

February 27, 2007

## TEAM UPDATE #15

### GENERAL NOTICES

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Innovation First  
FOR IMMEDIATE RELEASE  
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#### **FIRST Robotics Competition Radio Modem Re-Programming Information**

We would like to address the growing concern within the *FIRST* community about the integrity of the new IFI Radio Modems used in this year's system. As with any new product or technology taken to production for the first time, we have identified several issues that may affect the performance of the overall system.

We have taken the feedback received VERY seriously, and have been tirelessly researching to figure out exactly what problems teams have experienced. There is not one single large problem, but instead there are several smaller ones which contribute to the sporadic issues some teams have seen. Now that we have a better handle on what our users have been experiencing, we are prepared to address the issues present in the system.

The intent of this communication is to inform the community of the issues we have found, the symptoms, how best to address these issues and the impact this will have on the teams. Many teams will not experience any glitches, however to prevent problems from occurring at competition we hope every team educates themselves and implements the solutions described below.

**In short, each team will need to have their RC radio re-programmed at competition by the IFI staff. Each team will also need to update their RC with RC Master Code v.15 before competing.** For technical reference, the following is a list of the issues reported and confirmed by our engineering staff along with some background, the issue identified, and the solution.

#### **Problem 1: Robot Doesn't Disable Correctly**

Background: The RC Radio receives a packet of data from the OI, buffers it, and then sends it down to the RC.

Issue Identified: If the new RC radio missed a packet from the OI, it sent the previous (or "stale") packet again to the RC. If the total link was lost, these stale packets were sent until a time-out period expired. The Disable command never made it to the RC due to the lost link. The previous radio did not send stale packets.

Solution: RC Master Code v.14 addressed this problem by detecting stale packets received by the RC and discarding them.

#### **Problem 2: Long Robot Drop-Outs (~8 seconds)**

Background: Upon power-up, the RC system scans all 40 channels looking for its pre-

programmed Team Number. Once it finds the channel that the OI is transmitting on, the RC locks to that channel, stores the channel in EPROM, and will never scan again until “reset” either manually or by power cycle. It always starts the scan on power-up with the last number stored. The backup battery prevents a “reset” on voltage fluctuations of the main battery.

Issue Identified: If you have a dead or missing backup battery, and the main battery voltage fluctuates causing a reset. The new RC Radio may miss the first command after a reset, thus skipping the correct channel and causing the RC to scan through all 40 channels until it returns back to the correct one. This scan takes about 8 seconds.

Solution: RC Master Code 14a addressed this problem by initializing the radio for a command, thus it will not miss scanning the initial and in this example the “correct” channel. It also tells the RC to dwell three times as long on the initial channel before starting a full scan.

### **Problem 3: Short Robot Drop-Outs (200ms drops)**

Background: There are two RF radio links per system, the link from the OI to the RC (primary link), and the RC back to the OI (return path). The primary link uses the metal antennas on each of the radios. The return path uses internal antennas on each of the radios. Also note that in order to be able to hot-swap OI radios, the OI will send an initialization command to the OI radio if it is not receiving data on the return path.

Issue Identified: Due to the return path using internal antennas, the link is more susceptible to radio placement and orientation. If there is interference or data loss on the return path (the OI cannot hear the RC), then the OI will re-initialize the OI radio and this interrupts the OI transmission, thus causing about a 200ms drop at the RC.

Solution: Ideally we would re-program the master code in the OI to disable this feature. Since the OI is not externally programmable and requires special hardware, logistically it may not be feasible to re-program at competitions. Currently this issue has been successfully addressed by mounting both the case and the antenna vertically on the robot. The internal antenna is located on the opposite side of the metal antenna and should be mounted away from metal or motors.

### **Problem 4 – Data Loss (Cause 1 – Needs Re-Tuning)**

Background: Radios produced this year contain one of two firmware versions. Approximately the first 200 production units have v.3 radio code, while the remaining units have v.5 code. The v.5 code addressed some “command data” issues as well as it automated the VCO tuning process in production.

Issue Identified: The v.3 radios are more likely to have intermittent transmissions due to a manual alignment process of the internal VCO. The latest v.15 of RC code requires the new “command data” fixes or the intermittent issue gets worse.

Solution: Must reprogram radios to v.5 or greater.

### **Problem 5 – Data Loss (Cause 2 – Needs Updated RC Radio Firmware)**

Background: Data packets from the OI to the RC come every 26ms. The RC must synchronize itself with the OI’s data timing and baud rate.

Issue Identified: The timing window for synchronization was too tight. The new Radios have a different variance in timing.

Solution: Reprogram radios with v.6 which widened the sink window.

## **Frequently Asked Questions:**

Q: Why did IFI design a new Radio?

A: The old radio used a 900 MHz RF module designed and produced by Uniden. This module has been discontinued due to obsolete parts, as well as the move to higher frequencies in the cordless phone market. This redesign was not by choice, it was by necessity.

Q: Why can't we just use the old radios at competition?

A: The two radios (old vs. new) will not be compatible on the same field. If updating all of the team's hardware becomes logistically not possible, we may explore the options of using the old radio at competition.

Q: Do we have to update our RC?

A: It has not been made mandatory at this time. However, those teams that choose not to update will be competing with a system that cannot be monitored by the IFI staff. The v.15 code has updated diagnostic features used to monitor the robots during a match. Therefore diagnosing or verifying problems will not be possible and teams will be on their own for technical issues.

Q: Do cellular phones interfere with the IFI Radio?

A: Yes, we have recorded instances of cell phones interfering with the IFI radio. Based on our testing, we have found this only occurs within distances of approximately 3 feet. We successfully ran the "Winter Warzone" scrimmage event with a setup identical to that of an FRC regional with virtually no problems. We do not anticipate this to be an issue at competition.

For more information or questions not answered in this update, please contact [info@ifirobotics.com](mailto:info@ifirobotics.com).

### **Section 0 - Introduction**

No changes.

### **Section 1 - Communication**

No changes.

### **Section 2 – Team Organization**

No changes.

### **Section 3 – At the Events**

No changes.

## Section 4 – Robot Transportation

No changes.

## Section 5 - The Awards

No changes.

## Section 6 – The Arena

No changes.

## Section 7 – The Game

**Section 7 – The Game, Rev F** has been modified to include the following changes:

Rule <G48> has been updated to state that:

Only the HUMAN PLAYERS may enter a RINGER or SPOILER onto the field once the TELEOPERATED PERIOD **begins**.

**(Section 7 – The Game, Rev E was incorrectly updated)**

## Section 8 – The Robot

No changes.

## Section 9 – The Tournament

Rule <T06> allows for the Head Referee to assign a YELLOW CARD to a team for exhibiting egregious behavior. Examples of egregious behavior include, but certainly are not limited to, the following:

- a) Behaving in an unsportsmanlike manner repeatedly or after receiving a warning
- b) Damaging the field repeatedly
- c) Ramming robots repeatedly and/or excessively
- d) Using foul language and/or gestures while on the field
- e) Tipping robots repeatedly and/or excessively
- f) Forcing your opponent to commit a rules violation
- g) Gaining an advantage by breaking a rule repeatedly and/or excessively

## Section 10 – Kit of Parts

### **Correction in Team Update #14:**

We incorrectly referred to the Allen-Bradley terminal blocks in Team Update #14. Please note that the **Rockwell Automation Terminal Blocks** are required per the Power

## Distribution Diagram.

### Replacement Parts:

*FIRST* recognizes that there may be issues at your event in which you may require replacement parts of which you do not have extras. For this reason, we offer a Spares Case at each event. The case is stocked with various items that your team may need in case of an emergency. Some of the items are consumables, but others will not be given out unless you exchange your damaged part for the new part (these parts have the superscript “<sup>Exc</sup>” after them in the list below).

Other parts are loaned parts and must be returned after the event (notated in **bold text** with the superscript “<sup>Ret</sup>” after its name). Teams must have written approval from the event’s Innovation First representative in order to borrow Innovation First items. *If these are not returned, FIRST will charge the credit card submitted upon the loan.*

The following components may be available at the Spares Case at your event. Please remember that there are limited quantities, and that they are distributed on a first come first serve basis. While *FIRST* will make every effort to keep the Space Case as fully stocked as possible, we cannot guarantee that every item will always be available. It is incumbent upon each team to obtain and bring any spare/replacement parts that may be critical to the operation of their robot, and only rely upon the Spares Case as a resource of last resort.

120A circuit breakers <sup>Exc</sup>	Denso motors, R or L <sup>Exc</sup>	Norgren relief valves <sup>Exc</sup>
20A breakers <sup>Exc</sup>	end anchors	Nylon washers
30A breakers <sup>Exc</sup>	end barriers	<b>Operator Interfaces<sup>Ret</sup></b>
40A breakers <sup>Exc</sup>	FESTO valves <sup>Exc</sup>	Parker cylinders (2006)
6 AWG Wire, black	FisherPrice motors <sup>Exc</sup>	pivot bracket sets <sup>Exc</sup>
6 AWG Wire, red	Globe motors <sup>Exc</sup>	pneumatic tubing
9-pin cables <sup>Exc</sup>	Keyang couplers <sup>Exc</sup>	<b>Radio modems<sup>Ret</sup></b>
AM battery plugs	Keyang motors, R or L <sup>Exc</sup>	<b>Robot Controllers<sup>Ret</sup></b>
backup batteries/chargers <sup>Exc</sup>	latex tubing	red terminal blocks
BaneBots gearmotors <sup>Exc</sup>	lead screws <sup>Exc</sup>	solid state relays
BaneBots motors <sup>Exc</sup>	<b>LEDs<sup>Ret</sup></b>	rod/clevis kits <sup>Exc</sup>
Battery connectors <sup>Exc</sup>	Lg muffin fans <sup>Exc</sup>	SMC double valve <sup>Exc</sup>
bearings <sup>Exc</sup>	Loctite	SMC fittings
black terminal blocks	Mabuchi motors <sup>Exc</sup>	SMC single valve <sup>Exc</sup>
brass fittings	microswitches <sup>Exc</sup>	<b>Spike relays<sup>Ret</sup></b>
carrier plates (transmission) <sup>Exc</sup>	Mini muffin fans <sup>Exc</sup>	Teflon tape
center jumpers	Monnier regulators <sup>Exc</sup>	tie wraps, 4"
CIM keys	Nason pressure switch <sup>Exc</sup>	vibration isolators
CIM motors <sup>Exc</sup>	Norgren bracket	<b>Victors<sup>Ret</sup></b>
Clippard tanks	Norgren gauge	WIKA pressure gauge <sup>Exc</sup>
Denso couplers <sup>Exc</sup>	Norgren regulator	

## Documents and Updates

No changes.

## 2007 FIRST Guidelines, Tips, and Good Practices

No changes.

## ***The Question & Answer System***

No changes.