

# Battlefield Communications

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## Challenge

The Combat Net Radio (CNR) is a single channel, tactical radio system used by the Australian Defence Force. Developed with the fast moving modern battlefield in mind, the efficient and intelligent co-ordination of communications is a vital factor in success. As in any communications system, a thorough and structured approach to maintenance and repair of the individual elements is crucial.

CPE Systems was approached to develop a test system that dramatically improved the turn around time for fault detection and analysis of CNRs in the field. The CNR system needed to be supported by a state-of-the-art transportable Field Repair Facility (FRF) which incorporated computer controlled automated test equipment. This would allow the radio units to be repaired and put back into the field as quickly as possible.

## Solution

The combination of custom and COTS hardware and custom software made the design of the FRF upgrade smaller, faster and more expandable than the previous system. The FRF is controlled via PXI (PCI eXtensions for Instrumentation). PXI combines commercial PC technology with rugged industrial packaging and instrumentation to provide a complete, customisable, test and measurement solution.

The FRF PXI consisted of a system controller running Windows 2000 and an array of modular instrumentation including oscilloscopes, multimeters and analogue and digital I/O. A flat screen monitor, keyboard, and microphone were connected to the PXI for easier user interaction with the test system.

The test system software developed for the FRF was installed on the PXI controller. External, stand-alone instrumentation including a signal generator, spectrum analyser, RF power amplifier and power supply were integrated into the system. GPIB and Ethernet were used for communications between the stand-alone instruments and the controlling PXI.



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# Improvements

CPE made many improvements to the test system:

- TestStand managed to reduce the original Basic code by 75%
- The specification tests were broken into logical blocks of subtests so that a failure at a particular point provided the operator with several options including repeat, continue or select a particular suite of diagnostic tests
- A five-fold increase in storage space in the shelter

# Custom Design

In order to connect the CNR under test to the system, three custom interface panels were developed by CPE Systems:

1. Main Interface Panel: routes audio, digital and control signals between the UUT and the PXI controller
2. Power Interface Panel: Supplies AC or DC power to the UUT
3. RF Interface Panel: Conditions the RF signals passed between the UUT, external instruments and PXI controller

LabVIEW was used to create the user interface and drivers to connect with the virtual and stand alone instruments. The original Basic code was converted into TestStand, and test scripts were written to run the various test sequences.

# Outcomes

While working to the strict standards of the military, CPE Systems was able to develop an upgrade with the following overall positive outcomes:

- Minimised disruption to operations due to easier fault diagnosis
- Reduced CNR downtime; repairs aimed at less than 60 minutes
- The completed system was easily duplicated resulting in eight mobile repair facilities and five static repair facilities being built for ongoing maintenance and repair of the CNR equipment

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