Summation Research Inc

STR-1800 Land Mobile Data Radio

Operations and Maintenance Manual

Meeting 21st Century Challenges

- with –

Technically Appropriate Solutions

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SUMMATION RESEARCH, INC.

LIMITED WARRANTY

Summation Research, Inc. (herein called SRI) warrants that the equipment's of its manufacture as identified and described within this manual shall, at the time of shipment to the original purchaser, be free from defects in material and workmanship. This warranty applies only to equipment installed, operated, and maintained in accordance with SRI recommendations. This warranty does not apply where SRI determines that installation, repair, alteration, or accidents have caused any claimed defect, or that excessive deterioration due to environmental contamination has occurred.

SRI's obligation under this warranty is limited to repairing, or replacing, exclusive of cost of installation and labor charges, any part that SRI determines to be defective, provided that such part is received at SRI's principal office, freight prepaid. All equipment's must receive prior approval for return to SRI for warranty repair and must be sent prepaid. If they are returned collect, they will not be accepted.

This warranty is subject to any existing conditions of supply that may directly affect SRI's ability to obtain materials or manufacture replacement parts.

SRI makes no warranty that the equipment shall be merchantable or fit for any particular purpose; nor does SRI make other warranties, express or implied, by operation of law or otherwise, except such as are expressly set forth herein. SRI shall not be liable to buyer, or to any third persons for any incidental, consequential, special or contingent damages for breach of any warranty.

All specifications within this document are subject to change without prior written notice.

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RF Exposure Statement

The radio generates RF electromagnetic energy during transmit mode. This radio is designed for and classified as "Occupational Use Only", meaning it must be used only during the course of employment by individuals aware of the hazards, and the ways to minimize such hazards. This radio is NOT intended for use by the "General Population" in an uncontrolled environment.

The antennas used for this transmitter must be installed to provide a separation distances from the human body as noted below. Users and installers must be provided with antenna installation and transmitter operating conditions for satisfying RF exposure compliance. For compliance with FCC, Industry Canada, and ETSI RF Exposure Requirements, the transmitter antenna installation shall comply with the following two conditions:

1. The transmitter antenna gain shall not exceed a limit necessary for the application.
2. The transmitter antenna is required to be located outside of a vehicle and kept at a separation distance of 60 centimeters (FCC, UHF), 80 centimeters (ISED, UHF), 50 centimeters (ETSI, UHF) or 65 centimeters (ETSI, VHF) or more between the transmitter antenna of this device and persons during operation.

To ensure that your exposure to RF electromagnetic energy is within the FCC allowable limits for occupational use, always adhere to the following guidelines:

- DO NOT operate the radio without a proper antenna attached, as this may damage the radio and may also cause you to exceed FCC RF exposure limits. A proper antenna is the antenna supplied with this radio by the manufacturer or an antenna specifically required to meet application requirements.
- DO NOT transmit for more than 25% of total radio use time ("25% duty cycle"). Transmitting more than 25% of the time can cause RF exposure compliance requirements to be exceeded.

This device has been designated to operate with the antennas listed below and having a maximum gain of 2.15 dBi. Antennas not included in this list or having a gain greater than 2.15 dBi are strictly prohibited for use with this device. The required antenna impedance is 50 ohms.

Recommended Antennas: Type: Omni-directional, Gain: 2.15 dBi

The STR-1800 series of radios include a transmit time-out timer to prevent continuous transmissions greater than fifteen (15) seconds. This timer starts when the PTT or equivalent signal is asserted and when this timer expires, the radio will stop transmitting immediately and may not re-transmit until PTT has been asserted again.

Electromagnetic Interference/Compatibility

During transmissions, the radio generates RF energy that can possibly cause interference with other devices or systems. To avoid such interference, turn off the radio in areas where signs are posted to do so. DO NOT operate the transmitter in areas that are sensitive to electromagnetic radiation such as hospitals, aircraft, and blasting sites.

Declaration of Conformity and Compliance

This device complies with FCC Part 15 and Industry Canada licence-exempt RSS standard(s). Operation is subject to the following two conditions: (1) this device may not cause interference, and (2) this device must accept any interference, including interference that may cause undesired operation of the device.

Modification warning statement:

Changes or modifications not expressly approved by the party responsible for compliance could void the user's authority to operate the equipment.

Summation Research, Inc., 305 East Dr Ste D, Melbourne, FL 32904 USA, (321) 254-2580

Déclaration d'exposition aux RF

La radio génère de l'énergie électromagnétique RF pendant le mode de transmission. Cette radio est conçue et classée comme «usage professionnel uniquement», ce qui signifie qu'elle ne doit être utilisée que pendant le travail par des personnes conscientes des dangers et des moyens de minimiser ces dangers. Cette radio n'est PAS destinée à être utilisée par la «population générale» dans un environnement non contrôlé.

Les antennes utilisées pour cet émetteur doivent être installées pour fournir une distance de séparation du corps humain comme indiqué ci-dessous. Les utilisateurs et les installateurs doivent disposer des conditions d'installation de l'antenne et de fonctionnement de l'émetteur pour satisfaire la conformité de l'exposition RF. Pour être conforme aux exigences d'exposition RF de la FCC, d'Industrie Canada et de l'ETSI, l'installation de l'antenne de l'émetteur doit respecter les deux conditions suivantes:

1. Le gain d'antenne de l'émetteur ne doit pas dépasser une limite nécessaire à l'application.

2. L'antenne de l'émetteur doit être située à l'extérieur d'un véhicule et maintenue à une distance de séparation de 60 centimètres (FCC, UHF), 80 centimètres (ISED, UHF), 50 centimètres (ETSI, UHF) ou 65 centimètres (ETSI, VHF) ou plus entre l'antenne de l'émetteur de cet appareil et des personnes pendant le fonctionnement.

Pour vous assurer que votre exposition à l'énergie électromagnétique RF est dans les limites autorisées par la FCC pour une utilisation professionnelle, respectez toujours les directives suivantes:

• NE FAITES PAS fonctionner la radio sans une antenne appropriée, car cela pourrait endommager la radio et vous faire dépasser les limites d'exposition RF de la FCC. Une antenne appropriée est l'antenne fournie avec cette radio par le fabricant ou une antenne spécifiquement requise pour répondre aux exigences de l'application.

• NE PAS transmettre pendant plus de 25% de la durée totale d'utilisation de la radio («cycle d'utilisation de 25%»). La transmission plus de 25% du temps peut entraîner un dépassement des exigences de conformité à l'exposition aux RF.

Cet appareil est désigné pour opérer avec des antennes listées ci-bas ayant un gain maximal de 2.15 dBi. Les antennes qui n'apparaissent pas sur cette liste ou ayant un gain plus grand que 2.15 dBi sont strictement défendu avec cet appareil. L'impédance requise est 50 ohm.

Antennes recommandées: Type: Omnidirectionnel, Gain: 2,15 dBi

La série de radios STR-1800 comprend un temporisateur de temporisation de transmission pour empêcher les transmissions continues de plus de quinze (15) secondes. Ce temporisateur démarre lorsque le PTT ou un signal équivalent est affirmé et lorsque ce temporisateur expire, la radio arrête immédiatement de transmettre et peut ne pas retransmettre tant que le PTT n'a pas été réaffirmé.

Interférence électromagnétique / compatibilité

Pendant les transmissions, la radio génère de l'énergie RF qui peut éventuellement provoquer des interférences avec d'autres appareils ou systèmes. Pour éviter de telles interférences, éteignez la radio dans les zones où des panneaux sont affichés à cet effet. N'UTILISEZ PAS l'émetteur dans des zones sensibles aux rayonnements électromagnétiques comme les hôpitaux, les avions et les sites de dynamitage.

Déclaration de conformité et de conformité

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.

Déclaration d'avertissement de modification:

Les modifications ou modifications non expressément approuvées par la partie responsable de la conformité pourraient annuler le pouvoir de l'utilisateur d'exploiter l'équipement.

Summation Research, Inc., 305 East Dr Ste D, Melbourne, FL 32904 USA, (321) 254-2580

Declaration of Conformity and Compliance (STR-1830 Model)

Hereby, Summation Research, Inc., declares that the STR-1800 radio is in compliance with the essential requirements and other relevant provisions of Radio Equipment Directive (RED) 2014/53/EC for the following countries: Germany (DE), France (FR), United Kingdom (UK), Greece (EL), Spain (ES), Ireland (IE), Belgium (BE), Croatia (HR), Cyprus (CY), Portugal (PT), Malta (MT), Luxembourg (LU), Bulgaria (BG), Latvia (LV), Slovenia (SI), Czech Republic (CZ), Denmark (DK), Estonia (EE), Lithuania (LT), Hungary (HU), Austria (AT), Poland (PL), Romania (RO), Solvakia (SK), Finland (FI), Sweden (SE), Italy (IT), Netherlands (NL).

Czech	Summation Research, Inc. tímto prohlašuje, že tento STR-1830 PMR je ve shodě se základními požadavky a dalšími příslušnými ustanoveními směrnice 2014/53/ES.
Danish	Undertegnede Summation Research, Inc. erklærer herved, at følgende udstyr STR-1830 PMR overholder de væsentlige krav og øvrige relevante krav i direktiv 2014/53/EF.
Dutch	Hierbij verklaart Summation Research, Inc. dat het toestel STR-1830 PMR in overeenstemming is met de essentiële eisen en de andere relevante bepalingen van richtlijn 2014/53/EG.
English	Hereby, Summation Research, Inc., declares that this STR-1830 PMR is in compliance with the essential requirements and other relevant provisions of Directive 2014/53/EC.
Estonian	Käesolevaga kinnitab Summation Research, Inc. seadme STR-1830 PMR vastavust direktiivi 2014/53/EÜ põhinõuetele ja nimetatud direktiivist tulenevatele teistele asjakohastele sätetele.
German	Hiermit erklärt Summation Research, Inc., dass sich das Gerät STR-1830 PMR in Übereinstimmung mit den grundlegenden Anforderungen und den übrigen einschlägigen Bestimmungen der Richtlinie 2014/53/ EG befindet.
Greek	ΜΕ ΤΗΝ ΠΑΡΟΥΣΑ Summation Research, Inc. ΔΗΛΩΝΕΙ ΟΤΙ STR-1830 PMR ΣΥΜΜΟΡΦΩΝΕΤΑΙ ΠΡΟΣ ΤΙΣ ΟΥΣΙΩΔΕΙΣ ΑΠΑΙΤΗΣΕΙΣ ΚΑΙ ΤΙΣ ΛΟΙΠΕΣ ΣΧΕΤΙΚΕΣ ΔΙΑΤΑΞΕΙΣ ΤΗΣ ΟΔΗΓΙΑΣ 2014/53/ΕΚ.
Hungarian	Alulírott, Summation Research, Inc. nyilatkozom, hogy a STR-1830 PMR megfelel a vonatkozó alapvetõ követelményeknek és az 2014/53/EC irányelv egyéb elõírásainak.
Finnish	Summation Research, Inc. vakuuttaa täten että STR-1830 PMR tyyppinen laite on direktiivin 2014/53/ EY oleellisten vaatimusten ja sitä koskevien direktiivin muiden ehtojen mukainen.
French	Par la présente Summation Research, Inc. déclare que l'appareil STR-1830 PMR est conforme aux exigences essentielles et aux autres dispositions pertinentes de la directive 2014/53/CE.

Icelandic	Hér með lýsir Summation Research, Inc. yfir því að STR-1830 PMR er í samræmi við grunnkröfur og aðrar kröfur, sem gerðar eru í tilskipun 2014/53/EC
Italian	Con la presente Summation Research, Inc. dichiara che questo STR-1830 PMR è conforme ai requisiti essenziali ed alle altre disposizioni pertinenti stabilite dalla direttiva 2014/53/CE.
Latvian	Ar šo Summation Research, Inc. deklarē, ka STR-1830 PMR atbilst Direktīvas 192014/53/K būtiskajām prasībām un citiem ar to saistītajiem noteikumiem.
Lithuanian	Šiuo Summation Research, Inc. deklaruoja, kad šis STR-1830 PMR atitinka esminius reikalavimus ir kitas 2014/53/EB Direktyvos nuostatas.
Maltese	Hawnhekk, Summation Research, Inc., jiddikjara li dan STR-1830 PMR jikkonforma mal-ħtiġijiet essenzjali u ma provvedimenti oħrajn relevanti li hemm fid-Dirrettiva 2014/53/EC.
Norwegian	Summation Research, Inc. erklærer herved at utstyret STR-1830 PMR er i samsvar med de grunnleggende krav og øvrige relevante krav i direktiv 2014/53/EF.
Polish	Niniejszym Summation Research, Inc. oświadcza, że STR-1830 PMR jest zgodny z zasadniczymi wymogami oraz pozostałymi stosownymi postanowieniami Dyrektywy 2014/53/EC
Portuguese	Summation Research, Inc. declara que este STR-1830 PMR está conforme com os requisitos essenciais e outras disposições da Directiva 2014/53/CE.
Slovak	Summation Research, Inc. týmto vyhlasuje, že STR-1830 PMR spĺňa základné požiadavky a všetky príslušné ustanovenia Smernice 2014/53/ES.
Slovenian	Summation Research, Inc. izjavlja, da je ta STR-1830 PMR v skladu z bistvenimi zahtevami in ostalimi relevantnimi določili direktive 2014/53/ES.
Spanish	Por medio de la presente Summation Research, Inc. declara que el STR-1830 PMR cumple con los requisitos esenciales y cualesquiera otras disposiciones aplicables o exigibles de la Directiva 2014/53/CE.
Swedish	Härmed intygar Summation Research, Inc. att denna STR-1830 PMR står I överensstämmelse med de väsentliga egenskapskrav och övriga relevanta bestämmelser som framgår av direktiv 2014/53/EG.

Declaration of Conformity and Compliance (STR-1820-BZ Model) Anatel, No. 1046-11-6919

Este equipamento não tem direito à proteção contra interferência prejudicial e não pode causar interferência em sistemas devidamente autorizados.

Record of Changes

Dates of issue for original and each revision of this document are:

REVISION	*DATE*	*TITLE OR BRIEF DESCRIPTION*	*ISSUED BY*
A	June 2010	Initial Production Release	Tom Drago
A1	September 2010	Updated Exposure Statement Limits	Todd Gross
B	January 2011	Updated for active RS485 interface	Todd Gross
C	January 2011	Updated for ETSI Radio Variants	Todd Gross
D	February 2011	Updated for Digital Interface	Todd Gross
E	June 2011	Updated for ETSI Radio Variants	Todd Gross
E2	August 2011	Updated for ETSI Radio Variants	Todd Gross
F	September 2011	Corrected Typos	Todd Gross
G	June 2012	Update for STR-1821	Todd Gross
H	July 2012	Updated to clarify deviation and flatness	Todd Gross
I	April 2018	Update for STR-1830, 2014/53/EU Radio Equipment Directive Update to SRI Corporate Address	Todd Gross
J	January 2020	Update to add Anatel declaration	Todd Gross
K	May 2020	Update to add STR-1820A, MPE calculation update	Todd Gross

LIST OF EFFECTIVE PAGES

This document is arranged in the following four (4) parts:

1 Document Cover
2 Warranty Statement
3 RF Exposure Statement
4 Record of Changes
5 Table of Contents
6 Document Main Text

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SECTION 1 INTRODUCTION

The STR-1800 series of UHF radio represents a state-of-the-art communications product line providing multi-mode, half-duplex audio to radio frequency (RF) transmit and receive functions. Consisting of multiple models, the series provides analog FM transceiver functions in the 400 to 470 MHz frequency band (STR-1820, STR-1820A, STR-1821, STR-1821A, and STR-1830) or the 136 to 174 MHz band (STR-1840). The design has been tailored towards narrowband data telemetry applications requiring fast transmit/receive response times with compact size and high reliability.

1.1 Scope

This manual describes the Summation Research, Incorporated STR-1800 series of Land Mobile Radios. The manual includes specifications, design description, installation, and operation instructions along with routine maintenance requirements for the STR-1800.

1.2 Product Description

The STR-1800 is a series of UHF and VHF digital and FSK analog radios. Versions of this product may also support extended UHF and other frequency bands. In order to make the product more applicable for data communications functions, the STR-1800 product line incorporates a custom front panel as depicted in the following picture.

Figure 1 STR-1800 Multi-Mode Land Mobile Data Radio

The custom front panel replaces the normal operator oriented local status/control interface and audio interface connector with a DB-25 connector targeted for computer control. The DB-25 provides both the audio interface and a selection capability for frequency select. A secondary connector provides for diagnostic and programming functions. These features are incorporated via a custom printed circuit board (PCB) located within the STR-1800 front panel known as a Front Panel Card (FPC). This card in-turn interfaces with an internal daughter card known as the Modem Card (MDC).

Figure 2 depicts a top level overview of the STR-1800 Radio.

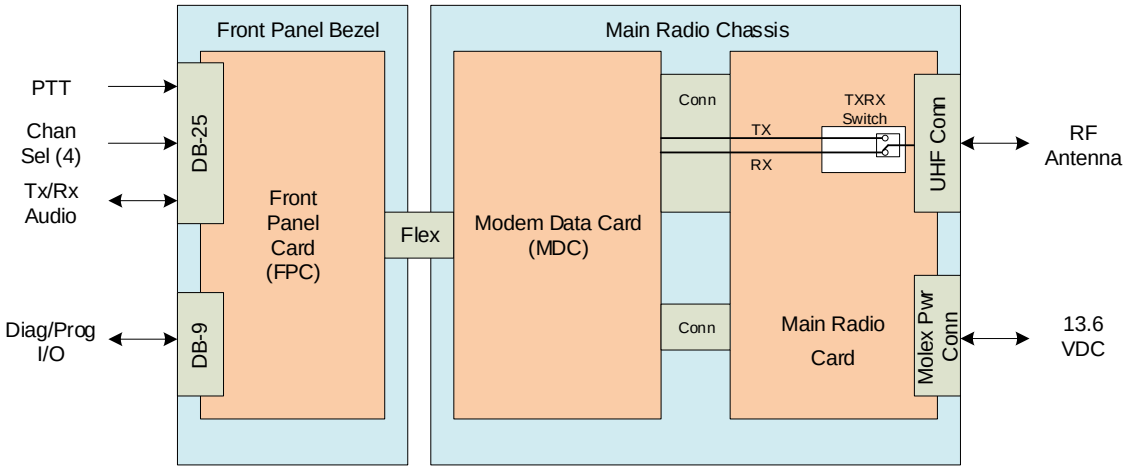

Figure 2 System Overview, Single Receive Channel Models

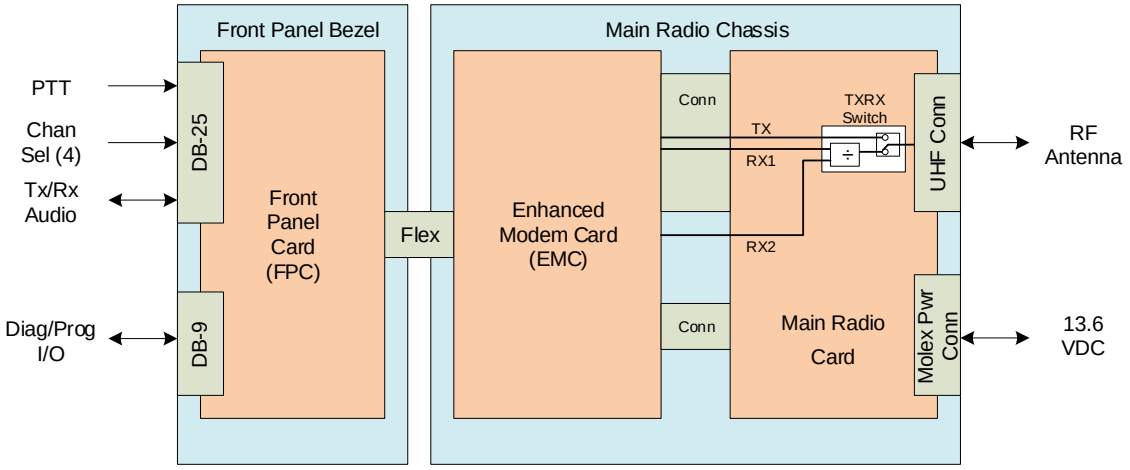

Figure 3 System Overview, Dual Receive Channel Model

1.3 Technical Specifications

The technical capabilities of the STR-1800 radios are summarized in the following table.

Table 1 Specifications

PARAMETER	SPECIFICATION
Frequency Range	STR-1820, STR-1820A, STR-1820, STR-1821A: 400-470 MHz (FCC/IC/Cofetel) STR-1830: 400-470 MHz (ETSI) STR-1835: 450-520 MHz (Australia) STR-1840: 136-174 MHz (ETSI)
Number of Channels	16 preset channels selected from 512 factory configured frequencies
Frequency Stability	±0.0001% of assigned center frequency from -30°C to +60°C (+25°C)
Compliance	STR-1820, STR-1820A, STR-1821, STR-1821A: FCC type certified (FCC 47 CFR 90), Industry Canada STR-1830, STR-1840: ETSI type qualified STR-1835: Australia type qualified

Operating Power	13.6 VDC ± 15% (current @ 13.6 V: transmit 9 A, receive 0.7 A)
Operator Adjustments	None
Reliability	25,000 hr MBTF
Antenna Connector	UHF PL-259 type female located on rear panel
Audio Interface and Control Connector	DB-25 socket on front panel including 4 channel select lines, audio in/out, push-to-talk. Does not apply to STR-1821 radios. Separate DB-9 socket for diagnostic and programming interface.
Power Connector	Tyco/AMP Electronics P/N 172129-1 (female housing with male contact pins)
Transmit Channel	All models: Single
Receive Channel	STR-1820, STR-1820A, STR-1830, STR-1835, STR-1840: Single receive channel STR-1821, STR-1821A: Two independently programmable receive channels
Channel Spacing	UHF (FCC/IC): Selectable to either 12.5 KHz or 6.25 KHz channel spacing UHF (Brazil): Selectable to either 25 KHz, 12.5 KHz, or 6.25 kHz channel spacing UHF (CE) versions include 20 KHz channel spacing selection VHF: Selectable to either 25 KHz or 12.5 KHz channel spacing.
RF Output Power	Selectable as 3 factory set discrete power levels from 0 and 30 watts (STR-1820, STR-1820A, STR-1821, STR-1821A) or 25 Watts (Other Models), (±2%) into a VSWR of 2:1 or better.
Output Impedance	50 ohms, nominal
Output Protection	Operating into a 10:1 VSWR of any phase angle without damage
Modulation	FM with a rated deviation of ±5 KHz (STR-1820, STR-1820A, STR-1821, STR-1821A) or ±4 KHz (STR-1830, STR-1835, STR-1840) for 25 KHz spacing (Brazil use only) and ±2.5 KHz for 12.5 KHz spacing. Typical operation at 60% rated deviation (±3 kHz/±1.5 kHz).
Modulation Sensitivity	Radio achieves 60% (+/- 5%) of rated system deviation is for a 1 KHz input tone between 40mV RMS and 1V RMS.
Turn-On Time	Within 20 msec (UHF models) or 40 msec (VHF model) of application of the keying signal, the transceiver reaches 90% of programmed output power and is capable of transmitting an on frequency signal.
Spurious and Harmonic Output	-70 dB below rated power
Audio Input Impedance	1200 Ohm ±20% Does not apply to STR-1821 radios.
Transmit Audio Frequency Response	Flat response over the 300-3000 Hz range with no pre-emphasis. Does not apply to STR-1821 radios.
Minimum Duty Cycle	25% transmit duty cycle continuous. Capable of 15 s continuous keying
Output S/N Ratio	30 dB minimum fully modulated
Spurious Leakage	-57 dBm maximum
Selectivity	70 dB minimum for 25 KHz channel spacing and 65 dB min. for 12.5 KHz spacing

	per TIA-603-C
Intermodulation	65 dB minimum
Dynamic Range	With input signals ranging from -100 dBm to 0 dBm, the SINAD at the receiver is 23 dB minimum when receiving a signal modulated with a 1 KHz tone at 60% rated deviation
Sensitivity	12 dB SINAD minimum for input signal level of -116 dBm
Spurious and Image Rejection	70 dB minimum
Transmit to Receive Recovery Time	30 msec maximum measured from removal of keying signal to the transmitter
Audio Output	A 1 KHz signal at 60% rated deviation produces a 900 mV p-p ±10% audio output into a 600 ohm resistive load. Does not apply to STR-1821 or STR-1821A radios.
Receive Frequency Response	Flat response over the 300-3000 Hz range with no de-emphasis. Does not apply to STR-1821 or STR-1821A radios.
Receiver Overload	A +28 dBm signal continuously for 30 minutes applied to the antenna input will not cause any permanent damage.
Dimensions	Approximately 1.8" high x 6.35" wide x 7" deep
Weight	4.5 pounds
Vibration	Per EN 50155 Railway Applications - Electronic Equipment Used on Rolling Stock
Shock	Per EN 50155 Railway Applications - Electronic Equipment Used on Rolling Stock
Temperature	-30°C to +60°C (operating and storage)
Humidity	Per EN 50155 Railway Applications - Electronic Equipment Used on Rolling Stock
Altitude	Sea level to 12,000 feet operating and 50,00 feet non-operating

1.4 Reference Documentation

The latest revision of the below documents serve as an addendum to this document. Users are referred to these documents for maintenance and design information pertaining to the standard ICOM radio circuitry.

Service Manual – VHF Transceivers – IC-F5062 © 2007 Icom Inc.)
Service Manual – UHF Transceivers – IC-F6061/6062/6063 © 2007 Icom Inc.)

1.5 Declaration of Conformity (Model STR-1830, STR-1840)

Summation Research, Inc. declares that when used in its intended application the radio unit STR-1830 and STR-1840 complies with the essential requirements of the European Radios and Telecommunication Terminal Directive 1999/5/EC (R&TTE directive).

Models STR-1830 and STR-1840 can be operated in the countries of the European Union (EU). Outside of the EU apply the national regulations of the relevant country. This equipment may operate in non-harmonized frequency bands and/or may be subject to licensing conditions in the country of use. Be sure to check that you have the correct programming of this radio, to comply with national licensing requirement.

SECTION 2 RECEIVING, INSPECTION AND INSTALLATION

2.1 Unloading and Unpacking

NOTE

If shipping carton is damaged upon receipt, request carrier's agent be present during unpacking and inspection of the system.

Upon receipt of the equipment, inspect the shipping container for damage. If the container or the cushioning material is found damaged, they should be kept until the contents of the shipment have been verified for completeness and the equipment has been inspected for mechanical and electrical defects. If the contents are incomplete or if there is a mechanical or electrical defect, please notify:

SUMMATION RESEARCH, INCORPORATED
305 East Dr, Ste D
Melbourne, Florida 32904 USA

2.2 Receiving Documentation

Each STR-1800 radio is shipped with a packing slip. The packing slip should be carefully checked against the contents of the shipping container.

2.3 Installation and Connection Requirements

The STR-1800 has four (4) connectors. These are:

1) Primary Power
2) Antenna
3) Audio/control
4) Programming/diagnostic

After carefully reviewing the connector and signal descriptions below, the user should establish all connections, making sure that the primary power input is turned off at the source. Once all interconnections are in place, primary power may be applied.

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2.4 Connector Descriptions and Signal Definitions

This section describes the types of connectors used on the STR-1800 and provides the definition of the signals associated with each.

2.4.1 Primary Power

The Primary Power connector is located on the rear of the STR-1800 series radios and is attached to the unit itself via approximately 6 inches of 14 gage wire. Characteristics of this connector are as indicated in the following table.

Table 2 Primary Power Connector Characteristics

PARAMETER	VALUES
Part number	Tyco/AMP Electronics P/N 172129-1 Female housing with male contact pins
Pin Assignments	When viewing contacts as a T, top horizontal pin is +13.6 VDC while vertical descending pin is Ground
Input Voltage Range	13.6 VDC +/- 15%
Current Drain	9 Amps maximum
Connector to Radio Color Coding	13.6 VDC Contact – Red Ground Contact - Black
Max. Fuse Rating (External)	STR-1820, STR-1820A, STR-1821A: 20 A All Other: 10A

2.4.2 Antenna

The Antenna connector is located on the rear of the STR-1800 series radios and is mounted directly to the main housing of the radio. Characteristics of this connector are as indicated in the following table.

Table 3 Antenna Port Connector Characteristics

PARAMETER	*VALUES*
Connector Type	UHF PL-259 Type Female
Antenna Impedance	50 Ohms
Maximum Output Power	45 Watts
Output Frequency Range	STR-1820, STR-1820A, STR-1821, STR-1821A: 400-470 MHz (FCC/IC/Cofetel) STR-1830: 400-470 MHz (ETSI) STR-1835: 450-512 MHz (Australia) STR-1840: 136-174 MHz (ETSI)

2.4.3 Audio/Control

The Audio/Control connector is located on the front of the STR-1800 series radios and is mounted directly to the front panel mold of the radio. Characteristics of this connector are as indicated in the following table.

Table 4 Audio/Control Connector Characteristics

PINS (+/-)	SIGNAL
Connector Part Number	DB-25 Female
Mating (User Supplied) Connector Part Number	DB-25 Male

The following table defines the signal contents of all assigned pins on this connector. Analog inputs, outputs, and analog channel select lines do not apply for the model STR-1821 or STR-1821A.

Table 5 Audio/Control Connector Pin Assignments

PIN	SIGNAL	DESCRIPTION AND CHARACTERISTICS
2	Audio Isolated Ground	Ground for the audio inputs/outputs of the radio
4	Receive Audio	Recovered audio signal output from the radio.
5	Channel Select 3	Control signal which when combined with Channel Select 0/1/2 forms a 4-bit binary channel selection control.
6	RS485 Out+	RS485 digital interface
7	Push-to-Talk (PTT)	Places the radio into transmit mode when low (i.e., grounded) or receive mode when high or floating.
8	RS485 Out-	RS485 digital interface
11	Audio Isolated Ground	Ground for the audio inputs/outputs of the radio
14	Channel Select 2	See pin 5 description above
17	Transmit Audio	Audio signal input to the radio when transmit operation is active.
18	Channel Select Lines Ground	Ground for the Channel Select 0/1/2/3 lines
19	Channel Select 0	See pin 5 description above
21	PTT Isolated Ground	Ground for the PTT signal
23	Channel Select 1	See pin 5 description above
24	RS485 In+	RS485 digital interface
25	RS485 In-	RS485 digital interface

Pins not listed within this table are all defined as no connects.

For the channel select lines described above, the following table defines the control functions of these inputs.

Table 6 Channel Selection Control Settings

FRONT PANEL 25 PIN D SIGNAL STATES				DEFINITION
CHANNEL SELECT 3	CHANNEL SELECT 2	CHANNEL SELECT 1	CHANNEL SELECT 0	
High	High	High	High	Select Chan 1
High	High	High	Low	Select Chan 2
High	High	Low	High	Select Chan 3
High	High	Low	Low	Select Chan 4
High	Low	High	High	Select Chan 5
High	Low	High	Low	Select Chan 6
High	Low	Low	High	Select Chan 7
High	Low	Low	Low	Select Chan 8
Low	High	High	High	Select Chan 9
Low	High	High	Low	Select Chan 10
Low	High	Low	High	Select Chan 11
Low	High	Low	Low	Select Chan 12
Low	Low	High	High	Select Chan 13
Low	Low	High	Low	Select Chan 14
Low	Low	Low	High	Select Chan 15
Low	Low	Low	Low	Select Chan 16

2.4.4 Diagnostic/Programming

The diagnostic/programming interface provides 3 different interfaces into the radio as follows:

1) RS-232 serial port interface for status/control and reprogramming of the modem processor contained on the MDC of the design.
2) USB universal serial bus interface for the same purpose to the MDC modem processor.
3) A full duplex interface with power to a remote front panel for the unit.

The pinouts associated with this connector are as follows:

Table 7 Reference Input Connectors

Pin	Signal	DESCRIPTION AND CHARACTERISTICS
1	RD (Input)	Data input to radio. RS-232 electrical levels.
2	Conn Key	A stubbed (i.e.; filled) pin location which prevents users from connecting a standard UART DB-9 cable into the radio.
3	TD (Output)	Data output from radio. RS-232 electrical levels.
4	RFPDO	Remote front panel data output. TTL electrical levels.
5	GND	Ground
6	USBD+	Universal serial data bus positive. USB electrical levels.
7	USBD-	Universal serial data bus negative. USB electrical levels.
8	RFPDI	Remote front panel data input. TTL electrical levels.
9	RFP+8 V	Remote front panel +8 Volt output. DC output power.

As identified in the section that follows this, these interfaces should only be used with cable assemblies provided by SRI.

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SECTION 3 OPERATION

Operation of the STR-1800 series radios is accomplished by utilizing a special software program to configure the radio for the proper configuration and then connecting the system into the target platform for audio data transmission and reception.

The following sections describe the STR-1800 series radio operations from the perspective of configuring the unit for the proper radio channel characteristics prior to final system installation.

3.1 Minimum System Requirements

This package requires a PC executing under the Windows XP or System 7 operating system.

3.2 Software Installation

The control software for the STR-1800 series radios is provided as a standard installation program from the factory. Executing this program activates a standard windows software installation process with full instructions as to required user actions. The installation will create the program "STR1800.exe" in the specified install directory.

3.3 Conventions

The STR-1800 control software supports standard Windows type operation, including menu based selection processes. The STR-1800 control program utilizes LabVIEW, a software package from National Instruments. The install directory also contains other support files associated with the run-time version capability required of LabVIEW for the control program.

3.4 Getting Started

3.4.1 Radio Interconnect

Before taking any actions from the control program with an STR-1800 series radio, the radio must be connected to a primary power source and to the PC via a special programming interface cable and adapter. The exact configuration and cable assembly number used varies based on the type of user.

Field users are limited to controlling channel specific information including frequency, transmit power level (Hi, Med, Lo), operational mode (V.23 analog or future), and channel bandwidth (currently 12.5 or 25 KHz). The configuration for these users is as shown below.

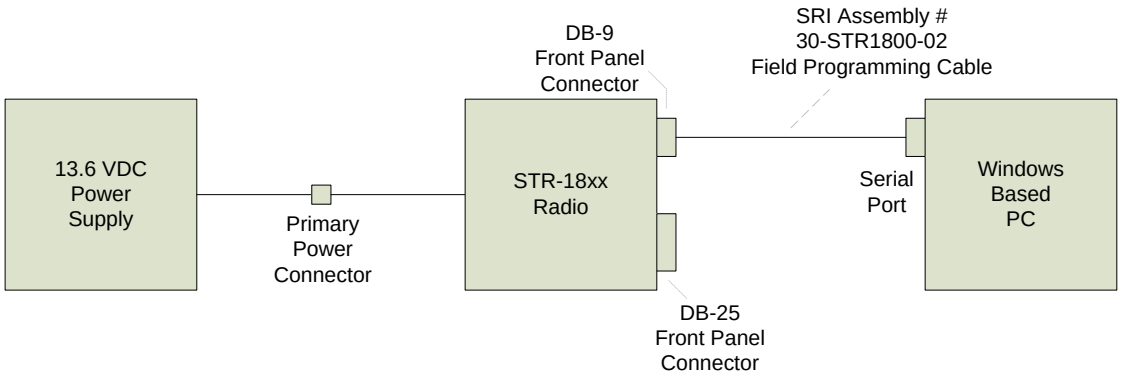

Figure 4 Field Radio to PC Interconnect Configuration

Factory users are allowed to control radio settings pertaining to output power level calibration. The following figure depicts this expanded configuration.

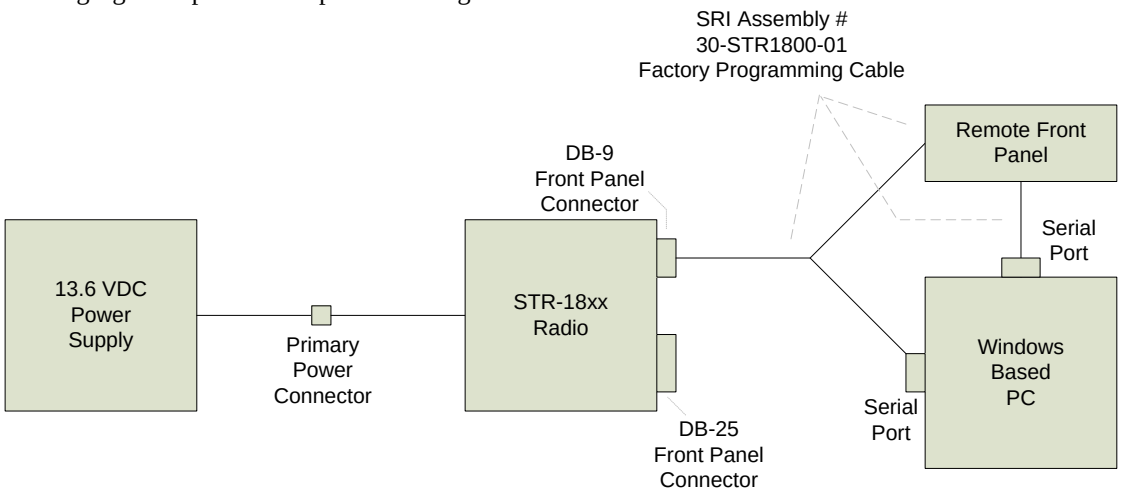

Figure 5 Factory Radio to PC Interconnect Configuration

For either mode, the 13.6 VDC power supply need only support the radio operation in a quiescent mode (i.e., < 0.7 A).

3.4.2. Power-on Sequence

Once the above configuration has been established, the primary power supply and PC should be powered on and initialized. The power up sequence of the radio versus the PC is not critical. However for the factory configuration the 30-STR-1800-01 cable assembly must be connected to the radio prior to powering on the radio. In this configuration the primary power will cause the remote front panel unit display to activate and display configuration information. No such indication is available on the field configuration

3.4.3. Reading the Radio Configuration

Assuming the above process is successful, the user can proceed to activate the Radio Configuration program.

There are two versions of the *STR-1800 Control.exe* Radio Configuration program with separate functionality for Factory or Field use. Generally the Factory version has capabilities that are not available to users of the Field version.

The Field version requires cabling as noted in Figure 4. Running the Field version of the application provides a user interface screen as shown in Figure 6 below.

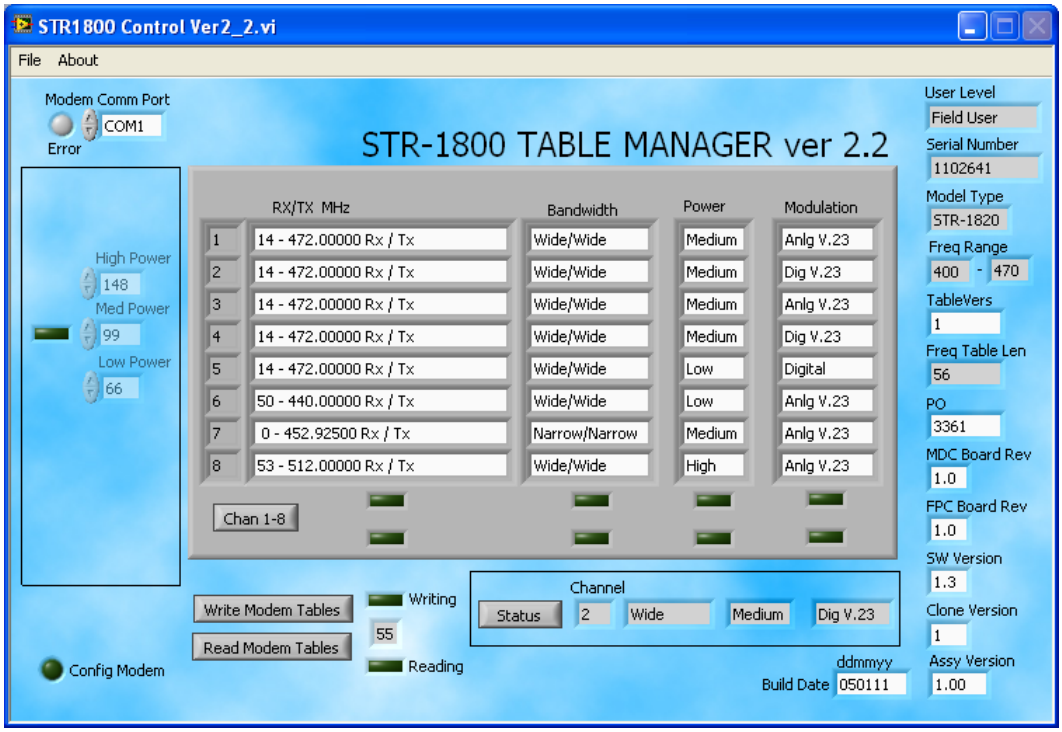

Figure 6 Field Control Software Initial Screen

The Factory version requires cabling as noted in Figure 5. Running the Factory ("GE Personnel") version of the application provides a user interface screen as shown in Figure 7 below. The capability is similar to the above mode however additional functionality will require the Figure 5 cabling.

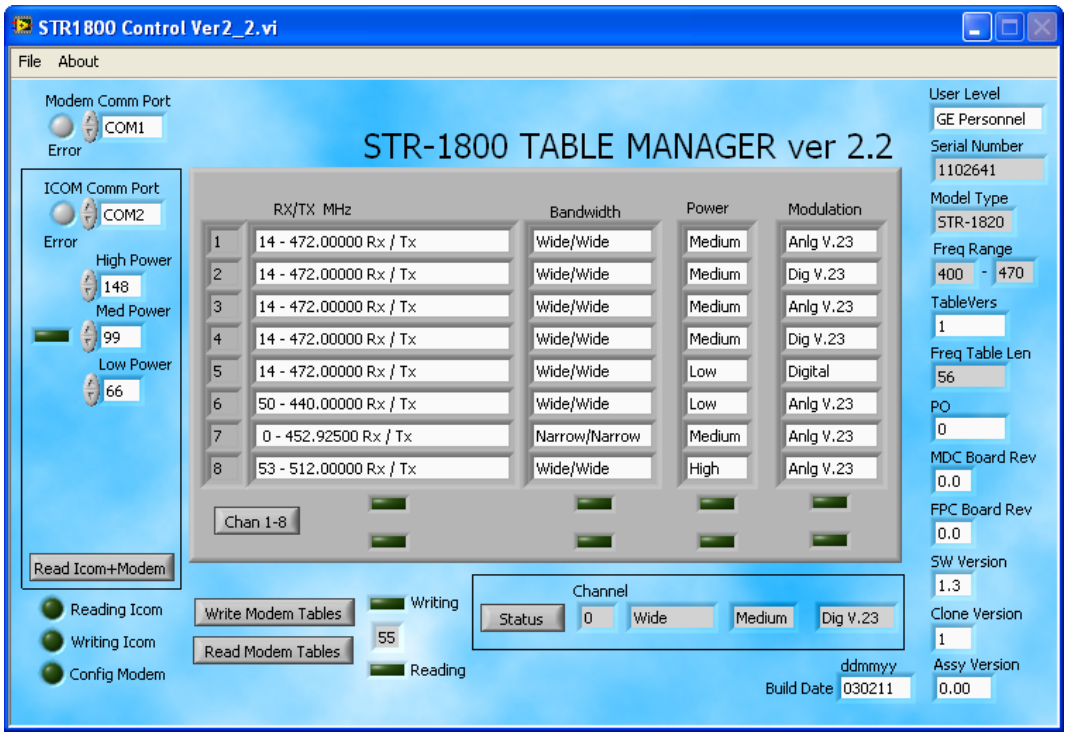

Figure 7 Factory Control Software Initial Screen

If this is the first time either program is being utilized or if the operator has changed the PC's serial communications port being utilized, the first action taken by the user should be to establish the correct port selection. This can be accomplished by doing a menu selection from the "Radio Comm Port" selection.

After this action, the user may select "Get All". This will cause the software to interrogate the interconnected STR-1800 series radios and then update the displayed fields. The Serial Number field should reflect the five (5) digit serial number from the product label on the STR-1800. The model number will indicate the specific model of the radio and the various version numbers will reflect the hardware and software versions of the radio.

The main part of the screen indicates the current settings for the sixteen (16) preset channel selections of the radio. This includes the channel frequency, bandwidth (i.e., wideband at 25 KHz or narrowband at 12.5 KHz) and output power level (i.e., "High" of 30 Watts, "Medium" (Undefined) or "Low" of 5 watts.).

3.4 Altering the Radio Configuration

3.5.1 Changing Individual Channel Settings

Once a radio has been read as described above, the channel configuration fields may be edited. The frequency field may be changed by selecting appropriate field and holding it to show a menu list of all available frequencies. Radios may be factory programmed for up to 512 frequencies. The frequencies of all defined items will be displayed when the field is selected. The bandwidth and power selections are toggle controls operate in a similar manner.

After establishing the changes to all channel settings, the user should select "Send All". The system will again interrogate the radio as to its current settings, modify the channel configurations according to the edited fields, and then write the new configuration back to the radio.

By interrogating the radio again prior to modifying its settings, the software ensures the correct configuration update even if a new radio has been connected to the PC since the last read radio action. As such, a user may establish a channel configuration and then write the data to multiple radios simply by connecting a new radio to the PC and invoking "Send All". The fields on the screen will be updated each time this action is taken.

3.5.2 Saving/Restoring Channel Parameters

This capability of the control program will be added on a future release.

3.5.3 Power Output Control

This capability of the control program will be added on a future release.

3.6 Radio Operation

Having established the proper channel configuration for the radio, the STR-1800 series radio is now ready for target platform installation. The following operational considerations should be noted:

1) Radios which are powered up with an active push-to-talk condition will not operate until the push-to-talk is removed and stay's in a non-active condition for a period of 2 seconds.

2) On initial power up or on any change of the frequency select lines into the radio, the target frequency setting may take up to 100 msec to obtain.

3) If push-to-talk is active at any time during the tuning period outlined in note 2 above, the tuning action will not complete until push-to-talk is removed and stay's in a non-active condition for a period of 2 seconds.

4) Radios which have a push-to-talk condition activated for more than 15 seconds will automatically shut down transmit operation and stay inactive until push-to-talk returns to a non-active condition for a period of 2 seconds.

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SECTION 4 MAINTENANCE

In order to ensure that the STR-1800 system is always ready for operation, it should be checked periodically so that potential defects may be discovered and corrected before they develop into any serious damage or system failure. A minimal preventive maintenance program will significantly increase the systems life span.

This section describes the necessary preventive maintenance checks and tests the user can perform to easily identify most defects and problems. Any other defects or problems discovered during the normal operation of the system should be noted for future corrective measures.

CAUTION
Stop the operation of the system immediately if a problem is noted during normal operation which can otherwise damage the system.

This section also describes the corrective maintenance checks that can be performed on the STR-1800 system.

4.1 Maintenance Concept

The maintenance concept for the STR-1800 system is limited to the removal and replacement of the entire unit.

4.2 Preventive Maintenance Requirements

The following is a recommended timetable for performing preventive maintenance checks on the STR-1800.

CAUTION
Primary power to the radio must be turned OFF when performing preventive maintenance on the equipment

4.2.1 Inspection

The STR-1800 system should be inspected periodically for defects or physical damage developed during operation. Inspect all the interface cables to and from the system for cracks, breaks and proper seating with their mating connectors on the card. Inspect all cables for frayed, broken or damaged wires. In addition, inspect all STR-1800 connections for accumulation of dirt, grease, or any foreign material that can cause a non-connection. If a cable is found damaged or non-repairable, it should be replaced before operating the system again.
Inspection should be performed at least once every month. The frequency of inspection should be increased for units exposed to dusty or heavy particulate environments.

5.2.2 Cleaning

Clean the outside surfaces and areas around the connectors periodically. Clean the surfaces with a clean, soft, lint-free cloth. Clean the areas around the connectors with a soft bristle brush. To remove grease, fungus, or corrosion, use a cloth dampened with an appropriate electronics cleaning fluid. Cleaning should be done at least once every month. The frequency of cleaning should be increased for units exposed to dusty or heavy particulate environments.

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APPENDIX A DECLARATION OF CONFORMITY

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SRI
SUMMATION RESEARCH INC.

Declaration of Conformity

We, the undersigned (☒Manufacturer / ☐ The manufacturers authorized representative established within EEA):

Company	Summation Research, Inc.
Address	305 East Drive Ste D, Melbourne, FL 32904
Country	USA
Telephone number	+1 (321) 254-2580
Telefax number	+1 (321) 254-2492
E-mail	info@summationresearch.com

Certify and declare under our responsibility that the following product:

Product Description	UHF Data Telemetry Transceiver
Manufacturer	Summation Research, Inc.
Brand Name	SRI
Model/Type	STR-1830

Is tested to and conforms with the essential test suites included in the following standards, which are in force within the EEA:

Standard	**Issue date**	**Reference to report/file**
EN 300 113-2 V2.2.1	2016-12	331376-1TRFWL 172406REU1Rev1 + Comparison_EN300113-2_STR-1830.pdf 172406REU1Rev1+ Comparison_EN300113-2_STR-1830.pdf
EN 301 489-5 V2.1.1	2016-11	331376-1TRFEMC 172406EETSI1 172406EETSI1+ Comparison_EN301489_STR-1830.pdf
EN 50121-3-2:2006 with amendment AC:2008	2006	172406EETSI1 (EMC directive for Railway environment)
EN 60950--1:2006+A2:2013	2006	167130-1TRFSAF
50385:2017	2017	354307TRFWL-1

And therefore complies with the essential requirements of the following directives:

Directive Name	**Directive number**	**Further identification**
Radio Equipment Directive(RED)	2014/53/EU	Annex II, Module A
ROHS Directive	2011/65/EU	EN 50581:2012

The technical documentation as required by the conformity assessment procedure is kept at the following address for a period ending at least 10 years after the last product has been manufactured at the disposal of the relevant national authorities of any Member State for inspection:

Company	Summation Research, Inc.
Address	305 East Drive Ste D, Melbourne, FL 32904
Country	USA
Telephone number	+1 (321) 254-2580
Telefax number	+1 (321) 254-2492
E-mail	info@summationresearch.com

Product is CE-marked in	EUROPE

CE

Drawn up in	USA
Date	1[illegible]
Signature and Company Stamp	[illegible] Drago

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SRI SUMMATION RESEARCH INC.

EU DECLARATION OF CONFORMITY

1. No: STR-1830 PMR

2. Summation Research, Inc.
   305 East Dr Ste D
   Melbourne, FL 32904 USA

3. This declaration of conformity is issued under the sole responsibility of the manufacturer.

4. Object of the declaration:

   STR-1830 PMR

5. The object of the declaration described above is in conformity with Directive 2011/65/EU of the European Parliament and of the Council of 8 June 2011 on the restriction of the use of certain hazardous substances in electrical and electronic equipment:

6. Where applicable, references to the relevant harmonized standards used or references to the technical specifications in relation to which conformity is declared: EN 50581:2012

7. Additional information:

Signed for and on behalf of: Summation Research, Inc.

Melbourne, FL USA 30 March 2018

Thomas Drago
President

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DECLARATION OF CONFORMITY

The responsible party declares that 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.

Responsible Party: SUMMATION RESEARCH INC.

Address: 3950 DOW ROAD
MELBOURNE FL 32934-9215 USA

Tel: +1 (321) 254-2580

Fax: +1 (321) 254-2492

Printed Name/Title: Todd Gross / Director of Marketing

Signature: 

Product Description: DUAL RECEIVER TRANSCEIVER

Model Name: STR-1820, STR-1821, STR-1830, STR-1840, STR-1835

Trade/Brand Name: STR-1821

Applicant: SUMMATION RESEARCH INC.

Address: 3950 DOW ROAD
MELBOURNE FL 32934-9215 USA

Report Number: S\SUMMATION RESEARCH\2001UT11\2001UT11TestReport.doc

Date: 8/31/2012

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Summation Research Inc

Summation Research, Inc Is

- ***A QUALIFIED SMALL BUSINESS VENDOR***
- ***LOCATED ON THE HIGH TECHNOLOGY SPACE COAST OF FLORIDA***
- ***DEDICATED TO PROVIDING ON-TIME AND APPROPRIATE SOLUTIONS TO THE CHALLENGES OUR CUSTOMERS PRESENT***
- ***FOUNDED ON THE FIRM BELIEVE THAT SMALL COMPANIES CAN EFFICIENTLY PROVIDE RAPID RESPONSE, LOWER COST SOLUTIONS TO LARGER COMMERCIAL CORPORATIONS OR GOVERNMENT AGENCIES.***

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- ***PRIVATE LAND MOBILE RADIOS***
- ***SATELLITE TELEMETRY AND COMMUNICATIONS EQUIPMENT***
- ***AUTOMATED PRODUCTION TEST EQUIPMENT***
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CONTACT ANY OF OUR AUTHORIZED REPRESENTATIVES

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