ROBOTICS DESIGN SYSTEM

VEXnet Field Control System User Guide

VEXnet 802.11g

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VEXnet Field Controller System Overview

The VEXnet Field Control System is used to control multiple VEX teams at a competition or scrimmage. It may control both 75MHz transmitters and VEXnet transmitters in any combination.

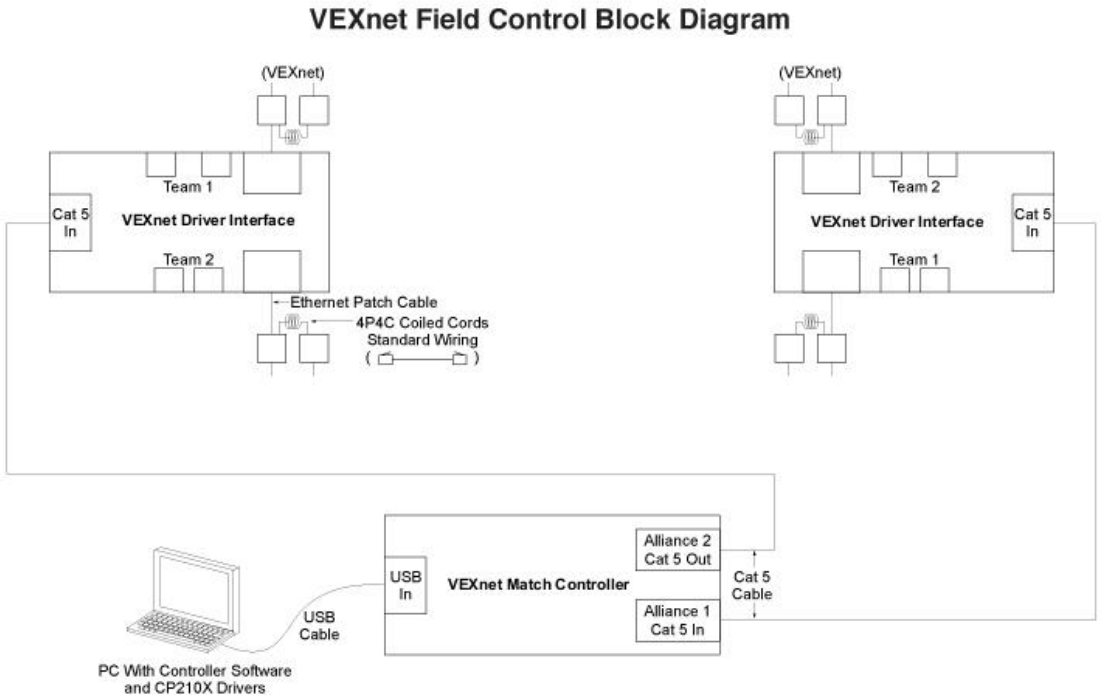
Software Installation

DO NOT attach the Match Controller to the PC unless you have first installed the VEXnet Field Control Software and the USB drivers per the installation documentation. Currently the software is written for PC compatible machines running Microsoft Windows. Most testing has been done with Windows XP.

For ease of use, you may create an icon to put on the desktop for the VEXnet Field Control Software. On the PC, click “start”, “All Programs” and navigate to the “Innovation First” call-out. The “VEXnet Field Control” shortcut will appear next to the arrow. Right click on “VEXnet Field Control” and click on “Create Shortcut”. Right click on the “VEXnet Field Control (2)” shortcut you just created and drag it to your desktop. The name may be changed to eliminate the “(2)”.

Equipment Setup – VEXnet only

Connect the Field Control equipment per the block diagram below.

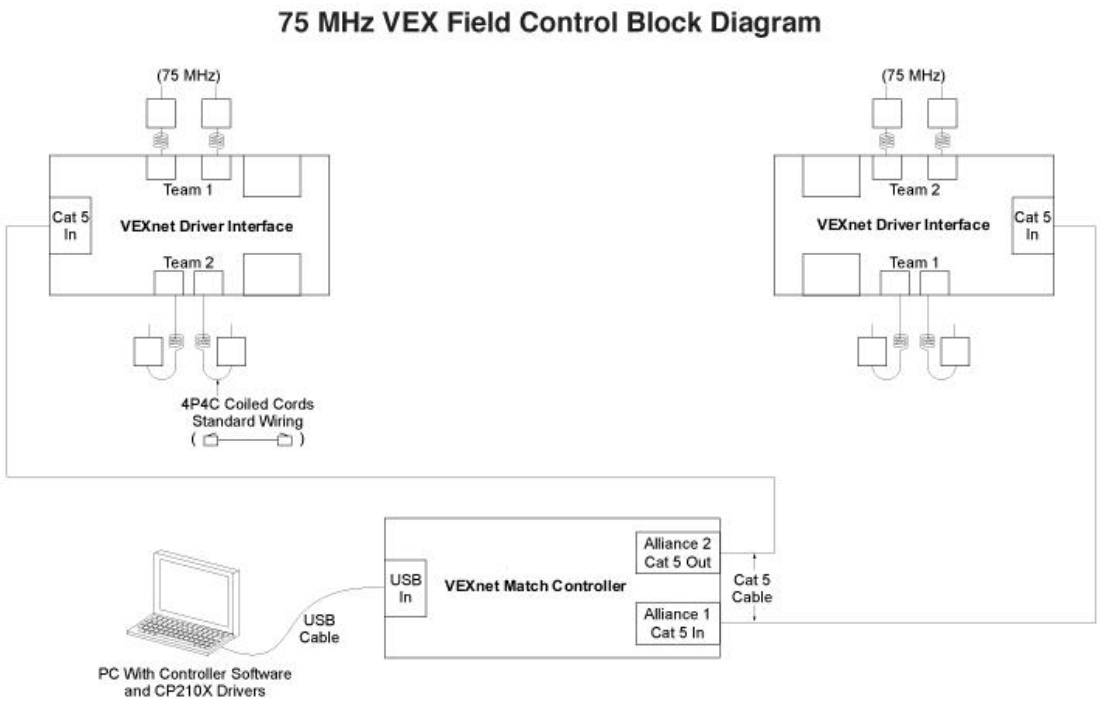


After the VEX Robotics Match Controller is attached to the PC you may open the VEXnet Field Control Software. Connect the VEXnet Driver Interface boards to the Match Controller using Ethernet cables. When the VEXnet Driver Interface board is plugged in, its “Disabled” LED will illuminate amber and the associated Match Controller LED will illuminate green. Otherwise, the Match Controller will illuminate red indicating a connection problem between the Match Controller and the Driver Interface boards. After you have verified a good connection between the two boards, try closing and then restarting the VEXnet Field Control Software to get a yellow “Disabled” LED on the Driver Interface. Connect Ethernet cables from the associated VEXnet Driver Interface to the VEXnet Joystick COMPETITION ports. A second Joystick may be connected to the primary Joystick via a 4-wire-4-contact (4P4C) handset cable.

Refer to the official game documentation for any over-riding or extra requirements.
Refer to Appendix A for images of the physical equipment setup.

Equipment Setup – 75MHz VEX only configuration

Connect the Field Control equipment per the block diagram below.



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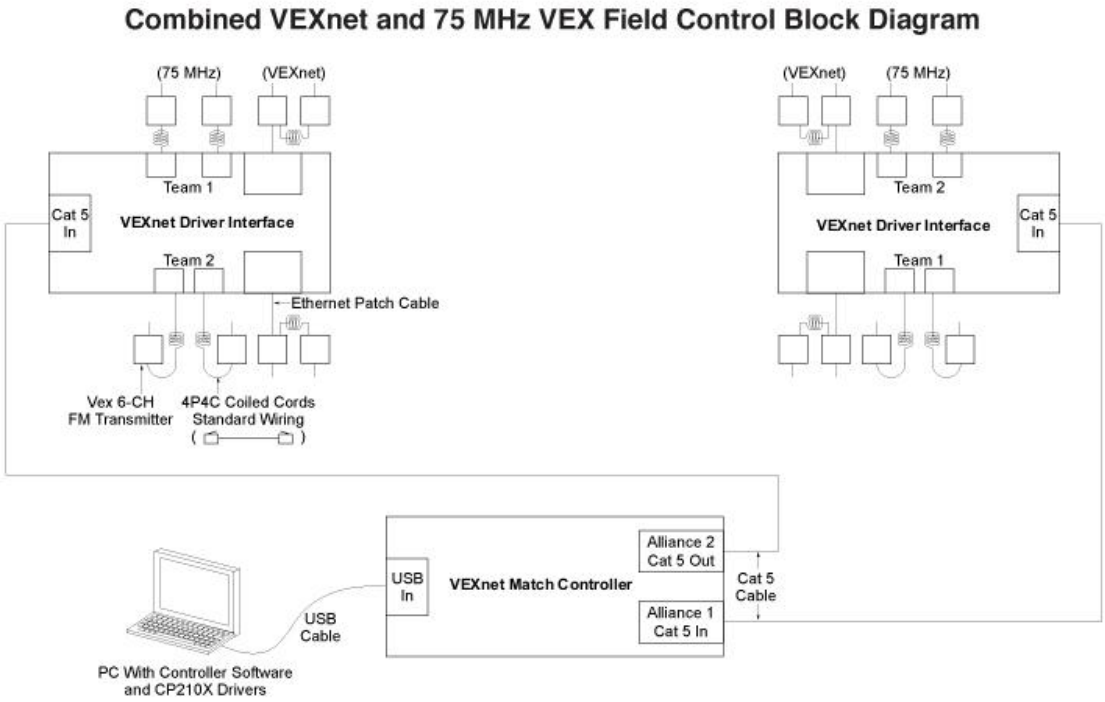
Control Software to get a yellow “Disabled” LED on the Driver Interface. Connect 4P4C handset cables from the VEXnet Driver Interface board to the associated VEX V.5 (75MHz) FM transmitters. If the competition has an autonomous period, the robot must be programmed with the associated template. Crystal management with the 75MHz system is required to prevent frequency interference.

Refer to official game documentation for any over-riding or extra requirements.
Refer to Appendix A for images of the physical equipment setup.

Equipment Setup – Combined VEXnet and 75MHz VEX

Connect the Field Control equipment per the block diagram below.



After the VEX Robotics Match Controller is attached to the PC you may open the VEXnet Field Control Software. Connect the VEXnet Driver Interface boards to the Match Controller using Ethernet cables. When the VEXnet Driver Interface board is plugged in, its “Disabled” LED will illuminate amber and the associated Match Controller LED will illuminate green. Otherwise, the Match Controller will illuminate red indicating a connection problem between the Match Controller and the Driver Interface boards. After you have verified a good connection between the two boards, try closing and then restarting the VEXnet Field Control Software to get a yellow “Disabled” LED on the Driver Interface.

For VEXnet Joysticks, connect an Ethernet cable from the associated VEXnet Driver Interface to the Joystick COMPETITION port. A second Joystick may be connected to the primary transmitter using a 4P4C handset cable.

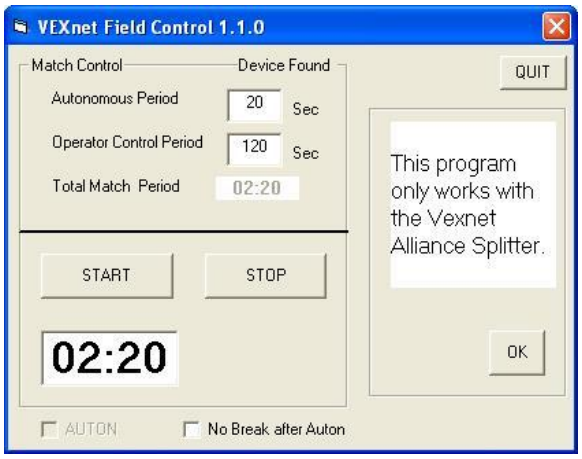
For 75MHz transmitters, connect 4P4C handset cables from the VEXnet Driver Interface to the associated VEX V.5 FM transmitters. If the competition has an autonomous period, the robot must be programmed with the associated template. 75MHz and VEXnet systems can be used concurrently. Crystal management with the 75MHz system is required to prevent frequency interference.

Refer to official game documentation for any over-riding or extra requirements.
Refer to Appendix A for images of the physical equipment setup.

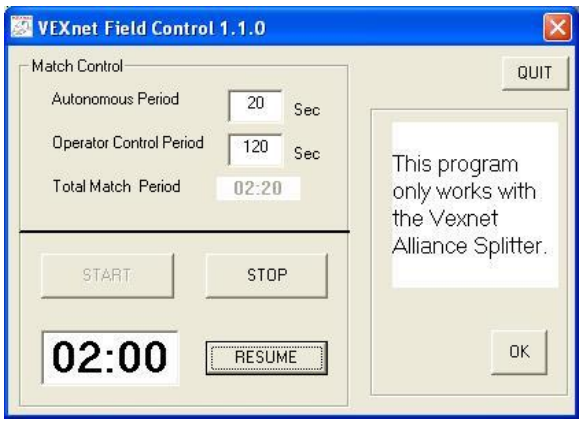
VEXnet Field Control Software Operation

Open the VEXnet Field Control Software. If required, change the Autonomous Period and Operator Control Period to match the game requirements. Leave the "No Break after Auton" unchecked unless you want the VEX Robots to automatically continue operation after the end of the autonomous period.

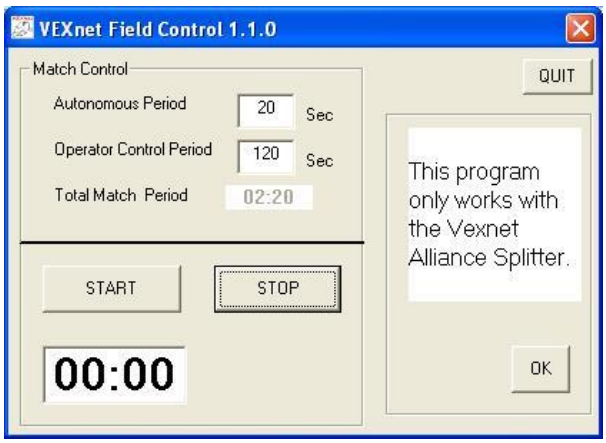
Press "START" to begin the match. Verify the Autonomous Mode LED illuminates green on the Driver Interface.



The next image shows a match that has finished autonomous and is ready to continue with the Operator Control Period. Verify the Disabled Mode LED illuminates amber, and the Driver Mode LED illuminates green after resuming the match. Press "RESUME" to continue the match.



The next image shows a match that has completed. The Disabled Mode LED should be amber once more. Press “START” to begin a new match.



Theory of Operation

The VEXnet Field Control System typically sequences through the game in five states: Disabled, Autonomous, Disabled (for autonomous scoring), Operator Control, and Disabled (end of match).

The 75MHz VEX Robots must have a special software template to allow for the sequencing. The software template will put the VEX Robots into Autonomous Mode for the first “X” seconds after powering on and a valid transmitter output is received. The value “X” is determined by the game requirement. After “X” seconds has elapsed, the VEX Robot software automatically goes into Operator Control Mode. The VEXnet Field Control Software turns “On” the 75MHz VEX transmitter outputs during the Autonomous and Operator Control Periods. It disables the VEX transmitter outputs until the autonomous template has finished. This means that robots can not be halted by the Field Control System during the autonomous mode.

The VEXnet Robots accept an Autonomous/Operator signal and an Enable/Disable signal from the VEXnet Field Control System. They do not need special templates to determine the run time of the Autonomous Period. The VEXnet Robots can be halted by the Field Control System at any time.

Normal Operation

Turn OFF all robots.

Turn OFF all transmitters.

Connect the VEX transmitters to the Driver Interface boards with the provided cables.

Verify the VEXnet Field Control Software timer is not running, or click STOP to turn the timer off.

Turn ON all robots. Place them in the starting position and configuration.

Turn ON all transmitters. If a robot moves, verify the 4P4C handset cable or Ethernet cable is properly attached to the transmitter.

Click on “START” on the VEXnet Field Control Software to start the game.

Click on “RESUME” on the VEXnet Field Control Software to resume the game after the Autonomous Period scoring has been completed.

Debugging - General

Verify that the transmitter and robot batteries are fully charged.

Close the VEXnet Field Control Software and reopen it if you have disconnected/reconnected the USB cable or if you started the software before connecting the VEX Robotics Match Controller to the PC.

Make sure that no interfering tasks are running, such as the VEXnet Tournament Manager Software. Also make sure there are no remnants of the VEX Field Controller and VEX Tournament Server in the notification area (typically the bottom right of the PC screen).

Debugging – VEXnet Robots

First, disconnect the VEXnet transmitter from the VEXnet Driver Interface. Turn on the robot and transmitter. Verify they link up by flashing green VEXnet lights on both the robot and transmitter. If not, perform the linking operation with a USB-A to USB-A cable between the robot and transmitter. Then connect the VEXnet transmitter competition port to the VEXnet Driver Interface using an Ethernet cable. The Robot and Transmitter GAME lights will show the state of the game: blinking yellow for Disabled, blinking green for Autonomous, and solid green for Operator Control. If the ROBOT light is blinking red, a charged backup battery needs to be attached. The no-backup-battery indication is not displayed if the transmitter is not attached to a controlling device at the COMPETITION port.

If robot action is erratic:

- Verify that the transmitter and robot batteries are fully charged.
- Verify the transmitter and robot will link together if not attached via the Field Control System.
- Close the VEXnet Field Control Software and reopen if you have disconnected/reconnected the USB cable or if you started the software before connecting the VEX Match Controller to the PC.

Debugging – 75MHz Robots

To check for a valid Autonomous/Operator Mode template in the 75MHz Robots, start with the robot turned OFF. Do not connect the VEX transmitter to the Driver Interface board. Turn on the VEX V.5 transmitter. Turn on the robot. Try to drive the robot within the first (X) seconds. If it moves then the template has not been programmed into the VEX microcontroller. Reprogram the robot with the valid template.

If robot action is erratic:

- Verify that the transmitter and robot batteries are fully charged.
- Verify that no two transmitters or receivers have the same crystal frequency.
- Verify the transmitter and respective receiver have the same crystal frequency.
- Verify that the competition crystals are being used and that there is a spacing of two crystal frequencies that are not being used between the crystals that are being used. Someone in the pits may be using the default or Set A or Set B crystals.
- Verify that the (75MHz) transmitter and receiver antennas are fully extended.
- Close the VEXnet Field Control Software and reopen it if you have disconnected/reconnected the USB cable or if you started the software and reopen it if you have

disconnected/reconnected the USB cable or if you started the software before connecting the VEX Robotics Match Controller to the PC.

Appendix A: Equipment Images

VEX Robotics Match Controller:

VEXnet 2.0 Transmitter Configuration:

VEXnet 1.5 Transmitter Configuration:

VEX 75MHz Transmitter Configuration: