

Telemetry And Transfer Trip

PG&E Distribution Interconnection Handbook

I. Applications

Before PG&E interconnects generators to its electric system, PG&E will specify the required protection and associated telecommunications systems. All protection and associated telecommunications equipment and channels must be operational before parallel operation can begin.

Due to the highly specialized and critical nature of direct transfer trip (DTT) equipment, PG&E recommends that it verify that this equipment is functional before PG&E can begin parallel operation.

The interconnecting generation facility personnel, or its representatives, are responsible for specifying the style it will use to meet the proper direct current (dc) voltage, the desired mounting configuration, and other pertinent substation hardware specifics.

If the generating facility requires PG&E's assistance in future maintenance, the facility must design and install the equipment for isolating and test switches that conform to PG&E's standards.

II. General Requirements

The generator is responsible for arranging, acquiring, and procuring the communication medium for transmitting of telecommunications and/or DTT protection signals according to PG&E's specification (switched and/or dedicated nonswitched). This includes alarm, status, and telemetry data. If PG&E and the generator mutually agree that the medium for protection, status, and alarms can be maintained on a leased circuit from the telephone company, the generating facility is responsible for making any necessary arrangements with the phone company.

The following types of circuits may be required between the generator and PG&E's facilities:

- **Telemetry**

If the amount of power supplied to PG&E's system exceeds 10 MW, telemetering signals must be transmitted via the telephone company's leased circuits between the generator, PG&E's Energy Control Center in San Francisco, and the designated PG&E switching center.

- **Alarm and Breaker Status**

This circuit is required to monitor the transfer trip protection circuit(s). The function of this circuit is to ensure that the equipment is operational and that there is a continuity of the leased circuit from the telephone company.

The alarm and the transfer trip signals are transmitted to the designated PG&E switching center at the generating facility's expense using a leased circuit.

- **Protection**

PG&E's System Protection department determines if nonpilot, protective relays are adequate for tripping the generator's and PG&E's station equipment during an emergency, or if the following additional systems are required:

- Teleprotection-assisted system
- Pilot wire (PW) system
- Current-differential or phase-comparison-type system
- DTT protection equipment

Current Differential and Phase Comparison

Current differential or phase-comparison line relays may be required for line protection. The relay may be applied using a tone at 9,600 bytes per second (bps) or digital communication.

In the case of fiber cable, PG&E gives special consideration to the routing. PG&E recommends not incorporating the routing as part of the same conduit that carries the generator's power. Special entrance cable specifications for this application are the same as those discussed in the next section.

If fiber cable is used for protection¹, PG&E's System Protection department determines if an independent channel or special equipment is required for the DTT, based on the types and the levels of protection and the required communication mediums.

PG&E recommends that the generating facility coordinate with PG&E any orders for current-differential and phase-comparison-type relays that connect all of the terminals and transmission. This is particularly important when the interconnecting company, or its representative procures equipment for a remote terminal.

DTT

A DTT system is a typical type of system installed for high-speed tripping of the generator's station equipment. When a line fault occurs, the DTT equipment clears the fault quickly and helps to protect the generator from any damages.

The DTT-type circuit must be highly reliable; therefore, the generator must ensure that the following requirements are met:

- **Uninterruptible Power Source**

To ensure that the transfer trip (TT) circuit operates even during a fault situation, the TT transmitting and receiving equipment must be supplied with dc-battery power from a separate 15-ampere (A) circuit breaker. The generator must decide on a battery voltage before the TT equipment can be ordered.

- **Telephone Company Line Treatment Equipment (For Remote Terminal Unit [RTU] Only)**

In some cases, the telephone company may install amplifiers or line-treatment equipment. This equipment is operated by 110 V alternating current (ac) power. The customer must provide an uninterruptible power supply that must be firm power.

Please note:

The telephone company no longer uses customer-provided dc power for its termination equipment.

Protection circuits such as DTT require the use of a line-termination unit. This is a passive-data interface and has no loop-

¹ Refer to Appendix Z for additional information and regional reliability requirements.

back capabilities. By requiring a C6-conditioned circuit, the telephone company will provide the line amplifiers at its central office.

- **Business Telephone**

The customer must ensure that there is a business telephone at DTT and telemetering equipment locations so that PG&E personnel can perform maintenance and repair work efficiently.

Generators are requested to provide the following information:

- Relay-target information
- Sequential-event listing
- Oscillography data following operations on the transmission line

The generating facility is responsible for evaluating alternatives to provide required data to PG&E, including remote data retrieval from its protective and automatic control devices, where applicable.

- **Environmental Considerations**

PG&E must review and approve the customer's proposed equipment and room arrangement.

Human Environment

PG&E personnel cannot be expected to maintain and repair equipment that is located in outdoor cabinets or in small buildings that would subject the personnel or their test equipment to extremes in temperatures and/or precipitation.

In addition, the generating facility must provide 36 inches of working space in the front and back of the equipment that is rated at 0 V to 600 V.

Equipment Environment

Extreme temperatures and/or excessive moisture can increase the deterioration of the equipment components and wiring. Premature failure of vital protection and telemetering equipment could result in severe damage to expensive transformer banks and line conductors, as well as the loss of vital data required for efficient operation of PG&E's Transmission Operating Center and the local Energy Control Center.

Therefore, the following requirements must be met:

- The generator must install all of the telemetering and DTT equipment in an environmentally controlled building whenever possible.

Temperature limits must be from -30°C to +60°C (0°C to +50°C is preferred).

- If an air-conditioned building is not feasible, use other means of cooling (such as thermostatically controlled exhaust fans), so that the temperature inside the equipment cabinets or chassis will not exceed the temperature rating specified by the manufacturer. Entrance louvers used for venting must include an air filter that is periodically replaced.
- Typically, environmentally controlled buildings are easy to keep clean. When emergency exhaust fans are used, the generator must ensure that an air filter is installed and maintained on a regular basis. Any failure of vital equipment at a customer's premise caused by excessive dirt can severely damage the station equipment. The customer is responsible for the labor and material costs of work performed on the equipment that is damaged because of a dirty air filter.

III. Circuit Requirements for Protection, Telemetering, and Telephone Circuits

Communication circuits connecting PG&E and the generating facility may be required for protection, Supervisory Control & Data Acquisition (SCADA), and voice communications. When external communication circuits are installed, the responsible party must ensure that the high voltage protection (HVP) equipment on these circuits meets all the applicable standards.

Some independent telephone companies are not tariffed to provide protection equipment for the required communication circuits. In such cases, the generator is responsible for purchasing any required protection equipment.

When planning a new generation facility, the generator must contact the telephone company serving the area of the planned generation facility up to three months in advance. This ensures that outside plant facilities can be arranged to serve the generation facility location. Failure to contact the telephone company in advance could result in the following situations:

- Postponement of the generation facility's operational date.
- Additional costs incurred if the entrance of the communication facility is not installed properly or if the wrong materials are used. (For example, entrance conduits should be nonmetallic.)

The customer must ensure that the following requirements are met for the three main types of lease service:

Types of Lease Service	Requirements
Transfer Trip Circuit Specification	VG36, Class A, Type 4, 2-Wire Lease (Typical), C6 Conditioning, Half-Duplex Metering Circuit (Note: Contact the telecommunications project engineer for confirmation of the 2-Wire requirement versus the 4-wire requirement with sealing current.)
Telemetry Data Circuit Specification	VG36, Class B, Type 3, Full Duplex, Data Circuit with sealing current, 1,200 Baud
Telephone Service Specification	Business Line, Class B, Type 1B, or telephone extension on a local switch at the generation facility. The telephone service must be supplied with battery-backup power.

Please Note:

The customer is responsible for the leased circuits. If PG&E is requested to perform work, and it is later determined that the cause of the problem is related to the telephone line or other customer-owned equipment, PG&E will bill the customer for the labor and travel expenses.

When the generator's personnel request alarm, telephone, transfer trip, and/or telemetry service/circuits from the telephone company, the generator's personnel must submit the requests per the information provided on the service or on the forms included at the end of this section (Forms F-1, F-2 and F-3).

Order Request Form Telemetry Telephone Lease

Description:

Circuit: Data Quality

Purpose: Electric Generation Telemetry to PG&E's
Energy Control Center

Specification: VG36, Class B, Type 3
4-wire, Full Duplex, Data Circuit with Sealing Current,
1,200 Baud

Customer's Name:

Address:

_____ Zip Code _____

Telephone Number:

____(____)_____

Terminal Address: (1) PG&E Sub: Pacific Gas and Electric Company
245 Market Street, Room B117
San Francisco, CA 94106

(2) Customer Sub: _____

(3) PG&E Line Name: _____

PG&E Contact: PG&E System Operations Supervisor (415) 973-2275

Special Considerations:

- This leased circuit will enter power substation yards.
The telephone company's protection department should review the special, high-voltage protection requirements.
- The California Independent System Operator (CAISO) may terminate this leased circuit in the future.

**Order Request Form
Business Telephone Service**

Description:

Circuit: Business Telephone Service

Specification: Class B, Type 1B

Customer's Name:

Address:

_____ Zip Code _____

Telephone Number: () _____

Terminal Address: _____

Special Considerations:

This leased circuit will enter power substation yards. The telephone company's protection department should review the special, high-voltage protection requirements.

Order Request Form
Transfer-Trip Telephone Lease

(This may be part of the transfer-trip circuit in some installations)

Description:

Circuit: Voice Grade

Purpose: Transfer-Trip Protective Relaying

Specification: VG36, Class A, Type 4, C6 Conditioning, 2-Wire (Half Duplex) or 4-Wire (Full Duplex with Sealing Current) to Include Alarms

Customer's Name:

Address:

_____ Zip Code _____

Telephone Number:

__ (__) _____

Terminal Address: (1) PG&E Sub: _____

(2) Customer Sub: _____

(3) PG&E Line Name: _____

PG&E Contact:

Special Considerations:

- This leased circuit will enter power substation yards.
- The telephone company's protection department should review special, high-voltage protection requirements.
- The circuit shall be supplied with a firm, uninterruptible power source.