



ADVANCED POWER  
TECHNOLOGIES

# 208V-38kV Switchgear Controls



## Control System Modules Paralleling, Transfer, Master Controls Solutions Brochure

www.appt-power.com  
433 N. 36<sup>th</sup> Street  
Lafayette, IN 47905  
(765) 446-2343

**SAFE SMART SERVICEABLE SWITCHGEAR &  
ENGINEERED POWER SYSTEM SOLUTIONS**



ALN: 570 Rev. 01

# APT Paralleling System Modules



Figure 1: Stand-alone Fully Isolated Master Control Panel (MCP) built with APT Control System Modules: UI, ATC, MG



Figure 2: UP Master Control System with Manual Generator Operation Controls

## Multi-source Paralleling & Transfer Controls

- ⊙ (GP) – APT “#” Generator Paralleling Control Module – requires one per generator:
  - Automatic generator paralleling control for each generator, configured to synchronize, bring multiple generators on-line, and service the load.
  - Expandable system architecture allows for any number of generators in the system.
- ⊙ (A2) – AdAPTor 2 Generator Only Paralleling Control Module – maximum one per two generators:
  - Automatic generator paralleling controls for use with synchronizing two generators in a non-expandable, cost effective system.
- ⊙ (N1) – APT N+1 Redundant Generator Control Module – requires one per switchgear:
  - Control for systems with back-up generator(s) to the back-up generator(s) to provide facilities with levels of redundancy and protect against back-up generator failure.
- ⊙ (LD) – APT Load Sense Demand Control Module – maximum one per switchgear:
  - Manually initiated automatic sequence to avoid extended operation of generators at light load after system has stabilized in emergency operation.
- ⊙ (IM) – APT Island Mode Control Module – maximum one per switchgear:
  - Allows safe system operation in isolation from the local electricity distribution network
- ⊙ (UP) – APT Utility Paralleling Control Module – requires one per utility source:
  - Integrated utility grade interconnection protection & control as required to meet ANSI/IEEE 1547 standard with source paralleling controls to parallel a utility source with other utility feeds or generator sources.
  - Includes APT Generator Base Load - Paralleled generator set(s) soft load to a desired constant load level against utility.
- ⊙ (UI) – APT Utility Intertie Control Module – requires one per utility:
  - Stand-alone utility grade interconnection protection & control as required to meet ANSI/IEEE 1547 standard without paralleling or transfer controls.



Figure 3: UP, PS, & ATC Control System Modules in Master Control Panel



Figure 4: GP Control System Module with Integrated Lights, Sync Control Switches

## We Are the Generator & Utility Source Experts!

- ⦿ (PS) – APT Peak Shaving Control Module – maximum one per switchgear:
  - Controls and adjusts the generator load levels to limit the amount of energy purchased from the utility during peak demand hours.
- ⦿ (IE) – APT Import/Export Control Module – maximum one per switchgear:
  - Maintains constant utility contribution to a site load by monitoring the utility contribution and trimming generator set load levels up and down as site loads change.
  - In Import Mode, generator kW remains constant while the utility kW loading follows load kW fluctuations
  - In Export Mode, utility kW remains constant while the generator kW loading follows load kW fluctuations
- ⦿ (ATO) – APT Automatic Standby Open Transfer Control Module – maximum one per switchgear:
  - This module transfers power to the generator in a “break-before-make” fashion. When test/transfer mode is turned off, power transfer from generator back to utility is also “break-before-make.” This operation produces two brief power outages – one outage per transfer.
  - Upon sensing of the utility failure (utility voltage is not within undervoltage setpoint) the Time Delay Engine Start timer shall start timing. If utility failure condition remains upon expiration of the Time Delay Engine Start timer the generator set shall be automatically started and brought up to speed and voltage. At that time utility circuit breaker shall open and generator circuit breaker shall close (after adjustable time delay neutral). At this time the generator is supplying power to the site load. Upon sensing of utility return (utility voltage is within set undervoltage tolerance) the Time Delay Emergency to Normal timer shall start timing. If utility power remains healthy (utility voltage is within set undervoltage tolerance) upon expiration of the Time Delay Emergency to Normal timer the generator circuit breaker shall open and the utility circuit breaker shall close (after adjustable time delay neutral). At this time the generator set shall be put in the cooldown mode of operation.
  - Time Delay Neutral shall determine the minimum time period the load will be deenergized before the load is energized from the alternative source (normal or emergency).
  - If the generator set should fail (generator voltage is not within undervoltage setpoint) while Time Delay Emergency to Normal timer is timing, the Time Delay Emergency to Normal timer shall be bypassed, generator circuit breaker shall open and the utility circuit breaker shall close (after adjustable time delay neutral).



Figure 5: ATO & SL (selectable) Control System  
Local Operator Interface

In-House Designed &  
Built Master Controls  
with Manual & Electrical  
Interlocking Systems

## Generators, Utilities, Renewables Source Control

- Operation of the overcurrent protection shall trip generator utility circuit breakers and disable closing of both circuit breakers until manually reset by placing the control switch in Off/Reset position.
- ◎ (ATC) – APT Automatic Standby Closed Transfer Control Module – maximum one per switchgear:
  - This mode provides a method of testing the back-up system without ever producing a power outage. Power is transferred from utility to generator in a “make-before-break” fashion by utilizing active generator synchronizing. When test/transfer mode is turned off, power is transferred back from generator to utility again using “make-before-break.” This mode can also be used as an effective means of “peak shaving” facility loads to reduce utility bills.
  - This mode can be also initiated remotely by a utility RTU of facility energy control system.
  - If utility failure condition remains upon expiration of the Time Delay Engine Start timer the generator set shall be automatically started and brought up to speed and voltage. At that time utility circuit breaker shall be automatically open and generator circuit breaker shall close (after adjustable time delay). At this time the generator is supplying power to the site load.
  - Upon sensing of utility return (utility voltage and frequency are within set tolerances) the Time Delay Emergency to Normal timer shall start timing. If utility power remains healthy (utility voltage and frequency are within set tolerances) upon expiration of the Time Delay Emergency to Normal timer the transition of the load to the utility shall begin.
  - The generator shall be synchronized with the utility source and when in synchronism (as determined by the synchronizing check relay), close the utility circuit breaker. At this time the generator breaker shall be tripped immediately.
  - At this time the genset shall be put in the cooldown mode of operation.
  - The utility under/over voltage and under/over frequency setpoints, all the automatic standby operation timers, unloading rate and unload trip setpoints shall be adjustable from the operator interface panel mounted on the control panel door.
- ◎ (SL) – APT Automatic Standby Closed Transfer w/ Soft Loading/Unloading Control Module – maximum one per switchgear:
  - Upon receipt of an Isolate signal initiated locally by the operator or remotely by customer SCADA or DCS system (via closure of a dry contact or MODBUS TCP/IP), the switchgear shall verify that utility phase voltages and frequency



Figure 6: Top Section Line-Up Integrated 20' Master Control HMI with APTView SCADA

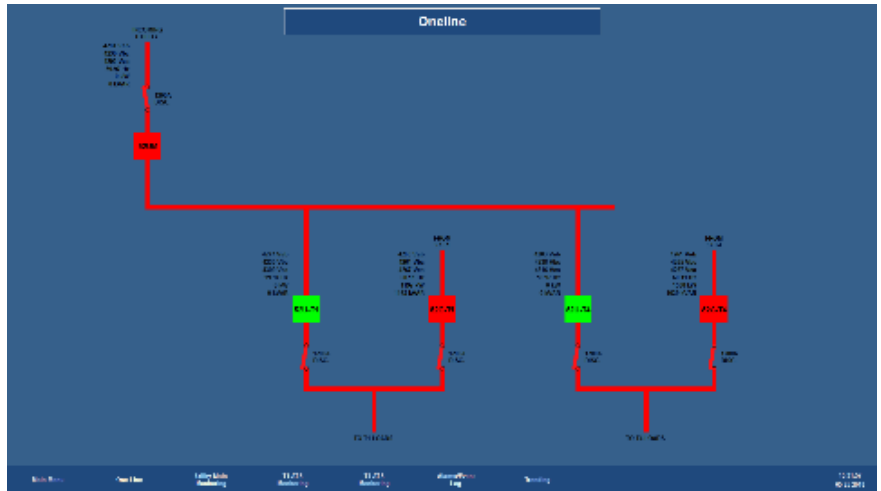


Figure 7: APTView SCADA HMI with System One-line

## Generators, Utilities, Renewables Source Control

are within acceptable tolerances and issue a start signal to the generator set. At that time, generator set's speed and voltage shall be controlled by the switchgear.

- The generator set's voltage shall be automatically matched with the utility bus and the genset shall be automatically synchronized with the utility under the supervision of the synchronizing check relay. When all the synchronizing conditions are met the synchronizing circuit breaker shall close. At that time, the generator set shall be gradually (soft) loaded to assume the entire site load (entire site load minus adjustable "zero power level" setpoint) and utility circuit breaker shall be tripped open. At this time the site load has been transferred to the generator power.
- Upon receipt of an automatic stop signal initiated locally by the operator or remotely by customer SCADA or DCS system the generator shall be synchronized with the utility source and when in synchronism (as determined by the synchronizing check relay), close the utility circuit breaker. At this time soft unloading of the generator set shall begin. When the genset load is gradually reduced to the level of the unload trip setpoint the generator synchronizing breaker shall trip open and the genset shall be put in the cooldown mode of operation. At this time the site load has been transferred to the utility power.
- Loading and unloading rates and "zero power level" setpoints shall be viewable and adjustable from the operator interface panel mounted on the control panel's front door.
- ⊙ (MT) – APT Manual/Non-Automatic Open Transition Control Transfer Control Module – maximum one per switchgear:
  - System operator executes a sequence of manual operational steps to actuate electrically or mechanically interlocked source disconnects, preventing inadvertent paralleling of sources.
- ⊙ (NA) – APT Non-Automatic Operator Supervised Return to Normal Control Module – maximum one per switchgear:
  - Operator initiated automatic transfer back to the primary source after an automatic transfer sequence has occurred.
- ⊙ (AR) – APT Automatic Return to Normal Control Module – maximum one per switchgear:
  - Fully automated transfer back to the primary source, upon sensing a healthy primary source, without operator initiation.



# APT Control System Modules & SCADA



Figure 8: Event Log (top left), Source Metering Data (top right), Power Usage Time Adjustable Trend Chart (bottom)

## Generators, Utilities, Renewables Source Control

- ⊙ (LS) – APT Load Shed Control – maximum one per switchgear:
  - Opens designated feeders during an outage and allows for only critical & life safety loads to be connected to the secondary source.
- ⊙ (BI) – APT Bypass/Isolation Control Module – maximum one per switchgear:
  - Manually bypass live power flow from source to load in the case that parts of the equipment are disabled/need to be isolated, de-energized for maintenance, testing, or repair.
- ⊙ (MG) – Microgrid Control Module – maximum one per switchgear:
  - Provides real time integrated control of power production/supply by renewable energy sources, natural gas / diesel generators, and energy storage for load power consumption for large scale (500kW – 50 MW) microgrid systems.
- ⊙ (EX) – External (Paralleling and/or Transfer):
  - Controls facilitated by other manufacturers than APT are to be used in APT switchgear to meet the desired Sequence of Operations. (Customer to Specify Controls Manufacturer & Controls Location)
- ⊙ (AV) – APTView Virtual Remote Switchgear SCADA System:
  - Utilizes Human Machine Interface (HMI) systems to monitor and control both APT and 3rd party equipment via personal computers or your web/network-connected mobile device.
  - Emails can be sent in order to notify the user of any occurring alarm.
  - All system alarms and events are logged and date/time stamped.
  - Equipment operating parameters are periodically stored for future record/retrieval
  - Customer specified security features to limit access only to the people who need access for maximum security.

# About Advanced Power Technologies



Advanced Power Technologies (APT) is on the cutting edge of the latest engineered power system smart technologies, as it relates to microgrid & storage management, renewable & conventional energy source deployment, demand peak shaving, and facility back-up and co-generation power systems. Located in the central United States and headquartered in Lafayette, Indiana with solutions development engineers around the country, APT provides domestic and international products and services to industry leading companies from around the world. APT engineers have decades of power system experience from working with some of the largest companies in industry. Over the last two decades, we have produced successful solutions for hundreds of large-scale electric power projects involving utility/generator paralleling, transfer, peak shaving, and distribution. We pride ourselves in providing electrical power systems that are engineered and custom built, utilizing state-of-the-art technologies to fit our customer's exact needs. The core of our business is low & medium voltage engineered power systems for a wide range of indoor & outdoor applications, such as:

- ⊙ Utility(ies) and Generator(s) Paralleling/Transfer/Peak Shaving/Distribution Switchgear
- ⊙ Microgrids, Microgrid Master Control Panels, SCADA systems
- ⊙ Containerized Battery Energy Storage Systems (BESS)
- ⊙ Photovoltaic (PV) Solar Power Collection/Distribution & Renewable Energy Storage Systems
- ⊙ Low & High Resistance Grounding Systems, Grounding Systems for Photovoltaic Effective Grounding
- ⊙ High Efficiency Combined Heat and Power Switchgear & Control Systems (CHP, Co-generation)
- ⊙ Outdoor Walk-In Electrical Houses (E-Houses) & Skid-Mounted Switchgear
- ⊙ Motor Control Centers & Motor Control Switchgear
- ⊙ Automatic & Manual Load Transfer Switchgear
- ⊙ Bypass/Isolation & Power Distribution Circuit Breaker Switchboards
- ⊙ Generator/Loadbank Quick Connection Switchgear, Switchboards, & Tap Boxes
- ⊙ Industrial Control Panels

Please see our product webpages on [www.appt-power.com](http://www.appt-power.com) for product brochures and relevant information. Actual products may look different from images shown on the website and in brochures, based on actual specifications.

APT cares and understands that each power system is different. We will evaluate various solutions in order to develop the best solution for a site. APT focuses on our ability to a combine several traditional pieces of equipment/functionality into as little of a footprint possible. This saves on space, the cost of equipment, cost of installation, and accomplishes the most optimal/state-of-the-art design your facilities. APT's desires to foster and grow a culture of continued open communication with each customer. Let APT be your source to provide fully engineered power system equipment solutions for the full customer facility on time, on or under budget, and in the smallest footprint possible. We are always available to assist customers and engineers representing customers in the development of complex power solutions for all facility types.