Beyond HMI

Reach Beyond Your Old HMI

October 24, 2015

Federal Communications Commission

Re: Theory of Operation for device 2AF59-REACH10

To Whom It May Concern:

The subject device (brand named "Reach") is intended to provide a remote operator interface for industrial control devices such as remote terminal units (RTUs) and Programmable Logic Controllers (PLCs). The Reach device connects to an RS-232 port of the industrial controller and provides a radio link (conforming to the Bluetooth 4.0/"BLE" standard) to any portable device (smart phone, tablet, or portable computer). Software programs in both the Reach device and in the portable device allow a human operator to experience a touch-screen monitoring/control experience while being remotely located (within about 30 meters) from the industrial device.

The Reach device is powered by a wide-range (8-32 VDC) direct current power source.

A microcontroller (ATMEL ATMEGA 2560) within the Reach device utilizes a 16.0 MHz resonator as a "system clock". The microcontroller interfaces with an external RTU/PLC via an RS-232 port using an RS-232 signal receiver/driver Integrated Circuit (IC). The microcontroller stores configuration information in EEPROM memory using an "Inter-Integrated Circuit" (I^2C) interface.

The microcontroller interfaces with a "Single Chip Bluetooth Low Energy Peripheral Device Solution" (Nordic NRF8001) IC. A 16.0 MHz oscillator provides a reference frequency for the RF transceiver of the NRF8001. A 32.768 kHz oscillator provides protocol timing for the NRF8001. The 2402 MHz-2480 MHz ("2.4 GHz") RF signals associated with the NRF8001 transceiver are interfaced to an external 6dBi antenna via an SMA-RP jack on the Reach.

Shortly after energizing the circuit, the NRF8001 begins advertising a BLE "virtual serial port" (VSP) interface. A software program installed on the portable device searches for this interface and requests a connection. Once the BLE "connection" is negotiated between the NRF8001 and the portable device, the Reach microcontroller begins interaction with the portable device via the VSP interface.

The Reach microcontroller receives requests and instructions from the portable device via the VSP interface. The Reach microcontroller converts these requests and instructions to communications signals – in the native protocol of the RTU/PLC – which are transmitted via the RS-232 physical serial port. The RTU/PLC's responses are subsequently processed by the microcontroller and responses are provided to the software program in the portable device via BLE radio signals generated by the NRF8001.

This series of communications links allows a human operator to visualize and/or manipulate data parameters within the RTU/PLC without having to be immediately adjacent (within arm's reach) of the industrial control panel. The Reach device thus improves operator safety and productivity.

Sincerely,

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