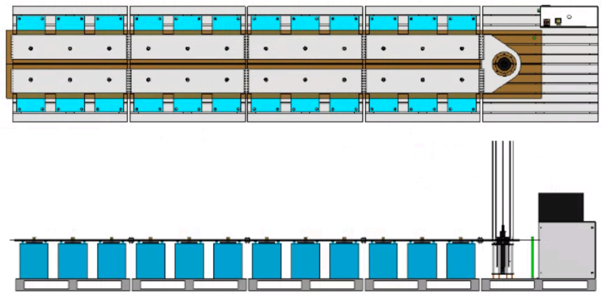
1 MJ Pulsed Capacitor Bank Module

Model WE-CBHS-1MJ · 264 kA Pulsed Power System for Fusion & High-Energy Physics Applications

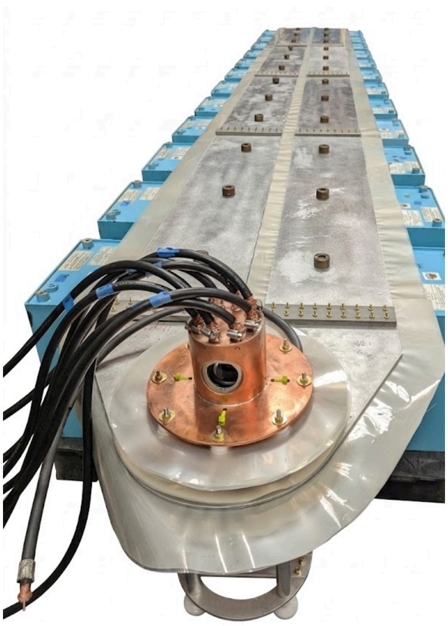
SHIPPED 18 Units delivered to customer, operated in parallel · 22 × 826 µF / 11 kV capacitors · 18-module parallel bank · Full system shipped with spares

Doc Ref: WE-CB-000001 · Rev 01 · 2026-03-09

Proven Pulsed Power Architecture for Plasma Fusion Research



The 1 MJ Pulsed Capacitor Bank delivers megajoule-scale energy storage and high-current discharge capability refined through decades of fusion plasma research. Storing 1 megajoule across 22 paralleled 826 µF / 11 kV capacitors arranged in a low-inductance parallel architecture, the bank generates 220 kA peak discharge currents through a Type D Ignitron —sufficient to drive plasma guns, Ohmic heating coils, and high-current fusion diagnostics requiring microsecond-scale energy delivery. Per-module 24V charge relays enable selective energy staging from single-module commissioning tests through full-bank plasma experiments, critical for phased research programs where experimental protocols evolve from proof-of-concept demonstrations to high-performance fusion shots.



Multi-Layer Safety and Modular Control Architecture

Safety systems integrate seamlessly with facility operations: fiber-optic abort circuits drive 24V abort relays that isolate charging systems on any fault condition—preventing energy accumulation during plasma gun misfires, crowbar events, or experimental anomalies. Soft dump relays with microswitch-verified contact closure provide fail-safe energy bleed paths independent of control system status, ensuring personnel safety during maintenance on multi-megajoule installations where residual stored energy presents electrocution and arc flash hazards. The USB-6001 control interface delivers real-time telemetry—capacitor voltage, relay states, fault conditions—through per-module breakout connectors that simplify integration with LabVIEW sequencers, EPICS-based facility control systems, or custom Python experimental controllers, while the modular architecture enables rapid troubleshooting by isolating faulty modules without disassembling the entire bank during active research campaigns.

Field-Proven Trigger System and Turnkey Deployment Package

The fiber optic trigger system provides sub-microsecond jitter and complete electrical isolation between control electronics and the high-voltage discharge path—critical for plasma experiments where electromagnetic interference from the main discharge can destroy sensitive diagnostics or corrupt data acquisition systems. LED-based fiber optic triggering eliminates ground loops, prevents HV-induced damage to low-voltage systems, and enables multi-bank synchronization for phased plasma formation sequences or coordinated spheromak merging experiments. The system ships turnkey with complete spares.

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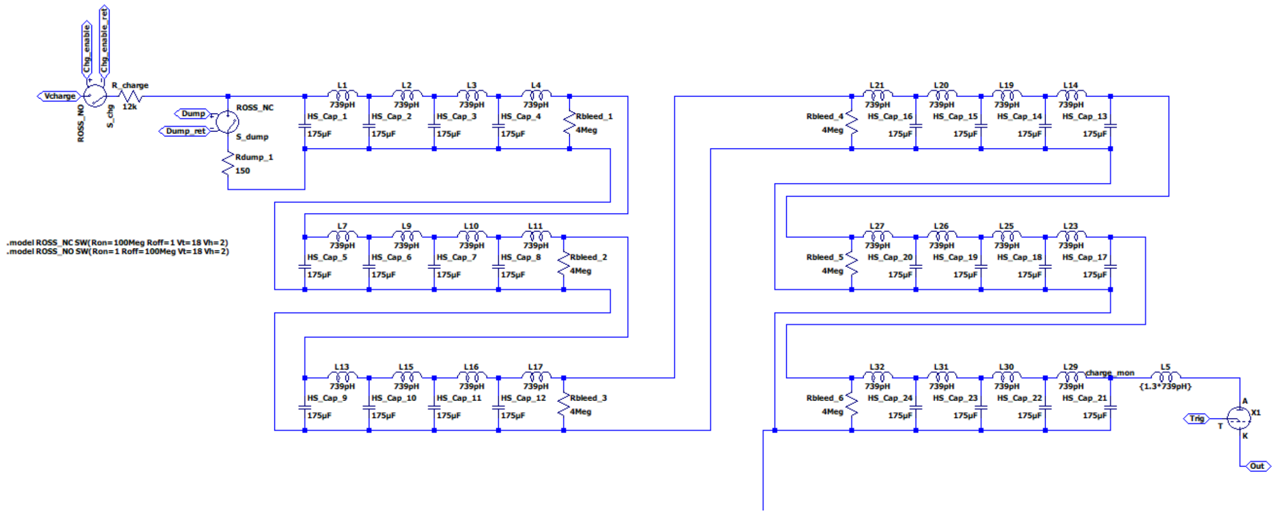
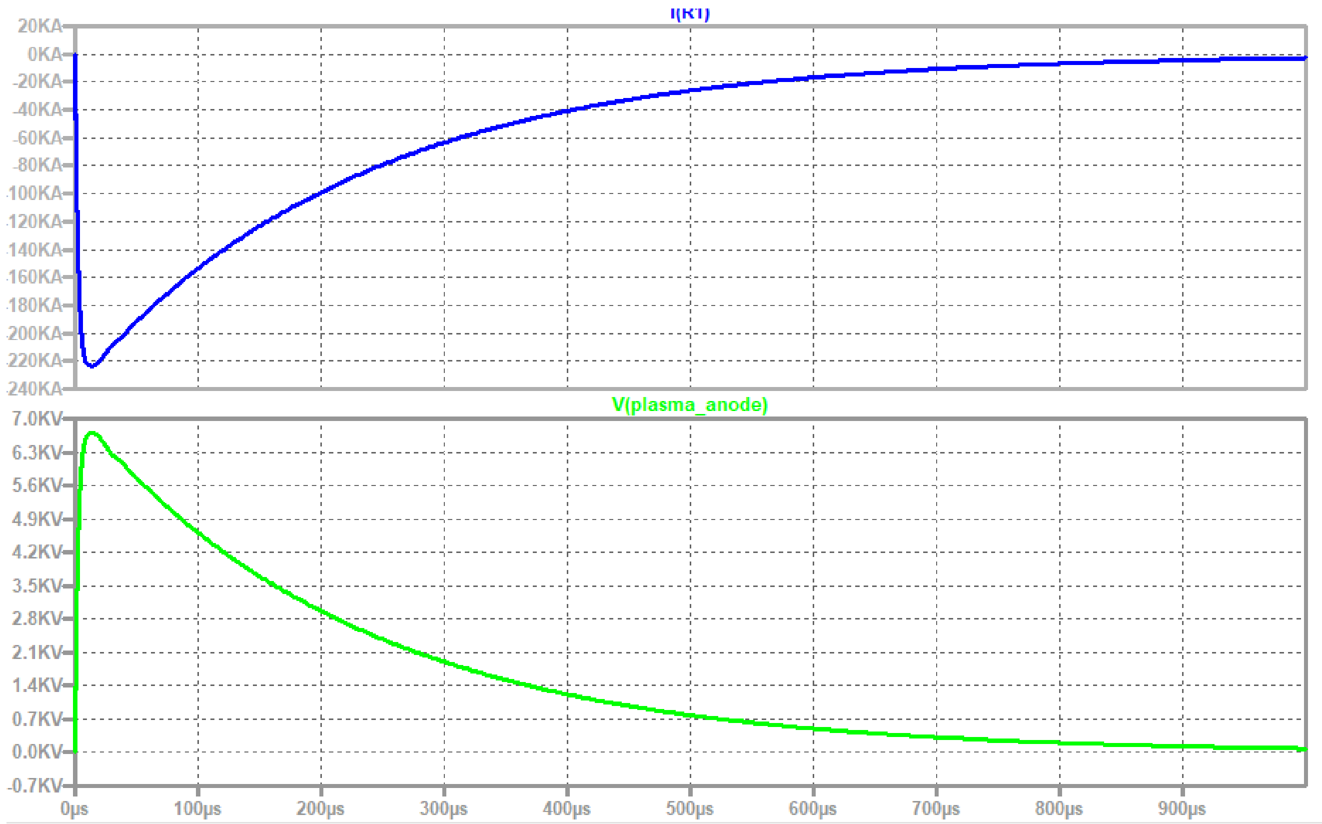
Production datasheet reviewed & accepted requirements.

SPICE simulations





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MJ PULSED CAPACITOR BANK MODULE

High-Voltage Plasma Fusion Power System

600 kA Peak Discharge • 20 Paralleled 24 kV Capacitors • Ignitron Switching • Modular Architecture (Up to 18 MJ Total)

SYSTEM OVERVIEW

Energy Storage per Module	1.01 MJ (1 megajoule) *20 capacitors × 50.4 kJ each*
Maximum System Configuration	No limit *Modular scalable architecture*
Peak Discharge Current	200 kA per module (typical) *Into low-impedance plasma gun loads via Type D ignitron*
Module Architecture	Parallel capacitor bank *All 20 capacitors discharged simultaneously*
Discharge Control	Type D ignitron tube *High-current mercury-arc switching*
Waveform Shaping	Integrated inductor network *PFN-style pulse forming for flat-top waveforms*
Module Dimensions	~6.1m × 1.2m × 1.2m (20ft × 4ft × 4ft) *2×10 array configuration on palletized base*
Module Weight	~2800 kg (2.8 metric tonnes) *Including capacitors, ignitron, inductors, and structure*

CAPACITOR SPECIFICATIONS

Capacitor Model	50.4 kJ, 24 kV, 175 μF High-Voltage Capacitor *Energy-rated metallized film capacitors*
Capacitors per Module	20 units *All connected in parallel*

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Individual Capacitor Energy	50.4 kJ @ 24 kV *$E = ½CV^2 = 0.5 × 175$ μF × (24 kV)^2*
Capacitance (Individual)	175 μF (±10% tolerance) *Nominal 175 μF, range 157.5-192.5 μF*
Total Module Capacitance	3500 μF (3.5 mF nominal) *20 × 175 μF parallel combination*
Voltage Rating	24 kV DC maximum *Continuous rated voltage*
Recommended Operating Voltage	20-22 kV DC *83-92% of rated voltage for extended lifetime*
ESL (Equivalent Series Inductance)	≤50 nH per capacitor *Low inductance for fast discharge*
Total Module ESL	~2.5 nH (parallel combination) *ESL_total = ESL_single / N ≈ 50 nH / 20*
Peak Discharge Current Rating	>30 kA per capacitor *600 kA total / 20 capacitors*
Capacitor Technology	Metallized polypropylene film *Self-healing, high dV/dt capability for plasma loads*
Charge Storage	84 Coulombs @ 24 kV *Q = CV = 3.5 mF × 24 kV*

DISCHARGE SYSTEM SPECIFICATIONS (IGNITRON)

Switch Type	Type D ignitron tube *High-current mercury-arc rectifier*
Peak Current Capability	300 kA (module rating, plasma gun load) *Single-shot discharge through ignitron*
Voltage Blocking	>30 kV forward blocking *Sufficient for 24 kV capacitor voltage*

Trigger Voltage	~10 kV ignitor pulse *High-voltage pulse ionizes mercury for conduction*
Trigger Jitter	<5 microseconds *Ignitron turn-on repeatability*
Conduction Drop	~50-100 V @ 600 kA *Arc voltage during discharge (low series resistance)*
Waveform Shaping Network	Pulse-forming network (PFN) with inductors *Controls discharge rise time and flat-top duration*
Typical Pulse Width	150-250 μs (load dependent) *Tuned for plasma gun impedance*
I^2t Rating	~60 × 10^6 $A^2 \cdot s$ per shot *(600 kA)² × 168 μs ≈ 60 $MA^2 \cdot s$*
Ignitron Lifetime	>10,000 shots (typical) *Depends on current magnitude and duty cycle*
Maintenance	Periodic ignitron replacement *Field-replaceable tube, spares included*

CHARGING AND CONTROL SYSTEM

Charging Architecture	Per-module selective charging *Independent charge control for each module*
Charge Control Relays	24V DC charge relay per module *Allows partial or full bank charging*
Energy Staging Capability	Flexible partial-to-full bank operation *1 MJ increments from single module to 18 MJ full bank*
Charge Voltage Setpoint	0 – 24 kV programmable *Typically operated at 20-22 kV for lifetime*
Voltage Monitoring	Per-module voltage breakout *Individual capacitor stack voltage measurement*

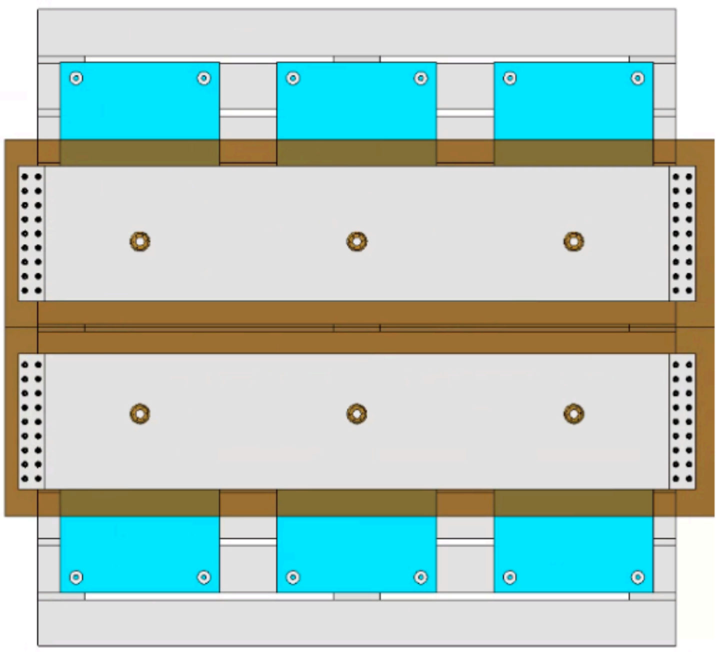
Control Interface	USB-6001 15-pin connector *Standard USB data acquisition interface*
Relay State Monitoring	Per-module relay state breakout *Confirms charge relay and dump relay positions*
Abort Circuit	Dedicated fiber optic abort *Isolated emergency stop signal*
Abort Relay	24V DC abort relay per module *Cuts power to module stack on fault*
Abort Response Time	<10 milliseconds *From fiber optic signal to relay actuation*

SAFETY SYSTEMS

Primary Safety: Soft Dump Relays	Per-module soft dump capability *Controlled energy bleed to ground on shutdown*
Dump Relay Verification	Microswitch position monitoring *Confirms mechanical contact closure before discharge*
Fiber Optic Abort Circuit	Isolated emergency shutdown *Drives 24V abort relay to cut module power*
Ignitron Keep-Alive Interlock	Prevents accidental triggering *Ignitron heater must be energized before trigger enabled*
Multi-Layer Protection	Abort + dump + monitoring + ignitron interlock *Redundant safety paths for fault conditions*
Personnel Safety	Complete electrical isolation via fiber optics *No HV-to-LV electrical connections for operator protection*
Fail-Safe Design	Energy dump paths always available *Passive bleed resistors + active dump relays*
Interlocks	Charge inhibit on dump relay open *Prevents charging with dump path unavailable*

Grounding	Integrated grounding provisions *Safe discharge of residual energy during maintenance*

MECHANICAL SPECIFICATIONS

Module Dimensions	~6.1m × 1.2m × 1.2m (20ft × 4ft × 4ft) *Length × Width × Height per module*
Module Weight	~2800 kg (2.8 metric tonnes) *Capacitors, ignitron, inductors, switching, structure*
Capacitor Array Configuration	2×10 parallel array (20 capacitors) *Two rows of 10 capacitors in rigid support structure*
Palletized Base	Modular pallet assembly *Multiple pallets connected for 20-capacitor array* 
Structural Material	Steel or aluminum framework *Designed for high-current mechanical forces*
Interconnect Cabling	High-current bus bars and cables *Rated for 600 kA peak current per module*

Ignitron Mounting	Integrated in discharge path *Positioned for minimal series inductance*
PFN Inductor Mounting	Integrated pulse-forming network *Inductor network in series with discharge path*
Module Interconnection	Provision for multi-module banks *Parallel module connections standard*
Enclosure Panels	Optional safety enclosure panels *Covers for capacitor array and high-voltage components*
Access and Maintenance	Front-accessible capacitor rack *Simplifies capacitor and ignitron inspection/replacement*
Lifting and Transport	Forklift/crane lifting points *Safe handling for 2.8-tonne module weight*

PERFORMANCE SPECIFICATIONS

Energy Delivery (per Module)	1.01 MJ @ 24 kV charge voltage *$E = \frac{1}{2}CV^2 = 0.5 \times 3.5\ mF \times (24\ kV)^2$*
Peak Current (per Module)	600 kA into plasma gun load (typical) *Current magnitude depends on load impedance*
Total System Energy	No limit *Scalable in 1 MJ increments*
Discharge Rise Time	<20 microseconds to peak current *Depends on PFN design and load inductance*
Pulse Width (Flat-Top)	150-250 microseconds (typical) *PFN-shaped quasi-rectangular pulse for plasma guns*
Charge Transfer	84 Coulombs per module *$Q = CV = 3.5\ mF \times 24\ kV$*
I^2t Thermal Load	~60 × 10^6 $A^2 \cdot s$ per shot *$(600\ kA)^2 \times 168\ \mu s \approx 60\ MA^2 \cdot s$*

Discharge Efficiency	>92% *Energy delivered to load vs. stored energy (ignitron + PFN losses)*
Repetition Rate	Application dependent *Limited by charging system power and thermal management*
Charge Time	Facility dependent *Determined by charging power supply capacity*

PLASMA GUN / LOAD INTERFACE

Output Connection	Coaxial transmission line interface *High-current coaxial cables to plasma gun*
Coaxial Cable Type	RG217 or equivalent (0.87" diameter) *Low-loss, high-current rated for pulsed operation*
Cable Characteristic Impedance	~50 Ω *Matches typical plasma gun input impedance*
Recommended Cable Length	Equal length for all modules to same load *Minimizes timing skew in multi-module configurations*
Typical Load Impedance	0.1 – 1 Ω (plasma gun) *Ultra-low impedance for high current delivery*
Multi-Module Configuration	2 modules per plasma gun typical *Enables vertical stacking for compact facility layout*
Crowbar Protection	Load crowbar for plasma gun faults *Fast crowbar shorts load on gun failure to protect bank*

SPARES AND CONSUMABLES PACKAGE

Type D Ignitron Tubes	Replacement ignitron tube(s) included *Consumable item requiring periodic replacement*

Ignitron Ignitor Assemblies	Spare ignitor rods and hardware *For ignitron maintenance and rebuilding*
Protection Fuses	High-current fault protection fuses *Rated for module short-circuit interruption*
Module Interconnect Cables	Verified high-current cabling *Spares for module-to-module connections*
Coaxial Cable Assemblies	RG217 coaxial cables with connectors *Spares for bank-to-load connections*
USB-6001 Interface Cable	Control and monitoring interface *15-pin connector to data acquisition system*
Fiber Optic Cables	Trigger and abort signal transmission *TG-75 compatible fiber optic cables*
Documentation Package	Full technical documentation *Schematics, assembly drawings, ignitron maintenance procedures*

TYPICAL APPLICATIONS

• Fusion Plasma Research: Coaxial plasma guns, spheromak formation and merging experiments, helicity injection systems for magnetic confinement

• Magneto-Inertial Fusion: Z-pinch drivers, plasma compression experiments, field-reversed configuration (FRC) formation

• Tokamak Auxiliary Systems: Ohmic heating coils, vertical field control, plasma current startup, disruption mitigation

• Dense Plasma Focus: High-current discharge for neutron production, X-ray generation, plasma diagnostics development

• Pulsed Power Research: Electromagnetic launchers, high-current materials testing, ultra-high magnetic field generation

• Industrial Plasma Applications: Plasma processing, surface treatment, large-volume plasma generation

KEY FEATURES

High-Voltage Architecture for Plasma Guns: 24 kV capacitor voltage enables efficient energy coupling to coaxial plasma gun impedances while reducing total capacitance requirements compared to lower-voltage designs. The 3.5 mF total capacitance delivers 84 Coulombs of charge transfer—sufficient for multi-hundred-kiloampere plasma gun currents with 150-250 microsecond pulse durations optimized for spheromak formation, helicity injection, or FRC generation where extended current drive is required for plasma equilibration and magnetic field penetration.

Ignitron Switching for Extreme Currents: Type D ignitron tubes provide reliable 300 kA peak current switching with ultra-low conduction drop (~50-100 V) and proven performance in fusion plasma applications where solid-state switches would fail from di/dt stress or thermal overload. Mercury-arc conduction physics enables repetitive mega-ampere discharge capability without semiconductor junction degradation, while the simple triggered-tube architecture eliminates complex gate drive circuitry and offers field-replaceable maintenance for sustained operations during multi-month experimental campaigns.

Optional Pulse-Forming Network for Flat-Top Waveforms: Optional PFN inductor network shapes the natural exponential capacitor discharge into quasi-rectangular current pulses with controlled rise time (<20 μs), extended flat-top duration (150-250 μs), and minimized reversal—critical for plasma gun experiments where current waveform directly determines plasma density, magnetic field topology, and energy confinement. PFN design can be tuned for specific load impedances and experimental requirements, from fast-rise Z-pinch applications to extended-pulse spheromak formation protocols.

Modular Palletized Construction: 2×10 capacitor array on connected pallet assemblies enables modular transport (individual pallets shipped separately, assembled on-site), flexible facility layout (linear arrays, stacked configurations, or custom geometries), and simplified maintenance access to individual capacitors or ignitron tubes without disassembling the entire bank. Optional enclosure panels provide safety barriers for high-voltage components while maintaining visual inspection capability and cable routing access for multi-module installations feeding multiple plasma guns.

Princeton Heritage Design: Architecture derived from Princeton Plasma Physics Laboratory FLARE Ohmic heating banks —proven designs with decades of operational experience in fusion research environments. Component selection, circuit topology, and safety systems reflect best practices from major fusion facilities, ensuring compatibility with facility control systems (EPICS, LabVIEW), standard coaxial transmission line interfaces, and experimental protocols common to university, national laboratory, and private fusion research programs.

Complete Turnkey System with Plasma-Specific Features: Ships with ignitron spares, coaxial cable assemblies, fiber optic trigger distribution, and comprehensive documentation including PFN design parameters, plasma gun interface specifications, and ignitron maintenance procedures. USB-6001 control interface with per-module breakout enables integration with shot-control sequencers, plasma diagnostics timing systems, and facility safety interlocks, while the modular architecture supports phased deployment from single-gun proof-of-concept experiments through multi-gun spheromak merging or tandem plasma formation configurations requiring synchronized multi-megajoule energy delivery.

HIGH-VOLTAGE PULSED CAPACITOR BANKS — Product Variants (Ignitron Switching)

24 kV High-Voltage Architecture • Type D Ignitron Switching (300 kA Limit) • Plasma Gun Optimized • Modular Palletized Design

MODEL	CAPSPER MODULE	VOLTAGE	TOTALCAPACITANCE	ENERGY	PEAKCURRENT	PULSEWIDTH	LEADTIME
WE-IGBANK-250KJ	10	24 kV	1.75 mF	0.5 MJ(504 kJ)	150 kA	100-150 μs	20 wks
WE-IGBANK-500KJ	15	24 kV	2.625 mF	0.76 MJ(756 kJ)	225 kA	125-175 μs	22 wks
WE-IGBANK-1MJ ⭐	20	24 kV	3.5 mF	1.01 MJ	300 kA	150-250 μs	24 wks
WE-IGBANK-1MJ-HV	12	30 kV	2.1 mF	0.95 MJ(945 kJ)	200 kA	125-200 μs	24 wks
WE-IGBANK-1MJ-HC	32	18 kV	5.6 mF	0.91 MJ(907 kJ)	300 kA	200-300 μs	26 wks
WE-IGBANK-1.5MJ	20	30 kV	3.5 mF	1.58 MJ	300 kA	175-275 μs	26 wks
WE-IGBANK-2MJ	24	30 kV	4.2 mF	1.89 MJ	300 kA	200-300 μs	28 wks
WE-IGBANK-250KJ-C	8	20 kV	1.4 mF	0.28 MJ(280 kJ)	120 kA	75-125 μs	18 wks
WE-IGBANK-1MJ-LC	20	24 kV	3.5 mF	1.01 MJ	150 kA	300-400 μs	24 wks
WE-IGBANK-CUSTOM	Variable	18-30 kV	Custom	0.25-2 MJ	≤300 kA	Custom	TBD

⭐ *WE-IGBANK-1MJ: Reference design — 20 capacitors, proven plasma gun architecture, Princeton/Helicity heritage*

Variant Selection Principles:

• Energy-Current Trade-off: Higher energy storage (more capacitors or higher voltage) increases available current for a given load impedance. All variants maintain ≤300 kA peak current limit through PFN inductance tuning or reduced capacitor count.• Voltage Selection: 18-30 kV range balances capacitor availability, insulation requirements, and load impedance matching. Higher voltage (30 kV) reduces total capacitance for same energy, enabling lighter/smaller modules. Lower voltage (18 kV) increases capacitance, extending pulse duration for slow plasma formation protocols.• Pulse Width Scaling: Pulse duration scales roughly with total capacitance and PFN inductance. Lower-capacitance variants (250-500 kJ) produce shorter pulses (75-150 μs) suitable for fast Z-pinch or rapid spheromak formation. Higher-capacitance variants (1-2 MJ with high C) deliver extended pulses (200-400 μs) for sustained helicity injection or slow FRC buildup.• Current Limiting Methods: Peak current controlled by (1) reducing capacitor count, (2) increasing PFN inductance, or (3) operating at lower charge voltage. The 1MJ-LC variant uses increased PFN inductance to halve peak current while maintaining 1 MJ energy, extending ignitron lifetime for high-repetition-rate applications.• Compact Variants: 250KJ-C and similar use fewer capacitors (8-10) for reduced weight (~1.5 tonnes vs. 2.8 tonnes), smaller footprint (10-12 ft vs. 20 ft), and simplified transport—suitable for mobile plasma experiments or space-constrained university laboratories.

Common Features Across All Variants:

• Type D Ignitron Switching: Single Type D ignitron per module (300 kA maximum safe rating), mercury-arc conduction, fiber optic trigger, <5 μs trigger jitter, field-replaceable tube• 175 μF / 24 kV Capacitors: Metallized polypropylene film, 50.4 kJ per capacitor, ≤50 nH ESL, self-healing technology, >100,000 cycle lifetime• Pulse-Forming Network: optional PFN inductors for quasi-rectangular waveform shaping, tunable for specific load impedances, minimizes current reversal and voltage ringing• Palletized Modular Construction: 2×N array (N = capacitor count / 2) on connected pallets, modular transport/assembly, optional enclosure panels for safety• USB-6001 Control Interface: Per-module voltage monitoring, relay state breakout, fiber optic abort circuit, 24V charge/dump relays with microswitch verification• Coaxial Load Interface: RG217 or equivalent coaxial cables to plasma gun, 50 Ω characteristic impedance, equal-length cables for multi-module synchronization• Complete Spares Package: Type D ignitron replacement tubes, ignitor assemblies, coaxial cables, fiber optic cables, protection fuses, full documentation• Safety Systems: Fiber optic abort, soft dump relays, ignitron keep-alive interlock, mercury vapor containment, grounding provisions, charge inhibit interlocks• Multi-Module Scaling: Modules can be paralleled for higher current (currents sum) or used independently for multiple loads.

1 MJ PULSED CAPACITOR BANK MODULES

Technical Specification Form — System Configuration

Please complete all sections below. This information will be used to prepare a detailed quotation and ensure the system meets your requirements. If you have questions about any specification, contact us at **sales@woodruffeng.com**

CUSTOMER INFORMATION

Organization / Institution	
Contact Name	
Email Address	
Phone Number	
Shipping Address	

SYSTEM CONFIGURATION

Preferred System Configuration (select one):

☐ WE-CAPBANK-1M — Single module (1 MJ, 24 weeks)

☐ WE-CAPBANK-2M — 2 modules (2 MJ, 28 weeks)

☐ WE-CAPBANK-3M — 3 modules (3 MJ, 30 weeks)

☐ WE-CAPBANK-4M — 4 modules (4 MJ, 32 weeks)

☐ WE-CAPBANK-6M — 6 modules (6 MJ, 36 weeks)

☐ WE-CAPBANK-8M — 8 modules (8 MJ, 40 weeks)

☐ WE-CAPBANK-10M — 10 modules (10 MJ, 44 weeks)

☐ WE-CAPBANK-CUSTOM — Custom configuration (specify below)

Number of Modules		*modules*
Total Energy Required		*MJ (1 MJ per module)*
Peak Current Required		*kA*

MODULE INTERCONNECTION ARCHITECTURE

Discharge Configuration:

☐ Standard Parallel — All modules discharge simultaneously (currents sum, maximum peak current)

☐ Series Configuration — Modules in series for high voltage (voltages sum, current limited)

☐ Hybrid Series-Parallel — Optimized voltage/current (specify configuration below)

☐ Phased Discharge — Sequential module triggering (specify delay requirements below)

☐ Independent Module Control — Each module charged/discharged separately

Custom Interconnection Details: ____

Inter-Module Delay (Phased Discharge): ________ *μs or ms*

OPERATING PARAMETERS

Operating Charge Voltage		*kV (Maximum: 24 kV, Recommended: 20 kV)*
Load Type		*(e.g., z-pinch coil, railgun, pulsed magnet)*
Load Impedance		*Ω or mΩ*
Load Inductance		*μH or mH*
Expected Pulse Width		*μs or ms (RLC circuit dependent)*

Discharge Repetition Rate:

☐ Single-shot (one discharge per setup)

☐ Repetitive (specify): _______ shots per hour or _______ shots per day

☐ Continuous research program (sustained operation over months/years)

Duty Cycle		%	*(Percentage of time actively discharging)*

TRIGGER AND CONTROL SYSTEM

Trigger System (Fiber Optic Standard):

☐ Single trigger source for all modules (synchronized discharge)

☐ Independent trigger per module (phased or selective discharge)

☐ External trigger source provided by customer

☐ Woodruff-supplied master trigger controller required

Trigger Fiber Cable Length		*meters*	*(Per module from control room)*

Synchronization Requirements:

☐ Standard synchronization (<1 μs jitter, included)

☐ Tighter synchronization required (specify): _______ ns jitter

☐ Absolute timing accuracy required (GPS or facility clock sync)

Control Interface (USB-6001 Standard):

☐ Standard USB-6001 interface per module (15-pin, voltage/relay monitoring)

☐ Integrated multi-module control system (centralized monitoring)

☐ Integration with facility SCADA or control system (specify below)

Control System Integration		*(e.g., LabVIEW, EPICS, PLC-based SCADA)*

CHARGING SYSTEM REQUIREMENTS

Charging System Scope:

☐ Customer provides charging system (specify voltage/current capability below)

☐ Woodruff Engineering to supply charging system (quote separately)

☐ Existing charging infrastructure available (specify below)

Available Charging Power		*kW (Total available for capacitor charging)*
Desired Charge Time		*minutes (Time to charge full bank to voltage)*

Charging Control:

☐ Per-module charge control (selective module charging via 24V relays)

☐ All modules charged simultaneously

☐ Programmable charge sequencing (specify requirements below)

Charge Sequencing Details: ____

SAFETY SYSTEMS AND INTERLOCKS

Standard Safety Features (included on all systems):

☐ ✓ Per-module soft dump relays with microswitch verification

☐ ✓ Fiber optic abort circuit (24V abort relay per module)

☐ ✓ Charge inhibit interlocks

☐ ✓ Per-module voltage monitoring

☐ ✓ Relay state monitoring and fault detection

☐ ✓ Integrated grounding provisions

Additional Safety Requirements:

☐ External facility interlock inputs (dry contact, specify voltage/current)

☐ Access control interlocks (gate/door monitoring)

☐ Remote emergency stop (specify location/quantity)

☐ Capacitor voltage monitoring display (local or remote)

☐ Audible/visual warning systems (charge status, HV live indicators)

☐ Grounding verification system (ensure safe-to-touch before maintenance)

FACILITY AND INSTALLATION REQUIREMENTS

Installation Location:

☐ Indoor laboratory (climate controlled)

☐ Dedicated pulsed power building

☐ Outdoor capacitor yard (weather protection required)

☐ Existing facility (specify constraints below)

Available Floor Space		*feet or meters (Length required for modules)*
Floor Loading Capacity		*kg/m² or tonnes total*
Ceiling Height		*feet or meters (For crane access)*

Handling and Access:

☐ Forklift access available (single modules ≤3 tonnes)

☐ Overhead crane available (specify capacity: _______ tonnes)

☐ Loading dock access for delivery

☐ Special rigging required (describe below)

Environmental Conditions:

Ambient Temperature Range		*°C (Operating environment)*
Humidity Range		*% (Typical laboratory: 20-80% RH)*

MECHANICAL CONFIGURATION

Module Layout:

☐ Linear array (modules in single row, standard)

☐ Dual row configuration (space-constrained facilities)

☐ Circular/radial arrangement (custom applications)

☐ Custom layout (describe below)

Inter-Module Spacing		*feet or meters (Minimum clearance for maintenance)*

Cable Run Requirements:

Distance from Bank to Load		*meters (Affects bus bar sizing)*
Distance to Control Room		*meters (For fiber optic and control cables)*

APPLICATION DETAILS

Primary Application:

☐ Fusion Energy Research — compression, plasma experiments

☐ High-Energy Physics — Particle accelerator kicker magnets, beam deflection

☐ Pulsed Power Research — Railguns, electromagnetic launchers, ultra-high fields

☐ Plasma Physics — Dense plasma focus, plasma compression studies

☐ Industrial Applications — Electromagnetic forming, discharge welding

☐ Defense Research — Electromagnetic launchers, directed energy programs

☐ Other (describe below)

Detailed Application Description:

(Brief description of the experimental setup, load characteristics, research objectives)

Facility Type:

☐ University research laboratory

☐ National laboratory (DOE, DOD, etc.)

☐ Industrial R&D facility

☐ Defense/government research center

☐ Private research foundation

SCHEDULE AND BUDGET

Target Delivery Date		*(Lead times: 24-56 weeks depending on scale)*
Target Installation Date		
Budget Range (optional)		*$ _______ to $ _______*

Deployment Strategy:

☐ Complete system delivery (all modules at once)

☐ Phased deployment (initial modules for early operation, remainder later)

☐ Rolling delivery (modules delivered/installed incrementally)

Phased Deployment Details: ____

Project Funding Status:

☐ Funded — ready to proceed

☐ Budget estimate needed for funding approval

☐ Feasibility study / concept development

☐ Multi-year capital equipment acquisition

SPECIAL REQUIREMENTS AND SERVICES

Testing and Documentation:

☐ Factory Acceptance Testing (FAT) required

☐ Module-by-module discharge characterization

☐ Multi-module synchronization validation

☐ Detailed test reports and certification

☐ As-built drawings, schematics, and technical documentation

☐ Operation and maintenance manuals

Installation and Commissioning:

☐ Woodruff Engineering installation supervision required

☐ Woodruff Engineering commissioning support

☐ Operator training required (specify number of personnel: _______)

☐ Customer self-installation (documentation only)

Ongoing Support:

☐ Spare electrode kits (ST300-A spark gap electrodes and seals)

☐ Extended warranty or service contract

☐ On-site maintenance training

☐ Remote diagnostic support

Additional Requirements or Notes:

SUBMISSION

Please email this completed form to: sales@woodruffeng.com We will review your specifications and provide a detailed quotation within 5–10 business days.

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