[redacted]

HARRIS ELECTRIC CO.
OF
WILMINGTON
BOX 4487, WILM., N.C. 28406

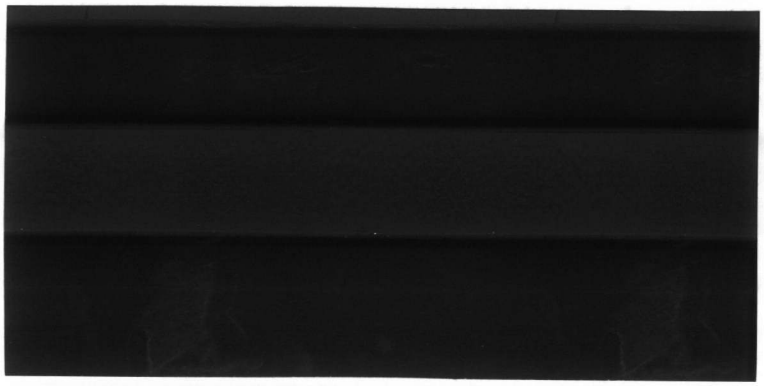
APPROVED Gene Hor
DISAPPROVED _____
APPROVED AS NOTED _____
RESUBMITTAL (IS) (IS NOT) REQUIRED
CHECKED BY SA DATE 10-15-87
CONT. _____ SPEC _____

GREGORY POOLE EQUIPMENT COMPANY

ENGINE DIVISION

Post Office Box 469 • Raleigh, North Carolina 27602 • Telephone (919) 828-0641

CATERPILLAR ®



BMO PROJ. NO. 6C159
K1090B3007
NAVFAC CONTRACT: N62470-86-B-5554

COMMENTS ON CONTRACTORS SUBMITTAL DATA FOR
REPLACE AUXILIARY ENGINES
CAMP LEJEUNE, NORTH CAROLINA

I. 125 KW PRIME, For BB190:

1. Control panel and meter indications are not as specified - digital/solid state vs. analog/electromechanical. However, the EMCP (electronic modular control panel) will be acceptable due to increased accuracy and greater number of monitored points. (Andy Young - 11-6-87)

2. Transfer switch time delay on retransfer to normal should have maximum time delay through 25 minutes. Data sheet marked for 10 minutes (Sect. 16216-12, para. 2.6.2)

3. Time delay to shutdown engine-generator, after retransfer of the load to normal, needs to be included. (Sect. 16216-13, para. 2.6.2)

4. It would appear that the day tank is larger than necessary for eight hours fuel supply at the listed rate; however, there is no specified maximum so long as there is no increased cost of equipment.

5. The enclosure (58" w X 105" l) does not appear to be large enough to enclose the engine-generator (34.44 w X 94.59" l) and the day tank (24" w X 48" l) and still have access to all the engine components. (Section 16216-16, para. 2.12)

II. 15 KW, for SBA 160:

1. Generator rated for 120/208 volt should be rated for 120/240 volt and configured for installation in a 120/240v, 3 phase, 4 wire, C.T. Delta distribution system.

2. Day tank is inadequate for 8 hour operation with running load, much less rated load. (Sect. 16216, para 2.9.1)

3. The bill of materials does not list the above ground fuel storage tank for this unit, but the tank for the 125 KW unit is listed.

4. The engine generator enclosure does not appear to be sized to contain the day tank. (Sect. 16216-16, para. 2.12)

CONTRACTOR'S SUBMITTAL TRANSMITTAL

LANTDIV NORFOLK 4-4355/3 (Rev. 11-80)

CONTRACT NO	TRANSMITTAL NO	DATE
N62470-86-C-5554	4	10-27-87

FROM CONTRACTOR: Harris Electric Co. of Wilmington

TO: Allen & Hoshall, Inc., Engineers & Architect

PROJECT TITLE AND LOCATION: Replace Auxiliary Engines SBA-160 SBA-190 MCB, Camp Lejeune, NC

CONTRACTOR USE ONLY

*List only one specification division per form.

List only one of the following categories on each transmittal form, and indicate which is being submitted

☐ Contractor Approved ☐ OICC Approval ☐ Deviation/Substitution For OICC Approval

REVIEWER USE ONLY

**ACTION CODES
A-Approved
D-Disapproved
AN-Approved as noted
RA-Receipt acknowledged.
C-Comments
R-Resubmit

ITEM NO.	PROJ. SPEC. SECT. & PARA. and/or PROJ. DWG. NO. *	ITEM IDENTIFICATION (Type, size, model no., Mfg. name, dwg. or brochure number)	NO. OF COPIES	ACTION CODES **	REVIEWER'S INITIALS CODE AND DATE
(1)		125 KW Generators and 15 KW Generators	6	R	eok 11/9/87

CONTRACTOR'S COMMENTS

COPY OF TRANSMITTAL AND SUBMITTALS TO ROICC

CONTRACTOR REPRESENTATIVE *(Signature)*

DATE RECEIVED BY REVIEWER	FROM (Reviewer)	TO

☐ Submittals are returned with action indicated. Approval of an item does not include approval of any deviation from the contract requirements unless the contractor calls attention to and supports the deviation.

☐ Submittals are forwarded to LANTDIV with A-E recommendations indicated in REVIEWER USE ONLY Section and in comments below on **ONE COPY** of the transmittal form.

REVIEWER'S COMMENTS

COPIES TO	DATE	SIGNATURE
ROICC (2) LANTDIV (1) A-E (1)		

☆ U.S. GPO:1984-537-003/11170 Region 3-11

ALLEN & HOSHALL
Established 1915
ENGINEERS ARCHITECTS CONSULTANTS

9041 Executive Park Drive
Suite 226
Knoxville, TN 37923

To Harris Electric Company
5929 Market Street
Wilmington, N.C.
28405

Date 12-11-86

Project N62470-86-B-5554

Job no. K1090B3007

We are sending you

[X] Enclosed herewith [ ] Under separate cover

The following

Spec. section	Drawing no. Model no.	Designation	No. of copies	Description	Disposition
			4	15KW & 125KW Generator	
				Resubmittal Comments	RV

Designation

DRAWING	D
SPECIFICATION	SP
SHOP DRAWING	SD
MANF. DATA	MD
SAMPLES	SM
OTHER	O

Disposition

FOR YOUR FILE OR USE	FF
FOR APPROVAL	FA
REVIEWED	RV
REJECTED	RJ
REVISE AND RESUBMIT	RR
FURNISH AS CORRECTED	FC

Remarks

CC - Mr. Andy Young
Camp Lejeune

By E. B. Fudgens
Chief Project Manager

A-32-6/87

CONTRACTOR'S SUBMITTAL TRANSMITTAL
LANTDIV NORFOLK 4-4355/3 (Rev. 11-80)

CONTRACT NO	TRANSMITTAL NO	DATE
N62470-86-C-5554	5	12-7-87

FROM CONTRACTOR
HaRRIS Electric Cimoany of Wilmington

TO
Allen & Hoshall, Inc.

PROJECT TITLE AND LOCATION
Replace Auxiliary Engines SBA-160
SBA-190
MCB, Camp Lejeune, NC

CONTRACTOR USE ONLY

*List only one specification division per form.

List only one of the following categories on each transmittal form, and indicate which is being submitted

☐ Contractor Approved ☐ OICC Approval ☐ Deviation/Substitution For OICC Approval

REVIEWER USE ONLY

**ACTION CODES
A-Approved
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AN-Approved as noted
RA-Receipt acknowledged
C-Comments
R-Resubmit

ITEM NO.	PROJ. SPEC. SECT. & PARA. and/or PROJ. DWG. NO. *	ITEM IDENTIFICATION (Type, size, model no., Mfg. name, dwg. or brochure number)	NO. OF COPIES	ACTION CODES **	REVIEWER'S INITIALS CODE AND DATE
1.		125 KW and 15 KW Generators	6	A	~~EBA~~ 12/4/87

RECEIVED
DEC 11 1987
ALLEN & HOSHALL, INC.
Knoxville, Tenn.

CONTRACTOR'S COMMENTS

Letter form Gregory Poole Equipment Company with comments on returned submittal.

COPY OF TRANSMITTAL AND SUBMITTALS TO ROICC

CONTRACTOR REPRESENTATIVE (Signature)

DATE RECEIVED BY REVIEWER | FROM (Reviewer) | TO

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☐ Submittals are forwarded to LANTDIV with A-E recommendations indicated in REVIEWER USE ONLY Section and in comments below on **ONE COPY** of the transmittal form.

REVIEWER'S COMMENTS

COPIES TO	DATE	SIGNATURE
ROICC (2) LANTDIV (1) A-E (1)		

☆ U.S. GPO:1984-537-003/11170 Region 3-11

GREGORY POOLE
EQUIPMENT COMPANY

Raleigh • Burlington • Edenton • Fayetteville • Washington • Wilmington

November 25, 1987

☑ REVIEWED ☐ REVISE & RESUBMIT
☐ REJECTED ☐ FURNISH AS CORRECTED

Corrections or comments made on the shop drawings during this review do not relieve contractor from compliance with requirements of the drawings and specifications. This check is only for review of general conformance with the design concept of the project and general compliance with the information given in the contract documents. The contractor is responsible for confirming and correlating all quantities and dimensions; selecting fabrication processes and techniques of construction; coordinating his work with that of all other trades; and performing his work in a safe and satisfactory manner.

ALLEN & HOSHALL

BY: EOK DATE: 12/11/87

Mr. Gene Harris
Harris Electric
5929 Market Street
Wilmington, NC 28405

Re: Replace Auxiliary Engines
BMO Project No. 6C159
K1090B3007
NAVFAC Contract: N62470-86-B-5554

Dear Mr. Harris:

The intent of this letter is to respond to the comments attached to the returned submittal data on the above project.

I. 125 KW Prime, for BB190

1. Control panel and meter indications are not as specified - digital/solid state vs. analog/electromechanical. However, the EMCP (electronic modular control panel) will be acceptable due to increased accuracy and greater number of monitored points. (Andy Young - 11-6-87)

   Response: The EMCP (electronic modular control panel) will be used on this unit.

2. Transfer switch time delay on retransfer to normal should have maximum time delay through 25 minutes. Data sheet marked for 10 minutes. (Sect. 16216-12, para. 2.6.2)

   Response: Transfer switch time delay on retransfer to normal will be option #3C, adjustable from 0.2-30 minutes.

3. Time delay to shutdown engine-generator, after retransfer of the load to normal, needs to be included. (Sect. 16216-13, para. 2.6.2)

   Response: A time delay engine cooldown will be included, option #4C, adjustable 0.2-30 minutes.

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Post Office Box 469 · Raleigh, North Carolina 27602 · Telephone (919) 828-0641

4. It would appear that the day tank is larger than necessary for eight hours fuel supply at the listed rate; however, there is no specified maximum so as long as there is no increased cost of equipment.

   Response: It is quite obvious a mistake occurred when the day tank was sized. An 8 hour supply of fuel at full load for the 125 KW, is 78.4 gallons, therefore a 100 gallon tank is ample size to fulfill the requirements of the specifications. The Pryco Day Tank brochure included in the submittal data represented the quality of construction and the options included with the unit. A drawing is included with this letter to represent a typical installation for a 100 gallon base day tank. The base day tank is mounted under the genset between the support rails.

5. The enclosure (58" w X 105" l) does not appear to be large enough to enclose the engine-generator (34.44 w X 94.59" l) and the day tank (24" w X 48" l) and still have access to all the engine components. (Section 16216-16, para. 2.12)

   Response: Answered above in comment No. 4.

II. 15 KW, for SBA 160

1. Generator rated for 120/208 volt should be rated for 120/240 volt and configured for installation in a 120/240v, 3 phase, 4 wire, C.T. Delta distribution system.

   Response: This is just a highlighting error; the Bill of Materials indicated the correct voltage.

2. Day tank is inadequate for 8 hour operation with running load, much less rated load. (Sect. 16216, para 2.9.1)

   Response: With the fuel consumption at 15 KW just over 1 gallon per hour, the 5 gallon day tank will be replaced for a 10 gallon capacity unit.

3. The bill of materials does not list the above ground fuel storage tank for this unit, but the tank for the 125 KW unit is listed.

   Response: A 285 gallon above ground, double walled, epoxy coated steel tank with lockable fill cap, vent cap, gauge, check valve, duplex fuel supply and return fitting, mounting cradles (just like the 550 submittal with the 125 KW unit) dimensions are 36" diameter X 5' long.

4. The engine generator enclosure does not appear to be sized to contain the day tank. (Sect. 16216-16, para. 2.12)

   Response: A special made day tank will fit beside the generator on the right hand side as you view the unit from the rear. The battery charger is relocated and mounted on the rear of the control panel.

The equipment has been corrected, per these comments, and released to be manufactured. Please let us know if you have any more questions.

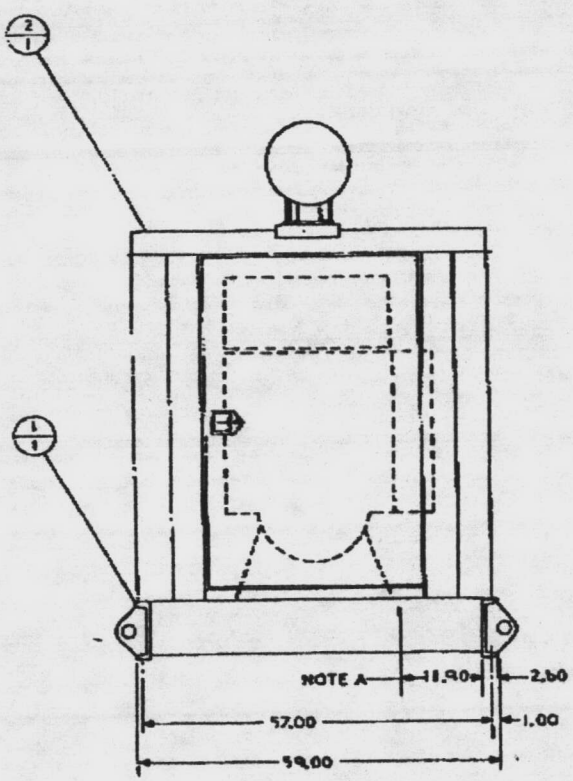
Sincerely,

David H. Bazemore

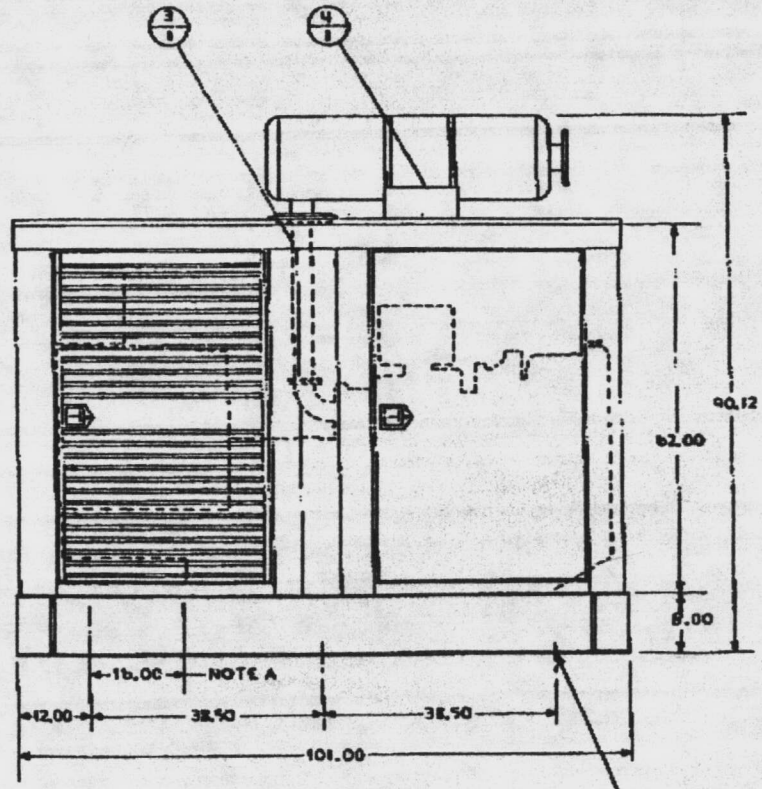
David H. Bazemore
Engine Sales
Engine Division

DHB/rlm

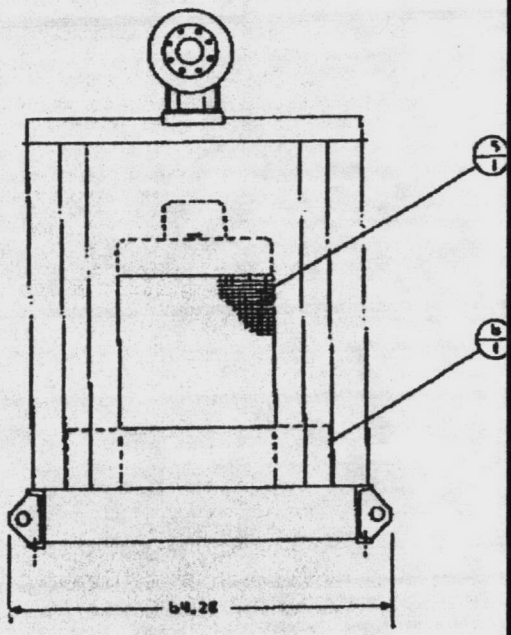
1	1	80 GAL FUEL TANK BASE STL FLOOR & FOUR FOOT
2	1	HOT A STL ENCL-SPKR & FOH
3	1	EXHAUST FLEX CONNECT
4	1	MUFFLER MTG BRKT
5	1	RADIATOR GUARD
6	1	BATTERY RACK & CABLE



REAR VIEW



RIGHT SIDE VIEW



FRONT VIEW

NOTE A: CONDUIT STUB UP AREA
11.90 X 16.00

3208 BASE AND ENCLOSURE

Chillicothe Metal Co

REVISION RECORD

DRN RED 2-20-87

ALLEN & HOSHALL
Established 1915
ENGINEERS ARCHITECTS CONSULTANTS

9041 Executive Park Dr.
P.O. Box 90345
Knoxville, TN 37990
(615) 693-7881

November 11, 1987

Public Works Division
Building 1005, Marine Corps Base
Camp LeJeune, North Carolina 28542

Attn: Mr. Andy Young

Re: Contract No. N62470-86-B-5554
Replace Auxiliary Engines, SBA160 and BB190

Gentlemen:

Please find enclosed one copy of Comments on Contractors Submittal Data and one copy of the submittal itself.

Sincerely yours,

ALLEN & HOSHALL, INC.

Emmett O. Kirkham, Jr.

Emmett O. Kirkham, Jr.

EOK:crs

Enclosures

K1090B3007

SUBMITTAL DATA FOR

REPLACE AUXILIARY ENGINES
CAMP LEJEUNE, NORTH CAROLINA

☑ REVIEWED ☑ REVISE & RESUBMIT
☐ REJECTED ☐ FURNISH AS CORRECTED

Corrections or comments made on the shop drawings during this review do not relieve contractor from compliance with requirements of the drawings and specifications. This check is only for review of general conformance with the design concept of the project and general compliance with the information given in the contract documents. The contractor is responsible for confirming and correlating all quantities and dimensions; selecting fabrication processes and techniques of construction; coordinating his work with that of all other trades; and performing his work in a safe and satisfactory manner.

ALLEN & HOSHALL

BY: COK DATE: 11/6/87

Bill of Materials

Replace Auxiliary Engines
Camp LeJeune, NC

QTY	DESCRIPTION
1	Caterpillar 3208T Diesel Electric Generator Package Set, rated at 125 KW Prime Power, 3 Phase, 60 Hertz at 1800 RPM. Includes the following standard and optional equipment to comply to the job specifications:

Engine:
Air Cleaner
Base, Narrow
Breather, Crankcase
Cooler, Lubricating Oil
Fan (blower) and Fan Drive
Filters, Fuel and Oil
Governor, Hydra-Mechanical (3% speed regulation)
Pumps
- Fuel Priming
- Fuel Transfer
- Jacket Water

Radiator
Service Meter
Starting, Electric, 24-Volt
Generator:
SR4 Brushless with Voltage Regulator
Control Panel:
Ammeter, Voltmeter, and Switch
Frequency Meter
Voltage Adjust Rheostat
Oil Pressure and Water Temperature Gauges
Auto Start-Stop
Shutoffs and Single Indicator for Oil Pressure Water Temperature, Overspeed, Overcrank
Prealarm Module
CAT SR4 Generator
Frame Size 444, 445
Type-Brushless, Revolving field, Solid-State Exciter
Construction-Single Bearing-Close Coupled
Phase-3
Wire, Connection-12 Wire
Meets or exceeds NEMA MG1-22 std. requirements
Insulation-Class F with tropicalization & anti abrasion
Three Phase Sensing
Enclosure-Drip Proof
Alignment-Pilot Shaft
Overspeed Capability-150%
Wave Form-Less than 5% deviation
Parallel Capability-Standard
Voltage Regulator-Generator Mounted, Volts per Hertz
Voltage Regulation-Less than ± 1/2%

QTY	DESCRIPTION
	Voltage Gain-Adjustable to compensate for engine speed droop and line loss
	Vibration Isolators-spring type
	Silencers-residential type mounted on the enclosure with rain cap and mounting brackets
	Flexible Exhaust Fitting-stainless steel type with gaskets, nuts and bolts
	Batteries-heavy duty lead acid type, 172 amp hour/24 VDC output, with mounting rack and cables
	Battery Charger-automatic float/equalizer type, 10 amp/24 VDC output, 120 VAC input, unit mounted in a Nema 1 enclosure inside a weatherproof enclosure
	Jacket Water Preheater-thermostatically controlled coolant heater, 2500 watt output/120 VAC input
	Day Tank-200 gallon capacity (enough for 8 hours of operation) unit, with low fuel contact, vent cap, check valve, fuel level gauge, test switch and pump running indicator light
	Weatherproof Enclosure - 58" wide and 105" long steel enclosure with five key-lockable doors
	Control Panel Pre-Alarm Module per NFPA-99 regulations
	Circuit Breaker-mainline molded case type, 3 pole with isolated neutral, Nema 1 enclosure, 600 amp frame/450 amp trip, 120/208 volts
	Automatic Transfer Switch- 600 amp capacity, 3 pole with solid neutral and the following accessories:
	Time Delay Engine Start
	Frequency/Voltage Relay for emergency source
	Time Delay Emergency to Normal
	Time Delay Neutral
	Pilot Light to indicate normal source
	Pilot Light to indicate emergency source
	Overcurrent Thermal Magnetic Breaker on the normal source; 400 amp trip
	Nema 1 enclosure
	Key Lockable Door
	Full Protection on normal source
	Auxiliary contacts on the normal and emergency source
	Load Center mounted inside weatherproof enclosure (ref. EG panel in specifications)
	Remote Annunciator per NFPA-99 regulations
	Fuel Tank - 550 gallon above ground, double walled, epoxy coated steel tank with lockable fill cap, vent cap, gauge, check valve, duplex fuel supply and return fitting, mounting cradles
	Oil and Antifreeze
	Parts, Operational and Maintenance Manuals
	Owner Startup and Operational Instructions
	Shop and Jobsite Testing
1	Generac Model SD025 diesel Electric Generator Set rated at 15KW Prime Power, 120/240 volts, 3 phase, 60 hertz at 1800

QTY	DESCRIPTION
	RPM. Includes the standard features per the attached brochure and the following items to comply to the job specifications:
	Weatherproof Enclosure with five key-lockable doors
	Silencer - critical type mounted on the enclosure with rain cap and mounting brackets
	Premium Control Panel with NFPA-99 prealarm panel
	Circuit Breaker - mainlines molded case type, 3 pole with isolated neutral, Nema 1 enclosure, 100 amp frame/90 amp trip
	Battery - heavy duty lead acid, maintenance free type, 24 VDC output with mounting rack and cables
	Flexible Exhaust Fitting - stainless steel type with gaskets, nut and bolt kits
	Battery Charger - automatic float/equalizer type, 10 amp/24 VDC output, 120 VAC input, mounted on the genset in a Nema 1 enclosure
	Day Tank - 5 gallon capacity unit with 2 gallon/minute pump, fuel level gauge, float switch, check valve, test to run switch, 120 VAC input
	Load Center mounted inside the enclosure, reference EG panel in the specifications
	Oil and Antifreeze
	Parts, Operational and Maintenance Manuals
	Owner Startup and Operational Instructions
	Shop and Jobsite Testing as required

TAB PLACEMENT HERE

DESCRIPTION:

125 KW

☑ Tab page did not contain hand written information

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*Scanned as next image

CATERPILLAR
GENERATOR SET

3208

125 kW PRIME | 150 kW STANDBY

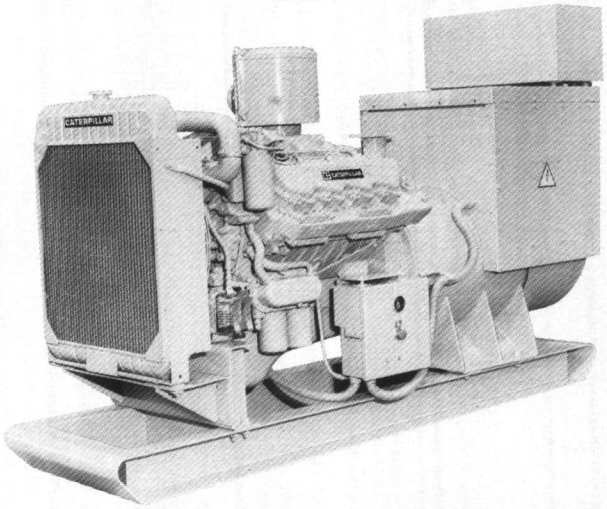
FEATURES

CAT DIESEL GENERATOR SETS
Factory Designed . . . assembled . . . tested and delivered to you in a package that is ready to be connected to your fuel and power lines . . . supported 100% by your Caterpillar Dealer.

RELIABLE, FUEL EFFICIENT DIESEL
The compact, four-stroke-cycle diesel engine combines durability with minimum weight while providing dependability and economy. The fuel system operates on a variety of fuels.

THE CAT GENERATOR
Single-bearing wye connected brushless generator designed to match performance and output characteristics of the Caterpillar Diesel Engine that drives it.

EXCLUSIVE CAT REGULATOR
Three phase sensing . . . Optimum control precision . . . Volts per Hertz regulation . . . Excellent block loading and constant voltage in the normal operating range.



Arrangement may be shown with optional equipment.

STANDARD PACKAGE ARRANGEMENT

Engine:
Air Cleaner
Base, Narrow
Breather, Crankcase
Cooler, Lubricating Oil
Fan (blower) and Fan Drive
Filters, Fuel and Oil
Governor, Hydra-Mechanical (3% speed regulation)
Pumps
- Fuel Priming
- Fuel Transfer
- Jacket Water

Radiator
Service Meter
Starting, Electric, 24 Volt

Generator:
SR4 Brushless with Voltage Regulator

Control Panel:
Ammeter, Voltmeter, and Switch
Frequency Meter
Voltage Adjust Rheostat
Oil Pressure and Water Temperature Gauges
Manual Start-Stop
Shutoffs and Single Indicator for Oil Pressure Water Temperature, Overspeed, Overcrank

OPTIONAL EQUIPMENT

Engine:
Air Cleaner, Heavy-Duty
Air Precleaner
Base Fuel Tank
Base Structural Steel
Cooling Systems
Exhaust Fittings
Governor, Woodward PSG
Lifting Arch
Muffler
Prealarm Contactors
Protection Devices
Starting Aids
Starting, Electric
Tachometer and Tachometer Drives

Generator:
Generator extension terminal box

Control Panel:
Annunciator Panel and Prealarm Module (meets NFPA 76-A requirement)
Provision for:
- Auto Start Stop Module,
- Charging Ammeter,
- Heat Start Switch,
- Cycle Cranking,
- Auxiliary Relay,
- Prealarm Module,
- Synchronizing Lights

Contacts for Remote Alarms
Illumination Lights and Switches

GENERAL SPECIFICATIONS — 60 Hz

CAT 3208 ENGINE
1800 RPM

Type—Watercooled Diesel	Bore—4.5 in (114 mm)
Aspiration—Turbocharged	Stroke—5.0 in (127 mm)
Cycle—Four-Stroke	Piston Displacement— 636 cu in (10.4 liter)
No. of Cylinders—V-8	

CAT SR4 GENERATOR
Frame Size 444, 445
Type—Brushless, Revolving field, Solid-State Exciter
Construction—Single Bearing—Close Coupled
Phase—3
Wire, Connection—12 Wire
Meets or exceeds NEMA MG 1-22 std. requirements
Insulation—Class F with tropicalization & anti abrasion
Three Phase Sensing
Enclosure—Drip Proof
Alignment—Pilot Shaft
Overspeed Capability—150%
Wave Form—Less than 5% deviation
Parallel Capability—Standard
Voltage Regulator—Generator Mounted, Volts per Hertz
Voltage Regulation—Less than ± ½%
Voltage Gain—Adjustable to compensate for engine speed droop and line loss

CAT CONTROL PANEL
24 V DC Control
Generator Mounted
Vibration Isolated
NEMA 1 Enclosure
Dead Front
Lockable Hinged Door
Generator Instruments meet ANSI C-39-1

VOLTAGES AVAILABLE

120/208, 240/416, 139/240, 277/480, 173/300, 346/600, 120/240.
(Adjustable a minimum of + 10% − 10%)

3208 GENERATOR SET 125-150 kW

CATERPILLAR

60 Hz

PRIME
125 kW — 156 kV•A w/fan
130 kW @ 0.8 PF without fan
197 Engine HP without fan*

STANDBY
150 kW — 187 kV•A w/fan
154 kW @ 0.8 PF without fan
230 Engine HP without fan**

ALTITUDE/TEMPERATURE CAPABILITY

Shows maximum altitude at which full rated kW is available at the respective ambient temperature.

AMBIENT TEMPERATURE	°F	68	86	104	122	68	86	104	122
	°C	20	30	40	50	20	30	40	50
ALTITUDE	feet	7215	6300	5415	4590	7940	7135	6230	5410
	meter	2200	1920	1650	1400	2420	2175	1900	1650

FUEL RATE DATA

PERCENT LOAD	25	50	75	100	25	50	75	100
kW with Fan	31	62	94	125	37	75	112	150
gal/hr	3.2	5.1	7.3	9.8	3.8	5.9	8.1	11.2
liter/hr	12.3	19.4	27.5	37.0	14.3	22.2	30.8	42.2

TECHNICAL DATA

		SI METRIC			ENGLISH		
			PRIME	STBY		PRIME	STBY
Rating Information	Rating Type						
	Power Rating @ 0.8 PF w/Fan	kW	125	150	kW	125	150
	Power Rating @ 0.8 PF w/o Fan	kW	130	154	kW	130	154
	Generator Frame Size		444	445		444	445
Cooling System	Engine Lubricating Oil Capacity	L	18.9	18.9	qts	20	20
	Engine Coolant Capacity w/o Radiator	L	24.6	24.6	gal	6.5	6.5
	Engine Coolant Capacity with Std. Rad.	L	37.8	37.8	gal	10	10
	Standard Radiator Arrangement Data:						
	Air Flow (Max. @ Rated Speed)	m^3/min	125	125	cfm	4414	4414
	Air Flow Restriction (Max. Allowable)	kPa	0.12	0.12	in H_2O	0.5	0.5
	Ambient Air Temperature (Max. Allowable)	°C	50	46	°F	122	115
	Coolant Pump External Resistance (Max. Allowable)	m H_2O	1.4	1.4	ft H_2O	4.7	4.7
	Coolant Pump Flow @ Max. Allowable Resistance	L/min	180	180	gpm	47.6	47.6
Exhaust System	System Backpressure (Max. Allowable)	kPa	6.7	6.7	in H_2O	27	27
Mounting System (Eng., Gen. & Rad.)	Length Overall	mm	2402.6	2453.4	in	94.59	96.59
	Height Overall	mm	1537.4	1541.6	in	60.42	60.69
	Width Overall	mm	874.7	874.7	in	34.44	34.44
	Unit Dry Weight	kg	1665	1740	lb	3670	3830
Performance Data @ Rated Conditions	Combustion Air Inlet Flow Rate	m^3/min	12.4	12.3	cfm	440	435
	Exhaust Gas Flow Rate	m^3/min	31.5	33.5	cfm	1110	1180
	Exhaust Gas Stack Temperature	°C	475	550	°F	900	1030
	Heat Rejection to Coolant (Total)	kW	105	106	Btu/min	5971	6028
	Heat Rejection to Exhaust (Total)	kW	130	173	Btu/min	7393	9838
	Heat Rejection to Atmosphere From Engine	kW	21	22	Btu/min	1194	1251
	Heat Rejection to Atmosphere From Generator	kW	15	18	Btu/min	853	1023

Materials and specifications are subject to change without notice.
The International System of Units (SI) is used in this publication.

CONDITIONS & DEFINITIONS

Standby — For continuous electrical service during interruption of normal power.**
Prime — For continuous electrical service with 10% overload capability.*
Ratings are based on SAE J1349 standard conditions of 100 kPa (29.61 in Hg) and 25°C (77°F). These ratings also apply at ISO 3046/1, DIN 6271 and BS 5514 standard conditions of 100 kPa (29.61 in Hg), 27°C (81°F) and 60% relative humidity.

Fuel rates are based on fuel oil of 35° API [16°C (60°F)] gravity having an LHV of 42 780 kJ/kg (18,390 Btu/lb) when used at 29°C (85°F) and weighing 838.9 g/liter (7.001 lbs/U.S. gal).

These capability charts apply to the engine only and include considerations for humidity. If air cleaner inlet conditions exceed the appropriate standard conditions, consult your Caterpillar Dealer for necessary deration.

*ISO power with 10% overload for one hour in 12 in accordance with ISO 3046/1, DIN 6271 or BS 5514.
**Fuel stop power in accordance with ISO 3046/1, DIN 6271 or BS 5514.

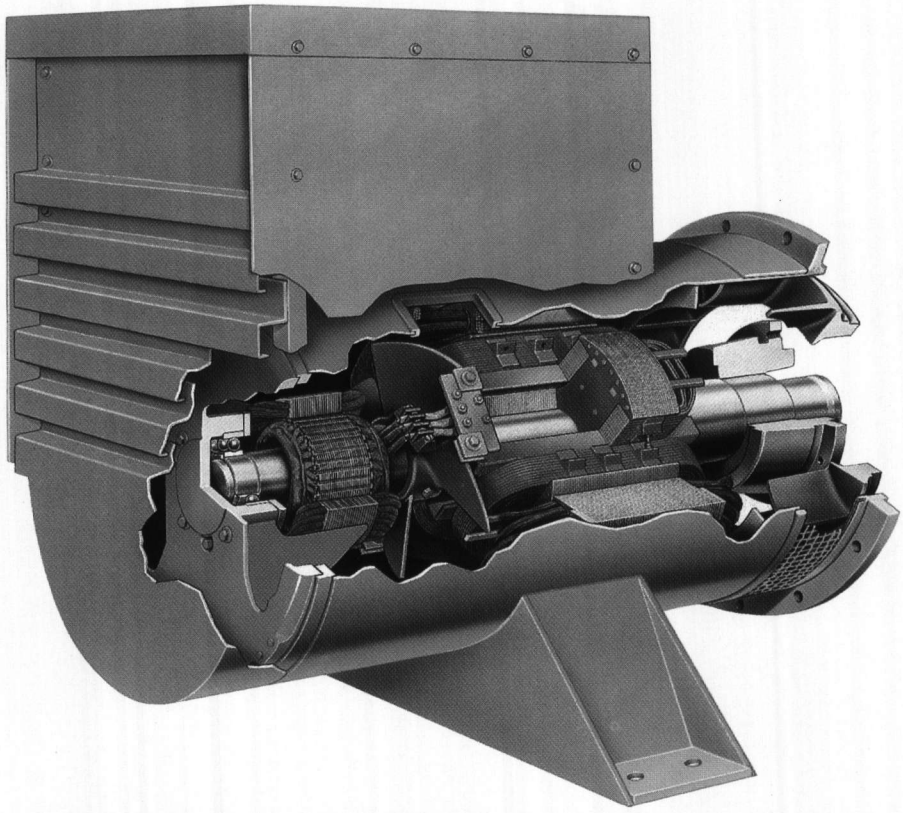
LEHX5427 (12-85)
Supersedes LEHX4480

Printed in U.S.A.

CATERPILLAR

SR4

GENERATORS



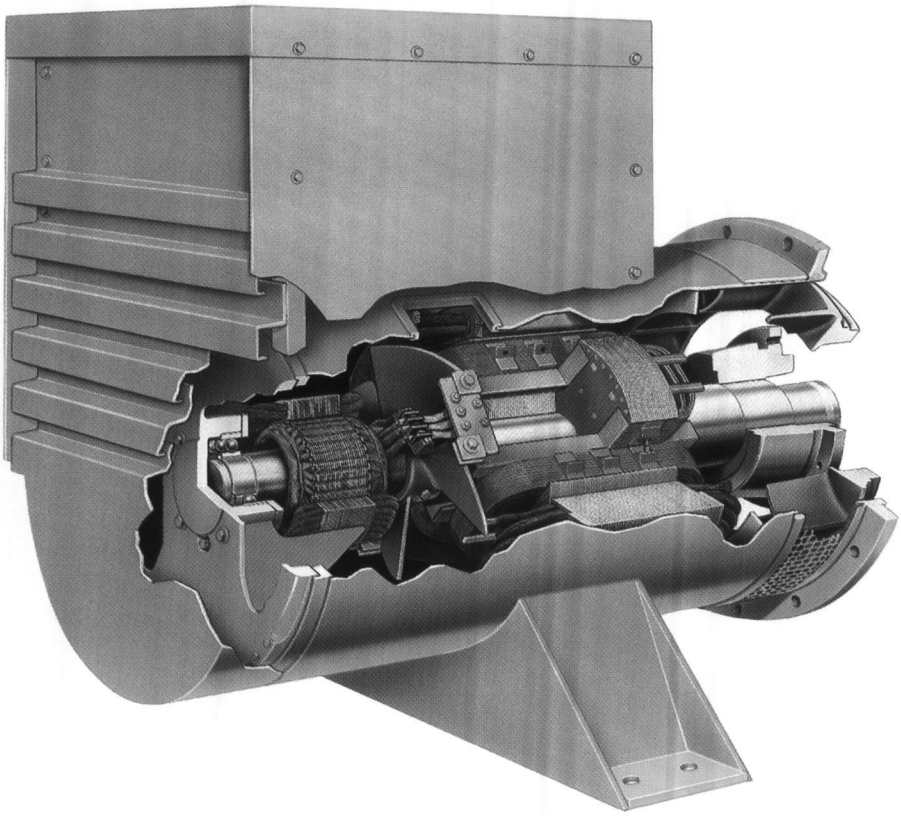
PROVEN, RELIABLE ELECTRICAL POWER

CAT SR 4 BRUSHLESS GENERATORS...
high performance, low maintenance, long life power sources

Since their introduction in 1972, Caterpillar SR 4 Brushless Generators have been continually upgraded and improved to keep pace with demands for superior performance in a variety of worldwide applications.

Cat SR 4 Generators have been proven in tens of thousands of installations . . . in buildings as prime and standby power sources . . . in ship's service as primary or emergency power . . . and in the oil field for drilling, hoisting and pumping.

Many of the following standard SR 4 features are not available or are offered only as options on competitive generators:



- Performance and design matched to Cat Engines
- Superior Class F insulation
- Windings coated with varnish which is fungus resistant
- All metal components plated or painted
- Regulator voltage sensing loss protection
- Better motor starting capability through volts-per-hertz response
- Constant voltage regulation in operating range
- Three-phase voltage sensing regulator
- Short circuit fault resistance
- Built-in parallel capability
- Telephone influence factor less than 50
- Radio frequency noise suppression exceeds industry standards
- Rotors individually tested to 125% overspeed; prototypes to 150%.

As part of Cat Generator Sets, the SR 4 is:

- Designed and built to rigid specifications and tested as a complete unit by Caterpillar
- Supported by Caterpillar Dealers worldwide
- Torsionally compatible
- Marine society works approved
- Within ISO/IEC specifications
- Available with optional MIL-STD-461B/VDE-875N RFI suppression.

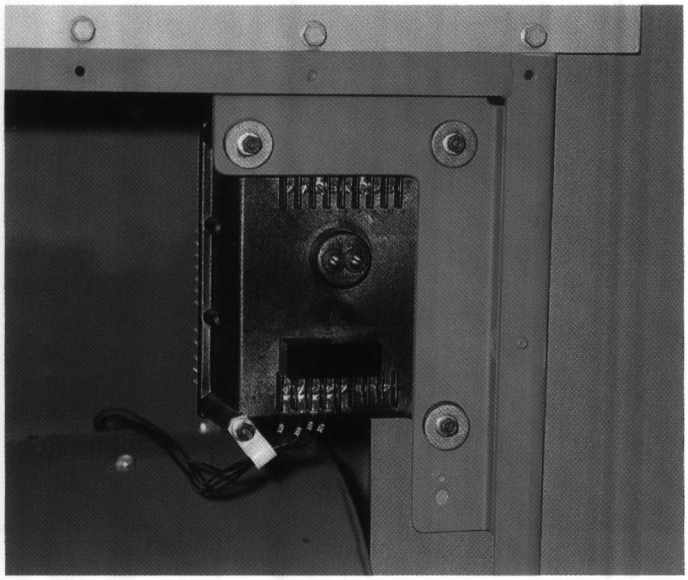
The Cat SR 4 Generator serves all heavy-duty applications and is performance matched to Cat Diesel and Spark-Ignited Engines. Long life and low maintenance are assured by rigid frame and rotor construction, ample cooling, fully protected windings, and a self-aligning bearing. Two-bearing generators are also available from Caterpillar.

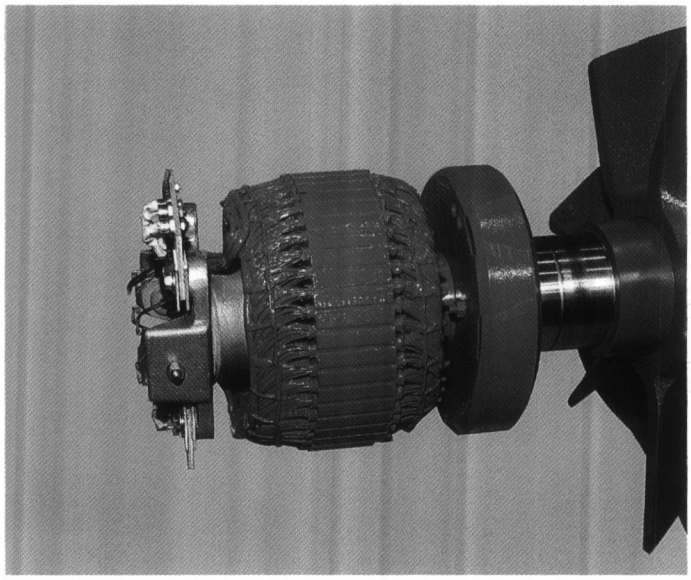
Compare the Cat SR 4 to other generators

Features	Benefit	Competition
GENERATOR DESIGN		
Performance and structurally matched to engine	Optimized design for both engine and generator	Designed to the generator output only, because of its use on engines by various manufacturers
REGULATOR DESIGN		
Solid State Construction	State-of-the-Art — no mechanical switches. Longer life. Greater reliability	Not solid state, most use mechanical voltage build-up relay and mechanical circuit breakers, if any
Volts/Hz Operation	Faster engine recovery with large block load changes.	Not standard on all regulators, offered as an add-on at higher prices
3 Phase Sensing	Superior voltage regulation with unbalanced loads. Improves response to distorted waveforms of SCR type loads.	Not standard on any regulator, offered as an add-on at higher price
Environmental Protection	Regulator suitable for all environments. Provides longer life and greater reliability	Minimal protection and not suited to harsh environments
PROTOTYPE TESTING		
Prototype rotors are tested at 150% overspeed for 2 hours at 170°C ambient	Ensures mechanical design integrity for increased reliability and longer life	Designed for 100 to 125% overspeed. Few are tested at 125% overspeed. Virtually none are tested at 170°C ambient
Temperature rise tested by both resistance and embedded thermocouple	Ensures against localized insulation "hot spots"	Thermal limits set by resistance methods — most measure rise and mathematically calculate average temperature rise across rotor and stator
Complete engine-generator system testing including mounting evaluation, wiring and control compatibility, linear vibration analysis and transient performance	Assures combination of equipment will perform adequately and reliably	Generally not offered as a factory assembled tested package
MANUFACTURING		
1/2 mil peak-to-peak rotor balance (four times closer tolerance than NEMA Requirement)	Less system vibration, greater reliability, longer life	Most competitors balance to only 2 mils peak-to-peak
All production rotors tested to 125% overspeed	Ensures the rotor's mechanical integrity for greater reliability and longer life	Most competitors do not production test for overspeed
Stator windings "high pot" tested at 3000 volts	Ensures insulation integrity for longer life	Standard "high pot" test at 1960 volts
VR 3 regulator is thermal-cycled from −20°C to +70°C	Ensures component and manufacturing quality	Competition performs no thermal cycle test on production regulators
All production generators are performance tested	Ensures generator performance	Competitors only perform an open circuit and short circuit test on production generators
After assembly with Caterpillar Engine, control panel, base, and cooling system, **all** units production tested	Complete quality control and service of entire generator set by one manufacturer	Quality control, performance characteristics and service divided among several manufacturers

Specifications and materials are subject to change without notice.

Rugged Solid-State Regulator





The new VR3 regulator precisely monitors SR 4 generator output voltage in all three phases and corrects for changes in line current and power factor. The VR3 is 100% environmentally protected. All components are sealed in a gasketed enclosure. Three-phase sensing improves voltage regulation when the phase load is unbalanced.*

Voltage gain control provides constant voltage under speed droop conditions. Voltage gain also provides compensation.

*Volt-per-hertz response provides superior large load acceptance.

Voltage regulators are 100% solid state, no mechanical buildup relays are used. The VR3 regulator receives the most strenuous production test in the industry to ensure performance and reliability. All VR3 regulators are functionally tested after assembly. Next, it is cold shocked to −20°C for two-hours and then tested again. Next, it is heat shocked to +70°C for two hours while being tested.

A solid state "circuit breaker" provides over excitation protection. All VR3 regulators meet commercial standards of radio frequency interference. Optional filters available to meet MIL-spec-461B and VDE-875N. All generators meet IEC specifications for use in most countries worldwide.

Other SR 4 regulation and control features include:

- The entire regulator assembly has shock absorbing mounts and is located in the generator box. It can be remotely mounted if desired.
- Fuse protection is provided.
- Voltage can be maintained to within ±½% in steady state with an isochronous governor.
- Optional control can be set for paralleling with like or dissimilar generators.
- Circuit current sustaining option for 300% rated current for 10 seconds: Series boost on small frame sizes, Permanent magnet exciter on large frame sizes.
- Voltage adjustment range: −25% to +10%.

All Caterpillar Generators are subject to a comprehensive prototype evaluation before production models are released for sale. Stator, rotor exciter and regulator are tested separately, followed by unit tests for:

- Structural Integrity
- Temperature Rise
- Waveform Analysis
- Transient Response
- Efficiency/Loss Test
- Short Circuit Tests
- Overload Capability
- Voltage Spike and Diode Stress
- Motor Starting
- No Load Rated Load and Short Circuit Saturation Curves
- EMI (Electro Magnetic Interference)
- TIF (Telephone Influence Factor).

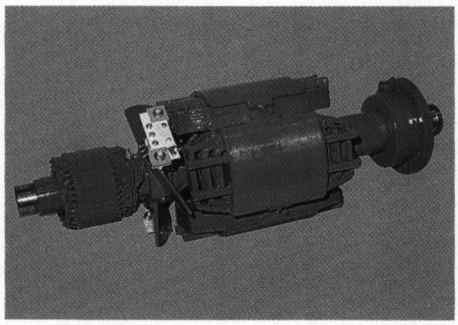
Tests are conducted in accordance with MIL STD 705B and/or test procedures approved by Caterpillar. Applicable standards include MG 1-22 NEMA, IEC Pub. 34-1, BS4999 and B5000.

Continually improved to enhance quality

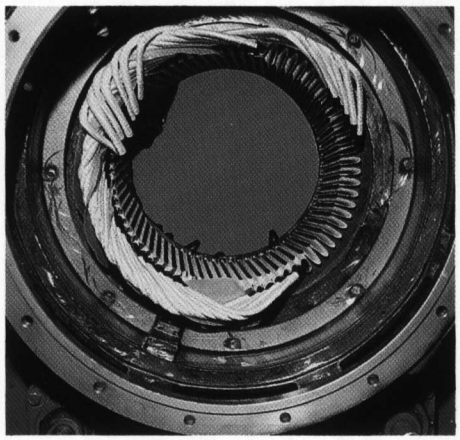
Beginning with the rotor, a precision "wet" layer-wound process provides excellent physical integrity and cooling. Epoxy is applied to each layer of magnet wire before the next layer is precision wound. Following a final coat of epoxy, the complete wound rotor core is oven cured. Numerically controlled machines produce close tolerances on the rotor shaft during turning and grinding for improved quality and repeatability. On outboard bearing models, four Grade 8 through-bolts retain the exciter rotor to the shaft. A complete coating of red sealer material seals the rotor against moisture to prevent corrosion.

All rotor designs have been type tested to 150% overspeed at 170°C for two hours without any movement of material. Every production rotor is dynamically balanced and run at 125% overspeed before assembly into the stator.

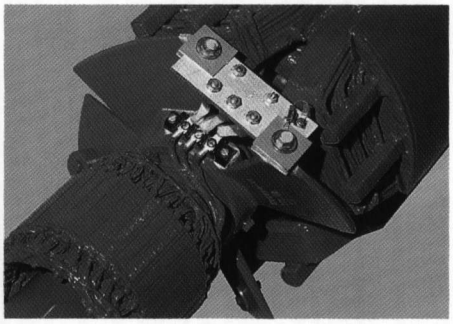
The aluminum amortisseur bar end plates are cut by a numerically controlled plasma torch for dimensional integrity. Stacking machines with automatic welding ensure proper lamination alignment, correct skew and stack pressure before the amortisseur circuit and coil support bars are welded in place. The full amortisseur circuit minimizes hunting and oscillations during transient loading, providing superior voltage stability.



On smaller generators, rotor and stator laminations are punched in a progressive die for greater accuracy. Winding coil pitch, coil distribution and stator skew are designed to produce optimum waveform.



Stator slots are insulated by slot liners and coil separators. Slot liners, coil separators and topsticks provide a minimum of 9.53 mm (3/8 in.) creepage distance from the ground. Thickness of liners, separators, and phase sheets provides adequate protection between phase and ground. Specially trained assemblers follow strict guidelines for superior quality control. Stator windings are tested for phase-to-phase and phase-to-ground faults by a 3000-volt "high pot" test prior to dipping and baking. NEMA standard only requires 1000 volts + 2 *x* rated voltage (for 480 volts, this is 1960 volts). In other words, the SR 4 is tested to 150% of the NEMA requirement!



Stators get two dips and bakes in epoxy varnish. Four dips and bakes for harsh environment are optional. Oil field and 4160 volt generators are Vacuum Pressure Impregnated (VPI). Surge rings hold end turns in place. Epoxy varnish drips over 6.35 mm (1/4 in.) long are trimmed before the rotor is inserted.

A Teflon-coated shield protects the stator end turns from potential nicks, cuts or scrapes during rotor insertion. After assembly, the stator is tested again for ground faults by a 2000-volt "high pot" test.

The exciter stator and rotor are machine wound. An improved process ensures epoxy insulation integrity and coverage. All connections are crimped to ensure 100% contact.

Precision tooling, extensive testing add up to exceptional quality

The Caterpillar commitment to quality is assured throughout the manufacturing process by the use of precision, state-of-the-art tooling and quality control inspection. Performance and adherence to strict specifications are verified during buildup and after final assembly through extensive testing.

All Cat SR 4 Generators receive extensive factory testing to ensure proper operation and exceptional quality. Each generator is driven by a synchronous motor and tested for:

- Waveform
- Line-to-line voltage
- No load circulating current
- Full load capabilities (at rated power factor)

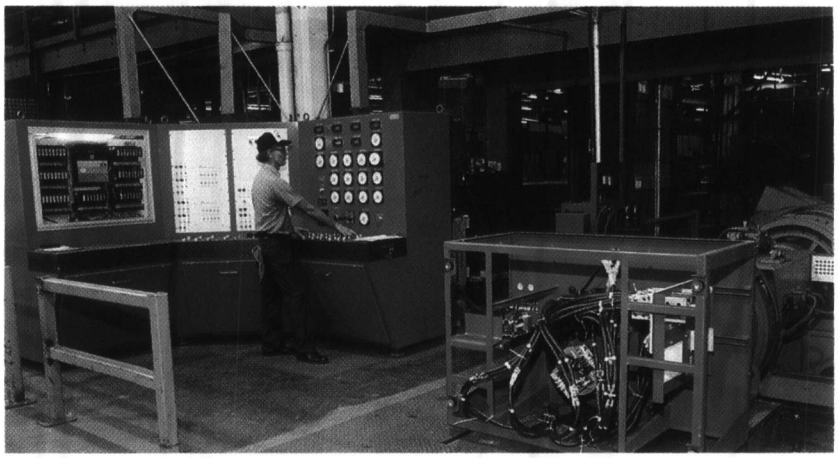
Following final assembly to the engine, each generator set is tested for:

- Full load capability
- Transient load capability

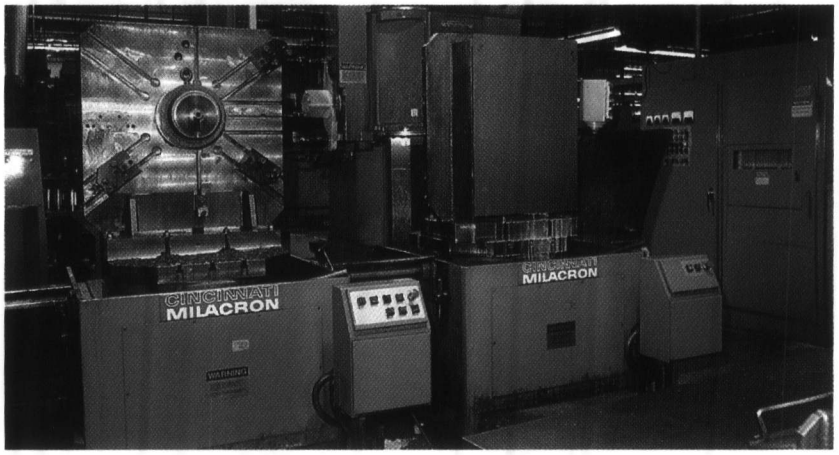
Almost all other manufacturers publish generator only and engine only data. Caterpillar publishes complete generator set data. Since Caterpillar controls the design, assembly and testing of the complete unit, customers are assured Cat generator sets meet published performance standards.

Talk to an electrical power generation specialist at your local Cat Dealer. Then specify Cat SR 4 Generators for proven reliability and performance.

CATERPILLAR



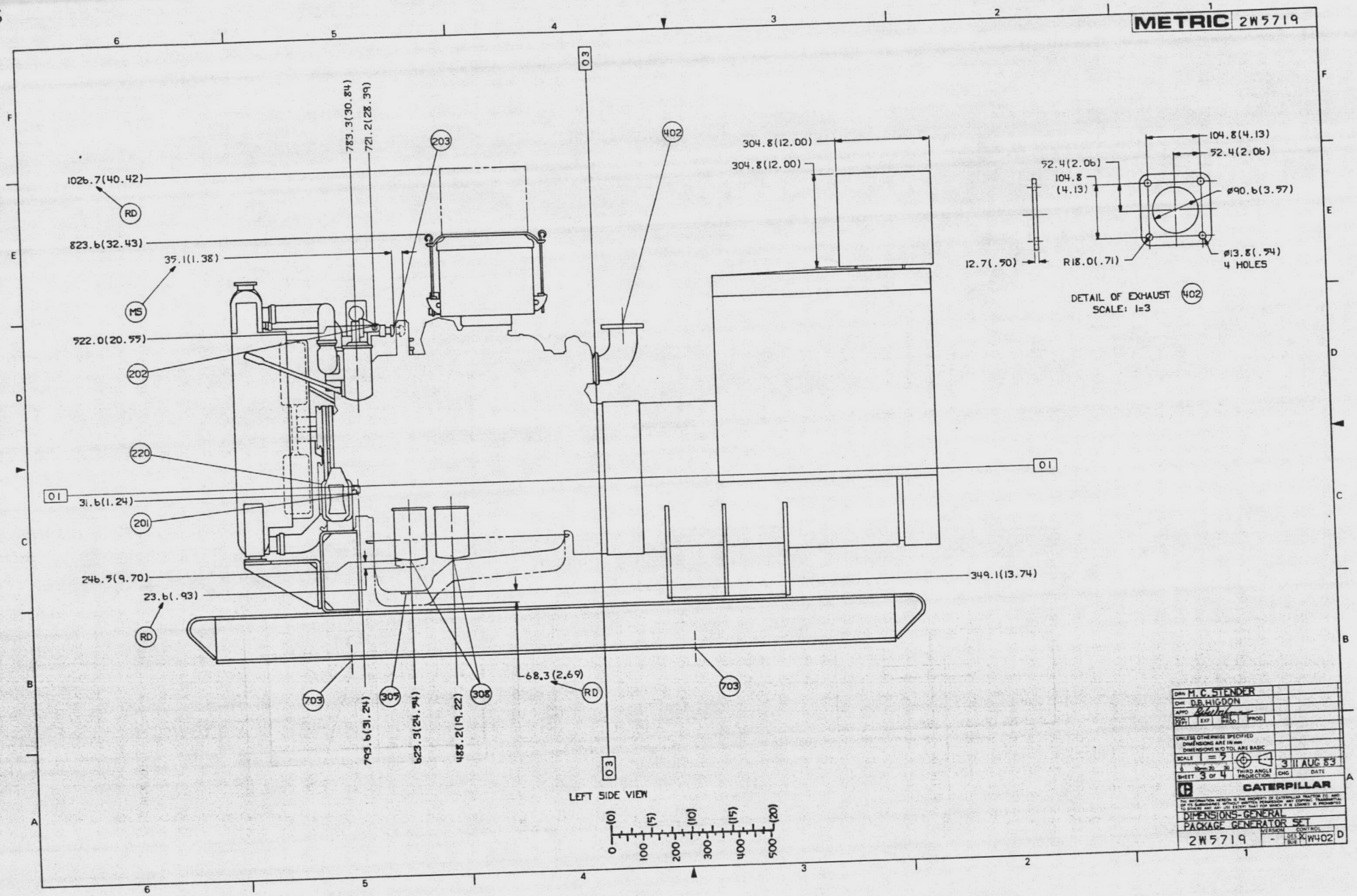
When these tests are completed, one generator in fifty is selected at random for complete teardown and inspection. Additional random teardown inspections are also conducted. Deficiencies noted in build and assembly procedures are corrected immediately.



A numerically controlled machining center assures all surfaces on the generator frame and bracket are concentric and spacially correct. Surfaces are cleaned and inspected after each machining step to verify precision.

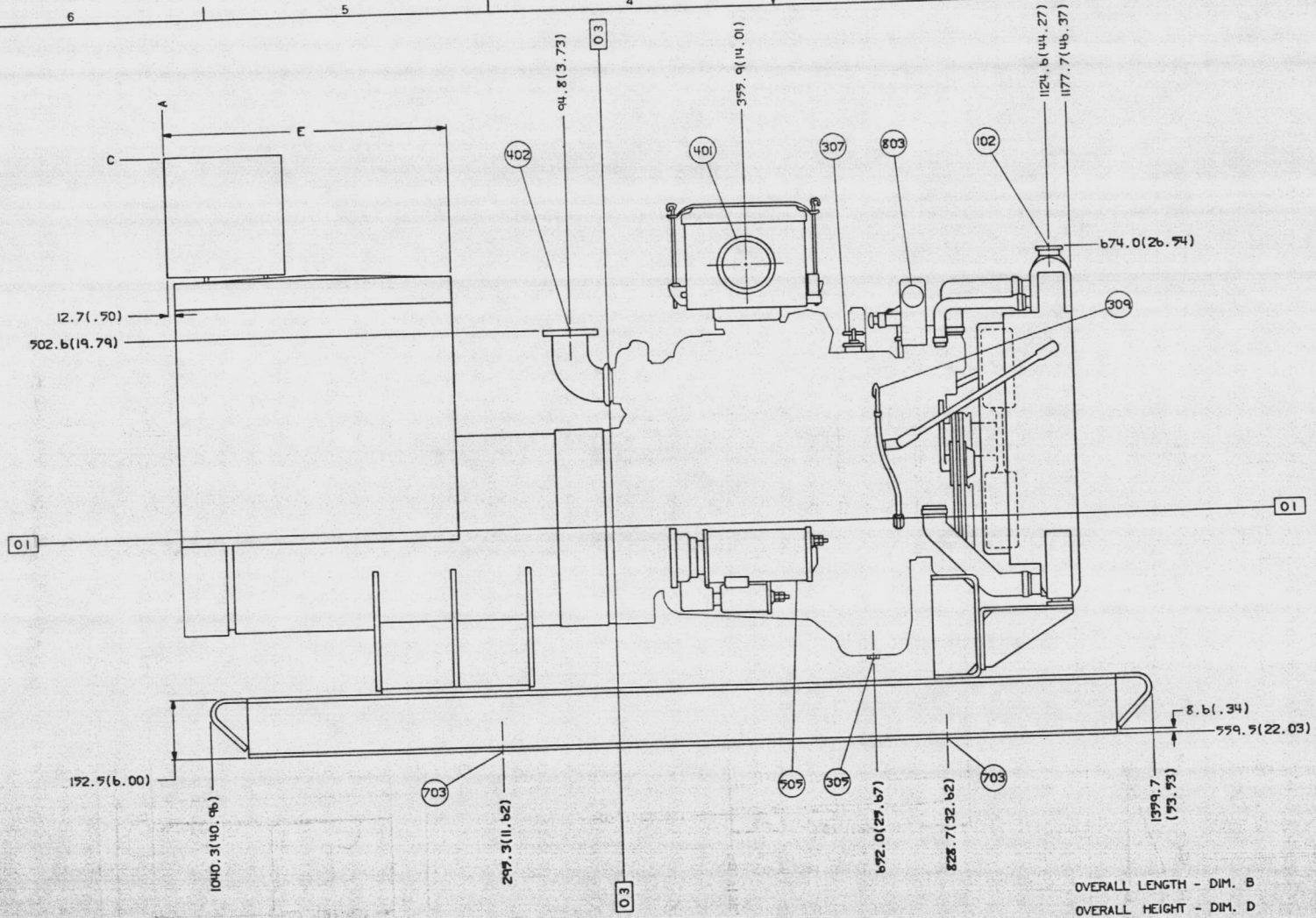
LEDX6274 (1-87)
Supersedes LEDX4286

Printed in U.S.A.


METRIC 2W5719
1026.7(40.42)
RD
823.6(32.43)
35.1(1.38)
MS
522.0(20.55)
202
220
01
31.6(1.24)
201
246.5(9.70)
23.6(.93)
RD
703
793.6(31.24)
309
623.3(24.54)
488.2(19.22)
308
68.3(2.69)
RD
703
783.3(30.84)
721.2(28.39)
203
03
402
304.8(12.00)
304.8(12.00)
01
349.1(13.74)
03
LEFT SIDE VIEW
0 (0) 100 (5) 200 (10) 300 (15) 400 (20) 500
104.8(4.13)
52.4(2.06)
52.4(2.06)
104.8
(4.13)
ø90.6(3.57)
12.7(.50)
R18.0(.71)
ø13.8(.54)
4 HOLES
DETAIL OF EXHAUST 402
SCALE: 1=3
DRN M.C. STENDER
CHK D.B. HIGDON
APPD
UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN mm
DIMENSIONS W/O TOL ARE BASIC
SCALE 1 = 5
SHEET 3 OF 4
THIRD ANGLE PROJECTION
3 11 AUG 83
CHG DATE
CATERPILLAR
DIMENSIONS-GENERAL
PACKAGE GENERATOR SET
2W5719
VERSION -
CONTROL
DES W402
D

3208

METRIC 2W5719



RIGHT SIDE VIEW

ITEM	DESCRIPTION
01	- CENTERLINE OF CRANKSHAFT
02	- CENTERLINE OF ENGINE
03	- REAR FACE OF FLYWHEEL HSG
102	- RADIATOR CAP
201	- FUEL INLET FLEXIBLE LINE, SHIPPED LOOSE 970.0(38.19) LG, 9/16-18 THD
202	- EXCESS FUEL RETURN FLEXIBLE LINE, SHIPPED LOOSE 1930.0(75.98) LG, 7/16-20 THD
203	- FUEL PRIMING PUMP
204	- FUEL FILTER
220	- FUEL-WATER SEPERATOR
305	- OIL DRAIN 3/4-16 TAP
307	- OIL FILLER
308	- OIL FILTER
309	- OIL LEVEL GAGE
401	- AIR INLET- ø127.0(5.00)
402	- EXHAUST (SEE DETAIL)
505	- STARTING MOTOR
608	- THROTTLE CONTROL
703	- CUSTOMER MOUNTING HOLES 27.0(1.06) DIA 2 HOLES EACH SIDE
801	- LIFTING EYE
803	- SERVICE METER
RD	- REMOVAL DISTANCE
MS	- MAXIMUM STROKE

OVERALL LENGTH - DIM. B

OVERALL HEIGHT - DIM. D

OVERALL WIDTH - 874.7(34.44)

SEE SHEET 4 FOR: ENG AR PL4070(NA)
AND OPTIONAL GENERATOR AR

FIGURES IN PARENTHESIS () ARE IN INCHES.

DIMENSIONS WITHOUT ARROWHEADS ARE LOCATED FROM PARALLEL ZERO PLANE. (REFER TO TD7107-00)

MODEL	ENG AR	HZ	VOLTS	PHASE	A	B	C	D	E	F
3208(T)	PL4071 CHG 6	50	200-400	3	1104.9 (43.50)	2464.6 (97.03)	968.4 (38.13)	1527.9 (60.15)	716.3 (28.20)	703.6 (27.70)
		60	240-480							
	PL4072 CHG 6	50	200-400		1155.7 (45.50)	2515.4 (99.03)				
		60	240-480							

0 (0) 100 (5) 200 (10) 300 (15) 400 (20) 500

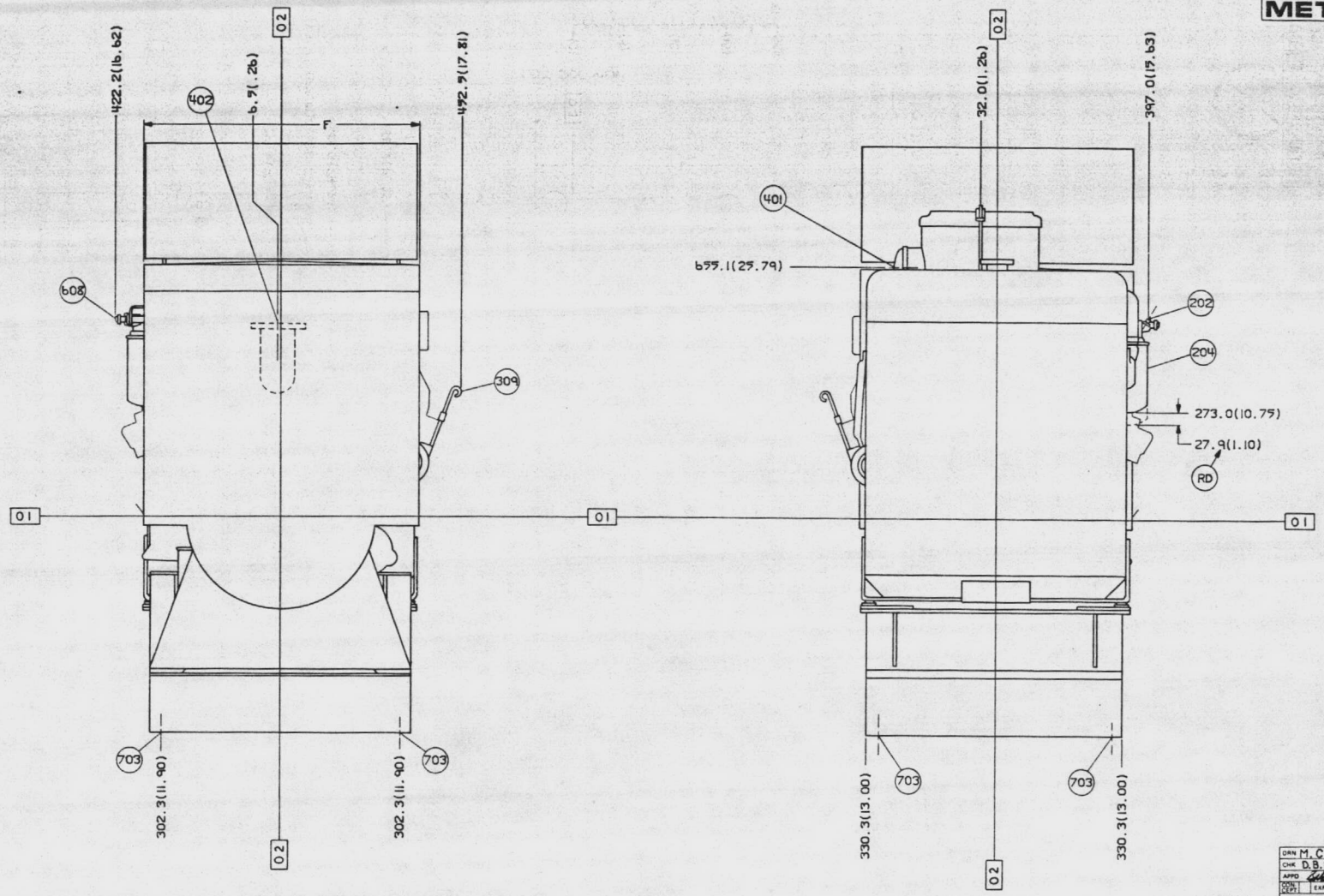
DRN M.C. STENDER
CHK D.B. HIGDON
APPD
SCALE 1 = 2
SHEET 1 OF 4
THIRD ANGLE PROJECTION
3 11 AUG 83
CHG DATE

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN mm
DIMENSIONS W/O TOL ARE BASIC

CATERPILLAR

DIMENSIONS-GENERAL
PACKAGE GENERATOR SET

VERSION 2W5719 CONTROL - DES 2 SUB 1 W402 D



REAR VIEW

FRONT VIEW

MODEL	OPTIONAL GEN AR	HZ	VOLTS	PHASE	A	B	C	D	E	F
3208(T)	PL4126	50	240-480	3	1155.7 (45.50)	2519.4 (99.03)	968.4 (38.13)	1527.9 (60.15)	716.3 (28.20)	703.6 (27.70)
		60	300-600							
	PL4127	60	208-416							
	PL4128	50	240-480		1104.7 (43.49)	2464.4 (97.02)				
		60	300-600							
	PL4129	60	208-416							

0 (0) 100 (5) 200 (10) 300 (15) 400 (20) 500

METRIC 2W5719

DRN M.C. STENDER
CHK D.B. HIGDON
APPD
COST CENT | EXP | PRE PROD | PROD

UNLESS OTHERWISE SPECIFIED
DIMENSIONS ARE IN mm
DIMENSIONS W/O TOL ARE BASIC

SCALE 1 = 5
SHEET 2 OF 4
THIRD ANGLE PROJECTION
CHG 3 | DATE 11 AUG 83

CATERPILLAR

DIMENSIONS-GENERAL
PACKAGE GENERATOR SET

2W5719 | VERSION - | DES X DUP | CONTROL W402 | D

Electronic Modular Control Panel

The electronic modular control panel (EMCP), Part 7C1000, is a generator-mounted control panel on package generator sets. Below is a brief summary of the EMCP and its advantages. A more complete and detailed analysis of the EMCP starts with Section B, Operation.

The EMCP consists of environmentally sealed, solid-state, microprocessor-based modules for engine control and AC metering as well as optional panel alarm and remote annunciation. These modules allow the EMCP to offer many advantages over the electro-mechanical and competitive panels:

A. Advantages

1. Reliability

   a. Environmentally sealed, dusttight, watertight, solid-state, microprocessor-based modules provide more than twice the reliability of electro-mechanical panels.

   b. Protected against short circuit.

   c. Protected against reverse polarity connection.

   d. Protected against overvoltage and transient surges.

   e. Solid-state meters eliminate possibility for failure/inaccuracy of mechanical meters.

   f. Rugged metering face architecture.

   g. LCDs are visible to -40°C (-40°F).

2. Accuracy

   a. Maintains metering accuracy over much greater ambient temperature range of -40°C (-40°F) to +70-C (+158°F). Needed in many outdoor applications.

   b. Provides much greater metering accuracy (0.5% AC volts and amps and 0.3 Hz versus 2% accuracy for most competition). Needed for many computer and other critical applications.

3. Flexibility

a. English or Metric

Engine operating information (i.e., oil pressure and coolant temperature) can be displayed in metric or English units.

b. Energized to Run or Shutdown

Programmable for energized-to-run or energized-to-shutdown-type fuel control systems.

c. Programmable

AC module is field programmable to work with 75:5 to 4000:5 current transformer ratios and line-to-line voltages from 0-700 V AC; thus, one AC metering module replaces 18 mechanical meter part numbers.

d. One Scale -- Better Accuracy

AC metering accuracy and programmability eliminates dual scale meters required by competition to serve in many applications such as rental.

e. Programmable Shutdown Points

Engine control module has dealer-programmable safety shutdown points for low oil pressure (step protection at low and high rpm), high coolant temperature, overspeed, and overcrank.

f. Alarm Modules

Provides three optional alarm modules (NFPA 99, NFPA 110, and prime power).

g. NFPA 110 and 99

Provides two optional remote annunicators (NFPA 110 which requires one of the three optional alarm modules to function and, specifically, the NFPA 110 alarm module to meet NFPA 110 and NFPA 99 which can operate with or without an optional alarm module).

h. Woodward Governor Available

Compatible with Woodward 2301 (shipped installed option) and 2301A (shipped loose option) governors.

4. Simplicity

a. System self-diagnostic capability standard to aid troubleshooting.

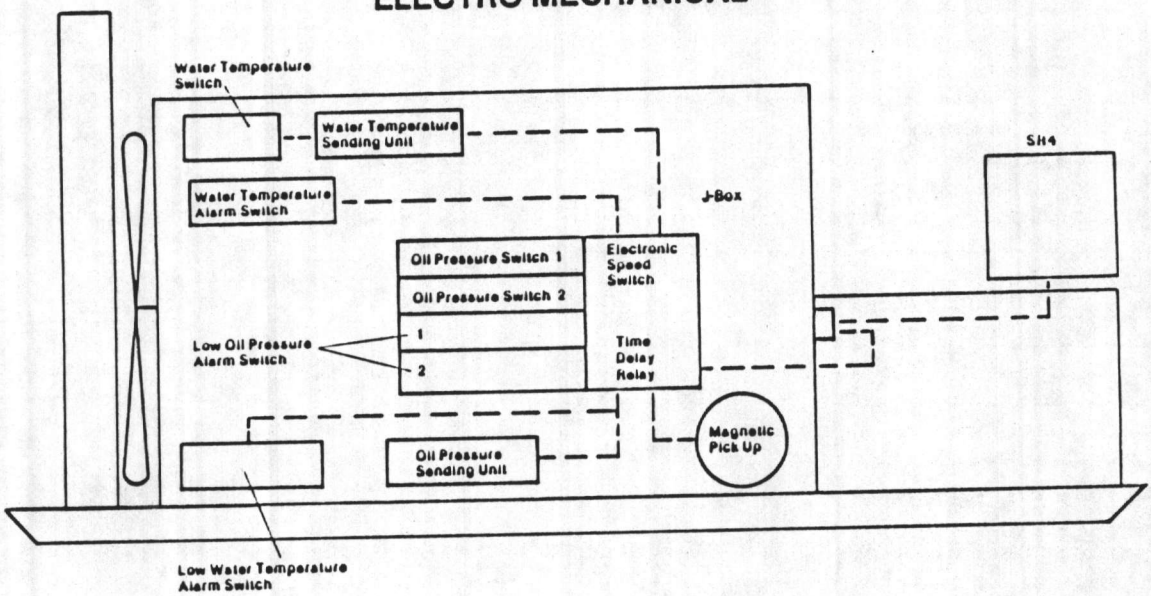
b. Eliminates 18 standard or optional switches, sending units, meters, etc., per unit and their possibility of inaccuracy and malfunction.

c. Electronic transducers eliminate additional, customer, or dealer expense to supply oil pressure and jacket water temperature switches needed to activate alarm systems and LCD gauges.

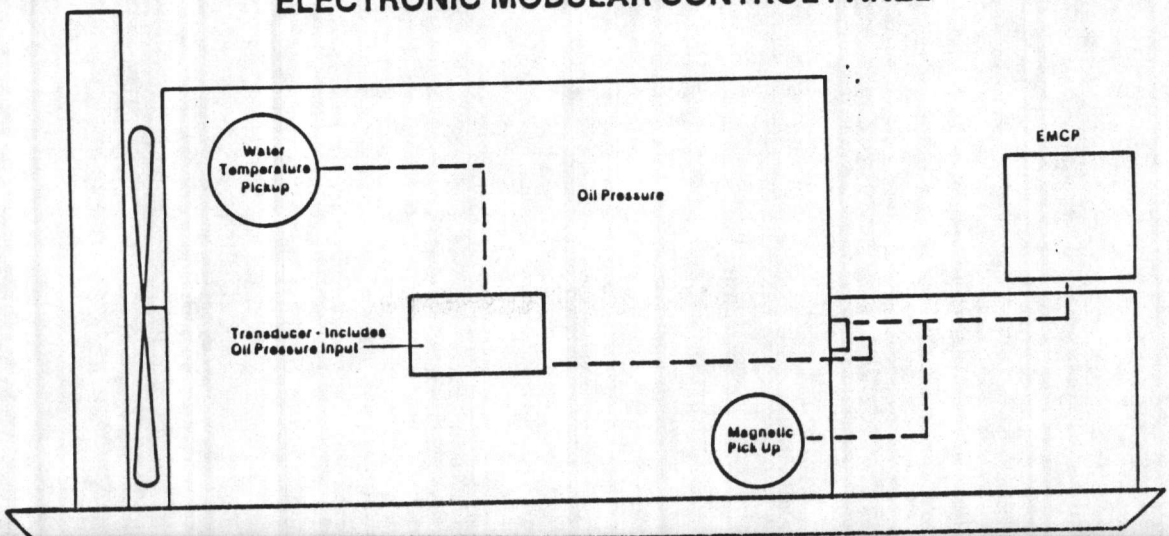
d. Cycle crank and cooldown timers, tachometer, DC voltmeter, and oil step protection is standard on EMCP.

e. Jacket water temperature and oil pressure, data sending unit, and serial data link require significantly less wiring, thus reducing number of wires, eliminating the junction boxes and giving a simpler cleaner installation.

ELECTRO MECHANICAL



ELECTRONIC MODULAR CONTROL PANEL



HOW IT WORKS

Optional Alarm Modules and Remote Annunciators

- Alarm LED'S or lights
- Alarm horn
- Alarm horn silence/ acknowledge pushbutton

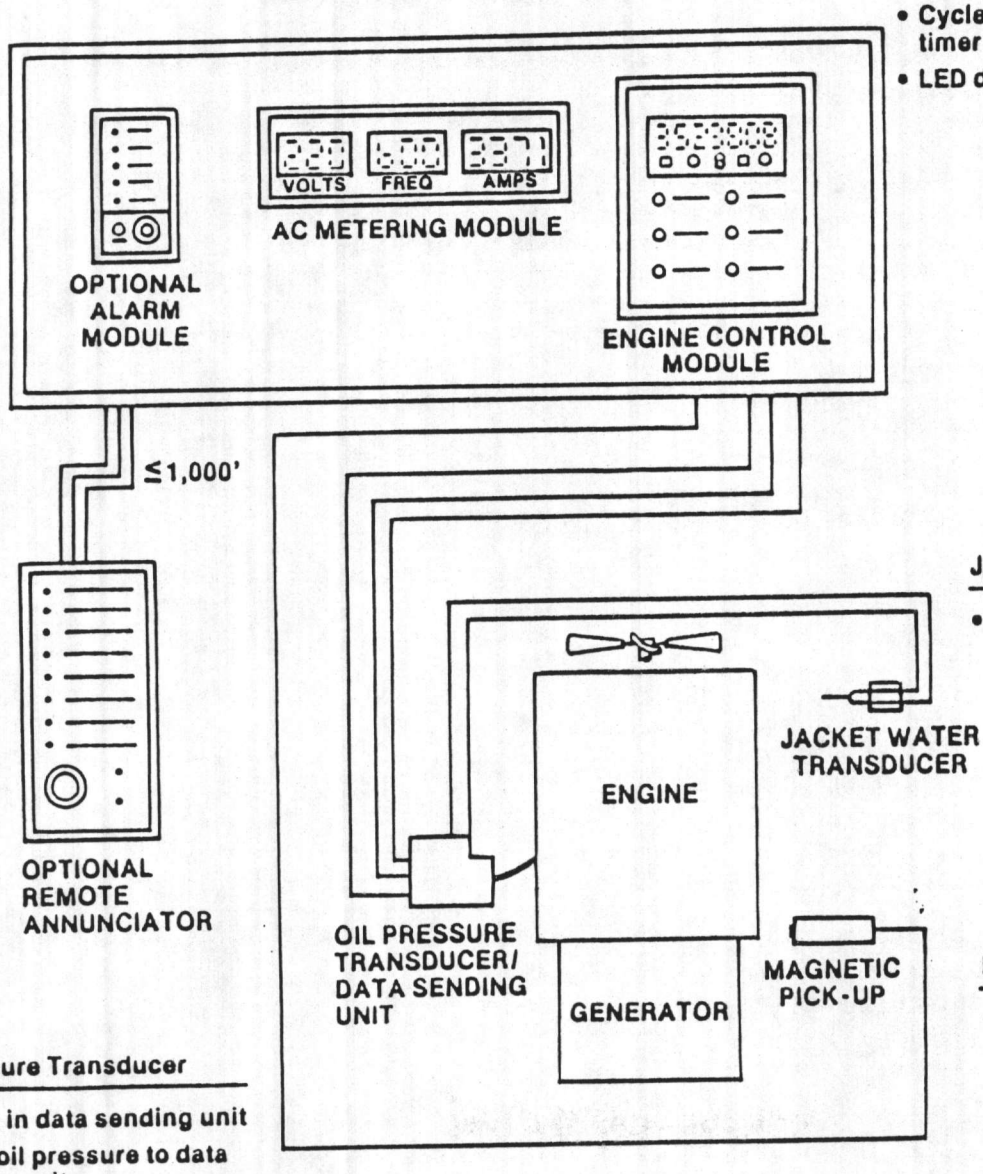
Generator Metering Module

- Digital LCD readouts
  - Volts
  - Frequency
  - Amps

Engine control Module

- Digital LCD readout
  - Oil pressure
  - Coolant temperature
  - System DC volts
  - Engine rpm
  - Service hour meter
  - Diagnostic codes
  - Programming data
- Cycle crank and cooldown timer
- LED display safety shutdown

SYSTEM CONFIGURATION



Jacket Water Transducer

- Feeds jacket water temperature to data sending unit

Magnetic Pick-up

- Feeds engine speed to engine control module

Oil Pressure Transducer

- Housed in data sending unit
- Feeds oil pressure to data sending unit

Data Sending Unit

- Transmits jacket water temperature and oil pressure via a single wire serial data link to engine control module

B. Operation

The engine control module will display operating information, system diagnostics, and fault shutdown using one back-lighted LCD (liquid crystal display) and six LEDs. The engine control module uses a 13 mm (0.5 in.) LCD to sequentially display operating hours, engine rpm, battery DC volts, oil pressure, and jacket water temperature in metric or English units. Any single function can be continuously displayed by pressing a switch (located just under the LCD). Pressing the switch a second time will resume normal display sequencing. The engine control module LCD is also used to annunciate system programming data, i.e., cycle crank, cooldown timers, etc., and diagnostic codes for troubleshooting. Most competitiors cannot or do not provide diagnostic capabilities. The engine control module LEDs are used to display fault shutdown.

The engine control module monitors oil pressure, jacket water temperature, and engine speed using two engine-mounted transducers and a magnetic pickup. The jacket water transducer requires two wires that transmit information to a "data sending unit" (DSU). The oil pressure transducer, which is housed in the DSU, requires a hydraulic hose to connect the transducer to the engine block. The DSU encodes oil pressure and jacket water temperature and transmits this data to the EMCP engine control module via a single wire serial data link. Only three wires (two power, one data) are needed to send this information from the DSU to the engine control module. Thus, the engine control system requires only seven wires (two jacket water, three DSU, and two magnetic pickup) and one hydraulic hose (oil pressure) to provide shutdown, gauging, and optional alarm features. The EMCP offers many advantages over the current electro-mechanical panel such as:

- Requires significantly less engine wiring.
- Eliminates the need for two engine-mounted wiring junction boxes.
- Cycle crank and cooldown timers, tachometer, DC voltmeter, and oil step protection are standard.
- Electronic transducers eliminate additional oil pressure and jacket water temperature switches needed to activate alarm systems and gauges.
- System diagnostics to aid troubleshooting.

One AC metering module will serve all Caterpillar Generator Sets. The AC module will display AC volts, frequency, and AC amps using three back-lighted 13 mm (0.5 in.) LCDs. Metering accuracy (0.5% AC volts/amps and 0.3 Hz frequency will be maintained throughout an operating ambient temperature range of -40C to +70C, even with distorted voltage and current waveforms (to a crest factor of 5)prevalent in SCR load applications. The AC module is also field programmable to work with 75:5 to 4000:5 current transformer ratios. This programmability combined with the AC module metering accuracy eliminates the need for dual-scale meters required by our competition to serve in many applications such as rental.

The EMCP will consist of the following standard features:

C. Consist

1. Engine Controls

a. Solid-state, microprocessor-based engine control module providing the following functions:

Digital LCD Back-Lighted Display Indicating:

- Engine rpm (0-4000 rpm).
- Battery DC volts (15-50 volts DC).
- Coolant temperature (0-120°C/32-248°F).
- Lube oil pressure (0-689 kPa/0-100 psi).
- Generator set operating hours (0-99,999 service hours).
- System diagnostic codes (for troubleshooting) indication:

  - Loss of magnetic speed pickup signal.
  - Loss of DSU signal.
  - Loss of programmed settings, i.e., cycle crank, cooldown timers, etc.
  - Invalid engine control switch signal.
  - Shutdown not control originated, i.e., fuel depravation.
  - Module internal fault.

Automatic/Manual Start-Stop With the Following Safety Shutdowns:

- Overspeed protection and LED indicator.

  - Adjustable 400-5000 rpm (factory set for each engine).

- Low lube oil pressure protection and LED indicator two-stage protection for low idle/high idle.

  - Adjustable 20-336 kPa (3-49 psi) for low idle, 34-420 kPa (5-61 psi) for high idle (factory set for each engine).

- High coolant temperature protection and LED indicator.

  - Adjustable 95-121°C (203-250°F) (factory set for each engine).

- Overcrank protection and LED indicator.

  - Adjustable 5-120 seconds (factory set for each engine).

- Safety shutdown for all system diagnostic codes above.

- Emergency stop via a red push button and LED indicator.

Cycle Cranking

- Adjustable 1-60 seconds crank/rest periods (factory set for each engine).

Cooldown Timer

- Adjustable 0-30 minutes (factory set for each engine).

Programmable for Energized-to-Run or Energized-to-Shutdown-Type Fuel Control Systems

b. Engine Control Switch (Four-Position, Stop -Off/Reset -Manual - Auto)

c. LED Indicator/LCD Display Test Switch

d. Voltage Adjust Potentiometer (+10%-25% Range)

2. AC Metering

a. Solid-State, Microprocessor-Based Digital AC Metering Module Displaying:

AC Volts

- 13 mm (0.5 in.) LCD, 0-700 vac True RMS, 0.5% Accuracy, 1.0 Volt Resolution

AC Amps

- 13 mm (0.5 in.) LCD, 0-4000 amp True RMS, 0.5% Accuracy, 1.0 Volt Resolution

Frequency

- 13 mm (0.5 in.) LCD, 45-99.9 Hz, 0.3 Hz Accuracy, 0.1 Hz Resolution

b. Ammeter/Voltmeter Phase Selector Switch

- Four Position (Phase 1, 2, 3, and Off)

c. Three Current Transformers

- Sized to Match the Generator Output Current

Optional features available on the EMCP will include, among other things, three alarm modules and two remote annunciators.

The optional alarm modules use the same type solid-state, microprocessor-based module used in the engine control and AC metering modules mentioned above. All three optional alarm modules are similar in that they will annunciate visual and audible alarms by flashing an

appropriately labeled LED while sounding an alarm horn. A horn silence/acknowledge push button is provided which, when pushed, will silence the horn and hold the LED on solid until the condition is corrected. If another condition occurs after the first, the horn will sound again and another LED will flash. In addition, alarm module diagnostics, which indicate loss of serial data link and internal module faults, will assist with troubleshooting. Specific features of each of the optional EMCP alarm modules are listed below:

- NFPA 99 alarm module.

  (1) Solid-state, microprocessor-based alarm module providing alarm horn and LED annunciation for:

    - High coolant temperature alarm.
    - Low coolant temperature alarm.
    - Low oil pressure alarm.
    - Low fuel level (requires customer-supplied switch).
    - Low battery voltage.
    - System not in auto start/stop mode.
    - Two spare LEDs for customer use.

  (2) Alarm horn silence/acknowledge push button.

- NFPA 110 alarm module.

  (1) Solid-state, microprocessor-based alarm module providing alarm horn and LED annunciation for:

    - High coolant temperature alarm.
    - Low coolant temperature alarm.
    - Low oil pressure alarm.
    - Low fuel level (requires customer-supplied switch).
    - Low battery voltage.
    - System not in auto start/stop mode.
    - Battery charger malfunction (requires customer-supplied switch).
    - Combustion inlet air damper closed (requires customer-supplied switch).

  (2) Alarm horn silence/acknowledge push button.

- Prime power alarm module.

  (1) Solid-state, microprocessor-based alarm module providing alarm horn and LED annunciation for:

    - High coolant temperature alarm.
    - Low coolant level (requires customer-supplied switch).
    - Low oil pressure alarm.
    - Low oil level (requires customer-supplied switch).
    - Low battery voltage.
    - One spare LED for customer use.

  (2) Alarm horn silence/acknowledge push button.

3. EMCP Options Which Are Also Available

a. Starting aid toggle switch.

b. Panel illumination lights (2) and on/off switch.

c. Governor raise-lower control toggle switch for hydra-mechanical governors.

d. Woodward 2301 speed-sensing governor (with door-mounted governor speed adjusting potentiometer).

e. Synchronizing lights and on/off switch.

f. Reverse power relay and LED fault indicator.

g. Auxiliary relay.

- Activates upon engine crank termination.
- 10 amp, 24 V DC, SPDT contacts wired for customer use.

h. Dustproof panel enclosure (designed to meet NEMA 12/IP44 requirements).

i. NFPA 110 remote annunciator (requires EMCP-mounted alarm module to function -- requires NFPA 110 alarm module to meet NFPA 110 standards).

(1) System trouble indicating lamp (push-to-test type).
(2) System trouble indicating horn.
(3) 2PDT relay contacts for customer wiring to other horns, bells, lights, etc., as required by NFPA 110 (10 amp 24 V DC).
(4) Alarm horn silence/acknowledge push button.
(5) Sheet metal enclosure (designed to meet NEMA 1/IP22 requirements).
- Indoor, wall surface mountable.

j. NFPA 99 remote annunciator.

(1) Serial data linked, solid-state, microprocessor-based alarm module providing alarm horn and LED annunciation for:

- Generator on load (requires interconnection to auxiliary switch on transfer switch).
- Low coolant temperature alarm.
- Battery charger malfunction alarm (requires customer-supplied switch).
- Low fuel level alarm (requires customer-supplied switch).
- High coolant temperature fault shutdown.
- Low oil pressure fault shutdown.
- Overcrank fault shutdown.
- Overspeed fault shutdown.

(2) Alarm horn silence/acknowledge push button.

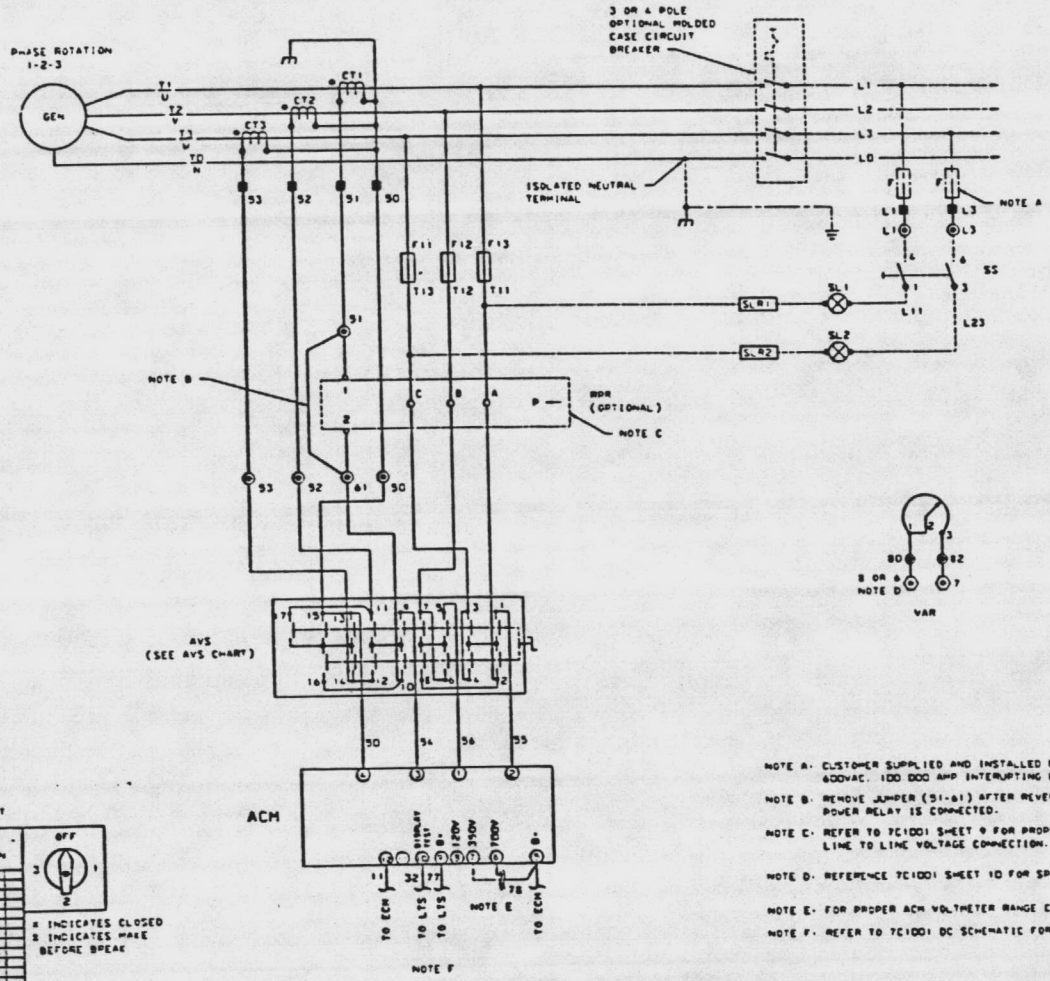
(3) Alarm horn/LED test push button.

(4) Remote annunciator diagnostics

- Loss of remote annunciator communication serial data link.
- Internal module fault.

(5) Sheet metal enclosure (designed to meet NEMA 1/IP22 requirements).

- Indoor, wall surface mountable. .
- Holes to accommodate conduit connections.



NOTE A. CUSTOMER SUPPLIED AND INSTALLED FUSES-1AMP.
600VAC. 100 000 AMP INTERUPTING CAPACITY.

NOTE B. REMOVE JUMPER (51-61) AFTER REVERSE
POWER RELAY IS CONNECTED.

NOTE C. REFER TO 7C1001 SHEET 9 FOR PROPER RPR
LINE TO LINE VOLTAGE CONNECTION.

NOTE D. REFERENCE 7C1001 SHEET 10 FOR SPECIFIC VAR CONNECTION.

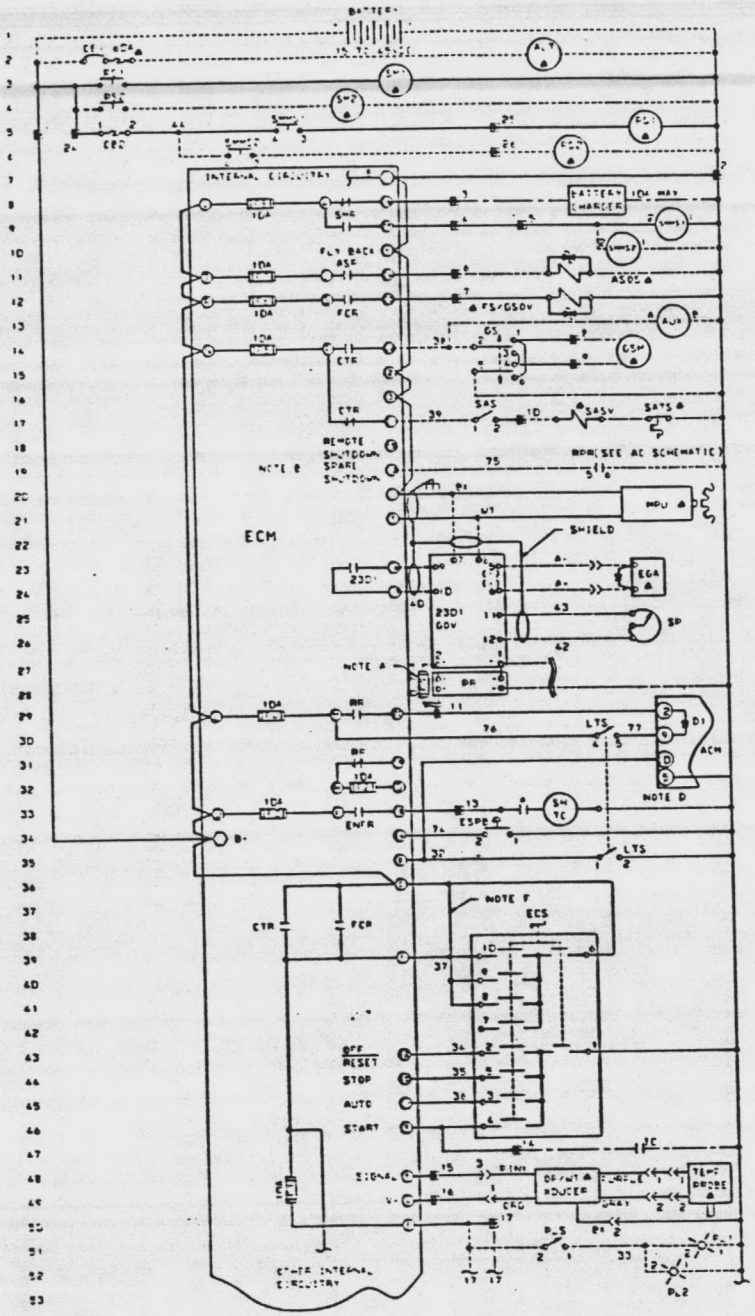
NOTE E. FOR PROPER ACM VOLTMETER RANGE CONNECTIONS REFER TO 7C1001 SHEET 9.

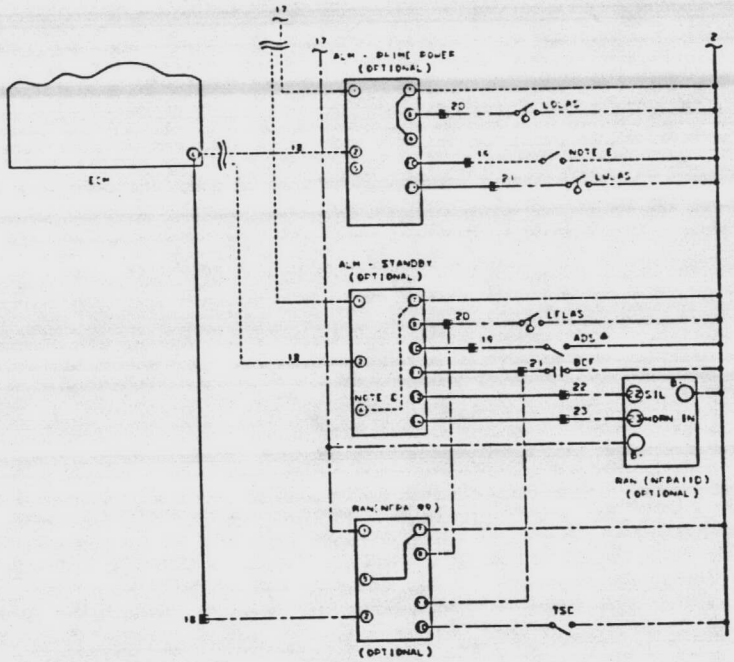
NOTE F. REFER TO 7C1001 DC SCHEMATIC FOR OTHER ACM CONNECTIONS

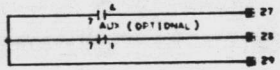
CATERPILLAR

AC SCHEMATIC (IEC)

7C1001



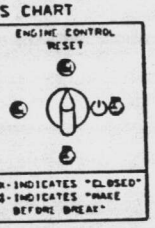




CONTACTS FOR CUSTOMER USE 10 AMP MAX AT 28 VDC/120 VAC

ECS CHART

CONTACTS	OFF/RESET	AUTO	MANUAL	STOP	LINE NO.
1	X	X	X	X	39
2	X				35
3		X			41
4			X		42
5				X	40
6	X	X	X	X	36
7	X				38
8		X			37
9			X		34
10				X	36



X - INDICATES "CLOSED"
O - INDICATES "MAKE BEFORE BREAK"

NOTE A: FUSE F9 WILL BE INSTALLED IF THE OPTIONAL PREREGULATOR(PR) IS NOT PROVIDED WITH THE OPTIONAL 2301 GOVERNOR.

NOTE B: THE INPUT TO THE ECM REMOTE & SPARE SHUTDOWN INPUT MUST BE A B- SIGNAL APPLIED FOR 250mSEC OR LONGER TO ASSURE PROPER OPERATION.

NOTE C: CONNECT ALM TERMINAL POINT 7 TO POINT 6 FOR NFPA110 ALARM MODULE OPERATING MODE. NO CONNECTION REQUIRED FOR NFPA99 OPERATION.

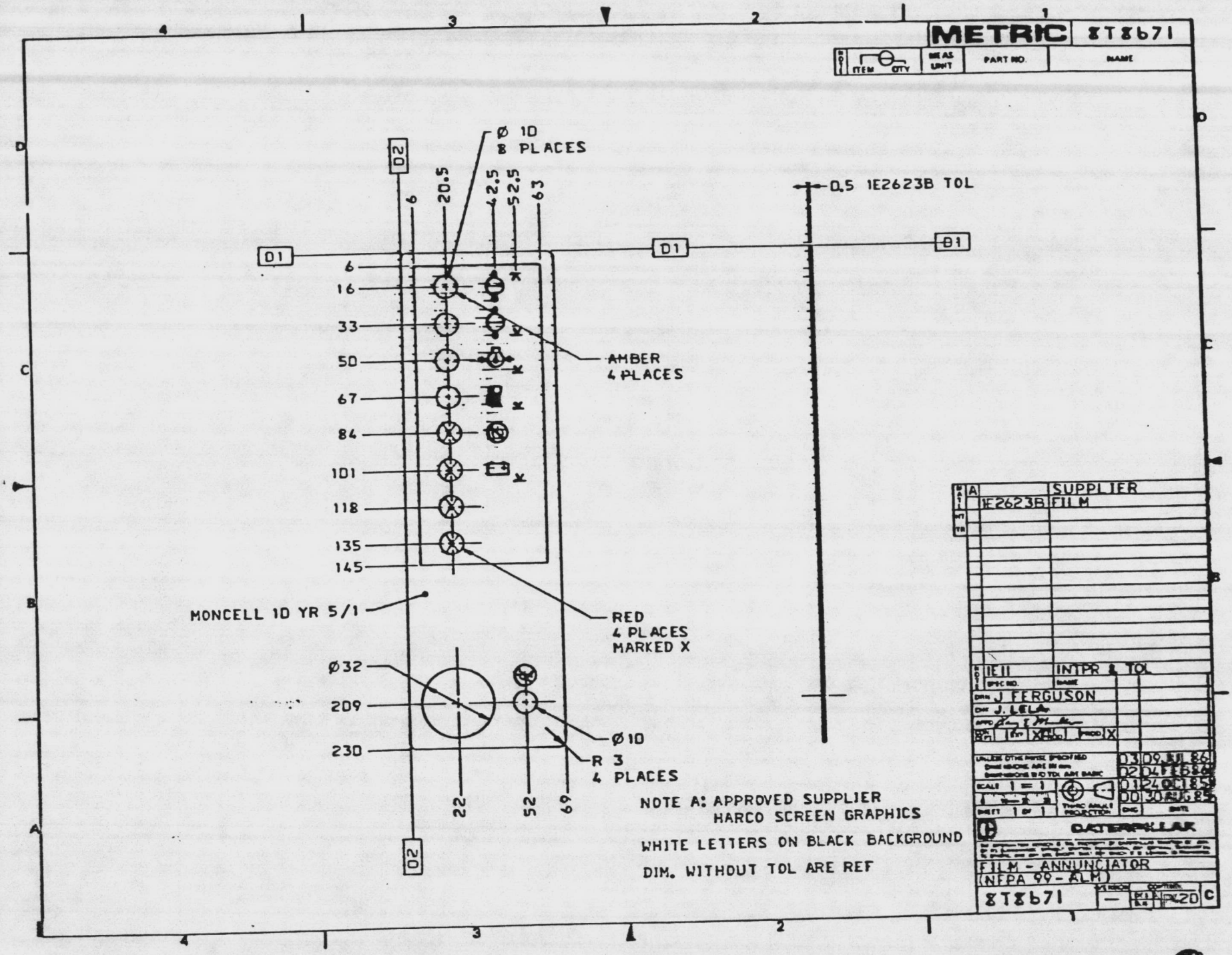
NOTE D: REFER TO AC SCHEMATIC FOR ADDITIONAL ACM CONNECTIONS.

NOTE E: SPARE INPUT FOR CUSTOMER DEFINED USE. WITH CUSTOMER PROVIDED SWITCH (RATED FOR 4 MA. 12 VDC OPERATION).

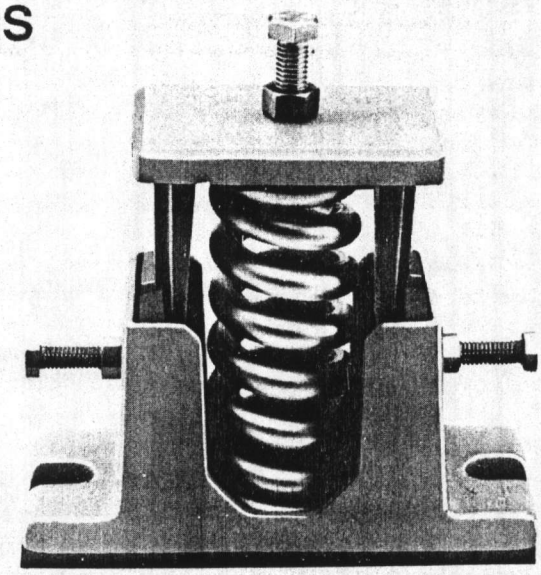
NOTE F: REMOVE THIS JUMPER IF IT IS DESIRABLE TO TURN OFF THE ECM, ALM & RAN VIA THE ENGINE CONTROL SWITCH(ECS) "OFF" POSITION. IN ORDER TO LIMIT BATTERY DRAIN. IE: PRIME POWER APPLICATIONS.

DC SCHEMATIC (JIC)

7C1001


METRIC
8T8671
ITEM
QTY
MEAS UNIT
PART NO.
NAME
Ø 1D
8 PLACES
D2
D1
6
20.5
42.5
52.5
63
0.5 1E2623B TOL
16
33
50
67
84
101
118
135
145
AMBER
4 PLACES
MONCELL 1D YR 5/1
RED
4 PLACES
MARKED X
Ø32
209
230
Ø10
R 3
4 PLACES
22
52
69
NOTE A: APPROVED SUPPLIER
HARCO SCREEN GRAPHICS
WHITE LETTERS ON BLACK BACKGROUND
DIM. WITHOUT TOL ARE REF
A
1E2623B
SUPPLIER
FILM
1E11
INTPR & TOL
DRN J FERGUSON
CHK J. LELA
SCALE 1 = 1
SHEET 1 OF 1
THIRD ANGLE PROJECTION
CATERPILLAR
FILM - ANNUNCIATOR
(NFPA 99 - ALM)
8T8671
PL20
C

SPRING ISOLATORS



APPLICATION

The Silex™ Isolators have been designed specifically for use on stationary and mobile diesel generator sets. They are also used on equipment including:- engine driven compressor sets
- engine and motor driven pumps
- utility sets
- reciprocating compressors
- refrigeration machines

The design of the isolators is such that they optimize the vibration isolation efficiency while optimizing cost, through the interchangeability of springs within the same housing.

TECHNICAL

With the installation of a diesel-engine generator set or other rotating equipment attention must be given to vibration to ensure that there is no transmission of objectionable vibration or structure born noise to the building in which it is situated. When designing an isolation system for a generator set there are many factors which should be considered. These include:
- mass of equipment
- mass of floor
- stiffness of floor
- vibratory force produced by equipment
- frequency of rotating equipment
- natural frequency of isolators
- natural frequency of floor

Isolation efficiency is a function of the relationship of disturbing frequency to the natural frequency of the isolator. The natural frequency of the isolator is a direct function of the deflection. The natural frequency of the isolator is given by:

$$fn\ (cpm) = 188\sqrt{1/d}$$

where d: static deflection

The % efficiency of the isolator is given by:

$$\%\ \text{efficiency} = 100\left(1 - \frac{1}{\left(\frac{fd}{fa}\right)^2 - 1}\right)$$

Figure 1.0 illustrates the isolation efficiency for various fd: fn relationships.

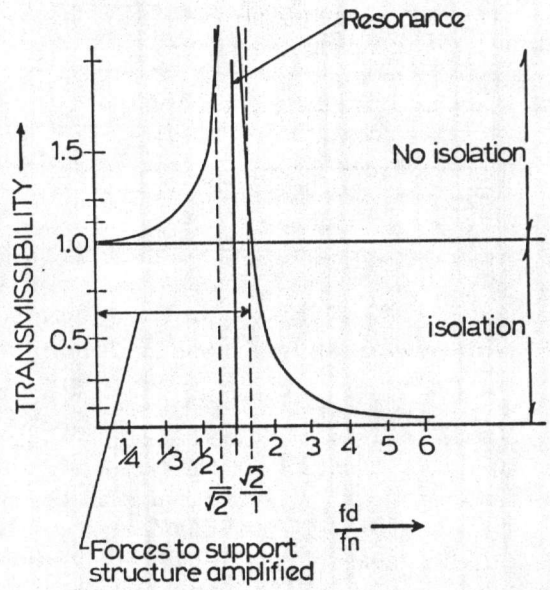


Figure 1.0

SILEX ISOLATOR FEATURES

The Silex™ isolators have been designed specifically for diesel engine isolation. Two separate models are available, SM and SMD. Both models have the same features however model SMD also has side dampening. The features of the isolators are outlined below.

SPRING INTERCHANGEBILITY: The isolators are designed to accomodate all of the different rated springs. This allows the flexibility to change springs without changing other parts of the isolator.

LEVEL ADJUSTING BOLT: All isolators are provided with standard external adjustment. The bolts are long enough to accomodate a 2" Base Channel.

INTERNAL DAMPING: All isolators incorporate internal neoprene-in-shear rubber side dampers. These dampers limit the machine vibration while the engine is passing through the resonant frequency on start-up.

SPRINGS: Oil Tempered and Chrome Silicone Steel is used on the standard springs.

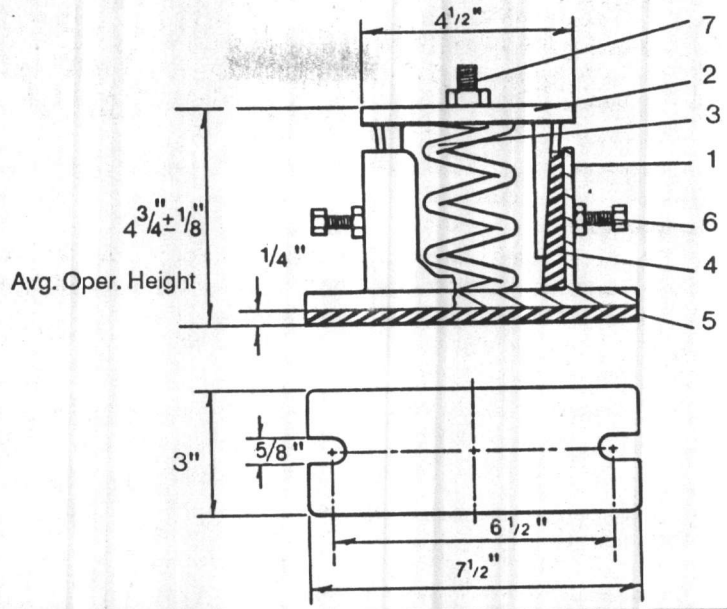
HOUSING MATERIALS: Ductile Iron is standard on all isolator housings.

SILEX SOUND PAD: To provide a non-skid surface and to increase isolation efficiency the Silex Sound Pad is installed on all isolators.

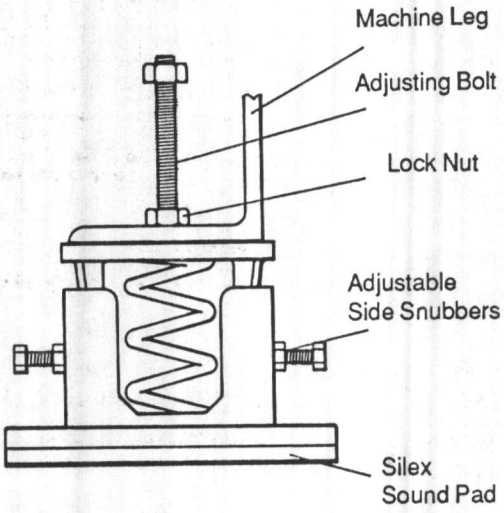
SIDE DAMPENING: On models SMD side dampening is standard.

Isolator Components

1. Bottom housing: Ductile Cast Iron
2. Top housing: Ductile Cast Iron
3. Springs: Chrome Silicone & Oil Tempered
4. Internal Damping Pad
5. Silex Sound Pad
6. External Side Damping - available on SMD isolators only.
7. External Level Adjustment - .5" UNC Bolt to suit 2" engine bolt.



Isolator models	Without damping	SM - 150	SM - 250	SM - 550	SM - 750	SM - 1250	SM - 1800	SM - 2500
	With damping	SMD - 150	SMD - 250	SMD - 550	SMD - 750	SMD - 1250	SMD - 1800	SMD - 2500
Max. Static Load (Lbs)		150	250	550	750	1250	1800	2500
Deflection at rated load		1"	1"	1"	1"	1"	1"	1"
Colour		Blue	Grey	Black	White	Orange	Yellow	Red
Isolator Weight		8	8	9	9	9	9	10



Model SMD

Installation Instructions

1. Position isolator on a level surface under equipment leg.
2. Loosen adjustable snubbers to allow full deflection (Model SMD)
3. Insert adjusting bolt and screw down 2 complete turns on each isolator alternatively until equipment is at required level.
4. Tighten lock nut securely to equipment leg.

   The Following Steps Are For Model SMD Only

5. Tighten adjustable snubber bolts finger tight.
6. Operate the equipment. If movement is excessive tighten snubber bolts .25 turn at a time on each isolator until movement is at allowable level.

ORDERING INFORMATION

To order identify quantity and model

i.e. SM - 150 This represents a 150 lb spring isolator without side damping

SMD-150 This represents a 150 lb spring isolator with side damping.

SILEX ™ NOISE CONTROL PRODUCTS CANADA INC.

1958 MATTAWA AVENUE
MISSISSAUGA, ONTARIO
L4X 1K1
(416) 848-5430 • TELEX: 06961343

EGSA
ELECTRICAL GENERATING SYSTEMS ASSOCIATION

APPLICATION:

The Silex™ series JA is used on applications where Residential Grade silencing is required. The JA series is used extensively on stationary generator sets, marine engines, mobile engines, engine driven compressor sets and positive displacement blowers.

They are effective on both naturally aspirated and turbo-charged engines when sized and selected to accommodate the allowable pressure drop of the engine.

The Residential Grade silencer series JA provides an average attenuation of 20-25 dB(a) depending on the engine type, size and application.

DESCRIPTION:

The Silex™ series JA silencer is designed for HEAVY DUTY APPLICATIONS. The JA series are a reactive design lending itself to good noise attenuation across the entire audible range of the frequency spectrum 63 thru 8000 HZ. The silencer consists of a series of chambers connected by non-resonant tubes. The entire silencer is manufactured from Plate Steel and is of a completely welded design. The heavy plate ensures longer silencer life and better resistance to damage. The heavy plate shell also prevents against shell radiated noise that may exist with lighter gauge thin walled silencers. There are no spot welds or press fits used in the design that could fail during operation.

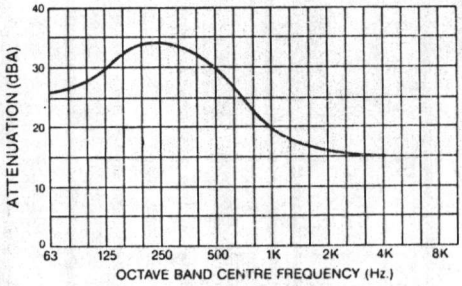
The inlet and discharge on silencers up to 3½" are sch. 40 NPT pipe. On silencers 4" and larger the inlet and discharge are flanged, manufactured from minimum ½" thick plate and drilled to Ansi 150 lb. The Silex™ series JA are available in both end in/end out and side in/end out configurations. Other configurations are also available. The side inlet locations may be selected within a given range to allow easier job-site installation.

The Silex™ series JA are provided standard with ½" drain connections (when specified at time of order). Prior to shipping they are thoroughly cleaned and coated in a high temperature 1200° F aluminium paint.

SELECTION:

To select the appropriate silencer for the application follow the steps below.

1) **ACOUSTICAL PERFORMANCE**
The first step is in deciding what grade of silencer is required. The JA series is a Residential Grade with an insertion loss of 20-25 dB(a). The frequency breakdown is given in the adjacent graph.



2) **ENGINE DATA**
Once the Grade of silencer has been identified the silencer size may then be determined. The information that is required includes:

Exhaust CFM _____
Exhaust Temp (°F) _____
Allowable Pressure drop
through silencer: (inches w.g) _____

The second step is to select the anticipated silencer size and calculate the gas velocity (equation No. 1) and then use this velocity in equation No. 2. to calculate the pressure drop through the silencer. If the pressure drop exceeds the allowable pressure drop select the next larger size and recalculate the gas velocity and pressure drop again. Repeat this until the size selected provides a pressure drop that is within the allowable limit.

FLOW AREA/SIZE

FLOW AREA-ft.2	DIA. (SIZE)-in.	FLOW AREA-ft.2	DIA. (SIZE)-in.
.0055	1	196	6
.012	1 1/2	.349	8
.022	2	.55	10
.034	2 1/2	.79	12
.049	3	1.07	14
.067	3 1/2	1.4	16
.087	4	1.8	18
.136	5	2.2	20

Table 1

$$\text{Gas Velocity} = \frac{\text{actual exhaust CFM}}{\text{Flow area (Table 1.0)}} = V\ (\text{fpm}) \ldots\ldots (1)$$

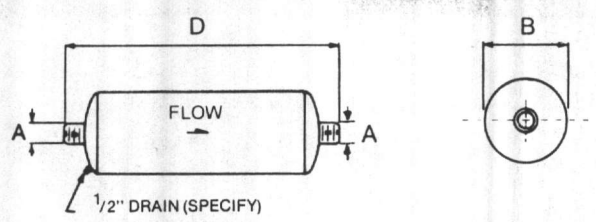
$$\text{Silencer Pressure Drop} = 4.0 \times \left(\frac{V}{4005}\right)^2 \times \frac{530}{T(°F) + 460} \ldots\ldots (2)$$

To convert this to inches H.g multiple the p.d. of equation (2) x .07334 = inches H.G.

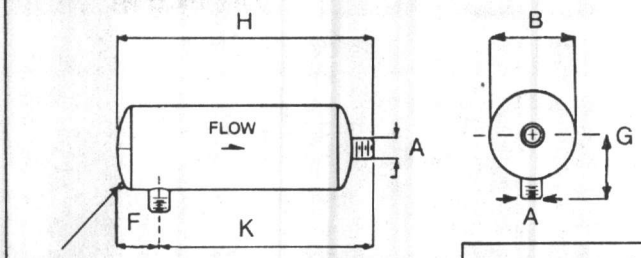
SPECIFICATIONS

RESIDENTIAL GRADE
SERIES JA

Sizes 1½" thru 3½" (all connections are NPT male)



MODEL JA-st

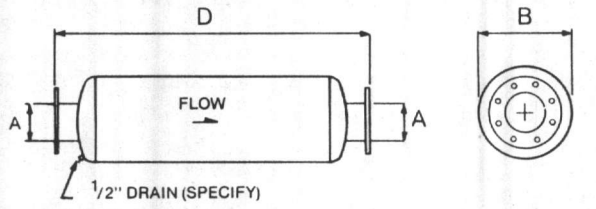


MODEL JA-si

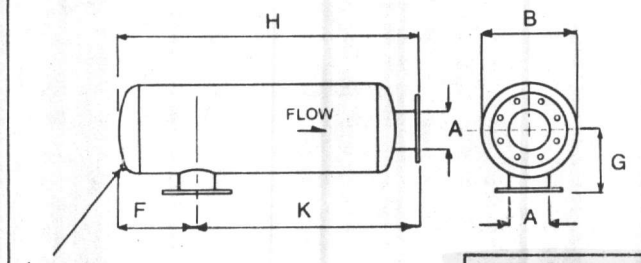
Dimensions (in inches)

SELECTION	MODEL	A (inlets)	B	D	F (specify)	F(min)	F(max)	G	H	K (H-F)	WT (lb)
	JA-1½	1½	9	20		3½	8	8	17		19
	JA-2	2	9	20		3½	8	8	17		20
	JA-2½	2½	10	24		4½	10	8	21		30
	JA-3	3	12	26		5½	11	9	23		38
	JA-3½	3½	14	30		6	13	10	27		51

SIZES 4" THRU 30" (flange connections conform to ANSI 150 lb. drilling.)



MODEL JA-st



MODEL JA-si

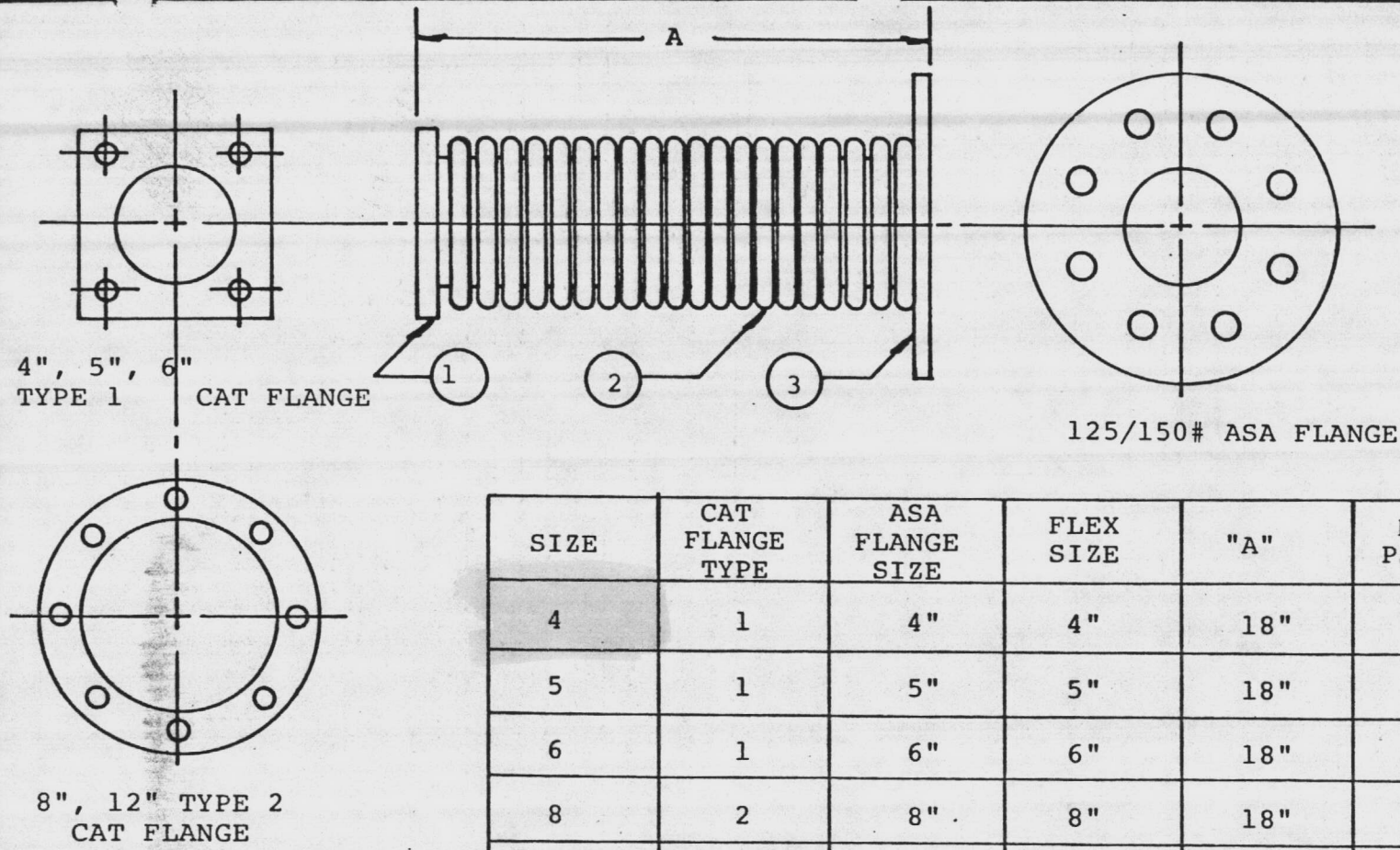
Dimensions (in inches)

SELECTION	MODEL	A	B	D	F (specify)	F(min)	F(max)	G	H	K (H-F)	Wt (lb.)	ACCESSORIES FLANGE	HARDWARE	GASKETS
	JA-4	4	14	34		6	14	10	31		70	FL-4	HW-4	GS-4
	JA-5	5	16	41		7	16	12	37		91	FL-5	HW-5	GS-5
	JA-6	6	18	47		7	19	13	43		120	FL-6	HW-6	GS-6
	JA-8	8	22	58		9	24	15	54		258	FL-8	HW-8	GS-8
	JA-10	10	26	60		11	25	17	56		347	FL-10	HW-10	GS-10
	JA-12	12	30	70		12	30	19	66		579	FL-12	HW-12	GS-12
	JA-14	14	36	80		14	33	23	75		758	FL-14	HW-14	GS-14
	JA-16	16	40	90		17	39	25	85		955	FL-16	HW-16	GS-16
	JA-18	18	45	102		19	44	27	97		1297	FL-18	HW-18	GS-18
	JA-20	20	50	110		21	47	30	105		1555	FL-20	HW-20	GS-20
	JA-22	22	54	120		22	51	33	114		1831	FL-22	HW-22	GS-22
	JA-24	24	60	132		24	57	36	126		2241	FL-24	HW-24	GS-24
	JA-26	26	64	140		26	62	38	134		2535	FL-26	HW-26	GS-26
	JA-28	28	68	155		27	70	40	149		2959	FL-28	HW-28	GS-28
	JA-30	30	72	166		29	75	42	160		3380	FL-30	HW-30	GS-30

All dimensions nominal due to construction tolerances.

SILEX™ NOISE CONTROL PRODUCTS CANADA INC.

1958 MATTAWA AVENUE
MISSISSAUGA, ONTARIO
L4X 1K1
(416) 848-5430 • TELEX: 06961343



SIZE	CAT FLANGE TYPE	ASA FLANGE SIZE	FLEX SIZE	"A"	MAX. PSIG	MAX TEMP.
4	1	4"	4"	18"	20	1500 F
5	1	5"	5"	18"	20	1500 F
6	1	6"	6"	18"	18	1500 F
8	2	8"	8"	18"	16	1500 F
12	2	12"	12"	18"	5	1500 F

1. CARBON STEEL CAT FLANGE.
2. T-321 STAINLESS STEEL CORRUGATED EXHAUST FLEX.
3. CARBON STEEL ASA FLANGE.

ALL WELDING T.I.G. (heli-arc)

REVISIONS		
NO.	DATE	BY
1		
2		
3		
4		
5		

DME, INCORPORATED
14005 MARQUARDT AVENUE SANTA FE SPRINGS, CA 90670

CATERPILLAR STAINLESS STEEL
EXHUAST FLEX ASSEMBLY

DRAWN BY DJM	SCALE NONE	MATERIAL NOTED
CHK'D	DATE 1/30/81	DRAWING NO. SK-13080
TRACED	APP'D	

LOW MAINTENANCE HIGH OUTPUT BATTERIES

- *More cold-cranking power*
- *Half the electrolyte loss*

Use this handy reference guide to help you choose the right Low Maintenance/High Output Battery, as well as Maintenance Free and Conventional Caterpillar Batteries.

CATERPILLAR

Depend on the Sure Starting-Power and Long Service Life of a Caterpillar Battery.

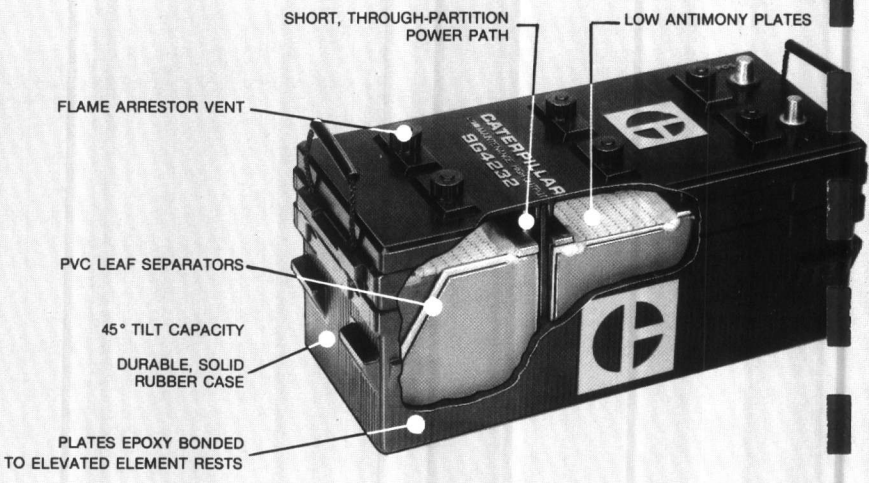
We Have One for Every Application

LOW MAINTENANCE/HIGH OUTPUT

- Extra Starting Power, Less Trouble to Maintain

Cat Low Maintenance/High Output batteries use a special alloy in their internal lead plates. It contains much less antimony than most batteries making it a better conductor of electricity. The result — more power for a superior performance. Cat Low Maintenance/High Output batteries have a higher cold cranking power for faster, more reliable severe-weather starts. They also have a longer battery life.

This special lead alloy also makes the Cat Low Maintenance/High Output more trouble-free. It results in less gassing, less terminal corrosion and less electrolyte loss. Compared with conventional-type batteries, the electrolyte level only needs to be checked half as often with the Cat Low Maintenance/High Output batteries.

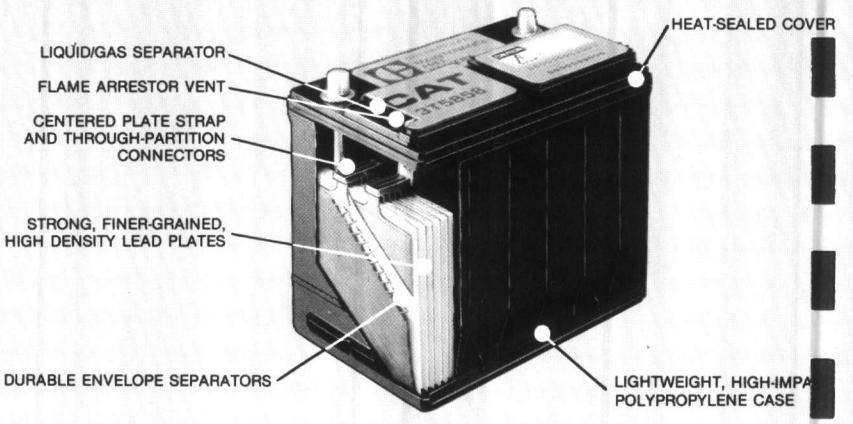


MAINTENANCE FREE

- Powerful, Tough and Trouble Free

Caterpillar's Maintenance Free batteries live up to their name. Never add water. They provide high cranking power, high reserve capacity and longer out-of-service life. They're designed with features which make them highly resistant to damage from vibration, road shock or severe temperature changes.

Cat Maintenance Free batteries fit most cars, trucks, light trucks, vans and recreational vehicles. The Original Equipment Maintenance Free battery has added durability and performance for rugged applications.

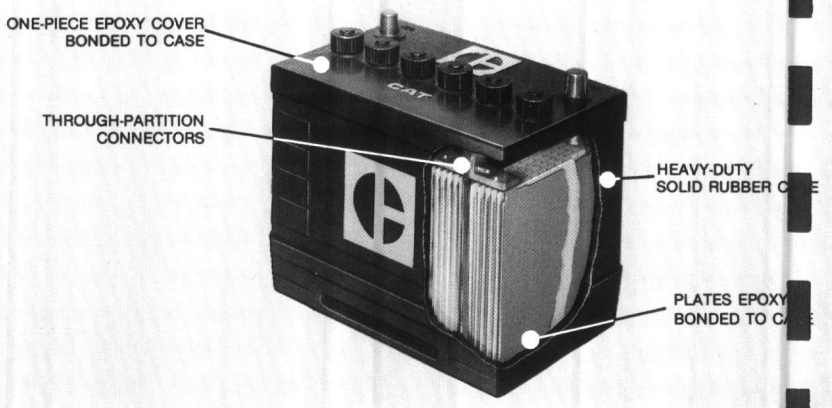


CONVENTIONAL DESIGN

- Tough, Dependable Power

Cat Conventional batteries feature unconventional power and durability. Depend on them! The through-partition connectors provide a short power path so you get consistent, reliable starting power. The battery case is one-piece solid rubber and is epoxy bonded to a one-piece cover. It is impact, vibration and corrosion resistant and is designed to prevent electrolyte spillage up to 45°.

These Cat batteries are tough. They're held to a 36 hour vibration test standard. Plates are epoxy bonded to the case to prevent separation and shorting.



Start with greater confidence.

CATERPILLAR LOW MAINTENANCE/HIGH OUTPUT BATTERY SPECIFICATIONS

Part Number	BCI Group Size	Case Type	Volts	Cold Cranking Power (CCA)	Reserve Capacity (Minutes)	Amp Hour Rating	Minimum Plates Per Cell	Overall Dimensions Inches (Millimeters) Length	Width	Height
9G4231	8D	SR	12	1,225	400	244	35	20.8 (526)	11.0 (278)	9.7 (246)
9G4232	4D	SR	12	925	290	172	25	20.8 (526)	8.7 (221)	9.7 (246)
9G4233	29H	SR	12	615	152	92	17	13.1 (333)	6.8 (173)	9.1 (232)
9G4234	24	SR	12	425	107	67	11	10.2 (259)	6.8 (173)	8.9 (226)
9G4250	2	SR	6	725	244	127	21	10.2 (259)	6.9 (176)	9.3 (237)
7T2456	4	SR	6	835	350	185	25	13.0 (330)	6.9 (176)	9.3 (237)

SR — Solid Rubber

CATERPILLAR MAINTENANCE FREE BATTERY SPECIFICATIONS

OEM										
3T5760	31	P	12	700	160	100	17	13.0 (330)	6.8 (173)	9.4 (239)
Automotive										
3T5859	22F	P	12	435	95	55	11	9.4 (241)	6.8 (173)	8.3 (212)
3T5857	24	P	12	550	135	80	12	10.3 (261)	6.8 (173)	8.8 (225)
3T5858	24F	P	12	550	135	80	12	10.3 (261)	6.8 (173)	8.8 (225)
3T5860	74*	P	12	550	135	80	12	10.3 (261)	7.0 (178)	8.4 (215)
Truck										
3T8198	31**	P	12	625	160	93	15	13.0 (330)	6.8 (173)	9.4 (239)

*Side Terminal **Threaded stud terminal P — Polypropylene

CATERPILLAR CONVENTIONAL BATTERY SPECIFICATIONS

8N0500	—	SR	8	860	315	185	29	19.0 (484)	7.3 (183)	10.3 (261)
9S4700	1	SR	6	600	200	95	17	9.1 (230)	7.0 (178)	8.7 (221)
9G9033	3D	SR	6	1,300	600	290	45	20.8 (527)	8.8 (222)	9.5 (243)
9S7120	3H	SR	6	680	245	120	21	11.8 (298)	6.9 (176)	9.1 (232)
9S7130	7D	SR	6	940	390	204	29	16.2 (411)	7.0 (178)	9.2 (234)

SR — Solid Rubber

POWERFUL BATTERIES WITH A POWERFUL WARRANTY

Effective with sales to the user on or after October 1, 1982.

Caterpillar Battery Limited Warranty

Caterpillar warrants new batteries sold by it bearing the name "Caterpillar" or "Cat" as follows:

1. To be free from defects in material and workmanship beginning with the date of delivery to the first user for one of the following periods:

Warranty Period	Use
72 months	Passenger cars and other on-highway vehicles through 680 kilogram (3/4 ton) capacity.
36 months	On-highway vehicles over 680 kilogram (3/4 ton) capacity, earthmoving and other off-highway equipment, lift trucks, electrical power generation products and marine products.
3 months	All applications without constant battery charging systems, and motive power applications.

2. Within the periods stated in Section 1, Caterpillar will replace a battery which it finds to be defective in material or workmanship with a new battery at the following cost to the user:

Period of Service	Cost
Six months or less from date of delivery.	No charge.
Longer than six months from date of delivery	$\frac{\text{Current Consumer's Battery Price} \times \text{Months of Service}}{\text{Months in warranty period}} = \text{User Cost}$

3. This warranty will be honored upon return of battery to a Caterpillar dealer or other establishment authorized by Caterpillar during normal working hours.

4. Taxes, installation or transportation costs which may result from replacement are not included in this warranty.

5. This warranty is expressly in lieu of any other warranties, express, or implied, including any warranty of merchantability or fitness for a particular purpose. Remedies under this warranty are limited to the provision of materials as specified herein. Caterpillar is not responsible for incidental or consequential damages.

5A. **BATTERIES SOLD FOR PERSONAL USE IN THE USA**

In the case of batteries sold for personal, family or household use in the United States of America, its territories and possessions, this section shall be substituted for Section 5.

This warranty is in lieu of any other express warranty. No implied warranties including any warranty of merchantability or fitness for a particular purpose shall be applicable after expiration of this Caterpillar limited warranty. Remedies under this warranty are limited to the provision of material as specified herein. Caterpillar is not responsible for incidental or consequential damages. Some states do not allow limitations on how long an implied warranty may last or allow the exclusion or limitation of incidental or consequential damages. Therefore, the above exclusion or limitation may not apply to you.

This warranty gives you specific legal rights. You may also have other rights which vary from state to state.

To find the location of the closest Caterpillar dealer or other establishment authorized by Caterpillar, call toll free (800) 447-4986 except in Illinois call (309) 673-3252.

6. Questions concerning this warranty or its application should be addressed to:

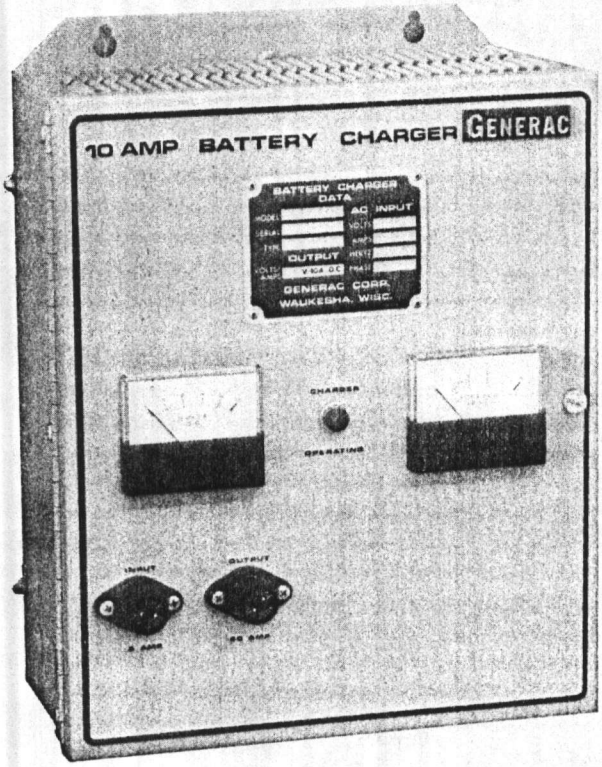
IN U.S.A.	OUTSIDE U.S.A.
Manager Service Operations Division USCD Service Caterpillar Tractor Co. 100 N.E. Adams Street Peoria, IL 61629 (309) 675-5002	CONTACT YOUR CATERPILLAR DEALER

As used in this warranty the term "Caterpillar" means Caterpillar Tractor Co. or one of its subsidiaries whichever last sold the product involved.

DUAL RATE BATTERY CHARGER

Model

12AF - 12 VOLT CHARGER WITH AUTOMATIC FLOAT
12MF - 12 VOLT CHARGER WITH MANUAL FLOAT
24AF - 24 VOLT CHARGER WITH AUTOMATIC FLOAT
24MF - 24 VOLT CHARGER WITH MANUAL FLOAT



- 12 VOLT - 10 AMP
- 24 VOLT - 10 AMP
- CONSTANT VOLTAGE
- FULLY AUTOMATIC

"SCR" CONTROLLED

(Optional Accessories)

- ✓ EQUALIZE TIME CHARGER
- ✓ AC CIRCUIT BREAKER
- ✓ AC POWER FAIL RELAY
- ✓ BATTERY VOLTAGE ALARM RELAY

GENERAC'S 12 and 24 volt Battery Charge Systems with Automatic Float and Equalizer control, use an "SCR", (Silicone Controlled Rectifier), to maintain the proper charge voltage. The 120 volt, 60 Hz, line voltage is bridge rectifier system, utilizing Silicone Rectifiers. The Battery level is monitored and the charge rate is controlled by an "SCR".

MODELS 12AF & 24AF - AUTOMATIC FLOAT WITH AUTOMATIC EQUALIZER:
A control circuit on the printed circuit board monitors and limits the charge current to 10 Amps. The output voltage is determined by the charge current rate. When the charge current exceeds approximately 8 Amps, the charger automatically switches into "equalize" mode of operation. When the charge rate drops below 7 Amps, the charger switches back to "float" mode of operation. The battery charge voltage is 2.17 Volts per cell (in automatic float position), or 13 volts on a 12 volt battery and 26 volts on a 24 volt battery. (2.33 V/Cell - Equalize)

MODELS 12MF & 24MF - AUTOMATIC FLOAT WITH SELECTABLE EQUALIZE:
The manual version of GENERAC'S battery charge system, maintains the battery at 13 or 14 volts, depending upon whether the switch, or timer, is set on "Float" or "Equalize". This voltage will be maintained up to the maximum current output.

MORE STANDARD FEATURES

ALL MODELS HAVE PANEL MOUNTED 0-15 AMP DC AMMETER
12 VOLT MODELS HAVE PANEL MOUNTED 0-15 VOLT DC VOLTMETER
24 VOLT MODELS HAVE PANEL MOUNTED 0-30 VOLT DC VOLTMETER
ALL MODELS HAVE FUSED - INPUT / OUTPUT CIRCUITS
ALL MODELS INCORPORATE AN AUTOMATIC CURRENT LIMITER DESIGN
ALL MODELS - IMPROVED REGULATION DUE TO REMOTE SENSING CIRCUIT

(See reverse side for specifications)

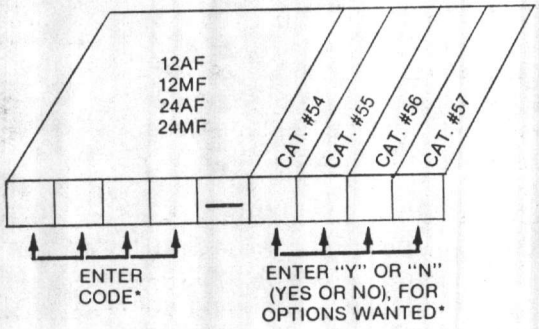
GENERAC

SPECIFICATIONS

Description	MODEL			
	12 AF	12 MF	24 AF	24 MF
Nominal Output Voltage	12V	12V	24V	24V
Adjustable Float Voltage	12.8 to 14.5 V.		25.6 to 29.0 V.	
Adjustable Equalized Voltage	Float V. to 14.5 V.		Float V. to 29.0 V.	
Recommended Float Voltage: Nickel-Cadmium batteries Lead-Acid batteries	 14 V. 10 Cell 13 V.		 28 V. 20 Cell 26 V.	
Voltage Regulation ±5%, 60 Hz, and ±10% Line Voltage	±2%		±2%	
Ampere Taper - Max. to Min.	10 Amp. to 0 Amp.		10 Amp. to 0 Amp.	
Manual Set Equalizer Timer	0 to 24 Hrs.		0 to 24 Hrs.	
Input Voltage	120 Volts		120 Volts	
Net Weight	21 Lb.		24 Lb.	
Dimensions Depth Width Height	 5½" 11½" 15½"		 7" 11½" 17½"	
Ambient Temperature	– 40F to 140F (– 40C to 60C)		– 40F to 140F (– 40C to 60C)	

HOW TO ORDER:

To order fill in each block of the following chart:



*(Note: Each block must have an entry).

CATEGORIES	CODE	DESCRIPTION
50	12AF	12 Volt Charger W/Automatic Float
51	12MF	12 Volt Charger W/Manual Float
52	24AF	24 Volt Charger W/Automatic Float
53	24MF	24 Volt Charger W/Manual Float
	OPTIONS	
54		Equalize Charge Timer (Used with 12MF or 24MF only)
55		AC Circuit Breaker
56		AC Power Fail Relay
57		Battery Voltage Monitor

GENERAC

Improving power by design

Generac Corporation P.O. Box 8, Waukesha, WI 53187
Phone (414) 544-4811 Telex 26-9687
Fax Group 2/3
(414) 968-2106 (414) 968-2306

Printed in U.S.A.

SB 3-510 — Jan., 83

NEW Vertical Mount

SINGLE PHASE-GENERAL PURPOSE assembled with thermostat

DRY LOCATIONS

Ambient Above -20° F	Ambient Below -20° F	✱ Kim Hotstart Model Number	Volts	Ph. Ø	Watts	Amps	Fig. No.
175 Cubic Inch or Less	100 Cubic Inch Or Less	WJSP110V/KSP____	120	1	500	4.2	1
		WJSP220V/KSP____	240	1	500	2.1	1
175-250 Cubic Inch	100-150 Cubic Inch	JRSP110V/KSP____	120	1	750	6.3	1
		JRSP220V/KSP____	240	1	750	3.1	1
250-350 Cubic Inch	150-200 Cubic Inch	ASP110V/KSP____	120	1	1000	8.4	1
		ASP220V/KSP____	240	1	1000	4.2	1
350-500 Cubic Inch	200-300 Cubic Inch	LBSP110V/KSP____	120	1	1500	12.5	2
		LBSP208V/KSP____	208	1	1500	7.2	2
		LBSP220V/KSP____	240	1	1500	6.3	2
		LBSP277V/KSP____	277	1	1500	5.4	2
		LBSP440V/KSP____	480	1	1500	3.2	4
500-600 Cubic Inch	300-400 Cubic Inch	MBSP110V/KSP____	120	1	2000	16.7	2
		MBSP208V/KSP____	208	1	2000	9.6	2
		MBSP220V/KSP____	240	1	2000	8.3	2
		MBSP277V/KSP____	277	1	2000	7.2	2
		MBSP440V/KSP____	480	1	2000	4.2	4
600-800 Cubic Inch	400-500 Cubic Inch	BCSP110V/KSP____	120	1	2500	20.8	2
		BCSP208V/KSP____	208	1	2500	12.0	2
		BCSP220V/KSP____	240	1	2500	10.4	2
		BCSP277V/KSP____	277	1	2500	9.0	2
		BCSP440V/KSP____	480	1	2500	5.2	4
800-1000 Cubic Inch	500-600 Cubic Inch	DSP110V/KSP____	120	1	3000	25.0	3
		DSP208V/KSP____	208	1	3000	14.4	3
		DSP220V/KSP____	240	1	3000	12.5	3
		DSP277V/KSP____	277	1	3000	9.0	3
		DSP440V/KSP____	480	1	3000	6.3	4
1000-1350 Cubic Inch	600-800 Cubic Inch	ESP208V/KSP____	208	1	4000	19.2	3
		ESP220V/KSP____	240	1	4000	16.7	3
		ESP277V/KSP____	277	1	4000	14.4	3
		ESP440V/KSP____	480	1	4000	8.3	4
1000-1350 Cubic Inch	600-800 Cubic Inch	1PSP44120V/KSP____	120V Only	1	4400	18.3 (2CIR) 36.7 (1CIR)	4
1350-1650 Cubic Inch	800-1000 Cubic Inch	1PSP50208V/KSP____	208	1	5000	24.0	4
		1PSP50V/KSP____	240	1	5000	20.8	4
		1PSP50277V/KSP____	277	1	5000	18.1	4
		1PSP5044V/KSP____	480	1	5000	10.4	4

ENGINE DISPLACEMENT (C.I.D.)

FIGURE 1

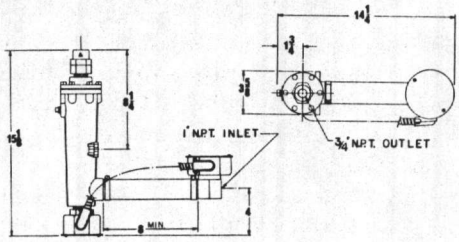


FIGURE 2

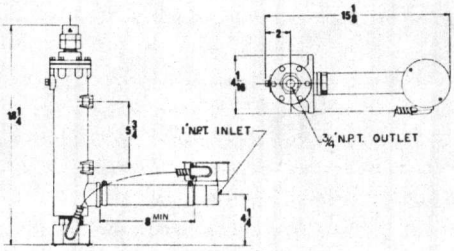


FIGURE 3

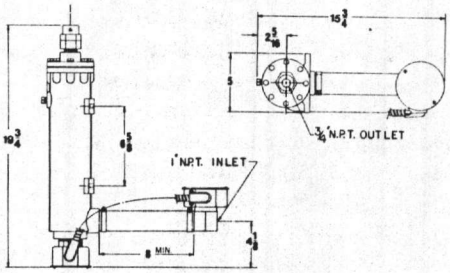
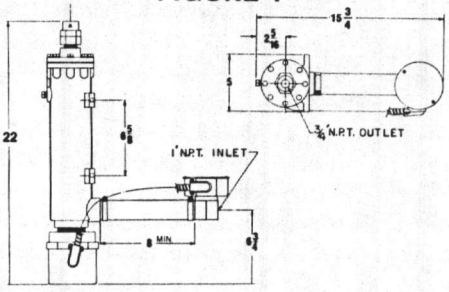
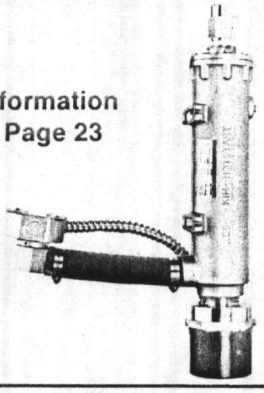


FIGURE 4



For Technical Information and Options see Page 23



New Vertical Mount Design Features Thermal Pumping Action

Forced thermal pumping action makes this heater ideal for installations where engine openings are difficult to reach or space for horizontal mounting is not available.

Valve mounted on discharge side of heater insures proper circulation, and will not be affected by sediment build up.

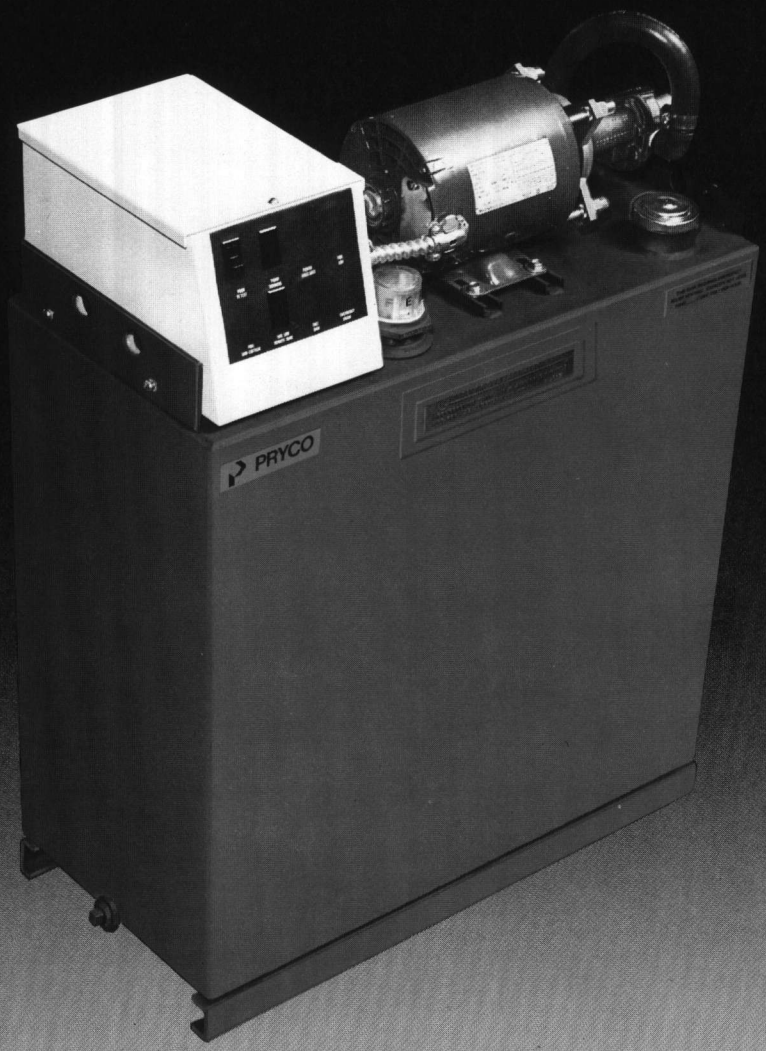
Easily replaces existing vertical mount heaters.

THERMOSTATS

✱ **NOTE:** Add desired temperature range to complete model number.
Example: WJSP110V/KSP**1012**.

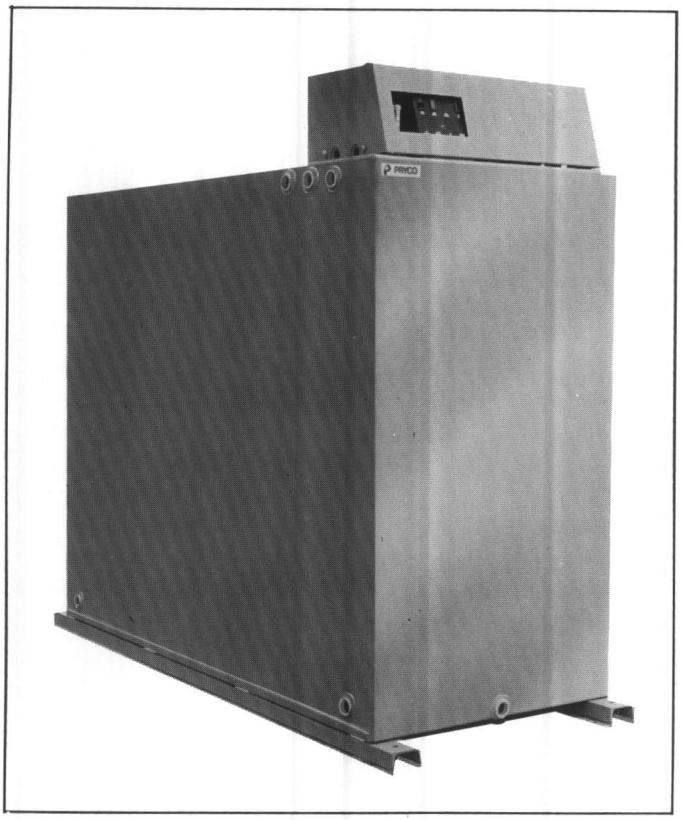
TEMP. RANGE	ON	OFF
68	60° F	80° F
810	80° F	100° F
1012	100° F	120° F
1214	120° F	140° F
1416	140° F	160° F
1618	160° F	180° F

PRYCO
DAY TANKS



A dependable day tank can be the key to the reliability of any emergency generating system. Pryco day tanks are designed and built to help insure that dependability. Carefully tested heavy duty components are used throughout. High quality control standards assure consistently fine workmanship.

A wide range of standard sizes is available for immediate shipment. Custom tanks, options, and accessories can be manufactured to your specifications.



STANDARD DAY TANKS

Heavy gauge steel, removable inspection plate 6" square gasketed, fuel level gauge, "press to test" switch, heavy duty float switch, "pump-running" indicator light, tank drain 4-1" NPT threaded pipe connections, 1-1 1/4" NPT threaded pipe connection for vent, plus fuel inlet, heavy duty 1/3HP, 115VAC, 1 phase, 60Hz motor w/2GPM bronze gear pump w/stainless steel shafts, removable top cover, tanks interior-epoxy coated, exterior-painted Medium Gray or color choice, all plumbing and wiring pre-connected.

HEIGHT INCLUDES 8" COVER AND 1 1/2" OR 3" LEG.

			WIDTH		DEPTH		HEIGHT			
MODEL	GAL.	LIT.	IN	CM	IN	CM	IN	CM	LBS.	KG.
PY5	5	19	24	61	6½	16	22	56	60	27
PY10	10	38	24	61	12	30	22	56	85	39
PY15	15	57	24	61	12	30	28	71	95	41
PY25	25	95	24	61	12	30	33	84	105	48
PY50	50	189	24	61	18	46	42	107	160	73
PY75	75	284	24	61	18	46	55	140	190	86
PY100	100	379	24	61	24	61	55	140	210	95
PY150	150	570	24	61	36	91	55	140	370	168
PY200	200	760	24	61	48	122	58	147	450	204
PY275	275	1041	27	68	66	168	58	147	500	227
PY300	300	1135	27	68	70	178	58	147	525	238
PY400	400	1514	34	86	72	183	58	147	570	258
PY500	500	1893	42	106	72	183	58	147	593	267

UL LISTED TANKS

Heavy gauge steel, removable gasketed inspection plate 6" square, fuel level gauge, "press to test" switch, heavy duty float switch, "pump running" indicator light, tank drain, heavy duty 1/3HP, 115VAC, 1 phase, 60Hz motor w/2GPM bronze gear pump w/stainless steel shafts, removable top cover, 4-1" NPT threaded pipe connections and fuel inlet plus required vent opening (PY10-PY50 2", PY75-PY150 3", PY275 4"), interior-epoxy coated, exterior-Medium Gray or color choice, all plumbing and wiring pre-connected, UL Listed Label.

MODEL NUMBER	CAPACITY IN GAL	VENT OPENING
PY10UL	10	2"
PY25UL	25	2"
PY50UL	50	2"
PY75UL	75	3"
PY100UL	100	3"
PY150UL	150	3"
PY275UL	275	4"

MANUAL TANKS

Heavy gauge steel, 6" sq. removable gasketed inspection plate, fuel level gauge, 4 - 1" NPT threaded pipe connections, 1 - 1 1/4" NPT threaded pipe connection for vent, plus fuel inlet manual fill cap, exterior primer painted, interior epoxy coated. Dimensions same as standard day tanks.

SIZES	SIZES
PY10M	PY300M
PY15M	PY400M
PY25M	PY500M
PY50M	PY600M
PY75M	PY700M
PY100M	PY800M
PY150M	PY900M
PY200M	PY1000M
PY275M	

Add $25.00 for exterior paint, your choice of color. Net

Add $45.00 for float valve. Net

L.A. TANKS

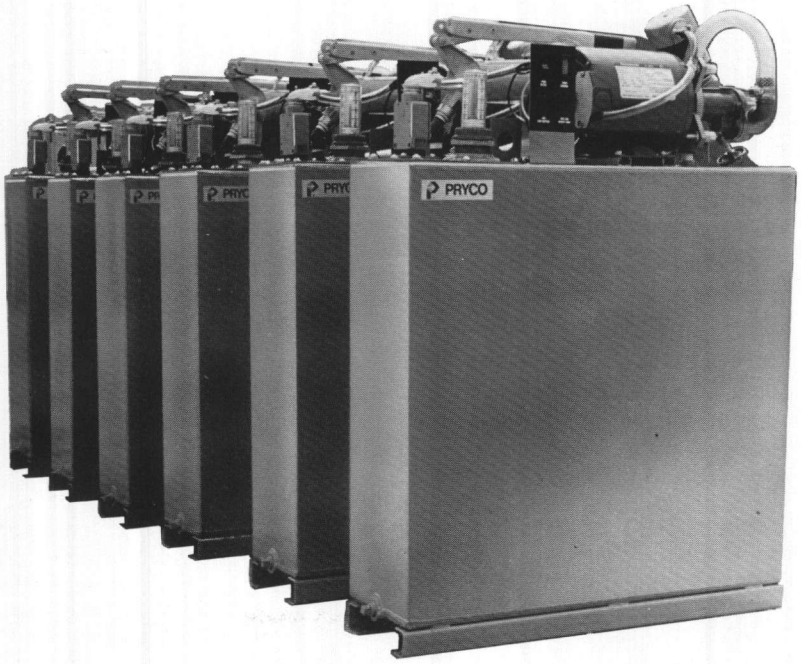
L.A.F.D. permit label on standard day tank add on all the required components.

OPT#	DESCRIPTION
205	low fuel level switch
209	high fuel level switch
300	2" manual fill cap
315	fuel strainer
340	drain-petcock valve
360	solenoid valve
375	foot valve
461	hand pump
464	engine connection pipe stems (set of two)

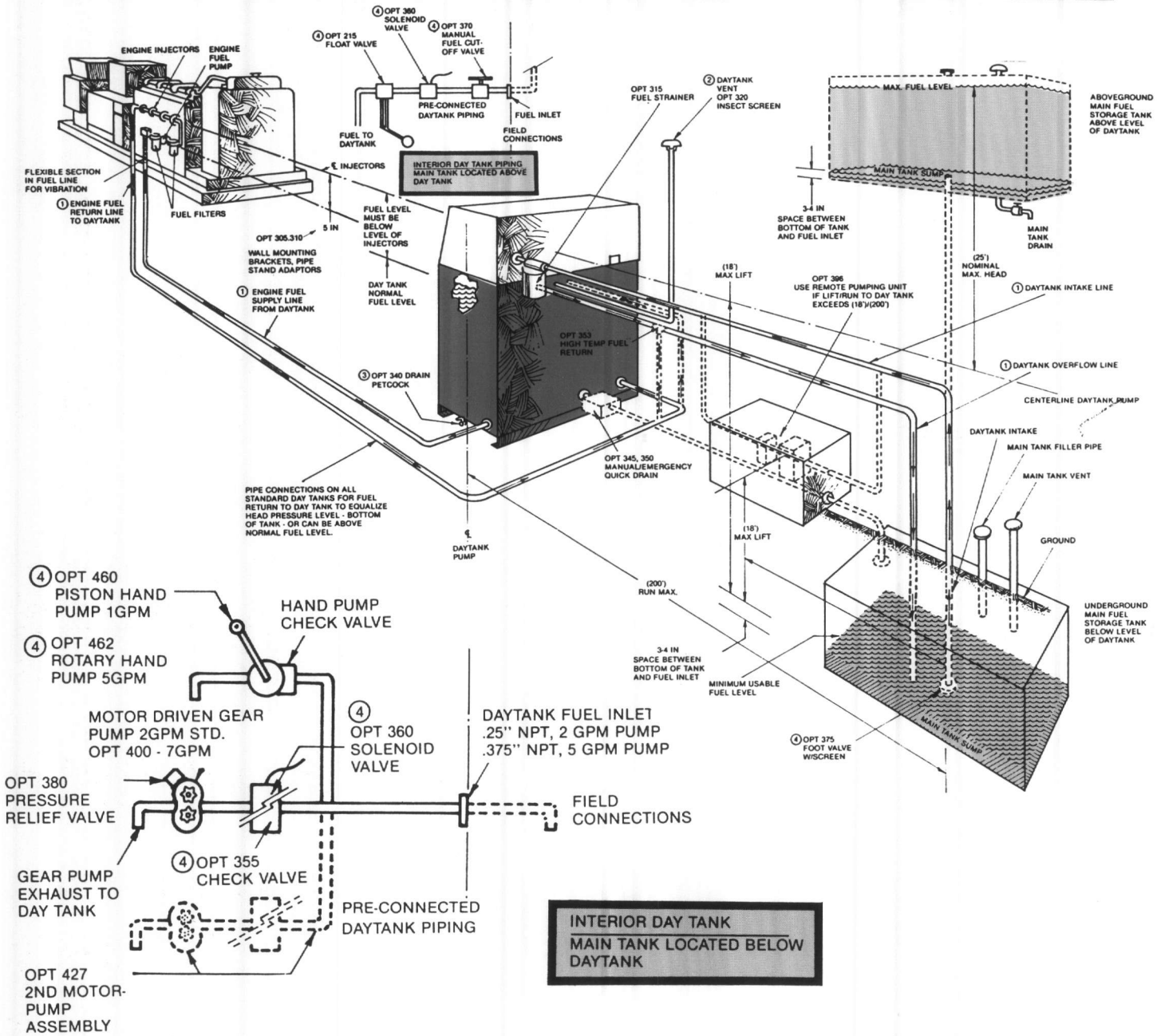
TRIM TANKS

Where space is limited, heavy gauge steel, 6" sq. removable gasketed inspection plate, fuel level gauge, 4 - 1" NPT threaded pipe connections, 1 - 1/4" NPT threaded pipe connection for vent, plus fuel inlet, interior epoxy coated, exterior color choice, 1 1/2" leg and pump/motor dimensions included in height.

MODEL	CAPACITY IN GALS	WIDTH INCHES	DEPTH INCHES	HEIGHT INCHES
PY10T	10	24"	6½"	26"
PY25T	25	36"	8"	34"
PY50T	50	36"	8"	52"
PY75T	75	36"	8"	67"



Day Tank Fuel Supply System



Fuel Supply System Specifications

1. Black iron pipe should be used for all fuel piping. (Brass, copper, or galvanized pipe can eventually lead to fuel decomposition.) Follow engine manufacturer's recommendations for pipe size and lift per run to the main tank and engine. Overflow line should be same size or larger than day tank supply line.

2. The day tank vent pipe should be at least five feet higher than other system pipe. The vent should be located outside and protected from water, debris and insects.

3. Water and sediment should be drained from the day tank sump at least once a year — more often if necessary.

4. Required option.
If the main tank is located above the day tank either a 360 solenoid valve or a 215 float valve must be used.

5. Recommended options.
a. If the main tank is located underground, one of the following valves is recommended to maintain day pump prime: 355 check valve on pump intake; 360 solenoid valve on pump intake; 375 foot valve.

b. If the main tank is located above the day tank a 370 manual fuel cutoff valve will facilitate day tank isolation: for periodic service, draining, valve failure, etc.

c. One of the following hand pumps is recommended as a backup: 460 IGPM piston hand pump; 462 5GPM rotary hand pump.

ACCESSORIES

ADD TO STANDARD DAY TANK PRICES

Effective September 1, 1986

ELECTRONIC SPECIFICATIONS

200 Pilot light, green, indicates power available.

201 Pilot light, red, to indicate low fuel level in the remote main storage tank. Others to supply signal, specify voltage.

202 Pump Run-Off Automatic. Three position selector switch. Replaces Press-To-Test Switch. Includes option 200.

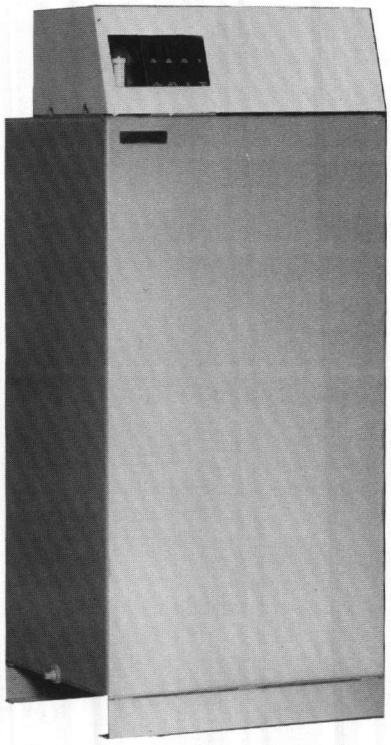
203 Low fuel level alarm. Separate float switch activates red light on control panel. Specify AC or DC voltage.

204 Terminals, socket, relay and wiring for remote signal of option 203 (10 amp relay).

205 Low fuel level switch. Separate float switch for remote annunciator only (10 watts).

206 Critical low fuel alarm-engine shut down. Separate float switch activates red light on control panel, provides signal for remote annunciator. Prevents loss of engine fuel prime. Operates from engine starting battery. Specify voltage and engine type.

75 GAL. STANDARD TANK



207 High fuel level alarm. Separate float switch activates red light on control panel. Specify AC or DC voltage.

208 Terminals, socket, relay and wiring for remote signal of option 207 (10 amp relay).

209 High fuel level switch. Separate float switch for remote annunciator only.

210 High/Low combination fuel level alarm. Separate dual float switch, activates red lights on control panel. Specify AC or DC voltage.

211 Terminals, socket, relay and wiring for remote signal of option 210 (10 amp relay).

212 High/Low combination fuel level switch. Separate dual float switch for remote annunciator only (10 watts).

213 Critical high level pump-motor shut down. Shut down of pump-motor on day tank, activates red light on day tank control panel, coil on relay for remote annunciator and closes normally open solenoid valve.

214 Explosion-proof float switch. Replaces basic float switch.

215 Float valve, replaces basic float switch.

216 Circuit breaker mounted on day tank.
DC motors
Single phase AC motors
Three phase AC motors

217 Standard float switch.

218 Double throw, double pole float switch.

219 Heater and thermostat — 300 watt, 2.5 amps available.
Large heat panels and thermo wrap.
Consult factory for sizing and pricing.

220 Variable float switch Multi-Station

221 Explosion proof low level switch

222 Explosion proof high level switch

223 Alarm horn — small — specify AC or DC.

224 Alarm horn — large — specify AC or DC.

DELETIONS

Standard pump and motor
Standard float switch

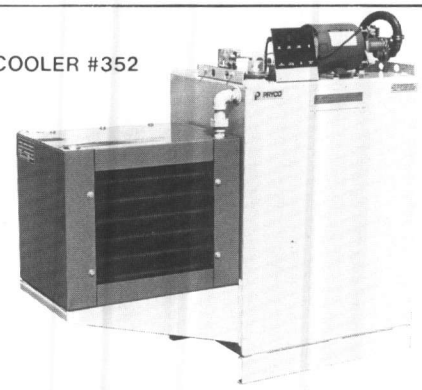
MECHANICAL SPECIFICATIONS

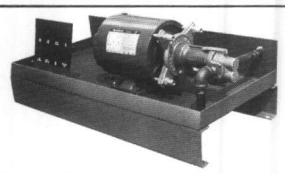
Effective September 1, 1986

ADD TO STANDARD DAY TANK PRICES

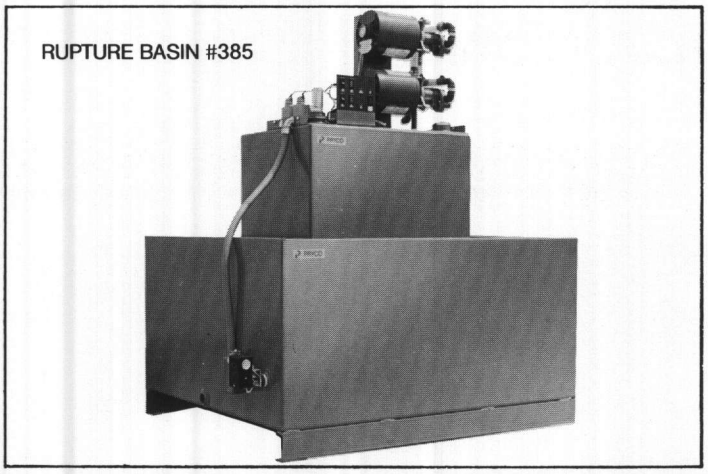
300 Manual fuel fill cap, 2" diameter.
301 Manual fuel fill locking cap, 2" diameter.
302 Manual fuel fill-threaded, 2" diameter.
305 Wall mounting brackets. 10 and 25 gallon tanks.
310 Pipe stand, adapter only PY10, PY25.
PY50, PY75, PY100.
PY150, PY275.
315 Fuel strainer (ship loose)
316 Replacement filter and gasket for option 315.
320 Vent cap. 1 1/4" NPT, for outdoor vent, screened plus shed water.
325 Sight glass (plastic) with valve at lower end, includes guard.
326 Sight glass (glass) w/2 hand valves and guard.
330 Extra 1" NPT pipe connections on tank.
331 Extra 1 1/4" to 2 1/2" NPT pipe connections.
334 Standard cover
335 Weatherproof cover
336 8" cover for trim tank
337 Double pump-motor cover
340 Drain, petcock valve replaces threaded plug in bottom of tank.
345 Drain, nominal 10 gallons per minute. Manual valve to gravity drain tank to main tank using existing plumbing.
350 Drain, emergency, for remote actuation. Nominal 10 gallons per minute. Signaled valve gravity drains day tank to main tank using existing plumbing. Indicator light on tank illuminates and pump-motor disconnect.
352 Oil cooler-mounted on day tank for cooling return hot fuel from engine. Consult factory for sizing and pricing.
353 High temperature fuel return, piping installed on day tank to send warm return fuel from the engine back to the main fuel storage tank.
354 High temperature return thermostatic valve. Specify temperature setting - 1" NPT
355 Check valve. Installed on pump intake to prevent loss of pump prime.
360 Solenoid valve, AC systems. Installed on pump intake to prevent loss of pump prime or tank flooding.
For standard 2GPM pump and
For optional 7GPM pump
365 Solenoid valve, DC systems. Same as option 360.
For standard 2GPM pump and
For optional 7GPM pump
366 Solenoid valve, AC or DC systems, with manual override.
370 Cut off valve, manual, mounted on fuel inlet for gravity fed day tanks.
371 Flow meter to meter fuel from main storage tank to day tank.
372 Flow switch to detect "no fuel" in fuel line and sound alarm - 10 watts.
375 Foot valve, to prevent loss of pump prime. (1"NPT)
380 Pressure relief valve for any motor driven pump.
381 Flame arrestor
385 Rupture basin. Open top, 150% capacity of tank specified.
PY10
PY25
PY50
PY75
PY100
PY150
PY275
390 Rupture basin float switch, stops day tank pump-motor.
395 Terminal, socket, relay and wiring for remote signal of option 390.
396 Remote pumping enclosure - for remounting of standard pump-motor from day tank.
a. single unit
b. duplex pump-motor unit
397 Remote pumping unit
a. single unit, includes 1/3HP, 115VAC, 1 phase, 60 Hz motor, 2GPM pump and required optional equipment installed in NEMA 3R enclosure for mounting remote from day tank.
b. duplex unit - same as option 397a, with dual pump-motor.
398 Remote reading level gauge
399 Piping for reversal flow from day tank back to main storage tank.

HOT OIL COOLER #352





REMOTE PUMPING UNIT #397


RUPTURE BASIN #385

PUMPS AND MOTORS

ADD TO STANDARD DAY TANK PRICES

400 7GPM highlift pump. Requires 1/2 HP motor (options 440-448). Replaces standard 2GPM pump.

401 4GPM pump. Requires 1/3 HP motor. Replaces standard 2GPM pump

402 Standard 2GPM pump

403 10GPM pump. Requires 3/4HP motor. Replaces standard 2GPM pump

404 23GPM pump. Requires 1HP motor. Replaces standard 2GPM pump

410 1/4HP, 12VDC motor

411 1/4HP, 24-28VDC motor

414 1/3HP, 115VAC, single phase, 60Hz motor

424 1/3HP, 115VAC, single phase, 60Hz motor totally enclosed, fan cooled

425 1/3HP, 115VAC, single phase, 60Hz explosion proof motor

426 1/3HP, 115VAC, single phase, 50Hz motor

427 Second Standard motor-pump assembly: 1/3HP, 115VAC, single phase, 60Hz, 2GPM pump, includes second float switch. First motor-pump operates at 86% of usable fuel capacity, second motor-pump operates at 82% of usable fuel capacity. Both motor-pumps turn off at 100% capacity.

a Automatic transfer switch to automatically alternate each motor-pump into the lead starting position. "Pump run-off-automatic" operates mode selector switch. "Pump Running" amber light for each motor-pump.

b Manual transfer switch to alternate each motor-pump into lead starting position. Running time meter for each motor-pump.

428 1/3HP, 230VAC, single phase, 60Hz motor

429 1/3HP, 230VAC, single phase, 50Hz motor

433 1/3HP, 230-460VAC, three phase, 60Hz motor w/motor starter and control transformer and three heaters

434 3/4HP, 115VAC, 1 phase, 60Hz-explosion proof motor.

435 3/4HP, 230/460VAC, 3 phase, 60Hz-explosion proof motor w/motor starter, 130 watt control transformer and heaters.

436 1HP, 115VAC, 1 phase, 60Hz-explosion proof motor.

437 1HP, 230/460VAC, 3 phase, 60Hz-explosion proof motor w/motor starter, 130 watt control transformers and heaters.

440 1/2HP, 12VDC motor

441 1/2HP, 24-28VDC motor

442 Motor starter, 130 watt control transformer and heater.

444 1/2HP, 115VAC, single phase, 60Hz, motor

445 1/2HP, 115VAC, single phase 60Hz motor, totally enclosed, fan cooled

446 1/2HP, 115VAC, single phase 60Hz explosion proof motor

447 1/2HP, 115VAC, single phase, 50Hz motor

448 1/2HP, 230VAC, single phase, 60Hz motor

449 1/2HP, 230VAC, single phase, 50Hz motor

451 1/2HP, 230VAC, three phase, 60Hz motor, totally enclosed, fan cooled w/motor starter and 130 watts control transformer and three heaters

452 1/2HP, 460VAC, three phase, 60Hz motor w/motor starter and 130 watts control transformer and three heaters

454 1/2HP, 230VAC, three phase, 60Hz motor w/motor starter, 130 watts control transformer, and three heaters

455 3/4HP, 115VAC, 1 phase, 60Hz motor

456 3/4HP, 230/460VAC, 3 phase, 60Hz motor w/motor starter, 130 watt control transformer and heaters.

457 1HP, 115VAC, 1 phase, 60Hz motor

458 1HP, 230/460VAC, 3 phase, 60Hz motor w/motor starter, 130 watt control transformer and heaters.

460 Auxiliary hand-pump, piston type, 1GPM, self primes to 20' of lift. Hand-pump check valve and motor-pump check valve included.

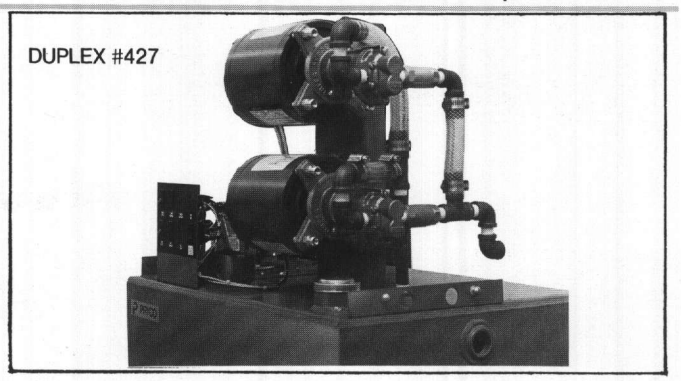
461 Auxiliary hand-pump, piston type, 20 gallons per 100 strokes, self primes to 20' of lift. Hand-pump check valve and motor pump check valve included.

462 Rotary hand-pump, includes hand-pump check valve and motor-pump check valve.

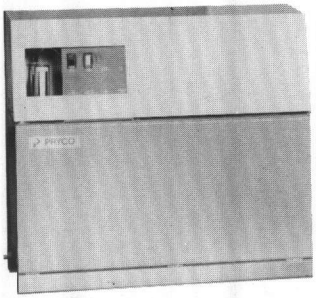
463 Standard pump and motor, purchased separately.

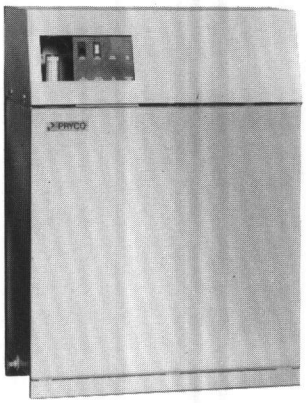
464 Pipe stem (set of 2) engine suction and return lines

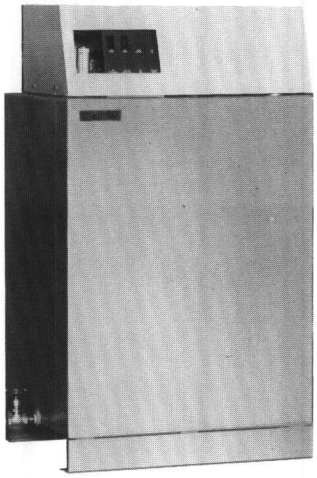
465 UL listed enclosed industrial control panel

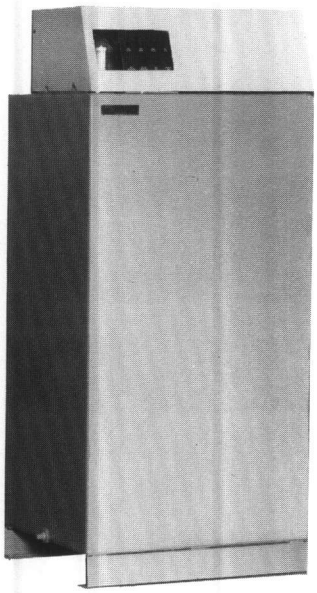

DUPLEX #427

Effective September 1, 1986









BATTERY BOX

SIZES:

12" W x 23" L x 12" H (1-4D or 1-8D)
12" W x 44" L x 12" H (2-4D or 8D)
Hinged, lockable, weatherproof enclosure with handle.
Heat panel
Heat panel with thermostat

BATTERY FRAMES

SIZES:

6½" x 13½" (2-6V-105A)
9½" x 29" (4-6V-105A)
7½" x 14" (1-12V-60A)
9½" x 14" (1-12V-90A)
12" x 44" x ¼" (2-12V) Group 8D (24V-204A)
1/8" x 1 1/2" x 1 1/2" or 2" angle iron
All frames are 4" high
Painted flat black or your choice of color.

WARRANTY PRYCO, INC.

All sales by PRYCO, INC., are subject to the following terms and conditions as its Warranties:

PRYCO, INC., warrants that its products shall be as represented in its catalog and warrants its products against defects in workmanship and materials under normal use and conformance with manufacturer's instructions for installation and use for a period of one year from date of sale determined by invoice date and which PRYCO's examination shall disclose to its satisfaction to be thus defective. This remedy is agreed by Buyer and PRYCO to constitute a sole and exclusive remedy and all sales are made subject to the condition that PRYCO is not liable for consequential damages or for personal injuries of its customers or others.

Pryco will not warrant installation of day tank. Alteration of design or repairs without written authorization will void warranty.

During such period PRYCO will repair or replace at its option such defective parts without charge to buyers provided buyer pays shipping charges for return of such products to PRYCO. Electrical parts are warranted only to the extent of the warranty provided by their respective manufacturers of such parts.

THIS WARRANTY IS EXPRESSLY IN LIEU OF ALL OTHER WARRANTIES, EXPRESS OR IMPLIED, INCLUDING THE WARRANTY OF MERCHANTABILITY, FITNESS OR PRODUCTIVENESS. THIS WARRANTY SHALL NOT APPLY TO ANY PRYCO PRODUCT OR ANY PART THEREOF WHICH HAS BEEN THE SUBJECT OF ACCIDENT, NEGLIGENCE, ABUSE OR MISUSE. PRYCO MAKES NO WARRANTY IN RESPECT TO ACCESSORIES OR PARTS NOT SUPPLIED BY PRYCO. THERE ARE NO OTHER WARRANTIES WHICH EXTEND BEYOND THE DESCRIPTION ON THE FACE HEREOF.

PRYCO, INC.

P.O. BOX 108
MECHANICSBURG, IL 62545
AREA CODE 217-364-4467
TELEX No. - 881013
FACSIMILE #217-364-4494

CAPITOL MACHINERY CO.
PACKAGING DIVISION
P.O. Box 689 • Peoria, Illinois 61652 • FAC 309/682-3537 • Phone 309/682-5481

WEATHERPROOF ENCLOSURE SPECIFICATIONS

58"W x 105"L

Weatherproof Enclosure

Weatherproof enclosure shall be designed to provide maximum weather protection against driving rain, snow or other weather elements. The formed steel enclosure shall be of modular design, constructed of not less than 14 gauge material and must provide full access for operation and servicing. Layout of the enclosure shall permit all operation and servicing from outside of the enclosure unless designated as a walkaround enclosure. Manufactured by Capitol Machinery Company of Peoria, Illinois, exterior shall be free of exposed bolts or fasteners except for the anchoring frame. Use of neoprene or other gasket material for weather sealing bolts is not acceptable as deterioration may result in leaks or loose bolts. Side panels and doors shall not exceed 36" wide. Panels shall be bolted with .375" diameter bolts and locking whiz nuts. Doors shall be bolted with .25" diameter truss head bolts, flats, locks and nuts. All hardware shall be cadium plated. Full height, full width, fixed blade louvers are permissible if provided with adequate vane stiffners. Radiator core shall be protected by an expanded metal screen. Roof shall have a minimum 2° pitch from the center to inhibit moisture collection. Actual open air intake surface shall allow combustion and cooling air to enter the enclosure at not greater than 1,000 fpm face velocity across louver vane. Static pressure drop over entire system must not exceed 0.5" H20. Perimeter angle anchoring frame shall be of minimum 11 guage steel and bolted to enclosure for ease of enclosure removal as a complete unit.

Roof

The roof shall be of one piece welded construction supported with 4 inch wide formed channels the full width of enclosure and conform to the roof line. The design shall incorporate a perimeter drip edge of not less than 1½ inches. Multi-piece or bolted section with center cap designs are not acceptable.

Doors

Doors must be located as to provide complete access for operation and maintenance of unit. Two integral 4 inch wide stiffners shall be included. All T-type handles must be cadium plated, flush mounted, adjustable, matched key locking and fastened with stainless steel rivets. Single doors 60" high and smaller shall utilize a single point spring loaded handle. Double wide and single doors over 60" high shall utilize a two point rod latch. Hinges must be welded to door assembly and bolt to enclosure with minimum ¼" truss head bolts with flats, locks and nuts. Hinge shall be continuous piano type with a .25" stainless steel pin.

Paint

All metal surfaces must be phosphate treatment cleaned prior to the application of two coats of rust inhibitive enamel primer. After assembly, any defects must be spot primed. Two coats of alkyd enamel finish paint shall be applied in a temperature controlled environment at 70°F minimum to assure proper adhesion and drying. Lastly, all panel joints and door jams must clear silicone caulked to prevent moisture seepage to enclosure interior.

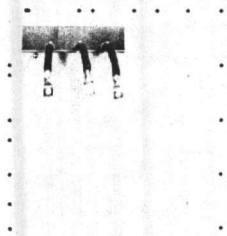
Drains/Fumes Disposal

The enclosure or engine manufacturer must provide oil and water drains. High quality, bronze body, ball valves shall be installed on the engine and extended to the enclosure edge with high quality hose. Engines equipped with fumes disposal tubes must be extended to the enclosure exterior at radiator end.

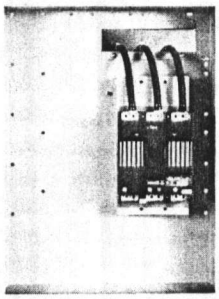
REDCO BREAKER BOX ASSEMBLIES FOR CATERPILLAR GENERATORS TYPE BBA

GENERATOR MOUNTED

600 Volts Maximum, 60 or 50 Hz., 3 Phase



Rear View



Front View

400A frame, 300A trip

STANDARD DESIGN FEATURES:

- Boxes are 14 gauge steel, designed to be installed in place of the side cover plate on Caterpillar generators. The basic breaker box fits directly on 360 and 440 frame generators. An adapter plate is used with 580 frame generators.
- Basic box size is 24½" wide X 33" high X 8" deep providing generous space for pulling load cables.
- Cable leads are provided for direct connection to generator winding leads. No lead extensions are required. Cable lugs are provided.
- Circuit breakers are molded case type, Westinghouse or General Electric with thermal-magnetic trips.
- Connection hardware and insulating tape are included.
- Standard paint color is Caterpillar yellow.

LIST PRICES

BASIC ASSEMBLY:

225 ampere frame
250 ampere frame
400 ampere frame
600 ampere frame
800 ampere frame
1000 ampere frame
1200 ampere frame

OPTIONS:

24 VDC shunt trip
120 VAC shunt trip
24 VDC undervoltage release
120 VAC undervoltage release
Auxiliary switch:
225-250A frame (1a & 1b)
All others (2a & 2b)

ORDER INFORMATION REQUIRED:

Generator Frame Size _____

Trip Rating _____

Options Required _____

_____

Republic Electric & Development Co.

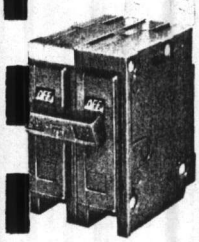
1619 Luthy Drive / Peoria, Illinois 61615 / Telephone (309) 691-7000 / Telex 40-4469

Circuit Breakers by Westinghouse Corp.

AB De-ion®

Circuit Breaker Selector Guide

Lighting Circuit Breakers | **Industrial Circuit Breakers** | **High Interrupting Capacity Circuit Breakers**



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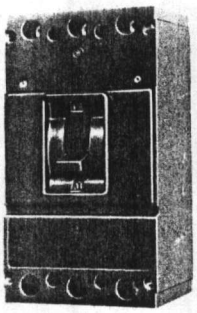

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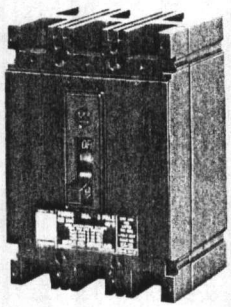
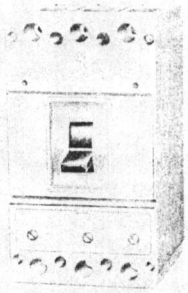
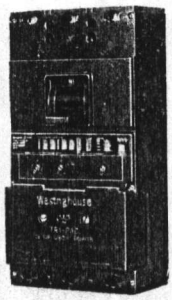


Type FB

Type MC SELTRONIC® Breaker



MARK 75® Type HLB



TRI-PAC® Type LA

Circuit Breaker Ratings				Dimensions Inches 3 Pole Breakers Only				U.L. Listed Interrupting Capacities, RMS Symmetrical Amps						
								AC Rating Volts					DC Rating Volts⑤	
Type	Cont. Amp. Rating	No. Poles	Volts Ac	Width	Height	Depth	X Units	120/240	240	277	480	600	125	250
Lighting Circuit Breakers														
QC, HQP, BAB	10-70	1	120/240	...	...	...	..	10,000	.....	.....	.....	.....	.....	.....
	15-125	2	120/240	...	...	...	..	10,000	.....	.....	.....	.....	.....	.....
HQC, HQNP, BA	15-50	2	240	...	...	...	..	.....	10,000	.....	.....	.....	.....	.....
	15-100	3	240	...	...	...	..	.....	10,000	.....	.....	.....	.....	.....
BA	15-30	1	277	...	...	...	..	.....	.....	10,000	.....	.....	.....	.....
QHP, QHC, HBA	15-30	1, 2	120/240	...	...	...	..	65,000	.....	.....	.....	.....	.....	.....
	15-20	3	240	...	...	...	..	.....	65,000	.....	.....	.....	.....	.....
QPGF, QBGF	15-30	1, 2	120/240	...	...	...	..	10,000	.....	.....	.....	.....	.....	.....
QPH, QCH, QBH	15-70	1	120/240	...	...	...	..	22,000	.....	.....	.....	.....	.....	.....
	15-100	2	120/240	...	...	...	..	22,000	.....	.....	.....	.....	.....	.....
	15-100	3	240	...	...	...	..	.....	22,000	.....	.....	.....	.....	.....
CA	125-225	2, 3	240	4⅛	6½	2 11/16	3X	.....	10,000	.....	.....	.....	.....	.....
CAH	125-225	2, 3	240	...	...	...	..	.....	22,000	.....	.....	.....	.....	.....
DA	250-400	2, 3	240	5½	10⅞	4 1/16	4X	.....	22,000	.....	.....	.....	.....	10,000④
Industrial Circuit Breakers														
EB	15-100	1	120	...	...	...	..	10,000①	.....	.....	.....	.....	5,000	.....
	15-100	2, 3	240	4⅛	6	3⅜	3X	.....	10,000	.....	.....	.....	.....	5,000②
EHB	15-100	1	277	...	...	...	..	.....	.....	14,000	.....	.....	10,000	.....
	15-100	2, 3	480	4⅛	6	3⅜	3X	.....	18,000	.....	14,000	.....	.....	10,000⑦
FB③	15-150	2, 3	600	4⅛	6	3⅜	3X	.....	18,000	.....	14,000	14,000	.....	10,000⑦
JB, KB	70-250	2, 3	600	4⅛	10	4 1/16	3X	.....	25,000	.....	22,000	22,000	.....	10,000⑦
LB, LBB	70-400	2, 3	600	5½	10⅞	4 1/16	4X	.....	42,000	.....	30,000	22,000	.....	10,000⑦
LA	250-600	2, 3	600	8¼	10¾	4 1/16	6X	.....	42,000	.....	30,000	22,000	.....	10,000⑦
MC Seltronic	400-800	2, 3	600	8¼	16	4 1/16	6X	.....	42,000	.....	30,000	22,000	.....	.....
NC Seltronic	800-1200	2, 3	600	8¼	16	5½	6X	.....	42,000	.....	30,000	22,000	.....	.....
PC Seltronic	1000-3000	2, 3	600	12 1/16	22⅛	9 1/16	..	.....	125,000	.....	100,000	100,000	.....	.....
PCC⑥ Seltronic	1000-3000	2, 3	600	12 1/16	22⅛	9 1/16	..	.....	125,000	.....	100,000	100,000	.....	.....
High Interrupting Capacity Circuit Breakers														
HFB Mark 75®	15-30	1	277	...	...	...	..	.....	.....	65,000	.....	.....	10,000	.....
	40-100	1	277	...	...	...	..	.....	.....	25,000	.....	.....	10,000	.....
	15-150	2, 3	600	4⅛	6	3⅜	3X	.....	65,000	.....	25,000	18,000	.....	10,000⑦
HKB Mark 75	70-250	2, 3	600	4⅛	10	4 1/16	3X	.....	65,000	.....	25,000	22,000	.....	10,000⑦
HLB Mark 75	125-400	2, 3	600	5¼	10⅞	4 1/16	4X	.....	65,000	.....	35,000	25,000	.....	10,000⑦
HLA Mark 75	250-600	2, 3	600	8¼	10¾	4 1/16	6X	.....	65,000	.....	35,000	25,000	.....	10,000⑦
HMC Mark 75	400-800	2, 3	600	8¼	16	4 1/16	6X	.....	65,000	.....	50,000	25,000	.....	.....
HNC Mark 75	800-1200	2, 3	600	8¼	16	5½	6X	.....	65,000	.....	50,000	25,000	.....	.....
FB Tri-Pac®	15-100	2, 3	600	4⅛	8¾	3½	3X	.....	200,000	.....	200,000	200,000	.....	.....
LA Tri-Pac	70-400	2, 3	600	8¼	16	4¾	6X	.....	200,000	.....	200,000	200,000	.....	.....
NB Tri-Pac	300-800	2, 3	600	8¼	22	5½	6X	.....	200,000	.....	200,000	200,000	.....	.....
PB Tri-Pac	600-1600	2, 3	600	12 1/16	22⅛	9 1/16	..	.....	200,000	.....	200,000	200,000	.....	.....

① 120 volt only.
② 125/250 VDC only.
③ Available in 4 pole version.
④ 2 pole only.
⑤ Higher NEMA ratings available.
⑥ U.L. listed at 100% rating.
⑦ Applies to two pole breakers only.

Westinghouse Electric Corporation
Distribution and Control Business Unit
Commercial Division – Components
London, Kentucky 40741

June, 1986
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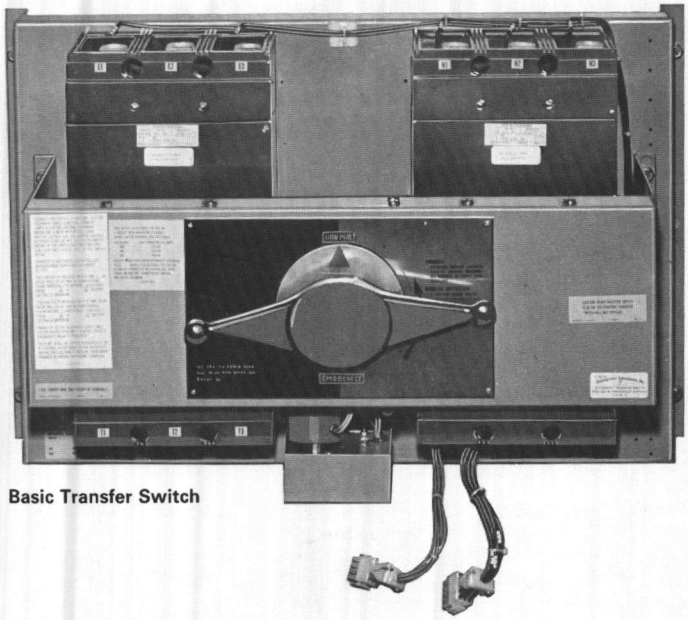
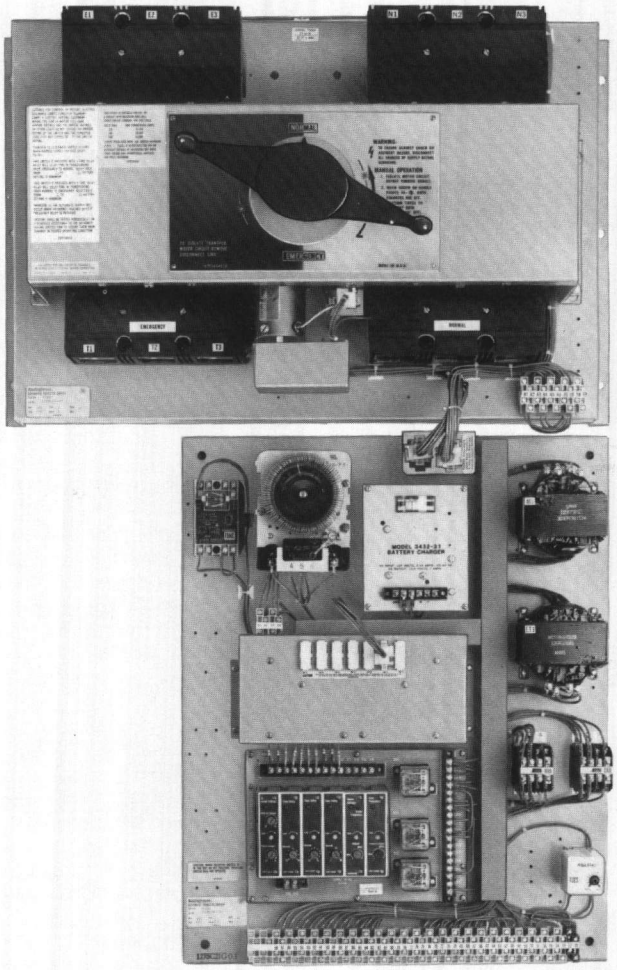
Mailed to: E, D, C/29-900A

Automatic, Basic and Manual Types

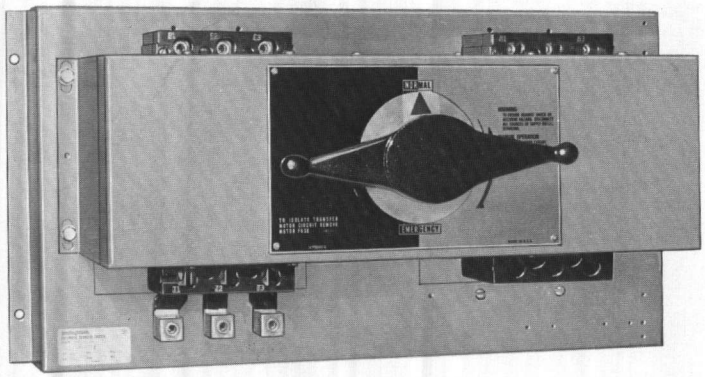
Transfer Switches 100 through 1000 Amperes



Basic Transfer Switch



Automatic Transfer Switch



Manual Transfer Switch – Single Handle

Transfer Switches
100-1000 Amperes

In This Publication

Description/Function ©

Westinghouse automatic transfer switches are reliable, rugged, versatile and compact assemblies for transferring essential loads and electrical distribution systems from one power source to another.

The intelligence/supervisory circuits on Westinghouse transfer switches constantly monitor the condition of both the normal and emergency power sources. These circuits automatically initiate an immediate transfer of power from the normal source to the emergency source when power fails or voltage levels drop below a preset value. Transfer back to the normal source is automatic upon return of the normal power source.

Monitoring of the power source is always performed on the line side of the source to which the switch is connected. Power to drive the transfer switch mechanism is taken from the side to which the load is being transferred. The normal power source is the preferred source which the switch will always seek when it is available.

Westinghouse automatic transfer switches are versatile. In addition to the normal power transfer functions, integral overcurrent protection – either conventional thermal magnetic or solid state – can be added to either or both of the power switching devices. A full line of factory and/or field installable accessories are available to satisfy the most demanding customer specifications.

Standards/Code Compliance ©

Westinghouse Automatic Transfer Switches are listed in File E38116 by Underwriters, Inc. under their standard UL 1008. This standard covers requirements for automatic transfer switches intended for use in ordinary locations to provide for lighting and power as follows:
A. In emergency systems, in accordance with articles 517 and 700 in the National Electric Code, ANSI/NFPA 70 and the National Fire Protection Association No. 76A and/or
B. In stand-by systems, in accordance with article 702 of the National Electrical Code and/or
C. In legally required stand-by systems in accordance with article 701 of the National Electrical Code.

Westinghouse Automatic Transfer Switches are available to meet NFPA 110 for emergency and stand-by power systems when ordered with the appropriate options.

An automatic transfer switch for use in a legally required stand-by system is identical to that for emergency systems.

Typical Switch Application ©

Westinghouse solid state transfer switches protect critical electrical loads against loss of power continuity by transferring the load to an emergency power source upon failure of the normal source. The load is transferred back to the normal source when power is restored.

Westinghouse transfer switches can be applied on systems having more than two power sources or where interlocking is required between transfer switches or other system components – i.e.; elevators – in fact, wherever it is necessary to protect against loss of electrical service. Potential applications include:

- Airports
- Banks
- Computer Installations
- Department Stores
- Extended Care Facilities
- Fish Hatcheries
- Greenhouses
- Hospitals
- Industrial Plants
- Laboratories
- Mines
- Missile Ranges
- Office Buildings
- Public Auditoriums
- Power Generation Plants
- Radar Installations
- Radio Stations
- Railroad Signals
- Ships
- Shopping Centers
- Subways
- TV Studios
- Theaters
- Tunnels
- Waste Water Treatment Facilities

Transfer Switch Application Considerations

Automatic transfer switches are selected in a manner similar to other components selected for application in electrical distribution systems. Thus, the following system characteristics should be identified to match properly the automatic transfer switch to the system requirement in accordance with NEC and other applicable codes or standards:

a. System voltage.
b. Number of phases: single or three phase
c. Number of wires: 2, 3 or 4
d. Frequency: 50 or 60 Hz
e. Number of switched poles: 2, 3 or 4
f. Type of Load: motor, electric heating, resistive, or a combination of types
g. Load requirements: continuous current and/or horsepower
h. Available fault current: at point of application in system
i. Type of service: emergency, stand-by or service equipment
j. Type of power sources: Two utilities, utility and generator, or two generators
k. Type of protection required: separate, integral overcurrent, equipment ground fault
l. Special environmental considerations: high ambient, high humidity, corrosive, elevation, etc.
m. Special operational considerations: simultaneous disconnection of load from both power sources, or other
n. Special options: as may be required to satisfy job specifications

Equipment descriptions, catalog identification details, list of available switch options, special application considerations and application tables are included with this technical data to enable a user to make the proper automatic transfer switch selection.

This guide assumes that the circuit protective devices provided on the source side of the automatic transfer switch have been properly applied in accordance with the requirements of the NEC. The fuse sizes shown in the application tables are based on the maximum "umbrella" values permitted for that size in the UL classification shown. Refer to Westinghouse for applications not shown.

Information on molded case circuit breaker application when used for source protective devices is given in Westinghouse publications AD 29-160 and AD 29-161.

See Technical Data 29-927 for information on Transfer Switches, 1200-4000 amps.

© Changed or added since previous issue.

Transfer Switches
100-1000 Amperes

Types of Switches

Westinghouse transfer switches are furnished in three types: automatic, basic and manual.

Automatic Transfer Switches

Switches are U.L. Inc. listed per U.L. Standard 1008.

Automatic transfer switches consist of three basic elements: 1) Main contacts connect and disconnect the load from the source of power. 2) Motor driven transfer mechanism to effect the transfer of the contacts between sources; and 3) Intelligence/Supervisory circuits to constantly monitor the condition of the power sources to provide the intelligence for the switch to correctly perform its transfer function.

The power transfer mechanism consists of the main contacts and the motor driven mechanism pre-assembled on a steel base plate. The main contacts are mechanically and electrically interlocked to prevent the simultaneous closing of both contact assemblies. The load side contacts of each of the two breakers is joined with a bus bar assembly to form a common load terminal location.

Automatic transfer switches include:

- Two high instantaneous trip only circuit breakers
- Connections: Refer to Option 20, page 9. See table on page 21 for terminal sizes.
- Positive mechanical interlocking by means of a walking beam interlock.
- Common load bus.
- Auxiliary contacts, normal source, (2A/2B).
- Auxiliary contacts, emergency source, (2A/2B).
- Test selector switch (Maintained contact).
- Complete protection, voltage sensing on each phase of the normal source.
- Engine start contact (1 NC).
- Automatic operation.
- Intelligence panel disconnect.
- Solid neutral bar assembly.
- Three and four pole switches have multi-tap transformers suitable for use on 208, 220, 240, 380, 415, 480, and 600 volts. 50/60 Hz. without modification.
- Manual Operating Handle
- Position Indicator

Options©
CSA Listing is available on a special order basis. Contact Westinghouse for information.©

Refer to pages 7-11 for other available options.

Ordering Information
Refer to page 6. Pay particular attention to Item 3 concerning insertion of letter designation for voltage and catalog number.

See Technical Data 29-927 for Transfer Switches, 1200-4000 amps.

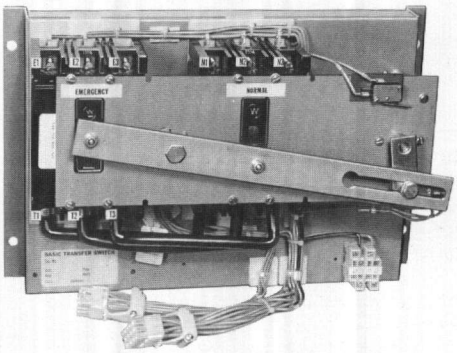


Fig. 1: Power Switching Panel, 100 Amperes

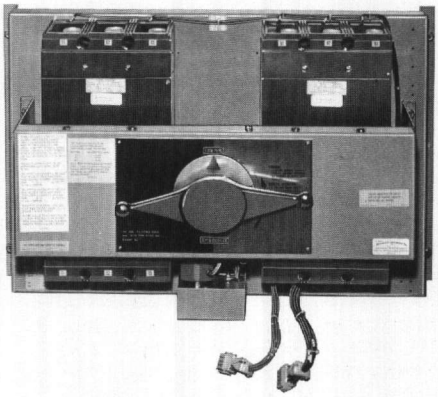


Fig. 2: Power Switching Panel, 150-1000 Amperes

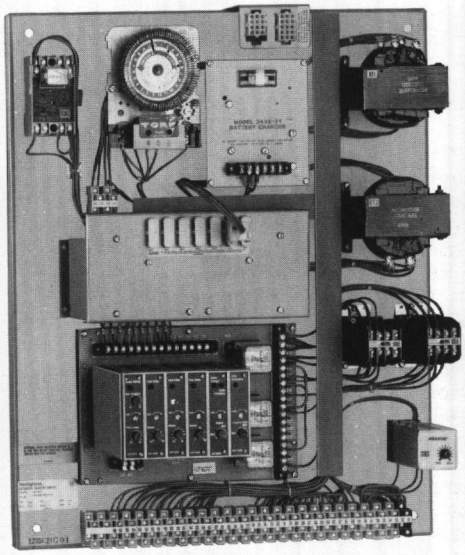


Fig. 3: Typical Intelligence Panel

© Changed or added since previous issue.

Transfer Switches
100-1000 Amperes

Basic Transfer Switches

Switches are UL, Inc. component recognized per UL Standard 1008. The basic transfer switch consists of a power transfer mechanism similar to the one supplied with automatic transfer switches. No intelligence panel is included. This switch is designed for use with customer furnished controls.

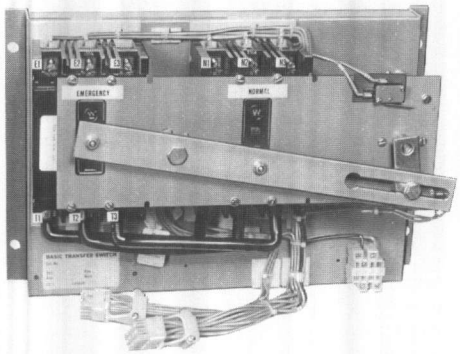


Fig. 4: 100 Amperes

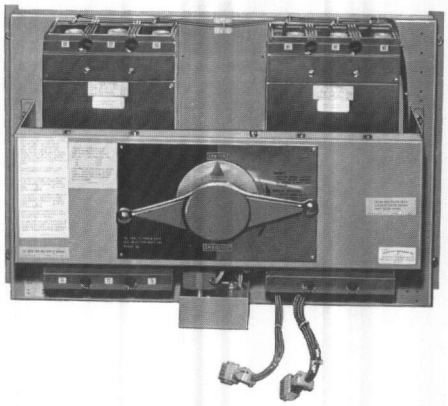


Fig. 5: 150-1000 Amperes

Standard voltages:
Application: 600 Volts Ac Maximum
Operating Motor: 120 Volts, 50/60 Hz.

Basic transfer switches include:
- Two high instantaneous trip only circuit breakers
- Connections: Refer to Option 20, page 9. (Front connections standard)
  See table on page 20 for terminal sizes.
- Positive mechanical interlocking by means of a walking beam interlock.
- Common load bus.
- Auxiliary contacts, normal source, (2A/2B).
- Auxiliary contacts, emergency source, (2A/2B).
- Manual Operating Handle
- Position Indicator

Options
Refer to pages 7-10 for available control options. Terminal blocks instead of cable connectors can be furnished if specified on the order.

Ordering Information
Refer to page 6.

Manual Transfer Switches

Switches are UL, Inc. listed.

Westinghouse manually operated transfer switches are available with a single operating handle, type MTSS, or type MTSD, which is dual handle operated. Above 100 amp, Type MTSS utilizes a common operating mechanism with a single free-wheeling handle mounted across the front of the two breakers for mechanically connecting and operating the individual breaker handles. With the type MTSD, individual breaker handles are used for on-off operation. Manually initiated, electrically operated manual transfer switches are available for special applications. Contact Westinghouse for details.

Standard Voltages ©
Application: 600 volts Ac Maximum
Options: Must be used on 120 volt Ac, 50/60 Hz only control circuit. Control transformers furnished by request only and subject to applicable upcharges.

Manual Transfer Switches include:
- Two high instantaneous trip only circuit breakers
- Connections: Refer to Option 20, page 9. See table on page 21 for terminal sizes.
- Positive mechanical interlocking by means of a walking beam interlock.
- Common load bus.
- Auxiliary contacts, normal source, (2A/2B).
- Auxiliary contacts, emergency source, (2A/2B).

Options ©
Electrically-operated manual transfer switches are available on a special order basis. Contact Westinghouse for information.

Refer to pages 7-11 for other available options.

Ordering Information
Refer to page 6.

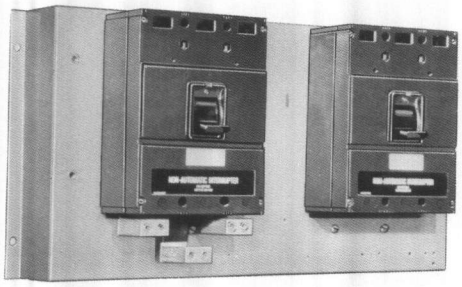


Fig. 6: Type MTSD, Dual Operating Handles ①
(100-1000A)

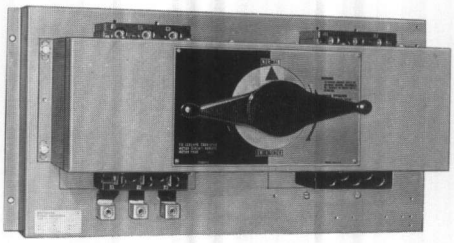


Fig. 7: Type MTSS, Single Operating Handle ①
(150-1000A)

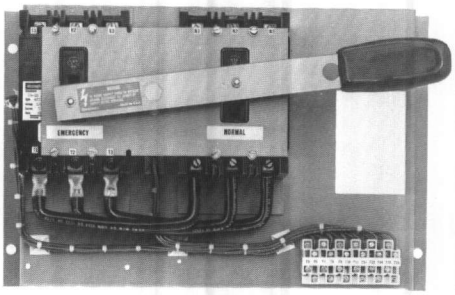


Fig. 8: Type MTSS, Single Operating Handle
(100A)

① Wires are connected to terminal blocks (not shown).
© Changed or added since previous issue.

Transfer Switches
100-1000 Amperes

User Benefits of Westinghouse Transfer Switches

Accurate, Reliable Protection Each pole of every breaker is individually calibrated and tested in a controlled temperature to meet UL, Inc. Standard 489 requirements for molded case circuit breakers. Especially hardened, ground and polished trip latches assure continuous and accurate tripping characteristics.

Long Breaker Contact Life Quick-make, quick-break toggle mechanism, coupled with De-ion arc quenchers, assure long contact life with minimal burning and pitting of contact surfaces.

Reduced Downtime and Maintenance Costs Circuit breakers are long-lived devices designed for maintenance-free, repetitive duty without costly shutdowns. Easily maintained, all parts are front accessible.

Reduced Operation Cost Welded internal parts, high contact pressure, and silver alloy, butt-type contacts used in circuit breakers offer less resistance to electrical current than fuse clips, bolted joints and hinged joints of other devices. Thus lower watts loss means savings in the costs of electrical power.

Protection Against Single Phasing A fault or overload on any phase opens all poles of the breaker, eliminating the possibility of single-phasing polyphase motors. (Options 16 or 17 only.)

Maximum Personal Safety Molded case circuit breakers are dead front, operating personnel are not exposed to "live" parts. Load connecting bus is behind the panel on switches above 100 amperes.

Dual Protective Elements/Trip Units Magnetic trip elements operate the breaker instantly on dangerous fault currents. The breaker is trip-free, cannot be held closed under fault conditions. Withstand, closing and interrupting ratings are identical for simplified application. Overload protection can be provided by the addition of the thermal magnetic or solid state trip units to one or both of the circuit breakers.

Reduced Installation Cost Small size of switch requires less space in switchboards, or for its enclosure. In many cases, overload protection can be incorporated in the switch, eliminating additional cost of upstream protective devices.

Simplified Application The breaker trip enables the switch to have a withstand, close and interrupting rating equivalent to the breaker's interrupting rating for easy coordination with upstream protective devices.

Added Protection The breaker trip unit provides system back-up protection in the event of short circuits.

Simplified Stocking ⓒ Split panel construction facilitates stocking, since one intelligence panel is used on all switches.

Easily Modified and Serviced Removal of the inter-connection control plug completely isolates the intelligence panel for simple servicing or modifications. Many options can be added in the field with the retention of the UL label.

Solid state cards plug in to facilitate changing of timing, voltage and frequency characteristics.

External pilot devices are wired to terminal blocks on the lower portion of the intelligence panel.

Automatic transfer switches can be applied on various system voltages up to the maximum rating of the switch. Control voltage changes are easily made by unplugging the control power plug and re-inserting it into the receptacle for the desired voltage.

Most adjustments, when provided, are tamperproof and can be locked. Options 2, 30, 32 and 35 are exceptions. These are non-lockable, adjustable solid state timers.

Reduced Inventory Only one plug-in timing card for a given time delay range is necessary. It can be used interchangeably in all timing card positions (Options 1, 3, 4).

Only one plug-in voltage sensing card is necessary for a given type of monitoring. It can be used interchangeably in all voltage sensing card positions, either normal or emergency (Options 5 and 26).

Only one frequency sensing card is required for a given type of frequency monitoring, either 50 or 60 Hertz. It can be used either in emergency or normal sources in any voltage/frequency sensing plug-in position.

Non-Ventilated NEMA 1 Enclosures utilize heavy duty steel construction minimizing possibilities of distortion. All enclosures comply with most recent NEC requirements for cable bending space. Construction facilitates ease of customer installation. Cable entry can be made top, bottom, or side. All enclosures are supplied with keylock handles as standard to prevent tampering by unauthorized personnel.

ⓒ Changed or added since previous issue.

Transfer Switches
100-1000 Amperes

Transfer Switch Catalog Number Explanation

For Use Only in Explaining Catalog Numbers
Do Not Build a Catalog Number

Type Switch	Construction	No. of Switched Poles	Ampere Rating	Voltage	Enclosure
A TS	**B**	**M 3**	**0225** ① ●	–	K
Transfer Switch	B – Circuit Breaker	2 – 2 Pole	0100 – 100 Amp	A – 120/60	K – Open
		3 – 3 Pole	0150 – 150 Amp	B – 208/60	S – Nema 1
		4 – 4 Pole	0225 – 225 Amp	W – 240/60	J – Nema 12
A – Automatic			0400 – 400 Amp	X – 480/60	R – Nema 3R
B – Basic			0600 – 600 Amp	E – 600/60	
M – Manual	D – Dual (2) Operating Handles	M – Mechanically Held	0800 – 800 Amp	G – 220/50/60	
			1000 – 1000 Amp	M – 230/50	
				Z – 365/50	
	S – Single (1) Operating Handle			H – 380/50	
				N – 401/50	
				O – 415/50	
				K – 600/50	

Ordering Information

1. Order by description and catalog number.
   A. Type of System
      1 Phase, 2 Wire: Use 2 pole switch
      1 Phase, 3 Wire: Use 2 pole switch plus Option 19
      3 Phase, 3 Wire: Use 3 pole switch
      3 Phase, 4 Wire: Use 3 pole switch plus Option 19
      For other types, refer to Westinghouse.

2. Specify:
   A. System voltage and frequency.
   B. Number of phases and wires.
   C. Current.

3. Select switch catalog number from listings at right. For automatic transfer switches, insert letter indicating voltage switch is to be wired for, from catalog number explanation above. Example: Catalog Number ATSBM30225-K is to be wired for 480 volts, 60 Hz. Letter for 480/60 is X; therefore complete catalog number is ATSBM30225XK.

4. Select desired options and order by option number.

5. Ordering example: Automatic Transfer Switch, Catalog Number ATSBM30225XK, 480 volts, 60 Hz, 3 phase, 4 wire, 225 ampere, with Options 1A, 2A, 3C and 9A.

6. List Prices: Refer to Price List 29-920.

Switch Catalog Numbers, Open Switches●

Ampere Rating	Switch Catalog Number 2 Poles	3 Poles	4 Poles
Mechanically Held, Automatic Transfer Switch			
100	ATSBM20100-K	ATSBM30100-K	ATSBM40100-K
150	ATSBM20150-K	ATSBM30150-K	ATSBM40150-K
225	ATSBM20225-K	ATSBM30225-K	ATSBM40225-K
400	ATSBM20400-K	ATSBM30400-K	ATSBM40400-K
600	ATSBM20600-K	ATSBM30600-K	ATSBM40600-K
800	ATSBM20800-K	ATSBM30800-K	ATSBM40800-K
1000	ATSBM21000-K	ATSBM31000-K	ATSBM41000-K
Mechanically Held, Basic Transfer Switch			
100	BTSBM20100-K	BTSBM30100-K	BTSBM40100-K
150	BTSBM20150-K	BTSBM30150-K	BTSBM40150-K
225	BTSBM20225-K	BTSBM30225-K	BTSBM40225-K
400	BTSBM20400-K	BTSBM30400-K	BTSBM40400-K
600	BTSBM20600-K	BTSBM30600-K	BTSBM40600-K
800	BTSBM20800-K	BTSBM30800-K	BTSBM40800-K
1000	BTSBM21000-K	BTSBM31000-K	BTSBM41000-K
Mechanically Held, Single Operating Handle Manual Transfer Switch			
100	MTSSM20100EK	MTSSM30100EK	MTSSM40100EK
150	MTSSM20150EK	MTSSM30150EK	MTSSM40150EK
225	MTSSM20225EK	MTSSM30225EK	MTSSM40225EK
400	MTSSM20400EK	MTSSM30400EK	MTSSM40400EK
600	MTSSM20600EK	MTSSM30600EK	MTSSM40600EK
800	MTSSM20800EK	MTSSM30800EK	MTSSM40800EK
1000	MTSSM21000EK	MTSSM31000EK	MTSSM41000EK
Mechanically Held, Dual (Two) Operating Handles Manual Transfer Switch			
100	MTSDM20100EK	MTSDM30100EK	MTSDM40100EK
150	MTSDM20150EK	MTSDM30150EK	MTSDM40150EK
225	MTSDM20225EK	MTSDM30225EK	MTSDM40225EK
400	MTSDM20400EK	MTSDM30400EK	MTSDM40400EK
600	MTSDM20600EK	MTSDM30600EK	MTSDM40600EK
800	MTSDM20800EK	MTSDM30800EK	MTSDM40800EK
1000	MTSDM21000EK	MTSDM31000EK	MTSDM41000EK

① See Technical Data 29-927 for Transfer Switches, 1200-4000 amps.

● Changed or added since previous issue.

Transfer Switches
100-1000 Amperes

Options, List Price Additions
For List Prices, refer to Price List 29-920

Type Switch Used On	Description
	The following options are Underwriters' Laboratories, Inc. listed, except as noted, when supplied on UL Listed switches. NOTE: If an option is selected that is not UL listed, the switch will not have a UL label.
Auto	①**1. Time Delay Normal to Emergency (TDNE)** Delays the transfer from normal to over-ride momentary power outages/voltage fluctuations. Timing begins when emergency source voltage appears. Does not affect initiation of engine start circuit. A. Adjustable 1 – 60 seconds B. Adjustable 0.1 – 10 minutes C. Adjustable 0.2 – 30 minutes
Auto	①**2. Time Delay on Engine Starting (TDES)**ⓒ This option is for use only where the emergency source is an engine generator. It delays initiation of the engine start circuit in order to over-ride momentary power outages or voltage fluctuations. B. Adjustable .5 – 15 seconds ⓒ C. Adjustable 4 – 120 seconds ⓒ
Auto	①**3. Time Delay Emergency to Normal (TDEN)** Delays the transfer from emergency to permit stabilization of the normal power source before retransfer is made. Timing begins when the normal source appears. If the emergency source fails during timing, transfer to normal source is immediate, over-riding the time delay. A. Adjustable 1 – 60 seconds B. Adjustable 0.1 – 10 minutes C. Adjustable 0.2 – 30 minutes
Auto	①**4. Time Delay for Engine Cooloff (TDEC)** Permits the generator to run under a no-load condition after transfer to normal has been made. Timing begins when transfer is made. A. Adjustable 1 – 60 seconds B. Adjustable 0.1 – 10 minutes C. Adjustable 0.2 – 30 minutes D. Fixed, non-adjustable, five (5) minutes
Auto	①**5. Frequency/Voltage Relay for Emergency Source**ⓒ Relay prevents transfer from normal to emergency until the engine generator has reached its operating frequency or voltage. When switch is in the emergency position and the emergency source is outside the relay setting, the switch will initiate transfer to the normal position if the normal source is present. Frequency monitoring relay is connected to one phase only of the emergency source, constantly monitoring that phase. Voltage sensing relay available for monitoring one phase only of the emergency source (5D and E) or all three phases (5F and G). (A maximum of three Emergency Source sensing options may be chosen at the same time.) A. Under frequency, adjustable 45 – 60 Hz (Drops out 2 Hz lower than setting). B. Under frequency/Under voltage, combines both functions in a single relay. Frequency adjustable 45 – 60 Hz (Drops out 2 Hz lower than setting). Voltage fixed non-adjustable set at 90% pickup, 70% drop-out, single phase sensing only. C. Over frequency, adjustable 50 – 65 Hz (Drops out 2 Hz above setting) D. Under voltage adjustable (nominally set at 90% pickup, 70% dropout), single phase sensing only. E. Over voltage, adjustable (nominally set at 115% drop-out, pick-up below 105%), single phase sensing only. F. Under voltage adjustable (nominally set at 90% pick-up, 70% drop-out) 3 phase sensing only G. Over voltage, adjustable (nominally set at 115% drop-out, pick-up below 105%), 3 phase sensing only.
Auto	①**6. Test Pushbutton (TPB)** Provides test operation of the transfer switch by simulating a loss of normal power. Engine starting will be initiated and transfer to emergency source will occur. When selected, the standard maintain contact test selector switch is omitted. A. For separate mounting. B. In cover of enclosed switch.
Auto	①**7. Four-Position Selector Switch (FPSS)** Permits four modes of switch operation: "TEST", "AUTO", "OFF", "ENGINE START". The "OFF" position de-energizes the control relays and opens the engine start circuit. The switch will not operate nor will the engine start on power failure. A white light is also furnished that lights only when the switch is in the off position. The "TEST" position simulates power failure. Engine starting is initiated and the switch will transfer when emergency voltage appears. The "AUTO" position returns the transfer switch to normal operation. The "ENGINE START" position retains the transfer switch at normal and initiates the engine start circuit. The switch will not transfer unless the normal source fails. C. For separate mounting. When selected, the standard test selector switch is omitted. D. In cover of enclosed switch. When selected, the standard test selector switch is omitted.
Auto	①**8. Bypass Pushbutton** Provides a by-pass on the TDNE (Option 1) or TDEN (Option 3) relay, permitting switch to be transferred to normal or emergency source without time delay. Option is normally used in testing when it is not desirable to wait for the timers to finish their timing sequence. A. Bypass TDEN (PBEN) for separate mounting B. Bypass TDNE (PBNE) for separate mounting C. Bypass TDEN (PBEN) in cover of enclosed switch D. Bypass TDNE (PBNE) in cover of enclosed switch

ⓒ Changed or added since previous issue.
① Not available on Manual or Basic switches.

Transfer Switches
100-1000 Amperes

Options, List Price Additions, Continued
For List Prices, refer to Price List 29-920

Type Switch Used On	Description
Auto	①**9. Selector Switch, Maintenance (SSM)** "A and B" disconnects power to the transfer motor. Marked "On/Off". Manual disconnection is standard. Disconnection of motor plug connector electrically isolates the intelligence circuit from the basic transfer switch. Subsequent manual operation of the transfer switch isolates the transfer switch load circuit from either source. A. For separate mounting (2 Position Selector Switch) B. In cover of enclosed switch (2 Position Selector Switch)
Auto	①**10. Preferred Source Selector (PSS)** For use when normal and emergency sources are both commercial power, or when the normal source is commercial power and the emergency is engine generator. Option permits selection of either source as the preferred source to which the switch will always transfer if the source is available. Marked Source 1/Source 2. A. For separate mounting B. In cover of enclosed switch For use when normal and emergency source are engine generators. Two engine start contacts are provided. Marked Source 1/Source 2. C. For separate mounting D. In cover of enclosed switch.
Auto	**11. Circuit Breaker Reset** This option provides means of resetting thermal magnetic breakers (options 16A, D, E, F, 17A and B) when used in the transfer switch A. Manual (Standard when Options 16A, D, E, F, 17A and B selected) ①B. Normal Breaker Reset PB for separate mounting. ①C. Emergency Breaker Reset PB for separate mounting. ①D. Normal Breaker Reset PB in cover of enclosed switch ①E. Emergency Breaker Reset PB in cover of enclosed switch ①F. Circuit Breaker Lock-out: Prevents transfer if breaker trips (available only on standard high instantaneous trip breakers. Lock-out of thermal magnetic breakers standard)
Auto	②**12. Pilot Lights** Pilot lights can be furnished to indicate (1) switch position; (2) source condition; and, (3) tripped condition. **Switch Position:** Utilizes a 1A breaker auxiliary contact. A. Normal supply (green) for separate mounting marked Normal. B. Emergency supply (red) for separate mounting marked Emergency. C. Normal supply (green) in cover of enclosed switch marked Normal. D. Emergency supply (red) in cover of enclosed switch marked Emergency. **Source Condition:** Indicates whether or not source voltage is present. E. Normal supply (white) for separate mounting marked Normal Source. F. Emergency supply (white) for separate mounting marked Emergency Source. G. Normal supply (white) in cover of enclosed switch marked Normal Source. H. Emergency supply (white) in cover of enclosed switch marked Emergency Source. **Tripped Condition:** Available only with thermal-magnetic breakers, Option 16 and 17 (not available on 100 amp units) J. Normal supply (amber) for separate mounting marked Normal Tripped. K. Emergency supply (amber) for separate mounting marked Emergency Tripped. L. Normal supply (amber) in cover of enclosed switch marked Normal Tripped. M. Emergency supply (amber) in cover of enclosed switch marked Emergency Tripped.
Auto	②**14. Relay Auxiliary Contact**ⓒ The Normal source relay is energized only when the switch is in the Normal position and normal power is present. The emergency source relay is energized whenever the emergency source is present. C. Normal Source: Provides 2 NO and 2 NC Contacts D. Emergency Source: Provides 2 NO and 2 NC Contacts
Auto Basic Manual	**16. Optional overcurrent protective device in place of Standard High Instantaneous Trip Breakers.** Use of this option can, in many cases, eliminate the need for separate upstream overcurrent/short circuit protection, thus enabling code requirements to be met with a device that takes up less space and requires less wiring. Either the normal or emergency breaker, or both, may be replaced. Includes Option 11F except for Options 16B, G, H. Four pole switches have trip units only in three poles. A. Thermal Magnetic: Switch ratings and trip ratings available.ⓒ

Switch Rating	2 Pole	3 Pole	4 Pole	Trip Ratings Available
100	X	X	X	10, 15, 25, 30, 40, 50, 60, 70, 90, 100
150	X	X	X	70, 90, 100, 125, 150
225	X	X	X	70, 90, 100, 125, 150, 175, 200, 225
400	X	X	X	250, 300, 350, 400
600	X	X	..	150, 175, 200, 225, 250, 300, 350, 400, 500, 600
600	..	..	X	600
800	X	X	X	600, 700, 800
1000	X	X	X	600, 700, 800, 900, 1000

ⓒ Changed or added since previous issue.
① Not available on Manual or Basic switches.
② Available on Manual switches with special negotiation.

Transfer Switches
100-1000 Amperes

Options, List Price Additions, Continued
For List Prices, refer to Price List 29-920

Type Switch Used On	Description
	B. Molded Case Switch, both sources D. SELTRONIC™ Circuit Breaker for both sources – Refer to Westinghouse. E. Thermal Magnetic Breaker, emergency source only. F. Thermal Magnetic Breaker, normal source only G. Molded Case Switch, emergency source only H. Molded Case Switch, normal source only I. SELTRONIC™ Circuit Breaker, emergency source only P. SELTRONIC™ Circuit Breaker, normal source only
Auto Basic Manual	①**17. MARK 75® Circuit Breakers** In place of standard high instantaneous trip breakers (Includes Option 11F) ①A. Thermal-Magnetic Mark 75®

Switch Rating Amps	Availability 2 Pole	3 Pole	4 Pole	Trip Ratings
100	X	X	..	Same as
150	X	X	..	Option
225	X	X	..	16A
400	X	X	..	
600	X	X	..	
800	X	X	..	
1000	X	X	..	

①B. SELTRONIC MARK 75 Circuit Breakers for both sources. Refer to Westinghouse.

Auto Basic Manual — **18. Special Enclosures**

A. Types ©

Switch Rating	Enclosure Availability Suffix Letter (Omit K from Cat. No. & Substitute) J(NEMA 12)	R(NEMA 3R)	S(NEMA 1)
Circuit Breaker Type Construction			
100-1000A	Yes	Yes	Yes

Refer to Westinghouse for knockouts, hubs or oversize enclosures. Key lock on enclosure doors standard on all enclosures.

C. Three point vault-type door hardware, NEMA 12 enclosure only

①②④D. Provides enclosure UL Inc. listed as "Suitable for use as service equipment", available only on automatic switches 400 amps and above. Utilizes two individually motor operated circuit breakers providing manual operations without opening enclosure door (NEMA 1 only). Selection of this option requires overcurrent protection (Options 16A, 17A or B) for UL listing. Ground fault protection optionally available.

Type Switch Used On	Description
	②③E. Voltmeter mounted in cover (includes potential transformers and selector switch). ②③F. Ammeter mounted in cover (includes current transformers and selector switch). ②③G. Frequency Meter ②③H. Running Time Meter
Auto Basic Manual	①**19. Solid Neutral Bar Assembly.** Standard on automatic switches, optional on basic and manual switches. Provides insulated and groundable panel mounted neutral bar. Connections for normal, emergency and load. Shipped loose with open switches, mounted on enclosed switches.

Switch Ampere Rating ©
A. 100
B. 150, 225
C. 400
D. 600
E. 800
F. 1000

Auto Basic Manual — **20. Non-Standard Connections ©**

Solderless lugs are furnished on all front connected units.

A. Rear Connections:
150-1000 amperes – optional on open units only (bus connections only)

Auto Basic Manual — **21. Non-Standard Terminals ©**

A. Refer to wire terminal data, page 21 and specify terminal desired.

Auto — ①②④**22. Narrow Unit (3 pole breaker switches only)**

A narrow, single panel for use primarily in motor control centers. There is no provision to mount options 23, 24 on the panel. If selected, they are furnished for separate mounting.

A. Front connected, line and load.
B. Front cable-connected line, rear bus-connected load

Auto — ②⑤**23. Plant Exerciser (PE) ©**

168-hour clock timer provides for automatic test operation of the plant for pre-selected intervals (adj. 0-168 hrs. in multiples of 15 minutes) at least once a week, mounted on intelligence circuitry panel. Contact Westinghouse if 14 day exerciser required.

C. Without interrupting normal supply.
D. By simulation of power failure.
D10. Similar to option 23D except with failsafe feature. This feature provides an immediate transfer to the normal source if emergency source fails during exercising period.
G. Plant Exerciser with Selector Switch for choosing 23C or 23D or for bypassing exerciser.
G10. Similar to option 23G except with failsafe feature during simulation of power failure.

© Changed or added since previous issue.
① Not available in 4 pole switch.
② Not available on Manual or Basic switches.
③ Refer to Westinghouse if NEMA 3R enclosure is required with this option.
④ See page 18 for photo.
⑤ Supplied unmounted if Option 22 supplied.

Transfer Switches
100-1000 Amperes

Options, List Price Additions, Continued
For List Prices, refer to Price List 29-920

Type Switch Used On	Description
Auto	①⑤**24. Battery Charger (BC)**ⓒ The trickle charge Dc output is 12 or 24 volts. Units are panel mounted. Fixed high-low charge rate. An Ammeter read-out is standard C. 12 Volt D. 24 Volt
Auto	①④**26. Type of Protection (Normal Source)**ⓒ Complete protection is standard. A voltage sensing relay monitors each phase of the normal power supply. Normally set at 70% dropout and 90% pickup. C. Overvoltage sensing relay – adjustable, nominally set at 115% dropout, pickup below 105%. D. Area protection connections with override circuit. Provides two terminal blocks for connection of one or more NO (open when there is no voltage) area protection contacts; these terminal blocks are wired in the same manner as the test switch and when the NO area protection contact opens, the switch will initiate engine start and will transfer to emergency. In the event that the NO area protection contact remains open and the emergency source fails when the switch is in the emergency position, an over-ride circuit will retransfer the switch to the normal source if it is available. E. Under frequency, adjustable 45-60 Hz (Drops out 2 Hz lower than setting). A frequency sensing relay is connected to 1 phase only of the normal source constantly monitoring that phase. F. Over frequency, adjustable 50-65 Hz (Drops out 2 Hz above setting). A frequency sensing relay is connected to 1 phase only of the normal source constantly monitoring that phase.
Auto	①**27. Non-Standard Voltages and Frequencies** A. Non-Standard Ac voltages and frequencies. Three and four pole breaker type switches are suitable for use on 208, 220, 240, 380, 415, 480 and 600 volts, 50/60 Hz without modification through the use of multi-tap transformers. VSR adjustment capability makes switches suitable for use on any intermediate voltage. Specify system voltage on order.
Auto	①**28. Intelligence Circuit Fuses** A. Provides fuses on all non-essential control circuitry
Auto	①**29. Type of Operation**ⓒ Automatic operation is standard. Provides for automatic transfer and retransfer from source to source as dictated by the reset values of the transfer switch intelligence circuits.
	②B. Pushbutton Operation Only (Pushbuttons for separate mounting). Includes two pushbuttons for operating the transfer switch from normal to emergency and from emergency to normal. No automatic operation is included. C. Pushbutton Return to Normal (Pushbutton for separate mounting). Automatic operation normal to emergency, pushbutton operation emergency to normal. This feature provides an immediate transfer to the Normal Source upon failure of the Emergency Source. ②D. Same as Option 29B, except pushbuttons in cover of enclosed switch. E. Same as Option 29C except pushbutton in cover of enclosed switch. ②F. Automatic/Manual Operation. Two position selector (marked Auto/Manual) permits selection of automatic or manual operation. Includes option 29B which only operates when the switch is in the manual mode. For separate mounting. ②G. Same as option 29F except pushbuttons and selector switch mounted in cover of enclosed switch. H. Automatic/Pushbutton operation return to normal. Two position selector (marked Auto/Manual) permits selection of automatic or pushbutton operation emergency to normal, automatic normal to emergency. Includes option 29C which only operates to return to normal when the switch is in the manual mode. For separate mounting. J. Same as option 29H except pushbutton and selector switch mounted in cover of enclosed switch.
Auto	①③**30. Cranking Limiter**ⓒ A. Adjustable 0-120 seconds. Interrupts engine start circuit if voltage does not appear within preselected time.
Auto	①**31. Audible alarm with silencing switch** Sounds alarm when switch is in the emergency position and emergency voltage is present. A. For separate mounting. B. Enclosure mounted. Sounds alarm when either breaker trips. Available only with options 16 and 17. C. Normal and emergency source for separate mounting D. Normal and emergency source, for enclosure mounting E. Normal source only, for separate mounting F. Normal source only, for enclosure mounting G. Emergency source only, for separate mounting H. Emergency source only, for enclosure mounting

ⓒ Changed or added since previous issue.
① Not available on Manual or Basic switches.
② Not UL listed.
③ Timing ranges are recommended ranges only. Actual time settings can be adjusted from 0 seconds to 10 hours. All timers are factory set at 0 seconds.
④ A maximum of two Normal Source sensing Options from Options 26C, 26E, and 26F may be chosen at the same time.
⑤ Supplied unmounted if Option 22 is supplied.

Transfer Switches
100-1000 Amperes

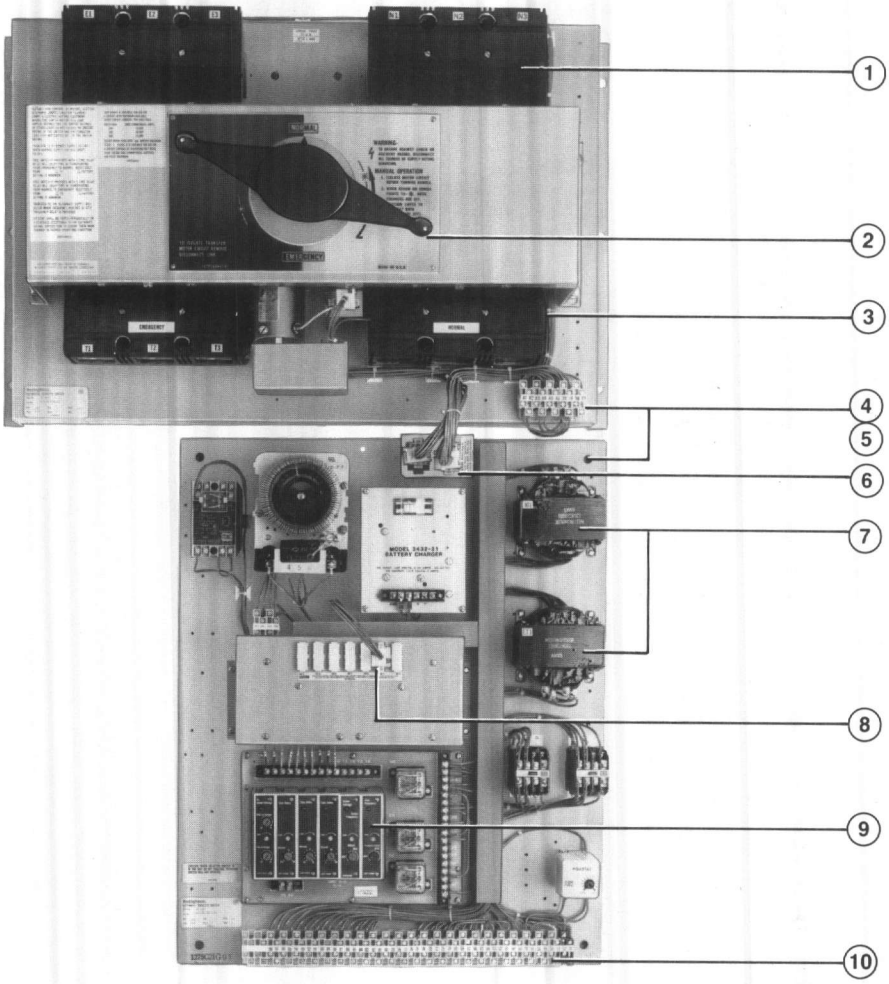
Options, List Price Additions, Continued
For List Prices, refer to Price List 29-920

Type Switch Used On	Description
Auto	①②**32. Time Delay Neutral**Ⓒ Provides a time delay in the neutral position when the load is transferred in either direction to prevent excessive inrush currents due to out-of-phase switching of large inductive loads. Utilizes one normally open breaker contact. A. Adjustable 0-120 seconds Ⓒ
Auto Basic Manual	**33. Shunt Trip** Wired to terminal blocks for customer connection. Specify coil voltage desired. (120VAC standard) If shunt trip is required with standard magnetic only breakers, options 11F must also be supplied. A. Supplied in normal breaker B. Supplied in emergency breaker
Auto	①**34. Extender Cable** Permits remote mounting of intelligence circuitry to accommodate limited space applications. A. 48 inches B. 72 inches C. 96 inches D. 120 inches E. 144 inches (Special lengths available. Contact Westinghouse).
Auto	②**35. Pre-transfer Signal Device**Ⓒ Contacts open/close on a timed basis (adjustable 0-120 seconds) to allow the load to be de-energized prior to transfer in either direction. (Typically used in conjunction with elevator controls. A. Form C Contacts (2NO, 2NC) B. Isolated Contacts (2NO, 2NC)

Ⓒ Changed or added since previous issue.
① Not available on Manual or Basic Switches.
② Timing ranges are recommended ranges only. Actual time settings can be adjusted from 0 seconds to 10 hours. All timers are factory set at 0 seconds.

Transfer Switches
100-1000 Amperes

Design Features
Standard Catalog Numbered Switches



① **Molded Case AB De-Ion® Circuit Breakers** function as main contacts to transfer the load from normal to emergency and back. They assure dependable, reliable operation under all conditions. Continuous duty rated for all classes of loads, open or enclosed, they have high dielectric strength, heavy duty switching and withstand capabilities and high interrupting capacity.

The breakers incorporate a positive quick-make, quick-break toggle mechanism, Westinghouse-developed De-Ion® arc quenchers, and main contact arcing horns for long life and reduced contact surface pitting and burning. Current-carrying members between line and load bus utilize all-brazed construction.

② **Manual Operating Handle** is electrically "dead". Transfer switch position indicator is visible from the front and shows to which source the switch is connected. Operating handle is mechanically and electrically interlocked with no electric OFF or neutral position. A manual-only neutral position is provided for load circuit maintenance. Available only if disconnect link or plug connector is removed. Handle "free wheels"; if switch operates while it is being held, there is no discomfort to the individual.

③ **Single, Unidirection Gear Motor/Train Transfer Mechanism,** mechanically held and electrically interlocked to prevent an electrical neutral/OFF position, and to prevent both sources being connected to the load simultaneously. No clutch or friction drive.

④ **Rugged/Rigid Steel Base Plate.**

⑤ **Split Panel Construction:** Switching panel (top) and intelligence circuitry panel are separate. Breaker load side bus is behind panel on switches above 100 amperes.

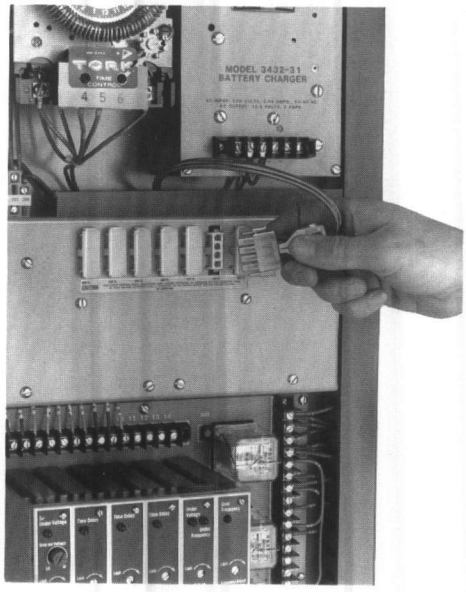
⑥ **Interconnection** between switching panel and intelligence panel is made by a control plug connector. Removal of plug completely isolates the intelligence panel.

⑦ **Control Transformers** reduce line voltage to 120 volts Ac or less for intelligence circuit. All are factory wired for specified voltage. All three and four pole automatic transfer switches have multi-tap primaries making them suitable for use with 208, 220, 240, 380, 415, 480, and 600 volts, 50/60 Hz. Two pole switches have single tap transformers for the system voltage.

⑧ **To Change Line Voltage** on three and four pole switches, remove plug and insert in the correct voltage socket.

⑨ **Adjustable Voltage Sensing** on all phases of the normal source. Emergency source monitoring (adjustable) on one phase or all phases. (Option 5).

⑩ **Terminal Blocks** easily accessible for speedy connection to external circuits. All customer wiring done at the bottom of the intelligence panel.



Line Voltage Plug and Receptacle

Transfer Switches
100-1000 Amperes

Additional Design Features — Circuit Breaker Switches

Factory Wired Field installation requires only the connection of power supply leads and leads from externally mounted pilot devices if furnished to the terminal blocks provided. All wiring terminals are numbered.

Components Front Mounted and Wired Few moving parts assure greater dependability and long life.

Field-Adjustable, Tamperproof Adjustments as opposed to fixed type, permit easy calibration should the setting requirement change. Adjustment can be done during service with no downtime.

Standard Breaker Accessories and modifications can be added.

Low Voltage Operation Transfer motor will transfer at lower line voltages than other methods.

The Switch will always seek a normal source when available; however, as long as power is available from any source, the switch will seek that source.

Rating is Continuous, either open or enclosed, for all classes of loads. If thermal magnetic trip units are used, the ampere rating is determined by the trip unit rating.

Low Transfer Current Drain The mechanically held transfer motor is energized only during transfer.

Circuit Provides Override of Time Delay Emergency to Normal relay in the event of emergency power source failure and normal source return. Switch will immediately transfer to normal without waiting for the time delay.

Quiet Operation Only the low-noise normal relay and voltage sensing relays are energized during normal operation.

Straight Through Wiring

Completely Self Contained No separate power source, battery or otherwise, required for operation.

The Common Load Connection of the breakers is located behind the panel. Load interconnections on 100 amp switches are accomplished by front cable connection.

Engine Start Contact Closes on normal source failure (Not illustrated).

Transfer Mechanisms

The function of the transfer mechanism is to provide an electrical means to transfer the switches' main contacts to the position indicated by the intelligence circuit. It also provides electrical and mechanical interlocks necessary for proper operation of the switch.

Transfer mechanisms utilize a motor-driven mechanism to toggle the circuit breaker handles, providing main contact closing and opening forces.

The transfer mechanism provides a positive mechanical interlock to prevent both breakers from being closed at the same time. It is designed to leave the breakers trip-free in the closed position, permitting overcurrent power protection to be incorporated in either or both breakers if required.

100 Ampere Switches
The transfer mechanism of the 100 ampere unit consists of a pivoting rocker-arm lever which operates the circuit breaker handles as the arm is moved by a rotating lever connected to the transfer motor. A slide pin engaging a pivot in the rotating lever converts rotary motion to linear motion.

150 – 1000 Ampere Switches
The transfer mechanism used in these units consists of a free-wheel, ratchet sprocket drive, a center drive gear, secondary spur gears and two cams which operate the breaker handles.

The conversion of rotary motion to linear motion is accomplished by a roller mounted eccentrically on each secondary gear, which drives its associated cam by riding in the cam's groove. The cams travel vertically on guide rods attached to a housing which enclose the entire mechanism.

A manual operating handle is supplied external to the mechanism housing. The free-wheel, ratchet sprocket drive permits disengagement of the gear train from the gear motor when the switch is being operated manually. During electrical operation of the transfer mechanism, the free-wheel feature enables the manual operation handle to remain stationary.

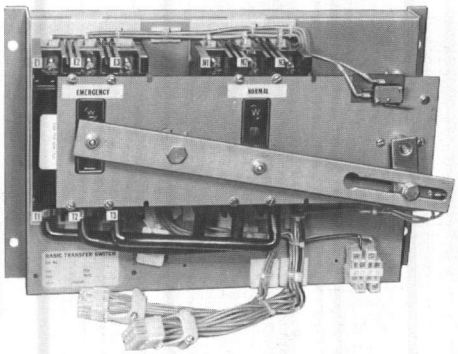


Fig. 9: Power Transfer Mechanism, 100 Ampere Switch

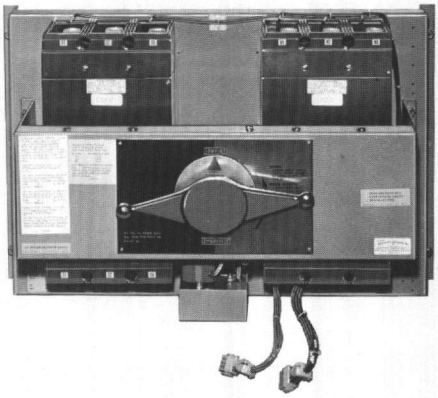


Fig. 10: Power Transfer Mechanism, 150-1000 Ampere Switches

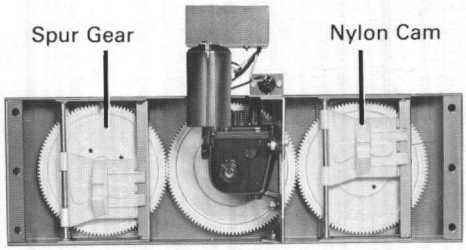


Fig. 11: Rear View, 150-1000 Ampere Switch Mechanism

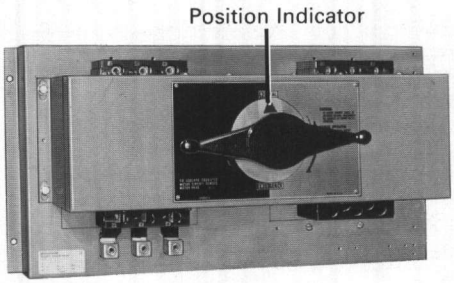


Fig. 12: Switch Position Indicator

Transfer Switches
100-1000 Amperes

Transfer Motors
100 Ampere Switches
This unit is a self-contained gearmotor and brake which utilizes a shaded pole motor. The brake is spring-set and is released by a magnetically operated armature only when the motor is energized.

150 – 1000 Ampere Switches
This unit is similar to that used in the 100 ampere switches, except that it uses a universal motor and gearbox. Brake pressure is spring-maintained and is released only when the motor is energized. The solenoid which operates the brake release is connected in parallel with the motor windings.

Motor Limit Switches
100 ampere transfer switches utilize limit switches mounted externally to the circuit breakers and operated by projections on the operating mechanism cam. Each switch is synchronized with its associated circuit breaker to open when its breaker closes.

150 ampere and larger transfer switches utilize auxiliary switches mounted in the circuit breakers and operated by the circuit breaker mechanism main contacts. Each switch opens when its associated breaker closes.

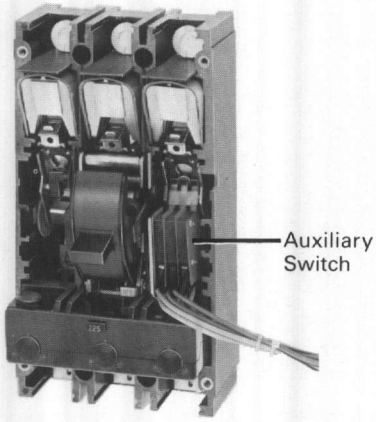


Fig. 13: Auxiliary Switch Mounted in Breaker

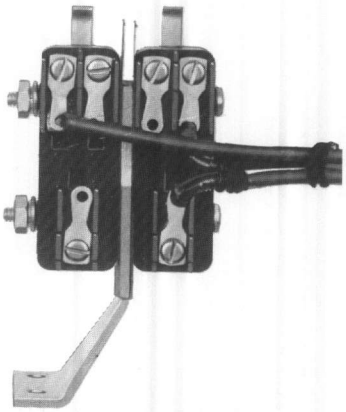


Fig. 14: Auxiliary Switch

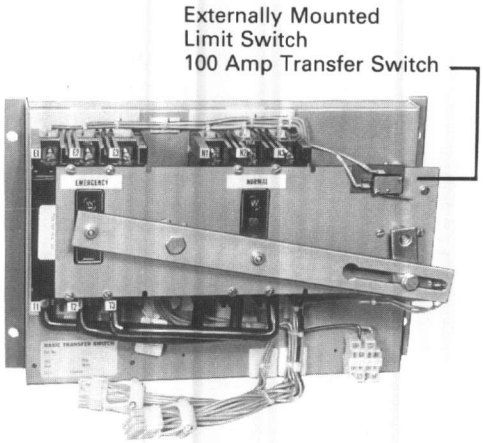


Fig. 15: Externally Mounted Limit Switch

Mechanical Interlocks
Westinghouse transfer switches utilize two separate and isolated mechanical interlocks to prevent both sources from being connected to the load circuit simultaneously. They are:

(1) Transfer mechanism which does not rely on clutches or friction drives. All parts, from normal breaker handle to emergency breaker handle, are in positive contact with all other parts through use of gear teeth, woodruff keys and slide pins.

(2) Walking beam interlock provides interlocking of both breakers so that only one may be closed, yet both may be open at any given time. This interlock mounts on panel at the rear of the breakers. When one breaker is closed, an insulated plunger extends into the opposite breaker to prevent it from closing. The closed breaker must open before the open breaker may be closed.

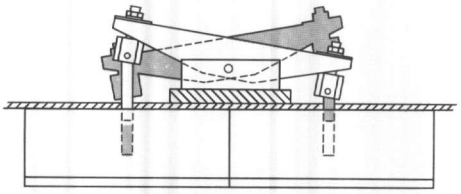


Fig. 16: Top View, Walking Beam Interlock Installed

Transfer Switches
100-1000 Amperes

Intelligence Circuitry

The intelligence circuit is mounted on the lower panel and is connected to the switching panel (upper panel) by means of cables from the upper panel terminating in keyed plugs, Fig. 17. Plugs are inserted in corresponding keyed sockets on the intelligence panel. An extender cable is available (option 34) to mount the intelligence panel a greater distance away from the switching panel than the standard cable allows.

All intelligence panels have two power transformers (one for normal, one for emergency source) and one logic transformer package (for monitoring both sources).

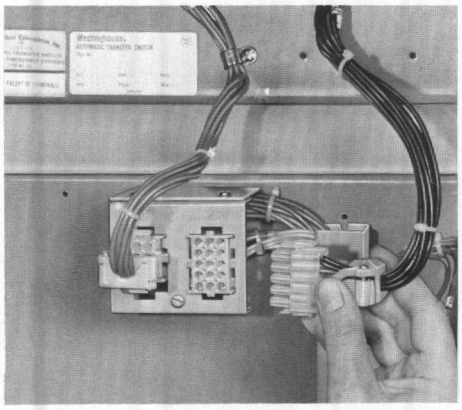
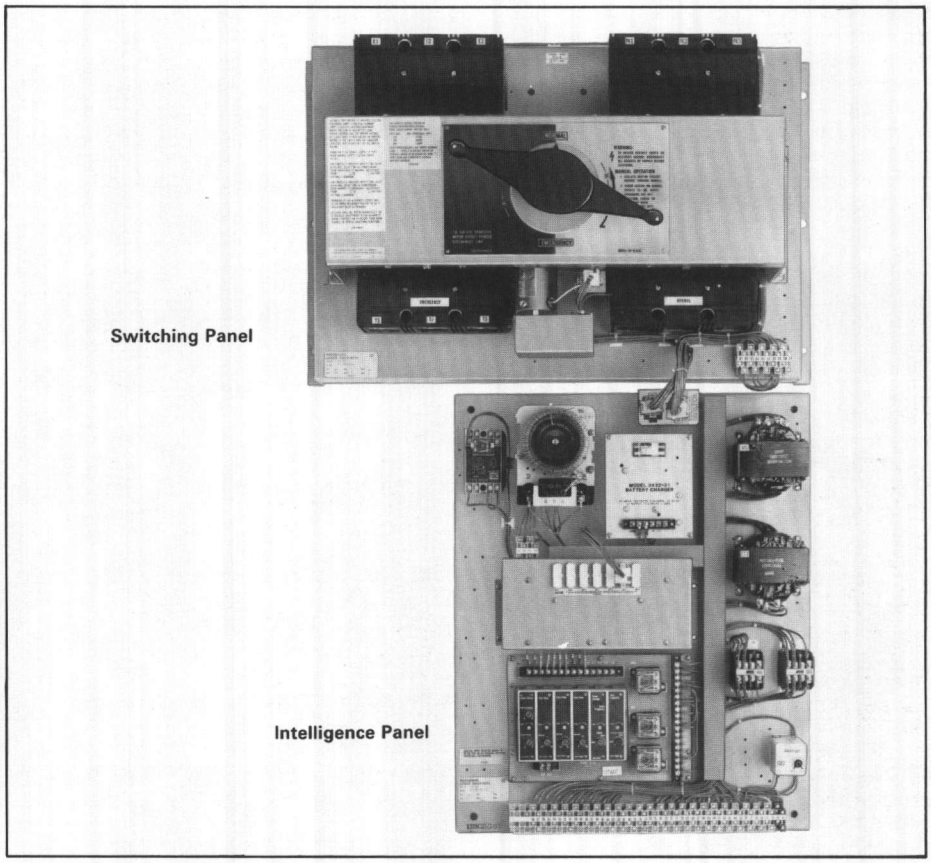


Fig. 17: Panel Interconnection Plugs



Transfer Switches
100-1000 Amperes

A solid state logic package capable of accommodating six or nine plug-in printed circuit cards (Fig. 18) is also mounted on the panel. The nine card version is used only when more than one normal source (option 26) and/or two emergency source (option 5) monitoring functions are required. The logic package also includes plug-in relays (Fig. 19) for output to the transfer controls.

Plug-in printed circuit cards (Fig. 20) are used for many of the optional sensing and timing functions (options 1,3,4,5, and 26). Each plug-in card has adjustment knobs that can be screwdriver or finger adjusted. In addition, each card has a captive, screwdriver lock that positively locks the adjustment setting by providing an even, uniform force that does not alter the setting when it is tightened. Voltage cards and frequency cards are interchangeable, as are timing cards; however, a timing card cannot be used in a voltage/frequency slot, or visa versa. They are key interlocked to prevent improper insertion. Each card is held in place by two screws. Empty card slots are covered by blank covers.

Each logic package is divided into sections for normal source and emergency source. Each source is further subdivided into sections for Voltage/Frequency and Timing. See Fig. 21. The standard catalog numbered switch without options has two driver cards (one in the normal and one in the emergency timing slot) which are required for operation. If timing options are selected, the drivers are omitted since either a driver or a timer is required on both the normal and emergency sources for operation.

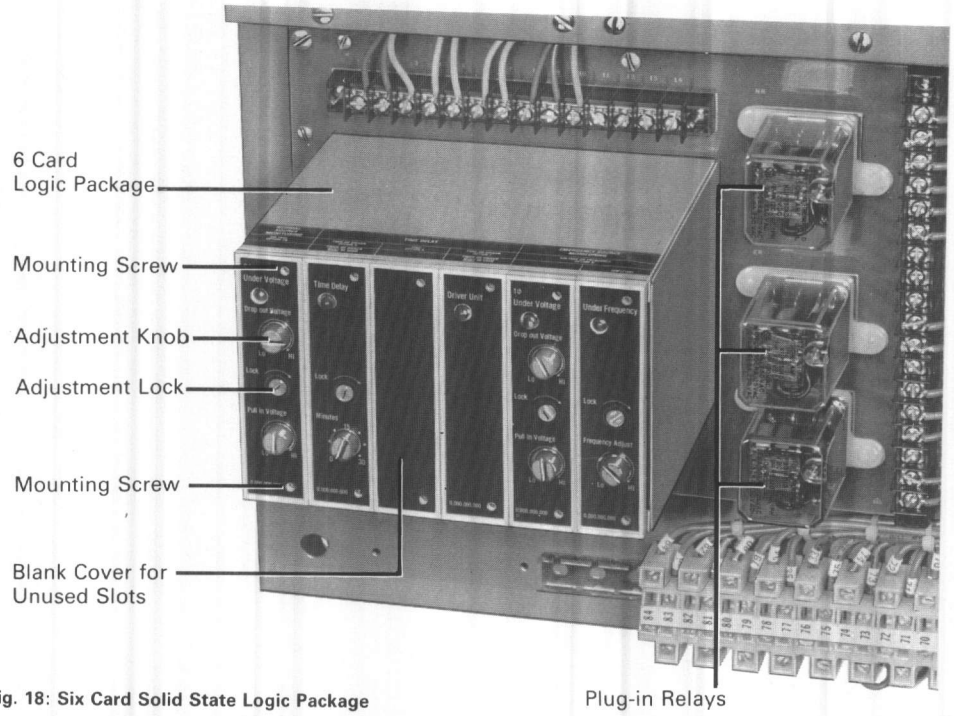


Fig. 18: Six Card Solid State Logic Package

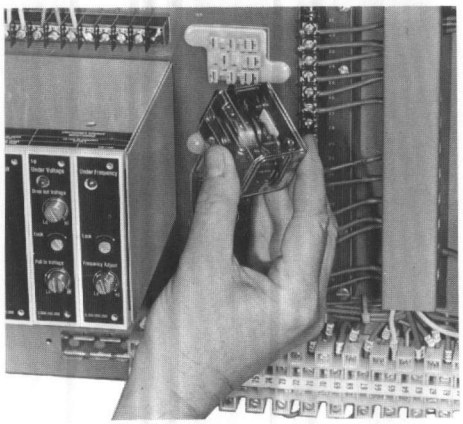


Fig. 19: Plug-in Relay

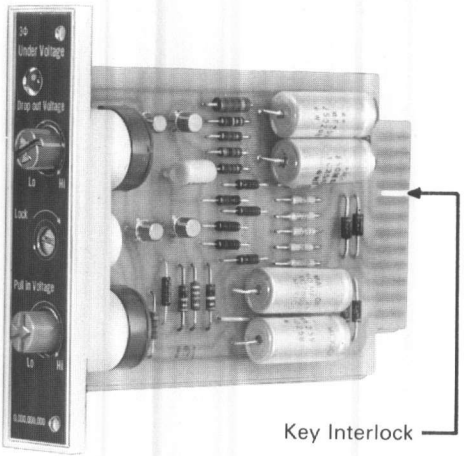


Fig. 20: Plug-in Card with Key Interlock

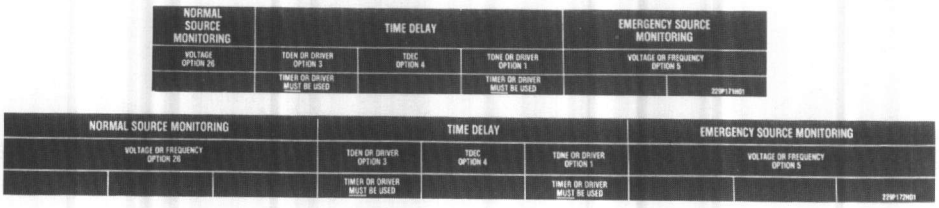


Fig. 21: Nameplates for 6 and 9 Card Solid State Logic Packages

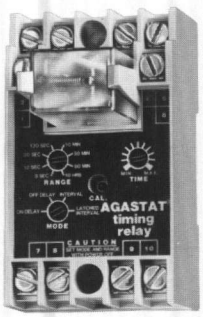
Transfer Switches
100-1000 Amperes

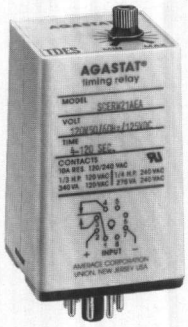
Options Illustrated

Westinghouse transfer switches provide users with a wide range of options that permit switches to be customized to meet specific needs. Most can be field-installed without affecting the UL label.

- Options 1, 3, 4, 5, 26C, E and F are performed by printed circuit cards. Three timing cards (1-60 seconds, 0.1-10 minutes, and 0.2-30 minutes) are used interchangeably in options 1, 3, 4 (option 4 also lists a fixed, five minute timing card; if it is desired, it can be used on options 1 or 3 also); cards for undervoltage, overvoltage, underfrequency and overfrequency are used interchangeably in options 5 and 26. Photo on page 15 shows typical cards. Use nameplate pictures to identify card types.

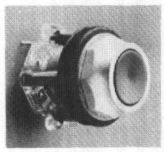
- Options 2, 30, 32 and 35 use state-of-the-art universal solid state timing relays rated for 10 ampere contacts.©





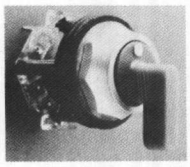
- Options 6, 7, 8, 9, 10, 11B – 11E, 12, 29 are performed by industrial-type pilot devices.

Indicating Light



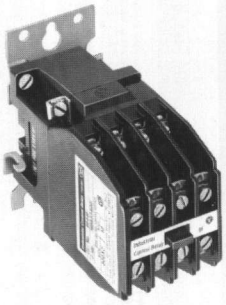
Pushbutton

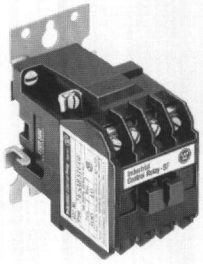
4 Position Selector Switch



2 Position Selector Switch

- Options 14C, D, and 26D use heavy duty relays featuring self-wiping, 10 ampere contacts.

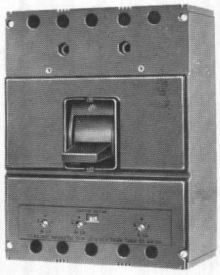




- Options 11F, 16A, D, E, F, I, J, 17A, B incorporate bell alarm contacts actuated only when the breaker trips, not when it is turn ON and OFF in normal operation.

The standard Westinghouse transfer switch utilizes a high instantaneous, magnetic only trip which gives the switch protection from short circuit current. This standard mag-only trip is set as high as possible to allow upstream protective devices to clear any faults prior to the tripping of the transfer switch breaker. Should any upstream device fail, the Westinghouse transfer switch will clear the fault thus protecting itself and downstream wiring from costly damage and downtime.

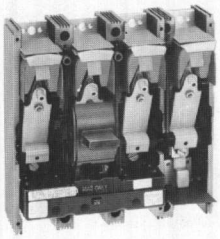
- Options 16 and 17 allow the selection of various combinations of Westinghouse breakers to be incorporated in the transfer switch in lieu of the standard mag-only breakers. Options 16A, D, E, F, I, P, and 17A, B incorporate thermal magnetic breakers in the switching panel thus adding overload protection to the transfer switch. In many applications, incorporating overload protection into the transfer switch eliminates the extra expense of a separately mounted overcurrent device and reduces the time and labor required in wiring such devices. These optional overcurrent devices are available with conventional thermal magnetic trips (16A, E, and F) or with solid state trip monitoring (16D, I, P, 17B). When specific applications require higher withstand, closing, and interrupting ratings, option 17A and B, Mark 75 breakers can be selected to comply with most requirements. Option 16B, G, H, provides non-automatic molded case switches in applications requiring no tripping functions.



Thermal Magnetic Breaker

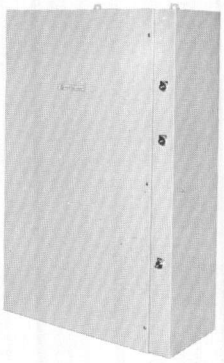
SELTRONIC™ Breaker

MARK 75®



4 Pole 400 Amp Breaker (Cover Removed)

- Option 18 covers enclosures and their modifications, service entrance provisions, and metering functions.



Key locks are standard on all enclosure doors, and three-point vault hardware is available on NEMA 12 enclosures. NEMA 3R enclosures use galvannealed steel.

© Changed or added since previous issue.

Transfer Switches
100-1000 Amperes

Options Illustrated, *Continued*

- Option 18D provides a transfer switch suitable for use as service equipment and is available on automatic switches 400 amps and above. The enclosed service entrance transfer switch utilizes motor operators on both breakers which allows manual switching of the device without opening the specially designed enclosure door. Ground fault protection is optionally available on service entrance switches rated 400 – 1000 amps. When 18D is selected, options 16 or 17 must also be selected to incorporate breakers with overcurrent protection required in service entrance applications. Service entrance transfer switches are also available as open devices to be incorporated in customer supplied equipment. When ordering, specify if enclosure is required.

- Option 19 covers insulated, groundable neutrals, 100% rated, with provision for normal, emergency and load connections.

Insulated Groundable Neutral, 225 Amp.

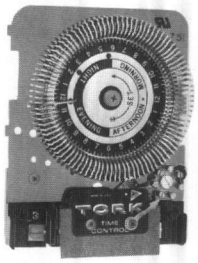
- Option 20 provides rear connections for 100-1000 amp switches.

- Option 21 Non-Standard Terminals – Refer to Westinghouse.

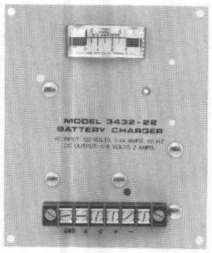
- Option 22 changes the constructional design of the transfer switch. The standard split panel construction is replaced with a long, narrow panel which incorporates the switching device and intelligence circuitry on a single, rigid steel baseplate. This narrow design may be highly desirable when mounting the device in switchboards, motor control centers, or other customer equipment in which space requirements necessitate a more compact switch design. See Dimensional Data 29-970.

- Option 23, Plant Exerciser, is a 168 hour clock timer which permits automatic test operation of the plant at least once a week at pre-selected intervals. Timer is adjustable from 0-168 hours in multiples of 15 minutes, and is mounted on the intelligence panel.

- Option 24, Battery Charger, provides trickle charge Dc output of 12 or 24 volts. Mounted on the intelligence panel.



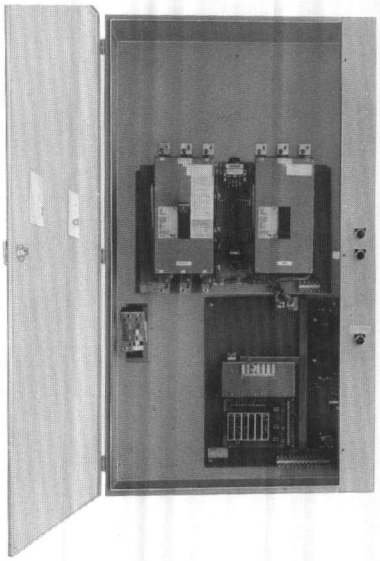
Plant Exerciser



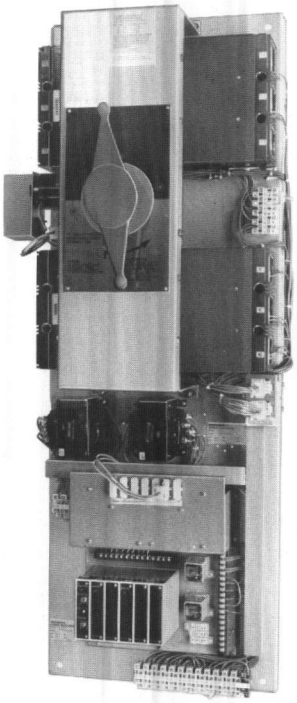
Battery Charger

- Option 27 Non-Standard Voltages and Frequencies. Multi-tap transformers for 208, 220, 240, 380, 415, 480 and 600 volts are furnished for 3 and 4 pole switches. Single voltage transformers are furnished for two pole switches.

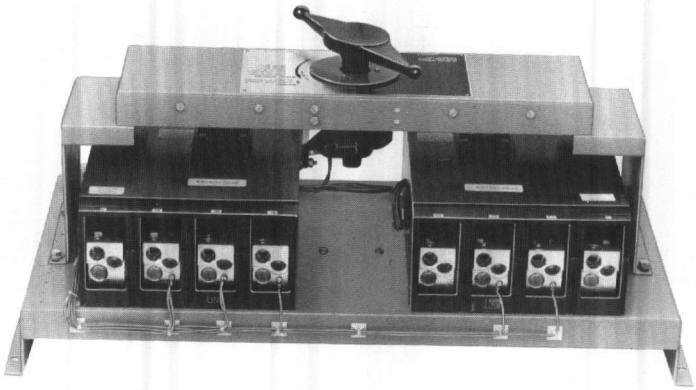
- In many applications incorporating sophisticated GFP (Ground Fault Protection) equipment, it may be desirable to switch the neutral conductor, as well as the power conductors, to preserve the integrity of the GFP system. The entire range of Westinghouse four pole transfer switches has synchronous contact operation and the contact rating as well as ampere capacity of the fourth pole (neutral) is identical to that of the power poles. The neutral is supplied with the same reliable arc quenching capabilities as the current carrying poles used on the Westinghouse three pole transfer switch design. These design features make the Westinghouse four pole transfer switch a highly reliable device for complete protection against system switching transients and any possible ground fault conditions.



Service Entrance Transfer Switch 800 Amp (Option 18D)



Narrow Unit, 600 Amp (Option 22)



4 Pole Power Switching Panel 600 Amp

Transfer Switches
100-1000 Amperes

Special Applications

A. Use of Thermal Magnetic Circuit Breakers.

Increasing technology in fields such as hospital life-support systems, demand more reliable sources of power than have ever been required before. Power outages due to electrical storms, etc., cannot be tolerated.

Whenever emergency/standby power is generated there is always an engine generator, generator circuit protective device, automatic transfer switch, and probably a distribution switchboard. These items must be connected together in the manner shown in Figure 1, a total of five runs of bus duct or conduit and cables. If these items are physically separated from each other, the cost of interconnection can be appreciable.

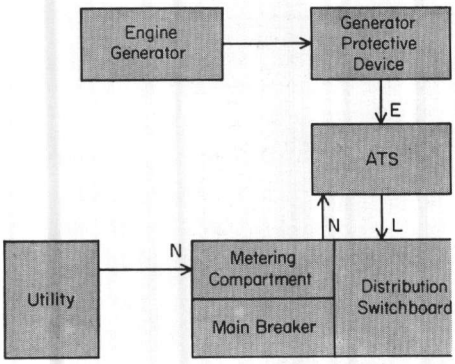


Figure 1

The greater the distance, the greater the cost. The engine generator, generator protective device, and ATS could be on the roof and the switchboard in the basement. Conceivably, the cost of interconnection could be the major factor in the selection of these items. A common method of reducing the cost of emergency/standby power installation is to incorporate the Automatic Transfer Switch into the distribution switchboard as shown in Figure 2. Thus only three interconnections are required, but the switchboard becomes larger by the amount of space taken by the Automatic Transfer Switch.

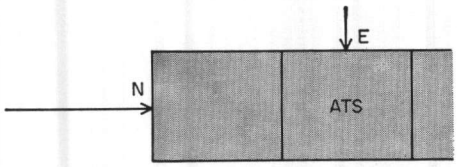


Figure 2

The versatility of circuit breakers can be most effectively utilized in Automatic Transfer Switch construction. The main in the distribution switchboard, if it is a breaker, can be physically placed in the Automatic Transfer Switch, reducing the number of interconnections from five to three and saving the space in the switchboard formerly required by the main as shown in Figure 3.

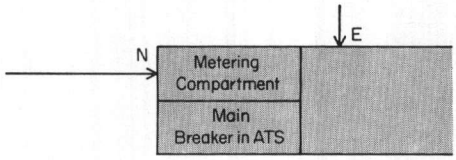


Figure 3

In many cases, the space required by the main is identical to the space required by the switch, and the best of both worlds can be realized, reduced interconnections and no increase in switchboard size. If the generator circuit protective device is a breaker and distances are proper, it can also be physically placed in the Automatic Transfer Switch thus achieving the ultimate in reduced interconnections and reduced switchboard space.

The versatility of circuit breakers can be effectively utilized even when an incoming distribution switchboard is not used. If the installation is that shown in Figure 4.

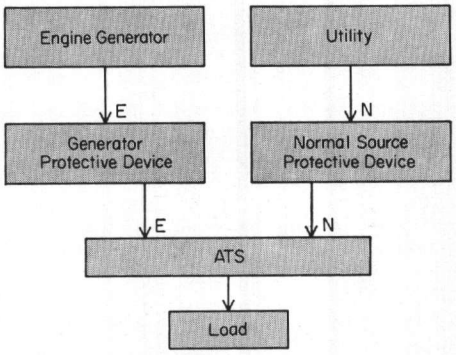


Figure 4

Two Protective Devices (generator & normal source) have to be provided, mounted and wired. All in all 5 interconnections are necessary. In many cases the protective devices can be mounted in the ATS as shown in Figure 5.

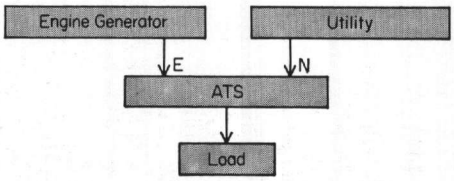


Figure 5

Thus the cost of interconnection has been reduced from 5 to 3. An additional saving is that it is not necessary to mount and wire the two protective devices.

If it is not possible to incorporate both protective devices in the ATS, either one or the other can be incorporated thus reducing the installed cost over that shown in Figure 4.

Refer to Option 11 for details on circuit breaker resetting and lockout.

B. Multiple Sources of Power

Automatic Transfer Switches can be connected in the following manner to provide continuous load service from more than two power sources, Figure 6.

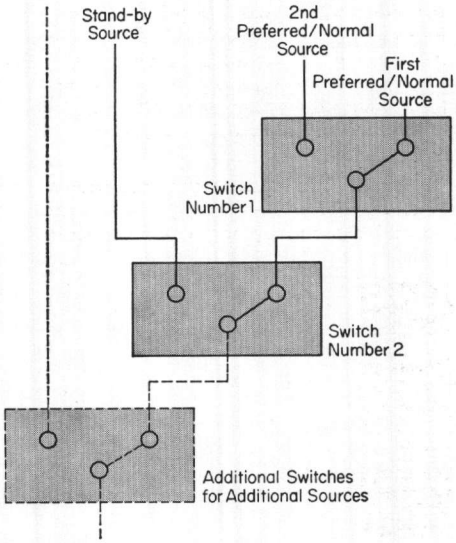


Figure 6

The operation is as follows:
Should the first preferred source fail, Automatic Transfer Switch 1 will transfer to the second preferred source, and Automatic Transfer Switch 2 will remain in the position it was in. Should the second preferred source fail, Automatic Transfer Switch 2 will transfer to the emergency source. Upon restoration of either preferred source, the transfer switches will seek that source. Various options can be incorporated into the Automatic Transfer Switches to provide time delays before the switches transfer, to override momentary power outages, or to allow stabilization of a power source before retransfer is made, etc. Standard transfer switches can be used without modification.

C. Uninterruptible Power Systems (UPS)

Where continuity of electric service cannot be interrupted for even a cycle duration, UPS is used. See Figure 7. UPS can be used in conjunction with standby power generation and an Automatic Transfer Switch as shown in the following figure in order to reduce the UPS battery requirement, reducing the total UPS system cost.

Transfer Switches
100-1000 Amperes

Special Applications, *Continued*

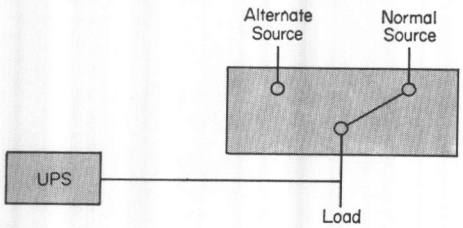


Figure 7

D. Area Protection
In many cases it is desired to monitor the voltage in more locations than at the ATS's line terminals, such as school corridors which are fed from a lighting panelboard and have the total emergency load connected to the ATS load circuit. Thus if any of the area's being monitored lose power, i.e. due to a lighting breaker tripping, the entire emergency circuit would be fed from the standby source even though the ATS normal voltage was still present. Monitoring is done by VSR's either individually mounted or several mounted in a single box whose contacts are connected so that the ATS is provided a NO contact when any relay fails. See Options 26D and E.

E. Non-Preferred Source
In many applications, both the primary source of power and the alternate source of power are utility supplied. The primary source (A) is utilized under normal operational conditions and the alternate utility source (B) only assumes the load when source (A) fails. Most utility rate structures incorporate minimum connect charges into their rate structures. When failure of source (A) requires switching to the source (B) power supply, it becomes economically desirable to remain connected to this alternate source for an extended length of time in order to make most efficient use of this minimum connect rate structure. By incorporating a non-preferred source design to the ATS, the load will remain indefinitely connected to source (B) regardless of the condition of the primary source (A) until retransfer to (A) is accomplished by means of pushbutton or similar manual controls. However, should source (B) fail, the switch will automatically retransfer to source (A) if available. This special application provides complete protection against loss of power to critical loads while allowing considerable savings on utility costs.

F. Customized Engine Control Contacts
Westinghouse Automatic Transfer Switches provide a normally closed (closed when normal source fails) engine start contact as a standard feature. This contact configuration is sufficient in most engine start applications. The rather extensive number of engine generator manufacturers and their varied products often require different control contacts for automatic starting/stopping of their specific equipment. Three wire engine control circuits or other special contact arrangements are easily incorporated into the Westinghouse ATS. Contact Westinghouse should special engine control contacts be necessary.

G. Shunt Trips
It is sometimes desirable and often necessary to instantaneously disconnect a critical load from its power source without reconnecting it to the alternate power supply until that source is stable enough to assume the load. An example of such an application would be when a time delay for engine starting is required to avoid nuisance starting of the engine while the load consists of large motors or compressors. Phase failure or extended periods of low voltage on any phase of such loads can often cause damage to expensive equipment. Positioning of the ATS contacts in a "neutral" position is not possible with many contactor type design automatic transfer switches which typically utilize single solenoid transfer mechanisms. The Westinghouse ATS can be supplied with shunt trips in one or both breakers which when energized instantaneously trip the breaker and place the ATS in the neutral position. In the above described example, the TDES function could be accomplished without fear of damaging critical equipment as a result of remaining connected to a sub-standard power supply. Control voltage for operating the shunt trips can be obtained from a separate feeder circuit (120VAC) or directly from the existing generator set battery (12VDC or 24VDC). Shunt trips are also valuable control elements when used with externally supplied monitoring devices such as energy monitoring systems, phase imbalance relays, etc.

H. Signals to Peripheral Equipment
The Westinghouse ATS can be modified to provide signals to peripheral equipment such as elevator controllers, motors, remote alarm devices, etc., prior to transferring load circuits. Such signalling is now required in many building codes where elevator equipment is installed. Advance signalling allows the elevator to stop at floor levels before momentary power interruption occurs during the transfer period (See option 35, page 11).

I. Load Shedding
During periods of operation on emergency power sources, it is often desirable to shed non-essential loads which would tend to overload the generator. The Westinghouse ATS can be modified to accommodate customer supplied signalling for shedding of such non-essential loads or our equipment can be designed to perform this function exclusive of external monitoring. This load shedding function can also be used to drop selected loads in cases of failure of a single generator in a multiple synchronized generator system.

J. Load Sequencing
When transferring mixed loads from utility power to emergency generator power, it is critical that the generator is capable of assuming the load. It may be necessary to restart and assume the loads of various types of equipment on a sequential basis. The sequential picking up of loads is usually based on the significance of each specific load (life safety, primary lighting, and etc.). This sequencing function may be necessary to avoid excessive inrush current associated with total and immediate load assumption. Such large inrush currents can result in generator failure requiring difficult, and many times futile, restarting efforts. The Westinghouse ATS can be supplied with appropriate controls to accomplish sequential time delayed startup of equipment when transferring the load to either source. This special modification insures that all loads are brought on line in a safe, efficient manner without undue overloading of the generator.

K. Peak Shaving
Due to the constantly increasing cost of utility power, many industrial facilities are incorporating energy management systems into their electrical distribution equipment. The purpose of such systems is to constantly monitor the use of utility power in an effort to ascertain the most cost efficient usage of such energy. The Westinghouse ATS has been used as a critical component of such energy management systems by providing timely switching functions to alternative power sources thus reducing utility peak demand charges.

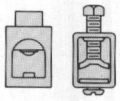
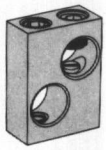
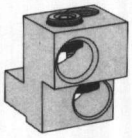
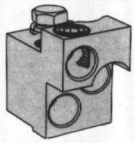
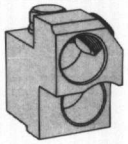
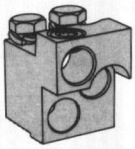
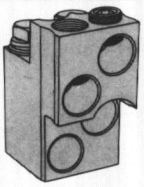
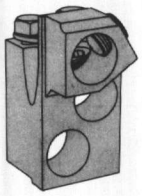
L. Other
The flexible design of the Westinghouse ATS lends itself to an inexhaustible number of special applications. Other applications include special enclosure modifications, special monitoring and instrumentation, bus tie systems, and special paint schemes. For any special application for an automatic transfer switch, do not hesitate to contact Westinghouse.

Transfer Switches
100-1000 Amperes

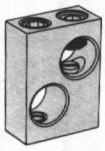
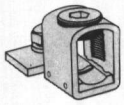
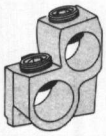
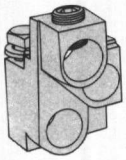
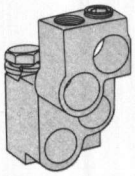
Wiring Terminal Data

Terminals listed as "standard" are included with the switches listed on pages 3, 4. Optional terminals are available, but must be specified.

Standard Terminals ©

Switch Rating, Amps	Option	Aluminum Terminal	Wire Range	No. of Cables	Type of Conductor
100	Standard		#6-1/0	1	Cu/Al
150, 225	Standard		#6-350 MCM or #4-350 MCM	1 1	Cu/Al
400	Standard		250-500 MCM	2	Cu/Al
400	Optional		3/0-300 MCM	2	Cu/Al
600	Standard		#1-500 MCM	2	Cu/Al
600	Optional		3/0-400 MCM	3	Cu/Al
600	Optional		500-750 MCM	2	Cu/Al
800 1000	Standard ©		3/0-400 MCM	3 3	Cu/Al
800 1000	Optional ©		4/0-500 MCM	4 4	Cu/Al
800 1000	Optional ©		500-750 MCM	3 3	Cu/Al

Optional Terminals ©

Switch Rating, Amps	Option	Copper Terminal	Wire Range	No. of Cables	Type of Conductor
150, 225	Option 21A		#6-350 MCM	1	Cu
400	Option 21A		250-500 MCM	2	Cu
600	Optional		#1-600 MCM	1	Cu
600	Option 21A		2/0-500 MCM	2	Cu
600	Optional		3/0-300 MCM	3	Cu
800 1000	Option 21A ©		3/0-500 MCM	3 3	Cu
800 1000	Optional ©		3/0-400 MCM	4 4	Cu

© Changed or added since previous issue.

Transfer Switches
100-1000 Amperes

Dimensions and Weights①②④Ⓒ
Not to be used for construction purposes unless approved.

Open and Enclosed Switches

Switch Amps.	Open Switches										Enclosed Switches									
	Breaker Panel								Approx. Ship. Wt.										Approx. Ship. Wt.	
	Height		Width				Depth				Height		Width				Depth			
			2, 3 Poles		4 Poles								2, 3 Poles		4 Poles					
	In.	mm.	In.	mm.	In.	mm.	In.	mm.	Lbs.	Kg.	In.	mm.	In.	mm.	In.	mm.	In.	mm.	Lbs.	Kg.
Automatic Switches																				
100	11	279	17	432	17	432	6 11/16	170	91	41	44½	1130	27	686	27	686	9 7/16	240	225	102
150, 225	14⅝	371	29¾	756	35¼	895	12 23/32	323	267	121	53½	1359	38	965	43½	1105	15¼	387	450	205
400	14⅝	371	29¾	756	35¼	895	13 27/32	352	306	139	53½	1359	38	965	43½	1105	15¼	387	475	216
600	19	483	29¾	756	35¼	895	13 31/32	353	332	151	63½	1613	38	965	43½	1105	16¾	425	540	245
800-1000	19	483	29¾	756	35¼	895	15 3/32	383	390	177	63½	1613	38	965	43½	1105	16¾	425	575	261
Basic Switches																				
100	11	279	17	432	17	432	6 11/16	170	26	12	44½	1130	27	686	27	686	9 7/16	240	170	77
150, 225	14⅝	371	29¾	756	35¼	895	12 23/32	323	202	92	53½	1359	38	965	43½	1105	15¼	387	295	134
400	14⅝	371	29¾	756	35¼	895	13 27/32	352	241	109	53½	1359	38	965	43½	1105	15¼	387	330	150
600	19	483	29¾	756	35¼	895	13 31/32	353	267	121	63½	1613	38	965	43½	1105	16¾	425	420	191
800-1000	19	483	29¾	756	35¼	895	15 3/32	383	325	147	63½	1613	38	965	43½	1105	16¾	425	445	202
Manual Single Handle Switches																				
100	11	279	17	432	17	432	6 3/16	157	17	8	17½	445	27	686	27	686	9 7/16	240	150	68
150, 225	14⅝	371	29¾	756	35¼	895	12 23/32	323	169	77	34¼	870	38	965	43½	1105	15¼	387	275	125
400	14⅝	371	29¾	756	35¼	895	13 27/32	352	208	94	34¼	870	38	965	43½	1105	15¼	387	310	141
600	19	483	29¾	756	35¼	895	13 31/32	353	234	106	47⅝	1210	38	965	43½	1105	16¾	425	400	182
800-1000	19	483	29¾	756	35¼	895	15 3/32	383	293	133	47⅝	1210	38	965	43½	1105	16¾	425	425	193
Manual Dual Handle Switches																				
100	11	279	17	432	17	432	5 29/32	151	20	9	17½	445	27	686	27	686	9 7/16	240	120	55
150, 225	14⅝	371	29¾	756	35¼	895	8 17/32	217	156	71	34¼	870	38	965	43½	1105	15¼	387	245	111
400	14⅝	371	29¾	756	35¼	895	9 3/16	233	195	88	34¼	870	38	965	43½	1105	15¼	387	280	127
600	19	483	29¾	756	35¼	895	9 25/32	248	221	100	47⅝	1210	38	965	43½	1105	16¾	425	370	168
800-1000	19	483	29¾	756	35¼	895	10 29/32	277	280	127	47⅝	1210	38	965	43½	1105	16¾	425	395	180

Control Logic Panel③

Dimensions						Approx. Ship. Wt.	
Height		Width		Depth			
In.	mm.	In.	mm.	In.	mm.	Lbs.	Kg.
26	660	21	533	7	178	60	27

① Dimensions and weights listed are for standard switches (no options). Certain options may affect both dimensions and weights.
② Dimensions in both inches and millimeters; weights shown in pounds and kilograms.
③ Control panel dimensions must be added to breaker panel on open automatic switches for total dimensions.
④ See Dimension Sheet 29-970 for detailed dimensions.
Ⓒ Changed or added since previous issue.

Transfer Switches
100-1000 Amperes

Transfer Switch Ratings

A. Transfer Switch Interrupting, Closing and Withstand Ratings.

1. For standard catalog number ATS, MTS or BTS switches. (High Magnetic Trip Breakers), or standard catalog numbered switches with Option 16A (Thermal Magnetic Breakers), and Option 16D (SELTRONIC Breakers).

Switch Rating, Amperes	Interrupting, Closing and Withstand Rating, Amps.					
	120, 208, 240 Volts Ac		480 Volts Ac		600 Volts Ac	
	Asym.	Sym.	Asym.	Sym.	Asym.	Sym.
100 (600 V. Max.)	20,000	18,000	15,000	14,000	15,000	14,000
150, 225	30,000	25,000	25,000	22,000	25,000	22,000
400	50,000	42,000	35,000	30,000	25,000	22,000
600	50,000	42,000	35,000	30,000	25,000	22,000
800	50,000	42,000	35,000	30,000	25,000	22,000
1000	50,000	42,000	35,000	30,000	25,000	22,000

2. Standard catalog numbered ATS, BTS or MTS switches with Option 17A (Mark 75® Breakers), Option 17B (Seltronic Mark 75 breakers).

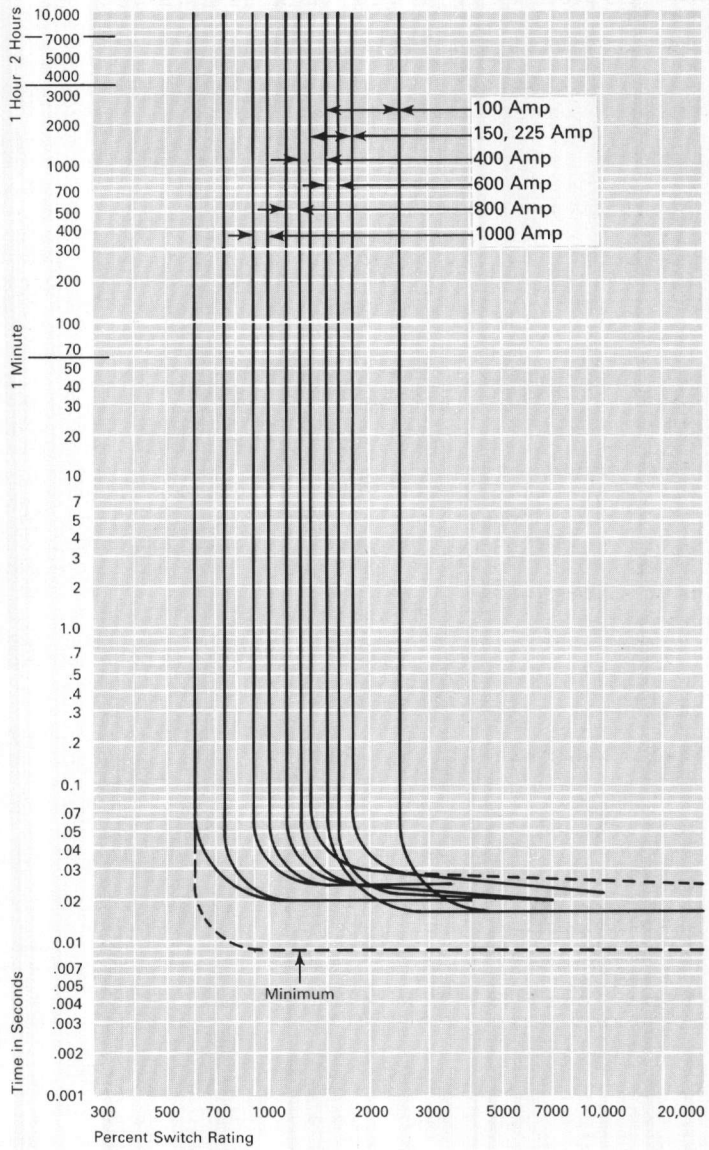
Switch Rating, Amperes	Interrupting, Closing and Withstand Rating, Amps.					
	120, 208, 240 Volts Ac		480 Volts Ac		600 Volts Ac	
	Asym.	Sym.	Asym.	Sym.	Asym.	Sym.
Standard MARK 75 Breakers						
100	75,000	65,000	30,000	25,000	20,000	18,000
150 thru 1000	75,000	65,000	40,000	35,000	30,000	25,000
SELTRONIC™ MARK 75 Breakers						
300 thru 600	75,000	65,000	40,000	35,000	30,000	25,000
600 thru 1000	75,000	65,000	58,000	50,000	30,000	25,000

Table 1: Withstand Current Ratings When Used With Type J, RK1, L Current Limiting Fuses.

Available Symmetrical Amperes RMS at 480 Volts Ac

Switch Rating	Withstand Current Rating	Maximum Fuse Size (Amps)
100	200,000	200
150	200,000	400
225	200,000	400
400	200,000	600
600	200,000	800
800	200,000	1000
1000	200,000	1600

B. High Instantaneous Trip Curve.



Further Information

Prices: Price List 29-920
Dimensions: DS 29-970
1200-4000 Amp. Switches: TD 29-927

Transfer Switches
100-1000 Amperes

Automatic Transfer Switch Typical Specification

1.0 General
Furnish and install where indicated an Automatic Transfer Switch having the ratings, options, enclosures, etc. indicated on the drawings or noted herein. The automatic transfer switch shall be fully rated to protect all types of loads, inductive and resistive, from loss of continuity of power, without derating, either open or enclosed.

The transfer switch shall automatically transfer its load circuit to an emergency or alternate power source upon failure of its normal or preferred source.

The transfer switch shall provide complete protection with field adjustable solid state voltage sensing logic to monitor each phase of the normal power supply. The close differential adjustment shall be factory set to drop out when the monitored voltage drops below 70% of normal and initiate load transfer when the alternate stand-by source becomes available. Upon restoration of the normal source to a pickup level of 90%, the logic shall initiate automatic re-transfer of the load circuits to the normal power source. The transfer switch shall obtain its operating current from the source to which the load is being transferred.

The transfer switch shall have withstand, closing and interrupting ratings sufficient for voltage of the system and the available short circuit at the point of application on the drawings.

2.0 Construction
The transfer switch shall be a device utilizing fully enclosed contact assemblies. These contacts shall be mechanically interlocked and operated by a transfer mechanism to provide double-throw switching action.

The transfer mechanism shall be electrically operated by a single unidirectional gearmotor/train with all parts in positive contact at all times. The mechanically held transfer mechanism shall be energized only momentarily during transfer. The switch shall be capable of being operated manually under load and shall have suitable provisions for readily disengaging the gearmotor when necessary. The transfer switch shall be mechanically and electrically interlocked so that a neutral position shall not be possible when under electrical operation unless a time delay neutral option is required.

It shall not be possible for load circuits to be connected to normal and alternate sources simultaneously, regardless of whether the switch is electrically or manually operated. The switch shall have a manual neutral position for load circuit maintenance. A transfer switch position indicator shall be visible from the front to show to which source the switch is connected.

The logic circuit shall utilize solid state components mounted on printed circuit boards to accomplish proper operation, wherever practical, to accomplish functions such as timing, voltage, and frequency monitoring. LED's shall be furnished to indicate the operation of each function furnished. Construction shall be such that functions are individually replaceable without requiring replacement of the complete solid state package. Plug-in modifications shall be available for field installation while retaining the UL label.

The transfer switch shall be suitable for operation on any voltage from 208 through 600 volts Ac, 50 or 60 Hertz, by placing the voltage selection plug in the desired position. Covers shall be used to block off the unused positions.

A hand held test kit shall be provided for field test and calibration of all plug-in timing and monitoring cards, as well as the output relays from the solid state logic.

All pilot devices and relays shall be of the industrial type rated 10 amperes with self-cleaning contacts.

The transfer switch and options (where permissible) shall be Underwriter's Laboratories, Inc. listed per Standard 1008.

Transfer switches and options shall be Type ATS as manufactured by the Westinghouse Electric Corporation.

Westinghouse Electric Corporation
Distribution and Control Business Unit
Commercial Division – Components
London, Kentucky 40741

Printed in U.S.A.

June, 1986

9 LIGHT NFPA 76A COMPATIBLE REMOTE ANNUNCIATOR

Unit consists of 9 specifically labeled fault and status points. A built in battery voltage detector detects battery charger malfunction via either a high or low voltage condition measured at the annunciator. Lamp test and alarm silence are included. The system uses "ringback" type detection circuitry.

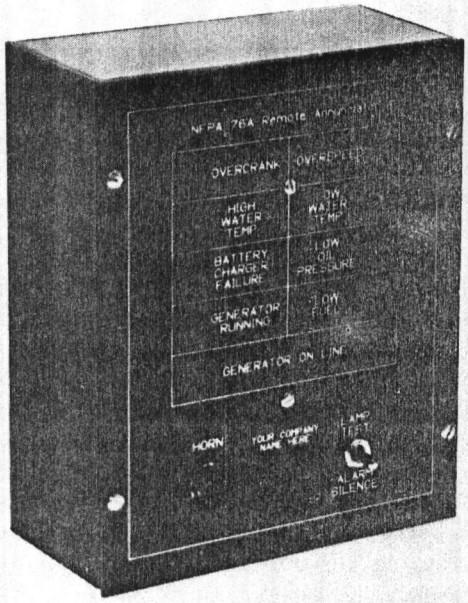
ECU-400

VERSIONS FOR 12, 24 AND 32 VDC

APPLICATIONS: Hospital required remote engine generator annunciator

FEATURES:

- Audible and visual signal for incoming fault lines
- Status only for generator on line and generator running
- Lamp test
- Alarm silence
- Wall mount or flush mount available
- All electronics are epoxy encapsulated for high reliability
- Totally compatible with other ECU components such as ECU-100 or ECU-500 generator control panels



ECU-400 . . . A COMPLETE NFPA-76A ANNUNCIATOR FOR HOSPITAL USE

A necessary part of any hospital standby system or similar application the ECU-400 fills the need of the remote annunciator. The unit is set up to accept OVERCRANK, OVERSPEED, LOW WATER TEMPERATURE, HIGH WATER TEMPERATURE, LOW OIL PRESSURE and LOW FUEL LEVEL and give both a light and horn indication of the malfunction.

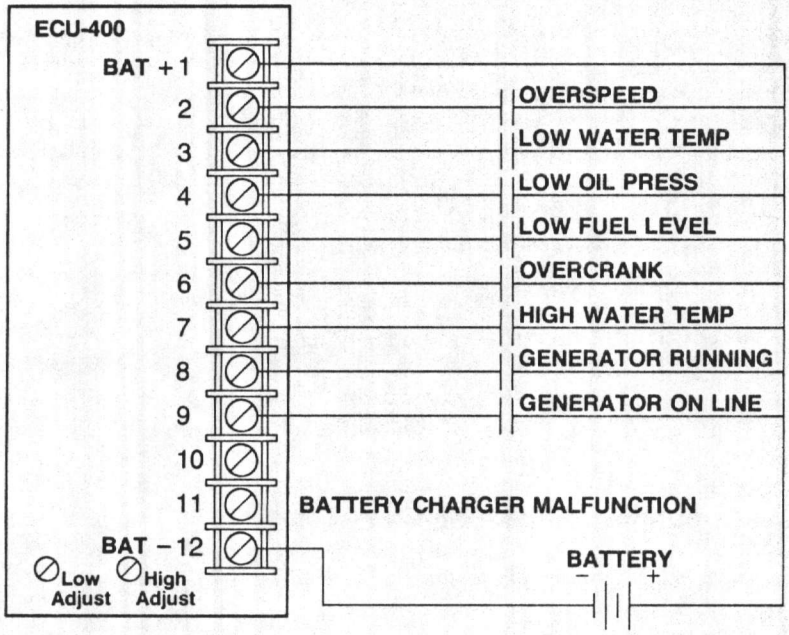
In addition a built-in adjustable battery voltage detector can be used to signify battery charger failure via voltage limits being exceeded.

Two status only lamps are provided for GENERATOR CARRYING LOAD and GENERATOR RUNNING thus allowing monitoring of "go" conditions.

Lamp test and Alarm silence is provided for both testing of the local lamps and silencing the horn during fault.

ENGINEERING CONCEPTS UNLIMITED, INC.
P.O. Box 11367 • 4000 E. 16th St. • Indianapolis, IN 46201 • 317-359-9063

SAMPLE ECU-400 APPLICATION: STANDARD ANNUNCIATOR CONNECTION



This example shows the required hook-up for generator set annunciation. In operation if either the OVERSPEED, LOW WATER TEMP, LOW OIL PRESSURE, LOW FUEL LEVEL, OVERCRANK or HIGH WATER TEMPERATURE switches close the appropriate lamp will light and the horn will sound. The horn may be silenced and if another fault occurs the respective lamp will light and the horn will again sound. This is a characteristic of the "ringback" style of annuncation assuring all faults will sound the horn.

If either the GENERATOR RUNNING or GENERATOR ON LINE switches close the respective lamp will light but no horn will sound.

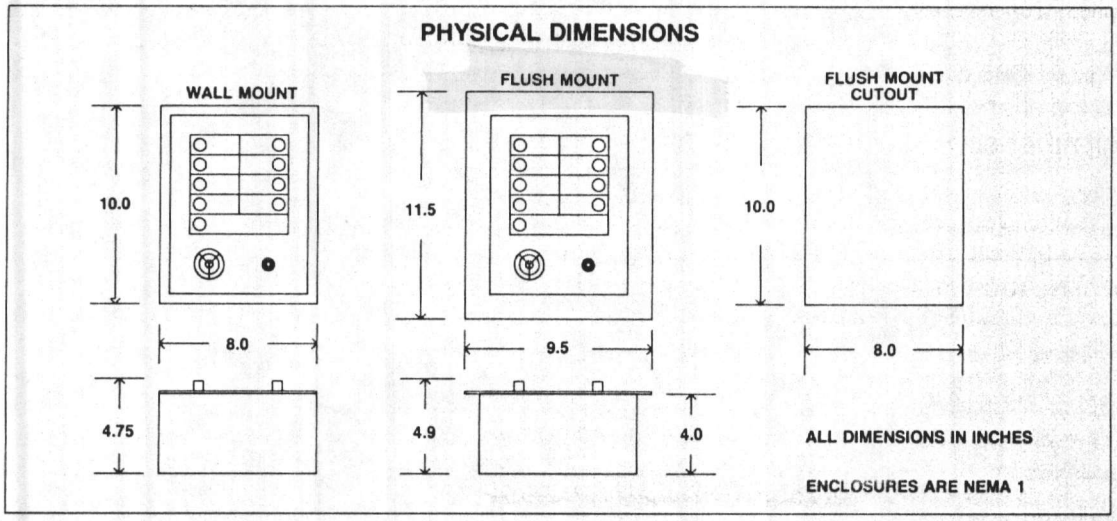
The ECU-400 has a built in HI-LO battery detector circuit. It's outputs are attached to terminal 11. If external battery maulfunction contacts are desired for detection remove the wires from terminal 11 and wire the external switch to terminal 11.

To adjust the voltage trip (they are pre-adjusted at the factory but may be re-adjusted if necessary) turn both adjustments fully counter-clockwise. Place the high trip voltage on the battery inputs and turn the high adjust clockwise until the battery charger malfunction just lights. Now place the desired low trip voltage on the battery inputs and turn the low adjust clockwise until the battery charger malfunction lamp just lights. The unit is now set for regular operation.

SPECIFICATIONS: 25% MAX DC OVERVOLTAGE

INPUT SIGNAL LOAD .2 A

TRIP POINTS	LOW TRIP: 9	HIGH TRIP:15	FOR 12 VDC
	LOW TRIP:19	HIGH TRIP:30	FOR 24 VDC
	LOW TRIP:27	HIGH TRIP:36	FOR 32 VDC



ORDERING INFORMATION:
Order by specifying:

WALL MOUNT	FLUSH MOUNT
ECU-400-12-W for 12 VDC	ECU-400-12-F for 12 VDC
ECU-400-24-W for 24 VDC	ECU-400-24-F for 24 VDC
ECU-400-32-W for 32 VDC	ECU-400-32-F for 32 VDC

Contact ECU about OEM customer labeling and other legend assignments. Also available in a High and Low voltage 10 lamp version.

TAB PLACEMENT HERE

DESCRIPTION:

15 KW

☑ Tab page did not contain hand written information

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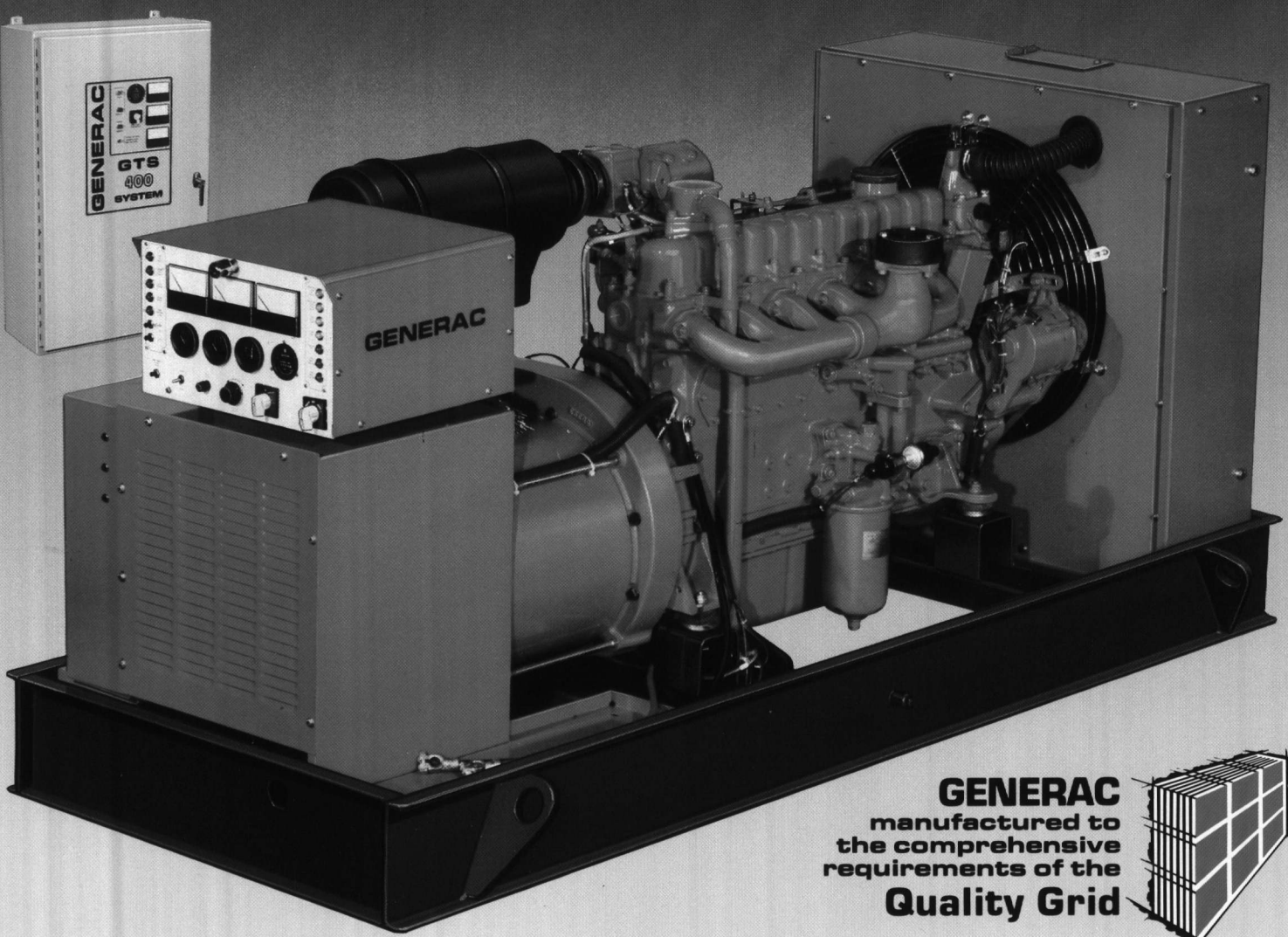
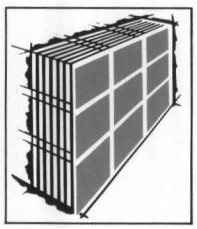
GENERAC CONTINUOUS STANDBY POWER SYSTEMS



GENERAC
manufactured to the comprehensive requirements of the
Quality Grid

GENERAC manufactured



Quality isn't accidental. It is part of a plan, placed into the system at every stage. Quality can only be accomplished to such a degree by a single source generator manufacturer. That's why GENERAC was able to develop the Quality Grid. No assembler can exercise such rigorous and thorough quality control. No competitor does. This concern with quality dominates every area and activity at GENERAC.

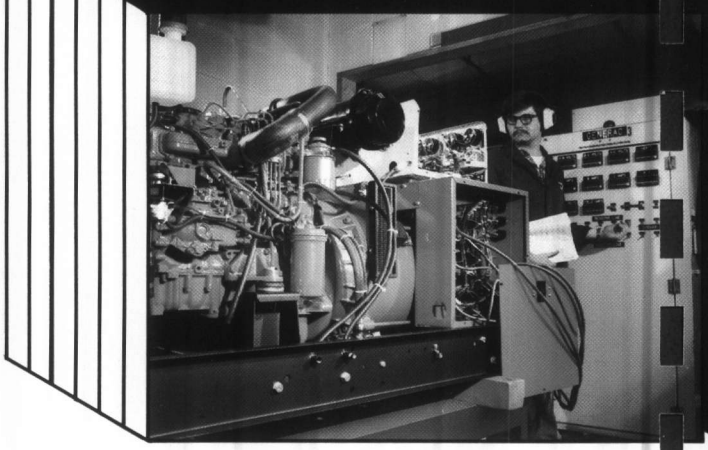
Why do we so fully subscribe to quality attitudes and practices? The answer is quite simple: *It gives us a better product.* Any assembler can put a generator together with the goal of getting it to work. A manufacturer that brings prototypes to compliance may not hold to the highest standards when building production models. That's not good enough for GENERAC. Power systems are our only business and we insist *ours* excel. As a complete manufacturer, we set higher quality standards than the industry requires and make certain every system meets them.

PROTOTYPE TESTING +
guarantees the promised performance

All GENERAC designs must pass all the tests and meet or exceed all of the industry standards before being accepted for full production. Our total commitment to quality involves component testing, reliability testing, environmental testing, destruction and life testing, plus testing to applicable Military, CSA, NEMA, EGSA standards and our own set of tough exclusive criteria. In addition to testing the prototype, each system we produce is tested for conformance prior to its delivery to the customer. We record and keep these results on every unit as part of our Quality Grid program.

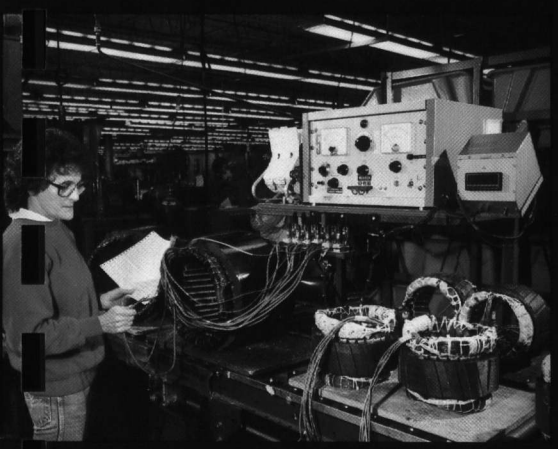
- During prototype testing, GENERAC systems are thoroughly checked for motor starting ability by measuring the voltage dip with an oscilloscope.
- GENERAC systems incorporate "Thermal Overload Protection" and there are optional "Main Line Circuit Breakers" capable of handling the full output capacity available. All protection systems are fully tested in the prototype stage to provide a reliable safeguard against overload damage.
- All models are short circuit tested. All 3Ø models pass three phase symmetrical short circuit testing during the prototype testing phase of design, to assure system protection and reliability.
- All GENERAC systems meet temperature rise standards for class "F" insulation as defined by NEMA MG1-22.40 and NEMA MG1-1.65. The rotor and stator and other insulation is impregnated twice with a class "F" varnish and conforms to MIL-1-24092, Type "M" Class 155. End coils are protected with a high strength epoxy.
- The voltage waveform deviation, total harmonic content of the "AC" waveform and T.I.F. (Telephone Influence Factor), have been tested and found to be within acceptable standards in accordance with NEMA MG1-22.
- System torsional acceptability is confirmed during prototype testing.

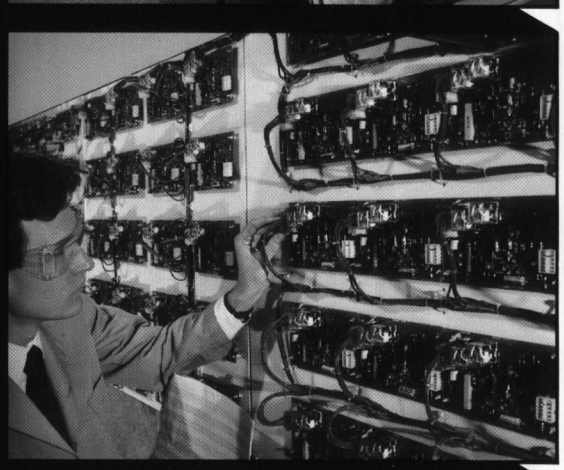
The key to performance in the field is the care taken in the factory.



means quality throughout

The Quality Grid: a comprehensive method of insuring quality in the finished product. We control the quality of each component and procedure in the entire cycle: design, prototype testing, post production, field testing, and service.





Engineering Design
GENERAC's motto, "Improving power by design," comes to life here. Because we create a complete standby system — engine, alternator, controls, transfer switches — and control its manufacture, we can achieve truly integrated, dependable operation and the utmost quality throughout.

Product Support Center
We are the first in our business to establish a specially equipped information communications center to speed accurate specification data to customers as well as quotations on bid projects.

Computer Control Center
We employ the very latest EDP hardware to assist our factory planning, scheduling and manufacturing control. All items from raw material to end products in inventory, all orders from entry to shipping, all costs, etc. are tracked and managed to maximize efficiency, service and quality.

Tri-axial Precision Measurement
This Hansford computer-controlled machine enables us to engineer and manufacture to the tightest tolerances.

High Voltage Component Testing
In this important quality control step, we check our rotors and stators for high voltage operation. Like all other key components, we make sure they are functioning properly ***before*** *they go into our standby systems.*

Solid-State Failure Testing
Using burn-in procedures, we subject all solid-state components to a minimum of 24-48 hours under cyclic overload conditions. This quality control procedure virtually eliminates "sleeping sickness" in the final product.

Final Testing
All of our standby generators are fully tested for several hours before they leave our plant.

Prototype Testing
Of the many testing regimens we apply to our products, this one is critical to each new and improved design. By setting a repeatable standard with our prototype, we can assure a consistent reliability that cannot be duplicated with "one of a kind" assembled generator sets.

Environmental Testing
Because of their critical role in installations world-wide, our systems get "baked, boiled, and frozen" under real and simulated ambient temperature extremes. Then we know they'll perform in all applications and locations.

Where dependability counts,

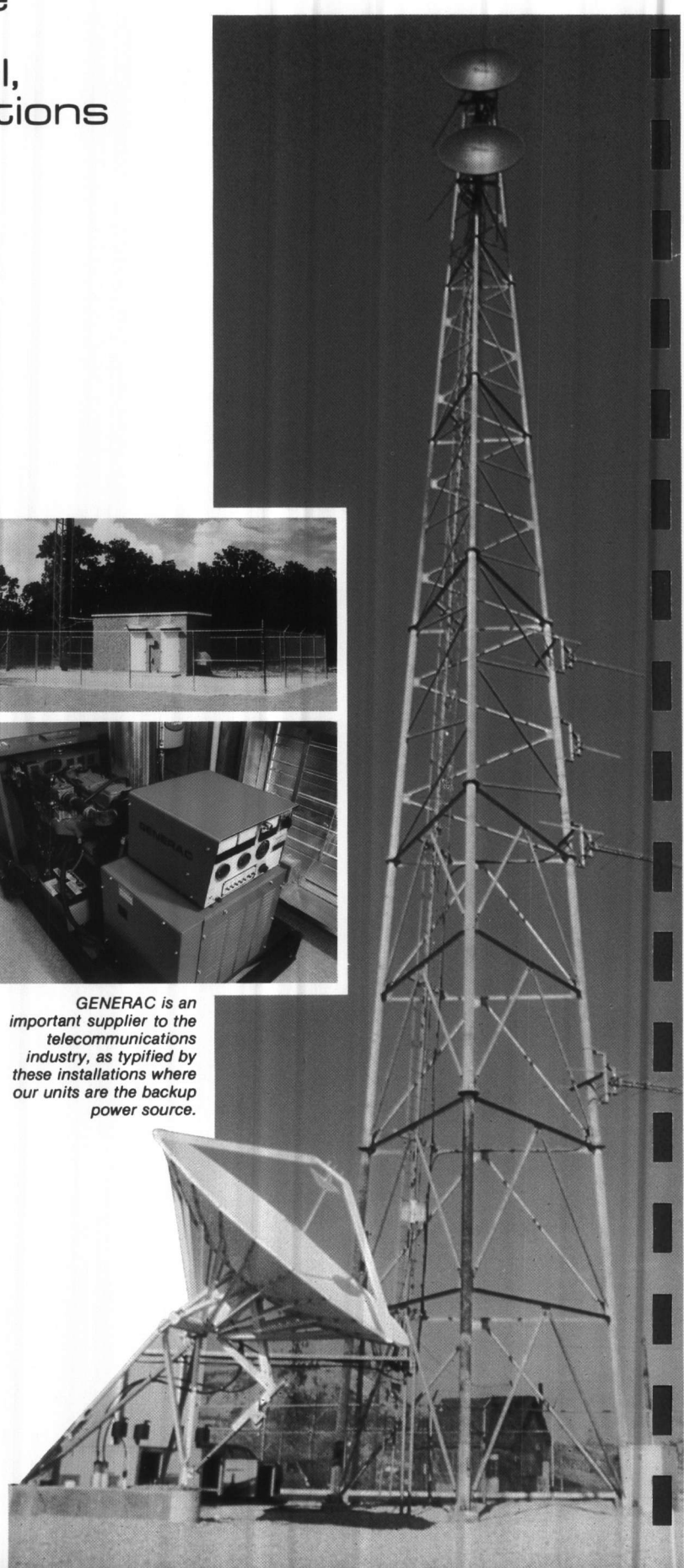
GENERAC protects the power supply to vital military, civil, commercial, medical and communications installations from coast to coast.

The clearest testimony on behalf of any product is its user acceptance. Our customers include:
• major metropolitan fire and police departments • U.S. military bases • nationally famous hotel and motel chains • supermarket outlets • telephone networks • cable television centers • department stores and other retail outlets • hospitals and nursing homes • civil defense facilities • schools and universities • office buildings • banks and other financial institutions • factories • radio and TV stations • data processing centers • restaurants and resorts • printing plants • security company central stations

Total responsibility that doesn't stop at delivery

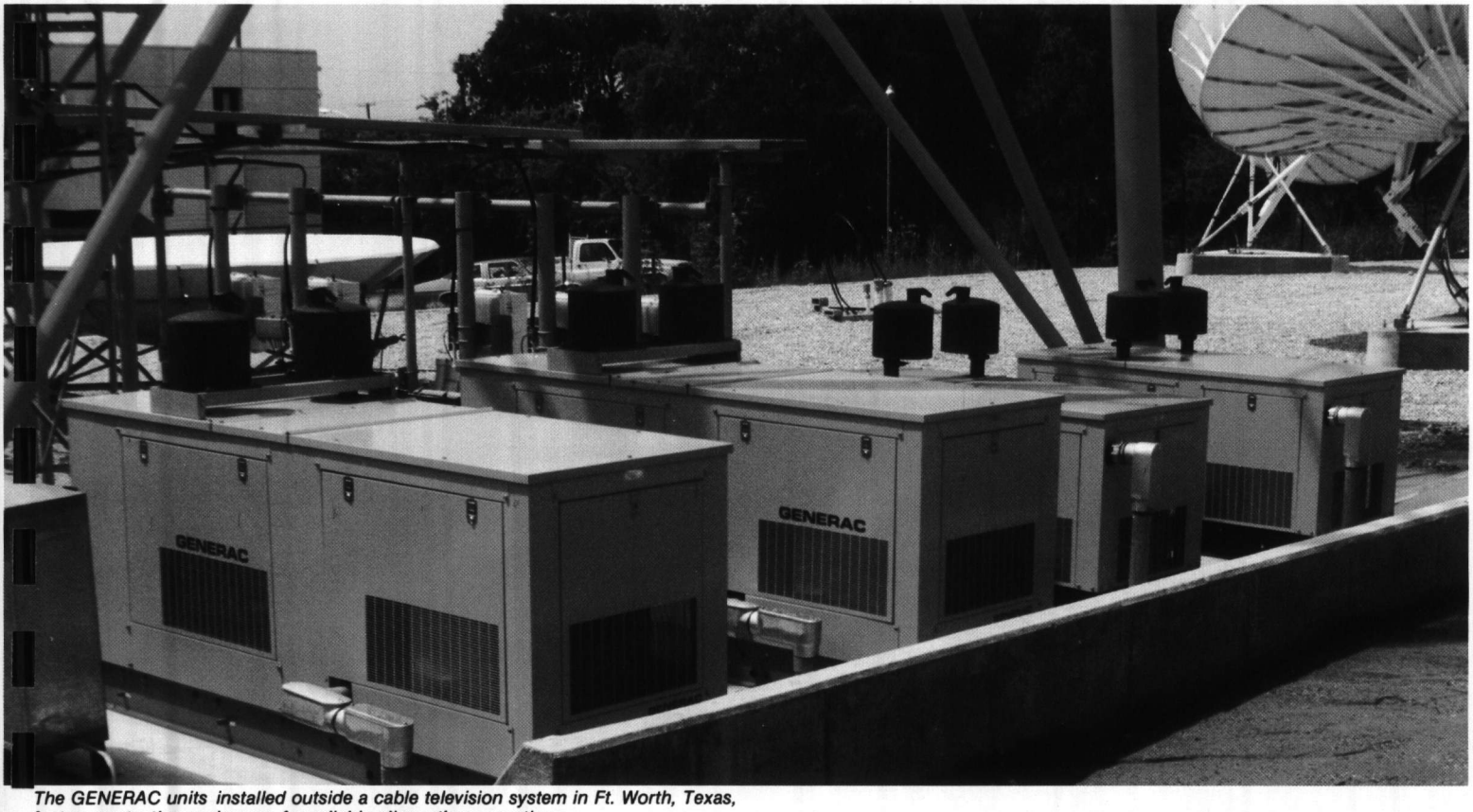
People count on GENERAC for more than just dependable generators. We provide the complete envelope of professional services that makes it easy to apply, buy and maintain a GENERAC system.

- Application Engineering Experts on call
- Complete and Detailed Specifications to fulfill your requirements
- GENERAC's Product Support Center, for fastest response to your information and quotation requests
- "Turn Key" Continuous Standby Power Systems to match your need
- Installation Management and Consultation available on the spot
- Start-Up and Training Assistance to start you off right
- Preventive Maintenance and Service Programs to keep everything in perfect readiness

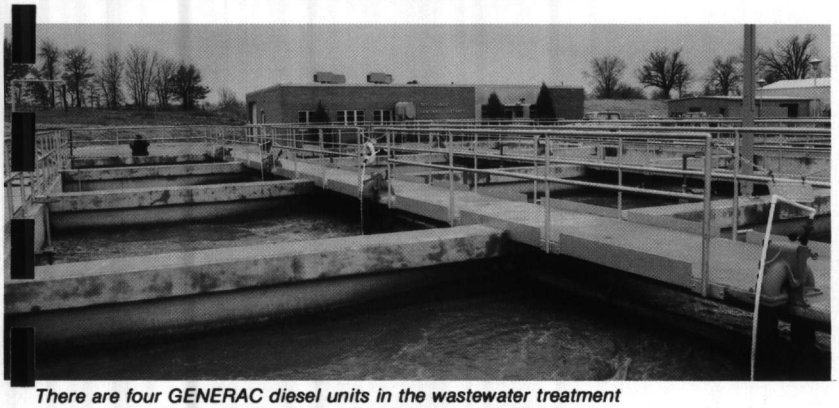


GENERAC is an important supplier to the telecommunications industry, as typified by these installations where our units are the backup power source.

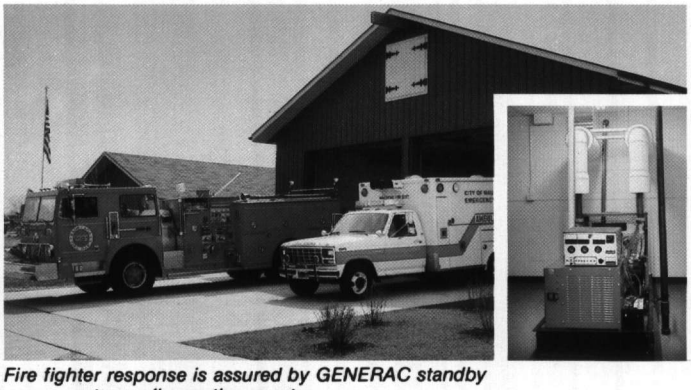
people count on GENERAC



The GENERAC units installed outside a cable television system in Ft. Worth, Texas, feature protective enclosures for reliable all-weather operation.

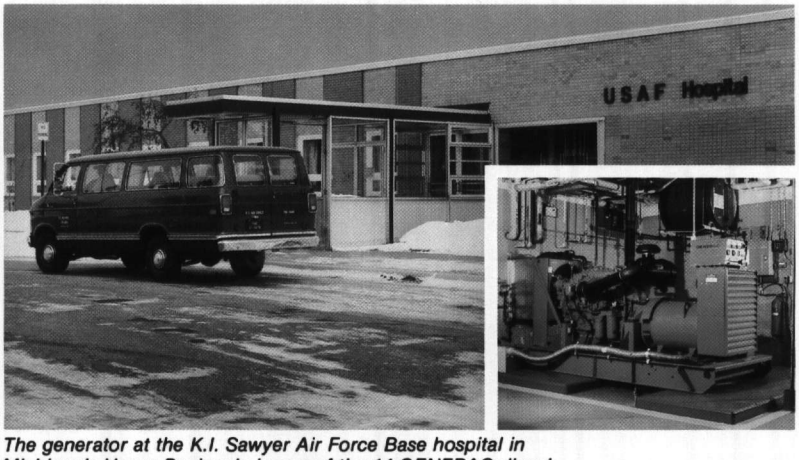


There are four GENERAC diesel units in the wastewater treatment facility of the Taylorville Sanitation District in central Illinois.



Fire fighter response is assured by GENERAC standby power systems all over the country.

BI-LO Foods supermarkets in Greenville, South Carolina have GENERAC standby units to keep checkout scanners, lights and refrigeration systems working during a power outage.



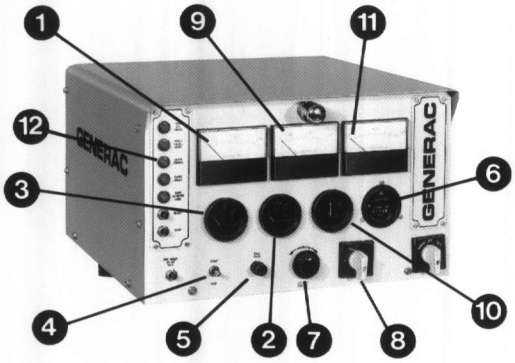
The generator at the K.I. Sawyer Air Force Base hospital in Michigan's Upper Peninsula is one of the 14 GENERAC diesel units on duty at key locations around the base.

GENERAC: more standard

25 years — a generation of improving power by design

Sound, but creative, engineering continues to be the hallmark of GENERAC's power products. We consider true value, that best blend of price and overall performance, to be our most important goal. Toward that end, we have made our *basic* system the most complete in the industry by making more features standard . . . including the most advanced. Others commonly make these features options at extra cost, when they're available at all. The bottom line result is the best operational performance from a GENERAC system at the price of less capable competitive models.

We invite you to look beneath the surface of our claims and those of our competitors to make a very tough-minded comparison of features, cost, track record and service. You will be comfortable selecting GENERAC.



1 **AC VOLTMETER** reads line-to-line output voltage.

2 **OIL PRESSURE GAUGE** provides a constant monitor on the engine's oil pressure.

3 **COOLANT TEMPERATURE GAUGE** provides a constant monitor on the engine's coolant temperature.

4 **MANUAL START-RUN-STOP SWITCH**

5 **30 AMP PANEL FUSE** protects the control circuits from overload damage.

6 **HOURMETER** records actual engine running time.

7 **VOLTAGE ADJUST RHEOSTAT** allows the operator to fine tune the line-to-line or leg-to-leg voltage.

8 **PHASE SELECTOR SWITCH** allows the operator to monitor the "AC" current and voltage of any line or Leg Load. It works in conjunction with the "AC" voltmeter and ammeter.

9 **AC AMMETER** provides current read-out on any phase of the system.

10 **DC BATTERY CHARGE AMMETER** provides a constant monitor on the battery charge current from the engine alternator during continuous standby operation.

11 **FREQUENCY METER** provides a constant monitor on the "AC" output frequency.

12 **OPTIONAL ENGINE MONITOR SYSTEMS** Automatic (Electric) Start — Low Oil Pressure Indicator Light — High Coolant Temperature, Low Coolant Level Indicator Light — Overcrank Indicator Light — Overspeed Indicator Light — RPM (Overspeed) Sensor Loss Indicator Light. Not In Auto Indicator Light.

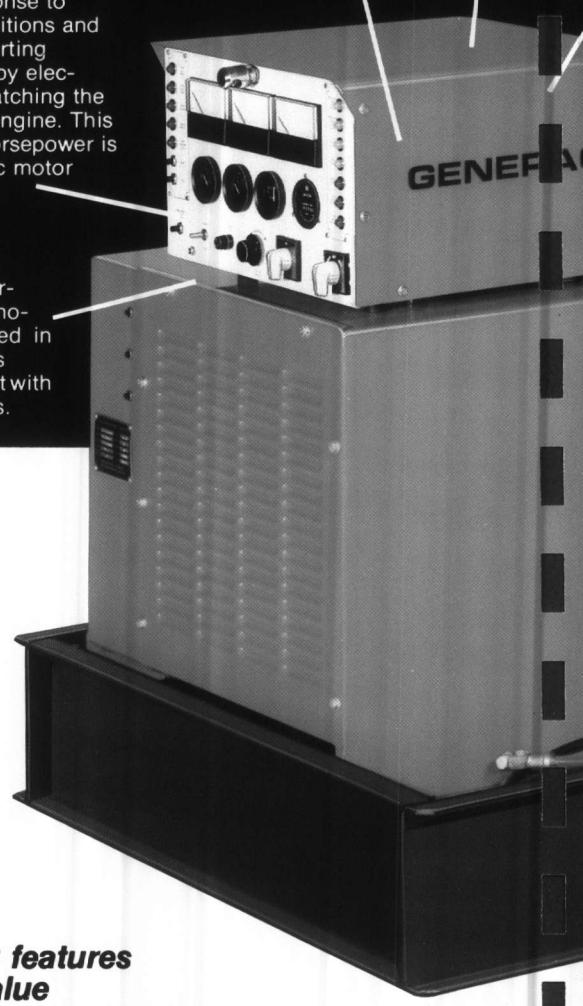
Only GENERAC makes these features standard

SOLID-STATE, FREQUENCY COMPENSATED VOLTAGE REGULATION (V/F)
This unique, power maximizing regulation system was initiated by GENERAC as a standard feature 15 years ago and has been kept at the state-of-the-art since that time. It provides optimized fast response to changing load conditions and maximum motor starting capability, assured by electronically torque matching the surge loads to the engine. This means that more horsepower is converted to electric motor starting power.

CONTROL PANEL
Most complete incorporating latest technology. Can be rotated in any direction and is isolated from the unit with vibration dampeners.

SOLID-STATE SENSING AND CONTROL
Magnetic pickup for overspeed sensing, starter motor disconnect and reingagement prevention provid the ultimate in engine protection.

GOLD PLATED CONNECTORS
Gold plated connectors are used on all printed circuit boards to insure long term reliablity.



More GENERAC features for even more value

BRUSHLESS EXCITATION SYSTEM
Available on all systems, this provides magnetically coupled "DC" current to the revolving field. The "DC" exciter is 8 pole, with a rotating silicone rectifier assembly. This entire excitation system is mounted outboard of the main generator bearing for quick removal for inspection or service.

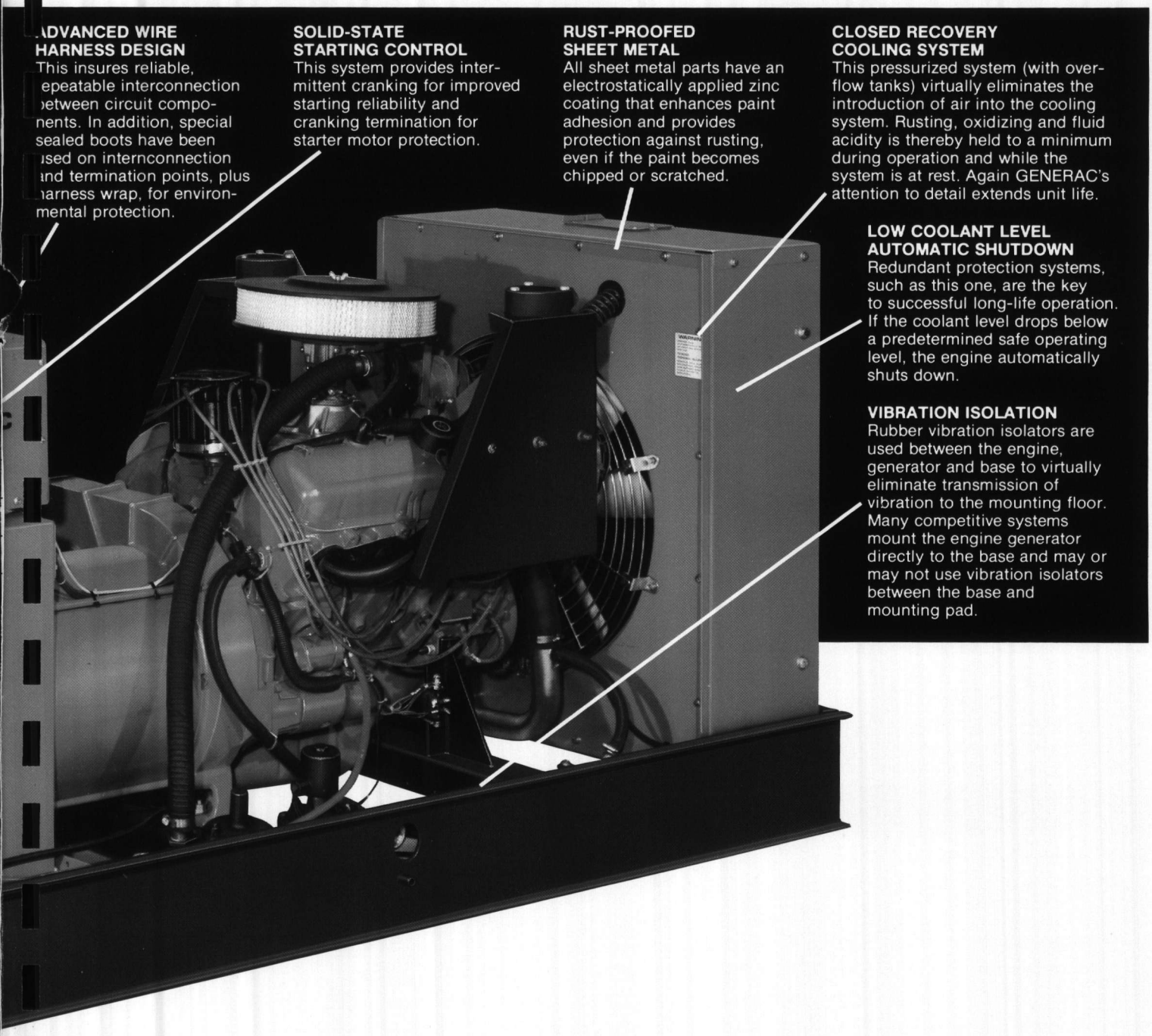
HIGH COOLANT TEMPERATURE SHUTDOWN
Should the coolant reach an unsafe operating temperature, a thermally operated switch automatically shuts down the engine.

MAIN-LINE CIRCUIT BREAKERS
Unit mounted main-line circuit breakers, capable of handling the full output capacity of the system while still protecting the unit, are optional on all models.

MANUAL OR AUTOMATIC ENGINE PRE-HEAT
All diesel systems have this for quicker engine starts under variable ambient temperature conditions.

CRITICAL EXHAUST SILENCER
Each system can be supplied with industrial, residential or critical silencers.

d features for your money



ADVANCED WIRE HARNESS DESIGN
This insures reliable, repeatable interconnection between circuit components. In addition, special sealed boots have been used on internconnection and termination points, plus harness wrap, for environmental protection.

SOLID-STATE STARTING CONTROL
This system provides intermittent cranking for improved starting reliability and cranking termination for starter motor protection.

RUST-PROOFED SHEET METAL
All sheet metal parts have an electrostatically applied zinc coating that enhances paint adhesion and provides protection against rusting, even if the paint becomes chipped or scratched.

CLOSED RECOVERY COOLING SYSTEM
This pressurized system (with overflow tanks) virtually eliminates the introduction of air into the cooling system. Rusting, oxidizing and fluid acidity is thereby held to a minimum during operation and while the system is at rest. Again GENERAC's attention to detail extends unit life.

LOW COOLANT LEVEL AUTOMATIC SHUTDOWN
Redundant protection systems, such as this one, are the key to successful long-life operation. If the coolant level drops below a predetermined safe operating level, the engine automatically shuts down.

VIBRATION ISOLATION
Rubber vibration isolators are used between the engine, generator and base to virtually eliminate transmission of vibration to the mounting floor. Many competitive systems mount the engine generator directly to the base and may or may not use vibration isolators between the base and mounting pad.

DIRECT EXCITATION SYSTEM
Optional on 36KW models and below, this "DC" system uses "Life-of-the-Unit" brushes and slip-rings (exclusively compounded to GENERAC specifications) to provide the regulated "DC" excitation current to the revolving field.

OIL DRAIN EXTENSION
An oil drain extension outside of the main frame provides a quick clean method of changing the oil.

OPTIONAL ENGINE BLOCK HEATER
For safe, reliable all-weather starting.

FIELD CIRCUIT BREAKERS
Another redundant protection system to prevent overload damage. Should the field excitation exceed a safe level, these breakers will automatically open making the excitation system inoperative. They also automatically reset.

THERMAL OVERLOAD PROTECTION
This stator mounted protector senses any abnormal temperature increase in the windings for automatic protection.

BATTERY TRAY & CABLES
GENERAC supplies the battery tray and cables as standard equipment.

AUTOMATIC LOW OIL PRESSURE SHUTDOWN
Should the oil pressure drop to a predetermined unsafe operating level, this pressure-sensitive switch automatically shuts the system down.

GENERAC BUILT, FLOAT TYPE, DC CHARGING SYSTEM
Several types of battery charge systems are optional.

BATTERY CHARGE ALTERNATOR
All systems have a separate alternator with more than enough capacity to maintain the battery charge during operation.

GENERAC continuous stand

GASOLINE / NATURAL GAS / LP FUELED SYSTEMS 10KW to 100KW

Model	Freq. (Hz)	Power Rating Note 5	Phase	Voltage-See Note #	Engine (Liter)	Eng. RPM	Gen. RPM	Excitation Note 8	Length Note 9	Width Note 9	Height Note 9	Weight Note 9
SG010	60	10.0KW	1,3	1	1.3	1800	1800	"D" or "B"	54.0"	29.5"	31.9"	890Lbs
	50	10.0KVA	1,3	2	1.3	1500	1500	"D" or "B"	137.1cm	75.0cm	81.0cm	404Kg
SG015	60	15.0KW	1,3	1	1.3	3600	3600	"D" or "B"	54.0"	29.5"	31.9"	890Lbs
	50	12.5KVA	1,3	2	1.3	3000	3000	"D" or "B"	137.1cm	75.0cm	81.0cm	404Kg
SG020	60	20.0KW	1,3	1	1.3	3600	3600	"D" or "B"	54.0"	29.5"	31.9"	890Lbs
	50	18.75KVA	1,3	2	1.3	3000	3000	"D" or "B"	137.1cm	75.0cm	81.0cm	404Kg
SG015	60	15.0KW	1,3	1	2.6	1800	1800	"D" or "B"	68.0"	37.0"	35.4"	890Lbs
									172.0cm	94.0cm	89.9cm	404Kg
SG020	60	20.0KW	1,3	1	2.6	1800	1800	"D" or "B"	68.0"	37.0"	35.4"	915Lbs
	50	18.75KVA	1,3	2	2.6	1500	1500	"D" or "B"	172.0cm	94.0cm	89.9cm	415Kg
SG025	60	25.0KW	1,3	1	2.6	1800	1800	"D" or "B"	68.0"	37.0"	35.4"	950Lbs
	50	25.0KVA	1,3	2	2.6	1500	1500	"D" or "B"	172.0cm	94.0cm	89.9cm	431Kg
SG030	60	30.0KW	1,3	1	2.6T[6]	1800	1800	"D" or "B"	68.0"	37.0"	35.4"	1000Lbs
	50	31.25KVA	1,3	2	2.6T[6]	1500	1500	"D" or "B"	172.9cm	94.0cm	89.9cm	454Kg
SG036	60	36.0KW	1,3	1	5.7	1800	1800	Brushless	81.0"	37.0"	41.1"	1170Lbs
	50	37.5KVA	1,3	2	5.7	1500	1500	Brushless	205.7cm	94.0cm	104.5cm	531Kg
SG050	60	50.0KW	1,3	1	5.7	1800	1800	Brushless	81.0"	37.0"	41.1"	1618Lbs
	50	50.0KVA	1,3	2	5.7	1500	1500	Brushless	205.7cm	94.0cm	104.5cm	734Kg
SG070	60	70.0KW	1,3	1	7.4	1800	1800	Brushless	81.0"	37.0"	41.1"	2011Lbs
	50	70.0KVA	1,3	2	7.4	1500	1500	Brushless	205.7cm	94.0cm	104.5cm	912Kg
SG080	60	80.0KW	1	3	5.7GD[7]	3000	1800	Brushless	115.5"	37.0"	49.9"	1875Lbs
									293.4cm	94.0cm	126.7cm	851Kg
SG085	60	85.0KW	3	4	5.7GD[7]	3000	1800	Brushless	115.5"	37.0"	49.9"	1875Lbs
	50	87.5KVA	1,3	2	5.7GD[7]	2500	1500	Brushless	293.4cm	94.0cm	126.7cm	851Kg
SG100	60	100.0KW	3	4	7.4GD[7]	3000	1800	Brushless	115.5"	37.0"	49.9"	2575Lbs
	50	100.0KVA	1,3	2	7.4GD[7]	2500	1500	Brushless	293.4cm	94.0cm	126.7cm	1168Kg

NOTES

1 VOLTAGE CODE (60 HZ)
- "A" Single Phase 120/240
- "B" 3 Phase (Y) 120/208
- "C" 3 Phase (Y) 240/416
- "D" 3 Phase (C.T. Delta) 120/240
- "F" 3 Phase (Y) 139/240
- "G" 3 Phase (Broad Range) 120/208
- "H" 3 Phase (Broad Range) 240/416
- "J" 3 Phase (Broad Range) 120/240
- "K" 3 Phase (Broad Range) 277/480
- "L" 3 Phase (Broad Range) 139/240

2 VOLTAGE CODE (50HZ)
- "M" Single Phase 220
- "N" 3 Phase (Y) 220/380
- "O" 3 Phase (Y) 240/416
- "P" 3 Phase (C.T. Delta) 120/240

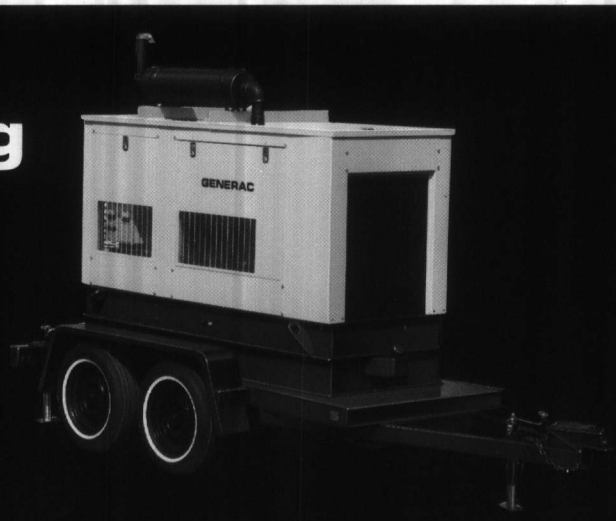
3 VOLTAGE CODE (60HZ)
- "A" Single Phase 120/240

(Voltages "B" through "F" are full capacity output and not reconnectable to 480 volts, Voltages "G" through "L" are "Broad Range", 12 lead reconnectable).

4 VOLTAGE CODE (60HZ)
- "B" 3 Phase (Y) 120/208
- "C" 3 Phase (Y) 240/416
- "D" 3 Phase (C.T. Delta) 120/240
- "F" 3 Phase (Y) 139/240
- "G" 3 Phase (Broad Range) 120/208
- "H" 3 Phase (Broad Range) 240/416
- "J" 3 Phase (Broad Range) 120/240
- "K" 3 Phase (Broad Range) 277/480
- "L" 3 Phase (Broad Range) 139/240

Trailer mounting

GENERAC offers both standard and custom-built trailers for applications where portability is required. Standard trailer capacities are 2500lb., 3500lb., 5000lb., and 8500lb. Trailers are "road ready." Custom features are "as required" and some customizing choices have been noted in the list.



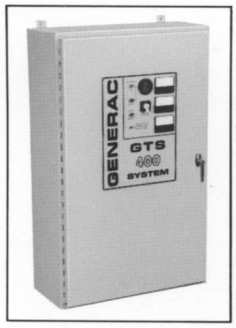
- steel floorbeds
- ball or pintel couplers
- swivel-type tongue jacks
- safety chains
- tail lights
- side marker lights
- license plate lights
- stabilizer jacks
- single or tandem axles (any number of axles on custom trailers)
- may have base-mounted fuel tanks (custom units may have trailer-mounted tanks)

by electric power systems

DIESEL FUELED SYSTEMS 10KW to 200KW

Model	Freq. (Hz)	Power Rating Note 5	Phase	Voltage-See Note #	Engine (Liter)	Eng. RPM	Gen. RPM	Excitation Note 8	Length Note 9	Width Note 9	Height Note 9	Weight Note 9
SD010	60	10.0KW	1,3	1	2.2	1800	1800	"D" or "B"	67.7"	34.5"	35.9"	940Lbs
	50	10.0KVA	1,3	2	2.2	1500	1500	"D" or "B"	172.0cm	87.6cm	91.2cm	426Kg
SD012	60	12.0KW	1,3	1	2.2	1800	1800	"D" or "B"	67.7"	34.5"	35.9"	785Lbs
	50	12.5KVA	1,3	2	2.2	1500	1500	"D" or "B"	172.0cm	87.6cm	91.2cm	356Kg
SD015	60	15.0KW	1,3	1	2.2	1800	1800	"D" or "B"	67.7"	34.5"	35.9"	1216Lbs
									172.0cm	87.6cm	91.2cm	553Kg
SD017	60	17.5KW	1,3	1	2.2	1800	1800	"D" or "B"	67.7"	34.5"	35.9"	1020Lbs
	50	18.7KVA	1,3	2	2.2	1500	1500	"D" or "B"	172.0cm	87.6cm	91.2cm	464Kg
SD020	60	20.0KW	1,3	1	3.0	1800	1800	"D" or "B"	68.0"	37.0"	34.3"	1235Lbs
	50	18.75KVA	1,3	2	3.0	1500	1500	"D" or "B"	172.0cm	94.0cm	87.0cm	560Kg
SD025	60	25.0KW	1,3	1	3.0	1800	1800	"D" or "B"	68.0"	37.0"	34.3"	1474Lbs
	50	25.0KVA	1,3	2	3.0	1500	1500	"D" or "B"	172.0cm	94.0cm	87.0cm	669Kg
SD030	60	30.0KW	1,3	1	3.0T[6]	1800	1800	"D" or "B"	68.0"	37.0"	40.0"	1592Lbs
	50	31.25KVA	1,3	2	3.0T[6]	1500	1500	"D" or "B"	172.0cm	94.0cm	102.0cm	722Kg
SD035	60	35.0KW	1,3	1	3.0T[6]	1800	1800	"D" or "B"	68.0"	37.0"	40.0"	1655Lbs
	50	37.5KVA	1,3	2	3.0T[6]	1500	1500	"D" or "B"	172.0cm	94.0cm	102.0cm	751Kg
SD040	60	40.0KW	1,3	1	4.0	1800	1800	Brushless	81.0"	37.0"	41.0"	2147Lbs
	50	43.7KVA	1,3	2	4.0	1500	1500	Brushless	205.7cm	94.0cm	104.0cm	975Kg
SD050	60	50.0KW	1,3	1	4.0T[6]	1800	1800	Brushless	81.0"	37.0"	41.0"	2192Lbs
	50	50.0KVA	1,3	2	4.0T[6]	1500	1500	Brushless	205.7cm	94.0cm	104.0cm	995Kg
SD060	60	60.0KW	1,3	1	4.0T[6]	1800	1800	Brushless	84.0"	35.25"	35.25"	2237Lbs
	50	62.5KVA	1,3	2	4.0T[6]	1500	1500	Brushless	213.4cm	89.5cm	89.5cm	1015Kg
SD080	60	80.0KW	1,3	1	6.4T[6]	1800	1800	Brushless	108.75"	37.6"	43.3"	2500Lbs
	50	81.25KVA	1,3	2	6.4T[6]	1500	1500	Brushless	276.2cm	95.5cm	110.0cm	1134Kg
SD100	60	100.0KW	3	3	6.4 T/A	1800	1800	Brushless	108.75"	37.6"	45.25"	2800Lbs
	50	100.0KVA	1,3	2	6.4 T/A	1500	1500	Brushless	276.2cm	95.5cm	114.94cm	1270Kg
SD130	60	130.0KW	3	3	13.3	1800	1800	Brushless	111.0"	36.6"	60.0"	5250Lbs
	50	115.0KW	1,3	2	13.3	1500	1500	Brushless	281.9cm	93.0cm	152.4cm	2382Kg
SD150	60	150.0KW	3	3	13.3T[6]	1800	1800	Brushless	111.0"	36.6"	60.0"	5550Lbs
	50	130.0KW	3	3	13.3T[6]	1500	1500	Brushless	281.9cm	93.0cm	152.0cm	2518Kg
SD180	60	180.0KW	3	3	13.3T[6]	1800	1800	Brushless	111.0"	36.6"	60.0"	5610Lbs
	50	150.0KW	1,3	3	13.3T[6]	1500	1500	Brushless	281.9cm	93.0cm	152.0cm	2545Kg
SD200	60	200.0KW	3	3	13.3T[6]	1800	1800	Brushless	111.0"	36.6"	60.0"	5610Lbs
									281.9cm	93.0cm	152.0cm	2545Kg

Transfer switches design



Our GTS Automatic Transfer Switches have been subjected to the same rigorous and demanding design and quality standards as GENERAC standby power systems. As a result, no other controls are more reliable, more sophisticated, or more suitable to a broad range of applications.

❶ System Control

LED status lights give visual readout of operation sequence — utility on • engine warmup • engine warmup bypass • standby voltage "ready" • standby frequency "ready" • standby "operating" • time delay neutral • transfer • return to line • engine cool down • engine minimum run

ENGINE WARMUP
Timer allows engine to operate at no load before GTS transfers load to generator sets, adjustable from 5 seconds — 3 minutes.

ENGINE WARMUP BYPASS
A switch allows the GTS to transfer the load to the generator set as soon as a pre-set voltage and frequency are reached.

VOLTAGE SET
Sets the minimum voltage required before the GTS will be allowed to transfer the load to the generator set, adjustable from 70% to 90%.

FREQUENCY SET
Sets the minimum frequency required before the GTS will be allowed to transfer the load to the generator set, adjustable from 80% to 90% of operating frequency.

RETURN TO UTILITY DELAY
Timer keeps the load on the generator set until a stable utility line is present, adjustable from 1 — 30 minutes.

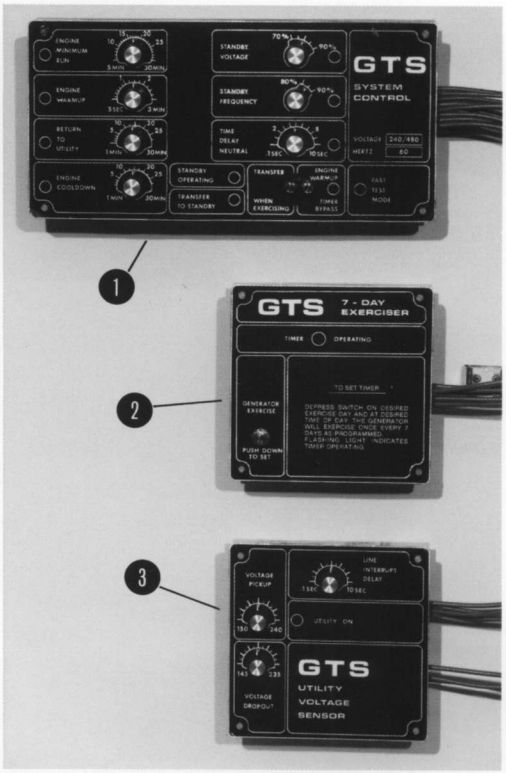
ENGINE COOL DOWN
Timer allows engine to run at no load after the GTS transfers the load back to the utility line, adjustable from 1 — 30 minutes.

MINIMUM RUN
Timer determines the shortest period of time the generator set will run. Insures adequate exercise periods, adjustable from 5 — 30 minutes.

❷ 7 Day Exerciser

Digital solid state circuit starts the engine once every seven days at a preselected time.

More features to make it the standard of the industry. From 100 AMP to 3000 AMP. 2, 3 and 4 pole.



(Located on inside door as shown at right)

❸ Utility Voltage Sensor

LINE FAILURE SENSING
Circuitry monitors all phase of the utility service with dropout and pickup points adjustable from 70% to 95%.

UTILITY INTERRUPT DELAY
Timer overrides momentary line failures, adjustable from 0.1 — 10 seconds.

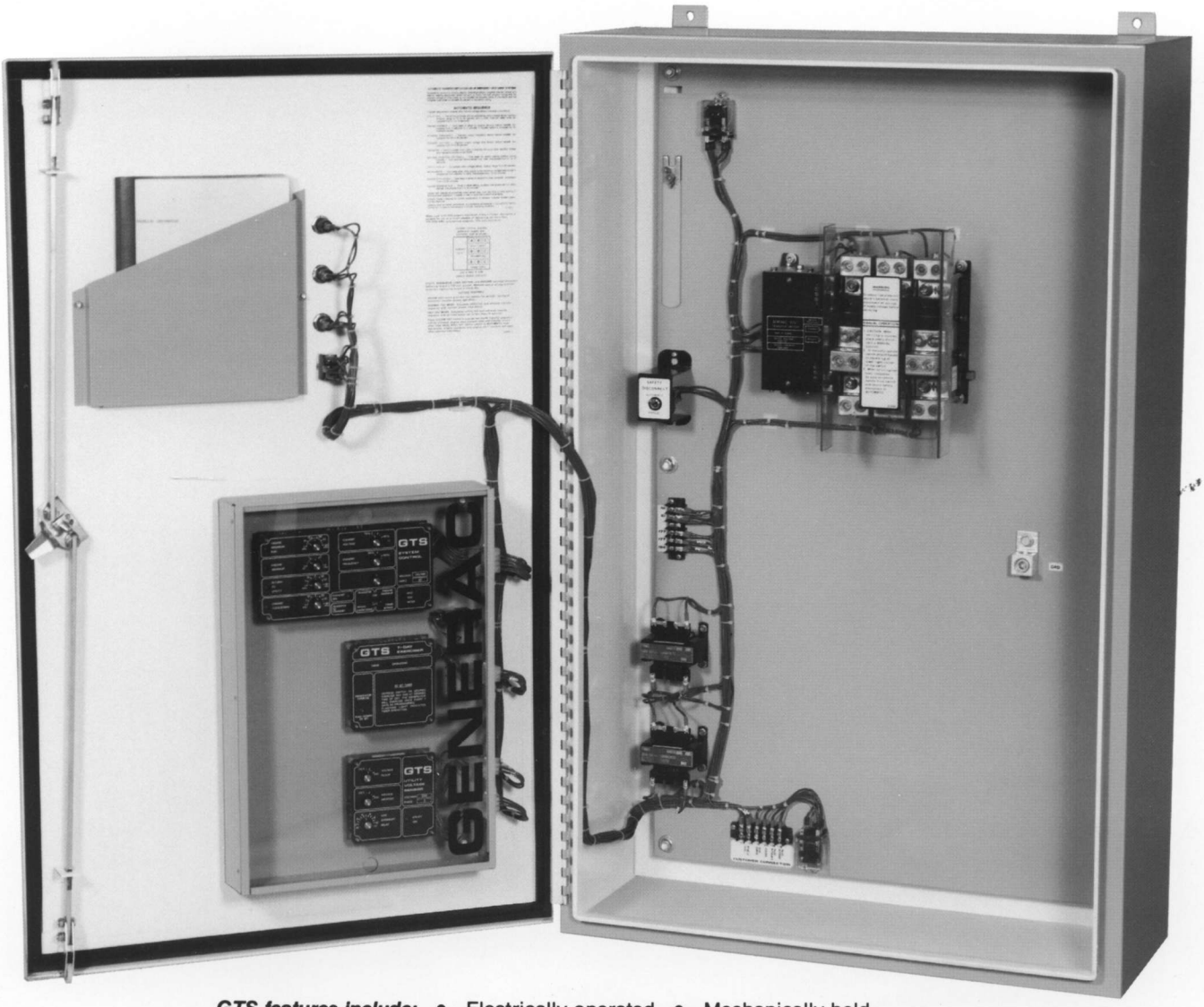
Optional equipment

We supply a broad range of options and accessories so that our systems can be both complete and exactly matched to the widely varying specifications we fulfill around the world. In addition to those items previously described, such as trailers and enclosures, our optional equipment includes the following.

Several battery chargers are available. Model shown here is 10 amp, solid-state with automatic or manual float and equalized voltage control. Includes ammeter and voltmeter.

- remote panel enclosures
- remote annunciator
- annunciator — 14 light NFPA-76A
- multi-direction panel harness
- multi-position switch w/warning light
- radiator air duct flange kit
- electronic governors
- pre-alarms, remote
- pre-alarms, panel mounted
- batteries
- battery heaters
- engine block heaters
- dual fuel option
- flex fuel lines

ed & built by GENERAC

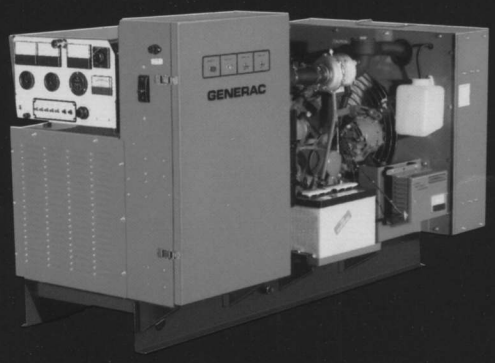


GTS features include: • Electrically operated • Mechanically held • Live source coil operation • Arc control • Front access • Continuous full load rating • Auxiliary contacts • Neutral terminal • Solid-state, modular construction • Individual adjustable sensors and timers • UL 1008 listed • NEMA 12 enclosure

Optional features include: • time delay neutral • precision voltage sensing • programmable exerciser • fourth pole

- day tanks
- sub-base tanks
- automatic transfer systems, 100 AMP to 3000 AMP
- automatic controllers w/wo intelligence system, interface system
- telephone dialer (auto alarm)
- horn alarm
- alarm system controller
- city water cooling w/heat exchanger
- remote radiator kits
- water cooled exhaust manifold
- stainless steel, flexible exhaust connectors
- mufflers

Custom designs



GENERAC evaluates every customer's requirements thoroughly before recommending the engine generator, transfer system, and auxiliary component features which will handle the job. But when an application calls for capabilities or physical configurations which are not normally available, we are ready and eager to meet that need as well. Our engineers can tailor an existing model design or create a new one that will accommodate the special circumstances of one unique installation or an entire industry. For example, the unit shown here was developed expressly for the telecommunications market. It has a unit-mounted transfer switch system with special fault-override controls.

If you own a GENERAC, you're never on your own

GENERATOR GIANTS CHOOSE GENERAC

The GENERAC quality built-in at our factory is solidly backed in the field by the nation's largest and most experienced multi-line distributors. They comprise the only independent distributor group in the country with annual sales of over a billion dollars. It is a particular source of pride to us that these "Generator Giants" have chosen our product line and unique quality program.

You may already know the Generator Giants in your area, personally or by good reputation. These GENERAC distributors all have complete facilities (including their own electrical and mechanical experts), plus parts for the installation and maintenance of your entire GENERAC system — from the engine down to the smallest electronic component. We provide each of them with detailed specification data, computerized "instant" quotes, custom engineering assistance, factory training, and a complete post-installation service program. Because the total system is GENERAC manufactured, not assembled, there's a single, fully responsible source with all the answers and service you need.

GENERAC

P.O. Box 8
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Telex: 26-9687

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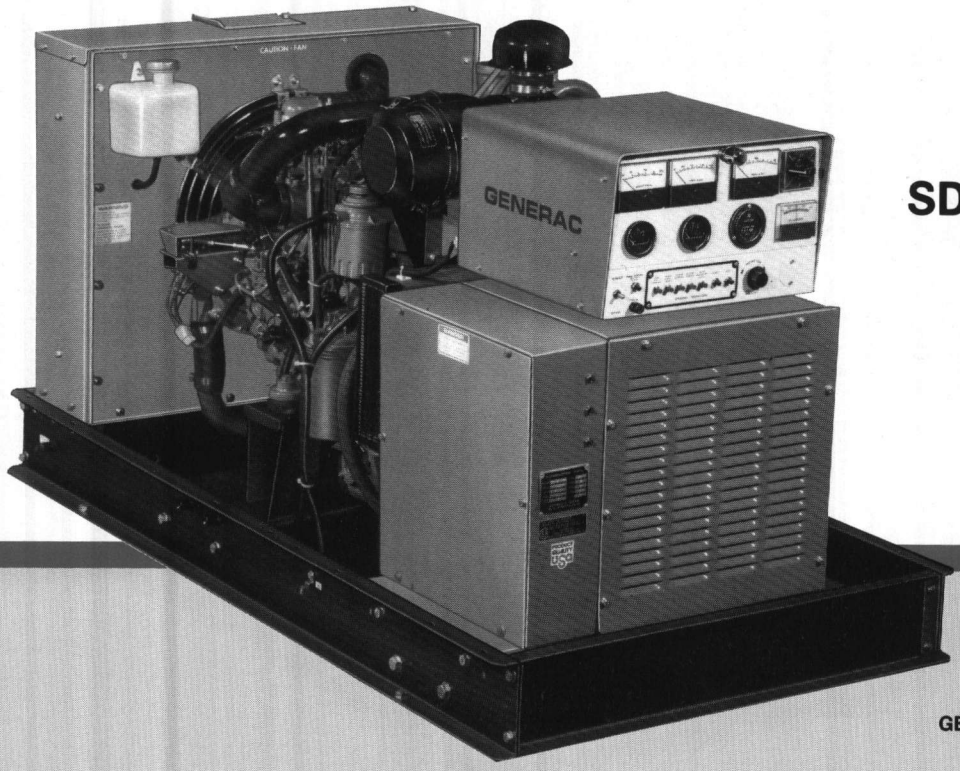
August 1987



SD025 (25KW 60Hz)
SD020 (25KVA 50Hz)

LIQUID COOLED DIESEL ENGINE DRIVEN GENERATOR

POWER-MATCHED
GENERAC 30DN ENGINE

25KW (60Hz) / 25KVA (50Hz) CONTINUOUS STANDBY ELECTRIC POWER SYSTEM

- **INNOVATIVE DESIGN & PROTO-TYPE TESTING** are key components of GENERAC'S successful quarter century of "IMPROVING POWER BY DESIGN". But it doesn't stop there, total commitment to component testing, reliability testing, environmental testing, destruction and life-testing, plus testing to applicable MILITARY, CSA, NEMA, EGSA and other standards, allows you to choose GENERAC CONTINUOUS STANDBY ELECTRIC POWER SYSTEMS with the confidence that these systems will provide superior performance.

  TEST CRITERIA APPLICABLE TO THE SD025 SYSTEM:
  - PROTO-TYPE TESTED
  - SYSTEM TORSIONAL TESTED
  - ELECTRO-MAGNETIC INTERFERENCE
  - NEMA MG1-22 EVALUATION
  - MOTOR STARTING ABILITY
  - MIL-1-24092
  - SHORT CIRCUIT TESTING

- **SOLID-STATE, FREQUENCY COMPENSATED VOLTAGE REGULATION (V/F).** This unique power maximizing regulation system was initiated by GENERAC 15 years ago and has been standard on all models since that time. It provides optimized FAST RESPONSE to changing load conditions and MAXIMUM MOTOR STARTING CAPABILITY is assured by electronically torque matching the surge loads to the engine. This means that with a GENERAC CONTINUOUS STANDBY ELECTRIC POWER SYSTEM more available engine horsepower is converted to electric motor starting power.

- **SINGLE SOURCE SERVICE RESPONSE** from GENERAC'S "GENERATOR GIANTS" distributor group, which maintains parts and service know-how for the entire unit from the engine to the smallest electronic component. This insures that you're never on your own, when you own a GENERAC ELECTRIC POWER SYSTEM.

- **ECONOMICAL DIESEL POWER.** Low cost operation due to modern Diesel Engine Technology. Better fuel utilization plus lower cost per gallon provide real savings.

- **LONGER ENGINE LIFE.** Modern Diesel's provide four to five times the operating life of comparable gasoline engines.

- **GENERAC MANUFACTURED TRANSFER SWITCHES AND ACCESSORIES.** Long-life reliability is rapidly becoming synonomous with GENERAC'S CONTINUOUS STANDBY ELECTRIC POWER SYSTEMS. And one of the reasons for this confidence is because GENERAC manufactures their own transfer systems, accessories and controls.

GENERAC
manufactured to the comprehensive requirements of the
Quality Grid

GENERAC

APPLICATION & ENGINEERING DATA

15KW PRIME

GENERAL SPECIFICATIONS

Manufacturer	GENERAC	
Type	Revolving Field	
Frequency	50 Hz	60 Hz
Rated Output Power	20KW	25KW

VOLTAGE CODE	60Hz Voltage
"A" Single Phase	120/240
"B" 3 Phase ("Y"), (See Note #1)	120/208
"C" 3 Phase ("Y"), (See Note #1)	240/416
"D" 3 Phase (C.T. Delta), (See Note #1)	120/240
"F" 3 Phase ("Y" Connected), (See Note #1)	139/240
"G" 3 Phase (Broad Range), (See Note #2)	120/208
"H" 3 Phase (Broad Range), (See Note #2)	240/416
"J" 3 Phase (Broad Range), (See Note #2)	120/240
"K" 3 Phase (Broad Range), (See Note #2)	277/480
"L" 3 Phase (Broad Range), (See Note #2)	139/240
	50Hz Voltage
"M" Single Phase	220
"N" Three Phase ("Y")	220/380
"O" Three Phase ("Y")	240/416
"P" Three Phase (C.T. Delta)	120/240

(Note: #1 **"Full Capacity"** single phase, **Not Reconnectable To 480 Volts)**
(Note: #2 All **"Broad Range"** stators are 12 lead reconnectable)
(Note: #3 Contact your local distributor for additional Voltage Ratings)

POWER FACTOR KW AND KVA RATINGS

CONTINUOUS STANDBY - 60 HZ

Voltage	Phase	Amps	KW	KVA	PF
120/240	1	104/Line	25	25	1.0
120/208	3	87/Leg	25	31	0.8
240/416	3	43/Leg	25	31	0.8
120/240	3	75/Line	25	31	0.8
277/480	3	38/Leg	25	31	0.8
139/240	3	75/Leg	25	31	0.8

CONTINUOUS STANDBY - 50 HZ

220	1	114/Line	20	25	0.8
220/380	3	38/Leg	20	25	0.8
240/416	3	35/Leg	20	25	0.8
120/240	3	60/Line	20	25	0.8

Excitation Method (Available)	GENERAC Brushless or Direct Excitation
Regulation	±2% (Exclusive Solid State w/Temp. Compensation

GENERATOR SPECIFICATIONS

Rotor Insulation	Class F
Stator Insulation	Class F
Bearings (Pre-lubed & Sealed)	1
Coupling	Direct, Flexible Disc
Load Capacity (See Note)	100%

(Note: One Step load capacity 100% voltage dip does not exceed 12.5% with recovery to stable operation within 2 seconds)

AVAILABLE EXCITATION SYSTEMS

DIRECT EXCITATION SYSTEM

- GENERAC'S direct "DC" excitation system uses Life-of-the-unit, low velocity, brushes and slip-rings (exclusively compounded to GENERAC specifications) to connect the regulated "DC" excitation current to the revolving field.

BRUSHLESS EXCITATION SYSTEM

- GENERAC brushless excitation system provides magnetically coupled "DC" current to the revolving field. The exciter is 8 Pole with battery driven field boost, utilizing a rotating silicone rectifier design and is mounted outboard of the main bearing for quick removal should a service problem arise.

GENERAC'S V/F REGULATION SYSTEM

- Both the **Direct Excitation and Brushless Excitation,** use GENERAC'S V/F regulation system. This advance design, solid-state system, maintains a ±2% regulation through out its operating range. Should an extra heavy inductive load drop the output frequency below 58Hz the V/F regulator automatically adjusts the voltage to maximize the motor starting capability of the system. As the engine speed stabilizes above 58Hz the V/F regulator provides a constant voltage output. This regulation system, provides a continuous monitor on the "AC" output, to insure **Constant Voltage** even with changes in the operating temperature.

STANDARD GENERATOR FEATURES

- The generator is a four pole, revolving field type, direct connected to the engine shaft through a heavy duty, flexible disc, to insure permanent alignment.
- The generator meets temperature rise standards, for class "F" insulation as defined by NEMA MG1-22, 40 and NEMA MG1-1.65. The rotor and stator and other insulation is impregnated twice with a class "F" varnish and conforms to MIL-1-24092, Type "M", Class 155.
- All models have passed the three phase symmetrical short circuit testing, during the proto-type testing phase of design, to assure system protection and reliability.
- During proto-type testing this unit was tested for motor-starting ability by measuring the voltage dip with an oscilloscope.
- All models utilize advance wire harness design to insure reliable interconnection within the circuitry and utilize special rubber boots on termination and connection points, for environmental protection.
- The magnetic circuit, including amortisseur windings, tooth and skewed stator design, provides a minimal level of waveform distortion and an electromagnetic interference level meeting accepted requirements for standard "AM" radio, "TV, and MARINE RADIO TELEPHONE APPLICATIONS.
- The voltage waveform deviation, total harmonic content of the "AC" waveform, and T.I.F. (Telephone Influence Factor), has been evaluated to acceptable standards in accordance with NEMA MG1-22.
- The alternator is self-ventilated and drip proof constructed.
- This system incorporates **"Thermal overload protection"** and optional main-line circuit breakers capable of handling the full output capacity are also available. All of these protective systems have been fully life-tested to insure reliable safeguard against overload damage.
- System Torsional acceptability was confirmed during **Proto-Type Testing.**

ENGINE SPECIFICATIONS

Make	GENERAC
Model	30DN
Cylinders	4 In-line
Displacement	3.0 Liter (183 Cu In)
Bore	95mm (3.74 In)
Stroke	105mm (4.13 In)
Compression Ratio	21:1
Intake Air	Naturally Aspirated
Number of Main Bearings	5
Connecting Rods	4 - Drop Forged Steel
Rated RPM	1500 (50 Hz) 1800 (60 Hz)
Max Hp at Rated RPM	43.5 (32.5KW) (60 Hz) 36 (27KW) (50 Hz)
Cylinder Head	Cast Iron w/Overhead Valve
Pistons	4 - Aluminum Alloy
BMEP (Brake Mean Effective Pressure)	96
Piston Speed	378M/min (1240 Ft/Min) (60 Hz) 315M/min (1033 Ft/Min) (50 Hz)
Crankshaft	Forged Steel

VALVE TRAIN

Lifter Type	Solid
Intake Valve Material	Silicon Chrome
Exhaust Valve Material	Stellite
Hardened Valve Seats	Standard

ENGINE GOVERNOR

Governor, Gear Driven (Adjustable Speed)	Standard
Frequency Regulation, No-load to Full-load	5.0%
Steady State Regulation	±0.5%

LUBRICATION SYSTEM

Type of Oil Pump	Trochoid
Oil Filter	Full Flow, Cartridge
Crankcase Capacity	6.3 Liters (6 Qts)

ENGINE COOLING SYSTEM

Coolant Capacity ..... 8.5 Liters (9 Qts)
Coolant Flow/Min ..... 90 Liters (95 Qts.) (60 Hz)
75 Liters (79 Qts.) (50 Hz)
Type of System ..... Pressurized, Closed Recovery
Automatic High Temperature Shut-down ..... Standard
Automatic Low Coolant Level Shut-down ..... Standard
Water Pump ..... Pre-Lubed, Self-sealing
Type of Fan ..... Pusher
Inlet Air ..... 122m³/M (4300CFM) (60 Hz)
101m³/M (3543CFM) (50 Hz)
Number of Fan Blades 6
Diameter of Fan ..... 440mm (17.3 In)

OPTIONAL COOLING SYSTEM ACCESSORIES

- City Water Cooling System
- Radiator Duct Adapter, Model 8663
- 1000 Watt Engine Block Heater

FUEL SYSTEM

Fuel ..... #2D Fuel (Min Cetain #40)
(Fuel should conform to ASTM Spec.)
Fuel Filter ..... 10 Micron
Fuel Injection Pump Bosch Type, Barrel & Plunger Type
Electric Fuel Pump ..... Standard
Fuel Pump Lift ..... 0.9M (36 In.)
Injectors ..... Pintel Type, 1950 PSI
Engine Type ..... Pre-combustion, Swirl Chamber
Fuel Line (Supply) ..... 6.35mm (0.25 In.)
Fuel Return Line ..... 3.17mm (0.125 In.)

FUEL CONSUMPTION - 60 Hz

Load	25%	50%	75%	100%
Gal/Hr	1.0	1.3	1.7	2.3
Ltr/Hr	3.7	4.9	6.5	8.4

FUEL CONSUMPTION - 50 Hz

Gal/Hr	0.8	1.0	1.4	1.9
Ltr/Hr	3.0	4.0	5.4	7.0

OPTIONAL FUEL ACCESSORIES

- Priming Tank
- Underground Tank
- Fuel Level Indicator
- Transfer Tank
- Flexible Fuel Lines

EXHAUST SYSTEM

Exhaust Flow at Rated Output ..... 7.0m³/M (250CFM) (60 Hz)
5.9m³/M (208CFM) (50 Hz)
Max Recommended Back Pressure ..... 5.0Kpa (1.5" Hg)
Exhaust Temperature at Rated Output ..... 480 C (900 F)
Exhaust Outlet Size ..... 2.00" N.P.T. (Female)

OPTIONAL EXHAUST ACCESSORIES

- Industrial Exhaust Silencer
- Residential Exhaust Silencer
- Critical Exhaust Silencer

COMBUSTION AIR REQUIREMENTS

Flow At Rated Power ..... 2.7m³/M (95CFM) (60 Hz)
2.3m³/M (80CFM) (50 Hz)
Air Cleaner ..... Re-usable, Cartridge

ENGINE ELECTRICAL SYSTEM

Battery Charge Alternator ..... 42 Amps at 13.71 volts
Starter Motor ..... 12 volt
Crank Limiter (Solid State) ..... Standard Equipment
Recommended Battery ..... 12 volt, 90 A.H., 24BCI
Ground Polarity ..... Negative
Battery Rack ..... Standard
Battery Cables ..... Standard

OPTIONAL ELECTRICAL ACCESSORIES

- Battery, 12 Volt, 90 A.H., 24BCI
- Battery Heater
- 2 Amp., Battery Charger
- 10 Amp., Float Type, Battery Charge System

STANDARD ENGINE FEATURES & SAFETY FEATURES

- High Coolant Temperature Auto. Shutdown
- Low Coolant Level Auto. Shutdown
- Low Oil Pressure Auto. Shutdown
- Over-speed Auto. Shutdown, (Solid State)
- Crank Limiter (Solid State)
- Oil Drain Extension
- Battery Charge Alternator
- Battery Cables
- Battery Tray
- Vibration Isolators
- 12 Volt, Solenoid Activated Starter Motor
- Air Cleaner
- Factory Installed Cool Flow Radiator
- Fan Guard
- Control Console (See Page 4)
- Electric Fuel Pump

ADDITIONAL OPTIONAL EQUIPMENT

- GENERAC Transfer Systems (GTS)
- Safe-Guard Enclosure (Locking Type)
- Alarm Controller
- Remote Annunciator Panel
- Alarm Relay and Horn
- Telephone Dialer System

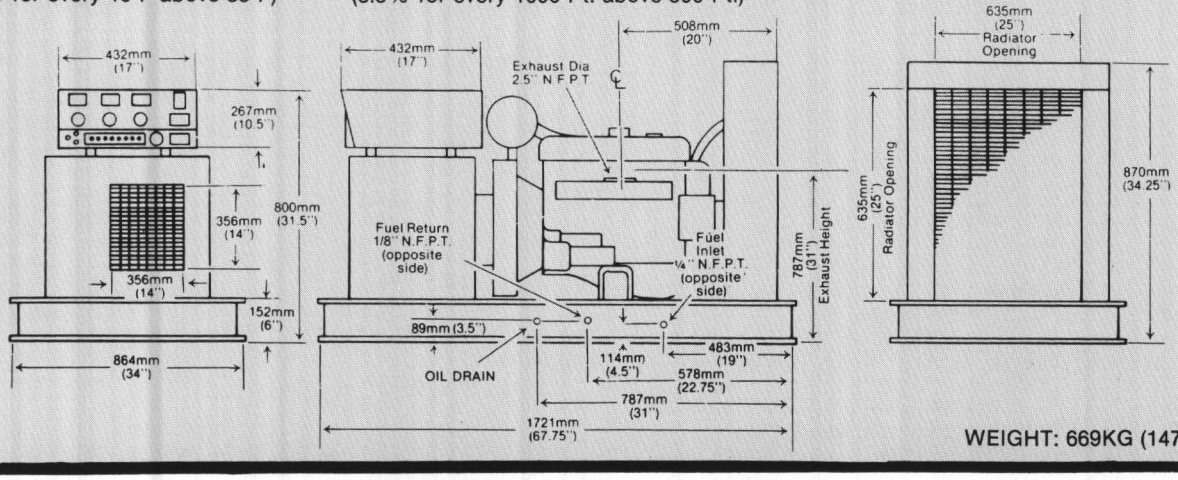
DERATION FACTORS

Maximum Mounting Angle any Direction - 10°

TEMPERATURE DERATION FACTORS
1.8% for every 10 C above 30 C
(1.0% for every 10 F above 85 F)

ALTITUDE DERATION FACTORS
1.1% for every 100 Meters above 150 Meters
(3.5% for every 1000 Ft. above 500 Ft.)

Generac reserves the right to change design or specifications without notice. Dimensions shown are approximate, contact Generac for certified dimensions drawings. DO NOT USE THESE DIMENSIONS FOR INSTALLATION PURPOSES.



WEIGHT: 669KG (1474 Lbs.)

GENERAC'S TYPICAL CONTROL CONSOLE

These Solid State Controls Monitor the vital functions and provide safety shutdown for low oil, high temperature, low coolant level and over-speed plus providing a monitor on the output voltages and current . . .

AC VOLTMETER - The "AC" voltmeter reads line-to-line or leg-to-leg output voltage.

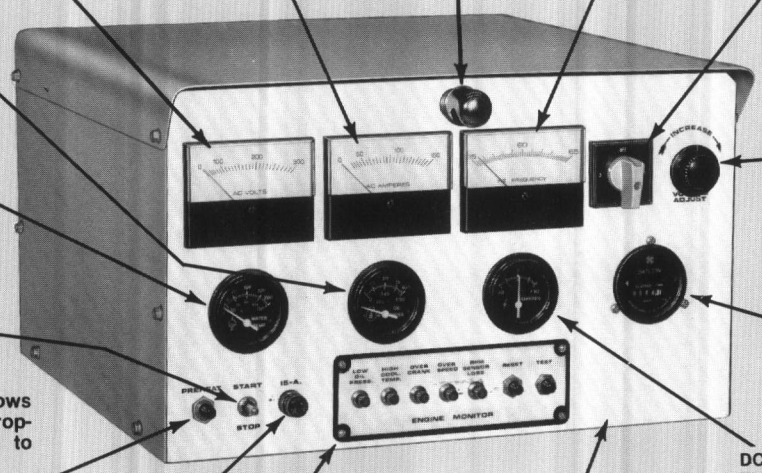
AC AMMETER - The "AC" ammeter provides current read-out on any phase of the system.

FREQUENCY METER - Provides a constant monitor on the "AC" output frequency.

PANEL LIGHT

PHASE SELECTOR SWITCH - The phase selector switch allows the operator to monitor the "AC current and voltage of any line or Leg Load. It works in conjunction with the "AC" voltmeter and ammeter.

COOLANT TEMPERATURE GAUGE -Provides a constant monitor on the engine's coolant temperature.



VOLTAGE ADJUST RHEOSTAT The voltage adjust rheostat allows the operator to fine tune the line-to-line or leg-to-leg output voltage.

OIL PRESSURE GAUGE - Provides a constant montior on the engines oil pressure.

MANUAL START-RUN-STOP SWITCH -Panel mounted, manual start-run-stop switch.

HOURMETER - Records actual engine running time.

NOTE: Control Panel Design allows operator to work on system by dropping the front panel, no need to remove covers.

ENGINE PRE-HEAT MANUAL SWITCH Provides pre-heat for quick, reliable starting.

DC BATTERY CHARGE AMMETER The battery charge ammeter provides a constant monitor on the battery charge current from the engine alternator during continuous standby operation.

CONTROL PANEL FUSE - This 30 Amp fuse protects the control panel circuits from overload damage.

CONTROL PANEL - Shock mounted control panel is isolated from the unit with vibration dampers. Optional connection harness allows panel to be rotated 90° in either direction.

OPTIONAL ENGINE MONITOR SYSTEMS (One panel must be selected when ordering)

(NOTE: Indicator Light Activates and Automatic Shut-down Occur Simultaineously)

A = **Manual (Electric) Start**
Low Oil Pressure indicator Light
High Coolant Temperature, Low Coolant Level, Indicator Light

B = **Automatic (Electric) Start**
Low Oil Pressure Indicator Light
High Coolant Temperature, Low Coolant Level, Indicator Light

(NOTE: Engine Monitor System "D" is a relay operated monitor system and does not have overspeed shutdown on the engine)

C = **Automatic (Electric) Start**
Low Oil Pressure indicator Light
High Coolant Temperature, Low Coolant Level, Indicator Light
Overcrank Indicator Light
Overspeed Indicator Light
RPM (Overspeed) Sensor Loss Indicator Light
Test and Reset Switch

D = **Automatic (Electric) Start**
Low Oil Pressure, Low Coolant Level, High Coolant Temperature, Indicator Light

A COMPLETE LINE OF ADDITIONAL CONTROL PANEL OPTIONS ARE AVAILABLE FROM YOUR LOCAL DISTRIBUTOR.

25 years a generation of improving power by design

GENERAC

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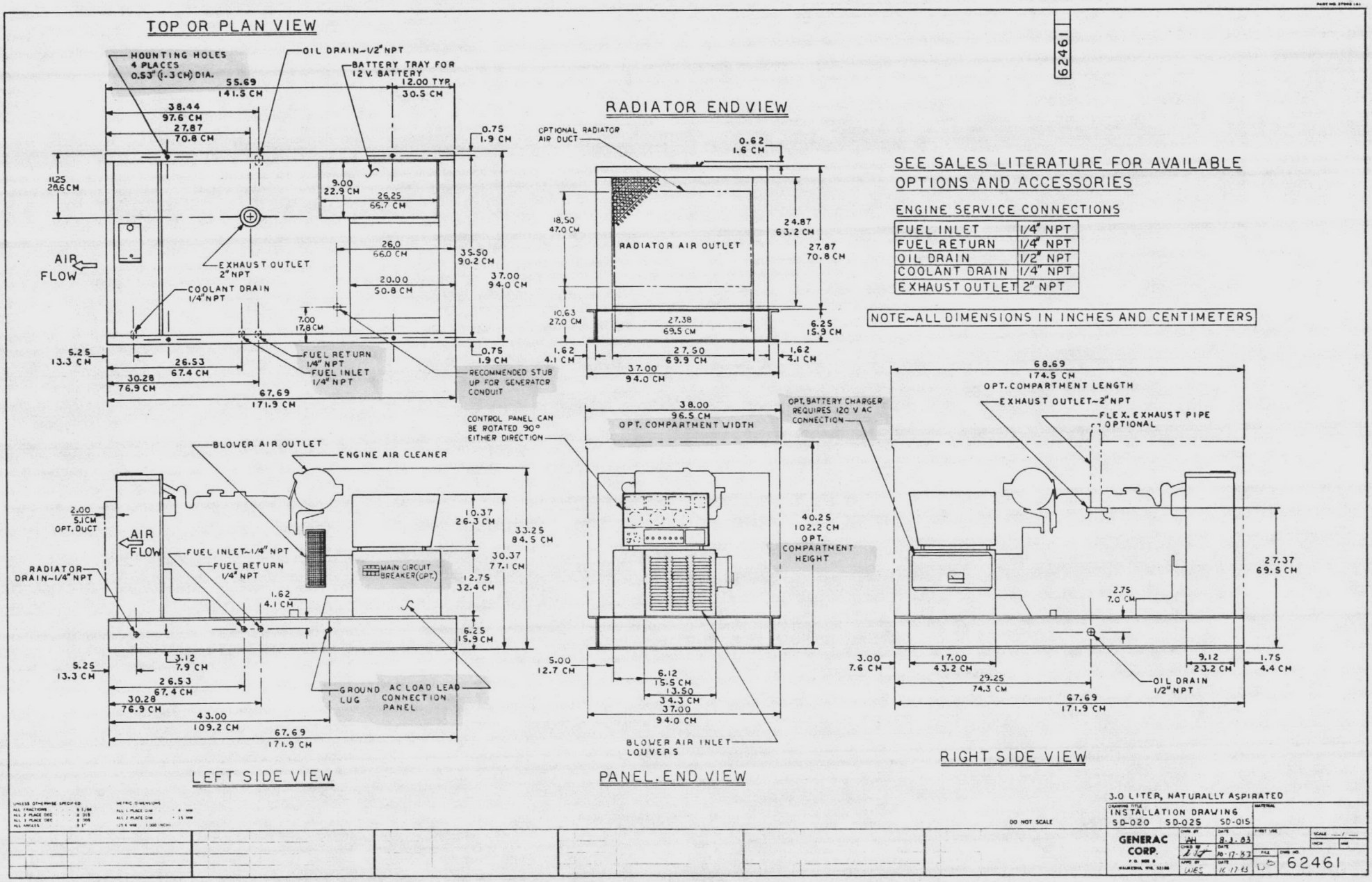
Waukesha, Wisconsin 53187
Telex: 26-9687 Tel. 414/544-4811
Fax 414/968-2106

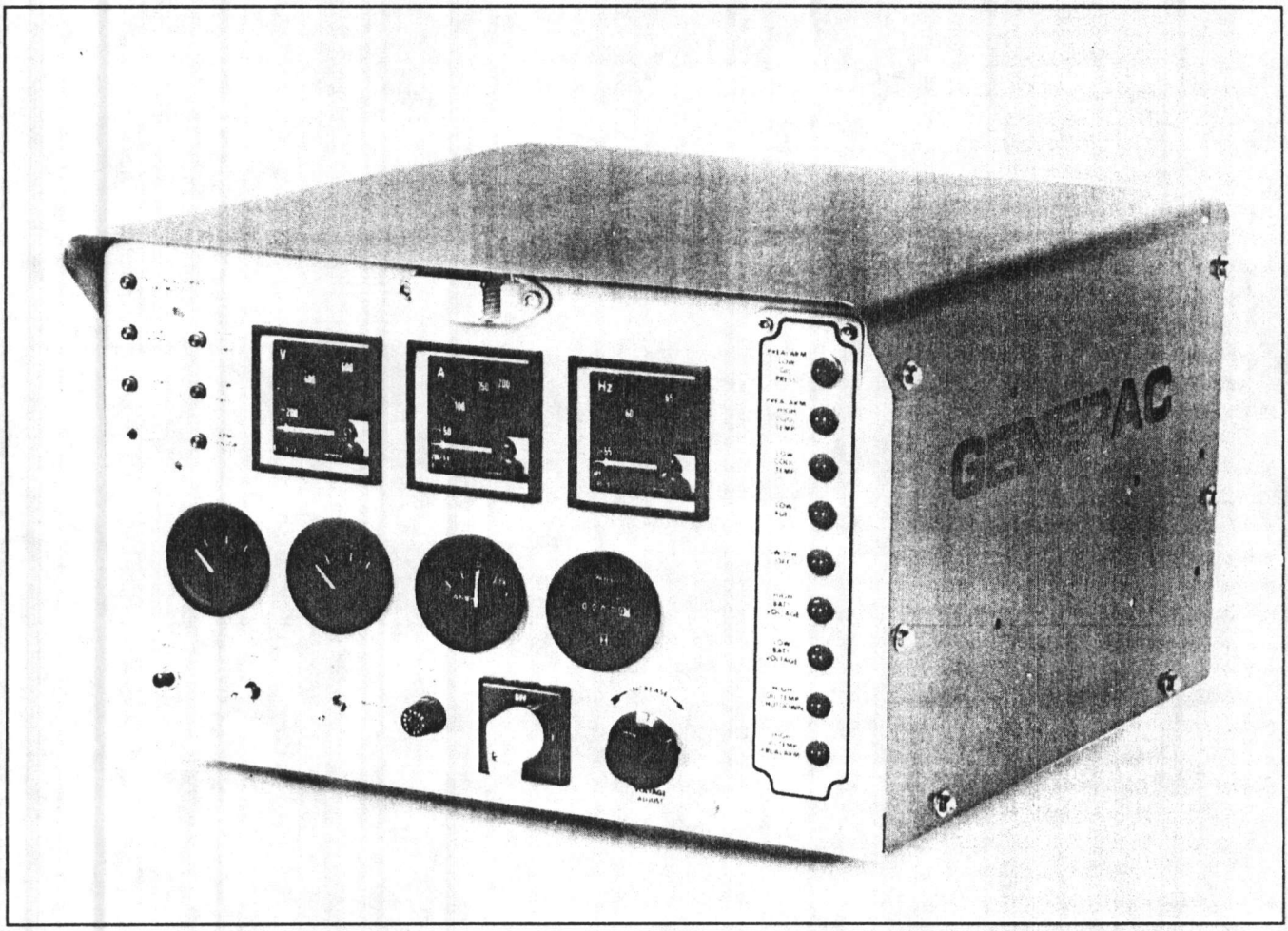
SB 84—116
Printed in U.S.A.

INSTALLATION DRAWING FOR SD-020 SD-025 3.0L



THE NEW GENERAC CONTROL CONSOLE

Combine form and function to monitor your complete power system needs. Solid state controls provide for safety shutdowns due to low oil pressure, low water level, high water temperature, engine overspeed, overcrank and RPM sensor loss. GENERAC's proven control console design provides you with precise analog annunciation of output voltage and current.



DURABLE, DEPENDABLE CONTROL CONSOLES

FOR THE PERFORMANCE YOU DEMAND

GENERAC

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In Wisconsin call:
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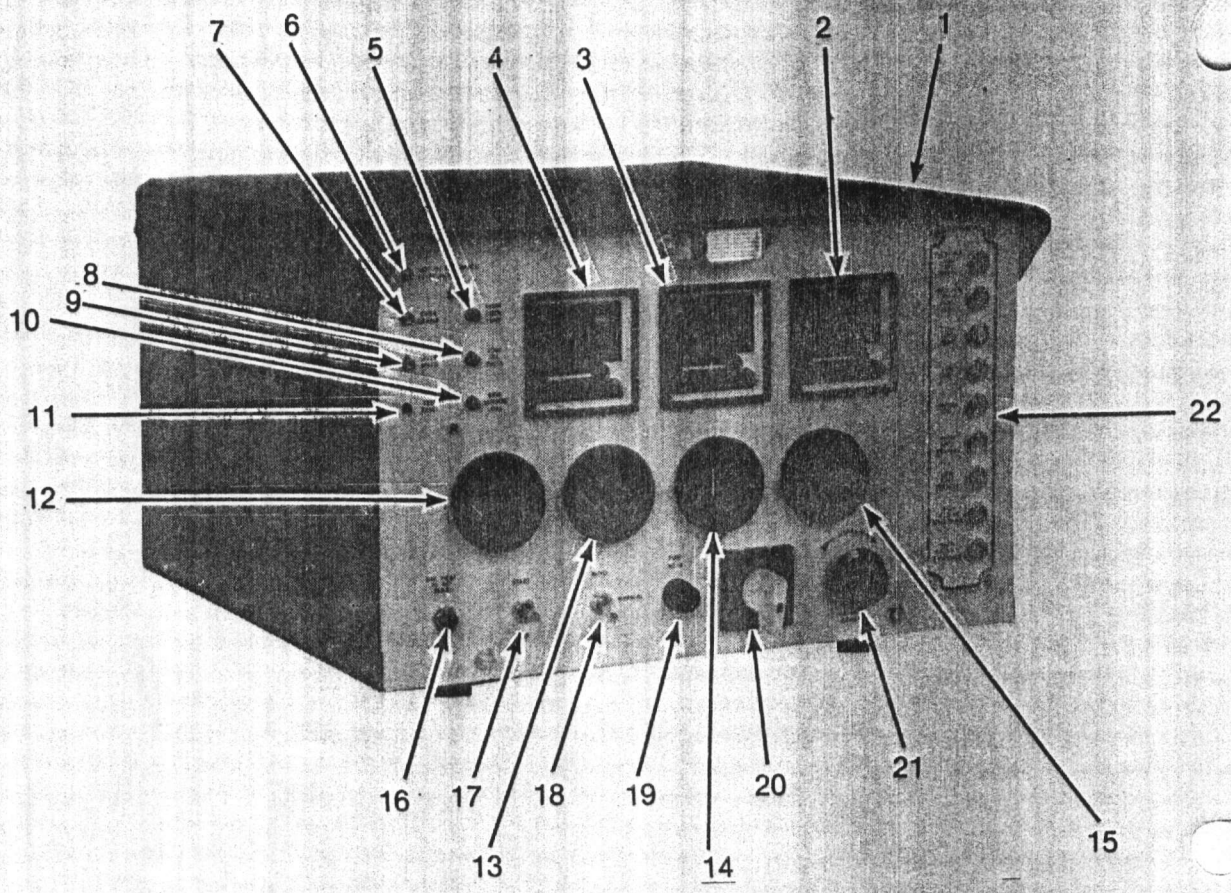
Telex: 201-302
Facs: 414/968-2106

DESIGNED AND MANUFACTURED IN THE U.S.A.

Let's take an in-depth look at how the new Generac Control Consoles operate by starting with the "C" Control Panel:



The New DC control/crank latch PCB combines the functions of the present 2 board system into 1 single board! [The new system will annunciate and latch up to 5 different fault conditions. A latch fault requires manual intervention before a restart can occur.]

Panel

1] Control Panel: Shock mounted control panel is isolated from the unit by vibration dampers.

Meters

2] Frequency Meter: Provides a constant monitor on the AC output frequency. 55 Hz or 65 Hz.

3] AC Ammeter: The "AC" ammeter provides current read out on any phase of the system.

4] AC Voltmeter: The "AC" voltmeter reads line-to-line output voltage.

Annunciators

5] High Coolant Temp/Low coolant Level: A failure latch, annunciator illumination and engine shutdown will occur if the water temperature exceeds the temperature switch setting or if the water level is below the temperature sending unit. The water sensors are checked only after the engine is at, or above, minimum run RPM. When engine RPM is below the minimum run point, the water sensors are not checked and thus have no control.

6] "Not In Auto" Mode: The red annunciator lamp will illuminate when the "Auto-Manual-Off" switch is not in the "Auto" position.

7] Overcrank: A failure latch, annunciator illumination, and system shutdown will occur if the engine fails to start within the 8 crank cycles [8 second crank-8 second rest] allowed by cyclic cranking. This failure will only occur when attempting to start in the auto mode.

8] Low Oil Pressure: If the system fails to produce proper oil pressure within 3 seconds after reaching minimum run RPM, the unit will shutdown without a failure latch or annunciator illumination. The system allows 4 attempts to restart with low oil pressure. After the 5th starting attempt, an oil pressure failure latch will occur, the annunciator lamp will illuminate and the engine will shut down. If the engine starts with proper oil pressure and oil pressure later drops, the system will shut the engine down 5 seconds later with a latched failure and an illuminated annunciator lamp.

9] Overspeed: A failure latch, annunciator illumination, and engine shutdown will occur after 4 seconds delay if engine RPM exceeds set RPM by 15% - 30%. If engine speed exceeds 30% of set RPM, an immediate failure latch occurs illuminating the annunciator lamp and shutting down the engine.

10] RPM Sensor Loss: Sensor loss failure latch will occur only while the engine is cranking. Sensor input must be present within 3 seconds after the crank relay is activated or latched failure will occur. The annunciator will be illuminated and the system will shutdown. Cranking RPM's must be greater than 2.5% of nominal engine RPM or again, latched failure will occur.

If sensor loss occurs while the engine is running [after minimum run RPM has been established as determined by the RPM sensor], the engine will shut down but a latched failure will NOT occur. Latched failure will occur on any attempt to recrank either manually or automatically if the sensor has failed.

11] Test Reset Switch: A single test/reset switch input will test the annunciator lamps. When the switch is depressed, all the failure annunciator lamps will illuminate. When the switch is released, the lamps will extinguish

and if a latched failure has occurred, will reset when the switch is released. The primary function of the switch is to test the annunciator lamps when depressed and to reset the system fault when released. Depressing the switch when the engine is running will only serve to check the annunciator lamps; THE ENGINE WILL NOT SHUT DOWN.

Gauges

12] Coolant Temperature Gauge: Provides a constant monitor on the engine coolant temperature. Range of 100 degrees-250 degrees F. [40 degrees - 120 degrees C].

13] Oil Pressure Gauge: Provides a constant monitor on the engine oil pressure. Range 0 - 100 PSI [0-600 Kpa]

14] DC Battery Charge Ammeter: Provides a constant monitor on the battery charge current from the engine alternator during continuous standby operation. Range 0 - 60 amps.

15] Hourmeter: Provides actual engine running time up to 99999.9 hours. This is an aid to be used for standard, as well as, Preventative Maintenance.

16] Pre-Heat 30 Second Maximum: [Diesel only] The PC board incorporates a pre-heat driver but no pre-heat relay on the board. On diesel units, the pre-heat relay will be external to the board. The pre-heat driver will be on when starting in the auto mode only and will turn off if a latched failure occurs or when the engine reaches minimum run RPM.

17] Manual Start-Run-Stop Switch: Panel mounted manual start-run-stop switch. When the manual start switch is activated, the unit will crank and attempt to start. The starter will remain engaged until the start switch is released or until the engine reaches minimum run RPM.

The manual stop detent disengages the run relay and shuts the engine down. It will cause the engine to shutdown whether the start was initiated manually or automatically. If the unit was started automatically and stopped manually, restart will not occur unless the two wire start opens and recloses. If the unit was started automatically and stopped manually, then restarted manually, stop will occur when the two wire start opens or the manual stop switch is activated.

18] Auto-Manual Off Switch: The automatic/manual/off switch simply activates the control console enabling the generator to start manually, start automatically, or shut the system off. A red annunciator lamp will indicate "Not in an auto mode" when this switch is out of Auto position.

Auto start responds to events which occur on the two wire start line. If the two wire start contact closes, the unit will crank in an attempt to start. If the 2 wire start contact opens, the unit will shut down and stop. When the two wire start contact opens, it is considered to be the same as a manual contact stop. In the auto start mode, cyclic cranking consists of 8 crank cycles of approximately 16 seconds duration for each cycle [8 second crank, 8 second rest time]

19] Control Console Fuse: This 30 amp fuse protects the control console circuits from overload.

20] Phase Selector Switch: This switch allows the operator to monitor the "AC" current and Voltage of any line.

21] Voltage Adjust Rheostat: Allows the operator to fine tune the line-to-line output voltage.

22] Optional Alarm Panel: Any combination of up to 9 alarm lamps with terminals may be selected, including low oil pressure pre-alarm, high coolant temp. pre-alarm, low coolant temp. pre-alarm, low fuel level, high oil temperature, switch off, high battery voltage and low battery voltage.

Additional Optional Accessories include a 3, 5 or 14 lamp remote annunciator panel that provides you with important generator information at locations remote to installation. The remote annunciator panel can be provided with an optional horn annunciator.

CONTROL CONSOLE "B"

Contains all the standard features of the "C" Control Console with the following exceptions:

Latched annunciation and shutdown is accomplished with a single lamp that annunciates and latches for the following failures--

Low water level
High water temperature
Low oil pressure
Overspeed
Overcrank

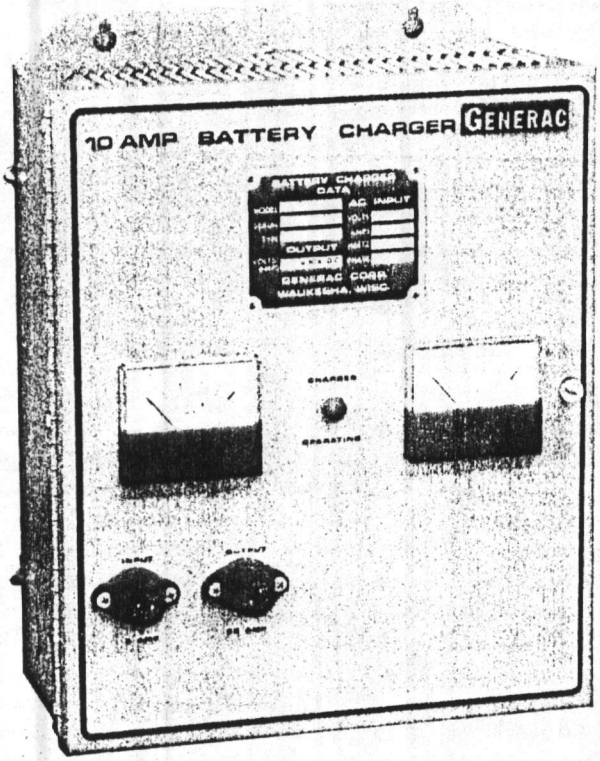
No RPM sensor - AC alternator frequency is utilized for starter disengagement and overspeed shutdown.

Options - 3 lamp remote annunciator panel
Annunciator Horn

DUAL RATE BATTERY CHARGER

Model

12AF - 12 VOLT CHARGER WITH AUTOMATIC FLOAT
12MF - 12 VOLT CHARGER WITH MANUAL FLOAT
24AF - 24 VOLT CHARGER WITH AUTOMATIC FLOAT
24MF - 24 VOLT CHARGER WITH MANUAL FLOAT



- **12 VOLT - 10 AMP**
- **24 VOLT - 10 AMP**
- **CONSTANT VOLTAGE**
- **FULLY AUTOMATIC**

"SCR" CONTROLLED

(Optional Accessories)

- ✓ **EQUALIZE TIME CHARGER**
- ✓ **AC CIRCUIT BREAKER**
- ✓ **AC POWER FAIL RELAY**
- ✓ **BATTERY VOLTAGE ALARM RELAY**

GENERAC'S 12 and 24 volt Battery Charge Systems with Automatic Float and Equalizer control, use an "SCR", (Silicone Controlled Rectifier), to maintain the proper charge voltage. The 120 volt, 60 Hz, line voltage is bridge rectifier system, utilizing Silicone Rectifiers. The Battery level is monitored and the charge rate is controlled by an "SCR".

MODELS 12AF & 24AF - AUTOMATIC FLOAT WITH AUTOMATIC EQUALIZER:
A control circuit on the printed circuit board monitors and limits the charge current to 10 Amps. The output voltage is determined by the charge current rate. When the charge current exceeds approximately 8 Amps, the charger automatically switches into "equalize" mode of operation. When the charge rate drops below 7 Amps, the charger switches back to "float" mode of operation. The battery charge voltage is 2.17 Volts per cell (in automatic float position), or 13 volts on a 12 volt battery and 26 volts on a 24 volt battery. (2.33 V/Cell - Equalize)

MODELS 12MF & 24MF - AUTOMATIC FLOAT WITH SELECTABLE EQUALIZE:
The manual version of GENERAC'S battery charge system, maintains the battery at 13 or 14 volts, depending upon whether the switch, or timer, is set on "Float" or "Equalize". This voltage will be maintained up to the maximum current output.

MORE STANDARD FEATURES

ALL MODELS HAVE PANEL MOUNTED 0-15 AMP DC AMMETER
12 VOLT MODELS HAVE PANEL MOUNTED 0-15 VOLT DC VOLTMETER
24 VOLT MODELS HAVE PANEL MOUNTED 0-30 VOLT DC VOLTMETER
ALL MODELS HAVE FUSED - INPUT / OUTPUT CIRCUITS
ALL MODELS INCORPORATE AN AUTOMATIC CURRENT LIMITER DESIGN
ALL MODELS - IMPROVED REGULATION DUE TO REMOTE SENSING CIRCUIT

(See reverse side for specifications)

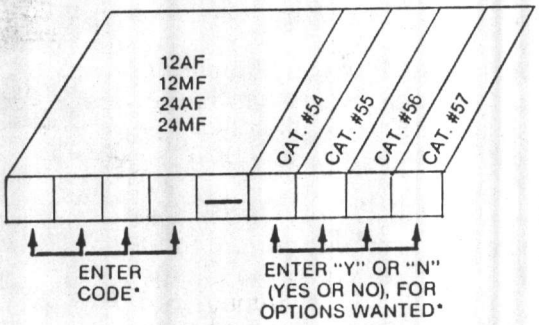
GENERAC

SPECIFICATIONS

Description	MODEL			
	12 AF	12 MF	24 AF	24 MF
Nominal Output Voltage	12V	12V	24V	24V
Adjustable Float Voltage	12.8 to 14.5 V.		25.6 to 29.0 V.	
Adjustable Equalized Voltage	Float V. to 14.5 V.		Float V. to 29.0 V.	
Recommended Float Voltage: Nickel-Cadmium batteries Lead-Acid batteries	 14 V. 10 Cell 13 V.		 28 V. 20 Cell 26 V.	
Voltage Regulation ±5%, 60 Hz, and ±10% Line Voltage	±2%		±2%	
Ampere Taper - Max. to Min.	10 Amp. to 0 Amp.		10 Amp. to 0 Amp.	
Manual Set Equalizer Timer	0 to 24 Hrs.		0 to 24 Hrs.	
Input Voltage	120 Volts		120 Volts	
Net Weight	21 Lb.		24 Lb.	
Dimensions Depth Width Height	 5½" 11½" 15½"		 7" 11½" 17½"	
Ambient Temperature	–40F to 140F (–40C to 60C)		–40F to 140F (–40C to 60C)	

HOW TO ORDER:

To order fill in each block of the following chart:



*(Note: Each block must have an entry).

CATEGORIES	CODE	DESCRIPTION
50	12AF	12 Volt Charger W/Automatic Float
51	12MF	12 Volt Charger W/Manual Float
52	24AF	24 Volt Charger W/Automatic Float
53	24MF	24 Volt Charger W/Manual Float
	OPTIONS	
54		Equalize Charge Timer (Used with 12MF or 24MF only)
55		AC Circuit Breaker
56		AC Power Fail Relay
57		Battery Voltage Monitor

GENERAC

Improving power by design

Generac Corporation P.O. Box 8, Waukesha, WI 53187
Phone (414) 544-4811 Telex 26-9687
Fax Group 2/3
(414) 968-2106 (414) 968-2306

Printed in U.S.A.

SB 3-510 — Jan., 83

LOW MAINTENANCE HIGH OUTPUT BATTERIES

- *More cold-cranking power*
- *Half the electrolyte loss*

Use this handy reference guide to help you choose the right Low Maintenance/High Output Battery, as well as Maintenance Free and Conventional Caterpillar Batteries.

CATERPILLAR

Depend on the Sure Starting-Power and Long Service Life of a Caterpillar Battery.

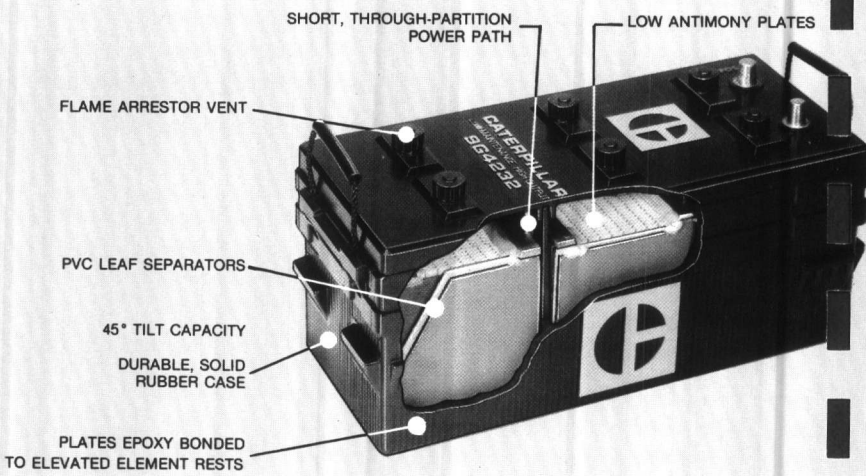
We Have One for Every Application

LOW MAINTENANCE/HIGH OUTPUT

- Extra Starting Power, Less Trouble to Maintain

Cat Low Maintenance/High Output batteries use a special alloy in their internal lead plates. It contains much less antimony than most batteries making it a better conductor of electricity. The result — more power for a superior performance. Cat Low Maintenance/High Output batteries have a higher cold cranking power for faster, more reliable severe-weather starts. They also have a longer battery life.

This special lead alloy also makes the Cat Low Maintenance/High Output more trouble-free. It results in less gassing, less terminal corrosion and less electrolyte loss. Compared with conventional-type batteries, the electrolyte level only needs to be checked half as often with the Cat Low Maintenance/High Output batteries.

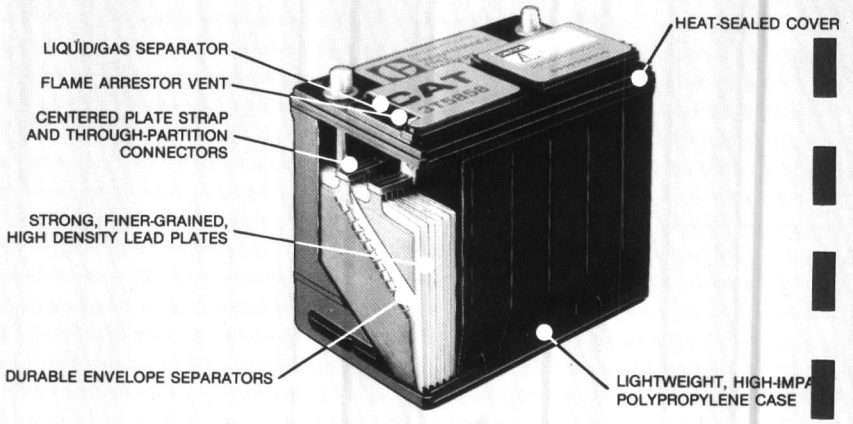


MAINTENANCE FREE

- Powerful, Tough and Trouble Free

Caterpillar's Maintenance Free batteries live up to their name. Never add water. They provide high cranking power, high reserve capacity and longer out-of-service life. They're designed with features which make them highly resistant to damage from vibration, road shock or severe temperature changes.

Cat Maintenance Free batteries fit most cars, trucks, light trucks, vans and recreational vehicles. The Original Equipment Maintenance Free battery has added durability and performance for rugged applications.

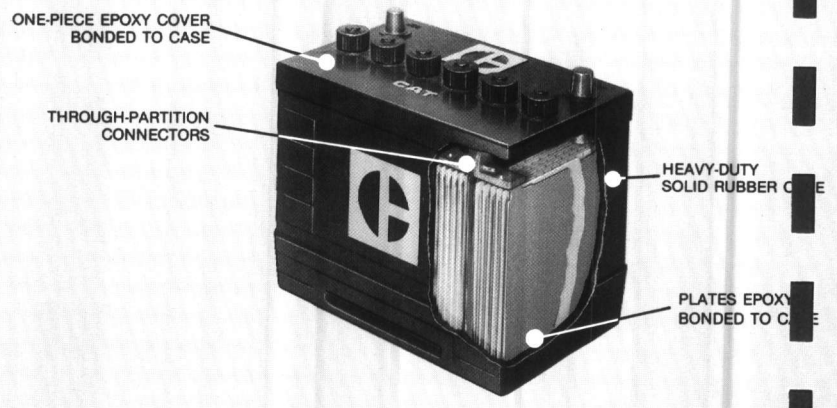


CONVENTIONAL DESIGN

- Tough, Dependable Power

Cat Conventional batteries feature unconventional power and durability. Depend on them! The through-partition connectors provide a short power path so you get consistent, reliable starting power. The battery case is one-piece solid rubber and is epoxy bonded to a one-piece cover. It is impact, vibration and corrosion resistant and is designed to prevent electrolyte spillage up to 45°.

These Cat batteries are tough. They're held to a 36 hour vibration test standard. Plates are epoxy bonded to the case to prevent separation and shorting.



Start with greater confidence.

Part Number	BCI Group Size	Case Type	Volts	Cold Cranking Power (CCA)	Reserve Capacity (Minutes)	Amp Hour Rating	Minimum Plates Per Cell	Overall Dimensions Inches (Millimeters) Length	Width	Height

CATERPILLAR LOW MAINTENANCE/HIGH OUTPUT BATTERY SPECIFICATIONS

9G4231	8D	SR	12	1,225	400	244	35	20.8 (526)	11.0 (278)	9.7 (246)
9G4232	4D	SR	12	925	290	172	25	20.8 (526)	8.7 (221)	9.7 (246)
9G4233	29H	SR	12	615	152	92	17	13.1 (333)	6.8 (173)	9.1 (232)
9G4234	24	SR	12	425	107	67	11	10.2 (259)	6.8 (173)	8.9 (226)
9G4250	2	SR	6	725	244	127	21	10.2 (259)	6.9 (176)	9.3 (237)
7T2456	4	SR	6	835	350	185	25	13.0 (330)	6.9 (176)	9.3 (237)

SR — Solid Rubber

CATERPILLAR MAINTENANCE FREE BATTERY SPECIFICATIONS

OEM										
3T5760	31	P	12	700	160	100	17	13.0 (330)	6.8 (173)	9.4 (239)
Automotive										
3T5859	22F	P	12	435	95	55	11	9.4 (241)	6.8 (173)	8.3 (212)
3T5857	24	P	12	550	135	80	12	10.3 (261)	6.8 (173)	8.8 (225)
3T5858	24F	P	12	550	135	80	12	10.3 (261)	6.8 (173)	8.8 (225)
3T5860	74*	P	12	550	135	80	12	10.3 (261)	7.0 (178)	8.4 (215)
Truck										
3T8198	31**	P	12	625	160	93	15	13.0 (330)	6.8 (173)	9.4 (239)

*Side Terminal **Threaded stud terminal P — Polypropylene

CATERPILLAR CONVENTIONAL BATTERY SPECIFICATIONS

8N0500	—	SR	8	860	315	185	29	19.0 (484)	7.3 (183)	10.3 (261)
9S4700	1	SR	6	600	200	95	17	9.1 (230)	7.0 (178)	8.7 (221)
9G9033	3D	SR	6	1,300	600	290	45	20.8 (527)	8.8 (222)	9.5 (243)
9S7120	3H	SR	6	680	245	120	21	11.8 (298)	6.9 (176)	9.1 (232)
9S7130	7D	SR	6	940	390	204	29	16.2 (411)	7.0 (178)	9.2 (234)

SR — Solid Rubber

POWERFUL BATTERIES WITH A POWERFUL WARRANTY

Effective with sales to the user on or after October 1, 1982.

Caterpillar Battery Limited Warranty

Caterpillar warrants new batteries sold by it bearing the name "Caterpillar" or "Cat" as follows:

1. To be free from defects in material and workmanship beginning with the date of delivery to the first user for one of the following periods:

Warranty Period	Use
72 months	Passenger cars and other on-highway vehicles through 680 kilogram (3/4 ton) capacity.
36 months	On-highway vehicles over 680 kilogram (3/4 ton) capacity, earthmoving and other off-highway equipment, lift trucks, electrical power generation products and marine products.
3 months	All applications without constant battery charging systems, and motive power applications.

2. Within the periods stated in Section 1, Caterpillar will replace a battery which it finds to be defective in material or workmanship with a new battery at the following cost to the user:

Period of Service	Cost
Six months or less from date of delivery.	No charge.
Longer than six months from date of delivery	$\frac{\text{Current Consumer's Battery Price} \times \text{Months of Service}}{\text{Months in warranty period}} = \text{User Cost}$

3. This warranty will be honored upon return of battery to a Caterpillar dealer or other establishment authorized by Caterpillar during normal working hours.

4. Taxes, installation or transportation costs which may result from replacement are not included in this warranty.

5. This warranty is expressly in lieu of any other warranties, express, or implied, including any warranty of merchantability or fitness for a particular purpose. Remedies under this warranty are limited to the provision of materials as specified herein. Caterpillar is not responsible for incidental or consequential damages.

5A. **BATTERIES SOLD FOR PERSONAL USE IN THE USA**

In the case of batteries sold for personal, family or household use in the United States of America, its territories and possessions, this section shall be substituted for Section 5.

This warranty is in lieu of any other express warranty. No implied warranties including any warranty of merchantability or fitness for a particular purpose shall be applicable after expiration of this Caterpillar limited warranty. Remedies under this warranty are limited to the provision of material as specified herein. Caterpillar is not responsible for incidental or consequential damages. Some states do not allow limitations on how long an implied warranty may last or allow the exclusion or limitation of incidental or consequential damages. Therefore, the above exclusion or limitation may not apply to you.

This warranty gives you specific legal rights. You may also have other rights which vary from state to state.

To find the location of the closest Caterpillar dealer or other establishment authorized by Caterpillar, call toll free (800) 447-4986 except in Illinois call (309) 673-3252.

6. Questions concerning this warranty or its application should be addressed to:

IN U.S.A.	OUTSIDE U.S.A.
Manager Service Operations Division USCD Service Caterpillar Tractor Co. 100 N.E. Adams Street Peoria, IL 61629 (309) 675-5002	CONTACT YOUR CATERPILLAR DEALER

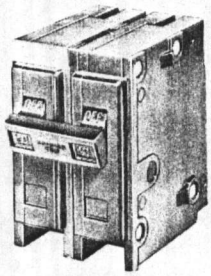
As used in this warranty the term "Caterpillar" means Caterpillar Tractor Co. or one of its subsidiaries whichever last sold the product involved.

August, 1980
Supersedes Application Data 29-160, pages 21-22, dated September, 1976
Mailed to: E, D, C/1901, 1928/DB

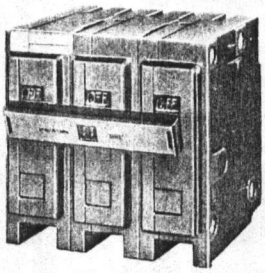
Standard Types HQP, QC, QPHW, QCHW, QHPX, QHCX, and MARK 75® Types QHCW and QHPW 10-125 Amperes, 1,2 and 3 poles, 120/240 and 240 Volts Ac.

AB DE-ION® Quicklag® Circuit Breakers

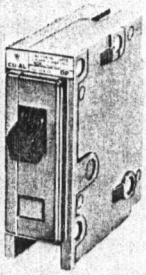
1 Pole
Type HQP
Type QPHW
Type QHPX



2 Pole
Type HQP
Type QPHW
Type QHPX

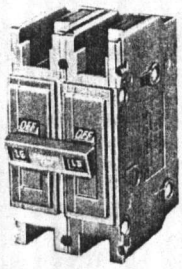


3 Pole
Type HQP
Type QPHW
Type QHPX

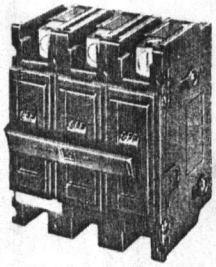


1 Pole
Type QHPW

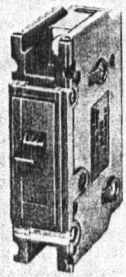
1 Pole
Type QC
Type QCHW
Type QHCX



2 Pole
Type QC
Type QCHW
Type QHCX



3 Pole
Type QC
Type QCHW
Type QHCX



1 Pole
Type QHCW

Note: MARK 75 Breaker Cases Are of Gray Molded Material

Continuous Ampere Ratings and Interrupting Capacity
Underwriters' Laboratories, Inc. Listed

Types HQP, QC
10,000 Amperes Asym, and Sym. I.C.①
1-Pole, 120/240 Volts Ac: 10 to 70 Amps.
2-Poles, 120/240 Volts Ac: 10 to 125 Amps.
2-Poles, 240 Volts Ac: 15 to 50 Amps.
3-Poles, 240 Volts Ac: 15 to 100 Amps.

Types QPHW, QCHW
22,000 Amperes Sym., 25,000 Amps Asym. I.C.
1-Pole, 120/240 Volts Ac: 15 to 70 Amps.
2-Poles, 120/240 Volts Ac: 15 to 100 Amps.
2-Poles, 240 Volts Ac: 15 to 100 Amps.
3-Poles, 240 Volts Ac: 15 to 100 Amps.

Types QHPX, QHCX
42,000 Amperes Sym
1-Pole 120/240 Volts Ac: 15-70 Amps.
2-Pole 120/240 Volts Ac: 15-100 Amps.
2-Pole 240 Volts Ac: 15-100 Amps.
3-Pole 240 Volts Ac: 15-100 Amps.

MARK 75 Types QHCW, QHPW
65,000 Amperes Sym., 75,000 Amperes Asym. I.C.
1-Pole, 120/240 Volts Ac: 15-30 Amps.
2-Poles, 120/240 Volts Ac: 15-30 Amps.
3-Poles, 240 Volts Ac: 15-20 Amps.

① Panelboards using these 10,000 I.C. breakers as Branch Breakers in series with Type CAH or QP 22,000 Amp I.C. Main Breakers can be listed for application at 22,000 amperes.

Application
These breakers are designed to protect small branch circuits in residential, commercial, or industrial applications. Typical uses are in loadcenters, lighting panelboards, and for individual mounting. They are listed with Underwriters' Laboratories Inc.

On all three-phase Delta, grounded B phase applications, refer to Westinghouse.

Construction
Features of these breakers include arc quenchers, quick-make, quick-break trip-free mechanisms, silver alloy contacts, electrically welded connections, and Molded case. The MARK 75 breakers have these same standard features, plus a higher grade molded case (identified by light gray color) for higher interrupting capacity.

Two and three-pole breakers are common trip to insure simultaneous manual or automatic opening of all poles. Ferrous parts are chemically plated to insure corrosion resistance.

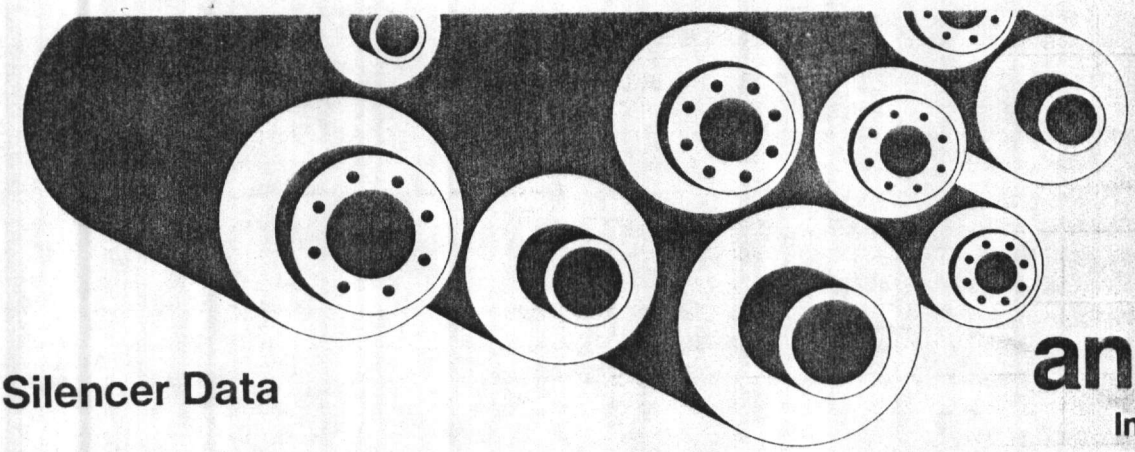
Federal Specification W-C-375b
See tabulation on page 20.1.

Terminals
Types HQP, QHPX, QPHW and QHPW plug-in breakers have a female, clamp-type line terminal which clips onto a bus stab projection of a panelboard or loadcenter. Load terminals are pressure-type connectors.

Breaker types QC, QHCW, QHCX and QCHW line and load terminals up to 20 amperes use binding head screws. Line and load terminals 30 amperes and above use pressure-type removable connectors.

Operation
The breaker is shown in the "off" position. In tripping, the contacts part and the handle moves to a mid-way position. Moving handle to extreme "off" position resets the breaker and it can be restored to service by moving handle to "on" position. Quicklag Breakers are U/L listed for inverted mounting and reverse feed.

Thermal Magnetic Trip
These breakers are equipped with a thermal magnetic trip. On temporary overloads, the breaker will not trip. On sustained overloads beyond safe limits for wire, the bi-metal will deflect, causing the breaker to trip. Instantaneous tripping is provided by a magnetic element under short circuit conditions. Trip elements are non-adjustable and non-interchangeable. Quicklag breakers are calibrated at 40°C as standard. Breakers applied in ambients higher than 40°C should be derated.



donaldson

BIU and BXU

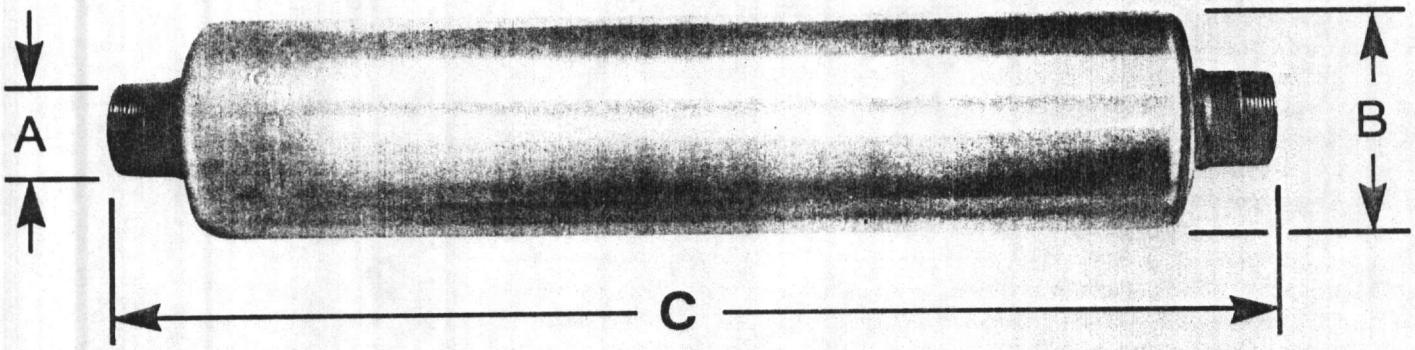
Industrial & Critical

Silencer Data

The new series of BIU and BXU Engine Silencers provide a decided size, weight and cost advantage over comparable units while delivering a high degree of silencing with no increase in pressure drop. These significant improvements are the result of combining years of heavy-duty engine exhaust silencing know-how with practical experience in industrial applications.

Features

- May be mounted vertically or horizontally.
- NPT connections (except 5" and 6").
- Durable fiberglass acoustical packing.
- High temperature protective primer.
- Backed by Donaldson's over thirty years of acoustical engineering and application know-how.
- Worldwide sales and service and product backup you can count on.



BIU Series

- Recommended for use in commercial or industrial area.
- Negligible pressure drop.
- Straight-through absorption type.
- Screw-on Flanges available.
- 2" thru 4" models are of heavy-duty, all-welded aluminized steel.
- 5" and 6" models are all-welded carbon steel.

Pipe-Threaded Connections

Model No.	A	B	C	WT (lbs)
BIU02-0096	2	6	23	10
BIU02-5100	2.5	6	27	12
BIU03-0178	3	8.5	30	19
BIU03-5119	3.5	8.5	31	22
BIU04-0343	4	9	36	26

Flange Connections*

BIU05-0395	5	10	48	60
BIU06-0499	6	10	60	75

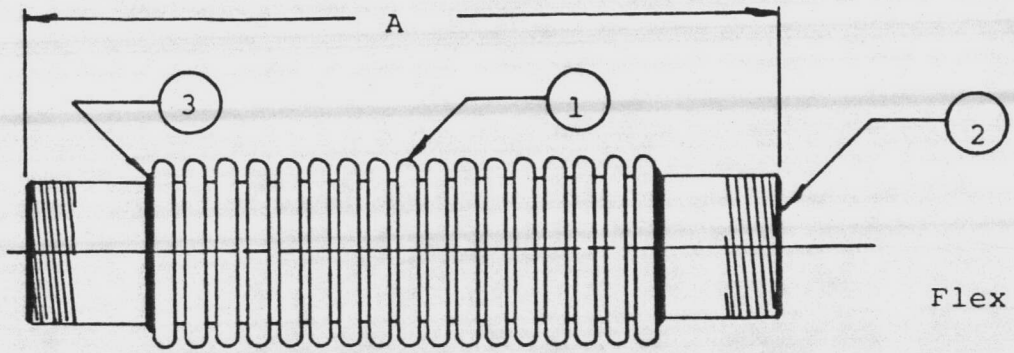
*Flange drilling to 125# ASA Standard.

BXU Series

- Recommended for use in residential/critical areas.
- Combination absorption and chamber design.
- Effectively attenuates the full range of sound frequencies.
- Complete body shell noise control.
- Screw-on flanges available.
- Heavy-duty, all-welded aluminized steel construction.

Model No.	A	B	C	WT (lbs)
BXU01-5070	1.5	4.4	24	10
BXU02-0092	2	6	32	18
BXU02-5107	2.5	8.8	40.5	44
BXU03-0174	3	8.8	41.25	44
BXU03-5122	3.5	10.4	53.62	66
BXU04-0337	4	10.4	53.62	66

Dimensions are in inches and weights in pounds.



Flex material Stainless Steel

Size	A	1.	2.	3.	Assembly Part Number
1-1/2"	18	Corrugated Diesel Hose	Carbon Steel Male Pipe Thread	T.I.G.(Heli-arc)	DMX 3 M1-1/2- 18
2"	18	Same	Same	Same	DMX 3 M2-18
2-1/2"	18	Same	Same	Same	DMX 3 M2-1/2-18
3"	18	Same	Same	Same	DMX 3 M3-18
3-1/2"	18	Same	Same	Same	DMX 3 M3-1/2-18
4"	18	Same	Same	Same	DMX 3 M4-18
5"	18	Same	Same	Same	DMX 3 M5-18
6"	18	Same	Same	Same	DMX 3 M6-18

CUSTOMER:

JOB NAME:

P.O.# :

REVISIONS		
NO.	DATE	BY
1		
2		
3		
4		
5		

DME, INCORPORATED
14005 MARQUARDT AVENUE SANTA FE SPRINGS, CA 90670

CORRUGATED EXHAUST FLEX-ASSEMBLY
MALE PIPE THREADED ENDS

DRAWN BY Dm	SCALE None	MATERIAL Noted
CHK'D MM	DATE 5/14/81	DRAWING NO. DMX51481
TRACED	APP'D	

PRYCO
DAY TANK SYSTEMS

Effective June 1, 1985

SUBMITTAL MANUAL

STANDARD DAY TANKS

Heavy gauge steel, removable inspection plate 6" square gasketed, fuel level gauge, "press to test" switch, heavy duty float switch, "pump-running" indicator light, tank drain, 5-1" NPT threaded pipe connections plus fuel inlet, heavy duty 1/3HP, 115VAC, 1 phase, 60Hz motor w/2GPM bronze gear pump w/stainless steel shafts, removable top cover, tanks interior-epoxy coated, exterior-painted Medium Gray or color choice, all plumbing and wiring pre-connected.

MODEL	GAL.	LBS.	KG.
PY5	5	60	27
PY10	10	85	39
PY15	15	95	41
PY25	25	105	48
PY50	50	160	73
PY75	75	190	86
PY100	100	210	95
PY150	150	370	168
PY200	200	450	204
PY275	275	500	227
PY300	300	525	238
PY400	400	570	258
PY500	500	593	267

UL LISTED TANKS

Heavy gauge steel, removable gasketed inspection plate 6" square, fuel level gauge, "press to test" switch, heavy duty float switch, "pump running" indicator light, tank drain, heavy duty 1/3HP, 115VAC, 1 phase, 60Hz motor w/2GPM bronze gear pump w/stainless steel shafts, removable top cover, 4-1" NPT threaded pipe connections and fuel inlet plus required vent opening (PY10-PY50 2", PY75-PY150 3", PY275 4"), interior-epoxy coated, exterior-Medium Gray or color choice, all plumbing and wiring pre-connected, UL Listed Label.

MODEL NUMBER	CAPACITY IN GAL	VENT OPENING
PY10UL	10	2"
PY25UL	25	2"
PY50UL	50	2"
PY75UL	75	3"
PY100UL	100	3"
PY150UL	150	3"
PY275UL	275	4"

MANUAL TANKS

Heavy gauge steel, 6" sq. removable gasketed inspection plate, fuel level gauge, 5-1" NPT threaded pipe connections plus fuel inlet manual fill cap, exterior primer painted, interior epoxy coated. Dimensions same as standard day tanks.

SIZES	SIZES
PY10M	PY300M
PY15M	PY400M
PY25M	PY500M
PY50M	PY600M
PY75M	PY700M
PY100M	PY800M
PY150M	PY900M
PY200M	PY1000M
PY275M	

TRIM TANKS

Where space is limited, heavy gauge steel, 6" sq. removable gasketed inspection plate, fuel level gauge, 5-1" NPT threaded pipe connections plus fuel inlet, interior epoxy coated, exterior color choice, 1 1/2" leg included in dimensions.

MODEL	CAPACITY IN GALS	WIDTH INCHES	DEPTH INCHES	HEIGHT INCHES
PY10T	10	24"	8"	19½"
PY25T	25	36"	8"	25½"
PY50T	50	36"	8"	59"
PY75T	75	36"	8"	46½"

L.A. TANKS

L.A.F.D. permit label on standard day tank add on all the required components.

OPT#	DESCRIPTION
205	low fuel level alarm
209	high fuel level alarm
300	2" manual fill cap
315	fuel strainer
340	drain-petcock valve
360	solenoid valve
375	foot valve
461	hand pump
464	engine connection pipe stems (set of two)