



Integrated Systems and Control
Research and Development
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DATE: September 25, 2003
TO: PCM400I and PCMNET Users
FROM: Ron Follmer
RE: Firmware Upgrade Instructions

Revision History:
Sept 25, 2003 (revised instructions)
July 2, 2003 (orig)

Beginning with the PCM400I ISAC has permitted the field upgrade of the firmware that performs the basic operation of our controls. This allows the field upgrade of our product without changing hardware memory chips and without the need to return the control device to ISAC for upgrade.

Upgrading the firmware requires that the control must stop controlling the process that it has been programmed to control for the time that it takes to perform the upgrade. Therefore the user must ensure that the equipment being controlled is placed into a manual bypass condition that will be safe for the process during the upgrade procedure.

When the process begins, the control will place it's outputs in the same condition that would exist immediately after power was applied to the control, before the application programming has executed it's first control scan. For digital outputs this means that they would all de-energize, and analog outputs will go to their relaxed condition (varies by product).

The TriNet operating system machine code is held in Flash type memory which must be completely erased before it is reprogrammed. So when the process begins, the current firmware must be lost and replaced with the new version being loaded. This means that the process must be successful or the control will cease to function. For this reason, precautions are taken to ensure that this complex process will be successful. Precautions such as disconnecting external network connections and other communications ports are prudent to ensure that asynchronous attempts to communicate with the control will be prevented until the update process is complete.

One communications port will be used to perform the firmware transfer. The port can be the local RS232 user interface port (J3 on the PCMNET board, and J3 on the PCM400I board), or the Modem port (J4 or on-board Modem of the PCMNET board, and J4 or on-board Modem of the PCM400I board). Whichever port is used, the other will be disconnected. The firmware upgrade cannot be performed from the Ethernet port on the PCMNET or via dialup Internet connection.

The following steps will yield the best results for the upgrade of the TriNet control.

Step 1, Prepare the control system

1. Any loads being controlled by the TriNet control that must be placed in a safe condition during the upgrade procedure should be overridden manually to protect the integrity of the process being controlled. One way to determine which loads should be overridden, would be to turn the power off just to the PCM control board by using the on-board power switch and putting it in the OFF position. This will simulate the condition of the controlled loads during the firmware load process which lasts approximately 25 minutes. Loads which do not go to an acceptable state (either ON or OFF depending on the system being controlled), should be manually overridden to a safe condition.
2. Power OFF the PCM control board.

Step 2, Prepare the PCM400I or PCMNET board connections

1. With the exception of the serial/Modem connection to be used during the firmware loading process, all other communications cables should be unplugged from the TriNet controller.
2. Disconnect local network connections (ie Modbus RS485 terminal strip), and the Ethernet RJ45 cable should be removed. Remove any serial user interface port connections not being used for the upgrade process. If the local RS232 port is used for the upgrade, then disconnect the Modem cable (serial cable or telephone cable if an on-board Modem is present).
3. Disconnect any other I/O terminal strips (unpluggable terminal strips) that are being used to connect to sensors and other I/O devices.

Step 3, Setup a computer and ISAC's ITERM software

1. To perform the firmware upgrade, you must use ISAC ITERM software (version 1.01E4 or higher) available from ISAC. ITERM can be installed on PC computers using Microsoft Windows 95, 98, NT, 2000, and XP Operating Systems. ISAC does not fully support the use of Microsoft's Windows Me. ITERM may be installed on computers using the Microsoft Me Operating System, but some functions will not work on this operating system (the firmware upgrade will work properly however).
2. If you are using a direct RS232, computer to computer, cable connection (ie J3 of the PCMNET to a Laptop computer), you **MUST** use a Null-Modem cable to make the connection. A Null-Modem cable is one designed to re-arrange the wires in the cable when two computers are connecting to each other without Modems. ISAC recommends using the direct RS232 connection to perform the upgrade as it is the most direct and trouble free connection.
3. Power ON the PCM control board.
4. Run ITERM, and if not already defined, define a site that is configured for 9600 baud that will be used to connect with the TriNet System. Connect with the PCM

control using this site definition and verify that ITERM can communicate with the PCM control.

5. Obtain a correct firmware file from ISAC that will work in the control being upgraded. Firmware files are *.BIN named files. Caution: The correct firmware must used, the wrong product file will make the control inoperable and you will have to return the control board to ISAC for repair.
6. Backup the existing TriNet programming from the site as it may be necessary to re-load the site programming after the firmware upgrade. This is very important!!! When upgrading the firmware to a new version that has a different basic number, such as from v7.11 to v7.20, the current program backup in on-board Flash memory IS NOT compatible and will not be automatically loaded after the firmware update is completed.

Step 4, Perform the new firmware upgrade

1. Connect with the PCM control using ITERM and enter the password to logon to the control.
2. You should perform a program backup to the computer if you haven't done so. To perform a programming Backup to the computer, go to the Run Mode Menu or Password screen, and select the "Actions" menu and select "BACKUP Trinet Programming from Site".
3. From the Program Mode Menu, use the "S" menu to save the current application programming into the Backup program storage. This will make it possible (if the version numbers do not change) for your current application programming to be restored once the new firmware is loaded.
4. From the Program Mode Menu, use the "S" menu to clear the existing working program. Use the "5" choice to clear the current programming in the RAM memory of the control. Once this is done, go to the Run Mode Menu.
5. Perform the firmware load. From the Run Mode Menu or the Password screen, pull down the "Actions" menu and select the "SEND New Firmware using Boot Loader Mode" pick. ITERM will prompt for the firmware file to send, it will be a file named "bromxxx.bin" where xxx is the firmware revision number. A PCM400I will have a revision in the 6xx range, and a PCMNET will have a firmware revision in the 7xx number range. If you are connected via the local RS232 port of the PCM, the firmware load will occur immediately. If you are connecting via Modem, the process requires the Modem connection to logon, then disconnect and re-dial into the control again. This occurs automatically. The ITERM screen will show "Working, Please Wait" while the process completes.
6. At the end of the firmware load process, if connected via Modem, the PCM control will automatically disconnect the Modem connection if used and ITERM's status line at the bottom of the main window will show that the connecton failed with a "no carrier" message. This is normal. If the connection was via the local RS232 port, ITERM will just remain on-line and the big "TRINET" password screen will be displayed.

7. Reconnect with the PCM control if necessary. If the previous Trinet programming has not been automatically loaded from the backup flash memory, perform a load from Backup from the Program Mode Menu, "S" pick. If the revision of the new firmware is incompatible with the previously saved Backup flash program, an error will be reported and you will have to re-load the Trinet Programming from your computer's disk.

Step 5, Complete the process, reset the connections and the control

1. Assuming a successful load and re-program operation, remove power from the PCM control board and re-connect all the terminal strips and communication cables that had been removed prior to the procedure above.
2. Power up the PCM control and verify the proper operation using ITERM to monitor the application programming.
3. Remove any manual overrides that were done in preparation of the firmware load. This should restore proper operation to the site.
4. DONE.

(PCM_firmware_upgrade_procedure.doc)