

## **Technical Supplement for Proximity Warning Unit (PWU)**

### **1. Objective**

The Program Executive Office for Simulation, Training and Instrumentation (PEO STRI) / Program Manager Training Devices (PM TRADE) currently has an operational fiber optic system at the US Army National Training Center (NTC). This fiber optic system is a critical infrastructure system and the backbone to the training and range Instrumentation System. This system enables critical data collection to support Force on Force (FoF) and Force on Target (FoT) training in an operational environment. This project is to develop and demonstrate a Proximity Warning Unit (PWU) prototype when digging operations occur at NTC. The prototype provides modern capabilities to alert in real time when digging operations detect a fiber optic cable nearby in the dig area and raises potential risk damage.

The NTC training network infrastructure is a modernized system and utilizes the cellular based Range Communication System (RCS) system. The RCS is composed of the cellular based 4G LTE network, Fixed Access Node towers and a supporting infrastructure. Fiber optic cables are the backbone and connect all of the Fixed Access Node tower locations in the training area back to the Core Instrumentation System (CIS) in the command center. These cables transport critical training data. This data becomes feedback shared to training units through After Action Reviews (AAR).

On the NTC grounds, digging operations occur from Military unit maneuvers during training events and/or commercial projects between training events. A PWU device is the first line of defense to prevent fiber optic cable damage during these possible digging operations. The intent of this PWU project is to provide effective warning to the digging operator when fiber optic cables are in close proximity before and/or during digging operations on day and night time. The PWU should be capable of operating as a stand-alone system. In addition, a possible integration with the NTC-Instrumentation Systems (NTC-IS) to provide near real time data PWU warnings to exercise control personnel through the instrumentation system network.

### **2. Demonstration Concept**

The demonstration will be a two phased approach. The first part of the demonstration will take place at the contractor's facility. The intent is to demonstrate the performance objectives of the PWU as much as possible before going to the NTC to conduct a demonstration on site with the actual fiber optic cable and Instrumentation System on the actual vehicles. The goal is to demonstrate functional performance in a controlled environment at the contractor's facility.

Following successful demonstration of functional performance in a controlled environment a second phase demonstration will be conducted in the operational environment at the NTC to demonstrate functional performance in detection of actual fiber locations on actual vehicle platforms in use at the NTC. For example, the functionality that will be demonstrated at the contractor's facility should include diagnostic capability, loading/modifying the fiber optic cable map data, alerts and alarms, power interface, user interface and meeting environmental conditions.

The NTC demonstration will concentrate on installation of the PWU on actual vehicle platforms and demonstrate the functionality and performance of the prototype to accurately alert the operator to the proximity of the fiber optic cable with alerts and alarms as its primary function. The demonstration will be performed on at least two vehicle types (military and commercial platforms) and show the mounting method, power interfaces, and the functional verification of operator alerts based on actual fiber optic cable locations.

3. For the final demonstration the Government Furnished Equipment (GFE) will provide:

- a) Vehicle(s) for the demonstration of installation and operation
- b) The area of optical fiber cable will be tested.

4. Documentation provided:

- a) Proximity Warning Unit User Manual ( for Reference)
- b) PWU ICD (for Reference)
- c) Master Disk MD290229 DWU firmware (for Reference if needed).

5. Performance Objectives for PWU:

The PWU should meet the following requirements with the ability to be updated to meet future needs. The Performance objectives for the PWU should include:

- a. The primary requirement is to warn operators of their imminent proximity to the fiber optic cable. The PWU is to interface with multiple digging platforms both military and commercial.
- b. The PWU should provide for two levels of alerts. The first is called the "Proximity alert" and, as a vehicle approaches the fiber optic cable from a far distance, is the first indication that the vehicle is nearing a fiber installed location. The default threshold value for the proximity alert is set at 30 meters. If the vehicle is within 30 meters or closer to the fiber optic cable, the PWU's Night Vision compatible LED will begin to flash at about a 2-second rate and audio alert will beep at about a 5-second rate. The second alert is called the "Critical alert". The default threshold value for the critical alert is set at 10 meters. It will come into

effect when the vehicle is within 10 meters from the installed fiber location. Both the LED and audio alert will activate at approximately a 0.5-second rate.

- c. The threshold detection values and alert rates should be programmable and allow for changes through a user interface.
- d. Provide real time alerts to digging operators and near-real time alert's to exercise control personnel.
- e. The PWU should provide a user interface that provides the operator an ability to change detection values and alert rates, diagnostic capability and modification of the fiber optic cable location database as new fiber optic cable is installed at the NTC.
- f. The system should utilize low cost internal commercial-Off-The-Shelf (COTS) Global Positioning System (GPS) for the PWU. The PWU will use the real time GPS to compare the position of the optical fibers cable from the database to the current position. Consideration should be given to integration with the NTC-IS for near-real time monitoring and control, remote software and configuration changes.
- g. The PWU should provide a stand-alone capability to make changes to the software, configuration settings and updates to the fiber location data.
- h. The PWU should provide a standalone diagnostic capability for maintenance and sustainment operations. The diagnostic capability should provide status of all the functions and features allowing maintenance personnel to determine faults or repair actions needed to any part of the system.
- i. The PWU shall be compatible with the harsh NTC environment, and work in High (120 degrees F) and Low (20 degrees F) temperatures, as well as, withstand the dust and water conditions to meet IP64 or better.

## 6. Data Package

Final Data Rights and Intellectual Property considerations will be negotiated based on the selected contractor's proposed solution. It is the preference of the Government to receive the following deliverables at the end of this project:

- a) All source code required by the PWU.
- b) List of libraries used to build the executable code.
- c) Description of the build environment used to build the executable code.
- d) List of hardware and or components.
- e) Software description documents
- f) System design description documents.

- g) User Manuals
- h) Maintenance Manuals
- i) Technical Data Package to allow for diagnostic and repair (schematic diagrams, bill of materials, system design drawings)

## 7. Installation

The PWU should be able to be installed time in 30 minutes or less.

## 8. Rough Order of Magnitude (ROM)

The plan is to receive two prototypes for testing. Acceptance test for the prototype will be determined based on specification requirements. If the prototype passed tests an order for 50 units will be placed. The contractor will provide a Rough Order of Magnitude (ROM) price of producing 50 units of the prototype design.