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**ComTrac Radio**

**User Manual**

**Document Control No: 1964C.031-UM-01 Rev. 01**

**Date: 23 August 2012**

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## REVISION HISTORY

Date	Rev.	Description	Author
23 August 2012	01	Initial DRAFT of the User's Guide	Thomas Borsodi

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## 1 COMTRAC RADIO MOBILE RADIO (MR) QUICK INSTALLATION GUIDE

This Quick Installation Guide is intended for experienced installers and network administrators. All others should refer to the relevant sections in the ComTrac Radio Installation Guide

The ComTrac Radio MR unit is a wireless LAN device configured as a mobile station.

1. Choose the best location to place the ComTrac Radio. Use the following guidelines:
  - As high as possible, clearing partitions and tall fixtures.
  - Away from metallic objects, heat and radiation sources.
2. Connect the DC power supply to an appropriate VDC power outlet. Connect the power output jack of the power supply to the 12 VDC input socket on the back panel of the unit. Verify that the STATUS LED on the front panel is turned ON and is green after the unit boots up, indicating that the unit is okay.
3. Using an appropriate length and type Ethernet LAN cable, connect the Ethernet port connection to the A Side Ethernet Port A-1 on the back panel of the ComTrac Radio unit. Repeat this process for other B-Side or A-Side Ethernet port connections to be connected to the ComTrac Radio unit.
4. Use the LEDs on the Ethernet connectors on the back panel to check unit functionality. One LED underneath each of the Ethernet ports (both B-Side and A-Side) should be ON and green when an Ethernet connection is made to this port. This LED should be green and flashing whenever there is Ethernet activity (data traffic) on the Port.
5. The Mode LED on the front panel should blink at the rate of 1 flash per second when the unit is properly configured as an MR.
6. The Assoc LED on the front panel of the unit should be turned ON once the unit is associated with an Access Point.
7. Use the Wireless Signal Strength LED indicators on the front panel to estimate the quality of the signal received from the AP. 1 LED is ON: Low Quality, 2 LEDs ON: Medium Quality, 3 LEDs ON: High Quality, 4 LEDs ON: Best Quality.

### 1.1 System Configuration and Access Control

1. To enable management via SNMP or firmware upgrade to configure the **IP**.
2. The ComTrac Radio APs contain a network identifier, **ESS ID**, that will prevent unauthorized access to your **AP**. All stations (STAs) must be configured to the same ESS ID. The parameter also enables segmentation of the wireless network.
3. With units connected to external antennas, sometimes only a single antenna is used. When using a single antenna with the ComTrac Radio unit configured as an STA, connect the antenna to Antenna Connector #3. Do **NOT** change the default setting of **Transmit Diversity**.

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## 1.2 Accessing and using local terminal management

1. Use a Monitor (RS232 null modem) cable to connect the ADMIN-A port on the front panel of the unit to the COM port of your PC.
2. Set up communications parameters to the following:
  - Baud Rate: 115200
  - Data Bits: 8
  - Stop Bits: 1
  - Parity: None
  - Flow Control: None
  - Connector: As selected
3. Configuration and Control Interface (CCI) is displayed.
4. Select the Config menu
 

Select IP and SNMP Parameters Load values as determined by the system administrator

  - IP Address
  - Subnet Mask
  - Default Gateway Address

Select Wireless LAN Parameters:

  - ESSID: Up to 32 printable ASCII characters (Default is ESSID1)

Select System to Reset Unit:

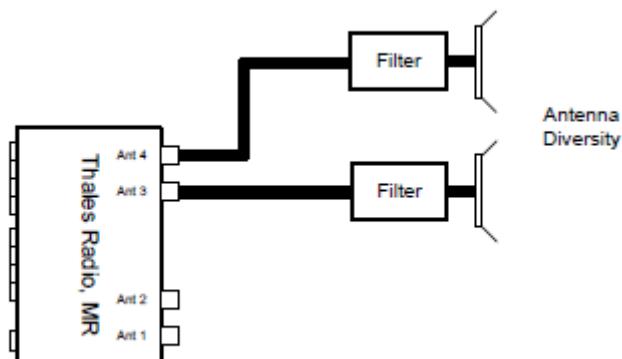
  - Restart Unit: 0 – Restart System, 1 – Cancel command.

**IMPORTANT**

*Do not forget to perform a unit Reset after making changes in the setup.*

## 1.3 Setting MR Output Power Level

The ComTrac Radio is a general purpose wireless transceiver to be used in computer based train control (CBTC) systems deployed by Thales Canada Inc. In an On-Board application, the ComTrac Radio configured as a mobile radio (MR) is deployed on a train, where it provides the train based half of the wireless link to connect the trains to the control network infrastructure. The system is powered through an external Direct Current (DC) power supply.



**Figure 1 Generic MR Connection Diagram.**

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Note: When installing the unit, the power level must be set in order to not exceed the maximum output power and EIRP requirements which are measured at the antenna output.

The maximum allowable transmitter output power limit is 1 Watt (30 dBm) and must be adjusted in order that the net power to the antenna terminal of the transmit antenna after cable, splitter, and filter losses does not exceed the following formula:

$$30 - (G + 10 \log N - 6) \text{ dBm}$$

where  $G$  is the gain of the antenna and  $N$  is the number of simultaneous transmitting antennas, for MR applications  $N = 1$ . After working through the equation above to obtain the maximum output power at the antenna and adding the physical losses due to the cable, splitter, and filter, one obtains the maximum output power that can be transmitted at the unit antenna terminal. Then one must then set the unit output power level through the Configuration and Control Interface accordingly. Note that this cannot exceed the maximum output power the unit can generate which is 30 dBm.

When setting the output power level in an MR application, the following steps must be employed.

1. First perform steps 1 through 3 in Section 2.2 to access the Configuration and Control Interface
2. Configuration and Control Interface (CCI) is displayed.
3. Select the Config menu

Select Power Level Parameters

Enter the appropriate output power level in dBm as determined by the equation above.

Select System to Reset Unit:

- Restart Unit: 0 – Restart System, 1 – Cancel command.

### **Electronic Emission Notices**

This device complies with Part 15 of the FCC rules, ETSI 300-328, and CE.

Operation of this device is subject to the following conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

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This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

1. l'appareil ne doit pas produire de brouillage, et
2. l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

#### **FCC Radio Frequency Interference Statement**

This equipment has been tested and found to comply within the limits for a Class DSS digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his/her own expense.

#### **FCC Information Statements**

Changes or modifications not expressly approved by Thales could void the user's authority to operate the equipment.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

The intended use of the ComTrac Radio is not for the general public. It is for industry/commercial use in Thales Computer Based Train Control (CBTC) systems and cannot be sold retail, to the general public or by mail order.

The ComTrac Radio requires professional installation, as the installed unit requires special programming (configuration is based on site specific parameters) during system deployment, and access must be limited (secure) due to safety requirements.

#### **FCC and IC RF Exposure Warning Statement**

The antennas used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and not be co-located with any other antenna or transmitters except as described in this manual.

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Les antennes utilisées pour cet émetteur doit être installé pour fournir une distance de séparation d'au moins 20 cm de toute personne et ne pas être co-localisées avec une autre antenne ou émetteur sauf tel que décrit dans ce manuel.

**Antennas Tested for This Filing (MR applications)**

Huber+Suhner Linear polarized directional WiFi-Antenna, 1324.17.0098, 8.5 dBi.

Huber+Suhner Linear polarized directional WiFi-Antenna, 1324.99.0025, 8.5 dBi.

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## 2 COMTRAC RADIO ACCESS POINT (AP) QUICK INSTALLATION GUIDE

This Quick Installation Guide is intended for experienced installers and network administrators. All others should refer to the relevant sections in the ComTrac Radio Installation Guide

The ComTrac Radio AP unit is a bridge that provides access for wireless mobile station into wired Ethernet LANs.

1. Choose the best location to place the ComTrac Radio. Use the following guidelines:
  - As high as possible, clearing partitions and tall fixtures.
  - Away from metallic objects, heat and radiation sources.
2. If necessary, attach the AP to the ceiling or a wall with a mounting bracket (in an appropriated rated enclosure).
3. Connect the DC power supply to an appropriate VDC power outlet. Connect the power output jack of the power supply to the 12 VDC input socket on the back panel of the unit. Verify that the STATUS LED on the front panel is turned ON and turns green after the unit boots up, indicating that the unit is okay.
4. Using an appropriate length and type Ethernet LAN cable, connect the Ethernet port connection to the A Side Ethernet Port A-1 on the back panel of the ComTrac Radio unit. Repeat this process for other B-Side or A-Side Ethernet port connections to be connected to the ComTrac Radio unit.
5. Use the LEDs on the Ethernet connectors on the back panel to check unit functionality. One LED underneath each of the Ethernet ports (both B-Side and A-Side) should be ON and green when an Ethernet connection is made to this port. This LED should be green and flashing whenever there is Ethernet activity (data traffic) on the Port.
6. The Mode LED on the front panel should blink at the rate of 2 flashes per second when the unit is properly configured as an AP.

Once wireless stations in the designated coverage area are present and activated, verify proper sensing of these stations by referring to the association LED.

### 2.1 System Configuration and Access Control

1. To enable management via SNMP or firmware upgrade to configure the **IP**.
2. The ComTrac Radio APs contain a network identifier, **ESS ID**, that will prevent unauthorized access to your **AP**. All stations (STAs) must be configured to the same ESS ID. The parameter also enables segmentation of the wireless network.
3. With units connected to external antennas, sometimes only a single antenna is used. When using a single antenna with the ComTrac Radio unit configured as an STA, connect the antenna to Antenna Connector #3. Do **NOT** change the default setting of **Transmit Diversity**.

### 2.2 Accessing and using local terminal management

1. Use a Monitor (RS232 null modem) cable to connect the ADMIN-A port on the front panel of the unit to the COM port of your PC.
2. Set up communications parameters to the following:

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- Baud Rate: 115200
- Data Bits: 8
- Stop Bits: 1
- Parity: None
- Flow Control: None
- Connector: As selected

3. Configuration and Control Interface (CCI) is displayed.

4. Select the Config menu

Select IP and SNMP Parameters Load values as determined by the system administrator

- IP Address
- Subnet Mask
- Default Gateway Address

Select Wireless LAN Parameters:

- ESSID: Up to 32 printable ASCII characters (Default is ESSID1)

Select System to Reset Unit:

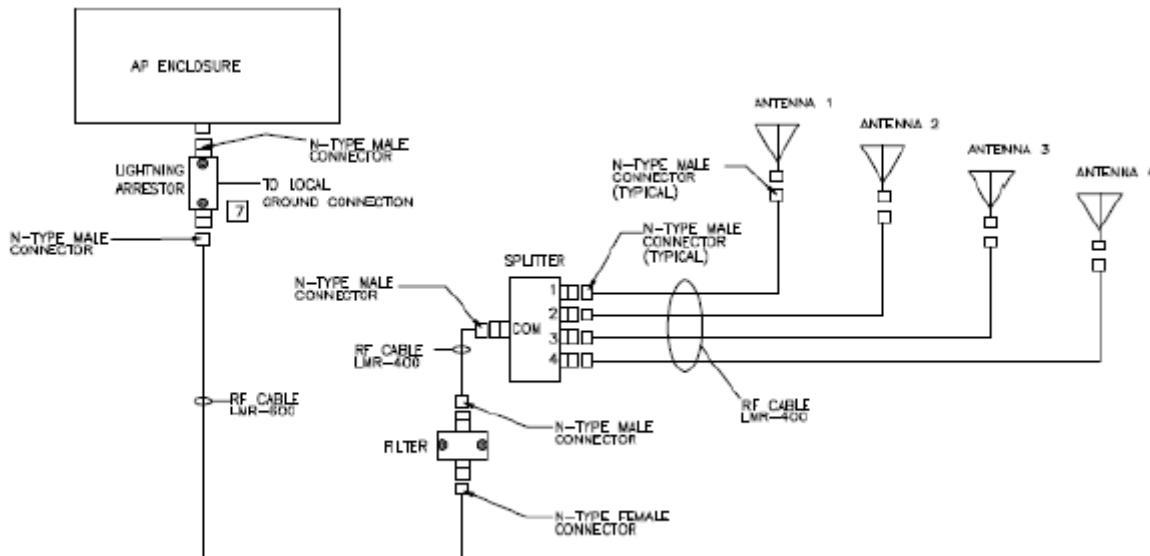
- Restart Unit: 0 – Restart System, 1 – Cancel command.

***IMPORTANT***

***Do not forget to perform a unit Reset after making changes in the setup.***

### 2.3 Setting AP Output Power Level

The ComTrac Radio is a general purpose wireless transceiver to be used in computer based train control (CBTC) systems deployed by Thales Canada Inc. In a Way-Side application, the ComTrac Radio configured as an Access Point (AP) is deployed on the trackside, where it provides the trackside half of the wireless link to connect the control network infrastructure to trains. The system is powered through an external Direct Current (DC) power supply.



**Figure 2: Generic AP Connection Diagram**

Note: When installing the unit, the power level must be set in order to not exceed the maximum output power and EIRP requirements which are measured at the antenna outputs.

The maximum allowable transmitter output power limit is 1 Watt (30 dBm) and must be adjusted in order that the net power to the antenna terminal of the transmit antenna after cable, splitter, and filter losses does not exceed the following formula:

$$30 - (G + 10 \log N - 6) \text{ dBm}$$

where  $G$  is the gain of the antenna and  $N$  is the number of antennas.

The maximum EIRP limit is 36 dBm. After working through the equation above to obtain the maximum output power at the antenna and adding the physical losses due to the cable, splitter, and filter, one obtains the maximum output power that can be transmitted at the unit antenna terminal. Then one must then set the unit output power level through the Configuration and Control Interface accordingly. Note that this cannot exceed the maximum output power the unit can generate which is 30 dBm.

When setting the output power level in an MR application, the following steps must be employed.

1. First perform steps 1 through 3 in Section 2.2 to access the Configuration and Control Interface
2. Configuration and Control Interface (CCI) is displayed.
3. Select the Config menu  
Select Power Level Parameters  
Enter the appropriate output power level in dBm as determined by the equation above.

Select System to Reset Unit:

- Restart Unit: 0 – Restart System, 1 – Cancel command.

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## Electronic Emission Notices

This device complies with Part 15 of the FCC rules, ETSI 300-328, and CE.

Operation of this device is subject to the following conditions:

1. This device may not cause harmful interference.
2. This device must accept any interference received, including interference that may cause undesired operation.

This device complies with Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions:

1. This device may not cause harmful interference, and
2. This device must accept any interference, including interference that may cause undesired operation of the device.

Le présent appareil est conforme aux CNR d'industrie Canada applicables aux appareils radio exempts de licence. L'exploitation est autorisée aux deux conditions suivantes:

1. l'appareil ne doit pas produire de brouillage, et
2. l'utilisateur de l'appareil doit accepter tout brouillage radioélectrique subi, même si le brouillage est susceptible d'en compromettre le fonctionnement.

This Class A digital apparatus complies with Canadian ICES-003.

Cet appareil numérique de la classe A est conforme à la norme NMB-003 du Canada.

## FCC Radio Frequency Interference Statement

This equipment has been tested and found to comply within the limits for a Class DSS digital device, pursuant to Part 15 of the FCC rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and, if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his/her own expense.

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## FCC Information Statements

Changes or modifications not expressly approved by Thales could void the user's authority to operate the equipment.

Note: This equipment has been tested and found to comply with the limits for a Class A digital device, pursuant to part 15 of the FCC Rules. These limits are designed to provide reasonable protection against harmful interference when the equipment is operated in a commercial environment. This equipment generates, uses, and can radiate radio frequency energy and if not installed and used in accordance with the instruction manual, may cause harmful interference to radio communications. Operation of this equipment in a residential area is likely to cause harmful interference in which case the user will be required to correct the interference at his own expense.

The intended use of the ComTrac Radio is not for the general public. It is for industry/commercial use in Thales Computer Based Train Control (CBTC) systems and cannot be sold retail, to the general public or by mail order.

The ComTrac Radio requires professional installation, as the installed unit requires special programming (configuration is based on site specific parameters) during system deployment, and access must be limited (secure) due to safety requirements.

## FCC and IC RF Exposure Warning Statement

The antennas used for this transmitter must be installed to provide a separation distance of at least 20 cm from all persons and not be co-located with any other antenna or transmitters except as described in this manual.

Les antennes utilisées pour cet émetteur doit être installé pour fournir une distance de séparation d'au moins 20 cm de toute personne et ne pas être co-localisées avec une autre antenne ou émetteur sauf tel que décrit dans ce manuel.

## Antennas Tested for This Filing (AP applications)

Andrew Flat Planar Array Microceptor Antenna, QD-2402, 16 dBi.