Downrange Data with DSL

(Alternate Network Design)

Purpose

This Section describes the requirements for designing the downrange data network to support the use of Digital Subscriber Line (DSL) rather than the standard Ethernet based network.

Background

Standard Army target systems communicate over Ethernet based networks that limit the maximum distance between targets using the copper cables to 100 meters (328 ft.). Many standard Army range layouts have distances between targets much greater than 100 meters. This requires the use of fiber optic cables to meet the network infrastructure requirements. Many installations have had issues maintaining fiber optic cables and equipment due to the lack of the required skill sets at Range Operations. DSL is an alternative technology that enables high-speed network communications over a standard twisted pair copper data cable over longer distances. DSL network extenders allow the high speed data communication required by the target network system to operate over the copper cables at a much longer distance between targets.

General Requirements

The use of DSL extended networks is authorized for some range types with the prior approval of the RTLP-MCX and TCM Range. While DSL technology is evolving to support a greater maximum cable distances at higher bandwidths, the use of DSL extenders is limited on Army Ranges to 300 meters. DSL should not be employed on Army projects without coordination through TCM-Ranges and the target procurement agency during the development of the project design and planning documents. The requirements for the target network equipment are different from standard Ethernet based network ranges. Funding and contracts for the target equipment must be established to support the alternative network equipment required for these ranges.

The types of ranges currently authorized for DSL networks with prior approval are:

- Automated Field Fire Range
- Automated Record Fire Range
- Combat Pistol/Military Police Qualification Course
- Modified Record Fire Range
- Fire and Movement Range

- Squad Defense Range

Design Requirements

The use of DSL extenders does not require a significant change to the design of the electrical power and communications systems for standard ranges. The power requirements for the target systems are the same. The typical electrical components will be utilized as further defined in this section. All power cables and twisted pair copper cables will be the same as standard Ethernet controlled range. There will be not fiber optic cables or equipment used downrange when DSL extenders are used on the range.
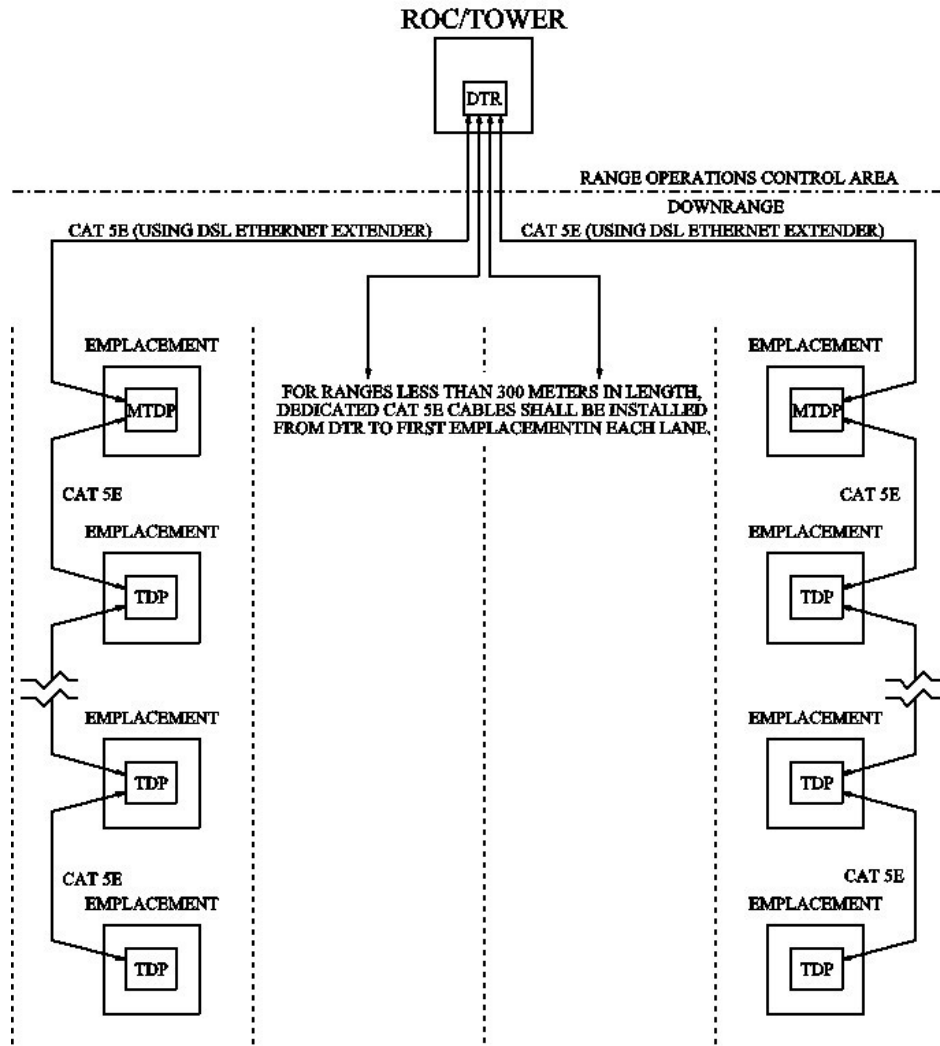
Refer to other sections of the Range Design Guide for all target emplacement, power, and twisted pair cable requirements for standard ranges.

General

The power and data cable routing of standard Ethernet controlled ranges should be utilized for DSL ranges. Power and data cables shall route down the range lanes such that the loss of any data line or branch circuit will only affect the targets on that lane. The use of DSL extenders will not alter the data cable routing other than is will allow twisted pair copper cables where data cable lengths exceed 100 meters (328 ft).

Data Distribution

The downrange data distribution shall originate the in the control tower and serve data downrange. The network will consist of network switches located in each target emplacement. Data cables will route to each lane individually connecting from target to target such that only one cable serves each lane. Under no instance shall data cables be permitted to be routed across lanes. Twisted pair copper cables, CAT 5E or better, shall be the only type of data cable used to supply data to all targets on DSL ranges.
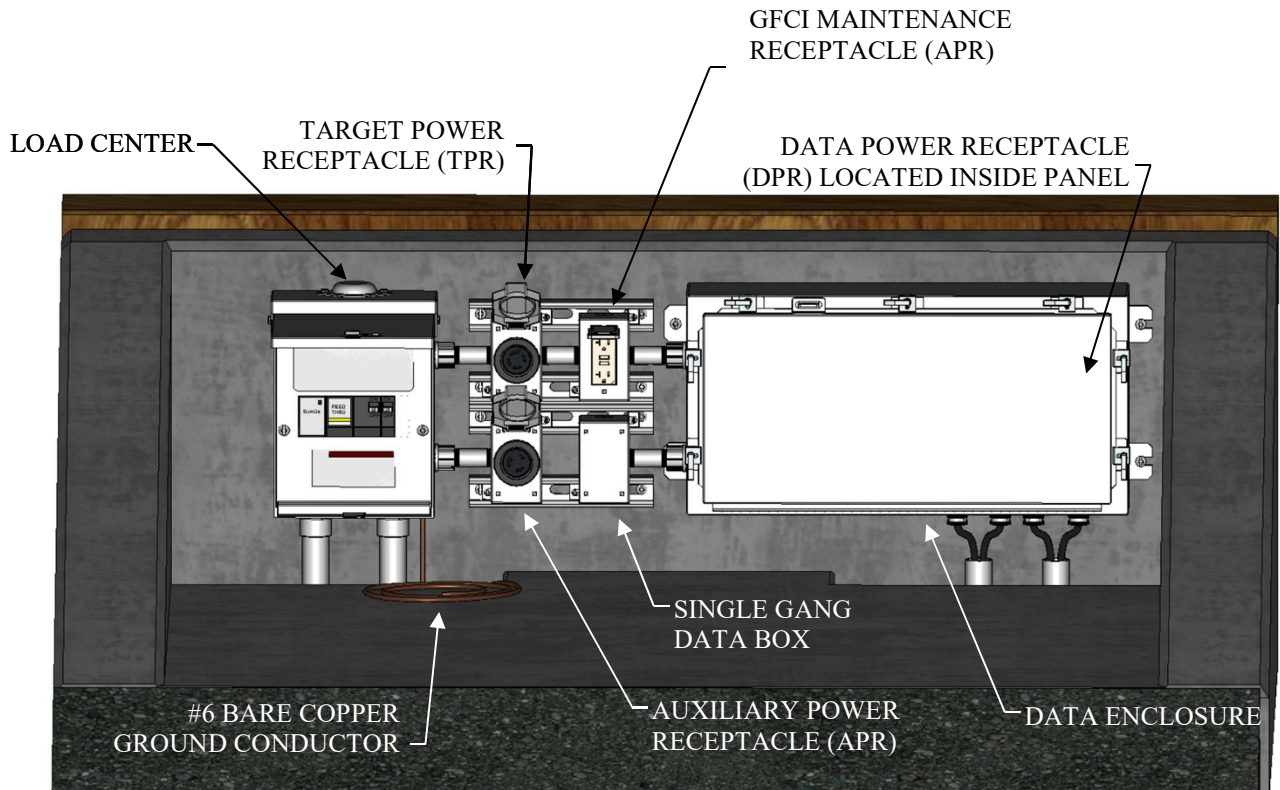
ROC/TOWER

DTR

RANGE OPERATIONS CONTROL AREA

DOWNRANGE

CAT 5E (USING DSL ETHERNET EXTENDER)   CAT 5E (USING DSL ETHERNET EXTENDER)

EMPLACEMENT   EMPLACEMENT

MTDP   MTDP

FOR RANGES LESS THAN 300 METERS IN LENGTH, DEDICATED CAT 5E CABLES SHALL BE INSTALLED FROM DTR TO FIRST EMPLACEMENT IN EACH LANE.

CAT 5E   CAT 5E

EMPLACEMENT   EMPLACEMENT

TDP   TDP

EMPLACEMENT   EMPLACEMENT

TDP   TDP

CAT 5E   CAT 5E

EMPLACEMENT   EMPLACEMENT

TDP   TDP

TYPICAL DOWNRANGE DATA RISER DIAGRAM

Power Distribution

Ranges utilizing DSL extenders have the same power requirements as Ethernet based ranges.

Target Emplacement Equipment

The Power and communication equipment requirements in the target emplacements are the same as Ethernet based ranges. The electrical equipment required in each SIT emplacement are the 1) Load Center (LC), 2) Target Power Receptacle (TPR), 3) Auxiliary Power Receptacle, 4) GFCI Maintenance Receptacle (MR), 5) and the data enclosure, along with the associated wiring and conduits which are not detailed in this document. A typical SIT elevation is provided in this section. See each target emplacement section of the Range Design Guide for more specific requirements of each target emplacement type.

LOAD CENTER

TARGET POWER RECEPTACLE (TPR)

GFCI MAINTENANCE RECEPTACLE (APR)

DATA POWER RECEPTACLE (DPR) LOCATED INSIDE PANEL

SINGLE GANG DATA BOX

#6 BARE COPPER GROUND CONDUCTOR

AUXILIARY POWER RECEPTACLE (APR)

DATA ENCLOSURE

REPRESENTATIVE SIT ELEVATION DRAWINGS (NOT TO SCALE)

There are two type of data enclosure utilized in target emplacements, Master Target Data Panels (MTDP) and Target Data Panels (TDP). Install MTDP data enclosures in target emplacements where DSL extenders are used due to cable distances to or from the next target emplacement exceeding 100 meters (328 ft.). Install TDP data enclosures where cable distances to or from the next target emplacements are less than 100 meters (328 ft.). As the design documents are developed for the construction of each range, it is critical that the MTDP and TDP enclosures are clearly defined in each specific emplacement to ensure the target networking equipment can be identified based on the cable distances between the target emplacements.

The configuration of the equipment inside the TDP shall be the same as the configuration in standard Ethernet ranges. The configuration inside the MTDP shall be the same as the TDP. The larger MTDP enclosure will provide additional space for the DSL extender that will be installed in addition to the target network switch. See the design drawings for Target Data Panels and DSL Master Target Data Panels for detailed requirements on how to construct each enclosure.

WIRING SCHEMATIC

————————————— PROVIDED BY MCA CONTRACTOR

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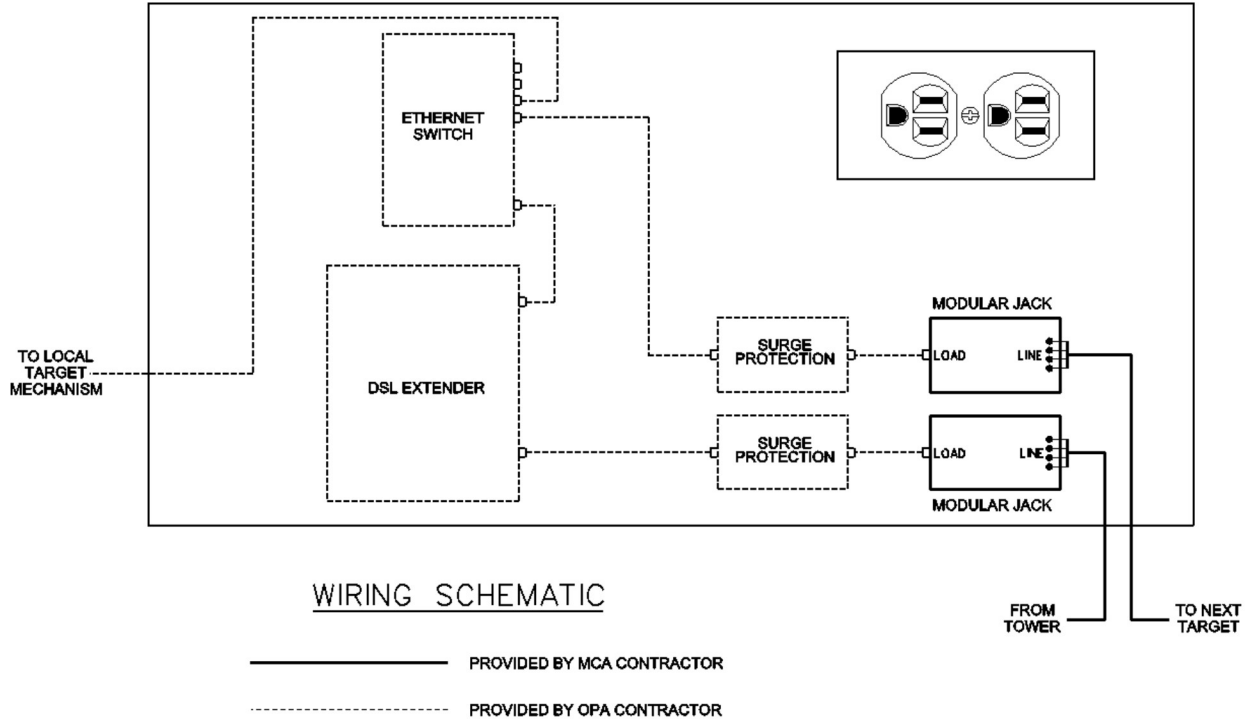
DSL MASTER TARGET DATA PANEL WIRING REQUIREMENTS (NOT TO SCALE)

Control Tower Requirements

The construction requirements inside the Control Tower are the same as Ethernet based ranges except that twisted copper cables are terminated in the Data Termination Rack instead of Fiber Optic Cables. The number of twisted pair copper cables entering the Control Tower is the same as the number of fiber optic cables on Ethernet based ranges, one cable per lane. Surge protection shall be provided for the data cables as required by article 800 of the National Electrical Code. This will require additional space to be utilized in the Data Termination Rack to mount these devices. It should be noted that this surge protection is not required on Ethernet based ranges with fiber optic serving data communications to downrange targets.