

Update History

Update	Section	Date
Added Figure G5-1 Simplified Flow Chart of Pre-Parallel/Parallel Test Procedure.	Section G5	Aug. 11, 2004
Addition of F-35 GE device to Table G2-4 Relays for Generator Application	Section G2	Aug. 11, 2004
Addition of Power Frequency Magnetic Field Immunity (ANSI/IEEE 1308-1994 (R2001) and IEC 61000-4-8), to Generator Protective Relay Requirements.	Appendix R	Aug. 11, 2004
Addition of Power Frequency Magnetic Field Immunity (ANSI/IEEE 1308-1994 (R2001) and IEC 61000-4-8) to requirements for Generator Automatic Synchronizers.	Appendix Q	Aug. 11, 2004
Corrected references in section 2.9.4	Section G2	September 21, 2004
Moved PSS test requirements to section G5.3.2	Section G3, G5	September 21, 2004
Addition of WECC Power System Stabilizer Design and Performance Criteria.	Appendix H	September 21, 2004
References to LGIA for FERC 2003 Compliance	Sections G – G5	September 6, 2005
Correction to Impedance/Phase Angle spec in G5.1.5	Section G5	September 6, 2005
Updated Battery Requirements	Section G2.3, G2.20, G5.1.8 and Appendix T	May 10, 2006
Update Protection requirements. Relays and Current Transformers to have nominal secondary current of 5A and 5A nominal AC input current.	Section G2-2, 2-3, 2-4, 2-5, Tables G201a,b, and Appendix R	November 30, 2006
Revised Tables G2-4 and G2-5	G2	January 5, 2007
Updated Rule 21, Rule2 and 22 links in G2 and Intro. Corrected WECC and NERC names.	G2, Intro.	August 6, 2007
Updated Introduction Section to explicitly include Transmission Facilities and added references to NERC Standard FAC-001-0. Updated Glossary to include definition of “Facility” and “Transmission” and updated various links.	Introduction, Glossary	October 7, 2009
Updated Sections L1-T, L2, L3, L4 and L5 to include application to Transmission Entities.	Sections L1-T, L2, L3, L4 and L5	October 25, 2009

Update	Section	Date
<p><u>Section G1</u>: Added metering equipment requirements, moved telemetering requirements to Appendix F.</p> <p><u>Section G2</u>: Added protection clarifications for Photo-Voltaic (PV) generation and inverters capable and incapable of stand-alone operation, and updated PG&E-approved devices.</p> <p><u>Section G3</u>: reactive and voltage control requirements for PV generation, PG&E to determine automatic voltage regulator (AVR) setpoint for voltage schedules, power system stabilizers (PSS) for synchronous generators larger than 30MVA, removed VAR production requirements, power factor (PF) requirements for PV, voltage ride-through references.</p> <p><u>Section G4</u>: Added notification requirement for failure of PSS or AVR, removed power quality requirement.</p> <p><u>Section G5</u>: Updated pre-parallel test requirements and clarified battery discharge testing.</p> <p><u>Section L1-T</u>: Added metering equipment requirements.</p> <p><u>Section L2</u>: Added break-and-a-half (BAAH) and ring bus configurations.</p> <p><u>Section L3</u>: Updated interconnection methods, added power quality clarifications, & removed “hard tap” configuration.</p> <p><u>Section L5</u>: added test department contact list</p> <p><u>Appendix A</u>: updated contact list</p> <p><u>Appendix B</u>: removed and merged into Appendix D</p> <p><u>Appendix C</u>: removed and merged into Appendix D</p> <p><u>Appendix D</u>: updated to include everything in the old Appendices B, C, D, E, G, O, and P.</p> <p><u>Appendix E</u>: removed and merged into Appendix D</p> <p><u>Appendix F</u>: Added telemetering requirements that used to be Section G1.</p> <p><u>Appendix G</u>: removed and merged into Appendix D</p> <p><u>Appendix I</u>: updated Form 79-847</p> <p><u>Appendix J</u>: changed to include the Standby Service Agreement</p> <p><u>Appendix K</u>: added notification to request the most recent Load Special Facilities Agreement</p> <p><u>Appendix L</u>: updated to include all Generation Interconnection Agreements</p> <p><u>Appendix O</u>: removed and merged into Appendix D</p> <p><u>Appendix P</u>: removed and merged into Appendix D</p> <p><u>Appendix T</u>: updated battery requirements</p>	<p>All Sections, except Sections L1-D & L4 and Appendix H, M, N, Q, R, & S</p>	<p>September 2, 2010</p>

Update	Section	Date
<u>Section G4, L3, & L4</u> : Revised/Added Power Quality Requirements <u>Section L1-T</u> : Added clarification for conduit material.	Sections G4, L1-T, L3, and L4	December 29, 2010
<u>Section G2</u> : Revised Manual Disconnect Switch requirements. Removed reference to Figure G2-9 (outdated illustration). <u>Section G3</u> : Added clarification for inverter-based generating facility reactive capability requirement. Added clarification for <u>Section G6</u> : Added to TIH (this is a new section)	Sections G2, G3, & G6	April 12, 2011
Minor grammatical updates, revised Introduction language and compliance references, and added hyperlinks to common terms and entities used throughout the handbook.	Entire Handbook	January 25, 2012
<u>Section L1D</u> : Removed reference to metering potential safety disconnect switch, and updated metering enclosure to be walk-in type. <u>Section L1T</u> : Updated metering enclosure to be walk-in type. <u>Sections L2 and L3</u> : Updated references to point to Appendix D. <u>Section G1</u> : Updated metering enclosure to be walk-in type and support structure to be H-frame, and removed telemetering duplication in G1.3. <u>Section G2</u> : Added relays to approved list in Table G.2.4. <u>Section G5</u> : Incorporated update to Figure G5 from bulletin 1013B-003. <u>Appendix F</u> : Incorporated additional DTT options from bulletin TD-1013B-002, updated EMS/SCADA minimum telemetering requirements, and removed outdated reference to RFL 6745 in Figures F-2 and F-3. Removed references to Appendices B, C, E, G, O and P as the information is already relocated to Appendix D.	Sections L1D, L1T, G1, G2, G5 and Appendix F	December 10, 2012
Added more SEL relays to approved list in Tables G.2-4 and G.2-5. Updated Table G2-6, and added Figure 1 for Prohibited Gen Trip per WECC Plan.	Section G2	May 30, 2013
Incorporated the applicable information from utility guideline G13079, published in May 2001. Also the Glossary has been updated to clarify the term Telemetering.	Sections L2, G2, and Glossary	December 31, 2013

Update	Section	Date
<p>In section <u>L5.1</u> and effective November 1, 2014, Test Reports must now be submitted for review a minimum of 30 business days prior to requested PPI, to reflect lead-time required for effective review. The previous timeframe was 15 business days. DC schematics are now required along with the test reports. The PPI date is then scheduled a minimum of 10 business days after all test reports have approved.</p> <p>Added section <u>L5.1.7</u> to emphasize that when a battery is installed, proof of discharge testing is required to ensure that the battery has the capacity to support the load and trip.</p> <p>In section <u>L5.3</u>, added emphasis that the Load Entity must follow the pre-parallel inspection (PPI) process.</p> <p>Section <u>G2</u> – added Appendix 1 as a Quick Reference Guide, and rearranged some sections for improved sequence.</p> <p>In section <u>G4.2.4</u>, confirmed and corrected the minimum advance notice required for generators to request clearances from PG&E—one week instead of the 96 hours.</p> <p>Throughout section <u>G5</u> the term “Pre-parallel test(ing)” has been replaced with “Pre-Parallel Inspection (PPI)”, to more accurately reflect the existing process.</p> <p>In section <u>G5.1</u> and effective November 1, 2014, Test Reports must now be submitted for review a minimum of 30 business days prior to requested PPI, to reflect lead-time required for effective review. DC schematics are now required along with the test reports. The PPI date is then scheduled a minimum of 10 business days after all test reports have approved.</p> <p>In section <u>G5.2</u>, added that the relay settings submitted to and approved by PG&E must be demonstrated. Also, PG&E recommends third party testers to be InterNational Electrical Testing Association (NETA) certified.</p>	Sections L5, G2, G4 and G5	September 30, 2014

Update	Section	Date
<p>In <u>G3.1.3</u>, clarified reactive power requirements and point-of-interconnection for inverter-based generating facilities.</p> <p>Updated <u>Figure G5-1</u> to distinguish Export or Non-export, and listed the Requirements for: “Authorization to Parallel”, “Permission to Parallel for Test Purposes”, and “Permission to Commence Commercial Operations”.</p> <p>Throughout <u>Appendix F</u>, clarified that SCADA, EMS, and DTT use standard DS0 interfaces, which are being discontinued by Local Exchange Carriers.</p> <p>In section F2.3, clarified to include revenue metering and updated to agree with line sharing in other sections.</p> <p>In section F6, added and rearranged definitions.</p> <p>Removed Figures F2, and F5 through F9, as they’re no longer valid or available.</p>	Sections G3, G5 and Appendix F	December 17, 2014
<p>In <u>Introduction</u>, added new section I-10 to incorporate an existing support document on “General Recommendations Concerning the Contents of Local CEQA Documents”.</p> <p>In <u>Section G2</u>, removed the “operating principle” for customer-owned equipment such that two relays from the same vendor is acceptable now (section G2.2). And for Tables G2-4 and G2-5, removed obsolete relays and included newer SEL relays, and updated some reference notes.</p> <p><u>Appendix R</u> -- fresh update to the approval process for relays, adding in 51C and 51V types (voltage controlled, and voltage restraint, time overcurrent elements), and updating the industry standard references.</p>	Introduction, Section G2, and Appendix R	February 23, 2015
Updated TOC to match new page numbering system	TOC	Feb. 2, 2016
<p>The Introduction was changed to match NERC language plus multiple changes were made to clean up the document to make it flow better.</p> <p>Sections G2, L3 and Appendix S were changed to:</p> <ul style="list-style-type: none"> • Match design criteria 076257, “Tapping Transmission Lines” • Update the approved relay models • Clarify transformer center taps • Modify use of circuit switchers • Correct errors in single line diagrams in G2 <p>Section L5 was not changed except to add a cleaner version of the Test Department Contact form at the end.</p>	G2, L3, App. S, Intro, L5, TOC	May 20, 2016

Update	Section	Date
Updated relay models in Table G2-4 and corrected Appendix 1 drawing (Y-gnd on wrong side).	G2	April 12, 2017
Updated Battery Models for Enersys NiCad, Added new Form AT-1 – “Battery Information and Acceptance Sheet”, added new Item 7 and racks must be designed for high seismic per IEEE 693.	App. T	May 10, 2017
Updated Form G5-1, “Preparallel Inspection” and specified that CT be tested on the “connected” tap	G5	June 1, 2017
Added one sentence – “If a new transition switching station is required in-lieu of a tap, then the new station must be owned, operated and maintained by PG&E.”	L3	March 19, 2018
<u>Section G2</u> : addressed LOP, complete rewrite of first 5 pages, updated Table G-2.6 to comply with PCR 24, revised Ground Grid requirements, added G2.7.2 switches, G2.8.2 - phasing out circuit switchers, revised G2.14 Event Recording, PRC 24 applies to BES, Revised Table G2.4 Relay types <u>Section G3</u> : Updated to comply with FERC Order 827 PF requirements, and Order 828 Ride Through. <u>Section G5</u> : Addressed Idle Facilities, PG&E can request a pre-parallel inspection for changing conditions, removed For G5-2 (applies to obsolete Hydro relays) <u>Appendix H</u> : Fixed links	G2, G3, G5, App. H	G3, G5 are posted April 1, 2018 G2 and App. H are posted May 1, 2018
<u>Appendix F</u> - Changes to clarify telemetering requirements for synchronous, non-synchronous and Rule 21 generator interconnections. Telemetry is required for > 1MW for all. Three figures were added.	App. F	Nov. 22, 2018
<u>Section G2 and L3</u> – Added restrictions for tapping third party owned transmission lines, effective Jan.1, 2019	G2, L3	January 24, 2019
<u>G5 and Appendix D</u> – Added new bulletin on signage (TD-1013B-005) to Appendix D and changed paragraph G5.3.6 to point to the bulletin	G5, App. D	March 27, 2019
<u>G2 and L2</u> – 1) 30 days lead time required for pre-parallel test reports, 2) Telemetering required for loads > 1,000 kVA, 3) Included PRC requirements for bulk connected load and generation, 4) Merged L2 and G2 to look as similar as possible, 5) Eliminated fuses as a protective device, 6) Voltage study required when adding load to existing facilities with delta connections on the high side of the transformer, 7) Updated approved relay table, 8) miscellaneous minor changes	G2, L2	September 1, 2019
<u>Appendix S</u> – replace Figure S1	App. S	October 25, 2019

Update	Section	Date
<p><u>Appendix F</u> – 1) F.0. - For SCADA and EMS applications, PG&E has added an option to use PG&E Standard Private Cellular Carrier APN (Access Point Name) for Electric SCADA. 2) F.2. - An acceptable cellular carrier signal on the associated PG&E Standard Cellular Carrier APN must be available for this option. 2) F2.1. – Recommend the PG&E Standard Cellular Carrier APN as the solution for facilities with SCADA/EMS telemetering data only with no DTT. 3) F.6. – Add “APN” to definitions. 4) F.7. – Note changes to Figure F-1.</p>	App. F	December 31, 2020
<p><u>G2</u> –Introduced three POI limitations, clarification on transition stations, PG&E doesn’t obtain R/W’s for customer owned tie-lines, clarifications on UL requirements, new table on “repair times”, clarified application of inverters < 1MW, new Table G2-5 on default inverter settings.</p> <p><u>G3</u> –Clarified pf at rated output</p> <p><u>G5</u> – Clarification on “proving insulation”, pre-parallel inspections, release to operations for testing purposes, gen load test exception, PSS test reports, and requirements to commence commercial operation.</p> <p><u>Appendix F</u> – APN (Access Point Name) approved for SCADA but not for protection purposes</p>	G2, G3, G5, Appendix F	October 25, 2021

Update	Section	Date
<p><u>Section G1</u>: Replaced G13079 reference with G2.8.3 and removed exceptions for using combo PT/CT units for Generator relaying.</p> <p><u>Section G2</u>: Added EMS/SCADA to Repair Times Table G2-2 and Metcalf 230kV to Table G2.</p> <p><u>Section G3</u>: Added generic default voltage schedule G3.1.4.</p> <p><u>Section G4</u>: Revised timeline verbiage for clearance requests by Generator Facility operator to 45-60 days under G4.2.4.</p> <p><u>Section L4</u>: Revised timeline verbiage for clearance requests by Generator Facility operator to 45-60 days under L4.3.3.</p> <p><u>Section L5</u>: Removed protection & control equipment certification on page L5-6.</p> <p><u>Appendix F</u>: Updated F2.2 to conform with WECC Communication System Performance Guide for Electric Protection Systems dated July 25, 2013. Reinforced business telephone service requirements & noted alternative mediums may be evaluated by PG&E, which absorbed and obsoleted TD-1013P-03.</p> <p><u>Appendix T</u>: Added verbiage reinforcing batteries need to conform to PRC-005, TPL-001, and that PG&E may request evidence of meeting IEEE testing requirements.</p>	G1, G2, G3, G4, L4, L5, App. F, App. T	June 14, 2022
<p><u>Appendix F</u>: Added additional ATT Managed Router Service options for SCADA and EMS applications.</p>	App. F	October 26, 2022

Update	Section	Date
<p><u>Section G2</u>: Updated Table G2 and Table G2-5. Added new Table G2-A and 500kV requirements.</p> <p><u>Section G3</u>: Added G3.5, G3.6, and cleared up discrepancies between Rule 21, FERC, and CAISO requirements. Added 500kV requirements G3.1.5.</p> <p><u>Section G5</u>: Updated Form G5-1, created sections for different generator types.</p> <p><u>Section L2</u>: Added Prohibited POI list based on space limitations, list of required drawing and document submittals, and requirements for 500kV systems.</p> <p><u>Section L3</u>: Added ownership change demarcation information.</p> <p><u>Section L4</u>: Added 500kV Interconnection requirements L4.7.</p> <p><u>Appendix F</u>: Added a reference to Table G2-2 for EMS/SCADA repair times under F2.1 and disclosed that PG&E will share telemetry data with CAISO as required by CPUC under F2.1.2.</p> <p><u>Appendix M</u>: Removed; no longer used.</p> <p><u>Appendix N</u>: Removed; no longer used.</p>	G2, G3, G5, L2, L3, L4, App. F, App. M, App. N	June 12, 2023

Update	Section	Date
<p><u>Introduction:</u> Updated NERC Standard references, definitions, website links, tables, other clarifications and editorial corrections.</p> <p><u>TOC:</u> Added missing subsections, corrected page numbers, removed App M and App N.</p> <p><u>Section G1:</u> Updated metering equipment, communication, and telemetering measurement accuracy requirements.</p> <p><u>Section G2:</u> Incorporated IEEE standard for interconnection of Inverter Based Resources (IBR), added breaker fail information, and updated various tables.</p> <p><u>Section G3:</u> Incorporated IEEE standard for interconnection of IBRs (IEEE 2800-2022).</p> <p><u>Section G4:</u> Provided general guidance on acceptable voltage range when attended generating facilities parallel with PG&E system.</p> <p><u>Section G5:</u> Added telemetry/relay accuracy requirements, and verification and testing matrix for IBRs.</p> <p><u>Section L2:</u> Updated the list of substation buses that cannot accept new connections based on space limitations (Table L2-0).</p> <p><u>Section L3:</u> Added station expansion information under L3.10.</p> <p><u>Section L1-D:</u> Updated metering equipment and communication circuit requirements.</p> <p><u>Section L1-T:</u> Revised metering class PT/CT and other metering equipment requirements.</p> <p><u>Appendix T:</u> Provided minor clarifications and requested voltage class information on Form AT-1.</p> <p><u>Appendix F:</u> Added fiber trench separation requirement of 10-feet, and unlicensed spread spectrum wireless DTT scheme information.</p>	Intro, TOC, G1, G2, G3, G4, G5, L2, L3, L1-D, L1-T, App. T, App. F.	August 5, 2024

Update	Section	Date
<p><u>Introduction:</u> Updated applicable tariffs with reference to new CAISO Tariff Appendix KK.</p> <p><u>Section G1:</u> Updated the distance limit to 100-ft between the metering enclosure and revenue-metering transformers.</p> <p><u>Section G2:</u> Various updates including relay testing, frequency, and documentation requirements. Updates to 500kV section; added requirements for CTs to have nominal 5A secondary current, relay failure alarm, circuit breaker maintenance, and new Figure A1-5.</p> <p><u>Section G4:</u> Added requirement for facility operator to supply results of instrument transformer maintenance.</p> <p><u>Section G5:</u> Revised process, workflow, and provided additional clarifications throughout.</p> <p><u>Section L2:</u> Updated relays and circuit breaker testing requirements, low SF6 tripping, relay failure alarm, 500kV section, requirements for CTs to have nominal 5A secondary current, and Table L2-3.</p> <p><u>Section L3:</u> Added reference to G2, for transformer winding configurations when adding generation; updated IEEE standard references for addressing harmonics.</p> <p><u>Appendix D:</u> Replaced outdated standards with the latest revision.</p> <p><u>Appendix F:</u> Added fiber-based ethernet lease service option for DTT, and new X2nSAT satellite communication solution for EMS.</p> <p><u>Appendix R:</u> Revised to allow relay manufacturers to conduct testing at manufacturers' facility with PG&E's approval and witness.</p> <p><u>Appendix S:</u> Updated Figure S1 to show dedicated tie line circuit breaker at generation facility.</p> <p><u>Appendix T:</u> Elaborated on battery and charger maintenance.</p>	Intro, G1, G2, G4, G5, L2, L3, App. D, App. F, App. R, App. S, App. T.	July 10, 2025