TYPE OF EXHIBIT: OPERATIONAL DESCRIPTION

FCC PART: 2.983 (d) (1,2,3,4,5,6,10,11)

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

MODEL: DTX-454

TYPE OF UNIT: UHF-FM Transceiver

FCC ID: AIERIT11-450

DATE: February 2, 1999

This exhibit includes a description of the DTX-454 along with some of the items required by FCC part 2.983 (d). The items of part 2.983 (d) not included here exist as separate exhibits which are a part of this type acceptance application.

The DTX-454 is a UHF two-way radio designed for either voice or data transmission. The deviation can be adjusted so that operation on either 12.5 kHz or 25 kHz channels is possible. The maximum power output can be either 6 watts or 10 watts, depending upon model. The device is designed for an external power supply, whose voltage can be either 7.5 VDC or range from 11 to 15 VDC depending upon model. A more detailed description of the device, including specifications, theory of operation, and input/output definition can be found in the user/maintenance manual, which is a separate exhibit.

TYPE OF EXHIBIT: TYPES OF EMISSION
FREQUENCY RANGE
OPERATING POWER VALUES
MAXIMUM POWER RATING

FCC PART: 2.983 (d) (1, 2, 3, 4)

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

MODEL: DTX-454

TYPE OF UNIT: UHF-FM Transceiver

FCC ID: AIERIT11-450

DATE: February 2, 1999

EMISSION TYPES:

12.5 kHz Channel Spacing

11K0F3E

11K0F1D

25 kHz Channel Spacing

16K0F3E

FREQUENCY RANGE

450 to 470 MHz

OPERATING POWER VALUES

6 watt version: 1 to 6 watts

10 watt version: 1 to 10 watts

Power is controlled by adjusting the bias voltage on the PA stage of the RF power module. This voltage typically varies between 1.5 and 3 volts. Typical values are shown in the DC voltage chart which follows.

MAXIMUM POWER RATING

6 watt version: 6 watts

10 watt version: 10 watts

TYPE OF TEST: DC VOLTAGE CHART
6 Watt Maximum Output Power Version

FCC PART: 2.983 (d) (5)

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

MODEL: DTX-454

TYPE OF UNIT: UHF-FM Transceiver

FCC ID: AIERIT11-450

DATE: January 28, 1999

TEST RESULTS:

Nominal Power Supply Voltage = 7.5 VDC

Frequency (MHz)	Output Power (W)	Final Stage Voltage (VDC)	Final Stage Current (IDC)	Control Voltage (VDC)
450.0125	1.0	7.4	0.78	1.46
	2.0	7.3	1.13	1.71
	3.0	7.3	1.44	2.00
	4.0	7.3	1.72	2.30
	5.0	7.2	1.99	2.63
	6.0	7.2	2.28	3.01
461.7500	1.0	7.4	0.73	1.35
	2.0	7.3	1.06	1.63
	3.0	7.3	1.35	1.90
	4.0	7.3	1.62	2.20
	5.0	7.2	1.86	2.52
	6.0	7.2	2.15	3.03
469.9875	1.0	7.4	0.72	1.33
	2.0	7.3	1.03	1.60
	3.0	7.3	1.29	1.87
	4.0	7.3	1.56	2.21
	5.0	7.2	1.86	2.68
	6.0	7.2	2.14	3.25

TYPE OF TEST: DC VOLTAGE CHART
10 Watt Maximum Output Power Version

FCC PART: 2.983 (d) (5)

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

MODEL: DTX-454

TYPE OF UNIT: UHF-FM Transceiver

FCC ID: AIERIT11-450

DATE: January 28, 1999

TEST RESULTS:

Nominal Supply Voltage = 13.7 VDC

Frequency (MHz)	Output Power (W)	Final Stage Voltage (VDC)	Final Stage Current (IDC)	Control Voltage (VDC)
450.0125	1.0	13.6	0.59	1.64
	2.0	13.6	0.85	1.90
	3.0	13.6	1.06	2.11
	4.0	13.5	1.19	2.25
	5.0	13.5	1.35	2.40
	6.0	13.5	1.53	2.60
	7.0	13.4	1.73	2.77
	8.0	13.4	1.88	2.93
	9.0	13.4	2.05	3.16
	10.0	13.4	2.16	3.38
461.7500	1	13.6	0.51	1.39
	2.0	13.6	0.72	1.61
	3.0	13.6	0.91	1.80
	4.0	13.5	1.10	1.97
	5.0	13.5	1.26	2.23
	6.0	13.5	1.47	2.49
	7.0	13.4	1.69	2.72
	8.0	13.4	1.82	2.95
	9.0	13.4	2.04	3.30
	10.0	13.4	2.20	3.45

Note: Results at 469.9875 MHz shown on following page.

TYPE OF TEST: DC VOLTAGE CHART
10 Watt Maximum Output Power Version

FCC PART: 2.983 (d) (5)

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

MODEL: DTX-454

TYPE OF UNIT: UHF-FM Transceiver

FCC ID: AIERIT11-450

DATE: January 28, 1999

TEST RESULTS:

Nominal Supply Voltage = 13.7 VDC

Frequency (MHz)	Output Power (W)	Final Stage Voltage (VDC)	Final Stage Current (IDC)	Control Voltage (VDC)
469.9875	1	13.6	0.54	1.38
	2.0	13.6	0.74	1.64
	3.0	13.6	0.94	1.86
	4.0	13.5	1.09	2.02
	5.0	13.5	1.25	2.22
	6.0	13.5	1.43	2.44
	7.0	13.4	1.55	2.63
	8.0	13.4	1.73	2.79
	9.0	13.4	1.91	2.97
	10.0	13.4	2.06	3.30

TYPE OF EXHIBIT:	CIRCUIT DESCRIPTION: SPURIOUS RADIATON SUPPRESSION MODULATION LIMITING POWER LIMITING
FCC PART:	2.983 (d) (11)
MANUFACTURER:	RITRON, INC. 505 West Carmel Drive Carmel, IN 46032
MODEL:	DTX-454
TYPE OF UNIT:	UHF-FM Transceiver
FCC ID:	AIERIT11-450
DATE:	February 2, 1999

SPURIOUS RADIATION SUPPRESION CIRCUITRY

Occupied Bandwidth

The occupied bandwidth of the transmitted signal is controlled by a combination of modulation limiter (described below) and clipper filter. The limiter is followed by a five pole active filter formed around IC310B and IC310C. This filter is of quasi-raised cosine design and removes high frequency audio components either from the input signal or from the limiting process itself.

Transmitter Spurious

The voltage controlled oscillator in the unit operates at the carrier frequency, thus no sub-harmonics of the carrier exist. The type of synthesizer used (fractional-N) along with a well designed synthesizer loop filter ensure that synthesizer reference spurs are well suppressed.

The harmonics of the transmitter carrier are attenuated by an Elliptic RF lowpass filter formed around a buried stripline on the RF board and capacitors C164, C165, C166, and C168.

MODULATION LIMITING CIRCUITRY

The transmitter modulation is limited by passing the audio signal to be transmitted through an amplitude limiter based around operational amplifier, IC310A, on the loader board. This device is allowed to be driven to its output voltage limits which provides a very stable and repeatable clamp on its output signal amplitude.

POWER LIMITING CIRCUITRY

The output power is limited and controlled by setting the voltage on the Vgg pin of the RF PA module. This pin sets the bias voltage of the driver stage internal to the module. The upper voltage limit of this pin is limited to 3.6 volts by the 5 volt limit of the power control logic IC and the voltage divider which follows. When operated at the specified supply voltage, the unit is not capable of exceeding the rated output power limit.

TYPE OF EXHIBIT:	CIRCUIT DESCRIPTION: FREQUENCY DETERMINING AND STABILIZING
FCC PART:	2.983 (d) (10)
MANUFACTURER:	RITRON, INC. 505 West Carmel Drive Carmel, IN 46032
MODEL:	DTX-454
TYPE OF UNIT:	UHF-FM Transceiver
FCC ID:	AIERIT11-450
DATE:	February 2, 1999

The frequency stability of the unit is solely determined by the frequency stability of the master reference oscillator, Y101, located on the RF board. Y101 is a voltage controlled temperature compensated crystal oscillator. Temperature compensating circuitry internal to this device ensures that with constant frequency control voltage, the frequency will remain within guaranteed tolerances over the required temperature range. Since the frequency can also be controlled by the voltage on the frequency control pin, the voltage to this pin is from a precision voltage regulator, IC314 on the loader board.

TYPE OF EXHIBIT: SEMICONDUCTOR FUNCTION LIST

FCC PART: 2.983 (d) (6)

MANUFACTURER: RITRON, INC.
505 West Carmel Drive
Carmel, IN 46032

MODEL: DTX-454

TYPE OF UNIT: UHF-FM Transceiver

FCC ID: AIERIT11-450

DATE: February 2, 1999

RF Board

Ref. Des.	Device	Function
Q101	MMBR941	Receiver front-end RF amplifier.
Q102	MMBTH10	Receiver IF amplifier.
Q103	UMZ1	Receiver squelch.
Q104	MMBR951	Transmitter PA driver amplifier.
Q105	MMBR941	Transmitter PA pre-driver amplifier.
Q106	MMBR941	VCO 2nd buffer amplifier.
Q107	MMBR941	VCO 1st buffer amplifier.
Q108	MMBR941	VCO oscillator.
Q109	MUN2211	NPN switching transistor for VCO T/R frequency shift.
Q110	MUN2114	PNP switching transistor for VCO T/R frequency shift.
Q111	MMBT5088	VCO power supply filter pass transistor.
Q112	MMBTH10	Reference oscillator multiplier.
Q113	MMBT3906	Transmitter PA driver stage PNP switching transistor.
Q114	MUN2211	Transmitter PA driver stage NPN switching transistor.
Q115	MUN2114	Transmitter enable PNP switching transistor.
Q116	MUN2114	Synthesizer lock detect transistor.
IC101	MC13143	Receiver 1st mixer.

IC102	MC3371	Receiver FM IF IC.
IC103	LM2904	Op-amp for receiver discriminator buffer amplifier.
IC104	M68732H	Transmitter power amplifier module.
IC105	74HC14	Logic IC for sequencing/control.
IC106	LP2980AIM-5.0	Monolithic 5 volt regulator.
IC107	LP2980AIM-5.0	Monolithic 5 volt regulator.
IC108	LMX2352	Synthesizer IC.
Y101		Integrated reference oscillator.

Loader Board

Ref. Des.	Device	Function
Q301	BCP69	PNP switching transistor for audio PA.
Q302	MMBT5088	NPN switching transistor for audio PA.
Q303	MMBT3906	Microprocessor reset.
Q304	MUN2211	NPN microprocessor interface.
Q305	MUN2211	NPN microprocessor interface.
Q306	MUN2211	NPN microprocessor interface.
IC301	LM386	Audio PA.
IC302	MC68HC705P6	Microprocessor.
IC303	74HC4053	Analog switch for transmitter audio.
IC304	MC33204	Op-amp bias voltage generator.
IC305	74HC4053	Analog switch for receiver audio.
IC306	MC33204	Op-amp for receiver audio.
IC307	1806E-010	Digital potentiomenter.
IC308	MC33204	Op-amp for transmitter audio.
IC309	74HC4053	Analog switch for transmitter audio.
IC310	MC33204	Op-amp for transmitter audio.
IC311	X24C01	EEPROM memory.
IC312	74HC595	Microprocessor port expander.

IC313	74HC595	Microprocessor port expander.
IC314	LP2951	Precision 5 volt regulator.
IC315	LM2931	5 volt regulator.
IC316	LM350T	High current 7.5 volt regulator.