400Hz
GROUND POWER SOLUTIONS
PRODUCTS & SERVICES
WWW.MCMENG.COM
WELCOME TO MCM ENGINEERING

Our mission at MCM Engineering is to help our customers succeed by providing the highest quality engineered systems, products and services the 400Hz Ground Power Industry has to offer. We understand our customers have choices and we work hard daily to earn and keep their business. We are proud of our 26 year history of providing innovative, superior products and outstanding customer support. We look forward to continuing the support of our customers with their 400Hz Ground Power needs.

Thank You,

[Signature]

Patrick G. O’Brien
President/CEO
MCM Engineering, Inc.
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MCM Engineering 400Hz Gate Boxes are designed to convert 400Hz system voltage to usable controlled voltage for aircraft, including protection when power limits are exceeded. Gate boxes are fully customizable for each specific requirement.

MCM Engineering also manufactures Load Banks to test 400Hz equipment. MCM Resistive and Reactive Load Banks are designed to be connected in series utilizing an interconnect cable allowing configurations of 90kVA (1 ea. 54kVAR & 1 ea. 72Kw) or 180kVA (2 ea. 54kVAR & 2 ea. 72kW). The design allows for uneven load distribution providing a more accurate simulation of aircraft power loads. Although best when used together, the load banks can be operated individually.
400Hz GATE BOXES & LOAD TESTING EQUIPMENT

400Hz GATE BOX

The MCM 400Hz Gate Box is specifically designed to convert 400Hz system voltage to usable controlled voltage for aircraft as well as providing a means of aircraft protection when power limits are exceeded.

* Gate Boxes are built to order. Please contact MCM Engineering for specific rating & application. (650) 259-9100

400Hz REACTIVE & RESISTIVE LOAD BANKS

The MCM 400Hz Load Banks are designed to test the 400Hz generating equipment or power source. The unit incorporates five (5) loading steps accurately replicating the load during the engine start sequence. Load banks are available as individual 54kVAR reactive and 72KW resistive units or in assemblies of 90kVA and 180kVA.

Features
- Weather resistant enclosure
- Realistic aircraft load simulation
- 5 step load testing
- E/F Feedback
- Forklift accessible
- Custom features available

<table>
<thead>
<tr>
<th>LOAD BANK SPECIFICATION</th>
<th>RATING</th>
<th>PART NUMBER</th>
<th>WEIGHT</th>
<th>DIMENSIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reactive Load Bank</td>
<td>54kVA</td>
<td>DD2-5082-1</td>
<td>345 LBS</td>
<td>3'-2&quot; x 1'-9&quot; x 1'-4&quot;</td>
</tr>
<tr>
<td>Resistive Load Bank</td>
<td>72kW</td>
<td>DD2-5082-2</td>
<td>155 LBS</td>
<td>3'-2&quot; x 1'-9&quot; x 1'-4&quot;</td>
</tr>
<tr>
<td>1 Reactive &amp; 1 Resistive Load Banks w/Cart</td>
<td>90kVA</td>
<td>DD2-5113-2</td>
<td>690 LBS</td>
<td>3'-6&quot; x 1'-9&quot; x 4'-5&quot;</td>
</tr>
<tr>
<td>2 Reactive &amp; 2 Resistive Load Banks w/Cart</td>
<td>180kVA</td>
<td>DD2-5113-1</td>
<td>1350 LBS</td>
<td>3'-6&quot; x 4'-6&quot; x 4'-5&quot;</td>
</tr>
<tr>
<td>Interconnecting Air Craft Cable</td>
<td>260A</td>
<td>DD7-5522-12</td>
<td>36 LBS</td>
<td>8'</td>
</tr>
</tbody>
</table>
MOTOR GENERATOR SETS

MCM Engineering is known for its innovative, reliable 400Hz Motor-Generator Based Central Ground Power Systems. These systems and our customers rely on the quality and performance of the Kato Engineering 400Hz Motor-Generators Sets (MG). Backed by over 85 years of experience, Kato Engineering MG sets have evolved over the years to meet our customer’s special requirements and power demands of the modern aviation industry.

Kato Engineering’s 400Hz MG sets supply conditioned and converted power available from 25kVA - 400kVA and inputs for either 50Hz or 60Hz. When utilizing multiple paralleled MG sets, the power capacities are limitless.
ADVANTAGES OF GROUND POWER MOTOR-GENERATORS

KATO™ motor-generator (MG) sets offer many advantages over solid-state units:

- **Long Life:** The mean time between failure (MTBF) for a motor-generator is in excess of 100,000 hours (with a 100,000 L10h bearing life). This is four times the average MTBF of a solid state converter.

- **Low Maintenance Cost:** Kato offers a horizontal, single-shaft design, which means that there are no couplings, gears or belts to wear out. Kato exciters are brushless; there are no commutators or brushes to replace.

- **Low Harmonics:** Harmonics can be a contributing factor in nuisance tripping of the circuit breakers, transformer failures and incidental damage to electronic components. MGs have a smooth sine wave generated by the mechanical construction of the generator resulting in negligible harmonic distortion.

- **High Overload Capability:** MGs are better suited to take short-term overload situations (300% of nominal amps for 3 seconds). Overload conditions, while not common, can occur when aircraft hydraulic motors or ovens operate.

- **Proven Technology:** Kato MGs are built with the latest technology and are backed by 85 years of experience in building rotary motor generators.

FEATURES

- Made in the U.S.A.
- Long standing life cycles in excess of 100,000 hours.
- Low maintenance & life cycle cost.
- 12” Touch Screen, Human Machine Interface (HMI).
- Ethernet/IP communications standard.
- Extremely low harmonics.
- Protective relays.
- Transient spike protection.
- High overload capacity.

STANDARD MODELS

<table>
<thead>
<tr>
<th>Voltage</th>
<th>kW</th>
<th>kVA</th>
</tr>
</thead>
<tbody>
<tr>
<td>200-208</td>
<td>75</td>
<td>93.75</td>
</tr>
<tr>
<td>200-208</td>
<td>144</td>
<td>180</td>
</tr>
<tr>
<td>575</td>
<td>144</td>
<td>180</td>
</tr>
<tr>
<td>575</td>
<td>250</td>
<td>312</td>
</tr>
<tr>
<td>575</td>
<td>320</td>
<td>400</td>
</tr>
<tr>
<td>575</td>
<td>400</td>
<td>400</td>
</tr>
</tbody>
</table>
MCM Engineering has developed a comprehensive line of 400Hz Aircraft Ground Power Cables and Accessories that increase the performance and life of our aircraft cables.

The MCM Engineering 400Hz Aircraft Ground Cable is built for longevity with replaceable pins, nose covers, including our exclusive Gold-X Nose option that further extends the life and performance of the cable. Ratings of 180A, 260A, and 300A are available as well as connector pushbutton configurations that meet various commercial and military applications.
400Hz AIRCRAFT CABLE PRODUCTS

400Hz AIRCRAFT CABLE

The MCM 400Hz Aircraft Cable is a single jacketed, multi-conductor aircraft cable built for longevity with replaceable pins and nose cover. 180A, 260A, & 300A ratings available.

* Pins and nose cover can be purchased individually or as a complete kit.

Product shown: 400Hz Aircraft Ground Power Cable
Four Pushbutton Model

<table>
<thead>
<tr>
<th>CABLE SPECIFICATION</th>
<th>NO PUSHBUTTON</th>
<th>2 PUSHBUTTON</th>
<th>4 PUSHBUTTON</th>
</tr>
</thead>
<tbody>
<tr>
<td>180A, Single Jacketed (3 #2)</td>
<td>PN: DD7-5580-XX</td>
<td>PN: DD7-5582-XX</td>
<td>PN: DD7-5583-XX</td>
</tr>
<tr>
<td>260A, Single Jacketed (6 #4)</td>
<td>PN: DD7-5500-XX</td>
<td>PN: DD7-5510-XX</td>
<td>PN: DD7-5515-XX</td>
</tr>
<tr>
<td>300A, Single Jacketed (6 #2)</td>
<td>PN: DD7-5620-XX</td>
<td>PN: DD7-5630-XX</td>
<td>PN: DD7-5635-XX</td>
</tr>
</tbody>
</table>

* XX indicates required cable length.

400Hz ATTACHABLE AIRCRAFT CABLE CONNECTOR

The MCM 400Hz Attachable Aircraft Cable Connector is designed for the field retrofitting of existing 400Hz aircraft cables. Includes replaceable pins and nose cover. 180A, 260A, & 300A ratings available.

* Pins and nose cover can be purchased individually or as a complete kit.

Product shown: 400Hz Attachable Aircraft Cable Connector

<table>
<thead>
<tr>
<th>CABLE SPECIFICATION</th>
<th>NO PUSHBUTTON</th>
<th>2 PUSHBUTTON</th>
<th>4 PUSHBUTTON</th>
</tr>
</thead>
<tbody>
<tr>
<td>180A, Single Jacketed (3 #2)</td>
<td>PN: DB04-5905-1</td>
<td>PN: DB04-5909-2</td>
<td>PN: DB04-5909-3</td>
</tr>
<tr>
<td>260A, Single Jacketed (6 #4)</td>
<td>PN: DB04-5904-1</td>
<td>PN: DB04-5904-2</td>
<td>PN: DB04-5904-3</td>
</tr>
<tr>
<td>300A, Single Jacketed (6 #2)</td>
<td>PN: DB04-5905-1</td>
<td>PN: DB04-5905-2</td>
<td>PN: DB04-5905-3</td>
</tr>
<tr>
<td>260A, Banded (#1/0)</td>
<td>PN: DB04-5906-1</td>
<td>PN: DB04-5906-2</td>
<td>PN: DB04-5906-3</td>
</tr>
<tr>
<td>300A, Banded(#2/0)</td>
<td>PN: DB04-5907-1</td>
<td>PN: DB04-5907-2</td>
<td>PN: DB04-5907-3</td>
</tr>
</tbody>
</table>

FEATURES

- Abrasion, petroleum & water resistant
- Silver-plated, high grade copper alloy pins
- 25% lighter than banded cables while retaining flexibility
- 0/2/4 pushbutton options

- Cost effective
- Abrasion, petroleum & water resistant
- Silver-plated, high grade copper alloy pins
- Ease of installation
- Stainless steel hardware
- 0/2/4 pushbuttons
400Hz AIRCRAFT CABLE PERFORMANCE

**GOLD-X NOSE**

The MCM Gold-X Nose is specifically designed to extend the life of the aircraft cable connector from the abrasive ramp environment. Made of high impact strength thermoplastic, the Gold-X Nose delivers, exceptional, light weight, replaceable performance.

**FEATURES**
- Highly abrasion & corrosion resistant
- Cost effective
- Easily replaceable
- Light weight
- Ease of installation

Product shown: Gold-X Nose

**PART NUMBER** DA12-6283

**GOLD-X NOSE REPAIR KIT**

The MCM’s Gold-X Nose Repair Kit is designed for the MCM’s 400Hz molded and field attachable cable connectors. Each kit includes; Gold-X Nose, Connector Pins, Yellow Base & Allen Wrench®.

* Replaceable pins, nose cover and base can be purchased individually.

Product shown: Gold-X Nose Repair Kit

**PART NUMBER** DA12-6271A

**STANDARD NOSE REPAIR KIT**

The MCM’s Standard Nose Repair Kit is designed for the MCM’s 400Hz molded and field attachable cable connectors. Each kit includes; Connector Pins, Standard Yellow Nose & Allen Wrench®.

* Replaceable pins and nose cover can be purchased individually.

Product shown: Standard Nose Repair Kit

**PART NUMBER** DA9-5509-4
400Hz AIRCRAFT CABLE TESTING EQUIPMENT & ACCESSORIES

400Hz AIRCRAFT CABLE POWER SOURCE ANALYZER

The MCM’s Power Source Analyzer is a valuable tool for testing the phase rotation, E & F circuit continuity and the supply voltage at the end of the aircraft cable. Designed for effortless connector insertion/extraction including recessed lights and test points for protection.

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>RATING</th>
<th>WEIGHT</th>
<th>DIMENSIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD2-5002</td>
<td>400Hz</td>
<td>5 LBS</td>
<td>12.75” x 4.5” x 3.75”</td>
</tr>
</tbody>
</table>

400Hz AIRCRAFT CABLE HOIST

The MCM Aircraft Cable Hoist is designed specifically for the raising/lowering and safe storage of aircraft cables on passenger loading bridges or in aircraft maintenance hangers.

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>RATING</th>
<th>WEIGHT</th>
<th>DIMENSIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>DD5-5260-2C</td>
<td>115VAC, 60Hz</td>
<td>175 LBS</td>
<td>12.75” x 49.5” x 13”</td>
</tr>
</tbody>
</table>

400Hz CABLE REEL

Hannay Reels has been the top choice of aviation OEMs for decades because of the quality of construction and components. Reels are individually designed and built to meet the specific requirements of the aviation industry – never retrofitted to the job – so you can expect unsurpassed fit and function.

<table>
<thead>
<tr>
<th>FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Standard aircraft receptacle configuration</td>
</tr>
<tr>
<td>Foot treads for ease of cable insertion/extraction</td>
</tr>
<tr>
<td>Light-weight and portable</td>
</tr>
<tr>
<td>Black anodized aluminum</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>NEMA 3R enclosure</td>
</tr>
<tr>
<td>200lbs. UL hoist rating</td>
</tr>
<tr>
<td>½ Hp, 480V, 60Hz motor</td>
</tr>
<tr>
<td>Spring-loaded trigger assy. on SS cable</td>
</tr>
<tr>
<td>Passenger loading bridge interlock</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>FEATURES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Heavy-duty compact design</td>
</tr>
<tr>
<td>Dual bearing including dual frame support</td>
</tr>
<tr>
<td>Sealed axle bearings with one-piece hub assembly</td>
</tr>
<tr>
<td>Universal usage</td>
</tr>
<tr>
<td>Custom enclosures available</td>
</tr>
</tbody>
</table>

Please contact MCM Engineering for your specific application (650) 259-9100.
MCM Engineering offers a full product line of 28VDC Aircraft Ground Support Equipment to support your commercial/military aircraft including:

- Aircraft Ground Power Cables
- Power Supplies (fixed/portable) designed for use with parked aircraft requiring 28VDC ground power
- 28VDC Load Bank Test Equipment that accurately mimics the load produced by an aircraft so you can monitor the health of your 28VDC system
28VDC GROUND POWER PRODUCTS

28VDC AIRCRAFT CABLE

The MCM 28VDC Aircraft Cable is an attachable head with individual power conductors banded together for aircraft requiring 28.5 VDC power.

FEATURERS
- Silver plated contacts
- Hypalon material
- Non-metallic bands
- 1, 2 or 4 ott banded cable options

PART NUMBER: DD7-5672-XX

* XX indicates required cable length.

Product shown: 28VDC Aircraft Cable

28VDC POWER SUPPLY

The MCM 28VDC Power Supplies are designed for use with parked aircraft requiring 28VDC ground power. The Power Supply is used in conjunction with a 400Hz power source, transforming 400Hz, 115VAC power to 28VDC.

FEATURERS
- Weather resistant enclosure
- Standard 400Hz connector input
- Aircraft protection
- 200A overload capacity
- Lightweight

<table>
<thead>
<tr>
<th>CONFIGURATION</th>
<th>PART NUMBER</th>
<th>WEIGHT</th>
<th>DIMENSIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed</td>
<td>DB10-6186</td>
<td>375 LBS</td>
<td>30 ½” x 20” x 14”</td>
</tr>
<tr>
<td>Portable</td>
<td>DB03-5858</td>
<td>400 LBS</td>
<td>16” x 21” x 33 ½”</td>
</tr>
</tbody>
</table>

Product shown: 28VDC Power Supply

28VDC LOAD BANK

The MCM 28VDC Load Banks are designed to test 28VDC generating equipment or power source. The unit incorporates six load steps and relays supplying up to a 1600A load, accurately replicating the load produced by an aircraft during the engine start sequence.

FEATURERS
- Weather resistant enclosure
- Voltage test points
- External fan power receptacle
- Programmable load step timing relays
- 300A continuous load
- Forklift accessible

<table>
<thead>
<tr>
<th>CONFIGURATION</th>
<th>PART NUMBER</th>
<th>WEIGHT</th>
<th>DIMENSIONS</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fixed/Portable</td>
<td>DD2-5082-13</td>
<td>125 LBS</td>
<td>42” x 26” x 16 ½”</td>
</tr>
</tbody>
</table>

Product shown: 28VDC Load Bank
270VDC AIRCRAFT GROUND POWER

The MCM Engineering 270VDC Aircraft Cable is a single jacketed, multi-conductor cable, suited for 270VDC aircraft ground power applications, including the Lockheed Martin F-22 & F-35 Aircraft.

270VDC AIRCRAFT CABLE

The MCM 270VDC Aircraft Cable is a single jacketed, multi-conductor aircraft cable built for longevity with replaceable pins and nose cover.

<table>
<thead>
<tr>
<th>PART NUMBER</th>
<th>DD11-6301-XX</th>
</tr>
</thead>
</table>

* XX indicates required cable length.
** Replaceable pins and nose cover can be purchased individually or as a kit.

FEATURES
- High grade silver-plated copper alloy pins
- Abrasion & corrosion resistant
- 25% lighter than banded cables
600VAC BATTERY CHARGER CABLE

The MCM Engineering 600VAC Battery Charger Cable is a multi-conductor banded cable. The cable is designed with replaceable pins and nose cover, adding considerable longevity to the life of the cable. Standard or custom lengths are available to accommodate various installation configurations.

The MCM 600VAC Battery Charger Cable is constructed of banded cable and a connector built for longevity with replaceable pins and nose cover.

FEATURES
- High grade silver plated copper pins
- Highly flexible
- Abrasion resistant
- Light weight

PART NUMBER DD13-6377-XX

* XX indicates required cable length.
** Replaceable pins and nose cover can be purchased individually or as a kit.
PRE-CONDITIONED AIR (PCA) PRODUCTS

PCA DUCTING

Ultra-Lyte PCA Ducting is specifically designed for the rigors of the airline ramp environment. The lightweight, durable three-ply fabric prevents wicking and does not degrade when exposed to Skydrol. Seams are lock-stitched with high strength polyester thread. Available configurations include: Layflat Duct, Elbow/Reducers, Transitions and PVC Starter Hose.

* Please contact MCM Engineering for your specific application (650) 259-9100.

PCA QUICK CONNECT AIR CONNECTOR (QC-AC)

The MCM Quick Connect Air Connector (QC-AC) is a patented technology that eliminates the need for hose clamps when connecting PCA ducting to the inlet connector. The QC-AC is a three part system utilizing a PCA inlet adapter, steel coupling and polyurethane (SEEFLEX) reducer.

| PART NUMBER | DB10-6034-1 |

* Components can be purchased separately.

PCA INLET ADAPTER

The PCA Inlet Adapter is constructed of a high impact resistant light weight polymer (nylon). Designed with rotary cam action latch handles, making attachment & removal effortless. Fits ATA standard flange & 8” ducting.

| PART NUMBER | DD06-5947-2 |
The MCM Engineering Aircraft Service Pits are available in 400Hz single/dual output power, air, water and utility packages.

**MCM Service Pits** incorporate extra thick fiberglass walls, supports, machined aluminum covers and interiors of stainless steel for the best possible durability in extreme environmental conditions.

**FEATURES**
- Machined aluminum covers
- Stainless steel hardware
- Industry standard electrical components
- Oversized to handle additional components & ease of service
* Custom options available.
LOADING BRIDGE PANTOGRAPH

MCM Engineering Loading Bridge Pantographs provide an economical and efficient method of carrying 400Hz power and utilities across telescoping portions of passenger loading bridges. MCM Pantographs are available in one, two and three tube configurations.

MCM Loading Bridge Pantographs are designed using machined aluminum knuckles forming a 3” reinforced welded sleeve (capture) for the aluminum arms (tubing). The mounting brackets are designed to fit all models of loading bridges.

FEATURES
- Machined aluminum knuckles
- Aluminum arms
- Light weight design
- Custom lengths & colors available.

Product shown: Pantograph Knuckle three tube configuration
400Hz SERVICES

400Hz GROUND POWER SYSTEM SERVICE

MCM Engineering recommends annual 400Hz Ground Power System Evaluation Service. The service consists of an MCM factory trained Field Service Specialist (FSS) inspecting and testing all equipment and components comprising the 400Hz ground power generation system.

A complete load testing of the system is performed utilizing MCM Engineering 400Hz resistive and reactive load banks in series to replicate actual loads produced by aircraft. The system is tested under load to determine any weaknesses or abnormalities within the system while also highlighting any needed adjustments for performance optimization.

A complete written report of all findings is generated including recommendations in order to establish a historical record and to determine future system preventative maintenance.

400Hz SYSTEM EQUIPMENT SERVICED

• Motor-Generators & Solid State Frequency converters
• Electrical Distribution
• Gate Boxes (contactor boxes)
• Cable Reels (retrieval system)
• Aircraft Cables

BENEFITS

• Safety
• System Optimization
• Life Cycle extension
• Capital Expenditure Planning
• Preventative Maintenance Planning

400Hz AIRCRAFT CABLE REPAIR SERVICE

MCM Engineering also offers 400Hz Aircraft Cable Repair Service to extend the life of our customer’s cables with considerable cost savings, customers can send their used non-operational cables to the MCM Factory Facility where a thorough diagnostic test is performed to determine if the cable can be repaired. If the cable is repairable; a new connector head will be molded on to the original cable.

MCM Engineering can repair the vast majority of aircraft cables for roughly 1/3 of the original cost. This is accomplished by molding our connector on to the cable of any aircraft cable manufacturer.

Below is an example of an unserviceable connector head that was removed and replaced with a new connector attached and molded on to the original cable.

* All aircraft cables with newly molded connector heads include replaceable base, pins and Gold-X Nose cover (optional).