

# Substation Communications Equipment (SCE)



The Substation Communications Equipment (SCE) is the intelligent interface between the Central TWACS® Net Server (TNS) master station software and remote transponders in DCSI's TWACS® (Two-Way Automatic Communication System) power line network.

The SCE is comprised of communications and power equipment located within a utility distribution substation. It receives commands from the TNS, translates the commands to TWACS format, and couples them to the utility power network for transmission to the remote transponders. The SCE then decodes transponder response messages for transmission back to the TNS. The SCE autonomously performs TWACS network management functions, such as determining electrical path data for each transponder and synchronizing the date/time for all transponders.

Each SCE is a stand-alone communications hub,

capable of independently and simultaneously executing commands, receiving data, and transmitting results back to the TNS. There are no limitations on the number of remote transponders that may be accessed from a single SCE. One SCE may interface with up to 12 substation busses, with up to 128 individual inputs, and may simultaneously receive and decode up to six channels of inbound information from remote transponders. Throughput can be increased by installing additional receivers to permit each substation bus to operate independently. Further throughput increases result from the ability of the SCE to buffer and store up to 25 TNS commands and the resultant data. The SCE uses CRC error detection and Hamming error correction algorithms to ensure data integrity.

SCE to TNS communications are through a standard voice-grade communications link, carried on a variety of physical media (dedicated

telephone, dial-up telephone, microwave, hybrid fiber/coax, radio, etc.). Both public and private networks have been used — the choices are based on the utility's existing wide-area communications assets and other factors within their territories. An asynchronous, UCA\*-compliant protocol is used to maximize flexibility and to ensure that the system remains open and interoperable.

The SCE's major components are the Outbound Modulation Unit (OMU) and the Control and Receiving Unit (CRU). The OMU produces the TWACS outbound message (i.e., from substation to remote transponder) which commands a transponder to respond with remotely acquired data, take a control action, or download an internal parameter. The outbound signal is coupled to the substation bus through a distribution transformer, referred to as a Modulation Transformer Unit. The CRU component receives the inbound data from one or

more remote transponders, verifies the integrity of the data, performs any necessary communication retries and returns the data to the TNS. The inbound signal is coupled to the CRU through an Inbound Pickup Unit (IPU) inserted in the existing metering or protection CT circuit. The CRU is responsible for all communication between the substation and the TNS. Each substation requires one CRU and as many OMUs as there are independent busses. SCE components may be used indoors or outdoors. Enclosures are highly resistant to the effects of precipitation, high humidity, solar load/UV and a corrosive (salt) atmosphere. They can withstand ground potential rises and switching transients. The components contain surge protection to ensure equipment reliability and are interconnected using fiber optic cables for reliability in the utility substation environment, as verified by over 15 years of operational experience.

\* Utility Communication Architecture

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## Outbound Modulation Unit (OMU)



## Control and Receiving Unit (CRU)



| Functional Specifications  | Value or Range  |
|----------------------------|---|
| Line Voltage               | 120 VAC @ 50/60 Hz (small cabinet)<br>125VDC or 120VAC @ 50/60 Hz (large cabinet)   |
| Operating Temperature      | Indoor CRU: 0°C to +60°C<br>* option available for -40°C (small cabinet only)<br>Outdoor CRU: -40°C to +55°C<br>OMU: -40°C to +60°C<br>* option available for -50°C |
| Storage Temperature        | -40°C to +85°C  |
| Humidity                   | Indoor CRU: 0 - 95% non-condensing<br>Outdoor CRU: 0 - 100%, condensing<br>OMU: 0 - 100%, condensing  |
| Dimensions                 | Indoor small cabinet CRU: 33"H X 24"W X 21"D<br>Indoor large cabinet CRU: 72"H X 24"W X 18"D<br>Outdoor CRU: 33"H X 33"W X 21"D<br>OMU: 25"H X 30"W X 12"D          |
| EMI/RFI Susceptibility     | MIL-STD-461/462 @10 V/m   |
| AC Surge/Transient         | ANSI/IEEE C62.41-1991 Cat. B<br>ANSI/IEEE C37.90.1-1989   |
| EMI/RFI Emission           | FCC Part 15 Subpart J, Class A  |
| <b>External Interfaces</b> |   |
| Outbound Coupling MTU      | Bus voltages up to 46kV<br>Capacity up to 160 MVA/bus<br>MTU Secondary: 277/480 VAC ±20%  |
| Inbound Coupling           | Inbound Pickup Unit (IPU) in 5 Amp (typ) CT loop, either bus or feeder level; mounted either external or internal to CRU  |
| TNS to SCE Link            | RS-232, 1200-9600 bps, direct, modem, 2W/4W leased or dialup<br>Others: radio, microwave, fiber, cellular, satellite, IP-addressable                                |
| TNS to SCE Protocol        | Asynchronous ADLC (a UCA-compliant open protocol)<br>SCE firmware downloadable from TNS   |