité avec les limites d'exposition RF établies.

http://www.fcc.gov/oet/rfsafety/rf-faqs.html
http://www.osha.gov/SLTC/radiofrequencyradiation/index.html

Règlements de la Federal Communications Commission:

Les règles de la FCC exigent que les fabricants se conforment aux limites d'exposition à l'énergie RF de la FCC pour les radios mobiles bidirectionnelles avant de pouvoir être commercialisées aux États-Unis. et capables de contrôler leur exposition pour répondre aux exigences professionnelles. La sensibilisation à l'exposition peut être facilitée par l'utilisation d'une étiquette orientant les utilisateurs vers des informations spécifiques de sensibilisation des utilisateurs.

La radio bidirectionnelle DTXM est conçue et testée pour se conformer à un certain nombre de normes et directives nationales et internationales (énumérées ci-dessous) concernant l'exposition humaine à l'énergie électromagnétique de radiofréquence. Cette radio est conforme aux limites d'exposition IEEE et ICNIRP pour un environnement d'exposition professionnelle / contrôlée aux RF à des facteurs de service

allant jusqu'à 50% de conversation et 50% d'écoute et est autorisée par la FCC pour une utilisation professionnelle. En termes de mesure de l'énergie RF pour se conformer aux directives d'exposition de la FCC, votre antenne radio émet de l'énergie RF mesurable uniquement lorsqu'elle émet (pendant la conversation), pas lorsqu'elle reçoit (écoute) ou en mode veille.

La radio bidirectionnelle DTXM est conforme aux normes et directives d'exposition à l'énergie RF suivantes, et lorsqu'elle est utilisée selon les instructions, la radio DTXM est conçue pour se conformer aux limites d'exposition RSS-102 d'ISDE. De plus, la radio DTXM est conçue pour se conformer aux normes et directives suivantes:

• Commission fédérale des communications des États-Unis, Code of Federal Regulations; 47 CFR JJ 1.1307, 1.1310, 2.1091 et 2.1093.

• Institut national américain des normes (ANSI) / Institut des ingénieurs électriques et électroniques (IEEE) C95. 3-2003.

• Édition C95.3-2003 de l'Institut des ingénieurs électriciens et électroniciens (IEEE).
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Pour contrôler l'exposition à vous-même et aux autres et garantir le respect des limites d'exposition de la population générale / de l'environnement non contrôlé, respectez toujours les procédures suivantes:

Des lignes directrices:
• Les instructions de sensibilisation de l'utilisateur doivent accompagner l'appareil lors du transfert à d'autres utilisateurs.

• N'utilisez pas cet appareil si les exigences opérationnelles décrites ici ne sont pas satisfaites.

Instructions:

• Ne transmettez pas plus que le facteur de service nominal de 50% du temps. Pour transmettre (parler ou envoyer des données), confirmez la broche d'entrée PTT. Pour recevoir des appels, désactivez l'entrée PTT. La transmission à 50% du temps, ou moins, est importante car cette radio génère une exposition à l'énergie RF mesurable uniquement lors de la transmission (en termes de mesure de la conformité aux normes).

• Ne transmettez que lorsque les personnes se trouvent au moins à la distance latérale minimale recommandée, comme indiqué dans le tableau 1, d'une antenne montée à l'extérieur correctement installée conformément aux instructions d'installation.

NOTE - Le Tableau 1 énumère la distance latérale minimale recommandée pour les spectateurs dans un environnement non contrôlé par rapport aux types d'antennes de transmission (c'est-à-dire monopôles sur un plan de masse ou dipôles) à plusieurs plages de puissance radio nominale pour les radios mobiles installées sur un véhicule.

Tableau 1. Puissance nominale et distance latérale recommandée pour l'antenne quart d'onde, gain unitaire, plan de masse:

Puissance nominale de DTXM-465-0BN30I	latérale minimale recommandée Distance radio bidirectionnelle de l'antenne émettrice
30 watts	8 pouces (22 cm)

Antennes

• Installez les antennes en tenant compte des distances latérales minimales recommandées ci-dessus. Ces directives d'installation d'antenne sont limitées aux antennes avec des plans de masse appropriés. L'installation de l'antenne doit en outre être conforme à:

a.) Les exigences du fabricant / fournisseur d'antenne.
b.) Les instructions de ce manuel, y compris les longueurs minimales de câble d'antenne.
c.) Les antennes autres que celles indiquées dans le tableau 1 doivent être testées avec le module DTX pour vérifier la conformité d'exposition RF dans l'environnement dans lequel il doit être utilisé, conformément au bulletin OET 65 de la FCC, édition 97-01 ou à l'industrie Canada RSS-102.

Utilisez uniquement une antenne quart d'onde UHF ou une antenne équivalente ou d'autres antennes comme décrit ci-dessus. Les antennes, modifications ou accessoires non autorisés peuvent endommager la radio et enfreindre les réglementations FCC.

Accessoires approuvés

• Cette radio a été testée et répond aux directives d'exposition RF de la FCC lorsqu'elle est utilisée avec les accessoires Ritron fournis ou désignés pour ce produit. L'utilisation d'autres accessoires peut ne pas garantir la conformité avec les directives d'exposition RF de la FCC et peut enfreindre les réglementations FCC.

• Pour une liste des accessoires approuvés par Ritron, consultez ce manuel de l'utilisateur ou visitez le site Web suivant qui répertorie les accessoires approuvés: www.ritron, com

Informations de contact:

Pour plus d'informations sur les exigences d'exposition ou d'autres informations, contactez Ritron au (317) 846-1201 ou sur www.ritron.com.

2   SPECIFICATIONS

2.1   GENERAL

DTXM-465-0BN30I

FCC ID:	AIERIT51-46530
IC ID:	1084A-RIT5146530
FCC Rule Parts	90
Industry Canada Rule Parts	RSS-119
Frequency Range	450-470 MHz
Number of Channels	4
Transmit/Receive Spacing	Up to the span of the sub-band
Mode of Operation	Simplex or Half Duplex
Frequency Control	PLL Synthesizer
Channel Increment (Synthesizer step size)	2.5 kHz/3.125 kHz/6.25 kHz
Emissions Bandwidth Narrowband	10 kHz

Frequency Stability
    -30 °C to +50 °C
    -40 °C to +60 °C
	+/-1.0 ppm
	+/-1.5 ppm

Supply Voltage	11 to 16 VDC
RF Input/Output Connector	BNC standard
Power/Data Interface	15 pin subminiature D type
Operating Temperature	-30 to +60 °C
Maximum Dimensions (L x W x H)	6.6" x 5.0" x 2.4" including connectors
Weight	35 oz.

2.2   TRANSMITTER

Operating Bandwidth	450-470 MHz
RF Output Power(internally adjustable)	5 to 30 watts
Duty Cycle	5 to 100 % depending upon voltage and power level (see chart elsewhere in manual)
RF Load Impedance	50 ohms
Modulation Distortion (per TIA/EIA 603)	5 % max.

Modulation Frequency Response (+1/-3 dB, ref 1 kHz)
    Narrowband version:

w pre-emphasis	400 Hz to 2500 Hz
w/o pre-emphasis	50 Hz to 2700 Hz

    Very Narrowband version:

w/o pre-emphasis	50 Hz to 1200 Hz
Transmitter Attack Time:	10 ms max
Spurious and Harmonics	-25 dBm max.

FM Hum and Noise

Narrowband (12.5/15 kHz) operation	45 dB min.
Group Delay Variation (Within Frequency Response)	5 us max.
Current Drain	Depends upon supply voltage and regulator options (see chart elsewhere in manual).

AUX IN adjustment range (60% rated dev.)

w pre-emphasis (@ 1 kHz)	200 to 1000 mVrms
w/o pre-emphasis (flat)	40 to 300 mVrms

2.3   RECEIVER

Operating Bandwidth	450-470 MHz
Sensitivity (12 dB SINAD @ 1 kHz w de-emphasis)	0.25 uV (-119.0 dBm)
RF Input Impedance	50 ohms nominal

Adjacent Channel Selectivity
+/- 6.25 kHz w/very narrow IF   45 dB min.
+/- 12.5 kHz w/ narrow IF   60 dB min.

Spurious and Image Rejection
IF/2   60 dB min.
Image & other   70 dB min.

Intermodulation Rejection   65 dB min.

FM Hum and Noise
Very Narrowband (5/6.25/7.5 kHz) operation   40 dB min.
Narrowband (12.5/15 kHz) operation   45 dB min.

Conducted Spurious   -70 dBm max.

Receive Attack Time (transmit to receive)   10 ms max.

Carrier Detect Attack Time   5 ms max.

Audio Distortion   5 % max.

Audio Response (+1/-3 dB, ref 1 kHz)
Narrowband version:
w de-emphasis   400 Hz to 2500 Hz
w/o de-emphasis   100 Hz to 3500 Hz
Very Narrowband version:
w/o de-emphasis   100 Hz to 1500 Hz

Receive Current Drain   Depends upon supply voltage options
                                                             (see chart elsewhere in manual).

AUX OUT Adjustment Range (60 % rated dev.)
w de-emphasis (@ 1 kHz)   0 to 90 mVrms open circuit
w/o de-emphasis (@1 kHz)   0 to 350 mVrms open circuit

3   DTXM INPUT/OUTPUT CONNECTORS

DB-15 Connector Pinout

Pin Number	Name	Description	Comments
1	Audio/Mic In	External Audio Input	Wideband input for data.
2	Audio Out	Auxiliary Output	Wideband output for data.
3	Speaker	Audio PA Output	Output of audio PA.
4	CS0	Channel Select low bit	Not used- Firmware disabled
5	RSSI	Receive Signal Strength	Analog Receive Signal Strength Indicator
6	NC	No Connection	
7	DISC Out	Buffered Discriminator Audio	
8	RD	Receive Program Data	
9	TD	Transmit Program Data	
10.	CTS	Clear To Send	Asserted when transmitter can accept modulation.
11.	CS1	Channel Select mid bit	Not used- Firmware disabled
12.	Test/PTT	Push To Talk	Activates transmitter.
13.	CD	Carrier Detect	Carrier detect output.
14.	RTS	Request To Send	
15.	GND	Ground	Negative supply point and reference for all inputs.

Pinout Description

Pin Number	Description
1	AUDIO/MIC IN -This is the main audio input for modulation. The gain through this input to the modulator is programmable, as is the use of pre-emphasis. This signal passes through the clipper and clipper filter.
2	AUDIO OUT-This is the broadband output of the receiver. The gain from the receiver to the output is programmable, as is the use of de-emphasis. The choice of AC or DC coupling from the RF board discriminator is also programmable. The coupling at the output of this pin is AC coupled, however. It can be converted to DC coupling with internal hardware modifications. **Note: The output impedance is approximately 600 ohms. Therefore, it is not recommended that this output drive loads with less than 1000 ohms unless the resultant voltage drop is accounted for.**
3	SPEAKER -This is the output of the audio power amplifier. This output can drive up to 100 milliwatts into an 8 ohm load. The output level can be controlled by programming. De-emphasis can be applied to this output, but not independently of the AUDIO OUT output. Note that this output level varies with the adjustment via the programmer of the AUX OUT level. Thus, the AUX OUT level should be set first before adjusting the AUDIO OUT level.

| 4 | Firmware Disabled. CS0-Least significant bit of the channel select lines. Active high 5 volt TTL/CMOS level. Internal 10 kΩ pull-up to +5 volts. |

Channel	CS1	CS0
1	0	0
2	0	1
3	1	0
4	1	1

0 = Logic low
1 = Logic high

Note: Due to the internal pull-up resistors, the unit defaults to channel 8 if the channel pins are left open (unconnected). **Channel 4 would be the nominal channel when the Ritron programmer is connected.**

| 5 | RSSI- This is an analog output whose amplitude is proportional to the signal strength of the received signal. The voltage at this pin varies from about 1.6 VDC for a -130 dBm signal to about 4 VDC for signals at or above -60 dBm. |

| 6 | NC – No Connection |

| 7 | DISC OUT- Buffered Discriminator Audio with DC Bias. |

| 8 | RD- Connect via RITRON DTXP-PCPK PC Programming Kit to computer for programming the unit. |

| 9 | TD-Connect via RITRON DTXP-PCPK PC Programming Kit to computer for programming the unit. |

| 10 | CTS-Clear-To-Send output from the unit which indicates that the unit is transmitting a carrier at the correct frequency and power level and is ready to accept an input signal to be transmitted. This output would normally become asserted in response to a PTT RTS (see pin 14 description below) activation. The polarity of this output can be programmed. The output is active low 5 volt logic with an internal 10 k ohm pull-up to 5 volts. It can source up to 10 mA when low. |

| 11 | Firmware Disabled. CS1-Most significant bit of the channel select lines. |

| 12 | TEST/PTT- Push to Talk/Request to Send. This input commands the unit to transmit. Input levels are TTL/CMOS; polarity may be programmed. Internal 10 kΩ pull-up to +5 volts. |

| 13 | CD-Carrier detect output. This output becomes asserted when a signal strong enough to exceed the programmed squelch threshold is present. This output is not affected by the RX MON input. The polarity can be programmed. The output is active low 5 volt logic with an internal 10 kΩ pull-up to +5 volts. It can source up to 10 mA when low. |

| 14 | RTS- This RS-232 input pin is asserted by the host computer or device to indicate that it has data to be transmitted by the modem. If the modem is able to accept the data, the CTS pin will be asserted in response. |

| 15 | GND-System ground. All signals and voltages are referenced to this input. The negative side of the power supply should connect here. |

4   ACCESSORIES
Note: Programming kits are for use by authorized service/maintenance personnel only.

The Programming Kit for DTXM Plus radios (via compatible computer) is model DTXM-PCPK-1-M-FIPS. It includes:

1) Programming Software, DTXM-PCPS-1-M-FIPS.

2) DB-9 to DB-15 connector cable with power cable.

3) 9-Pin to USB Adapter, 2147C002.

Factory programming of channels and features is also optional. Contact the factory for details.

5   OPERATION

5.1   CHANNEL SELECTION

The DTXM module supports four channels. The desired channel is selected from RS-232 communication. Radio defaults to Channel 1 with no connection.

5.2   POWER SUPPLY VOLTAGE

The 2-pin Molex connector is the supply voltage input to the unit. One should be absolutely sure of the proper voltage and current requirements before applying power.

The DTXM-465 unit uses 12.5 volt RF Power Modules. The supply voltage can be at any voltage between 11 and 16 volts. Since the module is powered directly from this voltage, the supply should be "clean" and, preferably, regulated. The output power will vary with supply voltage. Switching power supplies can be used, but care must be taken that the output waveform is low noise. Also, the module antenna should never be placed near an unshielded switching power supply.

5.3   CURRENT DRAIN VS SUPPLY VOLTAGE

The current drain of the module is a function of the supply voltage, the RF output in transmit and the regulator option. The internal 7.5-volt regulator is a switching type such that the current drain actually decreases with an increase in supply voltage. Typical current drain values are shown in the table below:

Receive Mode

Supply Voltage	Internal Regulator	Current Drain
11.0 V	Yes	200 mA
12.5 V	Yes	200 mA
16.0 V	Yes	200 mA

Transmit Mode – 5 watt output power

Supply Voltage	Internal Regulator	Current Drain
11.0 V	Yes	2.2 A
12.5 V	Yes	2.3 A
16.0 V	Yes	2.4 A

Warning: Although the output power can be set as low as 5 watts, and the module is certified as low as 5 watt, operation below 5 watts output power is not recommended. At low power levels, the output power can vary by 50% or more with variations in ambient temperature.

Transmit Mode – 15 watt output power

Supply Voltage	Internal Regulator	Current Drain
11.0 V	Yes	3.8 A
12.5 V	Yes	3.9 A
16.0 V	Yes	3.9 A

Transmit Mode – 30 watt output power

Supply Voltage	Internal Regulator	Current Drain
11.0 V	Yes	6.0 A
12.5 V	Yes	6.5 A
16.0 V	Yes	6.8 A

5.4   DUTY CYCLE/KEY-DOWN LIMITATIONS

The major heat generating component within the modules is the RF power amplifier which has a maximum temperature limit that should not be exceeded. In addition, the temperature within the module itself must be kept below the maximum temperature of the reference oscillator to ensure that regulatory frequency stability limits are observed. As a result, depending upon the RF output power, the supply voltage, and the ambient temperature, limits upon the average transmit duty cycle and the maximum continuous transmitter on time exist. These limits are summarized below for operation in still air:

	Ambient Temperature (°C)	Duty Cycle (%)	Key-Down Time (min)
5 watts RF output	25	100	
	50	50	6
15 watts RF output	25	100	
	50	50	6
30 watts RF output	25	75	
	50	25	6

Blowing air across the large finned heat sink can significantly improve the duty cycle/key-down times.

5.5   OPERATING MODES

5.5.1   RECEIVE

Carrier Detect and Squelch Operation

The DTXM is a transceiver; i.e. it can receive and transmit, although not at the same time. A carrier detect system exists within the unit to detect the presence of a carrier which controls the logic state of the DCD (data carrier detect) output. The RF levels at which this output changes state are programmable. In addition, the unit may be programmed such that the audio outputs, AUDIO OUT and AUX OUT, are muted (squelched) in conjunction with DCD operation. In units where squelch operation has been enabled, the RX MON input can be used to override a squelched condition. The DCD output is not affected by the RX MON operation.

Receiver Audio Outputs

Two receiver audio outputs are present on the DTXM module. The AUX OUT is a general purpose output which can have pre-emphasis enabled or bypassed. Its gain can be controlled and its output is designed to drive 1000 ohm or higher loads. The coupling from the discriminator on the RF board may be set to AC or DC by the programmer. DC coupling allows for internal bandwidth to extend to DC, but if a high gain value is chosen for the AUX OUT, clipping may occur on the waveform due to discriminator voltage offsets. AC coupling removes this issue. The output stage is AC coupled, but can be modified for DC coupling. This requires replacing a coupling capacitor with a zero-ohm resistor. Contact Ritron for details on this modification. The AUDIO OUT is always de-emphasized, but its gain can be programmed. This output can drive 8-ohm speaker-type loads. In the programmer menu, there is provision to set both the AUX OUT levels and the AUDIO OUT levels. However, the AUDIO OUT level is dependent upon the AUX OUT level. Therefore, the AUX OUT level should be set before setting the AUDIO OUT level.

5.5.2   TRANSMIT

PTT Operation

The transmitter is activated by placing the PTT/RTS (Push-To-Talk/Request-To-Send) input in its asserted state. This state is programmable. If the unit is to operate in simplex (transmitter and receiver on the same frequency), one should check for activity on the channel before transmitting. This can be done by checking the state of the DCD output. In addition, the unit can be programmed so that transmit operation is inhibited if the DCD threshold has been exceeded (busy channel lockout option).

CTS Output

The CTS (Clear To Send) output goes to its active state when the unit has powered up the transmitter, it is locked on the correct transmit frequency, and it is ready to accept modulation. This output may be used to signal a modem to start transmitting data. If this output is not used, to avoid losing data, a delay of at least 12 ms is required between PTT/RTS activation and the application of data.

Transmitter Audio Input

The choice of the input source is made via the programmer. The selected signal can be set for a pre-emphasized or flat audio response and the gain can also be set. The Flat signal input can achieve 60% rated modulation with about 25 mv rms input signal, or the Pre-emphasized signal can achieve the same modulation with 0.5 - 4.0 mv rms in the depending on the TX Gain setting.

High/Low Power

High and low power levels can be programmed into the unit on a channel by channel basis. High power is selected by placing the CSN input at a logic high state. Placing the CSN input at a logic low state chooses low power. The CSN input has an internal pull-up resistor; it will assume the high state and the module will be set for high power when left unconnected.

Specialized Modem Operation

Modems designed to achieve the highest data rates possible in a radio channel may require a direct DC connection to the modulation path and the removal of the limiter-filter. In order to receive FCC Certification, the DTX module must either be tested and approved with a specific modem connected to the transmitter, or a modulation limiter and limiter-filter must always be present in the transmit modulator audio path with the modulation inputs AC coupled. To allow for the most flexibility for the end user, the unit was certified as a stand-alone unit. It is possible, with hardware modifications and special programming software (not supplied with the unit), to DC couple the AUX IN input and/or defeat the limiter-filter. The modulation limiter would still be in place, but the deviation of the DTX module could be set such that the modulation limit within the DTX module is never reached. The deviation would be set by the modem level and the AUX IN gain setting. The end user/system integrator would then bear the responsibility of obtaining certification or operating in a frequency band where certification is not required. Contact RITRON for details. **Note: Most modems will connect directly to the DTX without requiring any special modifications or programming.**

Antenna Placement

The DTXM module is enclosed in a metal housing for RF shielding. However, RF emitting sources located very close (less than 12 inches) to the unit can at times affect its operation. It is not recommended that an antenna be connected directly to the module's BNC connector unless the RF output power is set for less than 5 watts or the module is placed within another RF-tight enclosure.

6   PROGRAMMING

To program DTXM Module, the RITRON PC Programming Kit, DTXM-PCPK-1-M-FIPS, must be used.

6.1   PC PROGRAMMING KIT

The user should install the programming software on the host computer. The RITRON adapter cables connect the radio to a computer's serial communications port. Once the cables are hooked up, the user runs the programmer software. This program transfers data between radio and computer memory.

6.1.1   PROGRAMMING KIT CONTENTS AND REQUIREMENTS

The Programming Kit for DTXM Plus radios (via compatible computer) is model DTXM-PCPK-1-M-FIPS. It includes:

1) Programming Software, DTXM-PCPS-1-M-FIPS.

2) DB-9 to DB-15 connector cable with power cable.

3) 9-Pin to USB Adapter, 2147C002.

The Programmer Kit requires a PC compatible computer with Windows 95 or later operating system installed. The computer must have a USB port available.

6.2   LOADING THE PROGRAMMER SOFTWARE

Insert the Software disc which contains the programmer in the CD/DVD/CD ROM drive of the host computer. The program should load automatically. If not, view the contents of the CD ROM and double click on the install.exe file. Follow the instructions as they appear on the screen. At the conclusion of the installation procedure, the programming software will be resident on the user's host computer.

6.3   COMPUTER SOFTWARE COPYRIGHTS

The RITRON, Inc. products described in this manual include copyrighted RITRON, Inc. computer programs. Laws in the United States and other countries grant to RITRON, Inc. certain exclusive rights in its copyrighted computer programs, including the exclusive right to distribute copies of the programs, make reproductions of the programs, and prepare derivative works based on the programs. Accordingly, any computer programs contained in RITRON, Inc. products may not be copied or reproduced in any manner without the express written permission of RITRON, Inc. The purchase of RITRON, Inc. products does not grant any license or rights under the copyrights or other intellectual property of RITRON, Inc. except for the non-exclusive, royalty fee license to use that arises in the sale of a product, or as addressed in a written agreement between RITRON, Inc. and the purchaser of RITRON, Inc. products.

6.4   USING THE PROGRAMMING SOFTWARE
Note: Power up the radio and connect it, via the programming cable, to the host computer before opening the programmer.

Upon starting the programming software, a screen will appear with two buttons at the upper right, Program Radio and Programmer Configuration. Program radio reads the configuration of the radio and moves the user to the program radio menus which are described below. Programmer configuration is used to select the appropriate serial port and password (if desired).

Note: Changes made to the radio via the programmer will be accepted by the radio, but will not be permanent i.e. if the radio is powered down, the changes will be lost. The pages of the radio menu will have a button, Update Radio, which will make changes permanent.

6.5   PROGRAMMER MENUS

The DTXM Programmer has seven menus or pages, selectable via tabs at the top of each page, which are always visible. These pages are:

1. Frequency-Used to program the channel frequencies and operating mode of the radio.

2. General-Used to set programmable features/functions of the radio.

3. NXDN-Used to program the NXDN Digital features/functions of the radio.

4. Encryption-Used to program the Key Data of the Encryption feature of the radio.

5. Audio-Used to program the TX and RX Audio features/functions of the radio.

6. Alignment-Used to align and set the radio's RF functions in the radio.

7. Summary-Used to summarize on one page the model, firmware, and Serial Number information.

The programmer also has radio buttons on the top right of each page. These are:

Receiving-This button is the software equivalent to the hardware PTT input. Clicking on this button forces the radio into transmit mode where the button will change to Transmitting. Clicking it again will put the radio back into Receive.

Monitor-This button is the software equivalent to the hardware RX MON input. Clicking on this button will override any squelch operation.

Update Radio-This button is used to update the radio with all of the changes that have been made via the programmer. Although the radio accepts changes as they are made via the programmer, the changes are volatile i.e. they are lost when the radio is powered off. Clicking on this button makes the changes non-volatile so that they are saved and stored permanently unless changed via the programmer.

Read Radio-Forces the programmer to do a read of the radio to update the programmer screens with the current state of the radio. This allows a radio to be connected to the programmer and powered up without closing and then reopening the programmer.

6.5.1 FREQUENCY SELECTION

The Frequency page has fields for transmit and receive frequencies of each channel, and for the selection of the operating mode of NXDN Super Narrow, NXDN Narrow, and Analog. Channel information can be entered by clicking on the appropriate box and entering the desired frequency. The frequency chosen must be within the operating range of the radio and on a frequency for which the synthesizer is capable of channeling i.e. for VHF, divisible by 2.5 kHz and for UHF, divisible by 5 or 6.25 kHz.

6.5.2 GENERAL

The General page allows for programming various parameters of the radio. These are detailed below:

Customer ID – Allows the user to store up to 35 ASCI characters to identify the individual unit.

Test Pin Input Logic Level(PTT)- Sets the polarity of the PTT input. Normally set for active low i.e. transmitter is activated when this input is at the logic low state. **Due to the internal pull-up resistor, setting this to active high will cause activation of the transmitter when the PTT/RTS input is left unconnected.** The factory default is active low.

TX Timeout Timer- Allows for limits on the maximum time the transmitter may be continuously keyed. When set, the maximum limit is set in the box. To prevent overheating and possible damage to the unit, this is normally set on with a time of 60 seconds of less. See section 5.4 for limits on maximum key-down times. The factory default is 60 seconds.

TX High Power- Sets the maximum limit of the High Power setting (5-30 Watts).

Channel/TX High Power/ TX BCL- Sets the High Power value on a per-channel basis and allows the user to Enable/Disable the TX BCL(Busy Channel Lockout) feature.
Busy Channel Lockout- Prevents the transmitter from activating when the carrier detect output is true. Used to prevent interference on a channel where activity already exists. Not normally enabled in half duplex operation since transmit and receive channels are not on the same frequency. Factory default is for this function to be off.

Green LED- Sets the operation of the green LED on the front of the radio. The choices are:

Off-The green LED is never on.

Power ON-The green LED is on whenever the radio is powered up.'

Carrier Detect-The green LED is on whenever a carrier is detected that is above the programmed carrier detect on threshold.

RX Synthesizer Lock-The green LED is on whenever the frequency synthesizer is locked while in receive mode. This is the factory default setting.

RX Data- The LED will turn on when a valid data stream has been received.

Red LED- Sets the operation of the red LED on the front of the radio. The choices are:

Off-The red LED is never on.

RX-The red LED is on whenever the radio is actually transmitting. This is the factory default setting.

Comm Port Baud Rate- Sets the communication Baud Rate between the computer and the radio.

38400, 19200, 9600, 4800, 2400 bps.

6.5.3 NXDN

The NXDN page programs the settings for NXDN operation for each individual channel.

RX RAN- Sets the value of the RAN Code (0-63) for the receiver.

RX Group ID- Sets the value of the received Group ID(1-65,519).

Squelch Type- Sets the unmute condition of the receiver.

> Off- The radio will unmute when it has received a digital signal on the programmed frequency.

> RAN- The radio will unmute when it has received a digital signal on the programmed frequency + programmed RX RAN Code.

> ID- The radio will unmute when it has received a digital signal on the programmed frequency + programmed RX Group ID.

> RAN + ID- The radio will unmute when it has received a digital signal on the programmed frequency + programmed RX RAN Code + programmed RX Group ID.

> TX RAN- Sets the value of the transmitted RAN Code(0-63).

> Destination ID- Sets the value of the ID to a specific destination. It can be left blank, set to 0-65,519, or set to 65,535 AllCall.

Call Type- Sets the transmitter to a specific Call Type.

> Off- No specific destination has been selected.

> Individual- Sets the radio to transmit to a specific destination as set by the Destination ID.

> Group- Sets the radio to transmit to a group of users as set by the Destination ID.

Encryption Key- Sets the Encryption Key Number for when the Encryption feature is enabled. Can be set to No Key or a value from 1-64.

6.5.4 ENCRYPTION

The Encryption page programs the encrypted 256-bit Key Data for a given Key Number. Click on a Key Number in the table, and enter the information on the right side of the page.

Key Number- Identifies specific programmed Encrypted Key(1-64).

Key Status- Indicates if specific Key Number is available for use. Set for Active or Inactive.

Key Tag- Numerical label(0-4,294,967,295) for the associated Key Number.

Key Data- 256-bit Encrypted number. Each numerical character ranges from 0-F.

Enter the Key Data- Click to open window to enter the 4X16 Key Data Number for the selected Key Number.

Zero the Key Data- Click to clear the Key Data for the selected Key Number.

6.5.5 AUDIO

The Audio page programs all settings associated with the Receiver and Transmitter Audio and their levels.

Analog Mode TX Pre-emphasis- Allows for the signal path from AUDIO IN/MIC IN input to be either pre-emphasized or flat. Most applications where the AUX IN input is used work best with a flat response. Factory default is Flat response.

Analog Mode RX De-emphasis- Allows for the signal path from the discriminator to the AUDIO OUT and SPEAKER output to be either de-emphasized or flat. Most applications where the AUDIO OUT output is used work best with a flat response. Factory default is for flat response.

Audio Out for Aux & PA(RX) Gain- Receiver Audio Gain adjustment for the high impedance AUDIO OUT and the low impedance SPEAKER output.

NXDN (TX)-

      Disable Mic Pre-Amp- When checked(disabled), TX Audio Gain is reduced by 11dB.

      Mic Pre-Amp Gain(0-255)- Adds up to 11dB to the TX Audio input.

      Vocoder Gain- Additional 22dB of gain for the TX Audio level.

Analog (TX)-

      Disable Mic Pre-Amp- When checked(disabled), TX Audio Gain is reduced by 11dB.

      Mic Pre-Amp Gain(0-255)- Adds up to 11dB to the TX Audio input.

      Amp Gain- Additional 22dB of gain for the TX Audio level.

CD Output Logic Level- Allows the setting of the polarity of the CD (Carrier Detect) output. Active high means that the true state is a logic high while active low means that the true state is logic low. Normal setting is active high. The factory default is active high.

Squelch Enable- Allows receive audio paths to be muted when the carrier detect output is false. It is used to prevent the output of noise from the audio outputs when no signal is present.

      On- The radio audio output ports AUDIO OUT and SPEAKER are muted until a signal stronger than the value set for Carrier Detect On is received. Once unmuted, the radio will mute once the signal level drops below the value set for Carrier Detect Off.

      Never Mute- The radio audio output ports AUDIO OUT and SPEAKER are never muted when the radio is in the receive mode.

6.5.6 ALIGNMENT

The Alignment page programs the frequency, power, and modulation adjustments.

Deviation & Balance

TX Freq Trim- Adjusts the transmitter center frequency error.

RX Gain- Adjusts the Receiver Discriminator output level.

RX Freq Trim- Adjusts the receiver L.O. center frequency error.
      F(LO)(MHz)=Fo(MHZ) -43.65 MHz

RX Offset- Adjusts the Receiver Discriminator DC voltage level offset. Should be set to 1.6 VDC.

Auto Alignment-Upper Band Edge Deviation- Adjusts the maximum modulation deviation level for 470 MHz.

Balance- Adjusts the input audio waveform for proper shape at 470 MHz.

Auto Alignment-Lower Band Edge Deviation- Adjusts the maximum modulation deviation level for 450 MHz.

Balance- Adjusts the input audio waveform for proper shape at 450 MHz.

Alignment Patterns- Select the modulation pattern to set balance and deviation.

      Analog Protocol- Allows the audio signal input at AUDIO IN/MIC IN to be modulated.

      NXDN Protocol- Internally random generated NXDN data stream.

      500 Hz Square Wave (Balance setup)- Internally generated 500 Hz square wave for proper balance alignment.

      NXDN 1031 Sine Wave- Internally generated NXDN data stream representing a 1031 Hz sine wave.

      600 Hz Sine Wave- Internally generated 600 Hz Sine Wave for proper NXDN Narrowband and Super Narrowband deviation adjustment.

      TX Carrier only(Trim setup)- When transmitter is activated, no modulation is present to properly set the TX Freq Trim.

Channel/Deviation Matrix- The radio has been factory aligned for proper operation across the entire frequency band of operation and should not need any re-alignment. If an adjustment is required on a specific channel, adjustments can be made on a per-channel basis.

Power Table

The radio has been factory aligned for proper operation across the entire frequency band of operation and should not need any re-alignment. If an adjustment is required on a specific channel, adjustments can be made on a per-channel basis. When adding or removing frequencies and power levels, carefully follow the instructions as outlined in the center of the page.

Frequency- Select the desired test frequency.

Power Level- Select the desired test power level.

Carrier Detect Calibration

The radio has been factory aligned for proper squelch operation and should not need any re-alignment. If an adjustment is required, carefully follow the instructions as outlined in the center of the page.

Receive Frequency- Test Frequency for the calibration.

Carrier Detect High(-80dBm)- High signal level test point.

Carrier Detect Low(-110dBm)- Low signal level test point.

6.5.7 SUMMARY

The summary page summarizes the information about the radio.

Model- Ritron Model Number of the radio.

Firmware Version- Firmware loaded into the radio.

Manufacture Date(Wk/Yr)- Date at which the radio completed te QC Test process,

Customer ID- User Programmed ID, up to 35 characters.

Serial Number- Serial Number found on FCC/ICC label.

Last Date(Mo/Day/Yr)- Date when radio information was last changed.

FCC ID- Radio Model FCC ID.

IC ID- Radio Model IC ID.

II   MAINTENANCE

7   IMPORTANT MAINTENANCE INFORMATION

Surface Mount Repair: RITRON surface mount products require special equipment and servicing techniques. Improper servicing techniques can cause permanent damage to the printed circuit board and/or components, which is not covered by RITRON's warranty. If you are not completely familiar with surface mount component repair techniques, RITRON recommends that you defer maintenance to qualified service personnel.

Precautions For Handling CMOS Devices: The DTXM transceiver module contains complementary metal-oxide semiconductor (CMOS) devices, which require special handling techniques. CMOS circuits are susceptible to damage by electrostatic or high voltage charges. Damage can be latent, with no failure appearing until weeks or months later. For this reason, take special precautions any time you disassemble the module. Follow the precautions below, which are even more critical in low humidity environments.

1) Storage/transport-CMOS devices that will be stored or transported must be placed in conductive material so that all exposed leads are shorted together. CMOS devices must not be inserted into conventional plastic "snow" or plastic trays of the type that are being used for other semiconductors. Conductive containers are typically gray or pink in color.

2) Grounding-All CMOS devices must be placed on a grounded bench surface. The technician that will work on the radio/CMOS circuit must be grounded before handling the radio. Normally, the technician wears a conductive wrist strap in series with a 100 kΩ resistor to ground.

3) Clothing-Do not wear nylon clothing while handling CMOS circuits.

4) Power Off-Remove power before connecting, removing, or soldering on a PC board that contains CMOS devices.

5) Power/Voltage Transients-Do not insert or remove CMOS devices with power applied. Check all power supplies to be used for testing CMOS devices, making sure that no voltage transients are present.

6) Soldering-Use a soldering iron with a grounded tip for soldering CMOS circuitry.

7) Lead-Straightening Tools-When straightening CMOS leads, provide ground straps for the tool used.

VCO Shield: The VCO shield is virtually impossible to remove without damaging either the PC board or nearby components. The parts within the shield are low failure items; repair or replacement should not be required unless the RF board is mishandled. If failure of a part within the shield is deemed to have occurred, the RF board should be returned to RITRON for service or replacement.

Unit Disassembly and Re-assembly:
1) Case Removal

  a) Remove the two screws at the rear of the unit. These screws secure the rear bracket to the case. Removal of these screws requires a TORX T-10 driver.

  b) Remove the three side screws (one on one side, two on the other). These screws secure the front bracket to the case.   Removal of these screws requires a TORX T-9 driver.

  c) Slide the case off the two-board assembly.

2) Board Separation

Remove the two screws that secure the control/loader board to the rear bracket. The rear bracket stays connected to the RF board. Remove the two screws that secure the RF board to the front bracket. The front bracket stays connected to the control/loader board. These four screws are removed with a TORX T-9 driver. The two boards are held together by their interconnecting header/socket. Gently pry the two boards apart at the header/socket. The RF board is then rotated and tilted so to allow the right angle BNC connector to pass through the hole in the front bracket.

3) Re-assembly is the reverse of assembly with the rear screws installed before the side screws.

8 HARDWARE OPTIONS

The DTXM is setup at the factory in a configuration that should be acceptable for most users. The most common changes required are effected through the programmer without removing the cover from the unit. There are, however, a number of component jumper changes which can be made which may result in more satisfactory integration in a data system. These changes require the soldering and unsoldering of SMD components and should be undertaken only by qualified service personnel. Refer to the PCB component locator and schematic diagrams as needed.

8.1 CONTROL/LOADER BOARD OPTIONS

8.1.1 AUX OUT COUPLING

The AUX OUT output is normally AC coupled through C399. If DC coupling is desired, an 0805 size SMD zero ohm jumper resistor (RITRON P/N 47100000) must be soldered in the location of MR384. (In lieu of a zero ohm jumper, a small piece of wire may be carefully soldered between the pads.) The AUX OUT DC level then becomes nominally 1.67 volts.

8.1.2 AUX IN COUPLING

The AUX IN input is normally AC coupled through C343. DC coupling is possible, however, the carrier frequency of the unit would then become directly affected by the DC voltage present. If DC coupling is desired, an 0805 size SMD zero ohm jumper resistor (RITRON P/N 47100000) must be soldered in the MR369 location. The DC voltage should be 2.5 volts nominal and very well regulated. **Note: The FCC Type Acceptance obtained by RITRON is invalid once this modification is made. The user is responsible for obtaining type acceptance in a configuration which includes the device which is connected to the AUX IN input.**

8.2 RF BOARD OPTIONS

8.2.1 DISCRIMINATOR POLARITY

The polarity of the discriminator output at pin 14 of J102 is configured at the factory such that an increase in RF frequency causes an increase in DC voltage. This is considered "normal" mode. An inverted mode is available where an increase in frequency causes a decrease in voltage. This is effected by removing R130 and placing it in the open pad pair denoted as MR125.